Appendix G:
Hydrology and Water Quality Supporting Information

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G.1 - Hydrology and Hydraulics Calculations

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By Contra Costa County
Department of Conservation and Development
CDRZ21-03258, CDDP21-3001

Preliminary Hydrology and Hydraulics Calculations for Oak Road Townhouse Condominiums

Contra Costa County, California

March 22, 2021

Prepared By:

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ENGINEERS ▪ PLANNERS ▪ SURVEYORS
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Table of Contents

I. Project Description 1

II. Existing Condition 1

III. Design Criteria 2

IV. Calculations and Analysis 2

V. Results 3

Exhibits

- Exhibit A – Existing Drainage Area Map
- Exhibit B – Existing Conditions Plan
- Exhibit C – Drainage Area Map

Appendices

- Appendix A – Record Drawing
- Appendix B – Contra Costa County Flood Control District Mean Seasonal Isohyets
  - Contra Costa County Flood Control District Standard Runoff Coefficients
  - Contra Costa County Flood Control District Intensity –Duration-Feasibility Curves
- Appendix C – Hydraflow Storm Sewers Tabulation
- Appendix D – Hydrograph Calculations
- Appendix E – Contra Costa Hydrology Model Project Report

I. Project Description

The project site is approximately 5.9 +/- acres and is located at the southwest corner of and between Oak Road and Jones Road in Contra Costa County within the City of Walnut Creek Sphere of Influence. The proposed project is a residential development and consists of approximately 125 condominium units in 19 3-story buildings with common area walkways, open space, on-site private streets and roadways and parking. Access to the project site will be from Jones Road and Oak Road, which is within the City of Walnut Creek right of way. The City/County boundary coincides with the project site easterly property line at approximately the back of existing sidewalk along Oak Road.

II. Existing Condition

The project site is the former Palmer School site, which consists of several existing classrooms, dormitory, library, administration and maintenance, athletics buildings, an outdoor swimming pool, paved sports fields, concrete walkways, AC paved roadways, and open area ballfields. The project site is generally flat with a gentle slope of approximately 5% in the northeasterly direction towards Oak Road, northwesterly towards Jones Road and with a localized portion of the site at the southwesterly portion of the site drains towards Jones Road as well. Currently, the on-site drainage and storm runoff generally sheet flows across the site or captured by on-site small drainage inlets connected by underground storm drain pipes and discharged into the existing storm drain facilities in Jones Road or Oak Road. Based on field observation and record drawings, it appears majority of the existing on-site drainage is discharged or conveyed via underground storm drains to the existing 30" storm drains in Oak Road. An existing Drainage Area Map, Exhibit A, showing the existing drainage pattern and boundary is included for reference.

The project site is within the Contra Costa County Flood Control Drainage Area 44B as shown on the "Drainage Area 44B Working As-built Drawing" attached in Appendix A for reference. According to the attached Drainage Area 44B drawing, the project is tributary to the existing 30" storm drain, "Line D – 1," in Oak Road and the existing 72" storm drain, "Line C," in Jones Road. These existing storm drains eventually converge at the intersection of Jones Road and Oak Road and discharge into an existing 84" storm drain, "Line A," which continues flowing east along Jones Road and turns north along the Railroad right of way and continues flows in a northerly direction. Attached is the "Existing Condition Plan," Exhibit B, showing the existing drainage system in Oak Road and Jones Road for reference.

III. Design Criteria

The hydrology calculations to generate the post development flow rate are based on the rational method in accordance with Contra Costa County Flood Control District (CCCFCD) hydrology standards as follows:

- Rational method (Q = CIA), whereas
  - Q = Flow Rate (cfs)
  - C = Runoff Coefficient
  - I = Intensity (in//hr)
  - A = Area (acres)

The parameters and criteria used for the calculations and analysis are in accordance with the requirements as shown on the Contra Costa County Flood Control District Documents and Standards, Hydrology Standards, and the following standards are applied:

- Mean Annual Precipitation is based on the Mean Seasonal Isohyet Map with GIS Feature Overlay, dated December 1977, attached in Appendix B for reference.

- Runoff Coefficient, C value, is based on the CCCFCD Standard Runoff Coefficient Table attached in Appendix B.

- Rainfall Intensity, I value, is based on CCCFCD Intensity-Duration-Frequency Curves attached in Appendix B for reference.

- A freeboard requirement of 1.25' from finished top of curb elevations is assumed for this calculation.

IV. Calculations and Analysis

Based on the Design Criteria from the Contra Costa County Flood Control District per Item III above, hydrology and hydraulic calculations were performed using the Hydraflow Storm Sewer Software Program by Autodesk Civil 3D to evaluate the hydraulic characteristics and performance of the proposed on-site storm drains. The following parameters are used for this calculation:

- Mean Annual Precipitation = 19 inches

- Runoff Coefficient, C value = 0.75

- Rainfall Intensity, I value (10-year) = 3.03 in./hr. (peak)

- Rainfall Intensity, I value (100-year) = 4.69 in./hr. (peak),

- Starting Hydraulic Grade Line (HGL) (See Note 1 below)

- Initial time of concentration, Tc = 5 minutes

Note 1: The starting HGL is based on the elevation obtained from the record drawings Contra County Flood Control Drainage Area 44B and Tract 6470 Oak Road Villas 1 attached in Appendix A for reference.

Analysis was performed to evaluate the pre and post development impervious surface and potential impact and mitigation needed to mitigate increase in the post development impervious surface areas and the need for on-site storage to meet the no net increase and/or hydromodification requirements.

It appears, based on our calculations, that there is a net increase of the post development impervious surface area:

- Post Development Impervious Area = 155,600 SF
- Pre Development Impervious Area = 195,736 SF

Net Increase = 36,420 SF

Due to the net increase of the post development impervious surface area, hydrograph calculation was performed, using the Hydraflow Software Program by Autodesk Civil 3D to evaluate and determine the storage volumes needed to mitigate peak flow rates for 10 and 100-year storm events such that adequate on-site storage facility is provided.

In addition, the project site is subject to hydromodification in accordance with the Contra Costa County C.3 Technical Guidance requirement to evaluate and determine the storage capacity requirement to meet the hydromodification. The Contra Costa County hydrology model was used to calculate the storage capacity to mitigate the potential increased flow between the 2 to 10-year storms. It is noted that the 6" ponding for the proposed bio-retention is taken into consideration with this calculation to optimize the calculations.

V. Results

The results of the hydraflow and hydromodification calculations are included in the "Storm Sewer Tabulation" table in Appendix C, the hydrograph calculations in Appendix D, and the hydrology model report in Appendix E for reference.

Based on the above calculations the on-site storm drain system has been designed to meet the County's hydraulic requirements and the 1.25' freeboard. Based on the hydrograph and hydromodification calculations, it appears on-site storage facilities of 2,800 cubic feet would be needed to mitigate the potential increase of post development flows and to meet the hydromodification requirements. To meet this requirement, two underground storage vaults are proposed to capture, store,

and release the post development storm flow into the existing off-site storm drainage facilities. These two vaults are placed at the downstream ends of the on-site storm drains at the respective discharge points at Oak Road and Jones Road as shown on the Drainage Area Map, Exhibit C.

Exhibits

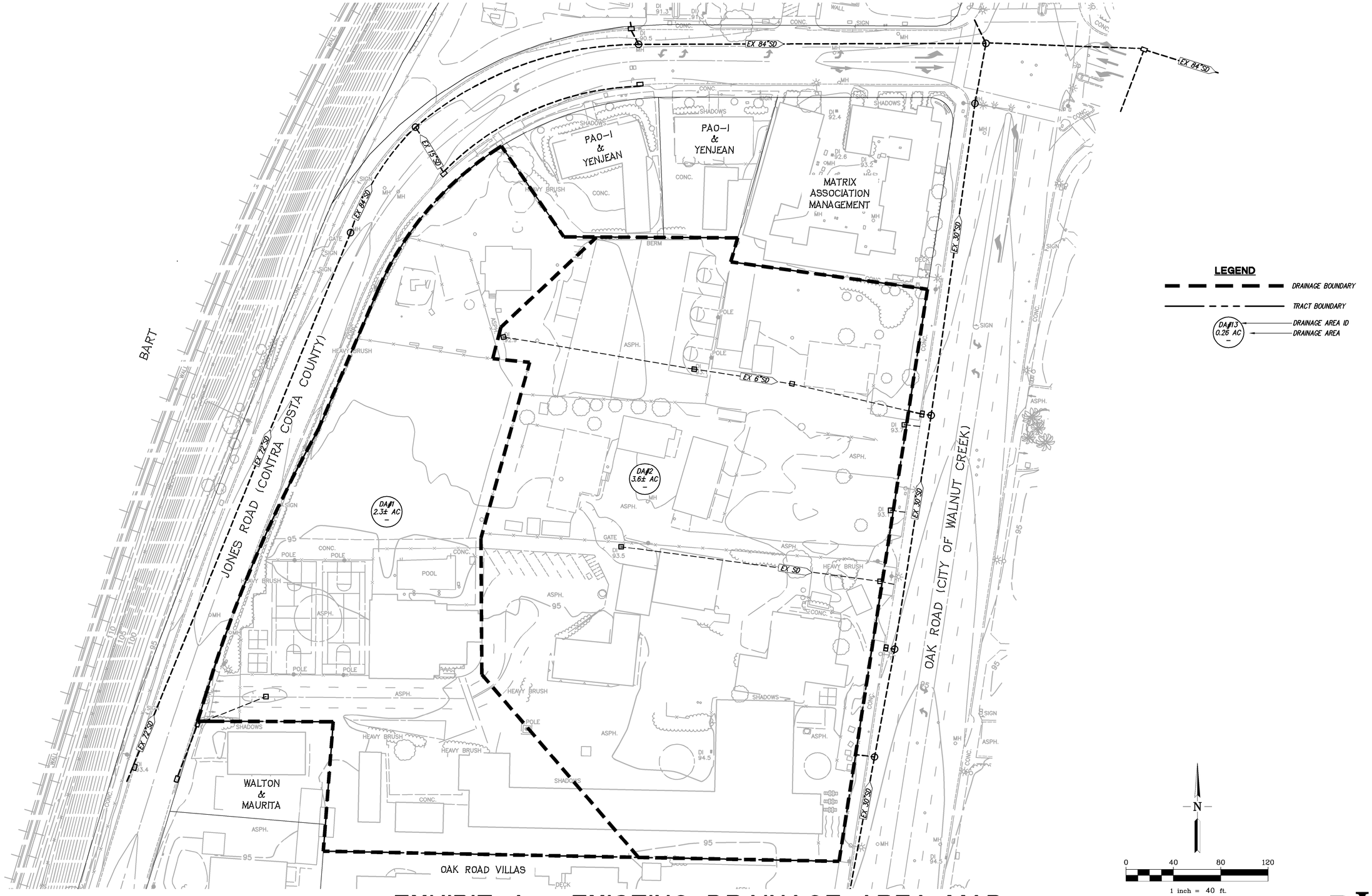


EXHIBIT A - EXISTING DRAINAGE AREA MAP

SUB 9559-OAK ROAD TOWNHOUSE CONDOMINIUMS

CITY OF WALNUT CREEK, CONTRA COSTA COUNTY, CALIFORNIA

FOR: SUMMERHILL HOMES

RJA

RUGGERI-JENSEN-AZAR

ENGINEERS ▪ PLANNERS ▪ SURVEYORS

4690 CHABOT DRIVE, SUITE 200 PLEASANTON, CA 94588

PHONE: (925) 227-9100 FAX: (925) 227-9300

DATE: MARCH 22, 2021 JOB NO. 201069 SHEET 1 OF 1

G:\JOB2020\201069\HYDRO\HYDRO\201069-EXHIBIT A EXISTING DRAINAGE AREA MAP.DWG 3/25/2021 6:16:20 PM WILL BARTALINI

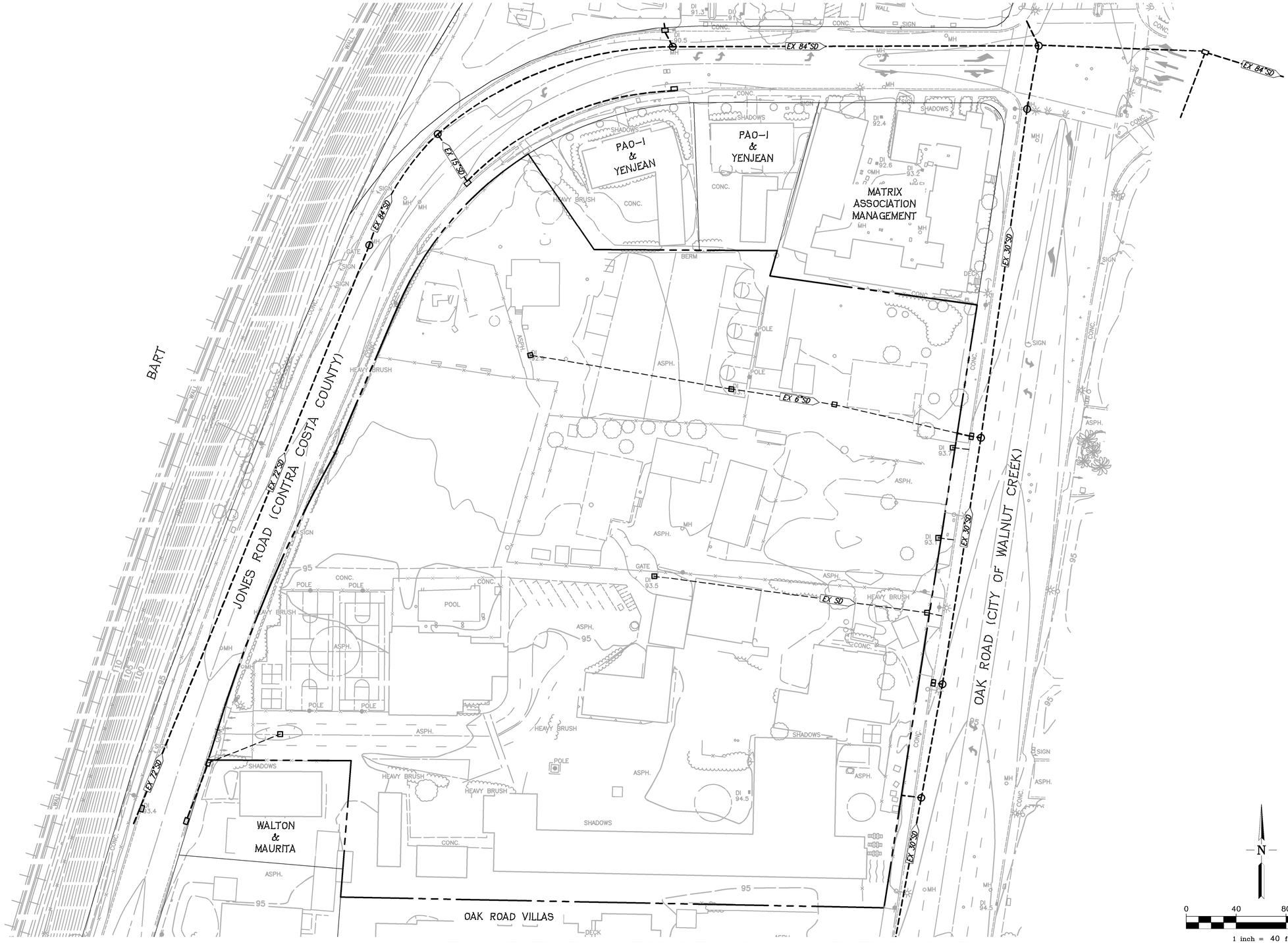


EXHIBIT B - EXISTING CONDITIONS PLAN

SUB 9559-OAK ROAD TOWNHOUSE CONDOMINIUMS

CITY OF WALNUT CREEK, CONTRA COSTA COUNTY, CALIFORNIA

FOR: SUMMERHILL HOMES

RJA

RUGGERI-JENSEN-AZAR

ENGINEERS ▪ PLANNERS ▪ SURVEYORS

4690 CHABOT DRIVE, SUITE 200 PLEASANTON, CA 94588

PHONE: (925) 227-9100 FAX: (925) 227-9300

DATE: MARCH 22, 2021 JOB NO. 201069 SHEET 1 OF 1

G:\JOB2020\201069\HYDRO\HYDRA\201069-EXHIBIT B EXISTING CONDITIONS.DWG 3/25/2021 4:30:31 PM MILL BARTALINI

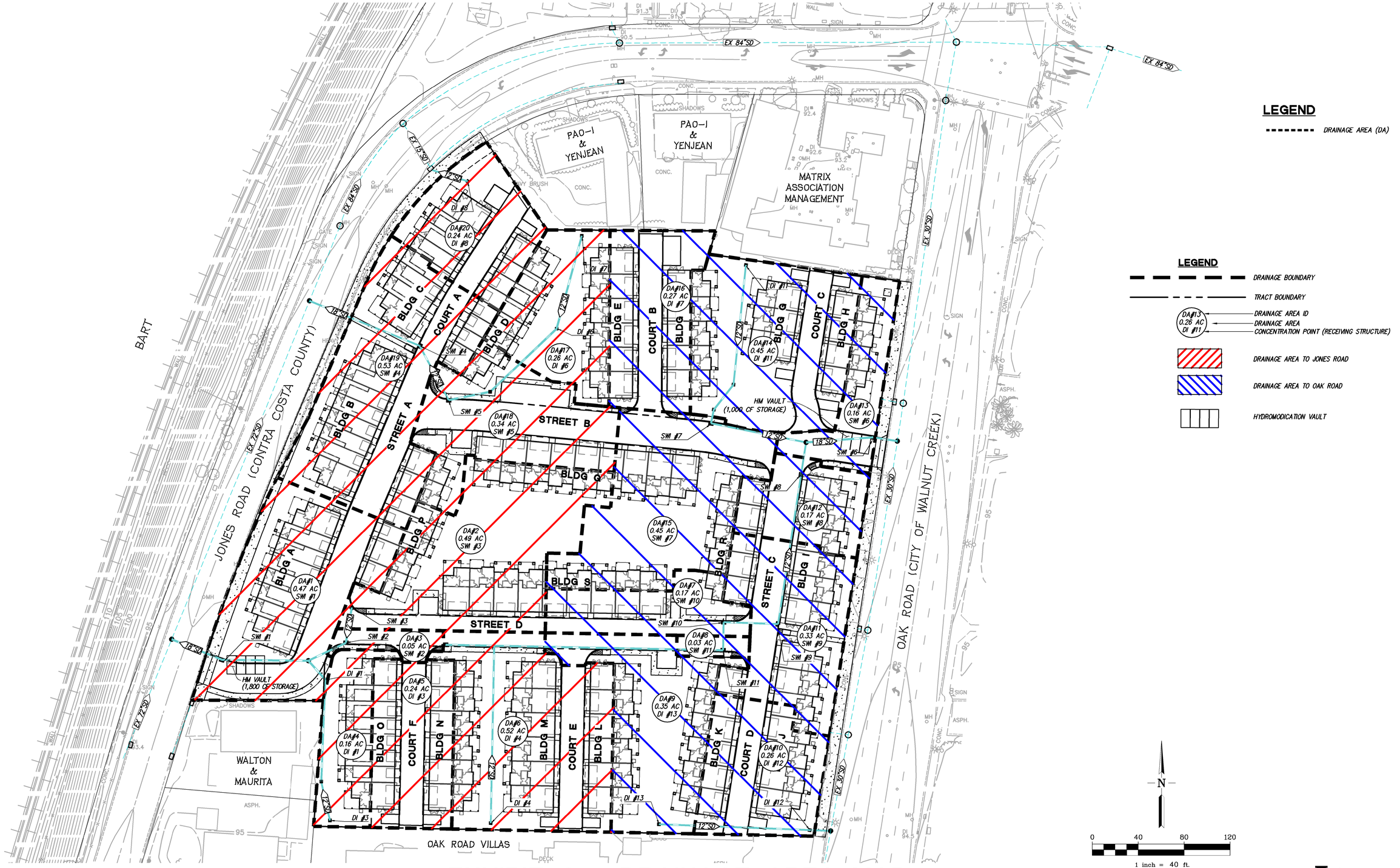


EXHIBIT C - DRAINAGE AREA MAP

SUB 9559-OAK ROAD TOWNHOUSE CONDOMINIUMS

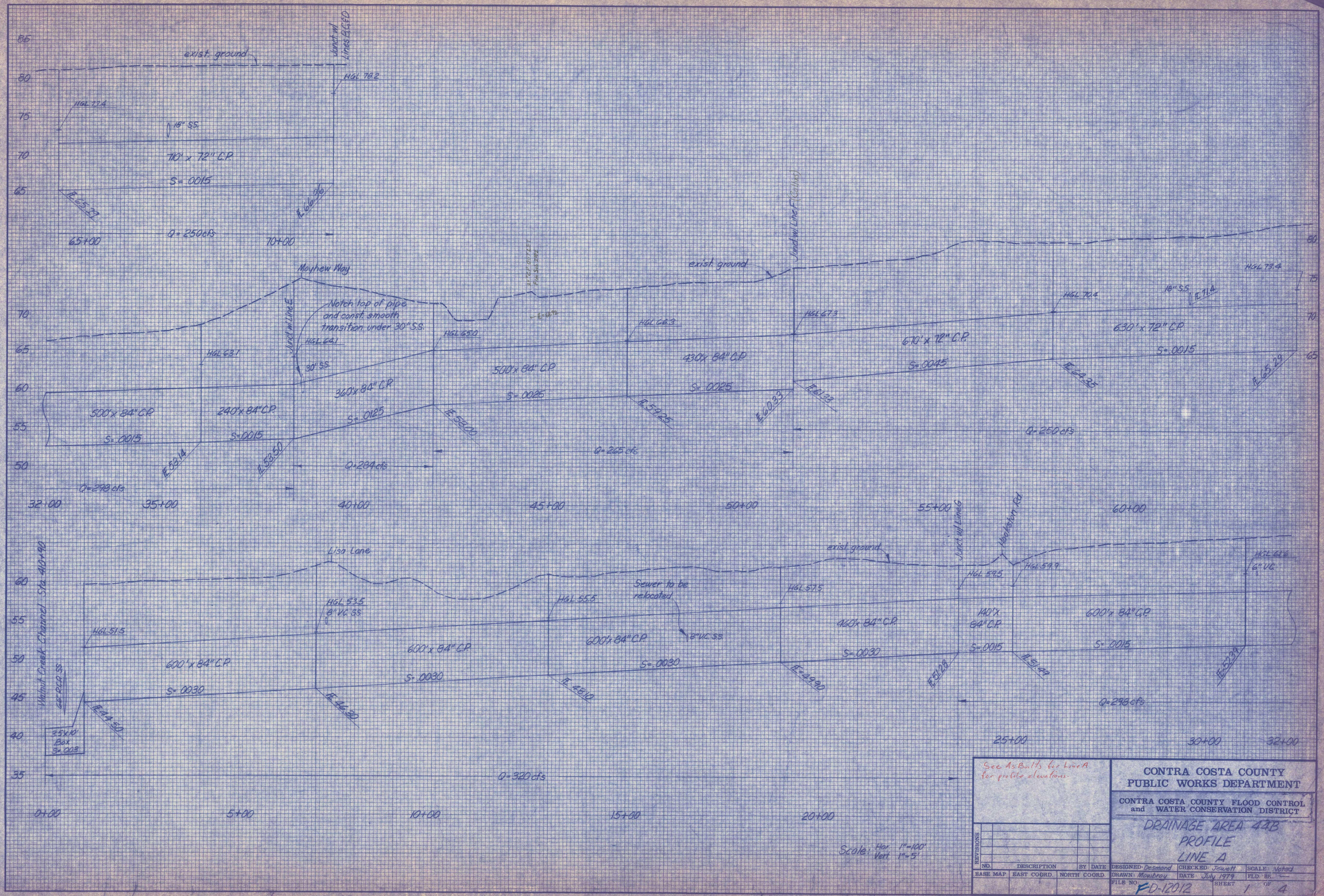
CITY OF WALNUT CREEK, CONTRA COSTA COUNTY, CALIFORNIA
FOR: SUMMERHILL HOMES

RJA
RUGGERI-JENSEN-AZAR
ENGINEERS ▪ PLANNERS ▪ SURVEYORS
4690 CHABOT DRIVE, SUITE 200 PLEASANTON, CA 94588
PHONE: (925) 227-9100 FAX: (925) 227-9300

DATE: MARCH 22, 2021 JOB NO. 201069 SHEET 1 OF 1

G:\JOB2020\201069\HYDRO\HYDRA\201069-EXHIBIT C- DRAINAGE AREA MAP.DWG, 3/25/2021 6:14:02 PM, ESSE MA

Appendix A
Record Drawings



See As Built's for Line A for profile elevations.

REVISIONS			
NO.	DESCRIPTION	BY	DATE

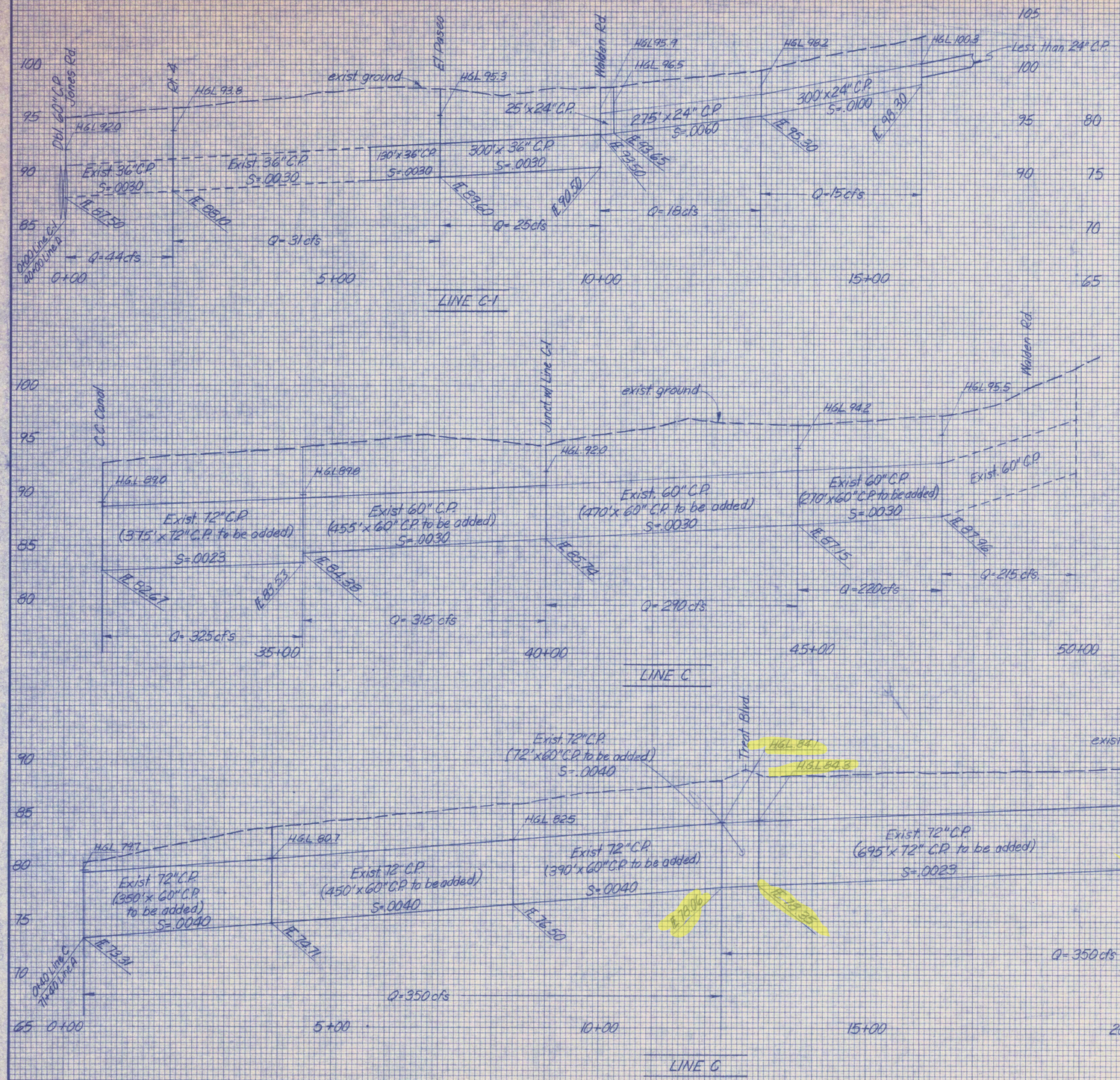
BASE MAP	EAST COORD.	NORTH COORD.

CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT

CONTRA COSTA COUNTY FLOOD CONTROL and WATER CONSERVATION DISTRICT

DRAINAGE AREA 44B
PROFILE
LINE A

DESIGNED: Desmond	CHECKED: Jewett	SCALE: Noted
DRAWN: Mowbray	DATE: July 1979	FLD. BK. —
FILE NO. FD-12012	SHEET 1 OF 4	



Scale: Hor. 1"=100'
Vert 1"=5'

REVISIONS			
NO.	DESCRIPTION	BY	DATE

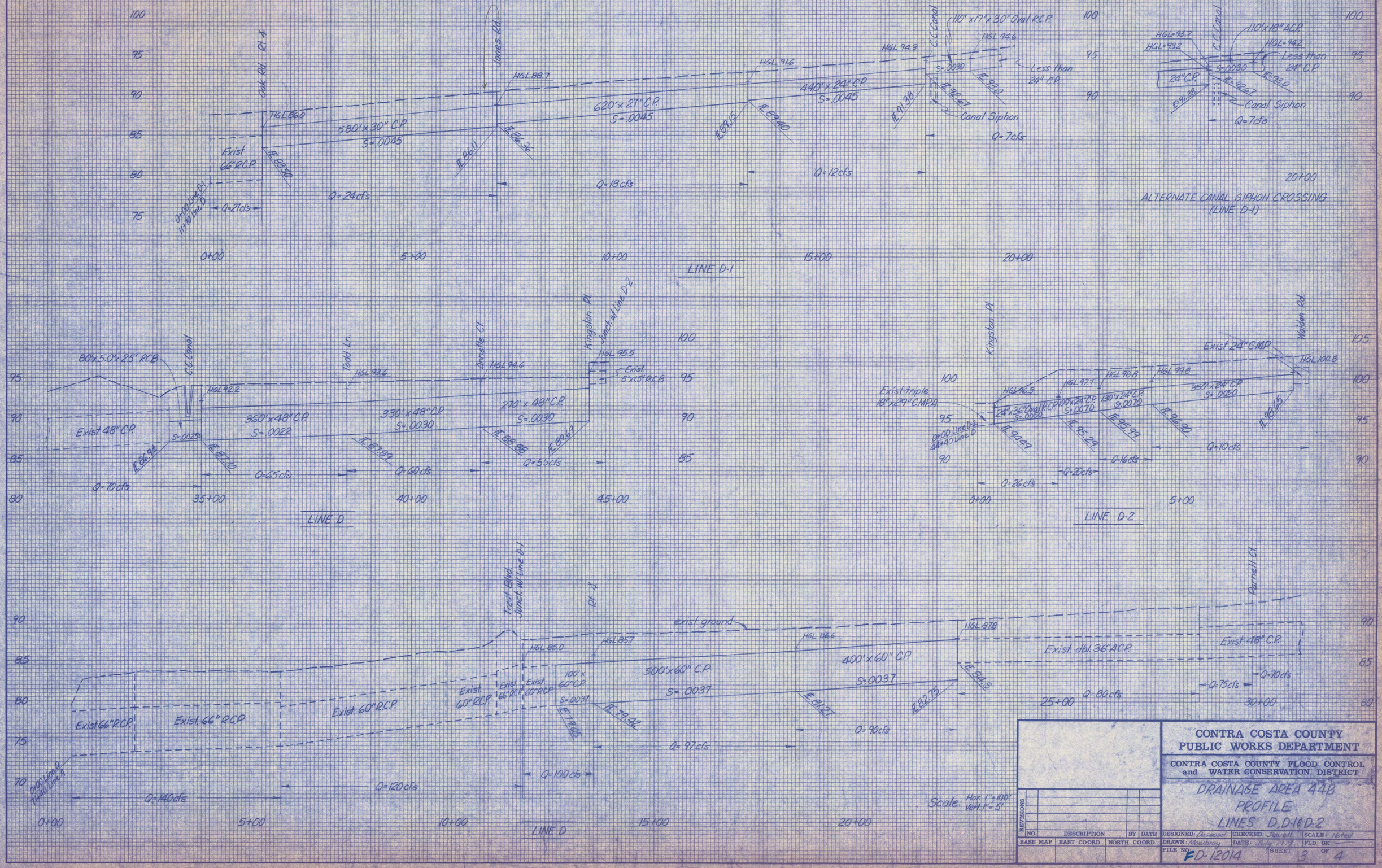
BASE MAP	EAST COORD.	NORTH COORD.

CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT

CONTRA COSTA COUNTY FLOOD CONTROL and WATER CONSERVATION DISTRICT

DRAINAGE AREA 44B
PROFILE
LINES B, C & C-1

DESIGNED: Desmond	CHECKED: Jawett	SCALE: Noted
DRAWN: Mowbray	DATE: July 1974	FLD. BK. —
FILE NO. FD-12013	SHEET 2 OF 4	



Scale: Hor. 1"=100'
Vert. 1"=5'

REVISIONS			
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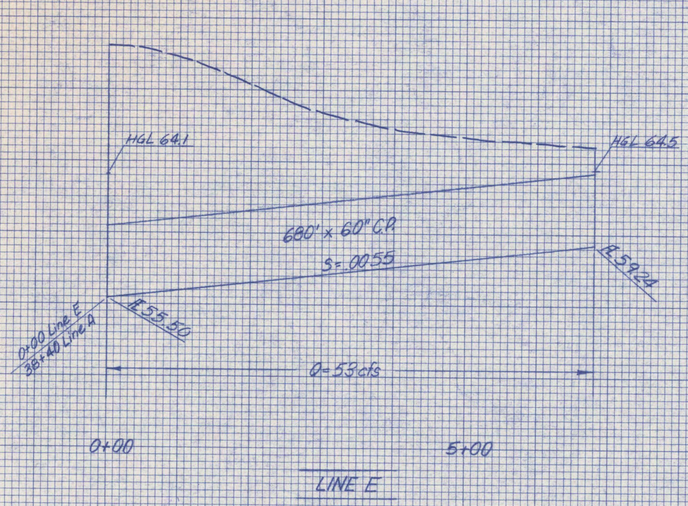
BASE MAP	EAST COORD.	NORTH COORD.

CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT

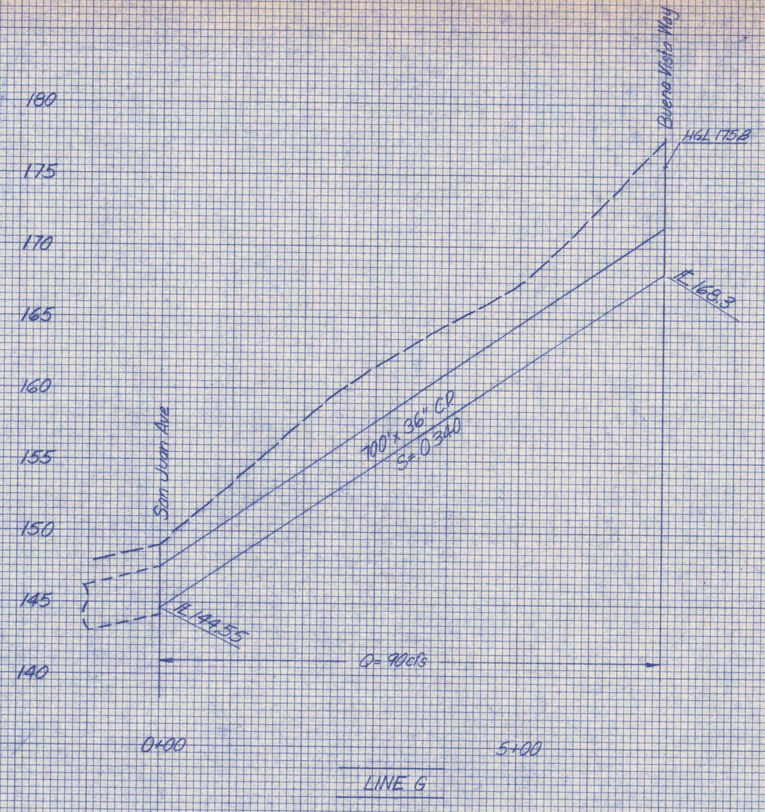
CONTRA COSTA COUNTY FLOOD CONTROL and WATER CONSERVATION DISTRICT

DRAINAGE AREA 44B
PROFILE
LINES D, D-1 & D-2

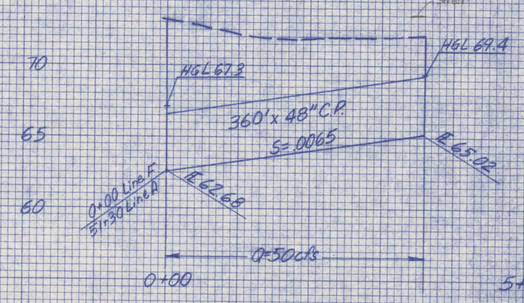
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DRAWN: Mowbray	DATE: July 1977	FLD. BK.	
FILE NO. FD-12014	SHEET 3 OF 4		



LINE E



LINE G



LINE F

* Line F is reduced to 42" C.P. if Q is Reduced to 38 c.f.s. if development to South puts in outside Pipe Upside to in Line A.

Scale: Hor. 1"=100'
Vert. 1"=5'

CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT

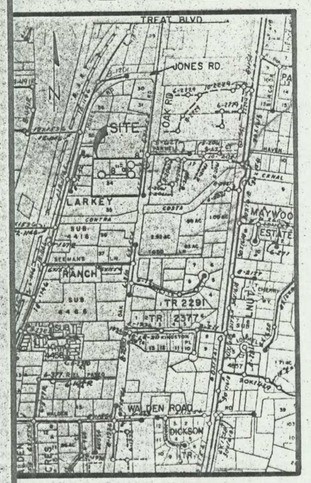
CONTRA COSTA COUNTY FLOOD CONTROL and WATER CONSERVATION DISTRICT

DRAINAGE AREA 44B
PROFILE
LINES E, F & G

REVISIONS			
NO.	DESCRIPTION	BY	DATE

BASE MAP	EAST COORD.	NORTH COORD.	DESIGNED: Desmond	CHECKED: Jewett	SCALE: Noted
			DRAWN: Mowbray	DATE: July 1979	FLD. BK. —
			FILE NO. FD-12015	SHEET 4 OF 4	

OAK ROAD VILLAS I
TRACT 6470



SANITARY SEWER SYSTEM
& VICINITY MAP
1" = 600'

SANITARY SEWER QUANTITIES

STANDARD MANHOLE	4 EA.
8" ABS	150 L.F.
8" DI-52-B	292 L.F.
6" LATERAL	8 EA. (2 TAPS)

STORM DRAIN SCHEDULE

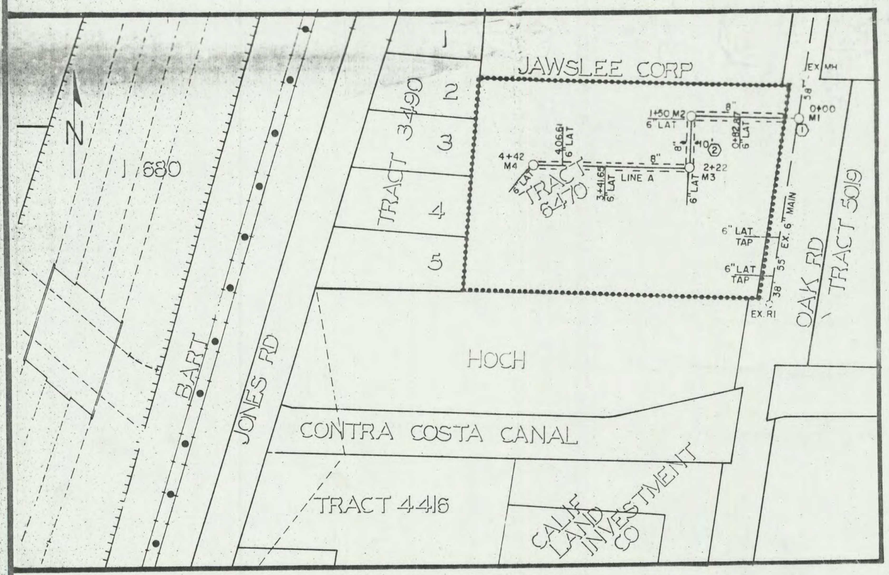
STRUCTURE	TYPE	BASE	SHEET
1	STRUCTURE BY OTHERS		
2	MH	TYPE II	4
3	MH	TYPE II	3
4	A	TYPE II	3
5	U-23	—	2(PLAN), 4(PROFILE)
6	U-23	—	2(PLAN), 4(PROFILE)
7	A	TYPE I	3
8	V-1	—	2

SHEET INDEX

1. TITLE SHEET
2. GRADING & SEWER PLAN
3. OAK ROAD
4. OAK ROAD STORM DRAIN
   ON SITE SEWER & STORM DRAIN PROFILES

LEGEND

- TOP OF CURB GRADE
- P= PAD GRADE
- 98.7 FINISH GRADE
- GAS MAIN
- W WATER MAIN
- SS SANITARY SEWER
- MANHOLE
- RI RODDING INLET
- WM WATER METER
- WV WATER VALVE
- EP EDGE OF PAVEMENT
- JP JOINT POLE
- TRAFFIC SIGN
- CO BUILDING SEWER CLEANOUT
- FIRE HYDRANT
- ELECTROLIER (100 WATT)
- FF= FINISH FLOOR ELEVATION



SANITARY SEWER SYSTEM
1" = 100'
TOTAL ACRES = 2.81

RIGHT OF WAY LOG

PARCEL NO.	NAME	TYPE	DATE
(1)	OAK RD.	PERMIT	
(2)	SUBDIVISION 6470	RESERVE	

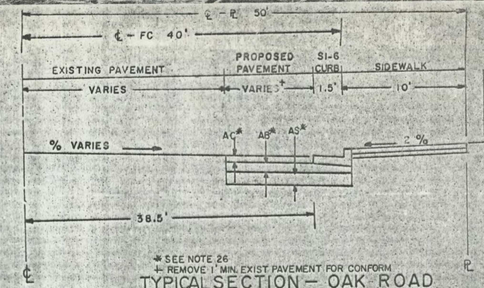
APPROVED: STREET LIGHT LOCATIONS
PACIFIC GAS & ELECTRIC COMPANY

BY: Ben W Green DATE: 7-21-84

GENERAL NOTES

1. OWNER: THE HOFMANN COMPANY, 1380 GALAXY WAY, P.O. BOX [illegible] CALIFORNIA 94522 PHONE 415-682-4830
2. CIVIL ENGINEER: RAYMOND VAIL AND ASSOCIATES 1430 ARROYO WAY, SUITE B, WALNUT CREEK, CALIFORNIA 94596 PHONE: (415) 932-0941 PROJECT MANAGER: LAWRENCE GOSSETT
3. SOILS ENGINEER: ENGEO, INC., 2280 DIAMOND BLVD. SUITE 200 CONCORD, CALIFORNIA 94519 PHONE: (415) 687-9700
4. BENCHMARK: CONTRA COSTA COUNTY BENCHMARK #3686, CHISELED "+" ON BOLT AT BASE OF STEEL POWER POLE AT NORTHEAST CORNER OF INTERSECTION OF TREAT BLVD. AND DEL HOMBRE LANE, 45'± EAST OF SPRR RIGHT-OF-WAY. ELEVATION = 89.518 FEET
5. SHOULD IT APPEAR THAT THE WORK TO BE DONE, OR ANY MATTER RELATIVE THERETO, IS NOT SUFFICIENTLY DETAILED OR EXPLAINED ON THESE PLANS, THE CONTRACTOR SHALL CONTACT RAYMOND VAIL AND ASSOCIATES AT (415) 932-0941 FOR SUCH FURTHER EXPLANATIONS AS MAY BE NECESSARY.
6. THE ENGINEER ASSUMES NO RESPONSIBILITY BEYOND THE ADEQUACY OF HIS DESIGN CONTAINED HEREIN.
7. CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY, THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS, AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE OWNER AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR THE ENGINEER.
8. CONTRACTOR SHALL COMPLY WITH THE RULES AND REGULATIONS OF THE STATE CONSTRUCTION SAFETY ORDERS.
9. CONTRACTOR SHALL POST EMERGENCY TELEPHONE NUMBERS FOR PUBLIC WORKS, AMBULANCE, POLICE AND FIRE DEPARTMENTS.
10. THE CONTRACTOR SHALL PROVIDE ALL LIGHTS, SIGNS, BARRICADES, FLAGMEN, OR OTHER DEVICES NECESSARY TO PROVIDE FOR PUBLIC SAFETY.
11. ENCROACHMENT PERMITS REQUIRED FOR WORK WITHIN EXISTING PUBLIC RIGHTS OF WAY SHALL BE OBTAINED BY THE CONTRACTOR.
12. RAYMOND VAIL AND ASSOCIATES WILL PROVIDE THE CONSTRUCTION STAKES. THE NUMBER AND LOCATION OF STAKES REQUIRED SHALL BE DETERMINED BEFORE THE CONSTRUCTION BEGINS AND SHALL BE AGREED UPON BY RAYMOND VAIL AND ASSOCIATES, THE OWNER AND THE CONTRACTOR. ALL STAKING REQUESTS SHOULD BE DIRECTED TO THE ENGINEER A MINIMUM OF 48 HOURS PRIOR TO ACTUAL NEED. ANY ADDITIONAL STAKING OR RESTAKING WILL ONLY BE DONE AS DIRECTED AND AUTHORIZED BY THE OWNER OR HIS AUTHORIZED AGENT.
13. DIMENSIONS LOCATING CURB AND GUTTER ARE TO FACE OF CURB.
14. ENGINEER ASSUMES NO RESPONSIBILITY FOR FINAL GRADE OF CONCRETE UNLESS FORMS ARE CHECKED PRIOR TO ANY POURING.
15. OBSTRUCTIONS INDICATED ARE FOR INFORMATION ONLY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE LOCATION AND DEPTH WITH THE APPROPRIATE AGENCIES. NEITHER THE OWNER NOR THE ENGINEER ASSUMES RESPONSIBILITY THAT THE OBSTRUCTIONS INDICATED WILL BE THE OBSTRUC[illegible]
16. THE CONTRACTOR SHALL NOTIFY UNDERGROUND SERVICE ALERT (800) 642-2444, 48 HOURS PRIOR TO ANY EXCAVATION.
17. THE CONTRACTOR SHALL EXPOSE AND CHECK INVERTS ON EXISTING SEWERS AND CLEARANCES OF KNOWN CROSSINGS OF OTHER UTILITIES BEFORE CONSTRUCTING NEW PIPELINES.
18. IF ARCHAEOLOGIC MATERIALS ARE UNCOVERED DURING GRADING, TRENCHING OR OTHER EXCAVATION, EARTHWORK WITHIN 100 FEET OF THESE MATERIALS SHALL BE STOPPED UNTIL A PROFESSIONAL ARCHAEOLOGIST WHO IS CERTIFIED BY THE SOCIETY OF CALIFORNIA ARCHAEOLOGY (SCA) AND/OR THE SOCIETY OF PROFESSIONAL ACRHAEOLOGY (SOPA) HAS HAD AN OPPORTUNITY TO EVALUATE THE SIGNIFICANCE OF THE FIND AND SUGGEST APPROPRIATE MITIGATION MEASURES, IF THEY ARE DEEMED NECESSARY.
19. ALL STREET IMPROVEMENTS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE PROVISIONS OF TITLE 9 OF THE CURRENT COUNTY ORDINANCE CODE AND ORDINANCE SPECIFICATIONS, AND WILL BE SUBJECT TO THE INSPECTION AND APPROVAL OF THE PUBLIC WORKS DEPARTMENT. CONTACT PUBLIC WORKS CONSTRUCTION INSPECTION DIVISION AT 372-4480 AT LEAST 48 HOURS PRIOR TO THE START OF ANY WORK TO ARRANGE FOR INSPECTION.
20. ALL REVISIONS TO THIS PLAN MUST BE APPROVED BY THE PUBLIC WORKS DEPARTMENT PRIOR TO CONSTRUCTION AND SHALL BE ACCURATELY SHOWN ON REVISED PLANS STAMPED AND DISTRIBUTED BY THE LAND DEVELOPMENT DIVISION PRIOR TO ACCEPTANCE OF THE WORK AS COMPLETE.
21. ALL NEW UTILITY DISTRIBUTION SERVICES SHALL BE PLACED UNDERGROUND.

REVIEWED
ONLY FOR COMPLIANCE WITH TITLE 9 OF THE COUNTY ORDINANCE CODE
AUG 01 1984
FILE COPY SIGNED BY CARLO P. BORLANGELLI RCE 17348 PUBLIC WORKS DEPARTMENT CONTRA COSTA COUNTY



* SEE NOTE 26
+ REMOVE 1' MIN. EXIST PAVEMENT FOR CONFORM

TYPICAL SECTION - OAK ROAD
(NO SCALE)
LOOKING DOWN STATION

22. ALL UNDERGROUND FACILITIES SHALL BE INSTALLED PRIOR TO THE CONSTRUCTION OF CURBS, FINAL PREPARATION OF SUBGRADE AND PLACEMENT OF BASE MATERIAL, CURBS AND GUTTERS TO BE COMPLETED PRIOR TO PLACEMENT OF BASE ROCK.
23. PRIOR TO PLACING SUBBASE OR BASE MATERIAL, THE PUBLIC WORKS DEPARTMENT CONSTRUCTION DIVISION SHALL BE NOTIFIED BY THE OWNER, OR ACCEPTING AGENCY, OF EACH UTILITY INSTALLATION BENEATH THE AREA TO BE PAVED, THAT THE INSTALLATION HAS SATISFACTORILY PASSED FINAL ACCEPTANCE TESTS.
24. IF PAVING AND STORM DRAIN IMPROVEMENTS ARE NOT COMPLETED BY OCTOBER 15, TEMPORARY SILT AND DRAINAGE CONTROL FACILITIES SHALL BE INSTALLED TO CONTROL AND CONTAIN EROSION CAUSED SILT DEPOSITS AND TO PROVIDE FOR THE SAFE DISCHARGE OF STORM WATERS INTO EXISTING STORM WATER FACILITIES. DESIGN OF THESE FACILITIES MUST BE APPROVED BY THE BUILDING INSPECTION DEPARTMENT.
25. ELEVATIONS SHOWN ON CURB LINES ARE AT TOP OF CURB UNLESS OTHERWISE NOTED.
26. THE THICKNESS OF SUBBASE, BASE AND SURFACING TO BE DETERMINED BY THE COUNTY PUBLIC WORKS DEPARTMENT BASED ON TRAFFIC INDEX AND SOIL TEST FOR "R" VALUE.
27. ALL GRADING, SITE PREPARATION, PLACING AND COMPACTION OF FILL TO BE DONE IN ACCORDANCE WITH CONTRA COSTA COUNTY GRADING ORDINANCE NO. 69-59 UNDER DIRECT SUPERVISION OF THE SOIL ENGINEER. SUBSEQUENT TO COMPLETION OF WORK, THE SOIL ENGINEER SHALL SUBMIT TO THE COUNTY BUILDING DEPARTMENT A REPORT STATING THAT ALL WORK HAS BEEN DONE TO HIS SATISFACTION.
28. CONTRACTOR TO NOTIFY CONTRA COSTA COUNTY GRADING SECTION 48 HOURS PRIOR TO THE START OF WORK.
29. ALL CUT SLOPES SHALL BE ROUNDED TO MEET EXISTING GRADES AND BLEND WITH SURROUNDING TOPOGRAPHY. ALL GRADED SLOPES OVER FIVE FEET IN HEIGHT SHALL BE PLANTED WITH SUITABLE GROUND COVER.
30. ANY DEVIATION FROM APPROVED PLAN REQUIRES APPROVAL OF THE CONTRA COSTA COUNTY GRADING ENGINEER.
31. DURING GRADING OPERATIONS, CONTRACTOR SHALL IMPLEMENT DUST CONTROL MEASURES ON SITE AND HAUL ROUTES.
32. A FINAL REPORT BY THE CIVIL ENGINEER CERTIFYING THAT ALL GRADING, LOT DRAINAGE AND DRAINAGE FACILITIES HAVE BEEN COMPLETED AND THE SLOPE PLANNING INSTALLED IN CONFORMANCE WITH THE APPROVED PLANS, SHALL BE SUBMITTED TO THE COUNTY PRIOR TO ISSUE OF BUILDING PERMITS.
33. MATERIALS AND CONSTRUCTION OR SANITARY SEWERS SHALL CONFORM TO THE CENTRAL CONTRA COSTA SANITARY DISTRICT'S STANDARD SPECIFICATIONS AND STANDARD DETAIL DRAWINGS. WHEN THE LOWEST FLOOR LEVEL OF A HOUSE TO BE CONNECTED TO THE MAIN SEWER IS BELOW A POINT 12" ABOVE THE TOP OF THE NEAREST UP-STREAM STRUCTURE, THERE SHALL BE A BACKWATER OVERFLOW DEVICE OR CHECK VALVE INSTALLED ON THE SIDE SEWER NEXT TO THE CLEANOUT.
34. ANY DEVIATION FROM APPROVED PLANS DURING CONSTRUCTION WILL REQUIRE APPROVAL OF THE CENTRAL CONTRA COSTA SANITARY DISTRICT.
35. AS A DISCREPANCY EXISTS BETWEEN FIELD AND RECORD DATA AS TO THE EXACT LOCATION OF THE EXISTING SEWER IN OAK ROAD, THE CONTRACTOR SHALL NOTIFY THE ENGINEER UPON EXPOSING THE EXISTING SEWER IN ORDER FOR THE ENGINEER TO REVIEW THE FIELD CONDITIONS AND REVISE THE SEWER PLANS AS MAY BE NECESSARY.
36. APPLICABLE PUBLIC WORKS DEPARTMENT STANDARD DRAWINGS

CC203	DRIVEWAY DATA
CC208	LOCATION OF UTILITY FACILITIES
CC306	CURBS, SIDEWALKS, DRIVEWAYS, CONCRETE DITCHES, VALLEY GUTTERS AND CURBED MEDIANS
CC3010	INLET FRAMES, GRATE AND COVER PLATE
CC3011	TYPE A INLET
CC3021	TYPE II M.H. BASE
CC3051	SIGNING, STRIPING AND INSTALLATION DETAILS
CC 3020	TYPE I M.H.
CC 3023	CIRCULAR GRATE & FRAME
CC 3024	M.H. FRAME & COVER

PRINTED
JUL 31 1984
RAYMOND VAIL & ASSOC.

