PERMIT APPLICATION NUMBER: GPA24-00002

CITY OF OCEANSIDE
ENGINEERING DIVISION

PRIORITY DEVELOPMENT PROJECT

STORM WATER QUALITY MANAGEMENT PLAN

FOR

GARRISON ELEMENTARY SCHOOL

ENGINEER OF WORK

Alisa S. Vialpando 04/14/2025

Signature Date

Alisa S. Vialpando, PE # 47945, Exp. 12/31/2025

PREPARED FOR:

The True Life
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PREPARED BY:

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San Diego, CA 92121

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How to Use This Template

This template, assembled by GHD Inc. on behalf of the City of Oceanside, is for the development of Storm Water Quality Management Plans (SWQMPs) for Priority Development Projects (PDPs) proposed within Oceanside, CA. It is based on requirements set forth in the Regional Water Quality Control Board's National Pollutant Discharge Elimination System MS4 Permit that covers the San Diego Region (Order No. R9-2013-0001).

All references within the template refer to the City of Oceanside BMP Design Manual dated February 2016 (Manual). Use of this template in conjunction with the Manual is intended to help a project applicant develop a SWQMP compliant with City of Oceanside and MS4 Permit requirements.

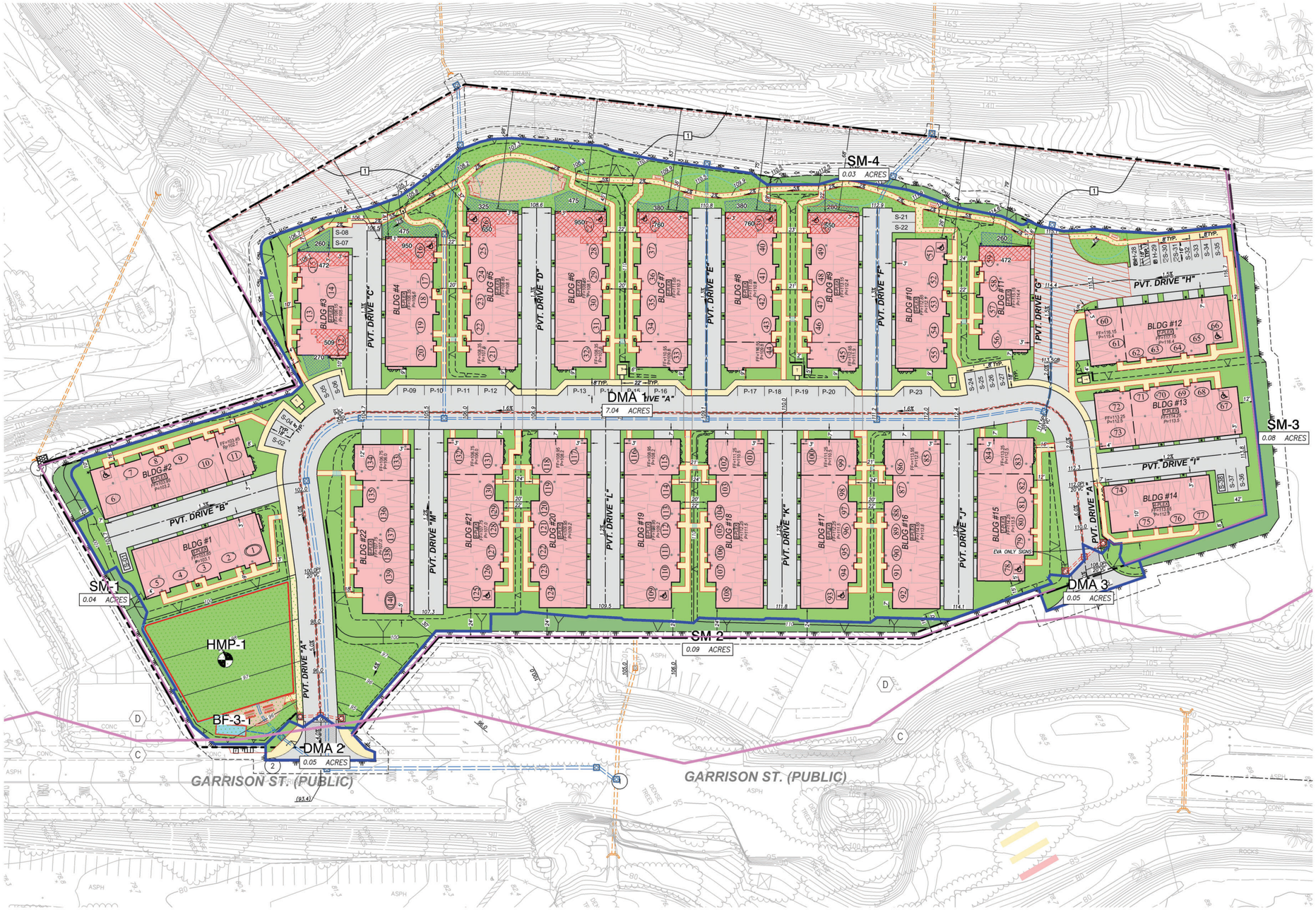
Applicable elements of SWQMP were update in accordance with the January 2022 city of Oceanside BMP Design Manual.

Template Date: February 16, 2016

Assembled By:

Quick Reference Guide

Item	Project Information
Project Name	Garrison elementary school
Application Number(s)	GPA24-00002
Project Address	333 Garrison Street, Oceanside, CA 92054
Total Parcel Area	362,290 sq. ft.
Project Description	• The Garrison Elementary School property is an 8.317-acre • The site is currently occupied by the former E. G. Garrison Elementary School, which has now been abandoned. Current site improvements include ten (10) classroom buildings, a miscellaneous-use building, paved parking, sporting fields and drive isle areas, as well as landscaping and hardscaping areas. The eastern portion of the site is vacant of structures and graded. • The site is proposed to construct a residential development, community open spaces and associated utility/street improvements. The project proposes 27 multi-family buildings consisting of 138 total units. Additionally, the development will install an underground storage facility with a proprietary biofiltration unit downstream. These systems will serve to meet water quality, detention, and hydromodification requirements.
Proposed Disturbed Area	321,618 sq. ft.
Created or Replaced Impervious	245,981 sq. ft.
Project Hydrologic Unit Watershed	☐ Santa Maria ☐ San Luis Rey ☒ Carlsbad
Required to implement HMP	☒ Yes ☐ No



LEGEND:

	SYMBOL:
PROJECT BOUNDARY	
DMA BOUNDARY	
DAYLIGHT	
HYDROLOGIC SOIL TYPE BOUNDARY	
PROPOSED STORM DRAIN	
PROPOSED BYPASS STORM DRAIN	
EXISTING STORM DRAIN TO REMAIN	
FLOW LINE	
SUBAREA ACREAGE	00.00 ACRES
DMA ICON	DMA 1
PROPRIETARY BIOFILTRATION BMP	
IMPERVIOUS - ROOF	
IMPERVIOUS - ASPHALT	
IMPERVIOUS - CONCRETE	
SEMI-PERVIOUS - DG OR TURF	
PERVIOUS - LANDSCAPED AREAS	
PERVIOUS - SELF-MITIGATING AREA	
DISPERSION AREAS PER SD-5 (6,073 SFT.)	6,073 SFT.
LANDSCAPE PER SD-5 (3,105 SFT.)	3,105 SFT.
INLET	
HYDROLOGIC SOIL TYPE	D
POINT OF COMPLIANCE	X
STRUCTURAL BMP	
DOWNSPOUT LOCATION	

NOTES:
-AN ADDITIONAL 20% OF THE BUILDING FOOTPRINT WAS FACTORED INTO THE IMPERVIOUS AREA CALCULATIONS TO ACCOUNT FOR ANY FUTURE IMPERVIOUS SURFACES ADDED TO THE OPEN SPACE AREAS. THIS FIGURE WILL BE VERIFIED DURING THE FINAL DESIGN PHASE OF THE OPEN SPACE AREAS.
-DOWNSPOUT LOCATIONS AND DISPERSION AREAS ARE PRELIMINARY AND ARE SUBJECT TO CHANGE DURING THE ENGINEERING PHASE. DISPERSION PATTERNS AND AREAS WILL BE VERIFIED DURING SUCH PHASE.

SITE DESIGN BMPs:

- [1] SD-2 CONSERVE NATURAL AREAS
- [ ] SD-3 MINIMIZE IMPERVIOUS AREAS
- [ ] SD-4 MINIMIZE SOIL COMPACTION
- [ ] SD-5 IMPERVIOUS AREA DISPERSION
- [ ] SD-6 RUNOFF COLLECTION
- [ ] SD-7 LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT SPECIES

SOURCE CONTROL BMPs:

- SC-1 PREVENTION OF ILLICIT DISCHARGES TO MS4
- SC-2 STORM DRAIN STENCILING OR SIGNAGE
- SC-6 ADDITIONAL BMPS BASED ON POTENTIAL SOURCES OF RUNOFF POLLUTANTS
  - 6A ON-SITE STORM DRAIN INLETS
  - 6D1 NEED FOR FUTURE INDOOR & STRUCTURAL PEST CONTROL
  - 6D2 LANDSCAPE/OUTDOOR PESTICIDE USE
  - 6N FIRE SPRINKLER TEST WATER
  - 6O MISCELLANEOUS DRAIN OR WASH WATER
  - 6P PLAZAS, SIDEWALKS, AND PARKING LOTS

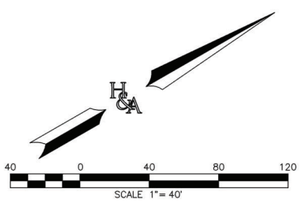
UNDERLYING SOIL GROUP : C & D
APPROXIMATE DEPTH TO GROUNDWATER > 30'

SITE DESIGN NOTES:

-SD-3 IS IMPLEMENTED BY DECREASING THE CITY OF OCEANSIDE MINIMUM STREET WIDTH ON ALL PRIVATE STREETS.
-SD-6 BUILDING PADS WILL HAVE EARTHEN SWALES IN THE ULTIMATE CONDITION TO CONVERY RUNOFF FORM ROOFS THROUGH LANDSCAPE. BROW DITCHES ARE PROPOSED AT THE BASE OF THE UNDISTURBED SLOPES TO COLLECT RUNOFF AND PREVENT IT FROM MIZING WITH RUNOFF FROM IMPERVIOUS AREAS, ENSURING THAT THE WATER IS ROUTED TO THE BYPASS SYSTEM.
-SD-8 HARVESTING AND USING PRECIPITATION HAS BEEN DEEMED INFEASIBLE.

AREA DRAINING TO EACH POC:

-POC 1 = 9.91 AC (DMA 1 & DMA 3 + BYPASS AREA)
-POC 2 = 0.43 AC (DMA 2 + EXISTING ROAD)
-POC 3 = 0.37 AC (EXISTING SLOPES)





NO DUMPING PLACARD
FOR INLETS DETAIL
NOT TO SCALE

PREPARED BY:
HUNSAKER & ASSOCIATES
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PLANNING 9707 Waples Street
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SURVEYING PH(858)558-4500- FX(858)558-1414

DMA MAP
GARRISON ELEMENTARY SCHOOL
CITY OF OCEANSIDE, CALIFORNIA

MAP 1 OF 1

W.O.# 3214-0002

R:\1778\Hyd\SWQMP\CAD\1778$ DMA Map.dwg[]Apr-14-2025:16:02

TREE MITIGATION & PROTECTION NOTES:

FINAL MITIGATION VALUE: 393" FOR 1:1 REPLACEMENT OF TREE CALIPER FOR NEW TREES MAY BE REQUIRED BY CITY OF OCEANSIDE PLANNING DEPARTMENT. 321" OF NEW CALIPER TREES PROPOSED.

EXISTING TREES NOTED AS "PRESERVE" SHALL BE PROTECTED IN PLACE. NO MECHANICAL OR OTHER GRADING WHICH WOULD ALTER GROUND ELEVATION AROUND BASE OR WITHIN DRIPLINE OF TREES SHALL BE ALLOWED, NO MECHANICAL EQUIPMENT OR TRENCHING WITIN THE DRIPLINE CAUSING DISTURBANCE TO TREE ROOTS SHALL OCCUR; NO EXCESSIVE PRUNING SHALL OCCUR; NO STORAGE OF EQUIPMENT SHALL OCCUR UNDER DRIPLINES; NO ACTIVITIES SHALL CAUSE SOIL COMPACTION AROUND TREE CANOPY OR TRUNK. IF EXISTING TREES TO BE PRESERVED ARE DAMAGED OR DESTROYED BY CONSTRUCTION ACTIVITIES, TREES SHALL BE REPLACED IN KIND WITH SAME SPECIES AND SIZE (DIAMETER AT BREAST HEIGHT) PER CITY REQUIREMENT.

ROOT BARRIER NOTE:

ROOT BARRIERS SHALL BE INSTALLED ADJACENT TO ALL PAVING SURFACES WHERE A PAVING SURFACE IS LOCATED WITHIN 6 FEET OF A TREE TRUNK ON SITE (PRIVATE) AND WITHIN 10 FEET OF A TREE TRUNK IN THE RIGHT-OF-WAY (PUBLIC). ROOT BARRIERS SHALL EXTEND 5 FEET IN EACH DIRECTION FROM THE CENTERLINE OF THE TRUNK, FOR A TOTAL DISTANCE OF 10 FEET. ROOT BARRIERS SHALL BE A MINIMUM 24 INCHES IN DEPTH. INSTALLING A ROOT BARRIER AROUND THE TREE'S ROOT BALL IS UNACCEPTABLE.

CITY OF OCEANSIDE PLAN NOTES:

1. FINAL LANDSCAPE PLANS SHALL ACCURATELY SHOW PLACEMENT OF TREES, SHRUBS, AND GROUNDCOVERS.
2. LANDSCAPE ARCHITECT SHALL BE AWARE OF UTILITY, SEWER, AND STORM DRAIN EASEMENTS AND PLACE PLANTING LOCATIONS ACCORDINGLY TO MEET CITY OF OCEANSIDE REQUIREMENTS.
3. ALL REQUIRED LANDSCAPE AREAS SHALL BE MAINTAINED BY OWNER OR AS STATED IN ANY LEGAL DOCUMENT SUCH AS BUT NOT LIMITED TO A LEASE AGREEMENT. THE LANDSCAPE AREAS SHALL BE MAINTAINED PER CITY OF OCEANSIDE REQUIREMENTS.
4. NO TRASH ENCLOSURES ARE PROPOSED; TRASH BINS TO BE STORED IN PRIVATE GARAGES. REFERENCE TRASH DAY PLAN BY ARCHITECT.
5. ALL STREET TREES SHALL COMPLY WITH STREET TREE STANDARD 211A.

IRRIGATION NOTE:

AN AUTOMATIC IRRIGATION SYSTEM SHALL BE INSTALLED TO PROVIDE COVERAGE FOR ALL PROPOSED PLANTING AREAS SHOWN ON THE PLAN. LOW PRECIPITATION EQUIPMENT SHALL PROVIDE SUFFICIENT WATER FOR PLANT GROWTH WITH A MINIMUM WATER LOSS DUE TO WATER RUN-OFF AND TIME SCHEDULED. IRRIGATION SYSTEMS SHALL USE HIGH QUALITY, AUTOMATIC CONTROL VALVES, CONTROLLERS, ONSITE WEATHER SENSOR, AND OTHER NECESSARY IRRIGATION EQUIPMENT. ALL COMPONENTS SHALL BE OF NON-CORROSIVE MATERIAL. ALL DRIP SYSTEMS SHALL BE ADEQUATELY FILTERED AND REGULATED PER THE MANUFACTURER'S RECOMMENDED DESIGN PARAMETERS. ALL IRRIGATION IMPROVEMENTS SHALL FOLLOW THE CITY OF OCEANSIDE GUIDELINES AND WATER CONSERVATION ORDINANCE.

PLANT LEGEND

SYMBOL	CODE	QTY	BOTANICAL NAME	COMMON NAME	CONT	WATER USE	SF CANOPY
TREES							
	ARB MAR	13	ARBUTUS X 'MARINA' STANDARD, DOUBLE STAKE. 2" CALIPER, 30' CANOPY (706.86 SF).	MARINA STRAWBERRY TREE STANDARD	24"BOX	LOW	9,189.18
	GEI PAR	51	GEIJERA PARVIFLORA STANDARD, DOUBLE STAKE. 2" CALIPER, 25' CANOPY (490.87 SF).	AUSTRALIAN WILLOW	24"BOX	LOW	25,034.37
	MEL NES	20	MELALEUCA NESOPHILA 1.5" CALIPER, 10' CANOPY (78.54 SF).	PINK MELALEUCA	15 GAL	LOW	1,570.80
	OLE SWA	26	OLEA EUROPAEA 'SWAN HILL' MULTI. 3" CALIPER.20' CANOPY (314.16 SF)	SWAN HILL FRUITLESS OLIVE	36"BOX	LOW	8,168.16
	PAR DES	13	PARKINSONIA X 'DESERT MUSEUM' STANDARD, DOUBLE STAKE. 3" CALIPER. 22' CANOPY (380.13 SF).	DESERT MUSEUM PALO VERDE	36"BOX	LOW	4,941.69
	QUE AGR	12	QUERCUS AGRIFOLIA STANDARD, DOUBLE STAKE. 1.5" CALIPER. 35' CANOPY (962.11 SF)	COAST LIVE OAK	15 GAL	LOW	11,545.32
	CHI PIN	14	X CHITALPA TASHKENTENSIS 'PINK DAWN' STANDARD, DOUBLE STAKE. 2" CALIPER. 20' CANOPY (314.16 SF). NOTE: 321" OF NEW CALIPER TREES PROPOSED.	PINK DAWN CHITALPA	24"BOX	LOW	4,398.24
							64,847.76 SF TOTAL
SYMBOL	CODE	QTY	BOTANICAL NAME	COMMON NAME	CONT	WATER USE	
GROUND COVERS							
	FES MAR	12,875 SF	FESTUCA ARUNDINACEA 'MARATHON II'	MARATHON II FESCUE	SOD	HIGH	

LOT COVERAGE:

CATEGORY	SF	% COVER
NEW LANDSCAPING	97,702	27.0
NATURAL LANDSCAPING	46,194	12.7
PAVING (ROADS, WALKS)	108,638	30.0
BUILDINGS	109,755	30.3
TOTAL:	362,289	100.0

CAP ITEM 3049:

PERCENTAGE TREE CANOPY COVER*: 17.9%

PERCENTAGE SITE PERMEABLE COVER**: 39.7%

*SEE CANOPY COVER ON PLANT LEGEND

**SEE LOT COVERAGE/ TOTAL INCLUDES NEW AND NATURAL LANDSCAPING

REFERENCE NOTES LEGEND

CODE	DESCRIPTION
1	5' HEIGHT TAN PRECISION BLOCK SCREEN WALL, SEE CONCEPTUAL WALL AND FENCING PLAN
2	BENCH WITH BACK
3	LAWN PLAY AREA
4	CONCRETE WALKS - NATURAL GREY COLOR, MEDIUM BROOM FINISH. ALL PEDESTRIAN PAVING (BOTH DECORATIVE AND STANDARD) SHALL COMPLY WITH THE MOST CURRENT EDITION OF THE AMERICAN DISABILITY ACT.
5	PICNIC TABLES
6	DECOMPOSED GRANITE
7	DOG PARK ENCLOSED WITH 4' HEIGHT TUBE STEEL FENCE AND SELF-CLOSING GATES
8	ACTIVE TURF AREA, 105' X 88'
9	5' HEIGHT TUBE STEEL FENCE, BLACK, SEE CONCEPTUAL WALL AND FENCING PLAN
10	DOG WASTE STATION
11	RETAINING WALL PER CIVIL EINGEER'S PLANS.

EXISTING VEGETATION ABOVE RETAINING WALLS & LIMIT OF GRADING TO REMAIN, TYP.

EXISTING TREE TO BE PRESERVED. SEE CL-2.1 AND ARBORIST'S REPORT.

15' SLOPE SETBACK

EXISTING TREE TO BE PRESERVED. SEE CL-2.1 AND ARBORIST'S REPORT.

EXISTING TREE TO BE PRESERVED. SEE CL-2.1 AND ARBORIST'S REPORT.

EX. DIEGAN SAGE SCRUB, PROTECT IN PLACE WHERE POSSIBLE.

PROPOSED BROW DITCH, TYP., REFER TO CIVIL ENGINEER'S PLANS

PROPOSED BROW DITCH, TYP., REFER TO CIVIL ENGINEER'S PLANS

VINES ON WALL

GARRISON STREET RIGHT OF WAY (R/W)

PROPERTY LINE (PL)

150' STOPPING SIGHT DISTANCE @ 25 MPH PER CALTRANS HIGHWAY DESIGN MANAUL CH. 200-1 DATED 7-01-2020, REFERENCE CIVIL ENGINEER'S PLANS

REFER TO CIVIL ENGINEER'S PLANS FOR ALL DRAINAGE SWALES, EXISTING AND PROPOSED GRADES, UTILITIES, AND EASEMENT INFORMATION.

STREET TREE & TREE SPACING NOTE:

STREET TREES AND OTHER TREES SHALL BE SPACED:

1. 8 FEET FROM TRANSFORMERS, CABLE, AND PULL BOXES.
2. 5' FROM MAILBOXES.
3. 5 FEET FROM FIRE HYDRANTS, ALL SIDES.
4. 10 FEET FROM CENTERLINE OF ALL UTILITY LINES WITHOUT EASEMENTS (SEWER, WATER, STORM DRAINS, DOUBLE CHECK DETECTORS, AIR RELIEF VALVES, AND GAS).
5. 10 FEET FROM EASEMENT BOUNDARIES (SEWER, WATER, STORM DRAINS, ACCESS OR OTHER UTILITIES).
6. 10 FEET FROM DRIVEWAYS (UNLESS A LINE OF SIGHT IS DETERMIEND BY THE TRAFFIC DIVISION TO BE OTHERWISE)
7. 10' FROM TRAFFIC AND DIRECTIONAL SIGNS.
8. 15 FEET (MINIMUM) FROM STREETLIGHTS, OTHER UTILITY POLES, (DETERMINED BY SPECIFICATIONS).
9. STREET TREES SHALL BE PLANTED 3' OUTSIDE RIGHT-OF-WAY IF THE RIGHT-OF-WAY DOES NOT ALLOW SPACE, SUBJECT TO THE CITY ENGINEER'S APPROVAL.
10. LINE OF SIGHT AT ARTERIALS, COLLECTOR AND LOCAL STREETS SHALL BE REVIEWED AND DETERMINED BY TRAFFIC ENGINEER. A MINIMUM OF TWENTY-FIVE FEET (25') FROM STREET INTERSECTION OR AS APPROVED BY THE TRAFFIC ENGINEER.
11. MINIMUM FIFTEEN FEET (15') STREETLIGHT AND STOP SIGN OR CLEARANCE DETERMINED BY SPECIFICATIONS.
12. SCREEN ALL UTILITIES ACCORDING TO SPECIFIC AGENCY REQUIREMENTS.

FIRE DEPARTMENT NOTES:

1. LANDSCAPE IMPROVEMENT PLAN SET AND INSTALLATION ARE REQUIRED TO IMPLEMENT APPROVED FIRE DEPT. REGULATIONS, CODES, AND STANDARDS AT THE TIME OF PROJECT APPROVAL
2. ALL FIRE HYDRANTS, DOUBLE CHECK DETECTORS, POST INDICATING VALVES, AND FIRE DEPARTMENT CONNECTIONS SHALL BE PROVIDED WITH A 3-FOOT CLEARANCE AROUND ALL FIRE APPARATUSES.
3. ALL TREES AT MATURITY SHALL MEET A HORIZONTAL CLEARANCE ALONG ALL ROADWAYS FROM CURB TO CURB. HORIZONTAL ROADWAY CLEARANCE FOR A ONE-STORY BUILDING IS 28-FEET WIDE.
4. ALL TREES AT MATURITY SHALL MEET A VERTICAL CLEARANCE OF 14-FEET FROM THE TOP OF THE ROADWAY TO THE LOWEST BRANCHES.

PLANTING NOTE:

THE SELECTION OF PLANT MATERIAL IS BASED ON CULTURAL, AESTHETIC, AND MAINTENANCE CONSIDERATIONS. ALL PLANTING AREAS SHALL BE PREPARED WITH APPROPRIATE SOIL AMENDMENTS, FERTILIZERS, AND APPROPRIATE SUPPLEMENTS BASED UPON A SOILS REPORT FROM AN AGRICULTURAL SUITABILITY SOIL SAMPLE TAKEN FROM THE SITE. GROUND COVERS OR BARK MULCH SHALL FILL IN BETWEEN THE SHRUBS TO SHIELD THE SOIL FROM THE SUN, EVAPOTRANSPORATION AND RUN-OFF. ALL THE FLOWER AND SHRUB BEDS SHALL BE MULCHED TO A 3" DEPTH TO HELP CONSERVE WATER, LOWER THE SOIL TEMPERATURE AND REDUCE WEED GROWTH. THE SHRUBS SHALL BE ALLOWED TO GROW IN THEIR NATURAL FORMS. ALL LANDSCAPE IMPROVEMENTS SHALL FOLLOW THE CITY OF OCEANSIDE GUIDELINES.

RECREATIONAL LAWNS:

PROJECT SHALL BE CONSISTENT WITH AB 1572 AND HAVE NO NON-FUNCTIONAL TURF AREAS IN HOA COMMON AREAS. ALL TURF/LAWN AREAS PROPOSED IN RECREATIONAL OPEN SPACE AREAS AND ARE OF SIZES TO MAKE THEM FUNCTIONAL.

WATER METER:

ALL COMMON AREAS WILL BE IRRIGATED BY A DEDICATED IRRIGATION METER MANAGED AND PAID FOR BY THE HOA.

LANDSCAPE MAINTENANCE:

ALL PROPOSED LANDSCAPE SHALL BE INSTALLED BY DEVELOPER AND MAINTAINED BY DEVELOPER UNTIL THE FORMATION OF A NEW HOMEOWNER'S ASSOCIATION (HOA), AT WHICH TIME ALL LANDSCAPE MAINTENANCE DUTIES WILL BE PERFORMED BY THE NEW HOA. MAINTENANCE DUTIES INCLUDE MOWING, TRIMMING GROUNDCOVER, BUSHES, AND TREES, WEEDING, TRASH REMOVAL, IRRIGATION, AND ROUTINE IRRIGATION SYSTEM REVIEWS AND ADJUSTMENTS AND REPAIRS.

SHEET INDEX

SHEET	DESCRIPTION
CL-1.1	CONCEPTUAL LANDSCAPE PLAN
CL-1.2	CONCEPTUAL WALL & FENCE PLAN
CL-1.3	CONCEPTUAL PLANT PALETTE
CL-1.4	CONCEPTUAL AMENITIES PLAN
CL-2.1	CONCEPTUAL EXISTING VEGETATION DISPOSITION PLAN

SCALE: 1"=40'-0"

0 20' 40' 80'

CONCEPTUAL LANDSCAPE PLAN

TRUE NATURE LANDSCAPE ARCHITECTURE

KIMBERLY TRUE, MLA
315 Meigs Road Suite A-131
Santa Barbara, CA 93109
TrueNatureDesign.com
805-770-2100

Date 5/10/2024

Revisions
07/02/2024 PLN PLCK 1
10/25/2024 PLN PLCK 2
04/14/2025 PLN PLCK 3

Garrison Street Residential Development
333 Garrison Street
Oceanside, California, 92054

REGISTERED LANDSCAPE ARCHITECT KIMBERLY J. TRUE NO. 6596 STATE OF CALIFORNIA SIGNATURE 4/30/2027 EXP. DATE

NOT FOR BIDDING OR CONSTRUCTION PURPOSES

Drawn By KJT
Sheet
CL-1.1
Of 5

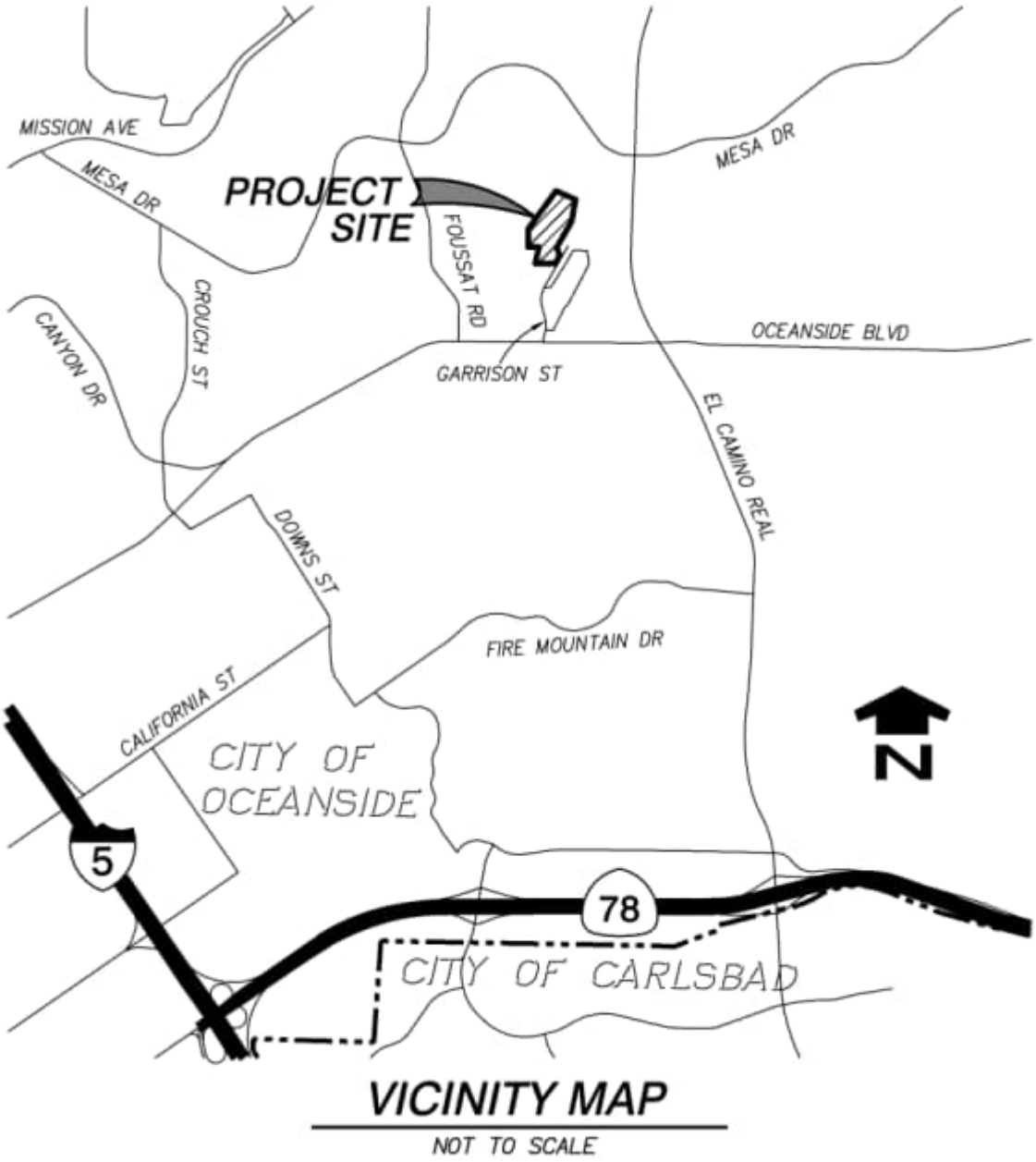
APN 162-020-26
GPA24-00002, ZA24-00001, T24-00002, D24-00010
Job No. 1906

SUBMITTAL RECORD

Use this Table to keep a record of submittals of this SWQMP. Each time the SWQMP is re-submitted, provide the date and status of the project. In last column indicate changes that have been made or indicate if response to plan check comments is included. When applicable, insert response to plan check comments behind this page.

Submittal Number	Date	Project Status	Changes
1	05/10/2024	☒ Preliminary Design/ Planning/ CEQA ☐ Final Design	Initial Submittal
2	07/03/2024	☒ Preliminary Design/ Planning/ CEQA ☐ Final Design	Addressed 1st round of plan check comments.
3	11/06/2024	☒ Preliminary Design/ Planning/ CEQA ☐ Final Design	Address plan check comments.
4	04/14/2025	☒ Preliminary Design/ Planning/ CEQA ☐ Final Design	Address plan check comments.

– **Project Vicinity Map**



Applicability of Permanent, Post-Construction Storm Water BMP Requirements (Storm Water Intake Form for all Development Permit Applications)	Form I-1

Project Identification

Project Name: Garrison Elementary School

Permit Application Number: GPA24-00002 | Date: 11/03/2024

Determination of Requirements

The purpose of this form is to identify permanent, post-construction requirements that apply to the project. This form serves as a short summary of applicable requirements, in some cases referencing separate forms that will serve as the backup for the determination of requirements.

Answer each step below, starting with Step 1 and progressing through each step until reaching "Stop".
Refer to the manual sections and/or separate forms referenced in each step below.

Step	Answer	Progression
Step 1: Is the project a "development project"? See Section 1.3 of the manual for guidance.	☒Yes	Go to Step 2.
	☐No	Stop. Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below.
Discussion / justification if the project is not a "development project" (e.g., the project includes *only* interior remodels within an existing building):		
Step 2: Is the project a Standard Project, PDP, or exception to PDP definitions? To answer this item, see Section 1.4 of the manual *in its entirety* for guidance, AND complete Form I-2, Project Type Determination.	☐Standard Project	Stop. Standard Project requirements apply, including Standard Project SWQMP.
	☒PDP	PDP requirements apply, including PDP SWQMP. Go to Step 3.
	☐ Exception to PDP definitions	Stop. Standard Project requirements apply. Provide discussion and list any additional requirements below. Prepare Standard Project SWQMP.
Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:		

Form I-1 Page 2 of 2		
Step	Answer	Progression
Step 3. Is the project subject to earlier PDP requirements due to a prior lawful approval? See Section 1.10 of the manual for guidance.	☐Yes	Consult the [City Engineer] to determine requirements. Provide discussion and identify requirements below. Go to Step 4.
	☒No	BMP Design Manual PDP requirements apply. Go to Step 4.
Discussion / justification of prior lawful approval, and identify requirements (*not required if prior lawful approval does not apply*):		
Step 4. Do hydromodification control requirements apply? See Section 1.6 of the manual for guidance.	☒Yes	PDP structural BMPs required for pollutant control (Chapter 5) and hydromodification control (Chapter 6). Go to Step 5.
	☐No	Stop. PDP structural BMPs required for pollutant control (Chapter 5) only. Provide brief discussion of exemption to hydromodification control below.
Discussion / justification if hydromodification control requirements do <u>not</u> apply:		
Step 5. Does protection of critical coarse sediment yield areas apply? See Section 6.2 of the manual for guidance.	☐Yes	Management measures required for protection of critical coarse sediment yield areas (Chapter 6.2). Stop.
	☒No	Management measures not required for protection of critical coarse sediment yield areas. Provide brief discussion below. Stop.
Discussion / justification if protection of critical coarse sediment yield areas does <u>not</u> apply: There are coarse sediment yield areas north but not upstream of the site; these areas drain east and away from the site. No Critical Coarse sediment yield areas exist on site per WMAA map.		

Project Type Determination Checklist			Form I-2
Project Information			
Project Name: Garrison Elementary School			
Permit Application Number: GPA24-00002			
Project Type Determination: Standard Project or PDP			
The project is (select one): ☐ New Development × Redevelopment			
The total proposed newly created or replaced impervious area is: _245,981_ ft² (__5.65__) acres			
Is the project in any of the following categories, (a) through (f)?			
Yes ☐	No ☒	(a)	New development projects that create 10,000 square feet or more of impervious surfaces (collectively over the entire project site). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
Yes ☒	No ☐	(b)	Redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site on an existing site of 10,000 square feet or more of impervious surfaces). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
Yes ☒	No ☐	(c)	New and redevelopment projects that create 5,000 square feet or more of impervious surface (collectively over the entire project site), and support one or more of the following uses: (i) Restaurants. This category is defined as a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption SIC code 5812). (ii) Hillside development projects. This category includes development on any natural slope that is twenty-five percent or greater. (iii) Parking lots. This category is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce. (iv) Streets, roads, highways, freeways, and driveways. This category is defined as any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles.

Form I-2 Page 2 of 2			
Yes ☐	No ☒	(d)	New or redevelopment projects that create or replace 2,500 square feet or more of impervious surface (collectively over the entire project site), and discharging directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands). Note: ESAs are areas that include but are not limited to all Clean Water Act Section 303(d) impaired water bodies; areas designated as Areas of Special Biological Significance by the State Water Board and SDRWQCB; State Water Quality Protected Areas; water bodies designated with the RARE beneficial use by the State Water Board and SDRWQCB; and any other equivalent environmentally sensitive areas which have been identified by the Copermittees. See manual Section 1.4.2 for additional guidance.
Yes ☐	No ☒	(e)	New development projects that support one or more of the following uses: (i) Automotive repair shops. This category is defined as a facility that is categorized in any one of the following SIC codes: 5013, 5014, 5541, 7532-7534, or 7536-7539. (ii) Retail gasoline outlets. This category includes retail gasoline outlets that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic of 100 or more vehicles per day.
Yes ☒	No ☐	(f)	New or redevelopment projects that result in the disturbance of one or more acres of land and are expected to generate pollutants post construction. *Note: See manual Section 1.4.2 for additional guidance.*

Does the project meet the definition of one or more of the PDP categories (a) through (f) listed above?

☐ No – the project is not a PDP (Standard Project).

☒ Yes – the project is a PDP.

The following is for redevelopment PDPs only:

The area of existing (pre-project) impervious area at the project site is: 165,848 ft^2 (A)
The total proposed newly created or replaced impervious area is: 245,981 ft^2 (B)
Percent impervious surface created or replaced (B/A)*100: 148 %
The percent impervious surface created or replaced is (select one based on the above calculation):

☐ less than or equal to fifty percent (50%) – only new impervious areas are considered PDP

OR

☒ greater than fifty percent (50%) – the entire project site is a PDP

Site Information Checklist For PDPs	Form I-3B (PDPs)
Project Summary Information	
Project Name	Garrison Elementary School
Project Address	333 Garrison Street, Oceanside, CA 92054
Assessor's Parcel Number(s)	162-020-24-00 & 162-030-14-00
Permit Application Number	GPA24-00002
Project Watershed (Hydrologic Unit)	Select One: ☐Santa Margarita 902 ☐San Luis Rey 903 ☒Carlsbad 904
Parcel Area (total area of Assessor's Parcel(s) associated with the project)	8.32 Acres (362,290 Square Feet)
Area to be disturbed by the project (Project Area)	7.38 Acres (321,618 Square Feet)
Project Proposed Impervious Area (subset of Project Area)	5.65 Acres (245,981 Square Feet)
Project Proposed Pervious Area (subset of Project Area)	1.73 Acres (75,638 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Parcel Area.	

Hydrologic Unit	Hydrologic Area	Hydrologic Sub-Area
Santa Margarita 902.00	☐ Ysidora 902.10	☐ Lower Ysidora 902.11
San Luis Rey 903.00	☐ Lower San Luis 903.10	☐ Mission 903.11
		☐ Bonsall 903.12
Carlsbad 904.00	☒ Loma Alta 904.10	Not Applicable
	☐ Buena Vista Creek 904.20	☐ El Salto 904.21
		☐ Vista 904.22
	☐ Agua Hedionda 4.30	☐ Los Monos 904.31

Description of Existing Site Condition and Drainage Patterns

Current Status of the Site (select all that apply):

☒Existing development

☒Previously graded but not built out

☐Agricultural or other non-impervious use

☒Vacant, undeveloped/natural

Description / Additional Information:

The site is currently occupied by the former E. G. Garrison Elementary School, which has now been abandoned. Current site improvements include ten (10) classroom buildings, a miscellaneous-use building, paved parking, sporting fields and drive isle areas, as well as landscaping and hardscaping areas. The northern portion of the site is vacant of structures and graded.

Existing Land Cover Includes (select all that apply):

☒Vegetative Cover

☒Non-Vegetated Pervious Areas

☒Impervious Areas

Description / Additional Information:

Existing land cover consists of buildings, parking lots, sport fields, drive isle areas, landscaping, hardscaping areas, vegetated slopes, and vacant graded but not developed pads.

Underlying Soil belongs to Hydrologic Soil Group (select all that apply):

☐NRCS Type A

☐NRCS Type B

☒NRCS Type C

☒NRCS Type D

Approximate Depth to Groundwater:

☐Groundwater Depth < 5 feet

☐5 feet < Groundwater Depth < 10 feet

☐10 feet < Groundwater Depth < 20 feet

☒Groundwater Depth > 20 feet

Description of Existing Site Topography and Drainage [How is storm water runoff conveyed from the site? At a minimum, this description should answer (1) whether existing drainage conveyance is natural or urban; (2) describe existing constructed storm water conveyance systems, if applicable; and (3) is runoff from offsite conveyed through the site? If so, describe]:

The drainage area under study encompasses approximately 10.71 acres, including an offsite area of 2.56 acres, with a total imperviousness of 40%. Of this offsite area, 2.18 acres are located to the north and east of the property and drain through the project site, merging with the northern onsite drainage. This commingled runoff then flows southeasterly towards an existing Type G catch basin located offsite. This catch basin collects the combined flows from the onsite central drainage area, which are channeled by an existing 30-inch RCP, and from western offsite flows entering the onsite storm drain system through two storm inlets (as per Inlet Apron for Culvert per As-built GP 28110) and a Type F catch basin (as per Improvement Plans R-02993-R-03010C and R-03252-R-03260A). Subsequently, the total flow is directed easterly beneath Garrison Street via existing 22"X36" CMP arch per DWG R-02758, to discharge into Garrison Creek (POC 1) and eventually into Loma Alta Creek.

Runoff from the southern portion of the site drains southward, collected by existing catch basins (Brooks boxes), and is then routed to the existing 18" storm drain as per As-built GP 28110. This 18" storm drain discharges into the offsite southern parking lot (POC 3), where the water first surface flows and then is channeled through the existing parking lot gutter to an existing catch basin. It then crosses Garrison Street to eventually discharge into Garrison Creek and subsequently into Loma Alta Creek.
Runoff from the southeastern portion of the site is conveyed via surface flow in a southeast direction towards Garrison Street (POC 2). There, it travels southward along the street's curb and gutter system for approximately 800 feet before being intercepted by a Type B curb inlet, which discharges into Garrison Creek, as detailed in DWG R-02611. From this point, Garrison Creek flows south towards Oceanside Boulevard and its flows are captured by a 60" RCB and conveyed across Oceanside Boulevard and Industry Street before discharging into Loma Alta Creek.

Loma Alta Creek then flows westerly, ultimately discharging into the Pacific Ocean via the Loma Alta Slough.

Description of Proposed Site Development and Drainage Patterns

Project Description / Proposed Land Use and/or Activities:

The proposed project is a 140-unit townhome development consisting of multi-family structures, driveways, access roads, sidewalks, landscaped areas, and open space areas.

List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features):

Impervious surfaces will include roofs, roads and drives, sidewalks and walkways as well as other semi-pervious surfaces like the pavers proposed at the entrance of the project off Private Street 'A'.

List/describe proposed pervious features of the project (e.g., landscape areas):

The project proposes approximately 32,300 square feet of open space areas for future recreation purposes.
The remaining pervious areas consist of landscape areas between buildings and behind sidewalks.
The site also includes semi-pervious areas as described above

Does the project include grading and changes to site topography?

☒Yes

☐No

Description / Additional Information:

The site is currently graded and with structures in most of it. The project will demolish the existing structures and grade streets, sidewalks, and 42 multi-family building pads. There will be additional grading along the perimeter.

Does the project include changes to site drainage (e.g., installation of new storm water conveyance systems)?

☒Yes

☐No

Description / Additional Information:

The project proposes two underground storm drain systems; One of the dual systems is necessary to collect and convey the onsite 100-year runoff through the project area to the proposed underground storage facility (CMP or equivalent). The second system (bypass storm drain system) is to replace the existing 30" storm drain that runs through the site and conveys the offsite flows and part of the onsite flows to the existing eastern channel. The existing 30" storm drain will be removed.

Identify whether any of the following features, activities, and/or pollutant source areas will be present (select all that apply):

☒Onsite storm drain inlets

☐Interior floor drains and elevator shaft sump pumps

☐Interior parking garages

☒Need for future indoor & structural pest control

☒Landscape/outdoor pesticide use

☐Pools, spas, ponds, decorative fountains, and other water features

☐Food service

☐Refuse areas

☐Industrial processes

☐Outdoor storage of equipment or materials

☐Vehicle and equipment cleaning

☐Vehicle/equipment repair and maintenance

☐Fuel dispensing areas

☐Loading docks

☒Fire sprinkler test water

☒Miscellaneous drain or wash water

☒Plazas, sidewalks, and parking lots

Form I-3B Page 6 of 10		
Identification of Receiving Water Pollutants of Concern		
Describe path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable): All three POCs eventually discharge into the Garrison Creek, which flows south for approximately 2,500 feet before discharging into the Loma Alta Creek. Loma Alta Creek flows west for approximately 2.54 miles before it discharges into the Pacific Ocean west of Buccaneer Park.		
List any 303(d) impaired water bodies within the path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable), identify the pollutant(s)/stressor(s) causing impairment, and identify any TMDLs for the impaired water bodies:		
303(d) Impaired Water Body	Pollutant(s)/Stressor(s)	TMDLs
Loma Alta Creek	Benthic Community Effects, Bifenthrin, Cyfluthrin, Cyhalothrin, Indicator Bacteria, Nitrogen, Phosphorus, Pyrethroid, Selenium, Toxicity	N/A
Loma Alta Slough	Eutrophic and Indicator Bacteria	Phosphorus (alternative TMDL-addressed by regional ms4 permit per Carlsbad WMA WQIP)
Pacific Ocean	Indicator Bacteria	N/A

Form I-3B Page 7 of 10			
Identification of Project Site Pollutants* *Identification of project site pollutants is only required if flow-thru treatment BMPs are implemented onsite in lieu of retention or biofiltration BMPs (note the project must also participate in an alternative compliance program unless prior lawful approval to meet earlier PDP requirements is demonstrated)			
Identify pollutants expected from the project site based on all proposed use(s) of the site (see manual Appendix B.6):			
Pollutant	Not Applicable to the Project Site	Expected from the Project Site	Also a Receiving Water Pollutant of Concern
Sediment			
Nutrients			
Heavy Metals			
Organic Compounds			
Trash & Debris			
Oxygen Demanding Substances			
Oil & Grease			
Bacteria & Viruses			
Pesticides			

Note: Indicator Bacteria shall be addressed as a Pollutant of Concern (POC) for projects located in the Lower San Luis Hydrologic Area and for projects that discharge to the Pacific Ocean Shoreline within the boundaries of the City of Oceanside.

Note: Nutrients shall be addressed as a Pollutant of Concern (POC) for projects located in the Loma Alta Hydrologic Area.

Hydromodification Management Requirements

Do hydromodification management requirements apply (see Section 1.6 of the manual)?

☒Yes, hydromodification management flow control structural BMPs required.

☐No, the project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐No, the project will discharge runoff directly to conveyance channels whose bed and bank are concrete-lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐No, the project will discharge runoff directly to an area identified as appropriate for an exemption by the WMAA for the watershed in which the project resides.

Description / Additional Information (to be provided if a 'No' answer has been selected above):

Critical Coarse Sediment Yield Areas*

*This Section only required if hydromodification management requirements apply

Based on the maps provided within the WMAA, do potential critical coarse sediment yield areas exist within the project drainage boundaries?

☐Yes

☒No, no critical coarse sediment yield areas to be protected based on WMAA maps

If yes, have any of the optional analyses presented in Section 6.2 of the manual been performed?

☐6.2.1 Verification of GLUs Onsite

☐6.2.2 Downstream Systems Sensitivity to Coarse Sediment

☐6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite

☐No optional analyses performed, the project will avoid critical coarse sediment yield areas identified based on WMAA maps

If optional analyses were performed, what is the final result?

☐No critical coarse sediment yield areas to be protected based on verification of GLUs onsite.

☐Critical coarse sediment yield areas exist but additional analysis has determined that protection is not required. Documentation attached in Attachment 8 of the SWQMP.

☐Critical coarse sediment yield areas exist and require protection. The project will implement management measures described in Sections 6.2.4 and 6.2.5 as applicable, and the areas are identified on the SWQMP Exhibit.

Discussion / Additional Information:

Based on the existing drainage patterns and tributary areas, there are no PCCSYAs located upstream of the project. The nearest areas are to the north but do not drain through the site or near its boundary.

Flow Control for Post-Project Runoff*

*This Section only required if hydromodification management requirements apply

List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit.

POC 1, comprising around 10.7 acres, directs its total flow eastward beneath Garrison Street through the existing 22"X36" CMP arch, ultimately discharging into Garrison Creek and, subsequently, into Loma Alta Creek.
POC 2 conveys runoff from the southeastern portion of the site is conveyed via surface flow in a southeast direction towards Garrison Street. There, it travels southward along the street's curb and gutter system for approximately 800 feet before being intercepted by a Type B curb inlet, which discharges into Garrison Creek, as detailed in DWG R-02611. From this point, Garrison Creek flows south towards Oceanside Boulevard and its flows are captured by a 60" RCB and conveyed across Oceanside Boulevard and Industry Street before discharging into Loma Alta Creek.
POC 3 manages runoff from the southern part of the site, directing it southward. The runoff is collected by existing catch basins (Brooks boxes) and then routed to the 18" storm drain per As-built GP 28110. This storm drain discharges into the offsite southern parking lot, where the water surface flows initially and then channels through the existing parking lot gutter to a catch basin. Crossing Garrison Street, it ultimately discharges into Garrison Creek and flows into Loma Alta Creek.

Has a geomorphic assessment been performed for the receiving channel(s)?

☒No, the low flow threshold is 0.1Q2 (default low flow threshold)

☐Yes, the result is the low flow threshold is 0.1Q2

☐Yes, the result is the low flow threshold is 0.3Q2

☐Yes, the result is the low flow threshold is 0.5Q2

If a geomorphic assessment has been performed, provide title, date, and preparer:

Discussion / Additional Information: (optional)

Other Site Requirements and Constraints

When applicable, list other site requirements or constraints that will influence storm water management design, such as zoning requirements including setbacks and open space, or local codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements.

Optional Additional Information or Continuation of Previous Sections As Needed

This space provided for additional information or continuation of information from previous sections as needed.

Garrison Street Improvements

This project proposes an entrance off Garrison Street to provide access to private drives, courtyards, and buildings. Due to design and space constraints, a portion of Private Drive 'A' drains to Garrison Street without being intercepted by onsite storm drains or structural BMPs. However, the project will propose pavers to address water quality requirements. Please refer to the "Geotechnical and Infiltration Evaluation" section 5.5.2 under Attachment 6 for thickness recommendations. Additionally, the construction of this project will include private sewer and potable water connections to the existing public lines along Garrison Street. This development must trench and resurface Garrison Street at the tie-in locations. This work, however, is considered maintenance and should not require water-quality treatment.

Oceanside Mesa Garrison Lift Station (D24-00007)

The City of Oceanside, in collaboration with X Engineering & Consulting, Inc., is currently advancing the expansion of the Mission Basin groundwater purification facility. As part of this development, a sewer lift station is proposed north of the site and is currently in the final engineering stage. It is expected that the lift station will be constructed before the commencement of this multi-family project. This development will then have a primary entrance off Garrison Street and an emergency entrance off the access road to the sewer lift station, with the project's grading tying into the edge conditions of the future lift station.
However, since the lift station is designed to address its own water quality, detention, and hydromodification requirements, it is not included in this development.

Source Control BMP Checklist for All Development Projects (Standard Projects and PDPs)	Form I-4

Project Identification

Project Name: Garrison Elementary School

Permit Application Number: GPA24-00002

Source Control BMPs

All development projects must implement source control BMPs SC-1 through SC-6 where applicable and feasible. See Chapter 4 and Appendix E of the manual for information to implement source control BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the source control BMP as described in Chapter 4 and/or Appendix E of the manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project has no outdoor materials storage areas). Discussion / justification may be provided.

Source Control Requirement	Implemented?		
SC-1 Prevention of Illicit Discharges into the MS4	☒ Yes	☐ No	☐ N/A

Discussion / justification if SC-1 not implemented:

All proposed walkways will drain to landscaped areas where applicable, and eventually to structural BMPs, thereby eliminating non-storm water discharges into the MS4. Efficient irrigation will be used. Additionally, BMPs found under SC-6 will help prevent illicit discharges; please see below for additional information.

SC-2 Storm Drain Stenciling or Signage	☒ Yes	☐ No	☐ N/A

Discussion / justification if SC-2 not implemented:

- Locations of inlets are shown on exhibits.
- All inlets will have a placard with the words “No dumping! Flows to Bay” or similar.
- Maintain and periodically replace inlet placards.
- Provide storm water pollution prevention information to new owners, lessees, or operations.

SC-3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A

Discussion / justification if SC-3 not implemented:

The are no facilities proposed to store materials. The only structures proposed are multi-family buildings.

Form I-4 Page 2 of 3			
Source Control Requirement	Implemented?		
SC-4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-4 not implemented: The are no outdoor work areas anticipated for this project. No materials will be stored outside.			
SC-5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-5 not implemented: No trash enclosures are proposed for this project. Each independent unit will handle its trash in dedicated bins.			

Form I-4 Page 3 of 3			
SC-6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below)	Implemented?		
Onsite storm drain inlets	☒ Yes	☐ No	☐ N/A
Interior floor drains and elevator shaft sump pumps	☐ Yes	☐ No	☒ N/A
Interior parking garages	☐ Yes	☐ No	☒ N/A
Need for future indoor & structural pest control	☒ Yes	☐ No	☒ N/A
Landscape/outdoor pesticide use	☒ Yes	☐ No	☐ N/A
Pools, spas, ponds, decorative fountains, and other water features	☐ Yes	☐ No	☒ N/A
Food service	☐ Yes	☐ No	☒ N/A
Refuse area	☐ Yes	☐ No	☒ N/A
Industrial processes	☐ Yes	☐ No	☒ N/A
Outdoor storage of equipment or materials	☐ Yes	☐ No	☒ N/A
Vehicle and equipment cleaning	☐ Yes	☐ No	☒ N/A
Vehicle/equipment repair and maintenance	☐ Yes	☐ No	☒ N/A
Fuel dispensing areas	☐ Yes	☐ No	☒ N/A
Loading docks	☐ Yes	☐ No	☒ N/A
Fire sprinkler test water	☒ Yes	☐ No	☒ N/A
Miscellaneous drain or wash water	☒ Yes	☐ No	☐ N/A
Plazas, sidewalks, and parking lots	☒ Yes	☐ No	☐ N/A

Discussion / justification if SC-6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for all "No" answers shown above.

- SC-6A: All onsite storm drain inlets to have a placard with legend "NO DUMPING, FLOWS TO BAY", or similar.
- SC-6B: There's NO "Interior floor drains and elevator shaft sump pumps" contemplated for this project.
- SC-6C: There's NO "Interior parking garages" contemplated for this project.
- SC-6D1: There's "Need for future indoor & structural pest control" contemplated for this project. Integrated pest management information will be provided to owners, lessees, and operators. Proposed building will integrate features that discourage entry of pests. Please see below for some examples:
    - Roof with simple geometry to avoid promoting hiding spots.
    - Metal drip edge to discourage pests from getting into the roofing at the eaves.
    - Install leaf guards over gutters to keep nesting materials out of gutters
    - Metal screens in all roof vents.
    - Use pest-resistant wall materials.
    - Seal holes or joints in exterior or other cavity walls.
    - Install screens in doors and windows.
    - Ensure that doors and windows are fit tightly and consider durable frames to prevent warping.
    - Ensure wood surfaces sit at least six inches above a concrete surface.
    - Avoid planting shrubs or trees near the home's walls.
    - Ensure patios, walks, driveways, and vegetated surfaces slope away from buildings.
- SC-6D2: Final landscape plans will accomplish all the following:
    - Preserve existing drought tolerant trees, shrubs, and ground cover to the maximum extent possible.
    - Landscaping designed to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to storm water pollution.
    - Where landscaped areas are used to retain or detain storm water, use plants that are tolerant of periodic saturated soil conditions.
    - Use pest-resistant plants, especially adjacent to hardscape.
    - Ensure successful establishment, appropriate selection of plants to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.
- SC-6E: There's NO "Pools, spas, decorative fountains, and other water features" contemplated for this project.
- SC-6F: There's NO "Food service" contemplated for this project.
- SC-6G: There's NO "Refuse areas" contemplated for this project.
- SC-6H: There's NO "Industrial processes" contemplated for this project.
- SC-6I: There's NO "Outdoor storage of equipment or materials" contemplated for this project.
- SC-6J: There's NO "Vehicle and equipment cleaning" contemplated for this project.
- SC-6K: There's NO "Vehicle/equipment repair and maintenance" contemplated for this project.
- SC-6L: There's NO "Fuel dispensing areas" contemplated for this project.
- SC-6M: There's NO "Loading docks" contemplated for this project.
- SC-6N: There's "Fire Sprinkler Test Water" contemplated for this project. Fire sprinkler line flushing shall be disposed into the sanitary sewer.
- SC-6O: Final architect's and engineer's plans will accomplish all the following:
    - Boiler drain lines will be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system.
    - Rooftop mounted equipment with potential to produce pollutants will be roofed and/or have secondary containment.
    - Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.

SC-6P: Plazas, sidewalks, and parking lots will be swept regularly to prevent the accumulation of litter and debris (Private roads and parking are HOA responsibility while public roads are city's).

Site Design BMP Checklist for All Development Projects (Standard Projects and PDPs)	Form I-5

Project Identification

Project Name: Garrison Elementary School

Permit Application Number: GPA24-00002

Site Design BMPs

All development projects must implement site design BMPs SD-1 through SD-8 where applicable and feasible. See Chapter 4 and Appendix E of the manual for information to implement site design BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the site design BMP as described in Chapter 4 and/or Appendix E of the manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project site has no existing natural areas to conserve). Discussion / justification may be provided.

Site Design Requirement	Applied?		
SD-1 Maintain Natural Drainage Pathways and Hydrologic Features	☐ Yes	☐ No	☒ N/A
Discussion / justification if SD-1 not implemented: The site was previously developed with a northern portion undeveloped but graded. No natural swales or other drainage features are present within the project boundary.			
SD-2 Conserve Natural Areas, Soils, and Vegetation	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-2 not implemented: Natural permeable soil and vegetation on the existing slopes (along the eastern boundary of the site) are to be maintained.			
SD-3 Minimize Impervious Area	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-3 not implemented: Streets, sidewalks & parking aisles were designed with widths minimized as much as possible. City of oceanside standard width for streets is 40' (20' travel lanes) and 32' minimum for streets with parking. The project proposes 28' and 24' travel lanes (with parking) hence increasing the landscape on all parkways.			
SD-4 Minimize Soil Compaction	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-4 not implemented: Proposed landscaped areas will be compacted as minimally as possible, re-tilled and amended per landscape plans. The goal is to ensure that the soil is compacted as little as possible to create optimal conditions for plant growth.			

Form I-5 Page 2 of 2			
Site Design Requirement	Applied?		
SD-5 Impervious Area Dispersion	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-5 not implemented: Pervious areas per SD-5 included where project design allows. The intent is to have the roof runoff discharge into landscape areas before being collected by area drain systems. These dispersion areas are implemented such that the DCV can be confidently reduced, and minimum retention met.			
SD-6 Runoff Collection	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-6 not implemented: Small collection strategies such as earthen swales on building pads to convey the runoff from roofs through landscape before being captured by catch basins, area drain, or inlet. Additionally, DMA-2 and DMA-3 are using permeable pavers.			
SD-7 Landscaping with Native or Drought Tolerant Species	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-7 not implemented: Native and drought tolerant species will be included in landscape design.			
SD-8 Harvesting and Using Precipitation	☐ Yes	☒ No	☐ N/A
Discussion / justification if SD-8 not implemented: 1. Maintenance Challenges: This multi-family residential project has limited space and no dedicated on-site personnel responsible for managing rain barrels. Harvesting the water from the barrels would require someone to perform this task within 36 hours after a rainfall event, which is impractical given the absence of such personnel on-site. The logistics of ensuring timely maintenance and water usage after every rain event would be difficult to implement effectively in this setting. 2. Limited Utility of Harvested Water: The locations where rain barrels could be installed are not within areas where the harvested water can be effectively used. A limited landscaped area on-site would benefit from the water, and the landscape maintenance is already accounted for through other sustainable measures. This further diminishes the practicality and utility of rain barrels in this specific project. 3. Space Constraints: The high-density nature of the development, with little open space between units, limits the available space to install and access rain barrels. This would make installation difficult and impede ongoing maintenance, making the long-term management of rain barrels unrealistic. Given these technical challenges, we believe rain barrels are not a suitable BMP for this project. We proposed alternative BMPs that are more practical and effective given the project's specific characteristics, such as dispersion areas where feasible and practical.			

Summary of PDP Structural BMPs	Form I-6 (PDPs)

Project Identification

Project Name: Garrison Elementary School

Permit Application Number: GPA24-00002

PDP Structural BMPs

All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the manual). Selection of PDP structural BMPs for storm water pollutant control must be based on the selection process described in Chapter 5. PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management (see Chapter 6 of the manual). Both storm water pollutant control and flow control for hydromodification management can be achieved within the same structural BMP(s).

PDP structural BMPs must be verified by the local jurisdiction at the completion of construction. This may include requiring the project owner or project owner's representative to certify construction of the structural BMPs (see Section 1.12 of the manual). PDP structural BMPs must be maintained to perpetuity, and the local jurisdiction must confirm the maintenance (see Section 7 of the manual).

Use this form to provide narrative description of the general strategy for structural BMP implementation at the project site in the box below. Then complete the PDP structural BMP summary information sheet (page 3 of this form) for each structural BMP within the project (copy the BMP summary information page as many times as needed to provide summary information for each individual structural BMP).

Describe the general strategy for structural BMP implementation at the site. This information must describe how the steps for selecting and designing storm water pollutant control BMPs presented in Section 5.1 of the manual were followed, and the results (type of BMPs selected). For projects requiring hydromodification flow control BMPs, indicate whether pollutant control and flow control BMPs are integrated or separate.

STEP 1 : A. The rainfall depth has been determined to be 0.61 inches.

B. Delineate tributary areas in the DMA exhibits. Self-mitigating DMAs have been delineated and identified that can be isolated from the remainder of the site (See Section 5.2).

C. Determine runoff factors using Automatic worksheet B.1 and impervious areas determined in the DMA exhibits.

D. Site design volume reductions were used by implementing dispersion of impervious areas into landscape pockets adjacent to building. The use of this site design BMP allowed for the reductions of DCV for DMAs A and B as well as meeting the retention credit requirements for the onsite improvements.

STEP 2: A. Capture and use analysis is not required as there are no structures taller than 9 stories.

B. According to the Geotechnical Engineer's percolation testing and evaluation provided in the Geotechnical and Infiltration Evaluation for Proposed Garrison School Site Residential Development by GeoTek, Inc., dated June 24, 2024, infiltration rates at the site appear to be poor due to subsurface soil conditions, making infiltration infeasible. However, the infiltration feasibility assessment has been expanded to include additional information on permeable pavers, with recommendations and feasibility considerations added as an amendment to the original report to support their use for water quality purposes. Please refer to the Geotechnical Review – Infiltration Feasibility and Updated Permeable Interlocking Concrete Paver Recommendations, dated November 2024.

(Page reserved for continuation of description of general strategy for structural BMP implementation at the site)

C. An infiltration BMP in these areas could cause localized groundwater mounding and increase the potential for liquefaction and settlement on adjacent properties. Lateral water migration could adversely impact public and private utilities and improvements. Saturating the compacted fill supporting the toe of the slope may result in slope instability and building distress.

D. Minimum Retention requirements determined using Automatic worksheet B.2.

STEP 3

A. DMA-1, an underground storage unit was proposed to store the 1.5 DCV and direct to the downstream proprietary volume-based biofiltration basin which were designed to treat the calculated flow (associated with 1.5 DCV). DMA-2 and DMA-3 are designed with permeable pavers solely to meet water quality requirements. For hydromodification purposes, these areas will be treated as impervious. The pavers will not include a liner but will have a sub-drain. The design will incorporate aggregate beneath the sub-drain to store the 85th percentile storm depth, making these DMAs "self-retaining."The pavers including a sub-drain (no liner), with the Design Capture Volume (DCV) stored beneath it. are not intended as structural BMPs for larger drainage areas (INF3); rather, they function as enhanced site design BMPs (SD-6B), specifically designed to retain the DCV from these areas, making them self-retaining (ratio of 1.5:1).

B. Calculate retention processes using Automatic worksheet B.2.

C. No biofiltration basins are proposed. For DMA-1, an underground storage unit was proposed to store the 1.5 DCV, and an outlet structure was designed to draw down the 1.5 DCV within 36 hrs. Using the orifice equation, the outflow from the storage unit when it is filled to the depth associated with the 1.5 DCV was determined. The flow from the outlet structure was directed to the downstream proprietary biofiltration basin, designed to treat the calculated flow (associated with 1.5 DCV). DMA-2 and 3 the required DCV will be stored in the aggregate storage beneath the subdrain for WQ only. .

D. Verify the pollutant control requirements are met using worksheets B.3 and sizing letters/details from Contech.

E. Verify the minimum retention requirements are met by adding the required volume for the site as a whole and comparing it to the volume provided.

Form I-6 Page 3 of 6 (Copy as many as needed)	
Structural BMP Summary Information (Copy this page as needed to provide information for each individual proposed structural BMP)	
Structural BMP ID No. HMP-1	
Construction Plan Sheet No. GPA24-00002, Sheet 5	
Type of structural BMP: ☐Retention by harvest and use (HU-1) ☐Retention by infiltration basin (INF-1) ☐Retention by bioretention (INF-2) ☐Retention by permeable pavement (INF-3) ☐Partial retention by biofiltration with partial retention (PR-1) ☐Biofiltration (BF-1) ☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☒Detention pond or vault for hydromodification management ☐Other (describe in discussion section below)	
Purpose: ☐Pollutant control only ☒Hydromodification control only ☐Combined pollutant control and hydromodification control ☐Pre-treatment/forebay for another structural BMP ☐Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the [City Engineer] (See Section 1.12 of the manual)	Hunsaker & Associates San Diego, Inc.
Who will be the final owner of this BMP?	The True Life/(Owner)
Who will maintain this BMP into perpetuity?	The True Life /(Owner)
What is the funding mechanism for maintenance?	The True Life /(Owner) (HOA Fees)

Form I-6 Page 4 of 6 (Copy as many needed)

Structural BMP Summary Information

(Copy this page as needed to provide information for each individual proposed structural BMP)

Discussion (as needed):

This structural will serve as DCV storage, hydromodification, and detention unit. The preliminary unit has been selected to be a CMP vault with the following configuration:

8-84" perforated pipes with a length of 113'. The pipes will be connected at one of the ends and will have 36" of separations between each other.

Additionally, the system will have 6" of gravel at the top of the pipe for additional storage.

Please see calculations and preliminary details in attachment 1.

Form I-6 Page 5 of 6 (Copy as many as needed)	
Structural BMP Summary Information (Copy this page as needed to provide information for each individual proposed structural BMP)	
Structural BMP ID No. BF-3-1	
Construction Plan Sheet No. GPA21-00002, Sheet 5	
Type of structural BMP: ☐Retention by harvest and use (HU-1) ☐Retention by infiltration basin (INF-1) ☐Retention by bioretention (INF-2) ☐Retention by permeable pavement (INF-3) ☐Partial retention by biofiltration with partial retention (PR-1) ☒~~Biofiltration (BF-1)~~ / Proprietary Biofiltration (BF-3) ☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐Detention pond or vault for hydromodification management ☐Other (describe in discussion section below)	
Purpose: ☒Pollutant control only ☐Hydromodification control only ☐Combined pollutant control and hydromodification control ☐Pre-treatment/forebay for another structural BMP ☐Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the [City Engineer] (See Section 1.12 of the manual)	Hunsaker & Associates San Diego, Inc.
Who will be the final owner of this BMP?	The True Life/(Owner)
Who will maintain this BMP into perpetuity?	The True Life /(Owner)
What is the funding mechanism for maintenance?	The True Life /(Owner) (HOA Fees)

Form I-6 Page 6 of 6 (Copy as many needed)

Structural BMP Summary Information

(Copy this page as needed to provide information for each individual proposed structural BMP)

Discussion (as needed):

This structural BMP BF-3-1 consists of 1 – 8'x20' (10.7' deep) MWS units, which were designed as volume-based proprietary biofiltration units with a treatment capacity of 17,783 CF. Please see attachment 1 for calculations and details.

These units do not retain volume and therefore additional BMPs were used to meet the site's requirements.

The use of dispersion areas was implemented around the buildings.

The credits for all onsite DMAs are quantified on the worksheets found in attachment 1 and are compared to the required credits.

The provided retention volume totals 468 cubic feet while the required volume is 119 cubic feet.

City of Oceanside 300 N Coast Highway Oceanside, CA 92054	**Permanent BMP Construction** **Self Certification Form**	February 2016

Date Prepared: TBD	Project No.: TBD
Project Applicant: TBD	Phone: TBD
Project Address: TBD	
Project Engineer: TBD	Phone: TBD

The purpose of this form is to verify that the site improvements for the project, identified above, have been constructed in conformance with the approved Storm Water Quality Management Plan (SWQMP) documents and drawings.

This form must be completed by the engineer and installing contractor and submitted prior to final inspection of the construction permit. Completion and submittal of this form is required for all new development and redevelopment projects in order to comply with the City's Storm Water ordinances and NDPES Permit Order No. R9-2013-0001. Final inspection for occupancy and/or release of grading or public improvement bonds may be delayed if this form is not submitted and approved by the City of Oceanside.

ENGINEER'S CERTIFICATION:

As the professional in responsible charge for the design of the above project, I certify that I have inspected all constructed Low Impact Development (LID) site design, source control and treatment control BMP's required per the approved SWQMP and Construction Permit No. Click here to enter text.; and that said BMP's have been constructed in compliance with the approved plans and all applicable specifications, permits, ordinances and Order No. R9-2013-0001 of the San Diego Regional Water Quality Control Board.

I understand that this BMP certification statement does not constitute an operation and maintenance verification.

Signature: _____

Date of Signature: _ Click here to enter text.__

Printed Name: _ Alisa S. Vialpando_____

Title: _ President_____

Phone No. _ (858) 558 4500 _____



Engineer's Stamp

CONTRACTOR'S CERTIFICATION:

As the professional in responsible charge for construction of the above project, I certify that all constructed Low Impact Development (LID) site design, source control and treatment control BMP's required per the approved SWQMP and Construction Permit No. Click here to enter text.; have been constructed in compliance with the approved plans and all applicable specifications, permits, and ordinances.

I understand that this BMP certification statement does not constitute an operation and maintenance verification.

Signature: _____

Date of Signature: _ TBD__

Printed Name: _ TBD_____

Title: _ TBD_____

Phone No. _ Click here to enter text. _____

ATTACHMENT 1

BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

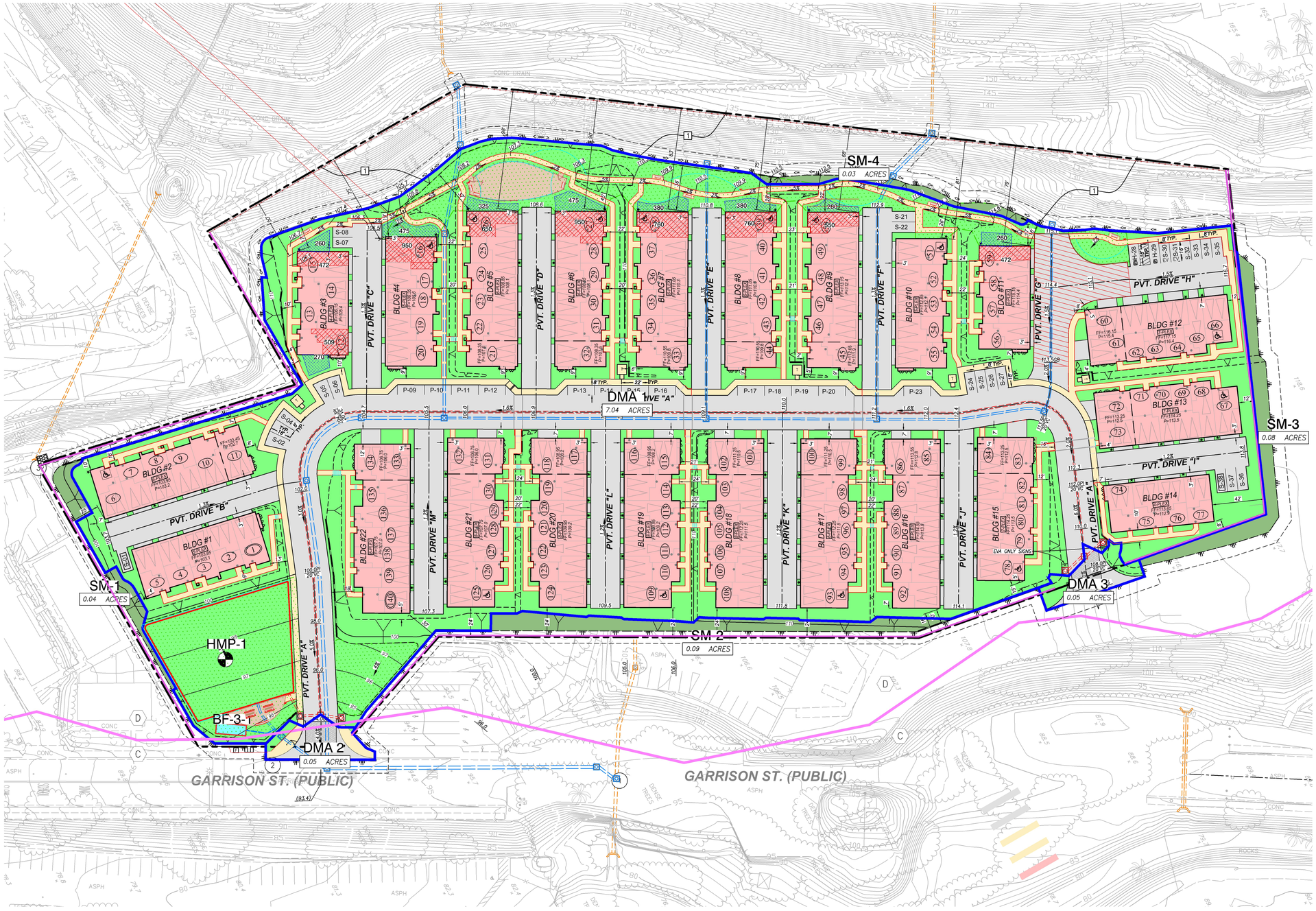
Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist.	☒Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	☐Included on DMA Exhibit in Attachment 1a ☒Included as Attachment 1b, separate from DMA Exhibit
Attachment 1c	Design Capture Volume Worksheet	☒Included
Attachment 1d	Form I-7, Harvest and Use Feasibility Screening Checklist (Required unless the entire project will use infiltration BMPs) Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7.	☒Included ☐Not included because the entire project will use infiltration BMPs **Feasibility addressed by B.2 Worksheet Line 7**
Attachment 1e	Form I-8, Categorization of Infiltration Feasibility Condition (Required unless the project will use harvest and use BMPs) Refer to Appendices C and D of the BMP Design Manual to complete Form I-8.	☒Included ☐Not included because the entire project will use harvest and use BMPs **Feasibility addressed by B.2 Worksheet Line 4**
Attachment 1f	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines	☒Included

Use this checklist to ensure the required information has been included on the DMA Exhibit:

The DMA Exhibit must identify:

☒Underlying hydrologic soil group
☒Approximate depth to groundwater
☒Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
☐Critical coarse sediment yield areas to be protected
☒Existing topography and impervious areas
☒Existing and proposed site drainage network and connections to drainage offsite
☒Proposed grading
☒Proposed impervious features
☒Proposed design features and surface treatments used to minimize imperviousness
☒Drainage management area (DMA) boundaries, DMA ID numbers, and DMA areas (square footage or acreage), and DMA type (i.e., drains to BMP, self-retaining, or self-mitigating)
☒Potential pollutant source areas and corresponding required source controls (see Chapter 4, Appendix E.1, and Form I-3B)
☒Structural BMPs (identify location, type of BMP, and size/detail)



LEGEND:

SYMBOL:

- PROJECT BOUNDARY
- DMA BOUNDARY
- DAYLIGHT
- HYDROLOGIC SOIL TYPE BOUNDARY
- PROPOSED STORM DRAIN
- PROPOSED BYPASS STORM DRAIN
- EXISTING STORM DRAIN TO REMAIN
- FLOW LINE
- SUBAREA ACREAGE — 00.00 ACRES
- DMA ICON — DMA 1
- PROPRIETARY BIOFILTRATION BMP
- IMPERVIOUS - ROOF
- IMPERVIOUS - ASPHALT
- IMPERVIOUS - CONCRETE
- SEMI-PERVIOUS - DG OR TURF
- PERVIOUS - LANDSCAPED AREAS
- PERVIOUS - SELF-MITIGATING AREA
- DISPERSION AREAS PER SD-5 (6,073 SFT.) — 6,073 SFT.
- LANDSCAPE PER SD-5 (3,105 SFT.) — 3,105 SFT.
- INLET
- HYDROLOGIC SOIL TYPE — D
- POINT OF COMPLIANCE — X
- STRUCTURAL BMP
- DOWNSPOUT LOCATION — ★

NOTES:
-AN ADDITIONAL 20% OF THE BUILDING FOOTPRINT WAS FACTORED INTO THE IMPERVIOUS AREA CALCULATIONS TO ACCOUNT FOR ANY FUTURE IMPERVIOUS SURFACES ADDED TO THE OPEN SPACE AREAS. THIS FIGURE WILL BE VERIFIED DURING THE FINAL DESIGN PHASE OF THE OPEN SPACE AREAS.
-DOWNSPOUT LOCATIONS AND DISPERSION AREAS ARE PRELIMINARY AND ARE SUBJECT TO CHANGE DURING THE ENGINEERING PHASE. DISPERSION PATTERNS AND AREAS WILL BE VERIFIED DURING SUCH PHASE.

SITE DESIGN BMPs:

- SD-2 CONSERVE NATURAL AREAS
- SD-3 MINIMIZE IMPERVIOUS AREAS
- SD-4 MINIMIZE SOIL COMPACTION
- SD-5 IMPERVIOUS AREA DISPERSION
- SD-6 RUNOFF COLLECTION
- SD-7 LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT SPECIES

SOURCE CONTROL BMPs:

- SC-1 PREVENTION OF ILLICIT DISCHARGES TO MS4
- SC-2 STORM DRAIN STENCILING OR SIGNAGE
- SC-6 ADDITIONAL BMPS BASED ON POTENTIAL SOURCES OF RUNOFF POLLUTANTS
  - 6A ON-SITE STORM DRAIN INLETS
  - 6D1 NEED FOR FUTURE INDOOR & STRUCTURAL PEST CONTROL
  - 6D2 LANDSCAPE/OUTDOOR PESTICIDE USE
  - 6N FIRE SPRINKLER TEST WATER
  - 6O MISCELLANEOUS DRAIN OR WASH WATER
  - 6P PLAZAS, SIDEWALKS, AND PARKING LOTS

UNDERLYING SOIL GROUP : C & D
APPROXIMATE DEPTH TO GROUNDWATER > 30'

SITE DESIGN NOTES:

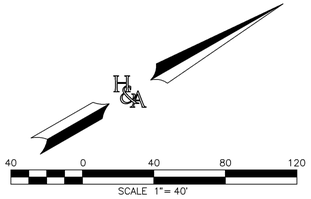
-SD-3 IS IMPLEMENTED BY DECREASING THE CITY OF OCEANSIDE MINIMUM STREET WIDTH ON ALL PRIVATE STREETS.
-SD-6 BUILDING PADS WILL HAVE EARTHEN SWALES IN THE ULTIMATE CONDITION TO CONVERY RUNOFF FORM ROOFS THROUGH LANDSCAPE. BROW DITCHES ARE PROPOSED AT THE BASE OF THE UNDISTURBED SLOPES TO COLLECT RUNOFF AND PREVENT IT FROM MIZING WITH RUNOFF FROM IMPERVIOUS AREAS, ENSURING THAT THE WATER IS ROUTED TO THE BYPASS SYSTEM.
-SD-8 HARVESTING AND USING PRECIPITATION HAS BEEN DEEMED INFEASIBLE.

AREA DRAINING TO EACH POC:

-POC 1 = 9.91 AC (DMA 1 & DMA 3 + BYPASS AREA)
-POC 2 = 0.43 AC (DMA 2 + EXISTING ROAD)
-POC 3 = 0.37 AC (EXISTING SLOPES)



NO DUMPING PLACARD
FOR INLETS DETAIL
NOT TO SCALE



PREPARED BY:
HUNSAKER & ASSOCIATES SAN DIEGO, INC
PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 · FX(858)558-1414

DMA MAP
GARRISON ELEMENTARY SCHOOL
CITY OF OCEANSIDE, CALIFORNIA

MAP 1 OF 1

W.O.# 3214-0002

R:\1778\Hyd\SWQMP\CAD\1778$ DMA Map.dwg[]Apr-14-2025:16:02

TREE MITIGATION & PROTECTION NOTES:

FINAL MITIGATION VALUE: 303" FOR 1:1 REPLACEMENT OF TREE CALIPER FOR NEW TREES MAY BE REQUIRED BY CITY OF OCEANSIDE PLANNING DEPARTMENT. 321" OF NEW CALIPER TREES PROPOSED.

EXISTING TREES NOTED AS "PRESERVE" SHALL BE PROTECTED IN PLACE. NO MECHANICAL OR OTHER GRADING WHICH WOULD ALTER GROUND ELEVATION AROUND BASE OR WITHIN DRIPLINE OF TREES SHALL BE ALOWED, NO MECHANICAL EQUIPMENT OR TRENCHING WITIN THE DRIPLINE CAUSING DISTURBANCE TO TREE ROOTS SHALL OCCUR; NO EXCESSIVE PRUNING SHALL OCCUR; NO STORAGE OF EQUIPMENT SHALL OCCUR UNDER DRIPLINES; NO ACTIVITIES SHALL CAUSE SOIL COMPACTION AROUND TREE CANOPY OR TRUNK. IF EXISTING TREES TO BE PRESERVED ARE DAMAGED OR DESTROYED BY CONSTRUCTION ACTIVITIES, TREES SHALL BE REPLACED IN KIND WITH SAME SPECIES AND SIZE (DIAMETER AT BREAST HEIGHT) PER CITY REQUIREMENT.

ROOT BARRIER NOTE:

ROOT BARRIERS SHALL BE INSTALLED ADJACENT TO ALL PAVING SURFACES WHERE A PAVING SURFACE IS LOCATED WITHIN 6 FEET OF A TREE TRUNK ON SITE (PRIVATE) AND WITHIN 10 FEET OF A TREE TRUNK IN THE RIGHT-OF-WAY (PUBLIC). ROOT BARRIERS SHALL EXTEND 5 FEET IN EACH DIRECTION FROM THE CENTERLINE OF THE TRUNK, FOR A TOTAL DISTANCE OF 10 FEET. ROOT BARRIERS SHALL BE A MINIMUM 24 INCHES IN DEPTH. INSTALLING A ROOT BARRIER AROUND THE TREE'S ROOT BALL IS UNACCEPTABLE.

CITY OF OCEANSIDE PLAN NOTES:

1. FINAL LANDSCAPE PLANS SHALL ACCURATELY SHOW PLACEMENT OF TREES, SHRUBS, AND GROUNDCOVERS.
2. LANDSCAPE ARCHITECT SHALL BE AWARE OF UTILITY, SEWER, AND STORM DRAIN EASEMENTS AND PLACE PLANTING LOCATIONS ACCORDINGLY TO MEET CITY OF OCEANSIDE REQUIREMENTS.
3. ALL REQUIRED LANDSCAPE AREAS SHALL BE MAINTAINED BY OWNER OR AS STATED IN ANY LEGAL DOCUMENT SUCH AS BUT NOT LIMITED TO A LEASE AGREEMENT. THE LANDSCAPE AREAS SHALL BE MAINTAINED PER CITY OF OCEANSIDE REQUIREMENTS.
4. NO TRASH ENCLOSURES ARE PROPOSED; TRASH BINS TO BE STORED IN PRIVATE GARAGES. REFERENCE TRASH DAY PLAN BY ARCHITECT.
5. ALL STREET TREES SHALL COMPLY WITH STREET TREE STANDARD 211A.

IRRIGATION NOTE:

AN AUTOMATIC IRRIGATION SYSTEM SHALL BE INSTALLED TO PROVIDE COVERAGE FOR ALL PROPOSED PLANTING AREAS SHOWN ON THE PLAN. LOW PRECIPITATION EQUIPMENT SHALL PROVIDE SUFFICIENT WATER FOR PLANT GROWTH WITH A MINIMUM WATER LOSS DUE TO WATER RUN-OFF AND TIME SCHEDULED. IRRIGATION SYSTEMS SHALL USE HIGH QUALITY, AUTOMATIC CONTROL VALVES, CONTROLLERS, ONSITE WEATHER SENSOR, AND OTHER NECESSARY IRRIGATION EQUIPMENT. ALL COMPONENTS SHALL BE OF NON-CORROSIVE MATERIAL ALL DRIP SYSTEMS SHALL BE ADEQUATELY FILTERED AND REGULATED PER THE MANUFACTURER'S RECOMMENDED DESIGN PARAMETERS. ALL IRRIGATION IMPROVEMENTS SHALL FOLLOW THE CITY OF OCEANSIDE GUIDELINES AND WATER CONSERVATION ORDINANCE.



PLANT LEGEND

SYMBOL	CODE	QTY	BOTANICAL NAME	COMMON NAME	CONT	WATER USE	SF CANOPY
TREES							
	ARB MAR	13	ARBUTUS X 'MARINA' STANDARD, DOUBLE STAKE. 2" CALIPER, 30' CANOPY (706.86 SF).	MARINA STRAWBERRY TREE STANDARD	24"BOX	LOW	9,189.18
	GEI PAR	51	GEIJERA PARVIFLORA STANDARD, DOUBLE STAKE. 2" CALIPER, 25' CANOPY (490.87 SF).	AUSTRALIAN WILLOW	24"BOX	LOW	25,034.37
	MEL NES	20	MELALEUCA NESOPHILA 1.5" CALIPER, 10' CANOPY (78.54 SF).	PINK MELALEUCA	15 GAL	LOW	1,570.80
	OLE SWA	26	OLEA EUROPAEA 'SWAN HILL' MULTI. 3" CALIPER,20' CANOPY (314.16 SF)	SWAN HILL FRUITLESS OLIVE	36"BOX	LOW	8,168.16
	PAR DES	13	PARKINSONIA X 'DESERT MUSEUM' STANDARD, DOUBLE STAKE. 3" CALIPER. 22' CANOPY (380.13 SF).	DESERT MUSEUM PALO VERDE	36"BOX	LOW	4,941.69
	QUE AGR	12	QUERCUS AGRIFOLIA STANDARD, DOUBLE STAKE. 1.5" CALIPER. 35' CANOPY (962.11 SF)	COAST LIVE OAK	15 GAL	LOW	11,545.32
	CHI PIN	14	X CHITALPA TASHKENTENSIS 'PINK DAWN' STANDARD, DOUBLE STAKE. 2" CALIPER. 20' CANOPY (314.16 SF). NOTE: 321" OF NEW CALIPER TREES PROPOSED.	PINK DAWN CHITALPA	24"BOX	LOW	4,398.24
							64,847.76 SF TOTAL
SYMBOL	CODE	QTY	BOTANICAL NAME	COMMON NAME	CONT	WATER USE	
GROUND COVERS							
	FES MAR	12,875 SF	FESTUCA ARUNDINACEA 'MARATHON II'	MARATHON II FESCUE	SOD	HIGH	

LOT COVERAGE:

CATEGORY	SF	% COVER
NEW LANDSCAPING	97,702	27.0
NATURAL LANDSCAPING	46,194	12.7
PAVING (ROADS, WALKS)	108,638	30.0
BUILDINGS	109,755	30.3
TOTAL:	362,289	100.0

CAP ITEM 3049:

PERCENTAGE TREE CANOPY COVER*: 17.9%

PERCENTAGE SITE PERMEABLE COVER**: 39.7%

*SEE CANOPY COVER ON PLANT LEGEND

**SEE LOT COVERAGE; TOTAL INCLUDES NEW AND NATURAL LANDSCAPING

REFERENCE NOTES LEGEND

CODE	DESCRIPTION
1	5' HEIGHT TAN PRECISION BLOCK SCREEN WALL, SEE CONCEPTUAL WALL AND FENCING PLAN
2	BENCH WITH BACK
3	LAWN PLAY AREA
4	CONCRETE WALKS - NATURAL GREY COLOR, MEDIUM BROOM FINISH. ALL PEDESTRIAN PAVING (BOTH DECORATIVE AND STANDARD) SHALL COMPLY WITH THE MOST CURRENT EDITION OF THE AMERICAN DISABILITY ACT.
5	PICNIC TABLES
6	DECOMPOSED GRANITE
7	DOG PARK ENCLOSED WITH 4' HEIGHT TUBE STEEL FENCE AND SELF-CLOSING GATES
8	ACTIVE TURF AREA, 195' X 88'
9	5' HEIGHT TUBE STEEL FENCE, BLACK, SEE CONCEPTUAL WALL AND FENCING PLAN
10	DOG WASTE STATION
11	RETAINING WALL PER CIVIL EINGEER'S PLANS.

LANDSCAPE MAINTENANCE:

ALL PROPOSED LANDSCAPE SHALL BE INSTALLED BY DEVELOPER AND MAINTAINED BY DEVELOPER UNTIL THE FORMATION OF A NEW HOMEOWNER'S ASSOCIATION (HOA), AT WHICH TIME ALL LANDSCAPE MAINTENANCE DUTIES WILL BE PERFORMED BY THE NEW HOA. MAINTENANCE DUTIES INCLUDE MOWING, TRIMMING GROUNDCOVER, BUSHES, AND TREES, WEEDING, TRASH REMOVAL, IRRIGATION, AND ROUTINE IRRIGATION SYSTEM REVIEWS AND ADJUSTMENTS AND REPAIRS.

SHEET INDEX

SHEET	DESCRIPTION
CL-1.1	CONCEPTUAL LANDSCAPE PLAN
CL-1.2	CONCEPTUAL WALL & FENCE PLAN
CL-1.3	CONCEPTUAL PLANT PALETTE
CL-1.4	CONCEPTUAL AMENITIES PLAN
CL-2.1	CONCEPTUAL EXISTING VEGETATION DISPOSITION PLAN

SCALE: 1"=40'-0"

0 20' 40' 80'

CONCEPTUAL LANDSCAPE PLAN

STREET TREE & TREE SPACING NOTE:

STREET TREES AND OTHER TREES SHALL BE SPACED:

1. 8 FEET FROM TRANSFORMERS, CABLE, AND PULL BOXES.
2. 5' FROM MAILBOXES.
3. 5 FEET FROM FIRE HYDRANTS, ALL SIDES.
4. 10 FEET FROM CENTERLINE OF ALL UTILITY LINES WITHOUT EASEMENTS (SEWER, WATER, STORM DRAINS, DOUBLE CHECK DETECTORS, AIR RELIEF VALVES, AND GAS).
5. 10 FEET FROM EASEMENT BOUNDARIES (SEWER, WATER, STORM DRAINS, ACCESS OR OTHER UTILITIES).
6. 10 FEET FROM DRIVEWAYS (UNLESS A LINE OF SIGHT IS DETERMIEND BY THE TRAFFIC DIVISION TO BE OTHERWISE)
7. 10' FROM TRAFFIC AND DIRECTIONAL SIGNS.
8. 15 FEET (MINIMUM) FROM STREETLIGHTS, OTHER UTILITY POLES, (DETERMINED BY SPECIFICATIONS).
9. STREET TREES SHALL BE PLANTED 3' OUTSIDE RIGHT-OF-WAY IF THE RIGHT-OF-WAY DOES NOT ALLOW SPACE, SUBJECT TO THE CITY ENGINEER'S APPROVAL.
10. LINE OF SIGHT AT ARTERIALS, COLLECTOR AND LOCAL STREETS SHALL BE REVIEWED AND DETERMINED BY TRAFFIC ENGINEER. A MINIMUM OF TWENTY-FIVE FEET (25') FROM STREET INTERSECTION OR AS APPROVED BY THE TRAFFIC ENGINEER.
11. MINIMUM FIFTEEN FEET (15') STREETLIGHT AND STOP SIGN OR CLEARANCE DETERMINED BY SPECIFICATIONS.
12. SCREEN ALL UTILITIES ACCORDING TO SPECIFIC AGENCY REQUIREMENTS.

FIRE DEPARTMENT NOTES:

1. LANDSCAPE IMPROVEMENT PLAN SET AND INSTALLATION ARE REQUIRED TO IMPLEMENT APPROVED FIRE DEPT. REGULATIONS, CODES, AND STANDARDS AT THE TIME OF PROJECT APPROVAL.
2. ALL FIRE HYDRANTS, DOUBLE CHECK DETECTORS, POST INDICATING VALVES, AND FIRE DEPARTMENT CONNECTIONS SHALL BE PROVIDED WITH A 3-FOOT CLEARANCE AROUND ALL FIRE APPARATUSES.
3. ALL TREES AT MATURITY SHALL MEET A HORIZONTAL CLEARANCE ALONG ALL ROADWAYS FROM CURB TO CURB. HORIZONTAL ROADWAY CLEARANCE FOR A ONE-STORY BUILDING IS 28-FEET WIDE.
4. ALL TREES AT MATURITY SHALL MEET A VERTICAL CLEARANCE OF 14-FEET FROM THE TOP OF THE ROADWAY TO THE LOWEST BRANCHES.

PLANTING NOTE:

THE SELECTION OF PLANT MATERIAL IS BASED ON CULTURAL, AESTHETIC, AND MAINTENANCE CONSIDERATIONS. ALL PLANTING AREAS SHALL BE PREPARED WITH APPROPRIATE SOIL AMENDMENTS, FERTILIZERS, AND APPROPRIATE SUPPLEMENTS BASED UPON A SOILS REPORT FROM AN AGRICULTURAL SUITABILITY SOIL SAMPLE TAKEN FROM THE SITE. GROUND COVERS OR BARK MULCH SHALL FILL IN BETWEEN THE SHRUBS TO SHIELD THE SOIL FROM THE SUN, EVAPOTRANSPORATION AND RUN-OFF. ALL THE FLOWER AND SHRUB BEDS SHALL BE MULCHED TO A 3" DEPTH TO HELP CONSERVE WATER, LOWER THE SOIL TEMPERATURE AND REDUCE WEED GROWTH. THE SHRUBS SHALL BE ALLOWED TO GROW IN THEIR NATURAL FORMS. ALL LANDSCAPE IMPROVEMENTS SHALL FOLLOW THE CITY OF OCEANSIDE GUIDELINES.

RECREATIONAL LAWNS:

PROJECT SHALL BE CONSISTENT WITH AB 1572 AND HAVE NO NON-FUNCTIONAL TURF AREAS IN HOA COMMON AREAS. ALL TURF/LAWN AREAS PROPOSED IN RECREATIONAL OPEN SPACE AREAS AND ARE OF SIZES TO MAKE THEM FUNCTIONAL

WATER METER:

ALL COMMON AREAS WILL BE IRRIGATED BY A DEDICATED IRRIGATION METER MANAGED AND PAID FOR BY THE HOA.

TRUE NATURE
LANDSCAPE ARCHITECTURE

KIMBERLY TRUE, MLA
315 Meigs Road Suite A-131
Santa Barbara, CA 93109
TrueNatureDesign.com
805-770-2100

Date 5/10/2024

Revisions
07/02/2024 PLN PLCK 1
10/25/2024 PLN PLCK 2
04/14/2025 PLN PLCK 3

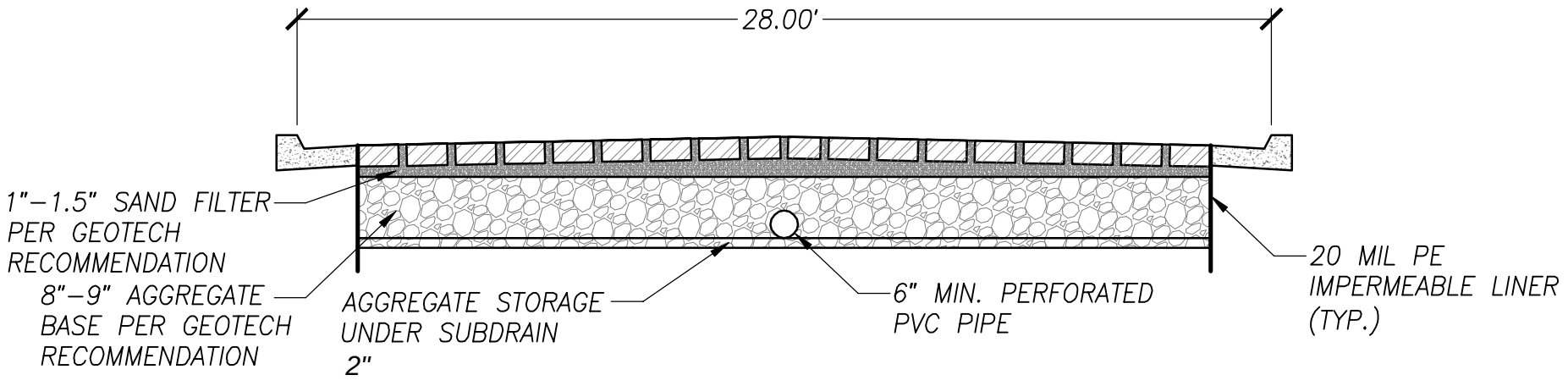
Garrison Street Residential Development
333 Garrison Street
Oceanside, California, 92054

REGISTERED LANDSCAPE ARCHITECT
KIMBERLY J. TRUE
NO. 5596
SIGNATURE
4/30/2027
EXP. DATE
STATE OF CALIFORNIA
NOT FOR BIDDING OR CONSTRUCTION

Drawn By KJT
Sheet
CL-1.1
Of 5

APN 162-020-26
GPA24-00002, ZA24-00001, T24-00002, D24-00010

Job No. 1906



REFER TO SWQMP ATTACHMENT 1 FOR STORAGE CALCULATIONS

PAVER SECTION FOR ENTRY DRIVES

NOT TO SCALE

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC.

PLANNING
ENGINEERING
SURVEYING

9707 Waples Street
San Diego, Ca 92121
PH(858)558-4500 · FX(858)558-1414

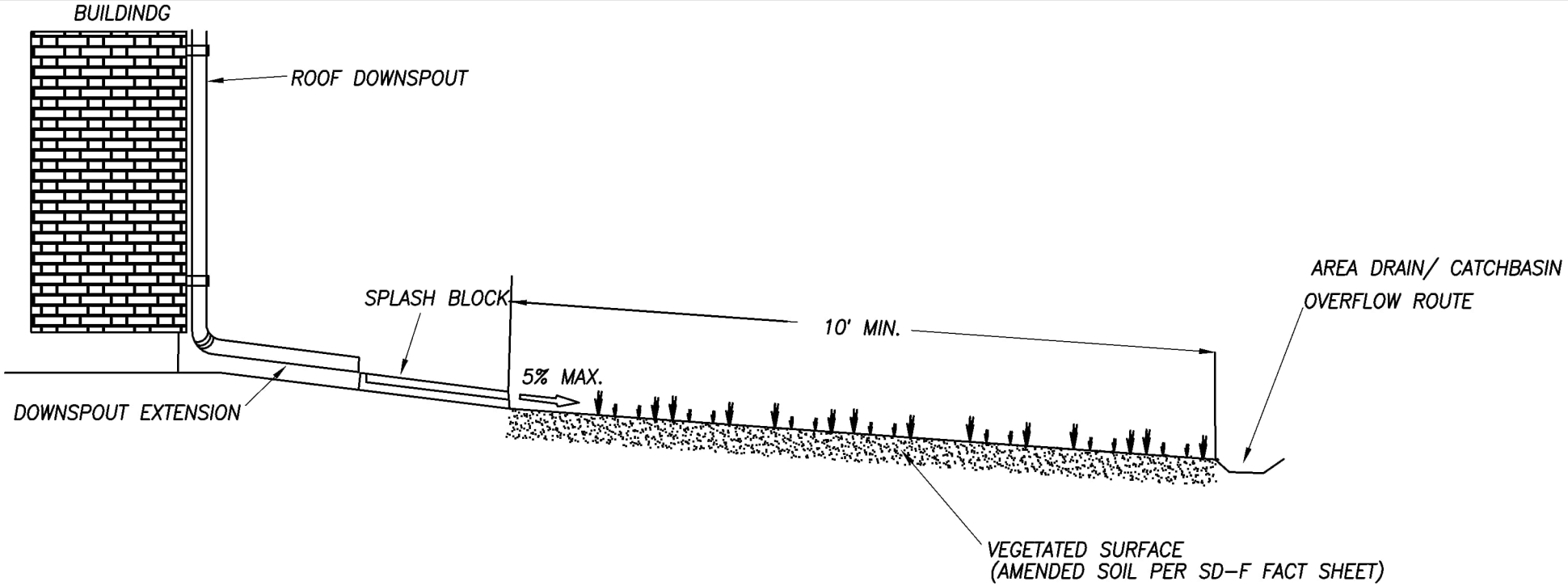
PRELIMINARY PAVER SECTION DETAIL

GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, CALIFORNIA

W.O.# 3214–0002

R:\1778\Hyd\SWQMP\CAD\1778–Pavers.dwg[]Nov–05–2024:11:58



TYPICAL SECTION VIEW FOR AN IMPERVIOUS AREA DISPERSSION BMP (SD-5 PER BMPDM)

PREPARED BY:

HUNSAKER & ASSOCIATES
SAN DIEGO, INC.

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ENGINEERING
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TYPICAL DETAIL EXHIBIT

DISPERSION AREAS

CITY OF OCEANSIDE, CALIFORNIA

DMA CALCULATIONS

	Imp. RF	Pervious RF	% Imp	DMA 1	Fraction of Total	Imp Area	Pervious Area	Summation RF x A	DMA 2	Fraction of Total	Imp Area	Pervious Area	Summation RF x A	DMA 3	Fraction of Total	Imp Area	Pervious Area	Summation RF x A
				SQFT		SQFT	SQFT		SQFT		SQFT	SQFT		SQFT		SQFT	SQFT	
Sidewalks / Walkways	0.90	0.30	100	25,332	0.10	25,332	0	22,799	615	0.30	615	0	554					
Roofs *	0.90	0.30	100	134,398	0.51	134,398	0	120,958										
Open Space / Slopes	0.90	0.30	0	61,519	0.08	0	61,519	18,456	200	0.03	0	200	60	883	0.18	0	883	265
DG or Turf	0.90	0.30	0	2,510	0.00	0	2,510	753										
Roads / Driveways	0.90	0.30	100	82,952	0.31	82,952	0	74,657	1,370	0.67	1,370	0	1,233	1,313	0.82	1,313	0	1,182
Total				306,711	1.00	242,682	64,029	237,622	2,186	1.00	1,985	200	1,847	2,197	1.00	1,313	883	1,447
				7.04	AC				0.05	AC				0.05	AC			
					Imp%	79.12%	Weighted C =	0.77		Imp%	90.84%	Weighted C =	0.85		Imp%	59.79%	Weighted C =	0.66

* FOR DMA1, 20% OF THE BUILDING FOOTPRINT HAS BEEN ADDED TO THE ROOF AREA TO BE MORE CONSERVATIVE IN THE IMPERVIOUS AREA CACULATIONS AND COUNT FOR ANY ADDITIONAL FLATWORK IN OPEN SPACE AREAS

Total Disturbed area	7.38	AC
Total Impervious Area	5.65	AC
Total Pervious	1.74	AC
Total Disturbed area	321,618	SQFT
Total Impervious Area	245,981	SQFT
Total Pervious	75,638	SQFT
Self mitigating area (SFT)	0.24	AC
	10,525	SQFT

GARRISON ELEMENTARY SCHOOL
DMA CALCULATIONS

Appendix B: Storm Water Pollutant Control Hydrologic Calculations and Sizing Methods

Tabular Summary of DMAs									Worksheet B-1
DMA Unique Identifier	**Type of Surface**	**Area (square feet)**	**Impervious Area (square feet)**	**% Imp**	**Hydrologic** Soil Group	**Area Weighted Runoff Coefficient**	**Treated by (BMP ID)**	**Proposed Pollutant** Control Type	**Drains to (POC ID)**
DMA 1	ROOF	134398	134398	100%	D	0.90	BF-3-1	MWS Unit	1
	CONCRETE/ASPHALT	108284	108284	100%	D	0.90	BF-3-1	MWS Unit	1
	DG of Turf	2510	0	0%	D	0.30	BF-3-1	MWS Unit	1
	LANDSCAPE	61519	0	0%	D	0.30	BF-3-1	MWS Unit	1
DMA 2	ROOF	0	0	100%	D	0.90	SD-6B	Permeable Pavers	2
	CONCRETE/ASPHALT	1985	1985	100%	D	0.90	SD-6B	Permeable Pavers	2
	LANDSCAPE	200	0	0%	D	0.30	SD-6B	Permeable Pavers	2
DMA 3	ROOF	0	0	100%	D	0.90	SD-6B	Permeable Pavers	1
	CONCRETE/ASPHALT	1313	1313	100%	D	0.90	SD-6B	Permeable Pavers	1
	LANDSCAPE	883	0	0%	D	0.30	SD-6B	Permeable Pavers	1
Total Disturbed Area =		311093	245981						

Summary of DMA Information (Must match Project description and SWQMP narrative)									
No. of DMAs	**Total DMA Area (acres)**	**Total Impervious Area (acres)**	**%** Impervious	**Area Weighted Runoff Coefficient**	**Design Intensity (in/hr)**	**Safe Factor**	**Design Flow Rate (cfs)**	**Proposed Pollutant Control Type**	**No. of POCs**
DMA 1	7.04	5.57	79.12%	0.77	N/A	N/A	N/A	MWS Unit	1
DMA 2	0.05	0.05	90.84%	0.85	N/A	N/A	N/A	Permeable Pavers	2
DMA 3	0.05	0.03	59.79%	0.66	N/A	N/A	N/A	Permeable Pavers	1
∑ =	7.14	5.65	79.07%	0.77					

DMA CALCULATIONS

DMA2 : Design Capture Volume		Worksheet B-2.1			
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.61	inches	<--- From 'latest' 85th % map.
2	Area tributary to BMP (s)	A=	7.04	acres	
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.77	unitless	
4	Street trees volume reduction	TCV=	0.00	cubic-feet	<-- Adjustment?
5	Rain barrels volume reduction	RCV=	0.00	cubic-feet	<-- Adjustment?
6	Calculate DCV= (3630 x C x d x A) - TCV - RCV	DCV=	12,079	cubic-feet	

DMA2 : Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.61	inches
2	Area tributary to BMP (s)	A=	0.05	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.85	unitless
4	Street trees volume reduction	TCV=	0.00	cubic-feet
5	Rain barrels volume reduction	RCV=	0.00	cubic-feet
6	Calculate DCV= (3630 x C x d x A) - TCV - RCV	DCV=	94	cubic-feet

DMA3 : Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.61	inches
2	Area tributary to BMP (s)	A=	0.05	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.66	unitless
4	Street trees volume reduction	TCV=	0.00	cubic-feet
5	Rain barrels volume reduction	RCV=	0.00	cubic-feet
6	Calculate DCV= (3630 x C x d x A) - TCV - RCV	DCV=	74	cubic-feet

DMA 2-Permeable Pavers Area (SFT)= 1750
Total impervious + pavers drainage area (SFT) = 2,186
Ratio Pavers/DMA2= 1.25 =<1.5:1
Slope is 4.0% less than 5%
Provided storage depth under subdrain is 1 in> Required 85th Perecntial depth is 0.61 in.
Required depth of aggregate storage under subdrain = 94/(1750X0.4)= 0.13 ft 1.61 inch
provided depth of aggregate storage under subdrain 2" (1" minimum depth under subdrain per GS-4-02 SD Design Standard)
where:
1750 sft is the aggregate area (under pavers)
0.4 in\in is the porosity of storage
Preliminary paver sections should be supported by at least 9-inches of Class II base . However, the pavement sections should be re-evaluated during construction and could change based on the R-Values of the subgrade materials within the paver areas.

