PRELIMINARY DRAINAGE REPORT

FOR

Rexford Industrial

13925 Benson Avenue

Chino, CA

Prepared for Owner/Developer:

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DRC Job No. 23-646

TABLE OF CONTENTS

Section I	Introduction
Section II	Hydrology Methodology
Section III	Project Description Existing Site Conditions Proposed Site Conditions
Section IV	Conclusion
Appendix A	Background Information Vicinity Map NOAA Precipitation Depth NOAA Precipitation Intensity
Appendix B	Hydrology Maps Existing Hydrology Map Proposed Hydrology Map Proposed Hydrology Subarea Map
Appendix C	Hydrology ToC “Plate D.4” Determination Existing Condition Proposed Condition
Appendix D	10-year & 100-year Small Area Unit Hydrographs Existing Condition Proposed Condition
Appendix E	10-year & 100-year Discharge Calculations Hydraflow Hydrographs Hydraflow Basin Analysis
Appendix F	10-year & 100-year Rational Method Calculations Proposed Condition
Appendix G	100-year Hydraulic Capacity Calculations Curb Inlet Analysis Grate Inlet Analysis Riser Inlet Analysis Curb Cut Opening FlowMaster Analysis Rip Rap Calculations (and SD County Dwg. D-40)
Appendix H	Geotech Report & Infiltration Testing
Appendix I	FEMA Firmette Flood Zone Map
Appendix J	Preliminary Pump Specifications

Introduction

The following hydrology study has been prepared for the development of the industrial property to be situated at 13925 Benson Avenue in the City of Chino in San Bernardino County, California. The subject site is approximately 6.64 acres and the general location of the site is illustrated on the Vicinity Map included in Appendix A of this report.

Hydrology Methodology

For both the existing and proposed conditions, the peak storm discharge and runoff volumes for the drainage areas were calculated using the SB County Hydrology Manual. Plate D-4 “Time of Concentration Nomograph for Initial Subarea” from the Hydrology Manual was used to calculate the time of concentration (ToC) for the 10-year and 100-year storm events in both the proposed and existing site conditions. The Small Unit Area Hydrograph Method for San Bernardino, using AES Software (Ratscx), was used to generate hydrographs for the 10-year and 100-year storm events. To determine the 10-year and 100-year precipitation depth and intensity, the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 Point Precipitation Frequency Estimates web-page was used. The stage-storage discharge method, using the Civil3d Hydraflow Hydrograph software, was used to design the proposed detention BMPs to attenuate and release the peak flows for the site. Civil3d Hydraflow utilizes the following equations:

- Detention Pond Routing: Inflow – Outflow = ds / dt
- Underground Chambers: V = (L / 6) * (A1 + 4M + A2)
- Weirs: Q = Weir Coefficient * Length * H^1.5
- Culverts/Orifices: Q = Co * A * SQRT [(2 * g * H) / k] * Nb
  - Co - Orifice Coefficient
  - A - Culvert/Orifice Area
  - g - Gravity
  - H - Distance between water surface and centroid of the culvert barrel
  - k - 1
  - Nb - Number of barrels

Hydraulic Methodology

For the proposed conditions, the peak storm discharge for the drainage subareas were calculated using the San Bernardino County Hydrology Manual. The Rational Method Equation (1978 April), AES Software (Ratscx), was used to calculate the peak flows for the 10-year and 100-year storm events in the proposed condition. The peak flows were used to determine the hydraulic capacity of the proposed drainage improvements. Onsite proposed storm drain lines were sized to meet or exceed the design sizes generated by the AES software. The onsite storm drain curb inlet, grate inlets, and riser inlets were sized using the weir equation. Bentley FlowMaster v8.1 was used to determine the capacity of the curb cut openings and determine the velocity through the curb cut openings for sizing of the rip-rap improvements. The San Diego County Hydrology Design Manual was used to calculate the sizing and dimensions of the rip-rap improvements.

Project Description

Existing Site Conditions:

Currently, the existing site is approximately 6.64 acres of industrial land. The site is mostly impervious with minimal commercial vegetation. Preliminary infiltration testing was performed by Leighton & Associates and presented in the geotechnical investigation attached in Appendix H. Per the investigation, the soil on the project site matches the characteristics of hydrologic soil class D and does not infiltrate.

Presently, the site sheet flows from the northeast corner to the southwest driveway at "Ex. Discharge 1". Refer to the "Existing Hydrology Map" in Appendix B for an illustration of the existing drainage patterns. The peak flows and runoff volumes were determined from the Small Unit Area Hydrograph results. All calculations can be found in Appendices C-E of this report. The following table summarizes the data and results for the 10-year and 100-year storm event in the existing condition.

EXISTING STORM SUMMARY

Drainage Area	Acreage (AC)	10-Year Flowrate (CFS)	100-Year Flowrate (CFS)	Discharge Location
A	6.64	10.80	17.47	Ex. Discharge 1
Total:	6.64	10.80	17.47	

Proposed Site Conditions:

The proposed development will consist of the demolition of the existing 43,940 sf industrial warehouse and construction of a 129,600 sf industrial warehouse. Accompanying the building is the development of associated paved parking areas, drive aisles, loading docks, concrete hardscape, retaining/screen walls, and curbing. The remaining portion of the site will be commercial landscaping. There are two proposed aboveground bioretention pond basins (Basin A & C), one proposed bioretention planter box (Basin B), and two proposed underground detention chambers (Detention 1 & 2).