PAVEMENT DESIGN

ROAD NAME	T.I.	R VALUE	AC	AB	AS	LIMITS
OAK RD.	8.0					
PARKING LOT **	5.5					DWY TO CB 6
"	4.5					CB 6 TO END

** SEE TYPICAL SECTION (SHEET 2) FOR LIMITS

O-2075
44B Line D-1
As-Built

REVISION	DATE	DESCRIPTION

DRAWN BY: LG DESIGN: LG
CHECK BY: LG
BY: Lawrence V. Gossett 7/12/84
REGISTERED PROFESSIONAL ENGINEER LAWRENCE V. GOSSETT No. 31695 CIVIL STATE OF CALIFORNIA

RAYMOND VAIL AND ASSOCIATES
ENGINEERING • PLANNING • SURVEYING
1430 ARROYO WAY, SUITE B · WALNUT CREEK, CALIFORNIA · 94596

OAK ROAD VILLAS I
TRACT 6470
TITLE SHEET
FOR CONDOMINIUM PURPOSES
WALNUT CREEK AREA
CONTRA COSTA COUNTY, CA

TRACT 6470
DATE MAY, 1984
SCALE
HORIZONTAL AS SHOWN
VERTICAL
W.O. NO. 6632.31
SHEET 1 OF 4 SHEETS
FILE NO. 6470

CCCSD 3978 1548 B 520 49 B5 1 of 4

NOTE: SANITARY SEWERS

CONTRACTOR SHALL EXPOSE AND ABANDON ALL 4" LATERALS TO THE EXISTING HOMES (TO BE REMOVED FROM THE PROJECT SITE) AT THE PROPERTY LINE ON OAK RD.
INSTALL 6" LATERALS UP TO WITHIN 2' OF BUILDING CLEANOUT.

N 88° 52' 44" W 425.33

OAK RD.

INSTALL 30"RCP SD SEE SHEET 3

INSTALL 24"RCP SD SEE SHEET 3

EXIST. 6" SS

INSTALL 15" RCP

INSTALL 15" RCP

INSTALL HYDRANT

6" SS LAT @ 2.1%

6 — P: 93.80 FF: 96.28 — 15 UNITS - 3 FLOORS

7 — P: 92.80 FF: 94.98 — 6 UNITS - 3 FLOORS

1 — P: 93.20 FF: 95.68 — 9 UNITS - 3 FLOORS

2 — P: 92.00 FF: 94.48 — 9 UNITS - 3 FLOORS

3 — P: 94.00 FF: 96.48 — 18 UNITS - 3 FLOORS

4 — P: 94.00 FF: 96.48 — 12 UNITS - 3 FLOORS

5 — P: 94.80 FF: 96.98 — 12 UNITS 3 FLOORS

POOL AREA

CLUB HOUSE

TRASH ENC.

LINE A

LINE B

GRADE BREAK

EARTH SWALE TO INTERCEPT FLOW FROM SOUTH

N 88° 52' 44" W 401.85

N 4° 24' 16" E 296.19

N 8° 46' 21" E 261.56

R.I. (BURIED) EXPOSE & RAISE TO PAVEMENT GRADE.

C.B. CHRIST W-1 (FIELD ADJ) 12 LF - 4" PVC

Δ 2° 13' 34" R: 952.00 L: 36.91 (R/W ONLY)

REVIEWED
ONLY FOR COMPLIANCE WITH TITLE 9 OF THE COUNTY ORDINANCE CODE
JAN 22 1985
FILE COPY SIGNED BY CARLO P. BORLANDELLI RCE 17348 PUBLIC WORKS DEPARTMENT CONTRA COSTA COUNTY

REVISED PLAN

CURB DETAIL
NO SCALE
(SEE SECTION 73 OF CAL-TRANS SPECS.) FOR INSTALLATION DETAILS
DOWEL MAY BE SUBSTITUTED WITH EPOXY RESIN CONFORMING WITH SECTION 95-203, CAL-TRANS SPECS.

TYPICAL SECTION
PRIVATE DRIVE
N.T.S.

FC 15-20' PARKING 24' DRIVEWAY PARKING
LIMITS OF COUNTY INSPECTION
SEE CURB DETAIL
AC 2" MIN.
6" AB MIN
ALL AC REQUIRED

FINAL THICKNESS OF PAVEMENT SECTION TO BE DETERMINED BY PUBLIC WORKS (DRIVEWAY ONLY)

PRINTED JAN 22 1985 RAYMOND VAIL & ASSOC.

O-2075

REVISION	DATE	DESCRIPTION
3	11-28-84	RELOCATE DWY & CARPORTS @ BLDG. 1 & 7, REMOVE SWALE
2	8/6/84	LAT. STATIONS & CO GRADES BLD 6
1	8/6/84	PAD GRADES - BLD 3 & 7

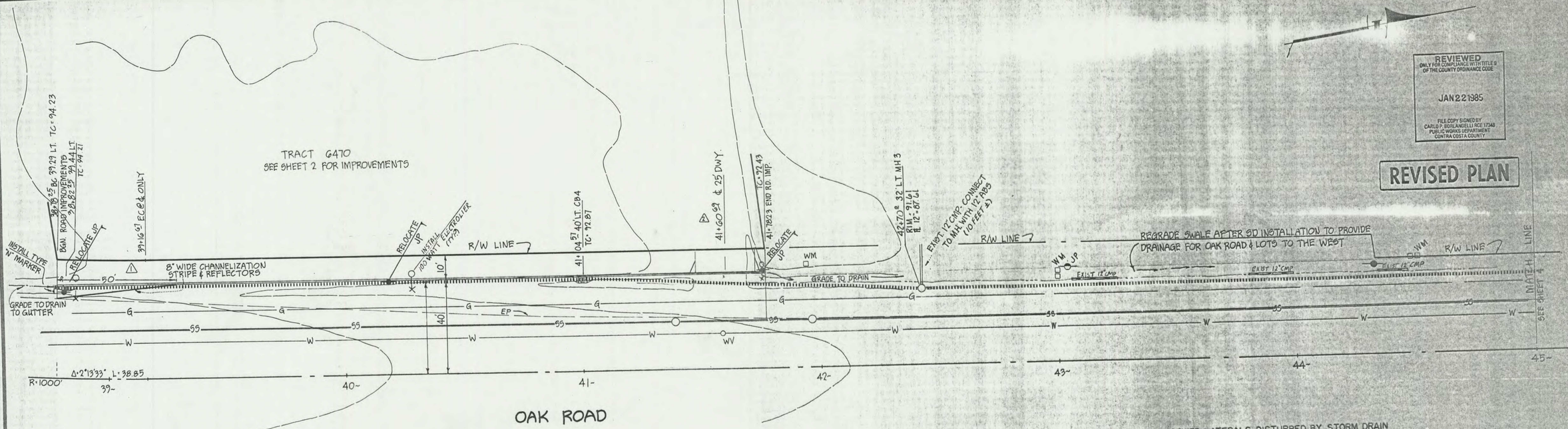
DRAWN BY J.C. DESIGN BY L.V.G.
CHECK BY L.V.G.
BY Lorraine V. Gross No. 31605 CIVIL 7/12/84

RAYMOND VAIL AND ASSOCIATES
ENGINEERING • PLANNING • SURVEYING
1430 ARROYO WAY, SUITE B · WALNUT CREEK, CALIFORNIA · 94596

OAK ROAD VILLAS I
TRACT 6470
GRADING & SEWER PLAN
WALNUT CREEK AREA
CONTRA COSTA COUNTY, CA.

DATE MAY 1984
SCALE HORIZONTAL 1" = 20' VERTICAL
W.O. NO 6632.31
SHEET 2 OF 4 SHEETS

CCCSD 3978 1548 B 520 49B5 2 of 4 6470 E.NO.



REVIEWED
ONLY FOR COMPLIANCE WITH TITLE 9 OF THE COUNTY ORDINANCE CODE
JAN 22 1985
FILE COPY SIGNED BY CARLO P. BORLANDELLI RCE 17348 PUBLIC WORKS DEPARTMENT CONTRA COSTA COUNTY

REVISED PLAN

PRINTED JAN 22 1985 RAYMOND VAIL & ASSOC.

O-2075

DRAWN BY: JC DESIGN BY: LVG
CHECK BY: L.V.G
BY Lawrence V. Goodell 7/23/84
REGISTERED PROFESSIONAL ENGINEER (CIVIL) No. 31645 STATE OF CALIFORNIA

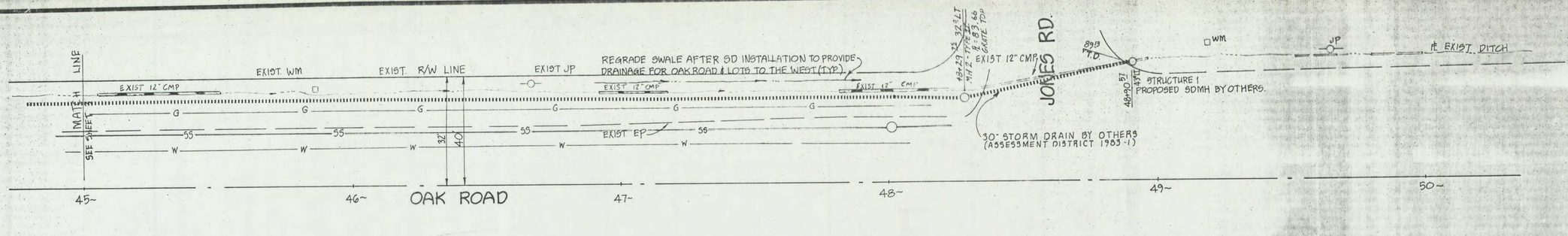
REVISION	DATE	DESCRIPTION
2	11-30-84	RELOCATE DWY. & ELECTROLIER
1	11-30-84	REMOVE HORIZ. CURVE (R=960') FROM CURB℄ SW

RAYMOND VAIL AND ASSOCIATES
ENGINEERING • PLANNING • SURVEYING
1430 ARROYO WAY, SUITE B · WALNUT CREEK, CALIFORNIA · 94596

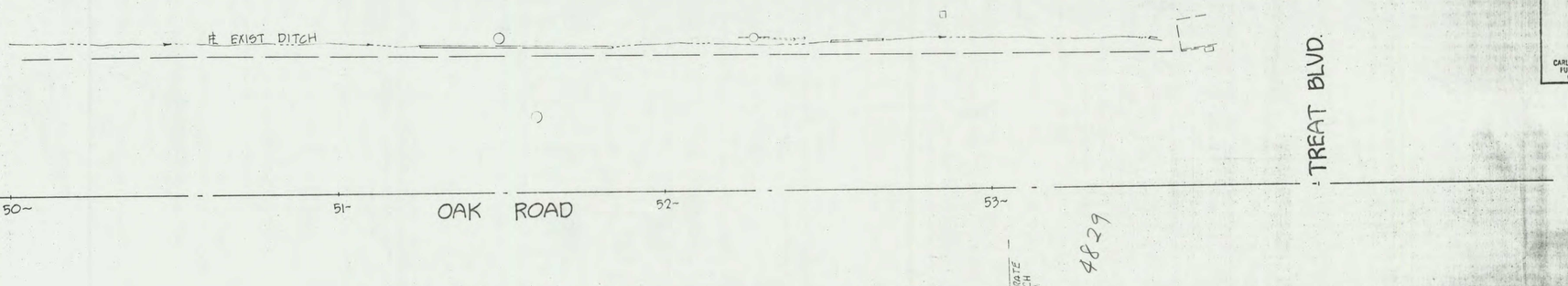
OAK ROAD VILLAS I' PROPOSED IMPROVEMENTS FOR TRACT 6470
OAK ROAD
WALNUT CREEK AREA CONTRA COSTA COUNTY, CA

DATE MAY 1984
SCALE
HORIZONTAL 1" = 20'
VERTICAL 1" = 2'
W.O. NO. 8632.31
FILE NO.
SHEET 3 OF 4 SHEETS

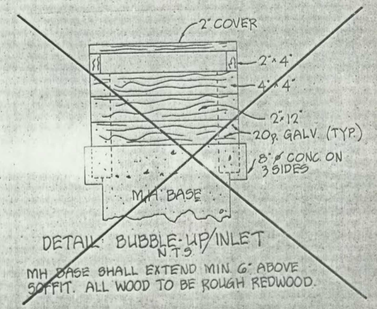
CCCSD 3978 1548 B520 49B5 3 of 4



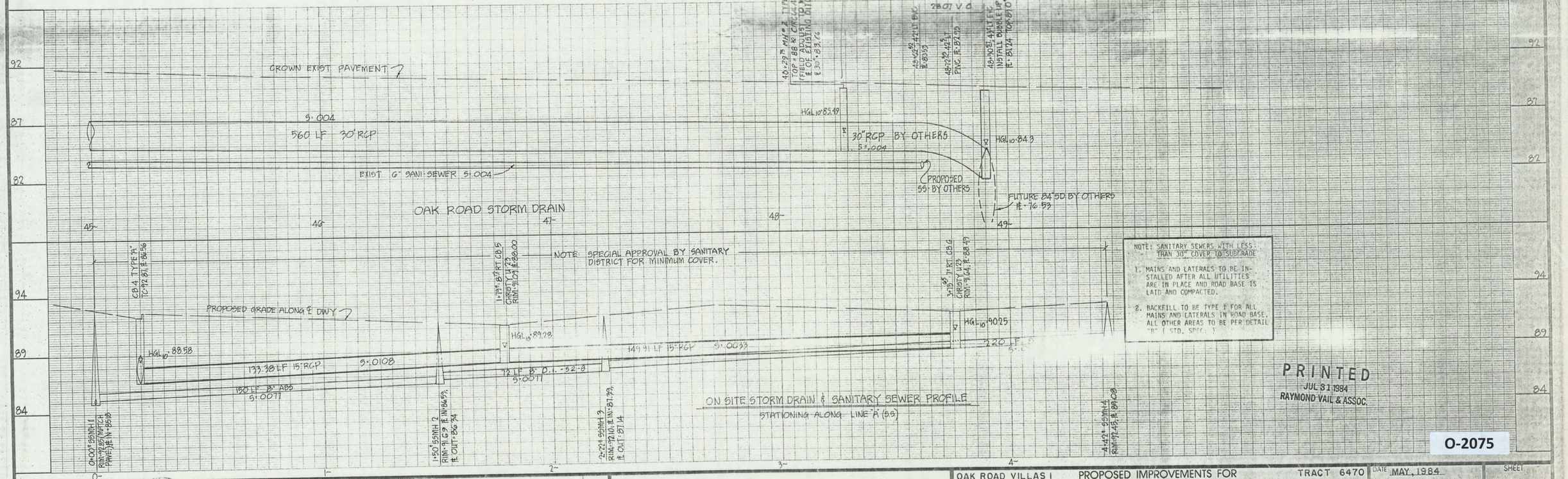




REVIEWED
ONLY FOR COMPLIANCE WITH TITLE 9 OF THE COUNTY ORDINANCE CODE
AUG 01 1984
FILE COPY SIGNED BY
CARLO P. LORLANDELLI RCE 17348
PUBLIC WORKS DEPARTMENT
CONTRA COSTA COUNTY



DETAIL BUBBLE-UP INLET
N.T.S.
MH BASE SHALL EXTEND MIN. 6" ABOVE SOFFIT. ALL WOOD TO BE ROUGH REDWOOD.



NOTE: SANITARY SEWERS WITH LESS THAN 30" COVER TO SUBGRADE

1. MAINS AND LATERALS TO BE INSTALLED AFTER ALL UTILITIES ARE IN PLACE AND ROAD BASE IS LAID AND COMPACTED.
2. BACKFILL TO BE TYPE E FOR ALL MAINS AND LATERALS IN ROAD BASE. ALL OTHER AREAS TO BE PER DETAIL "B" (STD. SPEC.)

ON SITE STORM DRAIN & SANITARY SEWER PROFILE
STATIONING ALONG LINE "A" (S.S.)

PRINTED
JUL 31 1984
RAYMOND VAIL & ASSOC.

O-2075

DRAWN BY: J.C. DESIGN BY: L.V.G.
CHECK BY: L.V.G.
BY: Laurence V. Gossett 7.23.84

REVISION	DATE	DESCRIPTION

RAYMOND VAIL AND ASSOCIATES
ENGINEERING • PLANNING • SURVEYING
1430 ARROYO WAY, SUITE B · WALNUT CREEK · CALIFORNIA 94596

OAK ROAD VILLAS I PROPOSED IMPROVEMENTS FOR TRACT 6470
OAK ROAD STORM DRAIN
ON SITE SEWER & STORM DRAIN PROFILE
WALNUT CREEK AREA CONTRA COSTA COUNTY, CA.

DATE: MAY, 1984
SCALE: HORIZONTAL 1" = 20' VERTICAL 1" = 4'
W.O. NO. 6632.31
SHEET 4 OF 4 SHEETS
FILE NO.

CCCSD 3978 1548B520 49B5 4 of 4

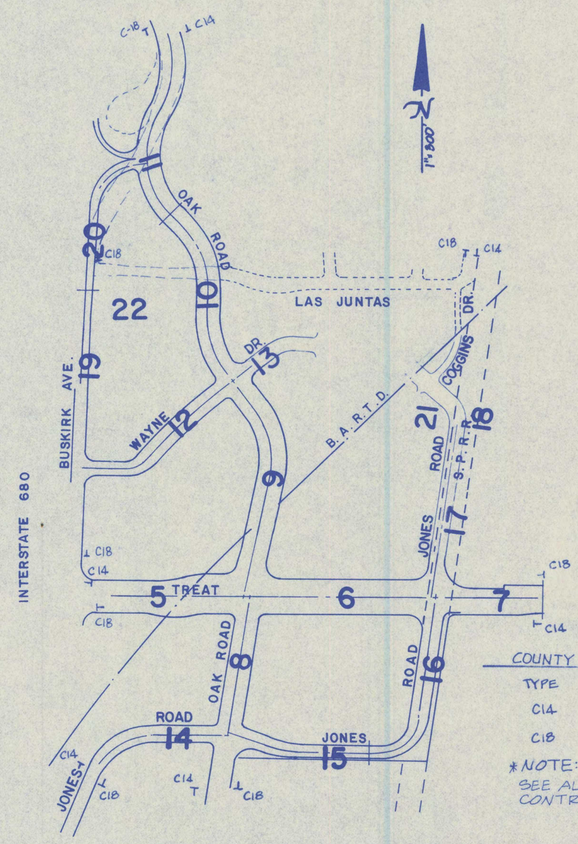
C.C. Co. Redevelopment Agency

Pleasant Hill B.A.R.T. Station Area

Contra Costa County, California

STORM DRAIN, SANITARY SEWER & OTHER MISCELLANEOUS IMPROVEMENTS

W.O. NO. 5547-1



Key Map

1" = 300'

COUNTY FURNISHED CONSTRUCTION SIGNS *

TYPE	QUANTITY	DESCRIPTION
C14	6	"END ROAD WORK"
C18	8	"ROAD CONST. AHEAD"

*NOTE:
SEE ALSO SHEET 25 FOR ADDITIONAL CONTRACTOR FURNISHED SIGNS

CONTRA COSTA COUNTY
REDEVELOPMENT AGENCY APPROVAL

APPROVED FOR CONSTRUCTION:

Milton Kubicek DATE 12-10-84

MILTON KUBICEK, DEPUTY PUBLIC WORKS DIRECTOR

Plans and Specifications prepared by

ALIQUOT
• CIVIL/STRUCTURAL ENGINEERS •
• PLANNERS • SURVEYORS •

3301 N. Main Street
Pleasant Hill, CA 94523
(415) 930-7078

ENGINEER'S CERTIFICATION

SUBMITTED BY

James R. Emanuel

JAMES R. EMANUEL — PRINCIPAL ENGINEER
ALIQUOT ASSOCIATES, INC.
R.C.E. C31641

CONTRACT NO. 5547-1
DATE ACCEPTED 5/6/86
RECORD DRAWING
RESIDENT ENGINEER William Nugent
REVISIONS BY WN DATE 12/29/87

Sheet Index

SHEET NO.	TYPE OF PLAN	DESCRIPTION
1	TITLE	TITLE, KEY MAP, SHEET INDEX
2	IMPROVEMENT PLAN	GENERAL NOTES, TYP. SECTIONS, LEGEND, VICINITY MAP
3	IMPROVEMENT PLAN	SANITARY SEWER SYSTEM MAP
4	" "	STORM DRAIN SYSTEM MAP
5	UTILITY IMPROVEMENT PLAN	TREAT BOULEVARD
6	" " "	TREAT BOULEVARD
7	" " "	TREAT BOULEVARD
8	UTILITY IMPROVEMENT PLAN	OAK ROAD
9	" " "	OAK ROAD
10	" " "	OAK ROAD
11	" " "	OAK ROAD
12	UTILITY IMPROVEMENT PLAN	WAYNE DRIVE
13	" " "	WAYNE DRIVE
14	UTILITY IMPROVEMENT PLAN	JONES ROAD
15	" " "	JONES ROAD
16	" " "	JONES ROAD
17	" " "	STORM DRAIN & SANITARY SEWER
18	" " "	STORM DRAIN & SANITARY SEWER
19	UTILITY IMPROVEMENT PLAN	BUSKIRK AVENUE
20	" " "	BUSKIRK AVENUE
21	UTILITY IMPROVEMENT PLAN	SANITARY SEWER PLAN & PROFILE
22	" " "	SANITARY SEWER PLAN & PROFILE
23	UTILITY IMPROVEMENT PLAN	NORTH MAIN STREET
24	DETAILS	
25	DETOUR PLAN	BUSKIRK AVENUE

NO.	BY	DATE	REVISION
1	JE	1/8/85	ADDENDUM #1

O-2069

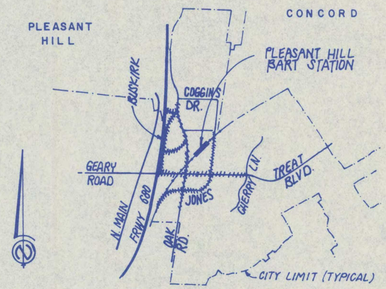
DA-44B

RDA 5548-85

GENERAL NOTES

1. BASIS OF ELEV. DATUM: ELEVATIONS ARE BASED ON CONTRA COSTA COUNTY DATUM: BENCH MARK: C.C.CO.B.M. NO. 3686 ELEV. 89.518 FEET. FOUND CHISELED "+" ON BOLT HEAD ON SOUTHWEST CORNER OF BASE OF A STEEL POWER POLE AT NORTHWEST CORNER OF INTERSECTION OF TREAT BOULEVARD AND DEL HOMBRE LANE. 45'± EAST OF S.P.R.R. TRACKS.
2. NO TREES SHALL BE REMOVED UNLESS THEY ARE SHOWN AND NOTED TO BE REMOVED ON THE IMPROVEMENT PLANS. ALL TREES CONFLICTING WITH GRADING, UTILITIES, OR OTHER IMPROVEMENTS, OR OVERHANGING THE SIDEWALK OR PAVEMENT SO AS TO FORM A NUISANCE OR HAZARD, SHALL BE TRIMMED AND PROPERLY TREATED AND SEALED.
3. PAVING CONFORMS SHALL BE MADE AT A SMOOTHLY TRIMMED BUTT JOINT. DO NOT OVERLAP EXISTING PAVEMENT.
4. THE EXCAVATION TRENCH WIDTH FOR ALL PIPES, WITH THE EXCEPTION OF C.I.P.P. SHALL BE A MINIMUM OF 24 INCHES GREATER THAN THE OUTSIDE DIAMETER OF THE PIPE. ONE-HALF OF THE MINIMUM DIMENSION SHALL BE AVAILABLE ON EITHER SIDE OF THE PIPE.
5.
6. IF ARCHAEOLOGIC MATERIALS ARE UNCOVERED DURING GRADING, TRENCHING OR OTHER ON-SITE EXCAVATION, EARTHWORK WITHIN 100 FEET OF THESE MATERIALS SHALL BE STOPPED UNTIL A PROFESSIONAL ARCHAEOLOGIST WHO IS CERTIFIED BY THE SOCIETY OF CALIFORNIA ARCHAEOLOGY (SOPA) HAS HAD AN OPPORTUNITY TO EVALUATE THE SIGNIFICANCE OF THE FIND AND SUGGEST APPROPRIATE MITIGATIONS MEASURES, IF THEY ARE SEEMED NECESSARY.
7. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING EXISTING UTILITY LINES AND FACILITIES.
8. THE CONTRACTOR SHALL COOPERATE AND COORDINATE WITH THE CONSTRUCTION OF P.G.&E., PACIFIC BELL AND WATER FACILITIES TO BE INSTALLED BY OTHERS.
9. ENGINEER REQUIRES 48 HOURS NOTICE (WEEKENDS NOT INCLUDED) FOR STAKING REQUESTS.
10.
11. MATERIALS AND CONSTRUCTION OF SANITARY SEWERS SHALL CONFORM TO THE CENTRAL CONTRA COSTA SANITARY DISTRICT'S STANDARD SPECIFICATIONS AND STANDARD DETAIL DRAWINGS.
12. APPLICABLE PUBLIC WORKS DEPARTMENT STANDARD DWGS.
    CC 208 STANDARDS FOR LOCATION OF UTILITY FACILITIES.
    CC 302 MARKERS, DELINEATORS AND TYPICAL CONSTRUCTION SIGN.
    CC 3010 INLET FRAMES, GRATE, AND COVER PLATE.
    CC 3016 TYPE "D" INLET
    CC 3020 PRECAST MANHOLE AND TYPE I BASE.
    CC 3021 TYPE II MANHOLE BASE.
    CC 3022 TYPE III MANHOLE BASE.
    CC 3024 MANHOLE FRAME AND COVER.
    CC 3052 TYPE IV MANHOLE BASES.

    EXISTING FACILITIES TO REMAIN UNLESS OTHERWISE NOTED.
13. -ALL SLEEVES SHALL BE 1120-SCHEDULE 40 PVC PLASTIC PIPE WITH MIN. 36" COVER.
    -INSTALL ONE 4" AND ONE 2" SLEEVE UNDER ALL ENTRANCE DRIVEWAYS PRIOR TO PAVING OR CONCRETE WORK.
    -EXTEND ALL SLEEVES 12" INTO PLANTING AREAS.
    -LOCATE ENDS OF ALL SLEEVES WITH 2"x2"x12" REDWOOD STAKES.
14. ALL TC PROFILES ARE PROPOSED AND SHALL BE DONE BY OTHERS.
15. EXISTING BUILDINGS AS SHOWN ON PLANS SHALL BE REMOVED BY OTHERS.
16. SALVAGED METAL CASTINGS SUCH AS FRAMES and COVERS and OTHER METAL APPURTENANCES FROM CCCSD STRUCTURES, UNLESS OTHERWISE SPECIFIED, SHALL BE DELIVERED, FREE OF ALL EXCESS CONCRETE OR MORTAR, TO THE DISTRICT YARD, 1250 SPRINGBROOK RD. WALNUT CREEK, CA.



NOTE:
////// DENOTES SUBJECT AREA

VICINITY MAP
N. T. S.

LEGEND:

(EXISTING UTILITIES)

——— S ———	SANITARY SEWER LINE
——— G ———	GAS LINE
——— E ———	OVERHEAD ELECTRICAL LINE
——— UE ———	UNDERGROUND ELECTRICAL LINE
——— T ———	TELEPHONE LINE
——— W ———	WATER LINE
——— TV ———	UNDERGROUND CABLE TV
= = = = = = = = = = =	STORM DRAIN LINE

(PROPOSED UTILITIES)

	STORM DRAIN LINE
	SANITARY SEWER LINE
4" IRS	IRRIGATION SLEEVE (SEE GEN. NOTES #13)

W = WATER BOX
T = TRAFFIC BOX
EM = ELECTRIC METER BOX
MB = MAIL BOX
TV = CABLE TV BOX

GM = GAS METER
TLP = TRAFFIC LIGHT POLE
SLB = STREET LIGHT BOX
SB = SERVICE BOX
PT&T = TELEPHONE BOX
WM = WATER METER
BP = BARRICADE POST
— STREET ROAD SIGN (AS NOTED)
ISB = IRRIGATION SERVICE BOX
SSMH = SANITARY SEWER MANHOLE
SDMH = STORM DRAIN MANHOLE
SSRI = SANITARY SEWER RODDING INLET

CB = CATCH BASIN
D.I. = DROP INLET
FH = FIRE HYDRANT
JP = JOINT POLE
PP = POWER POLE
GW = GUY WIRE
WV = WATER VALVE
DWY = DRIVEWAY
GP = GUARD POST
EXIST. = EXISTING

R/W = RIGHT OF WAY
☼ = ELECTROLIER

CP = CONCRETE PIPE
TBA = TO BE ABANDONED
SSCO = SANITARY SEWER CLEAN OUT
GB = GRADE BREAK
N.I.C. = NOT IN CONTRACT
STD. = STANDARD
RDWD = REDWOOD
SSTMH = SANITARY SEWER TRUNK MANHOLE
APC = ALTERNATIVE PIPE CULVERT (EXIST.)

CONTRACT NO. 5547-1
DATE ACCEPTED 5/6/86
RECORD DRAWING
RESIDENT ENGINEER
REVISIONS BY MW DATE 12/29/89

O-2069

DA 44B

RDA 5548-85

Aliquot Associates, Inc.
CIVIL ENGINEERS · PLANNERS · SURVEYORS
3301 N. MAIN ST., SUITE B
PLEASANT HILL, CA. 94523
(415) 930-7078

NO.	BY	DATE
1	JRE	12-29-89

ADDENDUM #1

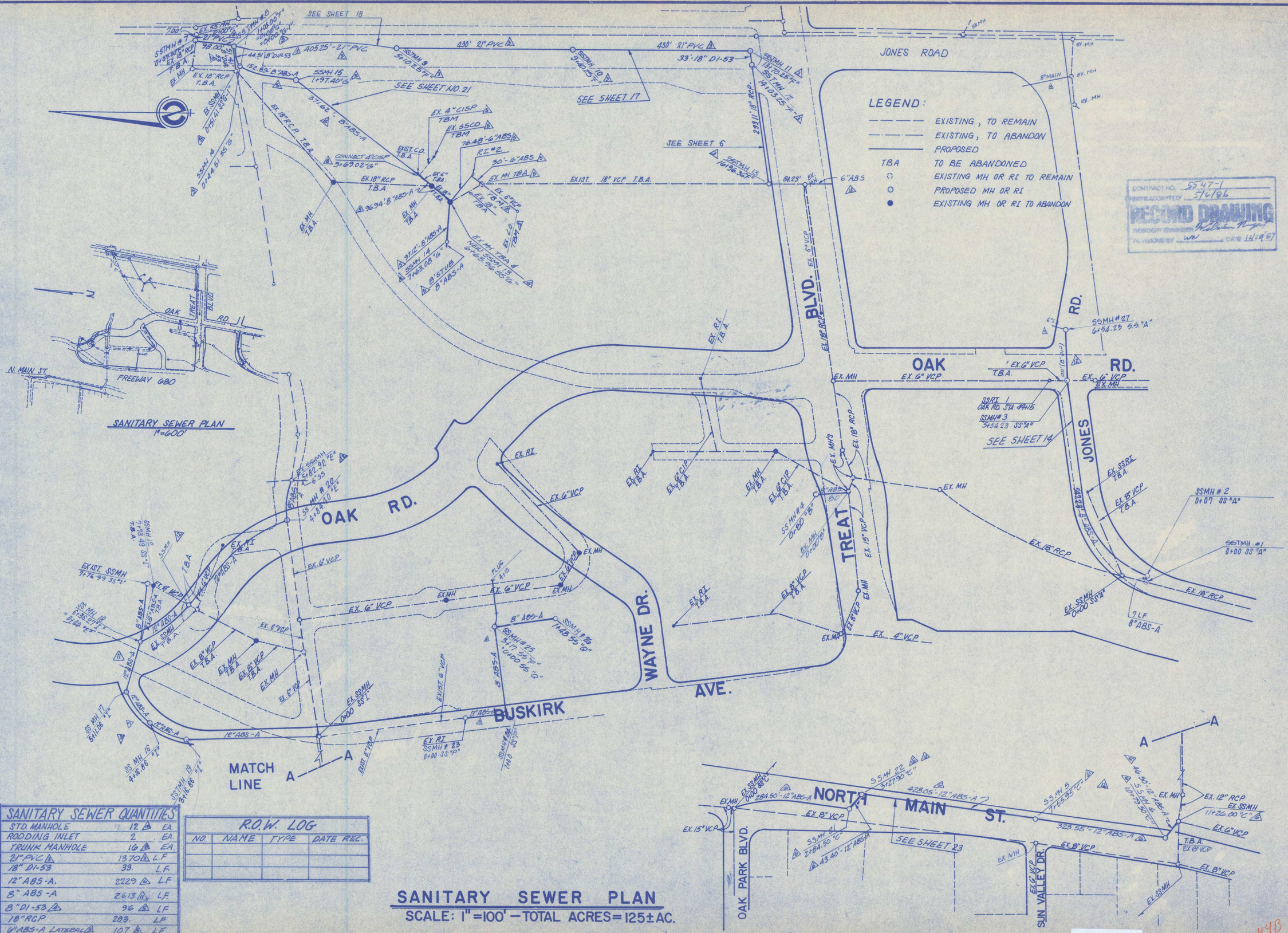
IMPROVEMENT PLAN
GENERAL NOTES - LEGEND
VICINITY MAP

C.C.CO. REDEVELOPMENT AGENCY
PLEASANT HILL BART STATION AREA
CONTRA COSTA COUNTY, CALIFORNIA

SCALE: AS SHOWN
DATE: APRIL 1986
DESIGN: SB JRE
DRAWN: RC
ENG: JRE
FB 10

JAMES R. EMANUEL
R.C.E. 31641

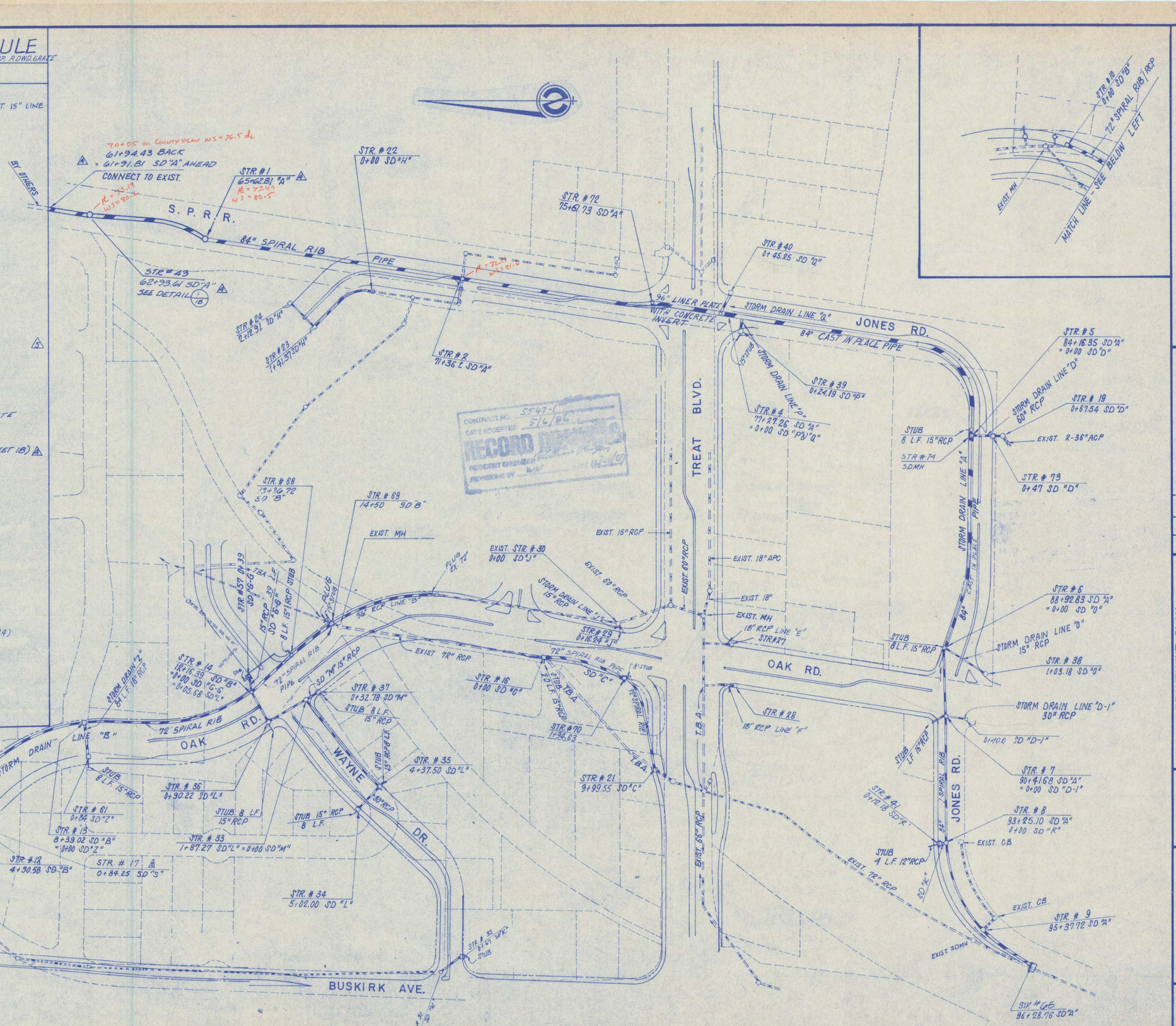
SHEET NO. 2
SHEET 2 OF 25 SHEETS
JOB NO. 8312.2


SEE SHEET 18
SEE SHEET NO. 21
SEE SHEET 17
SEE SHEET 6
SEE SHEET 14
SEE SHEET 23
JONES ROAD
LEGEND:
EXISTING, TO REMAIN
EXISTING, TO ABANDON
PROPOSED
TBA TO BE ABANDONED
EXISTING MH OR RI TO REMAIN
PROPOSED MH OR RI
EXISTING MH OR RI TO ABANDON
OAK RD.
OAK TREAT BLVD
JONES RD.
WAYNE DR.
BUSKIRK AVE.
TREAT BLVD.
NORTH MAIN ST.
OAK PARK BLVD.
SUN VALLEY DR.
FREEWAY 680
N. MAIN ST.
MATCH LINE
SSMH #7
SSMH #8
SSMH #9
SSMH #10
SSMH #11
SSMH #12
SSMH #13
SSMH #14
SSMH #15
SSMH #16
SSMH #17
SSMH #18
SSMH #19
SSMH #20
SSMH #21
SSMH #22
SSMH #23
SSMH #24
SSMH #25
SSMH #26
SSMH #27
SSRT 1
SSMH #1
SSMH #2
SSMH #3
SSMH #4
SSMH #5
EX. MH
EX. RI
EX. 18" RCP
EX. 6" VCP
EX. 8" VCP
EX. 15" VCP
EX. 4" VCP
EX. 12" RCP
EX. 18" VCP
EX. 8" ABS-A
EX. 6" ABS-A
EX. 4" CISP TBM
EX. SSCO TBM
EXIST. CO. T.B.A.
EX. MH T.B.A.
EX. RI T.B.A.
EX. 6" VCP T.B.A.
EX. 8" VCP T.B.A.
EX. 18" RCP T.B.A.
EX. 6" CISP T.B.A.
EXIST. 18" VCP T.B.A.
EX. SSMH T.B.A.
EX. SSRT T.B.A.
EXIST. SSMH
EXIST. 6" VCP
EX. 8" ABS-A
EX. 6" ABS-A
EX. 4" CISP
EX. 8" VCP
EX. 6" VCP
EX. MH
EX. 18" RCP
EX. 15" VCP
EX. 4" VCP
EX. 12" RCP
EX. SSMH
EX. 6" VCP
EX. 8" VCP
EX. SSMH
EX. 8" VCP
EX. SSMH
EX. 8" VCP
EX. SSMH

STORM DRAIN SCHEDULE

NOTE: ALL CB'S ARE TYPE "D" UNLESS NOTED # BASE W/TEMP. R.O.W.D. GRATE

STRUCT. NO.	LINE	STRUCT TYPE	BASE TYPE	SHEET NO.	REMARKS
1	A	MH	IV	18	
2				17	
3				6,16,17	CONST. NEW MH ON EXIST. 15" LINE
4	, P,Q	MH		16	
* 5	, O	CB		15,16	TYPE A INLET BASE
* 6	, O	CB		15	TYPE A INLET BASE
7	, O-1	MH		14,15,B	
* 8		CB		14	
9	A	MH		14	
* 10	B	CB		11	
* 11	, T	MH		11	
* 12		CB		11	
* 13	, Z	CB		10	
* 14	Y, L	MH		10, 13	
16	C			9	SPECIAL - SEE DET. SHT. 9
17	S	CB		10	
19	D	MH	IV	16	
* 21	C	CB	IV	5	
* 22	H	MH	I	17	
* 23	H	CB		18	
* 24	H	CB		18	
* 27	E	CB		5	TYPE A INLET BASE
* 28	F	CB		5	
* 29	J	CB		9	
30	J	MH	I	9	EXIST. TO REMAIN
* 31	K	MH		12	
* 32	K	CB		12	
* 33	L,M	MH	II	10	
* 34	L	CB	II	12	
* 35	L		II	12	
* 36	M			10	
* 37	M			10,9	
* 38	O			15	
* 39	P			16	
* 40	Q	CB		16	TYPE A INLET, COMPLETE
* 41	R	CB		14	
42	A	MH	II	14	
43	A	MH	IV	18	SPECIAL (SEE DETAIL, SHEET 18)
* 57	G-G	CB		13	
* 61	Z	CB		10	
65	A	MH		14	SPECIAL (SEE DETAIL SHT. 24)
* 68	B	CB	IV	9	
* 69	B	MH	IV	9	
* 70	C	CB	IV	9	
72	A	MH	IV	17	
* 73	D	CB	IV	15	
74	A	MH	II	15	



CONTRACT NO. 5547-1
DATE ACCEPTED 5/6/86
RESIDENT ENGINEER
REVISIONS BY

Aliquot Associates, Inc.
CIVIL ENGINEERS · PLANNERS · SURVEYORS
3301 N. MAIN ST., SUITE B
PLEASANT HILL, CA. 94523
(415) 930-7078

NO.	BY	DATE
	RDB	12/4/85
	RDB	12/18/85
1	JRE	1/6/86
2	RC	4/16/86
3	RC	5/20/86

ADD 13 DRAIN INLETS PER COUNTY REQUEST
ADD STR #43
ADD STR 3/4 SD "K", REV. SD "A", "D"
ADD STR 17A, 23, 24; REV. STR 33, 18, 61, 11, 22
ADDENDUM #1

IMPROVEMENT PLAN
STORM DRAIN SYSTEM MAP

C.C.C.O. REDEVELOPMENT AGENCY
PLEASANT HILL B.A.R.T. STATION AREA
CONTRA COSTA COUNTY CALIFORNIA

SCALE: 1" = 100'
DATE: APRIL, 1986
DESIGN: GB, JRE
DRAWN: RC
ENG: JRE
FB 10

JAMES R. EMANUEL
R.C.E. 31641

SHEET NO. 4
SHEET 4 OF 25 SHEETS
JOB NO. 8312.2

O-2069

RDA 5548-85

SEE SHEET NO. 9

ABANDON EXIST. 8" VCP

REMOVE EXIST. CB and PIPE

SSMH # 4
90+37 76.38' LT.
0+81.49 "B"

0+89.49 END STUB

8' STUB

EXIST. SDMH

CONSTRUCT STR. # 21 TYPE "D" INLET TYPE IV MH BASE ON EXIST. 72" (VERIFY LOCATION)
90+88.41 73.74' LT.
= 4+06.63 SD "C"

STR. # 70 SEE SHEET 9

ABANDON EXIST. 72" FROM STR. 21 TO STR. 6

R=215' Δ= 40°58'37" L=153.76 SD "C"

3+51.93 P.R.C.

OAK ROAD

REMOVE EXIST. CB and PIPE TO STR. # 59

12"X12" DRAIN INLET W/ 8" DRAIN PIPE (PVC)

SEE SHEET NO. 6

ABANDON EXIST. 15" RCP

SEE PROFILE BELOW RT. OAK ROAD

EX. SSMH 0+00 55 "B"

68" RCP

BART TIER & FOOTING

ABANDON EXIST. 66" RCP

CONNECT 18" RCP TO EXIST. 30" RCP
45 L.F. S= 0.005
USE B-30 COLLAR TO CONNECT PIPES

STR # 28 TYPE "A" INLET

SEE SHEET NO. 8

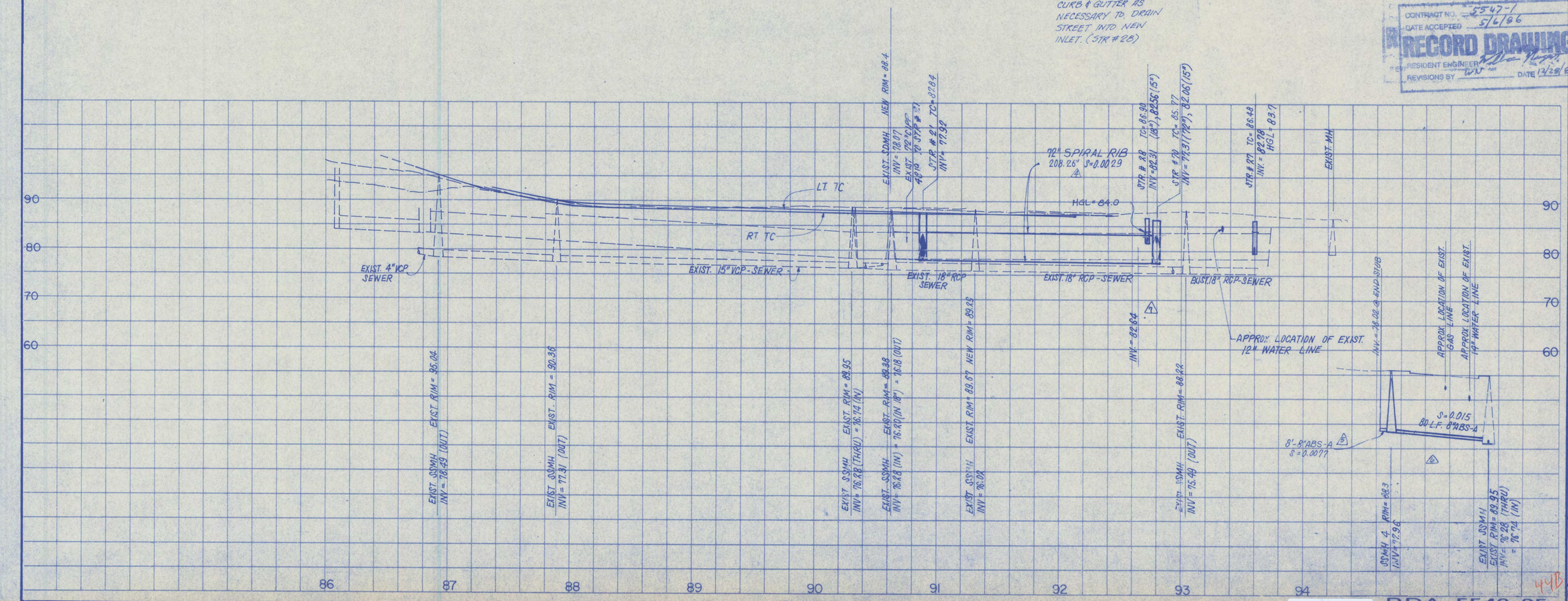
STR. #27 TYPE "D" INLET

STUB

EXIST. MH

CONNECT 18" RCP TO EXIST. 18" RCP
30 L.F. S= 0.005
USE B-30 COLLAR TO CONNECT PIPES. GRADE TO DRAIN STREET INTO NEW INLET. (STR # 27)

REMOVE EXIST. CB and PORTION OF EXIST. 30" RCP. REMOVE EX. CURB & GUTTER AS NECESSARY TO DRAIN STREET INTO NEW INLET. (STR # 28)



CONTRACT NO. 5547-1
DATE ACCEPTED 5/6/86
RESIDENT ENGINEER
REVISIONS BY DATE 12/28/87

RECORD DRAWING

RDA 5548-85

O-2069

Aliquot Associates, Inc.
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3301 N. MAIN ST., SUITE B
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(415) 930-7078

NO.	BY	DATE
5	KCB	4-2-87
4	KCB	12/16/86
3	RC	6-09-86
2	RC	6-09-86
1	RC	4-16-86
1	JE	12-9-85

REVISED PER AS BUILT PLAN COUNTY
REV. SS "B"
REV. SS "B"
REV. SS "B"
REVISE SS "B" PROFILE
REVISE SD "C"
ADDENDUM #1

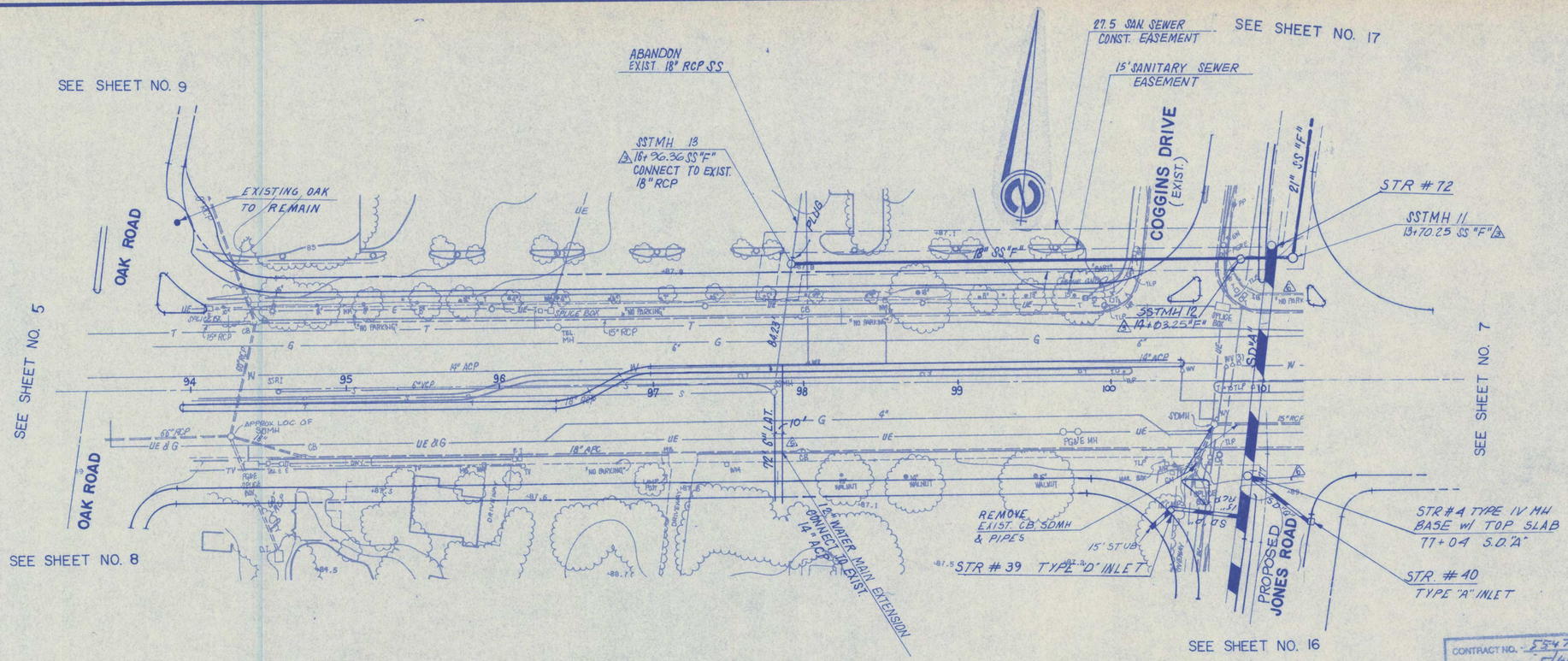
IMPROVEMENT PLAN

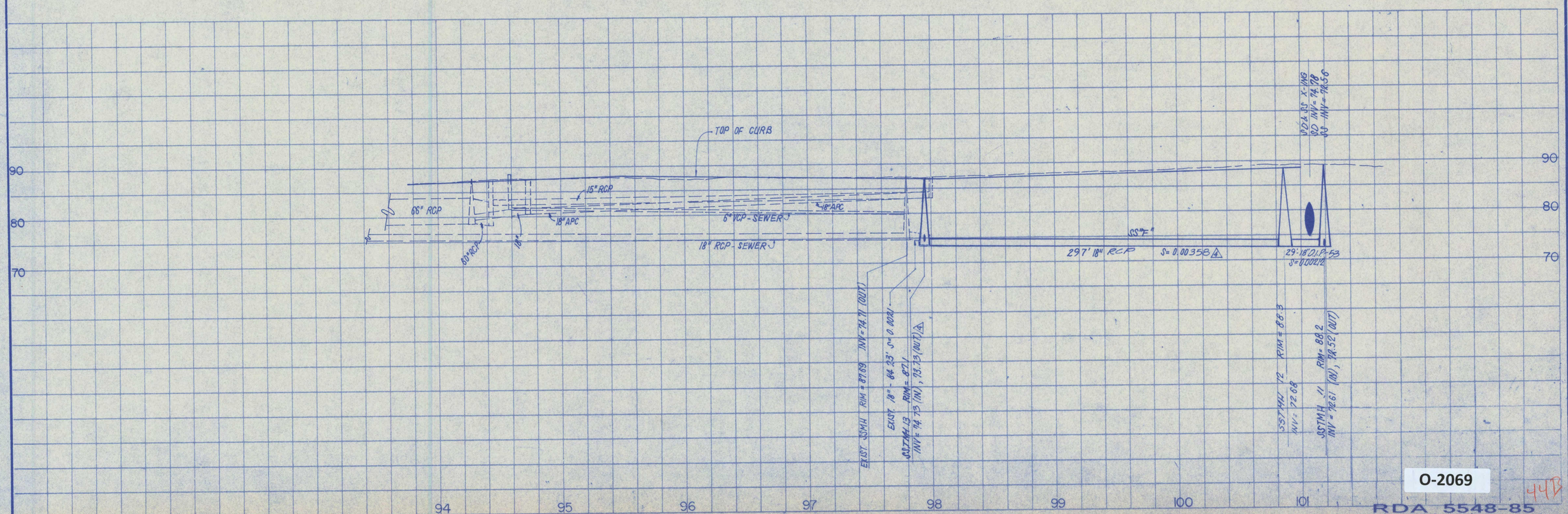
TREAT BLVD.
BUSKIRK THRU OAK ROAD
UTILITIES PLAN & PROFILE
C.C.CO. REDEVELOPMENT AGENCY
PLEASANT HILL B.A.R.T. STATION AREA
CONTRA COSTA COUNTY CALIFORNIA

SCALE: H:1"=40' V:1"=10'
DATE: APRIL, 1984
DESIGN: G.B., J.R.E.
DRAWN: R.C., R.M.
ENG: J.R.E.
FB 10

JAMES R. EMANUEL
R.C.E. 3641

SHEET NO. 5
SHEET 5 OF 25 SHEETS
JOB NO. 8312.2





Aliquot Associates, Inc.
CIVIL ENGINEERS · PLANNERS · SURVEYORS
3301 N. MAIN ST., SUITE B
PLEASANT HILL, CA. 94523
(415) 930-7078

NO.	BY	DATE
4	RCB	12-2-85
3	RC	6-16-85
2	RCB	12-9-85
1	RCB	4-25-84
2	RC	6-1-84
1	J.E.	1-8-85

AS BUILT PER COUNTY
ADD 12" WATER MAIN EXT.
Rev. 55 "F" to Match Exist. Inv. of 18"SS
Rev. Station & 55 "F"
REV. 55 "F" PRINCE
ADDENDUM #1

IMPROVEMENT PLAN

TREAT BLVD.