DMA 3-Permeable Pavers Area (SFT)= 1500
Total impervious + pavers drainage area (SFT) = 2,197
Ratio Pavers/DMA3= 1.46 =<1.5:1
Slope is 4.0% less than 5%
Provided storage depth under subdrain is 1 in> Required 85th Perecntial depth is 0.61 in.
Required depth of aggregate storage under subdrain = 74/(1500 X0.4)= 0.12 ft 1.47 inch
provided depth of aggregate storage under subdrain 2" (1" is the minimum depth under subdrain per GS-4-02 SD Design Standard)
where:
1500 sft is the aggregate area (under pavers)
0.4 in\in is the porosity of storage
Preliminary paver sections should be supported by at least 9-inches of Class II base . However, the pavement sections should be re-evaluated during construction and could change based on the R-Values of the subgrade materials within the paver areas.

Continuous simulation modeling in accordance with Appendix G is required to develop adjustment factors for surfaces that have an unadjusted runoff factor less than 0.9. Approval of adjustment factors for surfaces that have an unadjusted runoff factor less than 0.9 is at the discretion of the City Engineer.

When using adjustment factors from Table B.2-1:

- **Linear interpolation** shall be performed if the impervious to pervious area ratio of the site is in between one of ratios for which an adjustment factor was developed;
- Use adjustment factor for a ratio of 1 when the impervious to pervious area ratio is less than 1; and
- Adjustment factor is not allowed when the impervious to pervious area ratio is greater than 4, when the pervious area is designed as a site design BMP.

Green Roofs

When green roofs are implemented in accordance with the SD-6A factsheet the green roof footprint shall be assigned a runoff factor of 0.10 for adjusted runoff factor calculations.

Permeable Pavement

When a permeable pavement is implemented in accordance with the SD-6B factsheet and it does not have an impermeable liner and has storage greater than the 85th percentile depth below the underdrain, if an underdrain is present, then the footprint of the permeable pavement shall be assigned a runoff factor of 0.10 for adjusted runoff factor calculations.

Permeable Pavement can also be designed as a structural BMP to treat run on from adjacent areas. Refer to INF-3 factsheet and Appendix B.4 for additional guidance.

B.1.4 Adjustment to DCV

When the following site design BMPs are implemented the anticipated volume reduction from these BMPs shall be deducted from the DCV to estimate the volume for which the downstream structural BMP should be sized for:

- SD-1: Street trees
- SD-8 Rain barrels

Tree Wells

Street tree credit volume from tree trenches or boxes (tree BMPs) is a sum of three runoff reduction volumes provided by trees that decrease the required DCV for a tributary area. The following reduction in DCV is allowed per tree based on the mature diameter of the tree canopy, when trees are

E.5 SD-6B Permeable Pavement (Site Design BMP)



Photo Credit: San Diego Low Impact Development Design Manual

Description

Permeable pavement is pavement that allows for percolation through void spaces in the pavement surface into subsurface layers. Permeable pavements reduce runoff volumes and rates and can provide pollutant control via infiltration, filtration, sorption, sedimentation, and biodegradation processes. When used as a site design BMP, the subsurface layers are designed to provide storage of storm water runoff so that outflow rates can be controlled via infiltration into subgrade soils. Varying levels of storm water treatment and flow control can be provided depending on the size of the permeable pavement system relative to its drainage area and the underlying infiltration rates. As a site design BMP permeable pavement areas are designed to be self-retaining and are designed primarily for direct rainfall. Self-retaining permeable pavement areas have a ratio of total drainage area (including permeable pavement) to area of permeable pavement of 1.5:1 or less. Permeable pavement surfaces can be constructed from modular paver units or paver blocks, pervious concrete, porous asphalt, and turf pavers. Sites designed with permeable pavements can significantly reduce the impervious area of the project. Reduction in impervious surfaces decreases the DCV and can reduce the footprint of treatment control and flow control BMPs.

Design Adaptations for Project Goals

Site design BMP to reduce impervious area and DCV. Permeable pavement without an underdrain can be used as a site design feature to reduce the impervious area of the site by replacing traditional pavements, including roadways, parking lots, emergency access lanes, sidewalks, trails and driveways.

Typical Permeable Pavement Components (Top to Bottom)
Permeable surface layer
Bedding layer for permeable surface
Aggregate storage layer with optional underdrain(s)
Optional final filter course layer over uncompacted existing subgrade

Conceptual Design and Sizing Approach for Site Design

1. Determine the areas where permeable pavements can be used in the site design to replace conventional pavements to reduce the DCV. These areas can be credited toward reducing runoff generated through representation in storm water calculations as pervious, not impervious, areas but are not credited for storm water pollutant control.
2. Calculate the DCV per Appendix B.2, taking into account reduced runoff from permeable pavement areas.

GeoTek, Inc.
1548 North Maple Street, Corona, California 92878
(951) 710-1160 Office (951) 710-1167 Fax www.geotekusa.com

March 28, 2025
Project No. 3346-CR

TTLC Management, Inc. an Arizona Corporation
4350 Von Karman Avenue, Suite 200
Newport Beach, California 92660

Attention: Mr. Michael Torres

Subject: **Geotechnical Review – Response to City of Oceanside Comments**
Proposed Garrison School Site Residential Development
APNs 162-020-24 and 161-030-14
333 Garrison Street
Oceanside, San Diego County, California

References: Page 5

Dear Mr. Torres:

In accordance with your request, GeoTek, Inc. (GeoTek) has prepared this geotechnical review letter to discuss the comments from Benjamin Grenis of the City of Oceanside distributed via email on March 27, 2025 (see attached).

Site Description

The approximate 11.14-acre site is addressed as 333 Garrison Street, in the City of Oceanside, San Diego County, California (See Figure 1, Site Location Map). The site is comprised of two (2) parcels of land identified as San Diego County Assessor's Parcel Numbers 162-020-24 and 161-030-14. The site is currently occupied by the former E. G. Garrison Elementary School, which has now been abandoned. Current site improvements include ten (10) classroom buildings, a miscellaneous-use building, paved parking and drive isle areas, as well as landscaping and hardscaping areas. GeoTek understands that a failed storm drain trends through the south-central portion of the site and was utilized for the now abandoned elementary school. The eastern portion of the site is vacant of structures and appears to have been utilized for sporting fields.

Proposed Development

Based on the Site Plan prepared by KTGY and dated November 25, 2024, it is proposed to construct 22 multi-family buildings on the project site. It is also proposed to construct

associated project improvements consisting of impervious pavement, pervious pavement, concrete flatwork, perimeter walls, open spaces, utilities, and typical landscaping.

Comment: *(Benjamin Grenis)*

As for the infiltration, the rates reported in the soils report were subject to a Porchet Correction, but did not account for the gravel pack that they describe in the test; this results in an approximate 2x over reporting of the tested rate. If you only need incidental infiltration, it may not be an issue; if you need any appreciable volume, the presented testing, and more specifically the corrections, are inadequate.

Response

GeoTek previously issued a report titled "Geotechnical and Infiltration Evaluation, Proposed Garrison School Site Residential Development, APNs 162-020-24 and 161-030-14, 333 Garrison Street, Oceanside, San Diego County, California," and dated June 24, 2024. In the previously issued report GeoTek stated that infiltration is likely infeasible. GeoTek previously issued a letter titled "Geotechnical Review – Infiltration Feasibility and Updated Permeable Interlocking Concrete Paver Recommendations, Proposed Garrison School Site Residential Development, APNs 162-020-24 and 161-030-14, 333 Garrison Street, Oceanside, San Diego County, California," and dated November 6, 2024. In the previously issued review letter GeoTek stated the unfactored infiltration rates appear to be poor for the subject site, which consists of Type D soils. It is GeoTek's opinion that due to subsurface soil conditions, infiltration is likely to be infeasible for this site. Infiltration is not being utilized for onsite stormwater management; however, below are revised Infiltration rates.

Infiltration Testing

Four (4) infiltration tests (Tests I-1 through I-4) were previously conducted for the referenced report dated June 24, 2024 on the project site to review the infiltration potential of the site soils. Infiltration testing was conducted in these borings in general accordance County of San Diego guidelines. The infiltration tests consisted of drilling eight-inch diameter test holes to the desired depth and installing approximately two inches of gravel in the bottom of the holes. A three-inch diameter perforated PVC pipe, wrapped in a filter sock, was placed in the excavations and the annular space was filled with gravel to prevent caving within the drill holes. Water was then placed in the bores to presoak the holes and percolation testing was performed following the pre-soak period. Following presoaking, the percolation tests were performed which consisted of adding water to each test hole and measuring the water drop over a 30-minute period. The water drop was recorded for twelve test intervals, depending upon the measurement time. The field percolation rates were then converted to an infiltration rate using the Porchet Method. The infiltration rates calculated using the Porchet Method are presented in the following table:

SUMMARY OF INFILTRATION RATES			
Boring	Depth of Test (Feet)	Infiltration Rate (Inches per hour)	Infiltration Rate (Adjusted with Gravel Correction) (Inches per hour)
I-1	10.0	0.09	0.046
I-2	10.0	0.91	0.464
I-3	10.0	0.09	0.046
I-4	10.0	0.04	0.020

A gravel correction factor of 0.51 was applied to the infiltration rates. A copy of the gravel correction factor data sheet is attached. No factors of safety were applied to the rates provided. Over the lifetime of the infiltration areas, the infiltration rates may be affected by sediment build up and biological activities, as well as local variations in near surface soil conditions. A suitable factor of safety should be applied to the field rate in designing the infiltration system.

The unfactored infiltration rates appear to be poor for the subject site which consists of Type D soils. It is GeoTek's opinion that due to subsurface soil conditions, infiltration is likely to be infeasible for this site.

It should be noted that the infiltration rates provided above were performed in relatively undisturbed on-site soils. Infiltration rates will vary and are mostly dependent on the underlying consistency of the site soils and relative density. Infiltration rates may be impacted by weight of equipment travelling over the soils, placement of engineered fill and other various factors. GeoTek assumes no responsibility or liability for the ultimate design or performance of the storm water facility.

The report is intended to be made a part of, and incorporated with, the referenced reports (GeoTek, 2024a and 2024b). All conclusions, recommendations, and limitations of those reports, except as amended in this report or future reports for the project by GeoTek, remain valid and apply to this report.

The opportunity to be of continued service on this project is sincerely appreciated. If you should have any questions, please do not hesitate to call GeoTek.

Respectfully submitted,
GeoTek, Inc.





Bruce A. Hick
GE 2284, Exp. 12/31/26
Geotechnical Engineer

Michael A. Lucas
PE 95468, Exp. 12/31/25
Project Engineer

Distribution: (1) Addressee via email

Enclosures: E-mail dated March 27, 2025
Gravel Correction Factor

https://geotekusa.sharepoint.com/teams/Corona_Branch/Shared Documents/Projects/GeoTek Inc/3300/3346/GEO/Working Files/Letters/3346-CR RESP 03-38-25 (Infiltration).doc

REFERENCES

GeoTek, Inc., 2024a, "Geotechnical and Infiltration Evaluation, Proposed Garrison School Site Residential Development, APNs 162-020-24 and 161-030-14, 333 Garrison Street, Oceanside, San Diego County, California", dated June 24, Project No. 3346-CR.

_____, 2024b, "Geotechnical Review-Infiltration Feasibility and Updated Permeable Interlocking Concrete Paver Recommendations, Proposed Garrison School Site Residential Development, APNs 162-020-24 and 161-030-14, 333 Garrison Street, Oceanside, San Diego County, California", dated November 6, Project No. 3346-CR.

Hunsaker & Associates, Inc., 2024, "Conceptual Site Setbacks, Garrison Elementary School," Sheet 12 of 13, WO# 3214-0002, Plot Dated November 8.

KTGY, 2024, "Site Plan, Garrison Street Oceanside, CA", plan dated November 25.

From: Benjamin Grenis <BGrenis@oceansideca.org>
Sent: Thursday, March 27, 2025 12:46 PM
To: Jaren Nuzman <jnuzman@tkcteam.com>
Cc: Keith Crabtree (kcrabtree@hunsakersd.com) <kcrabtree@hunsakersd.com>; Dane Thompson <DThompson@oceansideca.org>; Michael Torres <MTorres@thetruelifecompanies.com>
Subject: RE: Garrison 3rd Sub Reviews GPA24-00002

Hi Jaren,

I was leaving you a voicemail…apparently too long of a voicemail; it cut off.

I have no more official redlines/comments for your project, only the advisory items in that email. I do not have conditions drafted yet, but can start working on that.

I am amenable you updating the topo based on whatever method you are comfortable with; but I now suspect we had a misunderstanding over when that update would happen. When do you plan to update the topo?

As for the infiltration, the rates reported in the soils repot were subject to a Porchet Correction, but did not account for the gravel pack that they describe in the test; this results in an approximate 2x over reporting of the tested rate. If you only need incidental infiltration, it may not be an issue; if you need any appreciable volume, the presented testing, and more specifically the corrections, are inadequate. I am going to make an analogy to buying a soda at a restaurant: imagine I sell you a 16 fl. oz. soda, I fill a 16 fl. oz. glass with ice and then with soda. Did you actually get 16 fl. oz.? How would you respond if you asked for a refill and I topped off the ice, gave you the remainder of the soda, then charged you both of the sodas?

Thanks.

Benjamin R. Grenis, P.E.
Associate Engineer
City of Oceanside | Engineering Division
300 North Coast Highway | Oceanside, CA 92054
Tel: 760-435-5182 | Fax: 760-435-6030

GRAVEL CORRECTION FACTOR CALCULATIONS

Radius of Boring (r2) =	4"
Radius of Pipe (r1) =	1.5"
% Gravel Voids (P) =	0.43%
C =	r2 / r1
Assume Unit Depth	

$$\text{Correction Factor} = \frac{[\,1 + P\,(C^2 - 1)]}{C^2} = 0.51$$

GEOTEK

DMA CALCULATIONS

Automated Worksheet B.1: Calculation of Design Capture Volume (V2.0)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
Standard Drainage Basin Inputs	1	Drainage Basin ID or Name	DMA 1	DMA 2	DMA 3								unitless
	2	85th Percentile 24-hr Storm Depth	0.61	0.61	0.61								inches
	3	Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	236,609	1,985	1,313								sq-ft
	4	Semi-Pervious Surfaces Not Serving as Dispersion Area (C=0.30)		0									sq-ft
	5	Engineered Pervious Surfaces Not Serving as Dispersion Area (C=0.10)											sq-ft
	6	Natural Type A Soil Not Serving as Dispersion Area (C=0.10)											sq-ft
	7	Natural Type B Soil Not Serving as Dispersion Area (C=0.14)											sq-ft
	8	Natural Type C Soil Not Serving as Dispersion Area (C=0.23)											sq-ft
	9	Natural Type D Soil Not Serving as Dispersion Area (C=0.30)	60,924	200	883								sq-ft
Dispersion Area, Tree Well & Rain Barrel Inputs (Optional)	10	Does Tributary Incorporate Dispersion, Tree Wells, and/or Rain Barrels?	Yes	No	No	No	No	No	No	No	No	No	yes/no
	11	Impervious Surfaces Directed to Dispersion Area per SD-B (Ci=0.90)	6,073										sq-ft
	12	Semi-Pervious Surfaces Serving as Dispersion Area per SD-B (Ci=0.30)											sq-ft
	13	Engineered Pervious Surfaces Serving as Dispersion Area per SD-B (Ci=0.10)	3,105										sq-ft
	14	Natural Type A Soil Serving as Dispersion Area per SD-B (Ci=0.10)											sq-ft
	15	Natural Type B Soil Serving as Dispersion Area per SD-B (Ci=0.14)											sq-ft
	16	Natural Type C Soil Serving as Dispersion Area per SD-B (Ci=0.23)											sq-ft
	17	Natural Type D Soil Serving as Dispersion Area per SD-B (Ci=0.30)											sq-ft
	18	Number of Tree Wells Proposed per SD-A											#
	19	Average Mature Tree Canopy Diameter											ft
	20	Number of Rain Barrels Proposed per SD-E											#
	21	Average Rain Barrel Size											gal
Initial Runoff Factor Calculation	22	Total Tributary Area	306,711	2,186	2,197	0	0	0	0	0	0	0	sq-ft
	23	Initial Runoff Factor for Standard Drainage Areas	0.78	0.85	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	24	Initial Runoff Factor for Dispersed & Dispersion Areas	0.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	25	Initial Weighted Runoff Factor	0.78	0.85	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	26	Initial Design Capture Volume	12,161	94	74	0	0	0	0	0	0	0	cubic-feet
Dispersion Area Adjustments	27	Total Impervious Area Dispersed to Pervious Surface	6,073	0	0	0	0	0	0	0	0	0	sq-ft
	28	Total Pervious Dispersion Area	3,105	0	0	0	0	0	0	0	0	0	sq-ft
	29	Ratio of Dispersed Impervious Area to Pervious Dispersion Area	2.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	ratio
	30	Adjustment Factor for Dispersed & Dispersion Areas	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	ratio
	31	Runoff Factor After Dispersion Techniques	0.76	0.85	0.66	n/a	n/a	n/a	n/a	n/a	n/a	n/a	unitless
	32	Design Capture Volume After Dispersion Techniques	11,849	94	74	0	0	0	0	0	0	0	cubic-feet
Tree & Barrel Adjustments	33	Total Tree Well Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
	34	Total Rain Barrel Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
Results	35	Final Adjusted Runoff Factor	0.76	0.85	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	36	Final Effective Tributary Area	233,100	1,858	1,450	0	0	0	0	0	0	0	sq-ft
	37	Initial Design Capture Volume Retained by Site Design Elements	312	0	0	0	0	0	0	0	0	0	cubic-feet
	38	Final Design Capture Volume Tributary to BMP	11,849	94	74	0	0	0	0	0	0	0	cubic-feet

No Warning Messages

Automated Worksheet B.2: Retention Requirements (V2.0)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
Basic Analysis	1	Drainage Basin ID or Name	DMA 1	DMA 2	DMA 3	-	-	-	-	-	-	-	unitless
	2	85th Percentile Rainfall Depth	0.61	0.61	0.61	-	-	-	-	-	-	-	inches
	3	Predominant NRCS Soil Type Within BMP Location	D	D	D								unitless
	4	Is proposed BMP location Restricted or Unrestricted for Infiltration Activities?	Restricted	Unrestricted	Unrestricted								unitless
	5	Nature of Restriction	Soil Type	n/a	n/a								unitless
	6	Do Minimum Retention Requirements Apply to this Project?	Yes	Yes	Yes								yes/no
	7	Are Habitable Structures Greater than 9 Stories Proposed?	No	No	No								yes/no
Advanced Analysis	8	Has Geotechnical Engineer Performed an Infiltration Analysis?	No	No	No								yes/no
	9	Design Infiltration Rate Recommended by Geotechnical Engineer											in/hr
Result	10	Design Infiltration Rate Used To Determine Retention Requirements	0.000	0.025	0.025	-	-	-	-	-	-	-	in/hr
	11	Percent of Average Annual Runoff that Must be Retained within DMA	1.5%	1.5%	1.5%	-	-	-	-	-	-	-	percentage
	12	Fraction of DCV Requiring Retention	0.01	0.01	0.01	-	-	-	-	-	-	-	ratio
	13	Required Retention Volume	118	1	1	-	-	-	-	-	-	-	cubic-feet

No Warning Messages

For DMA 1

Infiltration Restrictions		Form 4		
Retention is required at the project site to the maximum extent practicable. Complete this form to summarize applicable infiltration restrictions. Supporting documentation must be provided in the Attachments.				
	Restriction Element	**Applicable?**		
Mandatory Considerations	BMP is within 100 feet of contaminated soils	☐ Yes	☑ No	ML
	BMP is within 100 feet of industrial activities lacking source control	☐ Yes	☑ No	ML
	BMP is within 100 feet of well/groundwater basin	☐ Yes	☑ No	ML
	BMP is within 50 feet of septic tanks/leach fields	☐ Yes	☑ No	ML
	BMP is within 10 feet of structures/tanks/walls	☐ Yes	☐ No	
	BMP is within 10 feet of sewer utilities	☐ Yes	☐ No	
	BMP is within 10 feet of groundwater table	☐ Yes	☑ No	ML
	BMP is within hydric soils	☐ Yes	☑ No	ML
	BMP is within highly liquefiable soils and has connectivity to structures	☐ Yes	☑ No	ML
	BMP is within 1.5 times the height of adjacent steep slopes (≥25%)	☐ Yes	☐ No	
	City staff has assigned "Restricted" Infiltration Category	☐ Yes	☐ No	
Optional Considerations	BMP is within predominantly Type D soil	☑ Yes	☐ No	ML
	BMP is within 10 feet of property line	☐ Yes	☐ No	
	BMP is within fill depths of ≥5 feet (existing or proposed)	☐ Yes	☑ No	ML
	BMP is within 10 feet of underground utilities	☐ Yes	☐ No	
	BMP is within 250 feet of ephemeral stream	☐ Yes	☐ No	
	Other (provide detailed geotechnical support in Attachment 6)	☐ Yes	☐ No	
Result	**Unrestricted** – No restriction elements are applicable	☐		
	Restricted – One or more restriction elements are applicable	☑		

REGISTERED PROFESSIONAL ENGINEER
MICHAEL A. LUCAS
95468
CIVIL
STATE OF CALIFORNIA

Michael Lucas 11/6/24

Automated Worksheet B.3: BMP Performance (V2.0)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
BMP Inputs	1	Drainage Basin ID or Name	DMA 1	DMA 2	DMA 3	-	-	-	-	-	-	-	sq-ft
	2	Design Infiltration Rate Recommended	0.000	0.025	0.025	-	-	-	-	-	-	-	in/hr
	3	Design Capture Volume Tributary to BMP	11,849	94	74	-	-	-	-	-	-	-	cubic-feet
	4	Is BMP Vegetated or Unvegetated?											unitless
	5	Is BMP Impermeably Lined or Unlined?											unitless
	6	Does BMP Have an Underdrain?											unitless
	7	Does BMP Utilize Standard or Specialized Media?											unitless
	8	Provided Surface Area											sq-ft
	9	Provided Surface Ponding Depth											inches
	10	Provided Soil Media Thickness											inches
	11	Provided Gravel Thickness (Total Thickness)											inches
	12	Underdrain Offset											inches
	13	Diameter of Underdrain or Hydromod Orifice (Select Smallest)											inches
	14	Specialized Soil Media Filtration Rate											in/hr
	15	Specialized Soil Media Pore Space for Retention											unitless
	16	Specialized Soil Media Pore Space for Biofiltration											unitless
	17	Specialized Gravel Media Pore Space											unitless
Retention Calculations	18	Volume Infiltrated Over 6 Hour Storm	0	0	0	0	0	0	0	0	0	0	cubic-feet
	19	Ponding Pore Space Available for Retention	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	unitless
	20	Soil Media Pore Space Available for Retention	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	unitless
	21	Gravel Pore Space Available for Retention (Above Underdrain)	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	unitless
	22	Gravel Pore Space Available for Retention (Below Underdrain)	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	unitless
	23	Effective Retention Depth	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	24	Fraction of DCV Retained (Independent of Drawdown Time)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	25	Calculated Retention Storage Drawdown Time	0	0	0	0	0	0	0	0	0	0	hours
	26	Efficacy of Retention Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	27	Volume Retained by BMP (Considering Drawdown Time)	0	0	0	0	0	0	0	0	0	0	cubic-feet
	28	Design Capture Volume Remaining for Biofiltration	11,849	94	74	0	0	0	0	0	0	0	cubic-feet
Biofiltration Calculations	29	Max Hydromod Flow Rate through Underdrain	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	cfs
	30	Max Soil Filtration Rate Allowed by Underdrain Orifice	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	in/hr
	31	Soil Media Filtration Rate per Specifications	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	in/hr
	32	Soil Media Filtration Rate to be used for Sizing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	in/hr
	33	Depth Biofiltered Over 6 Hour Storm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	34	Ponding Pore Space Available for Biofiltration	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	35	Soil Media Pore Space Available for Biofiltration	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	unitless
	36	Gravel Pore Space Available for Biofiltration (Above Underdrain)	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	unitless
	37	Effective Depth of Biofiltration Storage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	38	Drawdown Time for Surface Ponding	0	0	0	0	0	0	0	0	0	0	hours
	39	Drawdown Time for Effective Biofiltration Depth	0	0	0	0	0	0	0	0	0	0	hours
	40	Total Depth Biofiltered	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	41	Option 1 - Biofilter 1.50 DCV: Target Volume	17,774	141	111	0	0	0	0	0	0	0	cubic-feet
	42	Option 1 - Provided Biofiltration Volume	0	0	0	0	0	0	0	0	0	0	cubic-feet
	43	Option 2 - Store 0.75 DCV: Target Volume	8,887	71	56	0	0	0	0	0	0	0	cubic-feet
	44	Option 2 - Provided Storage Volume	0	0	0	0	0	0	0	0	0	0	cubic-feet
	45	Portion of Biofiltration Performance Standard Satisfied	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
Result	46	Do Site Design Elements and BMPs Satisfy Annual Retention Requirements?	Yes	No	No	-	-	-	-	-	-	-	yes/no
	47	Overall Portion of Performance Standard Satisfied (BMP Efficacy Factor)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	48	Deficit of Effectively Treated Stormwater	-11,849	-94	-74	n/a	n/a	n/a	n/a	n/a	n/a	n/a	cubic-feet

Attention!

To the volume based proprietary biofiltration BMP

To Permeable Pavers

-Minimum annual retention criteria are not satisfied fo te design elements, increase structural BMP retention capacity, or demonstrate that such requirements are satisfied at the project-level.
-This BMP does not fully satisfy the performance sta

E.3 SD-5 Impervious Area Dispersion



MS4 Permit Category
Site Design

Manual Category
Site Design

Applicable Performance Criteria
Site Design

Primary Benefits
Volume Reduction
Peak Flow Attenuation

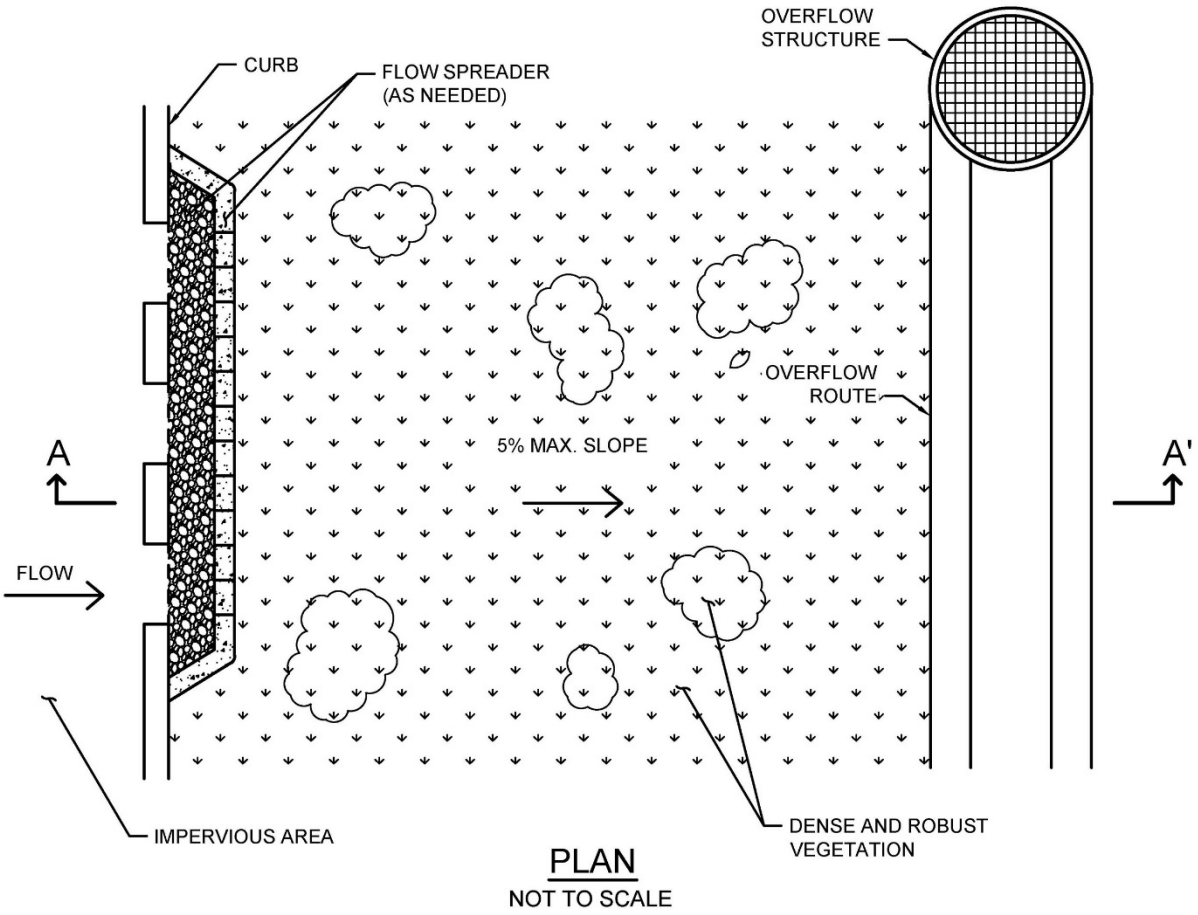
Photo Credit: Orange County Technical Guidance Document

Description

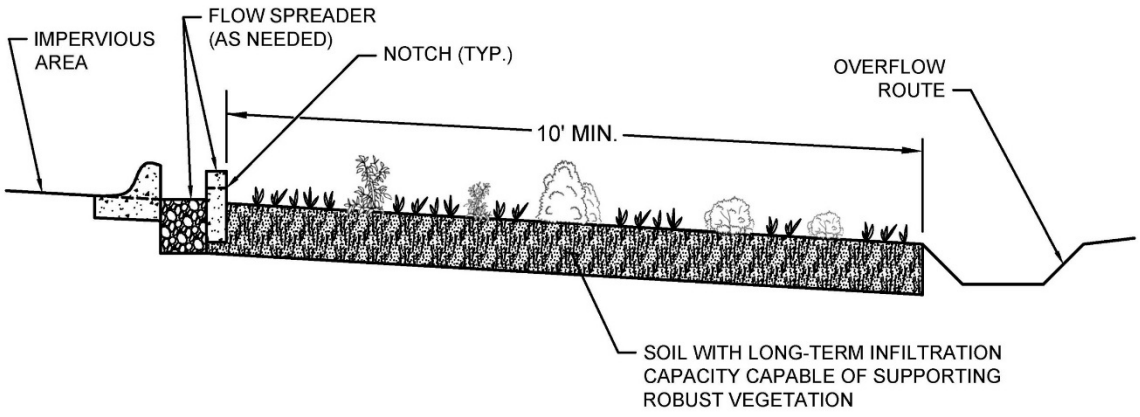
Impervious area dispersion (dispersion) refers to the practice of effectively disconnecting impervious areas from directly draining to the storm drain system by routing runoff from impervious areas such as rooftops (through downspout disconnection), walkways, and driveways onto the surface of adjacent pervious areas. The intent is to slow runoff discharges, and reduce volumes. Dispersion with partial or full infiltration results in significant volume reduction by means of infiltration and evapotranspiration.

Typical dispersion components include:

- An impervious surface from which runoff flows will be routed with minimal piping to limit concentrated inflows
- Splash blocks, flow spreaders, or other means of dispersing concentrated flows and providing energy dissipation as needed
- Dedicated pervious area, typically vegetated, with in-situ soil infiltration capacity for partial or full infiltration
- Optional soil amendments to improve vegetation support, maintain infiltration rates and enhance treatment of routed flows
- Overflow route for excess flows to be conveyed from dispersion area to the storm drain system or discharge point



PLAN
NOT TO SCALE



SECTION A-A'
NOT TO SCALE

Typical plan and section view of an Impervious Area Dispersion BMP

Design Adaptations for Project Goals

Site design BMP to reduce impervious area and DCV. Impervious area dispersion primarily functions as a site design BMP for reducing the effective imperviousness of a site by providing partial or full infiltration of the flows that are routed to pervious dispersion areas and otherwise slowing down excess flows that eventually reach the storm drain system. This can significantly reduce the DCV for the site.

Design Criteria and Considerations

Dispersion must meet the following design criteria. Deviations from the below criteria may be approved at the discretion of the City Engineer if it is determined to be appropriate:

Siting and Design	*Intent/Rationale*
Dispersion is over areas with soil types capable of supporting or being amended (e.g., with sand or compost) to support vegetation. Media amendments must be tested to verify that they are not a source of pollutants.	Soil must have long-term infiltration capacity for partial or full infiltration and be able to support vegetation to provide runoff treatment. Amendments to improve plant growth must not have negative impact on water quality.
Dispersion has vegetated sheet flow over a relatively large distance (minimum 10 feet) from inflow to overflow route.	Full or partial infiltration requires relatively large areas to be effective depending on the permeability of the underlying soils.
Pervious areas should be flat (with less than 5% slopes) and vegetated.	Flat slopes facilitate sheet flows and minimize velocities, thereby improving treatment and reducing the likelihood of erosion.
Inflow velocities	
Inflow velocities are limited to 3 ft/s or less or use energy dissipation methods (e.g., riprap, level spreader) for concentrated inflows.	High inflow velocities can cause erosion, scour and/or channeling.
Dedication	
Dispersion areas must be owned by the project owner and be dedicated for the purposes of dispersion to the exclusion of other future uses that might reduce the effectiveness of the dispersion area.	Dedicated dispersion areas prevent future conversion to alternate uses and facilitate continued full and partial infiltration benefits.

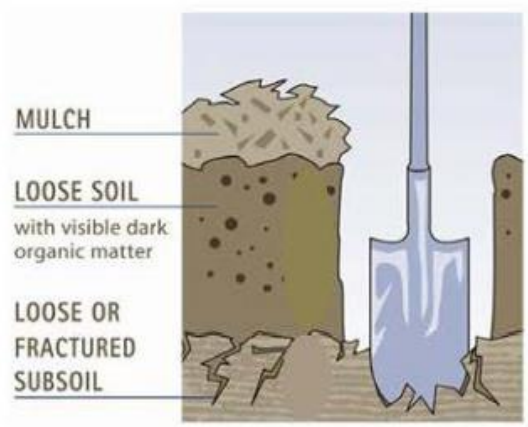
Siting and Design	*Intent/Rationale*
Vegetation	
☐ Dispersion typically requires dense and robust vegetation for proper function. Drought tolerant species should be selected to minimize irrigation needs. A plant list to aid in selection can be found in Appendix E.20.	Vegetation improves resistance to erosion and aids in runoff treatment.

Conceptual Design and Sizing Approach for Site Design

1. Determine the areas where dispersion can be used in the site design to reduce the DCV for pollutant control sizing.
2. Calculate the DCV for storm water pollutant control per Appendix B.2, taking into account reduced runoff from dispersion.
3. Determine if a DMA is considered "Self-retaining" if the impervious to pervious ratio is:
    a. 2:1 when the pervious area is composed of Hydrologic Soil Group A
    b. 1:1 when the pervious area is composed of Hydrologic Soil Group B

E.7 SD-F Amended Soil

Image Credit: WDOE Guidelines and Resources for Implementing Amended Soil BMP T5.13



MS4 Permit Category
Site Design
Manual Category
Site Design
Applicable Performance Standard
Site Design
Primary Benefits
Volume Reduction Peak Flow Attenuation

Description

Amended soils are soils whose physical, chemical, and biological characteristics have been altered from the natural condition to promote beneficial storm water characteristics. Amended soils shall be used as part of SD-B Impervious Area Dispersion, where applicable. Typical storm water management benefits associated with amended soils include:

- **Improved hydrologic characteristics**—amended soils can promote infiltration, decrease runoff rates and volumes, and more effectively filter pollutants from storm water runoff
- **Improved vegetation health**—amended soils provide greater moisture retention, and altered chemical and biological characteristics that can result in healthier plant growth, reduced irrigation demands, and reduced need for fertilization and maintenance
- **Reduced erosion**—amended soils produce healthier plant growth and reduced runoff which results in reduced soil erosion

Not all amended soils have the same storm water benefits, the soil amendment used should be suited for the design purpose and design period of the amended area.

Design Adaptations for Project Goals

Amended soil primarily functions as a site design BMP for reducing the effective imperviousness of a site by providing partial or full infiltration of the flows that are routed to amended soil areas and otherwise slowing down excess flows that eventually reach the storm drain system. Amended soil is used in conjunction with SD-B Impervious Area Dispersion.

Varying categories of soil amendments have different benefits and applications. Mulch is a soil amendment that is added at grade, rather than mixed into the soil. Mulch reduces evaporation and improves retention. Shavings and compost are common soil amendments that improve biological and chemical properties of the soil. Sand can be used as an amendment to improve the drainage rates of amended soils. Native soil samples may need to be analyzed by a lab to determine the specific soil amendments needed to achieve the desired infiltration, retention, and/or filtration rates.

Amending soil per these guidelines is not the same as preservation of naturally occurring topsoil and vegetation. However, amending soil will improve on-site management of storm water flow and water quality.

Design Criteria and Considerations

Soil amendments must meet the following design criteria and considerations. Deviations from the below criteria may be approved at the discretion of the County reviewer if appropriate:

	Siting and Design	***Intent/Rationale***
☐	Mulch is applied at grade over all planting areas to a depth of 3".	Mulch should be applied on top and not mixed into underlying soils
☐	Shavings or compost are rototilled into the native soil to a minimum depth of 6" (12 inches preferred).	If soil is not completely mixed the overall benefit will be reduced.
☐	Compost meets the criteria in Appendix F.2 Section 803-5.1	If poor quality compost is used, it will have negative impact to water quality.
☐	Soil amendments are free of stones, stumps, roots, glass, plastic, metal, and other deleterious materials.	Large debris in amended soils can cause localized erosion. Trash/harmful materials can result in personal injury or contamination.
☐	Mixing of soils are done prior to planting	Soil mixing before planting results in a more homogeneous mixing and will reduce the stress on plants.
☐	Care is taken around existing trees and shrubs to prevent root damage during construction and soil amendment application.	Preservation of existing established vegetation is an important part of site design and erosion control.
☐	Soil amendments are applied at the end of construction	Soil amendments applied too soon in the construction process may become over compacted reducing effectiveness.
☐	Soil amendments are compatible with planned vegetation	The soil amendments impact the pH and salinity of the soil. Some plants have sensitive pH and/or salinity tolerance ranges.

Conceptual Design and Sizing Approach for Site Design

- When soil amendments are used a runoff factor of 0.1 can be used for DCV calculation for the amended area.
- Amended soils should be used as part of SD-B Impervious Area Dispersion, and to increase the retention volume in other BMPs.

Maintenance

Annual maintenance may be required to determine reapplication requirements of amended soils. Amended soils should be regularly inspected for signs of compaction, waterlogging, and unhealthy vegetation.

SSD-BMP Automated Worksheet I-1: Step 1. Calculation of Design Capture Volume (V1.0)													
Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
Standard Drainage Basin Inputs	1	Drainage Basin ID or Name	SD-5-15	SD-5-16	SD-5-26	SD-5-27	SD-5-38	SD-5-39	SD-5-50	SD-5-59	SD-5-12		unitless
	2	85th Percentile 24-hr Storm Depth	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61		inches
	3	Is Hydromodification Control Applicable?	No	No	No	No	No	No	No	No	No		yes/no
	4	Impervious Surfaces Not Directed to Dispersion Area (C=0.90)											sq-ft
	5	Semi-Pervious Surfaces Not Serving as Dispersion Area (C=0.30)											sq-ft
	6	Engineered Pervious Surfaces Not Serving as Dispersion Area (C=0.10)											sq-ft
	7	Natural Type A Soil Not Serving as Dispersion Area (C=0.10)											sq-ft
	8	Natural Type B Soil Not Serving as Dispersion Area (C=0.14)											sq-ft
	9	Natural Type C Soil Not Serving as Dispersion Area (C=0.23)											sq-ft
	10	Natural Type D Soil Not Serving as Dispersion Area (C=0.30)											sq-ft
SSD-BMPs Proposed	11	Does Tributary Incorporate Dispersion and/or Rain Barrels?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		yes/no
	12	Does Tributary Incorporate Tree Wells?	No	No	No	No	No	No	No	No	No		yes/no
Dispersion Area & Rain Barrel Inputs (Optional)	13	Impervious Surfaces Directed to Dispersion Area per SD-B (Ci=0.90)	472	950	650	950	760	760	550	472	509		sq-ft
	14	Semi-Pervious Surfaces Serving as Dispersion Area per SD-B (Ci=0.30)											sq-ft
	15	Engineered Pervious Surfaces Serving as Dispersion Area per SD-B (Ci=0.10)	260	475	325	475	380	380	280	260	270		sq-ft
	16	Natural Type A Soil Serving as Dispersion Area per SD-B (Ci=0.10)											sq-ft
	17	Natural Type B Soil Serving as Dispersion Area per SD-B (Ci=0.14)											sq-ft
	18	Natural Type C Soil Serving as Dispersion Area per SD-B (Ci=0.23)											sq-ft
	19	Natural Type D Soil Serving as Dispersion Area per SD-B (Ci=0.30)											sq-ft
	20	Number of Rain Barrels Proposed per SD-E											#
	21	Average Rain Barrel Size											gal
Initial Runoff Factor Calculation	22	Total Tributary Area	732	1,425	975	1,425	1,140	1,140	830	732	779	0	sq-ft
	23	Initial Runoff Factor for Standard Drainage Areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	24	Initial Runoff Factor for Dispersed & Dispersion Areas	0.62	0.63	0.63	0.63	0.63	0.63	0.63	0.62	0.62	0.00	unitless
	25	Initial Weighted Runoff Factor	0.62	0.63	0.63	0.63	0.63	0.63	0.63	0.62	0.62	0.00	unitless
	26	Initial Design Capture Volume	23	46	31	46	37	37	27	23	25	0	cubic-feet
Dispersion Area Adjustment & Rain Barrel Adjustment	27	Total Impervious Area Dispersed to Pervious Surface	472	950	650	950	760	760	550	472	509	0	sq-ft
	28	Total Pervious Dispersion Area	260	475	325	475	380	380	280	260	270	0	sq-ft
	29	Ratio of Dispersed Impervious Area to Pervious Dispersion Area for DCV Reduction	1.80	2.00	2.00	2.00	2.00	2.00	2.00	1.80	1.90	n/a	ratio
	30	Adjustment Factor for Dispersed & Dispersion Areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	ratio
	31	Runoff Factor After Dispersion Techniques	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n/a	unitless
	32	Design Capture Volume After Dispersion Techniques	0	0	0	0	0	0	0	0	0	0	cubic-feet
	33	Total Rain Barrel Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
Results	34	Final Adjusted Runoff Factor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	35	Final Effective Tributary Area	0	0	0	0	0	0	0	0	0	0	sq-ft
	36	Initial Design Capture Volume Retained by Dispersion Area and Rain Barrel(s)	23	46	31	46	37	37	27	23	25	0	cubic-feet
	37	Remaining Design Capture Volume Tributary to Tree Well(s)	0	0	0	0	0	0	0	0	0	0	cubic-feet

No Warning Messages

SSD-BMP Automated Worksheet I-2: Step 2. Dispersion Area Validation (V1.0)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
Standard Dispersion Area Inputs	1	Drainage Basin ID or Name	SD-5-15	SD-5-16	SD-5-26	SD-5-27	SD-5-38	SD-5-39	SD-5-50	SD-5-59	SD-5-12	-	unitless
	2	Final Design Capture Volume (DCV)	0	0	0	0	0	0	0	0	0	-	cubic-feet
	3	Is Hydromodification Control Applicable?	No	No	No	No	No	No	No	No	No	-	yes/no
	4	Total Impervious Area Dispersed to Pervious Surface	472	950	650	950	760	760	550	472	509	-	sq-ft
	5	Total Engineered Pervious Surface and/or Natural Soil Dispersion Area (Does Not Include Semi-Pervious Surfaces Serving as Dispersion Area)	260	475	325	475	380	380	280	260	270	-	sq-ft
	6	Ratio of Dispersed Impervious Area to Total Engineered Pervious Surface and/or Natural Soil Dispersion Area	1.82	2.00	2.00	2.00	2.00	2.00	1.96	1.82	1.89	-	unitless
	7	Dispersion Area Length (Length of Sheet Flow Across Dispersion Area)	10	10	10	10	10	10	10	10	10		feet
	8	Dispersion Area Slope	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		%
	9	Thickness of Amended Soil	3	3	3	3	3	3	3	3	3		inches
	10	How is Flow Dispersed Across Width of Dispersion Area (definitions below*)?	Roof Drains	Roof Drains	Roof Drains	Roof Drains	Roof Drains	Roof Drains	Roof Drains	Roof Drains	Roof Drains		unitless
Results	11	Is DCV Requirement Fully Satisfied by Dispersion Area?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	yes/no
	12	Is Hydromodification Control Requirement Satisfied by Dispersion Area?	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-	yes/no
	13	Are Dispersion Area Length, Slope, and Thickness of Amended Soil (when applicable) Adequate?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	yes/no

No Warning Messages

Notes:

*How is Flow Dispersed Across Width of Pervious Dispersion Area?

Sheet Flow: Flow arrives as sheet flow across the width of the adjacent impervious area

Spreader(s): Flow is discharged from flow spreader(s) across the width of the pervious area

Roof Drains: Discharge from roof drains distributed across the width of the pervious area

Curb Cuts: Discharge from curb cuts distributed across the width of the pervious area

Other: Other (Describe in PDP SWQMP)

DMA CALCULATIONS

	DMA 1	DMA 2	DMA 3	Onsite Retention Volume
Required Retention Volume	118	1	1	120
Provided Retention Volume	312	0	0	312
Do Site Design Elements and BMPs Satisfy Annual Retention Requirements?	YES	NO	NO	YES

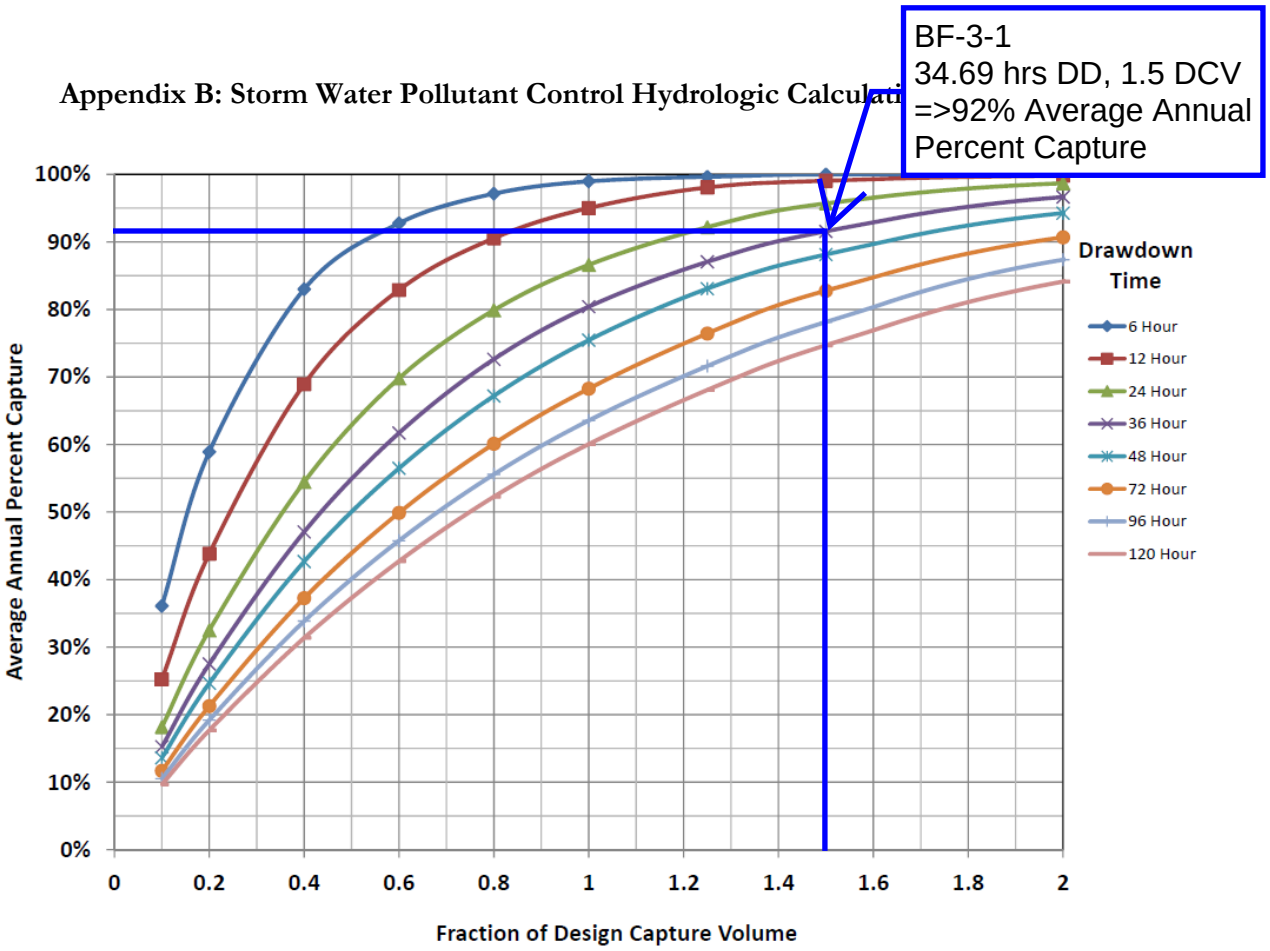


Figure B.3-1: Percent Capture Nomograph

Part 6) Determine the efficacy of the retention processes provided by the BMP. This value represents the portion of the pollutant control performance standard that is satisfied through retention processes of the BMP and is calculated as follows.

$$E_R = P_C/80\%$$

Where:
E_R: Efficacy of retention processes (decimal)
P_C: Average Annual Percent Capture (%)

Part 7) Determine the total volume retained by the proposed BMP.

$$V_{RBMP} = DCV \times E_R$$

Where:
V_{RBMP}: Total volume retained by BMP (ft_3)
DCV: Design capture volume (ft_3)
E_R: Efficacy of retention processes (decimal)

Part 8) Determine the volume of storm water runoff still available for biofiltration treatment as shown

CMP-1 Discharge to MWS BF-3-1

Discharge vs Elevation Table

Low orifice:	2.5 "	Top orifice:	0.625 "
Number:	1	Number:	0
Cg-low:	0.61	Cg-low:	0.61
invert elev:	0.00 ft	invert elev:	0.40 ft

h	H/D-low	H/D-mid	H/D-top	Qlow-orif	Qlow-weir	Qtot-low	Qmid-orif	Qmid-weir	Qtot-med	Qtop-orif	Qtop-weir	Qtot-top	Qpeak-top	Qtot
(ft)	-	-	-	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000
0.17	0.80	0.00	0.00	0.042	0.035	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0354
0.33	1.60	0.00	0.00	0.080	0.100	0.080	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0799
0.50	2.40	0.00	1.92	0.105	0.136	0.105	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1050
0.67	3.20	2.42	5.12	0.125	0.142	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1252
0.83	4.00	4.85	8.32	0.142	0.234	0.142	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1425
1.00	4.80	7.27	11.52	0.158	0.708	0.158	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1579
1.17	5.60	9.70	14.72	0.172	2.103	0.172	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1720
1.33	6.40	12.12	17.92	0.185	5.265	0.185	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1850
1.50	7.20	14.55	21.12	0.197	11.405	0.197	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1972
1.67	8.00	16.97	24.32	0.209	22.164	0.209	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2086
1.83	8.80	19.39	27.52	0.219	39.678	0.219	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2194
2.00	9.60	21.82	30.72	0.230	66.635	0.230	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2298
2.17	10.40	24.24	33.92	0.240	106.340	0.240	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2396
2.33	11.20	26.67	37.12	0.249	162.779	0.249	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2491
2.50	12.00	29.09	40.32	0.258	240.680	0.258	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2583
2.67	12.80	31.52	43.52	0.267	345.572	0.267	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2671
2.75	13.20	32.73	45.12	0.271	410.104	0.271	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2714
2.83	13.60	33.94	46.72	0.276	483.854	0.276	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2757
3.00	14.40	36.36	49.92	0.284	662.852	0.284	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2840
3.17	15.22	38.84	53.18	0.292	896.007	0.292	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2922
3.33	16.00	41.21	56.32	0.300	1177.320	0.300	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2999
3.50	16.80	43.64	59.52	0.308	1532.649	0.308	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3075
3.67	17.60	46.06	62.72	0.315	1968.536	0.315	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3150
3.83	18.40	48.48	65.92	0.322	2497.888	0.322	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3222
4.00	19.20	50.91	69.12	0.329	3134.913	0.329	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3294
4.17	20.00	53.33	72.32	0.336	3895.187	0.336	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3363
4.33	20.80	55.76	75.52	0.343	4795.713	0.343	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3432
4.50	21.60	58.18	78.72	0.350	5854.983	0.350	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3499
4.67	22.40	60.61	81.92	0.356	7093.043	0.356	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3564
4.83	23.20	63.03	85.12	0.363	8531.553	0.363	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3629
5.00	24.00	65.45	88.32	0.369	10193.852	0.369	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3692
5.17	24.80	67.88	91.52	0.375	12105.017	0.375	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3755
5.33	25.60	70.30	94.72	0.382	14291.927	0.382	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3816
5.50	26.40	72.73	97.92	0.388	16783.327	0.388	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3876
5.67	27.20	75.15	101.12	0.394	19609.887	0.394	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3936
5.83	28.00	77.58	104.32	0.399	22804.268	0.399	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3994
6.00	28.80	80.00	107.52	0.405	26401.180	0.405	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4052
6.17	29.60	82.42	110.72	0.411	30437.450	0.411	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4109
6.33	30.40	84.85	113.92	0.416	34952.078	0.416	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4165
6.50	31.20	87.27	117.12	0.422	39986.307	0.422	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4220
6.67	32.00	89.70	120.32	0.427	45583.676	0.427	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4275
6.83	32.80	92.12	123.52	0.433	51790.090	0.433	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4329
7.00	33.60	94.55	126.72	0.438	58653.882	0.438	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4382
7.17	34.40	96.97	129.92	0.443	66225.868	0.443	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4435
7.33	35.20	99.39	133.12	0.449	74559.419	0.449	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4487
7.50	36.00	101.82	136.32	0.454	83710.517	0.454	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4538

CMP #1 Stage Storage					
Input DCV			11,849		
Input Factor			1.5		
Factor X DCV			17,773.5		
WQ Ponding Depth			2.750	ft	
Note: Find out the elevation value in relation to required WQ volume					
HMP-1					
depth	area	area (ac)	elevation	volume (cf)	volume (acft)
0.00	3634.0	0.0834	0.00	0.0	0.00000
0.17	4818.6	0.1106	0.17	737.9	0.01694
0.33	5288.7	0.1214	0.33	1,582.7	0.03633
0.50	5635.1	0.1294	0.50	2,494.2	0.05726
0.67	5914.8	0.1358	0.67	3,457.4	0.07937
0.83	6150.3	0.1412	0.83	4,463.3	0.10246
1.00	6352.9	0.1458	1.00	5,505.7	0.12639
1.17	6529.7	0.1499	1.17	6,579.6	0.15105
1.33	6685.1	0.1535	1.33	7,681.1	0.17633
1.50	6822.2	0.1566	1.50	8,806.9	0.20218
1.67	6943.4	0.1594	1.67	9,954.3	0.22852
1.83	7050.2	0.1619	1.83	11,120.6	0.25529
2.00	7144.1	0.1640	2.00	12,303.6	0.28245
2.17	7226.1	0.1659	2.17	13,501.3	0.30995
2.33	7296.8	0.1675	2.33	14,711.7	0.33773
2.50	7357.1	0.1689	2.50	15,933.0	0.36577
2.67	7407.3	0.1700	2.67	17,163.5	0.39402
2.75	7427.6	0.1705	2.75	17782.5	0.40823
2.83	7447.9	0.1710	2.83	18,401.5	0.42244
3.00	7479.2	0.1717	3.00	19,645.6	0.45100
3.17	7501.3	0.1722	3.17	20,894.1	0.47966
3.33	7514.6	0.1725	3.33	22,145.5	0.50839
3.50	7519.0	0.1726	3.50	23,398.5	0.53715
3.67	7514.6	0.1725	3.67	24,651.4	0.56592
3.83	7501.3	0.1722	3.83	25,902.8	0.59465
4.00	7479.2	0.1717	4.00	27,151.3	0.62331
4.17	7447.9	0.1710	4.17	28,395.4	0.65187
4.33	7407.3	0.1700	4.33	29,633.4	0.68029
4.50	7357.1	0.1689	4.50	30,863.9	0.70854
4.67	7296.8	0.1675	4.67	32,085.2	0.73658
4.83	7226.1	0.1659	4.83	33,295.6	0.76436
5.00	7144.1	0.1640	5.00	34,493.3	0.79186
5.17	7050.2	0.1619	5.17	35,676.3	0.81902
5.33	6943.4	0.1594	5.33	36,842.6	0.84579
5.50	6822.2	0.1566	5.50	37,990.0	0.87213
5.67	6685.1	0.1535	5.67	39,115.8	0.89798
5.83	6529.7	0.1499	5.83	40,217.3	0.92326
6.00	6352.9	0.1458	6.00	41,291.2	0.94792
6.17	6150.3	0.1412	6.17	42,333.6	0.97184
6.33	5914.8	0.1358	6.33	43,339.5	0.99494
6.50	5635.1	0.1294	6.50	44,302.7	1.01705
6.67	5288.7	0.1214	6.67	45,214.2	1.03798
6.83	4818.6	0.1106	6.83	46,059.0	1.05737
7.00	3634.0	0.0834	7.00	46,796.9	1.07431
7.17	3634.0	0.0834	7.17	47,402.6	1.08821
7.33	3634.0	0.0834	7.33	48,008.2	1.10212
7.50	3634.0	0.0834	7.50	48,613.9	1.11602

CONTECH ENGINEERED SOLUTIONS

Date: 12/22/2023
Project Name: DetentionHMP1 - 42891 (12-22-2023 20-32-6)

City / County:
State:

Designed By:
Company:
Telephone:

CMP: Underground Detention System Storage Volume Estimation

=Adjustable Input Cells

Contech Engineered Solutions, LLC is pleased to offer the following estimate of storage volume for the above named project. The results are submitted as an estimate only, without liability on the part of Contech Engineered Solutions, LLC for accuracy or suitability to any particular applicaton and are subject to verification of the Engineer of Record. This tool is only applicable for rectangular shaped systems.

Summary of Inputs

System Information		Backfill Information		Pipe & Analysis Information	
Out-to-out length (ft):	113.0	Backfill Porosity (%):	40%	System Diameter (in):	84
Out-to-out width (ft):	77.0	Depth Above Pipe (in):	6.0	Pipe Spacing (in):	36
Number of Manifolds (ea):	1.0	Depth Below Pipe (in):	0.0	Incremental Analysis (in):	2
Number of Barrels (ea):	8.0	Width At Ends (ft):	1.0	System Invert (Elevation):	0
		Width At Sides (ft):	1.0		

Storage Volume Estimation

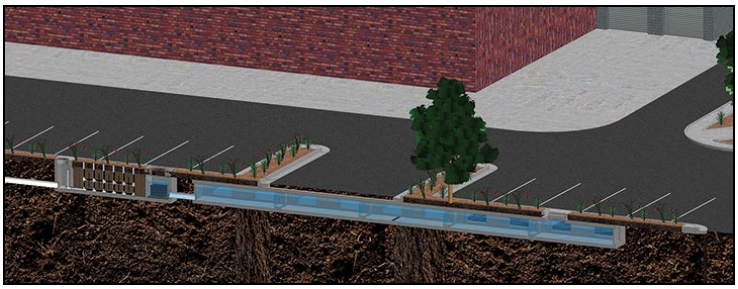
System		Pipe		Stone		Total System		Miscellaneous	
Depth (ft)	Elevation (ft)	Incremental Storage (cf)	Cumulative Storage (cf)	Incremental Storage (cf)	Cumulative Storage (cf)	Incremental Storage (cf)	Cumulative Storage (cf)	Percent Open Storage (%)	Ave. Surface Area (sf)
0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	3,634.0
0.17	0.16	220.4	220.4	517.5	517.5	737.9	737.9	29.9%	4,818.6
0.33	0.33	398.5	618.9	446.3	963.8	844.8	1,582.7	39.1%	5,288.7
0.50	0.50	509.7	1,128.6	401.8	1,365.5	911.5	2,494.2	45.3%	5,635.1
0.67	0.66	595.9	1,724.6	367.3	1,732.8	963.2	3,457.4	49.9%	5,914.8
0.83	0.83	667.1	2,391.7	338.8	2,071.7	1,005.9	4,463.3	53.6%	6,150.3
1.00	1.00	727.8	3,119.5	314.6	2,386.2	1,042.3	5,505.7	56.7%	6,352.9
1.17	1.16	780.4	3,899.8	293.5	2,679.7	1,073.9	6,579.6	59.3%	6,529.7
1.33	1.33	826.4	4,726.2	275.1	2,954.8	1,101.5	7,681.1	61.5%	6,685.1
1.50	1.50	867.0	5,593.2	258.9	3,213.7	1,125.8	8,806.9	63.5%	6,822.2
1.67	1.66	902.8	6,496.0	244.5	3,458.3	1,147.3	9,954.3	65.3%	6,943.4
1.83	1.83	934.4	7,430.4	231.9	3,690.2	1,166.3	11,120.6	66.8%	7,050.2
2.00	2.00	962.3	8,392.7	220.8	3,910.9	1,183.0	12,303.6	68.2%	7,144.1
2.17	2.16	986.7	9,379.4	211.0	4,121.9	1,197.7	13,501.3	69.5%	7,226.1
2.33	2.33	1,007.9	10,387.2	202.5	4,324.4	1,210.4	14,711.7	70.6%	7,296.8
2.50	2.50	1,026.1	11,413.3	195.2	4,519.7	1,221.3	15,933.0	71.6%	7,357.1
2.67	2.66	1,041.4	12,454.7	189.1	4,708.8	1,230.5	17,163.5	72.6%	7,407.3
2.83	2.83	1,054.0	13,508.7	184.1	4,892.9	1,238.1	18,401.5	73.4%	7,447.9
3.00	3.00	1,064.0	14,572.6	180.1	5,072.9	1,244.0	19,645.6	74.2%	7,479.2
3.17	3.16	1,071.4	15,644.0	177.1	5,250.1	1,248.5	20,894.1	74.9%	7,501.3
3.33	3.33	1,076.3	16,720.3	175.1	5,425.2	1,251.5	22,145.5	75.5%	7,514.6
3.50	3.50	1,078.8	17,799.1	174.2	5,599.4	1,252.9	23,398.5	76.1%	7,519.0
3.67	3.66	1,078.8	18,877.8	174.2	5,773.5	1,252.9	24,651.4	76.6%	7,514.6
3.83	3.83	1,076.3	19,954.2	175.1	5,948.7	1,251.5	25,902.8	77.0%	7,501.3
4.00	4.00	1,071.4	21,025.5	177.1	6,125.8	1,248.5	27,151.3	77.4%	7,479.2
4.17	4.16	1,064.0	22,089.5	180.1	6,305.9	1,244.0	28,395.4	77.8%	7,447.9
4.33	4.33	1,054.0	23,143.5	184.1	6,489.9	1,238.1	29,633.4	78.1%	7,407.3
4.50	4.50	1,041.4	24,184.9	189.1	6,679.0	1,230.5	30,863.9	78.4%	7,357.1
4.67	4.66	1,026.1	25,210.9	195.2	6,874.3	1,221.3	32,085.2	78.6%	7,296.8
4.83	4.83	1,007.9	26,218.8	202.5	7,076.8	1,210.4	33,295.6	78.7%	7,226.1
5.00	5.00	986.7	27,205.5	211.0	7,287.8	1,197.7	34,493.3	78.9%	7,144.1
5.17	5.16	962.3	28,167.8	220.8	7,508.6	1,183.0	35,676.3	79.0%	7,050.2
5.33	5.33	934.4	29,102.2	231.9	7,740.5	1,166.3	36,842.6	79.0%	6,943.4
5.50	5.50	902.8	30,005.0	244.5	7,985.0	1,147.3	37,990.0	79.0%	6,822.2
5.67	5.66	867.0	30,872.0	258.9	8,243.9	1,125.8	39,115.8	78.9%	6,685.1
5.83	5.83	826.4	31,698.4	275.1	8,519.0	1,101.5	40,217.3	78.8%	6,529.7
6.00	6.00	780.4	32,478.7	293.5	8,812.5	1,073.9	41,291.2	78.7%	6,352.9
6.17	6.16	727.8	33,206.5	314.6	9,127.1	1,042.3	42,333.6	78.4%	6,150.3
6.33	6.33	667.1	33,873.6	338.8	9,465.9	1,005.9	43,339.5	78.2%	5,914.8

These results are submitted to you as a guideline only, without liability on the part of CONTECH Engineered Solutions, LLC for accuracy or suitability to any particular application, and are subject to your verification.

6.50	6.50	595.9	34,469.5	367.3	9,833.2	963.2	44,302.7	77.8%	5,635.1
6.67	6.66	509.7	34,979.2	401.8	10,235.0	911.5	45,214.2	77.4%	5,288.7
6.83	6.83	398.5	35,377.7	446.3	10,681.2	844.8	46,059.0	76.8%	4,818.6
7.00	7.00	220.4	35,598.2	517.5	11,198.7	737.9	46,796.9	76.1%	3,634.0
7.17	7.16	0.0	35,598.2	605.7	11,804.4	605.7	47,402.6	75.1%	3,634.0
7.33	7.33	0.0	35,598.2	605.7	12,410.1	605.7	48,008.2	74.2%	3,634.0
7.50	7.50	0.0	35,598.2	605.7	13,015.7	605.7	48,613.9	73.2%	3,634.0

These results are submitted to you as a guideline only, without liability on the part of CONTECH Engineered Solutions, LLC for accuracy or suitability to any particular application, and are subject to your verification.

WQ Drawdown @		2.75	ft=	34.69
Elevation	Q_{AVG} (CFS)	DV (CF)	DT (HR)	Total T
0.00	0.040	738	5.13	34.69
0.17	0.058	845	4.07	29.56
0.33	0.092	911	2.74	25.49
0.50	0.115	963	2.33	22.75
0.67	0.134	1006	2.09	20.42
0.83	0.150	1042	1.93	18.33
1.00	0.165	1074	1.81	16.41
1.17	0.179	1102	1.71	14.60
1.33	0.191	1126	1.64	12.88
1.50	0.203	1147	1.57	11.25
1.67	0.214	1166	1.51	9.68
1.83	0.225	1183	1.46	8.16
2.00	0.235	1198	1.42	6.70
2.17	0.244	1210	1.38	5.28
2.33	0.254	1221	1.34	3.91
2.50	0.263	1230	1.30	2.57
2.67	0.271	1238	1.27	1.27
2.75	0.280	1244	1.23	



Volume Based Sizing

36 Hr

Many states require treatment of a water quality volume and do not offer the option of flow based design. The MWS Linear and its unique horizontal flow makes it the only biofilter that can be used in volume based design installed downstream of ponds, detention basins, and underground storage systems.

Model #	Treatment Capacity (cu. ft.) @ 24-Hour Drain Down		Treatment Capacity (cu. ft.) @ 48-Hour Drain Down
MWS-L-4-4	1140	1710	2280
MWS-L-4-6	1600	2400	3200
MWS-L-4-8	2518	3777	5036
MWS-L-4-13	3131	4696	6261
MWS-L-4-15	3811	5716	7623
MWS-L-4-17	4492	6738	8984
MWS-L-4-19	5172	7758	10345
MWS-L-4-21	5853	8779	11706
MWS-L-6-8	3191	4786	6382
MWS-L-8-8	5036	7554	10072
MWS-L-8-12	7554	11331	15109
MWS-L-8-16	10073	15109	20145
MWS-L-8-20	12560	18840	25120
MWS-L-8-24	15108	22662	30216

VOLUME-BASED MWS MWS-L-8-20

Given by EOR:	V, upstream storage volume	=	17,783	ft^3
	t, maximum drain down time	=	36	hrs
Calc'd by Contech:	H, Media Operating Head	=	3.2	ft
	W, wetted perimeter of media cage	=	14.8	ft per cage
	N, number of media cages	=	5	cages
	R, wetlandmedia loading rate	=	0.26	gpm/sf
	Q_d = discharge flow rate (gpm)			

Calculate Q_d, disharge flow rate in gpm.
Then confirm the draindown time, t in hours.

$Q_d = H * W * N * R$

R = 0.26 gpm/sf is a typical value for volume-based MWS. This is a 1:4 safety factor from flow-based MWS, which are typically 1.03 gpm/sf.

t = V / [Q_d * (0.00222801 cfs/gpm * 60 s/min * 60 min/hr)]

Q_d =	**61.76 gpm**	**=**	**0.14**	**cfs**
t =	**36 hrs**			

MWS ORIFICE SIZING

Q = vA; Q = treatment flow rate; $v = c_d \sqrt{(2gh)}$; $A = \pi D^2/4$

H, Media Operating Head = 3.2 ft
h, Orifice Operating Head = 3.14 ft
c_d, Discharge coefficient
c_v, Coefficient of velocity = 0.98
c_c, Coefficient of contraction for the orifice = 0.62

$c_d = c_v \times c_c = 0.61$

This unit has 2 underdrain outlets, so c_d = 2 x 0.61 = 1.22

Rewrite to solve for the diameter of the orifice:

$$A = \frac{Q}{V} rewrite \rightarrow \frac{\pi D^2}{4} = \frac{Q}{c_d\sqrt{2gh}}$$

$$D = \sqrt{\frac{4Q}{\pi C_d\sqrt{2gh}}};$$

Given Qd = 0.138 cfs , c_d= 1.22 , g = 32.17 ft/s²

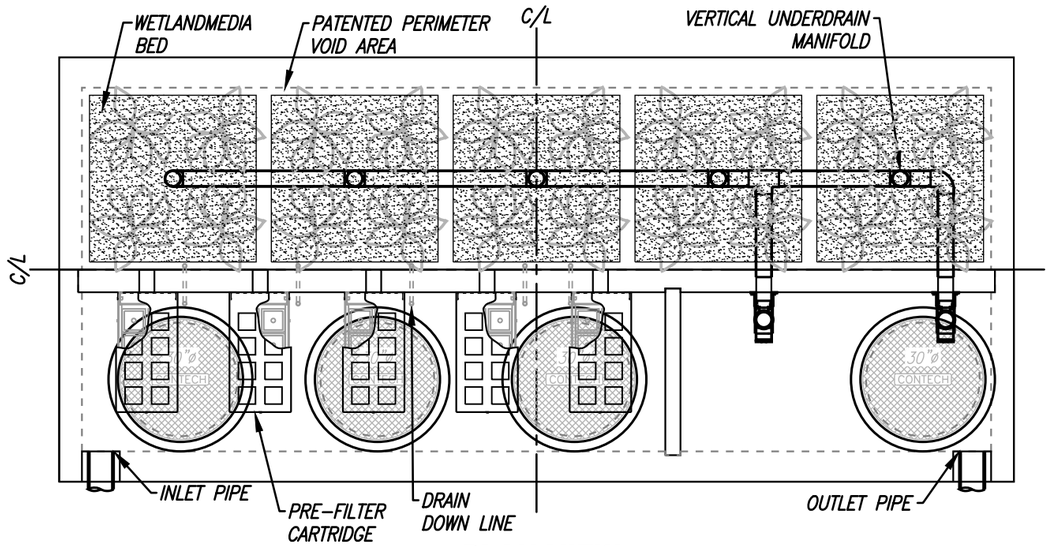
$$D = \sqrt{\left(\frac{4 \times 0.138}{\pi \times 1.22 \times \sqrt{(2 \times 32.17 \times 3.14)}}\right)} \times 12 \text{ in/ft} = \textbf{1.21 in}$$

Each orifice shall be 1.21 inches in diameter, and the weir crest for internal bypass, if required, shall be at least 3 feet 4 inches above the outlet chamber floor invert.

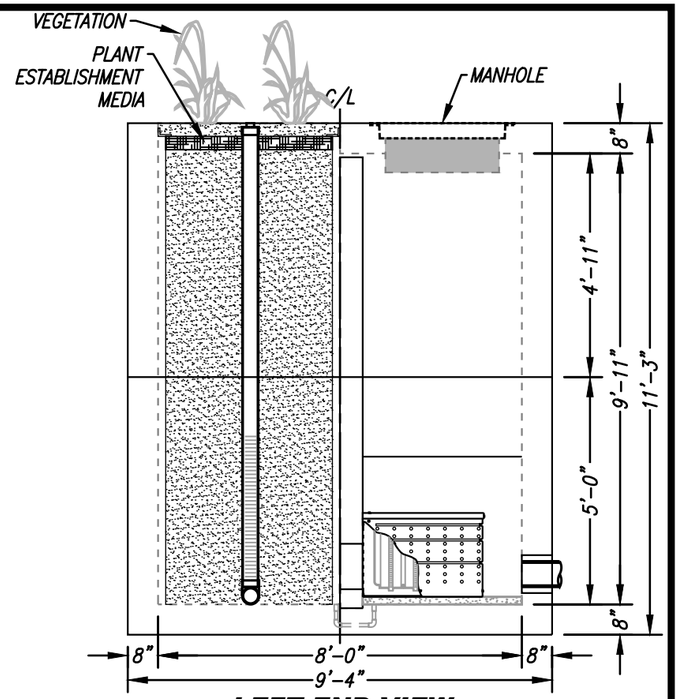
SITE SPECIFIC DATA

PROJECT NUMBER		825863	
PROJECT NAME		GARRISON ELEMENTARY SCHOOL	
PROJECT LOCATION		OCEANSIDE, CA	
STRUCTURE ID		BF-3-1	
TREATMENT REQUIRED			
VOLUME BASED (CF)			
17,783			
TREATMENT HGL AVAILABLE (FT)			N/K
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			0.405
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	85.80	PVC	6"
OUTLET PIPE	85.30	PVC	6"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	95.97	95.97	95.97
SURFACE LOAD	PEDESTRIAN	N/A	PEDESTRIAN
FRAME & COVER	ø30"	OPEN PLANTER	ø30"
WETLANDMEDIA VOLUME (CY)			26.84
ORIFICE SIZE (DIA. INCHES)			ø1.21" EACH

NOTES: PRELIMINARY NOT FOR CONSTRUCTION.



PLAN VIEW



LEFT END VIEW

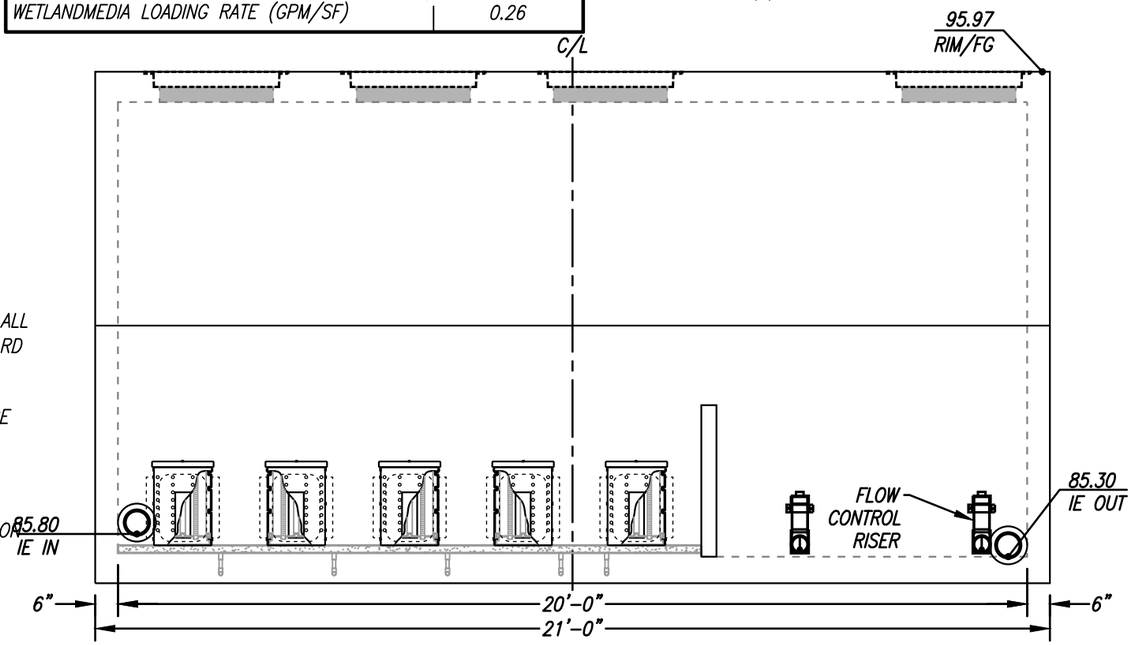
REQUIRED TREATMENT VOLUME (CF)	17,783
DRAINDOWN DURATION (HOURS)	36
AVERAGE DISCHARGE RATE PER MWS UNIT(GPM)	61.57
OPERATING HEAD (FT)	3.2
WETLANDMEDIA FILTRATION RATE (IN/HR) OR	26
WETLANDMEDIA LOADING RATE (GPM/SF) OR	0.26

LOW INFLOW PIPE DISCLOSURE:

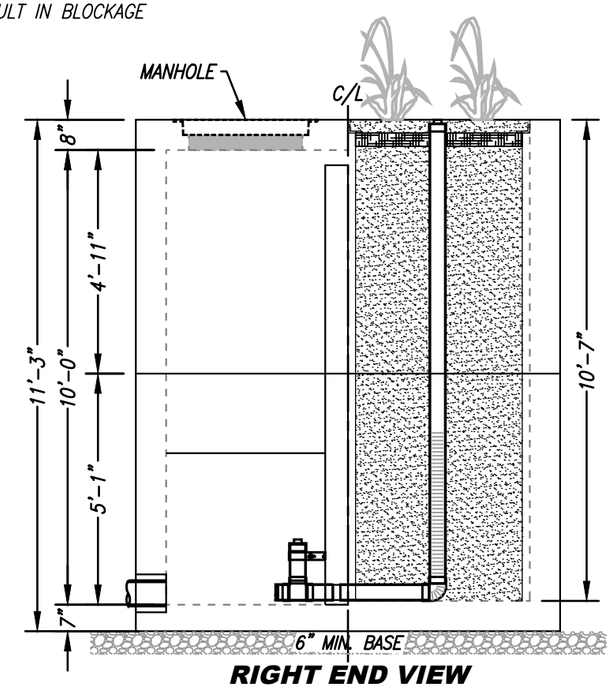
IT IS RECOMMENDED THAT A SUFFICIENT VARIATION IN ELEVATION BETWEEN THE INLET AND OUTLET BE PROVIDED TO ALLOW FOR ACCUMULATION OF SEDIMENT IN THE PRE-TREATMENT CHAMBER. FAILURE TO DO SO MAY RESULT IN BLOCKAGE AT INFLOW POINT(S) WHICH MAY CAUSE UPSTREAM FLOODING.

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. PRECAST CONTCRETE UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
5. MANHOLES SHIPPED CAST INTO TOP SLAB. CONTRACTOR TO USE GROUT AND/OR SHIMS TO MATCH TOP SLAB WITH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.



ELEVATION VIEW



RIGHT END VIEW

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT CONTECH.

11/4/24 SCOTT.SERTICH

MODULAR WETLANDS
FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

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CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com

MWS-L-8-20-10'-7"-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

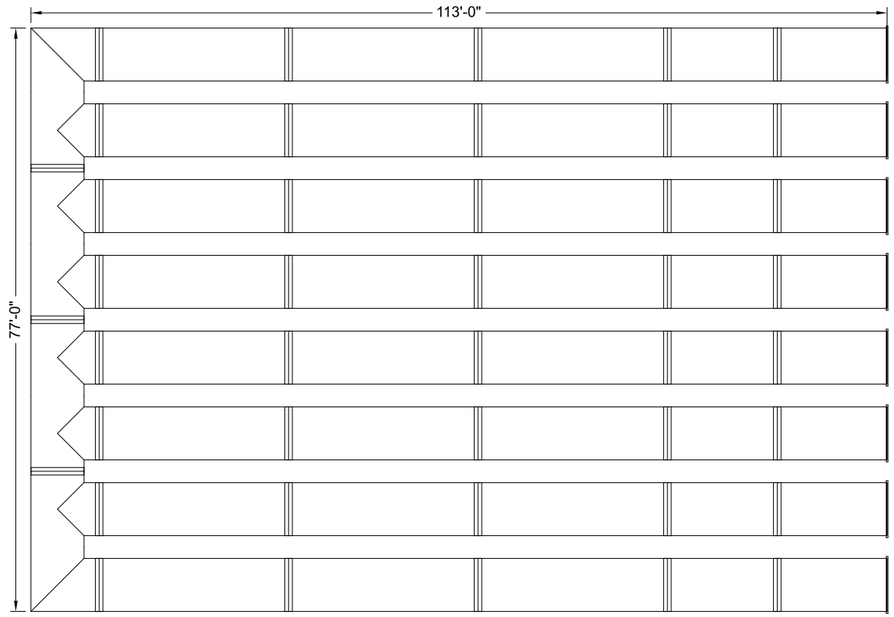
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 925 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 35,598 CF
- BACKFILL STORAGE VOLUME = 13,016 CF
- TOTAL STORAGE PROVIDED = 48,614 CF

PIPE DETAILS
- DIAMETER = 84"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = PERFORATED
- BARREL SPACING = 36"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 6"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"



NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE $2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

ASSEMBLY
SCALE: 1" = 20'

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DATE	REVISION DESCRIPTION	BY

CONTECH® ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH® CMP DETENTION SYSTEMS
CONTECH **DYODS** DRAWING

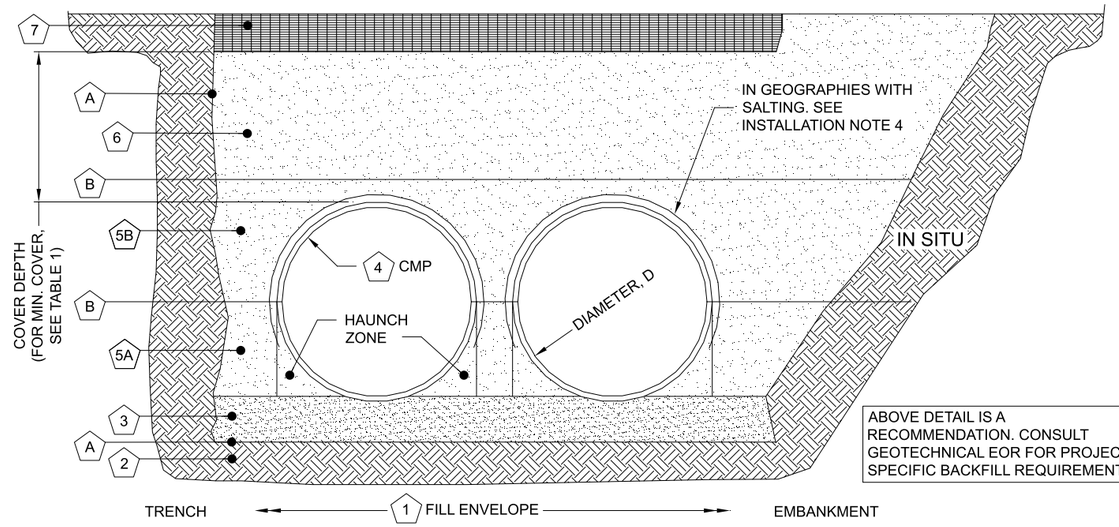
DYO42891 Garrison Elementary School
Detention1
Oceanside, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
29441	42891	12/22/2023
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

TABLE 1:

DIAMETER, D	MIN. COVER	CORR. PROFILE
6"-10"	12"	1 1/2" x 1/4"
12"-48"	12"	2 2/3" x 1/2"
>48"-96"	12"	3" x 1", 5" x 1"
>96"	D/8	3" x 1", 5" x 1"

- STRUCTURAL BACKFILL MUST EXTEND TO LIMITS OF THE TABLE
- TOTAL HEIGHT OF COMPACTED COVER FOR CONVENTIONAL HIGHWAY LOADS IS MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TOP OF RIGID PAVEMENT
- ULTRAFLO ALSO AVAILABLE FOR SIZES 18" - 120" WITH 3/4"x 3/4"x 7 1/2" CORRUGATION



MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT

INSTALLATION NOTES

1. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES.
2. OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.
3. BACKFILL USING CONTROLLED LOW-STRENGTH MATERIAL (CLSM, "FLASH FILL" OR "FLOWABLE FILL") MAY BE USED WHEN THE SPACING BETWEEN THE PIPES WILL NOT ALLOW FOR PLACEMENT AND ADEQUATE COMPACTION OF THE BACKFILL. CONTACT CONTECH FOR FURTHER EVALUATION.
4. IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, A GEOMEMBRANE BARRIER IS RECOMMENDED OVER THE UPPER HALF OF THE PIPE. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

TABLE 2: SOLID STANDARD

CMP DETENTION AND CMP DRAINAGE STANDARD BACKFILL SPECIFICATIONS

	MATERIAL LOCATION	MATERIAL SPECIFICATION	DESCRIPTION	
1	FILL ENVELOPE WIDTH	PER ENGINEER OF RECORD	MINIMUM TRENCH WIDTH MUST ALLOW ROOM FOR PROPER COMPACTION OF HAUNCH MATERIALS UNDER THE PIPE. THE SUGGESTED MINIMUM TRENCH WIDTH, OR EOR RECOMMENDATION: PIPE ≤ 12": D + 16" PIPE > 12": 1.5D + 12"	MINIMUM EMBANKMENT WIDTH (IN FEET) FOR INITIAL FILL ENVELOPE: PIPE < 24": 3.0D PIPE 24" - 144": D + 4'0" PIPE > 144": D + 10'0"
2	FOUNDATION	**AASHTO 26.5.2** OR PER ENGINEER OF RECORD	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 FOUNDATION BROUGHT BACK TO GRADE WITH A FILL MATERIAL APPROVED BY THE ENGINEER OF RECORD.	
3	BEDDING	**AASHTO M 43: 3, 357, 4, 467, 5, 56, 57** (APPROVED REGIONAL EQUIVALENTS INCLUDE CA-7)	ENGINEER OF RECORD TO DETERMINE IF BEDDING IS REQUIRED. PIPE MAY BE PLACED ON THE TRENCH BOTTOM OF A RELATIVELY LOOSE, NATIVE SUITABLE WELL GRADED GRANULAR MATERIAL THAT IS ROUGHLY SHAPED TO FIT THE BOTTOM OF THE PIPE, 2" MIN DEPTH. THE BEDDING MATERIAL MAY BE SUITABLE FOUNDATION SOILS CONFORMING TO AASHTO SOIL CLASSIFICATIONS A1, A2, OR A3 WITH MAXIMUM PARTICLE SIZE OF 3" PER AASHTO 26.3.8.1	
4	CORRUGATED METAL PIPE			
5A	CRITICAL BACKFILL	**AASHTO M 145: A-1, A-2, A-3** *	HAUNCH ZONE MATERIAL SHALL BE HAND SHOVELED OR SHOVEL SLICED INTO PLACE TO ALLOW FOR PROPER COMPACTION WITHOUT SOFT SPOTS. BACKFILL SHALL BE PLACED IN 8" +/- LOOSE LIFTS AND COMPACTED TO 90% STANDARD PROCTOR PER AASHTO T 99. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A THREE LIFT (24") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHOULD BE ADVANCED ALONG THE LENGTH OF THE SYSTEM TO AVOID DIFFERENTIAL LOADING. WELL GRADED GRANULAR MATERIAL WHICH MAY CONTAIN SMALL AMOUNTS OF SILT OR CLAY AND MAXIMUM PARTICLE SIZE OF 3" (PER AASHTO 26.3.8.1 AND 12.4-1.3).	
5B	BACKFILL	**AASHTO M 145: A-1, A-2, A-3**		
6	COVER MATERIAL	UP TO MIN. COVER - SEE 5A AND 5B ABOVE ABOVE MIN. COVER - PER ENGINEER OF RECORD	COVER MATERIAL MAY INCLUDE NON-BITUMINOUS, GRANULAR ROAD BASE MATERIAL WITHIN MIN COVER LIMITS	
7	RIGID OR FLEXIBLE PAVEMENT (IF APPLICABLE)	PER ENGINEER OF RECORD	FLEXIBLE PAVEMENT SHOULD NOT BE COUNTED AS PART OF THE FILL HEIGHT OVER THE CMP. FINAL BACKFILL MATERIAL SELECTION AND COMPACTION REQUIREMENTS SHALL FOLLOW THE PROJECT PLANS AND SPECIFICATIONS PER THE ENGINEER OF RECORD.	
A	OPTIONAL SIDE GEOTEXTILE	NONE	GEOTEXTILE LAYER IS RECOMMENDED ON SIDES OF EXCAVATION TO PREVENT SOIL MIGRATION.	
B	OPTIONAL GEOTEXTILE BETWEEN LAYERS	NONE	IF SOIL TYPES DIFFER AT ANY POINT ABOVE PIPE INVERT, A GEOTEXTILE LAYER IS RECOMMENDED TO BE PLACED BETWEEN THE LAYERS TO PREVENT SOIL MIGRATION.	

NOTES:
- FOR MULTIPLE BARREL INSTALLATIONS, THE RECOMMENDED STANDARD SPACING BETWEEN PARALLEL PIPE RUNS SHALL BE THE PIPE DIAMETER /2 BUT NO LESS THAN 12" FOR DIAMETERS <72". FOR 72" AND LARGER DIAMETERS, THE MINIMUM SPACING IS 36". CONTACT YOUR CONTECH REPRESENTATIVE FOR NONSTANDARD SPACING.

* APPROVED REGIONAL EQUIVALENTS FOR SECTION 5A INCLUDE CA-7, MIDOT 2G, 34G, OR 21AA STONE OR GRAVEL; #8; #57; MIDOT 6A, 2G, 3G, 34G.

MANUFACTURER RECOMMENDED BACKFILL

NOT TO SCALE

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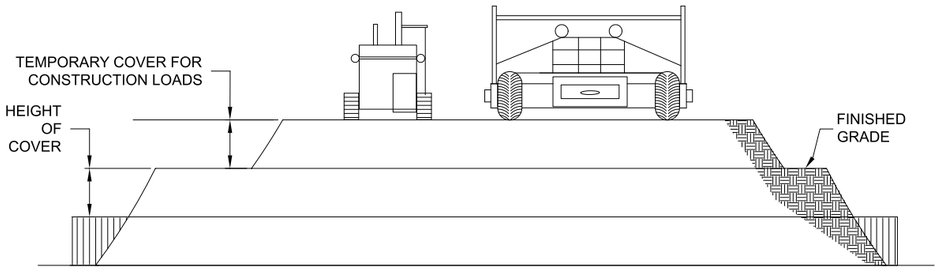
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CONTECH® CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO42891 Garrison Elementary School
Detention1
Oceanside, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
29441	42891	12/22/2023
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

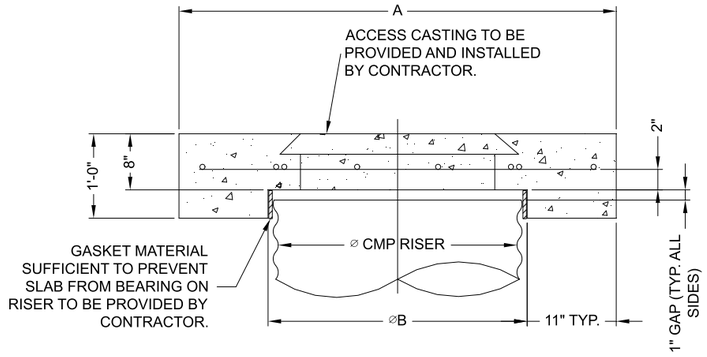
APPLICABLE POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

APPLICABLE
HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.
REQUIREMENTS
INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) 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.

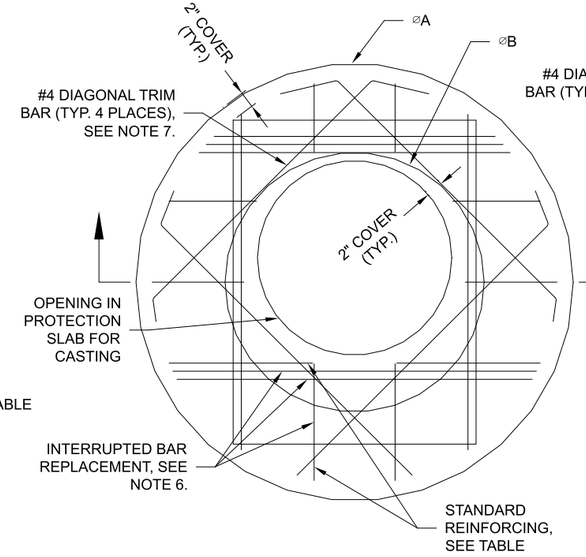
NOTE:
THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.



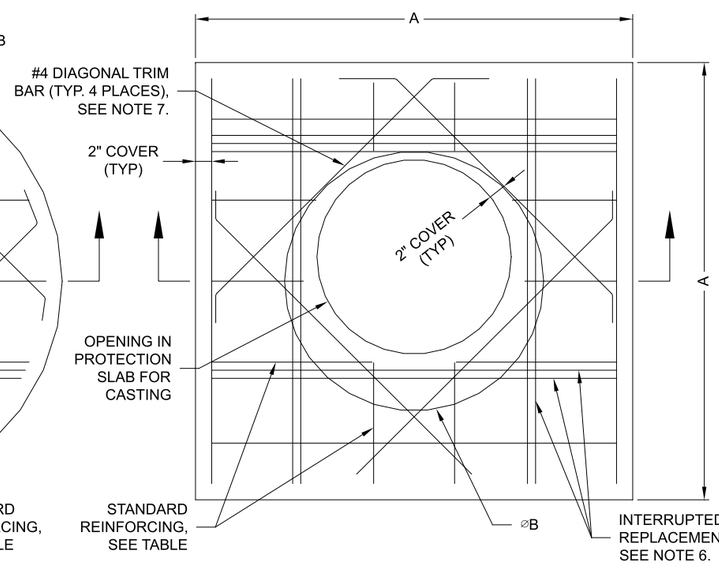
SECTION VIEW

REINFORCING TABLE				
⌀ CMP RISER	A	⌀ B	REINFORCING	**BEARING PRESSURE (PSF)
24"	⌀ 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	⌀ 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	⌀ 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	⌀ 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	⌀ 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th 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. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

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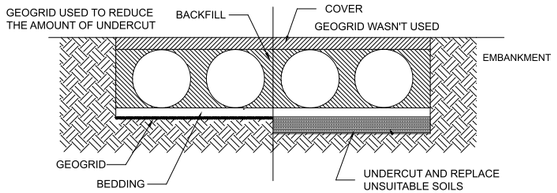
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.

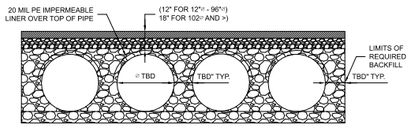


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

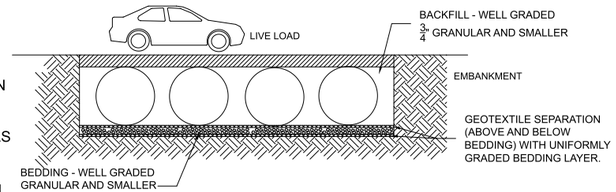
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

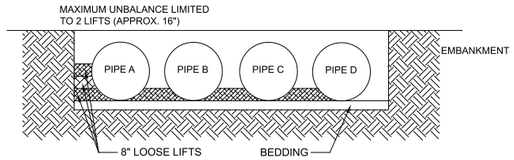
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



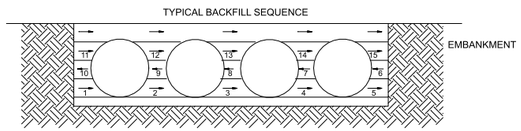
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

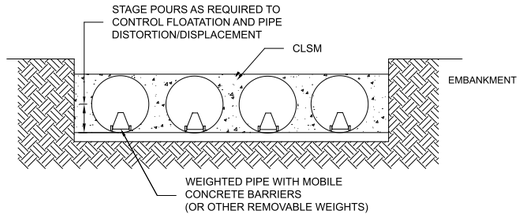


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

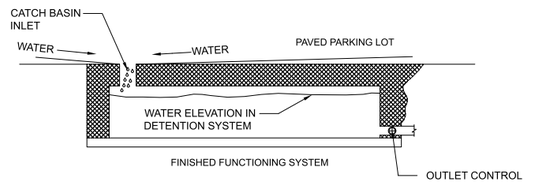


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

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. 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.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION 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.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

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CONTECH CMP DETENTION SYSTEMS

CONTECH **DYODS** DRAWING

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DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
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DESIGNED: DYO	DRAWN: DYO	
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SHEET NO.: 1		

ATTACHMENT 2
BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

This is the cover sheet for Attachment 2.

☐Mark this box if this attachment is empty because the project is exempt from PDP hydromodification management requirements.

Indicate which Items are Included:

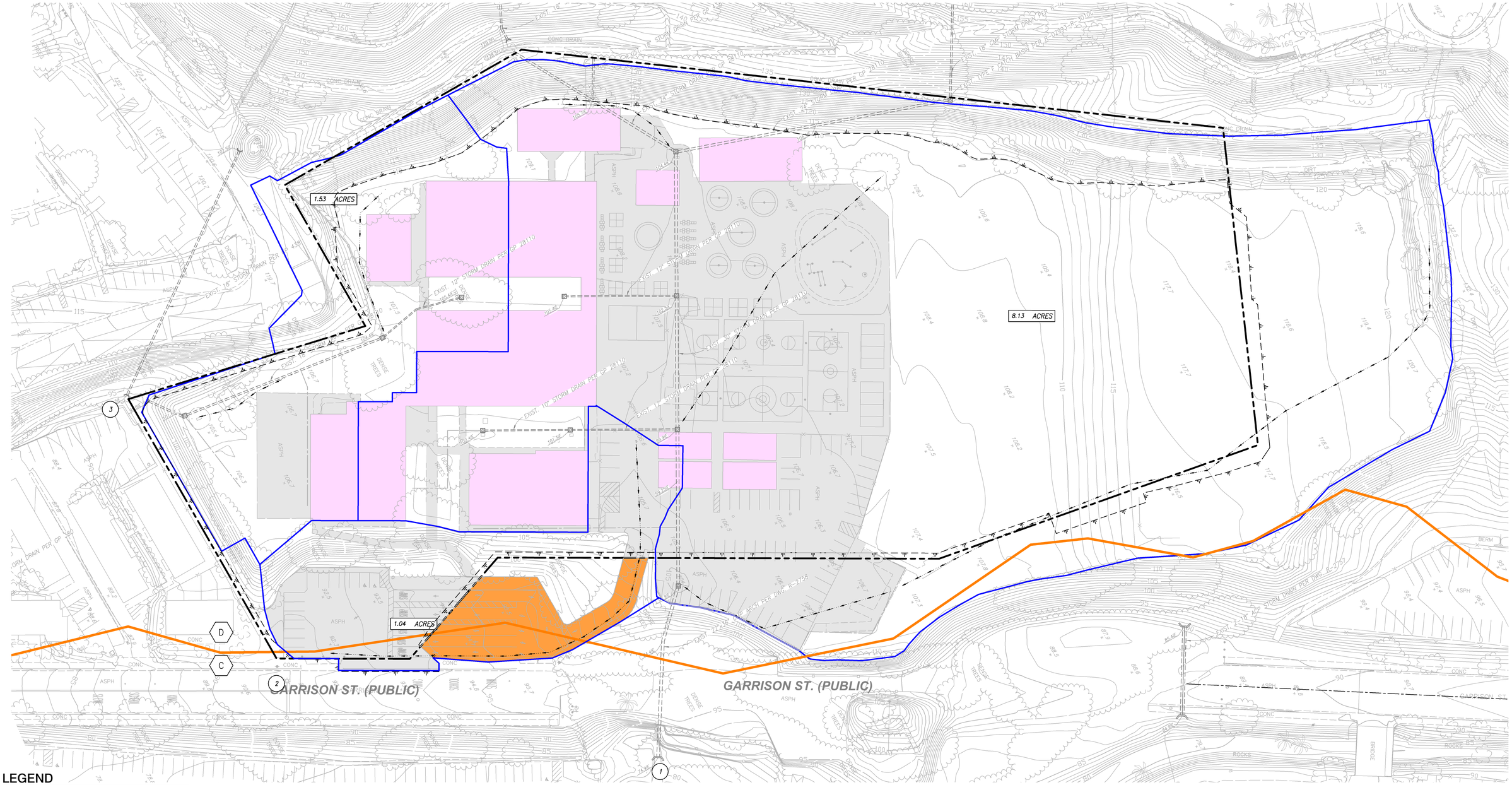
Attachment Sequence	Contents	Checklist
Attachment 2a	1. Hydromodification Management Exhibit (Required)	☒Included See Hydromodification Management Exhibit Checklist.
Attachment 2b	Management of Critical Coarse Sediment Yield Areas (WMAA Exhibit is required, additional analyses are optional) See Section 6.2 of the BMP Design Manual.	☒Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required) Optional analyses for Critical Coarse Sediment Yield Area Determination ☐6.2.1 Verification of Geomorphic Landscape Units Onsite ☐6.2.2 Downstream Systems Sensitivity to Coarse Sediment ☐6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite
Attachment 2c	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual.	☒Not performed ☐Included ☐Submitted as separate stand-alone document
Attachment 2d	Flow Control Facility Design and Structural BMP Drawdown Calculations (Required) Overflow Design Summary for each structural BMP See Chapter 6 and Appendix G of the BMP Design Manual	☒Included ☐Submitted as separate stand-alone document
Attachment 2e	Vector Control Plan (Required when structural BMPs will not drain in 96 hours)	☐Included ☒Not required because BMPs will drain in less than 96 hours

Use this checklist to ensure the required information has been included on the Hydromodification Management Exhibit:

The Hydromodification Management Exhibit must identify:

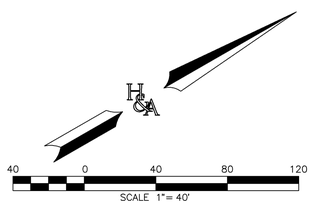
☒Underlying hydrologic soil group
☒Approximate depth to groundwater
☒Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
☐Critical coarse sediment yield areas to be protected
☒Existing topography
☒Existing and proposed site drainage network and connections to drainage offsite
☒Proposed grading
☒Proposed impervious features
☒Proposed design features and surface treatments used to minimize imperviousness
☒Point(s) of Compliance (POC) for Hydromodification Management
☒Existing and proposed drainage boundary and drainage area to each POC (when necessary, create separate exhibits for pre-development and post-project conditions)
☒Structural BMPs for hydromodification management (identify location, type of BMP, and size/detail)

Please provide the Exhibit in 24”x36” format with map pocket, wet date, and stamp.