The majority of the site drains to Basin B and then to Detention 2 at the south side of the site. The northerly surface runoff sheet flows to the proposed curb and gutter into Basin A and then to Detention 1 at the southwest corner of the site. The westerly surface runoff sheet flows to the proposed curb and gutter and either to Basin C and then to Detention 1 or directly to Detention 1.

Basin's A & C were not included in the calculations for hydrology detention due to the minimal relative volume and stage-storage discharge reduction that would result in negligible effects on the overall drainage condition. The proposed condition was analyzed as two areas tributary to either Detention 1 (DMA A) or Detention 2 (DMA B). Both detention fields outlet to the manhole with side opening and bubble-up to the u-channel and parkway drain at the southwest corner of the site (Discharge 1). The low flows and residual stormwater runoff will route from the manhole to the proposed pump unit and be pumped to the u-channel. Refer to the “Proposed Hydrology Map” in Appendix B for an illustration of the proposed areas and to Appendix J for the proposed pump preliminary specifications. The following table summarizes the results for the 10-year and 100-year storm event in the proposed condition prior to mitigation.

PROPOSED STORM SUMMARY PRE-DETENTION

Drainage Area	Acreage (AC)	10-Year Flowrate (CFS)	100-Year Flowrate (CFS)	Discharge Location
A	2.22	3.88	6.41	Pr. Discharge 1
B	4.42	8.17	13.09	Pr. Discharge 1
Total:	6.64	12.05	19.50	

For drainage area A, the proposed onsite storm drain system is designed to collect the runoff from Basin A, Basin C, and curb inlets/drop inlets and convey the runoff to the proposed Detention 1 prior to being released by a control structure manhole with a weir to the manhole with side opening and will either bubble-up or pump up to the u-channel and parkway drain at the southwest corner of the site (Discharge 1). This curb face outlet will match the existing drainage pattern for the project site. For drainage area B, the proposed onsite storm drain system is designed to collect the runoff in the planter box Basin B and through to Detention 2 prior to being released by a control structure manhole with a weir to the manhole with side opening and will either bubble-up or pump up to the u-channel and parkway drain (See Appendix E for the stage-storage discharge results of the runoff from Area B routing through Basin B and then through Detention 2 for the fully mitigated peak flow). The bioretention planter box Basin C and detention fields Detention 1 & 2 have been sized to reduce the peak flows for discharge of the 10-year and 100-year storm events below the existing condition. The following table summarizes the results for the 10-year and 100-year storm event in the proposed condition post-mitigation.

PROPOSED STORM SUMMARY POST-DETENTION

Drainage Area	Acreage (AC)	10-Year Flowrate (CFS)	100-Year Flowrate (CFS)	Discharge Location
A	2.22	3.86	6.36	Pr. Discharge 1
B	4.42	3.24	3.92	Pr. Discharge 1
Total:	6.64	7.10	10.28	

The proposed drainage areas were divided into subareas for hydraulic analysis of the individual drainage improvements, refer to the “Proposed Hydrology Subarea Map” in Appendix B for an illustration of the proposed subareas. The onsite storm drain pipe network meets or exceeds the minimum pipe design sizing generated by the Rational Method report in Appendix F. The curb inlet, grate inlets, and riser inlets are adequately sized to convey the 100-year storm event peak discharge without ponding above the adjacent curb face or pond freeboard limit, refer to Appendix G for the calculations.

The proposed curb cut openings were hydraulically evaluated as rectangular channels in the Bentley FlowMaster program. For the subareas with multiple curb cuts handling similar runoff, the peak discharge was determined by the rational method using one overall subarea and then a rectangular channel with a width equal to the sum of the curb cut openings was modeled in FlowMaster. The resulting normal depth in the openings did not exceed the curb height. The model also calculated the velocity of the runoff to the basins for determination of the rip-rap sizing. For the non-erosive runoff with a velocity below 6.0 feet/second, rip-rap is not required to protect the basin slopes. To be conservative, rip-rap is proposed at these locations at a reduced length based on the geometric conditions. Full rip-rap is provided for the locations of runoff greater than 6.0 feet/second. Refer to Appendix G for the rip-rap calculations.