OAK ROAD THRU JONES ROAD
UTILITIES PLAN & PROFILE
CC.CO. REDEVELOPMENT AGENCY
PLEASANT HILL B.A.R.T. STATION AREA
CONTRA COSTA COUNTY CALIFORNIA

SCALE: H: 1"=40' V: 1"=10'
DATE: APRIL, 1984
DESIGN: G.B., J.R.E.
DRAWN: R.C., R.M.
ENG: J.R.E.
FB 10

JAMES G. EMANUEL
R.C.E. 31641

SHEET NO. 6
SHEET 6 OF 25 SHEETS
JOB NO. 8312.2

CONTRACT NO. 5347-1
DATE ACCEPTED 5/6/86
RECORD DRAWING
RESIDENT ENGINEER
REVISIONS BY WN DATE 4/28/87

O-2069

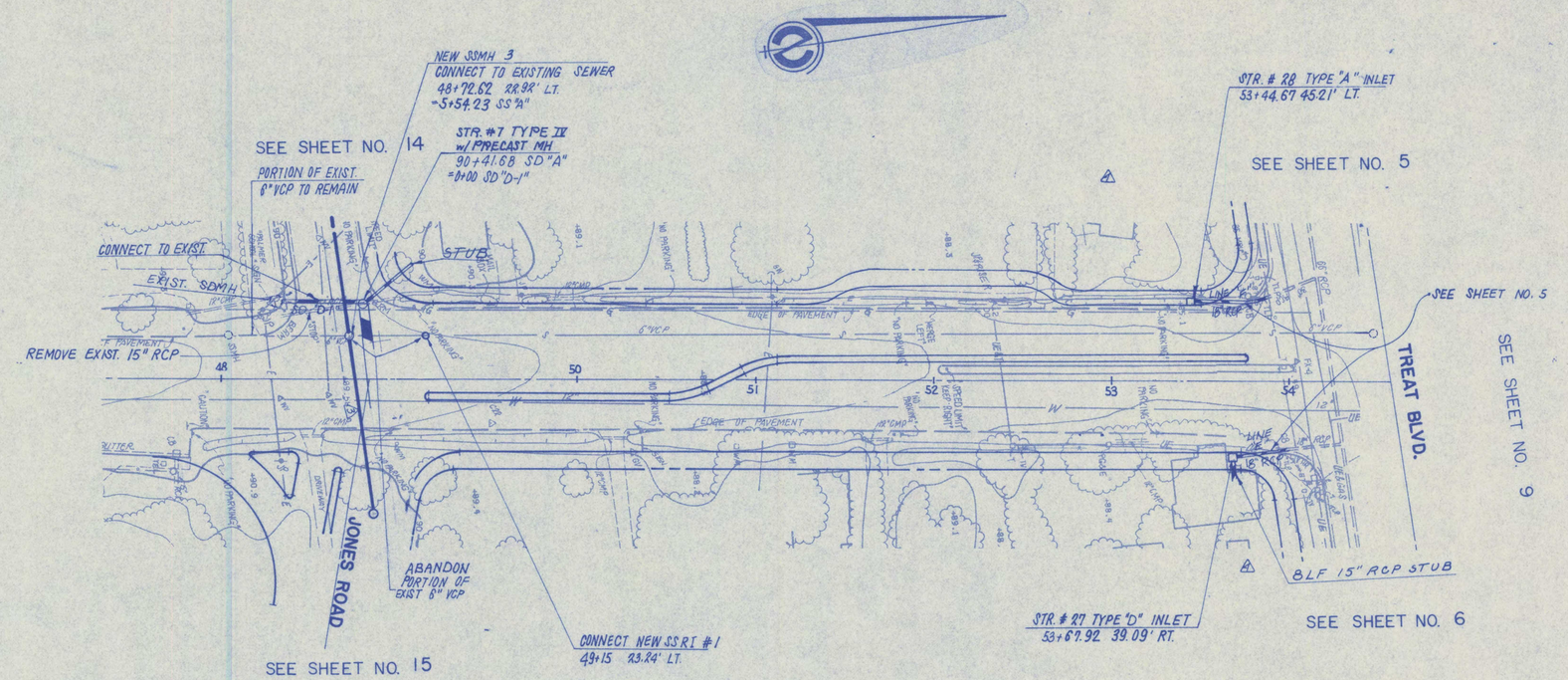
RDA 5548-85

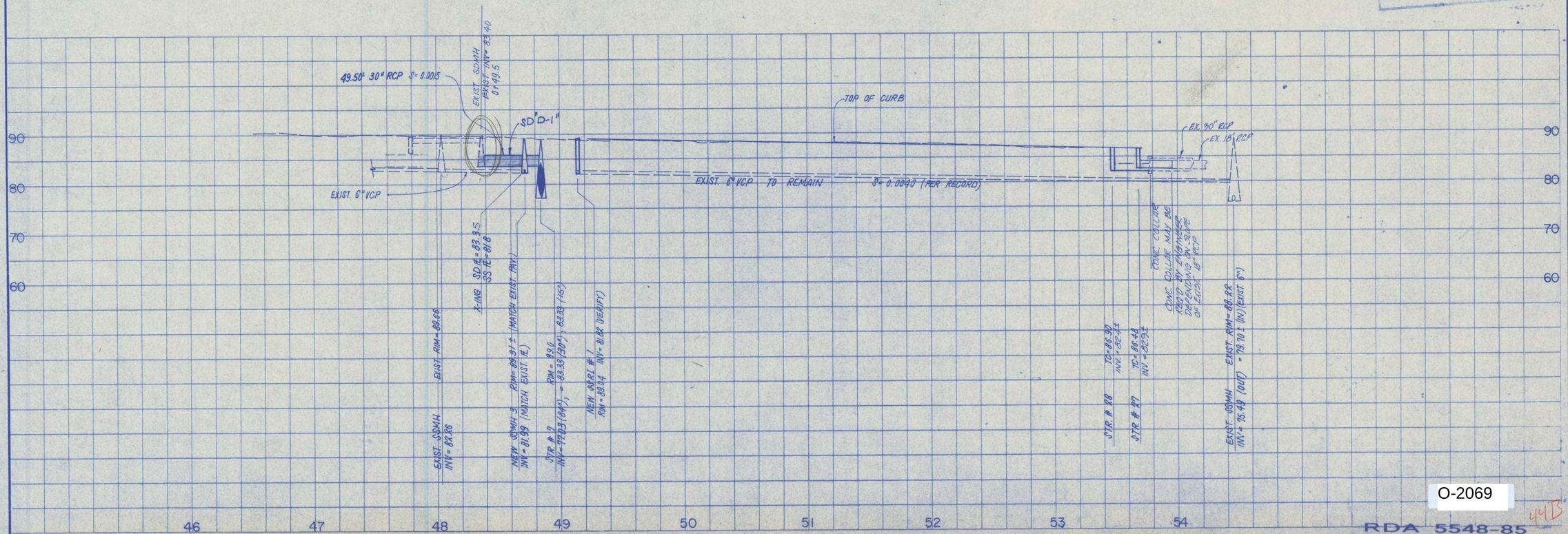
CCCSD 155B524 49B3

CONTRACT NO. 5547-1
DATE ACCEPTED 5/7/86
RECORD DRAWING
REVISIONS BY [illegible] DATE 12/29/87

Aliquot Associates, Inc.
CIVIL ENGINEERS · PLANNERS · SURVEYORS
3301 N. MAIN ST., SUITE B
PLEASANT HILL, CA. 94523
(415) 930-7078

NO.	BY	DATE
1	JJ	12-8-86
2	JJ	1-5-87
3	JJ	1-16-87
4	JJ	1-22-87
5	JJ	1-29-87
6	JJ	2-4-87
7	JJ	2-11-87
8	JJ	2-18-87
9	JJ	2-25-87
10	JJ	3-4-87
11	JJ	3-11-87
12	JJ	3-18-87
13	JJ	3-25-87
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15	JJ	4-8-87
16	JJ	4-15-87
17	JJ	4-22-87
18	JJ	4-29-87
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22	JJ	5-27-87
23	JJ	6-3-87
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25	JJ	6-17-87
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33	JJ	8-12-87
34	JJ	8-19-87
35	JJ	8-26-87
36	JJ	9-2-87
37	JJ	9-9-87
38	JJ	9-16-87
39	JJ	9-23-87
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463	JJ	11-8-95
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465	JJ	11-22-95
466	JJ	11-29-95
467	JJ	12-6-95
468	JJ	12-13-95
469	JJ	12-20-95
470	JJ	12-27-95
471	JJ	1-3-96
472	JJ	1-10-96
473	JJ	1-17-96
474	JJ	1-24-96
475	JJ	1-31-96
476	JJ	2-7-96
477	JJ	2-14-96
478	JJ	2-21-96
479	JJ	2-28-96
480	JJ	3-7-96
481	JJ	3-14-96
482	JJ	3-21-96
483	JJ	3-28-96
484	JJ	4-4-96
485	JJ	4-11-96
486	JJ	4-18-96
487	JJ	4-25-96
488	JJ	5-2-96
489	JJ	5-9-96
490	JJ	5-16-96
491	JJ	5-23-96
492	JJ	5-30-96
493	JJ	6-6-96
494	JJ	6-13-96
495	JJ	6-20-96
496	JJ	6-27-96
497	JJ	7-4-96
498	JJ	7-11-96
499	JJ	7-18-96
500	JJ	7-25-96
501	JJ	8-1-96
502	JJ	8-8-96
503	JJ	8-15-96
504	JJ	8-22-96
505	JJ	8-29-96
506	JJ	9-5-96
507	JJ	9-12-96
508	JJ	9-19-96
509	JJ	9-26-96
510	JJ	10-3-96
511	JJ	10-10-96
512	JJ	10-17-96
513	JJ	10-24-96
514	JJ	10-31-96
515	JJ	11-7-96
516	JJ	11-14-96
517	JJ	11-21-96
518	JJ	11-28-96
519	JJ	12-5-96
520	JJ	12-12-96
521	JJ	12-19-96
522	JJ	12-26-96
523	JJ	1-2-97
524	JJ	1-9-97
525	JJ	1-16-97
526	JJ	1-23-97
527	JJ	1-30-97
528	JJ	2-6-97
529	JJ	2-13-97
530	JJ	2-20-97
531	JJ	2-27-97
532	JJ	3-6-97
533	JJ	3-13-97
534	JJ	3-20-97
535	JJ	3-27-97
536	JJ	4-3-97
537	JJ	4-10-97
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554	JJ	8-7-97
555	JJ	8-14-97
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563	JJ	10-9-97
564	JJ	10-16-97
565	JJ	10-23-97
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569	JJ	11-20-97
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573	JJ	12-18-97
574	JJ	12-25-97
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577	JJ	1-15-98
578	JJ	1-22-98
579	JJ	1-29-98
580	JJ	2-5-98
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582	JJ	2-19-98
583	JJ	2-26-98
584	JJ	3-5-98
585	JJ	3-12-98
586	JJ	3-19-98
587	JJ	3-26-98
588	JJ	4-2-98
589	JJ	4-9-98
590	JJ	4-16-98
591	JJ	4-23-98
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593	JJ	5-7-98
594	JJ	5-14-98
595	JJ	5-21-98
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598	JJ	6-11-98
599	JJ	6-18-98
600	JJ	6-25-98
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602	JJ	7-9-98
603	JJ	7-16-98
604	JJ	7-23-98
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609	JJ	8-27-98
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615	JJ	10-8-98
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646	JJ	5-13-99
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659	JJ	8-12-99
660	JJ	8-19-99
661	JJ	8-26-99
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663	JJ	9-9-99
664	JJ	9-16-99
665	JJ	9-23-99
666	JJ	9-30-99
667	JJ	10-7-99
668	JJ	10-14-99
669	JJ	10-21-99
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673	JJ	11-18-99
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675	JJ	12-2-99
676	JJ	12-9-99
677	JJ	12-16-99
678	JJ	12-23-99
679	JJ	12-30-99
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681	JJ	1-13-00
682	JJ	1-20-00
683	JJ	1-27-00
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687	JJ	2-24-00
688	JJ	3-2-00
689	JJ	3-9-00
690	JJ	3-16-00
691	JJ	3-23-00
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693	JJ	4-6-00
694	JJ	4-13-00
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699	JJ	5-18-00
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705	JJ	6-29-00
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709	JJ	7-27-00
710	JJ	8-3-00
711	JJ	8-10-00
712	JJ	8-17-00
713	JJ	8-24-00
714	JJ	8-31-00
715	JJ	9-7-00
716	JJ	9-14-00
717	JJ	9-21-00
718	JJ	9-28-00
719	JJ	10-5-00
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721	JJ	10-19-00
722	JJ	10-26-00
723	JJ	11-2-00
724	JJ	11-9-00
725	JJ	11-16-00
726	JJ	11-23-00
727	JJ	11-30-00
728	JJ	12-7-00
729	JJ	12-14-00
730	JJ	12-21-00
731	JJ	12-28-00
732	JJ	1-4-01
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734	JJ	1-18-01
735	JJ	1-25-01
736	JJ	2-1-01
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738	JJ	2-15-01
739	JJ	2-22-01
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742	JJ	3-15-01
743	JJ	3-22-01
744	JJ	3-29-01
745	JJ	4-5-01
746	JJ	4-12-01
747	JJ	4-19-01
748	JJ	4-26-01
749	JJ	5-3-01
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752	JJ	5-24-01
753	JJ	5-31-01
754	JJ	6-7-01
755	JJ	6-14-01
756	JJ	6-21-01
757	JJ	6-28-01
758	JJ	7-5-01
759	JJ	7-12-01
760	JJ	7-19-01
761	JJ	7-26-01
762	JJ	8-2-01
763	JJ	8-9-01
764	JJ	8-16-01
765	JJ	8-23-01
766	JJ	8-30-01
767	JJ	9-6-01
768	JJ	9-13-01
769	JJ	9-20-01
770	JJ	9-27-01
771	JJ	10-4-01
772	JJ	10-11-01
773	JJ	10-18-01
774	JJ	10-25-01
775	JJ	11-1-01
776	JJ	11-8-01
777	JJ	11-15-01
778	JJ	11-22-01
779	JJ	11-29-01
780	JJ	12-6-01
781	JJ	12-13-01
782	JJ	12-20-01
783	JJ	12-27-01
784	JJ	1-3-02
785	JJ	1-10-02
786	JJ	1-17-02
787	JJ	1-24-02
788	JJ	1-31-02
789	JJ	2-7-02
790	JJ	2-14-02
791	JJ	2-21-02
792	JJ	2-28-02
793	JJ	3-7-02
794	JJ	3-14-02
795	JJ	3-21-02
796	JJ	3-28-02
797	JJ	4-4-02
798	JJ	4-11-02
799	JJ	4-18-02
800	JJ	4-25-02
801	JJ	5-2-02
802	JJ	5-9-02
803	JJ	5-16-02
804	JJ	5-23-02
805	JJ	5-30-02
806	JJ	6-6-02
807	JJ	6-13-02
808	JJ	6-20-02
809	JJ	6-27-02
810	JJ	7-4-02
811	JJ	7-11-02
812	JJ	7-18-02
813	JJ	7-25-02
814	JJ	8-1-02
815	JJ	8-8-02
816	JJ	8-15-02
817	JJ	8-22-02
818	JJ	8-29-02
819	JJ	9-5-02
820	JJ	9-12-02
821	JJ	9-19-02
822	JJ	9-26-02
823	JJ	10-3-02
824	JJ	10-10-02
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828	JJ	11-7-02
829	JJ	11-14-02
830	JJ	11-21-02
831	JJ	11-28-02
832	JJ	12-5-02
833	JJ	12-12-02
834	JJ	12-19-02
835	JJ	12-26-02
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837	JJ	1-9-03
838	JJ	1-16-03
839	JJ	1-23-03
840	JJ	1-30-03
841	JJ	2-6-03
842	JJ	2-13-03
843	JJ	2-20-03
844	JJ	2-27-03
845	JJ	3-6-03
846	JJ	3-13-03
847	JJ	3-20-03
848	JJ	3-27-03
849	JJ	4-3-03
850	JJ	4-10-03
851	JJ	4-17-03
852	JJ	4-24-03
853	JJ	5-1-03
854	JJ	5-8-03
855	JJ	5-15-03
856	JJ	5-22-03
857	JJ





O-2069

RDA 5548-85

44B

CONTRACT NO. 5547-1
DATE ACCEPTED 5/6/86
RECORD DRAWING
RESIDENT ENGINEER
REVISIONS BY WN DATE 12/28/89

NO.	BY	DATE
4	RCB	12-2-85
3	RC	12-4-85
2	RC	5-8-86
1	J.E.	5-8-86

AS BUILT PER CONSTR.
EXTEND 36" A"
ADD SDMH #1
ADDENDUM #1

Aliquot Associates, Inc.
CIVIL ENGINEERS · PLANNERS · SURVEYORS
3301 N. MAIN ST., SUITE B
PLEASANT HILL, CA. 94523
(415) 930-7078

IMPROVEMENT PLAN

OAK ROAD

START THRU TREAT BLVD.
UTILITIES PLAN & PROFILE

C.C.C.O. REDEVELOPMENT AGENCY
PLEASANT HILL B.A.R.T. STATION AREA
CONTRA COSTA COUNTY CALIFORNIA

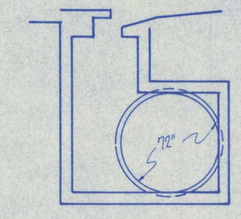
SCALE: H: 1"= 40' V: 1"= 10'
DATE: APRIL, 1984
DESIGN: G.B., J.R.E.
DRAWN: R.C., R.M.
ENG: J.R.E.
FB 10

REGISTERED PROFESSIONAL ENGINEER JAMES R. EMANUEL No. C31641 CIVIL STATE OF CALIFORNIA

JAMES R. EMANUEL
R.C.E. 31641

SHEET NO. 8
SHEET 8 OF 25 SHEETS
JOB NO. 8312.2

CCCSD I55LR524 49B3



STR. #16 TYPE "D" INLET
ON A MH BASE
N. T. S.

STR. #70 TYPE "D" INLET
TYPE IV MH BASE
56+11.38 49.65' LT
= 1+98.17 SD "C"

R= 215' Δ= 52°48'40" L= 198.17'

ABANDON EXIST. SEWER LINE

ABANDON EXIST. 72" RCP FROM STR.# 21 TO STR.# 16

STR. #16 SEE DET. THIS SHT.
58+02.33 44.21' LT. TO ℄ OF TYPE "D" INLET
= 0+00 SD "C"

REMOVE EXIST. CB

SEE SHEET NO. 5

SEE SHEET NO. 8

TREAT BLVD.

18" RCP

6" VCP

15" RCP STUB

72" RCP

SD "C"

EXIST. SSMH
0+00 SS "B"
= 54+76.77 ℄

EXIST. STR. #30 TO REMAIN
0+00 SD "J" = 56+55.61 64.71' RT.

SEE SHEET NO. 6

STR. #29 TYPE "D" INLET
0+16.24 SD "J"
= 56+46.52 51.25' RT.

STR. #36 TYPE "D" INLET
65+05.59 41.25' LT.
= 0+90.22 SD "L"

SEE SHEET NO. 12

SEE SHEET NO. 10

STUB
EXIST. SS RI

WAYNE

SD "L"

STR. # 37 TYPE "D" INLET
= 63+76.70 46.25' LT.
= 0+32.78 SD "M"

STR. # 33 TYPE IV MH BASE W/ PRECAST MH 64+09.45 44.97' LT. = 1+87.97 SD "M"

SEE SHT. 13

STUB 8 L.F
15" RCP S= 0.01

STR. # 68 TYPE "D" INLET TYPE IV MH BASE
63+78.70 53' RT @ ℄ PIPE
= 13+36.71 SD "B"

SD "15"

14+24.10 B.C.
SD "B"

ABANDON EXIST. 72" RCP @ EXIST. MH

R= 388' Δ= 4°38'30"
L= 31.43'

STR. # 69 TYPE IV MH BASE W/ TOP SLAB
CONNECT TO EXIST. PIPE
14+50 SD "B"
= 62+65.4 53' RT. ℄ PIPE

R= 388' L= 232.57'
Δ= 34°20'39"

STR. #23
EXIST. SDMH TO REMAIN
= 16+88.10 SD "B"
60+62.70 50.41' RT.

8.00' S= 0.005 15" RCP

16.24' S= 0.005 15" RCP
S.D. "J"

72" ALTERNATE PIPE
198.17' S= 0.0030
SD "C"

HGL = 81.5

EXISTING 72" RCP

TOP OF CURB

EXIST. 72" RCP

36" RCP 232.57' S= 0.0041 SD "B"

72" ALTERNATE PIPE
113.28' S= 0.0034

STUB 8 L.F.
15" RCP S= 0.01

INV = 76.35

32.78' 15" RCP S= 0.005

97.05' 30" RCP S= 0.005

SD "L"

STR. #70 TC= 85.27
INV = 77.31 (72") = 82.06 (15")

STR. #29 TC= 86.12
INV= 81.20

EXIST. STR. #30 NEW RIM= 86.3
INV= 77.37 (60") EXIST. HGL= 83.3
= 81.12 (15")

STR. #17 RIM= 85.9
INV= 77.12 (72" & 36"), 81.87 (15")

STR. #16 TC= 84.92
INV= 78.11 (VERIFY PRIOR TO CONSTRUCTION)
INV= 81.46 (15")

STUB 20 L.F. 15" RCP S= 0.01

INV= 81.68

STR. #69 RIM= 83.4
INV= 78.29 (72" BLF)
= 14.78 (72" IN.)
= 78.23 (36")
= 73.29 (15" STUB)

STR. # 37 TC= 81.02
INV= 76.27

STR. # 68 TC= 81.76
INV= 77.91 (72"), 77.40 (15")
HGL= 79.6

STR. # 33 RIM= 81.8
INV= 77.18 (30"), 78.11 (15")
HGL= 79.4

STR. # 36 TC= 82.41
INV= 77.37

53 56 57 58 59 60 61 62 63 64

90 80 70

CONTRACT NO. 55477
DATE ACCEPTED 5/6/86
RECORD DRAWING
RESIDENT ENGINEER
REVISIONS BY WN DATE 12/29/89

NO.	BY	DATE
A	RC	7.8.85
B	RC	6.7.85
C	RC	5.28.85
D	RC	4.4.85
1	JE	1.9.85

REV. RIM ELEV.
REV. SD "C"
MINOR STR. & MAIN ST.
REVISE SD "C" & "M"
ADDENDUM #1

Aliquot Associates, Inc.
CIVIL ENGINEERS · PLANNERS · SURVEYORS
3301 N. MAIN ST., SUITE B.
PLEASANT HILL, CA. 94523
(415) 930-7078

IMPROVEMENT PLAN

OAK ROAD

TREAT BLVD. THRU WAYNE DR.
UTILITIES PLAN & PROFILE
C.C.CO. REDEVELOPMENT AGENCY
PLEASANT HILL B.A.R.T. STATION AREA
CONTRA COSTA COUNTY CALIFORNIA

SCALE: H: 1"= 40' V: 1"= 10'
DATE: APRIL, 1984
DESIGN: G.B., J.R.E.
DRAWN: R.C., R.M.
ENG: J.R.E.
FB 10

REGISTERED PROFESSIONAL ENGINEER JAMES R. EMANUEL No. 31641 CIVIL STATE OF CALIFORNIA

JAMES R. EMANUEL
R.C.E. 31641

SHEET NO. 9
SHEET 9 OF 25 SHEETS
JOB NO. 8312.2

O-2069

448

RDA 5548-85

MATCH LINE
SEE SHEET NO. 12

STR. #33 TYPE II MH BASE w/ PRECAST MH
64+09.45 44.97' LT.
= 1+87.27 SD "L"
= 0+00 SD "M"

STR. # 37 TYPE "D" INLET 01+32.78 SD "M"

WAYNE DRIVE

STUB

SD "L"

SEE PROFILE ON SHT 9

STR. # 36 TYPE "D" INLET
65+05.59 41.25' LT.
= 0+90.22 SD "L"

EXIST. 8" SD TO REMAIN

SEE PROFILE ON SHEET 12

SD "B"

SEE SHEET NO. 9

SEE SHT. 13

SEE PROFILE ON SHT 13

STR. # 57 SEE SHT. 13

STR. # 68 SEE SHT. 9

EXPAND EX. 2'x2' CB

STR. # 14 TYPE IV MH BASE W/ PRECAST MH
12+16.42 SD "B" BC
= 0+00 SD "G-G" = 0+05.68 BEG. SD "L"
= 64+98.47 43' RT. @ ℄ PIPE

SD CURVE 72"
R=307' Δ=39°25'57"
L=211.29'

CONNECT EXIST. 8" RCP TO S.D. "B"

STR. # 61 TYPE "D" INLET
69+00 41.25' LT.
= 0+84.25 SD "Z"

SEE SHEET NO. 22

SD "Z"

STUB 8" LEC

SSTMH # 20 CONNECT TO EXIST. 6" VCP 4+71.49 "E"
69+20.93 25' RT.

SD CURVE 72"
R=393' Δ=7°14'24"
L=49.66'

STR. # 13 TYPE "D" INLET ON TYPE IV MH BASE
8+39.06 SD "B"
= 69+00 43' RT. @ ℄ OF PIPE
= 0+00 SD "Z"

EXIST SSMH
= 5+70.01 SS "E"

R=280' Δ=20°09'33"
L=98.52'

SS "E"

STR. # 17 TYPE "D" INLET
72+20.09 41.25' LT.
= 0+84.25 SD "S"

MATCH LINE
BC 72+20.21

ABANDON EXIST. 8" RCP

EXIST J.P. TO BE ABANDONED BY OTHERS

EXIST. SSMH TO ABANDON

REMOVE EXIST. CB and 22 L.F. 18" RCP

ABANDON EXIST. 18" RCP

SEE SHEET NO. 11

STR. # 12 4+90.58 SD "B"
72+20.09 43' RT. @ ℄ PIPE
@ INLET TYPE IV MH BASE W/ TYPE "D" INLET
= 0+00 SD "S"

EXIST 6" VCP TO BE ABANDONED

5+79.60 SD "B" BC

ABANDON EX. SSRI

CONTRACT NO. 5547-1
DATE ACCEPTED 5/6/86
RECORD DRAWING
RESIDENT ENGINEER Nathan Rogers
REVISIONS BY WN DATE 12/28/89

STR. #1 TC=60.43 ⏥
INV= 76.35 (18") ABL = 78.7
INV= 76.60 (15") ABL

STR. #13 TC=60.43 ⏥
INV=75.51 (18")

INV=76.68

STR. #1
INV= 76.35 (18")
INV= 76.60 (15")

STUB 8 L.F. 15" RCP S=0.01

SD "Z"
84 L.F. 18" RCP
S=0.01

STR. #13
INV= 75.51 (18")

STR. #1
INV= 76.02 (P.D. BY BULL)
INV= 70.03 (FLD BY BULL)

X-ING
SD
SS

T-6" RCP

SS "E"
98.52' 8" ABS-A
S=0.031

EXIST SSMH
INV= 72.82 (MLT)
INV= 72.73 (M)

SSTMH 20
INV= 69.11 (12")
69.36 (8")

STR. # 18
INV= 69.44 (12")
INV= 74.13 (15")
TC= 77.00

SSTMH 20
INV= 69.11 (12")
69.30 (8")

STR. #13
INV= 71.41 (72")
INV= 75.51 (18")
TC= 80.14

EXIST 6" VCP - SEWER
IE= 70.09 (6")
IE= 71.3 (12")

RIM= 80.2
70 VHSS "E"

STR. #17
INV= 75.03
TC= 77.90

SD "C"
84.25' 15" RCP
S=0.01

12" ABS-A

STR. #14
INV= 72.54 (12")
INV= 72.45 (30")
RIM= 82.4

STR. #36
INV= 75.97 (30")
INV= 76.02 (15")
TC= 82.40
HGL= 79.6

STR. #68
INV= 74.91 (12")
INV= 77.40 (18")
HGL= 78.6

JTP #12
INV= 69.44 (12")
INV= 74.19 (15")
TC= 77.90
= 74.19 (15" STUB)

72" ALTERNATE PIPE
115.98' S=0.0032

72" SPIRAL RIB PIPE 377.37' SD "B" S=0.0030

72" SPIRAL RIB PIPE 348.48 S=0.0057

12" ABS-A 47.49' S=0.0028
SS "E"

EXISTING GROUND @ ℄

TOP OF CURB

APPROXIMATE LOCATION OF EXISTING WATER and GAS LINE TO BE RELOCATED BY OTHERS

HGL=

90
80
70
60

64 65 66 67 68 69 70 71 72

RDA 5548-85

O-2069

443

CCCSD: I55IR524 4983

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PLEASANT HILL, CA. 94523
(415) 930-7078

NO.	BY	DATE
4	RCB	12/1/89
3	RC	10/31/85
2	RC	7/24/85
1	RC	6/7/85
5	RC	5/31/85
4	RC	5/15/85
3	RC	4/4/85
2	JRE	1/8/85
1	JRE	12/5/84

REV. SD "S" & "E", STA. & PROFILE
REV. TC ELEV.
ADD STUBS, ADJ STR. 13 & 12.
REV. SD "S"
ADD STR. 17, MOVED STR 13, 61, 53
ADDENDUM NO. 1

IMPROVEMENT PLAN

OAK ROAD

WAYNE DRIVE THRU BC 72+20.09
UTILITIES PLAN & PROFILE
CCCO. REDEVELOPMENT AGENCY
PLEASANT HILL B.A.R.T. STATION AREA
CONTRA COSTA COUNTY CALIFORNIA

SCALE: H:1"=40' V:1"=10'
DATE: APRIL, 1984
DESIGN: G.B., J.R.E.
DRAWN: R.C., R.M.
ENG: J.R.E.
FB 10

REGISTERED PROFESSIONAL ENGINEER JAMES R. EMANUEL No. C31641 CIVIL STATE OF CALIFORNIA

JAMES R. EMANUEL
R.C.E. 31641

SHEET NO. 10
SHEET 10 OF 25 SHEETS
JOB NO. 8312.2

SSTMH 17
6+11.06 SS I

SSTMH 18
6+36.27 SS "I"
= 0+00 SS "E"

R=325' Δ=29°37'29"
L=168.04'

R=307' Δ=40°05'33"
L=214.82'

SEE SHEET NO. 20

BUSKIRK AVE.

ABANDON EXIST. 8" VCP

ABANDON EXIST. CB and RCP

INSTALL "K" RAILS & DIVERT TRAFFIC DURING CONSTRUCTION

34 LF 72" RCP

SEE SHEET NO. 10

SPIRAL RIB

ABS-A

REMOVE 137.22' OF EXIST. SS "I" & ABANDON

REMOVE EXIST. 8" SSE & BASE PROPOSED

RELOCATE EXIST. WS FROM SSE LIMITS

SD CURVE @ ℄
R=600' L=49.84
Δ=4°45'34"

Δ 2+25.92 SD @ 8°

STR # 11 TYPE IV MH BASE w/ PRECAST MH 4'X 22' INSIDE
DIMENSIONS BUILT AROUND EXISTING TELEPHONE DUCT (LATER REMOVED)

CURB & GUTTER

APPROX. LOCATION OF EXIST. 8'×4' RCB

BOXES ABOVE GROUND

BASE TRANS. ON CONC. PAD

TEMPORARY RAMP OVER PIPE ON EXISTING NORTH BOUND LANES OF BUSKIRK AVE.

77+95.11 - 25.15 RT
= -(0+37.17) SD "B"
℄ 72" PROJECTED TO ℄ 8'×4' RCB
(VERIFY IN FIELD)

STR # 10
S.D. "B"
SEE DETAIL 7/24

MATCH LINE
BC 72+20.09

STR # 12
SEE SHT. 10

ABANDON EXIST. 18" RCP

REMOVE EX. FENCE, PUMPHOUSE & PUMP & APPURTENANCES. SEAL EX. 40'± WATER WELL PER STATE DEPT. OF WATER RESOURCES. RESTORE LANDSCAPING ON N. SIDE OF P.L.

REMOVE SSMH 12 & CONNECTING SAN SWRS.

EXIST. SSMH 12
7+73.49 SS "I"

7+76.99 SS "I"
PLUG EX. 8" OUT

APPROXIMATE LOCATION OF EXISTING WATER, GAS and TELEPHONE LINES TO BE RELOCATED BY OTHERS

EXIST. 8'×4' RCB

APPROX. EX. GROUND PROFILE

72" SPIRAL RIB 214.82' S=0.0015

72" SPIRAL RIB - 312.92' S=0.00197 Δ

471.49' 12" ABS-A S=0.0028
SS "E"

SD "B"

EXIST. 24" WATER LINE ACCOMODATE IN BASE OF STRUCTURE

72" 8" ABS-A @ S=0.0076
SS "I"

6+36.27 SS "I" SSTMH 18 RIM=79.3 INV=67.90 (8"Ø)

X-ING
INV 72"= 69.2
INV 8" = 69.9

137.22' SS "I" REMOVE SS "I" AND RELOCATE 137.22' FROM SSTMH 18 TO SSTMH 12 ALIGNMENT

7+73.49 SS "I" SSTMH 12 RIM=75.17
INV="68.85 (8") SSTMH 12 &
Δ REMOVE EX. CONNECTING SAN SWRS

7+76.99 SS "I" EX. MH RIM=75.85
PLUG EX. 8"OUT INV=68.88

STR # 12
INV=69.42

72"

SSTMH 18 RIM=79.2
INV=67.81 (8"Ø)
(8"Ø)

STR # 11
INV=69.12 (72") 69.37 (36")

RIM=79.5 Δ

STR # 10
INV=68.80 (72")
=69.30 EXIST. 8'×4' RCB
VERIFY PRIOR TO STAKE REQUEST

RIM=77.3 ±
HGL=72.7 ±

72 73 74 75 76 77 78 79

90 80 70 60

CONTRACT NO. 5547-1
DATE ACCEPTED 5/6/86
RECORD DRAWING
RESIDENT ENGINEER
REVISIONS BY JWN DATE 12/29/87

PROFESSIONAL ENGINEER JAMES R. EMANUEL No. C8648 CIVIL STATE OF CALIFORNIA REGISTERED

JAMES R. EMANUEL
R.C.E. 31641

NO.	BY	DATE
1		
2		
3		
4	JWS	5-14-86
5	RC	10-31-86
6	RC	2-3-87
7	RC	7-7-87
8	RC	12-29-87

4 105 12-8-86 AS BUILT PER COUNTY
5 WO 5-14-86 REV 3SS I" ON NEW ALIGNMENT
6 RC 10-31-86 REV SS "I" & E" AND ADD SSMH 12
7 RC 2-3-87 REV RIM ELEV
8 RC 7-7-87 REV 18" STUB TO 42" RCP
9 RC 12-29-87 REV SD "B" Beginning to Sta "11
10 RC 4-4-88 MINED = ℄ JTR 11, JSTMH 11, 19
11 1-25 10-88 ADDENDUM NO. 1

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IMPROVEMENT PLAN

OAK ROAD
BC 72+20.09 THRU END
UTILITIES PLAN & PROFILE

CCCO. REDEVELOPMENT AGENCY
PLEASANT HILL B.A.R.T. STATION AREA
CONTRA COSTA COUNTY CALIFORNIA

SCALE: H: 1"=40' V: 1"=10'
DATE: APRIL, 1984
DESIGN: G.B., J.R.E.
DRAWN: R.C., R.M.
ENG: J.R.E.
FB 10

SHEET NO. 11
SHEET 11 OF 25 SHEETS
JOB NO. 8312.2

O-2069

448

RDA 5548-85

SEE SHEET NO. 19

BUSKIRK AVE.

BY OTHERS

STUB

BY OTHERS

STR #34 TYPE "D" INLET
5+02.00 SD "L"
= 5+00 32.25' LT.

STR. # 36
SEE SHT. NO. 10

SEE SHEET NO. 10

STUB

SEE PROFILE ON SHT. 9

S.D. "L"

OAK ROAD

SEE SHT. 13

STR. # 37
SEE SHT. NO. 9

STR. # 14 TYPE IV MH BASE
W/ PRECAST MH
SEE SHT. NO. 10

S.D. "L"

STUB

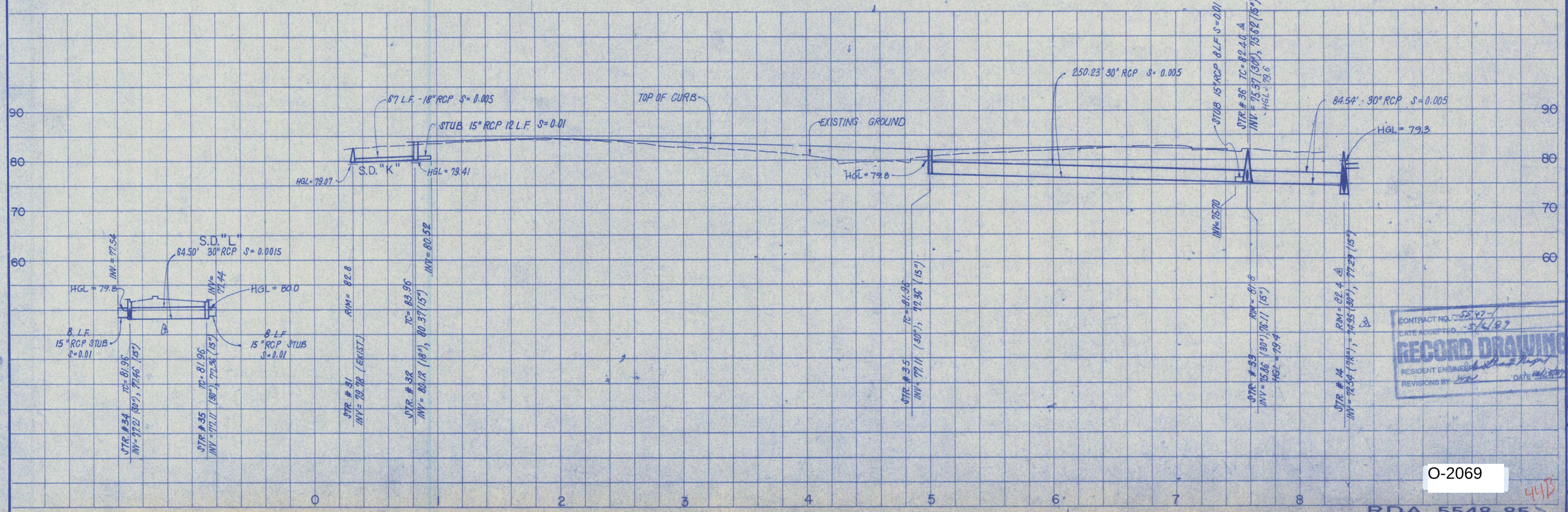
ABANDON EXIST.
WATER and GAS LINES
BY OTHERS

3+06.10 BC
SD "L"

SD CURVE
R = 966.75' Δ = 7°47'15"
L = 131.40'

SEE SHEET NO. 9
STR. # 33 TYPE II MH BASE
W/ PRECAST MH
64+09.45 44.97' LT.
= 1+87.27 SD "L"
= 0+00 SD "M"

STR. #35 TYPE "D" INLET ON
TYPE II MH BASE
= 4+37.50 SD "L"
= 5+00 32.25' RT.



CONTRACT NO. 5547-1
DATE ACCEPTED 5/6/87
RECORD DRAWING
RESIDENT ENGINEER
REVISIONS BY
DATE

JAMES R. EMANUEL
No. C36641
CIVIL
REGISTERED PROFESSIONAL ENGINEER
STATE OF CALIFORNIA

JAMES R. EMANUEL
R.C.E. 36641

O-2069

RDA 5548-85

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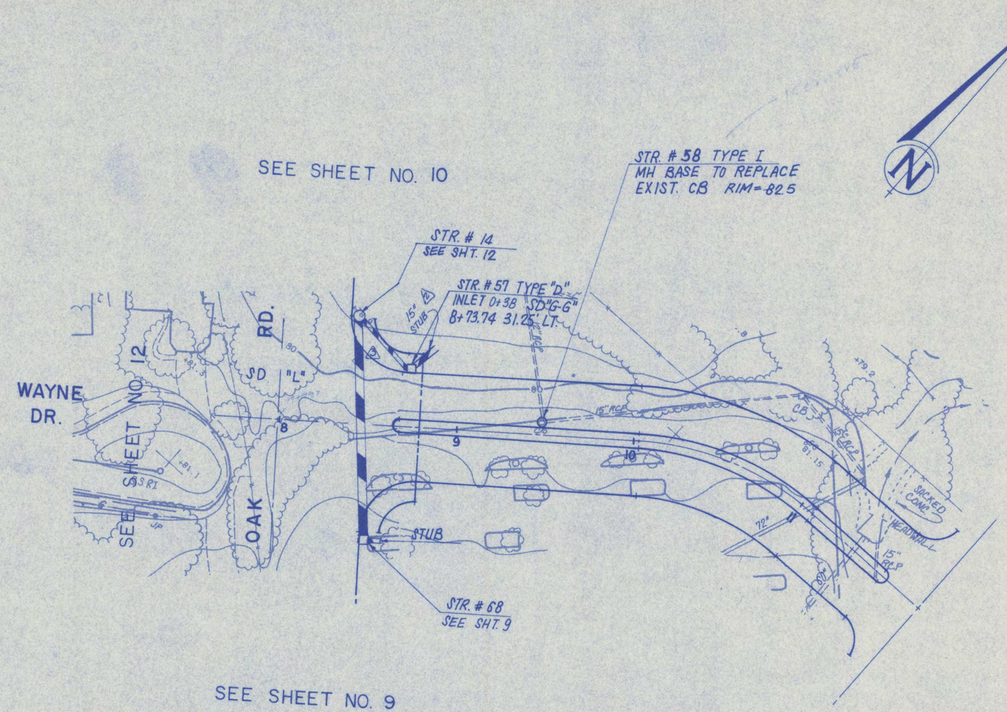
NO.	BY	DATE
1	RC	5/17/84
2	RC	4-4-85
3	JRE	10/8/86
4	RC	5/17/84
5	RC	5-02-85
6	RC	7-26-85
7	RC	9-23-85
8	JRE	11-8-85

IMPROVEMENT PLAN
WAYNE DRIVE
UTILITIES PLAN & PROFILE
C.C.C.O. REDEVELOPMENT AGENCY
PLEASANT HILL B.A.R.T. STATION AREA
CONTRA COSTA COUNTY CALIFORNIA

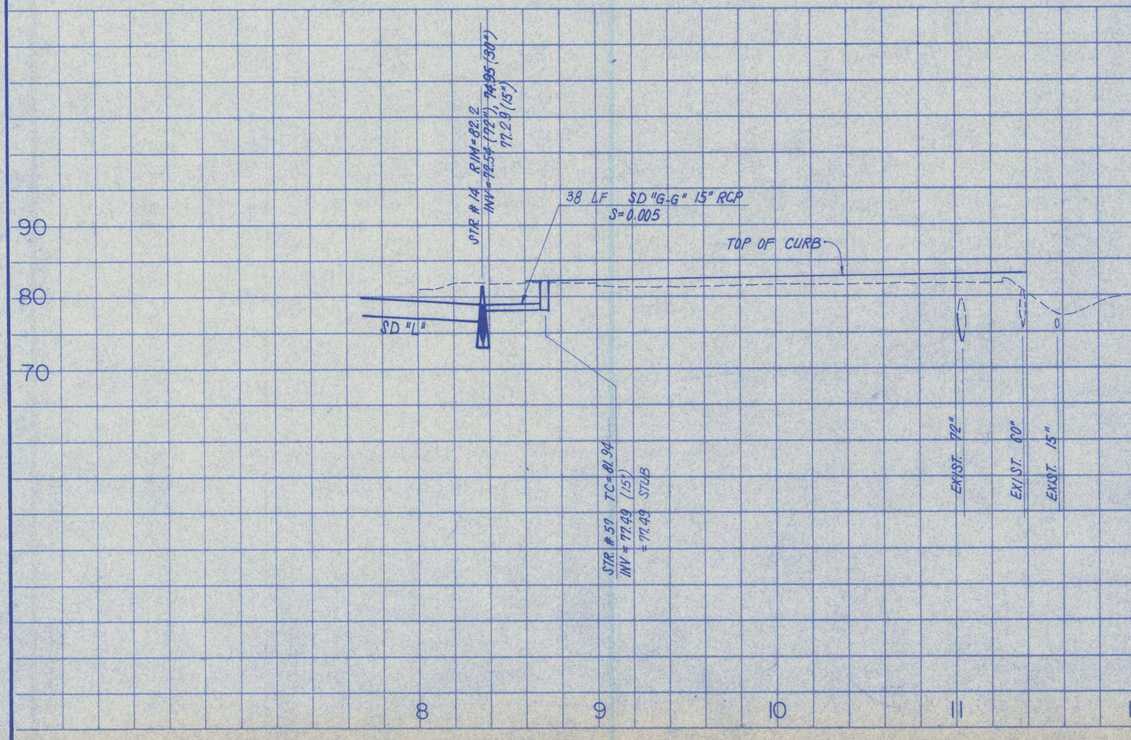
SCALE: H:1" = 40' V:1" = 10'
DATE: APRIL, 1984
DESIGN: G.B., J.R.E.
DRAWN: R.C., R.M.
ENG: J.R.E.
FB 10

SHEET NO. 12
SHEET 12 OF 25 SHEETS
JOB NO. 8312.2

SEE SHEET NO. 10



SEE SHEET NO. 9



CONTRACT NO. 5342-1
DATE ACCEPTED 5/6/86
RECORD DRAWING
RESIDENT ENGINEER
REVISIONS BY
DATE 12/29/87

O-2069

4413

RDA 5548-85

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(415) 930-7078

NO.	BY	DATE
1	JRE	7/18/85
2	RC	5/1/86
3	RCB	12/1/87

ADDED STUB ON STA 57
AS BUILT PER COUNTY

IMPROVEMENT PLAN

WAYNE DRIVE

OAK RD. THRU BART PARKING

C.C.C.O. REDEVELOPMENT AGENCY
PLEASANT HILL B.A.R.T. STATION AREA
CONTRA COSTA COUNTY CALIFORNIA

SCALE: H 1"=40' V 1"=10'
DATE: APRIL 84
DESIGN: JRE SB
DRAWN: RC
ENG: JRE
FB 10

JAMES R. EMANUEL
R.C.E. 31641

SHEET NO. 13
SHEET 13 OF 25 SHEETS
JOB NO. 8312.2

SEE SHEET NO. 8

STR. # 41
TYPE A INLET BASE
0+12.18 SD "R"

REMOVE PORTION OF EXIST. 18" TYPE SD

SD CURVE 84"
R=350' Δ=32°31'30"
L=210.30'

ABANDON EXIST. CB and SD (33 L.F.±)

24 L.F. 15" RCP STUB

ABANDON PORTION OF EX. 8" VCP

STR #7
TYPE IV MH BASE W/ PRECAST MH
=90+41.68 SD "A"

S.D. "A"

8" S.S. "A"

SEE SHEET NO. 15

STUB

CURB and GUTTER

CYCLONE CHAIN LINK FENCE

PALMER SCHOOL

CONNECT TO EXIST. MH

SEE SHEET NO. 8 FOR PROFILE

STR. # 9
TYPE IV MH BASE W/ TOP SLAB
95+36.00 SD "A"
CONNECT EXIST. 18" PIPE (SD)

STR. #8
93+25.10 SD "A"
TYPE IV MH BASE W/ TOP SLAB

ABANDON EXIST. 8" VC and SS R.I.

L=176.40' EC
SS "A"

OAK ROAD

NEW SSMH 3 CONNECT TO EXIST. SEWER LINE
5+54.23 SS "A"
=9+76.81 ℄

STR. #65
TYPE IV MH
96+28.76 EC
SD "A"
SEE DET. B/24

SS CURVE
R=280'
Δ=55°07'38"
L=269.40'
21.5 COUPLINGS @ 12'-6"

SSMH 2
0+07 SS "A"

SSMH 1
CONSTRUCT NEW SSTMH
ON EXIST. 18" RCP
0+00 SS "A"

NOTE:

PRIOR TO CONSTRUCTION, CONTRACTOR SHALL EXPOSE AND LOCATE EXISTING LATERALS. ENGINEER TO LOCATE NEW WYES PRIOR TO CONSTRUCTION OF NEW MAIN. PRIOR TO ABANDONMENT OF EXISTING MAIN, TEST AND CONNECT EXISTING LATERALS TO NEW MAIN.

38.26' 84" RCP/SPIRAL RIB S=0.0015

212.62' S=0.0096 84" RCP/SPIRAL RIB

54.49' 84" RCP/SPIRAL RIB S=0.0015

54.23' 8" ABS-A SS "A" S=0.0064

STUB 8 L.F. 12" RCP S=0.01

TOP OF CURB LEFT

EXISTING EP LEFT

STUB 24 L.F.-15" RCP S=0.01

HGL=84.3

148.85' 84" RCP/SPIRAL RIB

283.42' S=0.0015 84" RCP/SPIRAL RIB

EXIST. 18" RCP SS

S.D. "A"

SS "A"

S.D. "A"

EXIST. SSMH INV=80.18 (78"), 88.53 (18")
EXIST. SSMH INV=79.53 (THRU), RIM=90.03
EXIST. CB TC=88.65 INV=83.94

CONNECT EXIST. 18" SD LINE TO 84" C.P.

SSMH 2 RIM=89.8 INV=76.51

71 L.F. 8" ABS-A S=0.0064

SSMH 1 RIM=89.7 INV=77.63 (18") = 78.43 (8")

84" C.P. SD INV=79.52

X-ING SS INV=77.58

EXIST 18" RCP 59.2'

STR # 65 RIM=89.9 INV=79.64

SSMH 2 INV=76.51 RIM=89.8

STR # 9 RIM=89.8 INV=79.53 (THRU), 88.53 (18")

STR # 8 RIM=89.4 INV=83.77 (18")

EXIST. SSMH SEE PROFILE AT LEFT

STR # 8 RIM=89.9 INV=77.46 (84"), = 82.96 (18")

STR # 7 RIM=89.9 INV=77.03 (84") = 83.33 (30") = 83.33 (15")

NEW SSMH 3 5+54.23 INV=88.82± (MATCH EXIST. ℄) RIM=89.3 EXPOSED 4' VERTICAL

STR # 8 RIM=89.9 INV=77.46 (84"), = 82.96 (18")

STR # 41 TC=88.8 INV=83.08

18" RCP S=0.01 12.18' SD "R"

CONTRACT NO. 5547-1
DATE ACCEPTED 3/6/84
RECORD DRAWING
RESIDENT ENGINEER
REVISIONS BY DATE 12/28/87

O-2069

RDA 5548-85

CCCSD 1551B524 4953

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NO.	BY	DATE
4	RCE	4/4/85
3	RC	5/20/85
2	RC	5/20/85
1	JRE	7/9/85

AS BUILT PER COUNTY REV. SD "A" REV. SD "R" ADDENDUM # 1 ADD STR # 41 & SD "R" ADD STR #42

IMPROVEMENT PLAN

JONES ROAD
START THRU OAK ROAD
UTILITIES PLAN & PROFILE
C.C.CO. REDEVELOPMENT AGENCY
PLEASANT HILL B.A.R.T. STATION AREA
CONTRA COSTA COUNTY CALIFORNIA

SCALE: H: 1"=40' V: 1"=10'
DATE: APRIL, 1984
DESIGN: G.B., J.R.E.
DRAWN: R.C., R.M.
ENG: J.R.E.
FB 10

REGISTERED PROFESSIONAL ENGINEER JAMES R. EMANUEL No. 31641 CIVIL STATE OF CALIFORNIA

JAMES R. EMANUEL
R.C.E. 31641

SHEET NO. 14
SHEET 14 OF 26 SHEETS
JOB NO. 8312.2

SEE SHEET NO. 8

STR. # 7

SEE SHEET NO. 14

OAK ROAD

S.D. "A"

8" S.S. "A"

S.D. "D-1"

SSMH 3
48+72.62 OAK RD.
22.92 LT. =
5+54.23 SS "A"

SSMH # 27
6+54.23 SS "A"
10+86 15' LT.

TYPE IV MH BASE
STR. # 6 TYPE "A" INLET
88+92.83 BC SD "A"
"11+14.63 31.25' LT. @ ℄ PIPE
= 0+00 SD "D"

SD CURVE
R= 286.25
Δ= 17°20'54"
L= 86.67'

STUB 8 L.F. 15" RCP
S=0.01 INV= 82.64 @ END

DWY

87+67.22 PC EC SD "A"

86+80.53 BC
SD "A"

S.D. "D"

S.D. "A"

STR. # 14
TYPE IV MH BASE

MATCH LINE
16+00

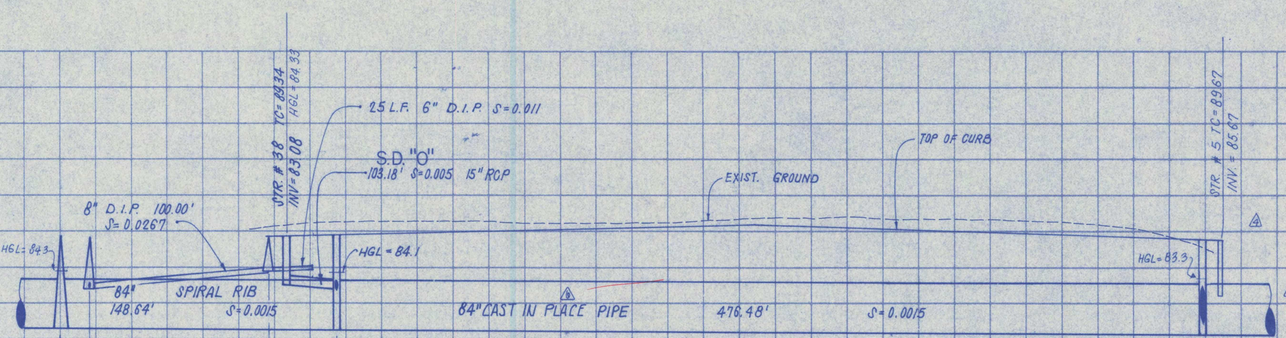
SEE SHEET NO. 16

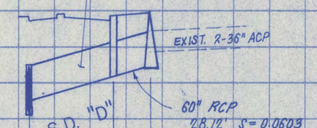
STR. # 5 TYPE 'A" INLET
16+10 28.67' LT.