LEGEND

- PROJECT BOUNDARY
- DRAINAGE BOUNDARY
- PROJECT DISTURBED LIMIT
- FLOW DIRECTION
- 00.00 ACRES — AREA
- X — HYDROLOGIC SOIL TYPE
- POCX — POINT OF COMPLIANCE
- EXISTING BUILDING MODELED AS PERVIOUS
- EXISTING HARDSCAPE MODELED AS PERVIOUS
- OFFSITE UNDISTURBED AREA MODELED AS IMPERVIOUS
- EXISTING STORM DRAIN
- EXISTING AREA DRAIN SYSTEM
- HYDROLOGIC SOIL GROUP BOUNDAR



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HMP MAP

PRE-DEVELOPED CONDITIONS

GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, CALIFORNIA

MAP 1 OF 1

W.O.# 3214-0002

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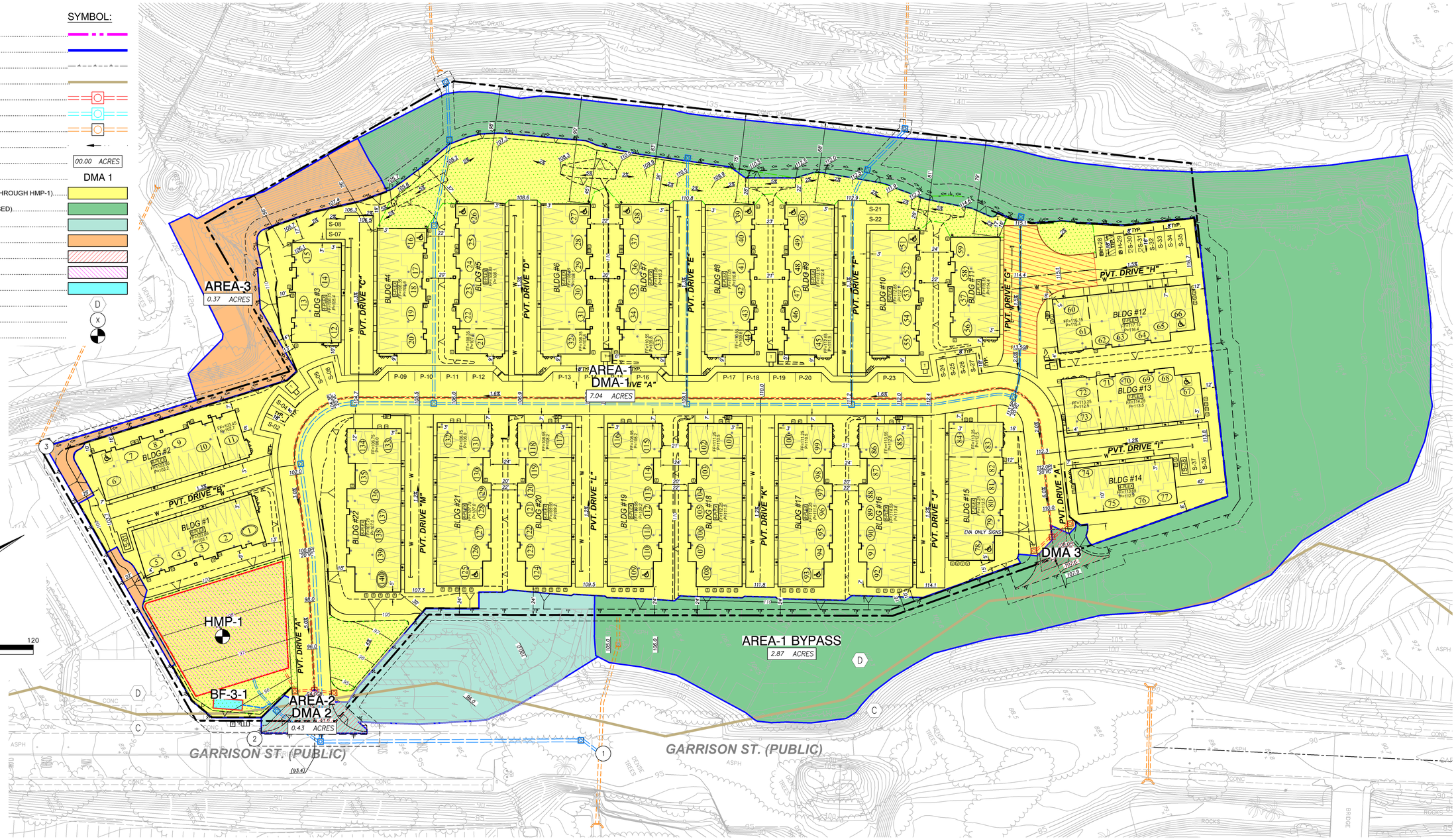
LEGEND:

	SYMBOL:
PROJECT BOUNDARY	
DMA BOUNDARY	
DAYLIGHT	
HYDROLOGIC SOIL TYPE BOUNDARY	
PROPOSED STORM DRAIN	
PROPOSED BYPASS STORM DRAIN	
EXISTING STORM DRAIN TO REMAIN	
FLOW LINE	
SUBAREA ACREAGE	00.00 ACRES
DMA ICON	DMA 1
DISTURBED AREA TRIBUTARY TO POC 1 (ROUTED THROUGH HMP-1)	
UNDISTURBED AREA TRIBUTARY TO POC 1 (BYPASSED)	
AREA TRIBUTARY TO POC 2	
AREA TRIBUTARY TO POC 3	
PROPOSED IMP. NOT ROUTED THROUGH HMP-1	
FLOW CONTROL BMP (HMP-1)	
PROPRIETARY BIOFILTRATION BMP	
HYDROLOGIC SOIL TYPE	D
POINT OF COMPLIANCE	X
STRUCTURAL BMP	

UNDERLYING SOIL GROUP : C & D
APPROXIMATE DEPTH TO GROUNDWATER > 30'

AREA DRAINING TO EACH POC:

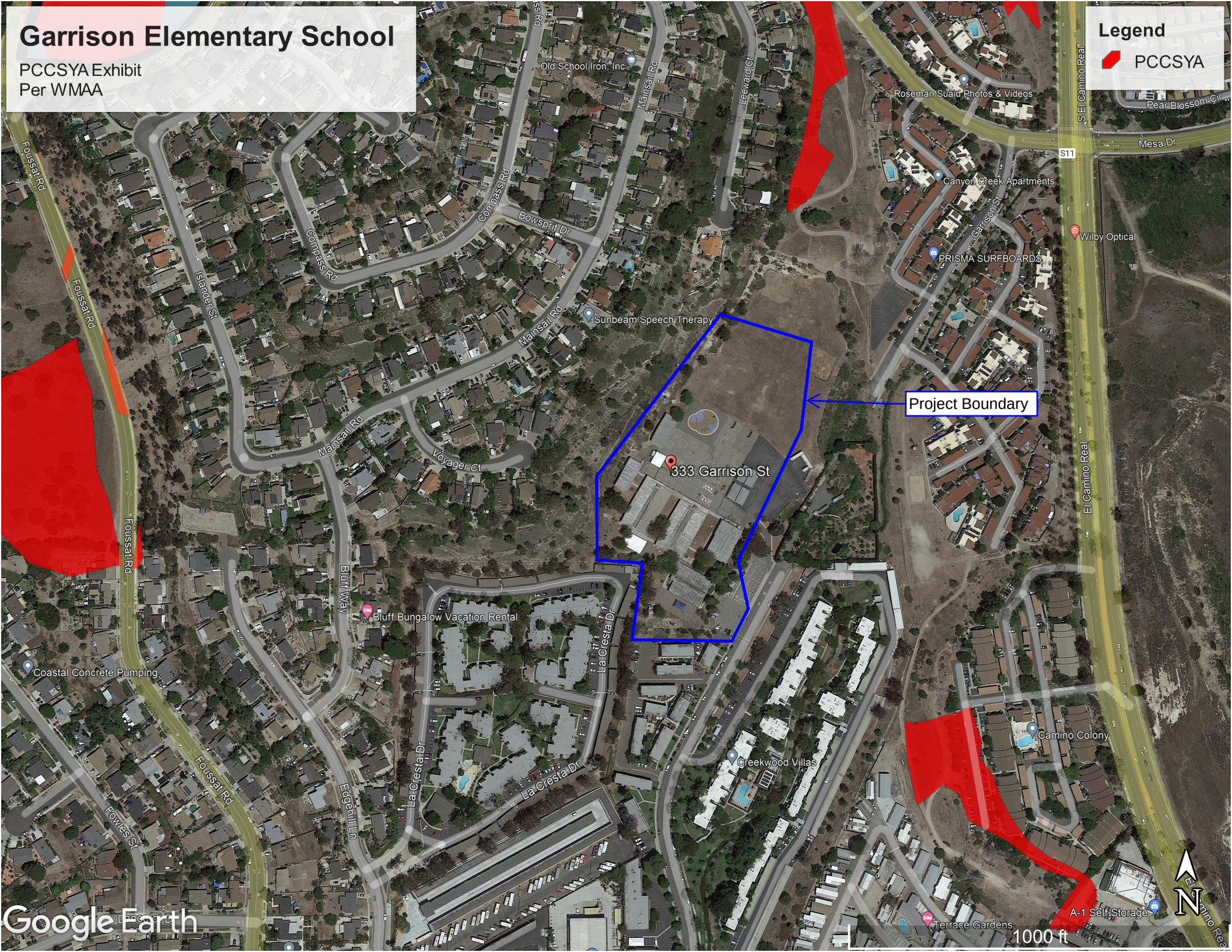
-POC 1 = 9.91 AC (DMA 1 & DMA 3 + BYPASS AREA)
-POC 2 = 0.43 AC (DMA 2 + EXISTING ROAD)
-POC 3 = 0.37 AC (EXISTING SLOPES)



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HUNSAKER & ASSOCIATES SAN DIEGO, INC	HMP MAP POST-DEVELOPED CONDITIONS GARRISON ELEMENTARY SCHOOL CITY OF OCEANSIDE, CALIFORNIA	MAP 2 OF 2
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Garrison Elementary School
PCCSYA Exhibit
Per WMAA
Legend
PCCSYA
Project Boundary
333 Garrison St
Old School Iron, Inc.
Roseman Suaid Photos & Videos
Pear Blossom Cir
Mesa Dr
S11
S El Camino Real
Canyon Creek Apartments
Garrison St
Wilby Optical
PRISMA SURFBOARDS
Sunbeam Speech Therapy
Foussat Rd
Compass Rd
Bowsprit Dr
Islander St
Mainsail Rd
Leeward Ct
Voyager Ct
Bluff Way
Bluff Bungalow Vacation Rental
La Cresta Dr
Edgehill Ln
Fowles St
Coastal Concrete Pumping
Creekwood Villas
Camino Colony
Terrace Gardens
A-1 Self Storage
El Camino Real
Google Earth
1000 ft
N

Placeholder – **6.2.1 Verification of GLUs Onsite** (if applicable)

Replace placeholder with required calculations/documentation.

Leave placeholder intact if not applicable.

☐Not Applicable

Placeholder – **6.2.3 Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite** (Optional)

Replace placeholder with required calculations/documentation.

Leave placeholder intact if not applicable.

Not Applicable

Placeholder – **6.3.4 Geomorphic Assessment of Receiving Channels** (Optional)

Replace placeholder with required calculations/documentation.

Leave placeholder intact if not applicable.

Not Applicable

Hydromodification Management Plan (HMP)
-Flow Control Facility Design

This HMP report has been prepared in place of Attachment 2d of the *Priority Development Project (PDP) SWQMP for Garrison Elementary School (July 2024)* and has been prepared to be submitted concurrently with the SWQMP.

SECTIONS

1. Introduction/Summary
2. Flow Duration Curve Analysis
3. Elevation vs. Discharge, Elevation vs Area Curves, Drawdown, SWMM Input Calculations
4. SWMM Input Data (Existing and Proposed Models)
5. Hydromodification Watershed Maps

I. INTRODUCTION/SUMMARY

This HMP report summarizes the approach used to model the proposed The Garrison Elementary School site within City of Oceanside, California using the Environmental Protection Agency (EPA) Storm Water Management Model 5.1 (SWMM).
SWMM models were prepared for pre- and post- developed conditions at the project designated Point of Compliance (POC) in order to demonstrate that for flow rates ranging from pre-development (0.1Q2) to Q10 runoff event, the post-development discharge rates and durations, don't exceed the pre-development (not pre-project) rates and durations by more than 10% at the discharge point of the project located south of the site at an existing catch basin. and ensure that the proposed hydromodification facility has sufficient volume to meet the current HMP requirements from the Regional Water Quality Control Board (RWQCB).
As a result, the stormwater discharge from the site will not cause any altered flow regimes or excessive downstream erosion in the receiving waters.

To manage the runoff generated by the site, concrete gutters, inlets, and underground storm drain will be installed to capture the flows and direct them to a proposed hydromodification vault (HMP-1) located beneath the open space by the entrance of the project.
The proposed vault (HMP-1) will store the required fraction of the designed captured volume and regulate flows to the proposed downstream proprietary biofiltration BMP (Modular Wetland System MWS BF-3-1). A closed-led outlet structure is designed with orifices to control the flow to the modular wetland downstream, ensuring compliance with water quality and pollutant control requirements. To meet hydromodification requirements, a secondary outlet structure with additional orifices is proposed at the water quality ponding depth in the vault. This structure will directly route the flows to the existing storm drain without passing through the modular wetland. For peak flows, the top opening of the secondary outlet is sized to safely route the 100-year peak flow downstream.

POC 1:

In the predevelopment condition, this POC encompasses approximately 8.13 acres in the existing condition. This POC takes 2.06 acres of offsite areas that drain through the project site, merging with the northern onsite drainage. This commingled runoff then flows southeasterly towards an existing Type G catch basin located offsite. This catch basin collects the combined flows from the onsite central drainage area, which are channeled by an existing 30-inch RCP, and from western offsite flows entering the onsite storm drain system through two storm inlets and a Type Of catch. Subsequently, the total flow is directed easterly beneath Garrison Street via existing 22”X36” CMP arch, to discharge into Garrison Creek.
In the post-development condition, the POC covers 9.91 acres, including multi-family buildings and streets designed to channel flows towards inlets and a storm drain. This storm drain discharges into the proposed underground vault, which, in turn, releases water into the storm drain through a hydromodification/detention/water quality riser. The proposed storm drain flows north and connects with the existing storm drain mentioned earlier, ultimately discharging into Garrison Creek.

POC 2:

In the predevelopment condition, this POC encompasses approximately 1.04 acres in the existing condition. Runoff from the southeastern portion of the site is conveyed via surface flow in a southeast direction towards Garrison Street.

In the post-development condition, the POC covers 0.43 acres. The area compared to the existing condition is reduced due to the new entrance to the site that includes inlets to convey the runoff to POC 1.

SWMM MODEL DEVELOPMENT

The following will outline the typical model development. Two (2) SWMM models are prepared for the POC; one represents existing conditions, and another represents proposed conditions.

The existing condition analysis was prepared by defining the area to the respective POC. Similarly, the proposed condition analysis was prepared by defining the areas to the respective POC.

The Garrison Elementary School site was modeled with 0% imperviousness in the pre-development condition, and 80% imperviousness in the post-development condition.

For all SWMM models, flow duration curves were prepared to demonstrate that the existing basin footprint/volume and outlet structure will be sufficient to meet the current HMP requirements. The inputs required to develop SWMM models include rainfall, watershed characteristics, and BMP configurations. The Oceanside Rain Gage from the Project Clean Water website was used for this study since it is the most representative of the project site precipitation.

Evaporation for the site was modeled using average monthly values from the San Diego County hourly dataset. The site was modeled with hydrologic group D soil. Other SWMM inputs for the subareas are discussed in the following sections of this document where the selection of parameters is further explained in detail.

The underground vault will have two separate risers. A water quality riser with a closed top will send the required treatment flows to the MWS unit while the secondary riser will include the additional orifices to meet the HMP requirements. These orifices will be above the water quality ponding depth in the vault. Additionally, the secondary outlet structure will directly to the existing storm drain without routing it through the proposed modular wetland.

Table 1: Proposed Outlet structure & Orifice Characteristics

WATER QUALITY RISER

Bottom orifice diameter:	2.5	in
Number:	1	
Cg-low:	0.61	
invert elev:	0.00	ft

HMP RISER

Bottom orifice diameter:	1.5	in	Top orifice diameter:	4	in
Number:	2		Number:	6	
Cg-low:	0.61		Cg-low:	0.61	
invert elev:	2.75	ft	invert elev:	4.00	ft

Middle orifice diameter:	4	In	Emergency weir:		
Number:	4		Invert:	6.00	ft
Cg-low:	0.61		Weir Length (ft)	10.0	ft
invert elev:	3.00	ft	Riser Box LxW	2x3	ft

FLOW DURATION CURVE COMPARISON

The Flow Duration Curves (FDC) for the site was calculated at the POC by exporting the hourly runoff time series results from SWMM to a spreadsheet. The FDC for the POC was compared between 10% of the existing condition Q2 ((based on accepting an assumption of high susceptibility for downstream channel erosion as required if no soils tests are completed)

Up to the existing condition Q10. The Q2 and Q10 were determined using a partial duration statistical analysis of the runoff time series in an Excel spreadsheet. As the SWMM Model is a statistical analysis based on the Weibull Plotting Position Method, the Weibull Method was also used within the spreadsheet to ensure that the results were like those obtained by the SWMM Model.

The range between 10% of Q_2 and Q_{10} was divided into 100 equal time intervals; the number of hours that each flow rate was exceeded was counted from the hourly series. Additionally, the intermediate peaks with a return period "i" were obtained (Q_i with i=3 to 9). To the plot, the values were presented as a percentage of time that exceeded for each flow rate.

Section 5 of this HMP Study provides detailed drainage exhibit for the post-developed conditions. As shown in Figures 1 and 2 in the succeeding section, the FDC for the proposed condition for the basin is within 110% of the curve for the existing condition. The additional runoff volume generated from developing the site will be released to the downstream storm drain at a flow rate below the 10% Q_2 lower threshold. Additionally, the Proposed Project will not increase peak flow rates between the Q_2 and the Q_{10}, as shown in the graphics in Figure 3 and in the Tables included in Section 1. Similar FDC comparison curves were also generated for the POC and included in the following Section 1 of this report.

SUMMARY & CONCLUSION

A summary of pre and post development conditions draining to the POC is shown in table 2 below.

Table 2 POC Area Summary

	Existing (AC)	Proposed (AC)
POC 1	8.13	9.91
POC 2	1.04	0.43
Total	9.17*	10.34*

For both SWMM models, flow duration curves were prepared to demonstrate that the proposed underground vault and outlet structures will be sufficient to meet the current HMP requirements for POC 1 and POC 2.

*Difference in area is due to POC 3 not being included in the analysis. POC 3 encompasses 1.53 acres in the existing condition and 0.37 acres in the proposed. Due to the decrease in area and no increase in runoff, it was safe to assume that the model would pass like it did for POC 2.

Additionally, in the post-project condition, all areas of POC 3 consist of offsite and onsite self-mitigating areas.

II. FLOW DURATION CURVE ANALYSIS

SECTION 1 - Flow Duration Curve Analysis, Plot & Table

The FDCs shall not exceed the existing conditions by more than 10%, neither in peak flow nor duration.

Figure 1 on the following page illustrates that the FDCs in post-development conditions, are not exceeding the existing FDC by more than 10%. The FDC table following the curve shows that if the interval 0.10Q2 – Q 10 is divided in 100 sub-intervals, then: a) the post development divided by pre-development durations are never larger than 110% (the permit allows up to 110%); and, b) there are no more than 3 intervals in the range 101%-110%, which would imply an excess over 10% of the length of the curve (the permit allows less than 10% of excesses measured as 101-110%). Consequently, the design passes the hydromodification test.

It is important to note that the FDCs can be expressed in the "x" axis as a percentage of time, hours per year, total number of hours, or any other similar time variable. As those variables only differ by multiplying a constant, their plot in logarithmic scale will appear the same and compliance can be observed regardless of the variable selected. The selection of a logarithmic scale in lieu of the normal scale is preferred, as differences between the pre-development and post-development curves can be depicted more clearly in the entire range of analysis. Both graphics are presented for reference in Table 4 and Figure 1 below.

For the "y" axis, the peak flow value is the variable of choice. As an additional analysis performed by H&A, not only the range of analysis is clearly depicted (10% of Q 2 to Q 10) but also all intermediate flows are shown (30% of Q 2, 50% of Q 2, Q 2, Q 3, Q 4, Q 5, Q 6, Q 7, Q 8 and Q 9) in order to demonstrate compliance at any range Q x – Q x+1. It must be pointed out that one of the limitations of both the SWMM and SDHM models is that the intermediate analysis is not performed (to obtain Q i from i = 2 to 10). H&A performed the analysis using the Cunnane Plotting Position Method (the preferred method in the HMP permit) from the "n" largest independent peak flows obtained from the continuous time series.

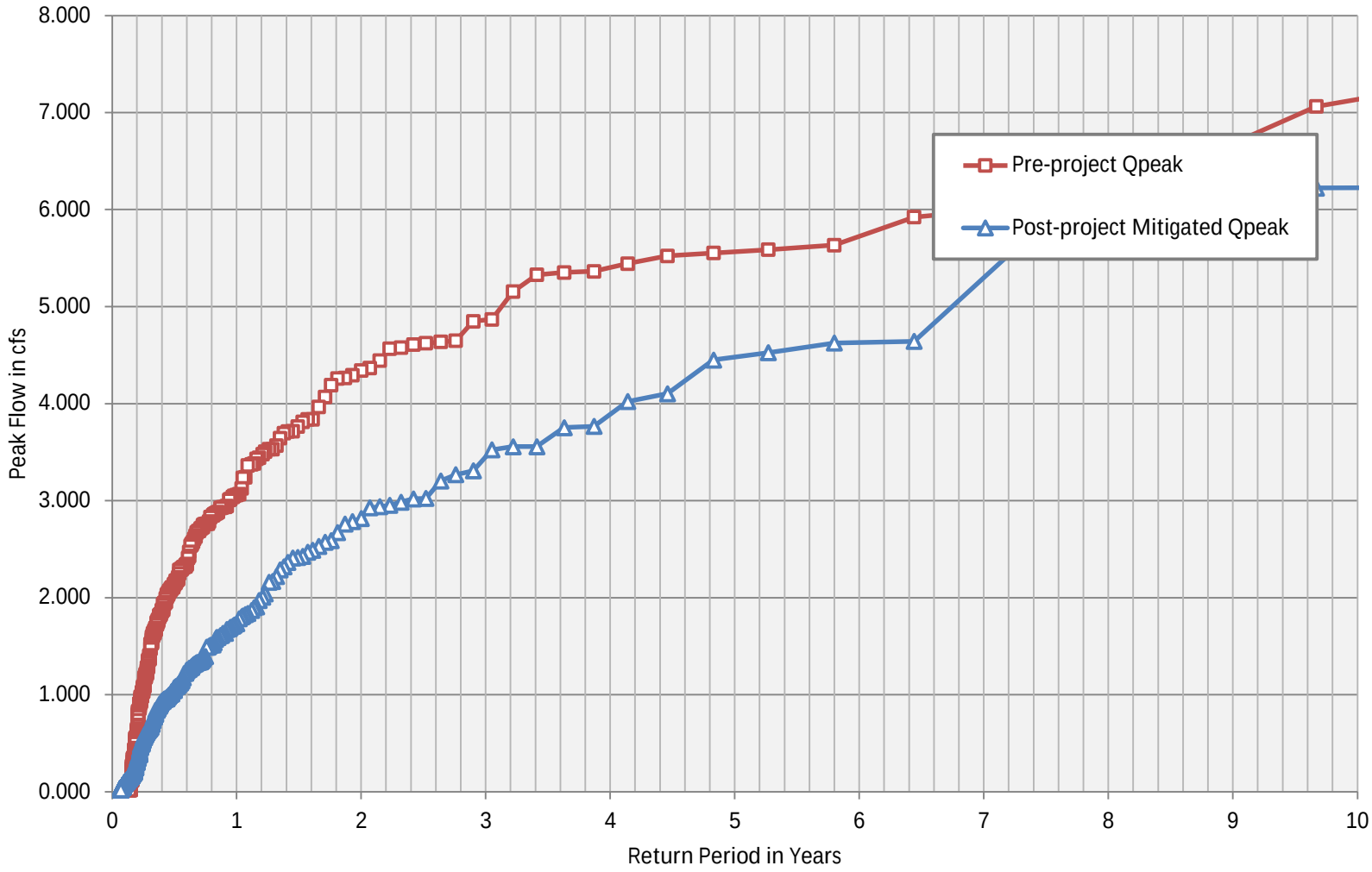
Flow Duration Curve Analysis, Plot & Table

Figure 1 Peak Flow Frequency Curves - POC1

POC1-Peak Flow Frequency Summary

Return Period	Pre-project Qpeak (cfs)	Post-project - Mitigated Q (cfs)	Post-project - Mitigated Reduction Q (cfs)
LF = 0.1xQ2	0.434	0.282	0.152
2-year	4.343	2.819	1.524
5-year	5.566	4.480	1.086
10-year	7.136	6.224	0.912

POC1-Peak Flow Frequency Curves



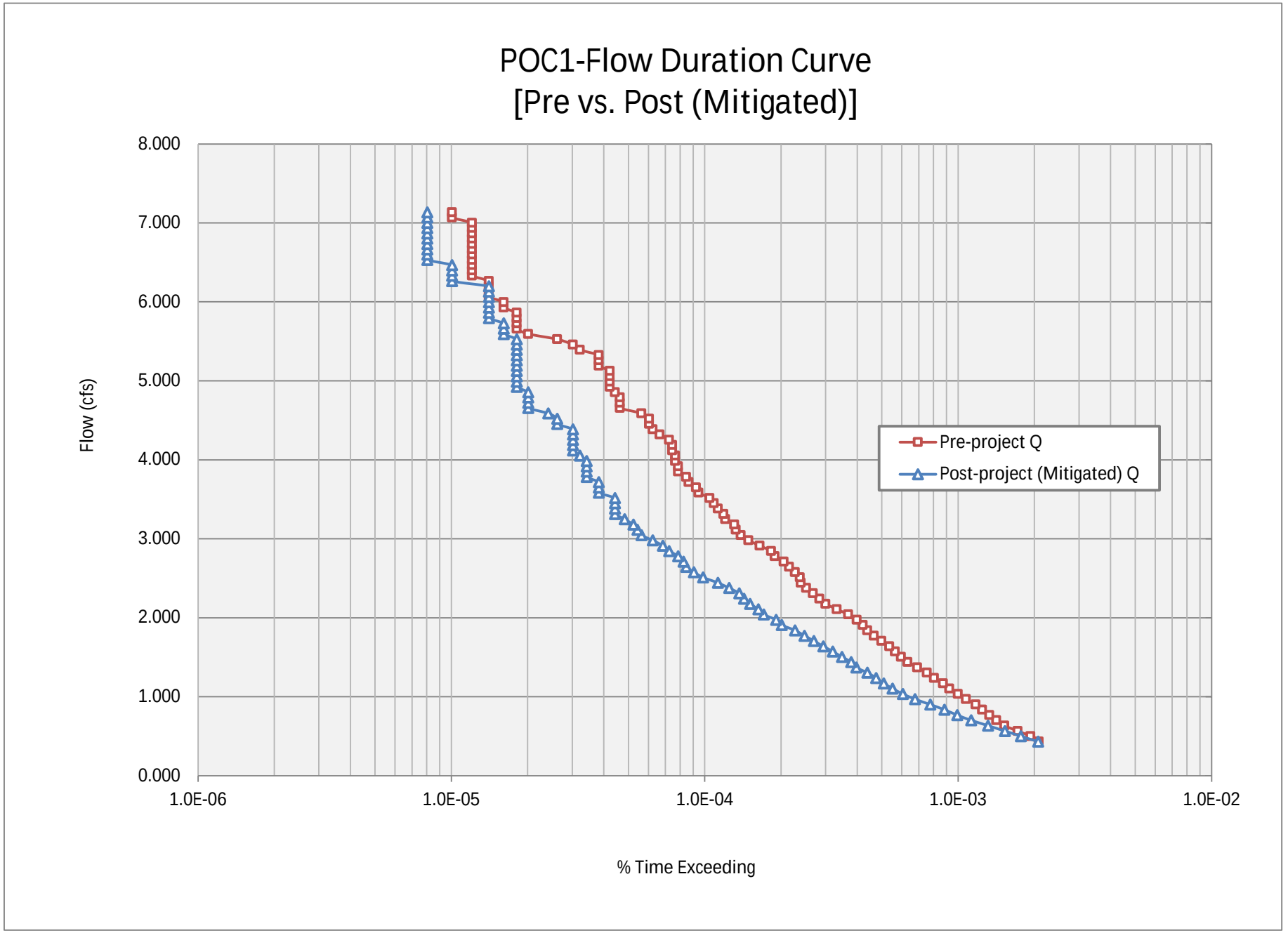
POC1

Low-flow Threshold:	10%	
0.1xQ2 (Pre):	0.434	cfs
Q10 (Pre):	7.136	cfs
Ordinate #:	100	
Incremental Q (Pre):	0.06702	cfs
Total Hourly Data:	497370	hours

The proposed BMP: PASSED

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
0	0.434	1036	2.08E-03	1031	2.07E-03	100%	Pass
1	0.501	960	1.93E-03	880	1.77E-03	92%	Pass
2	0.568	855	1.72E-03	760	1.53E-03	89%	Pass
3	0.635	758	1.52E-03	655	1.32E-03	86%	Pass
4	0.702	704	1.42E-03	562	1.13E-03	80%	Pass
5	0.769	660	1.33E-03	499	1.00E-03	76%	Pass
6	0.836	619	1.24E-03	440	8.85E-04	71%	Pass
7	0.903	583	1.17E-03	386	7.76E-04	66%	Pass
8	0.970	534	1.07E-03	336	6.76E-04	63%	Pass
9	1.037	496	9.97E-04	302	6.07E-04	61%	Pass
10	1.104	459	9.23E-04	274	5.51E-04	60%	Pass
11	1.171	434	8.73E-04	253	5.09E-04	58%	Pass
12	1.238	400	8.04E-04	236	4.74E-04	59%	Pass
13	1.306	374	7.52E-04	218	4.38E-04	58%	Pass
14	1.373	343	6.90E-04	198	3.98E-04	58%	Pass
15	1.440	314	6.31E-04	188	3.78E-04	60%	Pass
16	1.507	296	5.95E-04	173	3.48E-04	58%	Pass
17	1.574	280	5.63E-04	160	3.22E-04	57%	Pass
18	1.641	266	5.35E-04	146	2.94E-04	55%	Pass
19	1.708	248	4.99E-04	134	2.69E-04	54%	Pass
20	1.775	231	4.64E-04	123	2.47E-04	53%	Pass
21	1.842	218	4.38E-04	113	2.27E-04	52%	Pass
22	1.909	209	4.20E-04	100	2.01E-04	48%	Pass
23	1.976	198	3.98E-04	96	1.93E-04	48%	Pass
24	2.043	183	3.68E-04	86	1.73E-04	47%	Pass
25	2.110	165	3.32E-04	81	1.63E-04	49%	Pass
26	2.177	149	3.00E-04	75	1.51E-04	50%	Pass
27	2.244	141	2.83E-04	71	1.43E-04	50%	Pass
28	2.311	133	2.67E-04	68	1.37E-04	51%	Pass
29	2.378	125	2.51E-04	62	1.25E-04	50%	Pass
30	2.445	119	2.39E-04	56	1.13E-04	47%	Pass
31	2.512	118	2.37E-04	49	9.85E-05	42%	Pass
32	2.579	113	2.27E-04	45	9.05E-05	40%	Pass
33	2.646	107	2.15E-04	42	8.44E-05	39%	Pass
34	2.713	102	2.05E-04	41	8.24E-05	40%	Pass
35	2.780	94	1.89E-04	39	7.84E-05	41%	Pass
36	2.847	91	1.83E-04	36	7.24E-05	40%	Pass
37	2.914	82	1.65E-04	34	6.84E-05	41%	Pass
38	2.981	74	1.49E-04	31	6.23E-05	42%	Pass
39	3.048	69	1.39E-04	28	5.63E-05	41%	Pass
40	3.115	66	1.33E-04	27	5.43E-05	41%	Pass
41	3.182	65	1.31E-04	26	5.23E-05	40%	Pass
42	3.249	60	1.21E-04	24	4.83E-05	40%	Pass
43	3.316	59	1.19E-04	22	4.42E-05	37%	Pass
44	3.383	56	1.13E-04	22	4.42E-05	39%	Pass
45	3.450	54	1.09E-04	22	4.42E-05	41%	Pass
46	3.517	52	1.05E-04	22	4.42E-05	42%	Pass
47	3.584	47	9.45E-05	19	3.82E-05	40%	Pass
48	3.651	46	9.25E-05	19	3.82E-05	41%	Pass
49	3.718	43	8.65E-05	19	3.82E-05	44%	Pass
50	3.785	42	8.44E-05	17	3.42E-05	40%	Pass
51	3.852	39	7.84E-05	17	3.42E-05	44%	Pass
52	3.919	39	7.84E-05	17	3.42E-05	44%	Pass
53	3.986	38	7.64E-05	17	3.42E-05	45%	Pass
54	4.053	38	7.64E-05	16	3.22E-05	42%	Pass
55	4.120	37	7.44E-05	15	3.02E-05	41%	Pass
56	4.187	37	7.44E-05	15	3.02E-05	41%	Pass
57	4.254	36	7.24E-05	15	3.02E-05	42%	Pass
58	4.321	33	6.63E-05	15	3.02E-05	45%	Pass
59	4.388	31	6.23E-05	15	3.02E-05	48%	Pass
60	4.455	30	6.03E-05	13	2.61E-05	43%	Pass
61	4.522	30	6.03E-05	13	2.61E-05	43%	Pass
62	4.589	28	5.63E-05	12	2.41E-05	43%	Pass
63	4.656	23	4.62E-05	10	2.01E-05	43%	Pass
64	4.723	23	4.62E-05	10	2.01E-05	43%	Pass
65	4.790	23	4.62E-05	10	2.01E-05	43%	Pass
66	4.857	22	4.42E-05	10	2.01E-05	45%	Pass

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
67	4.924	21	4.22E-05	9	1.81E-05	43%	Pass
68	4.991	21	4.22E-05	9	1.81E-05	43%	Pass
69	5.058	21	4.22E-05	9	1.81E-05	43%	Pass
70	5.125	21	4.22E-05	9	1.81E-05	43%	Pass
71	5.192	19	3.82E-05	9	1.81E-05	47%	Pass
72	5.259	19	3.82E-05	9	1.81E-05	47%	Pass
73	5.326	19	3.82E-05	9	1.81E-05	47%	Pass
74	5.393	16	3.22E-05	9	1.81E-05	56%	Pass
75	5.460	15	3.02E-05	9	1.81E-05	60%	Pass
76	5.527	13	2.61E-05	9	1.81E-05	69%	Pass
77	5.594	10	2.01E-05	8	1.61E-05	80%	Pass
78	5.662	9	1.81E-05	8	1.61E-05	89%	Pass
79	5.729	9	1.81E-05	8	1.61E-05	89%	Pass
80	5.796	9	1.81E-05	7	1.41E-05	78%	Pass
81	5.863	9	1.81E-05	7	1.41E-05	78%	Pass
82	5.930	8	1.61E-05	7	1.41E-05	88%	Pass
83	5.997	8	1.61E-05	7	1.41E-05	88%	Pass
84	6.064	7	1.41E-05	7	1.41E-05	100%	Pass
85	6.131	7	1.41E-05	7	1.41E-05	100%	Pass
86	6.198	7	1.41E-05	7	1.41E-05	100%	Pass
87	6.265	7	1.41E-05	5	1.01E-05	71%	Pass
88	6.332	6	1.21E-05	5	1.01E-05	83%	Pass
89	6.399	6	1.21E-05	5	1.01E-05	83%	Pass
90	6.466	6	1.21E-05	5	1.01E-05	83%	Pass
91	6.533	6	1.21E-05	4	8.04E-06	67%	Pass
92	6.600	6	1.21E-05	4	8.04E-06	67%	Pass
93	6.667	6	1.21E-05	4	8.04E-06	67%	Pass
94	6.734	6	1.21E-05	4	8.04E-06	67%	Pass
95	6.801	6	1.21E-05	4	8.04E-06	67%	Pass
96	6.868	6	1.21E-05	4	8.04E-06	67%	Pass
97	6.935	6	1.21E-05	4	8.04E-06	67%	Pass
98	7.002	6	1.21E-05	4	8.04E-06	67%	Pass
99	7.069	5	1.01E-05	4	8.04E-06	80%	Pass
100	7.136	5	1.01E-05	4	8.04E-06	80%	Pass


POC1-Flow Duration Curve
[Pre vs. Post (Mitigated)]
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Flow (cfs)
1.0E-06
1.0E-05
1.0E-04
1.0E-03
1.0E-02
% Time Exceeding
Pre-project Q
Post-project (Mitigated) Q

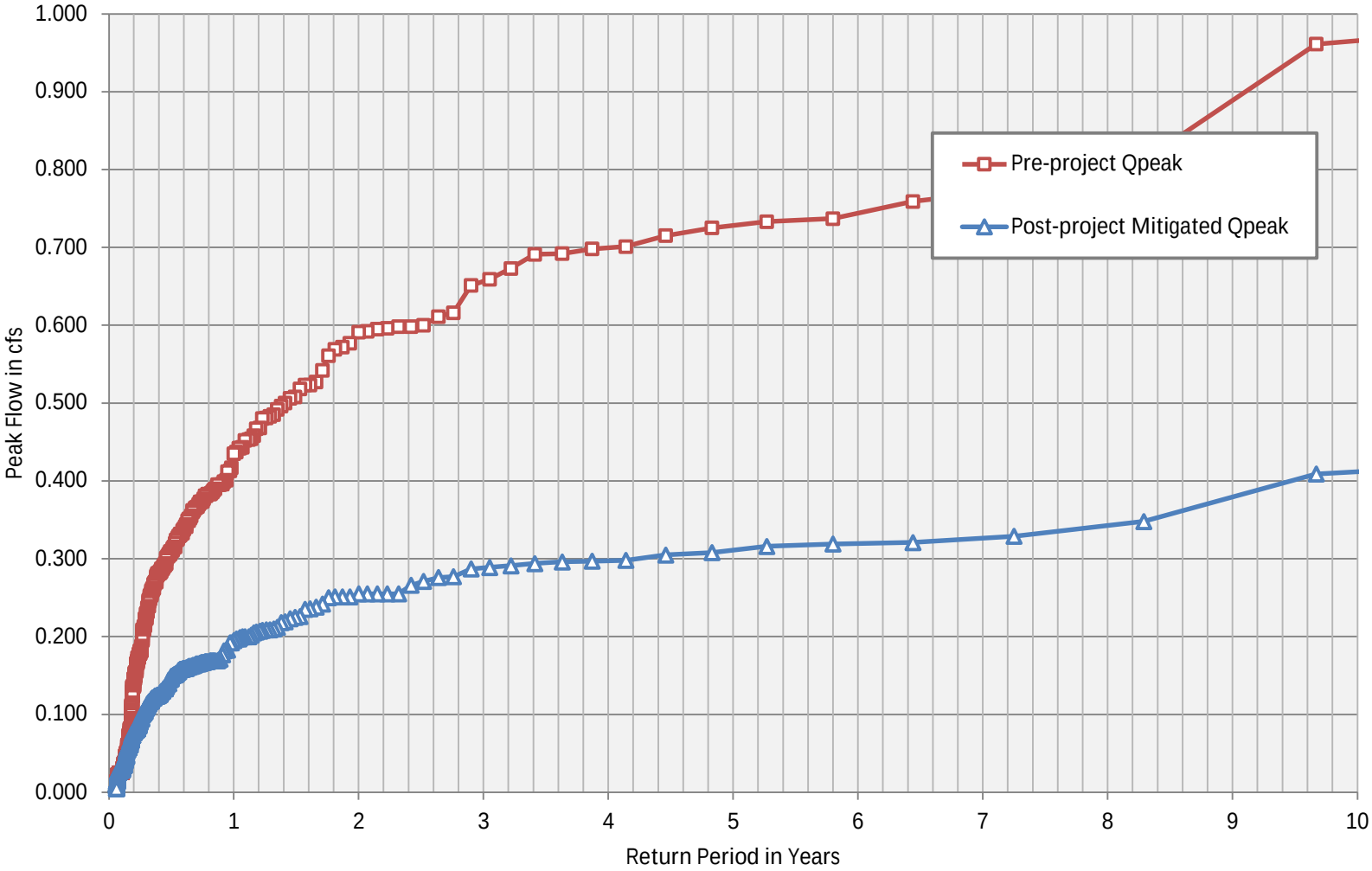
Flow Duration Curve Analysis, Plot & Table

Figure *2* Peak Flow Frequency Curves – POC2

POC2-Peak Flow Frequency Summary

Return Period	Pre-project Qpeak (cfs)	Post-project - Mitigated Q (cfs)	Post-project - Mitigated Reduction Q (cfs)
LF = 0.1xQ2	0.059	0.025	0.034
2-year	0.593	0.254	0.339
5-year	0.734	0.310	0.424
10-year	0.972	0.411	0.561

POC2-Peak Flow Frequency Curves



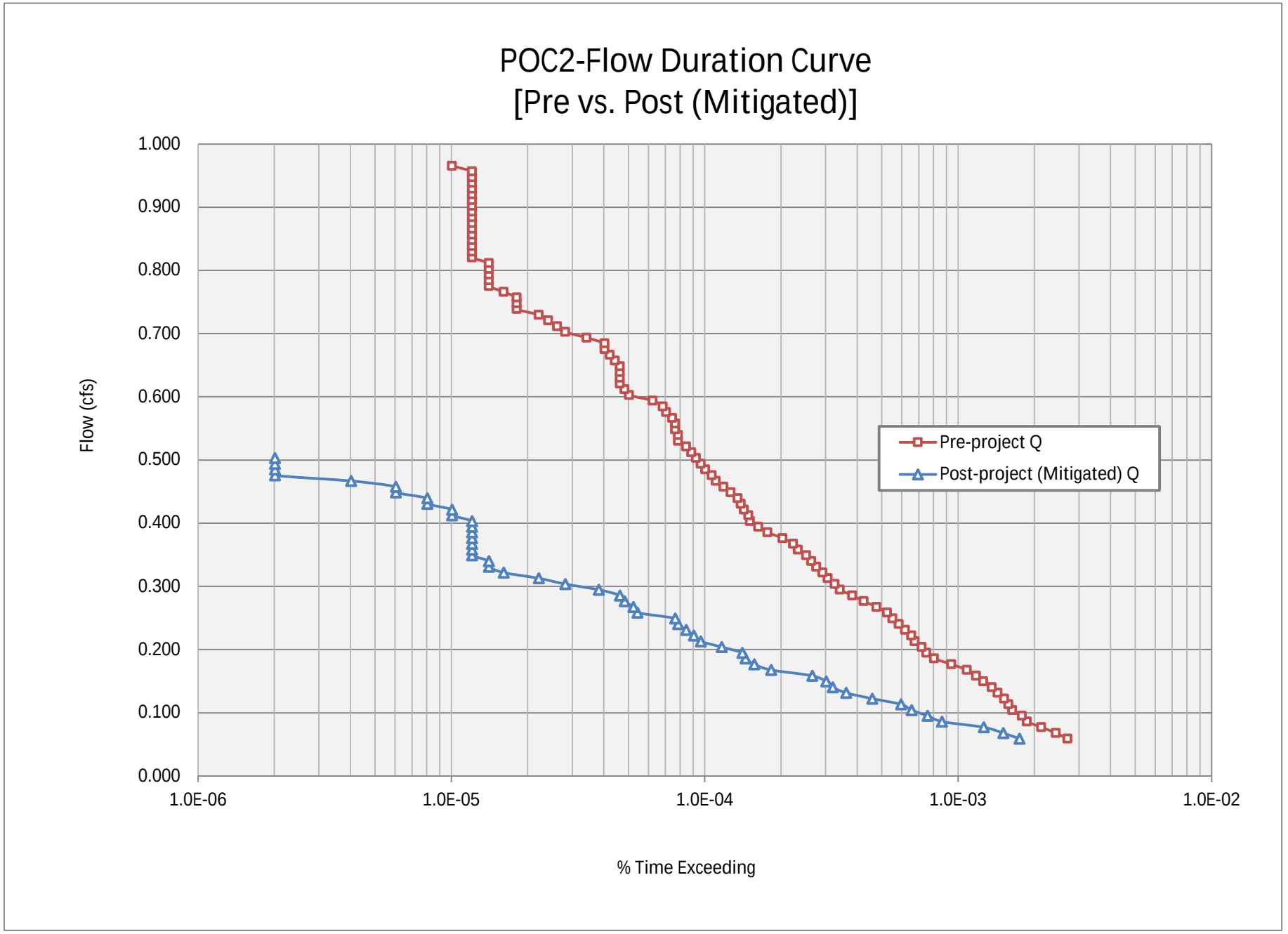
Low-flow Threshold:	10%	
0.1xQ2 (Pre):	0.059	cfs
Q10 (Pre):	0.972	cfs
Ordinate #:	100	
Incremental Q (Pre):	0.00913	cfs
Total Hourly Data:	497370	hours

POC-2

The proposed BMP: PASSED

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
0	0.059	1294	2.60E-03	834	1.68E-03	64%	Pass
1	0.068	1170	2.35E-03	713	1.43E-03	61%	Pass
2	0.078	1026	2.06E-03	567	1.14E-03	55%	Pass
3	0.087	913	1.84E-03	410	8.24E-04	45%	Pass
4	0.096	867	1.74E-03	362	7.28E-04	42%	Pass
5	0.105	805	1.62E-03	314	6.31E-04	39%	Pass
6	0.114	776	1.56E-03	282	5.67E-04	36%	Pass
7	0.123	744	1.50E-03	208	4.18E-04	28%	Pass
8	0.132	697	1.40E-03	171	3.44E-04	25%	Pass
9	0.141	661	1.33E-03	159	3.20E-04	24%	Pass
10	0.151	607	1.22E-03	143	2.88E-04	24%	Pass
11	0.160	563	1.13E-03	118	2.37E-04	21%	Pass
12	0.169	518	1.04E-03	79	1.59E-04	15%	Pass
13	0.178	455	9.15E-04	77	1.55E-04	17%	Pass
14	0.187	392	7.88E-04	72	1.45E-04	18%	Pass
15	0.196	368	7.40E-04	65	1.31E-04	18%	Pass
16	0.205	350	7.04E-04	54	1.09E-04	15%	Pass
17	0.215	334	6.72E-04	48	9.65E-05	14%	Pass
18	0.224	321	6.45E-04	43	8.65E-05	13%	Pass
19	0.233	306	6.15E-04	41	8.24E-05	13%	Pass
20	0.242	287	5.77E-04	38	7.64E-05	13%	Pass
21	0.251	274	5.51E-04	34	6.84E-05	12%	Pass
22	0.260	254	5.11E-04	27	5.43E-05	11%	Pass
23	0.269	233	4.68E-04	25	5.03E-05	11%	Pass
24	0.278	210	4.22E-04	23	4.62E-05	11%	Pass
25	0.288	189	3.80E-04	21	4.22E-05	11%	Pass
26	0.297	170	3.42E-04	15	3.02E-05	9%	Pass
27	0.306	162	3.26E-04	12	2.41E-05	7%	Pass
28	0.315	150	3.02E-04	10	2.01E-05	7%	Pass
29	0.324	145	2.92E-04	8	1.61E-05	6%	Pass
30	0.333	135	2.71E-04	7	1.41E-05	5%	Pass
31	0.342	129	2.59E-04	7	1.41E-05	5%	Pass
32	0.351	125	2.51E-04	6	1.21E-05	5%	Pass
33	0.361	117	2.35E-04	6	1.21E-05	5%	Pass
34	0.370	109	2.19E-04	6	1.21E-05	6%	Pass
35	0.379	102	2.05E-04	6	1.21E-05	6%	Pass
36	0.388	89	1.79E-04	6	1.21E-05	7%	Pass
37	0.397	81	1.63E-04	6	1.21E-05	7%	Pass
38	0.406	76	1.53E-04	6	1.21E-05	8%	Pass
39	0.415	74	1.49E-04	5	1.01E-05	7%	Pass
40	0.424	72	1.45E-04	5	1.01E-05	7%	Pass
41	0.434	69	1.39E-04	4	8.04E-06	6%	Pass
42	0.443	67	1.35E-04	3	6.03E-06	4%	Pass
43	0.452	63	1.27E-04	3	6.03E-06	5%	Pass
44	0.461	59	1.19E-04	3	6.03E-06	5%	Pass
45	0.470	55	1.11E-04	1	2.01E-06	2%	Pass
46	0.479	53	1.07E-04	1	2.01E-06	2%	Pass
47	0.488	49	9.85E-05	1	2.01E-06	2%	Pass
48	0.498	48	9.65E-05	1	2.01E-06	2%	Pass
49	0.507	46	9.25E-05	0	0.00E+00	0%	Pass

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
50	0.516	44	8.85E-05	0	0.00E+00	0%	Pass
51	0.525	41	8.24E-05	0	0.00E+00	0%	Pass
52	0.534	39	7.84E-05	0	0.00E+00	0%	Pass
53	0.543	39	7.84E-05	0	0.00E+00	0%	Pass
54	0.552	38	7.64E-05	0	0.00E+00	0%	Pass
55	0.561	38	7.64E-05	0	0.00E+00	0%	Pass
56	0.571	36	7.24E-05	0	0.00E+00	0%	Pass
57	0.580	35	7.04E-05	0	0.00E+00	0%	Pass
58	0.589	34	6.84E-05	0	0.00E+00	0%	Pass
59	0.598	31	6.23E-05	0	0.00E+00	0%	Pass
60	0.607	25	5.03E-05	0	0.00E+00	0%	Pass
61	0.616	24	4.83E-05	0	0.00E+00	0%	Pass
62	0.625	23	4.62E-05	0	0.00E+00	0%	Pass
63	0.634	23	4.62E-05	0	0.00E+00	0%	Pass
64	0.644	23	4.62E-05	0	0.00E+00	0%	Pass
65	0.653	23	4.62E-05	0	0.00E+00	0%	Pass
66	0.662	22	4.42E-05	0	0.00E+00	0%	Pass
67	0.671	21	4.22E-05	0	0.00E+00	0%	Pass
68	0.680	20	4.02E-05	0	0.00E+00	0%	Pass
69	0.689	20	4.02E-05	0	0.00E+00	0%	Pass
70	0.698	17	3.42E-05	0	0.00E+00	0%	Pass
71	0.707	14	2.81E-05	0	0.00E+00	0%	Pass
72	0.717	13	2.61E-05	0	0.00E+00	0%	Pass
73	0.726	12	2.41E-05	0	0.00E+00	0%	Pass
74	0.735	11	2.21E-05	0	0.00E+00	0%	Pass
75	0.744	9	1.81E-05	0	0.00E+00	0%	Pass
76	0.753	9	1.81E-05	0	0.00E+00	0%	Pass
77	0.762	9	1.81E-05	0	0.00E+00	0%	Pass
78	0.771	8	1.61E-05	0	0.00E+00	0%	Pass
79	0.781	7	1.41E-05	0	0.00E+00	0%	Pass
80	0.790	7	1.41E-05	0	0.00E+00	0%	Pass
81	0.799	7	1.41E-05	0	0.00E+00	0%	Pass
82	0.808	7	1.41E-05	0	0.00E+00	0%	Pass
83	0.817	7	1.41E-05	0	0.00E+00	0%	Pass
84	0.826	6	1.21E-05	0	0.00E+00	0%	Pass
85	0.835	6	1.21E-05	0	0.00E+00	0%	Pass
86	0.844	6	1.21E-05	0	0.00E+00	0%	Pass
87	0.854	6	1.21E-05	0	0.00E+00	0%	Pass
88	0.863	6	1.21E-05	0	0.00E+00	0%	Pass
89	0.872	6	1.21E-05	0	0.00E+00	0%	Pass
90	0.881	6	1.21E-05	0	0.00E+00	0%	Pass
91	0.890	6	1.21E-05	0	0.00E+00	0%	Pass
92	0.899	6	1.21E-05	0	0.00E+00	0%	Pass
93	0.908	6	1.21E-05	0	0.00E+00	0%	Pass
94	0.917	6	1.21E-05	0	0.00E+00	0%	Pass
95	0.927	6	1.21E-05	0	0.00E+00	0%	Pass
96	0.936	6	1.21E-05	0	0.00E+00	0%	Pass
97	0.945	6	1.21E-05	0	0.00E+00	0%	Pass
98	0.954	6	1.21E-05	0	0.00E+00	0%	Pass
99	0.963	6	1.21E-05	0	0.00E+00	0%	Pass
100	0.972	5	1.01E-05	0	0.00E+00	0%	Pass


POC2-Flow Duration Curve
[Pre vs. Post (Mitigated)]
Flow (cfs)
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
1.0E-06
1.0E-05
1.0E-04
1.0E-03
1.0E-02
% Time Exceeding
Pre-project Q
Post-project (Mitigated) Q

III. ELEVATION VS DISCHARGE, ELEVATION VS AREA, DRAWDOWN, SWMM INPUT PARAMETER CALCULATIONS

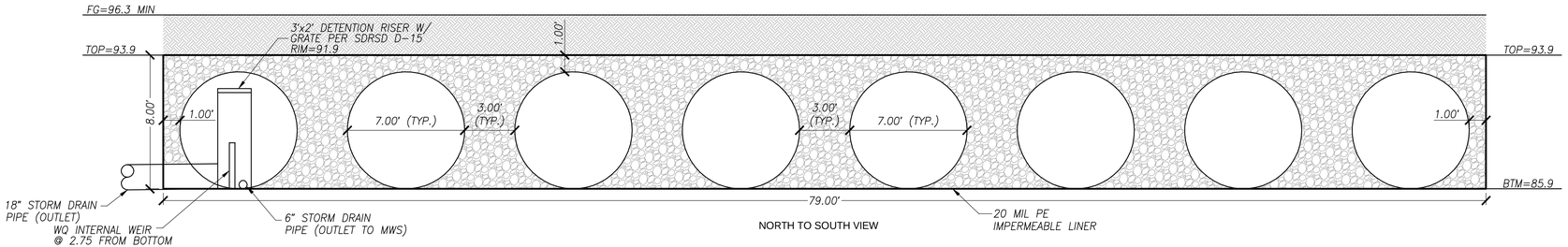
Elevation vs. Area

For the flow diverted each respective receiving detention basin, a pond is used to route the hydrographs. The elevation vs area curve in the model is calculated in Excel and imported into the model.

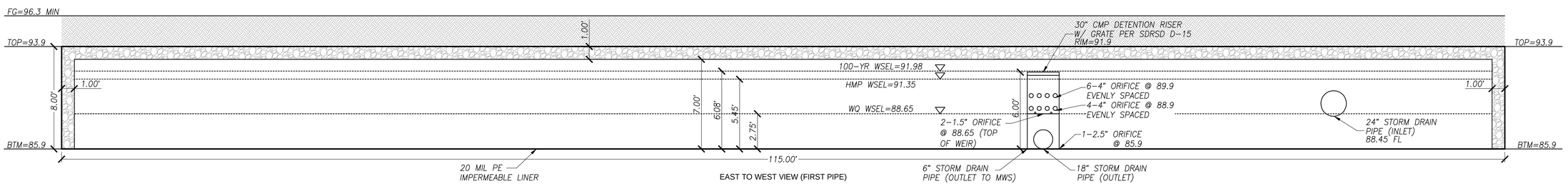
Elevation vs Discharge

The total discharge peak flow data is imported from an Excel spreadsheet that calculated the elevation vs discharge of the outlet system for the basin.

A detail of the orifice and riser structure is provided in Section 3 of this attachment. The stage-storage and stage-discharge calculations have been provided on the following pages.



NORTH TO SOUTH VIEW



EAST TO WEST VIEW (FIRST PIPE)

GRADING SECTION FOR CMP VAULT (HMP-1) & OUTLET STRUCTURE DETAIL

NOT TO SCALE

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC

PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 · FX(858)558-1414

PRELIMINARY CMP VAULT AND RISER DETAIL

GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, CALIFORNIA

W.O.# 5214-1002

R:\1778\Hyd\SWQMP\CAD\1778-Riser.dwg[]Nov-04-2024:17:01

CMP #1 Stage Storage					
Input DCV			11,849		
Input Factor			1.5		
Factor X DCV			17,773.5		
WQ Ponding Depth			2.750	ft	
Note: Find out the elevation value in relation to required WQ volume					
HMP-1					
depth	area	area (ac)	elevation	volume (cf)	volume (acft)
0.00	3634.0	0.0834	0.00	0.0	0.00000
0.17	4818.6	0.1106	0.17	737.9	0.01694
0.33	5288.7	0.1214	0.33	1,582.7	0.03633
0.50	5635.1	0.1294	0.50	2,494.2	0.05726
0.67	5914.8	0.1358	0.67	3,457.4	0.07937
0.83	6150.3	0.1412	0.83	4,463.3	0.10246
1.00	6352.9	0.1458	1.00	5,505.7	0.12639
1.17	6529.7	0.1499	1.17	6,579.6	0.15105
1.33	6685.1	0.1535	1.33	7,681.1	0.17633
1.50	6822.2	0.1566	1.50	8,806.9	0.20218
1.67	6943.4	0.1594	1.67	9,954.3	0.22852
1.83	7050.2	0.1619	1.83	11,120.6	0.25529
2.00	7144.1	0.1640	2.00	12,303.6	0.28245
2.17	7226.1	0.1659	2.17	13,501.3	0.30995
2.33	7296.8	0.1675	2.33	14,711.7	0.33773
2.50	7357.1	0.1689	2.50	15,933.0	0.36577
2.67	7407.3	0.1700	2.67	17,163.5	0.39402
2.75	7427.6	0.1705	2.75	17782.5	0.40823
2.83	7447.9	0.1710	2.83	18,401.5	0.42244
3.00	7479.2	0.1717	3.00	19,645.6	0.45100
3.17	7501.3	0.1722	3.17	20,894.1	0.47966
3.33	7514.6	0.1725	3.33	22,145.5	0.50839
3.50	7519.0	0.1726	3.50	23,398.5	0.53715
3.67	7514.6	0.1725	3.67	24,651.4	0.56592
3.83	7501.3	0.1722	3.83	25,902.8	0.59465
4.00	7479.2	0.1717	4.00	27,151.3	0.62331
4.17	7447.9	0.1710	4.17	28,395.4	0.65187
4.33	7407.3	0.1700	4.33	29,633.4	0.68029
4.50	7357.1	0.1689	4.50	30,863.9	0.70854
4.67	7296.8	0.1675	4.67	32,085.2	0.73658
4.83	7226.1	0.1659	4.83	33,295.6	0.76436
5.00	7144.1	0.1640	5.00	34,493.3	0.79186
5.17	7050.2	0.1619	5.17	35,676.3	0.81902
5.33	6943.4	0.1594	5.33	36,842.6	0.84579
5.50	6822.2	0.1566	5.50	37,990.0	0.87213
5.67	6685.1	0.1535	5.67	39,115.8	0.89798
5.83	6529.7	0.1499	5.83	40,217.3	0.92326
6.00	6352.9	0.1458	6.00	41,291.2	0.94792
6.17	6150.3	0.1412	6.17	42,333.6	0.97184
6.33	5914.8	0.1358	6.33	43,339.5	0.99494
6.50	5635.1	0.1294	6.50	44,302.7	1.01705
6.67	5288.7	0.1214	6.67	45,214.2	1.03798
6.83	4818.6	0.1106	6.83	46,059.0	1.05737
7.00	3634.0	0.0834	7.00	46,796.9	1.07431
7.17	3634.0	0.0834	7.17	47,402.6	1.08821
7.33	3634.0	0.0834	7.33	48,008.2	1.10212
7.50	3634.0	0.0834	7.50	48,613.9	1.11602

CONTECH ENGINEERED SOLUTIONS

Date: 12/22/2023
Project Name: DetentionHMP1 - 42891 (12-22-2023 20-32-6)

City / County:
State:

Designed By:
Company:
Telephone:

CMP: Underground Detention System Storage Volume Estimation

=Adjustable Input Cells

Contech Engineered Solutions, LLC is pleased to offer the following estimate of storage volume for the above named project. The results are submitted as an estimate only, without liability on the part of Contech Engineered Solutions, LLC for accuracy or suitability to any particular applicaton and are subject to verification of the Engineer of Record. This tool is only applicable for rectangular shaped systems.

Summary of Inputs

System Information		Backfill Information		Pipe & Analysis Information	
Out-to-out length (ft):	113.0	Backfill Porosity (%):	40%	System Diameter (in):	84
Out-to-out width (ft):	77.0	Depth Above Pipe (in):	6.0	Pipe Spacing (in):	36
Number of Manifolds (ea):	1.0	Depth Below Pipe (in):	0.0	Incremental Analysis (in):	2
Number of Barrels (ea):	8.0	Width At Ends (ft):	1.0	System Invert (Elevation):	0
		Width At Sides (ft):	1.0		

Storage Volume Estimation

System		Pipe		Stone		Total System		Miscellaneous	
Depth (ft)	Elevation (ft)	Incremental Storage (cf)	Cumulative Storage (cf)	Incremental Storage (cf)	Cumulative Storage (cf)	Incremental Storage (cf)	Cumulative Storage (cf)	Percent Open Storage (%)	Ave. Surface Area (sf)
0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	3,634.0
0.17	0.16	220.4	220.4	517.5	517.5	737.9	737.9	29.9%	4,818.6
0.33	0.33	398.5	618.9	446.3	963.8	844.8	1,582.7	39.1%	5,288.7
0.50	0.50	509.7	1,128.6	401.8	1,365.5	911.5	2,494.2	45.3%	5,635.1
0.67	0.66	595.9	1,724.6	367.3	1,732.8	963.2	3,457.4	49.9%	5,914.8
0.83	0.83	667.1	2,391.7	338.8	2,071.7	1,005.9	4,463.3	53.6%	6,150.3
1.00	1.00	727.8	3,119.5	314.6	2,386.2	1,042.3	5,505.7	56.7%	6,352.9
1.17	1.16	780.4	3,899.8	293.5	2,679.7	1,073.9	6,579.6	59.3%	6,529.7
1.33	1.33	826.4	4,726.2	275.1	2,954.8	1,101.5	7,681.1	61.5%	6,685.1
1.50	1.50	867.0	5,593.2	258.9	3,213.7	1,125.8	8,806.9	63.5%	6,822.2
1.67	1.66	902.8	6,496.0	244.5	3,458.3	1,147.3	9,954.3	65.3%	6,943.4
1.83	1.83	934.4	7,430.4	231.9	3,690.2	1,166.3	11,120.6	66.8%	7,050.2
2.00	2.00	962.3	8,392.7	220.8	3,910.9	1,183.0	12,303.6	68.2%	7,144.1
2.17	2.16	986.7	9,379.4	211.0	4,121.9	1,197.7	13,501.3	69.5%	7,226.1
2.33	2.33	1,007.9	10,387.2	202.5	4,324.4	1,210.4	14,711.7	70.6%	7,296.8
2.50	2.50	1,026.1	11,413.3	195.2	4,519.7	1,221.3	15,933.0	71.6%	7,357.1
2.67	2.66	1,041.4	12,454.7	189.1	4,708.8	1,230.5	17,163.5	72.6%	7,407.3
2.83	2.83	1,054.0	13,508.7	184.1	4,892.9	1,238.1	18,401.5	73.4%	7,447.9
3.00	3.00	1,064.0	14,572.6	180.1	5,072.9	1,244.0	19,645.6	74.2%	7,479.2
3.17	3.16	1,071.4	15,644.0	177.1	5,250.1	1,248.5	20,894.1	74.9%	7,501.3
3.33	3.33	1,076.3	16,720.3	175.1	5,425.2	1,251.5	22,145.5	75.5%	7,514.6
3.50	3.50	1,078.8	17,799.1	174.2	5,599.4	1,252.9	23,398.5	76.1%	7,519.0
3.67	3.66	1,078.8	18,877.8	174.2	5,773.5	1,252.9	24,651.4	76.6%	7,514.6
3.83	3.83	1,076.3	19,954.2	175.1	5,948.7	1,251.5	25,902.8	77.0%	7,501.3
4.00	4.00	1,071.4	21,025.5	177.1	6,125.8	1,248.5	27,151.3	77.4%	7,479.2
4.17	4.16	1,064.0	22,089.5	180.1	6,305.9	1,244.0	28,395.4	77.8%	7,447.9
4.33	4.33	1,054.0	23,143.5	184.1	6,489.9	1,238.1	29,633.4	78.1%	7,407.3
4.50	4.50	1,041.4	24,184.9	189.1	6,679.0	1,230.5	30,863.9	78.4%	7,357.1
4.67	4.66	1,026.1	25,210.9	195.2	6,874.3	1,221.3	32,085.2	78.6%	7,296.8
4.83	4.83	1,007.9	26,218.8	202.5	7,076.8	1,210.4	33,295.6	78.7%	7,226.1
5.00	5.00	986.7	27,205.5	211.0	7,287.8	1,197.7	34,493.3	78.9%	7,144.1
5.17	5.16	962.3	28,167.8	220.8	7,508.6	1,183.0	35,676.3	79.0%	7,050.2
5.33	5.33	934.4	29,102.2	231.9	7,740.5	1,166.3	36,842.6	79.0%	6,943.4
5.50	5.50	902.8	30,005.0	244.5	7,985.0	1,147.3	37,990.0	79.0%	6,822.2
5.67	5.66	867.0	30,872.0	258.9	8,243.9	1,125.8	39,115.8	78.9%	6,685.1
5.83	5.83	826.4	31,698.4	275.1	8,519.0	1,101.5	40,217.3	78.8%	6,529.7
6.00	6.00	780.4	32,478.7	293.5	8,812.5	1,073.9	41,291.2	78.7%	6,352.9

These results are submitted to you as a guideline only, without liability on the part of CONTECH Engineered Solutions, LLC for accuracy or suitability to any particular application, and are subject to your verification.

6.17	6.16	727.8	33,206.5	314.6	9,127.1	1,042.3	42,333.6	78.4%	6,150.3
6.33	6.33	667.1	33,873.6	338.8	9,465.9	1,005.9	43,339.5	78.2%	5,914.8
6.50	6.50	595.9	34,469.5	367.3	9,833.2	963.2	44,302.7	77.8%	5,635.1
6.67	6.66	509.7	34,979.2	401.8	10,235.0	911.5	45,214.2	77.4%	5,288.7
6.83	6.83	398.5	35,377.7	446.3	10,681.2	844.8	46,059.0	76.8%	4,818.6
7.00	7.00	220.4	35,598.2	517.5	11,198.7	737.9	46,796.9	76.1%	3,634.0
7.17	7.16	0.0	35,598.2	605.7	11,804.4	605.7	47,402.6	75.1%	3,634.0
7.33	7.33	0.0	35,598.2	605.7	12,410.1	605.7	48,008.2	74.2%	3,634.0
7.50	7.50	0.0	35,598.2	605.7	13,015.7	605.7	48,613.9	73.2%	3,634.0

These results are submitted to you as a guideline only, without liability on the part of CONTECH Engineered Solutions, LLC for accuracy or suitability to any particular application, and are subject to your verification.

CMP-1 Discharge to MWS BF-3-1

Discharge vs Elevation Table

Low orifice:	2.5 "	Top orifice:	0.625 "
Number:	1	Number:	0
Cg-low:	0.61	Cg-low:	0.61
invert elev:	0.00 ft	invert elev:	0.40 ft

h	H/D-low	H/D-mid	H/D-top	Qlow-orif	Qlow-weir	Qtot-low	Qmid-orif	Qmid-weir	Qtot-med	Qtop-orif	Qtop-weir	Qtot-top	Qpeak-top	Qtot
(ft)	-	-	-	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000
0.17	0.80	0.00	0.00	0.042	0.035	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0354
0.33	1.60	0.00	0.00	0.080	0.100	0.080	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0799
0.50	2.40	0.00	1.92	0.105	0.136	0.105	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1050
0.67	3.20	2.42	5.12	0.125	0.142	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1252
0.83	4.00	4.85	8.32	0.142	0.234	0.142	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1425
1.00	4.80	7.27	11.52	0.158	0.708	0.158	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1579
1.17	5.60	9.70	14.72	0.172	2.103	0.172	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1720
1.33	6.40	12.12	17.92	0.185	5.265	0.185	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1850
1.50	7.20	14.55	21.12	0.197	11.405	0.197	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1972
1.67	8.00	16.97	24.32	0.209	22.164	0.209	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2086
1.83	8.80	19.39	27.52	0.219	39.678	0.219	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2194
2.00	9.60	21.82	30.72	0.230	66.635	0.230	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2298
2.17	10.40	24.24	33.92	0.240	106.340	0.240	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2396
2.33	11.20	26.67	37.12	0.249	162.779	0.249	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2491
2.50	12.00	29.09	40.32	0.258	240.680	0.258	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2583
2.67	12.80	31.52	43.52	0.267	345.572	0.267	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2671
2.75	13.20	32.73	45.12	0.271	410.104	0.271	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2714
2.83	13.60	33.94	46.72	0.276	483.854	0.276	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2757
3.00	14.40	36.36	49.92	0.284	662.852	0.284	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2840
3.17	15.22	38.84	53.18	0.292	896.007	0.292	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2922
3.33	16.00	41.21	56.32	0.300	1177.320	0.300	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2999
3.50	16.80	43.64	59.52	0.308	1532.649	0.308	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3075
3.67	17.60	46.06	62.72	0.315	1968.536	0.315	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3150
3.83	18.40	48.48	65.92	0.322	2497.888	0.322	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3222
4.00	19.20	50.91	69.12	0.329	3134.913	0.329	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3294
4.17	20.00	53.33	72.32	0.336	3895.187	0.336	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3363
4.33	20.80	55.76	75.52	0.343	4795.713	0.343	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3432
4.50	21.60	58.18	78.72	0.350	5854.983	0.350	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3499
4.67	22.40	60.61	81.92	0.356	7093.043	0.356	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3564
4.83	23.20	63.03	85.12	0.363	8531.553	0.363	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3629
5.00	24.00	65.45	88.32	0.369	10193.852	0.369	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3692
5.17	24.80	67.88	91.52	0.375	12105.017	0.375	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3755
5.33	25.60	70.30	94.72	0.382	14291.927	0.382	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3816
5.50	26.40	72.73	97.92	0.388	16783.327	0.388	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3876
5.67	27.20	75.15	101.12	0.394	19609.887	0.394	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3936
5.83	28.00	77.58	104.32	0.399	22804.268	0.399	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3994
6.00	28.80	80.00	107.52	0.405	26401.180	0.405	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4052
6.17	29.60	82.42	110.72	0.411	30437.450	0.411	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4109
6.33	30.40	84.85	113.92	0.416	34952.078	0.416	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4165
6.50	31.20	87.27	117.12	0.422	39986.307	0.422	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4220
6.67	32.00	89.70	120.32	0.427	45583.676	0.427	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4275
6.83	32.80	92.12	123.52	0.433	51790.090	0.433	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4329
7.00	33.60	94.55	126.72	0.438	58653.882	0.438	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4382
7.17	34.40	96.97	129.92	0.443	66225.868	0.443	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4435
7.33	35.20	99.39	133.12	0.449	74559.419	0.449	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4487
7.50	36.00	101.82	136.32	0.454	83710.517	0.454	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4538

WQ Drawdown @		2.75	ft=	34.69
Elevation	Q_{AVG} (CFS)	DV (CF)	DT (HR)	Total T
0.00	0.040	738	5.13	34.69
0.17	0.058	845	4.07	29.56
0.33	0.092	911	2.74	25.49
0.50	0.115	963	2.33	22.75
0.67	0.134	1006	2.09	20.42
0.83	0.150	1042	1.93	18.33
1.00	0.165	1074	1.81	16.41
1.17	0.179	1102	1.71	14.60
1.33	0.191	1126	1.64	12.88
1.50	0.203	1147	1.57	11.25
1.67	0.214	1166	1.51	9.68
1.83	0.225	1183	1.46	8.16
2.00	0.235	1198	1.42	6.70
2.17	0.244	1210	1.38	5.28
2.33	0.254	1221	1.34	3.91
2.50	0.263	1230	1.30	2.57
2.67	0.271	1238	1.27	1.27
2.75	0.280	1244	1.23	

CMP #1 Discharge HMP Riser

Discharge vs Elevation Table

Low orifice:	1.50 "	Top orifice:	4 "
Number:	2	Number:	6
Cg-low:	0.61	Cg-low:	0.61
invert elev:	2.75 ft	invert elev:	4.00 ft
Middle orifice:	4 "	Emergency inlet:	
number of orif:	4	Rim height:	6.00 ft
Cg-middle:	0.61	Riser Box D	3x2
invert elev:	3.00 ft	Weir Length	10.00 ft

														Peak Flow	WQ+HMP
h	H/D-low	H/D-mid	H/D-top	Qlow-orif	Qlow-weir	Qtot-low	Qmid-orif	Qmid-weir	Qtot-med	Qtop-orif	Qtop-weir	Qtot-top	Qpeak-top	Qtot	Qtot
(ft)	-	-	-	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000
0.17	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0354
0.33	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0799
0.50	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1050
0.67	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1252
0.83	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1425
1.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1579
1.17	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1720
1.33	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1850
1.50	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1972
1.67	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2086
1.83	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2194
2.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2298
2.17	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2396
2.33	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2491
2.50	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2583
2.67	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2671
2.75	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2714
2.83	0.67	0.00	0.00	0.017	0.014	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.014	0.2900
3.00	2.00	0.00	0.00	0.052	0.069	0.052	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.052	0.3360
3.17	3.36	0.51	0.00	0.072	0.082	0.072	0.099	0.204	0.204	0.000	0.000	0.000	0.000	0.276	0.5681
3.33	4.67	1.00	0.00	0.087	0.325	0.087	0.698	0.666	0.666	0.000	0.000	0.000	0.000	0.753	1.0531
3.50	6.00	1.50	0.00	0.100	1.895	0.100	0.987	1.200	0.987	0.000	0.000	0.000	0.000	1.086	1.3937
3.67	7.33	2.00	0.00	0.111	7.153	0.111	1.208	1.605	1.208	0.000	0.000	0.000	0.000	1.319	1.6343
3.83	8.67	2.50	0.00	0.121	20.180	0.121	1.395	1.784	1.395	0.000	0.000	0.000	0.000	1.517	1.8388
4.00	10.00	3.00	0.00	0.131	47.216	0.131	1.560	1.811	1.560	0.000	0.000	0.000	0.000	1.691	2.0202
4.17	11.33	3.50	0.50	0.140	97.116	0.140	1.709	2.010	1.709	#NUM!	0.295	0.295	0.000	2.144	2.4799
4.33	12.67	4.00	1.00	0.148	181.788	0.148	1.846	3.030	1.846	1.046	1.000	1.000	0.000	2.994	3.3367
4.50	14.00	4.50	1.50	0.156	316.649	0.156	1.973	5.921	1.973	1.480	1.800	1.480	0.000	3.609	3.9589
4.67	15.33	5.00	2.00	0.164	521.067	0.164	2.093	12.215	2.093	1.812	2.407	1.812	0.000	4.069	4.4252
4.83	16.67	5.50	2.50	0.171	818.809	0.171	2.206	24.001	2.206	2.093	2.676	2.093	0.000	4.470	4.8325
5.00	18.00	6.00	3.00	0.178	1238.490	0.178	2.314	44.001	2.314	2.340	2.717	2.340	0.000	4.831	5.2004
5.17	19.33	6.50	3.50	0.184	1814.020	0.184	2.417	75.648	2.417	2.563	3.015	2.563	0.000	5.164	5.5395
5.33	20.67	7.00	4.00	0.191	2585.051	0.191	2.515	123.164	2.515	2.769	4.544	2.769	0.000	5.474	5.8561
5.50	22.00	7.50	4.50	0.197	3597.421	0.197	2.610	191.634	2.610	2.960	8.881	2.960	0.000	5.767	6.1544
5.67	23.33	8.00	5.00	0.203	4903.610	0.203	2.702	287.087	2.702	3.139	18.323	3.139	0.000	6.044	6.4375
5.83	24.67	8.50	5.50	0.209	6563.176	0.209	2.790	416.572	2.790	3.309	36.002	3.309	0.000	6.308	6.7076
6.00	26.00	9.00	6.00	0.215	8643.213	0.215	2.876	588.231	2.876	3.471	66.002	3.471	0.000	6.561	6.9665
6.17	27.33	9.50	6.50	0.220	11218.791	0.220	2.960	811.382	2.960	3.625	113.472	3.625	2.266	9.070	9.4812
6.33	28.67	10.00	7.00	0.225	14373.406	0.225	3.041	1096.593	3.041	3.773	184.745	3.773	6.409	13.448	13.8641
6.50	30.00	10.50	7.50	0.231	18199.428	0.231	3.120	1455.757	3.120	3.915	287.451	3.915	11.773	19.039	19.4611
6.67	31.33	11.00	8.00	0.236	22798.546	0.236	3.197	1902.174	3.197	4.053	430.631	4.053	18.126	25.612	26.0390
6.83	32.67	11.50	8.50	0.241	28282.219	0.241	3.272	2450.626	3.272	4.186	624.858	4.186	25.332	33.031	33.4636
7.00	34.00	12.00	9.00	0.246	34772.120	0.246	3.346	3117.450	3.346	4.314	882.347	4.314	33.300	41.206	41.6440
7.17	35.33	12.50	9.50	0.251	42400.585	0.251	3.418	3920.621	3.418	4.439	1217.073	4.439	41.963	50.070	50.5140
7.33	36.67	13.00	10.00	0.255	51311.058	0.255	3.488	4879.827	3.488	4.561	1644.889	4.561	51.269	59.573	60.0219
7.50	38.00	13.50	10.50	0.260	61658.544	0.260	3.557	6016.544	3.557	4.680	2183.635	4.680	61.176	69.673	70.1266

HMP Drawdown @		6	ft=	38.85
Elevation	Q_{AVG} (CFS)	DV (CF)	DT (HR)	Total T
0.00	0.040	738	5.13	38.85
0.17	0.058	845	4.07	33.72
0.33	0.092	911	2.74	29.65
0.50	0.115	963	2.33	26.91
0.67	0.134	1006	2.09	24.59
0.83	0.150	1042	1.93	22.50
1.00	0.165	1074	1.81	20.57
1.17	0.179	1102	1.71	18.76
1.33	0.191	1126	1.64	17.05
1.50	0.203	1147	1.57	15.41
1.67	0.214	1166	1.51	13.84
1.83	0.225	1183	1.46	12.33
2.00	0.235	1198	1.42	10.87
2.17	0.244	1210	1.38	9.45
2.33	0.254	1221	1.34	8.07
2.50	0.263	1230	1.30	6.74
2.67	0.279	1238	1.23	5.43
2.83	0.313	1244	1.10	4.20
3.00	0.452	1248	0.77	3.10
3.17	0.811	1251	0.43	2.33
3.33	1.223	1253	0.28	1.90
3.50	1.514	1253	0.23	1.62
3.67	1.737	1251	0.20	1.39
3.83	1.929	1248	0.18	1.19
4.00	2.250	1244	0.15	1.01
4.17	2.908	1238	0.12	0.85
4.33	3.648	1230	0.09	0.73
4.50	4.192	1221	0.08	0.64
4.67	4.629	1210	0.07	0.56
4.83	5.016	1198	0.07	0.49
5.00	5.370	1183	0.06	0.42
5.17	5.698	1166	0.06	0.36
5.33	6.005	1147	0.05	0.30
5.50	6.296	1126	0.05	0.25
5.67	6.573	1102	0.05	0.20
5.83	6.837	1074	0.04	0.15
6.00	8.224	1042	0.04	0.11
6.17	11.673	1006	0.02	0.07
6.33	16.663	963	0.02	0.05
6.50	22.750	911	0.01	0.03
6.67	29.751	845	0.01	0.02
6.83	37.554	738	0.01	0.01
7.00	46.079	606	0.00	0.01
7.17	55.268	606	0.00	0.01
7.33	65.074	606	0.00	0.00
7.50	35.063			

IV. SWMM INPUT DATA (EXISTING AND PROPOSED MODELS)

Attached are the EPA-SWMM Model outputs for pre-development and post-development conditions for the POC. Similar modeling was used for analyzing the remaining POC locations using the input data found in the previous section. Each area, i.e., sub-catchments, outfalls, storage units, weir as a discharge, and outfalls (point of compliance), also are shown, as applicable.

Variables in the modeling are associated with typical recommended values by the EPA-SWMM model and typical values found in technical literature (such as Maidment's Handbook of Hydrology). Recommended values for the SWMM model have been obtained from the City of Oceanside BMP manual Appendix G.

Soil characteristics of the existing soils were determined based on data provided by Geotechnical Engineer/Geologist. KEY ASSUMPTIONS: Group C & D soils are representative of the existing conditions for the site.

Some values incorporated within the SWMM model have been determined from the professional experience of H&A using conservative assumptions that tend to increase the size of the needed BMP and generate a long-term runoff as a percentage of rainfall like those measured in gage stations in Southern California by the USGS.

Description of model parameters and assumptions:

N-Imperv – Manning's N for impervious surfaces

0.012 (typical)

N-Perv – Manning's N for pervious surfaces

0.15

Dstore-Imperv – Depth of depression storage on impervious area (in)

0.05 (typical)

Dstore-Perv – Depth of depression storage on pervious area (in)

0.100

%Zero-Imperv – Percentage of impervious area with no depression storage (%)

25 (typical)

Suction Head – Soil capillary suction head (in)

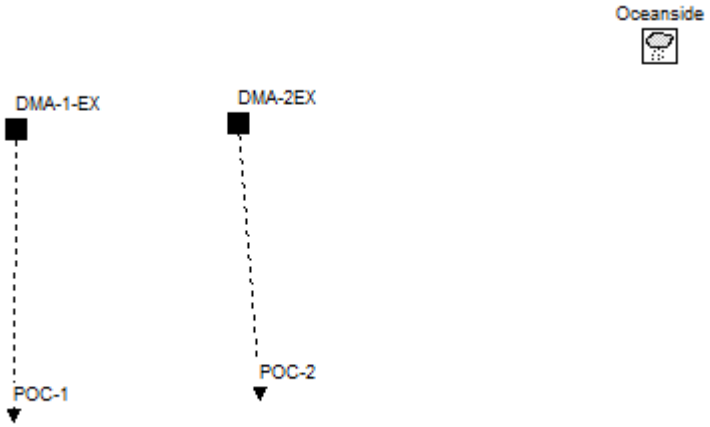
Conductivity – Soil saturated hydraulic conductivity (in/hr)

-75% of these values if subcatchment is graded/compacted

Initial Deficit – Initial moisture deficit (fraction)

Soil Type	Suction Head	Conductivity	Initial Deficit
A	1.5	0.3	0.33
B	3	0.2	0.32
C	6	0.1	0.31
D	9	0.025	0.30

POC 1 and 2 – Pre-Developed Condition



SWMM Model - EX Condition Input Data

```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           08/28/1951
START_TIME           05:00:00
REPORT_START_DATE    08/28/1951
REPORT_START_TIME    05:00:00
END_DATE             05/23/2008
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:08:00
DRY_STEP             02:00:00
ROUTING_STEP         0:00:05
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.566
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          0.06   0.08   0.11   0.15   0.17   0.19   0.19   0.18   0.15   0.11   0.08   0.06
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- ------ ------ ----------
Oceanside        INTENSITY 1:00     1.0      TIMESERIES Oceanside

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
DMA-1-EX         Oceanside        POC-1            8.13     0        932      2.9      0
DMA-2EX          Oceanside        POC-2            1.04     20.8     445      3        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA-1-EX         0.012      0.05       00.05      0.1        25         OUTLET
DMA-2EX          0.012      0.05       0.05       0.1        25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    Ksat       IMD
```

```
;;-------------- ---------- ---------- ----------
DMA-1-EX         9          0.01875    0.33
DMA-2EX          9          0.01875    0.33

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC-1            0          FREE                        NO
POC-2            0          FREE                        NO

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;Rainfall data from Oceanside gage.
Oceanside        FILE "R:\1594\Hyd\FE\HMP\SWMM\POC-3 El Corazon\OCEANSIDE.prn"

[REPORT]
;;Reporting Options
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            -98.684            7061.404
POC-2            1284.201           7184.466

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA-1-EX         -88.028            8661.972
DMA-2EX          1160.635           8702.560

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
Oceanside        3530.702           9111.842
```

SWMM Model - EX Condition Output Report

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.014)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... NO
  Water Quality ..... NO
Infiltration Method ..... GREEN_AMPT
Starting Date 08/28/1951 05:00:00
Ending Date 05/23/2008 23:00:00
Antecedent Dry Days 0.0
Report Time Step 01:00:00
Wet Time Step 00:08:00
Dry Time Step 02:00:00

Runoff Quantity Continuity	Volume acre-feet	Depth inches
Total Precipitation	516.004	675.250
Evaporation Loss	21.004	27.486
Infiltration Loss	364.684	477.232
Surface Runoff	135.035	176.708
Final Storage	0.001	0.001
Continuity Error (%)	-0.915	

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	135.167	44.046
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	135.167	44.046
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

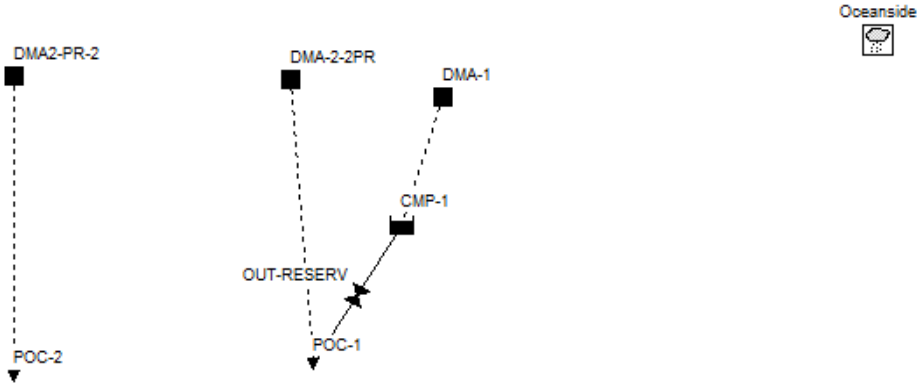
****
Subcatchment Runoff Summary
****

	Total Precip	Total Runon	Total Evap	Total Infil	Imperv Runoff	Perv Runoff	Total Runoff	Total Runoff	Peak Runoff	Runoff Coeff

Subcatchment	in	in	in	in	in	in	in	10^6 gal	CFS	
DMA-1-EX	675.25	0.00	25.79	489.70	0.00	165.83	165.83	36.61	9.23	0.246
DMA-2EX	675.25	0.00	40.72	379.74	121.02	140.75	261.77	7.39	1.20	0.388

Analysis begun on: Mon Apr 14 13:09:38 2025
Analysis ended on: Mon Apr 14 13:12:01 2025
Total elapsed time: 00:02:23

POC 1 and 2 – Developed Condition



SWMM Model - PR Condition Input Data

```
[TITLE]
;;Project Title/Notes
Garrsion
POST PROJECT
POC1

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           08/28/1951
START_TIME           05:00:00
REPORT_START_DATE    08/28/1951
REPORT_START_TIME    05:00:00
END_DATE             05/23/2008
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:08:00
DRY_STEP             02:00:00
ROUTING_STEP         0:00:05
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.566
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          0.06   0.08   0.11   0.15   0.17   0.19   0.19   0.18   0.15   0.11   0.08   0.06
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- ------ ------ ----------
Oceanside        INTENSITY 1:00     1.0      TIMESERIES Oceanside

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
DMA-1            Oceanside        CMP-1            7.04     80       4018     2        0
Bypass           Oceanside        POC-1            2.87     1.04     601      2.9      0
DMA2-PR-2        Oceanside        POC-2            0.43     60.8     235      3        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA-1            0.012      0.05       0.05       0.1        25         OUTLET
```

```
Bypass          0.012     0.05      00.05     0.1       25        OUTLET
DMA2-PR-2       0.012     0.05      0.05      0.1       25        OUTLET

[INFILTRATION]
;;Subcatchment   Suction    Ksat       IMD
;;-------------- ---------- ---------- ----------
DMA-1           9          0.01875    0.33
Bypass          9          0.01875    0.33
DMA2-PR-2       9          0.01875    0.33

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC-1           0          FREE                        NO
POC-2           0          FREE                        NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params            N/A      Fevap    Psi      Ksat     IMD
;;-------------- -------- ---------- ---------- ---------- ---------------------------- -------- --------          -------- --------
CMP-1           0        7.5        0          TABULAR    CMP-1                        0        1        8        0.045    0.33

[OUTLETS]
;;Name           From Node        To Node          Offset     Type            QTable/Qcoeff    Qexpon     Gated
;;-------------- ---------------- ---------------- ---------- --------------- ---------------- ---------- --------
OUT-RESERV      CMP-1            POC-1            0          TABULAR/HEAD    HMP-1                       NO

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
HMP-1           Rating     0.00       0.0000
HMP-1                      0.17       0.0354
HMP-1                      0.33       0.0799
HMP-1                      0.50       0.1050
HMP-1                      0.67       0.1252
HMP-1                      0.83       0.1425
HMP-1                      1.00       0.1579
HMP-1                      1.17       0.1720
HMP-1                      1.33       0.1850
HMP-1                      1.50       0.1972
HMP-1                      1.67       0.2086
HMP-1                      1.83       0.2194
HMP-1                      2.00       0.2298
HMP-1                      2.17       0.2396
HMP-1                      2.33       0.2491
HMP-1                      2.50       0.2583
HMP-1                      2.67       0.2671
HMP-1                      2.75       0.2714
HMP-1                      2.83       0.2900
HMP-1                      3.00       0.3360
HMP-1                      3.17       0.5681
HMP-1                      3.33       1.0531
HMP-1                      3.50       1.3937
HMP-1                      3.67       1.6343
HMP-1                      3.83       1.8388
HMP-1                      4.00       2.0202
HMP-1                      4.17       2.4799
HMP-1                      4.33       3.3367
HMP-1                      4.50       3.9589
HMP-1                      4.67       4.4252
HMP-1                      4.83       4.8325
HMP-1                      5.00       5.2004
HMP-1                      5.17       5.5395
HMP-1                      5.33       5.8561
HMP-1                      5.50       6.1544
HMP-1                      5.67       6.4375
HMP-1                      5.83       6.7076
```

```
HMP-1                      6.00       6.9665
HMP-1                      6.17       9.4812
HMP-1                      6.33       13.8641
HMP-1                      6.50       19.4611
HMP-1                      6.67       26.0390
HMP-1                      6.83       33.4636
HMP-1                      7.00       41.6440
HMP-1                      7.17       50.5140
HMP-1                      7.33       60.0219
HMP-1                      7.50       70.1266
;
CMP-1            Storage   0.00       3634.0
CMP-1                      0.17       4818.6
CMP-1                      0.33       5288.7
CMP-1                      0.50       5635.1
CMP-1                      0.67       5914.8
CMP-1                      0.83       6150.3
CMP-1                      1.00       6352.9
CMP-1                      1.17       6529.7
CMP-1                      1.33       6685.1
CMP-1                      1.50       6822.2
CMP-1                      1.67       6943.4
CMP-1                      1.83       7050.2
CMP-1                      2.00       7144.1
CMP-1                      2.17       7226.1
CMP-1                      2.33       7296.8
CMP-1                      2.50       7357.1
CMP-1                      2.67       7407.3
CMP-1                      2.75       7427.6
CMP-1                      2.83       7447.9
CMP-1                      3.00       7479.2
CMP-1                      3.17       7501.3
CMP-1                      3.33       7514.6
CMP-1                      3.50       7519.0
CMP-1                      3.67       7514.6
CMP-1                      3.83       7501.3
CMP-1                      4.00       7479.2
CMP-1                      4.17       7447.9
CMP-1                      4.33       7407.3
CMP-1                      4.50       7357.1
CMP-1                      4.67       7296.8
CMP-1                      4.83       7226.1
CMP-1                      5.00       7144.1
CMP-1                      5.17       7050.2
CMP-1                      5.33       6943.4
CMP-1                      5.50       6822.2
CMP-1                      5.67       6685.1
CMP-1                      5.83       6529.7
CMP-1                      6.00       6352.9
CMP-1                      6.17       6150.3
CMP-1                      6.33       5914.8
CMP-1                      6.50       5635.1
CMP-1                      6.67       5288.7
CMP-1                      6.83       4818.6
CMP-1                      7.00       3634.0
CMP-1                      7.17       3634.0
CMP-1                      7.33       3634.0
CMP-1                      7.50       3634.0

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;Rainfall data from Oceanside gage.
Oceanside        FILE "R:\1594\Hyd\FE\HMP\SWMM\POC-3 El Corazon\OCEANSIDE.prn"

[REPORT]
```

```
;;Reporting Options
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            -98.684            7061.404
POC-2            -2018.813          6975.398
CMP-1            457.746            7931.338

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA-1            730.634            8767.606
Bypass           -246.479           8882.042
DMA2-PR-2        -2018.813          8900.145

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
Oceanside        3530.702           9111.842
```

SWMM Model - PR Condition Output Report

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.014)

Garrsion
POST PROJECT
POC1

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... GREEN_AMPT
Flow Routing Method ..... KINWAVE
Starting Date 08/28/1951 05:00:00
Ending Date 05/23/2008 23:00:00
Antecedent Dry Days 0.0
Report Time Step 01:00:00
Wet Time Step 00:08:00
Dry Time Step 02:00:00
Routing Time Step ..... 5.00 sec

Runoff Quantity Continuity	Volume acre-feet	Depth inches
Total Precipitation	581.840	675.250
Evaporation Loss	59.338	68.864
Infiltration Loss	176.798	205.181
Surface Runoff	350.680	406.979
Final Storage	0.021	0.024
Continuity Error (%)	-0.859	

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	350.763	114.301
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	321.163	104.656
Flooding Loss	0.000	0.000
Evaporation Loss	1.302	0.424
Exfiltration Loss	28.296	9.221
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.003	0.001
Continuity Error (%)	-0.000	

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****
Minimum Time Step : 5.00 sec
Average Time Step : 5.00 sec
Maximum Time Step : 5.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00
Percent Not Converging : 0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Imperv Runoff in	Perv Runoff in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
DMA-1	675.25	0.00	86.16	95.10	463.03	36.71	499.74	95.53	8.38	0.740
Bypass	675.25	0.00	26.13	477.94	6.12	170.82	176.94	13.79	3.27	0.262
DMA2-PR-2	675.25	0.00	70.94	187.03	352.68	71.01	423.69	4.95	0.51	0.627

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
POC-1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
POC-2	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
CMP-1	STORAGE	0.04	5.45	5.45	18857 12:02	5.42

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
POC-1	OUTFALL	3.27	9.28	18857 12:00	13.8	99.7	0.000
POC-2	OUTFALL	0.51	0.51	18857 12:00	4.95	4.95	0.000
CMP-1	STORAGE	8.38	8.38	18857 12:00	95.5	95.5	-0.000

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
CMP-1	0.228	0	0	10	37.570	77	18857 12:02	6.09

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
POC-1	6.61	0.11	9.28	99.700
POC-2	1.67	0.02	0.51	4.948
System	4.14	0.13	0.51	104.648

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
OUT-RESERV	DUMMY	6.06	18857 12:02			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Apr 14 16:44:37 2025
Analysis ended on: Mon Apr 14 16:47:54 2025
Total elapsed time: 00:03:17

EXPLANATION OF SELECTED VARIABLES

Parameters for the pre- and post-development models include soil type group D in accordance with the San Diego County Hydrology Manual and the USGS Soil Survey. Suction head, conductivity and initial deficit corresponds to average values expected for the soil types, according to sources consulted, professional experience, and approximate values obtained by the City of Oceanside BMP manual.

Selection of a Kinematic Approach: As the continuous model is based on hourly rainfall, and the time of concentration for the pre-development and post-development conditions is significantly smaller than 60 minutes, precise routing of the flows through the impervious surfaces, the underdrain pipe system, and the discharge pipe was considered unnecessary. The truncation error of the precipitation into hourly steps is much more significant than the precise routing in a system where the time of concentration is much smaller than 1 hour.

V. HYDROMODIFICATION WATERSHED MAPS

SEE ATTCHMENT 2A FOR HMP EXHIBITS

Placeholder – **Vector Control Plan** (required when structural BMPs will drain in 96 hours)

Replace placeholder with required documentation.

Leave placeholder intact if not applicable.

Not Applicable

ATTACHMENT 3
STRUCTURAL BMP MAINTENANCE INFORMATION

This is the cover sheet for Attachment 3.

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 3a	Structural BMP Maintenance Thresholds and Actions (Required)	☒Included See Structural BMP Maintenance Information Checklist.
Attachment 3b	Draft Maintenance Agreement (when applicable)	☐Included ☒Not Applicable

Use this checklist to ensure the required information has been included in the Structural BMP Maintenance Information Attachment:

Preliminary Design / Planning / CEQA level submittal:

- Attachment 3a must identify:

☒Typical maintenance indicators and actions for proposed structural BMP(s) based on Section 7.7 of the BMP Design Manual

- Attachment 3b is not required for preliminary design / planning / CEQA level submittal.

Final Design level submittal:

Attachment 3a must identify:

☐Specific maintenance indicators and actions for proposed structural BMP(s). This shall be based on Section 7.7 of the BMP Design Manual and enhanced to reflect actual proposed components of the structural BMP(s)
☐How to access the structural BMP(s) to inspect and perform maintenance
☐Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
☐Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
☐Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
☐Recommended equipment to perform maintenance
☐When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management
Attachment 3b: For private entity operation and maintenance, Attachment 3b shall include a draft maintenance agreement in the local jurisdiction's standard format (PDP applicant to contact the City Engineer to obtain the current maintenance agreement forms).

CONTECH®
ENGINEERED SOLUTIONS

Modular Wetlands® Linear
Operation & Maintenance Manual



MODULAR WETLANDS®

MODULAR WETLANDS® LINEAR OPERATION & MAINTENANCE MANUAL

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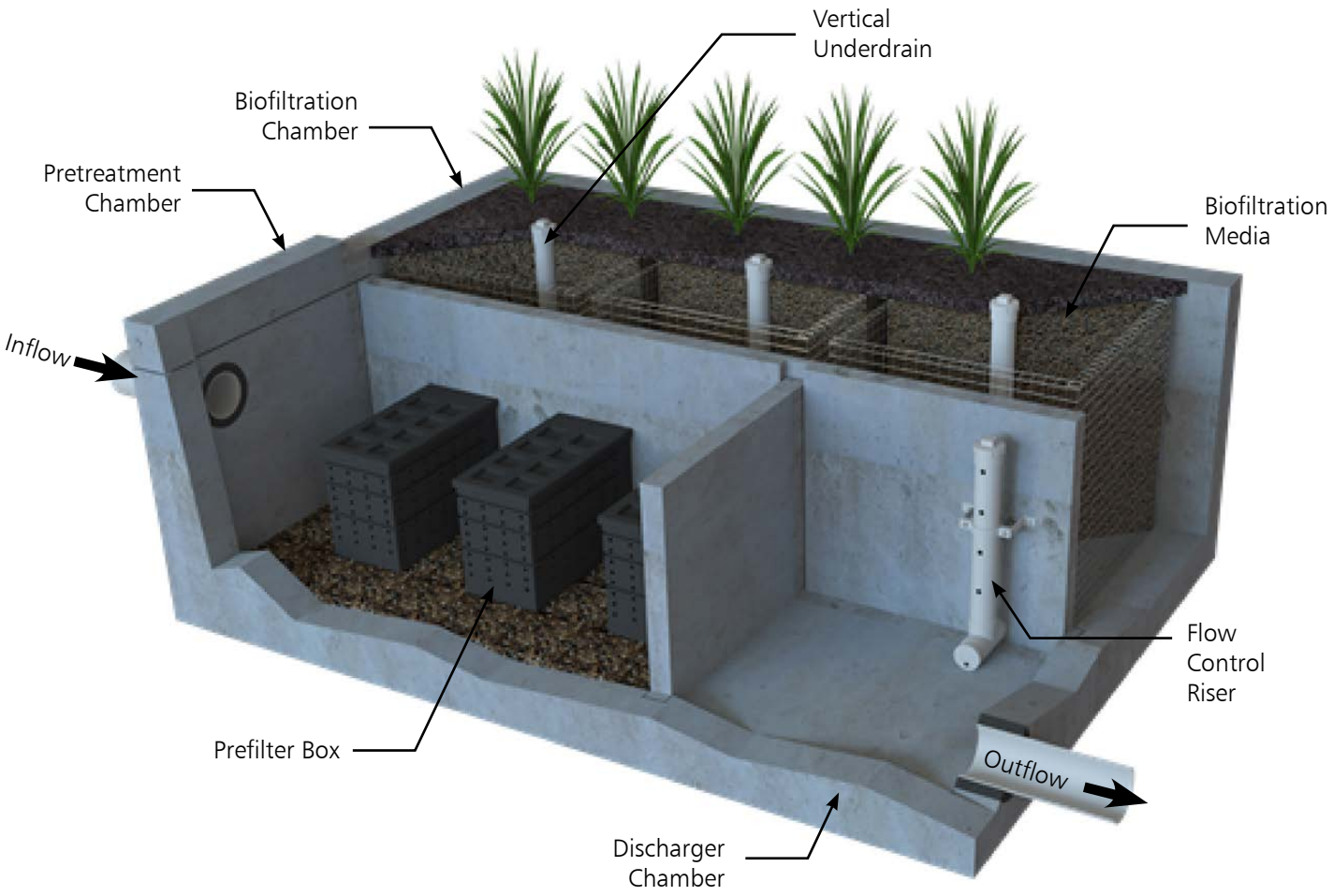
Cleaning and Maintenance Report 14

OVERVIEW

The Modular Wetlands® Linear Biofilter is designed to remove high levels of trash, debris, sediments, nutrients, metals, and hydrocarbons. Its simple design allows for quick and easy installation. The system is housed in a standard precast structure and can be installed at various depths to meet site-specific conditions.

INTRODUCTION

This is the Modular Wetlands Linear Biofilter operation and maintenance manual. Before starting, read the instructions and equipment lists closely. It is important to follow all necessary safety procedures associated with state and local regulations. Some steps required confined space entry. Please contact Contech for more information on pre-authorized third party contractors who can provide installation services in your area. For a list of service providers in your area please visit: www.conteches.com/maintenance.



INSTRUCTIONS

INSPECTION SUMMARY

Stormwater regulations require BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess the site specific loading conditions. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years to ensure appropriate maintenance is provided.

- Inspect pre-treatment, biofiltration, and discharge chambers an average of once every six to twelve months. Varies based on site specific and local conditions.
- Average inspection time is approximately 15 minutes. Always ensure appropriate safety protocol and procedures are followed.

The following is a list of equipment required to allow for simple and effective inspection of the Modular Wetlands Linear:

- Modular Wetlands Linear Inspection Form
- Flashlight
- Manhole hook or appropriate tools to remove access hatches and covers
- Appropriate traffic control signage and procedures
- Measuring pole and/or tape measure
- Protective clothing and eye protection
- 7/16" open or closed ended wrench
- Large permanent black marker (initial inspections only - first year)

Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections of the system

INSPECTION AND MAINTENANCE NOTES

1. Following maintenance and/or inspection, it is recommended that the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.
2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.
3. Transport all debris, trash, organics, and sediments to approved facility for disposal in accordance with local and state requirements.
4. Entry into chambers may require confined space training based on state and local regulations.
5. No fertilizer shall be used in the biofiltration chamber.
6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may not require irrigation after initial establishment.

INSPECTION PROCESS

1. Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other information (see inspection form).
2. Observe the inside of the system through the access covers. If minimal light is available and vision into the unit is impaired, utilize a flashlight to see inside the system and all of its chambers.
3. Look for any out of the ordinary obstructions in the inflow pipe, pre-treatment chamber, biofiltration chamber, discharge chamber or outflow pipe. Write down any observations on the inspection form.
4. Through observation and/or digital photographs, estimate the amount of trash, debris accumulated in the pre-treatment chamber. Utilizing a tape measure or measuring stick, estimate the amount of sediment in this chamber. Record this depth on the inspection form.
5. Through visual observation, inspect the condition of the pre-filter cartridges. Look for excessive build-up of sediment on the cartridges, any build-up on the tops of the cartridges, or clogging of the holes. Record this information on the inspection form. The prefilter cartridges can be further inspected by removing the cartridge tops and assessing the color of the BioMediaGREEN filter cubes (requires entry into pre-treatment chamber - see notes previous notes regarding confined space entry). Record the color of the material. New material is a light green color. As the media becomes clogged, it will turn darker in color, eventually becoming dark brown or black. The closer to black the media is the higher percentage that the media is exhausted and is in need of replacement.

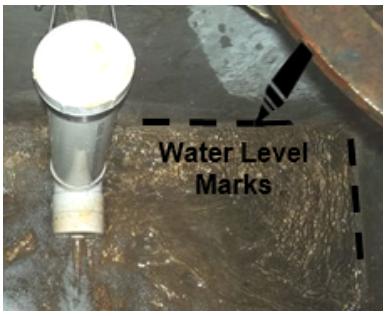


6. The biofiltration chamber is generally maintenance-free due to the system's advanced pre-treatment chamber. For units which have open planters with vegetation, it is recommended that the vegetation be inspected. Look for any plants that are dead or showing signs of disease or other negative stressors. Record the general health of the plants on the inspection form and indicate through visual observation or digital photographs if trimming of the vegetation is required.
7. The discharge chamber houses the orifice control structure, drain down filter (only in California - older models), and is connected to the outflow pipe. It is important to check to ensure the orifice is in proper operating conditions and free of any obstructions. It is also important to assess the condition of the drain down filter media which utilizes a block form of the BioMediaGREEN. Assess in the same manner as the cubes in the pre-filter cartridge as mentioned above. Generally, the discharge chamber will be clean and free of debris. Inspect the water marks on the side walls. If possible, inspect the discharge chamber during a rain event to assess the amount of flow leaving the system while it is at 100% capacity (pre-treatment chamber water level at peak HGL - top of bypass weir). The water level of the flowing water should be compared to the watermark level on the side walls, which is an indicator of the highest discharge rate the system achieved when initially installed. Record on the form if there is any difference in level from the watermark in inches.

NOTE: During the first few storms, the water level in the outflow chamber should be observed and a 6" long horizontal watermark line drawn (using a large permanent marker) at the water level in the discharge chamber while the system is operating at 100% capacity. The diagram below illustrates where the line should be drawn. This line is a reference point for future inspections of the system.

Water level in the discharge chamber is a function of flow rate and pipe size. Observation of the water level during the first few months of operation can be used as a benchmark level for future inspections. The initial mark and all future observations shall be made when the system is at 100% capacity (water level at maximum level in the pre-treatment chamber). If future water levels are below this mark when the system is at 100% capacity, this is an indicator that maintenance to the pre-filter cartridges may be needed.