Conclusion

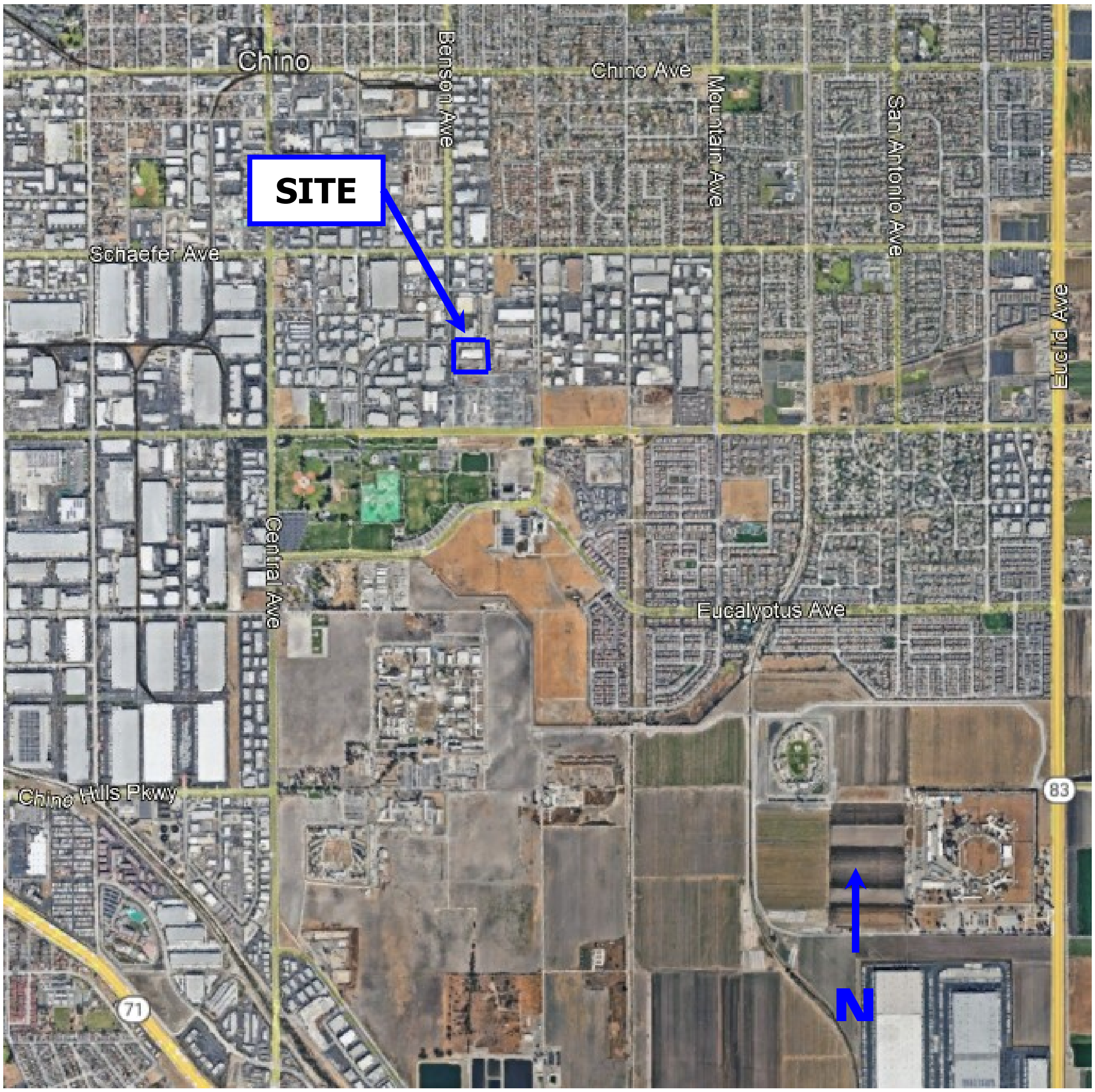
The proposed aboveground bioretention planter box and underground detention fields are sized to reduce the proposed 10-year and 100-year storm flowrates to below the existing 10-year and 100-year peak flowrates. Proposed low flows will discharge through pump discharge to the u-channel and parkway drain and then ultimately to the curb and gutter in Benson Ave. The proposed high flows will bubble-up in the proposed manhole with side opening to the u-channel and parkway drain and then ultimately to the curb and gutter in Benson Ave. at the south end of the project site at a peak flow of 10.28 CFS. The proposed drainage improvements are adequately sized to convey the 100-year runoff with ponding less than the curb face adjacent to the improvements. The proposed site is also designed to ensure a secondary overland release path for the surface runoff that is below the proposed building finished floor and below the adjacent properties, allowing for safe discharge of a storm event greater than the design storm. Offsite surface runoff tributary to the site was determined to be negligible. Due to the site reducing peak flows to below the existing condition and the proposed drainage improvements adequately conveying the design storm runoff, the proposed development will not pose any flood dangers to any downstream or upstream drainage facilities and properties.