STR. # 73 TYPE "D" INLET ON
TYPE IV MH BASE
15+99.41 15.67' RT. @ ℄ INLET
= 0+97 SD "D"

CONSTRUCT STR. #19
0+67.54 SD "D"
" 15+99.41 43.79' RT. @ ℄ PIPE
TYPE III MH
BASE W/ TOP SLAB
CONNECT EXIST 2-36" ACP
TO STR. # 19

STR. # 38 TYPE "D" INLET
10+86.18 67.91' RT.
= 1+03.18 SD "D"





CONTRACT NO. 5547-1
DATE ACCEPTED 5/6/86
RECORD DRAWING
RESIDENT ENGINEER
REVISIONS BY DATE

JAMES R. EMANUEL
No. C31491
CIVIL
REGISTERED PROFESSIONAL ENGINEER
STATE OF CALIFORNIA

JAMES R. EMANUEL
R.C.E. 31641

O-2069

448

RDA 5548-85

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PLEASANT HILL, CA. 94523
(415) 930-7079

NO.	BY	DATE	
7	RCG	10-2-85	AS BUILT PER COUNTY
6	JRE	1/16/85	"AS BUILT" REVISIONS
5	RC	11-9-84	EXTEND SS "A"
4	RC	9-14-84	REVISE STR. 5, PLAN & PROFILE
3	RC	8-1-84	REV. STR. 73 & "D" "D" PROFILE
2	JRE	6-15-84	ADD STR. 74 & 38, STR. 19
1	JRE	4-19-84	ADDENDUM # 2

IMPROVEMENT PLAN

JONES ROAD.
OAK ROAD THRU STA. 16+00
UTILITIES PLAN & PROFILE

C.C.C.O. REDEVELOPMENT AGENCY
PLEASANT HILL B.A.R.T. STATION AREA
CONTRA COSTA COUNTY CALIFORNIA

SCALE: H:1" = 40' V:1" = 10'
DATE: APRIL, 1984
DESIGN: G.B., J.R.E.
DRAWN: R.C.
ENG: J.R.E.
FB 10

SHEET NO. 15
SHEET 15 OF 25 SHEETS
JOB NO. 8312.2

CONSTRUCT STR. 19
0+87.54 SD "D"
= 15+99.41 43.79' RT.
TYPE III MH BASE
w/ PRECAST MH

SEE SHEET NO. 15

STR # 74
SEE SHT. 15

S.D. "D"

MATCH LINE
STA 16+00

STUB STR # 5

SD CURVE DATA
R=140' Δ=82°11'08"
L=200.82'

STR. # 73
(SEE SHT. 15)

81+54.18 BC
SD "A"

CONSTRUCTION EASEMENT
(SEE NOTE ON SHT. 18)

POWER POLES (3)
TO REMAIN

SEE SHEET NO. 6

STR # 39 TYPE "D" INLET
22+44.38 33.25' LT.
0+69.19 SD "P"

STR # 4 B'S. OF B.S.W.
RIM = 88.7
INV = 75.03 (84")

TREAT BLVD.

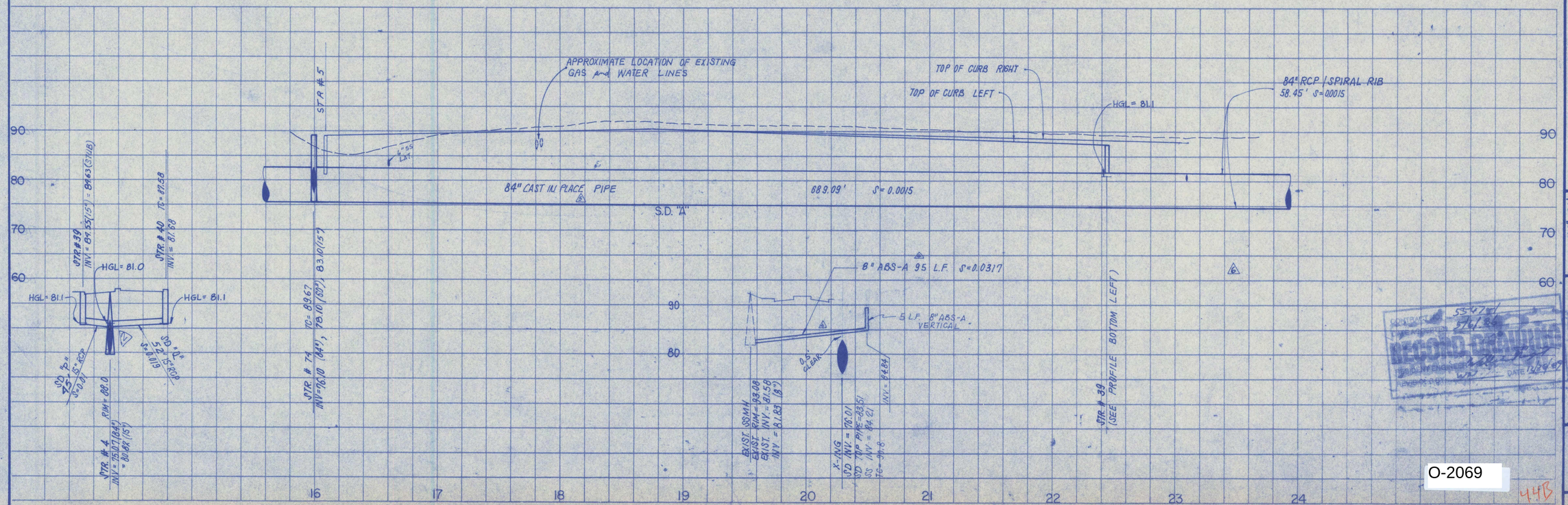
SEE SHEET NO. 17

STORM DRAIN
EASEMENT

STR # 4
23+37.16 15' LT.
= 77+00.00 SD "A"
= 0+00 SD "Q"
TYPE IV MH BASE
w/ PRECAST MH

STR # 40
23+09.90 30.25' RT.
= 0+45.25 SD "Q"
TYPE "A" INLET

SEE SHEET NO. 7



RECORD DRAWING
DATE 1/20/87

O-2069

448

NO.	BY	DATE
6	RCB	12/1/89
5	PG	10/2/89
4	RC	6-28-89
3	RC	5-24-89
2	RC	5/15/89
1	JRE	1/20/89

AS BUILT PER COUNTY
"AS BUILT" REVISIONS
ADD SS LAT. W/ JONES RD
ADD STUB W/ STA 5+9
REVISE SD "D" PROFILE & SIZE

Aliquot Associates, Inc.
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3301 N. MAIN ST., SUITE B
PLEASANT HILL, CA. 94523
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IMPROVEMENT PLAN

JONES ROAD

16+00 THRU TREAT BLVD.
UTILITIES PLAN & PROFILE
C.C.C.O. REDEVELOPMENT AGENCY
PLEASANT HILL B.A.R.T. STATION AREA
CONTRA COSTA COUNTY CALIFORNIA

SCALE: H: 1" = 40'
V: 1" = 10'
DATE: APRIL, 1984
DESIGN: G.B., J.R.E.
DRAWN: R.C., R.M.
ENG: J.R.E.
FB 10

JAMES R. EMANUEL
R.C.E. 31641

SHEET NO. 16
SHEET 16 OF 25 SHEETS
JOB NO. 8312.2

SEE SHEET NO. 6

SEE SHEET NO. 16

STR # 72 TYPE IV MH BASE W/ PRECAST MH 75+56 SD "A"

SSTMH 12 14+03.25 SS "F"

STR # 39 TYPE 'D' INLET

JONES ROAD

STR # 9 TYPE II MH BASE W/ TOP SLAB

STR # 40 TYPE 'A' INLET

SD "A" 74+92.10 BC

R=400' Δ=12°50'19" L=89.63 SD "A"

S. P. 100' SPRR R/W R. R.

SS "F"

DEL HOMBRE LANE

TREAT BLVD.

SSTMH 11 13+70.25 SS "F" = 24+84.22 25' RT. "JONES"

CONSTRUCTION EASEMENT (STORM DRAIN) (SEE NOTE ON SHEET 18)

CONSTRUCT NEW STR #2 TYPE IV MH BASE w/PRECAST MH ON EXIST. 15" SD LINE (VERIFY LOC.) 71+36 ± SD "A" 29+11 "JONES" 9.5' RT.

STR # 20 TYPE I MH BASE CONNECT TO EXIST. 15" RCP 0+00 SD "H"

R= 85' Δ= 53°46'39" L= 79.78'

SEE PROFILE ON SHT. 18

A&F 15" RCP S=0.01

SD "H"

REMOVE EXIST. 15" RCP TO STR. 22

15' SANITARY SEWER EASEMENT

215' SAN. SEWER CONSTRUCTION EASEMENT

SSTMH 10 9+40.25 SS "F" 29+17.51 29.5' RT.

MATCH LINE STA. 68+82 I.E. SHEET NO. 18

SEE SHT. 18

EXIST. WATER LINE

EXISTING GROUND

HGL+81.0

36" LINER PLATE S=0.0015 150'

84" SPIRAL RIB PIPE 151.94' S=0.0022

293.79' S=0.0011 S.D "A"

84" SPIRAL RIB PIPE- 573.19' S=0.0011

21" PVC 430.00' S=0.00095 SS "F"

21" PVC 430.00' S=0.00095 SS "F"

STR # 4 RIM= 88.5 INV= 75.03(84") = 80.82 (15")

SSTMH 11 RIM= 88.2 INV= 72.61 (W), 72.52 (OUT)

STR # 12 RIM= 88.2 INV= 74.85

74+23.79 G.B. SD "A" INV= 74.44 (84")

STR # 8 RIM= 85.8 INV= 74.11 (84") 80.49 (EXIST. 15")

SSTMH 10 RIM= 86.4 INV= 76.11

80 70 60

77 76 75 74 73 72 71 70 69

RDA 5548-85

O-2069

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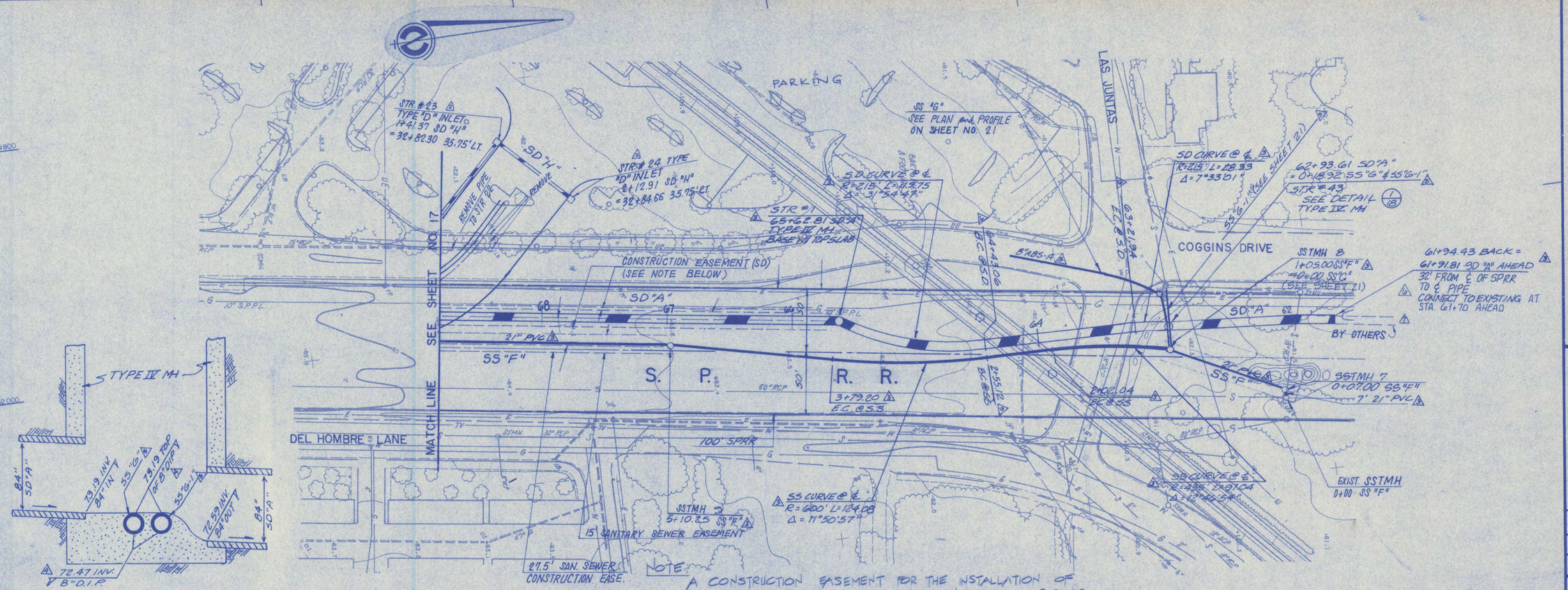
NO.	BY	DATE
7	KJB	12-2-85 AS BUILT PER COUNTY
6	PG	1/30/85 "AS BUILT" REVISIONS
5	EGB	9-25-85 REV. SD "A", SS "F"
4	RC	6-7-85 REV. SD "A" PROFILE
3	RC	4-3-85 REMOVE STR 15 & 18
2	RC	4-4-85 MOVED STR 22, REV. PROFILE 10'+/-
1	JRE	1-28-85 ADDENDUM # 1

IMPROVEMENT PLAN
STORM DRAIN & SANITARY SEWER PLAN & PROFILE
C.C.CO. REDEVELOPMENT AGENCY
PLEASANT HILL B.A.R.T. STATION AREA
CONTRA COSTA COUNTY CALIFORNIA

SCALE: H: 1" = 40' V: 1" = 10'
DATE: APRIL, 1984
DESIGN: G.B., J.R.E.
DRAWN: R.C.
ENG: J.R.E.
FB 10

JAMES R. EMANUEL R.C.E. 31641

SHEET NO. 17
SHEET 17 OF 25 SHEETS
JOB NO. 8312.2



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(415) 930-7078

NO.	BY	DATE
7	RDS	11-21-89
6	PG	1/30/89
5	EGB	10/6/86
4	EGB	12/2/85
3	AEB	9/25/85
2	RC	4-4-85
1	JREI	1/8/85

AS BUILT PER COUNTY
AS BUILT REVISIONS
Elev. 55'F", 15", 36'-4" Cor. 1
Elev. 55'S, 16" # 1 Detail 1
Elev. 50'A", 55'F", 55'G"
ADD DIR 83, 84
ADDENDUM #1

IMPROVEMENT PLAN
STORM DRAIN & SANITARY SEWER PLAN & PROFILE

C.C.C.O. REDEVELOPMENT AGENCY
PLEASANT HILL B.A.R.T. STATION AREA
CONTRA COSTA COUNTY CALIFORNIA

SCALE: H:1" = 40' V:1" = 10'
DATE: APRIL, 1984
DESIGN: G.B., J.R.E.
DRAWN: R.C.
ENG: J.R.E.
FB 10

CONTRACT NO. 5347-1
DATE ACCEPTED 5/16/90
RECORD DRAWING
RESIDENT ENGINEER
REVISIONS BY DATE 12/28/89

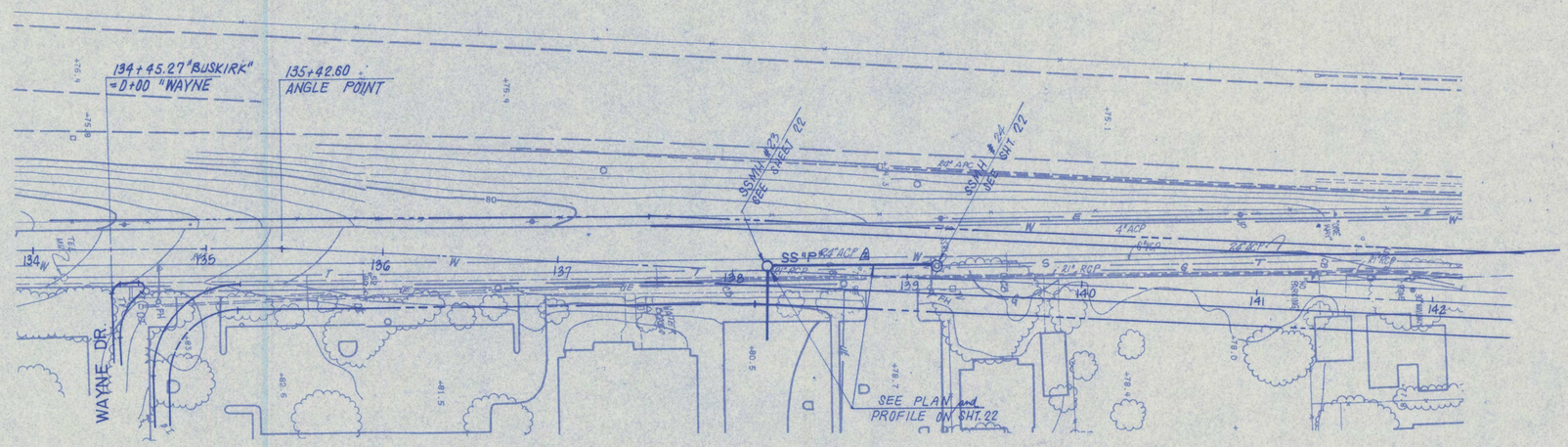
REGISTERED ENGINEER JAMES R. EMANUEL No. C13641 CIVIL STATE OF CALIFORNIA
JAMES R. EMANUEL R.C.E. 36641

SHEET NO. 18
SHEET 18 OF 26 SHEETS
JOB NO. 8312.2

O-2069

RDA 5548-85

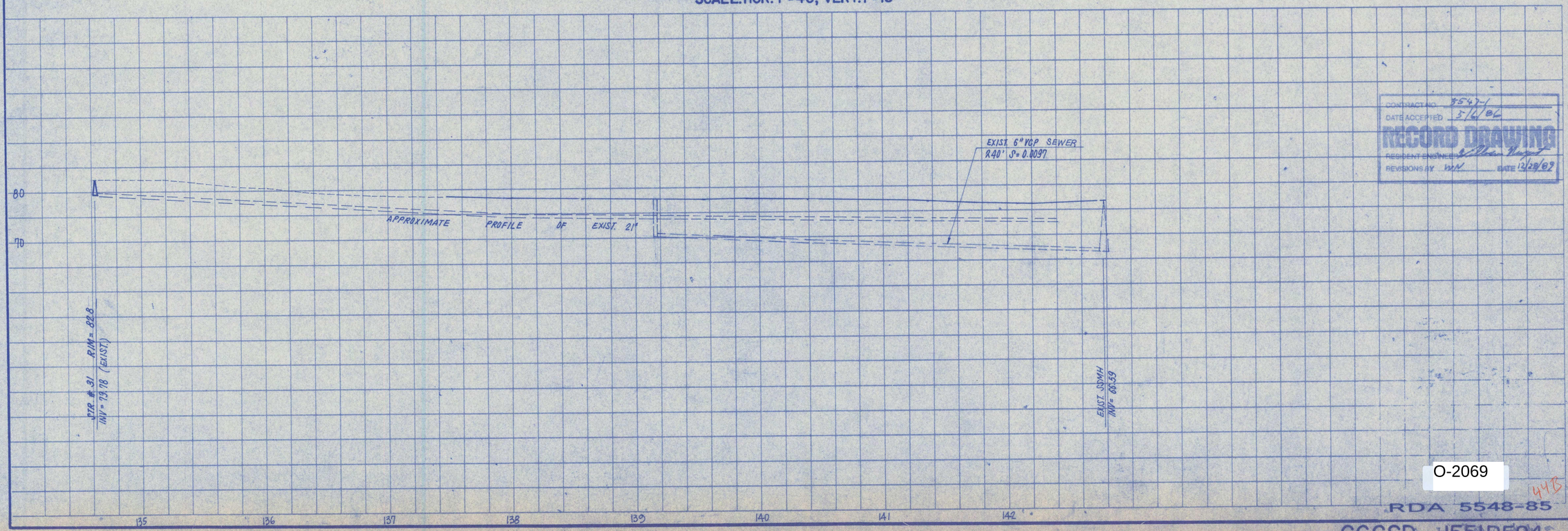
CCCSD I55IR524 49R3



SEE SHEET NO. 12

BUSKIRK AVE.

SCALE: HOR. 1"=40', VERT. 1"=10



CONTRACT NO. 5547-1
DATE ACCEPTED 5/6/82
RECORD DRAWING
RESIDENT ENGINEER
REVISIONS BY MW DATE 12/29/82

O-2069

RDA 5548-85

448

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NO.	BY	DATE
1	R.C.	7/1/83
		ADDENDUM #1

IMPROVEMENT PLAN

BUSKIRK AVE.

WAYNE DR. THRU STA 142.02.36 PRC
UTILITIES PLAN & PROFILE
C.C.CO. REDEVELOPMENT AGENCY
PLEASANT HILL B.A.R.T. STATION AREA
CONTRA COSTA COUNTY CALIFORNIA

SCALE: H: 1"=40' V: 1"=10'
DATE: APRIL, 1984
DESIGN: G.B., J.R.E.
DRAWN: R.C., R.M.
ENG: J.R.E.
FB 10

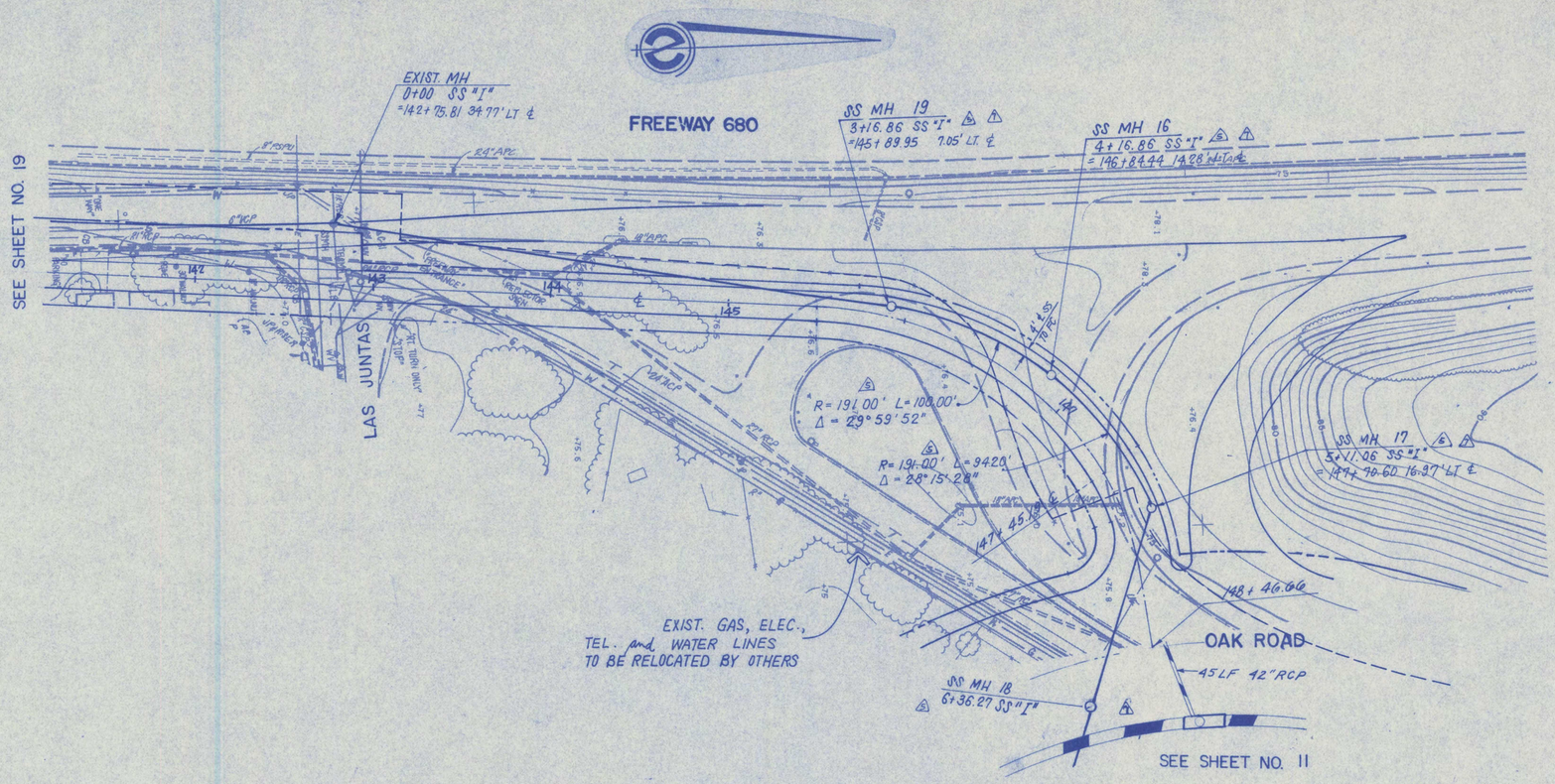
PROFESSIONAL ENGINEER · JAMES R. EMANUEL · No. C31641 · CIVIL · STATE OF CALIFORNIA

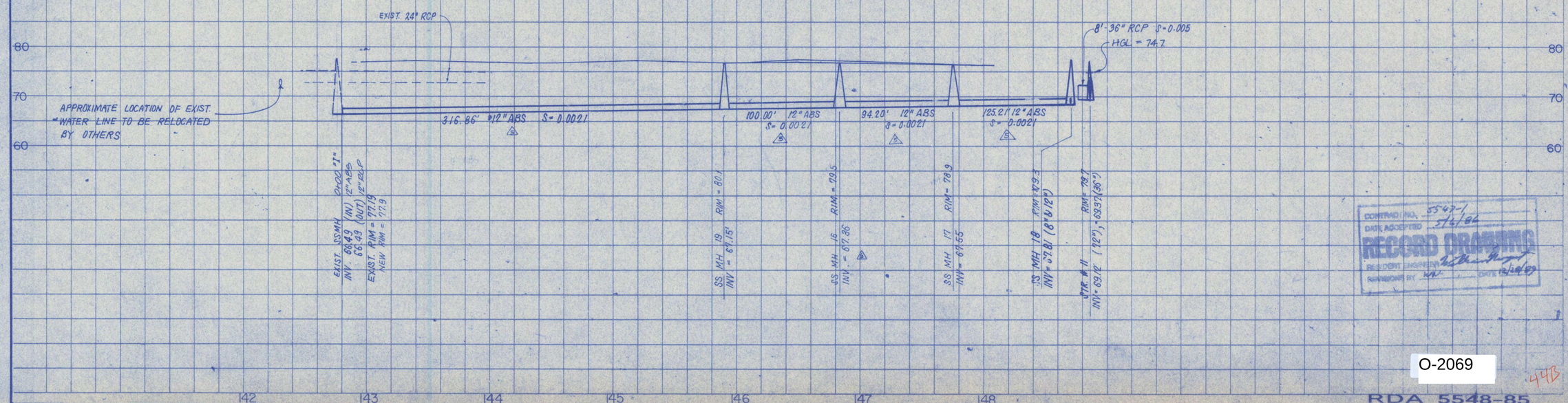
JAMES R. EMANUEL
R.C.E. 31641

SHEET NO.
19
SHEET 19 OF 25 SHEETS

JOB NO. 8312.2

CCCSD 455[R52]-49R3





CONTRACT NO. 5547-1
DATE ACCEPTED 5/6/86
RECORD DRAWING
RESIDENT ENGINEER
REVISIONS BY DATE 12/16/87

O-2069

448

RDA 5548-85

CCCSD 155IB524 49B3

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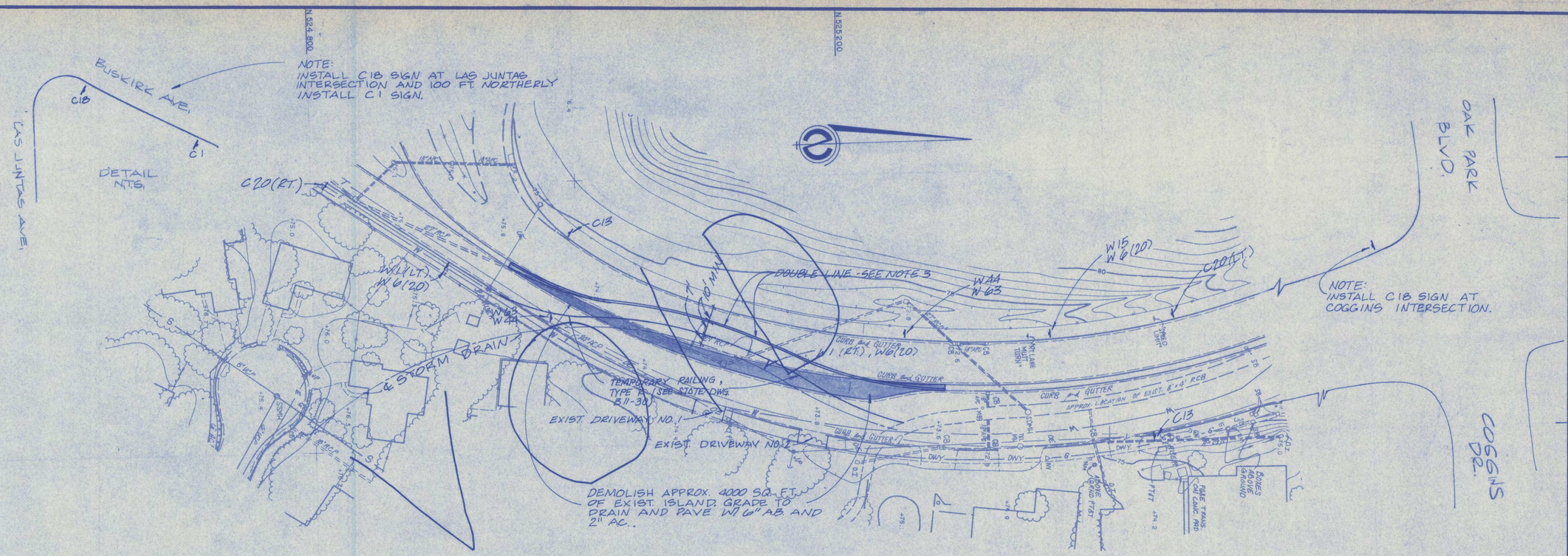
NO.	BY	DATE
7	KCR	6-21-89	AS BUILT PER COMMENTS
6	PG	10-31-88	AS BUILT REVISIONS
5	RC	10-21-88	REV SS "1" PLAN and PROFILE
4	RC	7-8-88	REV RIM ELEV.
3	RC	2-1-88	REV. INVS IN STR 11
2	RC	12-4-87	ADDS SS "1"
1	RC	11-6-87	ADDENDUM NO. 1

IMPROVEMENT PLAN
BUSKIRK AVE.
UTILITIES PLAN & PROFILE
C.C.C.O. REDEVELOPMENT AGENCY
PLEASANT HILL B.A.R.T. STATION AREA
CONTRA COSTA COUNTY CALIFORNIA

SCALE: H: 1" = 40'
V: 1" = 10'
DATE: APRIL, 1984
DESIGN: G.B.; J.R.E.
DRAWN: R.C., J.R.M.
ENG: J.R.E.
FB 10

JAMES R. EMANUEL
R.C.E. 36641

SHEET NO. 20
SHEET 20 OF 25 SHEETS
JOB NO. 8312.2



NOTES:
1. PHASE WORK AS REQUIRED TO PROVIDE CONTINUOUS ACCESS TO EXISTING DRIVEWAYS NO. 1 AND/OR NO. 2.
2. TRAFFIC WARNING AND DELINEATION SYSTEMS SHALL BE CONTINUOUSLY MAINTAINED.
3. REFER TO COUNTY ISSUED "MANUAL OF WARNING SIGNS, LIGHTS AND DEVICES FOR USE IN PERFORMANCE OF WORK UPON COUNTY HIGHWAYS" FOR DETAILS RELATED TO ROAD CLOSURE WITH CONSTRUCTED DETOUR ROUTE.

CONTRACT NO. 31-82
DATE ACCEPTED 5/6/86
RECORD DRAWING
REVISIONS BY WW DATE 6/6/86

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NO.	BY	DATE
1	JE	1-8-85

ADDENDUM #1

DETOUR PLAN

BUSKIRK AVE.

C.C.CO. REDEVELOPMENT AGENCY
PLEASANT HILL B.A.R.T. STATION AREA
CONTRA COSTA COUNTY CALIFORNIA

SCALE: AS NOTED
DATE: APRIL 1984
DESIGN: GB, J.R.E.
DRAWN: R.C.
ENG: J.R.E.
FB 10

REGISTERED PROFESSIONAL ENGINEER JAMES R. EMANUEL No. 13641 CIVIL STATE OF CALIFORNIA

JAMES R. EMANUEL
R.C.E. 31641

SHEET NO. 25
SHEET 25 OF 25 SHEETS
JOB NO. 8312.2

SCAN DATE: 6/2009
Please duplicate and submit any markups to this plan sheet. See instructions.

O-2069

44 B

RDA 5548.85

BUSKIRK AVE.

WAYNE DRIVE

WAYNE COURT

SSMH #24 1+00.01 4"P"

8" 24" VCP SS "P" W

EXIST. 6" VCP TO REMAIN S= 0.0097

EXIST. SSMH TO REMAIN 0+00 SS "B"

EXIST. WATER LINE TO BE RELOCATED BY OTHERS

EXIST. 6" VCP TO REMAIN

EXIST. SSMH TO REMAIN

EXIST. 8" VCP

SSMH #23 EXPOSE PRIOR TO REPLACE W/ MH 1+00 SS "P" VERIFY INV. PRIOR TO STAKING SEWER EXIST. SS R.I.

SSMH #25 3+76.5 SS "Q" 0+00 SS "P" VERIFY INV. PRIOR TO STAKING SEWER EXPOSE and

EXIST LAT. TO REMAIN

ABANDON EXIST. LATERAL

R=103' Δ=22°30'38" L=41.25' 3-12"-6" 3° LOOSE COUPLING

3+58.90 EL

PLUG 4+15.27

ABANDON EXIST. SSMH'S and 6" VCP

EXIST. GROUND

EXIST. 21" RCP

100.01' S= 0.0077 8" ABS-A

SSMH #24 INV= 72.85 (OUT) RIM= 81.41 INV= 74.10 (IN)

SSMH #23 RIM= 91.8 INV= 80.08

EXIST. GROUND

217.64' 8" ABS-A S= 0.0077

97.62' 8" ABS-A S= 0.0077

SSMH #24 RIM= 78.1 INV= 70.06 (OUT) INV= 74.11 (IN)

SSMH #25 RIM= 81.0 INV= 72.75 (OUT) INV= 73.03 (IN)

AUG 47.6E SS "P" INV= 78.53

EXIST. GROUND

148.10 L.F. 8" ABS-A S=0.015

1+47 SS "Q" SSMH #26 RIM=81.43 INV=75.24 EXPOSE & VERIFY PRIOR TO STAKING

ADD SS "Q" SSMH #25 RIM=81.07 INV=73.03 (IN) INV=72.78 (OUT)

SS "Q"

80 70 80 70

135 136 137 138 139

RDA 5548-85

O-2069

448

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NO.	BY	DATE
A	RJE	11/19/84
2	GJS	9-30-85
1	RC	7-30-85
/	JRE	4-8-85

REV. 35"Ø" REV SS "P" & ADD SS "Q"
ADD SS "P"
ADDENDUM #1

IMPROVEMENT PLAN

SANITARY SEWER LINE
PLAN AND PROFILE

C.C.C.O. REDEVELOPMENT AGENCY
PLEASANT HILL B.A.R.T. STATION AREA
CONTRA COSTA COUNTY CALIFORNIA

SCALE: HOR: 1" = 40'
VERT: 1" = 10'

DATE: APRIL, 1984

DESIGN: G.B., J.R.E.

DRAWN: R.C., R.M.

ENG: J.R.E.

FB 10

REGISTERED PROFESSIONAL ENGINEER * JAMES R. EMANUEL No. C36641 CIVIL * STATE OF CALIFORNIA

JAMES R. EMANUEL
R.C.E. 31641

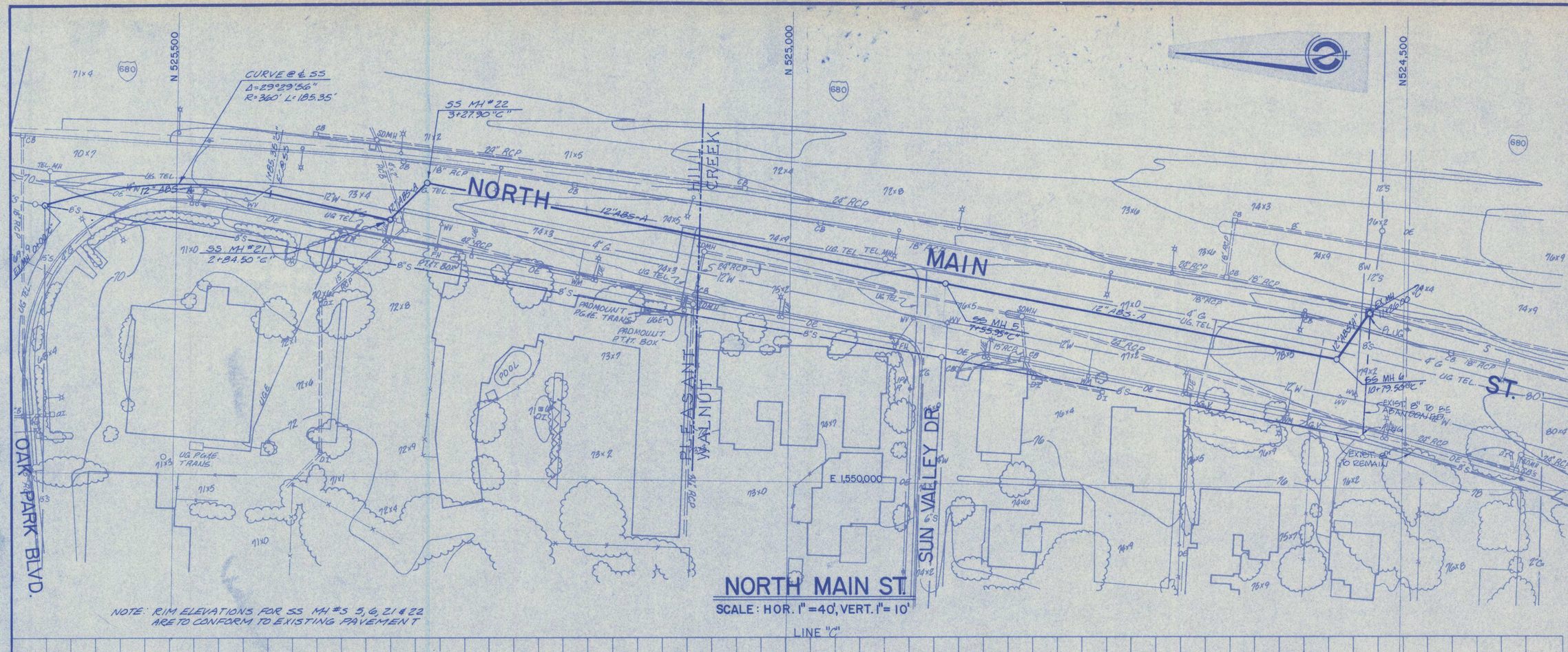
55127
2/26/86

RECEIVED
FEB 27 1986
RESIDENT ENGINEER
REVISIONS BY

SHEET NO. 22

SHEET 22 OF 25 SHEETS

JOB NO. 8312.2



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NO.	BY	DATE
1	JE	12/3/85
2	JDB	1/13/86
3	PG	1/29/86

REV. S.S. NOTE
REV. ENTRANCE SHEET
CROSS-POINT #1

IMPROVEMENT PLAN

NORTH MAIN ST.

C.C.CO. REDEVELOPMENT AGENCY
PLEASANT HILL B.A.R.T. STATION AREA
CONTRA COSTA COUNTY CALIFORNIA

SCALE: AS NOTED
DATE: MAY 1984
DESIGN: G.B., J.R.E.
DRAWN: M.H.
ENG: J.R.E.
FB 10

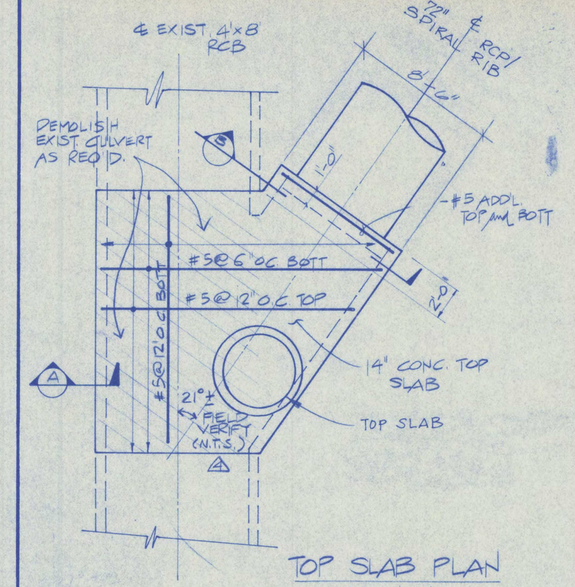
JAMES R. EMANUEL
R.C.E. 31641

CONTRACT NO. 5547-1
DATE ACCEPTED 5/6/86
RECORD DRAWING
RESIDENT ENGINEER
REVISIONS BY DATE 5/28/89

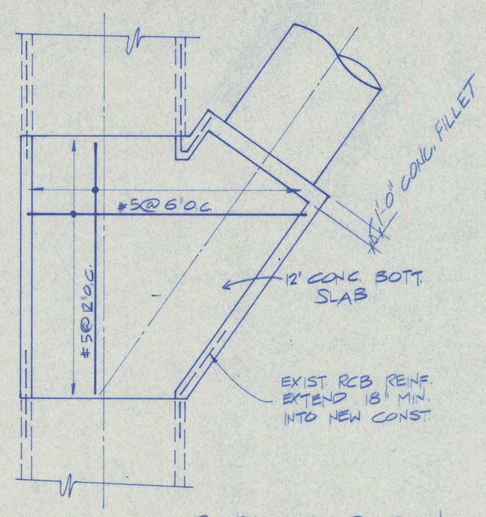
SHEET NO. 23
SHEET 23 OF 25 SHEETS
JOB NO. 8312.2

RDA 5548-85

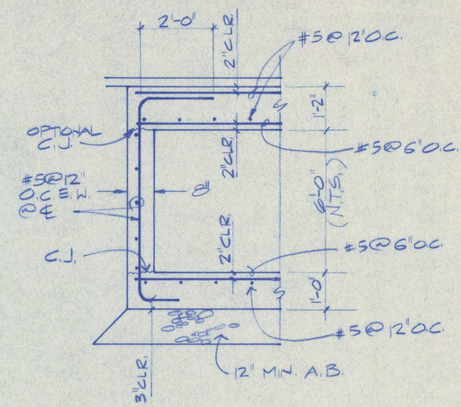
O-2069



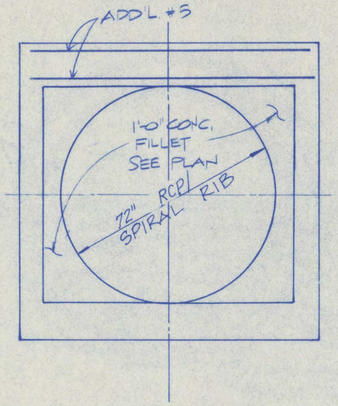
TOP SLAB PLAN
1/4" = 1'-0"



BOTTOM SLAB PLAN
1/4" = 1'-0"



SECTION
1/2" = 1'-0"
A/24

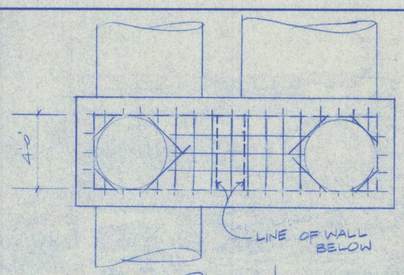


SECTION
1/2" = 1'-0"
B/24

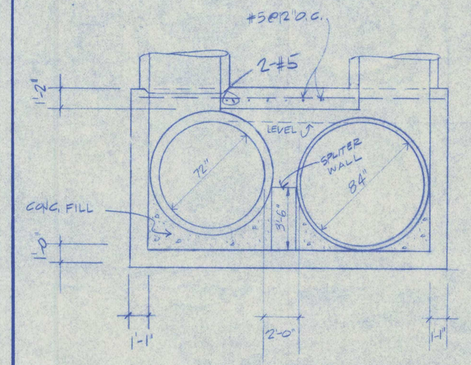
STRUCTURE 10 DETAILS (1/24)

SEE PLAN ON SHEET 11

NOTE: ANGLE BETWEEN 72" PIPE & 4'x8' RCB NOT DRAWN TO SCALE (4)

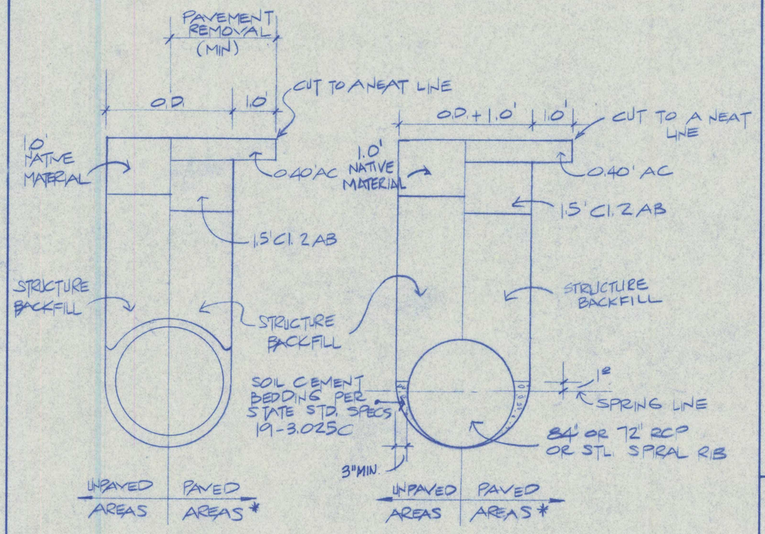


TOP PLAN



A
SECTION @ STR. #65
1/4" = 1'-0"
A

NOTES:
STR. SM. TO TYPE IV MANHOLE BASE EXCEPT AS SHOWN. SEE CC 3025, SECT. B-B

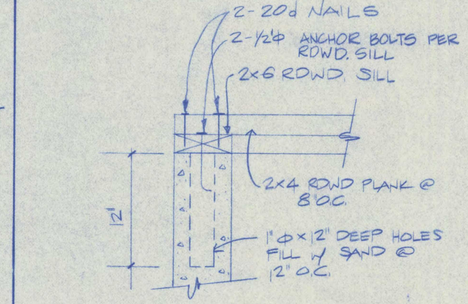


CAST-IN-PLACE PIPE
N.T.S.

MANUFACTURED PIPE
N.T.S.

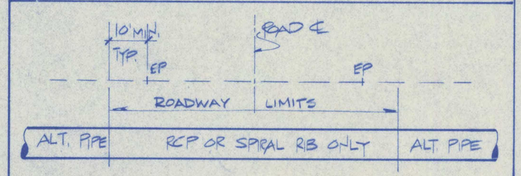
TRENCH EXCAVATION and BACKFILL DETAIL U.O.N.
N.T.S.

*"PAVED AREAS" ARE EQUIVALENT TO THE ROADWAY LIMITS SHOWN ON ROADWAY DETAIL, SHEET 24



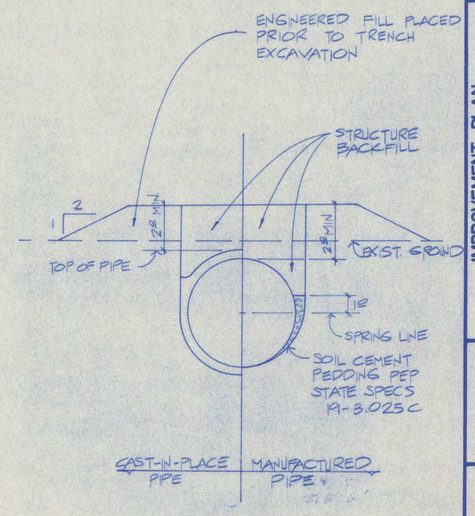
TEMPORARY RDWD. GRATE
N.T.S.

NOTE: INSTALL AS INDICATED ON STORM DRAIN SCHEDULE, GRADE TO DRAIN, TYP.



NOTES:
1. ALTERNATE PIPE SHALL BE RCP OR SPIRAL RIB W/IN THE LIMITS SHOWN ABOVE.

ROADWAY DETAIL
N.T.S.



FILL, TRENCH EXCAVATION and BACK FILL DETAIL S.D."B" 0+00 TO 12+41

CONTRACT NO. 33-92-1
DATE ACCEPTED 5/6/86
RECORD DRAWING
RESIDENT ENGINEER
REVISIONS BY MW DATE 4/20/87

O-2069

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(415) 930-7078

NO.	BY	DATE
4	ESB	7/8/86
3	RC	5/9/86
2	RC	5/22/86
1	JE	1/8/86

REV. ANGLE IN STR #10
REV STR 65
REVISE STR 65 PVMT.
ADDENDUM #1

IMPROVEMENT PLAN

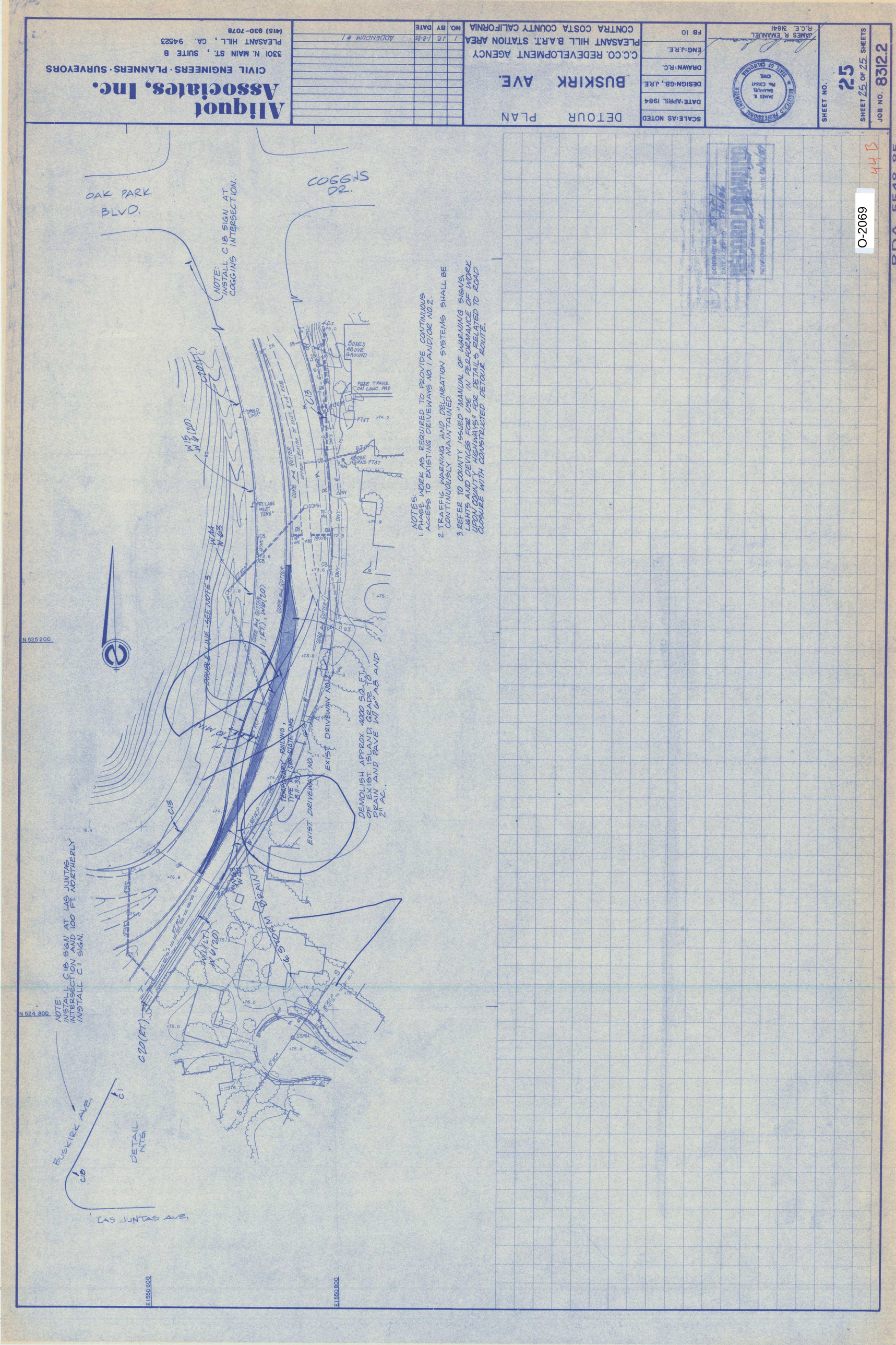
DETAILS

C.C.CO. REDEVELOPMENT AGENCY
PLEASANT HILL B.A.R.T. STATION AREA
CONTRA COSTA COUNTY CALIFORNIA

SCALE: AS SHOWN	DESIGN: JRE	DRAWN: RC	ENG: JRE	FB 10
DATE: APRIL '84				

JAMES R. EMANUEL
RE 2052

SHEET NO. 24
SHEET 24 OF 25 SHEETS
JOB NO. 8312.2



NOTES:
1. PHASE WORK AS REQUIRED TO PROVIDE CONTINUOUS ACCESS TO EXISTING DRIVEWAYS NO.1 AND/OR NO.2.
2. TRAFFIC WARNING AND DELINEATION SYSTEMS SHALL BE CONTINUOUSLY MAINTAINED
3. REFER TO COUNTY ISSUED "MANUAL OF WARNING SIGNS, LIGHTS AND DEVICES FOR USE IN PERFORMANCE OF WORK UPON COUNTY HIGHWAYS" FOR DETAILS RELATED TO ROAD CLOSURE WITH CONSTRUCTED DETOUR ROUTE.