8. Finalize the inspection report for analysis by the maintenance manager to determine if maintenance is required.





MAINTENANCE INDICATORS

Based upon the observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components or cartridges
- Obstructions in the system or its inlet and/or outlet pipes
- Excessive accumulation of floatables in the pretreatment chamber in which the length and width of the chamber is fully impacted more than 18". See photo below.
- Excessive accumulation of sediment in the pretreatment chamber of more than 6" in depth.
- Excessive accumulation of sediment on the BioMediaGREEN media housed within the pretreatment cartridges. The following chart shows photos of the condition of the BioMediaGREEN contained within the pre-filter cartridges. When media is more than 85% clogged, replacement is required.
- Excessive accumulation of sediment on the BioMediaGREEN media housed within the pretreatment cartridges. When media is more than 85% clogged, replacement is required. The darker the BioMediaGREEN, the more clogged it is and in need of replacement.





INSPECTION PROCESS

- Excessive accumulation of sediment on the BioMediaGREEN media housed within the drain down filter (California only - older models). The following photos show the condition of the BioMediaGREEN contained within the drain down filter. When media is more than 85% clogged, replacement is required.





- Overgrown vegetation.



- Water level in the discharge chamber during 100% operating capacity (pretreatment chamber water level at max height) is lower than the water mark by 20%.

MAINTENANCE SUMMARY

The time has come to maintain your Modular Wetlands® Linear. All necessary pre-maintenance steps must be carried out before maintenance occurs. Once traffic control has been set up per local and state regulations and access covers have been safely opened, the maintenance process can begin. It should be noted that some maintenance activities require confined space entry. All confined space requirements must be strictly followed before entry into the system. In addition, the following is recommended:

- Prepare the maintenance form by writing in the necessary information including project name, location, date & time, unit number and other info (see maintenance form).
- Set up all appropriate safety and cleaning equipment.
- Ensure traffic control is set up and properly positioned.
- Prepared pre-checks (OSHA, safety, confined space entry) are performed.

The following is a list of equipment to required for maintenance of the Modular Wetlands® Linear:

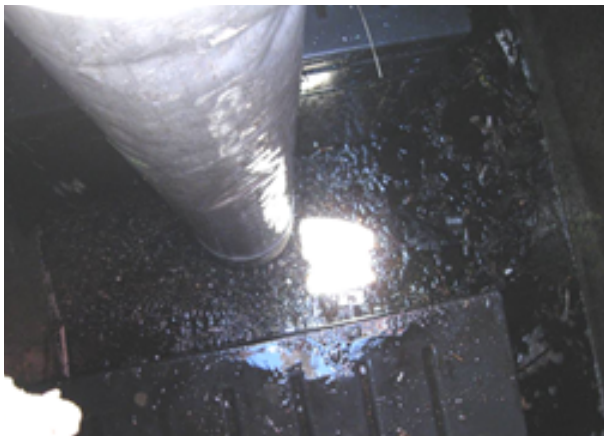
- Modular Wetlands Linear Maintenance Form
- Manhole hook or appropriate tools to access hatches and covers
- Protective clothing, flashlight, and eye protection
- 7/16" open or closed ended wrench
- Vacuum assisted truck with pressure washer
- Replacement BioMediaGREEN for pre-filter cartridges if required (order from one of Contech's Maintenance Team members at https://www.conteches.com/maintenance).

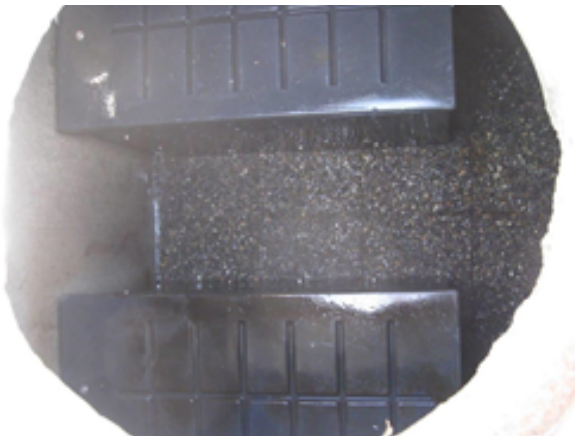
MAINTENANCE | PRETREATMENT CHAMBER

1. Remove access cover over pre-treatment chamber and position vacuum truck accordingly.
2. With a pressure washer, spray down pollutants accumulated on walls and pre-filter cartridges.
3. Vacuum out pre-treatment chamber and remove all accumulated pollutants including trash, debris, and sediments. Be sure to vacuum the floor until the pervious pavers are visible and clean.
4. If pre-filter cartridges require media replacement, continue to step 5. If not, replace access cover and move to step 11.





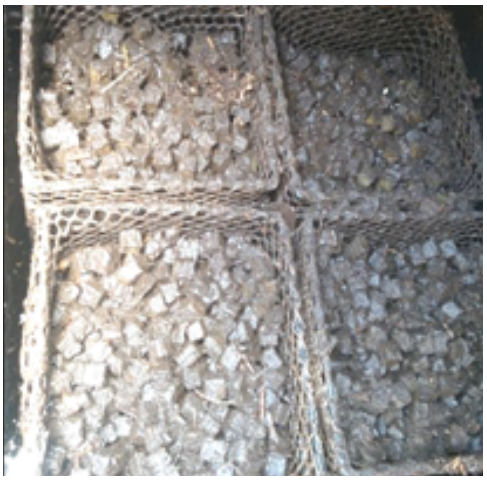




MAINTENANCE | PREFILTER CARTRIDGES

5. After successfully cleaning out the pre-treatment chamber (previous page) enter the pre-treatment chamber.
6. Unscrew the two bolts (circles shown below) holding the lid on each cartridge filter and remove lid.

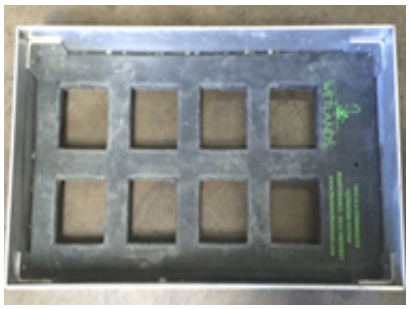


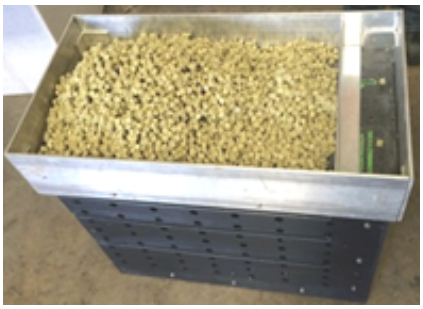


7. Place the vacuum hose over each individual media filter to suck out filter media.



8. Once filter media has been sucked out, use a pressure washer to spray down the inside of the cartridge and it's media cages. Remove cleaned media cages and place to the side. Once removed, the vacuum hose can be inserted into the cartridge to vacuum out any remaining material near the bottom of the cartridge.
9. Reinstall media cages and fill with new media from the manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase. Utilize the manufacture-provided refilling tray and place on top of the cartridge. Fill the tray with new bulk media and shake down into place. Using your hands, lightly compact the media into each filter cage. Once the cages are full, remove the refilling tray and replace the cartridge top, ensuring bolts are properly tightened.







10. Exit the pre-treatment chamber. Replace access hatch or manhole cover.

MAINTENANCE | BIOFILTRATION CHAMBER

11. In general, the biofiltration chamber is maintenance-free with the exception of maintaining the vegetation. The Modular Wetlands Linear utilizes vegetation similar to surrounding landscape areas, therefore trim vegetation to match surrounding vegetation. If any plants have died, replace them with new ones.



12. Each vertical under drain on the biofiltration chamber has a removable (threaded cap) that can be taken off to check any blockages or root growth. Once removed, a jetting attachment can be used to clean out the under drain and orifice riser.
13. As with all biofilter systems, at some point the biofiltration media (WetlandMedia) will need to be replaced. Either because of physical clogging of sorptive exhaustion of the media ion exchange capacity (to remove dissolved metals and phosphorous). The general life of this media is 10 to 20 years based on site specific conditions and pollutant loading. Utilize the vacuum truck to vacuum out the media by placing the hose into the chamber. Once all the media is removed use the power washer to spray down all the netting on the outer metal cage. Inspect the netting for any damage or holes. If the netting is damaged it can be repaired or replaced with guidance by the manufacturer.
14. Contact one of Contech's Maintenance Team members at https://www.conteches.com/maintenance to order new WetlandMedia. The quantity of media needed can be determined by providing the model number and unit depth. Media will be provided in super sacks for easy installation. Each sack will weigh between 1000 and 2000 lbs. A lifting apparatus (backhoe, boom truck, or other) is recommended to position the super sack over the biofiltration chamber. Fill the media cages up to the same level as the old media. Replant with vegetation.





MAINTENANCE | DISCHARGE CHAMBER

15. Remove access hatch or manhole cover over discharge chamber.
16. Enter chamber to gain access to the drain down filter. Unlock the locking mechanism and lift up drain down filter housing to remove used BioMediaGREEN filter block as shown below. *NOTE: Drain down filter is only found on units installed in California prior to 2023. If no drain down filter is present, skip steps 16 and 17.*





17. Insert a new BioMediaGREEN filter block and lock drain down filter housing back in place.
18. Replace access hatch or manhole cover over discharge chamber.

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Inspection Report
Modular Wetlands Linear

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

Inspection Checklist

Modular Wetland System Type (Curb, Grate or UG Vault): _____ Size (22', 14' or etc.): _____

Structural Integrity:	**Yes**	**No**	**Comments**
Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?			
Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?			
Working Condition:			
Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?			
Is there standing water in inappropriate areas after a dry period?			
Is the filter insert (if applicable) at capacity and/or is there an accumulation of debris/trash on the shelf system?			
Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes, specify which one in the comments section. Note depth of accumulation in in pre-treatment chamber.			Depth:
Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?			Chamber:
Any signs of improper functioning in the discharge chamber? Note issues in comments section.			
Other Inspection Items:			
Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?			
Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.			
Is there a septic or foul odor coming from inside the system?			

Waste:	**Yes**	**No**
Sediment / Silt / Clay		
Trash / Bags / Bottles		
Green Waste / Leaves / Foliage		

Recommended Maintenance	
No Cleaning Needed	
Schedule Maintenance as Planned	
Needs Immediate Maintenance	

Plant Information	
Damage to Plants	
Plant Replacement	
Plant Trimming	

Additional Notes: _____

CONTECH®
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Cleaning and Maintenance Report
Modular Wetlands Linear

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Inspector Name _____ Date ____/____/____ Time _____AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

Site Map #	GPS Coordinates of Insert	Manufacturer / Description / Sizing	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Total Debris Accumulation	Condition of Media 25/50/75/100 (will be changed @ 75%)	Operational Per Manufactures' Specifications (If not, why?)
	Lat: Long:	MWS Catch Basins						
		MWS Sedimentation Basin						
		Media Filter Condition						
		Plant Condition						
		Drain Down Media Condition						
		Discharge Chamber Condition						
		Drain Down Pipe Condition						
		Inlet and Outlet Pipe Condition						

Comments:

NOTES



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SUPPORT

DRAWINGS AND SPECIFICATIONS ARE AVAILABLE AT WWW.CONTECHES.COM

Modular Wetlands Maintenance Guide 1/2023

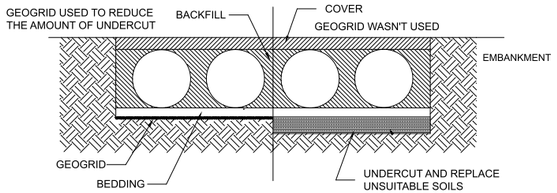
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.

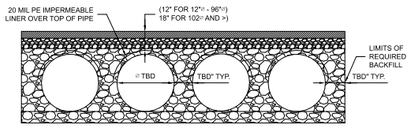


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

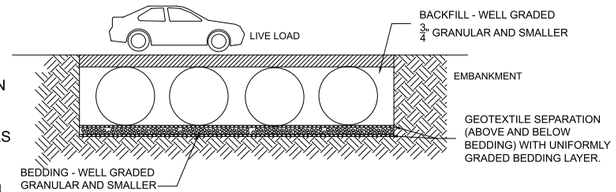
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

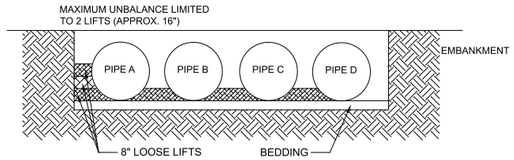
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



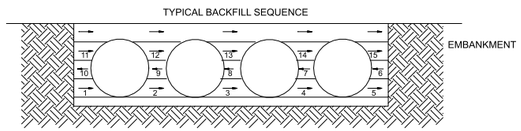
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

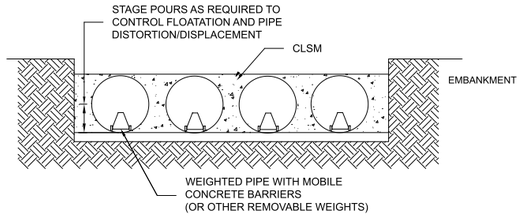


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

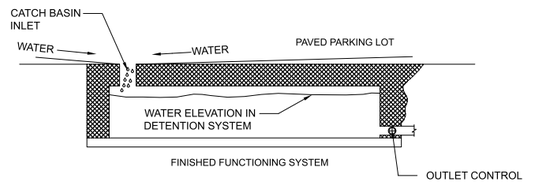


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

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. 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.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION 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.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

C:\EXPORTS\TEMPLATES\NEW\CMP_V8.DWG 10/18/2019 10:02 AM

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If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Contech immediately for re-evaluation of the design. Contech accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS

CONTECH **DYODS** DRAWING

DYO42891 Garrison Elementary School
Detention1
Oceanside, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
29441	42891	12/22/2023
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

ATTACHMENT 4
Copy of Plan Sheets Showing Permanent Storm Water BMPs

This is the cover sheet for Attachment 4.

Use this checklist to ensure the required information has been included on the plans:

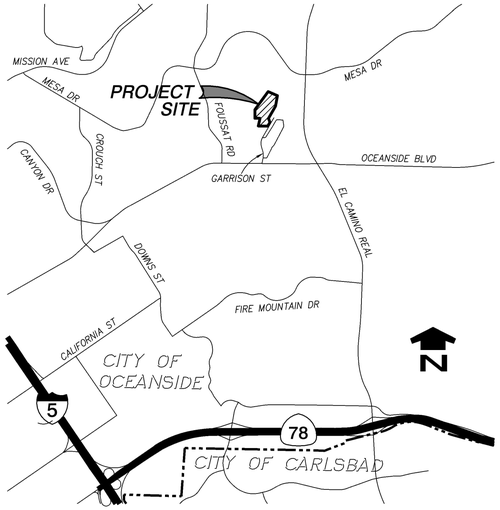
The plans must identify:

☒Structural BMP(s) with ID numbers matching Form I-6 Summary of PDP Structural BMPs
☒The grading and drainage design shown on the plans must be consistent with the delineation of DMAs shown on the DMA exhibit
☒Details and specifications for construction of structural BMP(s)
☒Signage indicating the location and boundary of structural BMP(s) as required by the City Engineer
☒How to access the structural BMP(s) to inspect and perform maintenance
☒Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
☒Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
☒Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
☒Recommended equipment to perform maintenance
☒When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management
☒Include landscaping plan sheets showing vegetation requirements for vegetated structural BMP(s)
☒All BMPs must be fully dimensioned on the plans
☒When propritery BMPs are used, site specific cross section with outflow, inflow and model number shall be provided. Broucher photocopies are not allowed.

TENTATIVE MAP/ DEVELOPMENT PLAN

GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, COUNTY OF SAN DIEGO, CALIFORNIA



VICINITY MAP

NOT TO SCALE

LEGEND

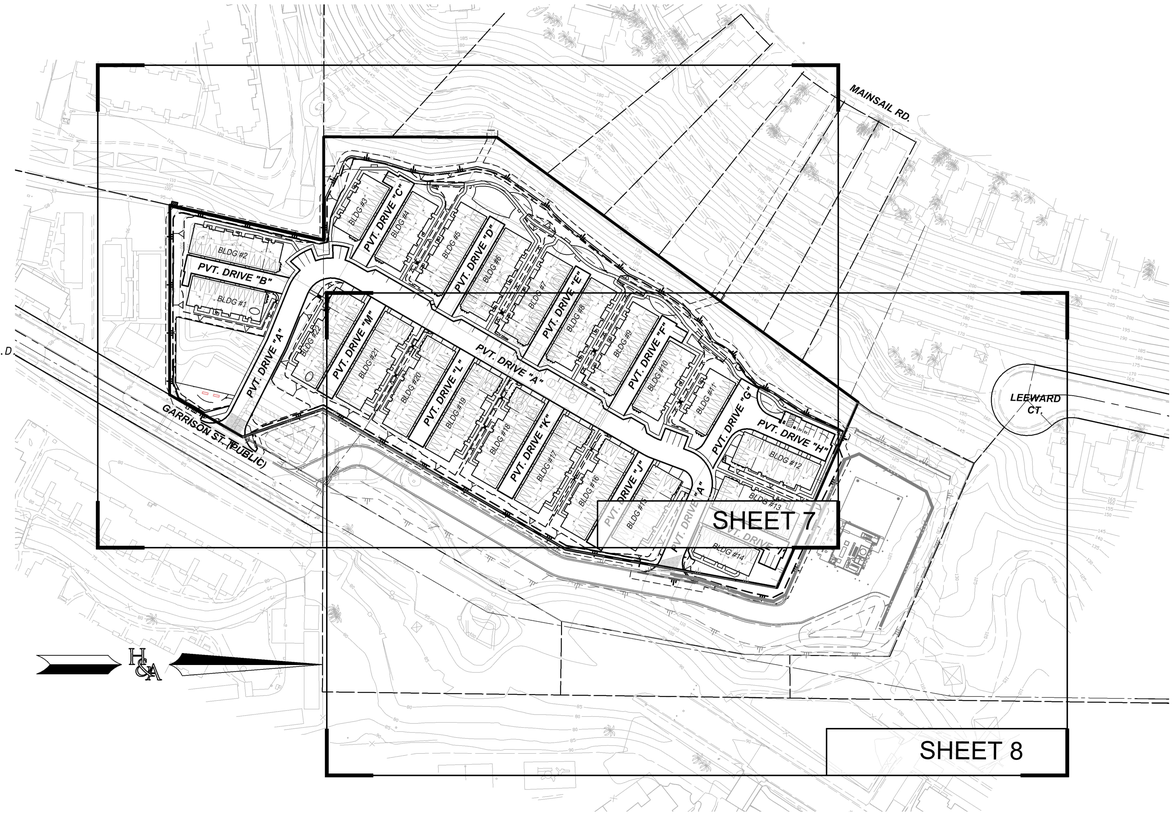
PROJECT BOUNDARY	PAVERS – SPECS T.B.D.
EXISTING TOPO CONTOUR	100
BUILDING NUMBER	BLDG #1
UNIT NUMBER	7
FINISH FLOOR ELEVATION	FF=106.75
PAD ELEVATION	P=106.0
SLOPE (2: 1 MAX)	2:1
DAYLIGHT LINE	
PERCENT OF GRADE	2%
STREET ELEVATION	106.0
SEWER INVERT ELEVATION	94.9IE
STORM DRAIN INVERT ELEVATION	92.9IE
6"-8" PVC PRIVATE SEWER MAIN W/ MANHOLE	S
4"-8" PVC PRIVATE WATER MAIN	W
PUBLIC WATER METER	M
PRIVATE BACKFLOW PREVENTER	BF
FIRE HYDRANT	
18" PRIVATE HDPE STORM DRAIN* *UNLESS SHOWN OTHERWISE ON PLAN	
24" PUBLIC BYPASS HDPE STORM DRAIN* *UNLESS SHOWN OTHERWISE ON PLAN	
RETAINING WALL* *PER OCEANSIDE STANDARD DRAWINGS	
TOP OF WALL ELEVATION/ FINISH GRADE	TW95.0 FG93.0 2' WALL
ST. LIGHT	
EASEMENT LINE	
TRANSFORMER	T
FUSE BOX	F
BROW DITCH PER SDRSD D-75	
ACCESSIBLE ADAPTABLE UNIT	
DOWNSPOUT LOCATIONS	
AC UNIT LOCATIONS	AC

PARKING SUMMARY

USE	PARKING STANDARD	# OF UNITS	REQUIRED	PROVIDED
ATTACHED RESIDENTIAL	2 spaces / two or more bedroom units	140	280	280
GUEST PARKING	Minimum amount equal to 1 Space plus 20% of the total dwelling units	140	29	38
	SUBTOTAL	**140**	**309**	**318**

DISABLED ACCESS REQUIREMENTS

Total Parking Spaces Provided	Min. Accessible Parking Spaces Required	# Accessible Parking Spaces Provided	Min. Van Accessible Parking Spaces Required	# Van Accessible Parking Spaces Provided
38	2	2	1	1



KEY MAP

NOT TO SCALE

BENCHMARK

POINT 1063. 2.5" BRASS DISK IN CURB INLET WITH TRIANGLE/PUNCH STAMPED "LS 7854" PER CITY OF OCEANSIDE CONTROL NETWORK AS ESTABLISHED BY R.O.S. NO. 21787. NAVD 88 ELEVATION 101.72'

SHEET INDEX

SHEET 1 - TITLE SHEET
SHEET 2 - SECTIONS / DETAILS
SHEET 3 - SITE DETAILS / DRIVEWAY DETAILS
SHEET 4 - SWQMP DETAILS
SHEET 5 - SWQMP DETAILS
SHEET 6 - EXISTING CONDITIONS
SHEET 7 - TM / DEVELOPMENT PLAN
SHEET 8 - TM / DEVELOPMENT PLAN
SHEET 9 - OPEN SPACE & BUILDING TYPES
SHEET 10 - BOUNDARIES & ENCUMBRANCES
SHEET 11 - ACCESSIBLE PATHS
SHEET 12 - SITE SETBACKS
SHEET 13 - SIGHT DISTANCES

REGISTERED PROFESSIONAL ENGINEER — ALISA S. VIALPANDO — C 47945 — CIVIL — STATE OF CALIFORNIA

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS SURVEY IS THE CALIFORNIA COORDINATE SYSTEM ZONE 6, NAD83 EPOCH 2011.00, AS DETERMINED LOCALLY BY A LINE BETWEEN STATION 1020 AND 1063 AS SAID COORDINATES ARE PUBLISHED IN RECORD OF SURVEY 21787.
I.E. N48°37'25"W

QUOTED BEARINGS FROM REFERENCE MAPS OR DEEDS MAY OR MAY NOT BE IN TERMS OF SAID SYSTEM.

TOPOGRAPHY SOURCE

TOPOGRAPHY USED FOR THIS TENTATIVE MAP WAS FLOWN ON NOVEMBER 10, 2022 BY PHOTO GEODETIC CORPORATION, CONTROL PROVIDED BY HUNSAKER & ASSOCIATES SAN DIEGO, INC. A FIELD VERIFICATION WAS PERFORMED BY HUNSAKER & ASSOCIATES SAN DIEGO, INC. ON APRIL 1, 2025 WHICH VALIDATED THE DATUM AND CONFIRMED THE ACCURACY OF THE TOPOGRAPHIC MAPPING PROVIDED PER SAID FLIGHT. NO SUBSTANTIAL VARIATIONS OR CHANGES IN FIELD CONDITIONS WERE WITNESSED DURING THE PERFORMANCE OF THE FIELD VERIFICATION.

GENERAL NOTES

1. EXISTING GROSS SUBDIVISION AREA: 8.317 AC
2. PROPOSED SUBDIVISION AREA: 8.317 AC
3. NET PROJECT AREA: 7.391
4. TOTAL NUMBER OF EXISTING LOTS: 1
5. TOTAL NUMBER OF PROPOSED LOTS: 1
6. TOTAL NUMBER OF UNITS: 140
7. ASSESSOR PARCEL NUMBER: 162-020-26-00
8. EXISTING GENERAL PLAN: CIVIC INSTITUTIONAL
9. PROPOSED GENERAL PLAN: MDC-R MEDIUM DENSITY-C RESIDENTIAL
10. EXISTING ZONING: PUBLIC/SEMIPUBLIC
11. PROPOSED ZONING: PD PLANNED DEVELOPMENT
12. PROPOSED DENSITY: 18.9 DU/AC (140 DU's/7.391 AC)
13. TOPOGRAPHIC CONTOUR INTERVAL: 1/5 FOOT
14. MAXIMUM SLOPE GRADIENT: 2:1
15. AREA/PERCENT OF TOTAL BUILDING COVERAGE: 2.52 AC. (30.3%)
16. AREA/PERCENT OF PROJECT IN STREETS, DRIVEWAYS & DRIVE AISLES: 1.95 AC (23.4%)
17. AREA/PERCENT OF SIDEWALKS & WALKWAYS: 0.55 AC. (6.6%)
17. AREA/PERCENT OF LANDSCAPING: 3.30 AC (39.8%)
18. GRADING QUANTITIES: RAW CUT: 83,065 C.Y. RAW FILL: 80,681 C.Y.
19. GRADED AREA: 7.391 AC

DESIGN NOTES

1. ALL STREET DESIGN SHALL CONFORM TO THE CITY OF OCEANSIDE DESIGN STANDARDS AS REQUIRED BY THE CITY ENGINEER.
2. EASEMENTS SHALL BE PROVIDED, REMOVED OR RELOCATED AS REQUIRED BY THE CITY ENGINEER.
3. ALL PROPOSED UTILITIES SHALL BE UNDERGROUNDED AND EASEMENTS PROVIDED.
4. GEOTECHNICAL INVESTIGATION PREPARED BY: GEOTEK, DATED NOVEMBER 14, 2022.
5. THE DEVELOPER SHALL INSTALL STREET LIGHTS PER THE CITY OF OCEANSIDE ENGINEERING DEPARTMENT TRAFFIC DIVISION, THE STREET LIGHT DESIGN MANUAL AND THE CITY OF OCEANSIDE STANDARD DRAWING NO. M-4. STREET LIGHT LOCATIONS MAY VARY IN FINAL DESIGN.
6. ALL RETAINING WALLS IN EXCESS OF 4 FEET SHALL BE PLANTABLE.
7. THE PROPOSED SEWER SHALL BE INSTALLED PER CITY OF OCEANSIDE STANDARDS. ALL ON-SITE SEWER IS PRIVATE.
8. THE PROPOSED WATER SHALL BE INSTALLED PER CITY OF OCEANSIDE STANDARDS. ALL ON-SITE WATER IS PRIVATE.
9. FINISH GRADES ARE APPROXIMATE AND SUBJECT TO CHANGE IN FINAL DESIGN.
10. MODEL UNITS MAY BE BUILT PRIOR TO FINAL MAP WITH APPROVAL FROM THE CITY ENGINEER AND PLANNING DIRECTOR.
11. ALL FUTURE DRIVEWAYS AND GEOMETRIC DESIGN SHALL BE DESIGNED IN COMPLIANCE WITH THE CITY OF OCEANSIDE ENGINEERS DESIGN STANDARDS.
12. THE PRESENT OR FUTURE OWNER/DEVELOPER SHALL INDEMNIFY AND SAVE CITY OF OCEANSIDE, ITS OFFICERS, AGENTS, AND EMPLOYEES HARMLESS FROM ANY AND ALL LIABILITIES, CLAIMS ARISING FROM ANY FLOODING THAT OCCURS ON THIS SITE AND FLOODING THAT MAY BE DISCHARGED FROM THIS SITE INTO ADJACENT PROPERTIES.
13. ALL SIDEWALK AND PATHWAYS SHALL BE ADA COMPLIANT.

PROPERTY ADDRESS

333 GARRISON ST
OCEANSIDE, CA 92054

APPLICANT

TTLC OCEANSIDE GARRISON, LLC
4350 VON KARMAN AVE
SUITE 210
NEWPORT BEACH, CA 92660
(949) 474-0440

PRELIMINARY

APPLICANT DATE

OWNER

OCEANSIDE UNIFIED SCHOOL DISTRICT
2111 MISSION AVE
OCEANSIDE, CA 92058
(760) 966-4000

PRELIMINARY

OWNER DATE

CIVIL ENGINEER

HUNSAKER & ASSOCIATES, SAN DIEGO, INC
9707 WAPLES STREET
SAN DIEGO, CA 92121
(858) 558-4500

Alisa S. Vialpando 04/14/24

ALISA S. VIALPANDO R.C.E. 47945 DATE

LEGAL DESCRIPTION

SEE SHEET 10

EASEMENTS

SEE SHEET 10

CONDOMINIUM NOTE

THIS IS A MAP OF A CONDOMINIUM PROJECT AS DEFINED IN SECTION 4125 OF THE CIVIL CODE OF THE STATE OF CALIFORNIA AND IS FILED PURSUANT TO THE SUBDIVISION MAP ACT. THE MAXIMUM NUMBER OF RESIDENTIAL UNITS IS 140.

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC

PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500· FX(858)558-1414

NO.	REVISIONS	DATE	BY
1	1st SUBMITTAL	MAY 13 2024	H&A
2	2nd SUBMITTAL	JULY 3 2024	H&A
3	3rd SUBMITTAL	NOV. 18 2024	H&A
4	4th SUBMITTAL	APR. 2024	H&A
5			
6			
7			
8			
9			
10			

TENTATIVE MAP / DEVELOPMENT PLAN

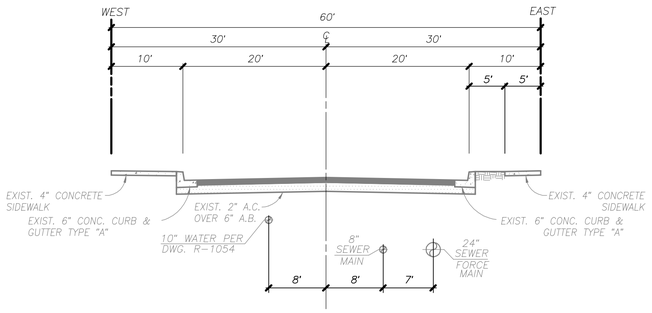
GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, CALIFORNIA

SHEET 1 OF 13

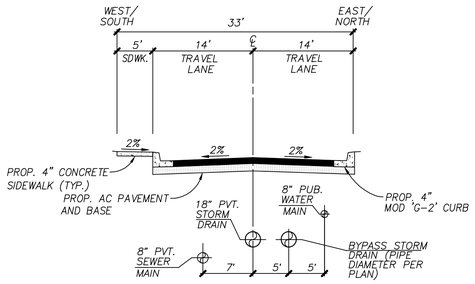
WO # 3214-0002

R:\1778\&Pln\Garrison Elementary TM Sht 01.dwg[]Apr-14-2025:12:19



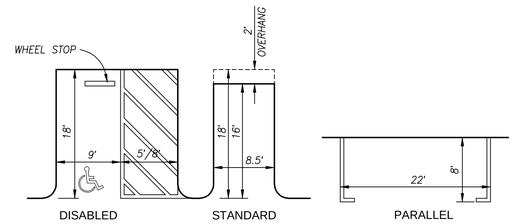
EXISTING GARRISON STREET

NOT TO SCALE



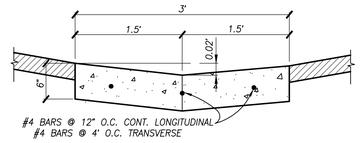
POR. OF PROPOSED PVT. DRIVE 'A'

NOT TO SCALE



TYPICAL PARKING DETAIL

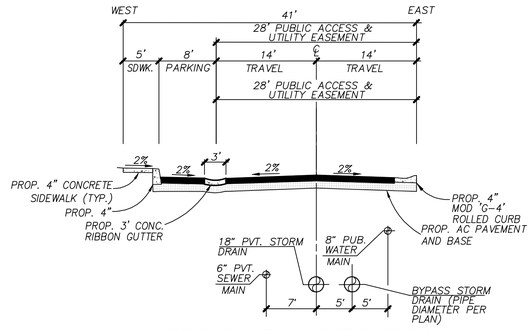
NOT TO SCALE



3' CONCRETE RIBBON GUTTER

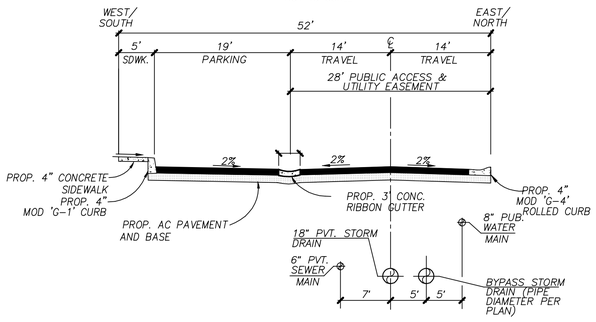
NOT TO SCALE

NOTES:
6" OF CLASS II AGGREGATE BASE REQUIRED BENEATH ALL CURB, GUTTER, AND SIDEWALK.



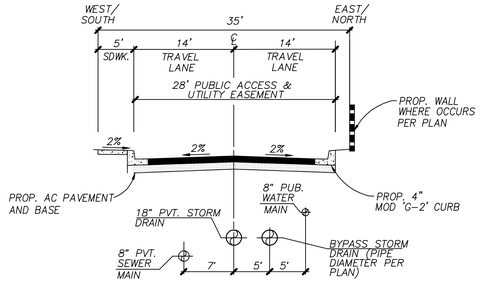
POR. OF PROPOSED PVT. DRIVE 'A'

BETWEEN PVT. DRIVE 'M' AND 'J'
NOT TO SCALE



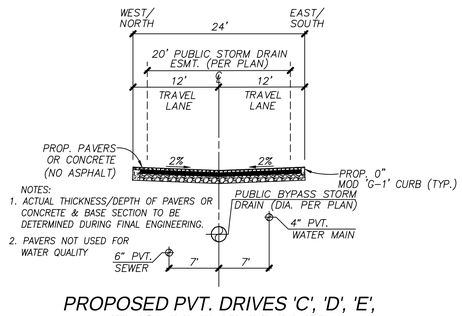
POR. OF PROPOSED PVT. DRIVE 'A'

BETWEEN PVT. DRIVE 'B' AND 'M' AND PVT DRIVE 'J' AND 'G'
NOT TO SCALE



POR. OF PROPOSED PVT. DRIVE 'A'

BETWEEN GARRISON AND PVT. DRIVE 'B' AND GARRISON AND PVT DRIVE 'G'
NOT TO SCALE

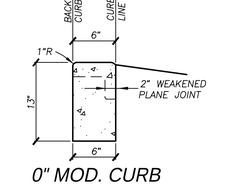


PROPOSED PVT. DRIVES 'C', 'D', 'E', 'F', 'G', 'H', 'I', 'J', 'K', 'L', 'M'

* POR. OF "G" MUST MEET H20 LOADING
NOT TO SCALE

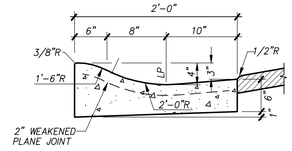
PRELIMINARY MINIMUM PAVEMENT SECTION		
Traffic Index	Thickness of Asphalt Concrete (inches)	Thickness of Aggregate Base (inches)
5.0	3.0*	8.0
6.0	4.0*	9.0

*City of Oceanside minimum requirement.



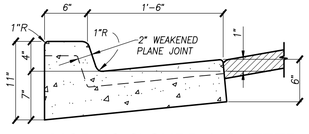
4" MOD. 'G-1' CURB

NOT TO SCALE



4" MOD. 'G-4' ROLLED CURB

NOT TO SCALE



4" MOD. 'G-2' CURB & GUTTER

NOT TO SCALE

0" MOD. CURB

NOT TO SCALE

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ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 FX(858)558-1414

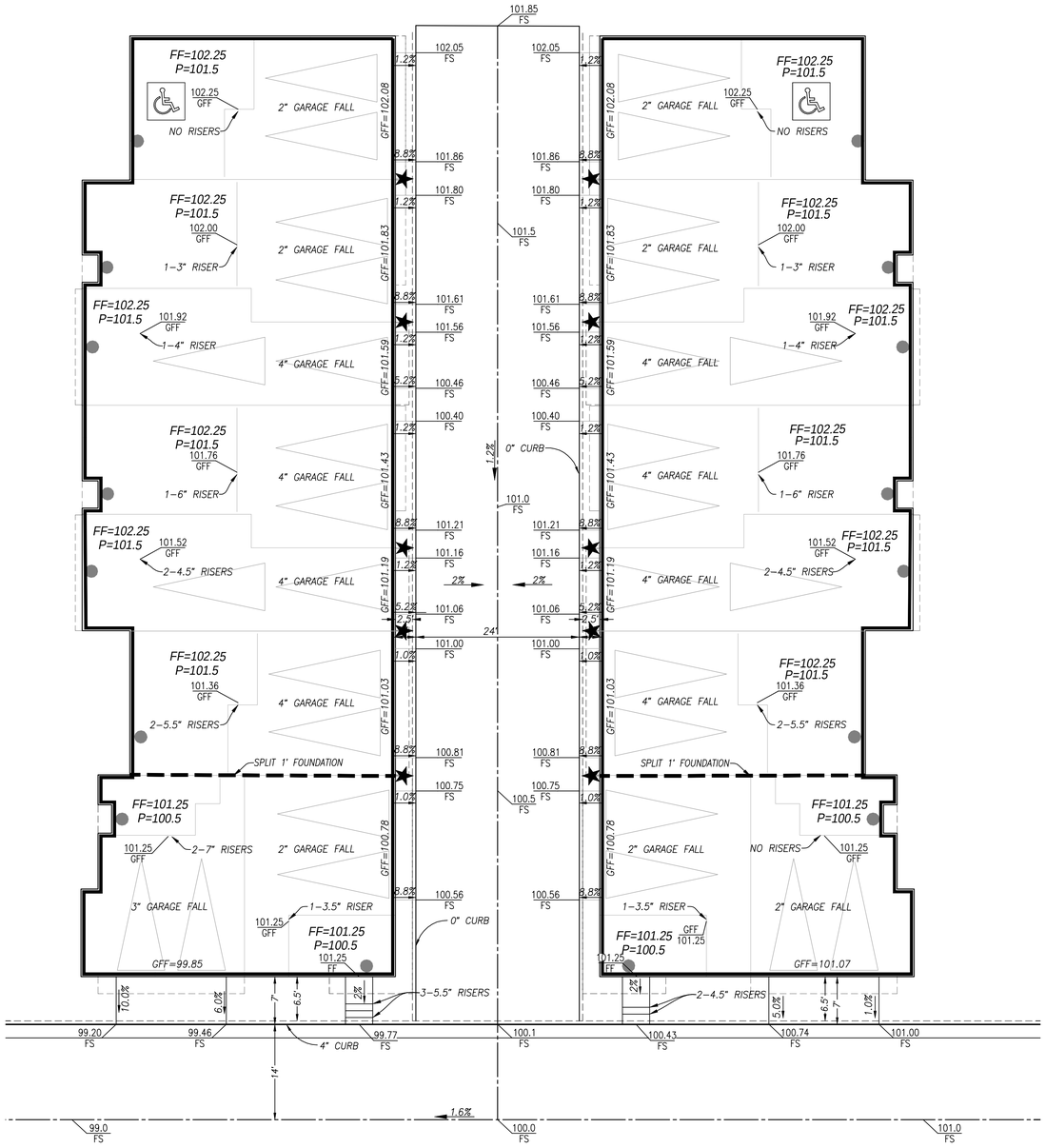
SECTIONS / DETAILS

GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, CALIFORNIA

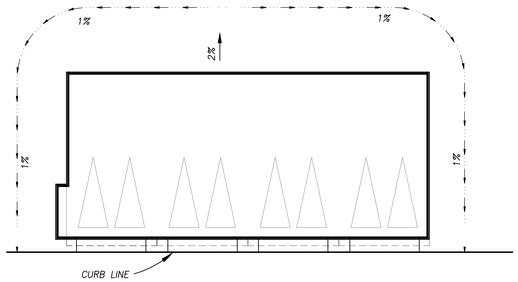
SHEET 2 OF 13

WO # 3214-0002



TYPICAL 8-PLEX DRIVEWAY/GARAGE DETAIL

NOT TO SCALE



TYPICAL BUILDING DRAINAGE SWALE DETAIL

APPLICABLE TO ALL BUILDING TYPES

NOT TO SCALE

SECTION 1804.4 SITE GRADING OF THE INTERNATIONAL BUILDING CODE (IBC) TO ALLOW FOR AN ALTERNATE METHOD OF DIVERTING WATER AWAY FROM THE FOUNDATION. TYPICAL LOT DRAINAGE TO BE REDUCED FROM 5% SLOPE AWAY FROM THE FOUNDATION TO A MINIMUM 2% SLOPE. ALSO, LOT DRAINAGE SWALE GRADE TO BE REDUCED FROM 2% TO 1%.

DESIGN WAIVER REQUEST TO ALLOW TYPICAL LOT DRAINAGE TO BE REDUCED FROM 5% AWAY FROM HOUSE (PER BLDG. CODE 1804.4) TO 2% AWAY FROM HOUSE. ALLOW LOT DRAINAGE SWALE GRADE TO BE REDUCED FROM 2% TO 1%.

TYPICAL 6-PLEX DRIVEWAY/GARAGE DETAIL

NOT TO SCALE

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC.

PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 FX(858)558-1414

SITE DETAILS / DRIVEWAY DETAILS

GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, CALIFORNIA

SHEET 3 OF 13

WO # 3214-0002

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Infiltration Systems - CMP Infiltration & CMP Perforated Drainage Pipe

	Material Location	Description	Material Designation	Designation
8	Rigid or Flexible Pavement (if applicable)			
7	Road Base (if applicable			
A	Geotextile Layer	Non-Woven Geotextile	CONTECH C-00 or C-05	Engineer Decision for consideration to prevent soil migration into varying soil types. Wrap the trench only.
6	Backfill	Infiltration pipe systems have a pipe perforation sized of 3/8" diameter. An open graded, free draining stone, with a particle size of ½" – 2 ½" diameter is recommended.	AASHTO M 1:02-A-1 or AASHTO M -13 - 3, -3	Material shall be worked into the pipe haunches by means of shovel-sliicing, rodding, air-tamper, vibratory rod, or other effective methods. Compaction of all placed fill material is necessary and shall be 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"
3	Bedding Stone	Well graded granular bedding material w/maximum particle size of 3"	AASHTO M43 - 3,357,/-/357, 5, 56, 57	For soil aggregates larger than 3/8" a dedicated bedding layer is not required for CMP. Pipe may be placed on the trench bottom comprised of native suitable well graded & granular material. For Arch pipes it is recommended to be shaped to a relatively flat bottom or fine-grade the foundation to a slight v-shape. Soil aggregates less than 3/8" and unsuitable material should be over-excavated and re-placed with a 1"-0" layer of well graded & granular stone per the material designation.
A	Geotextile Layer	None	None	Contech does not recommend geotextiles be placed under the invert of infiltration systems due to the propensity for geotextiles to clog over time.

Note: The listed AASHTO designations are for gradation only. The stone must also be angular and clean.

1. MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT.

FOUNDATION/BEDDING PREPARATION

2. 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 ENGINEER.

5. HAUNCH ZONE MATERIAL SHALL BE PLACED AND UNIFORMLY COMPACTED WITHOUT SOFT SPOTS.

BACKFILL

MATERIAL SHALL BE PLACED IN 8"-10" MAXIMUM LIFTS. 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. MAINTAIN 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.

OPEN AREA = 3.76 SQ IN/SQ FT

OPEN AREA = 4.16 SQ IN/SQ FT

OPEN AREA = 3.33 SQ IN/SQ FT

NOTES:

1. PERFORATIONS MEET AASHTO AND ASTM SPECIFICATIONS.
2. PERFORATION OPEN AREA PER SQUARE FOOT OF PIPE IS BASED ON THE NOMINAL DIAMETER AND LENGTH OF PIPE.
3. ALL DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
4. ALL HOLES =3/8".

TYPICAL PERFORATION DETAIL

SCALE: N.T.S.

TYPICAL MANWAY DETAIL

SCALE: N.T.S.

NOTE:
MANWAY DETAIL APPLICABLE FOR CMP SYSTEMS WITH DIAMETERS ≤8' AND, LARGER. MANWAYS MAY BE REQUIRED ON SMALLER SYSTEMS DEPENDING ON ACTUAL SITE SPECIFIC CONDITIONS.

TYPICAL RISER DETAIL

SCALE: N.T.S.

NOTE:
LADDERS ARE OPTIONAL AND ARE NOT REQUIRED FOR ALL SYSTEMS.

TYPICAL SECTION VIEW

LINER OVER ROWS
SCALE: N.T.S.

NOTE: IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, AN HDPE MEMBRANE LINER IS RECOMMENDED WITH THE SYSTEM. THE IMPERMEABLE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

TYPICAL SECTION VIEW FOR AN IMPERVIOUS AREA DISPERSSION BMP (SD-5 PER BMPDM)

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DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO30727 Garrison Site
Garrison Site 84" Perf CMP
San Diego, CA
DETENTION SYSTEM

PROJECT No.:	ESQ. No.:	DATE:
30727	30727	-/25/2023
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

PREPARED BY:
HUNSAKER & ASSOCIATES SAN DIEGO, INC
PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 · FX(858)558-1414

SWQMP DETAILS

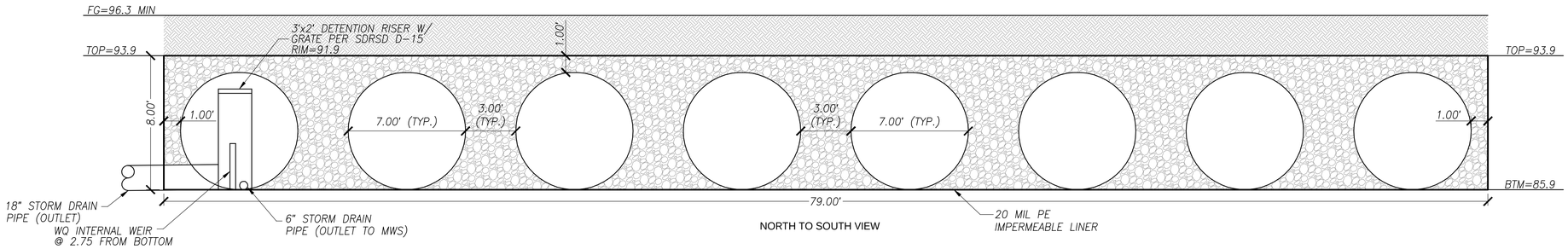
GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, CALIFORNIA

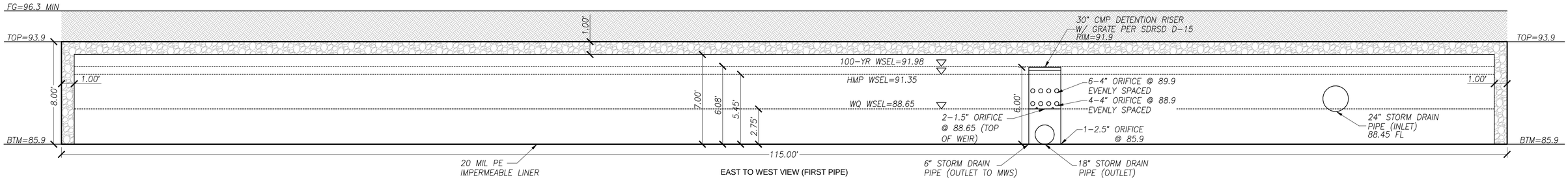
SHEET 4 OF 13

WO # 3214-0002

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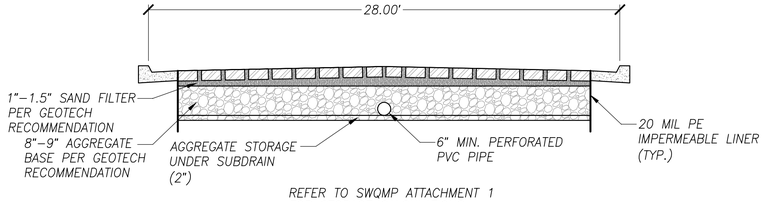
NORTH TO SOUTH VIEW



EAST TO WEST VIEW (FIRST PIPE)

GRADING SECTION FOR CMP VAULT (HMP-1) & OUTLET STRUCTURE DETAIL

NOT TO SCALE



REFER TO SWQMP ATTACHMENT 1 FOR STORAGE CALCULATIONS

PAVER SECTION FOR ENTRY DRIVES

NOT TO SCALE

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SWQMP DETAILS

GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, CALIFORNIA

SHEET 5 OF 13

WO # 3214-0002

TITLE REPORT EXCEPTIONS

7 AN EASEMENT FOR TRANSMISSION AND DISTRIBUTION OF ELECTRICITY AND INCIDENTAL PURPOSES, RECORDED OCTOBER 16, 1974 AS FILE/PAGE NO. 276566 OF OFFICIAL RECORDS.
IN FAVOR OF: SAN DIEGO GAS AND ELECTRIC COMPANY
AFFECTS: THE ROUTE THEREOF AFFECTS A PORTION OF SAID LAND AND IS MORE FULLY DESCRIBED IN SAID DOCUMENT

9 AN EASEMENT FOR THE CONSTRUCTION, OPERATION, INSPECTION, MAINTENANCE, REPLACEMENT, REMOVAL OR DESTRUCTION OF TELECOMMUNICATION FACILITIES ("FACILITIES"), INCLUDING BUT NOT LIMITED TO AERIAL COMMUNICATION FACILITIES CONSISTING OF POLES, ANCHORS, GUYS, CABLES, WIRES, CROSSARMS, TERMINALS, TERMINAL EQUIPMENT CABINETS, SERVICE BOXES, ASSOCIATED ELECTRICAL CONDUCTORS AND NECESSARY FIXTURES AND APPURTENANCES, INCLUDING BUT NOT LIMITED TO FIBER OPTICS (EXCLUDING CELLULAR OR OTHER MOBILE COMMUNICATION INFRASTRUCTURES) FOR ANY PUBLIC OR PRIVATE COMMUNICATION, VIDEO AND/OR INFORMATION SERVICES, OR ANY OTHER SERVICES NECESSARY FOR SUCH FACILITIES TO SERVE THE GRANTOR'S SCHOOL PROJECT AND INCIDENTAL PURPOSES, RECORDED OCTOBER 19, 2010 AS FILE/PAGE NO. 2010-0561114 OF OFFICIAL RECORDS.
IN FAVOR OF: PACIFIC BELL TELEPHONE COMPANY, A CALIFORNIA CORPORATION, DOING BUSINESS AS AT&T CALIFORNIA, AND ITS ASSOCIATED AND AFFILIATED COMPANIES, ITS AND THEIR SUCCESSORS, ASSIGNS, LESSEES AND AGENTS
AFFECTS: AS DESCRIBED THEREIN TERMS AND PROVISIONS CONTAINED IN THE ABOVE DOCUMENT.

DEMOLITION NOTE:

ALL EXISTING BUILDINGS, RETAINING WALLS AND STORM DRAIN, WITH THE EXCPTION OF:
'STORM DRAIN TO REMAIN'
'RETAINING WALL TO REMAIN'
NOTED ON THIS SHEET TO BE DEMOLISHED WITHIN THE PROPERTY BOUNDARY.

NOTE: SEE SHEET 10 FOR BOUNDARY INFORMATION

0 40 80 120
SCALE 1" = 40'

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EXISTING CONDITIONS

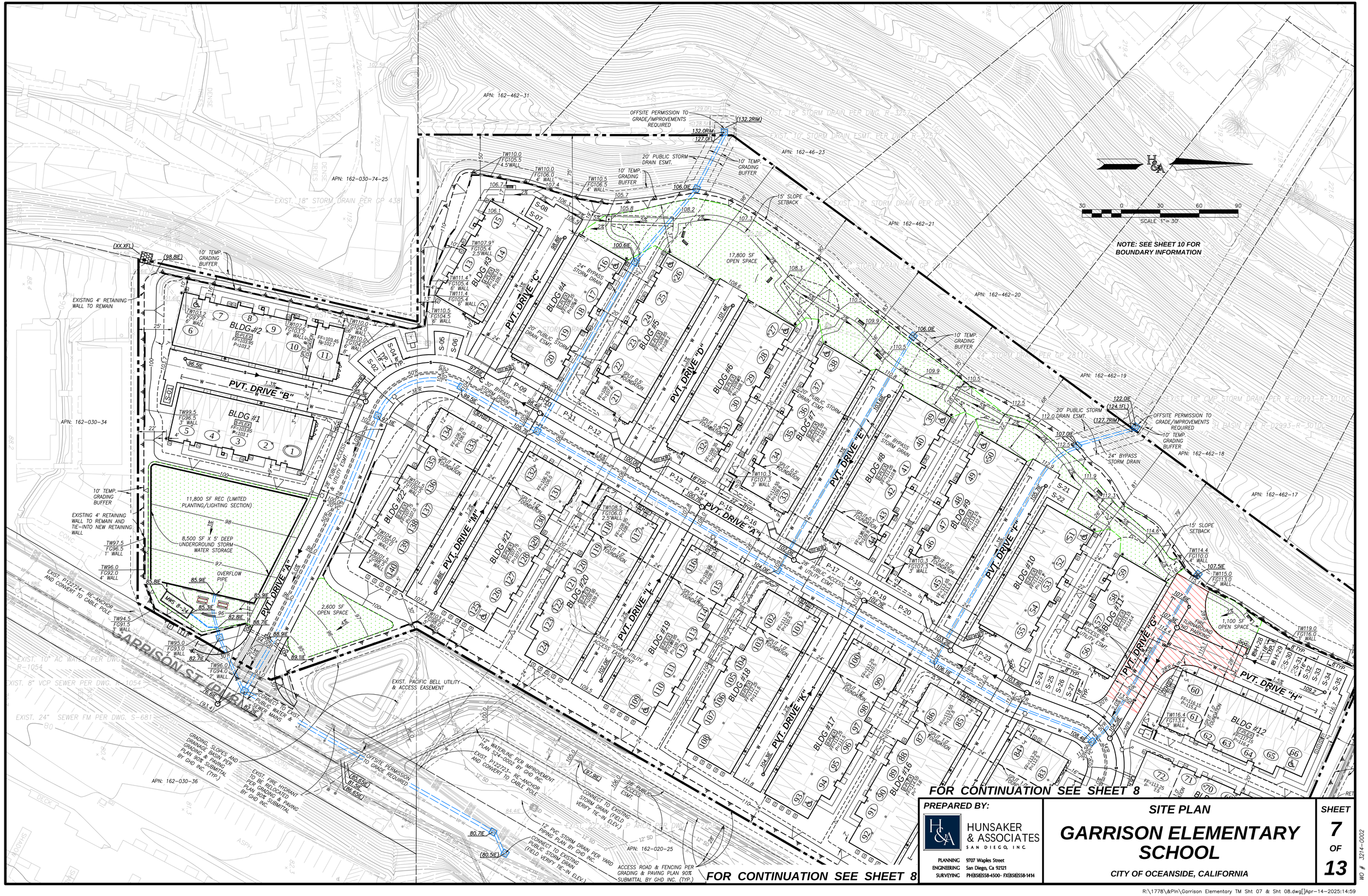
GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, CALIFORNIA

SHEET 6 OF 13

WO # 3214-0002

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SITE PLAN

GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, CALIFORNIA

SHEET 7 OF 13

WO # 3214-0022

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FOR CONTINUATION SEE SHEET 7

PVT. DRIVE "M"
PVT. DRIVE "A"
PVT. DRIVE "E"
PVT. DRIVE "F"
PVT. DRIVE "G"
PVT. DRIVE "H"
PVT. DRIVE "I"
PVT. DRIVE "J"
PVT. DRIVE "K"
PVT. DRIVE "L"
PVT. DRIVE "A"
BLDG #21
BLDG #20
BLDG #19
BLDG #18
BLDG #17
BLDG #16
BLDG #15
BLDG #14
BLDG #13
BLDG #12
BLDG #11
BLDG #10
BLDG #9
BLDG #8
GARRISON ST. (PUBLIC)
APN: 162-020-23
APN: 162-020-25
APN: 162-020-22
APN: 162-462-17
APN: 162-461-18
APN: 162-462-16
EXIST. PACIFIC BELL UTILITY & ACCESS EASEMENT
EXIST. SDGE UTILITY & ACCESS EASEMENT
EXIST. 24" SEWER FM PER DWG. S-681
EXIST. 8" VCP SEWER PER DWG. R-2756
EXIST. 10" AC WATER PER DWG. R-2756
EXIST. 12" AC WATER PER DWG. R-2757
EXIST. 24"x36" RCP STORM DRAIN PER DWG. R-2757
12" WATERLINE PER IMPROVEMENT PLAN S24-0002 BY GHD INC. EXIST. P122723 - RE-ANCHOR AND CONVERT TO CABLE POLE
12" PVC STORM DRAIN PER YARD PIPING PLAN BY GHD INC.
CONNECT TO EXISTING PUBLIC STORM DRAIN (FIELD VERIFY TIE-IN ELEV.)
CONNECT TO EXISTING STORM DRAIN (FIELD VERIFY TIE-IN ELEV.)
ACCESS ROAD & FENCING PER GRADING & PAVING PLAN 90% SUBMITTAL BY GHD INC. (TYP.)
20" BUCCANEER SEWER FORCE MAIN PER IMPROVEMENT PLAN S24-0002 BY GHD INC.
30" LO SEWER FORCE MAIN PER IMPROVEMENT PLAN S24-0002 BY GHD INC.
CONNECT TO 12" WATERLINE PER IMPROVEMENT PLAN S24-0002 BY GHD INC.
12" WATERLINE PER IMPROVEMENT PLAN S24-0002 BY GHD INC.
30" RCP STORM DRAIN PER YARD PIPING PLAN BY GHD INC.
12" PVC STORM DRAIN PER YARD PIPING PLAN BY GHD INC.
12" WATERLINE PER IMPROVEMENT PLAN S24-0002 BY GHD INC.
30" OMGLS SEWER FORCE MAIN PER IMPROVEMENT PLAN S24-0002 BY GHD INC.
30" LO SEWER FORCE MAIN PER IMPROVEMENT PLAN S24-0002 BY GHD INC.
27" SEWER MAIN PER IMPROVEMENT PLAN S24-0002 BY GHD INC.
24" BYPASS STORM DRAIN
GRADE/IMPROVEMENTS REQUIRED
10' TEMP. GRADING BUFFER
15' SLOPE SETBACK
1,100 SF OPEN SPACE
FIRE TURNAROUND AND PARKING
DOUBLE SWING EVA GATE
OFFSITE PERMISSION TO GRADE REQUIRED
GRADING AND SLOPES PER GRADING & PAVING PLAN 90% SUBMITTAL BY GHD INC. (TYP.)
RETAINING WALL PER 90% SUBMITTAL BY GHD INC. (TYP.)
PUBLIC SEWER LIFT STATION PER 90% SUBMITTAL BY GHD INC.
GRADING, SLOPES AND DRAINAGE BASIN PER GRADING & PAVING PLAN 90% SUBMITTAL BY GHD INC. (TYP.)
28' PUBLIC ACCESS & UTILITY ESMT.
24' PUBLIC ACCESS ESMT.
EVA ONLY SIGNS
SPLIT 0.5' FOUNDATION
SPLIT 1.0' FOUNDATION
SPLIT 1.5' FOUNDATION
SPLIT 1.6' FOUNDATION
SPLIT 2.0' FOUNDATION
SPLIT 1.0' FOUNDATION

NOTE: SEE SHEET 10 FOR BOUNDARY INFORMATION

30 0 30 60 90
SCALE 1" = 30'

PREPARED BY:		SITE PLAN	SHEET
HUNSAKER & ASSOCIATES SAN DIEGO, INC		GARRISON ELEMENTARY SCHOOL	8 OF 13
PLANNING	9707 Waples Street	CITY OF OCEANSIDE, CALIFORNIA	
ENGINEERING	San Diego, Ca 92121		
SURVEYING	PH(858)558-4500 · FX(858)558-1414		

WO # 3214-0002

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BUILDING TYPES AND PRIVATE OPEN SPACE			
PRODUCT TYPE	BUILDING TYPE	# BLDGS	PRIVATE OS (SF)
A	8-PLEX	7	Per ARCH.
	4-PLEX	1	Per ARCH.
	7-PLEX	3	Per ARCH.
B	4-PLEX	2	Per ARCH.
	5-PLEX	3	Per ARCH.
	6-PLEX	6	Per ARCH.
	TOTAL	22	11,692

11,800 SF — INDICATES LIMITS OF COMMON OPEN SPACE

USEABLE OPEN SPACE REQUIRED FOR PROJECT Comprised of Private & Common Open Space Areas 300 S.F./ Unit @ 140 Units	42,000 S.F.
COMMON USEABLE OPEN SPACE PROVIDED	33,300 S.F.
PRIVATE USEABLE OPEN SPACE PROVIDED Townhome Balconies	11,692 S.F.
TOTAL USEABLE OPEN SPACE PROVIDED	44,992 S.F.

SCALE 1" = 40'

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OPEN SPACE & BUILDING TYPES

GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, CALIFORNIA

SHEET 9 OF 13

WO # 3214-0002

TITLE REFERENCE

THIS SURVEY IS BASED ON THE PRELIMINARY REPORT ISSUED BY FIRST AMERICAN TITLE COMPANY AS ORDER NO. OSA-6905088 DATED AS OF NOVEMBER 7, 2024 (UPDATED NOVEMBER 13, 2024).

ASSESSOR PARCEL NO.

162-020-26-00

LEGAL DESCRIPTION

REAL PROPERTY IN THE CITY OF OCEANSIDE, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

THE LAND DESCRIBED IN CERTAIN CERTIFICATE OF COMPLIANCE RECORDED NOVEMBER 30, 2022 AS INSTRUMENT NO. 2022-0453728 OF OFFICIAL RECORDS, AS MORE FULLY DESCRIBED AS FOLLOWS:

ALL THAT PORTION OF THE EAST HALF OF SECTION 19, TOWNSHIP 11 SOUTH, RANGE 4 WEST, SAN BERNARDINO BASE AND MERIDIAN, IN THE CITY OF OCEANSIDE, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO UNITED STATES GOVERNMENT SURVEY APPROVED DECEMBER 27, 1870, DESCRIBED IN GRANT DEED RECORDED FEBRUARY 20, 1962 AS FILE/PAGE NO. 29606 TOGETHER WITH THAT PARCEL DESCRIBED IN GRANT DEED RECORDED MAY 7, 1962 AS FILE/PAGE NO. 77946, BOTH RECORDED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY.

EXCEPTING THEREFROM:

ALL THAT PORTION OF THE EAST HALF OF SECTION 19, TOWNSHIP 11 SOUTH, RANGE 4 WEST, SAN BERNARDINO BASE AND MERIDIAN, IN THE CITY OF OCEANSIDE, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO UNITED STATES GOVERNMENT SURVEY APPROVED DECEMBER 27, 1870, DESCRIBED IN GRANT DEED RECORDED FEBRUARY 20, 1962 AS FILE/PAGE NO. 29606 TOGETHER WITH THAT PARCEL DESCRIBED IN GRANT DEED RECORDED MAY 7, 1962 AS FILE/PAGE NO. 77946, BOTH RECORDED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, DESCRIBED AS FOLLOWS:

COMMENCING AT A POINT ON THE SOUTH LINE OF SAID PARCEL DESCRIBED IN GRANT DEED RECORDED FEBRUARY 20, 1962 AS FILE/PAGE NO. 29606, SAID POINT BEING ON THE EAST AND WEST CENTER LINE OF SAID SECTION, DISTANT THEREON NORTH 89°30' 30" EAST 690.81 FEET FROM THE CENTER OF SAID SECTION, SAID POINT BEING THE NORTHEASTERLY CORNER OF THE LAND DESCRIBED IN DEED TO A.O. ELSTAD, ET UX, RECORDED MARCH 15, 1961 AS DOCUMENT NO. 46030 OF OFFICIAL RECORDS; THENCE ALONG SAID PARCEL DESCRIBED IN GRANT DEED RECORDED FEBRUARY 20, 1962 AS FILE/PAGE NO. 29606 THE FOLLOWING COURSES:

CONTINUING ALONG SAID EAST AND WEST CENTER LINE, NORTH 89°30'30" EAST, 340.12 FEET TO THE NORTHWESTERLY LINE OF THAT 60.00 FEET EASEMENT DESCRIBED IN DEED TO RAY A. WILCOX, ET AL, RECORDED JANUARY 25, 1960 AS DOCUMENT NO. 15744 AND THE TRUE POINT OF BEGINNING; THENCE ALONG THE NORTHEASTERLY PROLONGATION OF SAID NORTHWESTERLY LINE, NORTH 29°25'43" EAST 385.59 FEET TO A LINE DRAWN PARALLEL WITH AND 6.00 FEET NORTHWESTERLY FROM THE CENTER LINE OF THAT EASEMENT DESCRIBED IN DEED TO THE SAN DIEGO GAS AND ELECTRIC COMPANY, RECORDED APRIL 11, 1951 IN BOOK 4049, PAGE 91 OF OFFICIAL RECORDS; THENCE ALONG SAID PARALLEL LINE, NORTH 9°51'43" EAST 255.66 FEET TO A LINE DRAWN PARALLEL AND 60.00 FEET WESTERLY AT RIGHT ANGLES FROM THE EAST LINE OF THE WEST HALF OF THE NORTHEAST QUARTER OF SAID SECTION 19; THENCE NORTH 0°16'43" EAST ALONG SAID PARALLEL LINE 205.00 FEET; THENCE LEAVING SAID PARALLEL LINE NORTH 66°52'17" WEST 295.00 FEET; THENCE SOUTH 25°44'30" WEST, 160.00 FEET; THENCE SOUTH 35°44'30" WEST, 23.85 FEET TO A LINE PARALLEL WITH THE NORTHERLY LINE OF SAID PARCEL DESCRIBED IN GRANT DEED RECORDED FEBRUARY 20, 1962 AS FILE/PAGE NO. 29606; THENCE LEAVING SAID PARCEL DESCRIBED IN GRANT DEED RECORDED FEBRUARY 20, 1962 AS FILE/PAGE NO. 29606, ALONG SAID PARALLEL LINE SOUTH 66°52'17" EAST 283.00 FEET TO A LINE PARALLEL WITH AND 100.00 FEET WESTERLY OF, MEASURED AT RIGHT ANGLE TO, THAT COURSE DESCRIBED IN SAID GRANT DEED RECORDED FEBRUARY 20, 1962 AS FILE/PAGE NO. 29606, HAVING A BEARING OF NORTH 9°51'43" EAST; THENCE ALONG SAID PARALLEL LINE SOUTH 9°51'43" WEST 297.82 FEET TO A LINE PARALLEL WITH AND 90.00 FEET NORTHWESTERLY OF, MEASURED AT RIGHT ANGLE TO, THAT COURSE DESCRIBED IN SAID GRANT DEED RECORDED FEBRUARY 20, 1962 AS FILE/PAGE NO. 29606 HAVING A BEARING OF NORTH 29°25'43" EAST; THENCE ALONG SAID PARALLEL LINE SOUTH 29°25'43" WEST 392.01 FEET TO THE SOUTH LINE OF SAID PARCEL DESCRIBED IN GRANT DEED RECORDED FEBRUARY 20, 1962 AS FILE/PAGE NO. 29606 AND THE NORTH LINE OF SAID PARCEL DESCRIBED IN GRANT DEED RECORDED MAY 7, 1962 AS FILE/PAGE NO. 77946; THENCE LEAVING SAID NORTH AND SOUTH LINES SOUTH 19°47'10" EAST, 118.86 FEET TO THE EASTERLY LINE OF SAID PARCEL DESCRIBED IN GRANT DEED RECORDED MAY 7, 1962 AS FILE/PAGE NO. 77946; THENCE ALONG SAID EASTERLY LINE NORTH 29°25'43" EAST 129.44 FEET TO THE TRUE POINT OF BEGINNING.

APN: 162-020-26-00

TITLE REPORT EXCEPTIONS

1. INTENTIONALLY DELETED
2. GENERAL AND SPECIAL TAXES AND ASSESSMENTS FOR THE FISCAL YEAR 2024-2025 ARE EXEMPT. AFFECTS: THE LAND AND OTHER PROPERTY.
3. THE LIEN OF SUPPLEMENTAL TAXES, IF ANY, ASSESSED PURSUANT TO CHAPTER 3.5 COMMENCING WITH SECTION 75 OF THE CALIFORNIA REVENUE AND TAXATION CODE.
4. INTENTIONALLY DELETED
5. INTENTIONALLY DELETED
6. INTENTIONALLY DELETED
7. AN EASEMENT FOR PUBLIC UTILITIES, INGRESS AND EGRESS AND INCIDENTAL PURPOSES, RECORDED OCTOBER 16, 1974 AS INSTRUMENT NO. 276566 OF OFFICIAL RECORDS.
   IN FAVOR OF: SAN DIEGO GAS AND ELECTRIC COMPANY
   AFFECTS: THE ROUTE THEREOF AFFECTS A PORTION OF SAID LAND AND IS MORE FULLY DESCRIBED IN SAID DOCUMENT
8. INTENTIONALLY DELETED
9. AN EASEMENT FOR THE CONSTRUCTION, OPERATION, INSPECTION, MAINTENANCE, REPLACEMENT,REMOVAL OR DESTRUCTION OF TELECOMMUNICATION FACILITIES ("FACILITIES"), INCLUDING BUT NOT LIMITED TO AERIAL COMMUNICATION FACILITIES CONSISTING OF POLES, ANCHORS, GUYS, CABLES, WIRES, CROSSARMS, TERMINALS, TERMINAL EQUIPMENT CABINETS, SERVICE BOXES, ASSOCIATED ELECTRICAL CONDUCTORS AND NECESSARY FIXTURES AND APPURTENANCES, INCLUDING BUT NOT LIMITED TO FIBER OPTICS (EXCLUDING CELLULAR OR OTHER MOBILE COMMUNICATION INFRASTRUCTURES) FOR ANY PUBLIC OR PRIVATE COMMUNICATION, VIDEO AND/OR INFORMATION SERVICES, OR ANY OTHER SERVICES NECESSARY FOR SUCH FACILITIES TO SERVE THE GRANTOR'S SCHOOL PROJECT AND INCIDENTAL PURPOSES, RECORDED OCTOBER 19, 2010 AS INSTRUMENT NO. 2010-0561114 OF OFFICIAL RECORDS.
   IN FAVOR OF: PACIFIC BELL TELEPHONE COMPANY, A CALIFORNIA CORPORATION, DOING BUSINESS AS AT&T CALIFORNIA, AND ITS ASSOCIATED AND AFFILIATED COMPANIES, ITS AND THEIR SUCCESSORS, ASSIGNS, LESSEES AND AGENTS
   AFFECTS: AS DESCRIBED THEREIN, TERMS AND PROVISIONS CONTAINED IN THE ABOVE DOCUMENT.
10. THE TERMS AND PROVISIONS CONTAINED IN THE DOCUMENT ENTITLED MEMORANDUM OF AGREEMENT RECORDED AUGUST 17, 2023 AS DOCUMENT NO. 2023-0224003 OF OFFICIAL RECORDS.
11. INTENTIONALLY DELETED
12. WATER RIGHTS, CLAIMS OR TITLE TO WATER, WHETHER OR NOT SHOWN BY THE PUBLIC RECORDS.
13. RIGHTS OF PARTIES IN POSSESSION.
14. THE FOLLOWING MATTERS DISCLOSED BY AN ALTA/NSPS SURVEY MADE BY HUNSAKER & ASSOCIATES ON DECEMBER 12, 2022, DESIGNATED JOB NO. 3214-0002:

    A. THE FACT THAT CHAIN LINK FENCING MEANDERS ACROSS THE EAST, WEST, AND SOUTHERLY PROPERTY LINES.

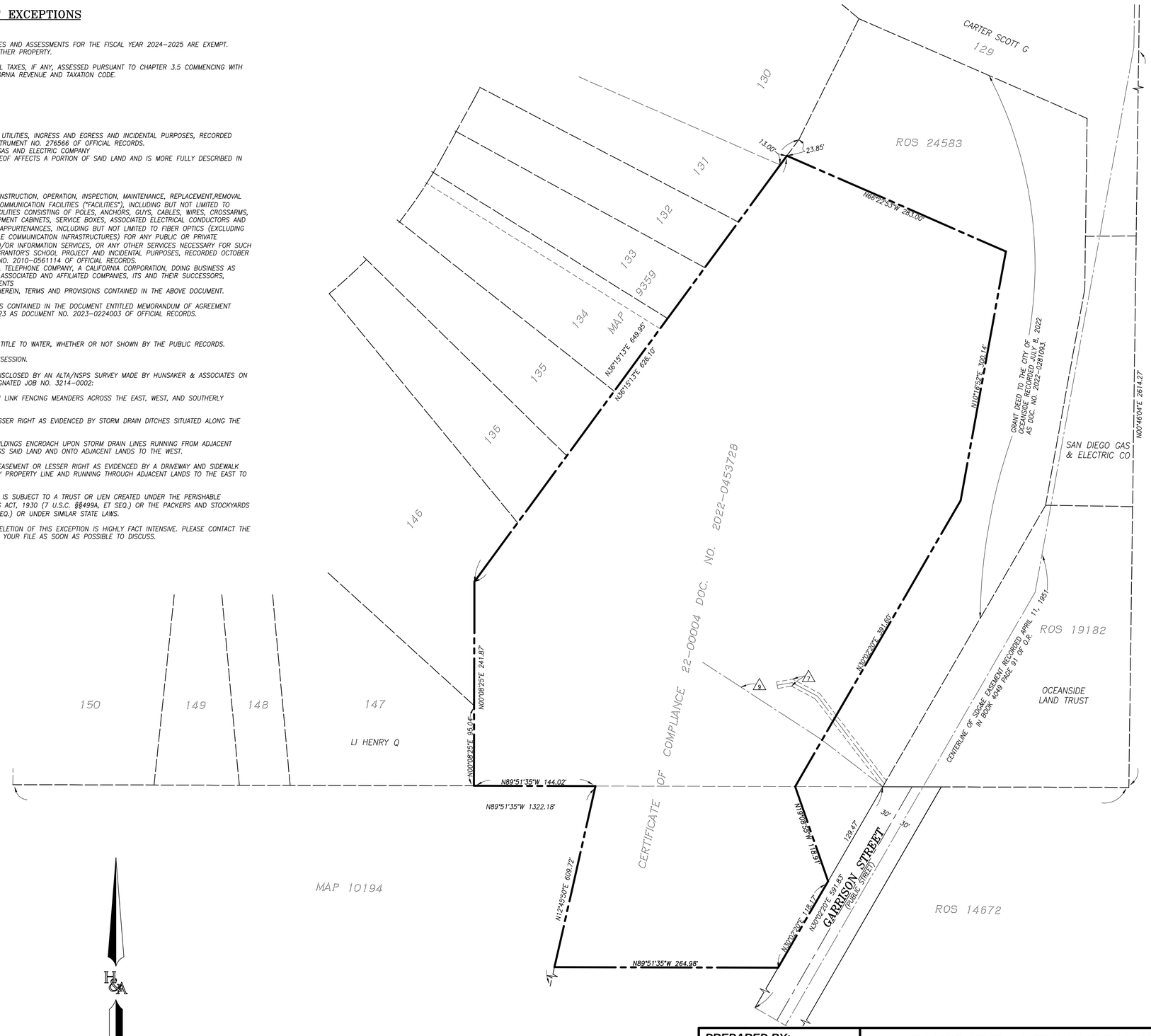
    B. AN EASEMENT OR LESSER RIGHT AS EVIDENCED BY STORM DRAIN DITCHES SITUATED ALONG THE WESTERLY PROPERTY LINE.

    C. THE FACT THAT 5 BUILDINGS ENCROACH UPON STORM DRAIN LINES RUNNING FROM ADJACENT LANDS TO THE EAST ACROSS SAID LAND AND ONTO ADJACENT LANDS TO THE WEST.

    D. AN ENCROACHMENT, EASEMENT OR LESSER RIGHT AS EVIDENCED BY A DRIVEWAY AND SIDEWALK SITUATED ON THE EASTERLY PROPERTY LINE AND RUNNING THROUGH ADJACENT LANDS TO THE EAST TO GARRISON STREET.

15. ANY CLAIM THAT THE TITLE IS SUBJECT TO A TRUST OR LIEN CREATED UNDER THE PERISHABLE AGRICULTURAL COMMODITIES ACT, 1930 (7 U.S.C. §§499A, ET SEQ.) OR THE PACKERS AND STOCKYARDS ACT (7 U.S.C. §§181 ET SEQ.) OR UNDER SIMILAR STATE LAWS.

    CONSIDERATION FOR THE DELETION OF THIS EXCEPTION IS HIGHLY FACT INTENSIVE. PLEASE CONTACT THE UNDERWRITER ASSIGNED TO YOUR FILE AS SOON AS POSSIBLE TO DISCUSS.



60 0 60 120 180
SCALE 1" = 60'

PREPARED BY:
HUNSAKER & ASSOCIATES SAN DIEGO, INC
PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 · FX(858)558-1414

BOUNDARIES & ENCUMBRANCES

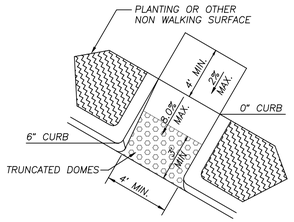
GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, CALIFORNIA

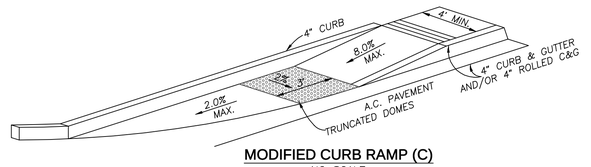
SHEET 10 OF 13

WO # 3214-0002

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MODIFIED PED. RAMP (A)
NO SCALE



MODIFIED CURB RAMP (C)
NO SCALE

0 40 80 120
SCALE 1" =40'

LEGEND

PROPOSED ACCESSIBLE ROUTE

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SURVEYING PH(858)558-4500 FX(858)558-1414

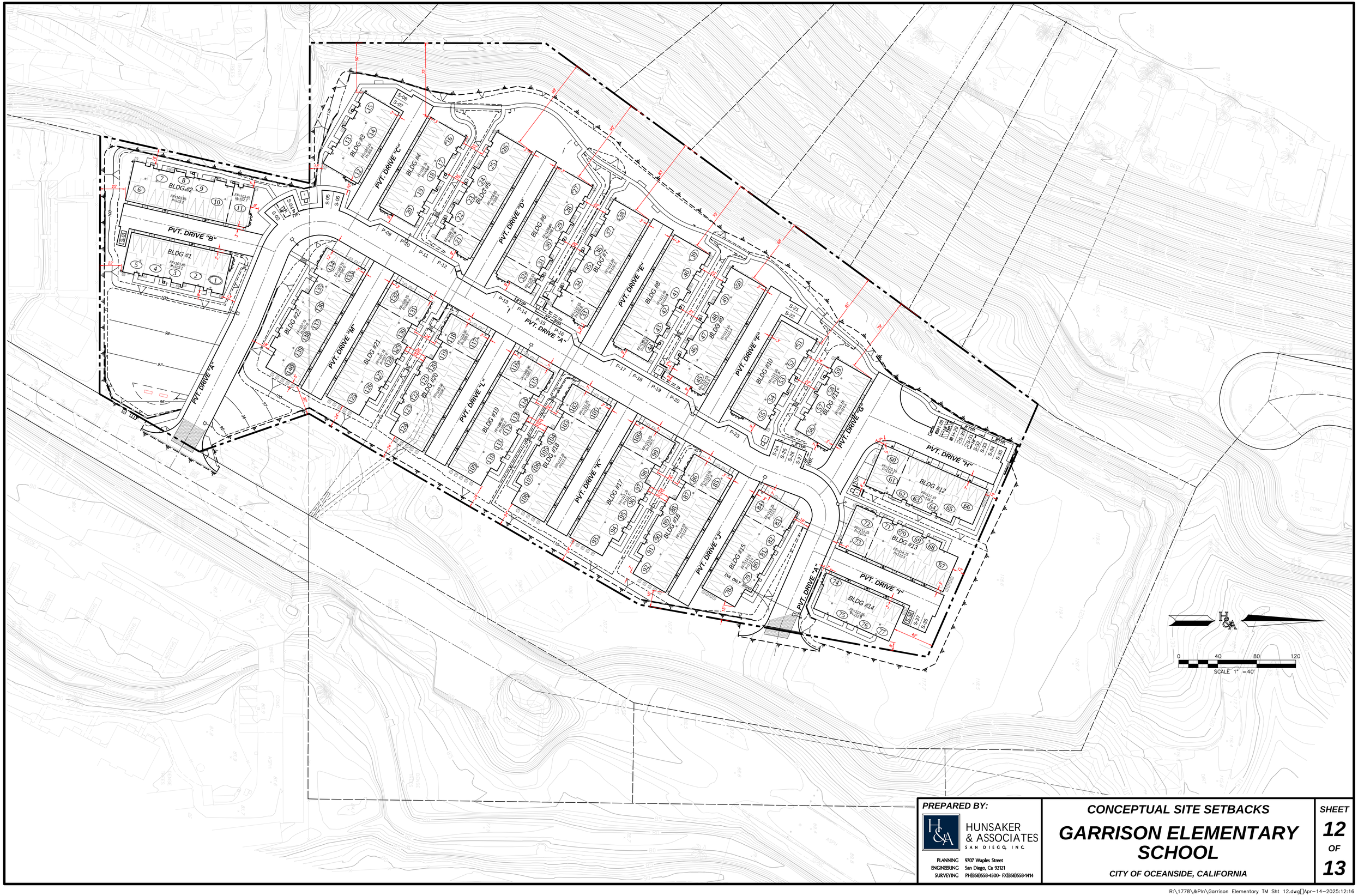
ACCESSIBLE PATHS

GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, CALIFORNIA

SHEET 11 OF 13

WO # 3214-0002



PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC.

PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 · FX(858)558-1414

CONCEPTUAL SITE SETBACKS

GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, CALIFORNIA

SHEET 12 OF 13

WO # 3214-0002

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SCALE 1" = 30'

11,800 SF REC (LIMITED PLANTING/LIGHTING SECTION)

8,500 SF X 5' DEEP UNDERGROUND STORM-WATER STORAGE

2,600 SF OPEN SPACE

17,800 SF OPEN SPACE

GARRISON ST. (PUBLIC)

PVT. DRIVE "A"

PVT. DRIVE "B"

PVT. DRIVE "C"

PVT. DRIVE "D"

PVT. DRIVE "E"

PVT. DRIVE "F"

PVT. DRIVE "I"

PVT. DRIVE "J"

PVT. DRIVE "K"

PVT. DRIVE "M"

BLDG #1 (5-PLEX)

BLDG #2 (5-PLEX)

BLDG #3 (5-PLEX)

BLDG #4 (5-PLEX)

BLDG #5 (5-PLEX)

BLDG #6 (5-PLEX)

BLDG #7 (5-PLEX)

BLDG #8 (5-PLEX)

BLDG #9 (5-PLEX)

BLDG #10 (5-PLEX)

BLDG #11 (5-PLEX)

BLDG #15 (5-PLEX)

BLDG #16 (5-PLEX)

BLDG #17 (5-PLEX)

BLDG #18 (5-PLEX)

BLDG #19 (5-PLEX)

BLDG #20 (5-PLEX)

BLDG #21 (5-PLEX)

BLDG #22 (5-PLEX)

EXISTING 4' RETAINING WALL TO REMAIN

EXISTING 4' RETAINING WALL TO REMAIN AND TIE-INTO NEW RETAINING WALL

10' TEMP. GRADING BUFFER

24" BYPASS STORM DRAIN

30" BYPASS STORM DRAIN

20' PUBLIC STORM DRAIN ESMT.

28' PUBLIC ACCESS & UTILITY ESMT.

28' PUBLIC ACCESS ESMT.

OVERFLOW PIPE

MWS 8-24

EXIST. P122724- RE-ANCHOR AND CONVERT TO CABLE POLE

150' STOPPING SIGHT DISTANCE @ 25 MPH PER CALTRANS HIGHWAY DESIGN MANUAL CH. 200-1 DATED 7-01-2020

CONNECT TO EXIST. PUBLIC WATER & SEWER MAINS

OFFSITE PERMISSION TO GRADE REQUIRED

EXIST. FIRE HYDRANT TO BE RELOCATED PER GRADING & PAVING PLAN 90% SUBMITTAL BY GHD INC.

EXIST. PACIFIC BELL UTILITY & ACCESS EASEMENT

12" WATERLINE PER IMPROVEMENT PLAN S24-0002 BY GHD INC.

CONNECT TO EXISTING STORM DRAIN (FIELD VERIFY TIE-IN ELEV.)

12" PVC STORM DRAIN PER YARD PIPING PLAN BY GHD INC.

CONNECT TO EXISTING PUBLIC STORM DRAIN (FIELD VERIFY TIE-IN ELEV.)

ACCESS ROAD & FENCING PER GRADING & PAVING PLAN 90% SUBMITTAL BY GHD INC.

20" IMPROVEMENT PLAN S24-0002 BY GHD INC.

30" LO SEWER FORCE MAIN PER IMPROVEMENT PLAN S24-0002 BY GHD INC.

CONNECT TO 12" WATERLINE PER IMPROVEMENT PLAN S24-0002 BY GHD INC.

DOUBLE SWING EVA GATE

EVA ONLY SIGNS

EXIST. 18" STORM DRAIN PER GP 380

EXIST. 24" STORM DRAIN PER GP 28110

EXIST. 10" AC WATER PER DWG. R-1054

EXIST. 8" VCP SEWER PER DWG. R-1054

EXIST. 24" SEWER FM PER DWG. S-681

EXIST. 8" VCP SEWER PER DWG. R-2756

EXIST. 10" AC WATER PER DWG. R-2756

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC

PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 FX(858)558-1414

SIGHT DISTANCES

GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, CALIFORNIA

SHEET 13 OF 13

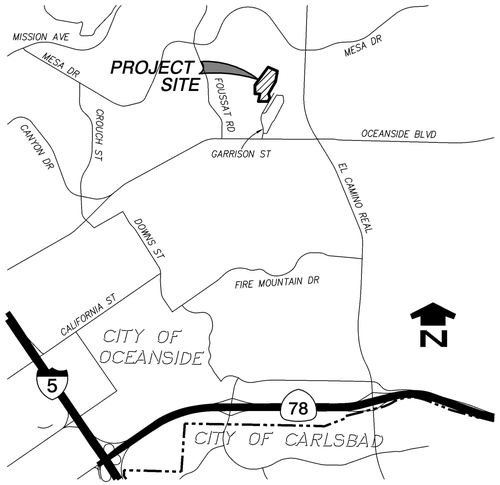
WO # 3214-0002

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CONCEPTUAL GRADING PLAN

GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, COUNTY OF SAN DIEGO, CALIFORNIA

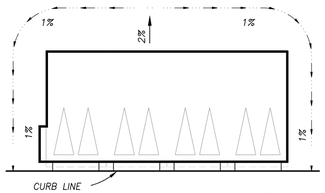


VICINITY MAP

NOT TO SCALE

LEGEND

PROJECT BOUNDARY	
EXISTING TOPO CONTOUR	100
SLOPE (2: 1 MAX)	2:1
DAYLIGHT LINE	
PERCENT OF GRADE	2%
STREET ELEVATION	106.0
SEWER INVERT ELEVATION	94.9IE
STORM DRAIN INVERT ELEVATION	92.9IE
6"-8" PVC PRIVATE SEWER MAIN W/ MANHOLE	S
4"-8" PVC PRIVATE WATER MAIN	W
PUBLIC WATER METER	M
PRIVATE BACKFLOW PREVENTER	BF
FIRE HYDRANT	
18" PRIVATE HDPE STORM DRAIN* *UNLESS SHOWN OTHERWISE ON PLAN	
24" PUBLIC BYPASS HDPE STORM DRAIN* *UNLESS SHOWN OTHERWISE ON PLAN	
RETAINING WALL* *PER OCEANSIDE STANDARD DRAWINGS	
TOP OF WALL ELEVATION/ FINISH GRADE	TW95.0 FG93.0 2' WALL
ST. LIGHT	
EASEMENT LINE	
BROW DITCH PER SDRSD D-75	
ACCESSIBLE ADAPTABLE UNIT	



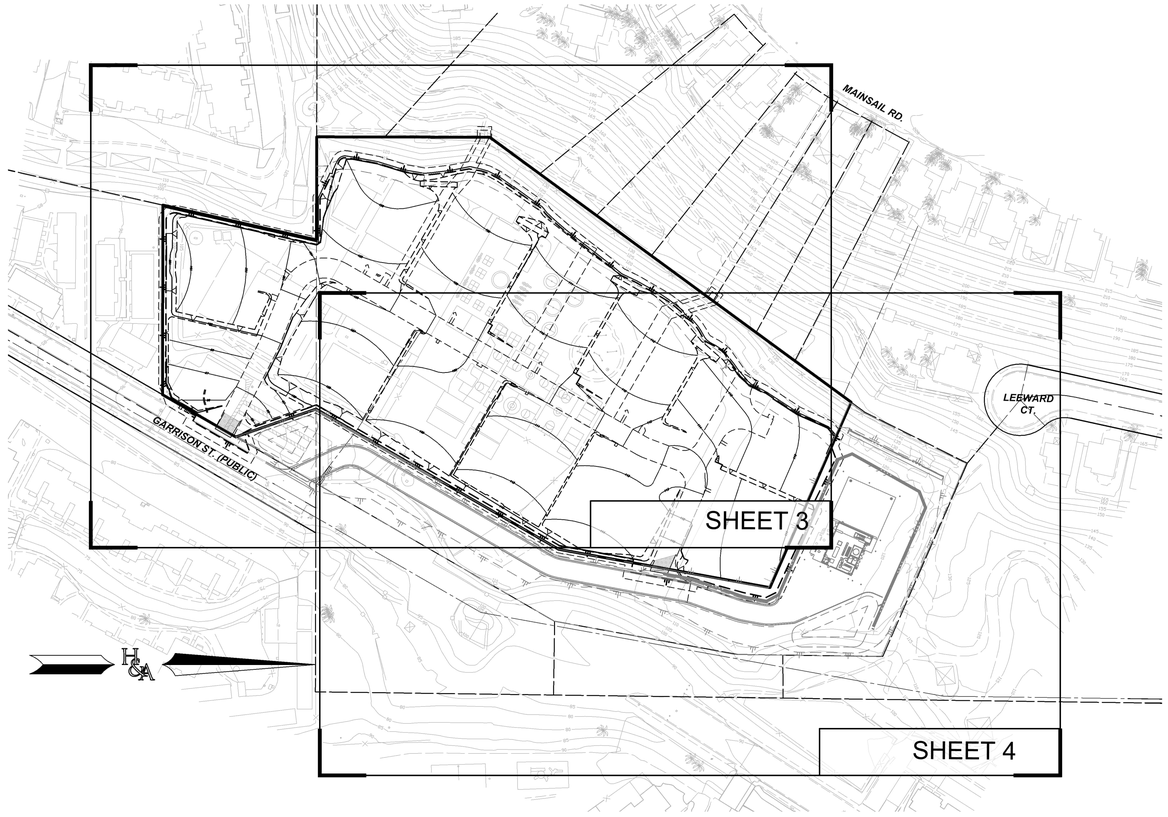
TYPICAL BUILDING DRAINAGE SWALE DETAIL

APPLICABLE TO ALL BUILDING TYPES

NOT TO SCALE

SECTION 1804.4 SITE GRADING OF THE INTERNATIONAL BUILDING CODE (IBC) TO ALLOW FOR AN ALTERNATE METHOD OF DIVERTING WATER AWAY FROM THE FOUNDATION. TYPICAL LOT DRAINAGE TO BE REDUCED FROM 5% SLOPE AWAY FROM THE FOUNDATION TO A MINIMUM 2% SLOPE. ALSO, LOT DRAINAGE SWALE GRADE TO BE REDUCED FROM 2% TO 1%.

DESIGN WAIVER REQUEST TO ALLOW TYPICAL LOT DRAINAGE TO BE REDUCED FROM 5% AWAY FROM HOUSE (PER BLDG. CODE 1804.4) TO 2% AWAY FROM HOUSE. ALLOW LOT DRAINAGE SWALE GRADE TO BE REDUCED FROM 2% TO 1%.



KEY MAP

NOT TO SCALE

PRELIMINARY GRADING PLAN NOTE

THIS PLAN IS PROVIDED TO ALLOW FOR FULL AND ADEQUATE DISCRETIONARY REVIEW OF A PROPOSED DEVELOPMENT PROJECT. THE PROPERTY OWNER ACKNOWLEDGES THAT ACCEPTANCE OR APPROVAL OF THIS PLAN DOES NOT CONSTITUTE ANY APPROVAL TO PERFORM ANY GRADING SHOW HERON, AND AGREES TO OBTAIN A VALID GRADING PERMIT BEFORE COMMENCING SUCH ACTIVITY.

EARTHWORK

GRADED AREA: 7.545 ACRES
RAW CUT: 21,873 CYS + 60,000 CYS ALLUVIUM REMOVALS (5') = 81,873 CYS TOTAL
RAW FILL: 11,490 CYS + 2,883 CYS AVG. 12.5% LOSS ALLUVIUM + 60,000 CYS ALLUVIUM REMOVALS (5') + 7,500 COLLUVIUM/TOPSOIL @ 12.5% LOSS = 81,873 CYS TOTAL

GRADING QUANTITIES SHOWN INCLUDE THE EFFECT OF REMEDIAL GRADING SHOWN IN THE PRELIMINARY SOILS REPORT DATED 11-14-2022.

SHEET INDEX

SHEET 1 - TITLE SHEET
SHEET 2 - EXISTING DETAILS
SHEET 3 - CONCEPTUAL GRADING PLAN
SHEET 4 - CONCEPTUAL GRADING PLAN
SHEET 5 - BOUNDARIES & ENCUMBRANCES

BENCHMARK

POINT 1063. 2.5" BRASS DISK IN CURB INLET WITH TRIANGLE/PUNCH STAMPED "LS 7854" PER CITY OF OCEANSIDE CONTROL NETWORK AS ESTABLISHED BY R.O.S. NO. 21787. NAVD 88 ELEVATION 101.72'

PAVING QUANTITY

APPROXIMATE PAVED AREA: 76,600 SF

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS SURVEY IS THE CALIFORNIA COORDINATE SYSTEM ZONE 6, NAD83 EPOCH 2011.00, AS DETERMINED LOCALLY BY A LINE BETWEEN STATION 1020 AND 1063 AS SAID COORDINATES ARE PUBLISHED IN RECORD OF SURVEY 21787.
I.E. N48°37'25"W

QUOTED BEARINGS FROM REFERENCE MAPS OR DEEDS MAY OR MAY NOT BE IN TERMS OF SAID SYSTEM.

TOPOGRAPHY SOURCE

TOPOGRAPHY USED FOR THIS TENTATIVE MAP WAS FLOWN ON NOVEMBER 10, 2022 BY PHOTO GEODETIC CORPORATION, CONTROL PROVIDED BY HUNSAKER & ASSOCIATES SAN DIEGO, INC. A FIELD VERIFICATION WAS PERFORMED BY HUNSAKER & ASSOCIATES SAN DIEGO, INC. ON APRIL 1, 2025 WHICH VALIDATED THE DATUM AND CONFIRMED THE ACCURACY OF THE TOPOGRAPHIC MAPPING PROVIDED PER SAID FLIGHT. NO SUBSTANTIAL VARIATIONS OR CHANGES IN FIELD CONDITIONS WERE WITNESSED DURING THE PERFORMANCE OF THE FIELD VERIFICATION.

GENERAL NOTES

1. EXISTING GROSS SUBDIVISION AREA: 8.317 AC
2. PROPOSED SUBDIVISION AREA: 8.317 AC
3. NET PROJECT AREA: 7.391
4. TOTAL NUMBER OF EXISTING LOTS: 1
5. TOTAL NUMBER OF PROPOSED LOTS: 1
6. TOTAL NUMBER OF UNITS: 140
7. ASSESSOR PARCEL NUMBER: 162-020-26-00
8. EXISTING GENERAL PLAN: CIVIC INSTITUTIONAL
9. PROPOSED GENERAL PLAN: MDC-R MEDIUM DENSITY-C RESIDENTIAL
10. EXISTING ZONING: PUBLIC/SEMIPUBLIC
11. PROPOSED ZONING: PD PLANNED DEVELOPMENT
12. PROPOSED DENSITY: 18.9 DU/AC (140 DU's/7.391 AC)
13. TOPOGRAPHIC CONTOUR INTERVAL: 1/5 FOOT
14. MAXIMUM SLOPE GRADIENT: 2: 1
15. AREA/PERCENT OF TOTAL BUILDING COVERAGE: 2.52 AC. (30.3%)
16. AREA/PERCENT OF PROJECT IN STREETS, DRIVEWAYS & DRIVE AISLES: 1.95 AC (23.4%)
17. AREA/PERCENT OF SIDEWALKS: 0.55 AC. (6.6%)
17. AREA/PERCENT OF LANDSCAPING: 3.30 AC (39.4%)
18. GRADING QUANTITIES: SEE EARTHWORK NEAR BOTTOM LEFT OF PAGE
19. GRADED AREA: 7.391 AC

DESIGN NOTES

1. ALL STREET DESIGN SHALL CONFORM TO THE CITY OF OCEANSIDE DESIGN STANDARDS AS REQUIRED BY THE CITY ENGINEER.
2. EASEMENTS SHALL BE PROVIDED, REMOVED OR RELOCATED AS REQUIRED BY THE CITY ENGINEER.
3. ALL PROPOSED UTILITIES SHALL BE UNDERGROUNDED AND EASEMENTS PROVIDED.
4. GEOTECHNICAL INVESTIGATION PREPARED BY: GEOTEK, DATED NOVEMBER 14, 2022.
5. THE DEVELOPER SHALL INSTALL STREET LIGHTS PER THE CITY OF OCEANSIDE ENGINEERING DEPARTMENT TRAFFIC DIVISION, THE STREET LIGHT DESIGN MANUAL AND THE CITY OF OCEANSIDE STANDARD DRAWING NO. M-4. STREET LIGHT LOCATIONS MAY VARY IN FINAL DESIGN.
6. ALL RETAINING WALLS IN EXCESS OF 4 FEET SHALL BE PLANTABLE.
7. THE PROPOSED SEWER SHALL BE INSTALLED PER CITY OF OCEANSIDE STANDARDS. ALL ON-SITE SEWER IS PRIVATE.
8. THE PROPOSED WATER SHALL BE INSTALLED PER CITY OF OCEANSIDE STANDARDS. ALL ON-SITE WATER IS PRIVATE.
9. FINISH GRADES ARE APPROXIMATE AND SUBJECT TO CHANGE IN FINAL DESIGN.
10. MODEL UNITS MAY BE BUILT PRIOR TO FINAL MAP WITH APPROVAL FROM THE CITY ENGINEER AND PLANNING DIRECTOR.
11. ALL FUTURE DRIVEWAYS AND GEOMETRIC DESIGN SHALL BE DESIGNED IN COMPLIANCE WITH THE CITY OF OCEANSIDE ENGINEERS DESIGN STANDARDS.
12. THE PRESENT OR FUTURE OWNER/DEVELOPER SHALL INDEMNIFY AND SAVE CITY OF OCEANSIDE, ITS OFFICERS, AGENTS, AND EMPLOYEES HARMLESS FROM ANY AND ALL LIABILITIES, CLAIMS ARISING FROM ANY FLOODING THAT OCCURS ON THIS SITE AND FLOODING THAT MAY BE DISCHARGED FROM THIS SITE INTO ADJACENT PROPERTIES.
13. ALL SIDEWALK AND PATHWAYS SHALL BE ADA COMPLIANT.

PROPERTY ADDRESS

333 GARRISON ST
OCEANSIDE, CA 92054

APPLICANT

TTLC OCEANSIDE GARRISON, LLC
4350 VON KARMAN AVE
SUITE 210
NEWPORT BEACH, CA 92660
(949) 474-0440

PRELIMINARY
APPLICANT DATE

OWNER

OCEANSIDE UNIFIED SCHOOL DISTRICT
2111 MISSION AVE
OCEANSIDE, CA 92058
(760) 966-4000

PRELIMINARY
OWNER DATE

CIVIL ENGINEER

HUNSAKER & ASSOCIATES, SAN DIEGO, INC
9707 WAPLES STREET
SAN DIEGO, CA 92121
(858) 558-4500

REGISTERED PROFESSIONAL ENGINEER ALISA S. VIALPANDO C 47945 CIVIL STATE OF CALIFORNIA

04/14/25
ALISA S. VIALPANDO R.C.E. 47945 DATE

LEGAL DESCRIPTION

SEE SHEET 5

EASEMENTS

SEE SHEET 5

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC

PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
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NO.	REVISIONS	DATE	BY
1	1st SUBMITTAL	MAY 13 2024	H&A
2	2nd SUBMITTAL	JULY 3 2024	H&A
3	3rd SUBMITTAL	NOV. 18 2024	H&A
4	4th SUBMITTAL	APR. 2024	H&A
5			
6			
7			
8			
9			
10			

CONCEPTUAL GRADING PLAN

GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, CALIFORNIA

SHEET 1 OF 5

WO # 3214-0002

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TITLE REPORT EXCEPTIONS

7 AN EASEMENT FOR TRANSMISSION AND DISTRIBUTION OF ELECTRICITY AND INCIDENTAL PURPOSES, RECORDED OCTOBER 16, 1974 AS FILE/PAGE NO. 276566 OF OFFICIAL RECORDS.
IN FAVOR OF: SAN DIEGO GAS AND ELECTRIC COMPANY
AFFECTS: THE ROUTE THEREOF AFFECTS A PORTION OF SAID LAND AND IS MORE FULLY DESCRIBED IN SAID DOCUMENT

9 AN EASEMENT FOR THE CONSTRUCTION, OPERATION, INSPECTION, MAINTENANCE, REPLACEMENT, REMOVAL OR DESTRUCTION OF TELECOMMUNICATION FACILITIES ("FACILITIES"), INCLUDING BUT NOT LIMITED TO AERIAL COMMUNICATION FACILITIES CONSISTING OF POLES, ANCHORS, GUYS, CABLES, WIRES, CROSSARMS, TERMINALS, TERMINAL EQUIPMENT CABINETS, SERVICE BOXES, ASSOCIATED ELECTRICAL CONDUCTORS AND NECESSARY FIXTURES AND APPURTENANCES, INCLUDING BUT NOT LIMITED TO FIBER OPTICS (EXCLUDING CELLULAR OR OTHER MOBILE COMMUNICATION INFRASTRUCTURES) FOR ANY PUBLIC OR PRIVATE COMMUNICATION, VIDEO AND/OR INFORMATION SERVICES, OR ANY OTHER SERVICES NECESSARY FOR SUCH FACILITIES TO SERVE THE GRANTOR'S SCHOOL PROJECT AND INCIDENTAL PURPOSES, RECORDED OCTOBER 19, 2010 AS FILE/PAGE NO. 2010-0561114 OF OFFICIAL RECORDS.
IN FAVOR OF: PACIFIC BELL TELEPHONE COMPANY, A CALIFORNIA CORPORATION, DOING BUSINESS AS AT&T CALIFORNIA, AND ITS ASSOCIATED AND AFFILIATED COMPANIES, ITS AND THEIR SUCCESSORS, ASSIGNS, LESSEES AND AGENTS
AFFECTS: AS DESCRIBED THEREIN TERMS AND PROVISIONS CONTAINED IN THE ABOVE DOCUMENT.

NOTE: SEE SHEET 5 FOR BOUNDARY INFORMATION

0 40 80 120
SCALE 1" = 40'

PREPARED BY:
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PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 FX(858)558-1414

EXISTING CONDITIONS

GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, CALIFORNIA

SHEET 2 OF 5

WO # 3214-0002

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SCALE 1" = 30'

APN: 162-030-74-25

APN: 162-462-31

APN: 162-462-23

APN: 162-462-21

APN: 162-462-20

APN: 162-462-19

APN: 162-462-18

APN: 162-462-17

APN: 162-030-34

APN: 162-030-36

OFFSITE PERMISSION TO GRADE/IMPROVEMENTS REQUIRED

EXIST. 18" STORM DRAIN PER GP 438

EXIST. 10" STORM DRAIN ESMT. PER DWG. R-3257

EXIST. 18" STORM DRAIN PER GP 28110

EXIST. 24" STORM DRAIN PER GP 28110

EXIST. 12" STORM DRAIN PER GP 28110

EXIST. 10" STORM DRAIN PER GP 28110

EXIST. 18" CMP STORM DRAIN PER R-02993-R-3010C

EXIST. 10" AC WATER PER DWG. R-1054

EXIST. 8" VCP SEWER PER DWG. R-1054

EXIST. 24" SEWER FM PER DWG. S-681

EXIST. 4' RETAINING WALL TO REMAIN

EXISTING 4' RETAINING WALL TO REMAIN AND TIE-INTO NEW RETAINING WALL

10' TEMP. GRADING BUFFER

20' PUBLIC STORM DRAIN ESMT.

15' SLOPE SETBACK

24" BYPASS STORM DRAIN

30" BYPASS STORM DRAIN

18" BYPASS STORM DRAIN

28' PUBLIC ACCESS & UTILITY ESMT.

11,800 SF REC (LIMITED PLANTING/LIGHTING SECTION)

8,500 SF X 5' DEEP UNDERGROUND STORM WATER STORAGE

OVERFLOW PIPE

MWS 8-24

2,600 SF OPEN SPACE

1,100 SF OPEN SPACE

EXIST. SDG&E UTILITY & ACCESS EASEMENT

EXIST. PACIFIC BELL UTILITY & ACCESS EASEMENT

CONNECT TO EXIST. PUBLIC WATER & SEWER MAINS

GARRISON ST (PUBLIC)

EXIST. P12274- RE-ANCHOR AND CONVERT TO CABLE POLE

12" WATERLINE PER IMPROVEMENT PLAN 524-0002 BY GHD INC.