APPENDIX A

Background Information

Vicinity Map
NOAA Precipitation Depth
NOAA Precipitation Intensity

Vicinity Map



NOAA Atlas 14, Volume 6, Version 2
Location name: Chino, California, USA*
Latitude: 34.0005°, Longitude: -117.6793°
Elevation: 685 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.116 (0.097-0.140)	0.151 (0.126-0.183)	0.198 (0.165-0.240)	0.237 (0.196-0.291)	0.292 (0.233-0.370)	0.335 (0.261-0.435)	0.380 (0.289-0.506)	0.427 (0.315-0.586)	0.493 (0.348-0.706)	0.585 (0.398-0.868)
10-min	0.166 (0.138-0.201)	0.216 (0.180-0.262)	0.284 (0.236-0.345)	0.340 (0.281-0.417)	0.419 (0.333-0.531)	0.481 (0.374-0.623)	0.545 (0.414-0.725)	0.613 (0.452-0.839)	0.707 (0.499-1.01)	0.839 (0.571-1.24)
15-min	0.201 (0.167-0.242)	0.261 (0.218-0.317)	0.343 (0.286-0.417)	0.411 (0.339-0.504)	0.506 (0.403-0.642)	0.581 (0.453-0.754)	0.659 (0.500-0.877)	0.741 (0.546-1.02)	0.855 (0.603-1.22)	1.01 (0.691-1.50)
30-min	0.301 (0.251-0.364)	0.393 (0.327-0.475)	0.515 (0.429-0.626)	0.618 (0.509-0.757)	0.760 (0.605-0.964)	0.873 (0.680-1.13)	0.990 (0.751-1.32)	1.11 (0.820-1.52)	1.28 (0.906-1.84)	1.52 (1.04-2.26)
60-min	0.452 (0.378-0.547)	0.589 (0.492-0.713)	0.774 (0.643-0.939)	0.927 (0.765-1.14)	1.14 (0.909-1.45)	1.31 (1.02-1.70)	1.48 (1.13-1.98)	1.67 (1.23-2.29)	1.93 (1.36-2.76)	2.29 (1.56-3.39)
2-hr	0.680 (0.568-0.822)	0.889 (0.741-1.08)	1.16 (0.962-1.40)	1.37 (1.13-1.68)	1.65 (1.32-2.10)	1.86 (1.45-2.42)	2.08 (1.58-2.76)	2.29 (1.69-3.14)	2.58 (1.82-3.69)	2.79 (1.90-4.14)
3-hr	0.863 (0.721-1.04)	1.13 (0.940-1.36)	1.46 (1.22-1.77)	1.72 (1.42-2.11)	2.07 (1.65-2.62)	2.32 (1.81-3.01)	2.57 (1.95-3.42)	2.82 (2.08-3.87)	3.15 (2.22-4.51)	3.40 (2.31-5.04)
6-hr	1.19 (0.994-1.44)	1.55 (1.30-1.88)	2.00 (1.67-2.43)	2.36 (1.94-2.89)	2.81 (2.24-3.57)	3.15 (2.45-4.08)	3.48 (2.64-4.62)	3.80 (2.80-5.20)	4.22 (2.98-6.04)	4.53 (3.08-6.72)
12-hr	1.56 (1.30-1.89)	2.04 (1.70-2.47)	2.64 (2.19-3.20)	3.11 (2.57-3.81)	3.74 (2.98-4.74)	4.20 (3.27-5.45)	4.66 (3.54-6.20)	5.12 (3.77-7.01)	5.72 (4.04-8.19)	6.18 (4.20-9.16)
24-hr	2.02 (1.78-2.32)	2.64 (2.33-3.05)	3.45 (3.04-4.00)	4.12 (3.60-4.80)	5.01 (4.24-6.04)	5.69 (4.72-7.00)	6.39 (5.17-8.05)	7.10 (5.59-9.19)	8.06 (6.10-10.9)	8.80 (6.44-12.3)
2-day	2.42 (2.15-2.80)	3.24 (2.86-3.74)	4.33 (3.82-5.02)	5.25 (4.59-6.12)	6.52 (5.52-7.86)	7.53 (6.25-9.27)	8.58 (6.95-10.8)	9.69 (7.63-12.5)	11.2 (8.50-15.1)	12.5 (9.11-17.4)
3-day	2.60 (2.30-3.00)	3.53 (3.12-4.07)	4.78 (4.22-5.54)	5.85 (5.11-6.82)	7.35 (6.22-8.86)	8.55 (7.09-10.5)	9.82 (7.95-12.4)	11.2 (8.80-14.5)	13.1 (9.89-17.6)	14.6 (10.7-20.4)
4-day	2.82 (2.50-3.26)	3.86 (3.41-4.45)	5.26 (4.63-6.08)	6.44 (5.63-7.51)	8.10 (6.86-9.76)	9.43 (7.82-11.6)	10.8 (8.76-13.6)	12.3 (9.69-15.9)	14.4 (10.9-19.4)	16.0 (11.7-22.4)
7-day	3.22 (2.85-3.71)	4.40 (3.89-5.08)	5.98 (5.28-6.93)	7.29 (6.38-8.51)	9.10 (7.70-11.0)	10.5 (8.72-12.9)	12.0 (9.69-15.1)	13.5 (10.6-17.5)	15.6 (11.8-21.0)	17.2 (12.6-24.0)
10-day	3.53 (3.12-4.07)	4.84 (4.28-5.59)	6.56 (5.78-7.60)	7.97 (6.97-9.30)	9.90 (8.38-11.9)	11.4 (9.45-14.0)	12.9 (10.5-16.3)	14.5 (11.4-18.8)	16.6 (12.6-22.4)	18.3 (13.4-25.5)
20-day	4.28 (3.79-4.94)	5.93 (5.24-6.85)	8.11 (7.15-9.39)	9.90 (8.66-11.6)	12.3 (10.4-14.9)	14.2 (11.8-17.5)	16.2 (13.1-20.4)	18.2 (14.3-23.5)	20.9 (15.8-28.2)	23.0 (16.8-32.1)
30-day	5.13 (4.54-5.92)	7.14 (6.31-8.24)	9.84 (8.67-11.4)	12.1 (10.6-14.1)	15.2 (12.9-18.3)	17.6 (14.6-21.7)	20.2 (16.3-25.4)	22.8 (18.0-29.6)	26.5 (20.1-35.8)	29.4 (21.5-41.0)
45-day	6.07 (5.37-7.00)	8.44 (7.46-9.74)	11.7 (10.3-13.5)	14.5 (12.7-16.9)	18.4 (15.6-22.2)	21.6 (18.0-26.6)	25.0 (20.3-31.5)	28.7 (22.6-37.1)	33.8 (25.6-45.6)	38.0 (27.8-53.0)
60-day	6.98 (6.18-8.05)	9.63 (8.51-11.1)	13.4 (11.8-15.5)	16.6 (14.6-19.4)	21.4 (18.1-25.8)	25.4 (21.1-31.2)	29.7 (24.0-37.4)	34.3 (27.1-44.5)	41.1 (31.1-55.5)	46.8 (34.2-65.3)