DETOUR PLAN

BUSKIRK AVE.

C.C.CO. REDEVELOPMENT AGENCY
PLEASANT HILL B.A.R.T. STATION AREA
CONTRA COSTA COUNTY CALIFORNIA

SCALE: AS NOTED	
DATE: APRIL 1984	
DESIGN: GB., J.R.E.	
DRAWN: R.C.	
ENG: J.R.E.	
FB 10	

JAMES R. EMANUEL
R.C.E. 31641
EXPIRES 6-30-86
STATE OF CALIFORNIA
REGISTERED PROFESSIONAL ENGINEER
JAMES R. EMANUEL No. C31641 CIVIL

SHEET NO. 25
SHEET 25 OF 25 SHEETS
JOB NO. 8312.2

NO.	BY	DATE
1	JE	1-8-85

ADDENDUM # 1

Allgood Associates, Inc.
CIVIL ENGINEERS · PLANNERS · SURVEYORS
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PLEASANT HILL, CA. 94523
(415) 930-7078

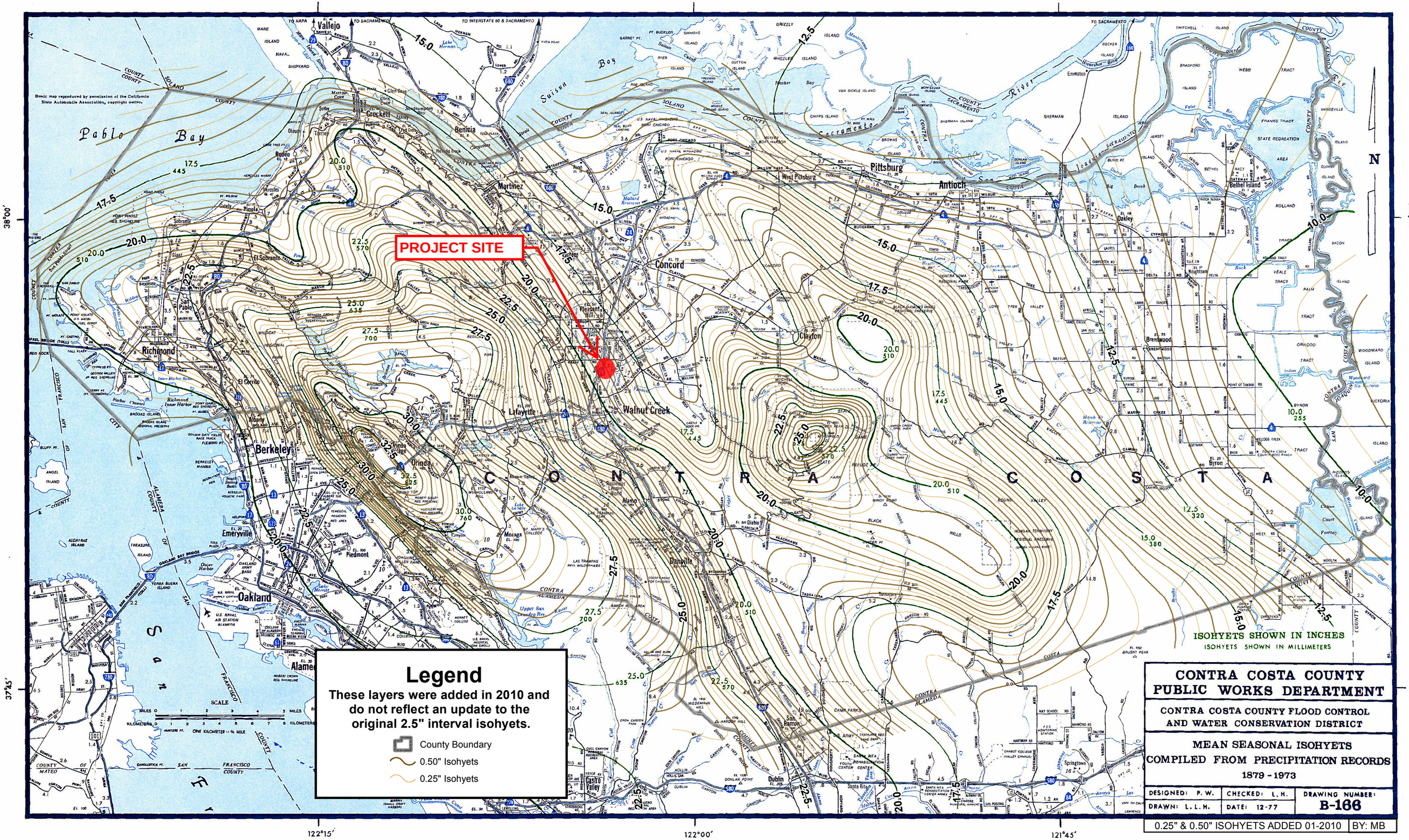
O-2069

44 B

PDA 5648 8E

Appendix B

- **Contra Costa County Flood Control District Mean Seasonal Isohyets**
- **Contra Costa County Flood Control District Standard Runoff Calculations**
- **Contra Costa County Flood Control District Intensity –Duration-Feasibility Curves**



Legend

These layers were added in 2010 and do not reflect an update to the original 2.5" interval isohyets.

- County Boundary
- 0.50" Isohyets
- 0.25" Isohyets

CONTRA COSTA COUNTY PUBLIC WORKS DEPARTMENT

CONTRA COSTA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

MEAN SEASONAL ISOHYETS COMPILED FROM PRECIPITATION RECORDS 1879 - 1973

DESIGNED: P. W.	CHECKED: L. H.	DRAWING NUMBER: B-166
DRAWN: L. L. H.	DATE: 12-77	

0.25" & 0.50" ISOHYETS ADDED 01-2010 | BY: MB

CCCFCD STANDARD - RUNOFF COEFFICIENTS

Rational Formula

Land Use	Runoff Coefficient	Average Impervious Area (%)	Time of Concentration-Roof to Gutter (min)
Residential:			
R - 6	.50 - .70	76	3 - 5
R - 10	.45 - .60	53	5 - 7
R - 20	.40 - .50	35	6 - 8
R - 40	.35 - .45	25	8 - 10
Apartment	.60 - .80		3 - 10
Commercial	.70 - .95		3 - 8
Industrial	.60 - .90		3 - 10
Open	.20 - .40		
Street:			
Asphalt	.75 - .95		
Concrete	.80 - .95		
Drives and Walks	.80 - .95		
Roofs	.75 - .95		

Legend

R - 6 = 6,000 ft^2 Lot
R - 10 = 10,000 ft^2 Lot
R - 20 = 20,000 ft^2 Lot
R - 40 = 40,000 ft^2 Lot

Note: For Contra Costa County Land Uses use the highest runoff coefficient in the range. This more closely approximates the peak flows calculated by the Unit Hydrograph method developed for Contra Costa County and calibrated with local rainfall and runoff data.

Intensity-Duration-Frequency Curve

Project: Subdivision SD21-9559 Oak Road Townhome Condominiums

By: Ruggeri-Jensen-Azar

Excel spreadsheet Created by the Contra Costa County Flood Control and Water Conservation District

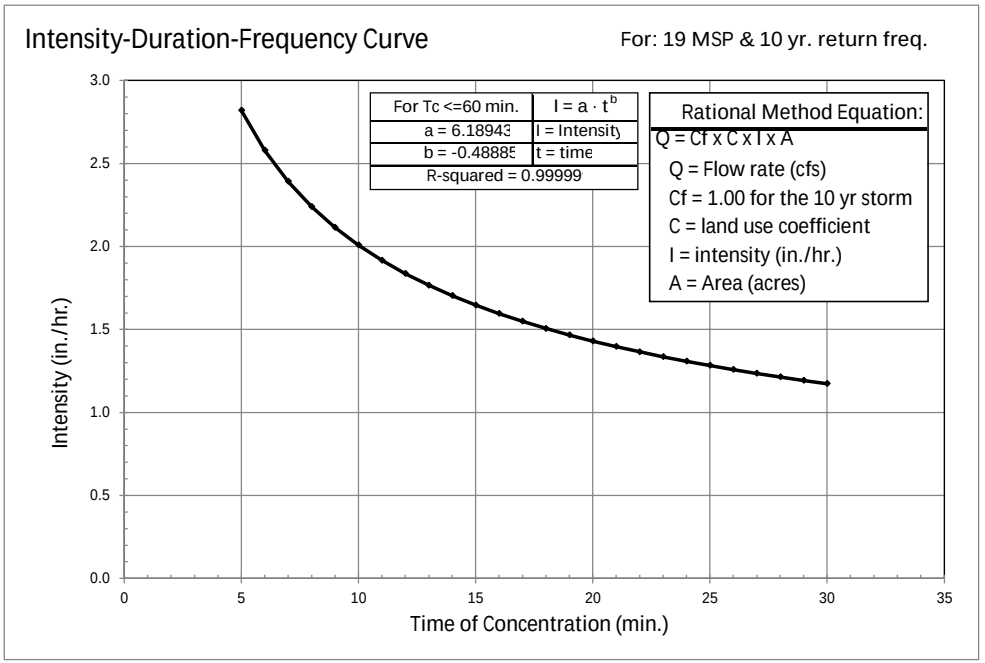
*Cells shaded yellow may be modified.

Contra Costa County Flood Control & Water Conservation District

CCCFCWCD Hydrology Standards

MSP:	19.0 in./yr.
Return Frequency:	10 yr.

Time Increment for this table:		5 min			
Time (min.)	Precipitation (in.)	Intensity (in./hr.)	Time (min.)	Precipitation (in.)	Intensity (in./hr.)
5.0	0.24	2.82	145.0	1.30	0.54
10.0	0.33	2.01	150.0	1.32	0.53
15.0	0.41	1.65	155.0	1.34	0.52
20.0	0.48	1.43	160.0	1.36	0.51
25.0	0.53	1.28	165.0	1.38	0.50
30.0	0.59	1.17	170.0	1.41	0.50
35.0	0.63	1.09	175.0	1.43	0.49
40.0	0.68	1.02	180.0	1.45	0.48
45.0	0.72	0.96	185.0	1.47	0.48
50.0	0.76	0.91	190.0	1.48	0.47
55.0	0.80	0.87	195.0	1.50	0.46
60.0	0.84	0.84	200.0	1.52	0.46
65.0	0.87	0.80	205.0	1.54	0.45
70.0	0.90	0.77	210.0	1.56	0.44
75.0	0.93	0.75	215.0	1.57	0.44
80.0	0.97	0.72	220.0	1.59	0.43
85.0	1.00	0.70	225.0	1.61	0.43
90.0	1.02	0.68	230.0	1.63	0.42
95.0	1.05	0.66	235.0	1.64	0.42
100.0	1.08	0.65	240.0	1.66	0.41
105.0	1.11	0.63	245.0	1.67	0.41
110.0	1.13	0.62	250.0	1.69	0.41
115.0	1.16	0.60	255.0	1.71	0.40
120.0	1.18	0.59	260.0	1.72	0.40
125.0	1.21	0.58	265.0	1.74	0.39
130.0	1.23	0.57	270.0	1.75	0.39
135.0	1.25	0.56	275.0	1.77	0.39
140.0	1.28	0.55	280.0	1.78	0.38



Time: -->	MSP v	5 min.	20 min.	60 min.	180 min.	360 min.	720 min.	1440 min.	
Known	20.0 in./yr.	0.240 in.	0.491 in.	0.865 in.	1.500 in.	2.090 in.	2.870 in.	3.900 in.	From 10_yr Table
Find	19.0 in./yr.	0.235 in.	0.477 in.	0.837 in.	1.446 in.	2.012 in.	2.756 in.	3.736 in.	Liniearly Interpolated
Known	15.0 in./yr.	0.215 in.	0.420 in.	0.723 in.	1.230 in.	1.700 in.	2.300 in.	3.080 in.	From 10_yr Table

Upper Range on X-Axis on Plot
30.0

Design Storm (Return Freq.) Criteria	
Area ≤ 1.0 sq. mi.	10 year
1 sq. mi. < Area < 4 sq. mi.	25 year
4 ≥ Area	50 year + Freeboard
	100 year contained

Table 1		5 to 20	20 to 60	60 to 180	180 to 360	360 to 720	720 to 1440
Delta log (Time)		0.602060	0.477121	0.477121	0.301030	0.301030	0.301030
Delta log (Depth)		0.307268	0.244182	0.237650	0.143460	0.136651	0.132128
Slope on log-log	a	0.510362	0.511781	0.498092	0.476563	0.453946	0.438919
Intercept on log-log	log(b)	-0.985660	-0.987506	-0.963166	-0.914611	-0.856794	-0.813857

Example for Tc's between 5 and 20 minutes					
Assumes that curves are linear on the log-log scale.					
Delta log (Time)		0.602060	log(20)-log(5)		
Delta log (Depth)		0.307268	log(Depth@20)-log(Depth@5)	log(0.477)-log(0.235)	(-.322) - (-.629)
Slope on log-log	a	0.510362	Delta log(Depth)/Delta log(Time)	0.307268 / 0.602060	
Intercept on log-log	log(b)	-0.985660	log(Depth@20)-log(20)*a	log(0.477)-log(20)*0.510362	(-.322) - (1.301) * 0.510362
Precipitation Equation - P =			10^(log(Time) * a + log(b))	10^(log(Time) * 0.510362 - 0.985660	

Intensity-Duration-Frequency Curve

Project: Subdivision SD21-9559 Oak Road Townhome Condominiums

By: Ruggeri-Jensen-Azar

Excel spreadsheet Created by the Contra Costa County Flood Control and Water Conservation District

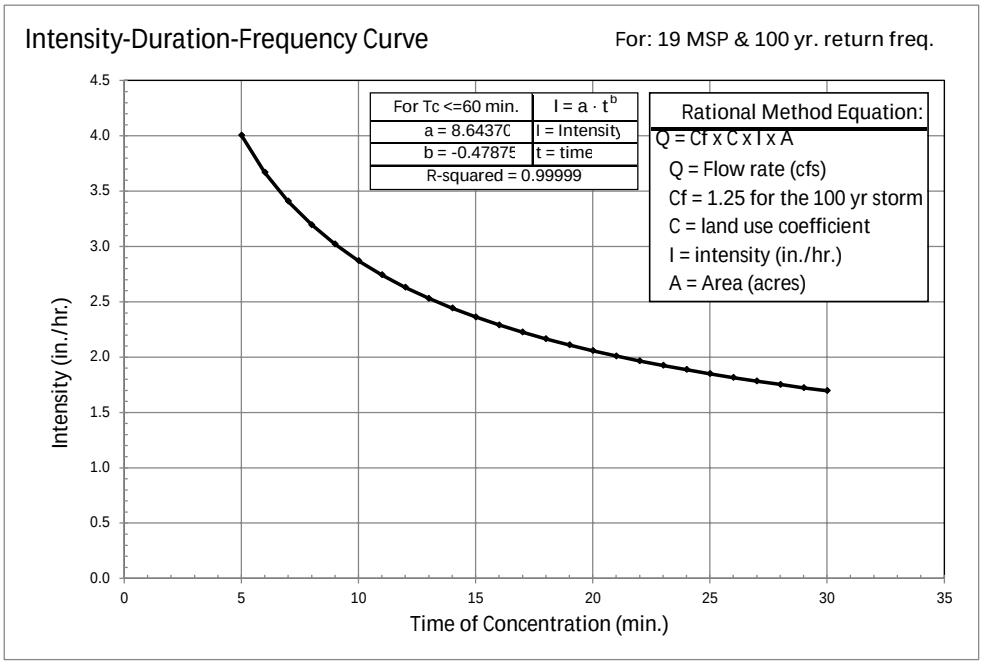
*Cells shaded yellow may be modified.

Contra Costa County Flood Control & Water Conservation District

CCCFCWCD Hydrology Standards

MSP:	19.0 in./yr.
Return Frequency:	100 yr.

Time Increment for this table:		5 min			
Time (min.)	Precipitation (in.)	Intensity (in./hr.)	Time (min.)	Precipitation (in.)	Intensity (in./hr.)
5.0	0.33	4.01	145.0	1.89	0.78
10.0	0.48	2.87	150.0	1.92	0.77
15.0	0.59	2.36	155.0	1.95	0.76
20.0	0.69	2.06	160.0	1.98	0.74
25.0	0.77	1.85	165.0	2.01	0.73
30.0	0.85	1.70	170.0	2.04	0.72
35.0	0.92	1.58	175.0	2.07	0.71
40.0	0.99	1.48	180.0	2.10	0.70
45.0	1.05	1.40	185.0	2.13	0.69
50.0	1.11	1.33	190.0	2.16	0.68
55.0	1.16	1.27	195.0	2.18	0.67
60.0	1.22	1.22	200.0	2.21	0.66
65.0	1.27	1.17	205.0	2.23	0.65
70.0	1.31	1.13	210.0	2.26	0.65
75.0	1.36	1.09	215.0	2.28	0.64
80.0	1.41	1.05	220.0	2.31	0.63
85.0	1.45	1.02	225.0	2.33	0.62
90.0	1.49	0.99	230.0	2.36	0.61
95.0	1.53	0.97	235.0	2.38	0.61
100.0	1.57	0.94	240.0	2.40	0.60
105.0	1.61	0.92	245.0	2.43	0.59
110.0	1.65	0.90	250.0	2.45	0.59
115.0	1.68	0.88	255.0	2.47	0.58
120.0	1.72	0.86	260.0	2.49	0.58
125.0	1.75	0.84	265.0	2.52	0.57
130.0	1.79	0.83	270.0	2.54	0.56
135.0	1.82	0.81	275.0	2.56	0.56
140.0	1.86	0.80	280.0	2.58	0.55



Time: -->	MSP v	5 min.	20 min.	60 min.	180 min.	360 min.	720 min.	1440 min.	
Known	20.0 in./yr.	0.340 in.	0.705 in.	1.260 in.	2.180 in.	3.010 in.	4.200 in.	5.720 in.	From 100_yr Table
Find	19.0 in./yr.	0.334 in.	0.686 in.	1.218 in.	2.102 in.	2.902 in.	4.040 in.	5.480 in.	Linearly Interpolated
Known	15.0 in./yr.	0.309 in.	0.610 in.	1.050 in.	1.790 in.	2.470 in.	3.400 in.	4.520 in.	From 100_yr Table

Upper Range on X-Axis on Plot
30.0

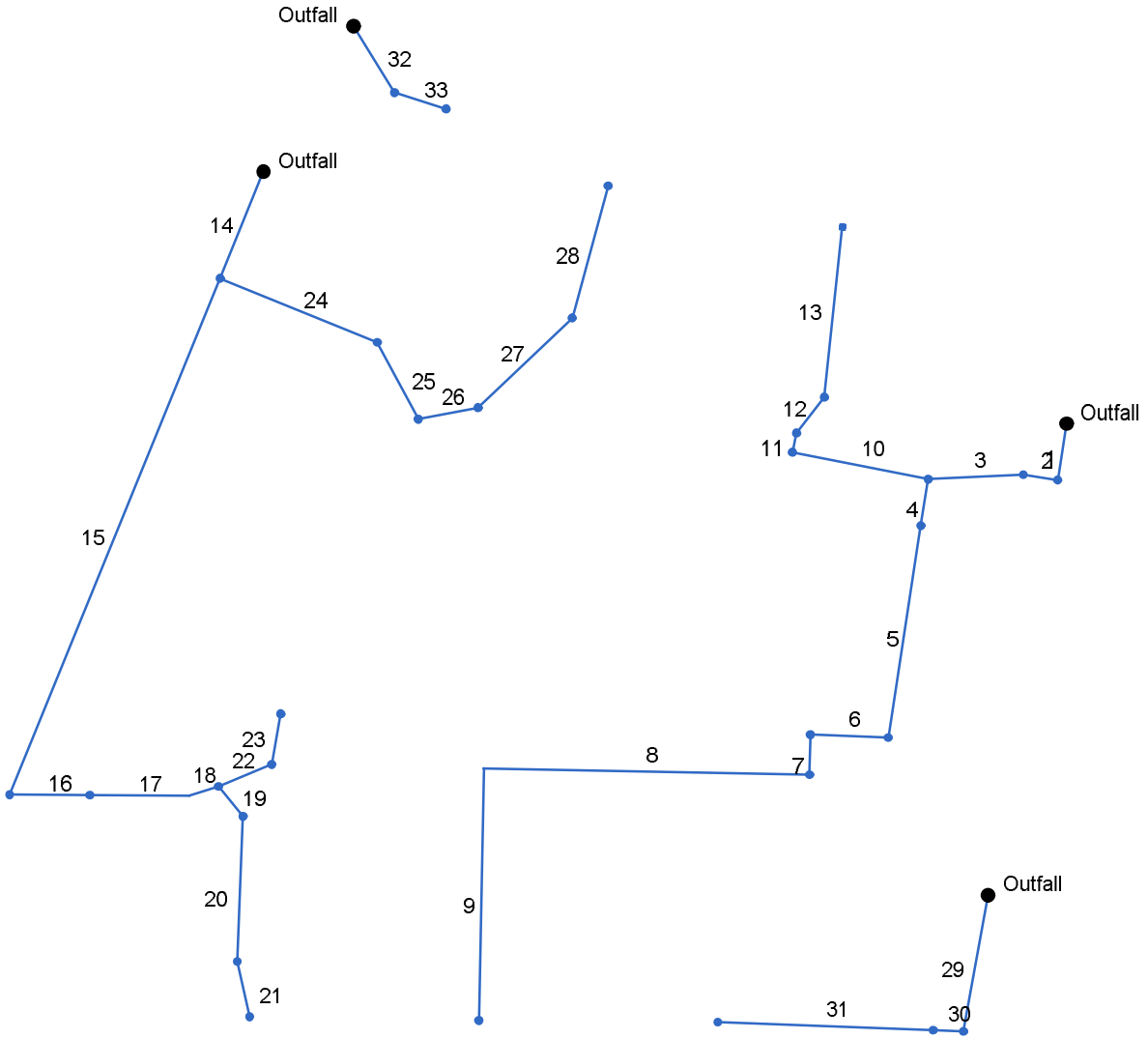
Design Storm (Return Freq.) Criteria	
Area ≤ 1.0 sq. mi.	10 year
1 sq. mi. < Area < 4 sq. mi.	25 year
4 ≥ Area	50 year + Freeboard
	100 year contained

Table 1		5 to 20	20 to 60	60 to 180	180 to 360	360 to 720	720 to 1440
Delta log (Time)		0.602060	0.477121	0.477121	0.301030	0.301030	0.301030
Delta log (Depth)		0.312838	0.249323	0.236985	0.140065	0.143684	0.132399
Slope on log-log	a	0.519612	0.522557	0.496699	0.465285	0.477308	0.439821
Intercept on log-log	log(b)	-0.839707	-0.843539	-0.797558	-0.726711	-0.757446	-0.650332

Example for Tc's between 5 and 20 minutes					
Assumes that curves are linear on the log-log scale.					
Delta log (Time)		0.602060	log(20)-log(5)		
Delta log (Depth)		0.312838	log(Depth@20)-log(Depth@5)	log(0.686)-log(0.334)	(-.164) - (-.477)
Slope on log-log	a	0.519612	Delta log(Depth)/Delta log(Time)	0.312838 / 0.602060	
Intercept on log-log	log(b)	-0.839707	log(Depth@20)-log(20)*a	log(0.686)-log(20)*0.519612	(-.164) - (1.301) * 0.519612
Precipitation Equation - P =			10^(log(Time) * a + log(b))	10^(log(Time) * 0.519612 - 0.839707	

Appendix C
Hydraflow Storm Sewers Tabulation

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: 201069-Prelim Hydro.stm	Number of lines: 33	Date: 1/29/2021

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	34.965	0.00	2.28	0.00	0.00	1.71	0.0	8.8	2.1	3.58	33.60	2.33	30	0.57	87.20	87.40	89.10	88.02	93.40	93.50	Pipe - (35)
2	1	21.264	0.16	2.28	0.75	0.12	1.71	5.0	8.7	2.1	3.60	6.23	3.65	18	0.30	87.40	87.46	88.22	88.28	93.50	94.20	Pipe - (14)
3	2	58.255	0.00	2.12	0.00	0.00	1.59	0.0	8.5	2.1	3.40	7.30	3.63	18	0.41	87.46	87.70	88.33	88.42	94.20	94.80	Pipe - (13)
4	3	28.664	0.17	1.22	0.75	0.13	0.91	5.0	8.3	2.2	1.97	2.73	2.62	12	0.50	87.70	87.84	88.67	88.72	94.80	94.30	Pipe - (12)
5	4	131.438	0.33	1.05	0.75	0.25	0.79	5.0	7.6	2.3	1.77	2.73	3.07	12	0.50	87.84	88.50	88.74	89.08	94.30	94.20	Pipe - (11)
6	5	47.391	0.17	0.72	0.75	0.13	0.54	5.0	7.3	2.3	1.24	2.73	2.62	12	0.50	88.60	88.84	89.29	89.34	94.20	94.60	Pipe - (10)
7	6	24.479	0.03	0.55	0.75	0.02	0.41	5.0	7.1	2.3	0.96	0.00	1.96	12	-0.16	88.94	88.90	89.49	89.55	94.60	94.60	Pipe - (9)
8	7	199.310	0.00	0.52	0.00	0.00	0.39	0.0	5.8	2.6	1.00	2.73	2.62	12	0.50	89.00	90.00	89.60	90.42	94.60	91.23	Pipe - (19) (1)
9	8	154.397	0.52	0.52	0.75	0.39	0.39	5.0	5.0	2.7	1.07	2.73	3.26	12	0.50	90.00	90.77	90.44	91.21	91.23	95.20	Pipe - (31)
10	3	84.353	0.45	0.90	0.75	0.34	0.68	5.0	5.8	2.6	1.73	2.73	3.67	12	0.50	88.70	89.12	89.28	89.70	94.80	94.80	Pipe - (28)
11	10	12.131	0.00	0.45	0.00	0.00	0.34	0.0	5.7	2.6	0.87	2.73	2.29	12	0.50	89.22	89.28	89.91	89.67	94.80	94.60	Pipe - (27)
12	11	27.682	0.00	0.45	0.00	0.00	0.34	0.0	5.6	2.6	0.88	2.73	3.09	12	0.50	89.28	89.42	89.67	89.81	94.60	93.70	Pipe - (26)
13	12	104.586	0.45	0.45	0.75	0.34	0.34	5.0	5.0	2.7	0.93	2.73	3.13	12	0.50	89.42	89.94	89.82	90.35	93.70	93.80	Pipe - (25)
14	End	70.474	0.00	2.81	0.00	0.00	2.10	0.0	71.4	0.8	1.63	227.7	0.06	72	0.25	82.90	83.07	88.80	88.80	92.80	93.20	Pipe - (32) (1) (1)
15	14	341.397	0.00	1.41	0.00	0.00	1.06	0.0	7.9	2.2	2.33	227.7	0.09	72	0.25	83.07	83.91	88.80	88.80	93.20	93.60	Pipe - (32) (1)
16	15	49.301	0.47	1.41	0.75	0.35	1.06	5.0	7.3	2.3	2.42	6.02	1.37	18	0.28	83.91	84.05	88.80	88.82	93.60	94.40	Pipe - (5)
17	16	60.664	0.00	0.94	0.00	0.00	0.70	0.0	6.3	2.5	1.73	6.23	0.98	18	0.30	84.05	84.23	88.82	88.84	94.40	85.88	Pipe - (4)
18	17	18.383	0.00	0.94	0.00	0.00	0.70	0.0	6.0	2.5	1.77	6.23	1.00	18	0.30	84.23	84.29	88.84	88.85	85.88	94.70	Pipe - (3)
19	18	23.744	0.16	0.40	0.75	0.12	0.30	5.0	5.8	2.6	0.76	8.45	2.05	12	4.80	88.08	89.22	88.86	89.58	94.70	95.20	Pipe - (7)
20	19	88.942	0.00	0.24	0.00	0.00	0.18	0.0	5.2	2.7	0.48	2.73	2.60	12	0.50	89.32	89.76	89.60	90.05	95.20	95.30	Pipe - (22)
21	20	34.652	0.24	0.24	0.75	0.18	0.18	5.0	5.0	2.7	0.49	2.73	2.59	12	0.50	89.76	89.93	90.05	90.22	95.30	95.30	Pipe - (21)
22	18	35.635	0.05	0.54	0.75	0.03	0.41	5.0	5.2	2.7	1.09	3.86	2.48	12	1.00	88.08	88.44	88.86	88.88	94.70	95.10	Pipe - (2)

Project File: 201069-Prelim Hydro.stm | Number of lines: 33 | Run Date: 1/29/2021

NOTES:Intensity = 5.98 / (Inlet time + 0.10) ^ 0.48 ; Return period =Yrs. 10 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
23	22	31.426	0.49	0.49	0.75	0.37	0.37	5.0	5.0	2.7	1.02	2.73	3.15	12	0.50	88.44	88.60	88.88	89.02	95.10	94.90	Pipe - (8)
24	14	103.591	0.53	1.40	0.75	0.40	1.05	5.0	8.0	2.2	2.30	19.52	1.30	18	2.94	83.20	86.25	88.80	88.84	93.20	94.60	Pipe - (17)
25	24	53.552	0.34	0.87	0.75	0.25	0.65	5.0	7.5	2.3	1.47	3.86	1.87	12	1.00	86.25	86.79	88.86	88.94	94.60	94.80	Pipe - (16)
26	25	36.787	0.00	0.53	0.00	0.00	0.40	0.0	7.0	2.3	0.93	3.86	1.18	12	1.00	86.79	87.16	88.99	89.01	94.80	94.80	Pipe - (15)
27	26	79.802	0.26	0.53	0.75	0.20	0.40	5.0	6.0	2.5	1.00	3.86	1.27	12	1.00	87.16	87.96	89.03	89.08	94.80	93.80	Pipe - (24)
28	27	83.775	0.27	0.27	0.75	0.20	0.20	5.0	5.0	2.7	0.55	3.86	1.45	12	1.00	87.96	88.80	89.10	89.15	93.80	93.80	Pipe - (23)
29	End	84.988	0.00	0.61	0.00	0.00	0.46	0.0	6.0	2.5	1.16	34.08	1.54	30	0.59	88.50	89.00	90.37	89.35	94.60	94.73	Pipe - (34)
30	29	18.294	0.26	0.61	0.75	0.20	0.46	5.0	5.9	2.5	1.17	3.86	3.83	12	1.00	89.10	89.28	89.48	89.74	94.73	94.40	Pipe - (30)
31	30	131.344	0.35	0.35	0.75	0.26	0.26	5.0	5.0	2.7	0.73	3.86	2.48	12	1.00	89.28	90.59	89.74	90.95	94.40	93.43	Pipe - (29)
32	End	47.721	0.00	0.24	0.00	0.00	0.18	0.0	5.9	2.5	0.46	5.55	0.38	15	0.63	86.40	86.70	88.50	88.50	92.00	92.20	Pipe - (33)
33	32	33.000	0.24	0.24	0.75	0.18	0.18	5.0	5.0	2.7	0.50	3.85	0.64	12	1.00	86.70	87.03	88.50	88.51	92.20	94.00	Pipe - (18)

Project File: 201069-Prelim Hydro.stm | Number of lines: 33 | Run Date: 1/29/2021

NOTES:Intensity = 5.98 / (Inlet time + 0.10) ^ 0.48 ; Return period =Yrs. 10 ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	30	3.58	87.20	89.10	1.90	0.95	0.89	0.22	89.32	0.000	34.965	87.40	88.02	0.62**	0.95	3.77	0.22	88.24	0.000	0.000	n/a	1.00	n/a
2	18	3.60	87.40	88.22	0.82*	0.99	3.65	0.21	88.43	0.300	21.264	87.46	88.28	0.82	0.98	3.65	0.21	88.49	0.300	0.300	0.064	0.24	0.05
3	18	3.40	87.46	88.33	0.87	1.06	3.19	0.16	88.49	0.219	58.255	87.70	88.42	0.72	0.83	4.07	0.26	88.67	0.416	0.317	0.185	0.98	0.25
4	12	1.97	87.70	88.67	0.97	0.78	2.54	0.10	88.77	0.230	28.664	87.84	88.72	0.88	0.73	2.70	0.11	88.84	0.235	0.233	0.067	0.15	0.02
5	12	1.77	87.84	88.74	0.90	0.74	2.38	0.09	88.83	0.185	131.438	88.50	89.08	0.58	0.47	3.76	0.22	89.30	0.524	0.355	0.466	0.99	0.22
6	12	1.24	88.60	89.29	0.69	0.58	2.13	0.07	89.36	0.151	47.391	88.84	89.34	0.51	0.40	3.10	0.15	89.49	0.394	0.273	0.129	1.00	0.15
7	12	0.96	88.94	89.49	0.55	0.45	2.15	0.07	89.57	0.177	24.479	88.90	89.55	0.65	0.54	1.77	0.05	89.60	0.108	0.142	0.035	1.00	0.05
8	12	1.00	89.00	89.60	0.60	0.31	2.04	0.16	89.76	0.000	199.310	90.00	90.42 j	0.42**	0.31	3.20	0.16	90.58	0.000	0.000	n/a	1.00	n/a
9	12	1.07	90.00	90.44	0.44*	0.33	3.27	0.17	90.60	0.500	154.397	90.77	91.21	0.44**	0.33	3.25	0.16	91.37	0.492	0.496	0.766	1.00	0.16
10	12	1.73	88.70	89.28	0.58*	0.47	3.67	0.21	89.49	0.500	84.353	89.12	89.70	0.58	0.47	3.67	0.21	89.91	0.498	0.499	0.421	1.00	0.21
11	12	0.87	89.22	89.91	0.69	0.28	1.51	0.15	90.06	0.000	12.131	89.28	89.67	0.39**	0.28	3.07	0.15	89.82	0.000	0.000	n/a	0.51	0.07
12	12	0.88	89.28	89.67	0.39*	0.28	3.10	0.15	89.82	0.000	27.682	89.42	89.81	0.39**	0.29	3.08	0.15	89.96	0.000	0.000	n/a	0.59	0.09
13	12	0.93	89.42	89.82	0.40*	0.30	3.14	0.15	89.97	0.000	104.586	89.94	90.35	0.40**	0.30	3.12	0.15	90.50	0.000	0.000	n/a	1.00	0.15
14	72	1.63	82.90	88.80	5.90	28.17	0.06	0.00	88.80	0.000	70.474	83.07	88.80	5.73	27.82	0.06	0.00	88.80	0.000	0.000	0.000	1.00	0.00
15	72	2.33	83.07	88.80	5.73	27.82	0.08	0.00	88.80	0.000	341.397	83.91	88.80	4.88	24.64	0.09	0.00	88.80	0.000	0.000	0.000	1.00	0.00
16	18	2.42	83.91	88.80	1.50	1.77	1.37	0.03	88.83	0.045	49.301	84.05	88.82	1.50	1.77	1.37	0.03	88.85	0.045	0.045	0.022	0.15	0.00
17	18	1.73	84.05	88.82	1.50	1.77	0.98	0.01	88.84	0.023	60.664	84.23	88.84	1.50	1.77	0.98	0.01	88.85	0.023	0.023	0.014	0.35	0.01
18	18	1.77	84.23	88.84	1.50	1.77	1.00	0.02	88.86	0.024	18.383	84.29	88.85	1.50	1.77	1.00	0.02	88.86	0.024	0.024	0.004	0.94	0.01
19	12	0.76	88.08	88.86	0.78	0.26	1.16	0.13	89.00	0.000	23.744	89.22	89.58 j	0.36**	0.26	2.95	0.13	89.72	0.000	0.000	n/a	0.71	n/a
20	12	0.48	89.32	89.60	0.28*	0.18	2.61	0.10	89.70	0.000	88.942	89.76	90.05	0.29**	0.19	2.58	0.10	90.15	0.000	0.000	n/a	0.30	0.03
21	12	0.49	89.76	90.05	0.29	0.19	2.59	0.10	90.15	0.000	34.652	89.93	90.22	0.29**	0.19	2.59	0.10	90.32	0.000	0.000	n/a	1.00	n/a
22	12	1.09	88.08	88.86	0.78	0.33	1.67	0.17	89.03	0.000	35.635	88.44	88.88 j	0.44**	0.33	3.29	0.17	89.05	0.000	0.000	n/a	0.88	0.15

Project File: 201069-Prelim Hydro.stm | Number of lines: 33 | Run Date: 1/29/2021

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
23	12	1.02	88.44	88.88	0.44	0.32	3.08	0.16	89.04	0.000	31.426	88.60	89.02	0.42**	0.32	3.22	0.16	89.18	0.000	0.000	n/a	1.00	n/a
24	18	2.30	83.20	88.80	1.50	1.77	1.30	0.03	88.83	0.041	103.591	86.25	88.84	1.50	1.77	1.30	0.03	88.87	0.041	0.041	0.042	0.69	0.02
25	12	1.47	86.25	88.86	1.00	0.79	1.87	0.05	88.92	0.145	53.552	86.79	88.94	1.00	0.79	1.87	0.05	88.99	0.145	0.145	0.077	0.97	0.05
26	12	0.93	86.79	88.99	1.00	0.79	1.18	0.02	89.01	0.058	36.787	87.16	89.01	1.00	0.79	1.18	0.02	89.04	0.058	0.058	0.021	0.59	0.01
27	12	1.00	87.16	89.03	1.00	0.79	1.27	0.03	89.05	0.067	79.802	87.96	89.08	1.00	0.79	1.27	0.03	89.11	0.067	0.067	0.054	0.58	0.01
28	12	0.55	87.96	89.10	1.00	0.79	0.70	0.01	89.10	0.020	83.775	88.80	89.15	0.35	0.25	2.20	0.08	89.23	0.279	0.150	0.126	1.00	0.08
29	30	1.16	88.50	90.37	1.87	0.42	0.30	0.12	90.49	0.000	84.988	89.00	89.35	0.35**	0.42	2.79	0.12	89.47	0.000	0.000	n/a	0.99	0.12
30	12	1.17	89.10	89.48	0.38*	0.27	4.30	0.18	89.65	0.000	18.294	89.28	89.74	0.46**	0.35	3.36	0.18	89.91	0.000	0.000	n/a	0.15	0.03
31	12	0.73	89.28	89.74	0.46	0.25	2.07	0.13	89.87	0.000	131.344	90.59	90.95 j	0.36**	0.25	2.90	0.13	91.08	0.000	0.000	n/a	1.00	n/a
32	15	0.46	86.40	88.50	1.25	1.23	0.38	0.00	88.50	0.004	47.721	86.70	88.50	1.25	1.23	0.38	0.00	88.50	0.004	0.004	0.002	0.70	0.00
33	12	0.50	86.70	88.50	1.00	0.79	0.64	0.01	88.51	0.017	33.000	87.03	88.51	1.00	0.79	0.64	0.01	88.52	0.017	0.017	0.006	1.00	0.01

Project File: 201069-Prelim Hydro.stm | Number of lines: 33 | Run Date: 1/29/2021

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Appendix D
Hydrograph Calculations

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	13.46	2	596	57,955	------	------	------	Existing Condition
2	SCS Runoff	13.86	2	596	59,982	------	------	------	Proposed
3	Reservoir	13.46	2	598	59,980	2	12.65	2,109	Proposed (w/ HM Vault)

Hydrograph Report

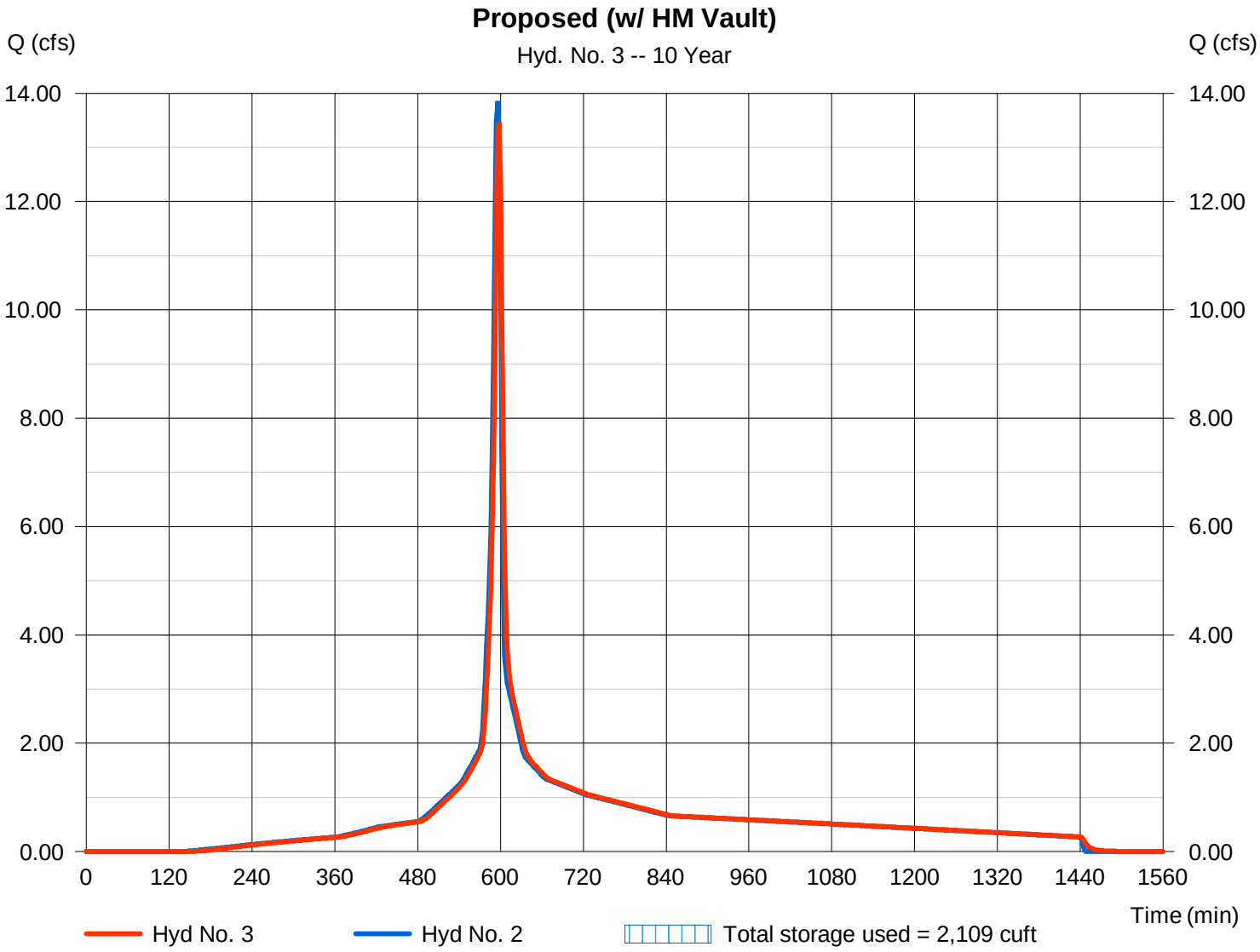
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2 Thursday, 03 / 18 / 2021

Hyd. No. 3

Proposed (w/ HM Vault)

Hydrograph type	= Reservoir	Peak discharge	= 13.46 cfs
Storm frequency	= 10 yrs	Time to peak	= 598 min
Time interval	= 2 min	Hyd. volume	= 59,980 cuft
Inflow hyd. No.	= 2 - Proposed	Max. Elevation	= 12.65 ft
Reservoir name	= HM Vault	Max. Storage	= 2,109 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	21.08	2	596	92,157	------	------	------	Existing Condition
2	SCS Runoff	21.45	2	596	94,400	------	------	------	Proposed
3	Reservoir	20.90	2	598	94,399	2	13.49	2,761	Proposed (w/ HM Vault)

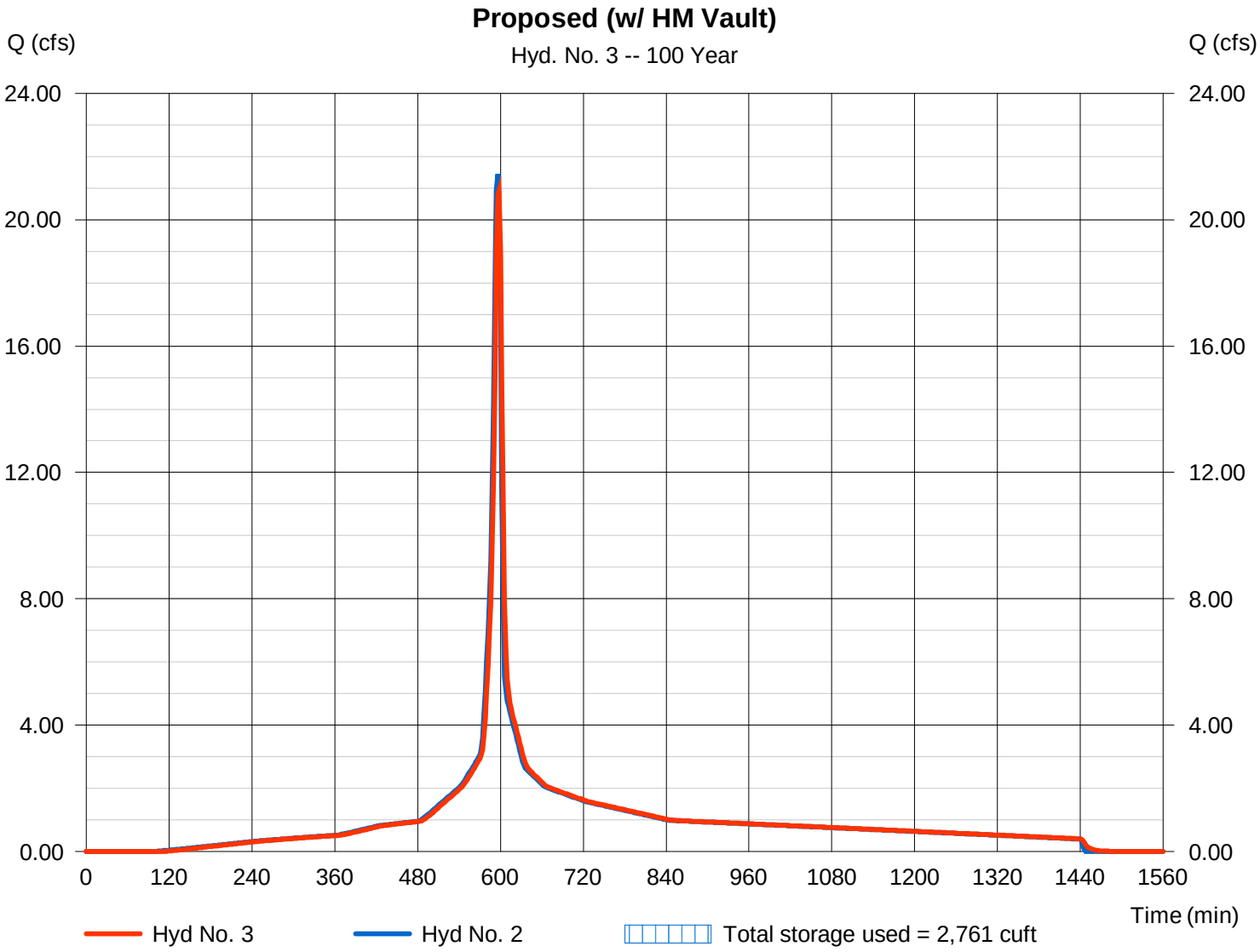
Hydrograph Report

Hyd. No. 3

Proposed (w/ HM Vault)

Hydrograph type	= Reservoir	Peak discharge	= 20.90 cfs
Storm frequency	= 100 yrs	Time to peak	= 598 min
Time interval	= 2 min	Hyd. volume	= 94,399 cuft
Inflow hyd. No.	= 2 - Proposed	Max. Elevation	= 13.49 ft
Reservoir name	= HM Vault	Max. Storage	= 2,761 cuft

Storage Indication method used.