EXIST. FIRE HYDRANT TO BE RELOCATED PER GRADING & PAVING PLAN 90% SUBMITTAL BY GHD INC.

GRADING, SLOPES AND DRAINAGE BASIN PER GRADING & PAVING PLAN 90% SUBMITTAL BY GHD INC. (TYP.)

12" PVC STORM DRAIN PER YARD PIPING PLAN BY GHD INC.

CONNECT TO EXISTING PUBLIC STORM DRAIN (FIELD VERIFY TIE-IN ELEV.)

CONNECT TO EXISTING STORM DRAIN (FIELD VERIFY TIE-IN ELEV.)

ACCESS ROAD & FENCING PER GRADING & PAVING PLAN 90% SUBMITTAL BY GHD INC. (TYP.)

TW110.0 FG105.5 4.5'WALL

TW110.0 FG106.0 4' WALL

TW110.5 FG106.5 4' WALL

TW107.9 FG105.4 2.5'WALL

TW111.4 FG105.4 6' WALL

TW111.4 FG105.4 6' WALL

TW110.5 FG104.5 6' WALL

TW103.2 FG97.2 6' WALL

TW107.2 FG103.2 4' WALL

TW110.0 FG104.0 6' WALL

TW110.0 FG104.0 6' WALL

TW98.0 FG96.0 2' WALL

TW101.5 FG100.5 1' WALL

TW104.0 FG100.0 4' WALL

TW101.5 FG98.5 3' WALL

TW97.5 FG96.5 1' WALL

TW96.0 FG92.0 4' WALL

TW94.5 FG91.5 3' WALL

TW95.0 FG93.0 2' WALL

TW96.0 FG94.0 2' WALL

TW103.0 FG98.5 5' WALL

TW110.3 FG107.3 3' WALL

TW110.3 FG107.3 3' WALL

TW114.4 FG110.0 4' WALL

TW115.0 FG113.0 2' WALL

TW119.0 FG116.0 3' WALL

TW116.4 FG113.4 3' WALL

1.3%

1.5%

1.6%

5.0%

10.0%

NOTE: SEE SHEET 5 FOR BOUNDARY INFORMATION

FOR CONTINUATION SEE SHEET 4

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC

PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 · FX(858)558-1414

SITE PLAN

GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, CALIFORNIA

SHEET 3 OF 5

WO # 3214-0002

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FOR CONTINUATION SEE SHEET 3

GRADE/IMPROVEMENTS REQUIRED
10' TEMP. GRADING BUFF.
APN: 162-462-18
24" BYPASS STORM DRAIN
APN: 162-462-17
15' SLOPE SETBACK
TW114.4 FG110.0 4' WALL
TW115.0 FG113.0 2' WALL
TW119.0 FG116.0 3' WALL
TW121.0 FG117.0 4' WALL
TW120.0 FG117.0 3' WALL
1,100 SF OPEN SPACE
APN: 162-461-18
TW110.3 FG107.3 3' WALL
TW110.3 FG107.3 3' WALL
TW103.0 FG98.0 5' WALL
EXIST. SDG&E UTILITY & ACCESS EASEMENT
EXIST. PACIFIC BELL UTILITY & ACCESS EASEMENT
28' PUBLIC ACCESS & UTILITY ESMT.
28' PUBLIC ACCESS UTILITY ESMT.
TW116.4 FG113.4 3' WALL
OFFSITE PERMISSION TO GRADE REQUIRED
10' TEMP. GRADING BUFFER
GRADING AND SLOPES PER GRADING & PAVING PLAN 90% SUBMITTAL BY GHD INC. (TYP.)
RETAINING WALL PER 90% SUBMITTAL BY GHD INC. (TYP.)
APN: 162-020-25
12" WATERLINE PER IMPROVEMENT PLAN S24-0002 BY GHD INC. EXIST. P122723. RE-ANCHOR AND CONVERT TO CABLE POLE
28' PUBLIC ACCESS ESMT.
CONNECT TO EXISTING STORM DRAIN (FIELD VERIFY TIE-IN ELEV.)
12" PVC STORM DRAIN PER YARD PIPING PLAN BY GHD INC.
CONNECT TO EXISTING PUBLIC STORM DRAIN (FIELD VERIFY TIE-IN ELEV.)
ACCESS ROAD & FENCING PER GRADING & PAVING PLAN 90% SUBMITTAL BY GHD INC. (TYP.)
20" BUCCANEER SEWER FORCE MAIN PER IMPROVEMENT PLAN S24-0002 BY GHD INC.
30" LO SEWER FORCE MAIN PER IMPROVEMENT PLAN S24-0002 BY GHD INC.
APN: 162-020-25
APN: 162-020-23
GARRISON ST. (PUBLIC)
TW114.5 FG108.5 6' WALL
TW111.5 FG109.5 2' WALL
TW112.9 FG110.9 2' WALL
TW113.9 FG109.9 3.5' WALL
TW112.9 FG109.4 3.5' WALL
CONNECT TO 12" WATERLINE PER IMPROVEMENT PLAN S24-0002 BY GHD INC.
(ELEV. PER SEWER LIFT STATION PLANS)
12" WATERLINE PER IMPROVEMENT PLAN S24-0002 BY GHD INC.
30" RCP STORM DRAIN PER YARD PIPING PLAN BY GHD INC.
12" PVC STORM DRAIN PER YARD PIPING PLAN BY GHD INC.
12" WATERLINE PER IMPROVEMENT PLAN S24-0002 BY GHD INC.
APN: 162-020-22
PUBLIC SEWER LIFT STATION PER 90% SUBMITTAL BY GHD INC.
APN: 162-462-16
OFFSITE PERMISSION TO GRADE REQUIRED
GRADING AND SLOPES PER GRADING & PAVING PLAN 90% SUBMITTAL BY GHD INC. (TYP.)
GRADING, SLOPES AND DRAINAGE BASIN PER GRADING & PAVING PLAN 90% SUBMITTAL BY GHD INC. (TYP.)
30" OMGLS SEWER FORCE MAIN PER IMPROVEMENT PLAN S24-0002 BY GHD INC.
30" LO SEWER FORCE MAIN PER IMPROVEMENT PLAN S24-0002 BY GHD INC.
27" SEWER MAIN PER IMPROVEMENT PLAN S24-0002 BY GHD INC.
EXIST. 24" SEWER FM PER DWG. S-681
EXIST. 8" VCP SEWER PER DWG. R-2756
EXIST. 12" STORM DRAIN PER GP 28110
EXIST. 10" STORM DRAIN PER GP 28110
EXIST. 10" AC WATER PER DWG. R-2756
EXIST. 24" RCP STORM DRAIN PER DWG. R-2757
EXIST. 10" AC WATER PER DWG. R-2757
24" ABND RW
BERM
CONC
TREES

NOTE: SEE SHEET 5 FOR BOUNDARY INFORMATION

SCALE: 1" = 30'

PREPARED BY:

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SITE PLAN

GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, CALIFORNIA

SHEET 4 OF 5

WO # 3214-0002

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TITLE REFERENCE

THIS SURVEY IS BASED ON THE PRELIMINARY REPORT ISSUED BY FIRST AMERICAN TITLE COMPANY AS ORDER NO. OSA-6905088 DATED AS OF NOVEMBER 7, 2024 (UPDATED NOVEMBER 13, 2024).

ASSESSOR PARCEL NO.

162-020-26-00

LEGAL DESCRIPTION

REAL PROPERTY IN THE CITY OF OCEANSIDE, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

THE LAND DESCRIBED IN CERTAIN CERTIFICATE OF COMPLIANCE RECORDED NOVEMBER 30, 2022 AS INSTRUMENT NO. 2022-0453728 OF OFFICIAL RECORDS, AS MORE FULLY DESCRIBED AS FOLLOWS:

ALL THAT PORTION OF THE EAST HALF OF SECTION 19, TOWNSHIP 11 SOUTH, RANGE 4 WEST, SAN BERNARDINO BASE AND MERIDIAN, IN THE CITY OF OCEANSIDE, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO UNITED STATES GOVERNMENT SURVEY APPROVED DECEMBER 27, 1870, DESCRIBED IN GRANT DEED RECORDED FEBRUARY 20, 1962 AS FILE/PAGE NO. 29606 TOGETHER WITH THAT PARCEL DESCRIBED IN GRANT DEED RECORDED MAY 7, 1962 AS FILE/PAGE NO. 77946, BOTH RECORDED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY.

EXCEPTING THEREFROM:

ALL THAT PORTION OF THE EAST HALF OF SECTION 19, TOWNSHIP 11 SOUTH, RANGE 4 WEST, SAN BERNARDINO BASE AND MERIDIAN, IN THE CITY OF OCEANSIDE, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO UNITED STATES GOVERNMENT SURVEY APPROVED DECEMBER 27, 1870, DESCRIBED IN GRANT DEED RECORDED FEBRUARY 20, 1962 AS FILE/PAGE NO. 29606 TOGETHER WITH THAT PARCEL DESCRIBED IN GRANT DEED RECORDED MAY 7, 1962 AS FILE/PAGE NO. 77946, BOTH RECORDED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, DESCRIBED AS FOLLOWS:

COMMENCING AT A POINT ON THE SOUTH LINE OF SAID PARCEL DESCRIBED IN GRANT DEED RECORDED FEBRUARY 20, 1962 AS FILE/PAGE NO. 29606, SAID POINT BEING ON THE EAST AND WEST CENTER LINE OF SAID SECTION, DISTANT THEREON NORTH 89°30' 30" EAST 690.81 FEET FROM THE CENTER OF SAID SECTION, SAID POINT BEING THE NORTHEASTERLY CORNER OF THE LAND DESCRIBED IN DEED TO A.O. ELSTAD, ET UX, RECORDED MARCH 15, 1961 AS DOCUMENT NO. 46030 OF OFFICIAL RECORDS; THENCE ALONG SAID PARCEL DESCRIBED IN GRANT DEED RECORDED FEBRUARY 20, 1962 AS FILE/PAGE NO. 29606 THE FOLLOWING COURSES:

CONTINUING ALONG SAID EAST AND WEST CENTER LINE, NORTH 89°30'30" EAST, 340.12 FEET TO THE NORTHWESTERLY LINE OF THAT 60.00 FEET EASEMENT DESCRIBED IN DEED TO RAY A. WILCOX, ET AL, RECORDED JANUARY 25, 1960 AS DOCUMENT NO. 15744 AND THE TRUE POINT OF BEGINNING; THENCE ALONG THE NORTHEASTERLY PROLONGATION OF SAID NORTHWESTERLY LINE, NORTH 29°25'43" EAST 385.59 FEET TO A LINE DRAWN PARALLEL WITH AND 6.00 FEET NORTHWESTERLY FROM THE CENTER LINE OF THAT EASEMENT DESCRIBED IN DEED TO THE SAN DIEGO GAS AND ELECTRIC COMPANY, RECORDED APRIL 11, 1951 IN BOOK 4049, PAGE 91 OF OFFICIAL RECORDS; THENCE ALONG SAID PARALLEL LINE, NORTH 9°51'43" EAST 255.66 FEET TO A LINE DRAWN PARALLEL AND 60.00 FEET WESTERLY AT RIGHT ANGLES FROM THE EAST LINE OF THE WEST HALF OF THE NORTHEAST QUARTER OF SAID SECTION 19; THENCE NORTH 0°16'43" EAST ALONG SAID PARALLEL LINE 205.00 FEET; THENCE LEAVING SAID PARALLEL LINE NORTH 66°52'17" WEST 295.00 FEET; THENCE SOUTH 25°44'30" WEST, 160.00 FEET; THENCE SOUTH 35°44'30" WEST, 23.85 FEET TO A LINE PARALLEL WITH THE NORTHERLY LINE OF SAID PARCEL DESCRIBED IN GRANT DEED RECORDED FEBRUARY 20, 1962 AS FILE/PAGE NO. 29606; THENCE LEAVING SAID PARCEL DESCRIBED IN GRANT DEED RECORDED FEBRUARY 20, 1962 AS FILE/PAGE NO. 29606, ALONG SAID PARALLEL LINE SOUTH 66°52'17" EAST 283.00 FEET TO A LINE PARALLEL WITH AND 100.00 FEET WESTERLY OF, MEASURED AT RIGHT ANGLE TO, THAT COURSE DESCRIBED IN SAID GRANT DEED RECORDED FEBRUARY 20, 1962 AS FILE/PAGE NO. 29606, HAVING A BEARING OF NORTH 9°51'43" EAST; THENCE ALONG SAID PARALLEL LINE SOUTH 9°51'43" WEST 297.82 FEET TO A LINE PARALLEL WITH AND 90.00 FEET NORTHWESTERLY OF, MEASURED AT RIGHT ANGLE TO, THAT COURSE DESCRIBED IN SAID GRANT DEED RECORDED FEBRUARY 20, 1962 AS FILE/PAGE NO. 29606 HAVING A BEARING OF NORTH 29°25'43" EAST; THENCE ALONG SAID PARALLEL LINE SOUTH 29°25'43" WEST 392.01 FEET TO THE SOUTH LINE OF SAID PARCEL DESCRIBED IN GRANT DEED RECORDED FEBRUARY 20, 1962 AS FILE/PAGE NO. 29606 AND THE NORTH LINE OF SAID PARCEL DESCRIBED IN GRANT DEED RECORDED MAY 7, 1962 AS FILE/PAGE NO. 77946; THENCE LEAVING SAID NORTH AND SOUTH LINES SOUTH 19°47'10" EAST, 118.86 FEET TO THE EASTERLY LINE OF SAID PARCEL DESCRIBED IN GRANT DEED RECORDED MAY 7, 1962 AS FILE/PAGE NO. 77946; THENCE ALONG SAID EASTERLY LINE NORTH 29°25'43" EAST 129.44 FEET TO THE TRUE POINT OF BEGINNING.

APN: 162-020-26-00

TITLE REPORT EXCEPTIONS

1. *INTENTIONALLY DELETED*
2. *GENERAL AND SPECIAL TAXES AND ASSESSMENTS FOR THE FISCAL YEAR 2024-2025 ARE EXEMPT. AFFECTS: THE LAND AND OTHER PROPERTY.*
3. *THE LIEN OF SUPPLEMENTAL TAXES, IF ANY, ASSESSED PURSUANT TO CHAPTER 3.5 COMMENCING WITH SECTION 75 OF THE CALIFORNIA REVENUE AND TAXATION CODE.*
4. *INTENTIONALLY DELETED*
5. *INTENTIONALLY DELETED*
6. *INTENTIONALLY DELETED*
7. *AN EASEMENT FOR PUBLIC UTILITIES, INGRESS AND EGRESS AND INCIDENTAL PURPOSES, RECORDED OCTOBER 16, 1974 AS INSTRUMENT NO. 276566 OF OFFICIAL RECORDS. IN FAVOR OF: SAN DIEGO GAS AND ELECTRIC COMPANY AFFECTS: THE ROUTE THEREOF AFFECTS A PORTION OF SAID LAND AND IS MORE FULLY DESCRIBED IN SAID DOCUMENT*
8. *INTENTIONALLY DELETED*
9. *AN EASEMENT FOR THE CONSTRUCTION, OPERATION, INSPECTION, MAINTENANCE, REPLACEMENT,REMOVAL OR DESTRUCTION OF TELECOMMUNICATION FACILITIES ("FACILITIES"), INCLUDING BUT NOT LIMITED TO AERIAL COMMUNICATION FACILITIES CONSISTING OF POLES, ANCHORS, GUYS, CABLES, WIRES, CROSSARMS, TERMINALS, TERMINAL EQUIPMENT CABINETS, SERVICE BOXES, ASSOCIATED ELECTRICAL CONDUCTORS AND NECESSARY FIXTURES AND APPURTENANCES, INCLUDING BUT NOT LIMITED TO FIBER OPTICS (EXCLUDING CELLULAR OR OTHER MOBILE COMMUNICATION INFRASTRUCTURES) FOR ANY PUBLIC OR PRIVATE COMMUNICATION, VIDEO AND/OR INFORMATION SERVICES, OR ANY OTHER SERVICES NECESSARY FOR SUCH FACILITIES TO SERVE THE GRANTOR'S SCHOOL PROJECT AND INCIDENTAL PURPOSES, RECORDED OCTOBER 19, 2010 AS INSTRUMENT NO. 2010-0561114 OF OFFICIAL RECORDS. IN FAVOR OF: PACIFIC BELL TELEPHONE COMPANY, A CALIFORNIA CORPORATION, DOING BUSINESS AS AT&T CALIFORNIA, AND ITS ASSOCIATED AND AFFILIATED COMPANIES, ITS AND THEIR SUCCESSORS, ASSIGNS, LESSEES AND AGENTS AFFECTS: AS DESCRIBED THEREIN, TERMS AND PROVISIONS CONTAINED IN THE ABOVE DOCUMENT.*
10. *THE TERMS AND PROVISIONS CONTAINED IN THE DOCUMENT ENTITLED MEMORANDUM OF AGREEMENT RECORDED AUGUST 17, 2023 AS INSTRUMENT NO. 2023-0224003 OF OFFICIAL RECORDS.*
11. *INTENTIONALLY DELETED*
12. *WATER RIGHTS, CLAIMS OR TITLE TO WATER, WHETHER OR NOT SHOWN BY THE PUBLIC RECORDS.*
13. *RIGHTS OF PARTIES IN POSSESSION.*
14. *THE FOLLOWING MATTERS DISCLOSED BY AN ALTA/NSPS SURVEY MADE BY HUNSAKER & ASSOCIATES ON DECEMBER 12, 2022, DESIGNATED JOB NO. 3214-0002:*

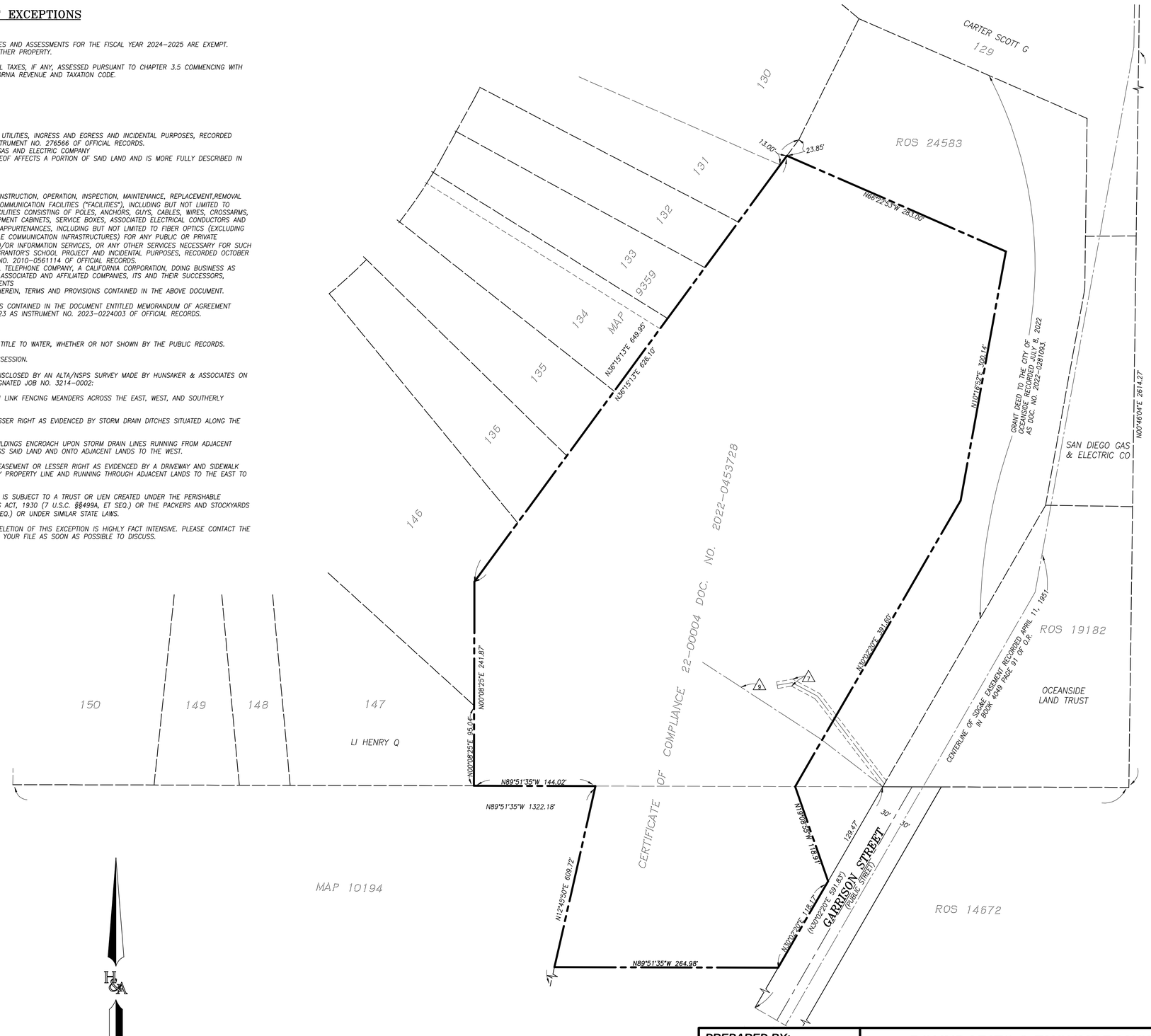
    A. THE FACT THAT CHAIN LINK FENCING MEANDERS ACROSS THE EAST, WEST, AND SOUTHERLY PROPERTY LINES.

    B. AN EASEMENT OR LESSER RIGHT AS EVIDENCED BY STORM DRAIN DITCHES SITUATED ALONG THE WESTERLY PROPERTY LINE.

    C. THE FACT THAT 5 BUILDINGS ENCROACH UPON STORM DRAIN LINES RUNNING FROM ADJACENT LANDS TO THE EAST ACROSS SAID LAND AND ONTO ADJACENT LANDS TO THE WEST.

    D. AN ENCROACHMENT, EASEMENT OR LESSER RIGHT AS EVIDENCED BY A DRIVEWAY AND SIDEWALK SITUATED ON THE EASTERLY PROPERTY LINE AND RUNNING THROUGH ADJACENT LANDS TO THE EAST TO GARRISON STREET.
15. *ANY CLAIM THAT THE TITLE IS SUBJECT TO A TRUST OR LIEN CREATED UNDER THE PERISHABLE AGRICULTURAL COMMODITIES ACT, 1930 (7 U.S.C. §§499A, ET SEQ.) OR THE PACKERS AND STOCKYARDS ACT (7 U.S.C. §§181 ET SEQ.) OR UNDER SIMILAR STATE LAWS.*

    CONSIDERATION FOR THE DELETION OF THIS EXCEPTION IS HIGHLY FACT INTENSIVE. PLEASE CONTACT THE UNDERWRITER ASSIGNED TO YOUR FILE AS SOON AS POSSIBLE TO DISCUSS.



PREPARED BY:

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BOUNDARIES & ENCUMBRANCES

GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, CALIFORNIA

SHEET **5** *OF* **5**

WO # 3214-0002

TREE MITIGATION & PROTECTION NOTES:

FINAL MITIGATION VALUE: 303" FOR 1:1 REPLACEMENT OF TREE CALIPER FOR NEW TREES MAY BE REQUIRED BY CITY OF OCEANSIDE PLANNING DEPARTMENT. 321" OF NEW CALIPER TREES PROPOSED.

EXISTING TREES NOTED AS "PRESERVE" SHALL BE PROTECTED IN PLACE. NO MECHANICAL OR OTHER GRADING WHICH WOULD ALTER GROUND ELEVATION AROUND BASE OR WITHIN DRIPLINE OF TREES SHALL BE ALOWED, NO MECHANICAL EQUIPMENT OR TRENCHING WITIN THE DRIPLINE CAUSING DISTURBANCE TO TREE ROOTS SHALL OCCUR; NO EXCESSIVE PRUNING SHALL OCCUR; NO STORAGE OF EQUIPMENT SHALL OCCUR UNDER DRIPLINES; NO ACTIVITIES SHALL CAUSE SOIL COMPACTION AROUND TREE CANOPY OR TRUNK. IF EXISTING TREES TO BE PRESERVED ARE DAMAGED OR DESTROYED BY CONSTRUCTION ACTIVITIES, TREES SHALL BE REPLACED IN KIND WITH SAME SPECIES AND SIZE (DIAMETER AT BREAST HEIGHT) PER CITY REQUIREMENT.

ROOT BARRIER NOTE:

ROOT BARRIERS SHALL BE INSTALLED ADJACENT TO ALL PAVING SURFACES WHERE A PAVING SURFACE IS LOCATED WITHIN 6 FEET OF A TREE TRUNK ON SITE (PRIVATE) AND WITHIN 10 FEET OF A TREE TRUNK IN THE RIGHT-OF-WAY (PUBLIC). ROOT BARRIERS SHALL EXTEND 5 FEET IN EACH DIRECTION FROM THE CENTERLINE OF THE TRUNK, FOR A TOTAL DISTANCE OF 10 FEET. ROOT BARRIERS SHALL BE A MINIMUM 24 INCHES IN DEPTH. INSTALLING A ROOT BARRIER AROUND THE TREE'S ROOT BALL IS UNACCEPTABLE.

CITY OF OCEANSIDE PLAN NOTES:

1. FINAL LANDSCAPE PLANS SHALL ACCURATELY SHOW PLACEMENT OF TREES, SHRUBS, AND GROUNDCOVERS.
2. LANDSCAPE ARCHITECT SHALL BE AWARE OF UTILITY, SEWER, AND STORM DRAIN EASEMENTS AND PLACE PLANTING LOCATIONS ACCORDINGLY TO MEET CITY OF OCEANSIDE REQUIREMENTS.
3. ALL REQUIRED LANDSCAPE AREAS SHALL BE MAINTAINED BY OWNER OR AS STATED IN ANY LEGAL DOCUMENT SUCH AS BUT NOT LIMITED TO A LEASE AGREEMENT. THE LANDSCAPE AREAS SHALL BE MAINTAINED PER CITY OF OCEANSIDE REQUIREMENTS.
4. NO TRASH ENCLOSURES ARE PROPOSED; TRASH BINS TO BE STORED IN PRIVATE GARAGES. REFERENCE TRASH DAY PLAN BY ARCHITECT.
5. ALL STREET TREES SHALL COMPLY WITH STREET TREE STANDARD 211A.

IRRIGATION NOTE:

AN AUTOMATIC IRRIGATION SYSTEM SHALL BE INSTALLED TO PROVIDE COVERAGE FOR ALL PROPOSED PLANTING AREAS SHOWN ON THE PLAN. LOW PRECIPITATION EQUIPMENT SHALL PROVIDE SUFFICIENT WATER FOR PLANT GROWTH WITH A MINIMUM WATER LOSS DUE TO WATER RUN-OFF AND TIME SCHEDULED. IRRIGATION SYSTEMS SHALL USE HIGH QUALITY, AUTOMATIC CONTROL VALVES, CONTROLLERS, ONSITE WEATHER SENSOR, AND OTHER NECESSARY IRRIGATION EQUIPMENT. ALL COMPONENTS SHALL BE OF NON-CORROSIVE MATERIAL ALL DRIP SYSTEMS SHALL BE ADEQUATELY FILTERED AND REGULATED PER THE MANUFACTURER'S RECOMMENDED DESIGN PARAMETERS. ALL IRRIGATION IMPROVEMENTS SHALL FOLLOW THE CITY OF OCEANSIDE GUIDELINES AND WATER CONSERVATION ORDINANCE.



PLANT LEGEND

SYMBOL	CODE	QTY	BOTANICAL NAME	COMMON NAME	CONT	WATER USE	SF CANOPY
TREES							
	ARB MAR	13	ARBUTUS X 'MARINA' STANDARD, DOUBLE STAKE. 2" CALIPER, 30' CANOPY (706.86 SF).	MARINA STRAWBERRY TREE STANDARD	24"BOX	LOW	9,189.18
	GEI PAR	51	GEIJERA PARVIFLORA STANDARD, DOUBLE STAKE. 2" CALIPER, 25' CANOPY (490.87 SF).	AUSTRALIAN WILLOW	24"BOX	LOW	25,034.37
	MEL NES	20	MELALEUCA NESOPHILA 1.5" CALIPER, 10' CANOPY (78.54 SF).	PINK MELALEUCA	15 GAL	LOW	1,570.80
	OLE SWA	26	OLEA EUROPAEA 'SWAN HILL' MULTI. 3" CALIPER,20' CANOPY (314.16 SF)	SWAN HILL FRUITLESS OLIVE	36"BOX	LOW	8,168.16
	PAR DES	13	PARKINSONIA X 'DESERT MUSEUM' STANDARD, DOUBLE STAKE. 3" CALIPER. 22' CANOPY (380.13 SF).	DESERT MUSEUM PALO VERDE	36"BOX	LOW	4,941.69
	QUE AGR	12	QUERCUS AGRIFOLIA STANDARD, DOUBLE STAKE. 1.5" CALIPER. 35' CANOPY (962.11 SF)	COAST LIVE OAK	15 GAL	LOW	11,545.32
	CHI PIN	14	X CHITALPA TASHKENTENSIS 'PINK DAWN' STANDARD, DOUBLE STAKE. 2" CALIPER. 20' CANOPY (314.16 SF). NOTE: 321" OF NEW CALIPER TREES PROPOSED.	PINK DAWN CHITALPA	24"BOX	LOW	4,398.24
							64,847.76 SF TOTAL
SYMBOL	CODE	QTY	BOTANICAL NAME	COMMON NAME	CONT	WATER USE	
GROUND COVERS							
	FES MAR	12,875 SF	FESTUCA ARUNDINACEA 'MARATHON II'	MARATHON II FESCUE	SOD	HIGH	

LOT COVERAGE:

CATEGORY	SF	% COVER
NEW LANDSCAPING	97,702	27.0
NATURAL LANDSCAPING	46,194	12.7
PAVING (ROADS, WALKS)	108,638	30.0
BUILDINGS	109,755	30.3
TOTAL:	362,289	100.0

CAP ITEM 3049:

PERCENTAGE TREE CANOPY COVER*: 17.9%

PERCENTAGE SITE PERMEABLE COVER**: 39.7%

*SEE CANOPY COVER ON PLANT LEGEND

**SEE LOT COVERAGE; TOTAL INCLUDES NEW AND NATURAL LANDSCAPING

REFERENCE NOTES LEGEND

CODE	DESCRIPTION
1	5' HEIGHT TAN PRECISION BLOCK SCREEN WALL, SEE CONCEPTUAL WALL AND FENCING PLAN
2	BENCH WITH BACK
3	LAWN PLAY AREA
4	CONCRETE WALKS - NATURAL GREY COLOR, MEDIUM BROOM FINISH. ALL PEDESTRIAN PAVING (BOTH DECORATIVE AND STANDARD) SHALL COMPLY WITH THE MOST CURRENT EDITION OF THE AMERICAN DISABILITY ACT.
5	PICNIC TABLES
6	DECOMPOSED GRANITE
7	DOG PARK ENCLOSED WITH 4' HEIGHT TUBE STEEL FENCE AND SELF-CLOSING GATES
8	ACTIVE TURF AREA, 195' X 88'
9	5' HEIGHT TUBE STEEL FENCE, BLACK, SEE CONCEPTUAL WALL AND FENCING PLAN
10	DOG WASTE STATION
11	RETAINING WALL PER CIVIL EINGEER'S PLANS.

LANDSCAPE MAINTENANCE:

ALL PROPOSED LANDSCAPE SHALL BE INSTALLED BY DEVELOPER AND MAINTAINED BY DEVELOPER UNTIL THE FORMATION OF A NEW HOMEOWNER'S ASSOCIATION (HOA), AT WHICH TIME ALL LANDSCAPE MAINTENANCE DUTIES WILL BE PERFORMED BY THE NEW HOA. MAINTENANCE DUTIES INCLUDE MOWING, TRIMMING GROUNDCOVER, BUSHES, AND TREES, WEEDING, TRASH REMOVAL, IRRIGATION, AND ROUTINE IRRIGATION SYSTEM REVIEWS AND ADJUSTMENTS AND REPAIRS.

SHEET INDEX

SHEET	DESCRIPTION
CL-1.1	CONCEPTUAL LANDSCAPE PLAN
CL-1.2	CONCEPTUAL WALL & FENCE PLAN
CL-1.3	CONCEPTUAL PLANT PALETTE
CL-1.4	CONCEPTUAL AMENITIES PLAN
CL-2.1	CONCEPTUAL EXISTING VEGETATION DISPOSITION PLAN

SCALE: 1"=40'-0"

0 20' 40' 80'

CONCEPTUAL LANDSCAPE PLAN

STREET TREE & TREE SPACING NOTE:

STREET TREES AND OTHER TREES SHALL BE SPACED:

1. 8 FEET FROM TRANSFORMERS, CABLE, AND PULL BOXES.
2. 5' FROM MAILBOXES.
3. 5 FEET FROM FIRE HYDRANTS, ALL SIDES.
4. 10 FEET FROM CENTERLINE OF ALL UTILITY LINES WITHOUT EASEMENTS (SEWER, WATER, STORM DRAINS, DOUBLE CHECK DETECTORS, AIR RELIEF VALVES, AND GAS).
5. 10 FEET FROM EASEMENT BOUNDARIES (SEWER, WATER, STORM DRAINS, ACCESS OR OTHER UTILITIES).
6. 10 FEET FROM DRIVEWAYS (UNLESS A LINE OF SIGHT IS DETERMIEND BY THE TRAFFIC DIVISION TO BE OTHERWISE)
7. 10' FROM TRAFFIC AND DIRECTIONAL SIGNS.
8. 15 FEET (MINIMUM) FROM STREETLIGHTS, OTHER UTILITY POLES, (DETERMINED BY SPECIFICATIONS).
9. STREET TREES SHALL BE PLANTED 3' OUTSIDE RIGHT-OF-WAY IF THE RIGHT-OF-WAY DOES NOT ALLOW SPACE, SUBJECT TO THE CITY ENGINEER'S APPROVAL.
10. LINE OF SIGHT AT ARTERIALS, COLLECTOR AND LOCAL STREETS SHALL BE REVIEWED AND DETERMINED BY TRAFFIC ENGINEER. A MINIMUM OF TWENTY-FIVE FEET (25') FROM STREET INTERSECTION OR AS APPROVED BY THE TRAFFIC ENGINEER.
11. MINIMUM FIFTEEN FEET (15') STREETLIGHT AND STOP SIGN OR CLEARANCE DETERMINED BY SPECIFICATIONS.
12. SCREEN ALL UTILITIES ACCORDING TO SPECIFIC AGENCY REQUIREMENTS.

FIRE DEPARTMENT NOTES:

1. LANDSCAPE IMPROVEMENT PLAN SET AND INSTALLATION ARE REQUIRED TO IMPLEMENT APPROVED FIRE DEPT. REGULATIONS, CODES, AND STANDARDS AT THE TIME OF PROJECT APPROVAL.
2. ALL FIRE HYDRANTS, DOUBLE CHECK DETECTORS, POST INDICATING VALVES, AND FIRE DEPARTMENT CONNECTIONS SHALL BE PROVIDED WITH A 3-FOOT CLEARANCE AROUND ALL FIRE APPARATUSES.
3. ALL TREES AT MATURITY SHALL MEET A HORIZONTAL CLEARANCE ALONG ALL ROADWAYS FROM CURB TO CURB. HORIZONTAL ROADWAY CLEARANCE FOR A ONE-STORY BUILDING IS 28-FEET WIDE.
4. ALL TREES AT MATURITY SHALL MEET A VERTICAL CLEARANCE OF 14-FEET FROM THE TOP OF THE ROADWAY TO THE LOWEST BRANCHES.

PLANTING NOTE:

THE SELECTION OF PLANT MATERIAL IS BASED ON CULTURAL, AESTHETIC, AND MAINTENANCE CONSIDERATIONS. ALL PLANTING AREAS SHALL BE PREPARED WITH APPROPRIATE SOIL AMENDMENTS, FERTILIZERS, AND APPROPRIATE SUPPLEMENTS BASED UPON A SOILS REPORT FROM AN AGRICULTURAL SUITABILITY SOIL SAMPLE TAKEN FROM THE SITE. GROUND COVERS OR BARK MULCH SHALL FILL IN BETWEEN THE SHRUBS TO SHIELD THE SOIL FROM THE SUN, EVAPOTRANSPORATION AND RUN-OFF. ALL THE FLOWER AND SHRUB BEDS SHALL BE MULCHED TO A 3" DEPTH TO HELP CONSERVE WATER, LOWER THE SOIL TEMPERATURE AND REDUCE WEED GROWTH. THE SHRUBS SHALL BE ALLOWED TO GROW IN THEIR NATURAL FORMS. ALL LANDSCAPE IMPROVEMENTS SHALL FOLLOW THE CITY OF OCEANSIDE GUIDELINES.

RECREATIONAL LAWNS:

PROJECT SHALL BE CONSISTENT WITH AB 1572 AND HAVE NO NON-FUNCTIONAL TURF AREAS IN HOA COMMON AREAS. ALL TURF/LAWN AREAS PROPOSED IN RECREATIONAL OPEN SPACE AREAS AND ARE OF SIZES TO MAKE THEM FUNCTIONAL

WATER METER:

ALL COMMON AREAS WILL BE IRRIGATED BY A DEDICATED IRRIGATION METER MANAGED AND PAID FOR BY THE HOA.

TRUE NATURE
LANDSCAPE ARCHITECTURE

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Date 5/10/2024

Revisions
07/02/2024 PLN PLCK 1
10/25/2024 PLN PLCK 2
04/14/2025 PLN PLCK 3

Garrison Street Residential Development
333 Garrison Street
Oceanside, California, 92054

REGISTERED LANDSCAPE ARCHITECT
KIMBERLY J. TRUE
NO. 5596
SIGNATURE
4/30/2027
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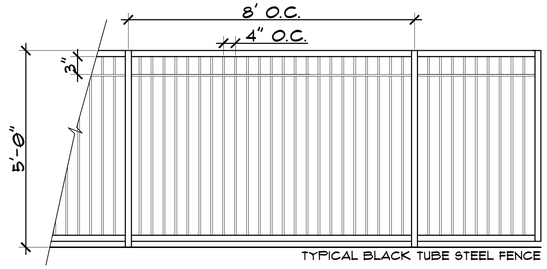
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APN 162-020-26
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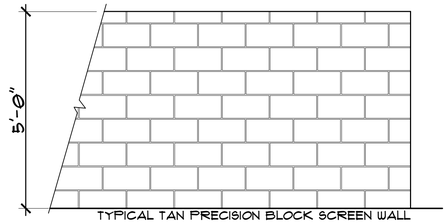
TUBE STEEL FENCE



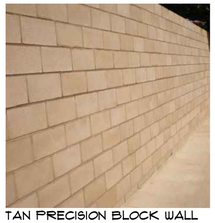
TYPICAL BLACK TUBE STEEL FENCE



TAN PRECISION BLOCK WALL



TYPICAL TAN PRECISION BLOCK SCREEN WALL



TAN PRECISION BLOCK WALL

NOTE: RETAINING WALLS TO BE OF SAME MATERIAL, COLOR, AND PATTERN, HEIGHT PER CIVIL ENGINEER'S GRADING PLANS.

CONCEPTUAL WALL & FENCE PLAN

TRUE NATURE
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ARBUTUS MARINA


AUSTRALIAN WILLOW


SWAN HILL FRUITLESS OLIVE


DESERT MUSEUM PALO VERDE


COAST LIVE OAK


PINK DAWN CHITALPA


PINK MELALEUCA


AGAVE BLUE FLAME


TREE ALOE


RED ALOE


HARMONY KANGAROO PAWS


DWARF BOTTLEBRUSH


PRIDE OF MADEIRA


PEACHES AND CREAM GREVILLEA


BLUE GRAMA


JESTER CONEBUSH


SAFARI GOLDSTRIKE CONEBUSH


SAFARI SUNSET CONEBUSH


LITTLE OLLIE


MEXICAN SAGE


COPPER CANYON DAISY


BLUE GEM COAST ROSEMARY


ORANGE FLAME VINE


ROYAL TRUMPET VINE


LOWFAST BARBERRY


CAMPFIRE CRASSULA


MYOPORUM


BLUE CHALKSTICKS


FAIRY CRASSULA

CONCEPTUAL PLANT PALETTE

SYMBOL	BOTANICAL NAME	COMMON NAME	CONT	WATER USE	REMARKS
TREES					
	ARBUTUS X 'MARINA'	MARINA STRAWBERRY TREE STANDARD	24"BOX	LOW	STANDARD, DOUBLE STAKE. 2" CALIPER,
	GEIJERA PARVIFLORA	AUSTRALIAN WILLOW	24"BOX	LOW	STANDARD, DOUBLE STAKE. 2" CALIPER.
	MELALEUCA NESOPHILA	PINK MELALEUCA	15 GAL	LOW	1.5" CALIPER
	OLEA EUROPAEA 'SWAN HILL'	SWAN HILL FRUITLESS OLIVE	36"BOX	LOW	MULTI. 3" CALIPER.
	PARKINSONIA X 'DESERT MUSEUM'	DESERT MUSEUM PALO VERDE	36"BOX	LOW	STANDARD, DOUBLE STAKE. 3" CALIPER.
	QUERCUS AGRIFOLIA	COAST LIVE OAK	15 GAL	LOW	STANDARD, DOUBLE STAKE. 1.5" CALIPER.
	X CHITALPA TASHKENTENSIS 'PINK DAWN'	PINK DAWN CHITALPA	24"BOX	LOW	STANDARD, DOUBLE STAKE. 2" CALIPER.

	BOTANICAL NAME	COMMON NAME	SIZE	WATER USE	REMARKS
SHRUBS					
	AGAVE ATTENUATA 'NOVA'	BLUE FOXTAIL AGAVE	5 GAL	LOW	
	AGAVE WEBERI 'ARIZONA STAR'	VARIEGATED WEBER'S AGAVE	5 GAL	LOW	
	AGAVE X 'BLUE FLAME'	BLUE FLAME AGAVE	5 GAL	LOW	
	ALOE ARBORESCENS	TREE ALOE	5 GAL	LOW	
	ALOE CAMERONII	RED ALOE	5 GAL	LOW	
	ANIGOZANTHOS X 'HARMONY'	HARMONY YELLOW KANGAROO PAW	5 GAL	LOW	
	ARBUTUS UNEDO 'ELFIN KING'	ELFIN KING STRAWBERRY TREE	5 GAL	LOW	
	BOUTELOUA GRACILIS 'BLONDE AMBITION'	BLUE GRAMA	1 GAL	LOW	
	CALLISTEMON VIMINALIS 'LITTLE JOHN'	LITTLE JOHN WEEPING BOTTLEBRUSH	5 GAL	LOW	
	DIANELLA REVOLUTA 'BIG REV'	BIG REV FLAX LILY	1 GAL	LOW	
	ECHIUM CANDICANS	PRIDE OF MADEIRA	1 GAL	LOW	
	GREVILLEA X 'PEACHES AND CREAM'	PEACHES AND CREAM GREVILLEA	15 GAL	LOW	
	LEUCADENDRON X 'JESTER'	JESTER CONEBUSH	5 GAL	LOW	
	LEUCADENDRON X 'SAFARI GOLDSTRIKE'	SAFARI GOLDSTRIKE CONEBUSH	5 GAL	LOW	
	LEUCADENDRON X 'SAFARI SUNSET'	SAFARI SUNSET CONEBUSH	5 GAL	LOW	
	LOMANDRA LONGIFOLIA 'ROMA 13'	PLATINUM BEAUTY® VARIEGATED MAT RUSH	5 GAL	LOW	
	MUHLENBERGIA CAPILLARIS 'REGAL MIST' TM	PINK MUHLY	1 GAL	LOW	
	MUHLENBERGIA DUBIA	PINE MUHLY	1 GAL	LOW	
	OLEA EUROPAEA 'MONTRA'	LITTLE OLLIE® OLIVE	5 GAL	LOW	
	PITTOSPORUM CRASSIFOLIUM 'COMPACTUM'	DWARF KARO PITTOSPORUM	5 GAL	LOW	
	SALVIA LEUCANTHA 'SANTA BARBARA'	SANTA BARBARA MEXICAN BUSH SAGE	1 GAL	LOW	
	TAGETES LEMMONII	COPPER CANYON DAISY	1 GAL	LOW	
	WESTRINGIA FRUTICOSA 'BLUE GEM'	BLUE GEM COAST ROSEMARY	1 GAL	LOW	
VINES					
	DISTICTIS X 'RIVERS'	ROYAL TRUMPET VINE	5 GAL	LOW	
	FICUS PUMILA MINIMA	CREEPING FIG	1 GAL	MEDIUM	STAKED.
	HARDENBERGIA VIOLACEA 'HAPPY WANDERER'	HAPPY WANDERER LILAC VINE	5 GAL	LOW	
	PYROSTEGIA VENUSTA	ORANGE FLAME VINE	5 GAL	LOW	

	BOTANICAL NAME	COMMON NAME	CONT	WATER USE	REMARKS
GROUND COVERS					
	ACACIA REDOLENS 'LOWBOY'	PROSTRATE ACACIA	1 GAL	VERY LOW	
	BOUGAINVILLEA X 'OO-LA-LA' TM	OO-LA-LA BOUGAINVILLEA	1 GAL	LOW	
	COTONEASTER DAMMERI 'LOWFAST'	LOWFAST BEARBERRY COTONEASTER	1 GAL	LOW	
	CRASSULA CAPITELLA 'CAMPFIRE'	CAMPFIRE CRASSULA	1 GAL OR 6" POT	LOW	
	CRASSULA MULTICAVA	FAIRY CRASSULA	1 GAL	LOW	
	FESTUCA ARUNDINACEA 'MARATHON II'	MARATHON II FESCUE	SOD	HIGH	
	GRAPTOPETALUM PARAGUAYENSE	GHOST PLANT	1 GAL OR 6" POT	LOW	
	LANTANA CAMARA 'YELLOW TRAILING'	YELLOW SPREADING LANTANA	1 GAL	LOW	
	MYOPORUM X 'PUTAH CREEK'	PUTAH CREEK MYOPRORUM	1 GAL	LOW	
	SEDUM NUSSBAUMERIANUM	COPPERTONE STONECROP	1 GAL OR 6" POT	LOW	
	SENECIO MANDRALISCAE 'BLUE CHALK STICKS'	SENECIO	4"POT	LOW	
	VERBENA LILACINA 'DE LA MINA'	LILAC VERBENA	1 GAL	LOW	

SCALE: 1"=40'-0"

0 20' 40' 80'

CONCEPTUAL PLANT PALETTE

TRUE NATURE
LANDSCAPE ARCHITECTURE

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REFERENCE NOTES LEGEND

CODE	DESCRIPTION
1	5' HEIGHT TAN PRECISION BLOCK SCREEN WALL, SEE CONCEPTUAL WALL AND FENCING PLAN
2	BENCH WITH BACK
3	LAWN PLAY AREA
4	CONCRETE WALKS - NATURAL GREY COLOR, MEDIUM BROOM FINISH. ALL PEDESTRIAN PAVING (BOTH DECORATIVE AND STANDARD) SHALL COMPLY WITH THE MOST CURRENT EDITION OF THE AMERICAN DISABILITY ACT.
5	PICNIC TABLES
6	DECOMPOSED GRANITE
7	DOG PARK ENCLOSED WITH 4' HEIGHT TUBE STEEL FENCE AND SELF-CLOSING GATES
8	ACTIVE TURF AREA, 105' X 88'
9	5' HEIGHT TUBE STEEL FENCE, BLACK, SEE CONCEPTUAL WALL AND FENCING PLAN
10	DOG WASTE STATION

STATISTICS:
- 10,300 SF RECREATION AREA, COMMON OPEN SPACE
- 9,437 SF ACTIVE TURF LAWN (~105' X 88')
- TWO (2) PICNIC TABLES, ONE ADA ACCESSIBLE
- ACCESSIBLE D.G. PICNIC AREA SURFACING
- CURVED BENCH WITH BACK
- WATERWISE LANDSCAPE PERIMETER

TURF PROPOSED OVER STORMWATER CHAMBER SYSTEM. TREES PROPOSED CLEAR OF STORM DRAIN LINES (SPECIES DO NOT HAVE INVASIVE ROOTS). DAYTIME USE ONLY. 4 PARKING SPACES PROVIDED NEARBY.

AMENITY AREA 1 - ACTIVE TURF & SEATING

SCALE: 1"=20'-0"
0 10' 20' 40'



REFERENCE NOTES LEGEND

CODE	DESCRIPTION
1	5' HEIGHT TAN PRECISION BLOCK SCREEN WALL, SEE CONCEPTUAL WALL AND FENCING PLAN
2	BENCH WITH BACK
3	LAWN PLAY AREA
4	CONCRETE WALKS - NATURAL GREY COLOR, MEDIUM BROOM FINISH. ALL PEDESTRIAN PAVING (BOTH DECORATIVE AND STANDARD) SHALL COMPLY WITH THE MOST CURRENT EDITION OF THE AMERICAN DISABILITY ACT.
5	PICNIC TABLES
6	DECOMPOSED GRANITE
7	DOG PARK ENCLOSED WITH 4' HEIGHT TUBE STEEL FENCE AND SELF-CLOSING GATES
8	ACTIVE TURF AREA, 105' X 88'
9	5' HEIGHT TUBE STEEL FENCE, BLACK, SEE CONCEPTUAL WALL AND FENCING PLAN
10	DOG WASTE STATION

STATISTICS:
- 16,800 SF RECREATION AREA, COMMON OPEN SPACE
- 1,600 SF LAWN FOR DOG RUN, REAL OR ARTIFICIAL TURF
- THREE (3) BENCHES WITH BACK AT DOG RUN
- ENCLOSURE FENCE WITH SELF-CLOSING GATES
- DOG WASTE STATION
- WATERWISE LANDSCAPE PERIMETER
- LINEAR PARK OPEN SPACE WITH FIVE LAWN AREAS AND BENCHES ALONG BASE OF SLOPE, SEE CL-1.1 FOR ENTIRE OPEN SPACE LAYOUT.

AMENITY AREA 2

SCALE: 1"=10-0"
0 5' 10' 20'

CONCEPTUAL AMENITIES PLAN

TRUE NATURE
LANDSCAPE ARCHITECTURE

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EXISTING TREE LEGEND

CODE	BOTANICAL NAME	COMMON NAME
COR	CORYMBIA CITRIODORA	LEMON-SCENTED GUM
CUP	CUPANIOPSIS ANACARDIOIDES	CARROTWOOD
EUC	EUCALYPTUS POLYANTHEMOS	SILVER DOLLAR GUM
FRA	FRAXINUS UHDEI	SHAMEL ASH
JUN	JUNIPERUS CHINENSIS	CHINESE JUNIPER
MYO	MYOPORUM LAETUM	MYOPORUM
PIN HAL	PINUS HALEPENSIS	ALEPPO PINE
PIN PIN	PINUS PINEA	ITALIAN STONE PINE
TIL	TILIA AMERICANA	AMERICAN LINDEN
TIP	TIPUANA TIPU	TIPU TREE
ULM	ULMUS PARVIFOLIA	CHINESE ELM

TREE DISPOSITION TABLE

TREE #	BOTANICAL NAME	DBH	DISPOSITION	REASON	MITIGATION
558	JUNIPERUS CHINENSIS	9	REMOVE	GRADING	YES - 9"
559	EUCALYPTUS POLYANTHEMOS	11	REMOVE	DISEASED	NO
560	JUNIPERUS CHINENSIS	5	REMOVE	GRADING	YES - 5"
561	PINUS PINEA (MULTI)	53	REMOVE	GRADING	YES - 29"
562	PINUS HALEPENSIS	20	REMOVE	POOR HEALTH	NO
563	EUCALYPTUS POLYANTHEMOS	20	OFFSITE	-	-
568	MYOPORUM LAETUM	13	REMOVE	POOR HEALTH	NO
569	PINUS HALEPENSIS	13	REMOVE	GRADING	YES - 13"
570	PINUS HALEPENSIS	14	REMOVE	GRADING	YES - 14"
571	PINUS HALEPENSIS	16	REMOVE	GRADING	YES - 16"
572	PINUS HALEPENSIS	10	REMOVE	GRADING	YES - 10"
573	JUNIPERUS CHINENSIS	6	REMOVE	GRADING	YES - 6"
574	MYOPORUM LAETUM	5.5	REMOVE	POOR HEALTH	NO
575	PINUS HALEPENSIS	10.5	REMOVE	POOR HEALTH	NO
576	PINUS HALEPENSIS	20	REMOVE	GRADING	YES - 20"
577	PINUS HALEPENSIS	20	REMOVE	GRADING	YES - 20"
578	PINUS HALEPENSIS	18	REMOVE	DISEASED	NO
579	FRAXINUS UHDEI	33	REMOVE	GRADING	YES - 33"
580	FRAXINUS UHDEI	19.5	REMOVE	POOR HEALTH	NO
581	FRAXINUS UHDEI	16	REMOVE	POOR HEALTH	NO
582	FRAXINUS UHDEI	16	REMOVE	POOR HEALTH	NO
583	TILIA AMERICANA	7.5	REMOVE	SEVERE DECLINE	NO
584	ULMUS PARVIFOLIA	18	REMOVE	DYING	NO
585	FRAXINUS UHDEI	15.5	REMOVE	POOR HEALTH	NO
586	CORYMBIA CITRIODORA	21	REMOVE	GRADING	YES - 21"
587	TILIA AMERICANA	27	REMOVE	POOR HEALTH	NO
588	CUPANIOPSIS ANACARDIOIDES	8	REMOVE	GRADING	YES - 8"
589	MYOPORUM LAETUM	10.5	REMOVE	GRADING (WALL)	YES - 10.5"
590	MYOPORUM LAETUM	9.5	REMOVE	POOR HEALTH	NO
591	MYOPORUM LAETUM	15.5	REMOVE	POOR HEALTH	NO
592	PINUS HALEPENSIS	17.5	PRESERVE	PRUNE	NO
593	MYOPORUM LAETUM	11.5	REMOVE	POOR HEALTH	NO
594	FRAXINUS UHDEI	14	REMOVE	GRADING	YES - 14"
595	FRAXINUS UHDEI	17	REMOVE	POOR HEALTH	NO
596	FRAXINUS UHDEI	18	REMOVE	GRADING	YES - 18"
597	PINUS HALEPENSIS	22	PRESERVE	PRUNE	NO
598	PINUS HALEPENSIS	15	PRESERVE	PRUNE	NO
599	TIPUANA TIPU	12	REMOVE	GRADING	YES - 12"
600	TIPUANA TIPU	11	REMOVE	GRADING	YES - 11"
601	PINUS HALEPENSIS	29	REMOVE	GRADING	YES - 29"
602	PINUS HALEPENSIS	18.5	REMOVE	POOR HEALTH	NO
UTI	JUNIPERUS CHINENSIS	4.5	REMOVE	GRADING	YES - 4.5"

TREE MITIGATION & PROTECTION NOTES:

FINAL MITIGATION VALUE: 303" FOR 1:1 REPLACEMENT OF TREE CALIPER FOR NEW TREES MAY BE REQUIRED BY CITY OF OCEANSIDE PLANNING DEPARTMENT.

REFERENCE TREE SURVEY AND ARBORIST REPORT PREPARED BY GEORGE J. WIRTESM MS, RCA#738, OF CAL PACIFIC SCIENCES, DATED MARCH 27, 2024. THE SITE IS AN ABANDONED SCHOOL AND TREES HAVE NOT BEEN IRRIGATED OR MAINTAINED. TREES RECOMMENDED AS "CONSIDER REMOVAL" BY ARBORIST ARE NOT INCLUDED IN MITIGATION QUANTITIES AS THESE TREES ARE TYPICALLY IN SEVERE DECLINE AND WOULD NEED TO BE REMOVED REGARDLESS OF DEVELOPMENT.

EXISTING TREES NOTED AS "REMOVE" SHALL BE REMOVED AND CHIPPED ON SITE. CHIPS MAY BE USED FOR EROSION CONTROL PURPOSES DURING CONSTRUCTION OR MAY BE SPREAD ON EXISTING SLOPES TO CONTROL WEEDS.

EXISTING TREES NOTED AS "PRESERVE" SHALL BE PROTECTED IN PLACE. NO MECHANICAL OR OTHER GRADING WHICH WOULD ALTER GROUND ELEVATION AROUND BASE OR WITHIN DRIPLINE OF TREES SHALL BE ALOWED, NO MECHANICAL EQUIPMENT OR TRENCHING WITIN THE DRIPLINE CAUSING DISTURBANCE TO TREE ROOTS SHALL OCCUR; NO EXCESSIVE PRUNING SHALL OCCUR; NO STORAGE OF EQUIPMENT SHALL OCCUR UNDER DRIPLINES; NO ACTIVITIES SHALL CAUSE SOIL COMPACTION AROUND TREE CANOPY OR TRUNK. IF EXISTING TREES TO BE PRESERVED ARE DAMAGED OR DESTROYED BY CONSTRUCTION ACTIVITIES, TREES SHALL BE REPLACED IN KIND WITH SAME SPECIES AND SIZE (DIAMETER AT BREAST HEIGHT) PER CITY REQUIREMENT.

SCALE: 1"=40'-0"

0 20' 40' 80'

CONCEPTUAL EXISTING VEGETATION DISPOSITION PLAN

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GARRISON STREET OCEANSIDE

TOWNHOMES

OCEANSIDE, CA

TRUE LIFE



SHEET INDEX

A0.00 COVER SHEET

CIVIL - TENTATIVE MAP

SHEET 1	TITLE SHEET
SHEET 2	SECTIONS / DETAILS
SHEET 3	SITE DETAILS / DRIVEWAY DETAILS
SHEET 4	EXISTING CONDITIONS
SHEET 5	TM / DEVELOPMENT PLAN
SHEET 6	TM / DEVELOPMENT PLAN
SHEET 7	OPEN SPACE & BUILDING TYPES
SHEET 8	BOUNDARIES & ENCUMBRANCES
SHEET 9	ACCESSIBLE PATHS
SHEET 10	SITE SETBACKS

CIVIL - CONCEPT GRADING PLAN

SHEET 1	TITLE SHEET
SHEET 2	EXISTING CONDITIONS
SHEET 3	CONCEPTUAL GRADING PLAN
SHEET 4	CONCEPTUAL GRADING PLAN
SHEET 5	BOUNDARIES & ENCUMBRANCES

LANDSCAPE

CL-1.1	CONCEPTUAL LANDSCAPE PLAN
CL-1.2	CONCEPTUAL WALL & FENCE PLAN
CL-1.3	CONCEPTUAL PLANT PALETTE
CL-1.4	CONCEPTUAL AMENITIES PLAN
CL-2.1	CONCEPTUAL EXISTING VEGETATION DISPOSITION PLAN

ARCHITECTURE

A1.00	SITE PLAN
A2.20	TOWNHOMES - ELEVATIONS
A2.21	TOWNHOMES - ELEVATIONS
A2.22	TOWNHOMES - ELEVATIONS
A2.23	TOWNHOMES - ELEVATIONS
A2.24	TOWNHOMES - ELEVATIONS
A2.25	TOWNHOMES - ELEVATIONS
A3.00	TOWNHOMES - BUILDING PLANS
A3.01	TOWNHOMES - BUILDING PLANS
A3.02	TOWNHOMES - BUILDING PLANS
A3.03	TOWNHOMES - BUILDING PLANS
A3.04	TOWNHOMES - BUILDING PLANS
A3.05	TOWNHOMES - BUILDING PLANS
A4.00	TOWNHOMES - UNIT PLANS
A4.01	TOWNHOMES - UNIT PLANS
A4.02	TOWNHOMES - UNIT PLANS
A4.03	TOWNHOMES - UNIT PLANS
A4.04	TOWNHOMES - UNIT PLANS
A4.05	TOWNHOMES - UNIT PLANS

Entitlement # : GPA24-00002, ZA24-00001, T24-00002, and D24-00010



Site Summary

Gross Site Area:	±8.3 Acres
Dwelling Units:	140 Units
Density:	17 du/ac
Lot Coverage:	30.3%

3 Story Townhomes A:

Plan	Type	Area	Quantity
P1	2 Bed/ 2.5 Bath	1364 sf Net	10 du
P2	2 Bed/ 2.5 Bath	1378 sf Net	20 du
P3	3 Bed/ 2.5 Bath	1561 sf Net	10 du
P4	3 Bed/ 3.5 Bath	1747 sf Net	20 du
P5	3 Bed/ 3.5 Bath	1788 sf Net	41 du
P6	4 Bed/ 3.5 Bath	1948 sf Net	17 du
P7	4 Bed/ 3.5 Bath	2093 sf Net	22 du
Total:			140 du

3 Story Townhomes Building Summary:

Bldg Type	Description	Quantity
Bldg A	4-Plex	1
Bldg B	7-Plex	3
Bldg C	8-Plex	7
Bldg D	4-Plex	2
Bldg E	5-Plex	3
Bldg F	6-Plex	6

Parking Required:

2+ Bed: 140 x 2/du	280 Spaces
Guest: 140 x 0.2 + 1	29 Spaces
Total Required:	309 Spaces

Parking Provided:

Garages:	280 Spaces	
Open parking:	38 Spaces	
Total Provided:	318 Spaces	(2.27/Unit)

Open Space Required:

140 du x 300 sf: 42,000 sf

Open Space Provided:

Private Townhome Balconies:	11,692 sf
Common Usable Open Space:	33,300 + sf
Total:	44,992 sf
	314 sf / du

Additional Development Standards (RM-C)

Density Required: 15.1-20.9 du/ac
Density Provided: 17 du/ac

Setbacks Required: Front - 15', Side - 5'/10', Corner Side - 10', Rear - 15'
Setbacks Provided: Front - 10' min., Side - 7' min., Corner Side - 10' min., Rear - 15' min.
Max Height: 36'-0
Max Height Provided: 36'-0"

NOTE: Buildings to be equipped with NFPA 13D sprinkler systems

EV EV Space with Charger

COLOR LEGEND - TYPE 'A'
A — STUCCO 1: SW 7757 HIGH REFLECTIVE WHITE
B — STUCCO/SIDING 2: SW 9621 CLEAN SLATE
C — STUCCO/SIDING 3: SW 7035 AESTHETIC WHITE
D — STUCCO/SIDING 4: SW 7076 CYBERSPACE
E — ENTRY DOOR 1 / METAL RAILING: SW 7076 CYBERSPACE
F — ENTRY DOOR 2: SW 7578 BORSCHT
G — GARAGE DOOR: SW 9621 CLEAN SLATE
I — BRICK VENEER: ENDICOTT MEDIUM IRONSPOT #77
J — STUCCO/SIDING 5: SW 9081 REDEND POINT

MATERIAL LEGEND - TYPE 'A'
1 — PARAPET ROOF
2 — SLIDING DOOR
3 — STUCCO, LIGHT SAND FINISH
4 — SMOOTH NICKEL GAP HORIZONTAL SIDING
5 — VINYL WINDOWS
6 — FIBER CEMENT TRIM
7 — FOAM TRIM W/ STUCCO OVER
8 — ENTRY DOOR
9 — SECTIONAL GARAGE
10 — LIGHT FIXTURE
11 — METAL RAILING
12 — UTILITY DOOR
13 — MODULAR BRICK VENEER - STACK BOND



LEFT



FRONT



RIGHT



REAR

COLOR LEGEND - TYPE 'A'	
A	STUCCO 1: SW 7757 HIGH REFLECTIVE WHITE
B	STUCCO/SIDING 2: SW 9621 CLEAN SLATE
C	STUCCO/SIDING 3: SW 7035 AESTHETIC WHITE
D	STUCCO/SIDING 4: SW 7076 CYBERSPACE
E	ENTRY DOOR 1 / METAL RAILING: SW 7076 CYBERSPACE
F	ENTRY DOOR 2: SW 7578 BORSCHT
G	GARAGE DOOR: SW 9621 CLEAN SLATE
I	BRICK VENEER: ENDICOTT MEDIUM IRONSPOT #77
J	STUCCO/SIDING 5: SW 9081 REDEND POINT

MATERIAL LEGEND - TYPE 'A'	
1	PARAPET ROOF
2	SLIDING DOOR
3	STUCCO, LIGHT SAND FINISH
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5	VINYL WINDOWS
6	FIBER CEMENT TRIM
7	FOAM TRIM W/ STUCCO OVER
8	ENTRY DOOR
9	SECTIONAL GARAGE
10	LIGHT FIXTURE
11	METAL RAILING
12	UTILITY DOOR
13	MODULAR BRICK VENEER - STACK BOND



LEFT



FRONT



RIGHT



REAR

COLOR LEGEND - TYPE 'A'	
A	STUCCO 1: SW 7757 HIGH REFLECTIVE WHITE
B	STUCCO/SIDING 2: SW 9621 CLEAN SLATE
C	STUCCO/SIDING 3: SW 7035 AESTHETIC WHITE
D	STUCCO/SIDING 4: SW 7076 CYBERSPACE
E	ENTRY DOOR 1 / METAL RAILING: SW 7076 CYBERSPACE
F	ENTRY DOOR 2: SW 7578 BORSCHT
G	GARAGE DOOR: SW 9621 CLEAN SLATE
I	BRICK VENEER: ENDICOTT MEDIUM IRONSPOT #77
J	STUCCO/SIDING 5: SW 9081 REDEND POINT

MATERIAL LEGEND - TYPE 'A'	
1	PARAPET ROOF
2	SLIDING DOOR
3	STUCCO, LIGHT SAND FINISH
4	SMOOTH NICKEL GAP HORIZONTAL SIDING
5	VINYL WINDOWS
6	FIBER CEMENT TRIM
7	FOAM TRIM W/ STUCCO OVER
8	ENTRY DOOR
9	SECTIONAL GARAGE
10	LIGHT FIXTURE
11	METAL RAILING
12	UTILITY DOOR
13	MODULAR BRICK VENEER - STACK BOND



LEFT(ENHANCED)



FRONT



RIGHT



REAR

COLOR LEGEND - TYPE 'B'
A STUCCO 1: SW 7667 ZIRCON
B STUCCO 2: SW 6554 LITE LAVENDER
C STUCCO 3 / METAL RAILING: SW 6033 BATEAU BROWN
D STUCCO 4: SW 7076 CYBERSPACE
E STUCCO 5: SW 7066 GRAY MATTERS
F WINDOW TRIM: SW 7757 HIGH REFLECTIVE
G SIDING 1: SW 9132 ACACIA HAZE
H SIDING 2: SW 9108 DOUBLE LATTE
I ENTRY DOOR: SW 6306 CORDIAL
J GARAGE DOOR: SW 9621 CLEAN SLATE

MATERIAL LEGEND - TYPE 'B'
1 PARAPET ROOF
2 SLIDING DOOR
3 STUCCO, LIGHT SAND FINISH
4 SMOOTH NICKEL GAP HORIZONTAL SIDING
5 VINYL WINDOWS
6 FIBER CEMENT TRIM
7 FOAM TRIM W/ STUCCO OVER
8 ENTRY DOOR
9 SECTIONAL GARAGE
10 LIGHT FIXTURE
11 METAL RAILING
12 UTILITY DOOR
13 WOODGRAIN SHIPLAP HORIZONTAL SIDING
14 STUCCO, SMOOTH FINISH



LEFT



FRONT



RIGHT



REAR

COLOR LEGEND - TYPE 'B'	
A	STUCCO 1: SW 7667 ZIRCON
B	STUCCO 2: SW 6554 LITE LAVENDER
C	STUCCO 3 / METAL RAILING: SW 6033 BATEAU BROWN
D	STUCCO 4: SW 7076 CYBERSPACE
E	STUCCO 5: SW 7066 GRAY MATTERS
F	WINDOW TRIM: SW 7757 HIGH REFLECTIVE
G	SIDING 1: SW 9132 ACACIA HAZE
H	SIDING 2: SW 9108 DOUBLE LATTE
I	ENTRY DOOR: SW 6306 CORDIAL
J	GARAGE DOOR: SW 9621 CLEAN SLATE

MATERIAL LEGEND - TYPE 'B'	
1	PARAPET ROOF
2	SLIDING DOOR
3	STUCCO, LIGHT SAND FINISH
4	SMOOTH NICKEL GAP HORIZONTAL SIDING
5	VINYL WINDOWS
6	FIBER CEMENT TRIM
7	FOAM TRIM W/ STUCCO OVER
8	ENTRY DOOR
9	SECTIONAL GARAGE
10	LIGHT FIXTURE
11	METAL RAILING
12	UTILITY DOOR
13	WOODGRAIN SHIPLAP HORIZONTAL SIDING
14	STUCCO, SMOOTH FINISH



LEFT



FRONT



RIGHT



REAR

COLOR LEGEND - TYPE 'B'
A STUCCO 1: SW 7667 ZIRCON
B STUCCO 2: SW 6554 LITE LAVENDER
C STUCCO 3 / METAL RAILING: SW 6033 BATEAU BROWN
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MATERIAL LEGEND - TYPE 'B'
1 PARAPET ROOF
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10 LIGHT FIXTURE
11 METAL RAILING
12 UTILITY DOOR
13 WOODGRAIN SHIPLAP HORIZONTAL SIDING
14 STUCCO, SMOOTH FINISH



LEFT



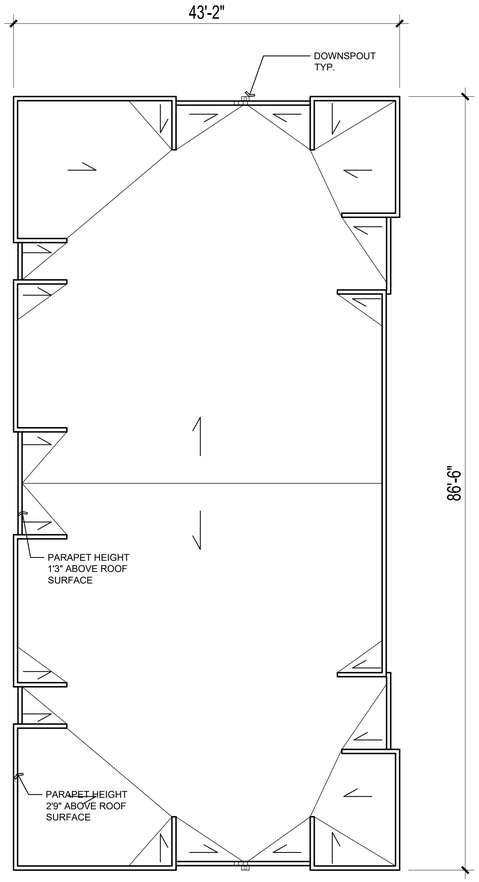
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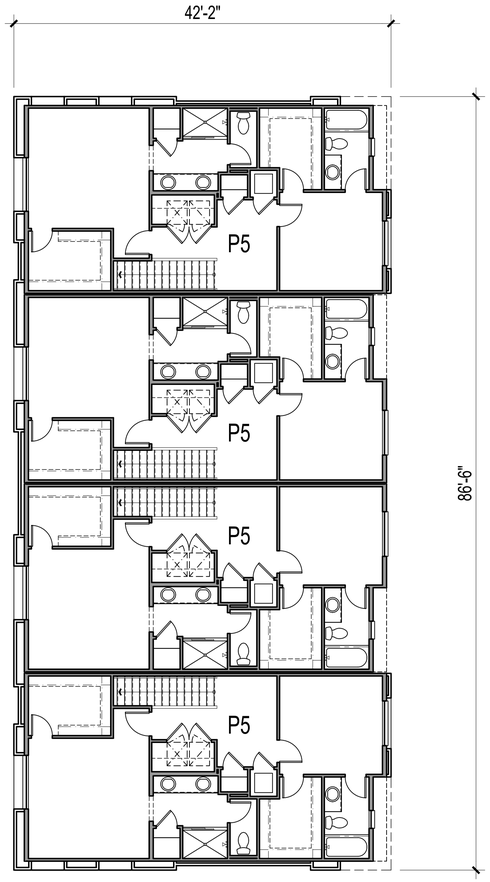
RIGHT



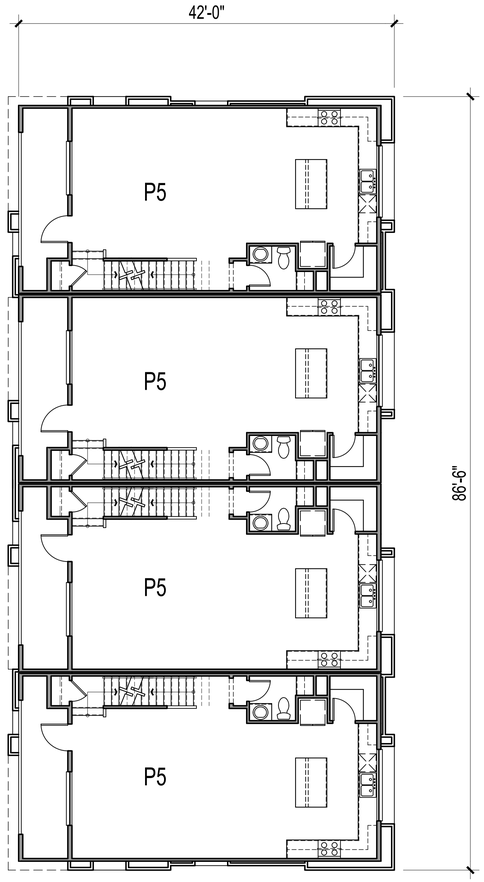
REAR



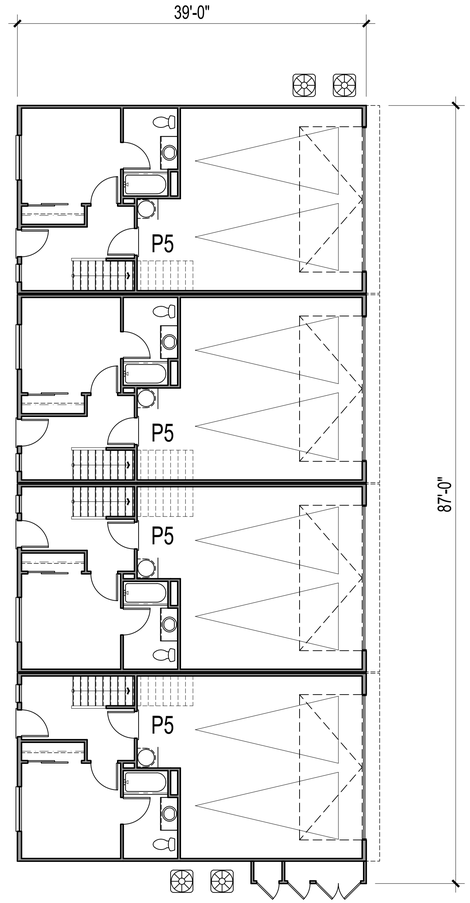
Roof Plan



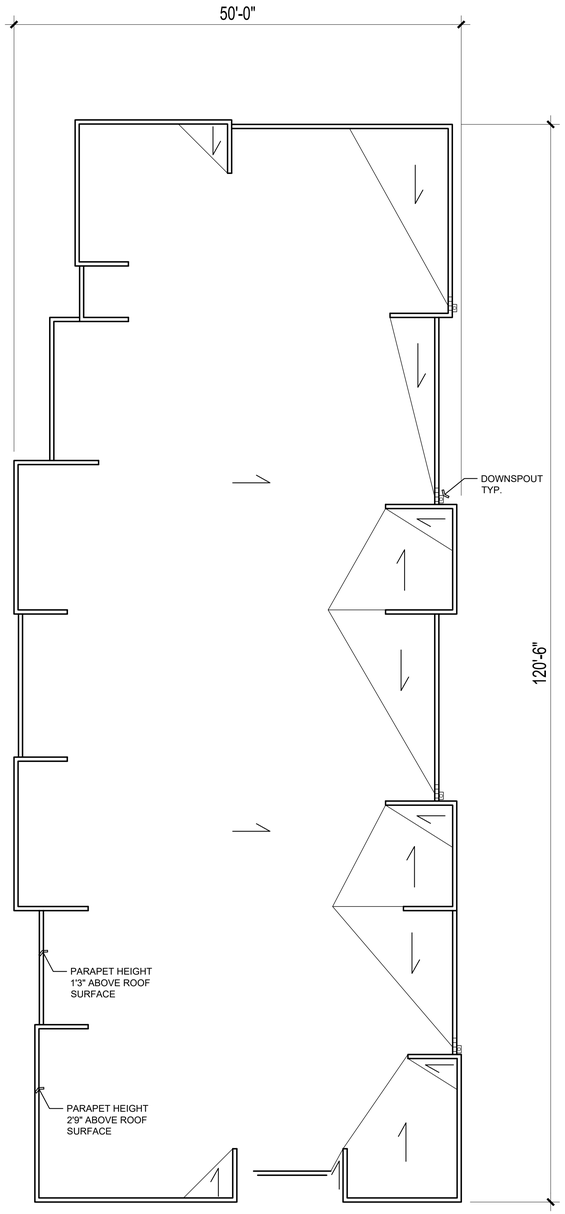
Third Floor
3422 SQ. FT.



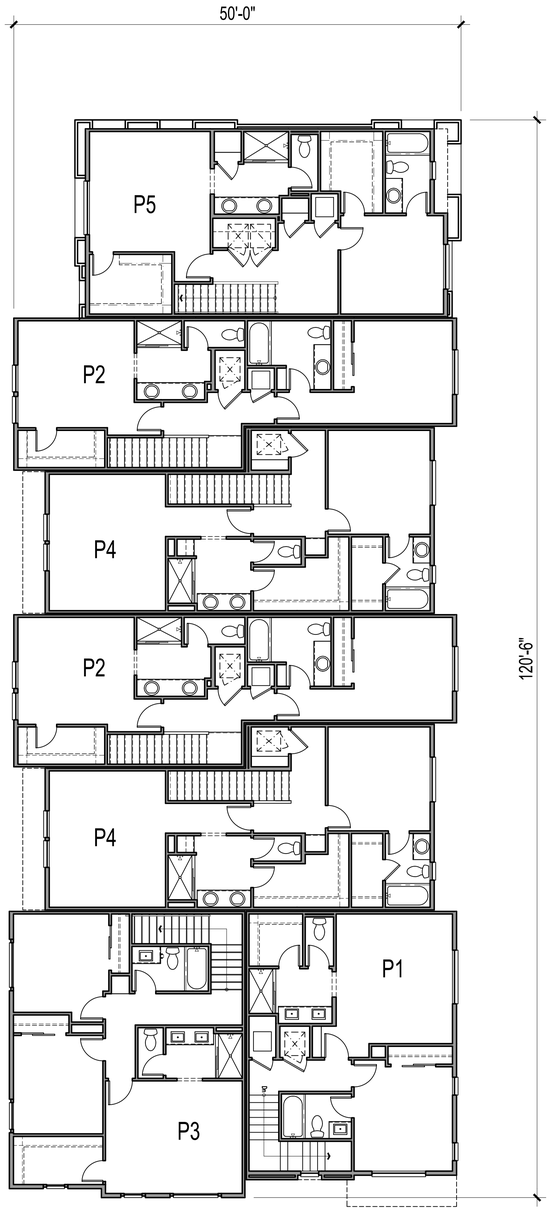
Second Floor
3422 SQ. FT.



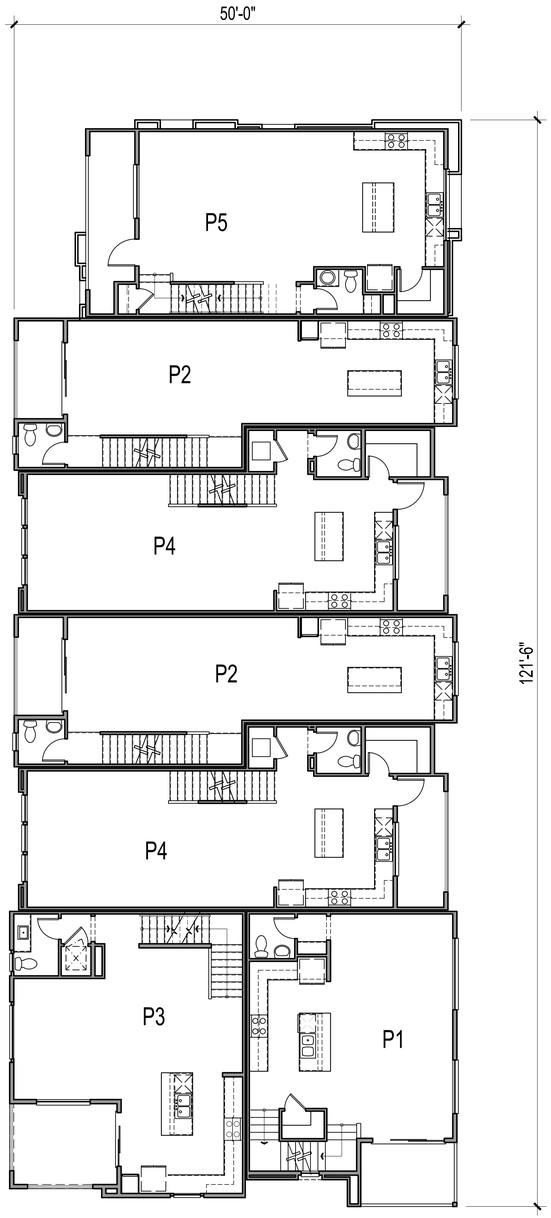
First Floor
3328 SQ. FT.



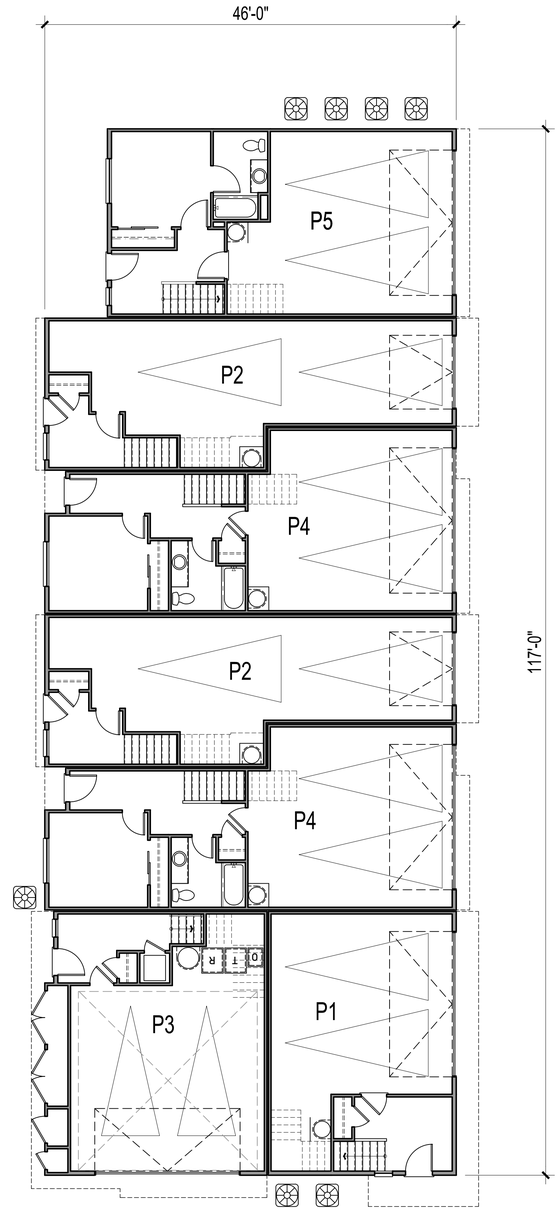
Roof Plan



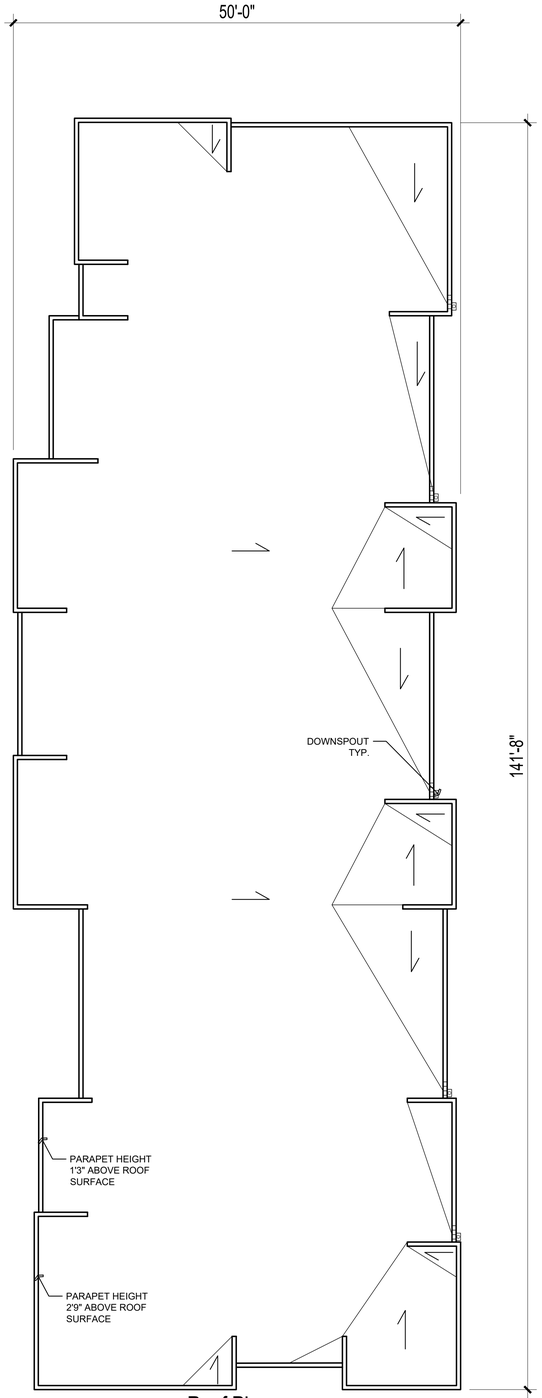
Third Floor
5307 SQ. FT.



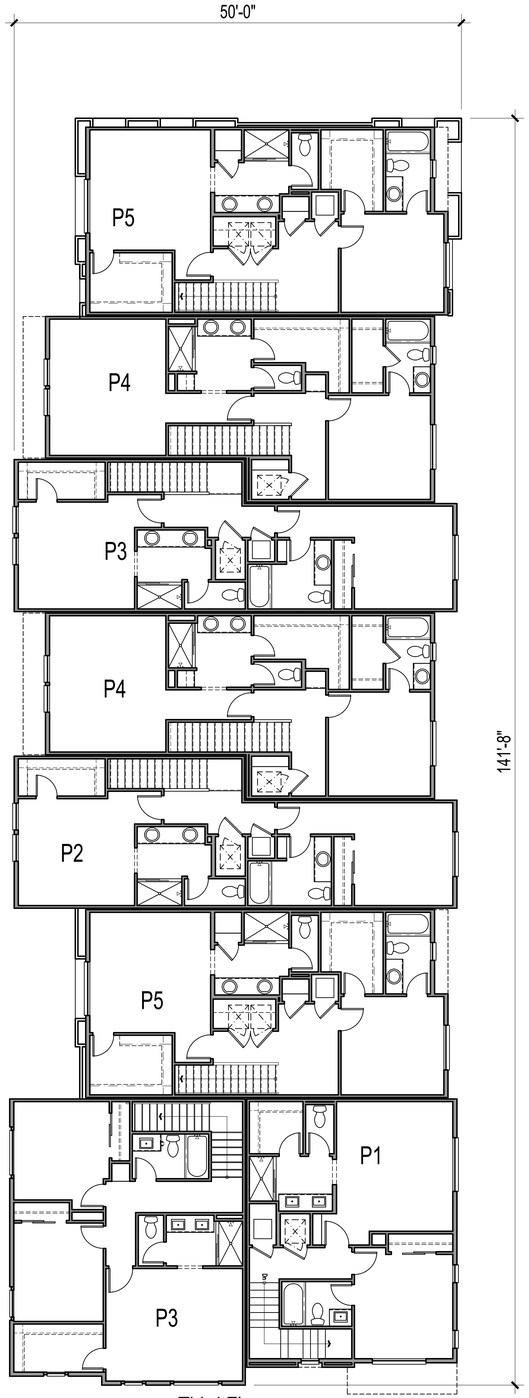
Second Floor
5490 SQ. FT.



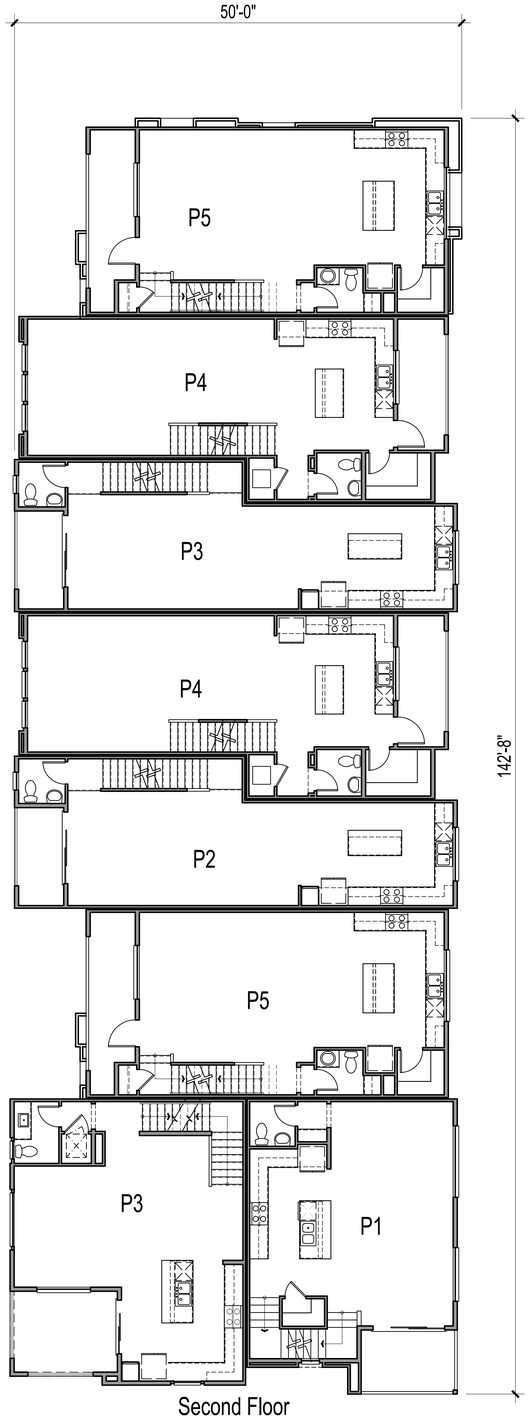
First Floor
5166 SQ. FT.



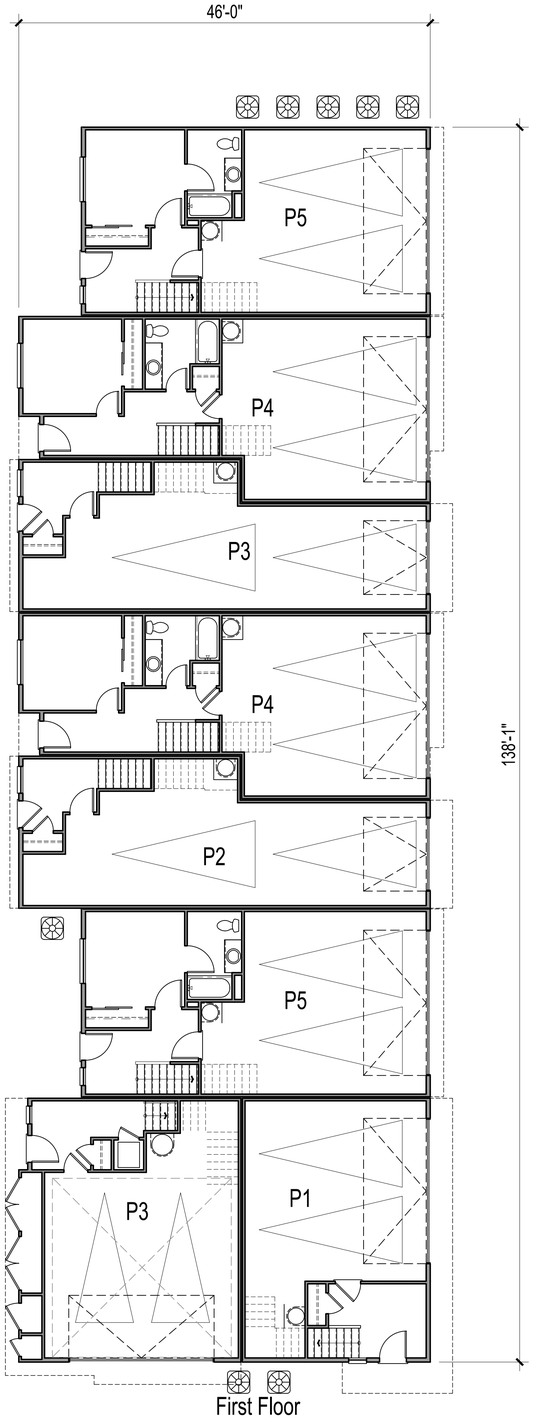
Roof Plan



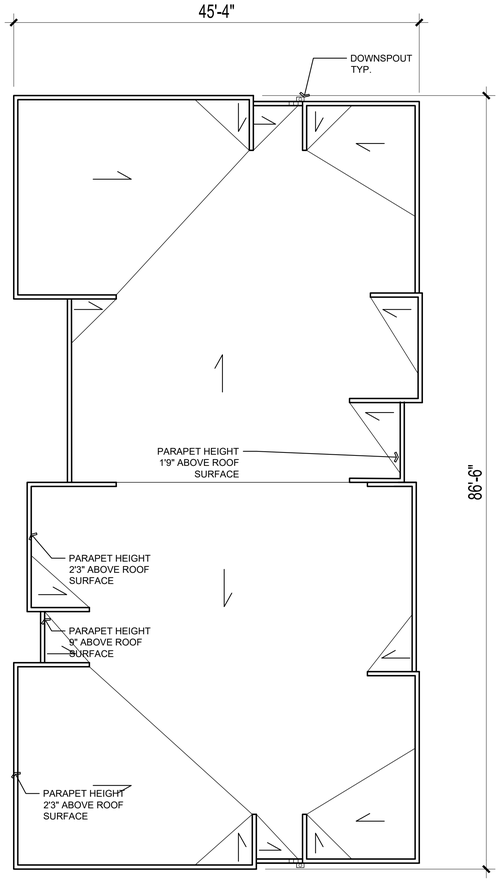
Third Floor
6161 SQ. FT.



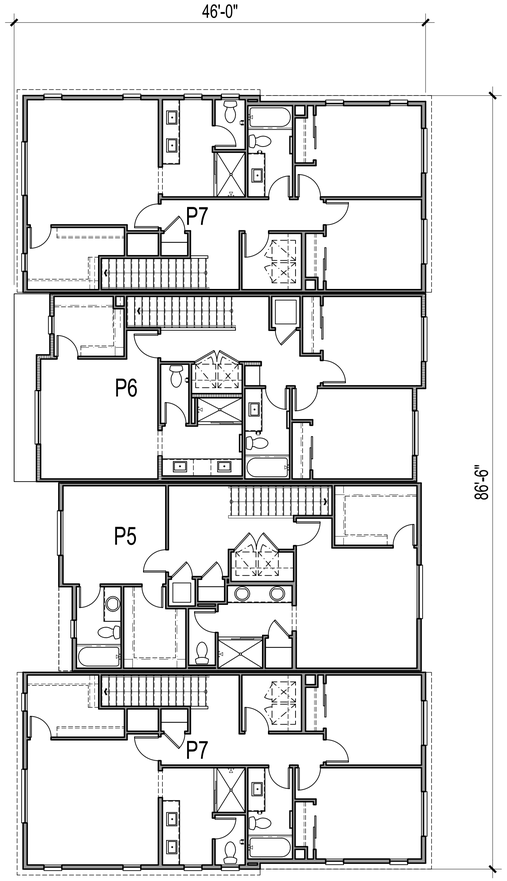
Second Floor
6353 SQ. FT.



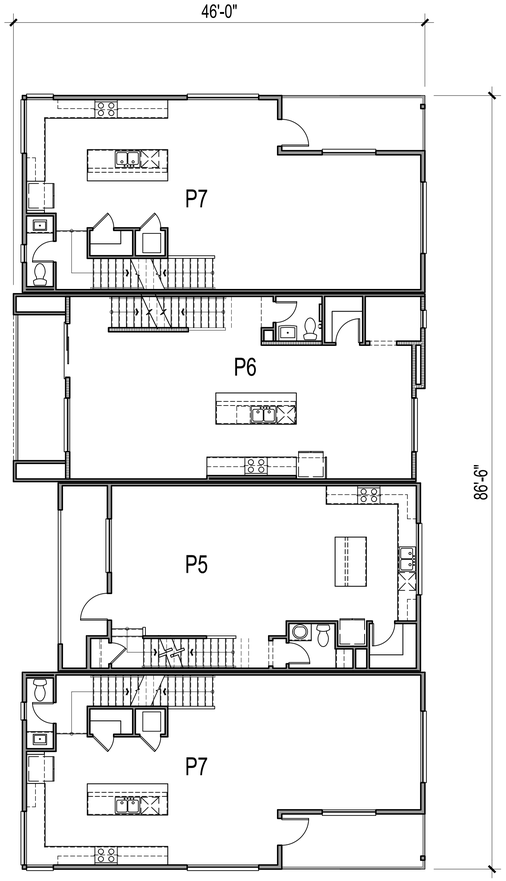
First Floor
5996 SQ. FT.



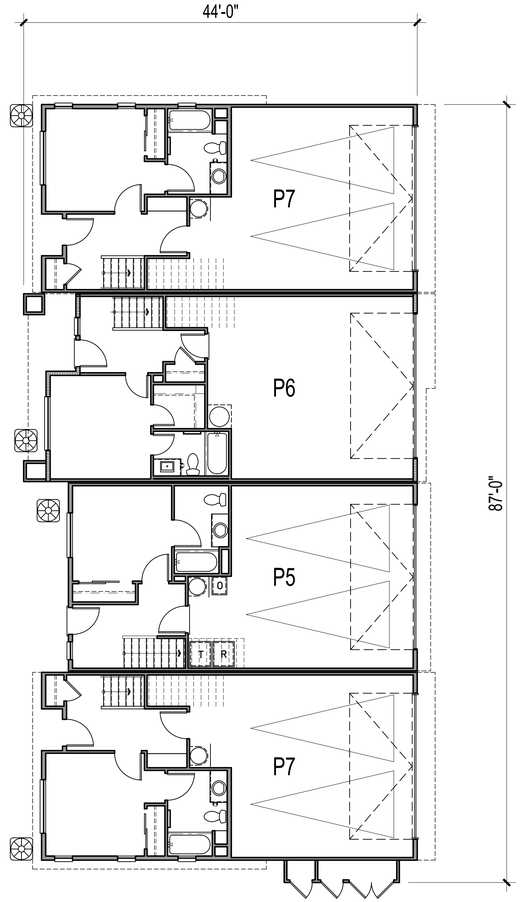
Roof Plan



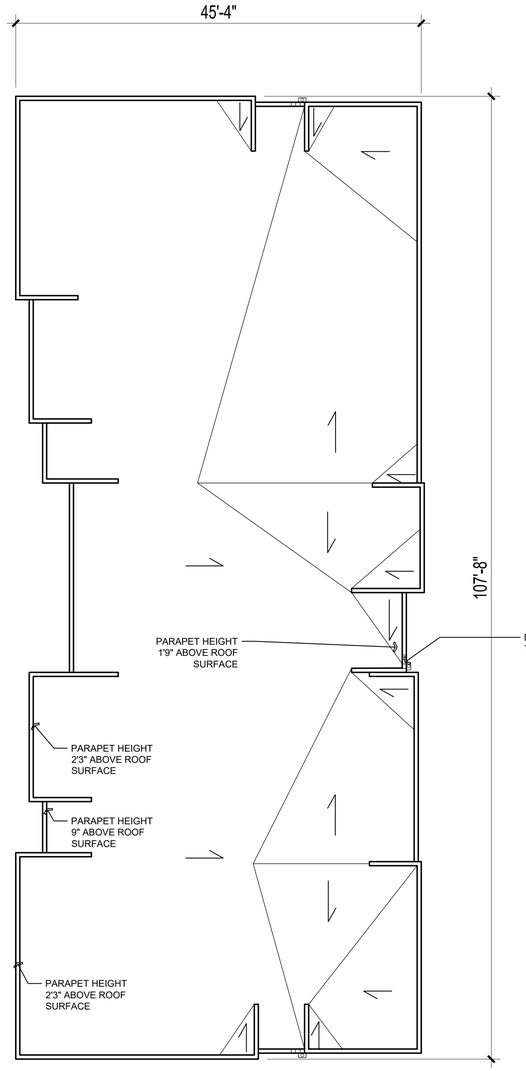
Third Floor
3665 SQ. FT.



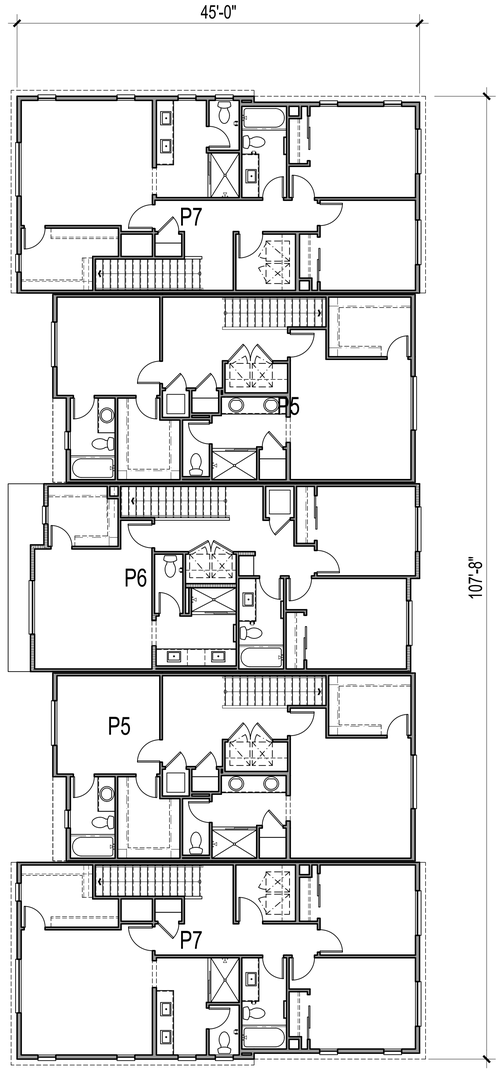
Second Floor
3718 SQ. FT.



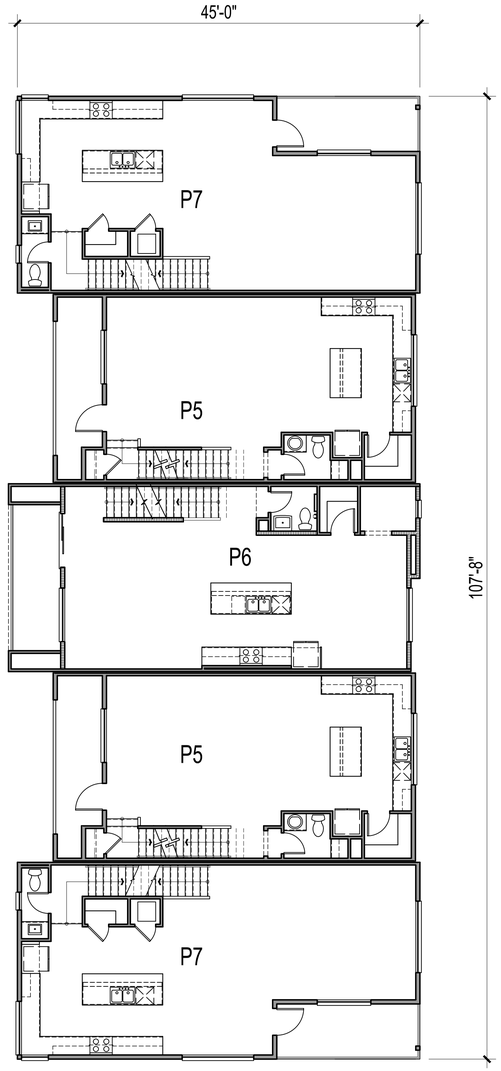
First Floor
3502 SQ. FT.



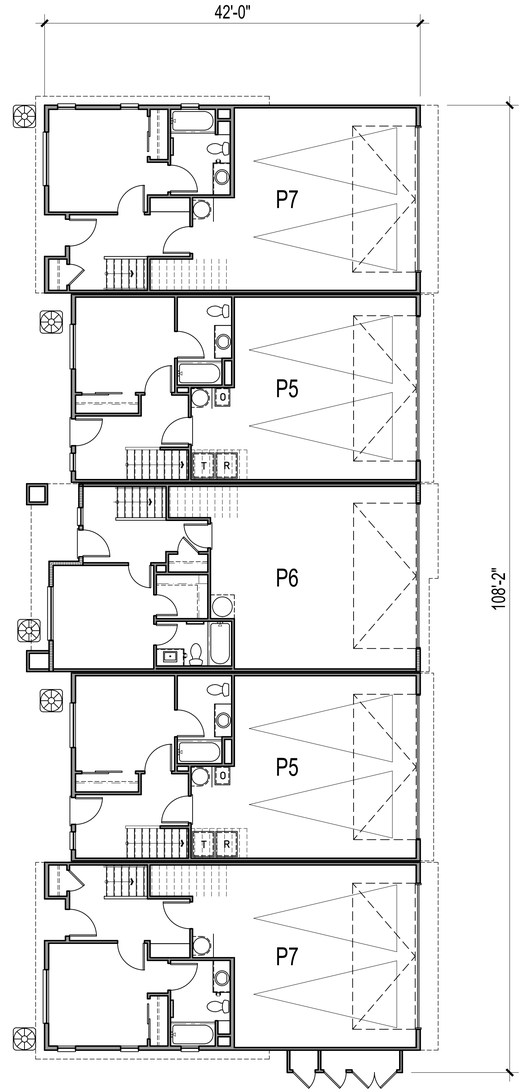
Roof Plan



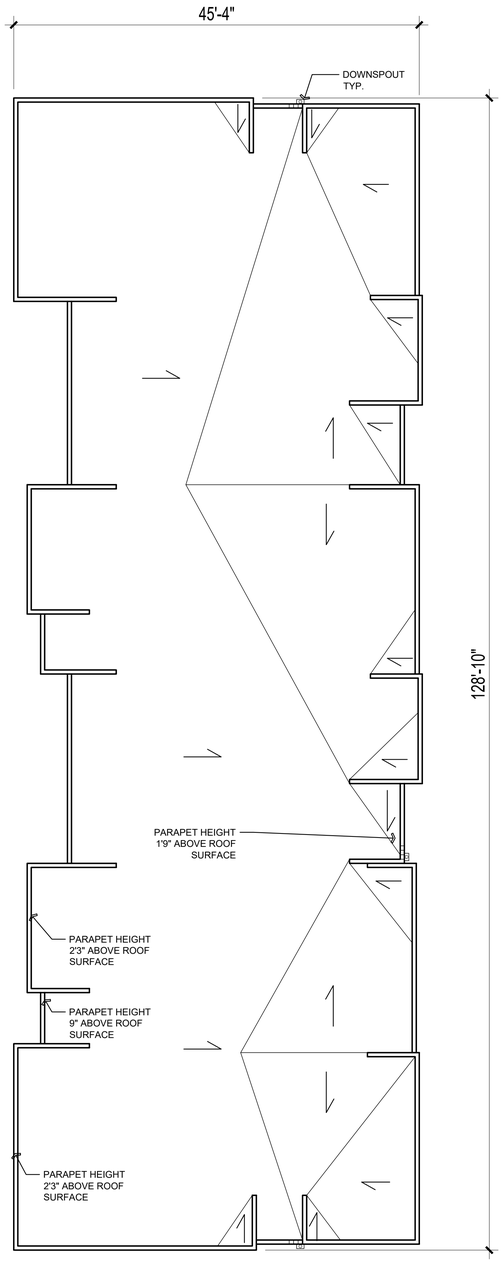
Third Floor
4520 SQ. FT.