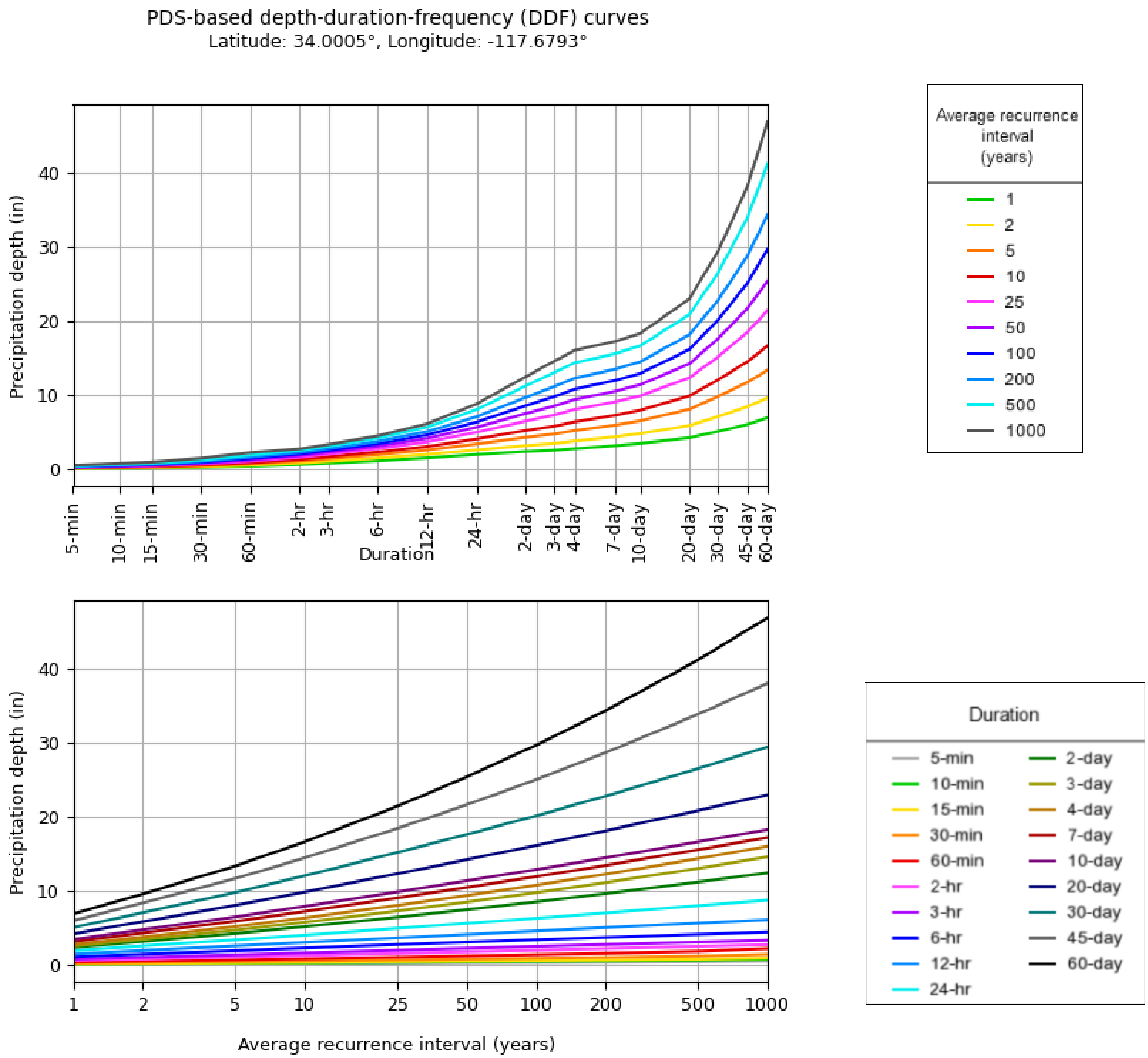
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical



NOAA Atlas 14, Volume 6, Version 2 Created (GMT): Mon Jun 5 20:25:54 2023

Back to Top

Maps & aerials

Small scale terrain

NOAA Atlas 14, Volume 6, Version 2
Location name: Chino, California, USA*
Latitude: 34.0005°, Longitude: -117.6793°
Elevation: 685 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.39 (1.16-1.68)	1.81 (1.51-2.20)	2.38 (1.98-2.88)	2.84 (2.35-3.49)	3.50 (2.80-4.44)	4.02 (3.13-5.22)	4.56 (3.47-6.07)	5.12 (3.78-7.03)	5.92 (4.18-8.47)	7.02 (4.78-10.4)
10-min	0.996 (0.828-1.21)	1.30 (1.08-1.57)	1.70 (1.42-2.07)	2.04 (1.69-2.50)	2.51 (2.00-3.19)	2.89 (2.24-3.74)	3.27 (2.48-4.35)	3.68 (2.71-5.03)	4.24 (2.99-6.07)	5.03 (3.43-7.46)
15-min	0.804 (0.668-0.968)	1.04 (0.872-1.27)	1.37 (1.14-1.67)	1.64 (1.36-2.02)	2.02 (1.61-2.57)	2.32 (1.81-3.02)	2.64 (2.00-3.51)	2.96 (2.18-4.06)	3.42 (2.41-4.89)	4.06 (2.76-6.02)
30-min	0.602 (0.502-0.728)	0.786 (0.654-0.950)	1.03 (0.858-1.25)	1.24 (1.02-1.51)	1.52 (1.21-1.93)	1.75 (1.36-2.26)	1.98 (1.50-2.63)	2.23 (1.64-3.05)	2.57 (1.81-3.67)	3.05 (2.07-4.52)
60-min	0.452 (0.378-0.547)	0.589 (0.492-0.713)	0.774 (0.643-0.939)	0.927 (0.765-1.14)	1.14 (0.909-1.45)	1.31 (1.02-1.70)	1.48 (1.13-1.98)	1.67 (1.23-2.29)	1.93 (1.36-2.76)	2.29 (1.56-3.39)
2-hr	0.340 (0.284-0.411)	0.444 (0.370-0.538)	0.578 (0.481-0.701)	0.684 (0.564-0.838)	0.826 (0.658-1.05)	0.932 (0.726-1.21)	1.04 (0.788-1.38)	1.15 (0.845-1.57)	1.29 (0.909-1.84)	1.40 (0.950-2.07)
3-hr	0.287 (0.240-0.347)	0.375 (0.313-0.454)	0.486 (0.404-0.590)	0.573 (0.473-0.702)	0.687 (0.548-0.872)	0.772 (0.602-1.00)	0.856 (0.650-1.14)	0.940 (0.692-1.29)	1.05 (0.740-1.50)	1.13 (0.770-1.68)
6-hr	0.198 (0.165-0.240)	0.259 (0.216-0.313)	0.334 (0.278-0.406)	0.393 (0.324-0.482)	0.469 (0.374-0.596)	0.525 (0.409-0.681)	0.580 (0.440-0.772)	0.634 (0.467-0.869)	0.704 (0.497-1.01)	0.756 (0.515-1.12)
12-hr	0.129 (0.108-0.156)	0.169 (0.141-0.204)	0.218 (0.182-0.265)	0.258 (0.212-0.316)	0.310 (0.246-0.393)	0.348 (0.271-0.452)	0.386 (0.293-0.514)	0.424 (0.313-0.581)	0.474 (0.335-0.679)	0.512 (0.349-0.760)
24-hr	0.084 (0.074-0.096)	0.110 (0.097-0.127)	0.143 (0.126-0.166)	0.171 (0.149-0.200)	0.208 (0.176-0.251)	0.237 (0.196-0.291)	0.266 (0.215-0.335)	0.295 (0.233-0.383)	0.335 (0.254-0.453)	0.366 (0.268-0.511)
2-day	0.050 (0.044-0.058)	0.067 (0.059-0.077)	0.090 (0.079-0.104)	0.109 (0.095-0.127)	0.135 (0.115-0.163)	0.156 (0.130-0.193)	0.178 (0.144-0.225)	0.201 (0.159-0.261)	0.233 (0.176-0.315)	0.259 (0.189-0.362)
3-day	0.036 (0.032-0.041)	0.048 (0.043-0.056)	0.066 (0.058-0.076)	0.081 (0.071-0.094)	0.102 (0.086-0.123)	0.118 (0.098-0.146)	0.136 (0.110-0.171)	0.155 (0.122-0.200)	0.181 (0.137-0.244)	0.202 (0.148-0.283)
4-day	0.029 (0.026-0.033)	0.040 (0.035-0.046)	0.054 (0.048-0.063)	0.067 (0.058-0.078)	0.084 (0.071-0.101)	0.098 (0.081-0.120)	0.112 (0.091-0.141)	0.128 (0.100-0.165)	0.149 (0.113-0.201)	0.167 (0.122-0.233)
7-day	0.019 (0.016-0.022)	0.026 (0.023-0.030)	0.035 (0.031-0.041)	0.043 (0.037-0.050)	0.054 (0.045-0.065)	0.062 (0.051-0.076)	0.071 (0.057-0.089)	0.080 (0.063-0.103)	0.092 (0.070-0.125)	0.102 (0.075-0.143)
10-day	0.014 (0.013-0.016)	0.020 (0.017-0.023)	0.027 (0.024-0.031)	0.033 (0.029-0.038)	0.041 (0.034-0.049)	0.047 (0.039-0.058)	0.053 (0.043-0.067)	0.060 (0.047-0.078)	0.069 (0.052-0.093)	0.076 (0.055-0.106)
20-day	0.008 (0.007-0.010)	0.012 (0.010-0.014)	0.016 (0.014-0.019)	0.020 (0.018-0.024)	0.025 (0.021-0.030)	0.029 (0.024-0.036)	0.033 (0.027-0.042)	0.037 (0.029-0.048)	0.043 (0.032-0.058)	0.047 (0.035-0.066)
30-day	0.007 (0.006-0.008)	0.009 (0.008-0.011)	0.013 (0.012-0.015)	0.016 (0.014-0.019)	0.021 (0.017-0.025)	0.024 (0.020-0.030)	0.028 (0.022-0.035)	0.031 (0.024-0.041)	0.036 (0.027-0.049)	0.040 (0.029-0.056)
45-day	0.005 (0.004-0.006)	0.007 (0.006-0.009)	0.010 (0.009-0.012)	0.013 (0.011-0.015)	0.017 (0.014-0.020)	0.020 (0.016-0.024)	0.023 (0.018-0.029)	0.026 (0.020-0.034)	0.031 (0.023-0.042)	0.035 (0.025-0.049)
60-day	0.004 (0.004-0.005)	0.006 (0.005-0.007)	0.009 (0.008-0.010)	0.011 (0.010-0.013)	0.014 (0.012-0.017)	0.017 (0.014-0.021)	0.020 (0.016-0.025)	0.023 (0.018-0.030)	0.028 (0.021-0.038)	0.032 (0.023-0.045)