Appendix E
Contra Costa Hydrology Model Project Report

CCHM

PROJECT REPORT

General Model Information

Project Name: 2740 Jones Road
Site Name:
Site Address:
City:
Report Date: 3/18/2021
Gage:
Data Start: 1950/10/01
Data End: 1985/09/30
Timestep: Hourly
Precip Scale: 1.000
Version Date: 2020/10/14

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Grass,Flat(0-5%)	2.37
Pervious Total	2.37

Impervious Land Use	acre
Roof Area	1.02
Parking,Flat(0-5%)	2.55
Impervious Total	3.57
Basin Total	5.94

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Grass,Flat(0-5%)	0.39
Pervious Total	0.39

Impervious Land Use	acre
Roads,Flat(0-5%)	0.47
Roof Area	0.86
Parking,Flat(0-5%)	0.21
Impervious Total	1.54
Basin Total	1.93

Element Flows To:

Surface	Interflow	Groundwater
Surface Bio Swale 1	Surface Bio Swale 1	

Basin 2

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Grass,Flat(0-5%)	0.37
Pervious Total	0.37

Impervious Land Use	acre
Roads,Flat(0-5%)	0.39
Roof Area	0.54
Sidewalks,Flat(0-5%)	0.1
Impervious Total	1.03
Basin Total	1.4

Element Flows To:

Surface	Interflow	Groundwater
Surface Bio Swale 2	Surface Bio Swale 2	

Basin 3

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Grass,Flat(0-5%)	0.08
Pervious Total	0.08

Impervious Land Use	acre
Roads,Flat(0-5%)	0.06
Roof Area	0.1
Impervious Total	0.16
Basin Total	0.24

Element Flows To:

Surface	Interflow	Groundwater
Surface Bio Swale 3	Surface Bio Swale 3	

Basin 5

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Grass,Flat(0-5%)	0.19
Pervious Total	0.19

Impervious Land Use	acre
Roads,Flat(0-5%)	0.12
Roof Area	0.26
Sidewalks,Flat(0-5%)	0.04
Impervious Total	0.42
Basin Total	0.61

Element Flows To:

Surface	Interflow	Groundwater
Surface Bio Swale 5	Surface Bio Swale 5	

Basin 4

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Grass,Flat(0-5%)	0.47
Pervious Total	0.47

Impervious Land Use	acre
Roads,Flat(0-5%)	0.48
Roof Area	0.68
Sidewalks,Flat(0-5%)	0.13
Impervious Total	1.29
Basin Total	1.76

Element Flows To:

Surface	Interflow	Groundwater
Surface Bio Swale 4	Surface Bio Swale 4	

Routing Elements
Predeveloped Routing

Mitigated Routing

Bio Swale 1

Bottom Length: 55.00 ft.
Bottom Width: 55.00 ft.
Material thickness of first layer: 1.5
Material type for first layer: Amended 5 in/hr
Material thickness of second layer: 1
Material type for second layer: GRAVEL
Material thickness of third layer: 0
Material type for third layer: GRAVEL
Underdrain used
Underdrain Diameter (feet): 0.34
Orifice Diameter (in.): 4
Offset (in.): 4
Flow Through Underdrain (ac-ft.): 58.528
Total Outflow (ac-ft.): 60.354
Percent Through Underdrain: 96.97
Discharge Structure
Riser Height: 0.5 ft.
Riser Diameter: 12 in.
Element Flows To:
Outlet 1 Outlet 2
Vault 1

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0911	0.0000	0.0000	0.0000
0.0352	0.0910	0.0005	0.0000	0.0000
0.0703	0.0907	0.0010	0.0000	0.0000
0.1055	0.0904	0.0015	0.0000	0.0000
0.1407	0.0901	0.0021	0.0000	0.0000
0.1758	0.0898	0.0026	0.0000	0.0000
0.2110	0.0895	0.0031	0.0000	0.0000
0.2462	0.0892	0.0036	0.0000	0.0000
0.2813	0.0889	0.0042	0.0000	0.0000
0.3165	0.0885	0.0047	0.0000	0.0000
0.3516	0.0882	0.0052	0.0000	0.0000
0.3868	0.0879	0.0058	0.0000	0.0000
0.4220	0.0876	0.0063	0.0000	0.0000
0.4571	0.0873	0.0069	0.0000	0.0000
0.4923	0.0870	0.0074	0.0000	0.0000
0.5275	0.0867	0.0079	0.0000	0.0000
0.5626	0.0864	0.0085	0.0000	0.0000
0.5978	0.0861	0.0090	0.0000	0.0000
0.6330	0.0858	0.0096	0.0000	0.0000
0.6681	0.0854	0.0101	0.0000	0.0000
0.7033	0.0851	0.0107	0.0000	0.0000
0.7385	0.0848	0.0113	0.0000	0.0000
0.7736	0.0845	0.0118	0.0000	0.0000
0.8088	0.0842	0.0124	0.0000	0.0000
0.8440	0.0839	0.0129	0.0000	0.0000
0.8791	0.0836	0.0135	0.0000	0.0000
0.9143	0.0833	0.0141	0.0000	0.0000
0.9495	0.0830	0.0146	0.0000	0.0000
0.9846	0.0827	0.0152	0.0000	0.0000

1.0198	0.0824	0.0158	0.0000	0.0000
1.0549	0.0821	0.0164	0.0000	0.0000
1.0901	0.0818	0.0170	0.0000	0.0000
1.1253	0.0815	0.0175	0.0000	0.0000
1.1604	0.0812	0.0181	0.0000	0.0000
1.1956	0.0809	0.0187	0.0000	0.0000
1.2308	0.0806	0.0193	0.0000	0.0000
1.2659	0.0802	0.0199	0.0000	0.0000
1.3011	0.0799	0.0205	0.0000	0.0000
1.3363	0.0796	0.0211	0.0000	0.0000
1.3714	0.0793	0.0217	0.0000	0.0000
1.4066	0.0790	0.0223	0.0000	0.0000
1.4418	0.0787	0.0229	0.0000	0.0000
1.4769	0.0784	0.0235	0.0000	0.0000
1.5121	0.0781	0.0241	0.0000	0.0000
1.5473	0.0778	0.0247	0.0000	0.0000
1.5824	0.0775	0.0253	0.0000	0.0000
1.6176	0.0772	0.0259	0.0000	0.0000
1.6527	0.0769	0.0265	0.0000	0.0000
1.6879	0.0766	0.0271	0.0000	0.0000
1.7231	0.0763	0.0277	0.0000	0.0000
1.7582	0.0760	0.0283	0.0000	0.0000
1.7934	0.0757	0.0290	0.0000	0.0000
1.8286	0.0754	0.0296	0.0000	0.0000
1.8637	0.0751	0.0302	0.0000	0.0000
1.8989	0.0748	0.0308	0.0000	0.0000
1.9341	0.0745	0.0315	0.0000	0.0000
1.9692	0.0742	0.0321	0.0000	0.0000
2.0044	0.0739	0.0327	0.0000	0.0000
2.0396	0.0736	0.0334	0.0000	0.0000
2.0747	0.0733	0.0340	0.0000	0.0000
2.1099	0.0730	0.0346	0.0000	0.0000
2.1451	0.0727	0.0353	0.0000	0.0000
2.1802	0.0724	0.0359	0.0000	0.0000
2.2154	0.0721	0.0372	0.0000	0.0000
2.2505	0.0718	0.0385	0.0000	0.0000
2.2857	0.0715	0.0398	0.0000	0.0000
2.3209	0.0712	0.0411	0.0000	0.0000
2.3560	0.0709	0.0424	0.0000	0.0000
2.3912	0.0706	0.0437	0.0000	0.0000
2.4264	0.0703	0.0450	0.0000	0.0000
2.4615	0.0700	0.0464	0.0000	0.0000
2.4967	0.0697	0.0477	0.0000	0.0000
2.5000	0.0694	0.0478	0.0000	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
2.5000	0.0911	0.0478	0.0000	0.3583	0.0000
2.5352	0.0914	0.0510	0.0000	0.3583	0.0000
2.5703	0.0917	0.0542	0.0000	0.3583	0.0000
2.6055	0.0920	0.0575	0.0000	0.3583	0.0000
2.6407	0.0923	0.0607	0.0000	0.3583	0.0000
2.6758	0.0926	0.0640	0.0000	0.3583	0.0000
2.7110	0.0929	0.0672	0.0000	0.3583	0.0000
2.7462	0.0932	0.0705	0.0000	0.3583	0.0000
2.7813	0.0936	0.0738	0.0000	0.3583	0.0000
2.8165	0.0939	0.0771	0.0000	0.3583	0.0000
2.8516	0.0942	0.0804	0.0000	0.3583	0.0000

2.8868	0.0945	0.0837	0.0000	0.3583	0.0000
2.9220	0.0948	0.0870	0.0000	0.3583	0.0000
2.9571	0.0951	0.0904	0.0000	0.3583	0.0000
2.9923	0.0955	0.0937	0.0000	0.3583	0.0000
3.0275	0.0958	0.0971	0.0000	0.3583	0.0000
3.0626	0.0961	0.1005	0.0000	0.3583	0.0000
3.0978	0.0964	0.1038	0.0000	0.3583	0.0000
3.1330	0.0967	0.1072	0.0000	0.3583	0.0000
3.1681	0.0970	0.1106	0.0000	0.3583	0.0000
3.2000	0.0973	0.1137	0.0000	0.3583	0.0000

Surface Bio Swale 1

Element Flows To:

Outlet 1	Outlet 2
Vault 1	Bio Swale 1

Vault 1

Width:	22.7 ft.		
Length:	22.7 ft.		
Depth:	3.5 ft.		
Infiltration On			
Infiltration rate:	0.2		
Infiltration safety factor:	1		
Total Volume Infiltrated (ac-ft.):		3.259	
Total Volume Through Riser (ac-ft.):		57.098	
Total Volume Through Facility (ac-ft.):		60.357	
Percent Infiltrated:		5.4	
Total Precip Applied to Facility:		0	
Total Evap From Facility:		0	
Discharge Structure			
Riser Height:	3.3 ft.		
Riser Diameter:	24 in.		
Orifice 1 Diameter:	1 in.	Elevation:0 ft.	
Orifice 2 Diameter:	4 in.	Elevation:2 ft.	
Orifice 3 Diameter:	6 in.	Elevation:2.5 ft.	
Element Flows To:			
Outlet 1	Outlet 2		

Vault Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.011	0.000	0.000	0.000
0.0389	0.011	0.000	0.005	0.002
0.0778	0.011	0.000	0.007	0.002
0.1167	0.011	0.001	0.009	0.002
0.1556	0.011	0.001	0.010	0.002
0.1944	0.011	0.002	0.012	0.002
0.2333	0.011	0.002	0.013	0.002
0.2722	0.011	0.003	0.014	0.002
0.3111	0.011	0.003	0.015	0.002
0.3500	0.011	0.004	0.016	0.002
0.3889	0.011	0.004	0.016	0.002
0.4278	0.011	0.005	0.017	0.002
0.4667	0.011	0.005	0.018	0.002
0.5056	0.011	0.006	0.019	0.002
0.5444	0.011	0.006	0.020	0.002
0.5833	0.011	0.006	0.020	0.002
0.6222	0.011	0.007	0.021	0.002
0.6611	0.011	0.007	0.022	0.002
0.7000	0.011	0.008	0.022	0.002
0.7389	0.011	0.008	0.023	0.002
0.7778	0.011	0.009	0.023	0.002
0.8167	0.011	0.009	0.024	0.002
0.8556	0.011	0.010	0.025	0.002
0.8944	0.011	0.010	0.025	0.002
0.9333	0.011	0.011	0.026	0.002
0.9722	0.011	0.011	0.026	0.002
1.0111	0.011	0.012	0.027	0.002
1.0500	0.011	0.012	0.027	0.002
1.0889	0.011	0.012	0.028	0.002
1.1278	0.011	0.013	0.028	0.002
1.1667	0.011	0.013	0.029	0.002

1.2056	0.011	0.014	0.029	0.002
1.2444	0.011	0.014	0.030	0.002
1.2833	0.011	0.015	0.030	0.002
1.3222	0.011	0.015	0.031	0.002
1.3611	0.011	0.016	0.031	0.002
1.4000	0.011	0.016	0.032	0.002
1.4389	0.011	0.017	0.032	0.002
1.4778	0.011	0.017	0.033	0.002
1.5167	0.011	0.017	0.033	0.002
1.5556	0.011	0.018	0.033	0.002
1.5944	0.011	0.018	0.034	0.002
1.6333	0.011	0.019	0.034	0.002
1.6722	0.011	0.019	0.035	0.002
1.7111	0.011	0.020	0.035	0.002
1.7500	0.011	0.020	0.035	0.002
1.7889	0.011	0.021	0.036	0.002
1.8278	0.011	0.021	0.036	0.002
1.8667	0.011	0.022	0.037	0.002
1.9056	0.011	0.022	0.037	0.002
1.9444	0.011	0.023	0.037	0.002
1.9833	0.011	0.023	0.038	0.002
2.0222	0.011	0.023	0.103	0.002
2.0611	0.011	0.024	0.146	0.002
2.1000	0.011	0.024	0.176	0.002
2.1389	0.011	0.025	0.201	0.002
2.1778	0.011	0.025	0.223	0.002
2.2167	0.011	0.026	0.242	0.002
2.2556	0.011	0.026	0.260	0.002
2.2944	0.011	0.027	0.276	0.002
2.3333	0.011	0.027	0.292	0.002
2.3722	0.011	0.028	0.306	0.002
2.4111	0.011	0.028	0.320	0.002
2.4500	0.011	0.029	0.333	0.002
2.4889	0.011	0.029	0.346	0.002
2.5278	0.011	0.029	0.521	0.002
2.5667	0.011	0.030	0.622	0.002
2.6056	0.011	0.030	0.699	0.002
2.6444	0.011	0.031	0.764	0.002
2.6833	0.011	0.031	0.821	0.002
2.7222	0.011	0.032	0.874	0.002
2.7611	0.011	0.032	0.923	0.002
2.8000	0.011	0.033	0.968	0.002
2.8389	0.011	0.033	1.012	0.002
2.8778	0.011	0.034	1.053	0.002
2.9167	0.011	0.034	1.092	0.002
2.9556	0.011	0.035	1.130	0.002
2.9944	0.011	0.035	1.166	0.002
3.0333	0.011	0.035	1.202	0.002
3.0722	0.011	0.036	1.236	0.002
3.1111	0.011	0.036	1.269	0.002
3.1500	0.011	0.037	1.301	0.002
3.1889	0.011	0.037	1.332	0.002
3.2278	0.011	0.038	1.363	0.002
3.2667	0.011	0.038	1.393	0.002
3.3056	0.011	0.039	1.431	0.002
3.3444	0.011	0.039	1.649	0.002
3.3833	0.011	0.040	1.988	0.002
3.4222	0.011	0.040	2.411	0.002

3.4611	0.011	0.040	2.900	0.002
3.5000	0.011	0.041	3.446	0.002
3.5389	0.011	0.041	4.038	0.002
3.5778	0.000	0.000	4.670	0.000

Bio Swale 2

Bottom Length:	43.00 ft.
Bottom Width:	43.00 ft.
Material thickness of first layer:	1.5
Material type for first layer:	Amended 5 in/hr
Material thickness of second layer:	1
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.34
Orifice Diameter (in.):	4
Offset (in.):	4
Flow Through Underdrain (ac-ft.):	39.747
Total Outflow (ac-ft.):	40.862
Percent Through Underdrain:	97.27
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	12 in.
Element Flows To:	
Outlet 1	Outlet 2

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0595	0.0000	0.0000	0.0000
0.0352	0.0594	0.0003	0.0000	0.0000
0.0703	0.0592	0.0006	0.0000	0.0000
0.1055	0.0590	0.0009	0.0000	0.0000
0.1407	0.0587	0.0013	0.0000	0.0000
0.1758	0.0585	0.0016	0.0000	0.0000
0.2110	0.0582	0.0019	0.0000	0.0000
0.2462	0.0580	0.0022	0.0000	0.0000
0.2813	0.0577	0.0026	0.0000	0.0000
0.3165	0.0575	0.0029	0.0000	0.0000
0.3516	0.0572	0.0032	0.0000	0.0000
0.3868	0.0570	0.0036	0.0000	0.0000
0.4220	0.0567	0.0039	0.0000	0.0000
0.4571	0.0565	0.0042	0.0000	0.0000
0.4923	0.0562	0.0046	0.0000	0.0000
0.5275	0.0560	0.0049	0.0000	0.0000
0.5626	0.0558	0.0052	0.0000	0.0000
0.5978	0.0555	0.0056	0.0000	0.0000
0.6330	0.0553	0.0059	0.0000	0.0000
0.6681	0.0550	0.0063	0.0000	0.0000
0.7033	0.0548	0.0066	0.0000	0.0000
0.7385	0.0545	0.0070	0.0000	0.0000
0.7736	0.0543	0.0073	0.0000	0.0000
0.8088	0.0541	0.0077	0.0000	0.0000
0.8440	0.0538	0.0080	0.0000	0.0000
0.8791	0.0536	0.0084	0.0000	0.0000
0.9143	0.0533	0.0087	0.0000	0.0000
0.9495	0.0531	0.0091	0.0000	0.0000
0.9846	0.0528	0.0095	0.0000	0.0000
1.0198	0.0526	0.0098	0.0000	0.0000
1.0549	0.0524	0.0102	0.0000	0.0000

1.0901	0.0521	0.0105	0.0000	0.0000
1.1253	0.0519	0.0109	0.0000	0.0000
1.1604	0.0516	0.0113	0.0000	0.0000
1.1956	0.0514	0.0117	0.0000	0.0000
1.2308	0.0512	0.0120	0.0000	0.0000
1.2659	0.0509	0.0124	0.0000	0.0000
1.3011	0.0507	0.0128	0.0000	0.0000
1.3363	0.0504	0.0132	0.0000	0.0000
1.3714	0.0502	0.0135	0.0000	0.0000
1.4066	0.0500	0.0139	0.0000	0.0000
1.4418	0.0497	0.0143	0.0000	0.0000
1.4769	0.0495	0.0147	0.0000	0.0000
1.5121	0.0493	0.0151	0.0000	0.0000
1.5473	0.0490	0.0155	0.0000	0.0000
1.5824	0.0488	0.0158	0.0000	0.0000
1.6176	0.0485	0.0162	0.0000	0.0000
1.6527	0.0483	0.0166	0.0000	0.0000
1.6879	0.0481	0.0170	0.0000	0.0000
1.7231	0.0478	0.0178	0.0000	0.0000
1.7582	0.0476	0.0186	0.0000	0.0000
1.7934	0.0474	0.0194	0.0000	0.0000
1.8286	0.0471	0.0202	0.0000	0.0000
1.8637	0.0469	0.0210	0.0000	0.0000
1.8989	0.0466	0.0218	0.0000	0.0000
1.9341	0.0464	0.0226	0.0000	0.0000
1.9692	0.0462	0.0234	0.0000	0.0000
2.0044	0.0459	0.0242	0.0000	0.0000
2.0396	0.0457	0.0250	0.0000	0.0000
2.0747	0.0455	0.0259	0.0000	0.0000
2.1099	0.0452	0.0267	0.0000	0.0000
2.1451	0.0450	0.0275	0.0000	0.0000
2.1802	0.0448	0.0284	0.0000	0.0000
2.2154	0.0445	0.0292	0.0000	0.0000
2.2505	0.0443	0.0300	0.0000	0.0000
2.2857	0.0441	0.0309	0.0000	0.0000
2.3209	0.0438	0.0317	0.0000	0.0000
2.3560	0.0436	0.0326	0.0000	0.0000
2.3912	0.0434	0.0334	0.0000	0.0000
2.4264	0.0431	0.0343	0.0000	0.0000
2.4615	0.0429	0.0352	0.0000	0.0000
2.4967	0.0427	0.0360	0.0000	0.0000
2.5000	0.0424	0.0361	0.0000	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
2.5000	0.0595	0.0361	0.0000	0.2191	0.0000
2.5352	0.0597	0.0382	0.0000	0.2191	0.0000
2.5703	0.0600	0.0403	0.0000	0.2293	0.0000
2.6055	0.0602	0.0424	0.0000	0.2345	0.0000
2.6407	0.0605	0.0445	0.0000	0.2396	0.0000
2.6758	0.0607	0.0467	0.0000	0.2447	0.0000
2.7110	0.0610	0.0488	0.0000	0.2499	0.0000
2.7462	0.0612	0.0510	0.0000	0.2550	0.0000
2.7813	0.0615	0.0531	0.0000	0.2601	0.0000
2.8165	0.0617	0.0553	0.0000	0.2653	0.0000
2.8516	0.0620	0.0575	0.0000	0.2704	0.0000
2.8868	0.0622	0.0596	0.0000	0.2756	0.0000
2.9220	0.0625	0.0618	0.0000	0.2807	0.0000

2.9571	0.0627	0.0640	0.0000	0.2858	0.0000
2.9923	0.0630	0.0662	0.0000	0.2910	0.0000
3.0275	0.0632	0.0685	0.0000	0.2921	0.0000
3.0626	0.0635	0.0707	0.0000	0.2921	0.0000
3.0978	0.0637	0.0729	0.0000	0.2921	0.0000
3.1330	0.0640	0.0752	0.0000	0.2921	0.0000
3.1681	0.0642	0.0774	0.0000	0.2921	0.0000
3.2000	0.0644	0.0795	0.0000	0.2921	0.0000

Surface Bio Swale 2

Element Flows To:

Outlet 1	Outlet 2
	Bio Swale 2

Bio Swale 3

Bottom Length:	18.00 ft.
Bottom Width:	18.00 ft.
Material thickness of first layer:	1.5
Material type for first layer:	Amended 5 in/hr
Material thickness of second layer:	1
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.34
Orifice Diameter (in.):	4
Offset (in.):	4
Flow Through Underdrain (ac-ft.):	6.342
Total Outflow (ac-ft.):	6.463
Percent Through Underdrain:	98.13
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	12 in.
Element Flows To:	
Outlet 1	Outlet 2

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0149	0.0000	0.0000	0.0000
0.0352	0.0149	0.0001	0.0000	0.0000
0.0703	0.0148	0.0001	0.0000	0.0000
0.1055	0.0147	0.0002	0.0000	0.0000
0.1407	0.0145	0.0002	0.0000	0.0000
0.1758	0.0144	0.0003	0.0000	0.0000
0.2110	0.0143	0.0003	0.0000	0.0000
0.2462	0.0142	0.0004	0.0000	0.0000
0.2813	0.0141	0.0005	0.0000	0.0000
0.3165	0.0140	0.0005	0.0000	0.0000
0.3516	0.0139	0.0006	0.0000	0.0000
0.3868	0.0138	0.0006	0.0000	0.0000
0.4220	0.0137	0.0007	0.0000	0.0000
0.4571	0.0135	0.0008	0.0000	0.0000
0.4923	0.0134	0.0008	0.0000	0.0000
0.5275	0.0133	0.0009	0.0000	0.0000
0.5626	0.0132	0.0010	0.0000	0.0000
0.5978	0.0131	0.0010	0.0000	0.0000
0.6330	0.0130	0.0011	0.0000	0.0000
0.6681	0.0129	0.0012	0.0000	0.0000
0.7033	0.0128	0.0012	0.0000	0.0000
0.7385	0.0127	0.0014	0.0000	0.0000
0.7736	0.0126	0.0015	0.0000	0.0000
0.8088	0.0125	0.0017	0.0000	0.0000
0.8440	0.0123	0.0018	0.0000	0.0000
0.8791	0.0122	0.0020	0.0000	0.0000
0.9143	0.0121	0.0021	0.0000	0.0000
0.9495	0.0120	0.0023	0.0000	0.0000
0.9846	0.0119	0.0024	0.0000	0.0000
1.0198	0.0118	0.0026	0.0000	0.0000
1.0549	0.0117	0.0027	0.0000	0.0000

1.0901	0.0116	0.0029	0.0000	0.0000
1.1253	0.0115	0.0030	0.0000	0.0000
1.1604	0.0114	0.0032	0.0000	0.0000
1.1956	0.0113	0.0033	0.0000	0.0000
1.2308	0.0112	0.0035	0.0000	0.0000
1.2659	0.0111	0.0037	0.0000	0.0000
1.3011	0.0110	0.0038	0.0000	0.0000
1.3363	0.0109	0.0040	0.0000	0.0000
1.3714	0.0108	0.0042	0.0000	0.0000
1.4066	0.0107	0.0043	0.0000	0.0000
1.4418	0.0105	0.0045	0.0000	0.0000
1.4769	0.0104	0.0047	0.0000	0.0000
1.5121	0.0103	0.0048	0.0000	0.0000
1.5473	0.0102	0.0050	0.0000	0.0000
1.5824	0.0101	0.0052	0.0000	0.0000
1.6176	0.0100	0.0054	0.0000	0.0000
1.6527	0.0099	0.0055	0.0000	0.0000
1.6879	0.0098	0.0057	0.0000	0.0000
1.7231	0.0097	0.0059	0.0000	0.0000
1.7582	0.0096	0.0061	0.0000	0.0000
1.7934	0.0095	0.0063	0.0000	0.0000
1.8286	0.0094	0.0065	0.0000	0.0000
1.8637	0.0093	0.0066	0.0000	0.0000
1.8989	0.0092	0.0068	0.0000	0.0000
1.9341	0.0091	0.0070	0.0000	0.0000
1.9692	0.0090	0.0072	0.0000	0.0000
2.0044	0.0089	0.0074	0.0000	0.0000
2.0396	0.0088	0.0076	0.0000	0.0000
2.0747	0.0087	0.0078	0.0000	0.0000
2.1099	0.0086	0.0080	0.0000	0.0000
2.1451	0.0085	0.0082	0.0000	0.0000
2.1802	0.0084	0.0084	0.0000	0.0000
2.2154	0.0083	0.0086	0.0000	0.0000
2.2505	0.0082	0.0088	0.0000	0.0000
2.2857	0.0081	0.0090	0.0000	0.0000
2.3209	0.0080	0.0092	0.0000	0.0000
2.3560	0.0079	0.0094	0.0000	0.0000
2.3912	0.0078	0.0096	0.0000	0.0000
2.4264	0.0077	0.0099	0.0000	0.0000
2.4615	0.0076	0.0101	0.0000	0.0000
2.4967	0.0075	0.0103	0.0000	0.0000
2.5000	0.0074	0.0103	0.0000	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
2.5000	0.0149	0.0103	0.0000	0.0384	0.0000
2.5352	0.0150	0.0108	0.0000	0.0384	0.0000
2.5703	0.0151	0.0114	0.0000	0.0402	0.0000
2.6055	0.0152	0.0119	0.0000	0.0411	0.0000
2.6407	0.0154	0.0124	0.0000	0.0420	0.0000
2.6758	0.0155	0.0130	0.0000	0.0429	0.0000
2.7110	0.0156	0.0135	0.0000	0.0438	0.0000
2.7462	0.0157	0.0141	0.0000	0.0447	0.0000
2.7813	0.0158	0.0146	0.0000	0.0456	0.0000
2.8165	0.0159	0.0152	0.0000	0.0465	0.0000
2.8516	0.0160	0.0158	0.0000	0.0474	0.0000
2.8868	0.0162	0.0163	0.0000	0.0483	0.0000
2.9220	0.0163	0.0169	0.0000	0.0492	0.0000

2.9571	0.0164	0.0175	0.0000	0.0501	0.0000
2.9923	0.0165	0.0180	0.0000	0.0510	0.0000
3.0275	0.0166	0.0186	0.0000	0.0512	0.0000
3.0626	0.0167	0.0192	0.0000	0.0512	0.0000
3.0978	0.0169	0.0198	0.0000	0.0512	0.0000
3.1330	0.0170	0.0204	0.0000	0.0512	0.0000
3.1681	0.0171	0.0210	0.0000	0.0512	0.0000
3.2000	0.0172	0.0215	0.0000	0.0512	0.0000

Surface Bio Swale 3

Element Flows To:

Outlet 1	Outlet 2
	Bio Swale 3

Bio Swale 4

Bottom Length:	49.00 ft.
Bottom Width:	49.00 ft.
Material thickness of first layer:	1.5
Material type for first layer:	Amended 5 in/hr
Material thickness of second layer:	1
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.34
Orifice Diameter (in.):	4
Offset (in.):	4
Flow Through Underdrain (ac-ft.):	49.819
Total Outflow (ac-ft.):	51.214
Percent Through Underdrain:	97.28
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	12 in.
Element Flows To:	
Outlet 1	Outlet 2
Vault 2	

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0744	0.0000	0.0000	0.0000
0.0352	0.0744	0.0004	0.0000	0.0000
0.0703	0.0741	0.0008	0.0000	0.0000
0.1055	0.0739	0.0012	0.0000	0.0000
0.1407	0.0736	0.0016	0.0000	0.0000
0.1758	0.0733	0.0021	0.0000	0.0000
0.2110	0.0730	0.0025	0.0000	0.0000
0.2462	0.0727	0.0029	0.0000	0.0000
0.2813	0.0725	0.0033	0.0000	0.0000
0.3165	0.0722	0.0037	0.0000	0.0000
0.3516	0.0719	0.0042	0.0000	0.0000
0.3868	0.0716	0.0046	0.0000	0.0000
0.4220	0.0713	0.0050	0.0000	0.0000
0.4571	0.0711	0.0055	0.0000	0.0000
0.4923	0.0708	0.0059	0.0000	0.0000
0.5275	0.0705	0.0063	0.0000	0.0000
0.5626	0.0702	0.0068	0.0000	0.0000
0.5978	0.0700	0.0072	0.0000	0.0000
0.6330	0.0697	0.0076	0.0000	0.0000
0.6681	0.0694	0.0081	0.0000	0.0000
0.7033	0.0691	0.0085	0.0000	0.0000
0.7385	0.0689	0.0090	0.0000	0.0000
0.7736	0.0686	0.0094	0.0000	0.0000
0.8088	0.0683	0.0099	0.0000	0.0000
0.8440	0.0680	0.0103	0.0000	0.0000
0.8791	0.0678	0.0108	0.0000	0.0000
0.9143	0.0675	0.0112	0.0000	0.0000
0.9495	0.0672	0.0117	0.0000	0.0000
0.9846	0.0669	0.0122	0.0000	0.0000
1.0198	0.0667	0.0126	0.0000	0.0000
1.0549	0.0664	0.0131	0.0000	0.0000

1.0901	0.0661	0.0136	0.0000	0.0000
1.1253	0.0658	0.0140	0.0000	0.0000
1.1604	0.0656	0.0145	0.0000	0.0000
1.1956	0.0653	0.0150	0.0000	0.0000
1.2308	0.0650	0.0155	0.0000	0.0000
1.2659	0.0648	0.0159	0.0000	0.0000
1.3011	0.0645	0.0164	0.0000	0.0000
1.3363	0.0642	0.0169	0.0000	0.0000
1.3714	0.0639	0.0174	0.0000	0.0000
1.4066	0.0637	0.0179	0.0000	0.0000
1.4418	0.0634	0.0183	0.0000	0.0000
1.4769	0.0631	0.0188	0.0000	0.0000
1.5121	0.0629	0.0193	0.0000	0.0000
1.5473	0.0626	0.0198	0.0000	0.0000
1.5824	0.0623	0.0203	0.0000	0.0000
1.6176	0.0621	0.0208	0.0000	0.0000
1.6527	0.0618	0.0213	0.0000	0.0000
1.6879	0.0615	0.0218	0.0000	0.0000
1.7231	0.0612	0.0223	0.0000	0.0000
1.7582	0.0610	0.0228	0.0000	0.0000
1.7934	0.0607	0.0233	0.0000	0.0000
1.8286	0.0604	0.0238	0.0000	0.0000
1.8637	0.0602	0.0243	0.0000	0.0000
1.8989	0.0599	0.0248	0.0000	0.0000
1.9341	0.0596	0.0253	0.0000	0.0000
1.9692	0.0594	0.0263	0.0000	0.0000
2.0044	0.0591	0.0274	0.0000	0.0000
2.0396	0.0588	0.0284	0.0000	0.0000
2.0747	0.0586	0.0294	0.0000	0.0000
2.1099	0.0583	0.0305	0.0000	0.0000
2.1451	0.0580	0.0315	0.0000	0.0000
2.1802	0.0578	0.0325	0.0000	0.0000
2.2154	0.0575	0.0336	0.0000	0.0000
2.2505	0.0572	0.0347	0.0000	0.0000
2.2857	0.0570	0.0357	0.0000	0.0000
2.3209	0.0567	0.0368	0.0000	0.0000
2.3560	0.0564	0.0378	0.0000	0.0000
2.3912	0.0562	0.0389	0.0000	0.0000
2.4264	0.0559	0.0400	0.0000	0.0000
2.4615	0.0556	0.0411	0.0000	0.0000
2.4967	0.0554	0.0422	0.0000	0.0000
2.5000	0.0551	0.0423	0.0000	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
2.5000	0.0744	0.0423	0.0000	0.2845	0.0000
2.5352	0.0747	0.0449	0.0000	0.2845	0.0000
2.5703	0.0750	0.0475	0.0000	0.2978	0.0000
2.6055	0.0753	0.0502	0.0000	0.3045	0.0000
2.6407	0.0756	0.0528	0.0000	0.3111	0.0000
2.6758	0.0758	0.0555	0.0000	0.3178	0.0000
2.7110	0.0761	0.0581	0.0000	0.3245	0.0000
2.7462	0.0764	0.0608	0.0000	0.3311	0.0000
2.7813	0.0767	0.0635	0.0000	0.3378	0.0000
2.8165	0.0770	0.0662	0.0000	0.3445	0.0000
2.8516	0.0772	0.0689	0.0000	0.3511	0.0000
2.8868	0.0775	0.0716	0.0000	0.3578	0.0000
2.9220	0.0778	0.0744	0.0000	0.3583	0.0000

2.9571	0.0781	0.0771	0.0000	0.3583	0.0000
2.9923	0.0784	0.0799	0.0000	0.3583	0.0000
3.0275	0.0787	0.0826	0.0000	0.3583	0.0000
3.0626	0.0789	0.0854	0.0000	0.3583	0.0000
3.0978	0.0792	0.0882	0.0000	0.3583	0.0000
3.1330	0.0795	0.0910	0.0000	0.3583	0.0000
3.1681	0.0798	0.0938	0.0000	0.3583	0.0000
3.2000	0.0801	0.0963	0.0000	0.3583	0.0000

Surface Bio Swale 4

Element Flows To:

Outlet 1	Outlet 2
Vault 2	Bio Swale 4

Bio Swale 5

Bottom Length:	28.00 ft.
Bottom Width:	28.00 ft.
Material thickness of first layer:	1.5
Material type for first layer:	Amended 5 in/hr
Material thickness of second layer:	1
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.34
Orifice Diameter (in.):	4
Offset (in.):	4
Flow Through Underdrain (ac-ft.):	16.443
Total Outflow (ac-ft.):	16.869
Percent Through Underdrain:	97.47
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	12 in.
Element Flows To:	
Outlet 1	Outlet 2

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0293	0.0000	0.0000	0.0000
0.0352	0.0293	0.0001	0.0000	0.0000
0.0703	0.0291	0.0003	0.0000	0.0000
0.1055	0.0289	0.0004	0.0000	0.0000
0.1407	0.0288	0.0005	0.0000	0.0000
0.1758	0.0286	0.0007	0.0000	0.0000
0.2110	0.0284	0.0008	0.0000	0.0000
0.2462	0.0283	0.0010	0.0000	0.0000
0.2813	0.0281	0.0011	0.0000	0.0000
0.3165	0.0279	0.0012	0.0000	0.0000
0.3516	0.0278	0.0014	0.0000	0.0000
0.3868	0.0276	0.0015	0.0000	0.0000
0.4220	0.0274	0.0017	0.0000	0.0000
0.4571	0.0273	0.0018	0.0000	0.0000
0.4923	0.0271	0.0020	0.0000	0.0000
0.5275	0.0270	0.0021	0.0000	0.0000
0.5626	0.0268	0.0023	0.0000	0.0000
0.5978	0.0266	0.0024	0.0000	0.0000
0.6330	0.0265	0.0026	0.0000	0.0000
0.6681	0.0263	0.0027	0.0000	0.0000
0.7033	0.0261	0.0029	0.0000	0.0000
0.7385	0.0260	0.0030	0.0000	0.0000
0.7736	0.0258	0.0032	0.0000	0.0000
0.8088	0.0257	0.0034	0.0000	0.0000
0.8440	0.0255	0.0035	0.0000	0.0000
0.8791	0.0253	0.0037	0.0000	0.0000
0.9143	0.0252	0.0038	0.0000	0.0000
0.9495	0.0250	0.0040	0.0000	0.0000
0.9846	0.0248	0.0042	0.0000	0.0000
1.0198	0.0247	0.0043	0.0000	0.0000
1.0549	0.0245	0.0045	0.0000	0.0000

1.0901	0.0244	0.0047	0.0000	0.0000
1.1253	0.0242	0.0050	0.0000	0.0000
1.1604	0.0240	0.0053	0.0000	0.0000
1.1956	0.0239	0.0057	0.0000	0.0000
1.2308	0.0237	0.0060	0.0000	0.0000
1.2659	0.0236	0.0064	0.0000	0.0000
1.3011	0.0234	0.0067	0.0000	0.0000
1.3363	0.0233	0.0071	0.0000	0.0000
1.3714	0.0231	0.0074	0.0000	0.0000
1.4066	0.0229	0.0078	0.0000	0.0000
1.4418	0.0228	0.0081	0.0000	0.0000
1.4769	0.0226	0.0085	0.0000	0.0000
1.5121	0.0225	0.0089	0.0000	0.0000
1.5473	0.0223	0.0092	0.0000	0.0000
1.5824	0.0221	0.0096	0.0000	0.0000
1.6176	0.0220	0.0100	0.0000	0.0000
1.6527	0.0218	0.0103	0.0000	0.0000
1.6879	0.0217	0.0107	0.0000	0.0000
1.7231	0.0215	0.0111	0.0000	0.0000
1.7582	0.0214	0.0114	0.0000	0.0000
1.7934	0.0212	0.0118	0.0000	0.0000
1.8286	0.0211	0.0122	0.0000	0.0000
1.8637	0.0209	0.0126	0.0000	0.0000
1.8989	0.0207	0.0130	0.0000	0.0000
1.9341	0.0206	0.0134	0.0000	0.0000
1.9692	0.0204	0.0137	0.0000	0.0000
2.0044	0.0203	0.0141	0.0000	0.0000
2.0396	0.0201	0.0145	0.0000	0.0000
2.0747	0.0200	0.0149	0.0000	0.0000
2.1099	0.0198	0.0153	0.0000	0.0000
2.1451	0.0197	0.0157	0.0000	0.0000
2.1802	0.0195	0.0161	0.0000	0.0000
2.2154	0.0194	0.0165	0.0000	0.0000
2.2505	0.0192	0.0170	0.0000	0.0000
2.2857	0.0191	0.0174	0.0000	0.0000
2.3209	0.0189	0.0178	0.0000	0.0000
2.3560	0.0188	0.0182	0.0000	0.0000
2.3912	0.0186	0.0186	0.0000	0.0000
2.4264	0.0185	0.0190	0.0000	0.0000
2.4615	0.0183	0.0195	0.0000	0.0000
2.4967	0.0181	0.0199	0.0000	0.0000
2.5000	0.0180	0.0199	0.0000	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
2.5000	0.0293	0.0199	0.0000	0.0929	0.0000
2.5352	0.0295	0.0210	0.0000	0.0929	0.0000
2.5703	0.0296	0.0220	0.0000	0.0972	0.0000
2.6055	0.0298	0.0230	0.0000	0.0994	0.0000
2.6407	0.0300	0.0241	0.0000	0.1016	0.0000
2.6758	0.0301	0.0251	0.0000	0.1038	0.0000
2.7110	0.0303	0.0262	0.0000	0.1059	0.0000
2.7462	0.0305	0.0273	0.0000	0.1081	0.0000
2.7813	0.0306	0.0283	0.0000	0.1103	0.0000
2.8165	0.0308	0.0294	0.0000	0.1125	0.0000
2.8516	0.0310	0.0305	0.0000	0.1147	0.0000
2.8868	0.0311	0.0316	0.0000	0.1168	0.0000
2.9220	0.0313	0.0327	0.0000	0.1190	0.0000

2.9571	0.0315	0.0338	0.0000	0.1212	0.0000
2.9923	0.0316	0.0349	0.0000	0.1234	0.0000
3.0275	0.0318	0.0360	0.0000	0.1238	0.0000
3.0626	0.0320	0.0372	0.0000	0.1238	0.0000
3.0978	0.0322	0.0383	0.0000	0.1238	0.0000
3.1330	0.0323	0.0394	0.0000	0.1238	0.0000
3.1681	0.0325	0.0406	0.0000	0.1238	0.0000
3.2000	0.0326	0.0416	0.0000	0.1238	0.0000

Surface Bio Swale 5

Element Flows To:

Outlet 1	Outlet 2
	Bio Swale 5

Vault 2

Width: 16.9 ft.
Length: 16.9 ft.
Depth: 3.5 ft.
Infiltration On
Infiltration rate: 0.2
Infiltration safety factor: 1
Total Volume Infiltrated (ac-ft.): 1.51
Total Volume Through Riser (ac-ft.): 49.7
Total Volume Through Facility (ac-ft.): 51.21
Percent Infiltrated: 2.95
Total Precip Applied to Facility: 0
Total Evap From Facility: 0
Discharge Structure
Riser Height: 3.3 ft.
Riser Diameter: 24 in.
Orifice 1 Diameter: 1 in. Elevation:0 ft.
Orifice 2 Diameter: 4 in. Elevation:2 ft.
Orifice 3 Diameter: 6 in. Elevation:2.5 ft.
Element Flows To:
Outlet 1 Outlet 2

Vault Hydraulic Table

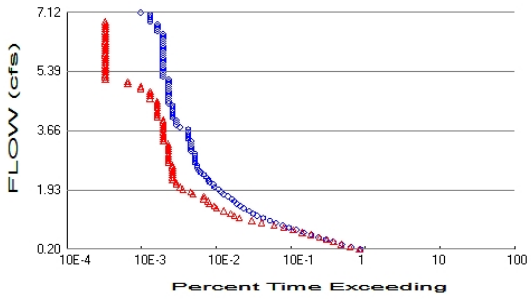
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.006	0.000	0.000	0.000
0.0389	0.006	0.000	0.005	0.001
0.0778	0.006	0.000	0.007	0.001
0.1167	0.006	0.000	0.009	0.001
0.1556	0.006	0.001	0.010	0.001
0.1944	0.006	0.001	0.012	0.001
0.2333	0.006	0.001	0.013	0.001
0.2722	0.006	0.001	0.014	0.001
0.3111	0.006	0.002	0.015	0.001
0.3500	0.006	0.002	0.016	0.001
0.3889	0.006	0.002	0.016	0.001
0.4278	0.006	0.002	0.017	0.001
0.4667	0.006	0.003	0.018	0.001
0.5056	0.006	0.003	0.019	0.001
0.5444	0.006	0.003	0.020	0.001
0.5833	0.006	0.003	0.020	0.001
0.6222	0.006	0.004	0.021	0.001
0.6611	0.006	0.004	0.022	0.001
0.7000	0.006	0.004	0.022	0.001
0.7389	0.006	0.004	0.023	0.001
0.7778	0.006	0.005	0.023	0.001
0.8167	0.006	0.005	0.024	0.001
0.8556	0.006	0.005	0.025	0.001
0.8944	0.006	0.005	0.025	0.001
0.9333	0.006	0.006	0.026	0.001
0.9722	0.006	0.006	0.026	0.001
1.0111	0.006	0.006	0.027	0.001
1.0500	0.006	0.006	0.027	0.001
1.0889	0.006	0.007	0.028	0.001
1.1278	0.006	0.007	0.028	0.001
1.1667	0.006	0.007	0.029	0.001

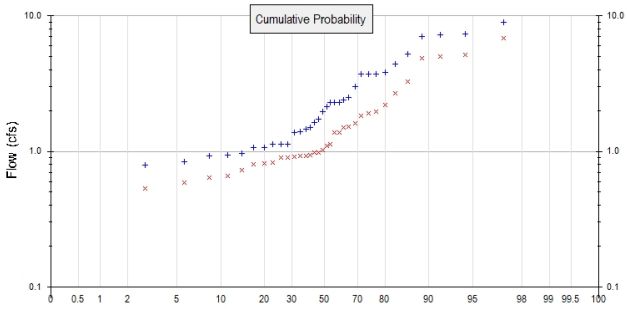
1.2056	0.006	0.007	0.029	0.001
1.2444	0.006	0.008	0.030	0.001
1.2833	0.006	0.008	0.030	0.001
1.3222	0.006	0.008	0.031	0.001
1.3611	0.006	0.008	0.031	0.001
1.4000	0.006	0.009	0.032	0.001
1.4389	0.006	0.009	0.032	0.001
1.4778	0.006	0.009	0.033	0.001
1.5167	0.006	0.009	0.033	0.001
1.5556	0.006	0.010	0.033	0.001
1.5944	0.006	0.010	0.034	0.001
1.6333	0.006	0.010	0.034	0.001
1.6722	0.006	0.011	0.035	0.001
1.7111	0.006	0.011	0.035	0.001
1.7500	0.006	0.011	0.035	0.001
1.7889	0.006	0.011	0.036	0.001
1.8278	0.006	0.012	0.036	0.001
1.8667	0.006	0.012	0.037	0.001
1.9056	0.006	0.012	0.037	0.001
1.9444	0.006	0.012	0.037	0.001
1.9833	0.006	0.013	0.038	0.001
2.0222	0.006	0.013	0.103	0.001
2.0611	0.006	0.013	0.146	0.001
2.1000	0.006	0.013	0.176	0.001
2.1389	0.006	0.014	0.201	0.001
2.1778	0.006	0.014	0.223	0.001
2.2167	0.006	0.014	0.242	0.001
2.2556	0.006	0.014	0.260	0.001
2.2944	0.006	0.015	0.276	0.001
2.3333	0.006	0.015	0.292	0.001
2.3722	0.006	0.015	0.306	0.001
2.4111	0.006	0.015	0.320	0.001
2.4500	0.006	0.016	0.333	0.001
2.4889	0.006	0.016	0.346	0.001
2.5278	0.006	0.016	0.521	0.001
2.5667	0.006	0.016	0.622	0.001
2.6056	0.006	0.017	0.699	0.001
2.6444	0.006	0.017	0.764	0.001
2.6833	0.006	0.017	0.821	0.001
2.7222	0.006	0.017	0.874	0.001
2.7611	0.006	0.018	0.923	0.001
2.8000	0.006	0.018	0.968	0.001
2.8389	0.006	0.018	1.012	0.001
2.8778	0.006	0.018	1.053	0.001
2.9167	0.006	0.019	1.092	0.001
2.9556	0.006	0.019	1.130	0.001
2.9944	0.006	0.019	1.166	0.001
3.0333	0.006	0.019	1.202	0.001
3.0722	0.006	0.020	1.236	0.001
3.1111	0.006	0.020	1.269	0.001
3.1500	0.006	0.020	1.301	0.001
3.1889	0.006	0.020	1.332	0.001
3.2278	0.006	0.021	1.363	0.001
3.2667	0.006	0.021	1.393	0.001
3.3056	0.006	0.021	1.431	0.001
3.3444	0.006	0.021	1.649	0.001
3.3833	0.006	0.022	1.988	0.001
3.4222	0.006	0.022	2.411	0.001

3.4611	0.006	0.022	2.900	0.001
3.5000	0.006	0.022	3.446	0.001
3.5389	0.006	0.023	4.038	0.001
3.5778	0.000	0.000	4.670	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 2.37
Total Impervious Area: 3.57

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.5
Total Impervious Area: 4.44

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	1.96038
5 year	3.798968
10 year	7.1183
25 year	7.945855

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	1.02605
5 year	2.142834
10 year	4.891753
25 year	5.799394

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1951	2.302	0.975
1952	3.818	1.511
1953	2.506	1.833
1954	3.007	0.799
1955	0.682	0.663
1956	3.723	3.290
1957	1.128	0.641
1958	2.385	1.508
1959	5.227	2.668
1960	1.125	0.944
1961	1.059	0.827
1962	7.212	4.980
1963	3.731	2.192
1964	1.401	1.026

1965	7.071	4.848
1966	1.133	0.899
1967	2.284	1.620
1968	1.501	1.136
1969	1.721	0.928
1970	7.316	5.122
1971	1.625	1.093
1972	0.961	0.533
1973	1.379	0.928
1974	1.960	1.384
1975	1.071	0.918
1976	0.944	0.731
1977	0.925	0.590
1978	2.301	0.895
1979	3.696	1.383
1980	4.423	1.900
1981	0.835	0.815
1982	2.138	1.971
1983	8.936	6.864
1984	0.793	0.254
1985	1.467	0.975

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	8.9362	6.8635
2	7.3156	5.1222
3	7.2119	4.9796
4	7.0715	4.8478
5	5.2267	3.2903
6	4.4228	2.6684
7	3.8184	2.1920
8	3.7311	1.9709
9	3.7235	1.8999
10	3.6965	1.8333
11	3.0068	1.6202
12	2.5058	1.5108
13	2.3849	1.5083
14	2.3025	1.3844
15	2.3006	1.3827
16	2.2837	1.1360
17	2.1384	1.0931
18	1.9604	1.0261
19	1.7212	0.9755
20	1.6251	0.9754
21	1.5011	0.9441
22	1.4671	0.9282
23	1.4013	0.9276
24	1.3786	0.9177
25	1.1330	0.8986
26	1.1283	0.8951
27	1.1249	0.8270
28	1.0710	0.8154
29	1.0594	0.7991
30	0.9607	0.7310
31	0.9435	0.6628
32	0.9246	0.6407
33	0.8354	0.5904

34	0.7933	0.5334
35	0.6820	0.2538

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1960	2629	2540	96	Pass
0.2660	1989	1908	95	Pass
0.3359	1479	1458	98	Pass
0.4058	1144	1150	100	Pass
0.4757	905	935	103	Pass
0.5456	716	746	104	Pass
0.6156	575	569	98	Pass
0.6855	457	439	96	Pass
0.7554	362	332	91	Pass
0.8253	291	246	84	Pass
0.8953	239	182	76	Pass
0.9652	195	125	64	Pass
1.0351	161	93	57	Pass
1.1050	131	63	48	Pass
1.1749	108	54	50	Pass
1.2449	96	48	50	Pass
1.3148	85	39	45	Pass
1.3847	72	31	43	Pass
1.4546	64	29	45	Pass
1.5246	58	25	43	Pass
1.5945	54	24	44	Pass
1.6644	50	21	42	Pass
1.7343	44	21	47	Pass
1.8042	38	15	39	Pass
1.8742	36	14	38	Pass
1.9441	33	11	33	Pass
2.0140	29	10	34	Pass
2.0839	28	9	32	Pass
2.1538	25	9	36	Pass
2.2238	24	8	33	Pass
2.2937	23	8	34	Pass
2.3636	21	8	38	Pass
2.4335	19	8	42	Pass
2.5035	18	8	44	Pass
2.5734	17	8	47	Pass
2.6433	17	8	47	Pass
2.7132	16	7	43	Pass
2.7831	16	7	43	Pass
2.8531	16	7	43	Pass
2.9230	16	7	43	Pass
2.9929	16	7	43	Pass
3.0628	14	7	50	Pass
3.1328	14	7	50	Pass
3.2027	14	7	50	Pass
3.2726	14	7	50	Pass
3.3425	14	6	42	Pass
3.4124	13	6	46	Pass
3.4824	13	6	46	Pass
3.5523	13	6	46	Pass
3.6222	13	6	46	Pass
3.6921	13	6	46	Pass
3.7621	10	6	60	Pass
3.8320	9	6	66	Pass

3.9019	9	6	66	Pass
3.9718	9	6	66	Pass
4.0417	8	5	62	Pass
4.1117	8	5	62	Pass
4.1816	8	5	62	Pass
4.2515	8	5	62	Pass
4.3214	8	5	62	Pass
4.3913	8	5	62	Pass
4.4613	7	5	71	Pass
4.5312	7	5	71	Pass
4.6011	7	4	57	Pass
4.6710	7	4	57	Pass
4.7410	7	4	57	Pass
4.8109	7	4	57	Pass
4.8808	7	3	42	Pass
4.9507	7	3	42	Pass
5.0206	7	2	28	Pass
5.0906	7	2	28	Pass
5.1605	7	1	14	Pass
5.2304	6	1	16	Pass
5.3003	6	1	16	Pass
5.3703	6	1	16	Pass
5.4402	6	1	16	Pass
5.5101	6	1	16	Pass
5.5800	6	1	16	Pass
5.6499	6	1	16	Pass
5.7199	6	1	16	Pass
5.7898	6	1	16	Pass
5.8597	6	1	16	Pass
5.9296	6	1	16	Pass
5.9996	6	1	16	Pass
6.0695	6	1	16	Pass
6.1394	6	1	16	Pass
6.2093	6	1	16	Pass
6.2792	6	1	16	Pass
6.3492	6	1	16	Pass
6.4191	6	1	16	Pass
6.4890	6	1	16	Pass
6.5589	5	1	20	Pass
6.6288	5	1	20	Pass
6.6988	5	1	20	Pass
6.7687	5	1	20	Pass
6.8386	4	1	25	Pass
6.9085	4	0	0	Pass
6.9785	4	0	0	Pass
7.0484	4	0	0	Pass
7.1183	3	0	0	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

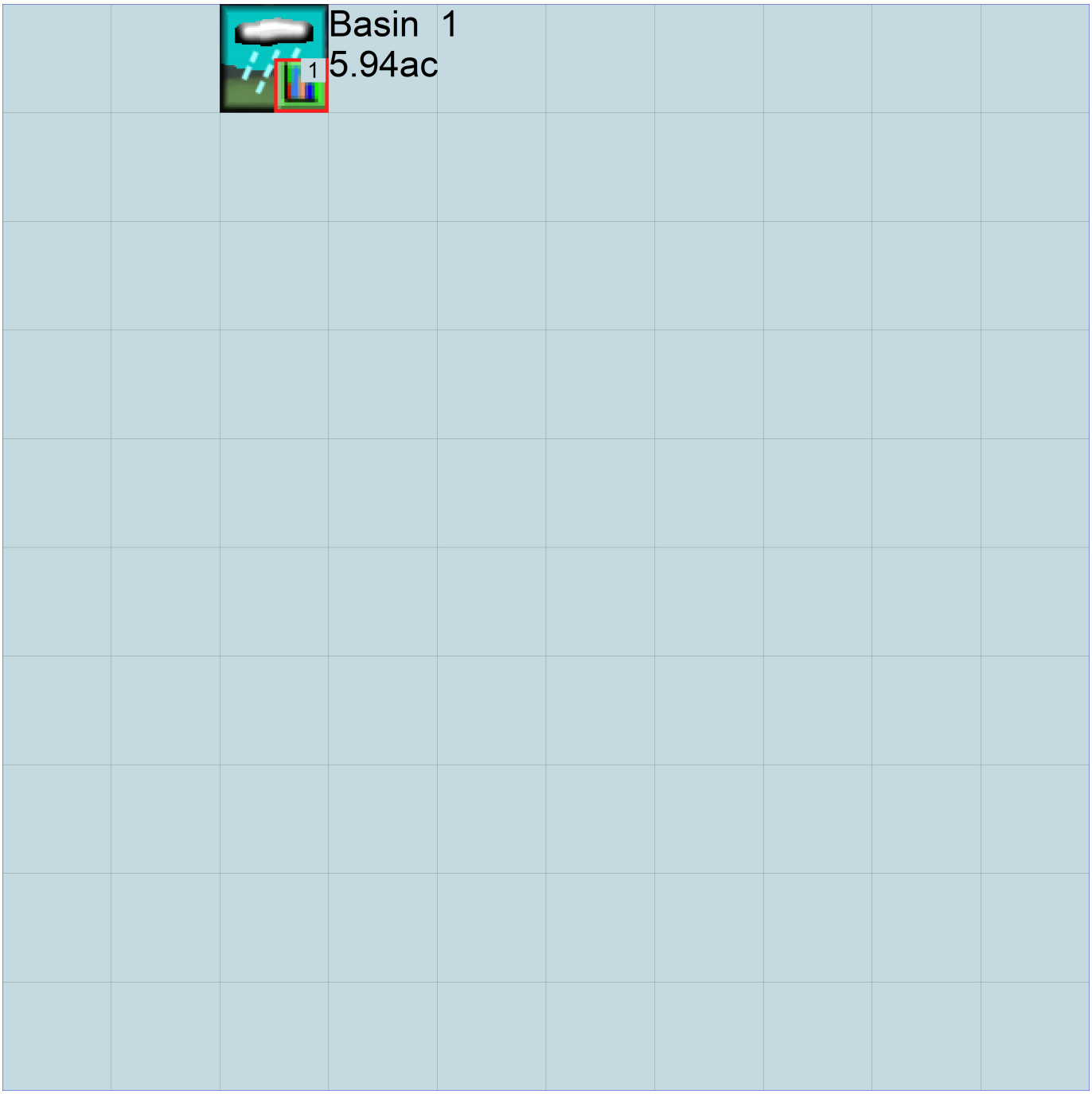
PERLND Changes

No PERLND changes have been made.