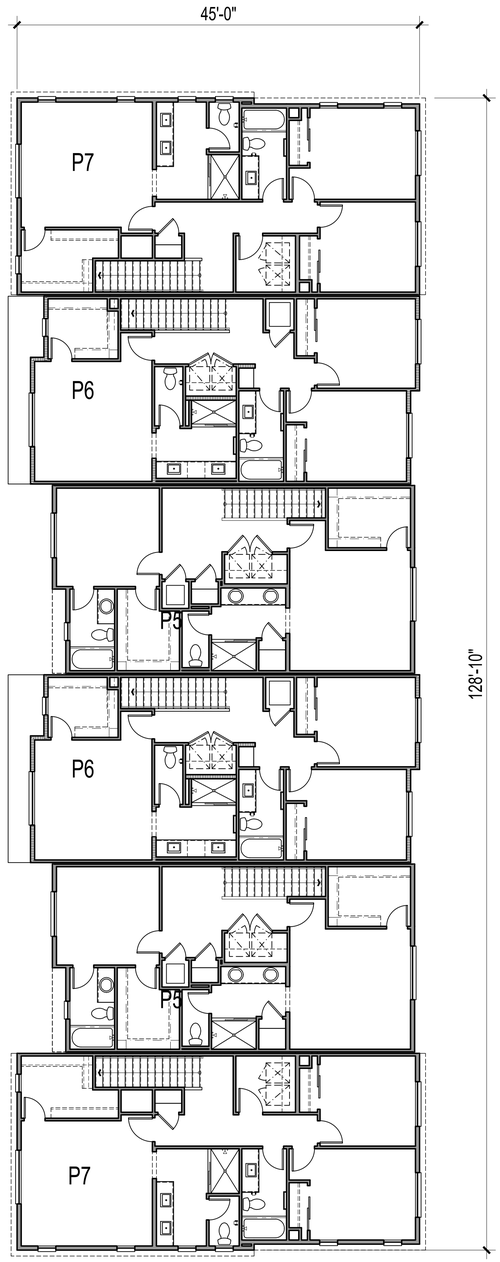
Second Floor
4613 SQ. FT.



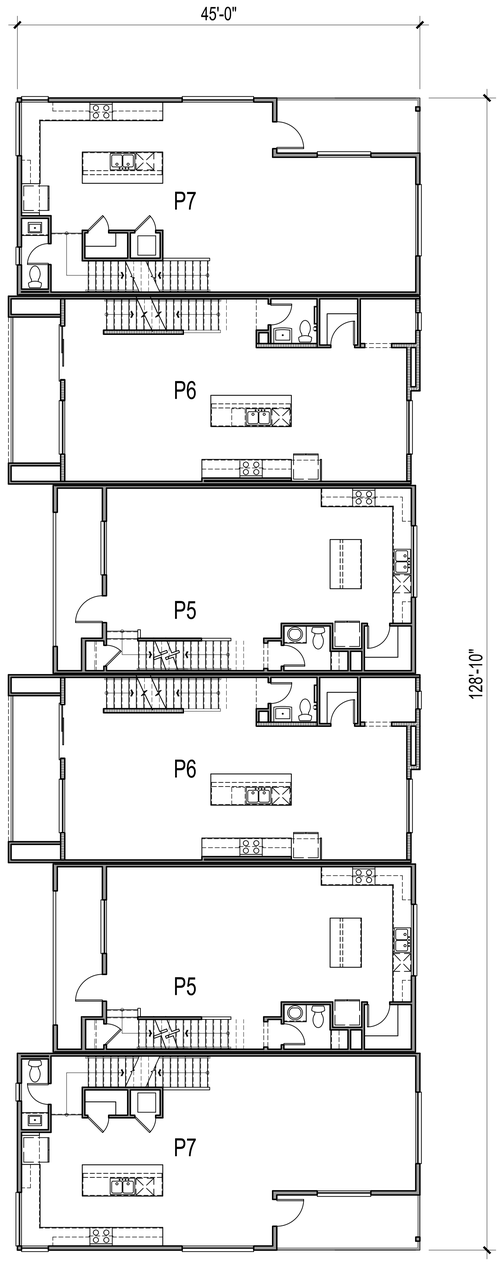
First Floor
4349 SQ. FT.



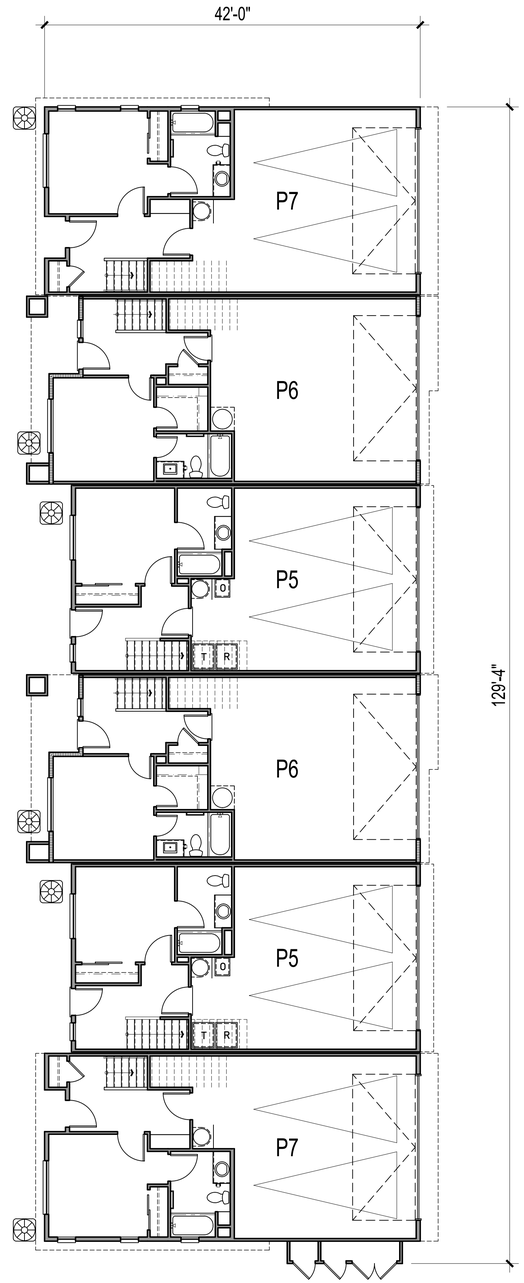
Roof Plan



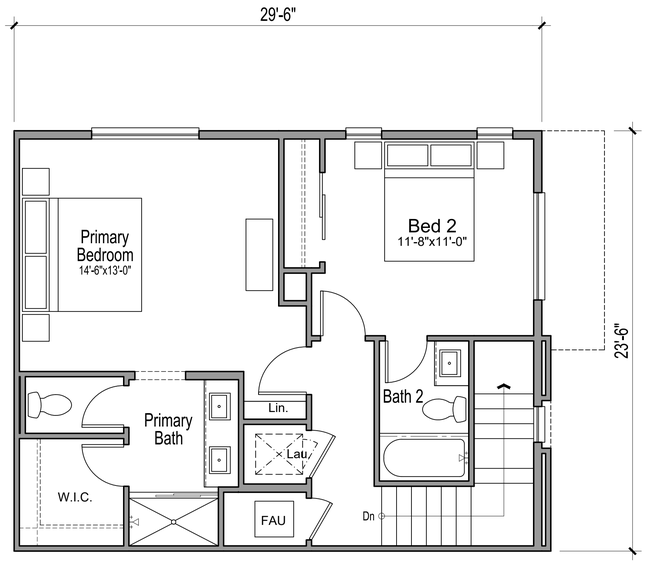
Third Floor
5373 SQ. FT.



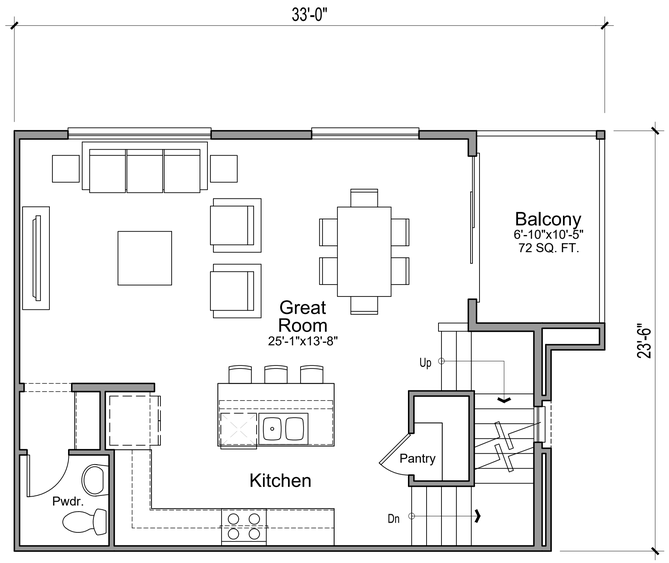
Second Floor
5542 SQ. FT.



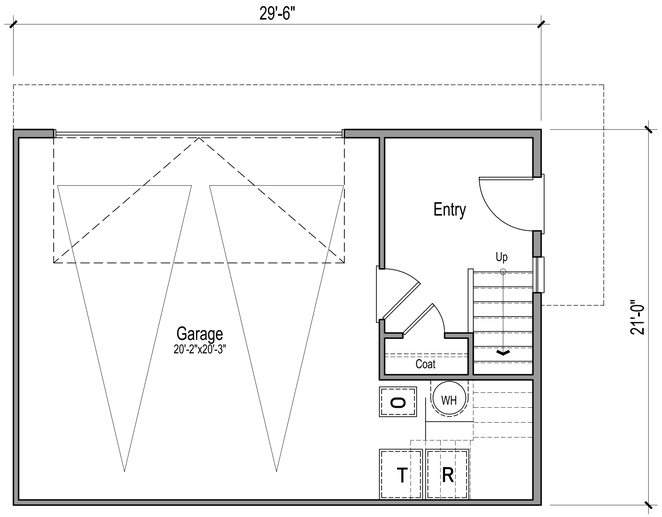
First Floor
5190 SQ. FT.



Third Floor

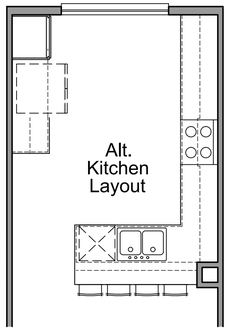


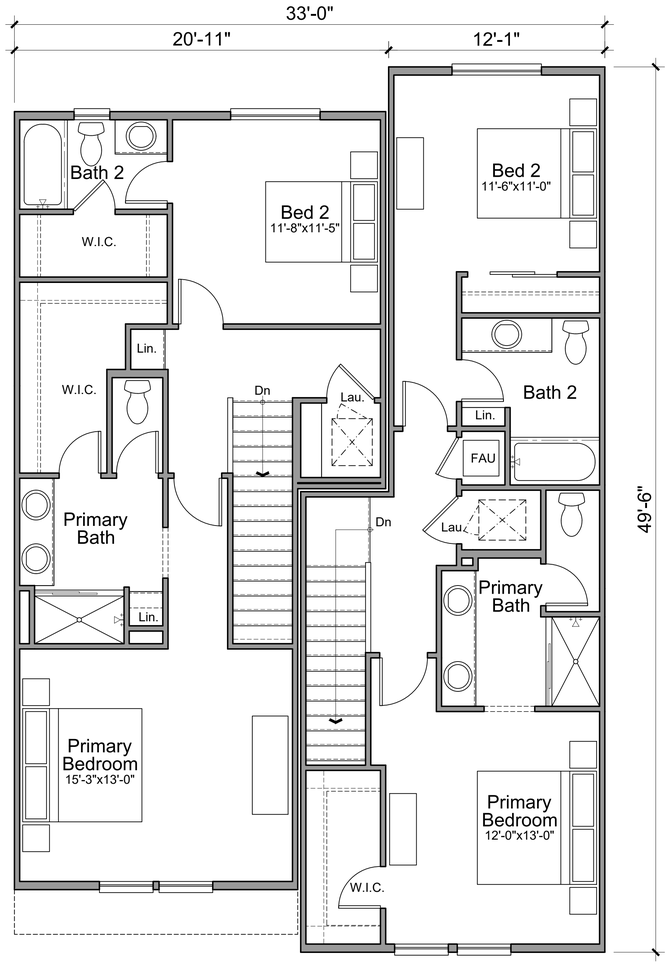
Second Floor



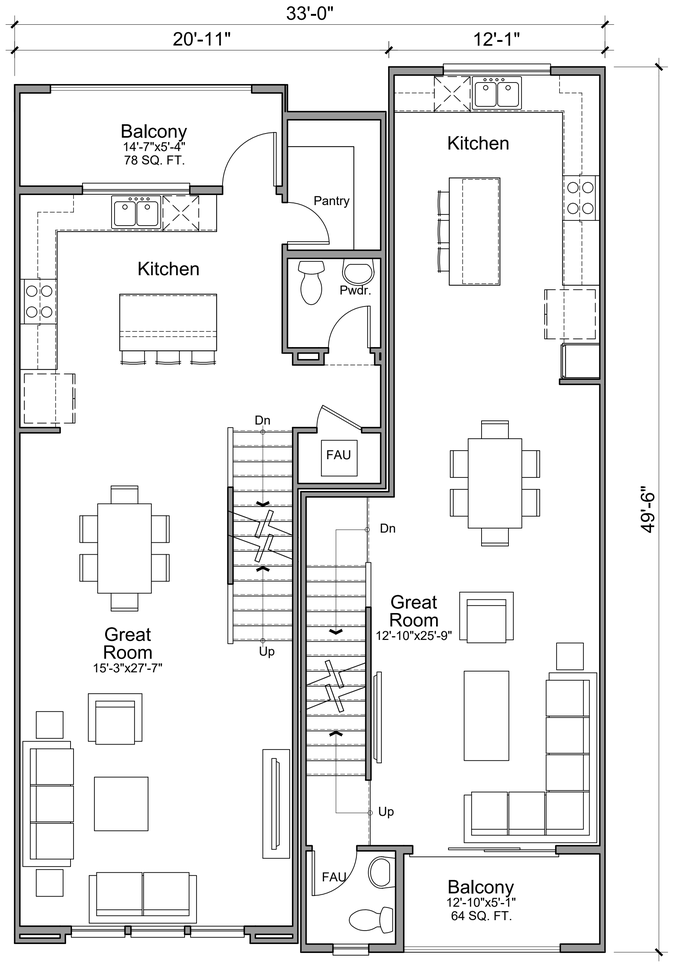
First Floor

PLAN 1 (2 BED / 2.5 BATH) - NET	
FIRST FLOOR	150 SQ. FT.
SECOND FLOOR	615 SQ. FT.
THIRD FLOOR	599 SQ. FT.
TOTAL	1,364 SQ. FT.

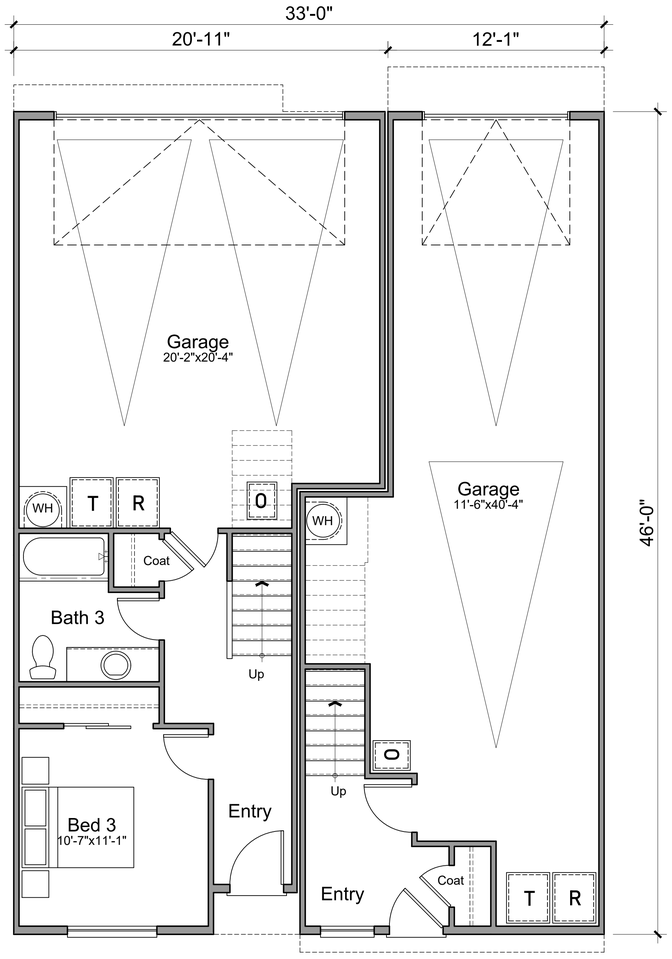




Third Floor

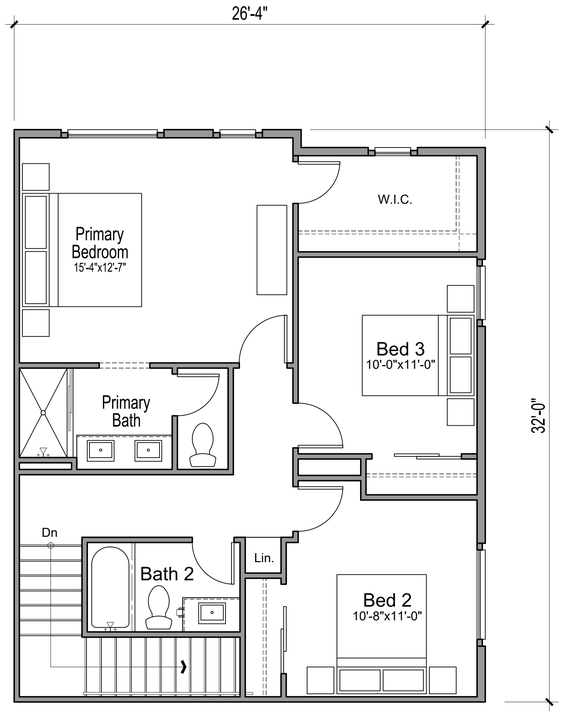


Second Floor

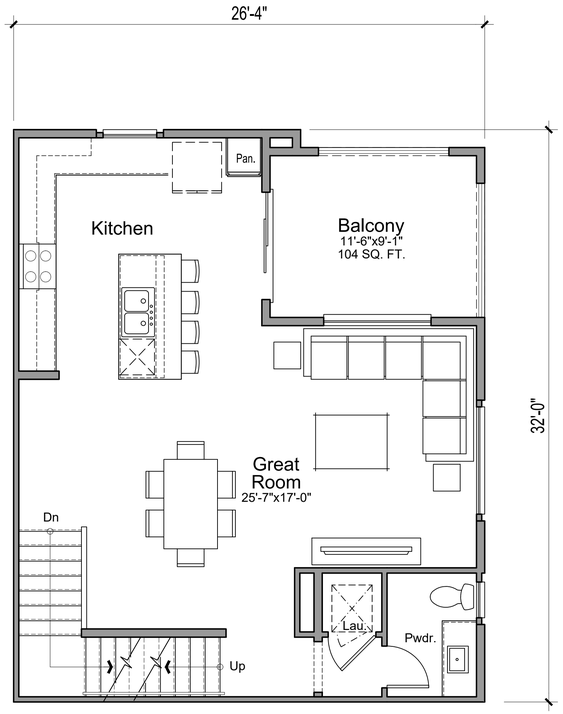


First Floor

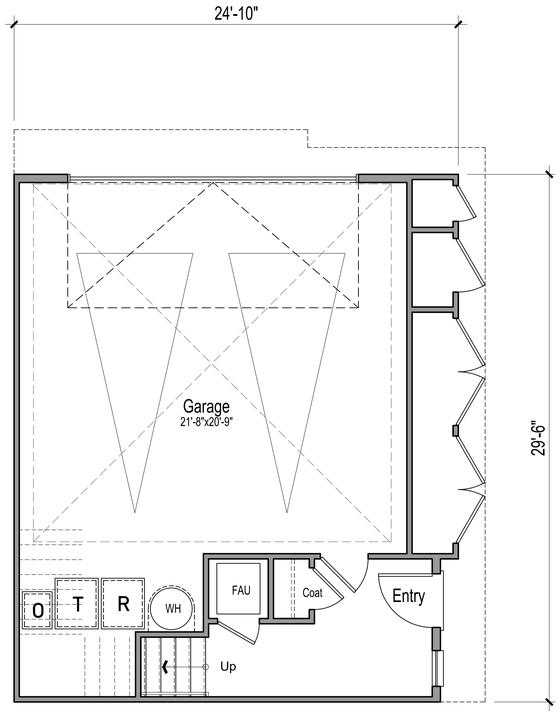
PLAN 4 (3 BED / 3.5 BATH) - NET		PLAN 2 (2 BED / 2.5 BATH) - NET	
FIRST FLOOR	347 SQ. FT.	FIRST FLOOR	128 SQ. FT.
SECOND FLOOR	698 SQ. FT.	SECOND FLOOR	619 SQ. FT.
THIRD FLOOR	702 SQ. FT.	THIRD FLOOR	631 SQ. FT.
TOTAL	1,747 SQ. FT.	TOTAL	1,378 SQ. FT.



Third Floor

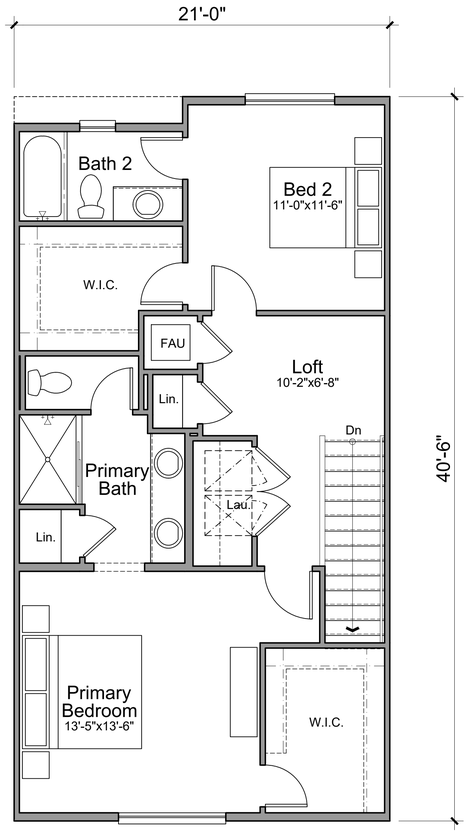


Second Floor

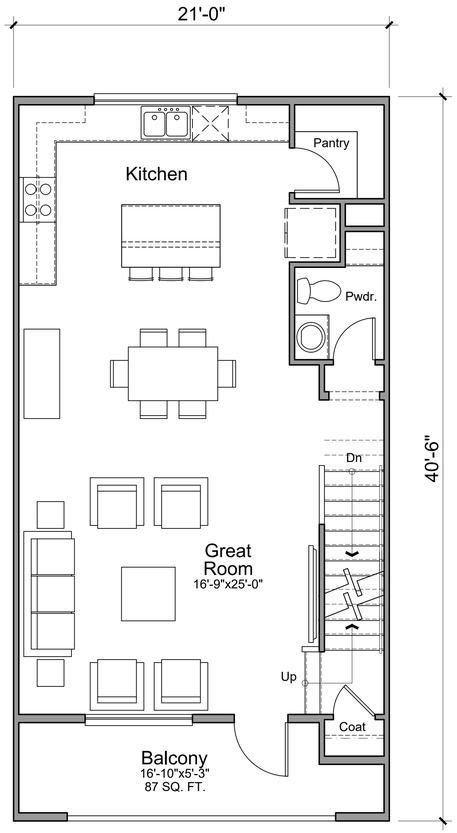


First Floor

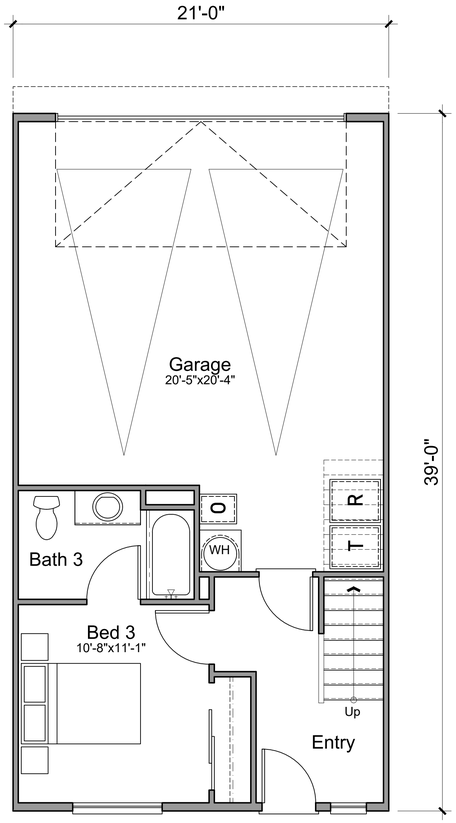
PLAN 3 (3 BED / 2.5 BATH) - NET	
FIRST FLOOR	158 SQ. FT.
SECOND FLOOR	673 SQ. FT.
THIRD FLOOR	730 SQ. FT.
TOTAL	1,561 SQ. FT.



Third Floor

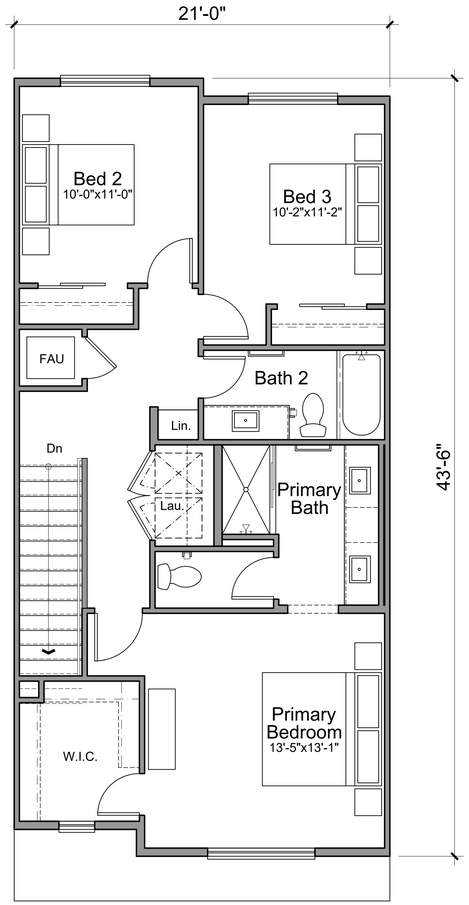


Second Floor

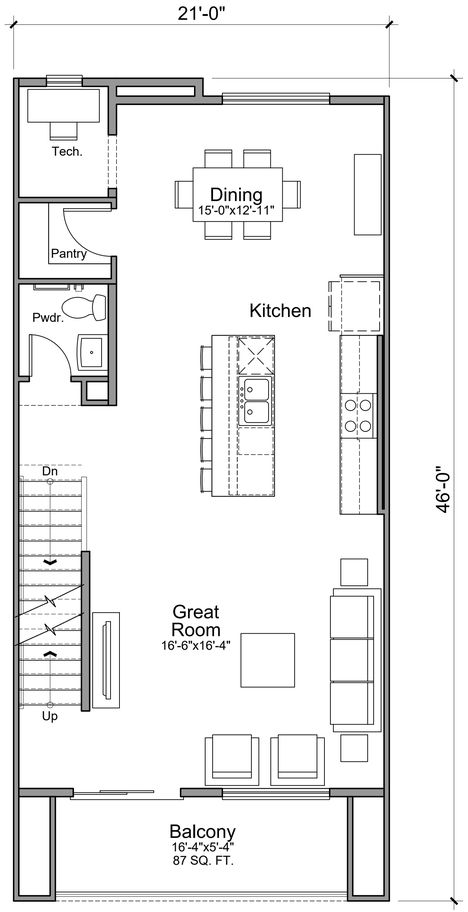


First Floor

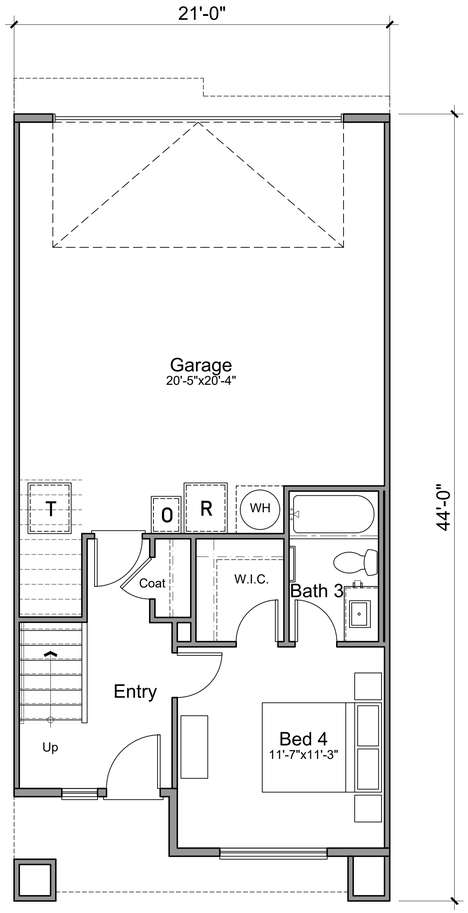
PLAN 5 (3 BED / 3.5 BATH) - NET	
FIRST FLOOR	333 SQ. FT.
SECOND FLOOR	698 SQ. FT.
THIRD FLOOR	756 SQ. FT.
TOTAL	1,788 SQ. FT.



Third Floor

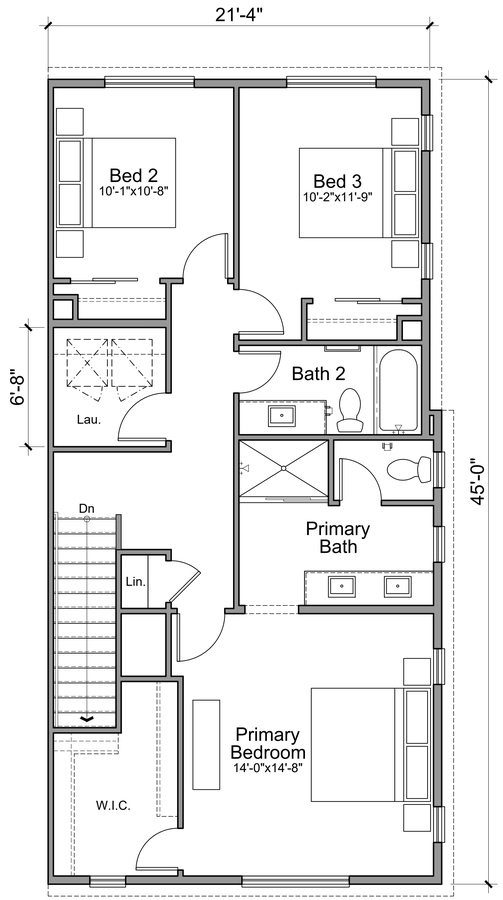


Second Floor

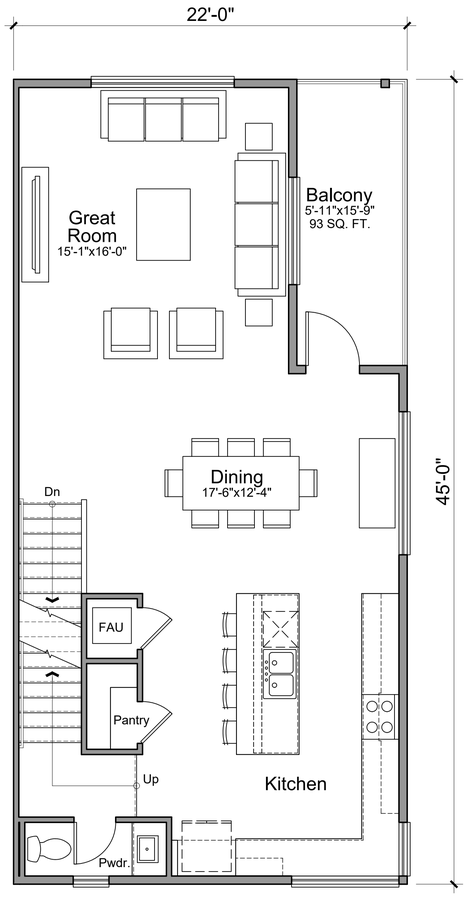


First Floor

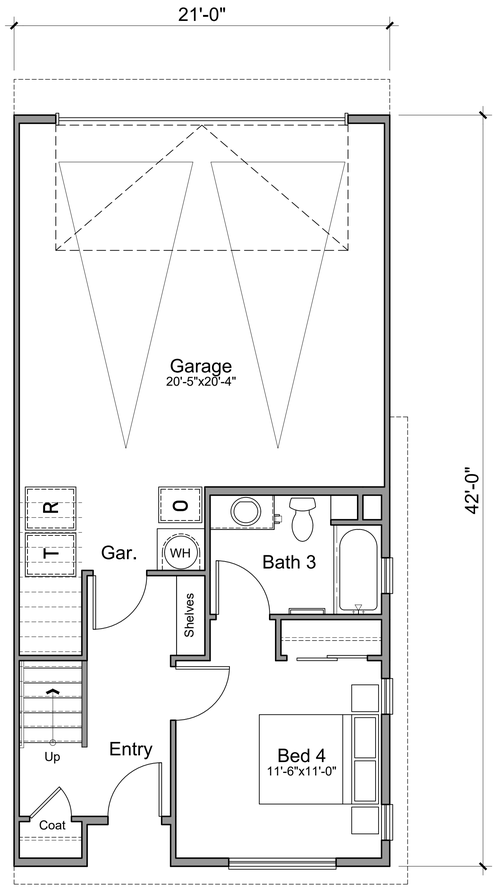
PLAN 6 (4 BED / 3.5 BATH) - NET	
FIRST FLOOR	355 SQ. FT.
SECOND FLOOR	786 SQ. FT.
THIRD FLOOR	807 SQ. FT.
TOTAL	1,948 SQ. FT.



Third Floor



Second Floor



First Floor

PLAN 7 (4 BED / 3.5 BATH) - NET	
FIRST FLOOR	373 SQ. FT.
SECOND FLOOR	838 SQ. FT.
THIRD FLOOR	883 SQ. FT.
TOTAL	2,093 SQ. FT.

ATTACHMENT 5
Drainage Report

This is the cover sheet for Attachment 5.

HUNSAKER & ASSOCIATES
SAN DIEGO, INC.

TENTATIVE PLAN DRAINAGE STUDY

for

GARRISON ELEMENTARY SCHOOL

Garrison Street
APN: 162-020-24-00 & 162-030-14-00

City of Oceanside, California

Prepared for:

The True Life
4350 Von Karman Ave. Suite 200
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Prepared by:

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W.O. 3214-0002

April 14, 2025

Hunsaker & Associates
San Diego, Inc.



Alisa S. Vialpando 04/14/2025
Alisa S. Vialpando, RCE # 47945
President

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2 – Soils Information
3 – Runoff Coefficient Determination
4 – Design Rainfall Determination
5 – Existing & Proposed Hydrology Calculations and Exhibits
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1. Introduction

1.1. Scope of Work

The purpose of this study is to provide hydrology calculations in support of a proposed residential development in the City of Oceanside, California. This report will quantify runoff for the 100-year frequency storm event and recommend storm drain infrastructure needed to convey stormwater through the site safely. Treatment of stormwater runoff from the site has been addressed in a separate report entitled “PDP Stormwater Quality Management Plan for Garrison Elementary School” prepared by Hunsaker & Associates, San Diego, and dated May 2024.

1.2. Existing Condition

The Garrison Elementary School property is an 8.32-acre site located at 333 Garrison Street, in the City of Oceanside, San Diego County, California. The site is currently occupied by the former E. G. Garrison Elementary School, which has now been abandoned. Current site improvements include ten (10) classroom buildings, a miscellaneous-use building, paved parking, sporting fields and drive isle areas, as well as landscaping and hardscaping areas. The northern portion of the site is vacant of structures and graded. Refer to the project vicinity map located in appendix 1.

An existing paved driveway off Garrison Street provides access to the property. To the north, the boundary is defined by a vacant, mass-graded pad. Vegetated slopes delineate the eastern edge, while Garrison Street lies to the west. A multifamily residential development borders the property to the south.

The drainage area under study encompasses approximately 10.70 acres, including an offsite area of 2.58 acres, with a total imperviousness of 40%. Of this offsite area, 2.06 acres are located to the north and east of the property and drain through the project site, merging with the northern onsite drainage. This commingled runoff then flows southeasterly towards an existing Type G catch basin (Node 106) located offsite. This catch basin collects the combined flows from the onsite central drainage area, which are channeled by an existing 30-inch RCP, and from western offsite flows entering the onsite storm drain system through two storm inlets (as per Inlet Apron for Culvert per As-built GP 28110) and a Type F catch basin (as per Improvement Plans R-02993-R-03010C). Subsequently, the total flow is directed easterly beneath Garrison Street via existing 22”X36” CMP arch per DWG R-2258, to discharge into Garrison Creek (Node 124) and eventually into Loma Alta Creek.

Runoff from the southern portion of the site drains southward, collected by existing catch basins (Brooks boxes), and is then routed to the existing 18” storm drain as per As-built GP 28110 (at Node 310). This 18” storm drain discharges into the offsite southern parking lot (Node 312), where the water first surface flows and then is channeled through the existing parking lot gutter to an existing catch basin. It then crosses Garrison Street to eventually discharge into Garrison Creek and subsequently into Loma Alta Creek.

Runoff from the southeastern portion of the site is conveyed via surface flow in a southeast direction towards Garrison Street (Node 204). There, it travels southward along the street's curb and gutter system for [insert distance] feet before being interrupted by a Type B curb inlet, as detailed in DWG R-02611. From this point, it travels easterly via 18" RCP pipe, crossing Garrison Street, and empties into Garrison Creek as per DWG R-01054, eventually flowing into Loma Alta Creek.

Loma Alta Creek then flows westerly, ultimately discharging into the Pacific Ocean via the Loma Alta Slough.

See **Appendix 4** for calculations of existing peak runoff from the site.

According to the FEMA Flood Insurance Rate Map (FIRM) 06073C0754H effective 05/16/2012, the project is in an unshaded Zone X, which is defined as "Areas determined to be outside the 500-year floodplain". Refer to the FIRMette Map in **Appendix 1**.

According to the Natural Resources Conservation Service (NRCS) Soil Report, the predominant soil type across the site falls under Hydrologic Soil Group "D," except for a 0.035-acre area classified within Hydrologic Soil Group "C." Soil D was assumed for the entire site. for detailed NRCS soil information, please see Appendix 2.

The runoff coefficient for each subarea was calculated based on soil type and impervious percentage using the formula from San Diego County Hydrology Manual Section 3.1.2

C= 0.90 x (% Impervious) + Cp x (1 - % Impervious)

Cp = Pervious Coefficient Runoff value for the soil type (per San Diego County Hydrology Manual Table 3.1)

Cp Soil D= 0.35

Please refer to existing conditions AES Input Data spreadsheet in appendix 4 for each subarea runoff factor.

Table 1 below summarizes the 100-year existing condition peak flow at the downstream project boundary.

TABLE 1 - Summary of Existing Flows

Exhibit	Node Number on Exhibit	Discharge Location	Drainage Area (ac)	Tc (min)	Q100-Year Peak Flow (cfs)
1	124	Southeast of the site to Garrison creek	8.13	8.66	12.87
1	204	Southeast of the site to Garrison Street	1.03	4.01	5.34
1	312	Southwest of the site	1.42	7.53	4.46
Total Area			10.69 acres		

1.3 Proposed Condition

The proposed project is a 140-unit townhome development consisting of multi-family structures, driveways, access roads, sidewalks, landscaped areas, and open space areas. The infrastructure will consist of streets and associated utilities including dual storm drain system (pipes, inlets, catch basins, brow ditches and cleanouts). One of the dual systems is necessary to collect and convey the onsite 100-year runoff through the project area to the proposed underground storage facility (CMP or equivalent). The second system (bypass storm drain system) is to replace the existing 30" storm drain that runs through the site and conveys the offsite flows and part of the onsite flows to the existing eastern channel. The existing 30" storm drain will be removed.

Onsite runoff will be conveyed via the street curb and gutter system, captured by the proposed inlets, and then routed through the proposed storm drain system to the previously mentioned underground storage facility (Node 146). This facility is specifically designed to store the designated capture volume and regulate flows to the downstream proprietary biofiltration Best Management Practice (BMP) to meet water quality requirements. Additionally, the underground storage facility will provide essential storage and flow control for hydromodification management and attenuate the 100-year peak flows. Finally, the discharge from the underground storage facility and the proprietary biofiltration BMP will be directed to the existing 22" x 36" Corrugated Metal Pipe (CMP) arch, subsequently flowing into Garrison Creek (Node 107).

Runoff from 0.05 ac of the entrance, drain towards Garrison Street and will be captured by the existing inlet and discharge into Garrison Creek, similarly to existing conditions. Permeable pavers are proposed to address the water quality requirements for the said area (please note that this water quality solution is preliminary, and a discussion will be processed with the city). For additional discussion on the proposed water quality features of the site, refer to the Stormwater Quality Management Plan for Garrison Elementary School (November 2024) prepared by Hunsaker & Associates San Diego, Inc.

Runoff from the western undisturbed slopes will be routed via proposed brow ditches to enter the proposed bypassed storm drain system via catch basins. The proposed bypass storm drain system will convey the mentioned flows with the offsite flows (captured by the existing headwalls and catch basins) to the respected discharge point southeast of the site, where it comingles with the onsite treated flows (at 119) and continues easterly to the analyzed discharge point (at Node 107). See **Appendix 4** for calculations of proposed condition run-off.

EL Corazon Lift Station

The City of Oceanside, in collaboration with X Engineering & Consulting, Inc., is currently advancing the expansion of the Mission Basin groundwater purification facility. As part of this development, a sewer lift station is proposed north of the site and is currently in the final engineering stage. It is expected that the lift station will be constructed prior to the commencement of this multi-family project.

However, since the lift station is designed to address its own water quality, detention, and hydromodification requirements, it is not included as part of the analysis conducted in this drainage study. The requirements for our project, along with the lift station project, are to maintain peak flows at discharge locations consistent with existing conditions, ensuring no impact on the capacity of downstream systems.

The total drainage area under investigation is 10.71 acres. For the onsite subareas, the runoff coefficient was sourced from Table 3-1, which pertains to high-density residential areas with Soil Group D and was established as 0.79. For the offsite areas, runoff coefficient for each subarea was calculated based on soil type and impervious percentage using the formula from San Diego County Hydrology Manual Section 3.1.2

C= 0.90 x (% Impervious) + Cp x (1 - % Impervious)

Cp = Pervious Coefficient Runoff value for the soil type (per San Diego County Hydrology Manual Table 3.1) Cp Soil D= 0.35

Please refer to proposed conditions AES Input Data spreadsheet in appendix 4 for each subarea runoff factor.

Table 2 below summarizes the unmitigated 100-year proposed condition peak flow at the downstream project boundary.

TABLE 2 - Summary of Proposed Unmitigated Flows

Exhibit	Node Number on Exhibit	Discharge Location	Drainage Area (ac)	Tc (min)	Q100-Year Peak Flow (cfs)
1	107	Southeast of the site to Garrison creek	9.91	8.90	31.67
1	204	Southeast of the site to Garrison Street	0.43	5.20	2.00
1	304	Southwest of the site	0.37	8.44	0.66
Total Area			10.71 acres		

Due to the increased flow associated with the development of *the project*, peak flow attenuation will be achieved by the proposed underground storage facility (CMP). The riser within the CMP has been sized and designed to include orifices along its height. Sizes and heights of orifices were determined to achieve outlet flow less than the existing flow shown on Table 1 above. Please refer to Chapter 2.2 for methodology and Appendix 5 for detention Analysis. The resultant discharge at Node 107 will continue easterly to Garrison Creek, then to Loma Alta Creek and ultimately discharging into the Pacific Ocean via the Loma Alta Slough.

Since this project is subject to comply with hydromodification requirements, the design of the CMP has been coordinated with those calculations, which are part of the *SWQMP for Garrison Elementary School.*

Table-3 below summarizes the Q100 Mitigated flow at Node 107.

TABLE 3 - Summary of Mitigated Developed Flows

Exhibit	Node Number on Exhibit	Discharge Location	Drainage Area (ac)	Average Runoff Coefficient	Tc (min)	Q100-Year Peak Flow (cfs)
1	107	Southeast of the site to Garrison creek	9.91	0.69	16.07	10.85

2. Methodology

2.1 Modified Rational Method Hydrologic Analysis

Computer Software Package – AES-2015

Design Storm - 100- year return interval.

Land Use –High Density Residential

Soil Type – According to the Natural Resources Conservation Service (NRCS) Soil Report, the predominant soil type across the site falls under Hydrologic Soil Group "D," except for a 0.035-acre area classified within Hydrologic Soil Group "C." Soil D was assumed for the entire site.

Runoff Coefficient - In accordance with the County of San Diego standards, runoff coefficient for each subarea was calculated based on soil type and impervious percentage using the formula from San Diego County Hydrology Manual Section 3.1.2
C= 0.90 x (% Impervious) + Cp x (1 - % Impervious)

Cp = Pervious Coefficient Runoff value for the soil type (per San Diego County Hydrology Manual Table 3.1)
Cp Soil D= 0.35

Rainfall Intensity- The rainfall intensity is determined per the San Diego County Hydrology Manual based on 6-hour precipitation amounts and calculated time of concentrations. Six-hour precipitations are taken from the San Diego County Hydrology Manual isopluvials. P6=2.70 inch

Method of Analysis – The Rational Method is the most widely used hydrologic model for estimating peak runoff rates. Applied to small urban and semi-urban areas with drainage areas less than 1.0 square miles, the Rational Method relates storm rainfall intensity, a runoff coefficient, and drainage area to peak runoff rate. This relationship is expressed by the equation:

Q = CIA, where:

Q = The peak runoff rate in cubic feet per second at the point of analysis.

C = A runoff coefficient representing the area - averaged ratio of runoff to rainfall intensity.

I = The time-averaged rainfall intensity in inches per hour corresponding to the time of concentration.

A = The drainage basin area in acres.

To perform a node-link study, the total watershed area is divided into subareas, which discharge at designated nodes.

The procedure for the subarea summation model is as follows:

(1) Subdivide the watershed into subareas with the initial subarea being less than 10 acres in size (generally one lot will do), and subsequent subareas gradually increasing in size. Assign upstream and downstream nodal numbers to each subarea to correlate calculations to the watershed map.

(2) Estimate an initial T_c by using the appropriate nomograph or overland flow velocity estimation.

(3) Using the initial T_c, determine the corresponding values of I. Then Q = CIA.

(4) Using Q, estimate the travel time between this node and the next by Manning's equation as applied to the channel or conduit linking the two nodes. Then, repeat the calculation for Q based on the revised intensity (which is a function of the revised time of concentration)

The nodes are joined together by links, which may be street gutter flows, drainage swales, drainage ditches, pipe flow, or various channel flows. The AES-2003 computer subarea menu is as follows:

SUBAREA HYDROLOGIC PROCESS

1. Confluence analysis at node.
2. Initial subarea analysis (including time of concentration calculation).
3. Pipe flow travel time (computer estimated).
4. Pipe flow travel time (user specified).
5. Trapezoidal channel travel time.
6. Street flow analysis through subarea.
7. User - specified information at node.
8. Addition of subarea runoff to main line.
9. V-gutter flow through the area.
10. Copy mainstream data to memory bank.
11. Confluence mainstream data with a memory bank

12. Clear a memory bank.

At the confluence point of two or more basins, the following procedure is used to combine peak flow rates to account for differences in the basin's times of concentration. This adjustment assumes that each basin's hydrographs are triangular.

(1). If the collection streams have the same times of concentration, then the Q values are directly summed,

$Q_p = Q_a + Q_b$; $T_p = T_a = T_b$

(2). If the collection streams have different times of concentration, the smaller of the tributary Q values may be adjusted as follows:

(i). The most frequent case is where the collection stream with the longer time of concentration has the larger Q. The smaller Q value is adjusted by the ratio of rainfall intensities.

$Q_p = Q_a + Q_b \ (I_a/I_b)$; $T_p = T_a$

(ii). In some cases, the collection stream with the shorter time of concentration has the larger Q. Then the smaller Q is adjusted by a ratio of the T values.

$Q_p = Q_b + Q_a \ (T_b/T_a)$; $T_p = T_b$

Underground storm drains are analyzed in a similar way. Flow data obtained from the surface model for inlets and collection points are input into the nodes representing those structures. Design grades and lengths are used to compute the capacity of the storm drains and to model the downstream travel times.

2.2 Detention Analysis

To provide adequate flood control, increases in peak flow rates at the outfall location for this site were mitigated using the proposed underground storage facility.

The hydrology calculations discussed above provide peak flowrates for the CMP's inflow, which are entered into a separate program called RickRatHydro. The RickratHydro was used to produce an inflow hydrograph for the project drainage area to the biofiltration basin, based on the area, time of concentration, P6 value, runoff coefficient, and peak flow rate.

Mitigation within the CMP was modeled using SWMM 5.1. The Hydrograph that was generated from RickRatHydro was used as an input data for the inflows to the storage unit in the SWMM model. The riser was modeled using the stage discharge table (Rating Curve in SWMM), and the volume was modeled using the storage stage table

(Storage Curve), which represents the storage provided within the CMP excluding the water quality ponding depth.

The results from the SWMM model were used as input data (code 7) in the AES proposed condition model at the discharge location from the proposed underground storage facility (Node 146), to generate the AES model for proposed mitigated flows.

3 Results

Conveyance of Q100 runoff flows through the proposed site required dual storm drain system. One of the dual systems is 18” storm drain system proposed to route flows (onsite) to the underground storage facility to address water quality, hydromodification and peak flow attenuation; while the second system is 30” bypassed storm drain to replace the existing 30” storm drain that runs through the site and conveys the offsite flows and part of the onsite undisturbed slopes to the existing eastern channel.

Storm drain system and hydraulic calculations will be conducted as part of the final engineering drainage study.

One underground storage facility was included in the design of the site to address hydromodification, peak flow attenuation, and water quality requirements. A proprietary biofiltration BMP is proposed downstream of the underground storage facility to address water quality requirements for most of the site. Preliminary, permeable pavement was sized for the two areas (total of 0.05 ac) that cannot be routed to the underground storage facility. Per the hydrologic and detention analysis conducted as part of this study, the detention analysis for the basin is included in Appendix 5 of this report. The table below summarizes the flow reductions at the discharge location.

The flow from the site is attenuated to make sure that the post-developed flows will not exceed the capacity of the existing downstream drainage facilities (post development flows compared to the existing flows at the point of compliance southwest corner of the project (POC-1/ Node 119). See table 4 in the next sheet.

TABLE 4 – Existing Condition vs. Post-development Condition

Discharge Location	Pre-Area (ac)	Post-Area (ac)	Pre-: 100-Year Peak Flow (cfs)	Post-: 100-Year Unmit. Peak Flow (cfs)	Post-: 100-Year Mit. Peak Flow (cfs)	TC Pre (min)	TC Post Unmit. (min)	TC Post Mit. (min)	Q100 Flow Difference (cfs)
Southeast of the site to Garrison Creek	8.13	9.91	12.87	31.67	10.85	8.66	8.90	16.07	-1.97
Southeast of the site to Garrison Street	1.03	0.43	5.34	2.00	N/A	4.01	5.20	N/A	-3.34
Southwest of the site	1.53	0.37	4.52	0.66	N/A	7.53	8.44	N/A	-3.86

-Pre : Pre-Developed Conditions
-Post. Unmit.: Post Developed Unmitigated Conditions
-Post. Mit.: Post Developed Mitigated Condition

4. Conclusions

The proposed redevelopment of Garrison School Site can be roughly graded and improved with storm drain to accommodate the ultimate expected flows from development. In addition, with the proposed drainage facilities such as curb inlets, storm drain, water quality, flow control and detention facility, runoff can be mitigated to accepted San Diego County and City of Oceanside standards.

The proposed project will not substantially alter the existing drainage pattern of the site. There will be a decrease in the peak discharge from the site. Therefore, the proposed project will not impact downstream properties or drainage facilities.

5. References

San Diego County Hydrology Manual, County of San Diego Department of Public Works Flood Control Division, June 2003.

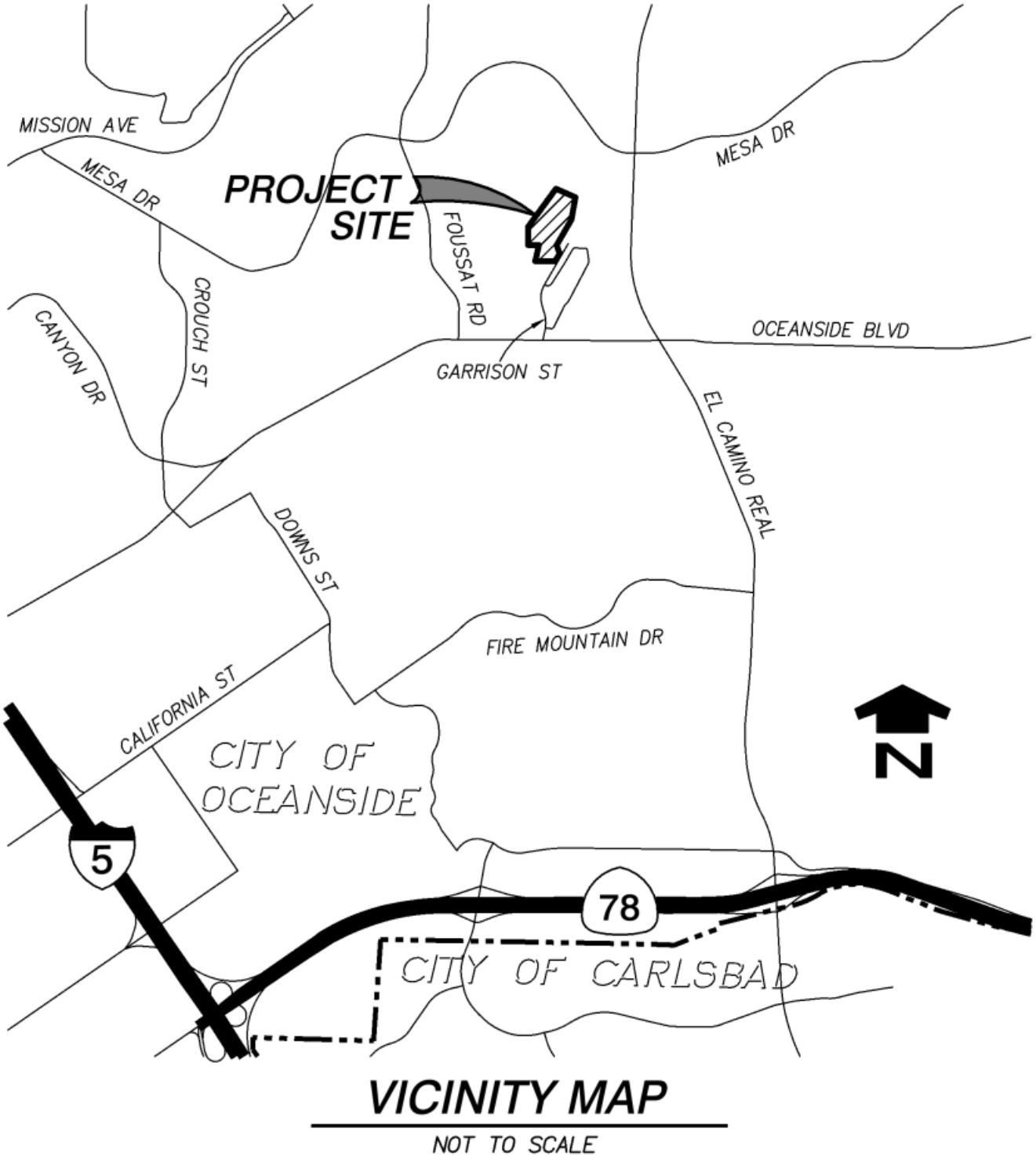
San Diego County Hydraulic Design Manual, County of San Diego Department of Public Works Flood Control Division, September 2014

San Diego County Drainage Design Manual, County of San Diego Department of Public Works Flood Control Division, July 2005

Stormwater Quality Management Plan for Garrison Elementary School, Hunsaker & Associates San Diego, Inc., November 2024.

Appendix 1 – Vicinity Map and FIRM Map

Vicinity Map



National Flood Hazard Layer FIRMette

FEMA

117°20'30"W 33°12'33"N



0 250 500 1,000 1,500 2,000 Feet

1:6,000

117°19'53"W 33°12'3"N

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 — Cross Sections with 1% Annual Chance
- 17.5 — Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 12/22/2023 at 1:58 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Appendix 2 - Soils Information

Hydrologic Soil Group—San Diego County Area, California



Map Scale: 1:1,890 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 19, Aug 30, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
LeD2	Las Flores loamy fine sand, 9 to 15 percent slopes, eroded	D	9.3	91.0%
SbA	Salinas clay loam, 0 to 2 percent slopes, warm MAAT, MLRA 19	C	0.2	1.7%
SbC	Salinas clay loam, 2 to 9 percent slopes	C	0.7	7.3%
Totals for Area of Interest			**10.3**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix 3 – Runoff Coefficient Determination

- The storm frequency of peak discharges is the same as that of I for the given T_c.

- The fraction of rainfall that becomes runoff (or the runoff coefficient, C) is independent of I or precipitation zone number (PZN) condition (PZN Condition is discussed in Section 4.1.2.4).

- The peak rate of runoff is the only information produced by using the RM.

3.1.2 Runoff Coefficient

Table 3-1 lists the estimated runoff coefficients for urban areas. The concepts related to the runoff coefficient were evaluated in a report entitled *Evaluation, Rational Method "C" Values* (Hill, 2002) that was reviewed by the Hydrology Manual Committee. The Report is available at San Diego County Department of Public Works, Flood Control Section and on the San Diego County Department of Public Works web page.

The runoff coefficients are based on land use and soil type. Soil type can be determined from the soil type map provided in Appendix A. An appropriate runoff coefficient (C) for each type of land use in the subarea should be selected from this table and multiplied by the percentage of the total area (A) included in that class. The sum of the products for all land uses is the weighted runoff coefficient ($\Sigma[CA]$). Good engineering judgment should be used when applying the values presented in Table 3-1, as adjustments to these values may be appropriate based on site-specific characteristics. In any event, the impervious percentage (% Impervious) as given in the table, for any area, shall govern the selected value for C. The runoff coefficient can also be calculated for an area based on soil type and impervious percentage using the following formula:

$$C = 0.90 \times (\% \text{ Impervious}) + C_p \times (1 - \% \text{ Impervious})$$

Where: C_p = Pervious Coefficient Runoff Value for the soil type (shown in Table 3-1 as Undisturbed Natural Terrain/Permanent Open Space, 0% Impervious). Soil type can be determined from the soil type map provided in Appendix A.

The values in Table 3-1 are typical for most urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the local agency.

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

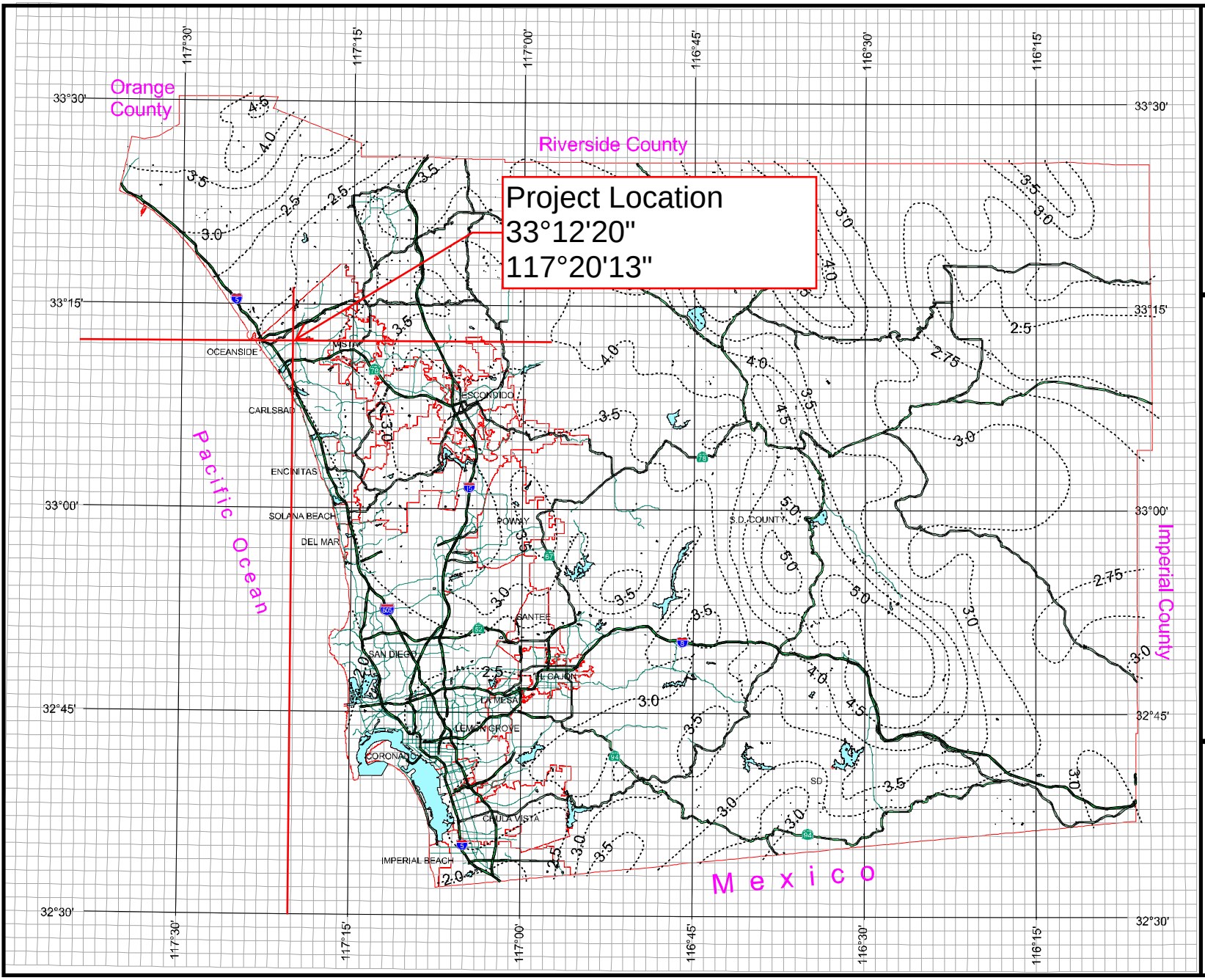
Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service

Appendix 4 –Desing Rainfall Determination

County of San Diego Hydrology Manual

Rainfall Isopluvials



100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

P6=2.70

DPW GIS
Department of Public Works
Geographic Information Services

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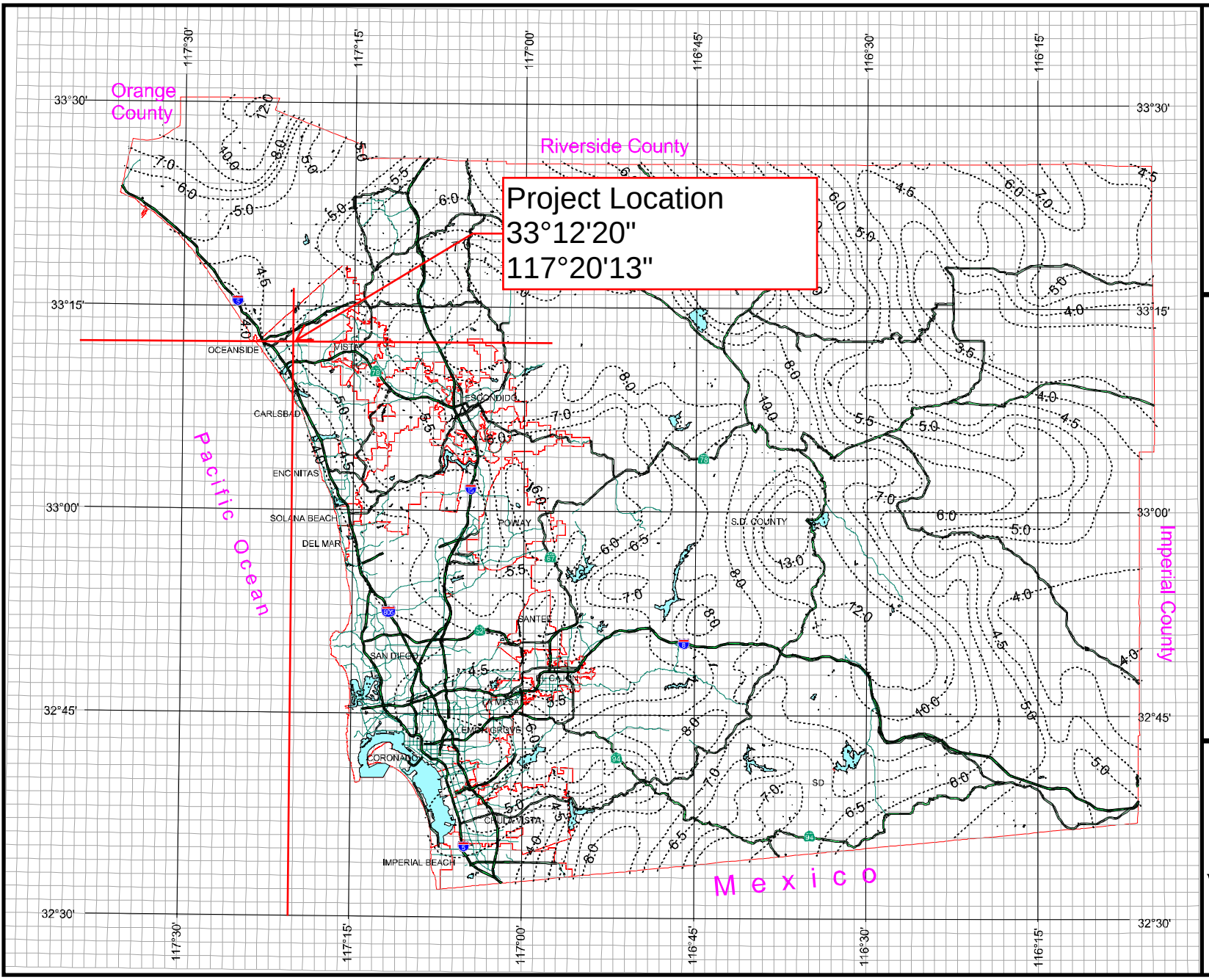
N
W E
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3 0 3 Miles

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County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

P24=5.05

DPW GIS
Department of Public Works
Geographic Information Services

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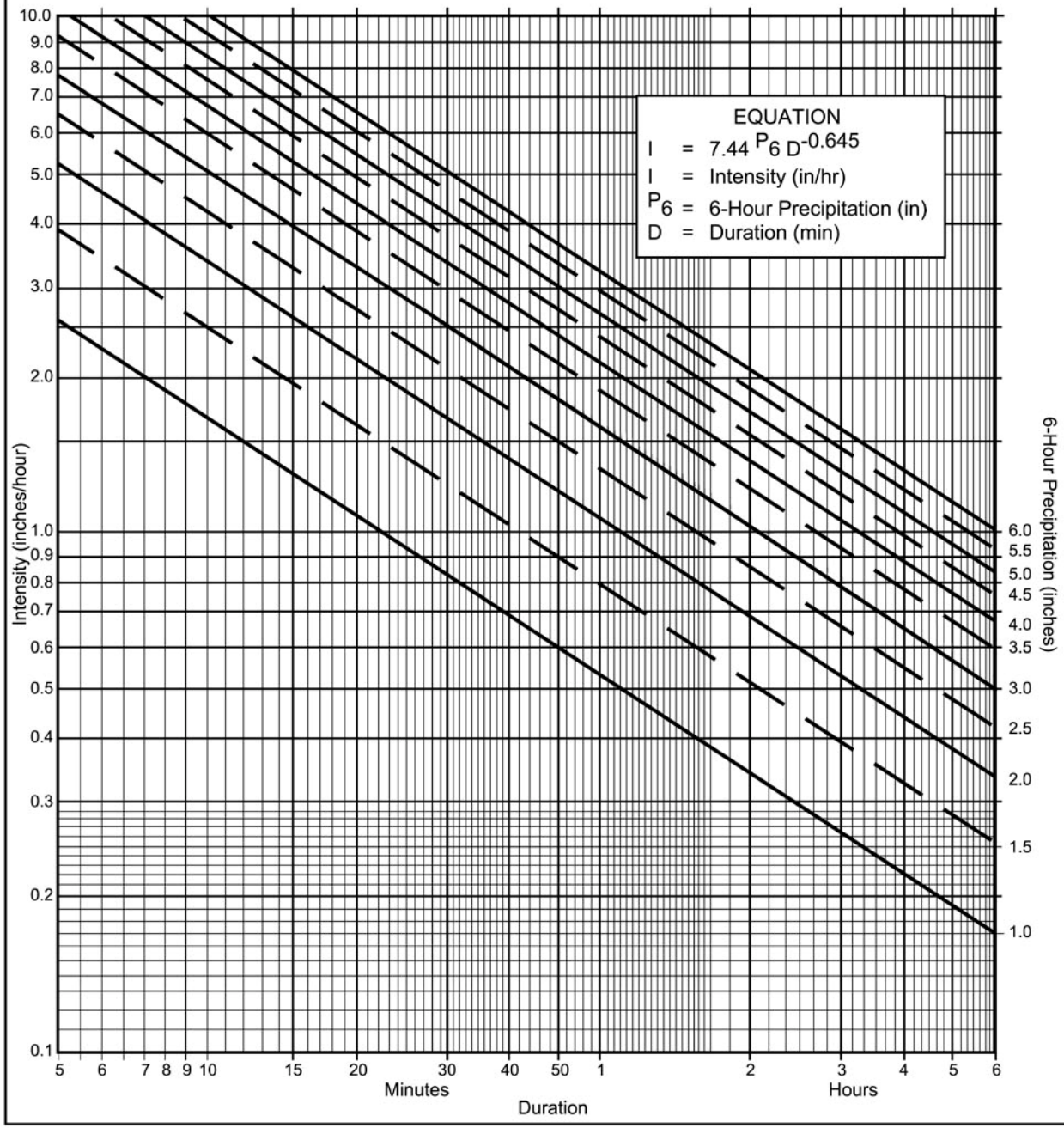
N
W E
S

3 0 3 Miles

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Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 2.70 in., P_{24} = 5.05, $\frac{P_6}{P_{24}} = \frac{2.70}{5.05}$ = 53% (2)

(c) Adjusted P_6 (2) = 2.70 in.

(d) t_x = _____ min.

(e) I = _____ in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

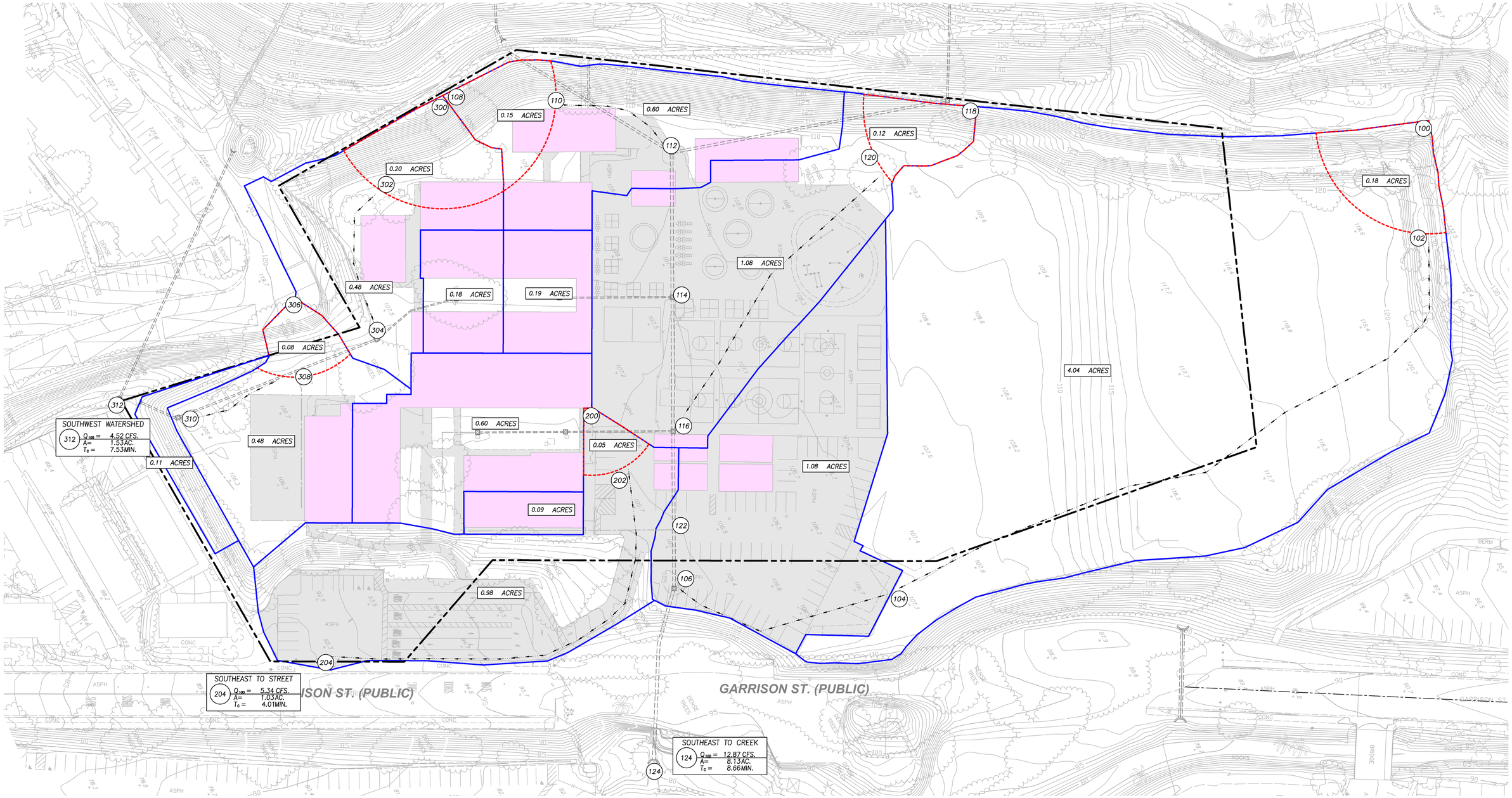
P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE 3-1

Appendix 5 –Hydrologic Calculations and Exhibits

EXISTING CONDITION



LEGEND

- PROJECT BOUNDARY
- DRAINAGE BOUNDARY
- INITIAL SUBAREA
- FLOW DIRECTION
- 00.00 ACRES — AREA
- X — HYDROLOGIC SOIL TYPE
- 406 — NODE NUMBER
- EXISTING BUILDING
- EXISTING HARDSCAPE
- EXISTING STORM DRAIN
- EXISTING AREA DRAIN SYSTEM

H&A

40 0 40 80 120

SCALE 1" = 40'

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC

PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 FX(858)558-1414

EXISTING DRAINAGE MAP

GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, CALIFORNIA

MAP 1 OF 2

W.O.# 3214-0002

R:\1778\Hyd\DR\CAD\1778$Hydro-EX.dwg[]Jul-03-2024:12:25

AES EX INPUT DATA																
Node #		Code	Elevation		Length	Slope	Area		Imperviousness	Assumed Soil Type	C value	If Channel			If memory
From	To		Up	Down			Total	Impervious Area				Base (ft)	Z:1	manning	Bank #
100	102	2	139	128.4	100	11%	0.18	0.00	0%	D	0.35				
102	104	5	128.4	107	613	3%	4.04	0.00	0%	D	0.35	200	50	0.03	
104	106	9	107	104.6	200	1%	1.08	1.08	100%	D	0.90				
106	106	10													1
108	110	2	136	110	100	26%	0.15	0.03	20%	D	0.46				
110	112	5	110	107.6	116	2%	0.60	0.29	48%	D	0.62	3	2	0.03	
112	114	3	104.4	102.5	127	1%									
114	114	8					0.19	0.15	79%	D	0.78				
114	116	3	102.5	99.9	119	2%									
116	116	8					0.60	0.44	73%	D	0.75				
116	116	1													1-2
118	120	2	126	109	100	17%	0.12	0.00	0%	D	0.35				
120	116	9	109	106.6	294	1%	1.08	0.96	89%	D	0.84				
116	116	1													2-2
116	122	3	99.9	98.7	86	1%									
122	122	8					0.09	0.09	100%	D	0.90				
122	106	3	98.7	97.9	54	1%									
106	106	11													1
106	106	12													1
106	124	3	97.9	74.9	155	15%									
					South Watershed		8.13								
200	202	2	107.4	106	60	2%	0.05	0.05	100%	D	0.90				
202	204	6	106	92	418.5	3%	0.98	0.66	67%	D	0.72				
					Southwest Watershed		1.03								
300	302	2	136	109	100	27%	0.20	0.04	20%	D	0.46				
302	304	5	109	107.8	144	1%	0.48	0.13	27%	D	0.50	3	2	0.03	
304	304	8					0.18	0.13	72%	D	0.75				
304	310	3	104.4	101.6	189	1%									
310	310	1													1-2
306	308	2	120.4	107	80	17%	0.08	0.00	0%	D	0.35				
308	310	5	107	105	100	2%	0.48	0.23	48%	D	0.61	20	50	0.03	
310	310	1													2-2
310	312	3	101.6	95.6	41	15%									
312	312	8					0.11	0.00	0%	D	0.35				
					West Watershed		1.53								

Runoff calculation example (typ):
0.9 X (0.48)+0.35 X (1-0.48)= 0.62
(0.9X Imp%) +(0.35X Per%)

```
**************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                          2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2015 Advanced Engineering Software (aes)
              Ver. 22.0 Release Date: 07/01/2015  License ID 1239

                              Analysis prepared by:

                      Hunsaker & Associates San Diego, Inc.
                                9707 Waples Street
                               San Diego,  CA 92121


 ************************* DESCRIPTION OF STUDY *************************
* GARRISON ELEMENTARY SCHOOL                                             *
* EXISTING CONDITIONS - 100-YEAR                                         *
* DLN 1778, W.O. 3214-0002                                               *
 ************************************************************************

  FILE NAME: R:\1778\HYD\DR\CALCS\AES\100EX.DAT
  TIME/DATE OF STUDY: 11:00 12/22/2023
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   13.5      6.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

+-------------------------------------------------------------------------+
| BEGIN North to south WATERSHED ANALYSIS                                 |
|                                                                         |
|                                                                         |
+-------------------------------------------------------------------------+

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    102.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    139.00
  DOWNSTREAM ELEVATION(FEET) =    128.40
  ELEVATION DIFFERENCE(FEET) =     10.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
```

```
  SUBAREA RUNOFF(CFS) =      0.39
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.39

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    128.40  DOWNSTREAM(FEET) =    107.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   613.00   CHANNEL SLOPE =  0.0349
  CHANNEL BASE(FEET) =  200.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.713
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.57
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.64
  AVERAGE FLOW DEPTH(FEET) =   0.02   TRAVEL TIME(MIN.) =  16.02
  Tc(MIN.) =   22.29
  SUBAREA AREA(ACRES) =     4.04       SUBAREA RUNOFF(CFS) =    3.84
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        4.2         PEAK FLOW RATE(CFS) =       4.01

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.03   FLOW VELOCITY(FEET/SEC.) =   0.77
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     713.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    106.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    107.00
  DOWNSTREAM NODE ELEVATION(FEET) =    104.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   200.00
  "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.125   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.631
  *USER SPECIFIED(SUBAREA):
  STREETS & ROADS (CURBS/STORM DRAINS) RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      5.29
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.10
  AVERAGE FLOW DEPTH(FEET) =   0.31   FLOOD WIDTH(FEET) =   16.14
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.08   Tc(MIN.) =   23.37
  SUBAREA AREA(ACRES) =    1.08       SUBAREA RUNOFF(CFS) =    2.56
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.462
  TOTAL AREA(ACRES) =        5.3         PEAK FLOW RATE(CFS) =       6.44

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.33   FLOOD WIDTH(FEET) =   18.17
  FLOW VELOCITY(FEET/SEC.) =   3.13   DEPTH*VELOCITY(FT*FT/SEC) =   1.02
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =     913.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    110.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .4600
```

```
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    136.00
  DOWNSTREAM ELEVATION(FEET) =    110.00
  ELEVATION DIFFERENCE(FEET) =     26.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.348
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.812
  SUBAREA RUNOFF(CFS) =      0.47
  TOTAL AREA(ACRES) =      0.15   TOTAL RUNOFF(CFS) =      0.47

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    112.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    110.00  DOWNSTREAM(FEET) =    107.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   116.00   CHANNEL SLOPE =  0.0207
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.191
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6200
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.62
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.26
  AVERAGE FLOW DEPTH(FEET) =   0.21   TRAVEL TIME(MIN.) =   0.85
  Tc(MIN.) =    6.20
  SUBAREA AREA(ACRES) =     0.60       SUBAREA RUNOFF(CFS) =    2.30
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.588
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       2.73

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.28   FLOW VELOCITY(FEET/SEC.) =   2.75
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    112.00 =     216.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    114.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   104.40  DOWNSTREAM(FEET) =   102.50
  FLOW LENGTH(FEET) =   127.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.67
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.73
  PIPE TRAVEL TIME(MIN.) =   0.37    Tc(MIN.) =    6.57
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    114.00 =     343.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    114.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.962
  *USER SPECIFIED(SUBAREA):
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7800
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6268
  SUBAREA AREA(ACRES) =    0.19   SUBAREA RUNOFF(CFS) =    0.88
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       3.51
  TC(MIN.) =    6.57

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    116.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   102.50  DOWNSTREAM(FEET) =    99.90
  FLOW LENGTH(FEET) =   119.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.97
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.51
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =    6.86
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    116.00 =     462.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    116.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.801
  *USER SPECIFIED(SUBAREA):
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6748
  SUBAREA AREA(ACRES) =    0.60   SUBAREA RUNOFF(CFS) =    2.61
  TOTAL AREA(ACRES) =        1.5   TOTAL RUNOFF(CFS) =       6.03
  TC(MIN.) =    6.86

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    116.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.86
  RAINFALL INTENSITY(INCH/HR) =   5.80
  TOTAL STREAM AREA(ACRES) =     1.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.03

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    120.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    126.00
  DOWNSTREAM ELEVATION(FEET) =    109.00
  ELEVATION DIFFERENCE(FEET) =     17.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
  SUBAREA RUNOFF(CFS) =      0.26
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.26

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    116.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    109.00
  DOWNSTREAM NODE ELEVATION(FEET) =    106.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   294.00
  "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.125   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.156
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .8400
```

```
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      2.60
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.49
  AVERAGE FLOW DEPTH(FEET) =   0.26   FLOOD WIDTH(FEET) =   11.32
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.97   Tc(MIN.) =    8.23
  SUBAREA AREA(ACRES) =    1.08       SUBAREA RUNOFF(CFS) =    4.68
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.791
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       4.89

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.32   FLOOD WIDTH(FEET) =   17.41
  FLOW VELOCITY(FEET/SEC.) =   2.55   DEPTH*VELOCITY(FT*FT/SEC) =   0.81
  LONGEST FLOWPATH FROM NODE    118.00 TO NODE    116.00 =     394.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    116.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.23
  RAINFALL INTENSITY(INCH/HR) =   5.16
  TOTAL STREAM AREA(ACRES) =     1.20
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.89

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        6.03     6.86        5.801          1.54
      2        4.89     8.23        5.156          1.20

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       10.11     6.86       5.801
      2       10.25     8.23       5.156

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      10.25   Tc(MIN.) =    8.23
  TOTAL AREA(ACRES) =        2.7
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    116.00 =     462.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    122.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    99.90  DOWNSTREAM(FEET) =    98.70
  FLOW LENGTH(FEET) =    86.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.68
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.25
  PIPE TRAVEL TIME(MIN.) =   0.19    Tc(MIN.) =    8.42
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    122.00 =     548.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.082
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =  88
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7312
  SUBAREA AREA(ACRES) =    0.09   SUBAREA RUNOFF(CFS) =    0.41
  TOTAL AREA(ACRES) =        2.8   TOTAL RUNOFF(CFS) =      10.52
  TC(MIN.) =    8.42

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    98.70  DOWNSTREAM(FEET) =    97.90
  FLOW LENGTH(FEET) =    54.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.90
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.52
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    8.53
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    106.00 =     602.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       10.52     8.53       5.039        2.83
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    106.00 =     602.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        6.44    23.37       2.631        5.30
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =     913.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      12.87       8.53        5.039
      2      11.94      23.37        2.631

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      12.87   Tc(MIN.) =    8.53
  TOTAL AREA(ACRES) =        8.1

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    124.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    97.90  DOWNSTREAM(FEET) =    74.90
  FLOW LENGTH(FEET) =   155.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  19.96
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.87
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    8.66
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    124.00 =    1068.00 FEET.

+----------------------------------------------------------------------------+
```

```
| BEGIN SOUTHEAST WATERSHED ANALYSIS                                          |
|                                                                             |
|                                                                             |
+-----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  STREETS & ROADS (CURBS/STORM DRAINS) RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    60.00
  UPSTREAM ELEVATION(FEET) =    107.40
  DOWNSTREAM ELEVATION(FEET) =    106.00
  ELEVATION DIFFERENCE(FEET) =      1.40
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.102
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    204.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  106.00  DOWNSTREAM ELEVATION(FEET) =   92.00
  STREET LENGTH(FEET) =   418.50   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 13.50

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.83
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    8.11
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.65
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.05
  STREET FLOW TRAVEL TIME(MIN.) =   1.91   Tc(MIN.) =    4.01
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7200
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.729
  SUBAREA AREA(ACRES) =    0.98      SUBAREA RUNOFF(CFS) =    5.02
  TOTAL AREA(ACRES) =        1.0        PEAK FLOW RATE(CFS) =       5.34

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.64
  FLOW VELOCITY(FEET/SEC.) =  4.27   DEPTH*VELOCITY(FT*FT/SEC.) =   1.45
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =     478.50 FEET.

+-----------------------------------------------------------------------------+
| BEGIN WEST WATERSHED ANALYSIS                                               |
|                                                                             |
|                                                                             |
+-----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    302.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .4600
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    136.00
  DOWNSTREAM ELEVATION(FEET) =    109.00
  ELEVATION DIFFERENCE(FEET) =     27.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.348
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.812
  SUBAREA RUNOFF(CFS) =      0.63
  TOTAL AREA(ACRES) =      0.20   TOTAL RUNOFF(CFS) =      0.63

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    304.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    109.00  DOWNSTREAM(FEET) =    107.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =   144.00   CHANNEL SLOPE =  0.0083
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.795
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (4.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.32
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.58
  AVERAGE FLOW DEPTH(FEET) =   0.24   TRAVEL TIME(MIN.) =   1.52
  Tc(MIN.) =    6.87
  SUBAREA AREA(ACRES) =     0.48       SUBAREA RUNOFF(CFS) =    1.39
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.488
  TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =       1.92

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.30   FLOW VELOCITY(FEET/SEC.) =   1.78
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    304.00 =     244.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    304.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.795
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5430
  SUBAREA AREA(ACRES) =    0.18   SUBAREA RUNOFF(CFS) =    0.78
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       2.71
  TC(MIN.) =    6.87

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    310.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   104.40  DOWNSTREAM(FEET) =   101.60
  FLOW LENGTH(FEET) =   189.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.63
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.71
  PIPE TRAVEL TIME(MIN.) =   0.56    Tc(MIN.) =    7.43
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    310.00 =     433.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    310.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.43
  RAINFALL INTENSITY(INCH/HR) =   5.51
  TOTAL STREAM AREA(ACRES) =     0.86
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.71

****************************************************************************
  FLOW PROCESS FROM NODE    306.00 TO NODE    308.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    120.40
  DOWNSTREAM ELEVATION(FEET) =    107.00
  ELEVATION DIFFERENCE(FEET) =     13.40
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.605
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.609
  SUBAREA RUNOFF(CFS) =      0.19
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.19

****************************************************************************
  FLOW PROCESS FROM NODE    308.00 TO NODE    310.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    107.00  DOWNSTREAM(FEET) =    105.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   100.00   CHANNEL SLOPE =  0.0200
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.487
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6100
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.97
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.89
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   1.87
  Tc(MIN.) =    7.48
  SUBAREA AREA(ACRES) =     0.48       SUBAREA RUNOFF(CFS) =    1.61
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.573
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       1.76

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   1.04
  LONGEST FLOWPATH FROM NODE    306.00 TO NODE    310.00 =     180.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    310.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.48
  RAINFALL INTENSITY(INCH/HR) =   5.49
  TOTAL STREAM AREA(ACRES) =     0.56
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.76

  ** CONFLUENCE DATA **
```

```
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        2.71     7.43        5.510          0.86
      2        1.76     7.48        5.487          0.56

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

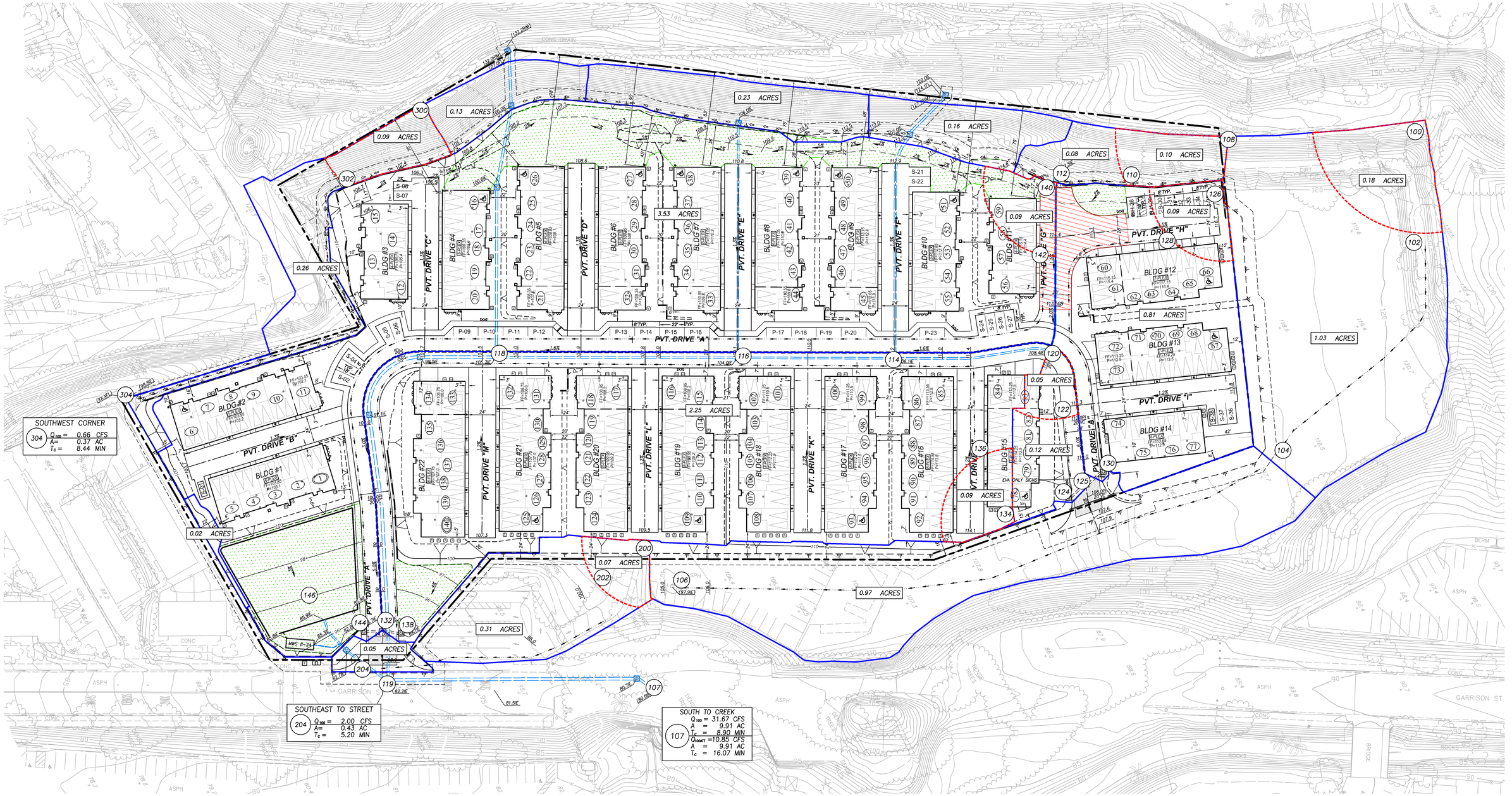
  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        4.45     7.43       5.510
      2        4.46     7.48       5.487

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.46   Tc(MIN.) =    7.48
  TOTAL AREA(ACRES) =        1.4
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    310.00 =     433.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    312.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   101.60  DOWNSTREAM(FEET) =    95.60
  FLOW LENGTH(FEET) =    41.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.71
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.46
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    7.53
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    312.00 =     474.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    312.00 TO NODE    312.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.465
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5401
  SUBAREA AREA(ACRES) =    0.11   SUBAREA RUNOFF(CFS) =    0.21
  TOTAL AREA(ACRES) =        1.5   TOTAL RUNOFF(CFS) =       4.52
  TC(MIN.) =    7.53
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.5  TC(MIN.) =      7.53
  PEAK FLOW RATE(CFS)   =       4.52
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

PROPOSED CONDITION



LEGEND

- PROJECT BOUNDARY
- DRAINAGE BOUNDARY
- INITIAL SUBAREA
- FLOW DIRECTION
- 00.00 ACRES — AREA
- X — HYDROLOGIC SOIL TYPE
- 406 — NODE NUMBER
- EXISTING HARDSCAPE
- EXISTING STORM DRAIN
- PROPOSED STORM DRAIN

PREPARED BY:
HUNSAKER & ASSOCIATES SAN DIEGO, INC
PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 FX(858)558-1414

PROPOSED
DRAINAGE MAP

GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, CALIFORNIA

MAP 2 OF 2

W.O.# 3214-0002

R:\1778\Hyd\DR\CAD\1778$Hydro-PR.dwg[]Apr-14-2025:16:59

AES PR INPUT DATA																
Node #		Code	Elevation		Length	Slope	Area		Imperviousness	Assumed	C value	If Channel			If memory
From	To		Up	Down			Total	Land Use / Imp Area		Soil Type		Base (ft)	Z:1	manning	Bank #
100	102	2	139	128.4	100	11%	0.18	0.00	0%	D	0.35				
102	104	5	128.4	117.8	266	4.0%	1.03	0.00	0%	D	0.35	200	50	0.03	
104	106	5	117.8	105	551	2.3%	0.97	0.26	27%	D	0.50	10	50	0.03	
106	107	3	97.9	80.5	96	18%									
107	107	10													1
108	110	2	138	117	100	21%	0.10	0.00	0%	D	0.35				
110	112	5	117	113	61	6.6%	0.08	0.00	0%	D	0.35	3	2	0.015	
112	114	3	102.83	97.03	290	2.0%									
114	114	8					0.16	0.00	0%	D	0.35				
114	116	3	97.03	94.93	140	1.5%									
116	116	8					0.23	0.00	0%	D	0.35				
116	118	3	94.93	91.7	215	1.5%									
118	118	8					0.13	0.00	0%	D	0.35				
118	119	3	91.7	82.2	380	2.5%									
119	119	10													2
120	122	2	113.5	112.2	65	2.0%	0.05	HDR 43DU/A	80%	D	0.79				
122	124	6	112.2	108.2	70	5.7%	0.12	HDR 43DU/A	80%	D	0.79				
124	125	3	105.2	105	12	1.7%									
125	125	1													1-2
126	128	2	117	116	65	1.5%	0.09	HDR 43DU/A	80%	D	0.79				
128	130	6	116	109	280	2.5%	0.81	HDR 43DU/A	80%	D	0.79				
130	125	3	106	105	12	8.3%									
125	125	1													2-2
125	132	3	105	88.9	965	1.7%									
132	132	1													1-2
134	136	2	114.1	113.4	65	1.1%	0.09	HDR 43DU/A	80%	D	0.79				
136	138	6	113.4	95	830	2.2%	2.25	HDR 43DU/A	80%	D	0.79				
138	132	3	89.1	88.9	12	1.7%									
132	132	1													2-2
132	144	3	88.9	88.7	12	1.7%									
144	144	1													1-2
140	142	2	115.1	114.1	65	1.5%	0.09	HDR 43DU/A	80%	D	0.79				
142	144	6	114.1	95	910	2.1%	3.53	HDR 43DU/A	80%	D	0.79				
144	144	1													2-2
144	146	3	88.7	88.45	22	1.1%									
146	119	3	83.45	82.2	81	1.5%									
119	119	11													2
119	119	12													2
119	107	3	82.2	80.5	230	0.7%									
107	107	11													1
107	107	12													1
					South Watershed		9.91								
200	202	2	109.5	101	65	13%	0.07	0.02	29%	D	0.51				
202	204	6	101	94	219	3.2%	0.31	0.19	61%	D	0.69				
204	204	8					0.05	0.04	76%	D	0.77				
					Southwest Watershed		0.43								
300	302	2	135	110	100	25%	0.09	0.00	0%	D	0.35				
302	304	5	110	94	357	4.5%	0.26	0.00	0%	D	0.35	3	2	0.015	
302	304	8					0.02	0.00	0%	D	0.35				
					West Watershed		0.37								

Runoff calculation example (typ):
0.9 X (0.30)+0.35 X (1-0.30)= 0.52
(0.9X Imp%) +(0.35X Per%)

```
**************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                          2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2015 Advanced Engineering Software (aes)
              Ver. 22.0 Release Date: 07/01/2015  License ID 1239

                             Analysis prepared by:

                     Hunsaker & Associates San Diego, Inc.
                               9707 Waples Street
                              San Diego,  CA 92121


 ************************* DESCRIPTION OF STUDY *************************
* GARRISON ELEMENTARY SCHOOL                                             *
* PROPOSED CONDITIONS - 100- YEAR                                        *
* DLN 1778, W.O. 3214-0002                                               *
 **************************************************************************

  FILE NAME: R:\1778\HYD\DR\CALCS\AES\100PR.DAT
  TIME/DATE OF STUDY: 17:04 10/18/2024
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   10.5      5.5    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  2   12.5      6.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    102.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    139.00
  DOWNSTREAM ELEVATION(FEET) =    128.40
  ELEVATION DIFFERENCE(FEET) =     10.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
  SUBAREA RUNOFF(CFS) =      0.39
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.39

**************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    104.00 IS CODE =  51
--------------------------------------------------------------------------
```

```
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    128.40  DOWNSTREAM(FEET) =    117.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =   266.00   CHANNEL SLOPE =  0.0398
  CHANNEL BASE(FEET) =  200.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.491
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.06
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.50
  AVERAGE FLOW DEPTH(FEET) =   0.01   TRAVEL TIME(MIN.) =   8.81
  Tc(MIN.) =   15.08
  SUBAREA AREA(ACRES) =     1.03       SUBAREA RUNOFF(CFS) =    1.26
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       1.48

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.01   FLOW VELOCITY(FEET/SEC.) =   0.59
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     366.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    106.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    117.80  DOWNSTREAM(FEET) =    105.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   551.00   CHANNEL SLOPE =  0.0232
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.748
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.14
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.36
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   6.77
  Tc(MIN.) =   21.84
  SUBAREA AREA(ACRES) =     0.97       SUBAREA RUNOFF(CFS) =    1.33
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.417
  TOTAL AREA(ACRES) =        2.2         PEAK FLOW RATE(CFS) =       2.50

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.11   FLOW VELOCITY(FEET/SEC.) =   1.44
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =     917.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    97.90  DOWNSTREAM(FEET) =    80.50
  FLOW LENGTH(FEET) =    96.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.38
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.50
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =   21.96
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =    1013.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
================================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    110.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    138.00
  DOWNSTREAM ELEVATION(FEET) =    117.00
  ELEVATION DIFFERENCE(FEET) =     21.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
  SUBAREA RUNOFF(CFS) =      0.22
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.22

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    112.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    117.00  DOWNSTREAM(FEET) =    113.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    61.00   CHANNEL SLOPE =  0.0656
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.927
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.30
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.75
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   0.37
  Tc(MIN.) =    6.64
  SUBAREA AREA(ACRES) =     0.08       SUBAREA RUNOFF(CFS) =    0.17
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.37

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.04   FLOW VELOCITY(FEET/SEC.) =   2.95
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    112.00 =     161.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    114.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   102.83  DOWNSTREAM(FEET) =    97.03
  FLOW LENGTH(FEET) =   290.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.52
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.37
  PIPE TRAVEL TIME(MIN.) =   1.37    Tc(MIN.) =    8.01
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    114.00 =     451.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    114.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.250
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.16   SUBAREA RUNOFF(CFS) =    0.29
```

```
  TOTAL AREA(ACRES) =        0.3   TOTAL RUNOFF(CFS) =       0.62
  TC(MIN.) =    8.01

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    116.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    97.03  DOWNSTREAM(FEET) =    94.93
  FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.69
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.62
  PIPE TRAVEL TIME(MIN.) =   0.63    Tc(MIN.) =    8.64
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    116.00 =     591.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    116.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.999
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.23   SUBAREA RUNOFF(CFS) =    0.40
  TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       1.00
  TC(MIN.) =    8.64

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    118.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    94.93  DOWNSTREAM(FEET) =    91.70
  FLOW LENGTH(FEET) =   215.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.24
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.00
  PIPE TRAVEL TIME(MIN.) =   0.85    Tc(MIN.) =    9.49
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    118.00 =     806.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    118.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.707
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.13   SUBAREA RUNOFF(CFS) =    0.21
  TOTAL AREA(ACRES) =        0.7   TOTAL RUNOFF(CFS) =       1.15
  TC(MIN.) =    9.49

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    119.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    91.70  DOWNSTREAM(FEET) =    82.20
  FLOW LENGTH(FEET) =   380.00   MANNING'S N =  0.013
```

```
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.31
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.15
  PIPE TRAVEL TIME(MIN.) =   1.19    Tc(MIN.) =   10.68
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    119.00 =    1186.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    119.00 TO NODE    119.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    122.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    113.50
  DOWNSTREAM ELEVATION(FEET) =    112.50
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.897
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.28
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.28

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    124.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  112.20  DOWNSTREAM ELEVATION(FEET) =  108.20
  STREET LENGTH(FEET) =    70.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.50

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.62
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.16
    HALFSTREET FLOOD WIDTH(FEET) =    1.50
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.51
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.70
  STREET FLOW TRAVEL TIME(MIN.) =   0.26   Tc(MIN.) =    4.16
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.790
  SUBAREA AREA(ACRES) =    0.12      SUBAREA RUNOFF(CFS) =    0.67
  TOTAL AREA(ACRES) =        0.2        PEAK FLOW RATE(CFS) =       0.96

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.20   HALFSTREET FLOOD WIDTH(FEET) =   3.65
  FLOW VELOCITY(FEET/SEC.) =  3.80   DEPTH*VELOCITY(FT*FT/SEC.) =   0.76
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    124.00 =     135.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    125.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   105.20  DOWNSTREAM(FEET) =   105.00
  FLOW LENGTH(FEET) =    12.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.34
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.96
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    4.20
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    125.00 =     147.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    125.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.20
  RAINFALL INTENSITY(INCH/HR) =   7.11
  TOTAL STREAM AREA(ACRES) =     0.17
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.96

****************************************************************************
  FLOW PROCESS FROM NODE    126.00 TO NODE    128.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    117.00
  DOWNSTREAM ELEVATION(FEET) =    116.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.897
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.51
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.51

****************************************************************************
  FLOW PROCESS FROM NODE    128.00 TO NODE    130.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  116.00  DOWNSTREAM ELEVATION(FEET) =  109.00
  STREET LENGTH(FEET) =   280.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.50

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.69
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    8.42
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.26
```

```
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.96
  STREET FLOW TRAVEL TIME(MIN.) =   1.43   Tc(MIN.) =    5.33
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.827
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.790
  SUBAREA AREA(ACRES) =    0.81      SUBAREA RUNOFF(CFS) =    4.37
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       4.85

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.86
  FLOW VELOCITY(FEET/SEC.) =  3.74   DEPTH*VELOCITY(FT*FT/SEC.) =   1.28
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    130.00 =     345.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    125.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   106.00  DOWNSTREAM(FEET) =   105.00
  FLOW LENGTH(FEET) =    12.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.35
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.85
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    5.35
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    125.00 =     357.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    125.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.35
  RAINFALL INTENSITY(INCH/HR) =   6.81
  TOTAL STREAM AREA(ACRES) =     0.90
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.85

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.96     4.20        7.114          0.17
      2        4.85     5.35        6.813          0.90

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        4.77     4.20       7.114
      2        5.77     5.35       6.813

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.77   Tc(MIN.) =    5.35
  TOTAL AREA(ACRES) =        1.1
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    125.00 =     357.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    132.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   105.00  DOWNSTREAM(FEET) =    88.90
```

```
  FLOW LENGTH(FEET) =   965.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.23
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.77
  PIPE TRAVEL TIME(MIN.) =   2.23    Tc(MIN.) =    7.57
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    132.00 =    1322.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    132.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.57
  RAINFALL INTENSITY(INCH/HR) =   5.44
  TOTAL STREAM AREA(ACRES) =     1.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.77

****************************************************************************
  FLOW PROCESS FROM NODE    134.00 TO NODE    136.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    114.10
  DOWNSTREAM ELEVATION(FEET) =    113.40
  ELEVATION DIFFERENCE(FEET) =      0.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.389
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.51
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.51

****************************************************************************
  FLOW PROCESS FROM NODE    136.00 TO NODE    138.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  113.40  DOWNSTREAM ELEVATION(FEET) =   95.00
  STREET LENGTH(FEET) =   830.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.50

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.16
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.35
    HALFSTREET FLOOD WIDTH(FEET) =   11.42
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.63
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.29
  STREET FLOW TRAVEL TIME(MIN.) =   3.81   Tc(MIN.) =    8.20
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.169
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.790
  SUBAREA AREA(ACRES) =    2.25      SUBAREA RUNOFF(CFS) =    9.19
```

```
  TOTAL AREA(ACRES) =        2.3        PEAK FLOW RATE(CFS) =       9.56

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.38   HALFSTREET FLOOD WIDTH(FEET) =  12.50
  FLOW VELOCITY(FEET/SEC.) =  3.79   DEPTH*VELOCITY(FT*FT/SEC.) =   1.43
  LONGEST FLOWPATH FROM NODE    134.00 TO NODE    138.00 =     895.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    138.00 TO NODE    132.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    89.10  DOWNSTREAM(FEET) =    88.90
  FLOW LENGTH(FEET) =    12.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.14
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.56
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    8.23
  LONGEST FLOWPATH FROM NODE    134.00 TO NODE    132.00 =     907.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    132.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.23
  RAINFALL INTENSITY(INCH/HR) =   5.16
  TOTAL STREAM AREA(ACRES) =     2.34
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.56

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        5.77     7.57        5.443          1.07
      2        9.56     8.23        5.159          2.34

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       14.56     7.57       5.443
      2       15.02     8.23       5.159

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      15.02   Tc(MIN.) =    8.23
  TOTAL AREA(ACRES) =        3.4
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    132.00 =    1322.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    144.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    88.90  DOWNSTREAM(FEET) =    88.70
  FLOW LENGTH(FEET) =    12.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.10
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      15.02
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    8.25
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    144.00 =    1334.00 FEET.