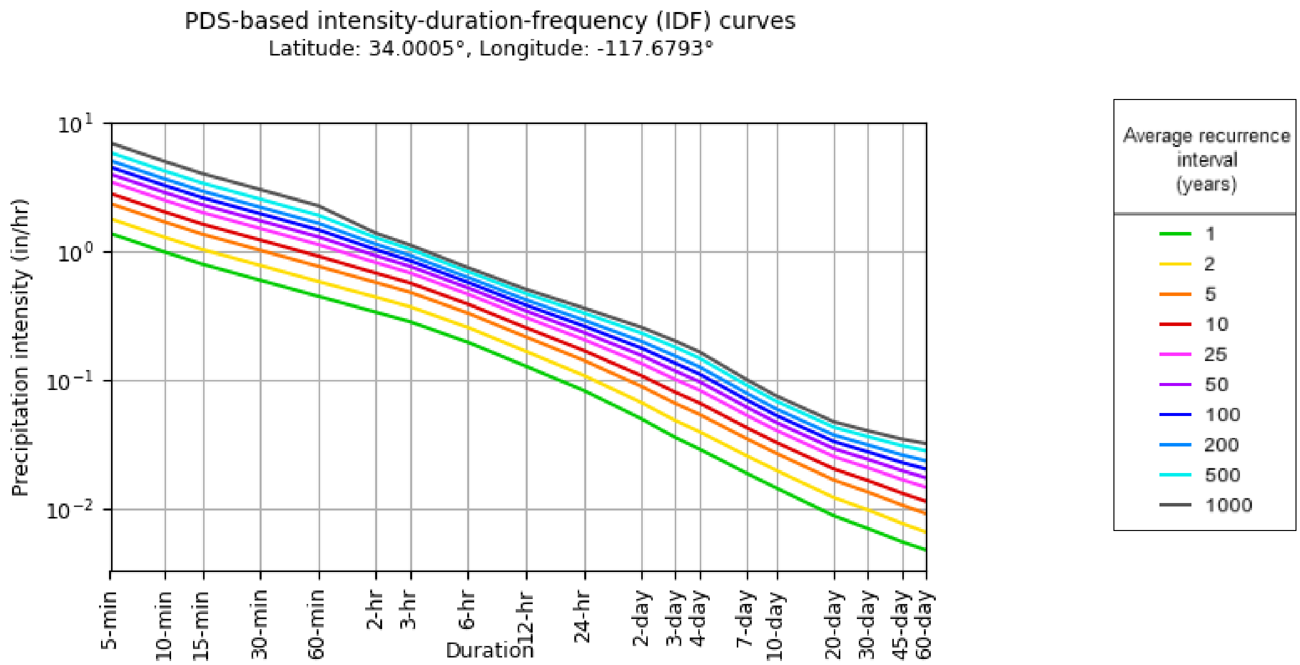
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