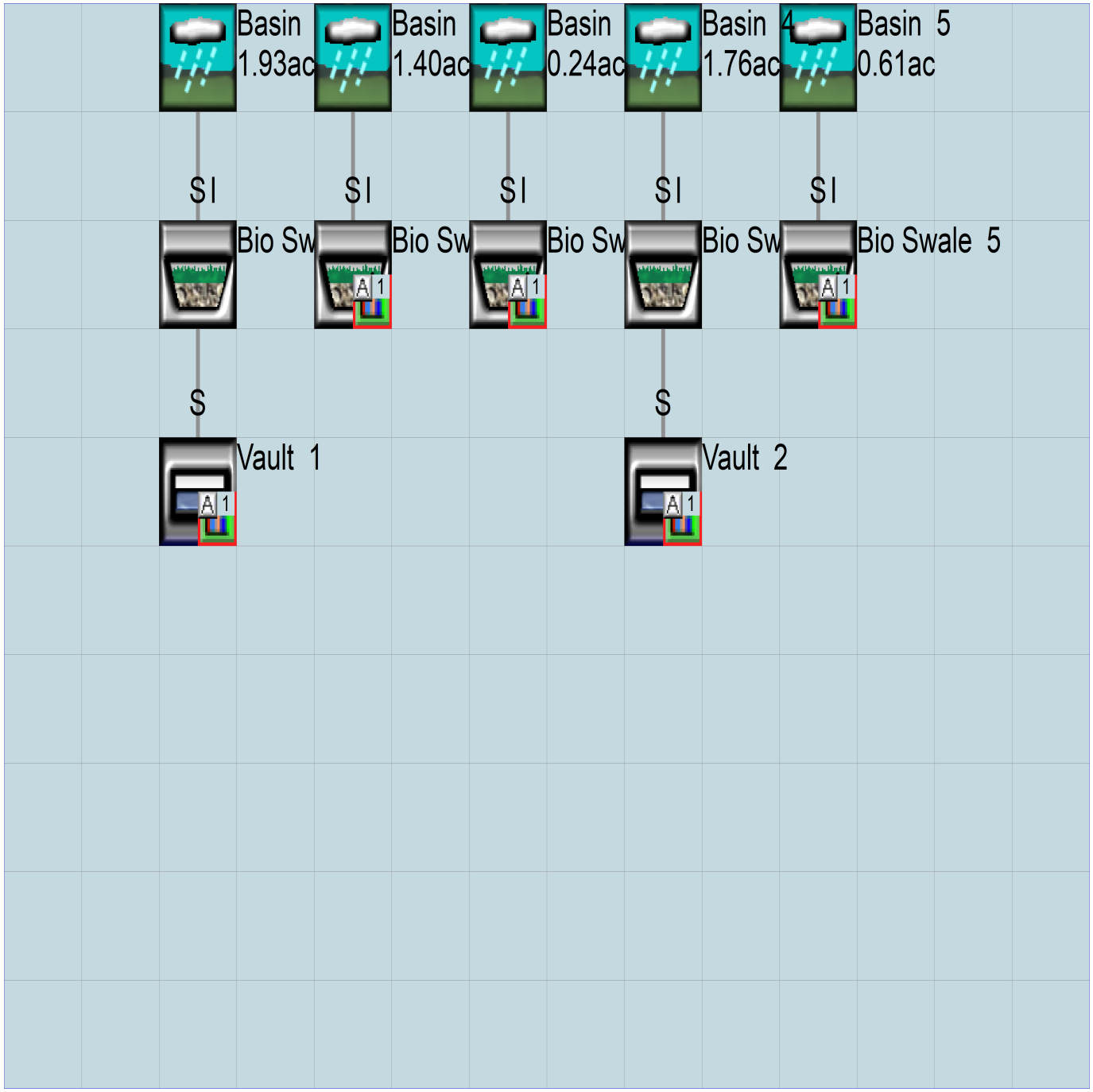
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1950 10 01        END    1985 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   2740 Jones Road.wdm
MESSU       25   Pre2740 Jones Road.MES
            27   Pre2740 Jones Road.L61
            28   Pre2740 Jones Road.L62
            30   POC2740 Jones Road1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:60
      PERLND      33
      IMPLND       5
      IMPLND      14
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                     1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                        in  out           ***
   33     C/D,Grass,Flat(0-5%)    1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   33         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   33         0    0    4    0    0    0    0    0    0    0    0    0    1    9
```

```
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   33         0    1    1    1    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   33             0         7      0.03       660      0.05         0      0.95
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   33            40        35         2         2       0.1         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   33             0       0.5       0.3       0.4       0.3         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   33       0.4  0.4  0.4 0.45  0.5 0.55 0.55 0.55 0.55 0.55 0.45  0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   33      0.12 0.12 0.12 0.11  0.1  0.1  0.1  0.1  0.1  0.1 0.11 0.12
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   33             0         0      0.15         0         4      0.05         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    5     Roof Area                1    1    1   27    0
   14     Parking,Flat(0-5%)       1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    5         0    0    1    0    0    0
   14         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    5         0    0    4    0    0    0    1    9
   14         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
```

```
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    5         0    0    0    0    1
   14         0    0    0    0    1
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    5            100     0.035      0.05       0.1
   14            100     0.035      0.05       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    5              0         0
   14              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    5              0         0
   14              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  33                       2.37     COPY   501     12
PERLND  33                       2.37     COPY   501     13
IMPLND   5                       1.02     COPY   501     15
IMPLND  14                       2.55     COPY   501     15

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
```

```
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *      *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                       ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     12.1      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1950 10 01        END    1985 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   2740 Jones Road.wdm
MESSU       25   Mit2740 Jones Road.MES
            27   Mit2740 Jones Road.L61
            28   Mit2740 Jones Road.L62
            30   POC2740 Jones Road1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:60
      PERLND      33
      IMPLND       1
      IMPLND       5
      IMPLND      14
      IMPLND      10
      RCHRES       1
      RCHRES       2
      RCHRES       3
      RCHRES       4
      RCHRES       5
      RCHRES       6
      RCHRES       7
      RCHRES       8
      RCHRES       9
      RCHRES      10
      RCHRES      11
      RCHRES      12
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Surface Bio Swale  2        MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
```

```
                                        in  out           ***
   33     C/D,Grass,Flat(0-5%)    1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   33         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   33         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   33         0    1    1    1    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   33              0         7      0.03       660      0.05         0      0.95
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   33             40        35         2         2       0.1         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   33             0       0.5       0.3       0.4       0.3         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   33       0.4  0.4  0.4 0.45  0.5 0.55 0.55 0.55 0.55 0.55 0.45  0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   33      0.12 0.12 0.12 0.11  0.1  0.1  0.1  0.1  0.1  0.1 0.11 0.12
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   33             0         0      0.15         0         4      0.05         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    1     Roads,Flat(0-5%)        1    1    1   27    0
    5     Roof Area               1    1    1   27    0
   14     Parking,Flat(0-5%)      1    1    1   27    0
   10     Sidewalks,Flat(0-5%)    1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***
```

```
  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
    5         0    0    1    0    0    0
   14         0    0    1    0    0    0
   10         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    0    1    9
    5         0    0    4    0    0    0    1    9
   14         0    0    4    0    0    0    1    9
   10         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    1
    5         0    0    0    0    1
   14         0    0    0    0    1
   10         0    0    0    0    1
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1          100     0.035      0.05       0.1
    5          100     0.035      0.05       0.1
   14          100     0.035      0.05       0.1
   10          100     0.035      0.05       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1             0         0
    5             0         0
   14             0         0
   10             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1             0         0
    5             0         0
   14             0         0
   10             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                <--Area-->     <-Target->   MBLK   ***
<Name>   #                <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  33                     0.39     RCHRES   1      2
PERLND  33                     0.39     RCHRES   1      3
IMPLND   1                     0.47     RCHRES   1      5
IMPLND   5                     0.86     RCHRES   1      5
IMPLND  14                     0.21     RCHRES   1      5
Basin  2***
PERLND  33                     0.37     RCHRES   3      2
PERLND  33                     0.37     RCHRES   3      3
IMPLND   1                     0.39     RCHRES   3      5
```

```
IMPLND   5                        0.54     RCHRES   3      5
IMPLND  10                         0.1     RCHRES   3      5
Basin  3***
PERLND  33                        0.08     RCHRES   5      2
PERLND  33                        0.08     RCHRES   5      3
IMPLND   1                        0.06     RCHRES   5      5
IMPLND   5                         0.1     RCHRES   5      5
Basin  5***
PERLND  33                        0.19     RCHRES   9      2
PERLND  33                        0.19     RCHRES   9      3
IMPLND   1                        0.12     RCHRES   9      5
IMPLND   5                        0.26     RCHRES   9      5
IMPLND  10                        0.04     RCHRES   9      5
Basin  4***
PERLND  33                        0.47     RCHRES   7      2
PERLND  33                        0.47     RCHRES   7      3
IMPLND   1                        0.48     RCHRES   7      5
IMPLND   5                        0.68     RCHRES   7      5
IMPLND  10                        0.13     RCHRES   7      5

******Routing******
RCHRES   2                           1     RCHRES  11      6
RCHRES   2                                 COPY     1     16
RCHRES   1                           1     RCHRES  11      7
RCHRES   1                                 COPY     1     17
RCHRES   1                           1     RCHRES   2      8
PERLND  33                        0.37     COPY     1     12
IMPLND   1                        0.39     COPY     1     15
IMPLND   5                        0.54     COPY     1     15
IMPLND  10                         0.1     COPY     1     15
PERLND  33                        0.37     COPY     1     13
PERLND  33                        0.08     COPY     1     12
IMPLND   1                        0.06     COPY     1     15
IMPLND   5                         0.1     COPY     1     15
PERLND  33                        0.08     COPY     1     13
PERLND  33                        0.19     COPY     1     12
IMPLND   1                        0.12     COPY     1     15
IMPLND   5                        0.26     COPY     1     15
IMPLND  10                        0.04     COPY     1     15
PERLND  33                        0.19     COPY     1     13
RCHRES   3                           1     RCHRES   4      8
RCHRES   5                           1     RCHRES   6      8
RCHRES   8                           1     RCHRES  12      6
RCHRES   8                                 COPY     1     16
RCHRES   7                           1     RCHRES  12      7
RCHRES   7                                 COPY     1     17
RCHRES   7                           1     RCHRES   8      8
RCHRES   9                           1     RCHRES  10      8
RCHRES  11                           1     COPY   501     17
RCHRES   4                           1     COPY   501     16
RCHRES   3                           1     COPY   501     17
RCHRES   6                           1     COPY   501     16
RCHRES   5                           1     COPY   501     17
RCHRES  10                           1     COPY   501     16
RCHRES   9                           1     COPY   501     17
RCHRES  12                           1     COPY   501     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
```

```
GEN-INFO
  RCHRES       Name        Nexits   Unit Systems   Printer                ***
  # -  #<----------------><---> User T-series  Engl Metr LKFG            ***
                                      in  out                            ***
  1     Surface Bio Swal-006    2    1    1    1   28    0    1
  2     Bio Swale  1            1    1    1    1   28    0    1
  3     Surface Bio Swal-013    2    1    1    1   28    0    1
  4     Bio Swale  2            1    1    1    1   28    0    1
  5     Surface Bio Swal-015    2    1    1    1   28    0    1
  6     Bio Swale  3            1    1    1    1   28    0    1
  7     Surface Bio Swal-017    2    1    1    1   28    0    1
  8     Bio Swale  4            1    1    1    1   28    0    1
  9     Surface Bio Swal-019    2    1    1    1   28    0    1
 10     Bio Swale  5            1    1    1    1   28    0    1
 11     Vault  1                2    1    1    1   28    0    1
 12     Vault  2                2    1    1    1   28    0    1
END GEN-INFO
*** Section RCHRES***

ACTIVITY
  <PLS > ************ Active Sections ******************************
  # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  1         1    0    0    0    0    0    0    0    0    0
  2         1    0    0    0    0    0    0    0    0    0
  3         1    0    0    0    0    0    0    0    0    0
  4         1    0    0    0    0    0    0    0    0    0
  5         1    0    0    0    0    0    0    0    0    0
  6         1    0    0    0    0    0    0    0    0    0
  7         1    0    0    0    0    0    0    0    0    0
  8         1    0    0    0    0    0    0    0    0    0
  9         1    0    0    0    0    0    0    0    0    0
 10         1    0    0    0    0    0    0    0    0    0
 11         1    0    0    0    0    0    0    0    0    0
 12         1    0    0    0    0    0    0    0    0    0
END ACTIVITY

PRINT-INFO
  <PLS > ***************** Print-flags ******************* PIVL  PYR
  # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  1         4    0    0    0    0    0    0    0    0    0    1    9
  2         4    0    0    0    0    0    0    0    0    0    1    9
  3         4    0    0    0    0    0    0    0    0    0    1    9
  4         4    0    0    0    0    0    0    0    0    0    1    9
  5         4    0    0    0    0    0    0    0    0    0    1    9
  6         4    0    0    0    0    0    0    0    0    0    1    9
  7         4    0    0    0    0    0    0    0    0    0    1    9
  8         4    0    0    0    0    0    0    0    0    0    1    9
  9         4    0    0    0    0    0    0    0    0    0    1    9
 10         4    0    0    0    0    0    0    0    0    0    1    9
 11         4    0    0    0    0    0    0    0    0    0    1    9
 12         4    0    0    0    0    0    0    0    0    0    1    9
END PRINT-INFO

HYDR-PARM1
  RCHRES  Flags for each HYDR Section                                  ***
  # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
         FG FG FG FG  possible  exit  *** possible  exit      possible  exit
          *  *  *  *    *  *  *  *  *      *  *  *  *  *         ***
  1       0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  2       0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  3       0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  4       0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  5       0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  6       0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  7       0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  8       0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  9       0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
 10       0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
 11       0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
 12       0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
```

```
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN      DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><--------><-------->       ***
    1              1      0.01       0.0       0.0       0.0       0.0
    2              2      0.01       0.0       0.0       0.0       0.0
    3              3      0.01       0.0       0.0       0.0       0.0
    4              4      0.01       0.0       0.0       0.0       0.0
    5              5      0.01       0.0       0.0       0.0       0.0
    6              6      0.01       0.0       0.0       0.0       0.0
    7              7      0.01       0.0       0.0       0.0       0.0
    8              8      0.01       0.0       0.0       0.0       0.0
    9              9      0.01       0.0       0.0       0.0       0.0
   10             10      0.01       0.0       0.0       0.0       0.0
   11             11      0.01       0.0       0.0       0.5       0.0
   12             12      0.01       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                          ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    3            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    4            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    5            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    6            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    7            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    8            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    9            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   10         0            4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   11         0            4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   12         0            4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      2
   73    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.091059  0.000000  0.000000
  0.035165  0.091030  0.000514  0.000000
  0.070330  0.090718  0.001030  0.000000
  0.105495  0.090406  0.001548  0.000000
  0.140659  0.090095  0.002069  0.000000
  0.175824  0.089784  0.002591  0.000000
  0.210989  0.089473  0.003116  0.000000
  0.246154  0.089162  0.003643  0.000000
  0.281319  0.088851  0.004173  0.000000
  0.316484  0.088541  0.004704  0.000000
  0.351648  0.088231  0.005238  0.000000
  0.386813  0.087921  0.005774  0.000000
  0.421978  0.087611  0.006312  0.000000
  0.457143  0.087302  0.006852  0.000000
  0.492308  0.086992  0.007394  0.000000
  0.527473  0.086683  0.007939  0.000000
  0.562637  0.086375  0.008486  0.000000
  0.597802  0.086066  0.009035  0.000000
  0.632967  0.085758  0.009586  0.000000
  0.668132  0.085450  0.010140  0.000000
  0.703297  0.085142  0.010696  0.000000
  0.738462  0.084834  0.011254  0.000000
  0.773626  0.084527  0.011814  0.000000
  0.808791  0.084219  0.012376  0.000000
  0.843956  0.083912  0.012941  0.000000
```

```
0.879121  0.083606  0.013508  0.011404
0.914286  0.083299  0.014077  0.032220
0.949451  0.082993  0.014648  0.034636
0.984615  0.082687  0.015222  0.039803
1.019780  0.082381  0.015798  0.045427
1.054945  0.082075  0.016376  0.051521
1.090110  0.081770  0.016956  0.058100
1.125275  0.081465  0.017538  0.059131
1.160440  0.081160  0.018123  0.072757
1.195604  0.080855  0.018710  0.076743
1.230769  0.080551  0.019299  0.082834
1.265934  0.080246  0.019891  0.094016
1.301099  0.079942  0.020485  0.098674
1.336264  0.079639  0.021081  0.101120
1.371429  0.079335  0.021679  0.116568
1.406593  0.079032  0.022279  0.124067
1.441758  0.078729  0.022882  0.129575
1.476923  0.078426  0.023487  0.130193
1.512088  0.078123  0.024087  0.142518
1.547253  0.077821  0.024689  0.153858
1.582418  0.077518  0.025294  0.164416
1.617582  0.077216  0.025900  0.172294
1.652747  0.076915  0.026509  0.174334
1.687912  0.076613  0.027120  0.183718
1.723077  0.076312  0.027734  0.192644
1.758242  0.076011  0.028349  0.201175
1.793407  0.075710  0.028967  0.209359
1.828571  0.075409  0.029587  0.217235
1.863736  0.075109  0.030210  0.224837
1.898901  0.074809  0.030834  0.232191
1.934066  0.074509  0.031461  0.239320
1.969231  0.074209  0.032090  0.246245
2.004396  0.073910  0.032722  0.252982
2.039560  0.073610  0.033355  0.259547
2.074725  0.073311  0.033991  0.265952
2.109890  0.073012  0.034629  0.272210
2.145055  0.072714  0.035270  0.278331
2.180220  0.072415  0.035913  0.284324
2.215385  0.072117  0.037202  0.290199
2.250549  0.071819  0.038497  0.295964
2.285714  0.071522  0.039796  0.301625
2.320879  0.071224  0.041099  0.307191
2.356044  0.070927  0.042407  0.312670
2.391209  0.070630  0.043720  0.321739
2.426374  0.070333  0.045037  0.332265
2.461538  0.070037  0.046358  0.342767
2.496703  0.069741  0.047684  0.358292
2.500000  0.069444  0.076830  0.351149
END FTABLE  2
FTABLE      1
 21    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
0.000000  0.069444  0.000000  0.000000  0.000000
0.035165  0.091372  0.003208  0.000000  0.358292
0.070330  0.091684  0.006426  0.000000  0.358292
0.105495  0.091997  0.009656  0.000000  0.358292
0.140659  0.092310  0.012896  0.000000  0.358292
0.175824  0.092623  0.016148  0.000000  0.358292
0.210989  0.092936  0.019410  0.000000  0.358292
0.246154  0.093250  0.022684  0.000000  0.358292
0.281319  0.093564  0.025969  0.000000  0.358292
0.316484  0.093878  0.029264  0.000000  0.358292
0.351648  0.094192  0.032571  0.000000  0.358292
0.386813  0.094506  0.035889  0.000000  0.358292
0.421978  0.094821  0.039218  0.000000  0.358292
0.457143  0.095136  0.042557  0.000000  0.358292
0.492308  0.095451  0.045908  0.000000  0.358292
0.527473  0.095766  0.049271  0.048301  0.358292
0.562637  0.096082  0.052644  0.166012  0.358292
```

```
0.597802  0.096398  0.056028  0.322698  0.358292
0.632967  0.096714  0.059423  0.507618  0.358292
0.668132  0.097030  0.062830  0.712243  0.358292
0.700000  0.097317  0.065927  0.928167  0.358292
END FTABLE  1
FTABLE     11
 92    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
0.000000  0.011829  0.000000  0.000000  0.000000
0.038889  0.011829  0.000460  0.005351  0.002386
0.077778  0.011829  0.000920  0.007568  0.002386
0.116667  0.011829  0.001380  0.009269  0.002386
0.155556  0.011829  0.001840  0.010703  0.002386
0.194444  0.011829  0.002300  0.011966  0.002386
0.233333  0.011829  0.002760  0.013108  0.002386
0.272222  0.011829  0.003220  0.014159  0.002386
0.311111  0.011829  0.003680  0.015136  0.002386
0.350000  0.011829  0.004140  0.016054  0.002386
0.388889  0.011829  0.004600  0.016923  0.002386
0.427778  0.011829  0.005060  0.017749  0.002386
0.466667  0.011829  0.005520  0.018538  0.002386
0.505556  0.011829  0.005980  0.019295  0.002386
0.544444  0.011829  0.006440  0.020023  0.002386
0.583333  0.011829  0.006901  0.020726  0.002386
0.622222  0.011829  0.007361  0.021406  0.002386
0.661111  0.011829  0.007821  0.022065  0.002386
0.700000  0.011829  0.008281  0.022704  0.002386
0.738889  0.011829  0.008741  0.023326  0.002386
0.777778  0.011829  0.009201  0.023932  0.002386
0.816667  0.011829  0.009661  0.024523  0.002386
0.855556  0.011829  0.010121  0.025101  0.002386
0.894444  0.011829  0.010581  0.025665  0.002386
0.933333  0.011829  0.011041  0.026217  0.002386
0.972222  0.011829  0.011501  0.026757  0.002386
1.011111  0.011829  0.011961  0.027287  0.002386
1.050000  0.011829  0.012421  0.027807  0.002386
1.088889  0.011829  0.012881  0.028317  0.002386
1.127778  0.011829  0.013341  0.028818  0.002386
1.166667  0.011829  0.013801  0.029311  0.002386
1.205556  0.011829  0.014261  0.029796  0.002386
1.244444  0.011829  0.014721  0.030272  0.002386
1.283333  0.011829  0.015181  0.030742  0.002386
1.322222  0.011829  0.015641  0.031204  0.002386
1.361111  0.011829  0.016101  0.031660  0.002386
1.400000  0.011829  0.016561  0.032109  0.002386
1.438889  0.011829  0.017021  0.032552  0.002386
1.477778  0.011829  0.017481  0.032989  0.002386
1.516667  0.011829  0.017941  0.033420  0.002386
1.555556  0.011829  0.018401  0.033846  0.002386
1.594444  0.011829  0.018861  0.034266  0.002386
1.633333  0.011829  0.019321  0.034681  0.002386
1.672222  0.011829  0.019781  0.035092  0.002386
1.711111  0.011829  0.020241  0.035498  0.002386
1.750000  0.011829  0.020702  0.035899  0.002386
1.788889  0.011829  0.021162  0.036295  0.002386
1.827778  0.011829  0.021622  0.036688  0.002386
1.866667  0.011829  0.022082  0.037076  0.002386
1.905556  0.011829  0.022542  0.037460  0.002386
1.944444  0.011829  0.023002  0.037840  0.002386
1.983333  0.011829  0.023462  0.038217  0.002386
2.022222  0.011829  0.023922  0.103315  0.002386
2.061111  0.011829  0.024382  0.146294  0.002386
2.100000  0.011829  0.024842  0.176628  0.002386
2.138889  0.011829  0.025302  0.201500  0.002386
2.177778  0.011829  0.025762  0.223117  0.002386
2.216667  0.011829  0.026222  0.242506  0.002386
2.255556  0.011829  0.026682  0.260249  0.002386
2.294444  0.011829  0.027142  0.276708  0.002386
2.333333  0.011829  0.027602  0.292131  0.002386
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2.372222  0.011829  0.028062  0.306695  0.002386
2.411111  0.011829  0.028522  0.320530  0.002386
2.450000  0.011829  0.028982  0.333739  0.002386
2.488889  0.011829  0.029442  0.346399  0.002386
2.527778  0.011829  0.029902  0.521397  0.002386
2.566667  0.011829  0.030362  0.622562  0.002386
2.605556  0.011829  0.030822  0.699074  0.002386
2.644444  0.011829  0.031282  0.763973  0.002386
2.683333  0.011829  0.031742  0.821665  0.002386
2.722222  0.011829  0.032202  0.874290  0.002386
2.761111  0.011829  0.032662  0.923085  0.002386
2.800000  0.011829  0.033122  0.968843  0.002386
2.838889  0.011829  0.033582  1.012109  0.002386
2.877778  0.011829  0.034042  1.053279  0.002386
2.916667  0.011829  0.034503  1.092652  0.002386
2.955556  0.011829  0.034963  1.130458  0.002386
2.994444  0.011829  0.035423  1.166882  0.002386
3.033333  0.011829  0.035883  1.202074  0.002386
3.072222  0.011829  0.036343  1.236158  0.002386
3.111111  0.011829  0.036803  1.269238  0.002386
3.150000  0.011829  0.037263  1.301401  0.002386
3.188889  0.011829  0.037723  1.332724  0.002386
3.227778  0.011829  0.038183  1.363271  0.002386
3.266667  0.011829  0.038643  1.393101  0.002386
3.305556  0.011829  0.039103  1.431058  0.002386
3.344444  0.011829  0.039563  1.649621  0.002386
3.383333  0.011829  0.040023  1.988820  0.002386
3.422222  0.011829  0.040483  2.411246  0.002386
3.461111  0.011829  0.040943  2.900638  0.002386
3.500000  0.011829  0.041403  3.446141  0.002386
3.538889  0.011829  0.041863  4.038910  0.002386
END FTABLE 11
FTABLE      4
 73    4
   Depth      Area    Volume  Outflow1 Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
0.000000  0.059471  0.000000  0.000000
0.035165  0.059448  0.000314  0.000000
0.070330  0.059201  0.000630  0.000000
0.105495  0.058954  0.000948  0.000000
0.140659  0.058707  0.001268  0.000000
0.175824  0.058460  0.001589  0.000000
0.210989  0.058213  0.001912  0.000000
0.246154  0.057967  0.002236  0.000000
0.281319  0.057721  0.002562  0.000000
0.316484  0.057475  0.002891  0.000000
0.351648  0.057230  0.003220  0.000000
0.386813  0.056984  0.003552  0.000000
0.421978  0.056739  0.003885  0.000000
0.457143  0.056494  0.004220  0.000000
0.492308  0.056250  0.004557  0.000000
0.527473  0.056005  0.004895  0.000000
0.562637  0.055761  0.005235  0.000000
0.597802  0.055517  0.005577  0.000000
0.632967  0.055273  0.005921  0.000000
0.668132  0.055030  0.006266  0.000000
0.703297  0.054786  0.006613  0.000000
0.738462  0.054543  0.006962  0.000000
0.773626  0.054301  0.007313  0.000000
0.808791  0.054058  0.007665  0.000000
0.843956  0.053816  0.008019  0.000000
0.879121  0.053573  0.008375  0.011404
0.914286  0.053331  0.008732  0.019694
0.949451  0.053090  0.009092  0.021171
0.984615  0.052848  0.009453  0.024329
1.019780  0.052607  0.009816  0.027767
1.054945  0.052366  0.010180  0.031492
1.090110  0.052125  0.010547  0.035513
1.125275  0.051885  0.010915  0.039837
1.160440  0.051644  0.011285  0.044472
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1.195604  0.051404  0.011656  0.049425
1.230769  0.051164  0.012030  0.054703
1.265934  0.050924  0.012405  0.059131
1.301099  0.050685  0.012782  0.066262
1.336264  0.050446  0.013160  0.069366
1.371429  0.050207  0.013541  0.075835
1.406593  0.049968  0.013923  0.082658
1.441758  0.049729  0.014307  0.082834
1.476923  0.049491  0.014693  0.097391
1.512088  0.049253  0.015076  0.101120
1.547253  0.049015  0.015461  0.109414
1.582418  0.048778  0.015847  0.113611
1.617582  0.048540  0.016235  0.116568
1.652747  0.048303  0.016625  0.130193
1.687912  0.048066  0.017017  0.136036
1.723077  0.047829  0.017804  0.140812
1.758242  0.047593  0.018595  0.142518
1.793407  0.047357  0.019389  0.153858
1.828571  0.047120  0.020187  0.164416
1.863736  0.046885  0.020988  0.171541
1.898901  0.046649  0.021793  0.174334
1.934066  0.046414  0.022602  0.183718
1.969231  0.046179  0.023414  0.192644
2.004396  0.045944  0.024229  0.199805
2.039560  0.045709  0.025048  0.201175
2.074725  0.045475  0.025871  0.209359
2.109890  0.045240  0.026697  0.222489
2.145055  0.045006  0.027527  0.237115
2.180220  0.044772  0.028360  0.250896
2.215385  0.044539  0.029197  0.263967
2.250549  0.044306  0.030038  0.276432
2.285714  0.044073  0.030882  0.288376
2.320879  0.043840  0.031730  0.292080
2.356044  0.043607  0.032581  0.292080
2.391209  0.043375  0.033436  0.292080
2.426374  0.043142  0.034294  0.292080
2.461538  0.042910  0.035157  0.292080
2.496703  0.042679  0.036022  0.292080
2.500000  0.042447  0.060242  0.292080
END FTABLE  4
FTABLE      3
 21    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
0.000000  0.042447  0.000000  0.000000  0.000000
0.035165  0.059719  0.002096  0.000000  0.219060
0.070330  0.059967  0.004200  0.000000  0.229331
0.105495  0.060215  0.006313  0.000000  0.234466
0.140659  0.060463  0.008435  0.000000  0.239602
0.175824  0.060712  0.010565  0.000000  0.244737
0.210989  0.060961  0.012705  0.000000  0.249873
0.246154  0.061210  0.014853  0.000000  0.255008
0.281319  0.061459  0.017010  0.000000  0.260144
0.316484  0.061708  0.019175  0.000000  0.265279
0.351648  0.061958  0.021350  0.000000  0.270415
0.386813  0.062208  0.023533  0.000000  0.275550
0.421978  0.062458  0.025725  0.000000  0.280686
0.457143  0.062708  0.027925  0.000000  0.285821
0.492308  0.062959  0.030135  0.000000  0.290957
0.527473  0.063210  0.032353  0.048301  0.292080
0.562637  0.063461  0.034580  0.166012  0.292080
0.597802  0.063712  0.036816  0.322698  0.292080
0.632967  0.063964  0.039061  0.507618  0.292080
0.668132  0.064215  0.041315  0.712243  0.292080
0.700000  0.064444  0.043365  0.928167  0.292080
END FTABLE  3
FTABLE      6
 73    4
   Depth      Area    Volume  Outflow1 Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
```

0.000000	0.014898	0.000000	0.000000
0.035165	0.014887	0.000055	0.000000
0.070330	0.014774	0.000111	0.000000
0.105495	0.014662	0.000168	0.000000
0.140659	0.014549	0.000225	0.000000
0.175824	0.014437	0.000284	0.000000
0.210989	0.014325	0.000342	0.000000
0.246154	0.014213	0.000402	0.000000
0.281319	0.014102	0.000462	0.000000
0.316484	0.013991	0.000524	0.000000
0.351648	0.013880	0.000585	0.000000
0.386813	0.013769	0.000648	0.000000
0.421978	0.013658	0.000711	0.000000
0.457143	0.013548	0.000775	0.000000
0.492308	0.013438	0.000840	0.000000
0.527473	0.013328	0.000905	0.000000
0.562637	0.013218	0.000972	0.000000
0.597802	0.013109	0.001038	0.000000
0.632967	0.012999	0.001106	0.000000
0.668132	0.012890	0.001175	0.000000
0.703297	0.012782	0.001244	0.000000
0.738462	0.012673	0.001384	0.000000
0.773626	0.012565	0.001525	0.000000
0.808791	0.012457	0.001668	0.000000
0.843956	0.012349	0.001812	0.000000
0.879121	0.012241	0.001958	0.003204
0.914286	0.012134	0.002106	0.003451
0.949451	0.012027	0.002255	0.003980
0.984615	0.011920	0.002405	0.004558
1.019780	0.011813	0.002557	0.005186
1.054945	0.011706	0.002711	0.005864
1.090110	0.011600	0.002866	0.006595
1.125275	0.011494	0.003022	0.007380
1.160440	0.011388	0.003180	0.008220
1.195604	0.011283	0.003340	0.009116
1.230769	0.011177	0.003501	0.010070
1.265934	0.011072	0.003664	0.011082
1.301099	0.010967	0.003828	0.011404
1.336264	0.010862	0.003994	0.013288
1.371429	0.010758	0.004162	0.013878
1.406593	0.010654	0.004331	0.015106
1.441758	0.010550	0.004501	0.016396
1.476923	0.010446	0.004673	0.017752
1.512088	0.010342	0.004845	0.019173
1.547253	0.010239	0.005018	0.020660
1.582418	0.010136	0.005193	0.022215
1.617582	0.010033	0.005369	0.023837
1.652747	0.009930	0.005547	0.025529
1.687912	0.009828	0.005726	0.027289
1.723077	0.009726	0.005907	0.029119
1.758242	0.009624	0.006090	0.031017
1.793407	0.009522	0.006274	0.032983
1.828571	0.009421	0.006460	0.035012
1.863736	0.009319	0.006647	0.037090
1.898901	0.009218	0.006836	0.051181
1.934066	0.009117	0.007026	0.051181
1.969231	0.009017	0.007219	0.051181
2.004396	0.008916	0.007412	0.051181
2.039560	0.008816	0.007608	0.051181
2.074725	0.008716	0.007804	0.051181
2.109890	0.008617	0.008003	0.051181
2.145055	0.008517	0.008203	0.051181
2.180220	0.008418	0.008405	0.051181
2.215385	0.008319	0.008608	0.051181
2.250549	0.008220	0.008813	0.051181
2.285714	0.008122	0.009020	0.051181
2.320879	0.008023	0.009228	0.051181
2.356044	0.007925	0.009438	0.051181
2.391209	0.007827	0.009649	0.051181
2.426374	0.007730	0.009863	0.051181

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2.461538  0.007632  0.010077  0.051181
2.496703  0.007535  0.010294  0.051181
2.500000  0.007438  0.014544  0.051181
END FTABLE  6
FTABLE      5
 21    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
0.000000  0.007438  0.000000  0.000000  0.000000
0.035165  0.015011  0.000526  0.000000  0.038386
0.070330  0.015124  0.001056  0.000000  0.040186
0.105495  0.015238  0.001590  0.000000  0.041086
0.140659  0.015352  0.002127  0.000000  0.041985
0.175824  0.015466  0.002669  0.000000  0.042885
0.210989  0.015580  0.003215  0.000000  0.043785
0.246154  0.015694  0.003765  0.000000  0.044685
0.281319  0.015809  0.004319  0.000000  0.045585
0.316484  0.015924  0.004877  0.000000  0.046485
0.351648  0.016039  0.005439  0.000000  0.047385
0.386813  0.016154  0.006005  0.000000  0.048285
0.421978  0.016270  0.006575  0.000000  0.049185
0.457143  0.016386  0.007149  0.000000  0.050084
0.492308  0.016502  0.007727  0.000000  0.050984
0.527473  0.016618  0.008310  0.048301  0.051181
0.562637  0.016735  0.008896  0.166012  0.051181
0.597802  0.016851  0.009487  0.322698  0.051181
0.632967  0.016968  0.010081  0.507618  0.051181
0.668132  0.017086  0.010680  0.712243  0.051181
0.700000  0.017192  0.011226  0.928167  0.051181
END FTABLE  5
FTABLE      8
 73    4
   Depth      Area    Volume  Outflow1 Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
0.000000  0.074439  0.000000  0.000000
0.035165  0.074413  0.000408  0.000000
0.070330  0.074133  0.000818  0.000000
0.105495  0.073854  0.001230  0.000000
0.140659  0.073574  0.001644  0.000000
0.175824  0.073295  0.002060  0.000000
0.210989  0.073017  0.002477  0.000000
0.246154  0.072738  0.002897  0.000000
0.281319  0.072460  0.003319  0.000000
0.316484  0.072182  0.003742  0.000000
0.351648  0.071904  0.004168  0.000000
0.386813  0.071626  0.004596  0.000000
0.421978  0.071349  0.005025  0.000000
0.457143  0.071072  0.005457  0.000000
0.492308  0.070795  0.005890  0.000000
0.527473  0.070518  0.006326  0.000000
0.562637  0.070241  0.006763  0.000000
0.597802  0.069965  0.007202  0.000000
0.632967  0.069689  0.007644  0.000000
0.668132  0.069413  0.008087  0.000000
0.703297  0.069138  0.008532  0.000000
0.738462  0.068862  0.008980  0.000000
0.773626  0.068587  0.009429  0.000000
0.808791  0.068312  0.009880  0.000000
0.843956  0.068038  0.010334  0.000000
0.879121  0.067763  0.010789  0.011404
0.914286  0.067489  0.011246  0.025573
0.949451  0.067215  0.011705  0.027491
0.984615  0.066941  0.012166  0.031592
1.019780  0.066667  0.012630  0.036056
1.054945  0.066394  0.013095  0.040894
1.090110  0.066121  0.013562  0.046115
1.125275  0.065848  0.014031  0.051730
1.160440  0.065576  0.014502  0.057749
1.195604  0.065303  0.014976  0.059131
1.230769  0.065031  0.015451  0.071035
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1.265934  0.064759  0.015928  0.074623
1.301099  0.064487  0.016407  0.082126
1.336264  0.064216  0.016889  0.082834
1.371429  0.063944  0.017372  0.098474
1.406593  0.063673  0.017857  0.101120
1.441758  0.063403  0.018344  0.111940
1.476923  0.063132  0.018834  0.116568
1.512088  0.062862  0.019319  0.126467
1.547253  0.062591  0.019807  0.130193
1.582418  0.062322  0.020296  0.142079
1.617582  0.062052  0.020787  0.142518
1.652747  0.061782  0.021281  0.153858
1.687912  0.061513  0.021776  0.164416
1.723077  0.061244  0.022274  0.170572
1.758242  0.060975  0.022773  0.174334
1.793407  0.060707  0.023275  0.183718
1.828571  0.060438  0.023778  0.192644
1.863736  0.060170  0.024284  0.201175
1.898901  0.059902  0.024791  0.208940
1.934066  0.059635  0.025301  0.209359
1.969231  0.059367  0.026324  0.217235
2.004396  0.059100  0.027351  0.224837
2.039560  0.058833  0.028382  0.232191
2.074725  0.058566  0.029417  0.239320
2.109890  0.058300  0.030456  0.246245
2.145055  0.058034  0.031499  0.252982
2.180220  0.057768  0.032547  0.259547
2.215385  0.057502  0.033598  0.265952
2.250549  0.057236  0.034654  0.276432
2.285714  0.056971  0.035713  0.288376
2.320879  0.056706  0.036777  0.299867
2.356044  0.056441  0.037844  0.310967
2.391209  0.056176  0.038916  0.321739
2.426374  0.055911  0.039992  0.332265
2.461538  0.055647  0.041071  0.342767
2.496703  0.055383  0.042155  0.358292
2.500000  0.055119  0.065291  0.278714
END FTABLE  8
FTABLE      7
 21    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
0.000000  0.055119  0.000000  0.000000  0.000000
0.035165  0.074719  0.002623  0.000000  0.284458
0.070330  0.074999  0.005255  0.000000  0.297795
0.105495  0.075279  0.007897  0.000000  0.304464
0.140659  0.075560  0.010549  0.000000  0.311133
0.175824  0.075841  0.013211  0.000000  0.317801
0.210989  0.076122  0.015883  0.000000  0.324470
0.246154  0.076403  0.018565  0.000000  0.331138
0.281319  0.076685  0.021257  0.000000  0.337807
0.316484  0.076966  0.023958  0.000000  0.344476
0.351648  0.077248  0.026670  0.000000  0.351144
0.386813  0.077531  0.029391  0.000000  0.357813
0.421978  0.077813  0.032122  0.000000  0.358292
0.457143  0.078096  0.034864  0.000000  0.358292
0.492308  0.078379  0.037615  0.000000  0.358292
0.527473  0.078662  0.040376  0.048301  0.358292
0.562637  0.078945  0.043147  0.166012  0.358292
0.597802  0.079229  0.045928  0.322698  0.358292
0.632967  0.079512  0.048719  0.507618  0.358292
0.668132  0.079796  0.051520  0.712243  0.358292
0.700000  0.080054  0.054067  0.928167  0.358292
END FTABLE  7
FTABLE     10
 73    4
   Depth      Area    Volume  Outflow1 Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
0.000000  0.029284  0.000000  0.000000
0.035165  0.029268  0.000133  0.000000
```