****************************************************************************
```

```
 FLOW PROCESS FROM NODE    144.00 TO NODE    144.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.25
 RAINFALL INTENSITY(INCH/HR) =   5.15
 TOTAL STREAM AREA(ACRES) =     3.41
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     15.02

****************************************************************************
 FLOW PROCESS FROM NODE    140.00 TO NODE    142.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
 S.C.S. CURVE NUMBER (AMC II) =   0
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
 UPSTREAM ELEVATION(FEET) =    115.10
 DOWNSTREAM ELEVATION(FEET) =    114.10
 ELEVATION DIFFERENCE(FEET) =      1.00
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.897
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.51
 TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.51

****************************************************************************
 FLOW PROCESS FROM NODE    142.00 TO NODE    144.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  114.10  DOWNSTREAM ELEVATION(FEET) =   95.00
 STREET LENGTH(FEET) =   910.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 12.50

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.82
   ***STREET FLOW SPLITS OVER STREET-CROWN***
   FULL DEPTH(FEET) =    0.38   FLOOD WIDTH(FEET) =   12.50
   FULL HALF-STREET VELOCITY(FEET/SEC.) =    3.69
   SPLIT DEPTH(FEET) =    0.26   SPLIT FLOOD WIDTH(FEET) =    6.92
   SPLIT FLOW(CFS) =    1.63   SPLIT VELOCITY(FEET/SEC.) =    2.73
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.38
   HALFSTREET FLOOD WIDTH(FEET) =   12.50
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.69
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.39
 STREET FLOW TRAVEL TIME(MIN.) =   4.12   Tc(MIN.) =    8.01
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.248
 *USER SPECIFIED(SUBAREA):
 RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.790
 SUBAREA AREA(ACRES) =    3.53      SUBAREA RUNOFF(CFS) =   14.64
 TOTAL AREA(ACRES) =        3.6        PEAK FLOW RATE(CFS) =      15.01

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.39   HALFSTREET FLOOD WIDTH(FEET) =  12.50
 FLOW VELOCITY(FEET/SEC.) =  3.98   DEPTH*VELOCITY(FT*FT/SEC.) =   1.56
```

```
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    144.00 =     975.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    144.00 TO NODE    144.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.01
 RAINFALL INTENSITY(INCH/HR) =   5.25
 TOTAL STREAM AREA(ACRES) =     3.62
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     15.01

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       15.02     8.25        5.150          3.41
     2       15.01     8.01        5.248          3.62

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       29.75     8.01       5.248
     2       29.75     8.25       5.150

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      29.75   Tc(MIN.) =    8.25
 TOTAL AREA(ACRES) =        7.0
 LONGEST FLOWPATH FROM NODE    126.00 TO NODE    144.00 =    1334.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    144.00 TO NODE    146.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    88.70  DOWNSTREAM(FEET) =    88.45
 FLOW LENGTH(FEET) =    22.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  20.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   9.19
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      29.75
 PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    8.29
 LONGEST FLOWPATH FROM NODE    126.00 TO NODE    146.00 =    1356.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    146.00 TO NODE    119.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    83.45  DOWNSTREAM(FEET) =    82.20
 FLOW LENGTH(FEET) =    81.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.46
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      29.75
 PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    8.42
 LONGEST FLOWPATH FROM NODE    126.00 TO NODE    119.00 =    1437.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    119.00 TO NODE    119.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================
```

```
 ** MAIN STREAM CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       29.75     8.42       5.083        7.03
 LONGEST FLOWPATH FROM NODE    126.00 TO NODE    119.00 =    1437.00 FEET.

 ** MEMORY BANK #  2 CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        1.15    10.68       4.360        0.70
 LONGEST FLOWPATH FROM NODE    108.00 TO NODE    119.00 =    1186.00 FEET.

 ** PEAK FLOW RATE TABLE **
 STREAM    RUNOFF       Tc      INTENSITY
 NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      30.66       8.42        5.083
     2      26.67      10.68        4.360

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      30.66   Tc(MIN.) =    8.42
 TOTAL AREA(ACRES) =        7.7

****************************************************************************
 FLOW PROCESS FROM NODE    119.00 TO NODE    119.00 IS CODE =  12
----------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    119.00 TO NODE    107.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    82.20  DOWNSTREAM(FEET) =    80.50
 FLOW LENGTH(FEET) =   230.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  30.0 INCH PIPE IS  22.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.91
 ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      30.66
 PIPE TRAVEL TIME(MIN.) =   0.48    Tc(MIN.) =    8.90
 LONGEST FLOWPATH FROM NODE    126.00 TO NODE    107.00 =    1667.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       30.66     8.90       4.903        7.73
 LONGEST FLOWPATH FROM NODE    126.00 TO NODE    107.00 =    1667.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        2.50    21.96       2.739        2.18
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =    1013.00 FEET.

 ** PEAK FLOW RATE TABLE **
 STREAM    RUNOFF       Tc      INTENSITY
 NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      31.67       8.90        4.903
     2      19.62      21.96        2.739

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      31.67   Tc(MIN.) =    8.90
 TOTAL AREA(ACRES) =        9.9
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .5100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    109.50
  DOWNSTREAM ELEVATION(FEET) =    101.00
  ELEVATION DIFFERENCE(FEET) =      8.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.974
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.25
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.25

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    204.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  101.00  DOWNSTREAM ELEVATION(FEET) =   94.00
  STREET LENGTH(FEET) =   219.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 10.50

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.50
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.99
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    4.64
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.97
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.65
  STREET FLOW TRAVEL TIME(MIN.) =   1.23   Tc(MIN.) =    5.20
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.934
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.657
  SUBAREA AREA(ACRES) =    0.31      SUBAREA RUNOFF(CFS) =    1.48
  TOTAL AREA(ACRES) =        0.4        PEAK FLOW RATE(CFS) =       1.73

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.25   HALFSTREET FLOOD WIDTH(FEET) =   6.42
  FLOW VELOCITY(FEET/SEC.) =  3.27   DEPTH*VELOCITY(FT*FT/SEC.) =   0.83
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =     284.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    204.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.934
  *USER SPECIFIED(SUBAREA):
```

```
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6700
  SUBAREA AREA(ACRES) =    0.05   SUBAREA RUNOFF(CFS) =    0.27
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       2.00
  TC(MIN.) =    5.20

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    135.00
  DOWNSTREAM ELEVATION(FEET) =    110.00
  ELEVATION DIFFERENCE(FEET) =     25.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
  SUBAREA RUNOFF(CFS) =      0.19
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.19

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    304.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    110.00  DOWNSTREAM(FEET) =     94.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   357.00   CHANNEL SLOPE =  0.0448
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.074
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.43
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.73
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   2.18
  Tc(MIN.) =    8.44
  SUBAREA AREA(ACRES) =     0.26       SUBAREA RUNOFF(CFS) =    0.46
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       0.62

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   3.11
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    304.00 =     457.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    304.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.074
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.02   SUBAREA RUNOFF(CFS) =    0.04
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       0.66
  TC(MIN.) =    8.44
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.4  TC(MIN.) =      8.44
  PEAK FLOW RATE(CFS)   =       0.66
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

AES PR-MITIGATED INPUT DATA															
Node #		Code	Elevation		Length	Slope	Area		Imperviousness	Assumed	C value	If Channel			If memory
From	To		Up	Down			Total	Land Use / Imp Area		Soil Type		Base (ft)	Z:1	manning	Bank #
100	102	2	139	128.4	100	11%	0.18	0.00	0%	D	0.35				
102	104	5	128.4	117.8	266	4.0%	1.03	0.00	0%	D	0.35	200	50	0.03	
104	106	5	117.8	105	551	2.3%	0.97	0.26	27%	D	0.50	10	50	0.03	
106	107	3	97.9	80.5	96	18%									
107	107	10													1
108	110	2	138	117	100	21%	0.10	0.00	0%	D	0.35				
110	112	5	117	113	61	6.6%	0.08	0.00	0%	D	0.35	3	2	0.015	
112	114	3	102.83	97.03	290	2.0%									
114	114	8					0.16	0.00	0%	D	0.35				
114	116	3	97.03	94.93	140	1.5%									
116	116	8					0.23	0.00	0%	D	0.35				
116	118	3	94.93	91.7	215	1.5%									
118	118	8					0.13	0.00	0%	D	0.35				
118	119	3	91.7	82.2	380	2.5%									
119	119	10													2
120	122	2	113.5	112.2	65	2.0%	0.05	HDR 43DU/A	80%	D	0.79				
122	124	6	112.2	108.2	70	5.7%	0.12	HDR 43DU/A	80%	D	0.79				
124	125	3	105.2	105	12	1.7%									
125	125	1													1-2
126	128	2	117	116	65	1.5%	0.09	HDR 43DU/A	80%	D	0.79				
128	130	6	116	109	280	2.5%	0.81	HDR 43DU/A	80%	D	0.79				
130	125	3	106	105	12	8.3%									
125	125	1													2-2
125	132	3	105	88.9	965	1.7%									
132	132	1													1-2
134	136	2	114.1	113.4	65	1.1%	0.09	HDR 43DU/A	80%	D	0.79				
136	138	6	113.4	95	830	2.2%	2.25	HDR 43DU/A	80%	D	0.79				
138	132	3	89.1	88.9	12	1.7%									
132	132	1													2-2
132	144	3	88.9	88.7	12	1.7%									
144	144	1													1-2
140	142	2	115.1	114.1	65	1.5%	0.09	HDR 43DU/A	80%	D	0.79				
142	144	6	114.1	95	910	2.1%	3.53	HDR 43DU/A	80%	D	0.79				
144	144	1													2-2
144	146	3	88.7	88.45	22	1.1%									
			Q (CFS)		A (AC)		TC (MIN)								
146	146	7	8.11		7.03		=8.25+7								
146	119	3	83.45	82.2	81	1.5%									
119	119	11													2
119	119	12													2
119	107	3	82.2	80.5	230	0.7%									
107	107	11													1
107	107	12													1
					South Watershed		9.91								
200	202	2	109.5	101	65	13%	0.07	0.02	29%	D	0.51				
202	204	6	101	94	219	3.2%	0.31	0.19	61%	D	0.69				
204	204	8					0.05	0.04	76%	D	0.77				
					Southwest Watershed		0.43								
300	302	2	135	110	100	25%	0.09	0.00	0%	D	0.35				
302	304	5	110	94	357	4.5%	0.26	0.00	0%	D	0.35	3	2	0.015	
302	304	8					0.02	0.00	0%	D	0.35				
					West Watershed		0.37								

Runoff calculation example (typ):
0.9 X (0.30)+0.35 X (1-0.30)= 0.52
(0.9X Imp%) +(0.35X Per%)

```
**************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                          2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2015 Advanced Engineering Software (aes)
              Ver. 22.0 Release Date: 07/01/2015  License ID 1239

                             Analysis prepared by:

                      Hunsaker & Associates San Diego, Inc.
                                9707 Waples Street
                               San Diego,  CA 92121


 ************************* DESCRIPTION OF STUDY *************************
* GARRISON ELEMENTARY SCHOOL                                             *
* PROPOSED CONDITIONS - 100-YEAR MITIGATED                               *
* DLN 1778, W.O. 3214-0002                                               *
 ************************************************************************

  FILE NAME: R:\1778\HYD\DR\CALCS\AES\100PRMIT.DAT
  TIME/DATE OF STUDY: 09:02 11/04/2024
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   10.5      5.5    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  2   12.5      6.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    102.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    139.00
  DOWNSTREAM ELEVATION(FEET) =    128.40
  ELEVATION DIFFERENCE(FEET) =     10.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
  SUBAREA RUNOFF(CFS) =      0.39
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.39

**************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    104.00 IS CODE =  51
--------------------------------------------------------------------------
```

```
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    128.40  DOWNSTREAM(FEET) =    117.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =   266.00   CHANNEL SLOPE =  0.0398
  CHANNEL BASE(FEET) =  200.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.491
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.06
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.50
  AVERAGE FLOW DEPTH(FEET) =   0.01   TRAVEL TIME(MIN.) =   8.81
  Tc(MIN.) =   15.08
  SUBAREA AREA(ACRES) =     1.03       SUBAREA RUNOFF(CFS) =    1.26
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       1.48

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.01   FLOW VELOCITY(FEET/SEC.) =   0.59
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     366.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    106.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    117.80  DOWNSTREAM(FEET) =    105.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   551.00   CHANNEL SLOPE =  0.0232
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.748
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.14
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.36
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   6.77
  Tc(MIN.) =   21.84
  SUBAREA AREA(ACRES) =     0.97       SUBAREA RUNOFF(CFS) =    1.33
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.417
  TOTAL AREA(ACRES) =        2.2         PEAK FLOW RATE(CFS) =       2.50

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.11   FLOW VELOCITY(FEET/SEC.) =   1.44
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =     917.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    97.90  DOWNSTREAM(FEET) =    80.50
  FLOW LENGTH(FEET) =    96.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.38
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.50
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =   21.96
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =    1013.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
================================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    110.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    138.00
  DOWNSTREAM ELEVATION(FEET) =    117.00
  ELEVATION DIFFERENCE(FEET) =     21.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
  SUBAREA RUNOFF(CFS) =      0.22
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.22

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    112.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    117.00  DOWNSTREAM(FEET) =    113.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    61.00   CHANNEL SLOPE =  0.0656
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.927
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.30
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.75
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   0.37
  Tc(MIN.) =    6.64
  SUBAREA AREA(ACRES) =     0.08       SUBAREA RUNOFF(CFS) =    0.17
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.37

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.04   FLOW VELOCITY(FEET/SEC.) =   2.95
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    112.00 =     161.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    114.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   102.83  DOWNSTREAM(FEET) =    97.03
  FLOW LENGTH(FEET) =   290.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.52
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.37
  PIPE TRAVEL TIME(MIN.) =   1.37    Tc(MIN.) =    8.01
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    114.00 =     451.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    114.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.250
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.16   SUBAREA RUNOFF(CFS) =    0.29
```

```
  TOTAL AREA(ACRES) =        0.3   TOTAL RUNOFF(CFS) =       0.62
  TC(MIN.) =    8.01

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    116.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    97.03  DOWNSTREAM(FEET) =    94.93
  FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.69
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.62
  PIPE TRAVEL TIME(MIN.) =   0.63    Tc(MIN.) =    8.64
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    116.00 =     591.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    116.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.999
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.23   SUBAREA RUNOFF(CFS) =    0.40
  TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       1.00
  TC(MIN.) =    8.64

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    118.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    94.93  DOWNSTREAM(FEET) =    91.70
  FLOW LENGTH(FEET) =   215.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.24
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.00
  PIPE TRAVEL TIME(MIN.) =   0.85    Tc(MIN.) =    9.49
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    118.00 =     806.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    118.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.707
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.13   SUBAREA RUNOFF(CFS) =    0.21
  TOTAL AREA(ACRES) =        0.7   TOTAL RUNOFF(CFS) =       1.15
  TC(MIN.) =    9.49

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    119.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    91.70  DOWNSTREAM(FEET) =    82.20
  FLOW LENGTH(FEET) =   380.00   MANNING'S N =  0.013
```

```
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.31
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.15
  PIPE TRAVEL TIME(MIN.) =   1.19    Tc(MIN.) =   10.68
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    119.00 =    1186.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    119.00 TO NODE    119.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    122.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    113.50
  DOWNSTREAM ELEVATION(FEET) =    112.50
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.897
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.28
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.28

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    124.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  112.20  DOWNSTREAM ELEVATION(FEET) =  108.20
  STREET LENGTH(FEET) =    70.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.50

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.62
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.16
    HALFSTREET FLOOD WIDTH(FEET) =    1.50
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.51
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.70
  STREET FLOW TRAVEL TIME(MIN.) =   0.26   Tc(MIN.) =    4.16
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.790
  SUBAREA AREA(ACRES) =    0.12      SUBAREA RUNOFF(CFS) =    0.67
  TOTAL AREA(ACRES) =        0.2        PEAK FLOW RATE(CFS) =       0.96

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.20   HALFSTREET FLOOD WIDTH(FEET) =   3.65
  FLOW VELOCITY(FEET/SEC.) =  3.80   DEPTH*VELOCITY(FT*FT/SEC.) =   0.76
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    124.00 =     135.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    125.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   105.20  DOWNSTREAM(FEET) =   105.00
  FLOW LENGTH(FEET) =    12.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.34
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.96
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    4.20
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    125.00 =     147.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    125.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.20
  RAINFALL INTENSITY(INCH/HR) =   7.11
  TOTAL STREAM AREA(ACRES) =     0.17
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.96

****************************************************************************
  FLOW PROCESS FROM NODE    126.00 TO NODE    128.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    117.00
  DOWNSTREAM ELEVATION(FEET) =    116.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.897
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.51
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.51

****************************************************************************
  FLOW PROCESS FROM NODE    128.00 TO NODE    130.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  116.00  DOWNSTREAM ELEVATION(FEET) =  109.00
  STREET LENGTH(FEET) =   280.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.50

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.69
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    8.42
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.26
```

```
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.96
  STREET FLOW TRAVEL TIME(MIN.) =   1.43   Tc(MIN.) =    5.33
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.827
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.790
  SUBAREA AREA(ACRES) =    0.81      SUBAREA RUNOFF(CFS) =    4.37
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       4.85

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.86
  FLOW VELOCITY(FEET/SEC.) =  3.74   DEPTH*VELOCITY(FT*FT/SEC.) =   1.28
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    130.00 =     345.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    125.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   106.00  DOWNSTREAM(FEET) =   105.00
  FLOW LENGTH(FEET) =    12.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.35
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.85
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    5.35
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    125.00 =     357.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    125.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.35
  RAINFALL INTENSITY(INCH/HR) =   6.81
  TOTAL STREAM AREA(ACRES) =     0.90
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.85

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.96     4.20        7.114          0.17
      2        4.85     5.35        6.813          0.90

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        4.77     4.20       7.114
      2        5.77     5.35       6.813

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.77   Tc(MIN.) =    5.35
  TOTAL AREA(ACRES) =        1.1
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    125.00 =     357.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    132.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   105.00  DOWNSTREAM(FEET) =    88.90
```

```
  FLOW LENGTH(FEET) =   965.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.23
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.77
  PIPE TRAVEL TIME(MIN.) =   2.23    Tc(MIN.) =    7.57
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    132.00 =    1322.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    132.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.57
  RAINFALL INTENSITY(INCH/HR) =   5.44
  TOTAL STREAM AREA(ACRES) =     1.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.77

****************************************************************************
  FLOW PROCESS FROM NODE    134.00 TO NODE    136.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    114.10
  DOWNSTREAM ELEVATION(FEET) =    113.40
  ELEVATION DIFFERENCE(FEET) =      0.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.389
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.51
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.51

****************************************************************************
  FLOW PROCESS FROM NODE    136.00 TO NODE    138.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  113.40  DOWNSTREAM ELEVATION(FEET) =   95.00
  STREET LENGTH(FEET) =   830.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.50

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.16
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.35
    HALFSTREET FLOOD WIDTH(FEET) =   11.42
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.63
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.29
  STREET FLOW TRAVEL TIME(MIN.) =   3.81   Tc(MIN.) =    8.20
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.169
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.790
  SUBAREA AREA(ACRES) =    2.25      SUBAREA RUNOFF(CFS) =    9.19
```

```
  TOTAL AREA(ACRES) =        2.3        PEAK FLOW RATE(CFS) =       9.56

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.38   HALFSTREET FLOOD WIDTH(FEET) =  12.50
  FLOW VELOCITY(FEET/SEC.) =  3.79   DEPTH*VELOCITY(FT*FT/SEC.) =   1.43
  LONGEST FLOWPATH FROM NODE    134.00 TO NODE    138.00 =     895.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    138.00 TO NODE    132.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    89.10  DOWNSTREAM(FEET) =    88.90
  FLOW LENGTH(FEET) =    12.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.14
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.56
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    8.23
  LONGEST FLOWPATH FROM NODE    134.00 TO NODE    132.00 =     907.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    132.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.23
  RAINFALL INTENSITY(INCH/HR) =   5.16
  TOTAL STREAM AREA(ACRES) =     2.34
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.56

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        5.77     7.57        5.443          1.07
      2        9.56     8.23        5.159          2.34

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       14.56     7.57       5.443
      2       15.02     8.23       5.159

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      15.02   Tc(MIN.) =    8.23
  TOTAL AREA(ACRES) =        3.4
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    132.00 =    1322.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    144.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    88.90  DOWNSTREAM(FEET) =    88.70
  FLOW LENGTH(FEET) =    12.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.10
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      15.02
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    8.25
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    144.00 =    1334.00 FEET.

****************************************************************************
```

```
 FLOW PROCESS FROM NODE    144.00 TO NODE    144.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.25
 RAINFALL INTENSITY(INCH/HR) =   5.15
 TOTAL STREAM AREA(ACRES) =     3.41
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     15.02

****************************************************************************
 FLOW PROCESS FROM NODE    140.00 TO NODE    142.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
 S.C.S. CURVE NUMBER (AMC II) =   0
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
 UPSTREAM ELEVATION(FEET) =    115.10
 DOWNSTREAM ELEVATION(FEET) =    114.10
 ELEVATION DIFFERENCE(FEET) =      1.00
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.897
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.51
 TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.51

****************************************************************************
 FLOW PROCESS FROM NODE    142.00 TO NODE    144.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  114.10  DOWNSTREAM ELEVATION(FEET) =   95.00
 STREET LENGTH(FEET) =   910.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 12.50

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.82
   ***STREET FLOW SPLITS OVER STREET-CROWN***
   FULL DEPTH(FEET) =    0.38   FLOOD WIDTH(FEET) =   12.50
   FULL HALF-STREET VELOCITY(FEET/SEC.) =    3.69
   SPLIT DEPTH(FEET) =    0.26   SPLIT FLOOD WIDTH(FEET) =    6.92
   SPLIT FLOW(CFS) =    1.63   SPLIT VELOCITY(FEET/SEC.) =    2.73
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.38
   HALFSTREET FLOOD WIDTH(FEET) =   12.50
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.69
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.39
 STREET FLOW TRAVEL TIME(MIN.) =   4.12   Tc(MIN.) =    8.01
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.248
 *USER SPECIFIED(SUBAREA):
 RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.790
 SUBAREA AREA(ACRES) =    3.53      SUBAREA RUNOFF(CFS) =   14.64
 TOTAL AREA(ACRES) =        3.6        PEAK FLOW RATE(CFS) =      15.01

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.39   HALFSTREET FLOOD WIDTH(FEET) =  12.50
 FLOW VELOCITY(FEET/SEC.) =  3.98   DEPTH*VELOCITY(FT*FT/SEC.) =   1.56
```

```
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    144.00 =     975.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    144.00 TO NODE    144.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.01
 RAINFALL INTENSITY(INCH/HR) =   5.25
 TOTAL STREAM AREA(ACRES) =     3.62
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     15.01

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       15.02     8.25        5.150          3.41
     2       15.01     8.01        5.248          3.62

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       29.75     8.01       5.248
     2       29.75     8.25       5.150

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      29.75   Tc(MIN.) =    8.25
 TOTAL AREA(ACRES) =        7.0
 LONGEST FLOWPATH FROM NODE    126.00 TO NODE    144.00 =    1334.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    144.00 TO NODE    146.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    88.70  DOWNSTREAM(FEET) =    88.45
 FLOW LENGTH(FEET) =    22.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  20.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   9.19
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      29.75
 PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    8.29
 LONGEST FLOWPATH FROM NODE    126.00 TO NODE    146.00 =    1356.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    146.00 TO NODE    146.00 IS CODE =   7
----------------------------------------------------------------------------
 >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
 USER-SPECIFIED VALUES ARE AS FOLLOWS:
 TC(MIN) =  15.25   RAIN INTENSITY(INCH/HOUR) =  3.47
 TOTAL AREA(ACRES) =     7.03   TOTAL RUNOFF(CFS) =      8.11

****************************************************************************
 FLOW PROCESS FROM NODE    146.00 TO NODE    119.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    83.45  DOWNSTREAM(FEET) =    82.20
 FLOW LENGTH(FEET) =    81.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.63
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       8.11
```

```
 PIPE TRAVEL TIME(MIN.) =   0.18    Tc(MIN.) =   15.43
 LONGEST FLOWPATH FROM NODE    126.00 TO NODE    119.00 =    1437.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    119.00 TO NODE    119.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        8.11    15.43       3.440        7.03
 LONGEST FLOWPATH FROM NODE    126.00 TO NODE    119.00 =    1437.00 FEET.

 ** MEMORY BANK #  2 CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        1.15    10.68       4.360        0.70
 LONGEST FLOWPATH FROM NODE    108.00 TO NODE    119.00 =    1186.00 FEET.

 ** PEAK FLOW RATE TABLE **
 STREAM    RUNOFF       Tc      INTENSITY
 NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1       6.77      10.68        4.360
     2       9.02      15.43        3.440

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       9.02   Tc(MIN.) =   15.43
 TOTAL AREA(ACRES) =        7.7

****************************************************************************
 FLOW PROCESS FROM NODE    119.00 TO NODE    119.00 IS CODE =  12
----------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    119.00 TO NODE    107.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    82.20  DOWNSTREAM(FEET) =    80.50
 FLOW LENGTH(FEET) =   230.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.93
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       9.02
 PIPE TRAVEL TIME(MIN.) =   0.65    Tc(MIN.) =   16.07
 LONGEST FLOWPATH FROM NODE    126.00 TO NODE    107.00 =    1667.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        9.02    16.07       3.350        7.73
 LONGEST FLOWPATH FROM NODE    126.00 TO NODE    107.00 =    1667.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        2.50    21.96       2.739        2.18
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =    1013.00 FEET.

 ** PEAK FLOW RATE TABLE **
```

```
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      10.85      16.07        3.350
      2       9.87      21.96        2.739

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      10.85   Tc(MIN.) =   16.07
  TOTAL AREA(ACRES) =        9.9

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .5100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    109.50
  DOWNSTREAM ELEVATION(FEET) =    101.00
  ELEVATION DIFFERENCE(FEET) =      8.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.974
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.25
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.25

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    204.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  101.00  DOWNSTREAM ELEVATION(FEET) =   94.00
  STREET LENGTH(FEET) =   219.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 10.50

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.50
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.99
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    4.64
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.97
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.65
  STREET FLOW TRAVEL TIME(MIN.) =   1.23   Tc(MIN.) =    5.20
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.934
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.657
  SUBAREA AREA(ACRES) =    0.31      SUBAREA RUNOFF(CFS) =    1.48
  TOTAL AREA(ACRES) =        0.4        PEAK FLOW RATE(CFS) =       1.73

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.25   HALFSTREET FLOOD WIDTH(FEET) =   6.42
  FLOW VELOCITY(FEET/SEC.) =  3.27   DEPTH*VELOCITY(FT*FT/SEC.) =   0.83
```

```
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =     284.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    204.00 TO NODE    204.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.934
 *USER SPECIFIED(SUBAREA):
 RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7700
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.6700
 SUBAREA AREA(ACRES) =    0.05   SUBAREA RUNOFF(CFS) =    0.27
 TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       2.00
 TC(MIN.) =    5.20

****************************************************************************
 FLOW PROCESS FROM NODE    300.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
 S.C.S. CURVE NUMBER (AMC II) =   0
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
 UPSTREAM ELEVATION(FEET) =    135.00
 DOWNSTREAM ELEVATION(FEET) =    110.00
 ELEVATION DIFFERENCE(FEET) =     25.00
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
 WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
 SUBAREA RUNOFF(CFS) =      0.19
 TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.19

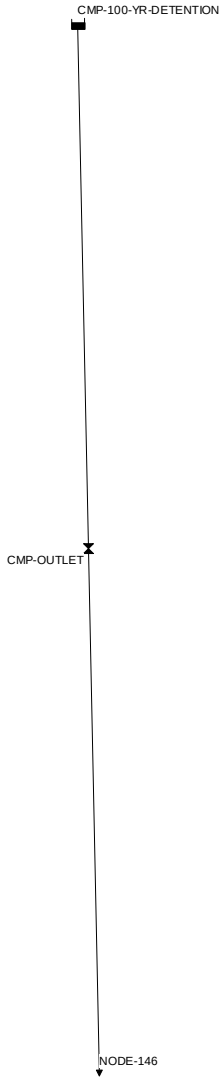
****************************************************************************
 FLOW PROCESS FROM NODE    302.00 TO NODE    304.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    110.00  DOWNSTREAM(FEET) =     94.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   357.00   CHANNEL SLOPE =  0.0448
 CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.074
 *USER SPECIFIED(SUBAREA):
 RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
 S.C.S. CURVE NUMBER (AMC II) =   0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.43
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.73
 AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   2.18
 Tc(MIN.) =    8.44
 SUBAREA AREA(ACRES) =     0.26       SUBAREA RUNOFF(CFS) =    0.46
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
 TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       0.62

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   3.11
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    304.00 =     457.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    302.00 TO NODE    304.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.074
 *USER SPECIFIED(SUBAREA):
 RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
 SUBAREA AREA(ACRES) =    0.02   SUBAREA RUNOFF(CFS) =    0.04
```

```
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       0.66
  TC(MIN.) =    8.44
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.4  TC(MIN.) =      8.44
  PEAK FLOW RATE(CFS)   =       0.66
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Appendix 6 –Detention Calculations


CMP-100-YR-DETENTION
CMP-OUTLET
NODE-146

Rational Method Hydrograph Calculations
for
Garrison Elementary School, City of Oceanside, CA

Q_{10}= 29.75 cfs

Tc= 8 min C= 0.79

#= 45 $P_{10,6}$= 2.7 in A= 7.03 acres

#	D (MIN)	I (IN/HR)	VOL (IN)	ΔVOL (IN)	I (INCR) (IN/HR)	Q (CFS)	VOL (CF)	ORDINATE (CFS)
		*(7.44*P6*D^-.645)*	*(I*D/60)*	*(V1-V0)*	*(ΔV/ΔT)*	*(Q=ciA)*		*(Re-ordered)*
0	0	0.00	0.00	0.70	5.25	29.75	14280	0.00
1	8	5.25	0.70	0.20	1.47	8.14	3907	0.90
2	16	3.36	0.90	0.14	1.04	5.78	2773	0.91
3	24	2.59	1.03	0.11	0.83	4.63	2224	0.94
4	32	2.15	1.15	0.09	0.71	3.93	1889	0.95
5	40	1.86	1.24	0.08	0.62	3.45	1658	0.98
6	48	1.65	1.32	0.07	0.56	3.10	1488	1.00
7	56	1.50	1.40	0.07	0.51	2.83	1357	1.04
8	64	1.37	1.47	0.06	0.47	2.61	1251	1.06
9	72	1.27	1.53	0.06	0.44	2.43	1164	1.10
10	80	1.19	1.59	0.05	0.41	2.27	1091	1.12
11	88	1.12	1.64	0.05	0.39	2.14	1029	1.17
12	96	1.06	1.69	0.05	0.37	2.03	975	1.19
13	104	1.00	1.74	0.05	0.35	1.93	928	1.25
14	112	0.96	1.79	0.04	0.33	1.85	886	1.28
15	120	0.92	1.83	0.04	0.32	1.77	849	1.35
16	128	0.88	1.87	0.04	0.31	1.70	815	1.39
17	136	0.84	1.92	0.04	0.29	1.64	785	1.48
18	144	0.81	1.95	0.04	0.28	1.58	757	1.52
19	152	0.79	1.99	0.04	0.27	1.52	732	1.64
20	160	0.76	2.03	0.04	0.27	1.48	709	1.70
21	168	0.74	2.06	0.03	0.26	1.43	687	1.85
22	176	0.72	2.10	0.03	0.25	1.39	667	1.93
23	184	0.70	2.13	0.03	0.24	1.35	649	2.14
24	192	0.68	2.16	0.03	0.24	1.32	632	2.27
25	200	0.66	2.20	0.03	0.23	1.28	616	2.61
26	208	0.64	2.23	0.03	0.23	1.25	601	2.83
27	216	0.63	2.26	0.03	0.22	1.22	586	3.45
28	224	0.61	2.29	0.03	0.21	1.19	573	3.93
29	232	0.60	2.31	0.03	0.21	1.17	560	5.78
30	240	0.59	2.34	0.03	0.21	1.14	548	8.14
31	248	0.57	2.37	0.03	0.20	1.12	537	29.75
32	256	0.56	2.40	0.03	0.20	1.10	526	4.63
33	264	0.55	2.42	0.03	0.19	1.08	516	3.10
34	272	0.54	2.45	0.03	0.19	1.06	507	2.43
35	280	0.53	2.47	0.02	0.19	1.04	497	2.03
36	288	0.52	2.50	0.02	0.18	1.02	488	1.77
37	296	0.51	2.52	0.02	0.18	1.00	480	1.58
38	304	0.50	2.55	0.02	0.18	0.98	472	1.43
39	312	0.49	2.57	0.02	0.17	0.97	464	1.32
40	320	0.49	2.59	0.02	0.17	0.95	457	1.22
41	328	0.48	2.62	0.02	0.17	0.94	450	1.14
42	336	0.47	2.64	0.02	0.17	0.92	443	1.08
43	344	0.46	2.66	0.02	0.16	0.91	436	1.02
44	352	0.46	2.68	0.02	0.16	0.90	430	0.97
45	360	0.45	2.71	0.00	0.00	0.00	0	0.92
						SUM=	**54371**	**cubic feet**
							1.25	**acre-feet**

Check: $V = C*A*P_6$

V= 1.25 acre-feet

OK

CMP #1 Stage Storage					
Input DCV			11,849		
Input Factor			1.5		
Factor X DCV			17,773.5		
WQ Ponding Depth			2.750	ft	
Note: Find out the elevation value in relation to required WQ volume					
HMP-1					
depth	area	area (ac)	elevation	volume (cf)	volume (acft)
0.00	3634.0	0.0834	0.00	0.0	0.00000
0.17	4818.6	0.1106	0.17	737.9	0.01694
0.33	5288.7	0.1214	0.33	1,582.7	0.03633
0.50	5635.1	0.1294	0.50	2,494.2	0.05726
0.67	5914.8	0.1358	0.67	3,457.4	0.07937
0.83	6150.3	0.1412	0.83	4,463.3	0.10246
1.00	6352.9	0.1458	1.00	5,505.7	0.12639
1.17	6529.7	0.1499	1.17	6,579.6	0.15105
1.33	6685.1	0.1535	1.33	7,681.1	0.17633
1.50	6822.2	0.1566	1.50	8,806.9	0.20218
1.67	6943.4	0.1594	1.67	9,954.3	0.22852
1.83	7050.2	0.1619	1.83	11,120.6	0.25529
2.00	7144.1	0.1640	2.00	12,303.6	0.28245
2.17	7226.1	0.1659	2.17	13,501.3	0.30995
2.33	7296.8	0.1675	2.33	14,711.7	0.33773
2.50	7357.1	0.1689	2.50	15,933.0	0.36577
2.67	7407.3	0.1700	2.67	17,163.5	0.39402
2.75	7427.6	0.1705	2.75	17782.5	0.40823
2.83	7447.9	0.1710	2.83	18,401.5	0.42244
3.00	7479.2	0.1717	3.00	19,645.6	0.45100
3.17	7501.3	0.1722	3.17	20,894.1	0.47966
3.33	7514.6	0.1725	3.33	22,145.5	0.50839
3.50	7519.0	0.1726	3.50	23,398.5	0.53715
3.67	7514.6	0.1725	3.67	24,651.4	0.56592
3.83	7501.3	0.1722	3.83	25,902.8	0.59465
4.00	7479.2	0.1717	4.00	27,151.3	0.62331
4.17	7447.9	0.1710	4.17	28,395.4	0.65187
4.33	7407.3	0.1700	4.33	29,633.4	0.68029
4.50	7357.1	0.1689	4.50	30,863.9	0.70854
4.67	7296.8	0.1675	4.67	32,085.2	0.73658
4.83	7226.1	0.1659	4.83	33,295.6	0.76436
5.00	7144.1	0.1640	5.00	34,493.3	0.79186
5.17	7050.2	0.1619	5.17	35,676.3	0.81902
5.33	6943.4	0.1594	5.33	36,842.6	0.84579
5.50	6822.2	0.1566	5.50	37,990.0	0.87213
5.67	6685.1	0.1535	5.67	39,115.8	0.89798
5.83	6529.7	0.1499	5.83	40,217.3	0.92326
6.00	6352.9	0.1458	6.00	41,291.2	0.94792
6.17	6150.3	0.1412	6.17	42,333.6	0.97184
6.33	5914.8	0.1358	6.33	43,339.5	0.99494
6.50	5635.1	0.1294	6.50	44,302.7	1.01705
6.67	5288.7	0.1214	6.67	45,214.2	1.03798
6.83	4818.6	0.1106	6.83	46,059.0	1.05737
7.00	3634.0	0.0834	7.00	46,796.9	1.07431
7.17	3634.0	0.0834	7.17	47,402.6	1.08821
7.33	3634.0	0.0834	7.33	48,008.2	1.10212
7.50	3634.0	0.0834	7.50	48,613.9	1.11602

CMP-1 Discharge to MWS BF-3-1

Discharge vs Elevation Table

Low orifice:	2.5 "	Top orifice:	0.625 "
Number:	1	Number:	0
Cg-low:	0.61	Cg-low:	0.61
invert elev:	0.00 ft	invert elev:	0.40 ft

h	H/D-low	H/D-mid	H/D-top	Qlow-orif	Qlow-weir	Qtot-low	Qmid-orif	Qmid-weir	Qtot-med	Qtop-orif	Qtop-weir	Qtot-top	Qpeak-top	Qtot
(ft)	-	-	-	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000
0.17	0.80	0.00	0.00	0.042	0.035	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0354
0.33	1.60	0.00	0.00	0.080	0.100	0.080	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0799
0.50	2.40	0.00	1.92	0.105	0.136	0.105	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1050
0.67	3.20	2.42	5.12	0.125	0.142	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1252
0.83	4.00	4.85	8.32	0.142	0.234	0.142	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1425
1.00	4.80	7.27	11.52	0.158	0.708	0.158	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1579
1.17	5.60	9.70	14.72	0.172	2.103	0.172	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1720
1.33	6.40	12.12	17.92	0.185	5.265	0.185	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1850
1.50	7.20	14.55	21.12	0.197	11.405	0.197	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1972
1.67	8.00	16.97	24.32	0.209	22.164	0.209	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2086
1.83	8.80	19.39	27.52	0.219	39.678	0.219	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2194
2.00	9.60	21.82	30.72	0.230	66.635	0.230	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2298
2.17	10.40	24.24	33.92	0.240	106.340	0.240	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2396
2.33	11.20	26.67	37.12	0.249	162.779	0.249	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2491
2.50	12.00	29.09	40.32	0.258	240.680	0.258	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2583
2.67	12.80	31.52	43.52	0.267	345.572	0.267	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2671
2.75	13.20	32.73	45.12	0.271	410.104	0.271	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2714
2.83	13.60	33.94	46.72	0.276	483.854	0.276	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2757
3.00	14.40	36.36	49.92	0.284	662.852	0.284	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2840
3.17	15.22	38.84	53.18	0.292	896.007	0.292	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2922
3.33	16.00	41.21	56.32	0.300	1177.320	0.300	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2999
3.50	16.80	43.64	59.52	0.308	1532.649	0.308	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3075
3.67	17.60	46.06	62.72	0.315	1968.536	0.315	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3150
3.83	18.40	48.48	65.92	0.322	2497.888	0.322	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3222
4.00	19.20	50.91	69.12	0.329	3134.913	0.329	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3294
4.17	20.00	53.33	72.32	0.336	3895.187	0.336	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3363
4.33	20.80	55.76	75.52	0.343	4795.713	0.343	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3432
4.50	21.60	58.18	78.72	0.350	5854.983	0.350	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3499
4.67	22.40	60.61	81.92	0.356	7093.043	0.356	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3564
4.83	23.20	63.03	85.12	0.363	8531.553	0.363	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3629
5.00	24.00	65.45	88.32	0.369	10193.852	0.369	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3692
5.17	24.80	67.88	91.52	0.375	12105.017	0.375	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3755
5.33	25.60	70.30	94.72	0.382	14291.927	0.382	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3816
5.50	26.40	72.73	97.92	0.388	16783.327	0.388	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3876
5.67	27.20	75.15	101.12	0.394	19609.887	0.394	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3936
5.83	28.00	77.58	104.32	0.399	22804.268	0.399	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3994
6.00	28.80	80.00	107.52	0.405	26401.180	0.405	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4052
6.17	29.60	82.42	110.72	0.411	30437.450	0.411	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4109
6.33	30.40	84.85	113.92	0.416	34952.078	0.416	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4165
6.50	31.20	87.27	117.12	0.422	39986.307	0.422	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4220
6.67	32.00	89.70	120.32	0.427	45583.676	0.427	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4275
6.83	32.80	92.12	123.52	0.433	51790.090	0.433	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4329
7.00	33.60	94.55	126.72	0.438	58653.882	0.438	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4382
7.17	34.40	96.97	129.92	0.443	66225.868	0.443	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4435
7.33	35.20	99.39	133.12	0.449	74559.419	0.449	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4487
7.50	36.00	101.82	136.32	0.454	83710.517	0.454	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4538

CMP #1 Discharge HMP Riser

Discharge vs Elevation Table

Low orifice:	1.50 "	Top orifice:	4 "
Number:	2	Number:	6
Cg-low:	0.61	Cg-low:	0.61
invert elev:	2.75 ft	invert elev:	4.00 ft
Middle orifice:	4 "	Emergency inlet:	
number of orif:	4	Rim height:	6.00 ft
Cg-middle:	0.61	Riser Box D	3x2
invert elev:	3.00 ft	Weir Length	10.00 ft

														Peak Flow	WQ+HMP
h	H/D-low	H/D-mid	H/D-top	Qlow-orif	Qlow-weir	Qtot-low	Qmid-orif	Qmid-weir	Qtot-med	Qtop-orif	Qtop-weir	Qtot-top	Qpeak-top	Qtot	Qtot
(ft)	-	-	-	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000
0.17	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0354
0.33	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0799
0.50	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1050
0.67	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1252
0.83	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1425
1.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1579
1.17	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1720
1.33	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1850
1.50	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1972
1.67	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2086
1.83	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2194
2.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2298
2.17	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2396
2.33	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2491
2.50	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2583
2.67	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2671
2.75	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2714
2.83	0.67	0.00	0.00	0.017	0.014	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.014	0.2900
3.00	2.00	0.00	0.00	0.052	0.069	0.052	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.052	0.3360
3.17	3.36	0.51	0.00	0.072	0.082	0.072	0.099	0.204	0.204	0.000	0.000	0.000	0.000	0.276	0.5681
3.33	4.67	1.00	0.00	0.087	0.325	0.087	0.698	0.666	0.666	0.000	0.000	0.000	0.000	0.753	1.0531
3.50	6.00	1.50	0.00	0.100	1.895	0.100	0.987	1.200	0.987	0.000	0.000	0.000	0.000	1.086	1.3937
3.67	7.33	2.00	0.00	0.111	7.153	0.111	1.208	1.605	1.208	0.000	0.000	0.000	0.000	1.319	1.6343
3.83	8.67	2.50	0.00	0.121	20.180	0.121	1.395	1.784	1.395	0.000	0.000	0.000	0.000	1.517	1.8388
4.00	10.00	3.00	0.00	0.131	47.216	0.131	1.560	1.811	1.560	0.000	0.000	0.000	0.000	1.691	2.0202
4.17	11.33	3.50	0.50	0.140	97.116	0.140	1.709	2.010	1.709	#NUM!	0.295	0.295	0.000	2.144	2.4799
4.33	12.67	4.00	1.00	0.148	181.788	0.148	1.846	3.030	1.846	1.046	1.000	1.000	0.000	2.994	3.3367
4.50	14.00	4.50	1.50	0.156	316.649	0.156	1.973	5.921	1.973	1.480	1.800	1.480	0.000	3.609	3.9589
4.67	15.33	5.00	2.00	0.164	521.067	0.164	2.093	12.215	2.093	1.812	2.407	1.812	0.000	4.069	4.4252
4.83	16.67	5.50	2.50	0.171	818.809	0.171	2.206	24.001	2.206	2.093	2.676	2.093	0.000	4.470	4.8325
5.00	18.00	6.00	3.00	0.178	1238.490	0.178	2.314	44.001	2.314	2.340	2.717	2.340	0.000	4.831	5.2004
5.17	19.33	6.50	3.50	0.184	1814.020	0.184	2.417	75.648	2.417	2.563	3.015	2.563	0.000	5.164	5.5395
5.33	20.67	7.00	4.00	0.191	2585.051	0.191	2.515	123.164	2.515	2.769	4.544	2.769	0.000	5.474	5.8561
5.50	22.00	7.50	4.50	0.197	3597.421	0.197	2.610	191.634	2.610	2.960	8.881	2.960	0.000	5.767	6.1544
5.67	23.33	8.00	5.00	0.203	4903.610	0.203	2.702	287.087	2.702	3.139	18.323	3.139	0.000	6.044	6.4375
5.83	24.67	8.50	5.50	0.209	6563.176	0.209	2.790	416.572	2.790	3.309	36.002	3.309	0.000	6.308	6.7076
6.00	26.00	9.00	6.00	0.215	8643.213	0.215	2.876	588.231	2.876	3.471	66.002	3.471	0.000	6.561	6.9665
6.17	27.33	9.50	6.50	0.220	11218.791	0.220	2.960	811.382	2.960	3.625	113.472	3.625	2.266	9.070	9.4812
6.33	28.67	10.00	7.00	0.225	14373.406	0.225	3.041	1096.593	3.041	3.773	184.745	3.773	6.409	13.448	13.8641
6.50	30.00	10.50	7.50	0.231	18199.428	0.231	3.120	1455.757	3.120	3.915	287.451	3.915	11.773	19.039	19.4611
6.67	31.33	11.00	8.00	0.236	22798.546	0.236	3.197	1902.174	3.197	4.053	430.631	4.053	18.126	25.612	26.0390
6.83	32.67	11.50	8.50	0.241	28282.219	0.241	3.272	2450.626	3.272	4.186	624.858	4.186	25.332	33.031	33.4636
7.00	34.00	12.00	9.00	0.246	34772.120	0.246	3.346	3117.450	3.346	4.314	882.347	4.314	33.300	41.206	41.6440
7.17	35.33	12.50	9.50	0.251	42400.585	0.251	3.418	3920.621	3.418	4.439	1217.073	4.439	41.963	50.070	50.5140
7.33	36.67	13.00	10.00	0.255	51311.058	0.255	3.488	4879.827	3.488	4.561	1644.889	4.561	51.269	59.573	60.0219
7.50	38.00	13.50	10.50	0.260	61658.544	0.260	3.557	6016.544	3.557	4.680	2183.635	4.680	61.176	69.673	70.1266

HMP Drawdown @		6	ft=	38.85
Elevation	Q_{AVG} (CFS)	DV (CF)	DT (HR)	Total T
0.00	0.040	738	5.13	38.85
0.17	0.058	845	4.07	33.72
0.33	0.092	911	2.74	29.65
0.50	0.115	963	2.33	26.91
0.67	0.134	1006	2.09	24.59
0.83	0.150	1042	1.93	22.50
1.00	0.165	1074	1.81	20.57
1.17	0.179	1102	1.71	18.76
1.33	0.191	1126	1.64	17.05
1.50	0.203	1147	1.57	15.41
1.67	0.214	1166	1.51	13.84
1.83	0.225	1183	1.46	12.33
2.00	0.235	1198	1.42	10.87
2.17	0.244	1210	1.38	9.45
2.33	0.254	1221	1.34	8.07
2.50	0.263	1230	1.30	6.74
2.67	0.279	1238	1.23	5.43
2.83	0.313	1244	1.10	4.20
3.00	0.452	1248	0.77	3.10
3.17	0.811	1251	0.43	2.33
3.33	1.223	1253	0.28	1.90
3.50	1.514	1253	0.23	1.62
3.67	1.737	1251	0.20	1.39
3.83	1.929	1248	0.18	1.19
4.00	2.250	1244	0.15	1.01
4.17	2.908	1238	0.12	0.85
4.33	3.648	1230	0.09	0.73
4.50	4.192	1221	0.08	0.64
4.67	4.629	1210	0.07	0.56
4.83	5.016	1198	0.07	0.49
5.00	5.370	1183	0.06	0.42
5.17	5.698	1166	0.06	0.36
5.33	6.005	1147	0.05	0.30
5.50	6.296	1126	0.05	0.25
5.67	6.573	1102	0.05	0.20
5.83	6.837	1074	0.04	0.15
6.00	8.224	1042	0.04	0.11
6.17	11.673	1006	0.02	0.07
6.33	16.663	963	0.02	0.05
6.50	22.750	911	0.01	0.03
6.67	29.751	845	0.01	0.02
6.83	37.554	738	0.01	0.01
7.00	46.079	606	0.00	0.01
7.17	55.268	606	0.00	0.01
7.33	65.074	606	0.00	0.00
7.50	35.063			

```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           08/28/1951
START_TIME           00:00:00
REPORT_START_DATE    08/28/1951
REPORT_START_TIME    00:00:00
END_DATE             08/28/1951
END_TIME             06:04:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.566
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0.0
DRY_ONLY         NO

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
NODE-146         0          FREE                        NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params            N/A      Fevap    Psi
  Ksat     IMD
;;-------------- -------- ---------- ---------- ---------- ---------------------------- -------- --------
   -------- --------
CMP-100-YR-DETENTION 0        6.5        2.75       TABULAR    CMP-1                        0        0

[OUTLETS]
;;Name           From Node        To Node          Offset     Type            QTable/Qcoeff    Qexpon     Gated

;;-------------- ---------------- ---------------- ---------- --------------- ---------------- ----------
--------
CMP-OUTLET       CMP-100-YR-DETENTION NODE-146         0          TABULAR/DEPTH   CMP-RISER                  NO


[INFLOWS]
;;Node           Constituent      Time Series      Type     Mfactor  Sfactor  Baseline Pattern
;;-------------- ---------------- ---------------- -------- -------- -------- -------- --------
CMP-100-YR-DETENTION FLOW             100-Year-Inflow-Hydrograph FLOW     1.0      1.0
```

```
[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
CMP-RISER        Rating     0.00       0.0000
CMP-RISER                   0.17       0.0354
CMP-RISER                   0.33       0.0799
CMP-RISER                   0.50       0.1050
CMP-RISER                   0.67       0.1252
CMP-RISER                   0.83       0.1425
CMP-RISER                   1.00       0.1579
CMP-RISER                   1.17       0.1720
CMP-RISER                   1.33       0.1850
CMP-RISER                   1.50       0.1972
CMP-RISER                   1.67       0.2086
CMP-RISER                   1.83       0.2194
CMP-RISER                   2.00       0.2298
CMP-RISER                   2.17       0.2396
CMP-RISER                   2.33       0.2491
CMP-RISER                   2.50       0.2583
CMP-RISER                   2.67       0.2671
CMP-RISER                   2.75       0.2714
CMP-RISER                   2.83       0.2900
CMP-RISER                   3.00       0.3360
CMP-RISER                   3.17       0.5681
CMP-RISER                   3.33       1.0531
CMP-RISER                   3.50       1.3937
CMP-RISER                   3.67       1.6343
CMP-RISER                   3.83       1.8388
CMP-RISER                   4.00       2.0202
CMP-RISER                   4.17       2.4799
CMP-RISER                   4.33       3.3367
CMP-RISER                   4.50       3.9589
CMP-RISER                   4.67       4.4252
CMP-RISER                   4.83       4.8325
CMP-RISER                   5.00       5.2004
CMP-RISER                   5.17       5.5395
CMP-RISER                   5.33       5.8561
CMP-RISER                   5.50       6.1544
CMP-RISER                   5.67       6.4375
CMP-RISER                   5.83       6.7076
CMP-RISER                   6.00       6.9665
CMP-RISER                   6.17       9.4812
CMP-RISER                   6.33       13.8641
CMP-RISER                   6.50       19.4611
CMP-RISER                   6.67       26.0390
CMP-RISER                   6.83       33.4636
CMP-RISER                   7.00       41.6440
CMP-RISER                   7.17       50.5140
CMP-RISER                   7.33       60.0219
CMP-RISER                   7.50       70.1266
;
CMP-1            Storage    0.00       3634.0
CMP-1                       0.17       4818.6
CMP-1                       0.33       5288.7
CMP-1                       0.50       5635.1
CMP-1                       0.67       5914.8
CMP-1                       0.83       6150.3
CMP-1                       1.00       6352.9
CMP-1                       1.17       6529.7
CMP-1                       1.33       6685.1
CMP-1                       1.50       6822.2
CMP-1                       1.67       6943.4
CMP-1                       1.83       7050.2
CMP-1                       2.00       7144.1
CMP-1                       2.17       7226.1
CMP-1                       2.33       7296.8
CMP-1                       2.50       7357.1
CMP-1                       2.67       7407.3
CMP-1                       2.75       7427.6
CMP-1                       2.83       7447.9
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CMP-1                      3.00       7479.2
CMP-1                      3.17       7501.3
CMP-1                      3.33       7514.6
CMP-1                      3.50       7519.0
CMP-1                      3.67       7514.6
CMP-1                      3.83       7501.3
CMP-1                      4.00       7479.2
CMP-1                      4.17       7447.9
CMP-1                      4.33       7407.3
CMP-1                      4.50       7357.1
CMP-1                      4.67       7296.8
CMP-1                      4.83       7226.1
CMP-1                      5.00       7144.1
CMP-1                      5.17       7050.2
CMP-1                      5.33       6943.4
CMP-1                      5.50       6822.2
CMP-1                      5.67       6685.1
CMP-1                      5.83       6529.7
CMP-1                      6.00       6352.9
CMP-1                      6.17       6150.3
CMP-1                      6.33       5914.8
CMP-1                      6.50       5635.1
CMP-1                      6.67       5288.7
CMP-1                      6.83       4818.6
CMP-1                      7.00       3634.0
CMP-1                      7.17       3634.0
CMP-1                      7.33       3634.0
CMP-1                      7.50       3634.0

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
100-Year-Inflow-Hydrograph 8/28/1951  0:00       0.00
100-Year-Inflow-Hydrograph 8/28/1951  0:08       0.90
100-Year-Inflow-Hydrograph 8/28/1951  0:16       0.91
100-Year-Inflow-Hydrograph 8/28/1951  0:24       0.94
100-Year-Inflow-Hydrograph 8/28/1951  0:32       0.95
100-Year-Inflow-Hydrograph 8/28/1951  0:40       0.98
100-Year-Inflow-Hydrograph 8/28/1951  0:48       1.00
100-Year-Inflow-Hydrograph 8/28/1951  0:56       1.04
100-Year-Inflow-Hydrograph 8/28/1951  1:04       1.06
100-Year-Inflow-Hydrograph 8/28/1951  1:12       1.10
100-Year-Inflow-Hydrograph 8/28/1951  1:20       1.12
100-Year-Inflow-Hydrograph 8/28/1951  1:28       1.17
100-Year-Inflow-Hydrograph 8/28/1951  1:36       1.19
100-Year-Inflow-Hydrograph 8/28/1951  1:44       1.25
100-Year-Inflow-Hydrograph 8/28/1951  1:52       1.28
100-Year-Inflow-Hydrograph 8/28/1951  2:00       1.35
100-Year-Inflow-Hydrograph 8/28/1951  2:08       1.39
100-Year-Inflow-Hydrograph 8/28/1951  2:16       1.48
100-Year-Inflow-Hydrograph 8/28/1951  2:24       1.52
100-Year-Inflow-Hydrograph 8/28/1951  2:32       1.64
100-Year-Inflow-Hydrograph 8/28/1951  2:40       1.70
100-Year-Inflow-Hydrograph 8/28/1951  2:48       1.85
100-Year-Inflow-Hydrograph 8/28/1951  2:56       1.93
100-Year-Inflow-Hydrograph 8/28/1951  3:04       2.14
100-Year-Inflow-Hydrograph 8/28/1951  3:12       2.27
100-Year-Inflow-Hydrograph 8/28/1951  3:20       2.61
100-Year-Inflow-Hydrograph 8/28/1951  3:28       2.83
100-Year-Inflow-Hydrograph 8/28/1951  3:36       3.45
100-Year-Inflow-Hydrograph 8/28/1951  3:44       3.93
100-Year-Inflow-Hydrograph 8/28/1951  3:52       5.78
100-Year-Inflow-Hydrograph 8/28/1951  4:00       8.14
100-Year-Inflow-Hydrograph 8/28/1951  4:08       29.75
100-Year-Inflow-Hydrograph 8/28/1951  4:16       4.63
100-Year-Inflow-Hydrograph 8/28/1951  4:24       3.10
100-Year-Inflow-Hydrograph 8/28/1951  4:32       2.43
100-Year-Inflow-Hydrograph 8/28/1951  4:40       2.03
100-Year-Inflow-Hydrograph 8/28/1951  4:48       1.77
100-Year-Inflow-Hydrograph 8/28/1951  4:56       1.58
100-Year-Inflow-Hydrograph 8/28/1951  5:04       1.43
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100-Year-Inflow-Hydrograph 8/28/1951  5:12       1.32
100-Year-Inflow-Hydrograph 8/28/1951  5:20       1.22
100-Year-Inflow-Hydrograph 8/28/1951  5:28       1.14
100-Year-Inflow-Hydrograph 8/28/1951  5:36       1.08
100-Year-Inflow-Hydrograph 8/28/1951  5:44       1.02
100-Year-Inflow-Hydrograph 8/28/1951  5:52       0.97
100-Year-Inflow-Hydrograph 8/28/1951  6:00       0.92

[REPORT]
;;Reporting Options
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
NODE-146         1110.155           6394.148
CMP-100-YR-DETENTION 1075.731           8055.077

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
```

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.014)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... NO
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date 08/28/1951 00:00:00
Ending Date 08/28/1951 06:04:00
Antecedent Dry Days 0.0
Report Time Step 01:00:00
Routing Time Step ..... 60.00 sec

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	1.243	0.405
External Outflow	1.054	0.343
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.407	0.133
Final Stored Volume	0.596	0.194
Continuity Error (%)	-0.029	

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****
Minimum Time Step : 60.00 sec
Average Time Step : 60.00 sec
Maximum Time Step : 60.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00
Percent Not Converging : 0.00

****
Node Depth Summary
****

	Average	Maximum	Maximum	Time of Max	Reported

Node	Type	Depth Feet	Depth Feet	HGL Feet	Occurrence days hr:min	Max Depth Feet
NODE-146	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
CMP-100-YR-DETENTION	STORAGE	3.80	6.08	6.08	0 04:16	4.74

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
NODE-146	OUTFALL	0.00	8.11	0 04:16	0	0.343	0.000
CMP-100-YR-DETENTION	STORAGE	29.75	29.75	0 04:09	0.405	0.538	-0.029

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
CMP-100-YR-DETENTION	25.544	58	0	0	41.751	94	0 04:16	8.11

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
NODE-146	100.00	2.10	8.11	0.343
System	100.00	2.10	8.11	0.343

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
CMP-OUTLET	DUMMY	8.11	0 04:16			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Nov 4 09:00:59 2024
Analysis ended on: Mon Nov 4 09:00:59 2024
Total elapsed time: < 1 sec

ATTACHMENT 6
Geotechnical and Groundwater Investigation Report

This is the cover sheet for Attachment 6.

GeoTek, Inc.
1548 North Maple Street, Corona, California 92878
(951) 710-1160 Office (951) 710-1167 Fax www.geotekusa.com

March 28, 2025
Project No. 3346-CR

TTLC Management, Inc. an Arizona Corporation
4350 Von Karman Avenue, Suite 200
Newport Beach, California 92660

Attention: Mr. Michael Torres

Subject: **Geotechnical Review – Response to City of Oceanside Comments**
Proposed Garrison School Site Residential Development
APNs 162-020-24 and 161-030-14
333 Garrison Street
Oceanside, San Diego County, California

References: Page 5

Dear Mr. Torres:

In accordance with your request, GeoTek, Inc. (GeoTek) has prepared this geotechnical review letter to discuss the comments from Benjamin Grenis of the City of Oceanside distributed via email on March 27, 2025 (see attached).

Site Description

The approximate 11.14-acre site is addressed as 333 Garrison Street, in the City of Oceanside, San Diego County, California (See Figure 1, Site Location Map). The site is comprised of two (2) parcels of land identified as San Diego County Assessor's Parcel Numbers 162-020-24 and 161-030-14. The site is currently occupied by the former E. G. Garrison Elementary School, which has now been abandoned. Current site improvements include ten (10) classroom buildings, a miscellaneous-use building, paved parking and drive isle areas, as well as landscaping and hardscaping areas. GeoTek understands that a failed storm drain trends through the south-central portion of the site and was utilized for the now abandoned elementary school. The eastern portion of the site is vacant of structures and appears to have been utilized for sporting fields.

Proposed Development

Based on the Site Plan prepared by KTGY and dated November 25, 2024, it is proposed to construct 22 multi-family buildings on the project site. It is also proposed to construct

associated project improvements consisting of impervious pavement, pervious pavement, concrete flatwork, perimeter walls, open spaces, utilities, and typical landscaping.

Comment: *(Benjamin Grenis)*

As for the infiltration, the rates reported in the soils report were subject to a Porchet Correction, but did not account for the gravel pack that they describe in the test; this results in an approximate 2x over reporting of the tested rate. If you only need incidental infiltration, it may not be an issue; if you need any appreciable volume, the presented testing, and more specifically the corrections, are inadequate.

Response

GeoTek previously issued a report titled "Geotechnical and Infiltration Evaluation, Proposed Garrison School Site Residential Development, APNs 162-020-24 and 161-030-14, 333 Garrison Street, Oceanside, San Diego County, California," and dated June 24, 2024. In the previously issued report GeoTek stated that infiltration is likely infeasible. GeoTek previously issued a letter titled "Geotechnical Review – Infiltration Feasibility and Updated Permeable Interlocking Concrete Paver Recommendations, Proposed Garrison School Site Residential Development, APNs 162-020-24 and 161-030-14, 333 Garrison Street, Oceanside, San Diego County, California," and dated November 6, 2024. In the previously issued review letter GeoTek stated the unfactored infiltration rates appear to be poor for the subject site, which consists of Type D soils. It is GeoTek's opinion that due to subsurface soil conditions, infiltration is likely to be infeasible for this site. Infiltration is not being utilized for onsite stormwater management; however, below are revised Infiltration rates.

Infiltration Testing

Four (4) infiltration tests (Tests I-1 through I-4) were previously conducted for the referenced report dated June 24, 2024 on the project site to review the infiltration potential of the site soils. Infiltration testing was conducted in these borings in general accordance County of San Diego guidelines. The infiltration tests consisted of drilling eight-inch diameter test holes to the desired depth and installing approximately two inches of gravel in the bottom of the holes. A three-inch diameter perforated PVC pipe, wrapped in a filter sock, was placed in the excavations and the annular space was filled with gravel to prevent caving within the drill holes. Water was then placed in the bores to presoak the holes and percolation testing was performed following the pre-soak period. Following presoaking, the percolation tests were performed which consisted of adding water to each test hole and measuring the water drop over a 30-minute period. The water drop was recorded for twelve test intervals, depending upon the measurement time. The field percolation rates were then converted to an infiltration rate using the Porchet Method. The infiltration rates calculated using the Porchet Method are presented in the following table:

SUMMARY OF INFILTRATION RATES			
Boring	Depth of Test (Feet)	Infiltration Rate (Inches per hour)	Infiltration Rate (Adjusted with Gravel Correction) (Inches per hour)
I-1	10.0	0.09	0.046
I-2	10.0	0.91	0.464
I-3	10.0	0.09	0.046
I-4	10.0	0.04	0.020

A gravel correction factor of 0.51 was applied to the infiltration rates. A copy of the gravel correction factor data sheet is attached. No factors of safety were applied to the rates provided. Over the lifetime of the infiltration areas, the infiltration rates may be affected by sediment build up and biological activities, as well as local variations in near surface soil conditions. A suitable factor of safety should be applied to the field rate in designing the infiltration system.

The unfactored infiltration rates appear to be poor for the subject site which consists of Type D soils. It is GeoTek's opinion that due to subsurface soil conditions, infiltration is likely to be infeasible for this site.

It should be noted that the infiltration rates provided above were performed in relatively undisturbed on-site soils. Infiltration rates will vary and are mostly dependent on the underlying consistency of the site soils and relative density. Infiltration rates may be impacted by weight of equipment travelling over the soils, placement of engineered fill and other various factors. GeoTek assumes no responsibility or liability for the ultimate design or performance of the storm water facility.

The report is intended to be made a part of, and incorporated with, the referenced reports (GeoTek, 2024a and 2024b). All conclusions, recommendations, and limitations of those reports, except as amended in this report or future reports for the project by GeoTek, remain valid and apply to this report.

The opportunity to be of continued service on this project is sincerely appreciated. If you should have any questions, please do not hesitate to call GeoTek.

Respectfully submitted,
GeoTek, Inc.





Bruce A. Hick
GE 2284, Exp. 12/31/26
Geotechnical Engineer

Michael A. Lucas
PE 95468, Exp. 12/31/25
Project Engineer

Distribution: (1) Addressee via email

Enclosures: E-mail dated March 27, 2025
Gravel Correction Factor

https://geotekusa.sharepoint.com/teams/Corona_Branch/Shared Documents/Projects/GeoTek Inc/3300/3346/GEO/Working Files/Letters/3346-CR RESP 03-38-25 (Infiltration).doc

REFERENCES

GeoTek, Inc., 2024a, "Geotechnical and Infiltration Evaluation, Proposed Garrison School Site Residential Development, APNs 162-020-24 and 161-030-14, 333 Garrison Street, Oceanside, San Diego County, California", dated June 24, Project No. 3346-CR.

_____, 2024b, "Geotechnical Review-Infiltration Feasibility and Updated Permeable Interlocking Concrete Paver Recommendations, Proposed Garrison School Site Residential Development, APNs 162-020-24 and 161-030-14, 333 Garrison Street, Oceanside, San Diego County, California", dated November 6, Project No. 3346-CR.

Hunsaker & Associates, Inc., 2024, "Conceptual Site Setbacks, Garrison Elementary School," Sheet 12 of 13, WO# 3214-0002, Plot Dated November 8.

KTGY, 2024, "Site Plan, Garrison Street Oceanside, CA", plan dated November 25.

From: Benjamin Grenis <BGrenis@oceansideca.org>
Sent: Thursday, March 27, 2025 12:46 PM
To: Jaren Nuzman <jnuzman@tkcteam.com>
Cc: Keith Crabtree (kcrabtree@hunsakersd.com) <kcrabtree@hunsakersd.com>; Dane Thompson <DThompson@oceansideca.org>; Michael Torres <MTorres@thetruelifecompanies.com>
Subject: RE: Garrison 3rd Sub Reviews GPA24-00002

Hi Jaren,

I was leaving you a voicemail…apparently too long of a voicemail; it cut off.

I have no more official redlines/comments for your project, only the advisory items in that email. I do not have conditions drafted yet, but can start working on that.

I am amenable you updating the topo based on whatever method you are comfortable with; but I now suspect we had a misunderstanding over when that update would happen. When do you plan to update the topo?

As for the infiltration, the rates reported in the soils repot were subject to a Porchet Correction, but did not account for the gravel pack that they describe in the test; this results in an approximate 2x over reporting of the tested rate. If you only need incidental infiltration, it may not be an issue; if you need any appreciable volume, the presented testing, and more specifically the corrections, are inadequate. I am going to make an analogy to buying a soda at a restaurant: imagine I sell you a 16 fl. oz. soda, I fill a 16 fl. oz. glass with ice and then with soda. Did you actually get 16 fl. oz.? How would you respond if you asked for a refill and I topped off the ice, gave you the remainder of the soda, then charged you both of the sodas?

Thanks.

Benjamin R. Grenis, P.E.
Associate Engineer
City of Oceanside | Engineering Division
300 North Coast Highway | Oceanside, CA 92054
Tel: 760-435-5182 | Fax: 760-435-6030

GRAVEL CORRECTION FACTOR CALCULATIONS

Radius of Boring (r2) =	4"
Radius of Pipe (r1) =	1.5"
% Gravel Voids (P) =	0.43%
C =	r2 / r1
Assume Unit Depth	

$$\text{Correction Factor} = \frac{[\,1 + P\,(C^2 - 1)]}{C^2} = 0.51$$

GEOTEK

GEOTECHNICAL AND INFILTRATION EVALUATION
PROPOSED GARRISON SCHOOL SITE RESIDENTIAL DEVELOPMENT
APNS 162-020-24 AND 161-030-14
333 GARRISON STREET
OCEANSIDE, SAN DIEGO COUNTY, CALIFORNIA

PREPARED FOR

TTLC MANAGEMENT, INC. AN ARIZONA CORPORATION
4350 VON KARMAN AVENUE, SUITE 200
NEWPORT BEACH, CALIFORNIA 92660

PREPARED BY

GEOTEK, INC.
1548 NORTH MAPLE STREET
CORONA, CALIFORNIA 92878

PROJECT NO. 3346-CR **JUNE 24, 2024**

GEOTEK

GeoTek, Inc.
1548 North Maple Street, Corona, California 92878
(951) 710-1160 Office (951) 710-1167 Fax www.geotekusa.com

June 24, 2024
Project No. 3346-CR

TTLC Management, Inc. an Arizona Corporation
4350 Von Karman Avenue, Suite 200
Newport Beach, California 92660

Attention: Mr. Michael Torres

Subject: **Geotechnical and Infiltration Evaluation**
Proposed Garrison School Site Residential Development
APNs 162-020-24 and 161-030-14
333 Garrison Street
Oceanside, San Diego County, California

Dear Mr. Torres:

GeoTek, Inc. (GeoTek) is pleased to provide the results of this Geotechnical and Infiltration Evaluation for the proposed residential development to be located at 333 Garrison Street, in the City of Oceanside, San Diego County, California. This report presents the results of GeoTek's evaluation, discussion of findings, and provides geotechnical recommendations for foundation design and construction.

Based upon review and evaluation, site development appears feasible from a geotechnical viewpoint provided that the recommendations included in this report are incorporated into the design and construction phases of the project.

The opportunity to be of service on this project is sincerely appreciated. If you should have any questions, please do not hesitate to contact GeoTek.

Respectfully submitted,
GeoTek, Inc.





Bruce A. Hick
GE 2244, Exp. 12/31/24
Geotechnical Engineer

Edward H. LaMont
CEG 1892, Exp. 07/31/26
Principal Geologist



Kyle R. McHargue
CEG 2790, Exp. 02/28/26
Project Geologist

Distribution: (1) Addressee via email (one PDF file)

G:\Projects\3303 to 3353\3346CR TTLC Management Inc 333 Garrison Street Oceanside\Geotechnical Investigation\3346-CR Geotechnical and Infiltration Evaluation 333 Garrison Street Oceanside GEO.doc

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Figure 1 – Site Location Map
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Appendix A – Logs of Exploratory Borings
Appendix B – Results of Laboratory Testing
Appendix C – Percolation Test Data and Porchet Calculations
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1. PURPOSE AND SCOPE OF SERVICES

The purpose of this study was to evaluate the geotechnical engineering and geologic conditions at the project site, as outlined in GeoTek's proposal P-0903322-CR, dated September 13, 2022. Services provided for this study included the following:

- Research and review of available geologic data and general information pertinent to the site,
- Site exploration consisting of the excavation, logging, and sampling of eight (8) exploratory test borings extending to depths ranging from about 14.5 to 51.5 feet below grade,
- Infiltration testing of four (4) additional test borings,
- Laboratory testing of soil samples collected during the field investigation,
- Review and evaluation of site seismicity, and
- Preparation of this geotechnical report which presents GeoTek's findings, conclusions, and recommendations for this site.

2. SITE DESCRIPTION AND PROPOSED DEVELOPMENT

2.1 SITE DESCRIPTION

The approximate 11.14-acre site is addressed as 333 Garrison Street, in the City of Oceanside, San Diego County, California. The site is comprised of two (2) parcels of land identified as San Diego County Assessor's Parcel Numbers 162-020-24 and 161-030-14. The site is currently occupied by the former E. G. Garrison Elementary School, which has now been abandoned. Current site improvements include ten (10) classroom buildings, a miscellaneous-use building, paved parking and drive isle areas, as well as landscaping and hardscaping areas. GeoTek understands that a failed storm drain trends through the south-central portion of the site and was utilized for the now abandoned elementary school. The eastern portion of the site is vacant of structures and appears to have been utilized for sporting fields.

The site is in an area largely characterized by residential development. The site is bordered by vacant land and residential tract development to the north; Garrison Street, followed by a drainage channel and multi-family residential development to the east; La Cresta Drive and multi-family residential development to the south; and a large fill slope, followed by a single-family residential tract development to the west.

Topographically, the site has relatively flat terrain with surface drainage being directed to the southwest by sheetflow. The elevation of the northern portion of the site is approximately 117 feet with approximately 30 feet of elevation differential across the site.

2.2 PROJECT DESCRIPTION

Based on the *Proposed Site Plan* prepared by Urban Area and dated August 4, 2022, it is proposed to construct a residential development, community open space and swimming pool area and associated utility/street improvements. Currently, 46 single-family residences and 14 multi-family buildings consisting of 95 total units are proposed.

GeoTek has assumed that the single-family structures will be wood-framed, one- to two-stories in height and that the structures will be supported by conventional shallow spread footings. It is assumed that the multi-family structures will likely be wood-framed and/or masonry-framed, one- to three-stories in height and that the structures will also be supported by conventional shallow spread footings. For the purposes of this report, it is assumed maximum column and wall loads will be about 75 kips and 3.5 kips per foot, respectively.

Based upon existing site topograpy and anticipated site grading, grading of the site will involve cuts and fills of less than ten feet in height, not including any recommended remedial grading. Low (less than five feet in height) site retaining walls are anticipated as part of the project development. Sewage disposal is anticipated to be be provided by a public swer system. If site development differs from the assumptions made herein, the recommendations included in this report should be subject to further review and evaluation.

3. FIELD EXPLORATION AND LABORATORY TESTING

3.1 FIELD EXPLORATION

The field exploration for this report was conducted on October 12, 2022 and consisted of excavating eight (8) geotechnical exploratory test borings with a hollow-stem drill rig to depths ranging from about 14.5 to 51.5 feet below grade. The approximate locations of the GeoTek excavations are shown on the Exploration Location Map (Figure 2). An engineer from GeoTek logged the excavations and collected earth material samples for use in subsequent laboratory testing. The logs of the exploratory borings are included in Appendix A.

Bulk and relatively undisturbed soil samples were recovered at various intervals in the geotechnical borings with a California sampler. The California sampler is a 3-inch outside diameter, 2.5-inch inside diameter, split barrel sampler lined with brass rings. The sampler was 18 inches long. The sampler conformed to the requirements of ASTM D 3550. A 140-pound automatic trip hammer was utilized, dropping 30 inches for each blow. The relatively undisturbed samples, together with bulk samples of representative soil types, were returned to the laboratory for testing and evaluation. The California sampler test data are presented on the boring logs in Appendix A.

In Boring B-1, Standard Penetration Tests (SPT) were performed with a 2.0-inch outside diameter, 1.5-inch inside diameter, split-barrel sampler. The sampler was approximately 18 inches in length. The inside diameter of the sampler shoe was 1.4 inches. The sampler was unlined. The sampler conformed to the requirements of ASTM D 1586. A 160-pound automatic trip hammer was utilized, dropping approximately 30 inches for each blow. The sampler penetration test data are presented on the Log for Boring for Boring B-1 in Appendix A.

Infiltration Testing

Four (4) infiltration tests (Tests I-1 through I-4) were conducted on the project site to review the infiltration potential of the site soils. Infiltration testing was conducted in these borings in general accordance County of San Diego guidelines. The infiltration tests consisted of drilling eight-inch diameter test holes to the desired depth and installing approximately two inches of gravel in the bottom of the holes. A three-inch diameter perforated PVC pipe, wrapped in a filter sock, was placed in the excavations and the annular space was filled with gravel to prevent caving within the drill holes. Water was then placed in the bores to presoak the holes and percolation testing was performed following the pre-soak period. Following presoaking, the

percolation tests were performed which consisted of adding water to each test hole and measuring the water drop over a 30-minute period. The water drop was recorded for twelve test intervals, depending upon the measurement time. The field percolation rates were then converted to an infiltration rate using the Porchet Method. The infiltration rates calculated using the Porchet Method are presented in the following table:

SUMMARY OF INFILTRATION RATES		
Boring	Depth of Test (Feet)	Infiltration Rate (Inches per hour)
I-1	10.0	0.09
I-2	10.0	0.91
I-3	10.0	0.09
I-4	10.0	0.04

Copies of the percolation data sheets and the Porchet infiltration rate conversion calculations are presented in Appendix C. No factors of safety were applied to the rates provided. Over the lifetime of the infiltration areas, the infiltration rates may be affected by sediment build up and biological activities, as well as local variations in near surface soil conditions. A suitable factor of safety should be applied to the field rate in designing the infiltration system.

Infiltration rates appear to be poor for the subject site. It is GeoTek's opinion that due to subsurface soil conditions, infiltration is likely to be infeasible for this site.

It should be noted that the infiltration rates provided above were performed in relatively undisturbed on-site soils. Infiltration rates will vary and are mostly dependent on the underlying consistency of the site soils and relative density. Infiltration rates may be impacted by weight of equipment travelling over the soils, placement of engineered fill and other various factors. GeoTek assumes no responsibility or liability for the ultimate design or performance of the storm water facility.

3.2 LABORATORY TESTING

Laboratory testing was performed on selected relatively undisturbed ring and bulk samples collected during the field exploration. The purpose of the laboratory testing was to confirm the field classification of the materials encountered and to evaluate their physical properties for use in the engineering design and analysis. Results of the laboratory testing program along with a brief description and relevant information regarding testing procedures are included on the exploratory borings logs included in Appendix A.

4. GEOLOGIC AND SOILS CONDITIONS

4.1 REGIONAL SETTING

The subject property is located in the Peninsular Ranges geomorphic province. The Peninsular Ranges province is one of the largest geomorphic units in western North America. It extends roughly 975 miles from the north and northeasterly adjacent the Transverse Ranges geomorphic province to the peninsula of Baja California. This province varies in width from about 30 to 100 miles. It is bounded on the west by the Pacific Ocean, on the south by the Gulf of California and on the east by the Colorado Desert Province.

The Peninsular Ranges are essentially a series of northwest-southeast oriented fault blocks. Several major fault zones are found in this province. The Elsinore Fault zone and the San Jacinto Fault zones trend northwest-southeast and are found in the near the middle of the province. The San Andreas Fault zone borders the northeasterly margin of the province. The closest known active fault is the Newport-Inglewood-Rose Canyon Fault Zone located approximately seven miles southwest of the site. No faults are shown in the immediate site vicinity on the map reviewed for the area.

4.2 GENERAL SOIL CONDITIONS

A brief description of the earth materials encountered is presented in the following section. Based on the site reconnaissance, the exploratory excavations and review of published geologic maps, the area investigated is generally underlain by artificial fill and/or alluvium underlain by sedimentary bedrock.

4.2.1 Artificial Fill

Asphalt concrete (AC) pavement was encountered at the surface of the borings located within the existing school site. Undocumented fill was encountered at the surface in all of the exploratory borings. The fill ranged from approximately 1 foot to approximately 2.5 feet below existing grade in the areas encountered. Additional areas and greater depths of fill may be present within unexplored areas of the site. The fill encountered in the test borings generally consisted of silty sands and clayey sand (SM and SC soil type based upon the Unified Soil Classification System). This fill was likely placed during the original grading of the school.

4.2.2 Alluvium

Alluvium was encountered in the borings beneath the fill soils. These soils extended to depths ranging from approximately 1 to 38.5 feet below existing grade. The depth of the alluvium

appears thickest in the southern and southeastern portions of the site and thinnest in the northwestern portion of the site. As encountered in the borings, the alluvium consisted of interbedded layers of silty sands, clayey sands, relatively clean sands, sandy silts and sandy and silty clays (SM, SC, SP, ML and CL soil types).

Based on the laboratory test results, the near surface soils have a "low" expansion index potential (ASTM D 4829). Based on the laboratory test results, the near surface soils have a soluble sulfate content of less than 0.1 percent (ASTM D 4327). Based upon the collapse tests performed, the upper approximate three to four feet of the site soils (undocumented fill) are anticipated to have a moderate to high potential for hydroconsolidation (settlement due to the addition of water with or without additional loading). The test results are provided in Appendix B.

4.2.3 Silverado Formation Sedimentary Bedrock

Silverado Formation sedimentary bedrock was encountered at depth in Borings B-1, B-3, B-4 and B-7. The sedimentary bedrock was shallowest in Boring B-4 (approximately 2.5 feet below the existing ground surface) and deepest in Boring B-1 (39.5 feet). The bedrock consists predominately of sandy siltstones and sandstones. Where encountered, the bedrock was found to be highly weathered at the soil/bedrock contact but becomes less weathered with depth. The bedrock had laminated to thin bedding planes where encountered.

4.3 SURFACE WATER AND GROUNDWATER

4.3.1 Surface Water

If encountered during earthwork operations, surface water on this site is likely the result of precipitation or possibly some minor surface run-off from the surrounding areas. Overall site area drainage varies due to the site topography and existing improvements. Provisions for surface drainage will need to be accounted for by the project civil engineer.

4.3.2 Groundwater

Groundwater was encountered within Boring B-1 at a depth of approximately 33.5 feet below the existing ground surface. This groundwater is considered to be perched above the underlying sedimentary bedrock. Groundwater was not encountered in any other boring.

Due to the depth to groundwater, it is unlikely that groundwater will be encountered during grading. However, it is possible for perched groundwater to occur in areas of the project site that are underlain by shallow bedrock. If encountered during grading, dewatering may be

necessary. The possibility of encountering localized areas of groundwater during grading should be considered and accounted for by the project civil engineer.

4.4 FAULTING AND SEISMICITY

4.4.1 Faulting

The geologic structure of the entire southern California area is dominated mainly by northwest-trending faults associated with the San Andreas system. The site is in a seismically active region. No active or potentially active fault is known to exist at this site nor is the site situated within an *"Alquist-Priolo"* Earthquake Fault Zone or a Special Studies Zone (Bryant and Hart, 2007). No faults transecting the site were identified on the readily available geologic maps reviewed. The nearest known active fault is the Newport Inglewood-Rose Canyon Fault located about seven miles to the southwest of the site.

4.4.2 Seismic Design Parameters

The site is located at approximately 33.2059 degrees West Latitude and 117.3373 degrees North Longitude. Due to the depth of relatively shallow bedrock beneath the site, a Site Class "C" is considered appropriate for this site. Site spectral accelerations (S_a and S_1) for 0.2 and 1.0 second periods for a Class "C" site were determined from the SEAOC/OSHPD web interface that utilizes the USGS web services and retrieves the seismic design data and presents that information in a report format. These values are presented in the following table:

SITE SEISMIC PARAMETERS	
Mapped 0.2 sec Period Spectral Acceleration, S_s	0.971g
Mapped 1.0 sec Period Spectral Acceleration, S_1	0.357g
Site Coefficient for Site Class "C", F_a	1.2
Site Coefficient for Site Class "C", F_v	1.5
Maximum Considered Earthquake Spectral Response Acceleration for 0.2 Second, S_{MS}	1.166g
Maximum Considered Earthquake Spectral Response Acceleration for 1.0 Second, S_{M1}	0.536g
5% Damped Design Spectral Response Acceleration Parameter at 0.2 Second, S_{DS}	0.777g
5% Damped Design Spectral Response Acceleration Parameter at 1 second, S_{D1}	0.357g
Peak Ground Acceleration (PGA_M)	0.507g
Seismic Design Category	D

Final selection of the appropriate seismic design coefficients should be made by the project structural engineer based upon the local practices and ordinances, expected building response and desired level of conservatism.

4.5 LIQUEFACTION

Liquefaction describes a phenomenon in which cyclic stresses, produced by earthquake-induced ground motion, create excess pore pressures in relatively cohesionless and some low-plastic silt and clay soils. These soils may thereby acquire a high degree of mobility, which can lead to lateral movement, sliding, settlement of loose sediments, sand boils and other damaging deformations. This phenomenon occurs only below the water table, but, after liquefaction occurs, the liquefied soil/water matrix can propagate upward into overlying non-saturated soil as excess pore water dissipates.

The factors known to influence liquefaction potential include soil type and grain size, relative density, plasticity, groundwater level, confining pressures, and both intensity and duration of ground shaking. In general, materials that are susceptible to liquefaction are loose, saturated granular soils having low fines content under low confining pressures and some low plastic silts and clays.

Due to the presence of relatively dense alluvium and relatively shallow bedrock, the liquefaction potential for this project is considered low. Due to the dense and clayey nature of the subsurface soils and presence of relatively shallow bedrock, seismic induced ("dry sand") settlements are estimated to be minimal within the areas of alluvium.

4.6 OTHER SEISMIC HAZARDS

Evidence of landslides or slope instabilities at the subject site was not observed during this investigation. However, the northwest portion of the site is regionally geologically mapped as the "toe" of landslide deposits that descend from the adjacent properties/slope to the west (Kennedy, M.P., Tan, S.S., Bovard, K.R., Alvarez, R.M., Watson, M.J., and Gutierrez, C.I., 2007). Based upon review of aerial imagery, the adjacent properties to the west are comprised of a residential tract development with what appears to be a large engineered slope descending to the subject site. The landslide deposits on the descending slope appear to have been mitigated by means of industry standard slope grading and benching, "v"-ditch construction and surficial landscaping.

The potential for secondary seismic hazards such as tsunami is considered negligible due to site elevation and distance from the Pacific Ocean. The potential for secondary seismic hazards such as seiche is considered remote due to the site elevation and distance to an open body of water.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 GENERAL

The anticipated site development appears feasible from a geotechnical viewpoint provided that the following recommendations, and those provided by this firm at a later date, are incorporated into the design and construction phases of development. Site development, grading and foundation plans should be reviewed by GeoTek, Inc. when they become available so the recommendations contained in this report can be confirmed.

The on-site soils exhibit a "low" expansion potential. Expansion index testing should be conducted at the completion of earthwork operations to verify this soil parameter.

Deposits of undocumented fill soils were encountered in the explorations. Some of these soils were tested to have a moderate to high potential for hydroconsolidation (settlement due to the addition of water with or without additional loading). In addition, the upper site soils are anticipated to be disturbed by the demolition of existing site structures and underground utilities. Deeper deposits of undocumented fill may be present in areas that were not explored. Remedial grading, consisting of overexcavation and recompaction of the upper site soils, is recommended to provide a uniform bearing for the proposed structures. GeoTek understands that a failed storm drain trends through the central portion of the site in the northern portion of the school site which will require repair, removal and/or replacement.

5.2 EARTHWORK CONSIDERATIONS

5.2.1 General

Earthwork and grading should be performed in accordance with the applicable grading ordinances of the County of San Diego, City of Oceanside and the 2022 California Building Code (CBC), and recommendations contained in this report. The Grading Guidelines included in Appendix D outline general procedures and do not anticipate all site-specific situations. In the event of conflict, the recommendations presented in the text of this report should supersede those contained in Appendix D.

5.2.2 Site Clearing

Initial site preparation should commence with removal of existing structures, underground utilities, slabs, pavements, debris, deleterious materials and vegetation within the limits of the planned improvements. The exact locations of underground utilities are not known. As

previously discussed, exiting structures are present in the school portion of the site. GeoTek understands that a failed storm drain trends through the central portion of the site in the northern portion of the school site which will require repair, removal and/or replacement. Any site clearing and demolition materials should be properly disposed of off-site. Voids resulting from removing any materials should be replaced with engineered fill materials with expansion characteristics similar to the onsite materials.

5.2.3 Site Preparation

Building Areas

Due to the non-uniform nature, thickness and hydroconsolidation potential of the near-surface artificial fill and alluvium, as well as the anticipated disturbance of the upper site soils to the demolition of existing structures and utilities, it is recommended that the soils be removed beneath the planned building footprints of the proposed structures to a depth of at least 5 feet below existing grade, or three (3) feet beneath the base of the proposed foundations, whichever is greater. Removal bottoms should be relatively uniform in soil type which is not visibly porous and having an in-place density of at least 85 percent of the soil's maximum dry density as determined by ASTM D 1557 test procedures. A representative of this firm should observe and approve the bottom of all remedial excavations. The lateral extent of this recommended over-excavation should extend at least 5 feet beyond the building or foundation limits.

Following site clearing operations, over-excavation and lowering of site grades, where necessary, it is recommended that the exposed subgrade soils beneath all surface improvements be proof rolled with a heavy rubber-tired piece of construction equipment approved by and in the presence of the geotechnical engineering representative. The proof rolling equipment should possess a minimum weight of 15 tons and proof rolling should include at least 4 passes, two in each perpendicular direction. All soil that ruts or excessively deflects during proof rolling should be removed as recommended by the GeoTek representative. Following proof rolling and removal of any unsuitable bearing soil, the exposed subgrade should be scarified to a depth of about 12 inches, be moisture conditioned to slightly above the soil's optimum moisture content and then be compacted to at least 90 percent of the soil's maximum dry density as determined by ASTM D-1557 test procedures.

Pavement Areas

Undocumented fill should be removed below proposed pavement areas. If no undocumented fill is encountered or is relatively shallow, the natural soils should be overexcavated to a depth of 12 inches below existing grade or 12 inches below proposed finished grade, whichever is deeper. Finished grade is defined as the top of the subgrade. The exposed soils in these areas

and in cut areas should be scarified to a depth of approximately eight inches, moistened to at least the optimum moisture content and compacted to a minimum relative compaction of at least 95 percent of maximum dry density as determined by ASTM D 1557 test procedures.

Hardscape Areas

Undocumented fill should be removed below hardscape areas. The exposed soils in these areas and in cut areas should be scarified to a depth of approximately eight inches, moistened to at least the optimum moisture content and compacted to a minimum relative compaction of at least 90 percent of maximum dry density as determined by ASTM D 1557 test procedures.

5.2.4 Engineered Fill

The on-site soils are generally considered suitable for reuse as engineered fill provided they are free from vegetation, debris, oversized materials (~6 inches) and other deleterious material. All areas should be brought to final subgrade elevations with fill materials that are placed and compacted in general accordance with minimum project standards. Engineered fill should be placed in 6-to-8-inch loose lifts, moisture conditioned to slightly above the optimum moisture content and compacted to a minimum relative compaction of 90 percent as determined by ASTM D-1557 test procedures.

If wet soils are encountered during remedial grading, methods for drying soils such as stockpiling or mixing with dry soils may be required to bring the soils to the required moisture content for placement as engineered fill. Placement of engineered fill should be observed and tested on a full-time basis by a GeoTek representative during grading activities.

5.2.5 Transition Lot Condition

Building pads graded with a cut/fill transition should be undercut to reduce the potential for differential settlement. The cut portion of the cut/fill transition should be undercut to a depth of at least 3 feet or two (2) feet below the deepest proposed footing, whichever is deeper, and be backfilled with a properly compacted engineered fill. The bottom of the undercut should be sloped at a minimum of 1 percent toward the adjacent street area.

5.2.6 Oversized Rock Disposal

Oversized cobbles, boulders and rock fragments may be encountered during rough grading and utility trench operations, especially if bedrock is encountered. On-site disposal of oversized materials is possible, provided the oversized materials are placed as recommended on Plate D-4 within Appendix D. Alternatively, oversized materials can be exported from the site.

5.2.7 Excavation Characteristics

Excavations in the on-site alluvium, fill and upper sedimentary bedrock should be readily accomplished with heavy-duty earthmoving or excavating equipment in good operating condition. All excavations should be formed in accordance with current Cal-OSHA requirements.

Some excavation difficulties should be anticipated for any deep excavations into the on-site bedrock. "Overbreak" (shattering) of deep utility trench excavations into the bedrock should be anticipated. Dependent upon the depth of excavations, specialized equipment and/or techniques may be necessary.

5.2.8 Trench Excavations and Backfill

Temporary trench excavations within the on-site materials should be stable at a 1:1 inclination for short durations during construction and where cuts do not exceed 15 feet in height. Deeper temporary excavations should be reviewed by GeoTek prior to their planned excavation to determine if supplemental recommendations or analysis are warranted. It is anticipated that temporary cuts to a maximum height of 4 feet can be excavated vertically.

Trench excavations should conform to Cal-OSHA regulations. The contractor should have a competent person, per OSHA requirements, on site during construction to observe conditions and to make the appropriate recommendations.

Utility trench backfill should be compacted to at least 90 percent relative compaction (as determined by ASTM D-1557 test procedures). Under-slab trenches should also be compacted to project specifications. Where applicable, based on jurisdictional requirements, the top 12 inches of backfill below subgrade for road pavements should be compacted to at least 95 percent relative compaction. On-site materials may not be suitable for use as bedding material but should be suitable as backfill provided particles larger than 6 inches are removed.

Compaction should be achieved with a mechanical compaction device. Ponding or jetting of trench backfill is not recommended. If backfill soils have dried out, they should be properly moisture conditioned prior to placement in trenches.

5.2.9 Shrinkage and Bulking

For planning purposes, a shrinkage loss of about 10 to 15 percent is anticipated for excavations within the artificial fill and upper alluvium at the site that are removed and placed as compacted fill. A bulking factor of up to 10 percent should be considered for excavations extending into the underlying sedimentary bedrock. Demolition of existing site structures, pavements, and utility lines will increase site earthwork losses and need to be accounted for.

Several factors will impact earthwork balancing on the site, including shrinkage, trench spoil from utilities and footing excavations, as well as the accuracy of topography. Shrinkage and bulking are primarily dependent upon the degree of compactive effort achieved during construction, depth of fill and underlying site conditions.

Due to the presence of relatively shallow bedrock and dense alluvium, subsidence is not anticipated to be a factor.

Site balance areas should be available in order to adjust project grades, depending on actual field conditions at the conclusion of earthwork construction.

5.2.10 Grading Plan Review

Upon completion of the site grading plans, it is recommended that those plans be provided to GeoTek for review. Based on that review, some modifications to the recommendations provided in this report may be necessary.

5.3 DESIGN RECOMMENDATIONS

5.3.1 Foundation Design Criteria

The earth materials anticipated to be utilized in the site grading operations are predominantly granular soils, or bedrock that excavates as granular soils, and anticipated to possess a "low" ($21 \leq EI \leq 50$) expansion index in accordance with ASTM D 4829. However, based on GeoTek's experience with nearby projects soils, soils that possess a "medium" ($51 \leq EI \leq 50$) expansion index may be possible. Laboratory testing should be performed at the completion of site grading to verify the expansion index of the near-surface soils.

Foundation design criteria, in general conformance with the 2022 CBC, are presented below. The recommendations provided are minimal and are not intended to supersede the design by the project structural engineer. It should be noted that the criteria provided are based on soil support characteristics only. The structural engineer should design the slab and beam reinforcement based on actual loading conditions.

The foundation elements for the proposed structures should bear entirely in engineered fill soils as recommended in this report. Foundations should be designed in accordance with the *2022 California Building Code* (CBC). A summary of the foundation design recommendations is presented in the following table:

MINIMUM DESIGN REQUIREMENTS FOR CONVENTIONALLY REINFORCED FOUNDATIONS		
Design Parameter	"Low" Expansion Index (21≤EI≤50)	"Medium" Expansion Index (51≤EI≤90)
Foundation Depth or Minimum Perimeter Beam Depth (inches below lowest adjacent grade)	One- and two-story – 12 Three-story – 18	One- and two-story – 18 Three-story – 24
Minimum Foundation Width (Inches)*	One-story – 12 Two-story – 12 Three-story – 15	One-story – 12 Two-story – 15 Three-story – 18
Minimum Slab Thickness (Inches)	4 – Actual	4 – Actual
Minimum Slab Reinforcing	6" x 6" – W2.9/W2.9 welded wire fabric or No. 3 reinforcing bars placed at 24 o.c. each way placed in middle of slab	No. 3 reinforcing bars placed at 18 o.c. each way or No. 4 reinforcing bars placed at 24 o.c. each way placed in middle of slab
Minimum Reinforcement for Continuous Footings, Grade Beams, and Retailing Wall Footings	Two No. 4 reinforcing bars, one placed near the top and one near the bottom	Two No. 4 reinforcing bars, one placed near the top and one near the bottom
Presaturation of Subgrade Soil (Percent of Optimum/Depth in Inches)	Minimum 110% of the optimum moisture content to a depth of at least 12 inches prior to placing concrete	Minimum of 120% of the optimum moisture content to a depth of at least 18 inches prior to placing concrete

*Code minimums per Table 1809.7 of the 2022 CBC should be complied with.

In general, an allowable bearing capacity of 2,000 pounds per square foot (psf) may be used for design of continuous and perimeter footings 12 inches deep and 12 inches wide, and pad footings 24 inches square and 12 inches deep. This value may be increased by 300 psf for each additional 12 inches in depth and 300 psf for each additional 12 inches in width to a maximum value of 3,000 psf.

Additionally, an increase of one-third may be applied when considering short-term live loads (e.g., seismic and wind loads).

The recommended allowable bearing capacity is based on an estimated maximum post-construction settlement of 1-inch. Differential settlement of about one-half of the total settlement over a horizontal distance of 40 feet could result. Seismically induced settlement is also expected to be approximately less than 1/2-inch total and 1/4-inch differential settlement over a horizontal distance of 40 feet. The project structural engineer, foundation engineer, and earth retention structure designer should incorporate these settlement estimates into the design, as appropriate.

For resistance to lateral loads, an allowable passive earth pressure equivalent to a fluid density of 350 pounds per cubic foot (pcf) is recommended assuming that (1) there is constant contact

between the footing and soil, (2) passive pressure does not exceed maximum total resistance of 3,500 psf, (3) the upper one foot of soil below the adjacent grade is not used in calculating passive pressure, and (4) the footings are fully founded in engineered fill. An allowable passive earth pressure equivalent to a fluid density of 250 pcf is recommended for footings on 2:1 sloping ground.

Full friction and passive resistance can be combined to resist lateral loads provided that the passive pressure component is reduced by one-third. An allowable friction coefficient of 0.35 with dead load forces may be used for resistance sliding between soil and concrete.

A grade beam, 12 inches wide by 12 inches deep (minimum), should be utilized across large openings (garages). The base of the grade beam should be at the same elevation as the bottom of the adjoining footings.

It is recommended that control joints be placed in two directions spaced approximately 24 to 36 times the thickness of the slab in inches. These joints are a widely accepted means to control cracks and should be reviewed by the project structural/civil engineer.

It should be realized that the effectiveness of the vapor retarding membrane can be adversely impacted as a result of construction related punctures (e.g., stake penetrations, tears, punctures from walking on the vapor retarder placed atop the underlying aggregate layer, etc.). These occurrences should be limited as much as possible during construction. Thicker membranes are generally more resistant to accidental puncture than thinner ones. Products specifically designed for use as moisture/vapor retarders may also be more puncture resistant. Although the CBC specifies a 6-mil vapor retarder membrane, it is GeoTek's opinion that a minimum 10 mil thick membrane with joints properly overlapped and sealed should be considered, unless otherwise specified by the slab design professional. The membrane should consist of Stego wrap or the equivalent.

Moisture and vapor retarding systems are intended to provide a certain level of resistance to vapor and moisture transmission through the concrete, but do not eliminate it. The acceptable level of moisture transmission through the slab is to a large extent based on the type of flooring used and environmental conditions. Ultimately, the vapor retarding system should be comprised of suitable elements to limited migration of water and reduce transmission of water vapor through the slab to acceptable levels. The selected elements should have suitable properties (i.e., thickness, composition, strength, and permeability) to achieve the desired performance level.

Moisture retarders can reduce, but not eliminate, moisture vapor rise from the underlying soils up through the slab. Moisture retarder systems should be designed and constructed in accordance with applicable American Concrete Institute, Portland Cement Association, Post-Tensioning Concrete Institute, ASTM and California Building Code requirements and guidelines.

GeoTek recommends that a qualified person, such as the flooring contractor, structural engineer, architect, and/or other experts specializing in moisture control within the building be consulted to evaluate the general and specific moisture and vapor transmission paths and associated potential impact on the proposed construction. That person (or persons) should provide recommendations relative to the slab moisture and vapor retarder systems and for migration of potential adverse impact of moisture vapor transmission on various components of the structures, as deemed appropriate.

In addition, the recommendations in this report and GeoTek's services in general are not intended to address mold prevention; since GeoTek, along with geotechnical consultants in general, do not practice in the area of mold prevention. If specific recommendations addressing potential mold issues are desired, then a professional mold prevention consultant should be contacted.

5.3.1 Miscellaneous Foundation Recommendations

5.3.1.1 To reduce moisture penetration beneath the slab on grade areas, utility trench excavations should be backfilled with engineered fill, lean concrete or concrete slurry where they intercept the perimeter footing or thickened slab edge.

5.3.1.2 Soils from the footing excavations should not be placed in the slab-on-grade areas unless properly compacted and tested. The excavations should be free of loose/sloughed materials and be neatly trimmed at the time of concrete placement.

5.3.2 Foundation Setbacks

Minimum setbacks for all foundations should comply with the 2022 CBC, San Diego County or City of Oceanside requirements, whichever is more stringent. Improvements not conforming to these setbacks are subject to the increased likelihood of excessive lateral movements and/or differential settlements. If large enough, these movements can compromise the integrity of the improvements. The top outside edge of all footings should be set back a minimum of H/3 (where H is the slope height) from the face of any descending slope. The setback should be at least five feet and need not exceed 40 feet.

5.3.3 Soil Corrosivity

The soil resistivity at this site was tested in the laboratory on one (1) soil sample collected during the field investigation. The results of the testing indicate that the on-site soils are considered to "highly corrosive" (2,747 ohm-cm) (Roberge, 2000) to buried ferrous metal in accordance with current standards used by corrosion engineers. It is recommended that a corrosion engineer be consulted to provide recommendations for the protection of buried ferrous metal at this site.

5.3.4 Soil Sulfate Content

The sulfate content was determined in the laboratory on one (1) sample collected during the field investigation. The results indicate that the soil water-soluble sulfate content is less than 0.1 percent by weight, which is considered "negligible" as per Table 4.2.1 of ACI 318. Based on the test results and Table 4.3.1 of ACI 318, no special recommendations for concrete are required for this project due to soil sulfate exposure.

5.4 RETAINING AND GARDEN WALL DESIGN AND CONSTRUCTION

5.4.1.1 General Design Criteria

Recommendations presented in this report apply to typical masonry or concrete vertical retaining walls to a maximum height of up to six (6) feet. Additional review and recommendations should be requested for higher walls. These are typical design criteria and are not intended to supersede the design by the structural engineer.

Retaining wall foundations should be embedded a minimum of 18 inches into engineered fill. Retaining wall foundations should be designed in accordance with Section 5.3 of this report. Structural needs may govern and should be evaluated by the project structural engineer.

All earth retention structure plans, as applicable, should be reviewed by this office prior to finalization.

Earthwork considerations, site clearing and remedial earthwork for all earth retention structures should meet the requirements of this report, unless specifically provided otherwise, or more stringent requirements or recommendations are made by the designer. The backfill material placement for all earth retention structures should meet the requirement of Section 5.2.4 in this report.

In general, cantilever earth retention structures, which are designed to yield at least 0.001H, where H is equal to the height of the earth retention structure, may be designed using the "active" condition. Rigid earth retention structures (including but not limited to rigid walls, and walls braced at top, such as typical basement walls) should be designed using the "at-rest" condition.

In addition to the design lateral forces due to retained earth, surcharges due to improvements, such as an adjacent building or traffic loading, should be considered in the design of the earth retention structures. Loads applied within a 1:1 (horizontal : vertical) projection from the surcharge on the stem of the earth retention structure should be considered in the design.

Final selection of the appropriate design parameters should be made by the designer of the earth retention structures.

5.4.1.2 Cantilevered Walls

The recommendations presented below are for cantilevered retaining walls up to six (6) feet high. Active earth pressure may be used for retaining wall design, provided the top of the wall is not restrained from minor deflections. An equivalent fluid pressure approach may be used to compute the horizontal pressure against the wall. Appropriate fluid unit weights are given below for specific slope gradients of the retained material. These do not include other superimposed loading conditions such as traffic, structures, seismic events, or adverse geologic conditions.

ACTIVE EARTH PRESSURES	
Surface Slope of Retained Materials (horizontal : vertical)	Equivalent Fluid Pressure (pcf) Select Backfill* and Native Soils
Level	44
2:1	74

*The design pressures assume the backfill material has an expansion index less than or equal to 20. Backfill zone includes area between back of the wall to a plane (1:1 horizontal : vertical) up from bottom of the wall foundation (on the backside of the wall) to the ground surface.

For walls with a retained height greater than 6 feet, an incremental seismic pressure should be included into the wall design. Where needed, it is recommended that an equivalent fluid pressure of 16 pcf be included in the wall design to account for seismic loading conditions. This pressure may be applied as a triangular distribution.

5.4.1.3 Retaining Wall Backfill and Drainage

The wall backfill should also include a minimum one (1) foot wide section of ¾- to 1-inch clean crushed rock (or an approved equivalent). The rock should be placed immediately adjacent to the back of the wall and extend up from a back drain to within approximately 24 inches of the finish grade. The upper 24 inches should consist of compacted on-site materials. The rock should be separated from the earth with filter fabric. The presence of other materials might necessitate revision of the parameters provided and modification of the wall designs. The backfill materials should be placed in lifts no greater than eight (8) inches in thickness and compacted to a minimum of 90% relative compaction as determined by ASTM D 1557 test procedures. Proper surface drainage needs to be provided and maintained.

As an alternative to the drain, rock and fabric, a pre-manufactured wall drainage product (example: Mira Drain 6000 or approved equivalent) may be used behind the retaining wall. The wall drainage product should extend from the base of the wall to within two (2) feet of the ground surface. The subdrain should be placed in direct contact with the wall drainage product.

Retaining walls should be provided with an adequate pipe and gravel back drain system to help prevent buildup of hydrostatic pressures. Backdrains should consist of a four (4)-inch diameter perforated collector pipe (Schedule 40, SDR 35, or approved equivalent) embedded in a minimum of one (1) cubic foot per linear foot of ¾- to 1-inch clean crushed rock or an approved equivalent, wrapped in filter fabric (Mirafi 140N or an approved equivalent). The drain system should be connected to a suitable outlet. Waterproofing of site walls should be performed where moisture migration through the walls is undesirable.

5.4.1.4 Restrained Retaining Walls

Retaining walls that will be restrained at the top that support level backfill or that have reentrant or male corners, should be designed for an equivalent at-rest fluid pressure of 65 pcf, plus any applicable surcharge loading. For areas of male or reentrant corners, the restrained wall design should extend a minimum distance of twice the height of the wall laterally from the corner, or a distance otherwise determined by the project structural engineer.

5.4.1.5 Other Design Considerations

- Wall design should consider the additional surcharge loads from superjacent slopes and/or footings, where appropriate.
- No backfill should be placed against concrete until minimum design strengths are evident by compression tests of cylinders.
- The retaining wall footing excavations, backcuts, and backfill materials should be approved by the project geotechnical engineer or their authorized representative.
- Positive separations should be provided in garden walls at horizontal distances not exceeding 20 feet.

5.5 PRELIMINARY PAVEMENT DESIGN RECOMMENDATIONS

5.5.1 Asphaltic Concrete Pavement

Although planned final grades beneath the street improvements within the site are not yet known, the following preliminary pavement design recommendations are based on a Traffic Index (TI) of 5.0 for Local Streets and a TI of 6.0 for Local Collectors as designated by the City of Oceanside (Table A). Preliminary pavement thickness design is based on the CalTrans Highway Design Manual (2018). An R-value of 20 has been assumed for the preliminary design of the project pavement sections. Once the traffic loading information becomes more defined, revision to the pavement design recommendations may be warranted. It is recommended that the final pavement design be based on R-value testing of the as-graded subgrade soils within the pavement areas.

Based on the assumptions noted above the following preliminary pavement recommendations are provided for the site:

PRELIMINARY MINIMUM PAVEMENT SECTION		
Traffic Index	Thickness of Asphalt Concrete (inches)	Thickness of Aggregate Base (inches)
5.0	3.0*	8.0
6.0	4.0*	9.0

*City of Oceanside minimum requirement.

Traffic Indices (TIs) used in the pavement design are designated by the City of Oceanside and should provide a pavement life of approximately 20 years with a normal amount of flexible pavement maintenance. Irrigation adjacent to pavements, without a deep curb or other cutoff

to separate landscaping from the paving may result in premature pavement failure. Traffic parameters used for design were selected based upon engineering judgment and not upon information furnished to us such as an equivalent wheel load analysis or a traffic study.

All base material and the upper 12 inches of subgrade should be compacted to at least 95 percent of the material's maximum dry density as determined by ASTM D 1557 test procedures. All materials and methods of construction should conform to the requirements of the City of Oceanside.

5.5.2 Permeable Interlocking Concrete Pavers

Interlocking concrete pavers can be used for this project. The pavers are assumed to be approximately 3.2 inches (80 millimeters) in thickness. Concrete pavers should be underlain by 1.0 inch to 1.5 inches of bedding sand overlying four inches of aggregate base founded on compacted subgrade soils. The aggregate base should be compacted to at least 95 percent of maximum dry density as determined by ASTM D 1557 test procedures.

Where possible, the aggregate base should extend beyond the perimeter of the pavers a minimum distance of four inches.

The bedding sand should be placed, lightly moistened and compacted. Since this compaction cannot be tested it should be observed by a representative of this firm.

Historically, paver systems have experienced failures in areas where water has degraded the support characteristics of the underlying base and/or subgrade soils. Since paver systems are permeable and allow transmission of water into the underlying materials, it may be prudent to discuss with the paver designer/manufacturer what methods may be employed to address the issue of potential water introduction into the underlying materials. Underdrain systems, local subgrade reinforcement, or additional structural elements such as geotextiles can be considered, particularly in high traffic areas and/or low areas where water will tend to collect. The recommendations of the designer/manufacturer should then be implemented in the design and construction of the paver system.

5.5.3 Portland Cement Concrete (PCC) Pavement

For the proposed vehicle parking and access lanes, it is recommended that a minimum of 5.0 inches of PCC pavement overlying four inches of aggregate base over 12 inches subgrade compacted to at least 95 percent of maximum dry density as determined by ASTM D 1557 test procedures be utilized. For vehicle service lanes, it is recommended that a minimum of six inches of PCC pavement over overlying four inches of aggregate base over 12 inches subgrade

compacted to at least 95 percent of maximum dry density be utilized. This section should also be used in heavy truck traffic areas such as fire lanes, trash dumpster pads and approaches.

Requirements of Section 90 of Caltrans Standard Specifications, and various ACI and ASTM standards regarding mixing and placing concrete should be followed. The PCC pavement should have a minimum modulus of rupture of 500 pounds per square inch, and a minimum 28-day compressive strength of 4,000 pounds per square inch. Concrete should incorporate 1-inch maximum size aggregate and should be proportioned to achieve a maximum slump of four inches. Instead of increasing the water content, a plasticizing admixture may be utilized to increase the workability of the concrete. The concrete should be properly cured after placement. Concrete should not be placed during hot and windy weather.

Crack control joints should be provided in the transverse direction spaced at horizontal intervals ranging from 24 to 36 times the thickness of the concrete.

5.5.4 Pavement Construction

All pavement installation, including preparation and compaction of subgrade and base material, placement and rolling of asphaltic concrete and placement of concrete pavement, should be done in accordance with the City of Oceanside or County of San Diego guidelines, and under the observation and testing of GeoTek and a City/County inspector, where required.

Any aggregate base should consist of crushed rock with an R-Value and gradation in accordance with Crushed Aggregate Base (Section 400-2.4 of the "Greenbook" Regional Supplement Amendments). Minimum compaction requirements should be 95 percent of maximum dry density as determined by ASTM D 1557 test procedures for both soil subgrade and aggregate base. Jurisdictional minimum compaction requirements in excess of the aforementioned minimums may govern. The upper 12 inches of subgrade should be moisture-conditioned to at least optimum moisture.

The top of the subgrade and aggregate base should be graded to drain to the perimeter of the pavement.

5.6 CONCRETE CONSTRUCTION

5.6.1 General

Concrete construction should follow the 2022 CBC and ACI guidelines regarding design, mix placement and curing of the concrete. If desired, GeoTek could provide quality control testing of the concrete during construction.

5.6.2 Concrete Mix Design

As discussed in Section 5.3.5, no special recommendations for concrete are required for this project due to soil sulfate exposure. Additional testing should be performed during grading so that specific recommendations can be formulated based on the as-graded conditions.

5.6.3 Concrete Flatwork

Exterior concrete flatwork is often one of the most visible aspects of site development. They are typically given the least level of quality control, being considered "non-structural" components. Cracking of these features is common due to various factors. While cracking usually does not affect the structural performance of the concrete, it is unsightly. It is recommended that the same standards of care be applied to these features as to the structure itself.

Flatwork should consist of a minimum four-inch (actual) thick concrete and the use of temperature and shrinkage control reinforcement is suggested. The project structural engineer should provide final design recommendations.

5.6.4 Concrete Performance

Concrete cracks should be expected. These cracks can vary from sizes that are hairline to more than 1/8 inch in width. Most cracks in concrete while unsightly do not significantly impact long-term performance. While it is possible to take measures (proper concrete mix, placement, curing, control joints, etc.) to reduce the extent and size of cracks that occur, some cracking will occur despite the best efforts to minimize it. Concrete undergoes chemical processes that are dependent on a wide range of variables, which are difficult, at best, to control. Concrete, while seemingly a stable material, is subject to internal expansion and contraction due to external changes over time.

One of the simplest means to control cracking is to provide weakened control joints for cracking to occur along. These do not prevent cracks from developing; they simply provide a relief point for the stresses that develop. These joints are a widely accepted means to control cracks but are not always effective. Control joints are more effective the more closely spaced

they are. GeoTek suggests that control joints be placed in two orthogonal directions and located a distance approximately equal to 24 to 36 times the slab thickness.

5.7 POST CONSTRUCTION CONSIDERATIONS

5.7.1 Landscape Maintenance and Planting

Water has been shown to weaken the inherent strength of soil, and slope stability is significantly reduced by overly wet conditions. Positive surface drainage away from graded slopes should be maintained and only the amount of irrigation necessary to sustain plant life should be provided for planted slopes. Controlling surface drainage and runoff and maintaining a suitable vegetation cover can minimize erosion. Plants selected for landscaping should be lightweight, deep-rooted types that require little water and are capable of surviving the prevailing climate.

Overwatering should be avoided. Care should be taken when adding soil amendments to avoid excessive watering. Leaching as a method of soil preparation prior to planting is not recommended. An abatement program to control ground-burrowing rodents should be implemented and maintained. This is critical as burrowing rodents can decreased the long-term performance of slopes.

It is common for planting to be placed adjacent to structures in planter or lawn areas. This will result in the introduction of water into the ground adjacent to the foundations. This type of landscaping should be avoided. Planters within 30 feet of the buildings should be above ground and underlain by a concrete slab. Waterproofing of the foundation and/or subdrains may be warranted and advisable. GeoTek could discuss these issues, if desired, when plans are made available.

5.7.2 Drainage

The need to maintain proper surface drainage and subsurface systems cannot be overly emphasized. Positive site drainage should be maintained at all times. Drainage should not flow uncontrolled down any descending slope. Water should be directed away from foundations and not allowed to pond or seep into the ground adjacent to the footings and floor-slabs. Pad drainage should be directed toward approved areas and not be blocked by other improvements.

Roof gutters should be installed that will direct the collected water at least 20 feet from the buildings.

It is the owner's responsibility to maintain and clean drainage devices on or contiguous to their lot. In order to be effective, maintenance should be conducted on a regular and routine schedule and necessary corrections made prior to each rainy season.

5.8 PLAN REVIEW AND CONSTRUCTION OBSERVATIONS

It is recommended that site grading, specifications, and foundation plans be reviewed by this office prior to construction to check for conformance with the recommendations of this report. It is also recommended that GeoTek representatives be present during site grading and foundation construction to observe and document for proper implementation of the geotechnical recommendations. The owner/developer should have GeoTek perform at least the following duties:

- Observe site clearing and grubbing operations for proper removal of all unsuitable materials.
- Observe and test bottom of removals prior to fill placement.
- Evaluate the suitability of on-site and import materials for fill placement and collect soil samples for laboratory testing where necessary.
- Observe the fill for uniformity during placement, including utility trench excavation backfill. Also, test the fill for density, relative compaction and moisture content.
- Observe and probe foundation excavations to confirm suitability of bearing materials with respect to density.

If requested, a construction observation and compaction report can be provided by GeoTek which can comply with the requirements of the governmental agencies having jurisdiction over the project. It is recommended that these agencies be notified prior to commencement of construction so that necessary grading permits can be obtained.

6. INTENT

It is the intent of this report to aid in the design and construction of the proposed development. Implementation of the advice presented in this report is intended to reduce risk associated with construction projects. The professional opinions and geotechnical advice contained in this report are not intended to imply total performance of the project or

guarantee that unusual or variable conditions will not be discovered during or after construction.

The scope of GeoTek's evaluation is limited to the area explored that is shown on the Exploration Location Map (Figure 2). This evaluation does not and should in no way be construed to encompass any areas beyond the specific area of the proposed construction as indicated to GeoTek by the client. Further, no evaluation of any existing site improvements is included. The scope is based on GeoTek's understanding of the project and the client's needs, GeoTek's proposal (Proposal No. P-0903322-CR) dated September 13, 2022 and geotechnical engineering standards normally used on similar projects in this region.

7. LIMITATIONS

GeoTek's findings are based on site conditions observed and the stated sources. Thus, GeoTek's comments are professional opinions that are limited to the extent of the available data.

GeoTek has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering at this time and location and science professions currently practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report.

Since the recommendations contained in this report are based on the site conditions observed and encountered and laboratory testing, the conclusions and recommendations are professional opinions that are limited to the extent of the available data. Thus, GeoTek's conclusions and recommendations are professional opinions that are limited to the extent of the available data. Observations during construction are important to allow for any change in recommendations found to be warranted. These opinions have been derived in accordance with current standards of practice and no warranty of any kind is expressed or implied. Standards of care/practice are subject to change with time.

8. SELECTED REFERENCES

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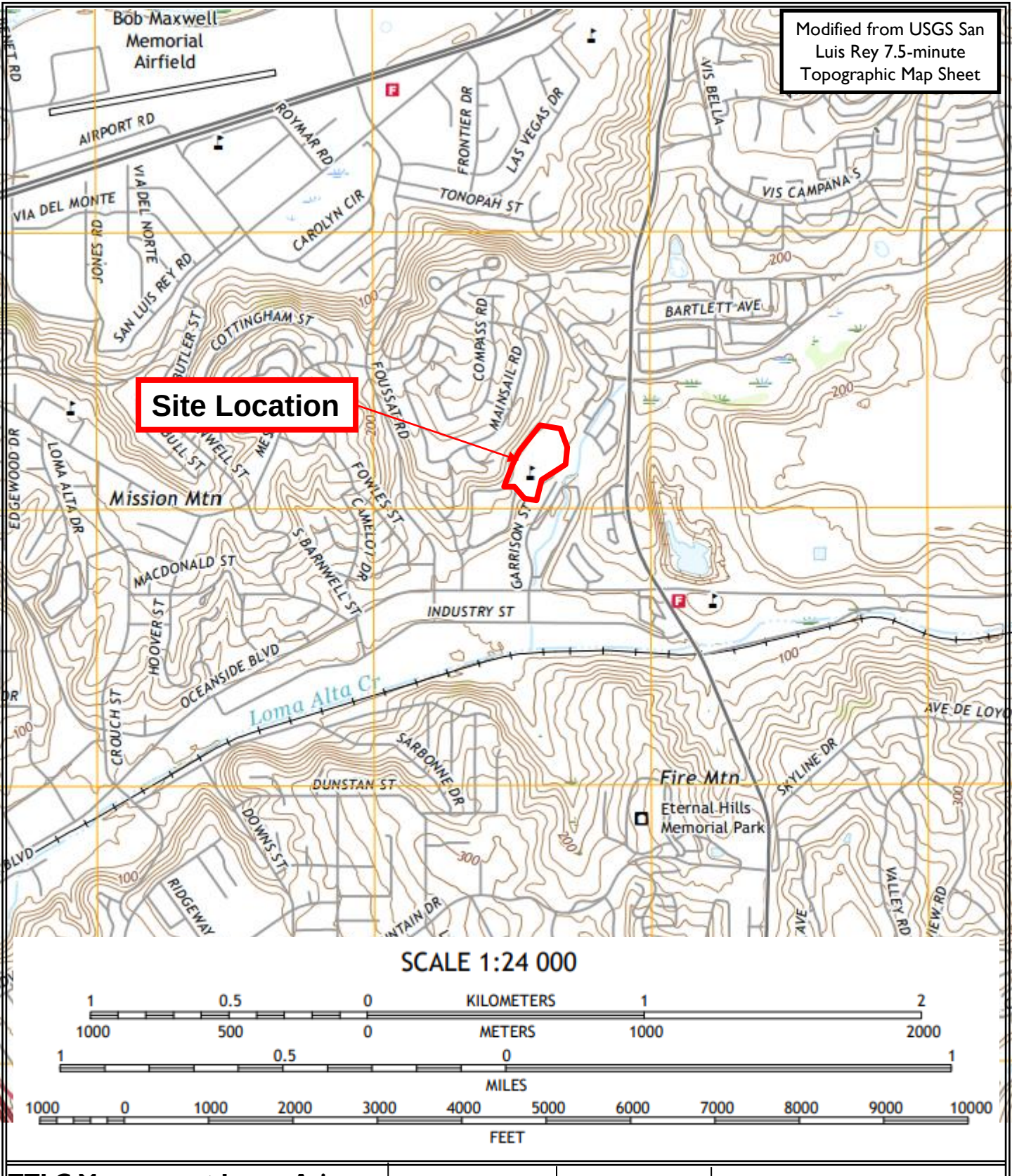
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SCALE 1:24 000

1 0.5 0 KILOMETERS 1 2

1000 500 0 METERS 1000 2000

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MILES

1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

FEET

TTLC Management Inc. an Arizona Corporation
333 Garrison Street
Oceanside, San Diego County, California

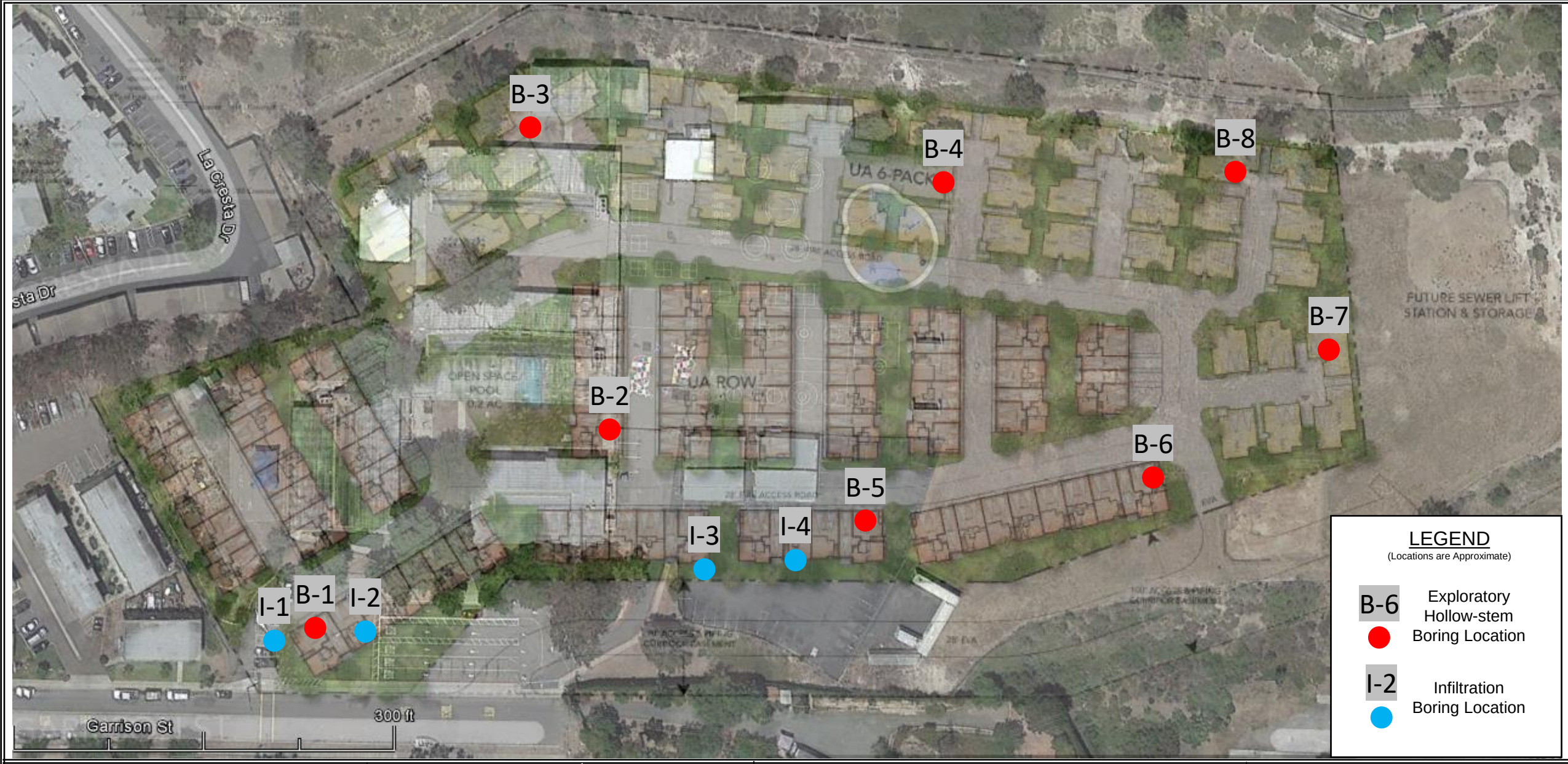
Project No. 3346-CR

NORTH

Figure 1

Site Location Map

GEOTEK



TTLC Management Inc. and Arizona Corporation
333 Garrison Street
Oceanside, San Diego County, California

Project No. 3346-CR

NORTH

Figure 2

Exploration Location Map

GEOTEK

APPENDIX A

LOG OF EXPLORATORY BORINGS

Proposed Garrison School Site Residential Development

333 Garrison Street

Oceanside, San Diego County, California

Project No. 3346-CR

GEOTEK

A - FIELD TESTING AND SAMPLING PROCEDURES

The Modified Split-Barrel Sampler (Ring)

The Ring sampler is driven into the ground at various depths in accordance with ASTM D 3550 test procedures. The sampler, with an external diameter of 3.0 inches, is lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sampler is typically driven into the ground 12 or 18 inches with a 140-pound hammer free falling from a height of 30 inches. Blow counts are recorded for every 6 inches of penetration as indicated on the log of boring. The samples are removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

The Standard Penetration Test (SPT) Sampler

Standard penetration tests (SPT) were performed with a 2.0-inch outside diameter, 1.5-inch inside diameter, split-barrel sampler. The sampler was 18 inches long. The inside diameter of the sampler shoe was 1.4 inches. The sampler was unlined. The sampler conformed to the requirements of ASTM D 1586. A 160-pound automatic trip hammer was utilized, dropping 30 inches for each blow. Blow counts are recorded for every 6 inches of penetration as indicated on the log of boring. Disturbed samples are removed from the sample barrel, sealed in a plastic bag, and transported to the laboratory for testing.

Bulk Samples (Large)

These samples are normally large bags of earth materials over 20 pounds in weight collected from the field by means of hand digging or exploratory cuttings.

Bulk Samples (Small)

These are plastic bag samples which are normally airtight and contain less than 5 pounds in weight of earth materials collected from the field by means of hand digging or exploratory cuttings. These samples are primarily used for determining natural moisture content and classification indices.

B - BORING LOG LEGEND

The following abbreviations and symbols often appear in the classification and description of soil and rock on the log of borings:

SOILS

USCS	Unified Soil Classification System
f-c	Fine to coarse
f-m	Fine to medium

GEOLOGIC

B: Attitudes	Bedding: strike/dip
J: Attitudes	Joint: strike/dip
C: Contact line	
……..	Dashed line denotes USCS material change
———	Solid Line denotes unit / formational change
———	Thick solid line denotes end of boring

(Additional denotations and symbols are provided on the boring logs)

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	TTLC Management, Inc.	**DRILLER:**	2R Drilling	**LOGGED BY:**	KIG
PROJECT NAME:	333 Garrison Street	**DRILL METHOD:**	Hollow Stem	**OPERATOR:**	Jaime
PROJECT NO.:	3346-CR	**HAMMER:**	140#/30"	**RIG TYPE:**	CME 75
LOCATION:	See Boring Location Map			**DATE:**	10/12/2022

Boring No.: B-1

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
0					**6" Asphaltic Concrete:**			
					Undocumented Fill:			
		11	R1		**Alluvium:**			
		10		SP-SM	f-m SAND, light brown, moist, medium dense, trace clay	7.0	113.3	
		10						
5		13	R2		less clay			
		17						Collapse
		19						
		10	R3	CL	silty CLAY, light brown, moist, stiff			
		15		SC	clayey f-m SAND, light brown, moist, medium dense	10.1	115.5	
		20		CL	f-m sandy CLAY, light brown, moist, very stiff			
10		9	R4		f sandy CLAY, light brown, moist, very stiff			
		14						
		19						
15		13	R5		f sandy to silty CLAY, light brown, moist, very stiff			
		16				95.4	26.1	
		20						
20		9	R6		f-m sandy CLAY, light brown, moist, very stiff			
		15				105.5	11.5	
		22			becomes reddish-brown			
25		3	S1		f sandy CLAY, light brown, very moist, stiff, trace oxidation staining			
		4						
		4						
30		4	S2	SM	silty f-m SAND, greyish-brown, very moist, medium dense, trace oxidation staining, little clay		18.2	
		9						
		9						

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	TTLC Management, Inc.	**DRILLER:**	2R Drilling	**LOGGED BY:**	KIG
PROJECT NAME:	333 Garrison Street	**DRILL METHOD:**	Hollow Stem	**OPERATOR:**	Jaime
PROJECT NO.:	3346-CR	**HAMMER:**	140#/30"	**RIG TYPE:**	CME 75
LOCATION:	See Boring Location Map			**DATE:**	10/12/2022

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	Boring No.: B-1 (continued) / MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
								▽
35		15 18 21	S3	SC	clayey f-c SAND, greyish-brown, wet, medium dense	21.3		44.1% Passing #200 Sieve Liquid Limit = 34 Plastic Limit = 18 Plasticity Index = 16
40		15 20 38	S4		**Sedimentary Bedrock:** f sandy SILTSTONE to SANDSTONE, light brown, moist, dense, little oxidation staining			
45		15 26 39	S5			23.0		
50		10 7 22	S6					
					BORING TERMINATED AT 51.5 FEET Groundwater encountered at 33 FEET 6 INCHES Boring backfilled with soil cuttings			

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	TTLC Management, Inc.	**DRILLER:**	2R Drilling	**LOGGED BY:**	KIG
PROJECT NAME:	333 Garrison Street	**DRILL METHOD:**	Hollow Stem	**OPERATOR:**	Jaime
PROJECT NO.:	3346-CR	**HAMMER:**	140#/30"	**RIG TYPE:**	CME 75
LOCATION:	See Boring Location Map			**DATE:**	10/12/2022

Boring No.: B-2

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
0					**2" Asphaltic Concrete:**			
					Undocumented Fill:			
					Alluvium:			
		6 7 6	R1	CL/SC	f-m sandy CLAY to clayey f-m SAND, whitish light-brown, moist, medium dense	11.0	119.8	
5		6 8 11	R2	CL	f-m sandy CLAY, dark grey, moist, stiff, trace oxidation staining	18.3	110.7	
		8 13 15	R3		f-m sandy CLAY, bluish light-grey, moist, very stiff	10.9	110.8	
10		6 11 24	R4		f-m sandy CLAY, dark grey, moist, very stiff			
15		13 30 32	R5		f-c sandy CLAY, greyish light-brown, moist, hard	13.8	111.5	
20		16 20 24	R6	SC/CL	f-m sandy CLAY to clayey f-m SAND, dark grey-brown, moist, medium dense to very stiff			
25					**BORING TERMINATED AT 21.5 FEET** No groundwater encountered Boring backfilled with soil cuttings			
30								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	TTLC Management, Inc.	**DRILLER:**	2R Drilling	**LOGGED BY:**	KIG
PROJECT NAME:	333 Garrison Street	**DRILL METHOD:**	Hollow Stem	**OPERATOR:**	Jaime
PROJECT NO.:	3346-CR	**HAMMER:**	140#/30"	**RIG TYPE:**	CME 75
LOCATION:	See Boring Location Map			**DATE:**	10/12/2022

Boring No.: B-3

Depth (ft)	Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Water Content (%)	Dry Density (pcf)	Others
0					**4" Asphaltic Concrete:**			
					Undocumented Fill:			
		10	R1					
		13			**Alluvium:**	12.7	106.8	
		13			f-m sandy CLAY to clayey f-m SAND, light brown, moist, medium dense			
		9	R2		f sandy CLAY, light brown, moist, stiff			
5		7				14.4	112.2	
		7						
		35	R3		**Sedimentary Bedrock:**			
		50/4"			excavates as silty f SAND, whitish-tan, moist			
		40	R5		Whitish-yellow, little oxidation staining			
10		50/5"				8.4	120.5	
		40	R6					
		50/4"						
15					**BORING TERMINATED AT 14.5 FEET**			
					No groundwater encountered			
					Boring backfilled with soil cuttings			
20								
25								
30								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	TTLC Management, Inc.	**DRILLER:**	2R Drilling	**LOGGED BY:**	KIG
PROJECT NAME:	333 Garrison Street	**DRILL METHOD:**	Hollow Stem	**OPERATOR:**	Jaime
PROJECT NO.:	3346-CR	**HAMMER:**	140#/30"	**RIG TYPE:**	CME 75
LOCATION:	See Boring Location Map			**DATE:**	10/12/2022

Boring No.: B-4

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
0					**Undocumented Fill**			
		18	R1	SC	clayey f-m SAND, light brown, moist			
		44 50/3"			**Sedimentary Bedrock:** silty SANDSTONE, yellowish-tan, slightly moist, very dense	10.9	122.3	
5		43 50/2"	R2					
		12 50/4"	R3			12.6	120.6	
10		49 50/3"	R5		excavates as silty f-m SAND, whitish light-brown, moist			
15		50/2"	R6			6.9	123.3	
					BORING TERMINATED AT 15.5 FEET No groundwater encountered Boring backfilled with soil cuttings			
20								
25								
30								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	TTLC Management, Inc.	**DRILLER:**	2R Drilling	**LOGGED BY:**	KIG
PROJECT NAME:	333 Garrison Street	**DRILL METHOD:**	Hollow Stem	**OPERATOR:**	Jaime
PROJECT NO.:	3346-CR	**HAMMER:**	140#/30"	**RIG TYPE:**	CME 75
LOCATION:	See Boring Location Map			**DATE:**	10/12/2022

Boring No.: B-5

Depth (ft)	Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Water Content (%)	Dry Density (pcf)	Others
0					**2" Asphaltic Concrete:**			
					Undocumented Fill:			
		4	R1					
		11			**Alluvium:**	11.9	119.8	MD, EI, SH
		14		CL	f-m sandy CLAY, dark grey, moist, very stiff			Expansion Index =13
		6	R2	SC	clayey f-m SAND, whitish-brown, moist, medium dense			
5		7		CL	f-m sandy CLAY, dark grey, moist, very stiff	17.9	108.8	
		10						
		9	R3		f-m sandy CLAY, dark grey, moist, very stiff			
		9					18.9	
		11						
		11	R4					
10		15				103.9	12.7	
		20						
		7	R5	SM	silty f SAND, blackish dark grey, moist, medium dense, trace organics			
		7				122.1	7.5	
15		7						
		16	R6	CL	f-m sandy CLAY, bluish-grey-brown, moist, very stiff			
		17						
20		17						
					BORING TERMINATED AT 20.0 FEET			
					No groundwater encountered Boring backfilled with soil cuttings			
25								
30								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	TTLC Management, Inc.	**DRILLER:**	2R Drilling	**LOGGED BY:**	KIG
PROJECT NAME:	333 Garrison Street	**DRILL METHOD:**	Hollow Stem	**OPERATOR:**	Jaime
PROJECT NO.:	3346-CR	**HAMMER:**	140#/30"	**RIG TYPE:**	CME 75
LOCATION:	See Boring Location Map			**DATE:**	10/12/2022

Boring No.: B-6

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
0					**Undocumented Fill:**			
		7 8 8	R1	SM	**Alluvium:** silty f-m SAND, dark grey, slightly moist, medium dense, trace clay	3.2	100.4	Collapse
5		17 25 28	R2	SC	f-m sandy CLAY, brown, moist, hard	9.0	106.0	
		10 15 20	R3		trace oxidation staining	15.4	115.1	
10		9 15 15	R5		becomes grey-brown	17.5	109.3	
15		10 16 28	R6					
					BORING TERMINATED AT 16.5 FEET No groundwater encountered Boring backfilled with soil cuttings			
20								
25								
30								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	TTLC Management, Inc.	**DRILLER:**	2R Drilling	**LOGGED BY:**	KIG
PROJECT NAME:	333 Garrison Street	**DRILL METHOD:**	Hollow Stem	**OPERATOR:**	Jaime
PROJECT NO.:	3346-CR	**HAMMER:**	140#/30"	**RIG TYPE:**	CME 75
LOCATION:	See Boring Location Map			**DATE:**	10/12/2022

Boring No.: B-7

Depth (ft)	Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Water Content (%)	Dry Density (pcf)	Others
0					**Undocumented Fill:**			
		12 32 30	R1	SM/SC	**Alluvium:** silty to clayey f-m SAND, brown, moist, dense	8.5	129.9	Corrosion
		14 21 28	R2	SC	clayey f-m SAND, light grey-brown, moist, dense, trace oxidation staining	6.0	128.4	
5		14 22 28	R3		clayey f-m SAND, light brown, moist, dense	13.7	118.8	
		16 37 50	R4	ML	f sandy SILT, light brown, moist, very dense, trace clay	18.6	112.6	
10		14 23	R5					
		49		CL	silty CLAY, brown, moist, hard			
15					**BORING TERMINATED AT 15.0 FEET** No groundwater encountered Boring backfilled with soil cuttings			
20								
25								
30								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	TTLC Management, Inc.	**DRILLER:**	2R Drilling	**LOGGED BY:**	KIG
PROJECT NAME:	333 Garrison Street	**DRILL METHOD:**	Hollow Stem	**OPERATOR:**	Jaime
PROJECT NO.:	3346-CR	**HAMMER:**	140#/30"	**RIG TYPE:**	CME 75
LOCATION:	See Boring Location Map			**DATE:**	10/12/2022

Boring No.: B-8

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
0					**Undocumented Fill:**			
					Alluvium:			
	■	30 33 33	R1	SM	silty f-m SAND, light brown, slightly moist, dense	3.1	121.7	
5	■	8 12 14	R2	CL	f sandy CLAY, whitish-grey, moist, very stiff	18.2	105.2	
	■	15 23 24	R3	SC	clayey f-m SAND, light brown, moist, dense	9.0	116.3	
10	■	9 13 29	R5		clayey f-m SAND, light grey-brown, moist, medium dense			
	■	40 50/2"		SC/SM	clayey to silty f-m SAND, whitish-tan, moist, very dense	8.3	113.8	
15					**REFUSAL AT 13.0 FEET**			
					No groundwater encountered Boring backfilled with soil cuttings			
20								
25								
30								

LEGEND

Sample type: ■ ---Ring ■ ---SPT ▨ ---Small Bulk ▩ ---Large Bulk □ ---No Recovery ▽ ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	TTLC Management, Inc.	**DRILLER:**	2R Drilling	**LOGGED BY:**	KIG
PROJECT NAME:	333 Garrison Street	**DRILL METHOD:**	Hollow Stem	**OPERATOR:**	Jaime
PROJECT NO.:	3346-CR	**HAMMER:**	140#/30"	**RIG TYPE:**	CME 75
LOCATION:	See Boring Location Map			**DATE:**	10/12/2022

Boring No.: I-1

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
0					**6" Asphaltic Concrete:**			
					Undocumented Fill:			
					Alluvium:			
				SP	f-m SAND, light brown, moist, medium dense, trace clay			
5					no clay			
				CL	f-m sandy CLAY, light brown, moist, very stiff			
10					**BORING TERMINATED AT 10 FEET**			
					No groundwater encountered Boring set with pipe, sock, and gravel			
15								
20								
25								
30								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	TTLC Management, Inc.	**DRILLER:**	2R Drilling	**LOGGED BY:**	KIG
PROJECT NAME:	333 Garrison Street	**DRILL METHOD:**	Hollow Stem	**OPERATOR:**	Jaime
PROJECT NO.:	3346-CR	**HAMMER:**	140#/30"	**RIG TYPE:**	CME 75
LOCATION:	See Boring Location Map			**DATE:**	10/12/2022

Boring No.: I-2

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
0					**6" Asphaltic Concrete:**			
					Undocumented Fill:			
					Alluvium:			
				SP	f-m SAND, light brown, moist, medium dense, trace clay			
5					no clay			
				CL	f-m sandy CLAY, light brown, moist, very stiff			
10					**BORING TERMINATED AT 10 FEET**			
					No groundwater encountered Boring set with pipe, sock, and gravel			
15								
20								
25								
30								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	TTLC Management, Inc.	**DRILLER:**	2R Drilling	**LOGGED BY:**	KIG
PROJECT NAME:	333 Garrison Street	**DRILL METHOD:**	Hollow Stem	**OPERATOR:**	Jaime
PROJECT NO.:	3346-CR	**HAMMER:**	140#/30"	**RIG TYPE:**	CME 75
LOCATION:	See Boring Location Map			**DATE:**	10/12/2022

Boring No.: I-3

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
0					**2" Asphaltic Concrete:**			
					Undocumented Fill:			
				CL	**Alluvium:** f-m sandy CLAY, dark grey, moist, very stiff			
5								
10					**BORING TERMINATED AT 10 FEET** No groundwater encountered Boring set with pipe, sock, and gravel			
15								
20								
25								
30								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	TTLC Management, Inc.	**DRILLER:**	2R Drilling	**LOGGED BY:**	KIG
PROJECT NAME:	333 Garrison Street	**DRILL METHOD:**	Hollow Stem	**OPERATOR:**	Jaime
PROJECT NO.:	3346-CR	**HAMMER:**	140#/30"	**RIG TYPE:**	CME 75
LOCATION:	See Boring Location Map			**DATE:**	10/12/2022

Boring No.: I-4

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
0					**2" Asphaltic Concrete:**			
					Undocumented Fill:			
				CL	**Alluvium:** f-m sandy CLAY, dark grey, moist, very stiff			
10					**BORING TERMINATED AT 10 FEET** No groundwater encountered Boring set with pipe, sock, and gravel			
15								
20								
25								
30								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

APPENDIX B

RESULTS OF LABORATORY TESTING

Proposed Garrison School Site Residential Development
333 Garrison Street
Oceanside, San Diego County, California
Project No. 3346-CR

GEOTEK

SUMMARY OF LABORATORY TESTING

Classification
Soils were classified visually in general accordance with the Unified Soil Classification System (ASTM Test Method D 2487). The soil classifications are shown on the logs of borings in Appendix A.

Atterberg Limits
Atterberg limits testing were performed on select fine-grained samples collected from the site. The tests were performed in general accordance with ASTM D 4318 test procedures. The test results are presented on the boring logs included within Appendix A.

Materials Finer Than the No. 200 Sieve
A #200 sieve wash was performed on selected samples of the soils according to ASTM Test Method D 1140. The results of this testing are presented on the boring logs in Appendix A.

Direct Shear
Shear testing was performed in a direct shear machine of the strain-control type in general accordance with ASTM D 3080 test procedures. The rate of deformation was approximately 0.035 inch per minute. The samples were sheared under varying confining loads in order to determine the coulomb shear strength parameters, angle of internal friction and cohesion. The tests were performed on soil samples remolded to approximately 90 percent of maximum dry density as determined by ASTM D 1557 test procedures. The shear test results are presented graphically in Appendix B.

Expansion Index
Expansion Index testing was performed on one (1) soil sample obtained from the field exploration. Testing was performed in general accordance with ASTM Test Method D 4829. The results of the testing are provided below and graphically in Appendix B.

Boring No.	Depth (ft.)	Description	Expansion Index	Classification
B-5	1-5	Clayey Sand (SC)	13	Very Low

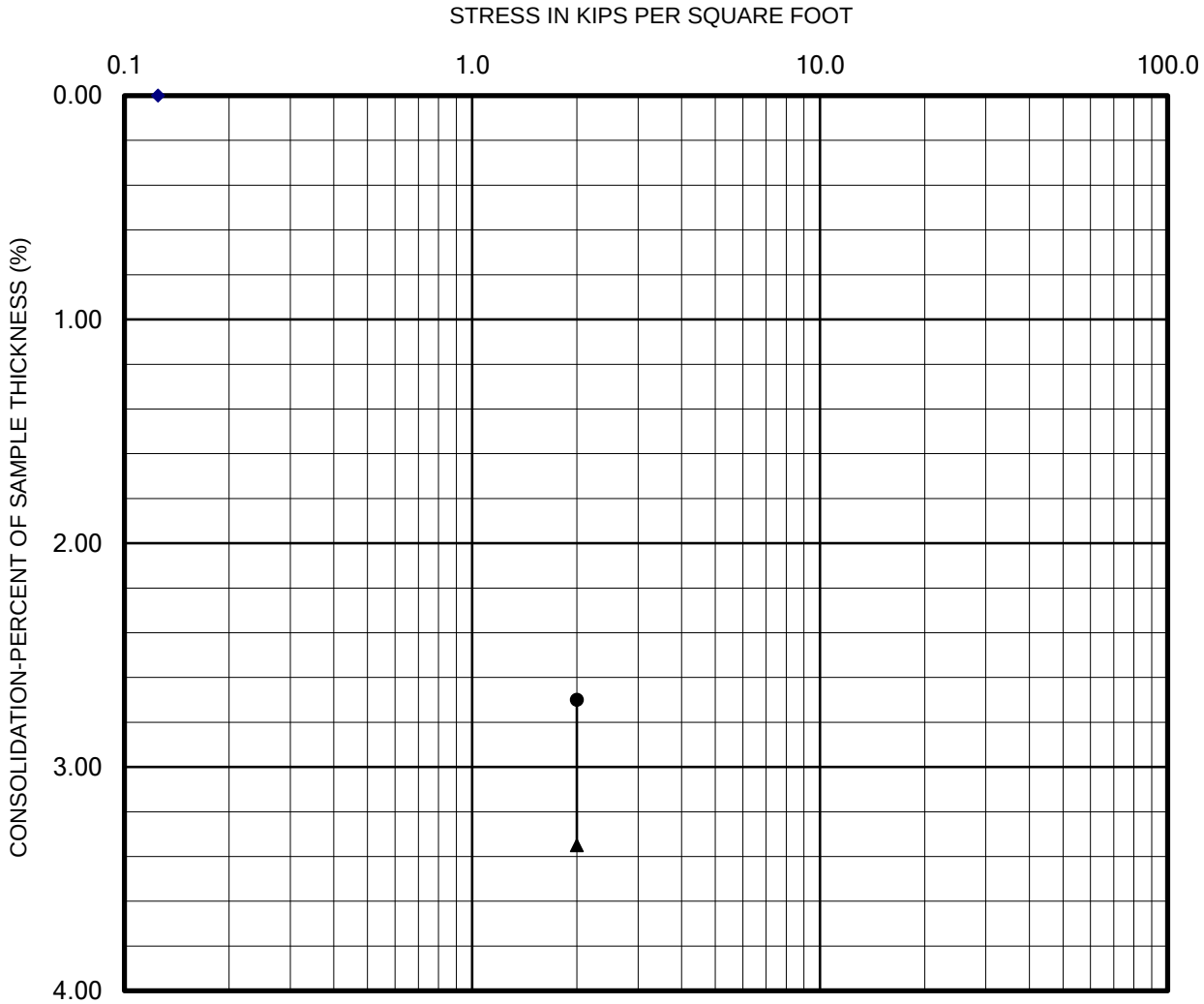
In-Situ Moisture and Density
The natural water content of sampled soils was determined in general accordance with ASTM D 2216 test procedures on samples of the materials recovered from the subsurface exploration. In addition, in-place dry density of the sampled soils was determined in general accordance with ASTM D 2937 test procedures on relatively undisturbed samples to measure the unit weight of the subsurface soils. Results of these tests are shown on the boring logs at the appropriate sample depths in Appendix A.

Moisture-Density Relationship
Laboratory testing was performed on one (1) sample collected during the subsurface exploration. The laboratory maximum dry density and optimum moisture content for the soil type was determined in general accordance with test method ASTM Test Procedure D 1557. The results of the testing are presented graphically in Appendix B.

Sulfate Content, Resistivity and Chloride Content

Testing to determine the water-soluble sulfate content was performed by others in general accordance with ASTM D4327 test procedures. Resistivity testing was completed by others in general accordance with ASTM G187 test procedures. Testing to determine the chloride content was performed by others in general accordance with ASTM D4327 test procedures. The results of the testing are provided below and in Appendix B.

Boring No.	Depth (ft.)	pH ASTM D4972	Chloride ASTM D4327 (mg/kg)	Sulfate ASTM D4327 (% by weight)	Resistivity ASTM G187 (ohm-cm)
B-7	1-5	7.6	43.0	0.0107	2,747



Seating Cycle
Loading Prior to Inundation
Loading After Inundation
Rebound Cycle

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

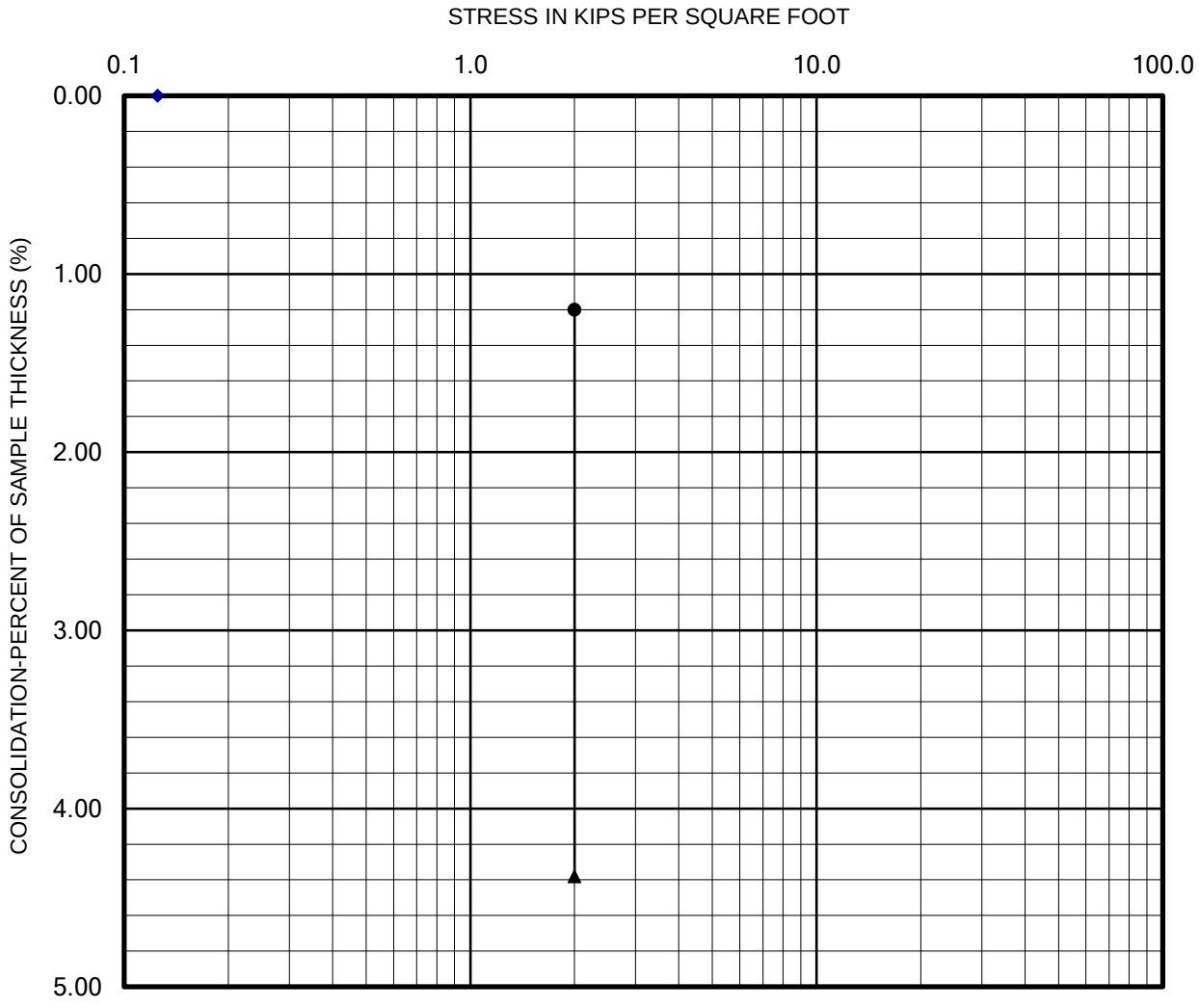
GEOTEK

CHECKED BY: JB	Lab: Corona
PROJECT NO.: 3346-CR	Date: 11/8/2022

COLLAPSE REPORT

Sample: B-1 @ 5 feet

Plate B-1



Seating Cycle
Loading Prior to Inundation
Loading After Inundation
Rebound Cycle

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

GEOTEK

CHECKED BY: JB	Lab: Corona
PROJECT NO.: 3346-CR	Date: 11/8/2022

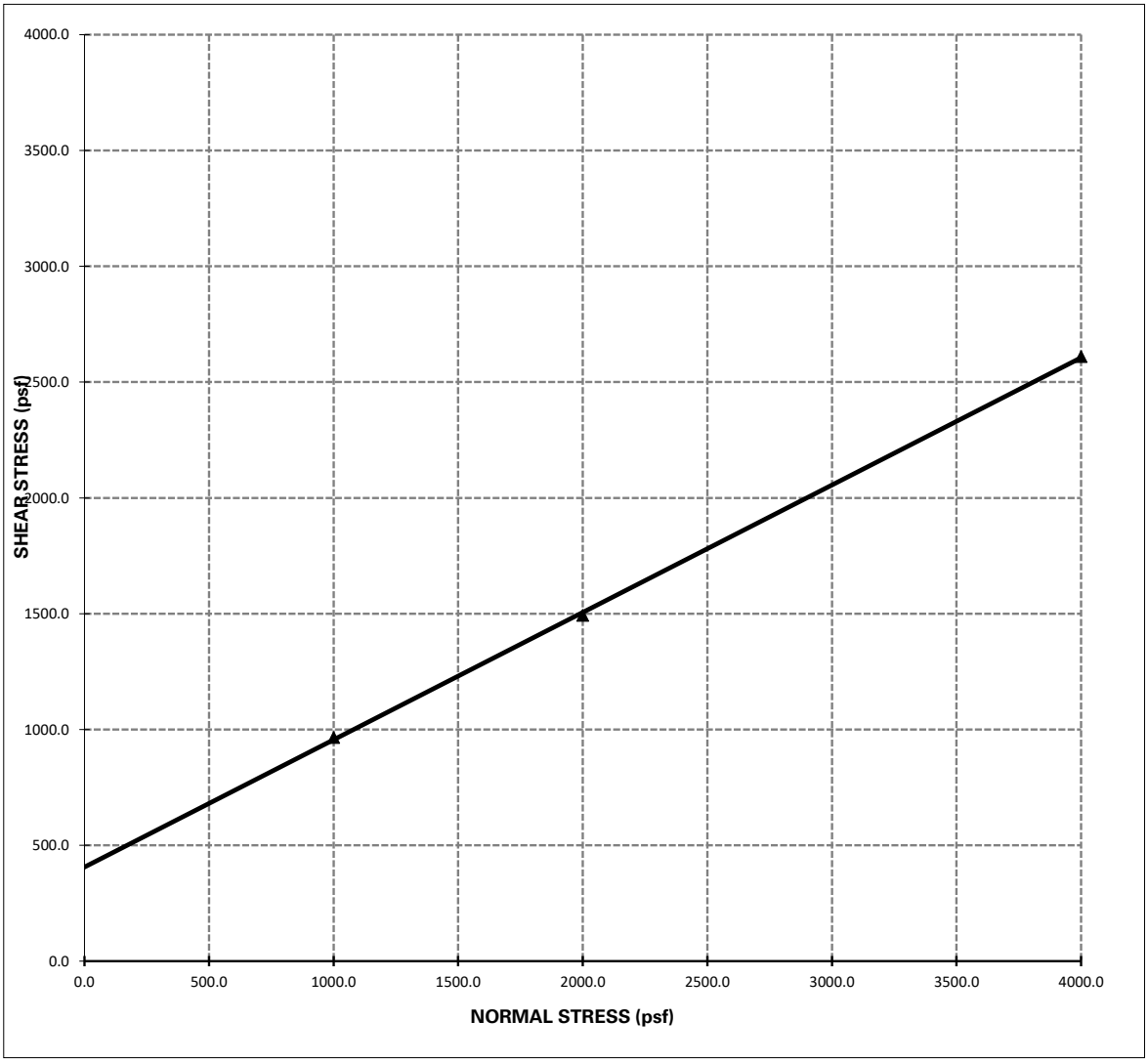
COLLAPSE REPORT

Sample: B-6 @ 2 feet

Plate B-2

DIRECT SHEAR TEST

Project Name:	333 Garrison Street	***Sample Location:***	B-5 @ 0-5 feet
Project Number:	3346-CR	***Date Tested:***	11/10/2022



Shear Strength: **Φ = 29 °** , **C = 406 psf**

Notes: 1 - The soil specimen used in the shear box was a ring sample remolded to approximately 90% relative compaction from a bulk sample collected during the field investigation.

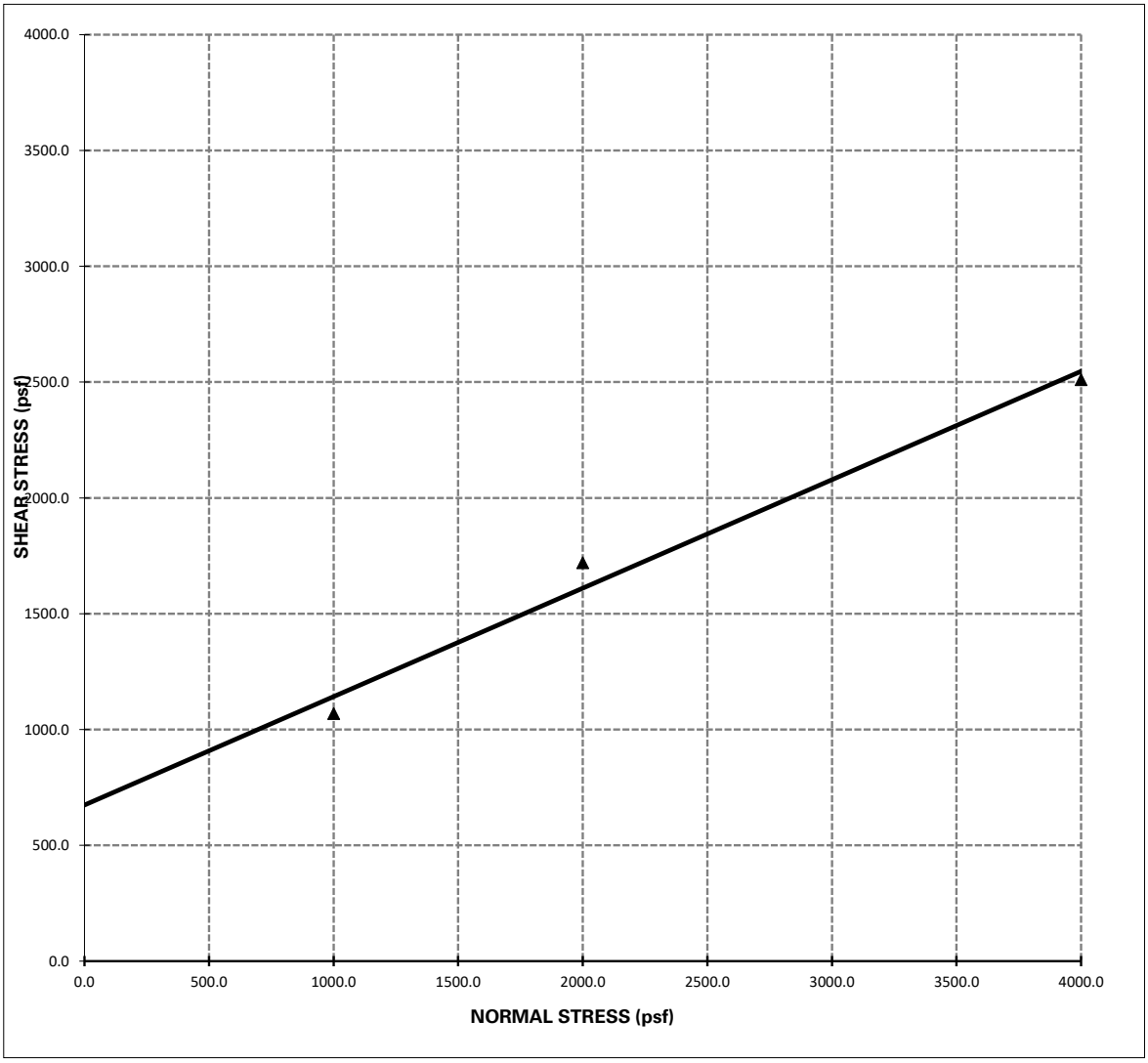
2 - The above reflect direct shear strength at saturated conditions.

3 - The tests were run at a shear rate of 0.01 in/min.

DIRECT SHEAR TEST

Project Name:	333 Garrison Street	***Sample Location:***	B-5 @ 0-5 feet
Project Number:	3346-CR	***Date Tested:***	11/10/2022

PEAK VALUE



Shear Strength: **Φ = 25 °** , **C = 674 psf**

Notes: 1 - The soil specimen used in the shear box was a ring sample remolded to approximately 90% relative compaction from a bulk sample collected during the field investigation.

2 - The above reflect direct shear strength at saturated conditions.

3 - The tests were run at a shear rate of 0.01 in/min.

GEOTEK

EXPANSION INDEX TEST

(ASTM D4829)

Client:	TTLC Management, Inc.	***Tested/ Checked By:***	RL Lab No Corona
Project Number:	3346-CR	***Date Tested:***	10/28/2022
Project Location:	Garrison School Site	***Sample Source:***	B-5 @ 0-5 feet
		Sample Description:	Clayey fine to medium sand

Ring #:_____ Ring Dia. : 4.01" Ring Ht.:1"

DENSITY DETERMINATION

Weight of compacted sample & ring (gm)	787.6
Weight of ring (gm)	370.5
Net weight of sample (gm)	**417.1**
Wet Density, lb / ft3 (C*0.3016)	**125.8**
Dry Density, lb / ft3 (D/1.F)	**115.9**

SATURATION DETERMINATION

Moisture Content, %	8.5
Specific Gravity, assumed	**2.70**
Unit Wt. of Water @ 20°C, (pcf)	**62.4**
% Saturation	**50.6**

READINGS

DATE	TIME	READING	
10/28/2022		0.5340	Initial
10/28/2022		0.5320	10 min/Dry
10/31/2022		0.5450	Final

FINAL MOISTURE

Final Weight of wet sample & tare	% Moisture
810.1	**13.9**

EXPANSION INDEX = 13

GeoTek - Corona
1548 N. Maple St.
Corona, CA 92880
Phone: (951) 710-1160
Fax: (951) 710-1167

Proctor Report

Report No: PTR:22-00111-S01

Client: TTLC Management, Inc. an AZ
ATTN: Michael Torres
Costa Mesa CA 92626

CC:

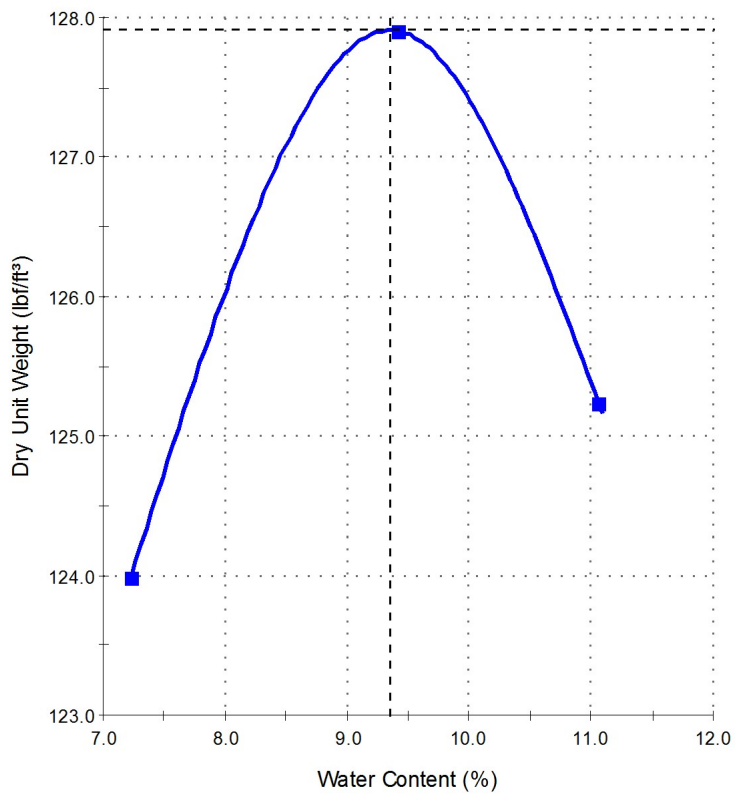
Project: 3346-CR
333 Garrison Street, Oceanside

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details

Sample ID: 22-00111-S01
Date Sampled: 10/12/2022
Sampled By: Kevin Gonzalez
Location: B-5 @ 0'-5' / Clayey fine to medium sand

Dry Unit Weight - Water Content Relationship



Test Results

ASTM D 1557

Maximum Dry Unit Weight (lbf/ft³):	**127.9**
Optimum Water Content (%):	**9.4**
Method:	A
Preparation Method:	
Tested By:	Mycheal Phillips
Date Tested:	10/28/2022

Comments

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Results Only Soil Testing

for
333 Garrison St.
Oceanside

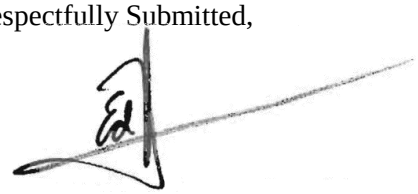
October 24, 2022

Prepared for:

Kyle McHargue
GeoTek, Inc.
1548 North Maple Street
Corona, CA 92280
kmchargue@geotekusa.com

Project X Job#: S221020F
Client Job or PO#: 3346-CR TTLC Management Inc

Respectfully Submitted,



Eduardo Hernandez, M.Sc., P.E.
Sr. Corrosion Consultant
NACE Corrosion Technologist #16592
Professional Engineer
California No. M37102
ehernandez@projectxcorrosion.com



Soil Analysis Lab Results

Client: GeoTek, Inc.
Job Name: 333 Garrison St., Oceanside
Client Job Number: 3346-CR TTLC Management Inc
Project X Job Number: S221020F
October 24, 2022

	Method	ASTM D4327		ASTM D4327		ASTM G187		ASTM G51	ASTM G200	SM 4500-D	ASTM D4327	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D4327	ASTM D4327
Bore# / Description	**Depth**	**Sulfates** SO_4^{2-}		**Chlorides** Cl^-		**Resistivity** As Rec'd | Minimum		**pH**	**Redox**	**Sulfide** S^{2-}	**Nitrate** NO_3^-	**Ammonium** NH_4^+	**Lithium** Li^+	**Sodium** Na^+	**Potassium** K^+	**Magnesium** Mg^{2+}	**Calcium** Ca^{2+}	**Fluoride** F_2^{--}	**Phosphate** PO_4^{3-}
	(ft)	(mg/kg)	(wt%)	(mg/kg)	(wt%)	(Ohm-cm)	(Ohm-cm)		(mV)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
B-7	1-5	106.6	0.0107	43.0	0.0043	19,430	2,747	7.6	170	16.20	6.7	2.2	ND	278.4	30.8	232.6	478.8	13.9	3.3

Cations and Anions, except Sulfide and Bicarbonate, tested with Ion Chromatography
mg/kg = milligrams per kilogram (parts per million) of dry soil weight
ND = 0 = Not Detected | NT = Not Tested | Unk = Unknown
Chemical Analysis performed on 1:3 Soil-To-Water extract
PPM = mg/kg (soil) = mg/L (Liquid)

Project X
Corrosion Engineering
Corrosion Control - Soil, Water, and Metallurgy Lab

Lab Request Sheet Chain of Custody
Phone: (213) 928-7213 · Fax (951) 226-1720 · www.projectxcorrosion.com
Ship Samples To: 29990 Technology Dr, Suite 13, Murrieta, CA 92563

Project X Job Number	S221020F Geotek 3346-CR 333 Garrison st 1 Full				
IMPORTANT: Please complete Project and Sample Identification Data as you would like it to appear in report & include this form with samples.					
Company Name:	Geotek USA	**Contact Name:**	Kyle McHargue	**Phone No:**	951-206-5443
Mailing Address:	1548 N. Maple Ave. Corona, CA	**Contact Email:**	kmchargue@geotekusa.com		
Accounting Contact:		**Invoice Email:**	kmchargue@geotekusa.com		
Client Project No:	3346-CR TTLC Management Inc.	**Project Name:**	333 Garrison St., Oceanside		
P.O. #:		**3-5 Day Standard**	**3 Day Guarantee** 50% mark-up	**24 hour RUSH** 100% mark-up	
(Business Days) Turn Around Time:					
Results By: ☐ Phone ☐ Fax ☐ Email					
Date & Received by :	10/20/22 Cynthia Diaz	**Default Method**			

ANALYSIS REQUESTED (Please circle)

Special Instructions:	SAMPLE ID - BORE #	DEPTH (ft)	DATE COLLECTED
196	1 B-7	1'-5'	
	2		
	3		
	4		
	5		
	6		
	7		
	8		
	9		
	10		
	11		
	12		
	13		
	14		
	15		

| Geo Quad | | | | Full Corrosion Series | | | | | | | | | | | | | | Full Corrosion Series | Reports | | | | | | | | | | | | | |

APPENDIX C

PERCOLATION TEST DATA AND PRCHET CALCULATIONS

Proposed Garrison School Site Residential Development

333 Garrison Street

Oceanside, San Diego County, California

Project No. 3346-CR

GEOTEK

Client:	**TTLC Management, Inc.**
Project:	**333 Garrison Street, Oceanside**
Project No:	**3346-CR**
Date:	**10/14/2022**

Boring No. **I-1**

Percolation to Infiltration Rate (Porchet Method)

Time Interval, Δt =	30
Final Depth to Water, D_F =	104.5
Test Hole Radius, r =	3
Initial Depth to Water, D_O =	104
Total Test Hole Depth, D_T =	120

Equation - $I_t = \dfrac{\Delta H\,(60r)}{\Delta t\,(r+2H_{avg})}$

$H_O = D_T - D_O$ =	16
$H_F = D_T - D_F$ =	15.5
$\Delta H = \Delta D = H_O - H_F$ =	0.5
$H_{avg} = (H_O+H_F)/2$ =	15.75

I_t = 0.09 **Inches per Hour**

GEOTEK

Client:	**TTLC Management, Inc.**
Project:	**333 Garrison Street, Oceanside**
Project No:	**3346-CR**
Date:	**10/14/2022**

Boring No. **I-2**

Percolation to Infiltration Rate (Porchet Method)

Time Interval, Δt =	30
Final Depth to Water, D_F =	118
Test Hole Radius, r =	3
Initial Depth to Water, D_O =	116.75
Total Test Hole Depth, D_T =	120

Equation - $I_t = \dfrac{\Delta H\,(60r)}{\Delta t\,(r+2H_{avg})}$

$H_O = D_T - D_O$ =	3.25
$H_F = D_T - D_F$ =	2
$\Delta H = \Delta D = H_O - H_F$ =	1.25
$H_{avg} = (H_O+H_F)/2$ =	2.625

I_t = 0.91 **Inches per Hour**

GEOTEK

Client:	**TTLC Management, Inc.**
Project:	**333 Garrison Street, Oceanside**
Project No:	**3346-CR**
Date:	**10/14/2022**

Boring No. **I-3**

Percolation to Infiltration Rate (Porchet Method)

Time Interval, Δt =	30
Final Depth to Water, D_F =	104.5
Test Hole Radius, r =	3
Initial Depth to Water, D_O =	104
Total Test Hole Depth, D_T =	120

Equation - $I_t = \dfrac{\Delta H\,(60r)}{\Delta t\,(r+2H_{avg})}$

$H_O = D_T - D_O$ =	16
$H_F = D_T - D_F$ =	15.5
$\Delta H = \Delta D = H_O - H_F$ =	0.5
$H_{avg} = (H_O+H_F)/2$ =	15.75

I_t = 0.09 **Inches per Hour**

GEOTEK

Client:	**TTLC Management, Inc.**
Project:	**333 Garrison Street, Oceanside**
Project No:	**3346-CR**
Date:	**10/14/2022**

Boring No. **I-4**

Percolation to Infiltration Rate (Porchet Method)

Time Interval, Δt =	30
Final Depth to Water, D_F =	102
Test Hole Radius, r =	3
Initial Depth to Water, D_O =	101.75
Total Test Hole Depth, D_T =	120

Equation - $I_t = \dfrac{\Delta H\,(60r)}{\Delta t\,(r+2H_{avg})}$

$H_O = D_T - D_O$ =	18.25
$H_F = D_T - D_F$ =	18
$\Delta H = \Delta D = H_O - H_F$ =	0.25
$H_{avg} = (H_O+H_F)/2$ =	18.125

I_t = 0.04 **Inches per Hour**

GEOTEK

PERCOLATION DATA SHEET

TTLC Management, Inc an AZ Corporation

Project: 333 Garrison Street, Oceanside **Job No.:** 3346-CR

Test Hole No.: I-1 **Tested By:** C.D **Date:** 10/14/2022

Depth of Hole As Drilled: 120" **Before Test:** 120" **After Test:** 120"

Reading No.	Time	Time Interval (Min)	Total Depth of Hole (Inches)	Initial Water Level (Inches)	Final water Level (Inches)	Δ in Water Level (Inches)	Rate (minutes per Inch)	Comments
	7:02		120	22				
	7:32	30			21 3/4	1/4		
	7:32		120	21 3/4				
	8:02	30			21 1/2	1/4		
1	8:02		120	21 1/2				
	8:32	30			21	1/2		
2	8:32		120	21				
	9:02	30			20 1/2	1/2		
3	9:02		120	20 1/2				
	9:32	30			20	1/2		
4	9:32		120	20				
	10:02	30			19 1/2	1/2		
5	10:02		120	19 1/2				
	10:32	30			19	1/2		
6	10:32		120	19				
	11:02	30			18 1/2	1/2		
7	11:02		120	18 1/2				
	11:32	30			18	1/2		
8	11:32		120	18				
	12:02	30			17 1/2	1/2		

PERCOLATION DATA SHEET

TTLC Management, Inc an AZ Corporation

Project: 333 Garrison Street, Oceanside **Job No.:** 3346-CR

Test Hole No.: T-1 **Tested By:** C.D. **Date:** 10/14/2022

Depth of Hole As Drilled: 120" **Before Test:** 120" **After Test:** 120"

Reading No.	Time	Time Interval (Min)	Total Depth of Hole (Inches)	Initial Water Level (Inches)	Final water Level (Inches)	Δ in Water Level (Inches)	Rate (minutes per Inch)	Comments
9	12:02 12:32	30	120	17 1/2	17	1/2		
10	12:32 1:02	30	120	17	16 1/2	1/2		
11	1:02 1:32	30	120	16 1/2	16	1/2		
12	1:32 2:02	30	120	16	15 1/2	1/2		

PERCOLATION DATA SHEET

TTLC Management, Inc an AZ Corporation

Project: 333 Garrison Street, Oceanside Job No.: 3346-CR

Test Hole No.: I-2 Tested By: C.D Date: 10/14/2022

Depth of Hole As Drilled: 120" Before Test: 120" After Test: 120"

Reading No.	Time	Time Interval (Min)	Total Depth of Hole (Inches)	Initial Water Level (Inches)	Final water Level (Inches)	Δ in Water Level (Inches)	Rate (minutes per Inch)	Comments
	7:00		120	22 1/2				
	7:30	30			21	1 1/2		
	7:30		120	21				
	8:00	30			19 1/2	1 1/2		
1	8:00		120	19 1/2				
	8:30	30			17 3/4	1 3/4		
2	8:30		120	17 3/4				
	9:00	30			16	1 3/4		
3	9:00		120	16				
	9:30	30			14 1/4	1 3/4		
4	9:30		120	14 1/4				
	10:00	30			12 3/4	1 1/2		
5	10:00		120	12 3/4				
	10:30	30			11 1/4	1 1/2		
6	10:30		120	11 1/4				
	11:00	30			9 3/4	1 1/2		
7	11:00		120	9 3/4				
	11:30	30			8 1/4	1 1/2		
8	11:30		120	8 1/4				
	12:00	30			7	1 1/4		

PERCOLATION DATA SHEET

Project: _____ Job No.: 3346-CR

Test Hole No.: I-2 Tested By: C.D Date: 10/14/2022

Depth of Hole As Drilled: 120" Before Test: 120" After Test: 120"

Reading No.	Time	Time Interval (Min)	Total Depth of Hole (Inches)	Initial Water Level (Inches)	Final water Level (Inches)	Δ in Water Level (Inches)	Rate (minutes per Inch)	Comments
9	12:00 12:30	30	120	7	5 3/4	1 1/4		
10	12:30 1:00	30	120	5 3/4	4 1/2	1 1/4		
11	1:00 1:30	30	120	4 1/2	3 1/4	1 1/4		
12	1:30 2:00	30	120	3 1/4	2	1 1/4		

PERCOLATION DATA SHEET

TTLC Management, Inc an AZ Corporation

Project: 333 Garrison Street, Oceanside Job No.: 3346-CR

Test Hole No.: I-3 Tested By: C.D. Date: 10/14/2022

Depth of Hole As Drilled: 120" Before Test: 120" After Test: 120"

Reading No.	Time	Time Interval (Min)	Total Depth of Hole (Inches)	Initial Water Level (Inches)	Final water Level (Inches)	Δ in Water Level (Inches)	Rate (minutes per Inch)	Comments
	7:09 / 7:39	30	120	21 1/2	21	1/2		
	7:39 / 8:09	30	120	21	20 3/4	1/4		
1	8:09 / 8:39	30	120	20 3/4	20 1/2	1/4		
2	8:39 / 9:09	30	120	20 1/2	20	1/2		
3	9:09 / 9:39	30	120	20	19 1/2	1/2		
4	9:39 / 10:09	30	120	19 1/2	19	1/2		
5	10:09 / 10:39	30	120	19	18 1/2	1/2		
6	10:39 / 11:09	30	120	18 1/2	18 1/4	1/4		
7	11:09 / 11:39	30	120	18 1/4	18	1/4		
8	11:39 / 12:09	30	120	18	17 1/2	1/2		

PERCOLATION DATA SHEET

TTLC Management, Inc an AZ Corporation

Project: 333 Garrison Street, Oceanside **Job No.:** 3346-CR

Test Hole No.: I-3 **Tested By:** C.D. **Date:** 10/14/2022

Depth of Hole As Drilled: 120" **Before Test:** 120" **After Test:** 120"

Reading No.	Time	Time Interval (Min)	Total Depth of Hole (Inches)	Initial Water Level (Inches)	Final water Level (Inches)	Δ in Water Level (Inches)	Rate (minutes per Inch)	Comments
9	12:09 / 12:39	30	120	17 1/2	17	1/2		
10	12:39 / 1:09	30	120	17	16 1/2	1/2		
11	1:09 / 1:39	30	120	16 1/2	16	1/2		
12	1:39 / 2:09	30	120	16	15 1/2	1/2		

PERCOLATION DATA SHEET

TTLC Management, Inc an AZ Corporation

Project: 333 Garrison Street, Oceanside Job No.: 3346-CR

Test Hole No.: I-4 Tested By: C.D. Date: 10/14/2022

Depth of Hole As Drilled: 120" Before Test: 120" After Test: 120"

Reading No.	Time	Time Interval (Min)	Total Depth of Hole (Inches)	Initial Water Level (Inches)	Final water Level (Inches)	Δ in Water Level (Inches)	Rate (minutes per Inch)	Comments
	7:07		120	21 1/2				
	7:37	30			21 1/4	1/4		
	7:37		120	21 1/4				
	8:07	30			21	1/4		
1	8:07		120	21				
	8:37	30			20 3/4	1/4		
2	8:37		120	20 3/4				
	9:07	30			20 1/2	1/4		
3	9:07		120	20 1/2				
	9:37	30			20 1/4	1/4		
4	9:37		120	20 1/4				
	10:07	30			20	1/4		
5	10:07		120	20				
	10:37	30			19 3/4	1/4		
6	10:37		120	19 3/4				
	11:07	30			19 1/2	1/4		
7	11:07		120	19 1/2				
	11:37	30			19 1/4	1/4		
8	11:37		120	19 1/4				
	12:07	30			19	1/4		

PERCOLATION DATA SHEET

TTLC Management, Inc an A2 Corporation

Project: 333 Garrison Street, Oceanside Job No.: 3346-CR

Test Hole No.: I-4 Tested By: C.D Date: 10/14/2022

Depth of Hole As Drilled: 120" Before Test: 120" After Test: 120"

Reading No.	Time	Time Interval (Min)	Total Depth of Hole (Inches)	Initial Water Level (Inches)	Final water Level (Inches)	Δ in Water Level (Inches)	Rate (minutes per Inch)	Comments
9	12:07 12:37	30	120	19	18 3/4	1/4		
10	12:37 1:07	30	120	18 3/4	18 1/2	1/4		
11	1:07 1:37	30	120	18 1/2	18 1/4	1/4		
12	1:37 2:07	30	120	18 1/4	18	1/4		

APPENDIX D

GENERAL GRADING GUIDELINES

Proposed Garrison School Site Residential Development

333 Garrison Street

Oceanside, San Diego County, California

Project No. 3346-CR

GEOTEK

GENERAL GRADING GUIDELINES

Guidelines presented herein are intended to address general construction procedures for earthwork construction. Specific situations and conditions often arise which cannot reasonably be discussed in general guidelines, when anticipated these are discussed in the text of the report. Often unanticipated conditions are encountered which may necessitate modification or changes to these guidelines. It is our hope that these will assist the contractor to more efficiently complete the project by providing a reasonable understanding of the procedures that would be expected during earthwork and the testing and observation used to evaluate those procedures.

General

Grading should be performed to at least the minimum requirements of governing agencies, Chapters 18 and 33 of the Uniform Building Code, CBC (2019) and the guidelines presented below.

Preconstruction Meeting

A preconstruction meeting should be held prior to site earthwork. Any questions the contractor has regarding our recommendations, general site conditions, apparent discrepancies between reported and actual conditions and/or differences in procedures the contractor intends to use should be brought up at that meeting. The contractor (including the main onsite representative) should review our report and these guidelines in advance of the meeting. Any comments the contractor may have regarding these guidelines should be brought up at that meeting.

Grading Observation and Testing

1. Observation of the fill placement should be provided by our representative during grading. Verbal communication during the course of each day will be used to inform the contractor of test results. The contractor should receive a copy of the "Daily Field Report" indicating results of field density tests that day. If our representative does not provide the contractor with these reports, our office should be notified.
2. Testing and observation procedures are, by their nature, specific to the work or area observed and location of the tests taken, variability may occur in other locations. The contractor is responsible for the uniformity of the grading operations; our observations and test results are intended to evaluate the contractor's overall level of efforts during grading. The contractor's personnel are the only individuals participating in all aspect of site work. Compaction testing and observation should not be considered as relieving the contractor's responsibility to properly compact the fill.
3. Cleanouts, processed ground to receive fill, key excavations, and subdrains should be observed by our representative prior to placing any fill. It will be the contractor's responsibility to notify our representative or office when such areas are ready for observation.

4. Density tests may be made on the surface material to receive fill, as considered warranted by this firm.
5. In general, density tests would be made at maximum intervals of two feet of fill height or every 1,000 cubic yards of fill placed. Criteria will vary depending on soil conditions and size of the fill. More frequent testing may be performed. In any case, an adequate number of field density tests should be made to evaluate the required compaction and moisture content is generally being obtained.
6. Laboratory testing to support field test procedures will be performed, as considered warranted, based on conditions encountered (e.g. change of material sources, types, etc.) Every effort will be made to process samples in the laboratory as quickly as possible and in progress construction projects are our first priority. However, laboratory workloads may cause in delays and some soils may require a **minimum of 48 to 72 hours to complete test procedures**. Whenever possible, our representative(s) should be informed in advance of operational changes that might result in different source areas for materials.
7. Procedures for testing of fill slopes are as follows:
    a) Density tests should be taken periodically during grading on the flat surface of the fill, three to five feet horizontally from the face of the slope.
    b) If a method other than over building and cutting back to the compacted core is to be employed, slope compaction testing during construction should include testing the outer six inches to three feet in the slope face to determine if the required compaction is being achieved.
8. Finish grade testing of slopes and pad surfaces should be performed after construction is complete.

Site Clearing

1. All vegetation, and other deleterious materials, should be removed from the site. If material is not immediately removed from the site it should be stockpiled in a designated area(s) well outside of all current work areas and delineated with flagging or other means. Site clearing should be performed in advance of any grading in a specific area.
2. Efforts should be made by the contractor to remove all organic or other deleterious material from the fill, as even the most diligent efforts may result in the incorporation of some materials. This is especially important when grading is occurring near the natural grade. All equipment operators should be aware of these efforts. Laborers may be required as root pickers.
3. Nonorganic debris or concrete may be placed in deeper fill areas provided the procedures used are observed and found acceptable by our representative.

Treatment of Existing Ground

1. Following site clearing, all surficial deposits of alluvium and artificial fill as well as weathered or creep effected bedrock, should be removed unless otherwise specifically indicated in the text of this report.
2. In some cases, removal may be recommended to a specified depth (e.g. flat sites where partial alluvial removals may be sufficient). The contractor should not exceed these depths unless directed otherwise by our representative.
3. Groundwater existing in alluvial areas may make excavation difficult. Deeper removals than indicated in the text of the report may be necessary due to saturation during winter months.
4. Subsequent to removals, the natural ground should be processed to a depth of six inches, moistened to near optimum moisture conditions and compacted to fill standards.
5. Exploratory back hoe or dozer trenches still remaining after site removal should be excavated and filled with compacted fill if they can be located.

Fill Placement

1. Unless otherwise indicated, all site soil and bedrock may be reused for compacted fill; however, some special processing or handling may be required (see text of report).
2. Material used in the compacting process should be evenly spread, moisture conditioned, processed, and compacted in thin lifts six (6) to eight (8) inches in compacted thickness to obtain a uniformly dense layer. The fill should be placed and compacted on a nearly horizontal plane, unless otherwise found acceptable by our representative.
3. If the moisture content or relative density varies from that recommended by this firm, the contractor should rework the fill until it is in accordance with the following:
    a) Moisture content of the fill should be at or above optimum moisture. Moisture should be evenly distributed without wet and dry pockets. Pre-watering of cut or removal areas should be considered in addition to watering during fill placement, particularly in clay or dry surficial soils. The ability of the contractor to obtain the proper moisture content will control production rates.
    b) Each six-inch layer should be compacted to at least 90 percent of the maximum dry density in compliance with the testing method specified by the controlling governmental agency. In most cases, the testing method is ASTM Test Designation D 1557.
4. Rock fragments less than eight inches in diameter may be utilized in the fill, provided:
    a) They are not placed in concentrated pockets;
    b) There is a sufficient percentage of fine-grained material to surround the rocks;
    c) The distribution of the rocks is observed by, and acceptable to, our representative.

5. Rocks exceeding eight (8) inches in diameter should be taken off site, broken into smaller fragments, or placed in accordance with recommendations of this firm in areas designated suitable for rock disposal. On projects where significant large quantities of oversized materials are anticipated, alternate guidelines for placement may be included. If significant oversize materials are encountered during construction, these guidelines should be requested.
6. In clay soil, dry or large chunks or blocks are common. If in excess of eight (8) inches minimum dimension, then they are considered as oversized. Sheepsfoot compactors or other suitable methods should be used to break up blocks. When dry, they should be moisture conditioned to provide a uniform condition with the surrounding fill.

Slope Construction

1. The contractor should obtain a minimum relative compaction of 90 percent out to the finished slope face of fill slopes. This may be achieved by either overbuilding the slope and cutting back to the compacted core, or by direct compaction of the slope face with suitable equipment.
2. Slopes trimmed to the compacted core should be overbuilt by at least three (3) feet with compaction efforts out to the edge of the false slope. Failure to properly compact the outer edge results in trimming not exposing the compacted core and additional compaction after trimming may be necessary.
3. If fill slopes are built "at grade" using direct compaction methods, then the slope construction should be performed so that a constant gradient is maintained throughout construction. Soil should not be "spilled" over the slope face nor should slopes be "pushed out" to obtain grades. Compaction equipment should compact each lift along the immediate top of slope. Slopes should be back rolled or otherwise compacted at approximately every 4 feet vertically as the slope is built.
4. Corners and bends in slopes should have special attention during construction as these are the most difficult areas to obtain proper compaction.
5. Cut slopes should be cut to the finished surface. Excessive undercutting and smoothing of the face with fill may necessitate stabilization.

UTILITY TRENCH CONSTRUCTION AND BACKFILL

Utility trench excavation and backfill is the contractors responsibility. The geotechnical consultant typically provides periodic observation and testing of these operations. While efforts are made to make sufficient observations and tests to verify that the contractors' methods and procedures are adequate to achieve proper compaction, it is typically impractical to observe all backfill procedures. As such, it is critical that the contractor use consistent backfill procedures.

Compaction methods vary for trench compaction and experience indicates many methods can be successful. However, procedures that "worked" on previous projects may or may not prove effective on a given site. The contractor(s) should outline the procedures proposed, so that we may discuss them **prior** to construction. We will offer comments based on our knowledge of site conditions and experience.

1. Utility trench backfill in slopes, structural areas, in streets and beneath flat work or hardscape should be brought to at least optimum moisture and compacted to at least 90 percent of the laboratory standard. Soil should be moisture conditioned prior to placing in the trench.
2. Flooding and jetting are not typically recommended or acceptable for native soils. Flooding or jetting may be used with select sand having a Sand Equivalent (SE) of 30 or higher. This is typically limited to the following uses:
   a) shallow (12 + inches) under slab interior trenches and,
   b) as bedding in pipe zone.

   The water should be allowed to dissipate prior to pouring slabs or completing trench compaction.
3. Care should be taken not to place soils at high moisture content within the upper three feet of the trench backfill in street areas, as overly wet soils may impact subgrade preparation. Moisture may be reduced to 2% below optimum moisture in areas to be paved within the upper three feet below sub grade.
4. Sand backfill should not be allowed in exterior trenches adjacent to and within an area extending below a 1:1 projection from the outside bottom edge of a footing, unless it is similar to the surrounding soil.
5. Trench compaction testing is generally at the discretion of the geotechnical consultant. Testing frequency will be based on trench depth and the contractors procedures. A probing rod would be used to assess the consistency of compaction between tested areas and untested areas. If zones are found that are considered less compact than other areas, this would be brought to the contractors attention.

JOB SAFETY

General

Personnel safety is a primary concern on all job sites. The following summaries are safety considerations for use by all our employees on multi-employer construction sites. On ground personnel are at highest risk of injury and possible fatality on grading construction projects. The company recognizes that construction activities will vary on each site and that job site safety is the contractor's responsibility. However, it is, imperative that all personnel be safety conscious to avoid accidents and potential injury.

In an effort to minimize risks associated with geotechnical testing and observation, the following precautions are to be implemented for the safety of our field personnel on grading and construction projects.

1. Safety Meetings: Our field personnel are directed to attend the contractor's regularly scheduled safety meetings.
2. Safety Vests: Safety vests are provided for and are to be worn by our personnel while on the job site.
3. Safety Flags: Safety flags are provided to our field technicians; one is to be affixed to the vehicle when on site, the other is to be placed atop the spoil pile on all test pits.

In the event that the contractor's representative observes any of our personnel not following the above, we request that it be brought to the attention of our office.

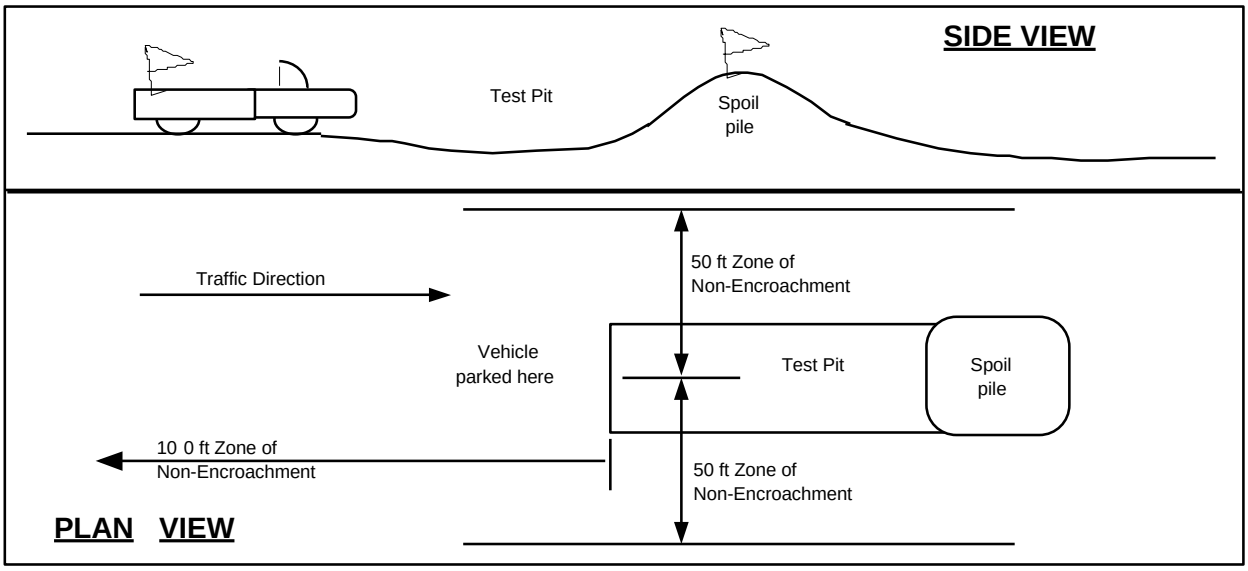
Test Pits Location, Orientation and Clearance

The technician is responsible for selecting test pit locations. The primary concern is the technician's safety. However, it is necessary to take sufficient tests at various locations to obtain a representative sampling of the fill. As such, efforts will be made to coordinate locations with the grading contractors authorized representatives (e.g. dump man, operator, supervisor, grade checker, etc.), and to select locations following or behind the established traffic pattern, preferably outside of current traffic. The contractors authorized representative should direct excavation of the pit and safety during the test period. Again, safety is the paramount concern.

Test pits should be excavated so that the spoil pile is placed away from oncoming traffic. The technician's vehicle is to be placed next to the test pit, opposite the spoil pile. This necessitates that the fill be maintained in a drivable condition. Alternatively, the contractor may opt to park a piece of equipment in front of test pits, particularly in small fill areas or those with limited access.

A zone of non-encroachment should be established for all test pits (see diagram below). No grading equipment should enter this zone during the test procedure. The zone should extend outward to the sides approximately 50 feet from the center of the test pit and 100 feet in the direction of traffic flow. This zone is established both for safety and to avoid excessive ground vibration, which typically decreases test results.

TEST PIT SAFETY PLAN



Slope Tests

When taking slope tests, the technician should park their vehicle directly above or below the test location on the slope. The contractor's representative should effectively keep all equipment at a safe operation distance (e.g. 50 feet) away from the slope during testing.

The technician is directed to withdraw from the active portion of the fill as soon as possible following testing. The technician's vehicle should be parked at the perimeter of the fill in a highly visible location.

Trench Safety

It is the contractor's responsibility to provide safe access into trenches where compaction testing is needed. Trenches for all utilities should be excavated in accordance with CAL-OSHA and any other applicable safety standards. Safe conditions will be required to enable compaction testing of the trench backfill.

All utility trench excavations in excess of 5 feet deep, which a person enters, are to be shored or laid back. Trench access should be provided in accordance with OSHA standards. Our personnel are directed not to enter any trench by being lowered or "riding down" on the equipment.

Our personnel are directed not to enter any excavation which;

1. is 5 feet or deeper unless shored or laid back,
2. exit points or ladders are not provided,
3. displays any evidence of instability, has any loose rock or other debris which could fall into the trench, or

4. displays any other evidence of any unsafe conditions regardless of depth.

If the contractor fails to provide safe access to trenches for compaction testing, our company policy requires that the soil technician withdraws and notifies their supervisor. The contractors representative will then be contacted in an effort to effect a solution. All backfill not tested due to safety concerns or other reasons is subject to reprocessing and/or removal.

Procedures

In the event that the technician's safety is jeopardized or compromised as a result of the contractor's failure to comply with any of the above, the technician is directed to inform both the developer's and contractor's representatives. If the condition is not rectified, the technician is required, by company policy, to immediately withdraw and notify their supervisor. The contractor's representative will then be contacted in an effort to effect a solution. No further testing will be performed until the situation is rectified. Any fill placed in the interim can be considered unacceptable and subject to reprocessing, recompaction or removal.

In the event that the soil technician does not comply with the above or other established safety guidelines, we request that the contractor bring this to technicians attention and notify our project manager or office. Effective communication and coordination between the contractors' representative and the field technician(s) is strongly encouraged in order to implement the above safety program and safety in general.

The safety procedures outlined above should be discussed at the contractor's safety meetings. This will serve to inform and remind equipment operators of these safety procedures particularly the zone of non-encroachment.

The safety procedures outlined above should be discussed at the contractor's safety meetings. This will serve to inform and remind equipment operators of these safety procedures particularly the zone of non-encroachment.

ATTACHMENT 7
Storm Water Quality Assessment Form

This is the cover sheet for Attachment 7.

City of Oceanside – Engineering Division – Clean Water Program

STORM WATER QUALITY ASSESSMENT FOR PLANNING, ENGINEERING, AND BUILDING PERMIT APPLICATIONS

All applications for Planning, Engineering, or Building Division permits are required to complete this assessment form and include it as part of the initial permit application submittal. Staff will review the permit application content to determine the applicability of State and City storm water requirements. Please note a storm water assessment cannot be provided without a complete permit application package.

Section 1 – Project Information	
Applicant Name: The True Life	Phone Number: (925) 331-7006
Project Name: Garrison Elementary School	Project Site Address: 333 Garrison Street, Oceanside, CA 92054
Permit Applications Number(s): GPA24-00002	Assessor Parcel Number(s): 162-020-24-00 & 162-030-14-00
Project Description: The site is proposed to construct a residential development, community open spaces and associated utility/street improvements. 27 multi-family buildings consisting of 138 total units are proposed.	Project Disturbed Area (square feet): 321,618
Existing Impervious Area (square feet): 165,848	Created or Replaced Impervious Area (square feet): 245,981

Section 2 – Identify Applicable Priority Development Project Categories (Check All Boxes that Apply)	
☐	**New Development Project** – A project that creates 10,000 square feet or more of impervious surfaces (collectively over the entire project site). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
☑	**Redevelopment Project** – A project that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the entire project site on an existing site of 10,000 square feet or more of impervious surfaces). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
☐	**Restaurants** – Category is defined as a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC code 5812); where new or redevelopment projects create and/or replace 5,000 square feet or more impervious surface (collectively over the entire project site).
☐	**Hillside Development** – Category includes development on any natural slope that is twenty-five percent or greater; where new or redevelopment projects create and/or replace 5,000 square feet or more impervious surface (collectively over the entire project site).
☐	**Parking Lots** – Category is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce; where new or redevelopment projects create and/or replace 5,000 square feet or more impervious surface (collectively over the entire project site).
☑	**Streets, Roads, Highways, Freeways, and Driveways** – Category is defined as any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles; where new or redevelopment projects that create and/or replace 5,000 square feet or more impervious surface (collectively over the entire project site).
☐	**Water Quality Environmentally Sensitive Area** – New or redevelopment projects that create and/or replace 2,500 square feet or more of impervious surface (collectively over the entire project site), and discharge directly to a Water Quality Environmentally Sensitive Area (WQESA). "Discharge directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the WQESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands).
☐	**Automotive Repair Shop** – Category is defined as a facility that is categorized in any one of the following Standard Industrial Classification (SIC) codes: 5013, 5014, 5541, 7532-7534, or 7536-7539, where new or redevelopment projects create and/or replace 5,000 square feet or more impervious surface (collectively over the entire project site).
☐	**Retail Gasoline Outlet (RGOs)** – Category includes RGOs that meet the following criteria (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day; where new or redevelopment projects create and/or replace 5,000 square feet or more impervious surface (collectively over the entire project site).
☑	**Development Projects greater than one acre** – New or redevelopment projects that result in the disturbance of one or more acres of land and are expected to generate pollutants post construction.

STORM WATER QUALITY ASSESSMENT FOR PLANNING, ENGINEERING, AND BUILDING PERMIT APPLICATIONS

Section 3 – Identify Projects Not Subject to Permanent Stormwater Requirements (Check All Boxes that Apply)	
☐	The project consists of work entirely within an existing structure.
☐	The project consists of construction of overhead or underground utilities (no new impervious surfaces).
☐	The project consists of routine maintenance.
☐	The project consists of less than 50 yards of grading and presents no opportunities to improve water quality.
Section 4 – Project Category Determination	
☑	**Priority Development Project**: If any item in Section 2 is applicable, the project is a Priority Development Project. **Please prepare a PDP SWQMP for the project.**
☐	**Standard Development Project**: If none of the items in Section 2 or 3 are applicable, the project is a Standard Development Project. **Please prepare an SDP SWQMP.**
☐	**Project Not Subject to Permanent Stormwater Requirements:** If any item in Section 3 is applicable, the project is not subject to Permanent Stormwater Requirements. **Please submit the project plans with this form.** **Note:** Projects in this category are subject to typical pollution prevention measures outlined by the pollution prevention checklist on the following page.

Section 5 – Applicant Certification	
Name of Responsible Party: Michael Torres	Title: Director of Aquisition & Development
Email Address (optional)	Phone Number: 949-474-0440
I understand and acknowledge the City of Oceanside has adopted minimum requirements, as mandated by the San Diego Regional Water Quality Control Board – Order No. R9-2013-0001, as amended by Order Nos. R9-2015-0001 and R9-2015-0100 (NPDES NO. CAS0109266) for mitigating impacts associated with urban runoff, including storm water from construction and land development activities. I certify this assessment has been accurately completed to the best of my knowledge and is consistent with the proposed project. I acknowledge that non-compliance with the City Best Management Practice (BMP) Design Manual, Grading Ordinance, and Erosion Control Ordinance may result in enforcement action by the City, the California State Water Resources Control Board, and/or the San Diego Regional Water Quality Control Board. Enforcement action may include stop work orders, notice of violation, fines, or other actions.	
Applicant Signature: *Michael Torres*	Date: 04.14.2025

Stormwater Pollution Prevention Measures for Projects Not Subject to Permanent Stormwater Requirements

Project Activity	Yes	No	Required Pollution Prevention
Trash & Waste Generation *****REQUIRED FOR ALL PROJECTS*****	☑	☐	• Train/inform all employees of pollution prevention requirements • Collect and contain all construction trash, waste, and debris • Promptly contain and clean any spill on site • Routinely inspect site, remove loose trash and prevent spills • Properly dispose of any hazardous materials • Do not wash down surfaces unless water is collected or directed to landscape • Permanent trash collection areas require full structure/enclosure
Digging of Dirt – excavation, trenching, or grading	☑	☐	• Do not allow dirt to migrate into street, sidewalk, or storm drain • Preserve existing vegetation where feasible • Perimeter site controls such as silt fence or straw wattles • Cover exposed dirt using mulch, tarps, or erosion control devices • Install and secure tarps over dirt piles • Routinely sweep site to remove dirt
Landscaping and Irrigation Systems	☑	☐	• Do not store landscape materials in street • Do not allow dirt to migrate into street, sidewalk, or storm drain • Test irrigation system and prevent runoff/overspray • Install and secure tarps over piles of mulch or soil • Routinely sweep site to remove mulch or soil • Do not wash down surfaces unless water is collected or directed to landscape
Concrete, Paint, Mortar, or Stucco Work	☑	☐	• Contain wet mixing areas within confined area • Do not allow material to travel into site soil, street, or storm drain • Properly dispose of waste material
Temporary Storage of Materials Outside	☑	☐	• Elevate material off ground where possible, such as on pallets • Install and secure tarps over materials
Demolition of Structures	☑	☐	• Follow Required Pollution Prevention for “Digging of Dirt”
New Structure – house addition, shed, etc.	☑	☐	• Follow Required Pollution Prevention for “Digging of Dirt” • Direct downspouts to landscape, where feasible • Consider rainwater harvesting • Preserve existing vegetation and drainage patterns, where feasible
Patio, Driveway, or Sidewalk	☑	☐	• Consider use of pervious pavers or pervious concrete (refer to Section 3 of page 4 for routine maintenance information) • Direct runoff to landscape areas, where feasible
Re-Roofing	☐	☑	• Contain removed roof debris in waste containers • Follow Required Pollution Prevention for “Temporary Storage of Materials Outside”
Washing of Material, Equipment, or Surface	☐	☑	• Do not wash down surfaces unless water is collected or directed to landscape
Draining of Water Heater, Pool, or Spa	☐	☑	• Direct drain water to landscape areas where possible • Contact Stormwater Division if considering draining to sanitary system cleanout or storm drain system (760-643-2804)
Storm Drain at Industrial or Commercial Property	☐	☑	• Install “No Dumping” or similar signage at each storm drain inlet

Completion Guidance

Please note – the Applicant is required to complete and submit this form as part of the project application. For definitions and additional information, please refer to the City of Oceanside BMP Design Manual. For assistance, please contact Development Services Staff at (760) 435-4373.

Section 1 – Project Information

1. Applicant Name – provide name of Individual completing form, i.e. Owner or Owner Representative
2. Phone Number – provide phone number of Individual completing form, i.e. Owner or Owner Representative
3. Project Name – provide project name (consistent with project application)
4. Project Site Address – provide a physical address for the proposed project, or nearest cross street
5. Permit Application Number(s) – provide all applicable permit application numbers
6. Assessor Parcel Number(s) – provide Assessor Parcel Number(s); refer to title documents or contact City Staff for assistance
7. Project Description – provide a brief project description (e.g. single-family dwelling, retail business, repair shop, etc)
8. Project Disturbed Area – provide the disturbed area for the entire project, including onsite and offsite work
9. Existing Impervious Area – provide the total existing impervious area within the property and project boundary
10. Created or Replaced Impervious Area – provide the total area of all newly created or replaced impervious surfaces within the project area

Section 2 – Identify Applicable Priority Development Project Categories

1. Review each category and check the appropriate boxes that apply to your project.
2. General identification of Automotive Repair Shop SIC (Standard Industrial Classifications) as follows:
   5013 – Motor vehicle supplies and new parts, 5014 – Tires and tubes, 5541 – Gasoline service stations, 7532 – Top and body repair, and paint shops, 7533 – Auto exhaust system repair shops, 7534 – Tire retreading and repair shops, 7536 – Automotive glass replacement shops, 7537 – Automotive transmission repair shops, 7538 – General automotive repair shops, 7539 – Automotive repair shops-not elsewhere classified
3. Contact Staff for assistance in determining applicability of the Water Quality Environmentally Sensitive Area (WQESA) category

Section 3 – Identify Projects Not Subject to Permanent Stormwater Requirements

1. Please refer to Page 1-6 of the City of Oceanside BMP Design Manual for a complete list of routine maintenance activities.
2. Activities that expose native subgrade in the process of replacing impervious surfaces, are not considered routine maintenance.

Section 4 – Project Category Determination

1. PDP SWQMP – Priority Development Project Stormwater Quality Management Plan
2. SDP SWQMP – Standard Development Project Stormwater Quality Management Plan
3. Contact Staff for assistance in determining the Project Category

Section 5 – Applicant Certification

1. Name of Responsible Party – provide name of Owner
2. Title of Responsible Party – provide responsible party's title, if applicable
3. Phone Number – provide phone number of Owner
4. Email Address (Optional) – provide email address
5. Applicant Signature – provide signature of Individual completing form, i.e. Owner or Owner Representative
6. Date – provide date current date

[Insert other supporting documentation here]