0.070330	0.029101	0.000268	0.000000
0.105495	0.028935	0.000404	0.000000
0.140659	0.028769	0.000541	0.000000
0.175824	0.028603	0.000678	0.000000
0.210989	0.028437	0.000818	0.000000
0.246154	0.028271	0.000958	0.000000
0.281319	0.028106	0.001099	0.000000
0.316484	0.027941	0.001241	0.000000
0.351648	0.027776	0.001385	0.000000
0.386813	0.027611	0.001530	0.000000
0.421978	0.027447	0.001676	0.000000
0.457143	0.027283	0.001822	0.000000
0.492308	0.027119	0.001971	0.000000
0.527473	0.026955	0.002120	0.000000
0.562637	0.026792	0.002270	0.000000
0.597802	0.026628	0.002422	0.000000
0.632967	0.026465	0.002574	0.000000
0.668132	0.026303	0.002728	0.000000
0.703297	0.026140	0.002883	0.000000
0.738462	0.025978	0.003039	0.000000
0.773626	0.025816	0.003196	0.000000
0.808791	0.025654	0.003355	0.000000
0.843956	0.025492	0.003514	0.000000
0.879121	0.025331	0.003675	0.007753
0.914286	0.025169	0.003837	0.008350
0.949451	0.025008	0.004000	0.009632
0.984615	0.024848	0.004164	0.011030
1.019780	0.024687	0.004329	0.011404
1.054945	0.024527	0.004496	0.014190
1.090110	0.024367	0.004663	0.015058
1.125275	0.024207	0.005001	0.016891
1.160440	0.024047	0.005341	0.018857
1.195604	0.023888	0.005683	0.020957
1.230769	0.023728	0.006027	0.023195
1.265934	0.023570	0.006374	0.025574
1.301099	0.023411	0.006724	0.028096
1.336264	0.023252	0.007075	0.030765
1.371429	0.023094	0.007429	0.033583
1.406593	0.022936	0.007786	0.036552
1.441758	0.022778	0.008144	0.039675
1.476923	0.022621	0.008505	0.042955
1.512088	0.022463	0.008864	0.046393
1.547253	0.022306	0.009226	0.049992
1.582418	0.022149	0.009590	0.053754
1.617582	0.021992	0.009956	0.057681
1.652747	0.021836	0.010324	0.059131
1.687912	0.021680	0.010695	0.066033
1.723077	0.021524	0.011068	0.068225
1.758242	0.021368	0.011444	0.072736
1.793407	0.021212	0.011822	0.077411
1.828571	0.021057	0.012202	0.082247
1.863736	0.020902	0.012585	0.082834
1.898901	0.020747	0.012970	0.092244
1.934066	0.020592	0.013357	0.101120
1.969231	0.020438	0.013747	0.123846
2.004396	0.020284	0.014139	0.123846
2.039560	0.020130	0.014534	0.123846
2.074725	0.019976	0.014931	0.123846
2.109890	0.019823	0.015330	0.123846
2.145055	0.019669	0.015732	0.123846
2.180220	0.019516	0.016136	0.123846
2.215385	0.019363	0.016543	0.123846
2.250549	0.019211	0.016951	0.123846
2.285714	0.019058	0.017363	0.123846
2.320879	0.018906	0.017777	0.123846
2.356044	0.018754	0.018193	0.123846
2.391209	0.018603	0.018611	0.123846
2.426374	0.018451	0.019032	0.123846
2.461538	0.018300	0.019456	0.123846
2.496703	0.018149	0.019882	0.123846

```
2.500000  0.017998  0.030157  0.123846
END FTABLE 10
FTABLE      9
 21    5
    Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
     (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
0.000000  0.017998  0.000000  0.000000  0.000000
0.035165  0.029451  0.001033  0.000000  0.092884
0.070330  0.029618  0.002071  0.000000  0.097239
0.105495  0.029785  0.003116  0.000000  0.099417
0.140659  0.029953  0.004166  0.000000  0.101594
0.175824  0.030120  0.005222  0.000000  0.103772
0.210989  0.030289  0.006284  0.000000  0.105949
0.246154  0.030457  0.007352  0.000000  0.108127
0.281319  0.030625  0.008426  0.000000  0.110304
0.316484  0.030794  0.009506  0.000000  0.112482
0.351648  0.030963  0.010592  0.000000  0.114659
0.386813  0.031132  0.011684  0.000000  0.116837
0.421978  0.031302  0.012782  0.000000  0.119014
0.457143  0.031471  0.013885  0.000000  0.121192
0.492308  0.031641  0.014995  0.000000  0.123369
0.527473  0.031811  0.016111  0.048301  0.123846
0.562637  0.031982  0.017232  0.166012  0.123846
0.597802  0.032152  0.018360  0.322698  0.123846
0.632967  0.032323  0.019494  0.507618  0.123846
0.668132  0.032494  0.020633  0.712243  0.123846
0.700000  0.032649  0.021671  0.928167  0.123846
END FTABLE  9
FTABLE     12
 92    5
    Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
     (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
0.000000  0.006557  0.000000  0.000000  0.000000
0.038889  0.006557  0.000255  0.005351  0.001322
0.077778  0.006557  0.000510  0.007568  0.001322
0.116667  0.006557  0.000765  0.009269  0.001322
0.155556  0.006557  0.001020  0.010703  0.001322
0.194444  0.006557  0.001275  0.011966  0.001322
0.233333  0.006557  0.001530  0.013108  0.001322
0.272222  0.006557  0.001785  0.014159  0.001322
0.311111  0.006557  0.002040  0.015136  0.001322
0.350000  0.006557  0.002295  0.016054  0.001322
0.388889  0.006557  0.002550  0.016923  0.001322
0.427778  0.006557  0.002805  0.017749  0.001322
0.466667  0.006557  0.003060  0.018538  0.001322
0.505556  0.006557  0.003315  0.019295  0.001322
0.544444  0.006557  0.003570  0.020023  0.001322
0.583333  0.006557  0.003825  0.020726  0.001322
0.622222  0.006557  0.004080  0.021406  0.001322
0.661111  0.006557  0.004335  0.022065  0.001322
0.700000  0.006557  0.004590  0.022704  0.001322
0.738889  0.006557  0.004845  0.023326  0.001322
0.777778  0.006557  0.005100  0.023932  0.001322
0.816667  0.006557  0.005355  0.024523  0.001322
0.855556  0.006557  0.005610  0.025101  0.001322
0.894444  0.006557  0.005865  0.025665  0.001322
0.933333  0.006557  0.006120  0.026217  0.001322
0.972222  0.006557  0.006375  0.026757  0.001322
1.011111  0.006557  0.006630  0.027287  0.001322
1.050000  0.006557  0.006885  0.027807  0.001322
1.088889  0.006557  0.007140  0.028317  0.001322
1.127778  0.006557  0.007395  0.028818  0.001322
1.166667  0.006557  0.007649  0.029311  0.001322
1.205556  0.006557  0.007904  0.029796  0.001322
1.244444  0.006557  0.008159  0.030272  0.001322
1.283333  0.006557  0.008414  0.030742  0.001322
1.322222  0.006557  0.008669  0.031204  0.001322
1.361111  0.006557  0.008924  0.031660  0.001322
1.400000  0.006557  0.009179  0.032109  0.001322
1.438889  0.006557  0.009434  0.032552  0.001322
```

```
  1.477778  0.006557  0.009689  0.032989  0.001322
  1.516667  0.006557  0.009944  0.033420  0.001322
  1.555556  0.006557  0.010199  0.033846  0.001322
  1.594444  0.006557  0.010454  0.034266  0.001322
  1.633333  0.006557  0.010709  0.034681  0.001322
  1.672222  0.006557  0.010964  0.035092  0.001322
  1.711111  0.006557  0.011219  0.035498  0.001322
  1.750000  0.006557  0.011474  0.035899  0.001322
  1.788889  0.006557  0.011729  0.036295  0.001322
  1.827778  0.006557  0.011984  0.036688  0.001322
  1.866667  0.006557  0.012239  0.037076  0.001322
  1.905556  0.006557  0.012494  0.037460  0.001322
  1.944444  0.006557  0.012749  0.037840  0.001322
  1.983333  0.006557  0.013004  0.038217  0.001322
  2.022222  0.006557  0.013259  0.103315  0.001322
  2.061111  0.006557  0.013514  0.146294  0.001322
  2.100000  0.006557  0.013769  0.176628  0.001322
  2.138889  0.006557  0.014024  0.201500  0.001322
  2.177778  0.006557  0.014279  0.223117  0.001322
  2.216667  0.006557  0.014534  0.242506  0.001322
  2.255556  0.006557  0.014789  0.260249  0.001322
  2.294444  0.006557  0.015044  0.276708  0.001322
  2.333333  0.006557  0.015299  0.292131  0.001322
  2.372222  0.006557  0.015554  0.306695  0.001322
  2.411111  0.006557  0.015809  0.320530  0.001322
  2.450000  0.006557  0.016064  0.333739  0.001322
  2.488889  0.006557  0.016319  0.346399  0.001322
  2.527778  0.006557  0.016574  0.521397  0.001322
  2.566667  0.006557  0.016829  0.622562  0.001322
  2.605556  0.006557  0.017084  0.699074  0.001322
  2.644444  0.006557  0.017339  0.763973  0.001322
  2.683333  0.006557  0.017594  0.821665  0.001322
  2.722222  0.006557  0.017849  0.874290  0.001322
  2.761111  0.006557  0.018104  0.923085  0.001322
  2.800000  0.006557  0.018359  0.968843  0.001322
  2.838889  0.006557  0.018614  1.012109  0.001322
  2.877778  0.006557  0.018869  1.053279  0.001322
  2.916667  0.006557  0.019124  1.092652  0.001322
  2.955556  0.006557  0.019379  1.130458  0.001322
  2.994444  0.006557  0.019634  1.166882  0.001322
  3.033333  0.006557  0.019889  1.202074  0.001322
  3.072222  0.006557  0.020144  1.236158  0.001322
  3.111111  0.006557  0.020399  1.269238  0.001322
  3.150000  0.006557  0.020654  1.301401  0.001322
  3.188889  0.006557  0.020909  1.332724  0.001322
  3.227778  0.006557  0.021164  1.363271  0.001322
  3.266667  0.006557  0.021419  1.393101  0.001322
  3.305556  0.006557  0.021674  1.431058  0.001322
  3.344444  0.006557  0.021929  1.649621  0.001322
  3.383333  0.006557  0.022184  1.988820  0.001322
  3.422222  0.006557  0.022438  2.411246  0.001322
  3.461111  0.006557  0.022693  2.900638  0.001322
  3.500000  0.006557  0.022948  3.446141  0.001322
  3.538889  0.006557  0.023203  4.038910  0.001322
  END FTABLE 12
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP
WDM      2 PREC     ENGL    1              RCHRES   1     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   3     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   5     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   7     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   9     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   1     EXTNL  POTEV
```

```
WDM      1 EVAP     ENGL    0.7             RCHRES   2     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5             RCHRES   3     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7             RCHRES   4     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5             RCHRES   5     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7             RCHRES   6     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5             RCHRES   7     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7             RCHRES   8     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5             RCHRES   9     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7             RCHRES  10     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES  11 HYDR   RO      1 1         1     WDM   1000 FLOW     ENGL       REPL
RCHRES  11 HYDR   O       1 1         1     WDM   1001 FLOW     ENGL       REPL
RCHRES  11 HYDR   O       2 1         1     WDM   1002 FLOW     ENGL       REPL
RCHRES  11 HYDR   STAGE   1 1         1     WDM   1003 STAG     ENGL       REPL
COPY     1 OUTPUT MEAN    1 1      12.1     WDM    701 FLOW     ENGL       REPL
COPY   501 OUTPUT MEAN    1 1      12.1     WDM    801 FLOW     ENGL       REPL
RCHRES   4 HYDR   RO      1 1         1     WDM   1010 FLOW     ENGL       REPL
RCHRES   4 HYDR   STAGE   1 1         1     WDM   1011 STAG     ENGL       REPL
RCHRES   3 HYDR   STAGE   1 1         1     WDM   1012 STAG     ENGL       REPL
RCHRES   3 HYDR   O       1 1         1     WDM   1013 FLOW     ENGL       REPL
RCHRES   6 HYDR   RO      1 1         1     WDM   1014 FLOW     ENGL       REPL
RCHRES   6 HYDR   STAGE   1 1         1     WDM   1015 STAG     ENGL       REPL
RCHRES   5 HYDR   STAGE   1 1         1     WDM   1016 STAG     ENGL       REPL
RCHRES   5 HYDR   O       1 1         1     WDM   1017 FLOW     ENGL       REPL
RCHRES  10 HYDR   RO      1 1         1     WDM   1018 FLOW     ENGL       REPL
RCHRES  10 HYDR   STAGE   1 1         1     WDM   1019 STAG     ENGL       REPL
RCHRES   9 HYDR   STAGE   1 1         1     WDM   1020 STAG     ENGL       REPL
RCHRES   9 HYDR   O       1 1         1     WDM   1021 FLOW     ENGL       REPL
RCHRES  12 HYDR   RO      1 1         1     WDM   1022 FLOW     ENGL       REPL
RCHRES  12 HYDR   O       1 1         1     WDM   1023 FLOW     ENGL       REPL
RCHRES  12 HYDR   O       2 1         1     WDM   1024 FLOW     ENGL       REPL
RCHRES  12 HYDR   STAGE   1 1         1     WDM   1025 STAG     ENGL       REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK        6
RCHRES     ROFLOW                          RCHRES         INFLOW
  END MASS-LINK    6

  MASS-LINK        7
RCHRES     OFLOW  OVOL   1                 RCHRES         INFLOW IVOL
  END MASS-LINK    7

  MASS-LINK        8
RCHRES     OFLOW  OVOL   2                 RCHRES         INFLOW IVOL
  END MASS-LINK    8

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12
```

```
  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

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G.2 - Stormwater Control Plan

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By Contra Costa County
Department of Conservation and Development

CDRZ21-03258, CDDP21-03001

Preliminary Stormwater Control Plans
for
Oak Road Townhouse Condominiums

Contra Costa County, California

March 22, 2021

Prepared By:

RUGGERI-JENSEN-AZAR
ENGINEERS ▪ PLANNERS ▪ SURVEYORS

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TABLE OF CONTENTS

I. Project Data 1

II. Setting 2

II.A. Project Location and Description 2

II.B. Existing Site Features and Conditions 2

II.C. Opportunities and Constraints for Stormwater Control 3

III. Low Impact Development Design Strategies 3

III.A. Optimization of Site Layout 3

III.B. Bioretention or other Integrated Management Practices 3

IV. Documentation of Drainage Design 4

IV.A. Descriptions of each Drainage Management Area 4

IV.A.1.Table of Drainage Management Areas 4

IV.A.2.Drainage Management Area Descriptions 7

IV.A.3.Sizing of Bio-Retention 9

V. Source Control Measures 10

V.A. Site Activities and Potential Sources of Pollutants 10

VI. Stormwater Facility Maintenance 10

VI.A. Ownership and Responsibility for Maintenance in Perpetuity 10

VI.B. Summary of Maintenance Requirements for Each Stormwater Facility 11

VII. Construction Plan C.3 Checklist 11

VIII. Certification 11

Figures

Exhibit A - Vicinity Map

Exhibit B – Existing Condition Plan

Exhibit C – Existing Drainage Area Map

Exhibit D – Preliminary Stormwater Treatment Plan

Appendix A - IMP Sizing Calculator Output

Appendix B - Maintenance Plans

I. PROJECT DATA

Table 1. Project Data

Project Name/Number	Sub 9559 – Oak Road Townhome Condominiums
Application Submittal Date	3/22/2021
Project Location	2740 Jones Road
Name of Developer	Summerhill Homes
Project Phase No.	N/A
Project Type and Description	Residential Development with 19 buildings consisting of 125 total condominium units
Project Watershed	Contra Costa County Drainage Area 44B
Total Project Site Area (acres)	5.9±
Total Area of Land Disturbed (acres)	5.9±
Total New Impervious Surface Area (sq. ft.)	36,420
Total Replaced Impervious Surface Area	155,600
Total Pre-Project Impervious Surface Area	155,600
Total Post-Project Impervious Surface Area	195,736
50% Rule[*]	Applies
Project Density	26.3 units/acre
Applicable Special Project Categories [Complete even if all treatment is LID]	N/A
Percent LID and non-LID treatment	100% LID with Bioretention
HM Compliance [†]	Applies

II. SETTING

II.A. Project Location and Description

The project site is approximately 5.9 +/- acres and is located at the southwest corner of and between Oak Road and Jones Road in Contra Costa County within the City of Walnut Creek Sphere of Influence. The proposed project is a residential development and consists of approximately 125 condominium units in 19 3-story buildings with common area walkways, open space, on-site private streets and roadways and parking. Access to the project site will be from Jones Road and Oak Road, which is within the City of Walnut Creek right of way. The City/County boundary coincides with the project site easterly property line at approximately the back of existing sidewalk along Oak Road. A Vicinity Map, Exhibit A, showing the project site location is included for reference.

II.B. Existing Site Features and Conditions

The project site is the former Palmer School site, which consists of several existing classrooms, dormitory, library, administration and maintenance, athletics buildings, an outdoor swimming pool, paved sports fields, concrete walkways, AC paved roadways, and open area ballfields. The project site is generally flat with a gentle slope of approximately 5% in the northeasterly direction towards Oak Road, northwesterly towards Jones Road and with a localized portion of the site at the southwesterly portion of the site drains towards Jones Road as well. Currently, the on-site drainage and storm runoff generally sheet flows across the site or captured by on-site small drainage inlets connected by underground storm drain pipes and discharged into the existing storm drain facilities in Jones Road or Oak Road. Based on field observation and record drawings, it appears majority of the existing on-site drainage is discharged or conveyed via underground storm drains to the existing 30" storm drains in Oak Road. An existing Drainage Area Map, Exhibit C, showing the existing drainage pattern and boundary is included for reference.

The project site is within the Contra Costa County Flood Control Drainage Area 44B. According to the attached Drainage Area 44B drawing, the project is tributary to the existing 30" storm drain, "Line D – 1," in Oak Road and the existing 72" storm drain, "Line C," in Jones Road. These existing storm drains eventually converge at the intersection of Jones Road and Oak Road and discharge into an existing 84" storm drain, "Line A," which continues flowing east along Jones Road and turns north along the Railroad right of way and continues flows in a northerly direction. Attached is the Existing Condition Plan, Exhibit B, showing the existing drainage system in Oak Road and Jones Road for reference.

II.C. Opportunities and Constraints for Stormwater Control

1. The low permeability and high clay content of the site soil combined with previously high ground water table make it undesirable to promote infiltration.

2. The proposed project is a small in-fill site with physical constraints and existing improvements and developments surrounding the project site limiting use of sediment basins.

3. Due to nature of this development, parkway strips and/or open landscape areas are limited where these areas could be utilized for LID treatment areas. However, pockets of landscape areas between the proposed buildings and roadways, and open space in the central portion of the project site could be utilized for LID treatment. The new impervious surfaces will be conveyed through drainage swales and/or bubble ups and treated prior to discharging into the underground storm drains.

III. LOW IMPACT DEVELOPMENT DESIGN STRATEGIES

III.A. Optimization of Site Layout

Due to the nature of the development on the density (required by the County Planning Department) and space needed for utilities, underground utility boxes, transformers, and backflow devices, etc., limited open space or landscape area is available for treatment purposes. Given the physical constraints and limitations, treatment is optimized by breaking up the new and/or replaced impervious areas in small drainage management areas (DMA's) and by using drainage swales, curb openings, bubble ups to convey the runoff to the treatment areas in paseos, landscape pockets between walkways/buildings and the center open space area on the project site. By implementing this approach, low impact development (LID) bio-retention treatment is dispersed throughout the site, which enables the project to treat 100% of the impervious surface with the bio-retention measures. Each DMA is documented in the following Section IV for reference.

III.B. Bioretention or other Integrated Management Practices

As discussed in Section III.A. above, the proposed project will utilize and integrate the bio-retention technique and approach to meet the LID treatments in compliance with the requirements set forth in the County C.3 Technical Guidance.

Bio-retention functions as soil and plant based filtration that removes pollutants through a variety of physical, biological, and chemical process. These facilities consist of a layer of cobble stone (mulch is not recommend), planted landscape (grass, shrub or trees), sandy loam soil

(with a minimum percolation rate of 5 inches/hour and a maximum percolation rate of 10 inches/hour), drain rock and under drains. The stormwater runoff from impervious surface is directed and passed through the bio-retention areas and distributed evenly along a ponding area. Stormwater runoff will percolate through the sandy loam treatment soil and eventually captured by the under drains and discharged into the underground storm drains. A Preliminary Stormwater Treatment Plan, Exhibit D, showing locations and details of the bio-retention is included for reference.

IV. DOCUMENTATION OF DRAINAGE DESIGN

IV.A. Descriptions of each Drainage Management Area

IV.A.1. Table of Drainage Management Areas

DMA Name	*Area (SF)*	*Surface Type*	*DMA Type*
DMA 1a	*11,577*	*Concrete/Asphalt*	*Bioretention*
DMA 1b	*890*	*Landscape*	*Bioretention*
DMA 2a	*13,048*	*Concrete/Asphalt*	*Bioretention*
DMA 2b	*1,170*	*Landscape*	*Bioretention*
DMA 3a	*11,483*	*Concrete/Asphalt*	*Bioretention*
DMA 3b	*1,230*	*Landscape*	*Bioretention*
DMA 4a	*6,153*	*Concrete/Asphalt*	*Bioretention*
DMA 4b	*150*	*Landscape*	*Bioretention*
DMA 5a	*4,697*	*Concrete/Asphalt*	*Bioretention*
DMA 5b	*320*	*Landscape*	*Bioretention*
DMA 6a	*12,076*	*Concrete/Asphalt*	*Bioretention*
DMA 6b	*2,210*	*Landscape*	*Bioretention*
DMA 7	*1,159*	*Asphalt*	*Bioretention*
DMA 8a	*6,049*	*Concrete/Asphalt*	*Bioretention*
DMA 8b	*1,380*	*Landscape*	*Bioretention*

DMA Name	*Area (SF)*	*Surface Type*	*DMA Type*
DMA 9	*9,674*	*Asphalt*	*Bioretention*
DMA 10a	*6,239*	*Concrete/Asphalt*	*Bioretention*
DMA 10b	*1,210*	*Landscape*	*Bioretention*
DMA 11	*1,596*	*Asphalt*	*Bioretention*
DMA 12	*2,005*	*Asphalt*	*Bioretention*
DMA 13a	*5,536*	*Concrete/Asphalt*	*Bioretention*
DMA 13b	*1,360*	*Landscape*	*Bioretention*
DMA 14a	*7,439*	*Concrete/Asphalt*	*Bioretention*
DMA 14b	*3,950*	*Landscape*	*Bioretention*
DMA 15a	*9,381*	*Concrete/Asphalt*	*Bioretention*
DMA 15b	*2,280*	*Landscape*	*Bioretention*
DMA 16a	*11,951*	*Concrete/Asphalt*	*Bioretention*
DMA 16b	*7,680*	*Landscape*	*Bioretention*
DMA 17a	*4,428*	*Concrete/Asphalt*	*Bioretention*
DMA 17b	*2,430*	*Landscape*	*Bioretention*
DMA 18a	*1,883*	*Concrete/Asphalt*	*Bioretention*
DMA 18b	*1,840*	*Landscape*	*Bioretention*
DMA 19a	*9,074*	*Concrete/Asphalt*	*Bioretention*
DMA 19b	*2,310*	*Landscape*	*Bioretention*
DMA 20a	*1,513*	*Concrete/Asphalt*	*Bioretention*
DMA 20b	*920*	*Landscape*	*Bioretention*
DMA 21a	*14,299*	*Concrete/Asphalt*	*Bioretention*

DMA Name	*Area (SF)*	*Surface Type*	*DMA Type*
DMA 21b	*3,750*	*Landscape*	*Bioretention*
DMA 22a	*1,788*	*Concrete/Asphalt*	*Bioretention*
DMA 22b	*1,350*	*Landscape*	*Bioretention*
DMA 23a	*9,411*	*Concrete/Asphalt*	*Bioretention*
DMA 23b	*980*	*Landscape*	*Bioretention*
DMA 24a	*2,078*	*Concrete/Asphalt*	*Bioretention*
DMA 24b	*1,740*	*Landscape*	*Bioretention*
DMA 25a	*2,050*	*Concrete/Asphalt*	*Bioretention*
DMA 25b	*1,070*	*Landscape*	*Bioretention*
DMA 26a	*9,028*	*Concrete/Asphalt*	*Bioretention*
DMA 26b	*5,100*	*Landscape*	*Bioretention*
DMA 27a	*1,080*	*Concrete/Asphalt*	*Bioretention*
DMA 27b	*880*	*Landscape*	*Bioretention*
DMA 28a	*6,811*	*Concrete/Asphalt*	*Bioretention*
DMA 28b	*4,590*	*Landscape*	*Bioretention*
DMA 29	*1,019*	*Asphalt*	*Bioretention*
DMA 30a	*2,825*	*Concrete/Asphalt*	*Bioretention*
DMA 30b	*1,760*	*Landscape*	*Bioretention*
DMA 31a	*2,460*	*Concrete/Asphalt*	*Bioretention*
DMA 31b	*980*	*Landscape*	*Bioretention*
DMA 32a	*2,033*	*Concrete/Asphalt*	*Bioretention*
DMA 32b	*960*	*Landscape*	*Bioretention*

DMA Name	*Area (SF)*	*Surface Type*	*DMA Type*
DMA 33a	*1,939*	*Concrete/Asphalt*	*Bioretention*
DMA 33b	*970*	*Landscape*	*Bioretention*
DMA 34a	*1,954*	*Concrete/Asphalt*	*Bioretention*
DMA 34b	*1,000*	*Landscape*	*Bioretention*

IV.A.2. Drainage Management Area Descriptions

DMA 1a and DMA 1b, totaling 12,470 square feet, drain to IMP #1 via through-curb drains, roof downspouts and an area drain system.

DMA 2a and DMA 2b, totaling 14,221 square feet, drain to IMP #2 via through-curb drains, roof downspouts and an area drain system.

DMA 3a and DMA 3b, totaling 12,715 square feet, drain to IMP #3 via through-curb drains, roof downspouts and an area drain system.

DMA 4a and DMA 4b, totaling 6,299 square feet, drain to IMP #4 via through-curb drains, roof downspouts and an area drain system.

DMA 5a and DMA 5b, totaling 5,018 square feet, drain to IMP #5 via through-curb drains, roof downspouts and an area drain system.

DMA 6a and DMA 6b, totaling 14,289 square feet, drain to IMP #6 via through-curb drains, roof downspouts and an area drain system.

DMA 7, totaling 1,159 square feet, drains to IMP #7 via through curb drains.

DMA 8a and DMA 8b, totaling 7,428 square feet, drain to IMP #8 via through-curb drains, roof downspouts and an area drain system.

DMA 9, totaling 15,380 square feet, drains to IMP #9 via through curb drains.

DMA 10a and DMA 10b, totaling 7,452 square feet, drain to IMP #10 via through-curb drains, roof downspouts and an area drain system.

DMA 11, totaling 1,596 square feet, drain to IMP #11 via through curb drains.

DMA 12, totaling 2,005 square feet, drains to IMP #12 via through curb drains.

DMA 13a and DMA 13b, totaling 6,894 square feet, drain to IMP #13 via through-curb drains, roof downspouts and an area drain system.

DMA 14a and DMA 14b, totaling 11,385 square feet, drain to IMP #14 via through-curb drains, roof downspouts and an area drain system.

DMA 15a and DMA 15b, totaling 11,658 square feet, drain to IMP #15 via through-curb drains, roof downspouts and an area drain system.

DMA 16a and DMA 16b, totaling 19,632 square feet, drain to IMP #16 via through-curb drains, roof downspouts and an area drain system.

DMA 17a and DMA 17b, totaling 6,858 square feet, drain to IMP #17 via through-curb drains, roof downspouts and an area drain system.

DMA 18a and DMA 18b, totaling 3,724 square feet, drain to IMP #18 via through-curb drains, roof downspouts and an area drain system.

DMA 19a and DMA 19b, totaling 11,382square feet, drain to IMP #19 via through-curb drains, roof downspouts and an area drain system.

DMA 20a and DMA 20b, totaling 2,435 square feet, drain to IMP #20 via through-curb drains, roof downspouts and an area drain system.

DMA 21a and DMA 21b, totaling 18,046 square feet, drain to IMP #21 via through-curb drains, roof downspouts and an area drain system.

DMA 22a and DMA 22b, totaling 3,134 square feet, drain to IMP #22 via through-curb drains, roof downspouts and an area drain system.

DMA 23a and DMA 23b, totaling 10,392 square feet, drain to IMP #23 via through-curb drains, roof downspouts and an area drain system.

DMA 24a and DMA 24b, totaling 3,822 square feet, drain to IMP #24 via through-curb drains, roof downspouts and an area drain system.

DMA 25a and DMA 25b, totaling 3,122 square feet, drain to IMP #25 via through-curb drains, roof downspouts and an area drain system.

DMA 26a and DMA 26b, totaling 14,131 square feet, drain to IMP #26 via through-curb drains, roof downspouts and an area drain system.

DMA 27a and DMA 27b, totaling 1,959 square feet, drain to IMP #27 via through-curb drains, roof downspouts and an area drain system.

DMA 28a and DMA 28b, totaling 11,400 square feet, drain to IMP #28 via through-curb drains, roof downspouts and an area drain system.

DMA 29, totaling 1,914 square feet, drains to IMP #29 via through curb drains.

DMA 30a and DMA 30b, totaling 4,582 square feet, drain to IMP #30 via through-curb drains, roof downspouts and an area drain system.

DMA 31a and DMA 31b, totaling 3,443 square feet, drain to IMP #31 via through-curb drains, roof downspouts and an area drain system.

DMA 32a and DMA 32b, totaling 2,993 square feet, drain to IMP #32 via through-curb drains, roof downspouts and an area drain system.

DMA 33a and DMA 33b, totaling 2,906 square feet, drain to IMP #33 via through-curb drains, roof downspouts and an area drain system.

DMA 34a and DMA 34b, totaling 2,956 square feet, drain to IMP #34 via through-curb drains, roof downspouts and an area drain system.

IV.A.3. Sizing of Bio-Retention

Impervious surface and pervious surface areas from each DMA outlined above are input into the County IMP sizing calculator to calculate and determine the require bio-retention area to treat each DMA. The output and results of the IMP calculations are included in Appendix A for reference.

V. SOURCE CONTROL MEASURES

V.A. Site Activities and Potential Sources of Pollutants

Source controls prevent potential pollutant sources from contacting rainfall and stormwater. Source control measures consist of structural or operational "good housekeeping" practices. The following source control measures will be implemented:

- Use non-chemical controls before using chemicals to treat a pest problem and pest resistant.
- Select planting materials to site specific characteristics such as soil type, climate, prevailing wind, sunlight, or rainfall to ensure successful establishment.
- Regular sweeping of streets and sidewalk to minimize accumulation of litter or debris.
- Routine inspection and cleaning of stormwater inlets and trash capture devices.
- Storm drain inlets clearly marked "no dumping – drains to bay".
- Proper maintenance of landscaping with minimal pesticide and fertilizer use.
- Project CC&R's or education materials to inform tenants and/or building owners that no person shall dispose of, or permit the disposal, directly or indirectly of vehicle fluids, hazardous materials or rinsed water from tools, equipment, or trash cans into storm drains.
- Regularly mow grass in bio-retention areas and remove clippings from the site.
- Install trash capture devices in stormwater inlets.

VI. STORMWATER FACILITY MAINTENANCE

VI.A. Ownership and Responsibility for Maintenance in Perpetuity

Maintenance is essential for assuring the stormwater treatment measures function effectively and do not cause flooding, provide habitat for mosquitos or otherwise become a nuisance. Essential maintenance will include:

- Flushing the storm drain pipes as needed before the rainy season begins.
- Inspect and service the trash capture devices
- Inspect and service the bio-retention treatment areas.
- Perform other site source controls.

The homeowners association (HOA) of the proposed residential development will be responsible for providing adequate funding to maintain these post-construction stormwater treatment measures. An Operation and Maintenance (O&M) Agreement will be executed by the HOA with the City at project approval stage accepting responsibility for maintenance as well as ensuring access to the City, Water Board, Alameda County Mosquito Abatement District or Vector Control District for routine inspection.

VI.B. Summary of Maintenance Requirements for Each Stormwater Facility

Maintenance plans outlining routine activities and frequency of the maintenance for bio-retention and trash capture devices are included in the Appendix B for reference.

VII. CONSTRUCTION PLAN C.3 CHECKLIST

The construction plans and the corresponding checklist will be prepared after the entitlement and planning approval for the County's review and approval prior to issuance of construction permits.

VIII. CERTIFICATION

Certification stating "The selection, sizing, and preliminary design of stormwater treatment and other control measures in this plan meet the requirements of Regional Water Quality Control Board Order R2-2015-0049" will be provided as required prior to final approval of the stormwater control plan and starting of construction.

EXHIBIT A
VICINITY MAP

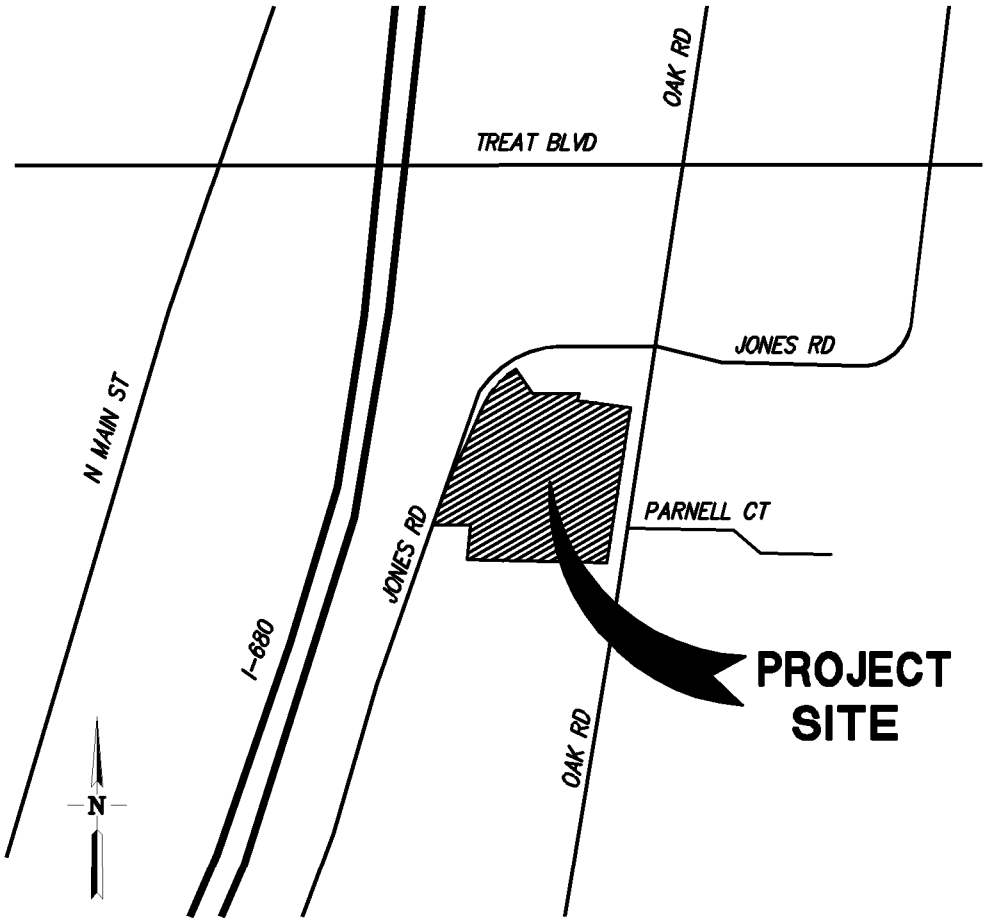


EXHIBIT A - VICINITY MAP

NOT TO SCALE

EXHIBIT B
EXISTING CONDITION PLAN

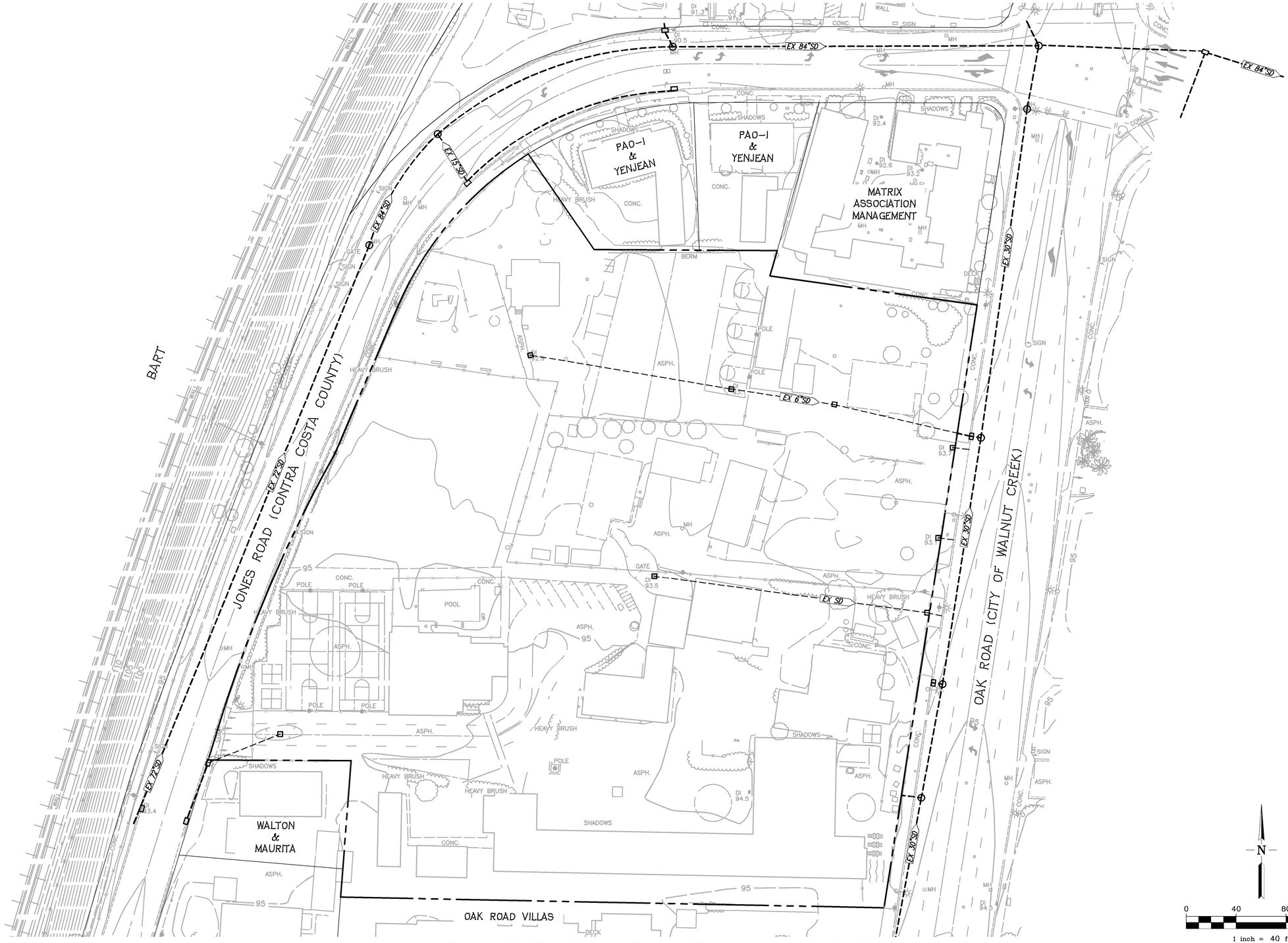


EXHIBIT B - EXISTING CONDITIONS PLAN

SUB 9559-OAK ROAD TOWNHOUSE CONDOMINIUMS

CITY OF WALNUT CREEK, CONTRA COSTA COUNTY, CALIFORNIA
FOR: SUMMERHILL HOMES

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0 40 80 120

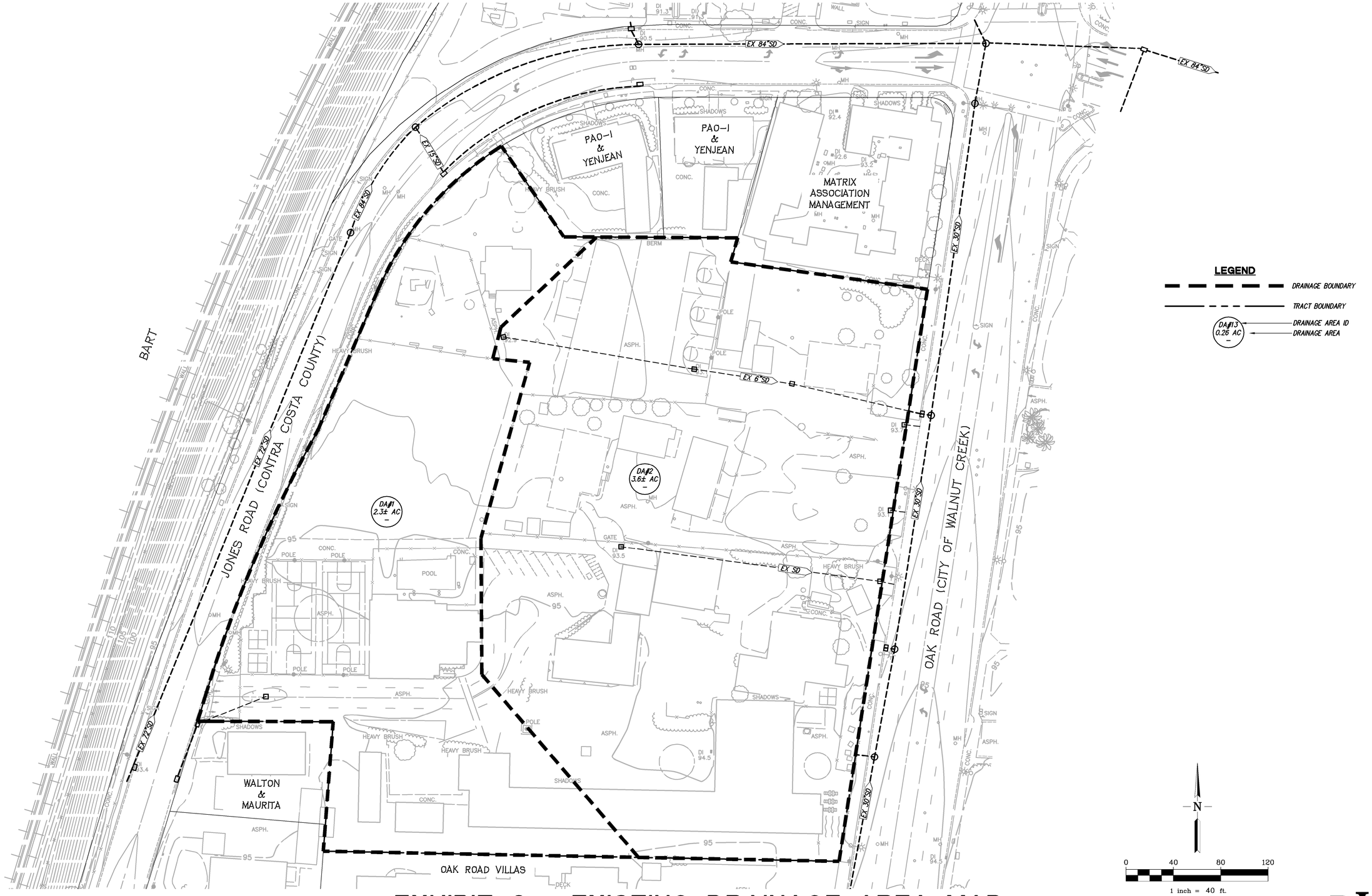
1 inch = 40 ft.

RJA
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DATE: MARCH 22, 2021 JOB NO. 201069 SHEET 1 OF 1

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EXHIBIT C
EXISTING DRAINAGE AREA MAP



LEGEND

- DRAINAGE BOUNDARY
- TRACT BOUNDARY
- DA#13 0.26 AC — DRAINAGE AREA ID / DRAINAGE AREA

N

0 40 80 120

1 inch = 40 ft.

EXHIBIT C - EXISTING DRAINAGE AREA MAP

SUB 9559-OAK ROAD TOWNHOUSE CONDOMINIUMS

CITY OF WALNUT CREEK, CONTRA COSTA COUNTY, CALIFORNIA

FOR: SUMMERHILL HOMES

RJA

RUGGERI-JENSEN-AZAR

ENGINEERS ▪ PLANNERS ▪ SURVEYORS

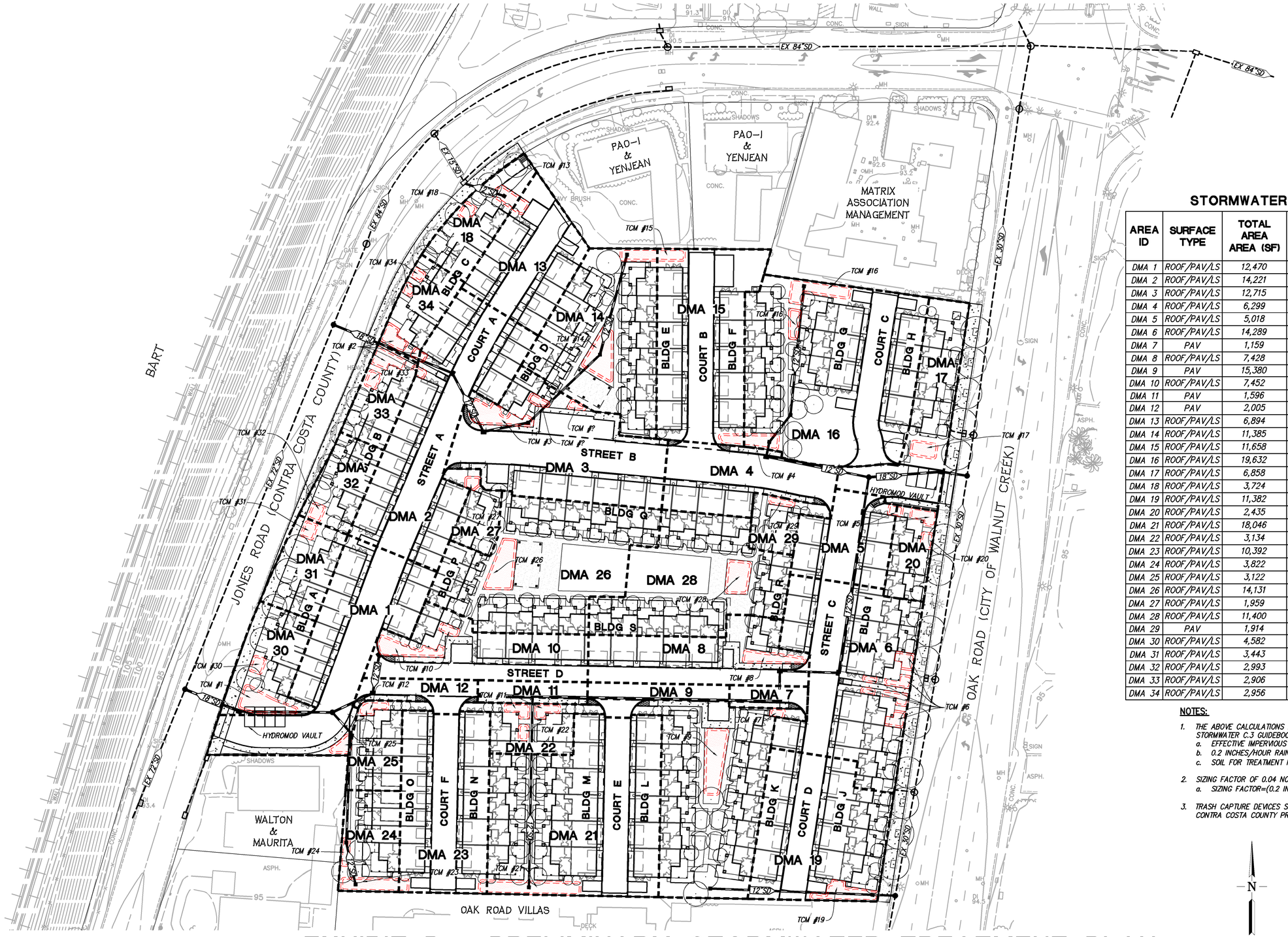
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DATE: MARCH 22, 2021 JOB NO. 201069 SHEET 1 OF 1

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EXHIBIT D
PRELIMINARY STORMWATER TREATMENT PLAN



LEGEND

- DRAINAGE MANAGEMENT AREA (DMA)
- BIO-RETENTION AREA
- HYDROMOD VAULT

STORMWATER TREATMENT CALCULATIONS

AREA ID	SURFACE TYPE	TOTAL AREA AREA (SF)	IMPERVIOUS AREA (SF)	EFFECTIVE LANDSCAPE AREA (SF)	TREATMENT AREA REQUIRED (SF)	TREATMENT AREA PROVIDED (SF)
DMA 1	ROOF/PAV/LS	12,470	11,577	89	467	477
DMA 2	ROOF/PAV/LS	14,221	13,048	117	527	529
DMA 3	ROOF/PAV/LS	12,715	11,483	123	464	465
DMA 4	ROOF/PAV/LS	6,299	6,153	15	247	261
DMA 5	ROOF/PAV/LS	5,018	4,697	32	189	204
DMA 6	ROOF/PAV/LS	14,289	12,076	221	492	493
DMA 7	PAV	1,159	1,159	0	46	46
DMA 8	ROOF/PAV/LS	7,428	6,049	138	247	261
DMA 9	PAV	15,380	9,674	571	410	422
DMA 10	ROOF/PAV/LS	7,452	6,239	121	254	288
DMA 11	PAV	1,596	1,596	0	64	110
DMA 12	PAV	2,005	2,005	0	80	89
DMA 13	ROOF/PAV/LS	6,894	5,536	136	227	242
DMA 14	ROOF/PAV/LS	11,385	7,439	395	313	326
DMA 15	ROOF/PAV/LS	11,658	9,381	228	384	346
DMA 16	ROOF/PAV/LS	19,632	11,951	768	509	545
DMA 17	ROOF/PAV/LS	6,858	4,428	243	187	187
DMA 18	ROOF/PAV/LS	3,724	1,883	184	83	87
DMA 19	ROOF/PAV/LS	11,382	9,074	231	372	374
DMA 20	ROOF/PAV/LS	2,435	1,513	92	64	73
DMA 21	ROOF/PAV/LS	18,046	14,299	375	587	637
DMA 22	ROOF/PAV/LS	3,134	1,788	135	77	77
DMA 23	ROOF/PAV/LS	10,392	9,411	98	380	415
DMA 24	ROOF/PAV/LS	3,822	2,078	174	90	90
DMA 25	ROOF/PAV/LS	3,122	2,050	107	86	116
DMA 26	ROOF/PAV/LS	14,131	9,028	510	382	381
DMA 27	ROOF/PAV/LS	1,959	1,080	88	47	72
DMA 28	ROOF/PAV/LS	11,400	6,811	459	291	291
DMA 29	PAV	1,914	1,019	90	44	56
DMA 30	ROOF/PAV/LS	4,582	2,825	176	120	120
DMA 31	ROOF/PAV/LS	3,443	2,460	98	102	102
DMA 32	ROOF/PAV/LS	2,993	2,033	96	85	87
DMA 33	ROOF/PAV/LS	2,906	1,939	97	81	87
DMA 34	ROOF/PAV/LS	2,956	1,954	100	82	86

NOTES:

1. THE ABOVE CALCULATIONS ARE BASED ON THE CONTRA COSTA CLEAN WATER PROGRAM, STORMWATER C.3 GUIDEBOOK, DATED JUNE 21, 2017, AND THE FOLLOWING CRITERIA:
   a. EFFECTIVE IMPERVIOUS AREA = IMPERVIOUS AREA + 10% OF PERVIOUS AREA
   b. 0.2 INCHES/HOUR RAINFALL INTENSITY ON 100% OF EFFECTIVE IMPERVIOUS AREA.
   c. SOIL FOR TREATMENT MEDIUM WITH A 5 INCHES/HOUR INFILTRATION RATE.
2. SIZING FACTOR OF 0.04 NOTED ABOVE IS CALCULATED BASED ON THE FOLLOWING CRITERIA:
   a. SIZING FACTOR=(0.2 IN/HR)/(5 IN/HR)=0.04
3. TRASH CAPTURE DEVICES SHALL BE INSTALLED IN EACH STORM WATER INLET (SWI) PER CONTRA COSTA COUNTY PROVISION C.10.

N

0 40 80 120

1 inch = 40 ft.

EXHIBIT D - PRELIMINARY STORMWATER TREATMENT PLAN

SUB 9559-OAK ROAD TOWNHOUSE CONDOMINIUMS

CITY OF WALNUT CREEK, CONTRA COSTA COUNTY, CALIFORNIA
FOR: SUMMERHILL HOMES

RUGGERI-JENSEN-AZAR
ENGINEERS ▪ PLANNERS ▪ SURVEYORS
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DATE: MARCH 22, 2021 JOB NO. 201069 SHEET 1 OF 1

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APPENDIX A
IMP SIZING CALCULATOR OUTPUT

Project Name: Palmer
Project Type: Treatment Only
APN:
Drainage Area: 258,800
Mean Annual Precipitation: 19.0

IV. Areas Draining to IMPs

IMP Name: IMP1
IMP Type: Bioretention Facility
Soil Group: IMP1

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA1A	11,577	Concrete or Asphalt	1.00	11,577
DMA1B	413	Landscape	0.10	41
			Total	11,618
			Area	

IMP Sizing

IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
0.040	1.000	465	477

IMP Name: IMP2
IMP Type: Bioretention Facility
Soil Group: IMP2

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA2A	13,048	Concrete or Asphalt	1.00	13,048
DMA2B	641	Landscape	0.10	64
			Total	13,112
			Area	

IMP Sizing

IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
0.040	1.000	524	529

IMP Name: IMP3
IMP Type: Bioretention Facility
Soil Group: IMP3

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA3A	11,483	Concrete or Asphalt	1.00	11,483
DMA3B	765	Landscape	0.10	77
			Total	11,560
			Area	

IMP Sizing

IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
0.040	1.000	462	465

IMP Name: IMP4
IMP Type: Bioretention Facility
Soil Group: IMP4

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA4A	6,153	Concrete or Asphalt	1.00	6,153
			Total	6,153

IMP Sizing

IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
Area 0.040	1.000	246	261

IMP Name: IMP5
IMP Type: Bioretention Facility
Soil Group: IMP5

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA5A	4,697	Concrete or Asphalt	1.00	4,697
DMA5B	116	Landscape	0.10	12
			Total	4,709

IMP Sizing

IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
Area 0.040	1.000	188	204

IMP Name: IMP6
IMP Type: Bioretention Facility
Soil Group: IMP6

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA6A	12,076	Concrete or Asphalt	1.00	12,076
DMA6B	1,717	Landscape	0.10	172
			Total	12,248

IMP Sizing

IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
Area 0.040	1.000	490	493

IMP Name: IMP7
IMP Type: Bioretention Facility
Soil Group: IMP7

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA7A	1,159	Concrete or Asphalt	1.00	1,159
			Total	1,159

IMP Sizing

IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
Area 0.040	1.000	46	47

IMP Name: IMP8
IMP Type: Bioretention Facility
Soil Group: IMP8

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor

IMP Sizing

DMA8A	6,049	Concrete or Asphalt	1.00	6,049
DMA8B	1,119	Landscape	0.10	112
			Total	6,161

IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
Area 0.040	1.000	246	261

IMP Name: IMP9
IMP Type: Bioretention Facility
Soil Group: IMP9

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA9A	9,674	Concrete or Asphalt	1.00	9,674
DMA9B	5,288	Landscape	0.10	529
			Total	10,203

IMP Sizing	IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
Area	0.040	1.000	408	422

IMP Name: IMP10
IMP Type: Bioretention Facility
Soil Group: IMP10

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA10A	6,239	Concrete or Asphalt	1.00	6,239
DMA10B	922	Conventional Roof	1.00	922
			Total	7,161

IMP Sizing	IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
Area	0.040	1.000	286	288

IMP Name: IMP11
IMP Type: Bioretention Facility
Soil Group: IMP11

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA11A	1,596	Concrete or Asphalt	1.00	1,596
			Total	1,596

IMP Sizing	IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
Area	0.040	1.000	64	110

IMP Name: IMP12
IMP Type: Bioretention Facility
Soil Group: IMP12

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA12A	2,005	Concrete or	1.00	2,005

IMP Sizing	IMP Sizing	Rain	Minimum	Proposed

		Asphalt						
				Total	2,005			
				Area		0.040	1.000	80	89

IMP Name: IMP13
IMP Type: Bioretention Facility
Soil Group: IMP13

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA13A	5,536	Concrete or Asphalt	1.00	5,536
DMA13B	1,118	Landscape	0.10	112
			Total	5,648
			Area	

IMP Sizing

IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
0.040	1.000	226	242

IMP Name: IMP14
IMP Type: Bioretention Facility
Soil Group: IMP14

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA14A	7,439	Concrete or Asphalt	1.00	7,439
DMA14B	3,624	Landscape	0.10	362
			Total	7,801
			Area	

IMP Sizing

IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
0.040	1.000	312	326

IMP Name: IMP15
IMP Type: Bioretention Facility
Soil Group: IMP15

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA15A	9,381	Concrete or Asphalt	1.00	9,381
DMA15B	1,896	Landscape	0.10	190
			Total	9,571
			Area	

IMP Sizing

IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
0.040	1.000	383	384

IMP Name: IMP16
IMP Type: Bioretention Facility
Soil Group: IMP16

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA16A	11,951	Concrete or Asphalt	1.00	11,951
DMA16B	6,954	Landscape	0.10	695

IMP Sizing

IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume

Total	12,646					
Area		0.040	1.000	506	545	

IMP Name: IMP17
IMP Type: Bioretention Facility
Soil Group: IMP17

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA17A	4,428	Concrete or Asphalt	1.00	4,428
DMA17B	2,243	Landscape	0.10	224
Total				4,652

IMP Sizing			
IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
0.040	1.000	186	187

IMP Name: IMP18
IMP Type: Bioretention Facility
Soil Group: IMP18

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA18A	1,883	Concrete or Asphalt	1.00	1,883
DMA18B	1,753	Landscape	0.10	175
Total				2,058

IMP Sizing			
IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
0.040	1.000	82	87

IMP Name: IMP19
IMP Type: Bioretention Facility
Soil Group: IMP19

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA19A	9,074	Concrete or Asphalt	1.00	9,074
DMA19B	1,936	Landscape	0.10	194
Total				9,268

IMP Sizing			
IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
0.040	1.000	371	374

IMP Name: IMP20
IMP Type: Bioretention Facility
Soil Group: IMP20

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA20A	1,513	Concrete or Asphalt	1.00	1,513
DMA20B	847	Landscape	0.10	85
Total				1,598

IMP Sizing			
IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume

Area	0.040	1.000	64	73

IMP Name: IMP21
IMP Type: Bioretention Facility
Soil Group: IMP21

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA21A	14,299	Concrete or Asphalt	1.00	14,299
DMA21B	3,113	Landscape	0.10	311
			Total	14,610

IMP Sizing			
IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
0.040	1.000	584	637
Area			

IMP Name: IMP22
IMP Type: Bioretention Facility
Soil Group: IMP22

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA22A	1,788	Concrete or Asphalt	1.00	1,788
DMA22B	1,273	Landscape	0.10	127
			Total	1,915

IMP Sizing			
IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
0.040	1.000	77	77
Area			

IMP Name: IMP23
IMP Type: Bioretention Facility
Soil Group: IMP23

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA23A	9,411	Concrete or Asphalt	1.00	9,411
DMA23B	565	Landscape	0.10	57
			Total	9,468

IMP Sizing			
IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
0.040	1.000	379	415
Area			

IMP Name: IMP24
IMP Type: Bioretention Facility
Soil Group: IMP24

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA24A	2,078	Concrete or Asphalt	1.00	2,078
DMA24B	1,650	Landscape	0.10	165
			Total	2,243

IMP Sizing			
IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
0.040	1.000	90	90
Area			

IMP Name: IMP25
IMP Type: Bioretention Facility
Soil Group: IMP25

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA25A	2,050	Concrete or Asphalt	1.00	2,050
DMA25B	954	Landscape	0.10	95
			Total	2,145
			Area	

IMP Sizing			
IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
0.040	1.000	86	116

IMP Name: IMP26
IMP Type: Bioretention Facility
Soil Group: IMP26

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA26A	9,028	Concrete or Asphalt	1.00	9,028
DMA26B	4,537	Landscape	0.10	454
			Total	9,482
			Area	

IMP Sizing			
IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
0.040	1.000	379	381

IMP Name: IMP27
IMP Type: Bioretention Facility
Soil Group: IMP27

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA27A	1,080	Concrete or Asphalt	1.00	1,080
DMA27B	808	Landscape	0.10	81
			Total	1,161
			Area	

IMP Sizing			
IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
0.040	1.000	46	72

IMP Name: IMP28
IMP Type: Bioretention Facility
Soil Group: IMP28

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA28A	6,811	Concrete or Asphalt	1.00	6,811
DMA28B	4,299	Landscape	0.10	430
			Total	7,241
			Area	

IMP Sizing			
IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
0.040	1.000	290	291

IMP Name: IMP29

IMP Type: Bioretention Facility
Soil Group: IMP29

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA29A	1,019	Concrete or Asphalt	1.00	1,019
DMA29B	844	Landscape	0.10	84
			Total	1,103
			Area	

IMP Sizing

IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
0.040	1.000	44	56

IMP Name: IMP30
IMP Type: Bioretention Facility
Soil Group: IMP30

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA30A	2,825	Concrete or Asphalt	1.00	2,825
DMA30B	1,640	Landscape	0.10	164
			Total	2,989
			Area	

IMP Sizing

IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
0.040	1.000	120	120

IMP Name: IMP31
IMP Type: Bioretention Facility
Soil Group: IMP31

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA31A	2,460	Concrete or Asphalt	1.00	2,460
DMA31B	878	Landscape	0.10	88
			Total	2,548
			Area	

IMP Sizing

IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
0.040	1.000	102	102

IMP Name: IMP32
IMP Type: Bioretention Facility
Soil Group: IMP32

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA32A	2,033	Concrete or Asphalt	1.00	2,033
DMA32B	873	Landscape	0.10	87
			Total	2,120
			Area	

IMP Sizing

IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
0.040	1.000	85	87

IMP Name: IMP33
IMP Type: Bioretention Facility

Soil Group: IMP33

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA33A	1,939	Concrete or Asphalt	1.00	1,939
DMA33B	883	Landscape	0.10	88
			Total	2,027
			Area	

IMP Sizing

IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
0.040	1.000	81	87

IMP Name: IMP34
IMP Type: Bioretention Facility
Soil Group: IMP34

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA34A	1,954	Concrete or Asphalt	1.00	1,954
DMA34B	914	Landscape	0.10	91
			Total	2,045
			Area	

IMP Sizing

IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
0.040	1.000	82	86

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APPENDIX B
MAINTENANCE PLANS

Bio-Retention Maintenance Plan

I. Routine Maintenance Activities

The maintenance objective is to prevent sediment buildup and clogging and to keep up the pollutant removal efficiency by maintaining a dense, healthy vegetated cover. Routine maintenance activities, and the frequency at which they will be conducted, are shown in the table below.

Table 1
Routine Maintenance Activities for Bioretention Areas

No.	Maintenance Task	Frequency of Task
1	Remove obstructions, debris and trash from bioretention area and dispose of properly.	Monthly, or as needed after storm events
2	Inspect bioretention area to ensure that it drains between storms and within five days after rainfall.	Monthly, or as needed after storm events
3	Inspect inlets for channels, soil exposure or other evidence of erosion. Clear obstructions and remove sediment.	Monthly, or as needed after storm events
4	Remove and replace all dead and diseased vegetation.	Twice a year
5	Maintain vegetation and the irrigation system. Prune and weed to keep bioretention area neat and orderly in appearance.	Before wet season begins, and after wet season
6	Till or replace soil (using soil mix specified in C.3 Technical Guidance Appendix K) as necessary to maintain the design elevation of soil (see Section V, Soil Mixing and Replacement for proper installation of bio-retention soils).	As needed when bio-retention area does not drain between storms and within 5 days after rainfall
7	Check if cobble stone is missing, patching or out of place and replace as necessary before wet season begins.	Monthly, or before wet season begins.
8	Inspect bioretention area using the attached inspection checklist.	Monthly, or after large storm events, after wet season, and monthly during wet season

II. Prohibitions

The use of pesticides and quick release fertilizers shall be minimized, and the principles of integrated pest management (IPM) followed:

1. Employ non-chemical controls (biological, physical and cultural controls) before using chemicals to treat a pest problem.
2. Prune plants properly and at the appropriate time of year.
3. Provide adequate irrigation for landscape plants. Do not over water.
4. Limit fertilizer use unless soil testing indicates a deficiency. Slow-release or organic fertilizer is preferable. Check with municipality for specific requirements.
5. Pest control should avoid harming non-target organisms, or negatively affecting air and water quality and public health. Apply chemical controls only when monitoring indicates that preventative and non-chemical methods are not keeping pests below acceptable levels. When pesticides are required, apply the least toxic and the least persistent pesticide that will provide adequate pest control. Do not apply pesticides on a prescheduled basis.
6. Sweep up spilled fertilizer and pesticides. Do not wash away or bury such spills.
7. Do not over apply pesticide. Spray only where the infestation exists. Follow the manufacturer's instructions for mixing and applying materials.
8. Only licensed, trained pesticide applicators shall apply pesticides.

9. Apply pesticides at the appropriate time to maximize their effectiveness and minimize the likelihood of discharging pesticides into runoff. With the exception of pre-emergent pesticides, avoid application if rain is expected.
10. Unwanted/unused pesticides shall be disposed as hazardous waste.

Standing water shall not remain in the treatment measures for more than five days, to prevent mosquito generation. Should any mosquito issues arise, contact the Alameda County Mosquito Abatement District (ACMAD), as needed for assistance. In Albany, contact the Alameda County Vector Control Services District (ACVCSD). Mosquito larvicides shall be applied only when absolutely necessary, as indicated by the ACMAD or ACVCSD, and then only by a licensed professional or contractor. Contact information for ACMAD and ACVCSD is provided below.

III. Vector Control Contacts

Alameda County Mosquito Abatement District
23187 Connecticut St.
Hayward, CA 94545
Phone: (510) 783-7747

Alameda County Vector Control Services District
1131 Harbor Bay Parkway, Ste. 166
Alameda, CA 94502
Phone: (510) 567-6800

IV. Inspections

The attached Bioretention Area Inspection and Maintenance Checklist shall be used to conduct inspections monthly (or as needed), identify needed maintenance, and record maintenance that is conducted.

V. Soil Mixing and Placement

- Do not excavate, place soils, or amend soils during wet or saturated conditions.
- Operate equipment adjacent to (not in) the facility.
- If machinery must operate in the facility, use light weight, low ground-contact pressure equipment.
- It may be necessary to rip or scarify the bottom soils to promote greater infiltration or excavate any sediment that may have built up during construction.
- Consider the time of year and site working area when determining whether to mix bioretention soil on-site or to import pre-mixed soil.
- If mixing bioretention media on-site, use an adjacent impervious area or on plastic sheeting.
- Place soil in 12”lifts with machinery adjacent to the facility. If working within the facility, to avoid over-compacting, place first lifts at far end from entrance and place backwards towards entrance.
- Do not place or work bioretention soil if it is saturated or raining.

- Allow bioretention soil lifts to settle naturally, boot pack (walk around to firm) lifts to achieve 85% compaction effort. After all lifts are placed, wait a few days to check for settlement, and add additional media as needed.
- An alternative to boot compaction is to settle bioretention soils by lightly watering until soils are just saturated. Allow soil to dry between lifts. It may take a day or more to dry adequately between lifts. Soil cannot be worked when saturated so this method should be used with caution. Allow for extra time to let soils dry between each lift. After all lifts are placed, wait a few days to check for settlement, and add additional media as needed.
- Verify bioretention soil elevations before applying cobble stone or installing plants.

Bioretention Area

Inspection and Maintenance Checklist

Property Address: _____ Property Owner: _____

Treatment Measure No.: _____ Date of Inspection: _____ Type of Inspection: ☐ Monthly ☐ Pre-Wet Season

☐ After heavy runoff ☐ End of Wet Season

Inspector(s): _____ ☐ Other:_____

Defect	**Conditions When Maintenance Is Needed**	**Maintenance Needed? (Y/N)**	**Comments** (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)	**Results Expected When Maintenance Is Performed**
1. Standing Water	When water stands in the bioretention area between storms and does not drain within five days after rainfall.			There should be no areas of standing water once inflow has ceased. Any of the following may apply: sediment or trash blockages removed, improved grade from head to foot of bioretention area, or added underdrains.
2. Trash and Debris Accumulation	Trash and debris accumulated in the bioretention area.			Trash and debris removed from bioretention area and disposed of properly.
3. Sediment	Evidence of sedimentation in bioretention area.			Material removed so that there is no clogging or blockage. Material is disposed of properly.
4. Erosion	Channels have formed around inlets, there are areas of bare soil, and/or other evidence of erosion.			Obstructions and sediment removed so that water flows freely and disperses over a wide area. Obstructions and sediment are disposed of properly.
5. Vegetation	Vegetation is dead, diseased and/or overgrown.			Vegetation is healthy and attractive in appearance.
6. Cobblestone	Cobble stone is missing or patchy in appearance. Areas of bare earth are exposed, or cobble stone layer is less than 3 inches in depth.			All bare earth is covered, except cobble stone is kept 6 inches away from trunks of trees and shrubs. Cobble stone is even in appearance, at a depth of 3 inches.
7. Irrigation	Irrigation system is not working properly.			Repair as needed and confirm irrigation system works properly.

8. Soil shrinkage	The soil surface is more than 6” below overflow drain.			Add biotreatment soil mix (specified in C.3 Technical Guidance Appendix K), so that soil is at proper depth (top of mulch is typically 6 inches below the overflow outlet).
9. Overlfow Pipe to Outlet to Storm Drain	Excess fire flows are not conveyed safely to storm drain. Piping is damaged or disconnected.			Repair the overflow pipe or remove material clogging the overflow outlet, so that excess flow is conveyed efficiently to storm drain.
10. Miscellaneous	Any condition not covered above that needs attention in order for the bioretention area to function as designed.			Meet the design specifications.

Trash Capture Device Maintenance Plan

I. Routine Maintenance Activities

The maintenance objective is to minimize trash going into the storm drain system by capturing and removing trash at the storm water inlets at location where storm water entering into the storm drain system. Routine maintenance activities at which they will be conducted are outlined below.

1. The storm water inlet should be inspected and serviced at a minimum two times per year. One inspection and service should be conducted before the rainy season begins annually and one should be conducted after the rainy season is ended.
2. Clean surface area immediately around each storm water inlet utilizing a stiff bristled push-broom, flat shovel or industrial vacuum.
3. Remove grate cover and set aside.
4. Inspect trash capture filter and ensure it is secured in the storm water inlet. Replace device, if damaged, as needed.
5. Remove debris trapped in grate slot openings.
6. Utilize an industrial vacuum to remove debris from within storm water inlet.
7. Place grate cover back on storm water inlet grate frame.
8. Secure dated service lock-out tag on grate lid.
9. Identify storm water inlet on site map for tracking and reporting.
10. Note observations, concerns or recommendation on maintenance report.

Storm water Treatment Measures Operation and Maintenance

Inspection Report to the

_____, Alameda County, California

This report and attached inspection checklists document the inspection and maintenance conducted for the identified storm water treatment measures (STMs) and flow duration controls (FDCs) subject to the Maintenance Agreement between the City and the property owner during the annual reporting period indicated below.

I. Property Information:

Property Address or APN: _____

Property Owner: _____

II. Contact Information:

Name of person to contact regarding this report: _____

Phone number of contact person: _____ Email: _____

Address to which correspondence regarding this report should be directed:

_____

_____

III. Reporting Period:

This report, with the attached completed inspection checklists, documents the inspections and maintenance of the identified treatment measures during the time period from January 1 to December 31 annually.

IV. Storm Water Treatment Measure and Flow Duration Control Information:

The following STMs and FDCs are located on the property identified above and are subject to the Maintenance Agreement:

Number of each type of STM or FDC	Type of STM or FDC	Location of STMs & FDCs on the Property

V. Sediment Removal

Total amount of accumulated sediment removed from the storm water treatment measure(s) during the reporting period: _____ cubic yards.

The sediment was removed and disposed as follows: _____

_____

VI. Inspector Information:

The inspections documented in the attached inspection checklists were conducted by the following inspector(s):

Inspector Name and Title	Inspector's Employer and Address

VII. Statement of STM and FDC Condition

Based on the inspections documented in the attached checklists, are the STMs and FDCs identified in this report present, functional and being maintained as required by the Maintenance Plan? (Check yes or no.)

____YES ____NO

If "NO", describe problem, proposed solution and schedule of correction:

VIII. Certification:

I hereby certify, under penalty of perjury, that the information presented in this report and attachments is true and complete:

_____ _____

Signature of Property Owner or Other Responsible Party Date

_____

Type or Print Name

_____

Company Name

_____

Address

Phone number:_____ Email:_____