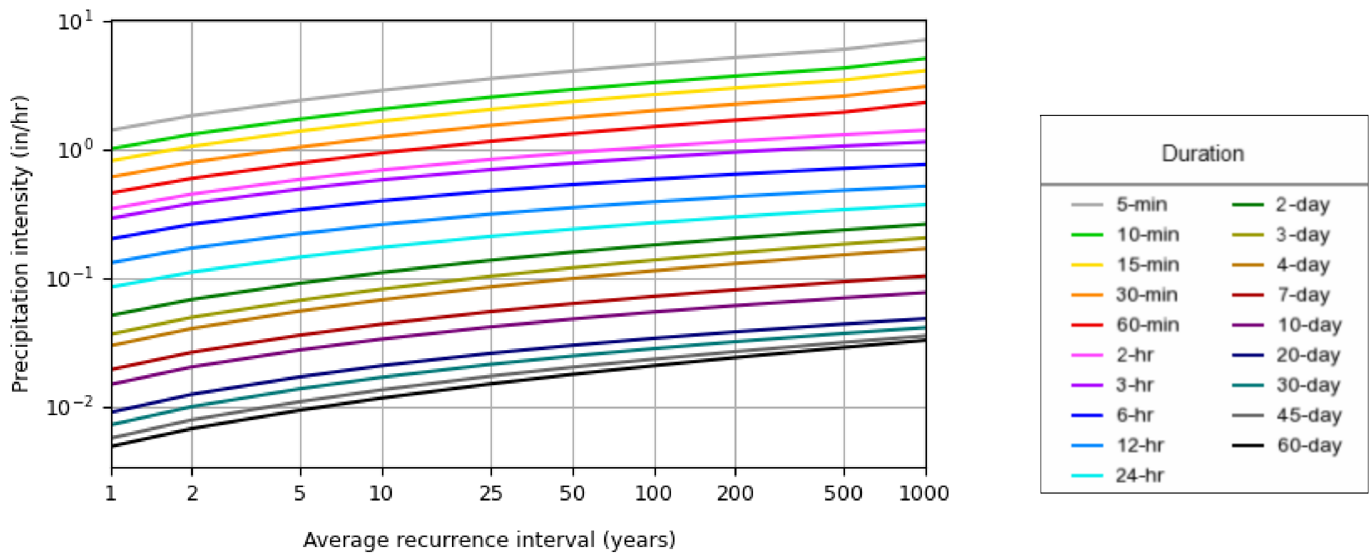
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical





NOAA Atlas 14, Volume 6, Version 2

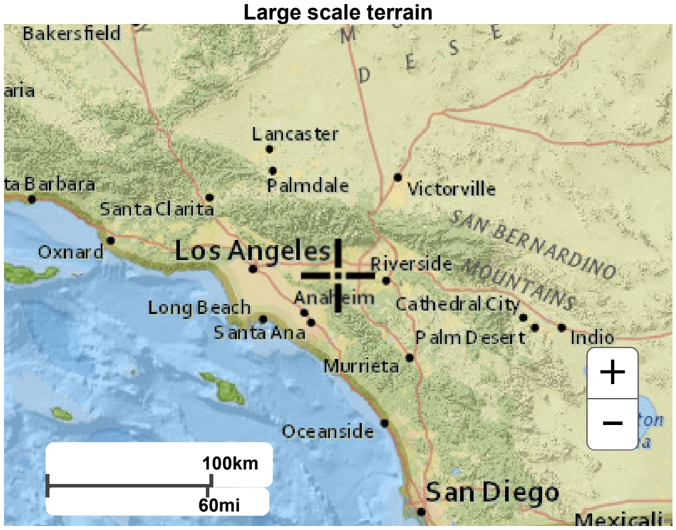
Created (GMT): Wed Dec 6 21:45:52 2023

Back to Top

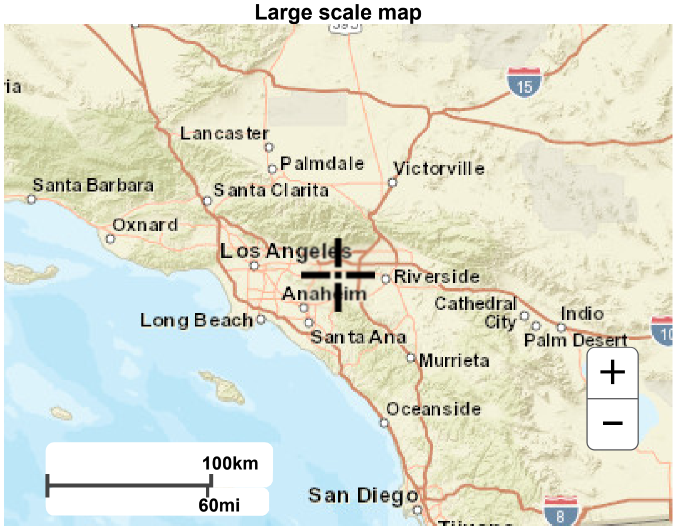
Maps & aerials

Small scale terrain

Large scale terrain

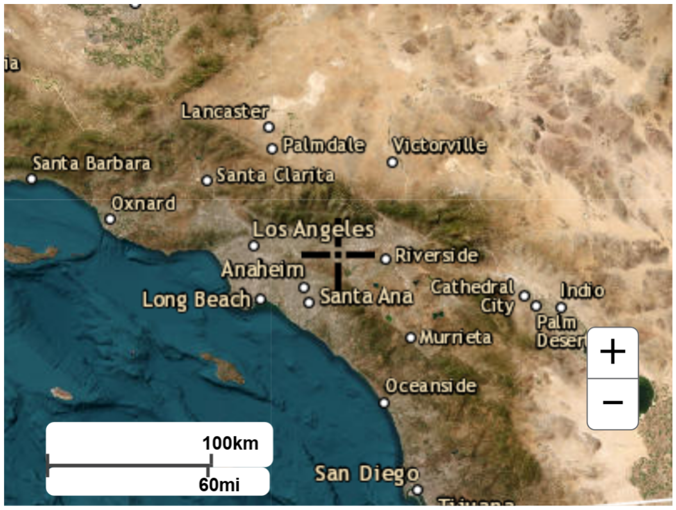


Large scale map



Large scale aerial

A6



Back to Top

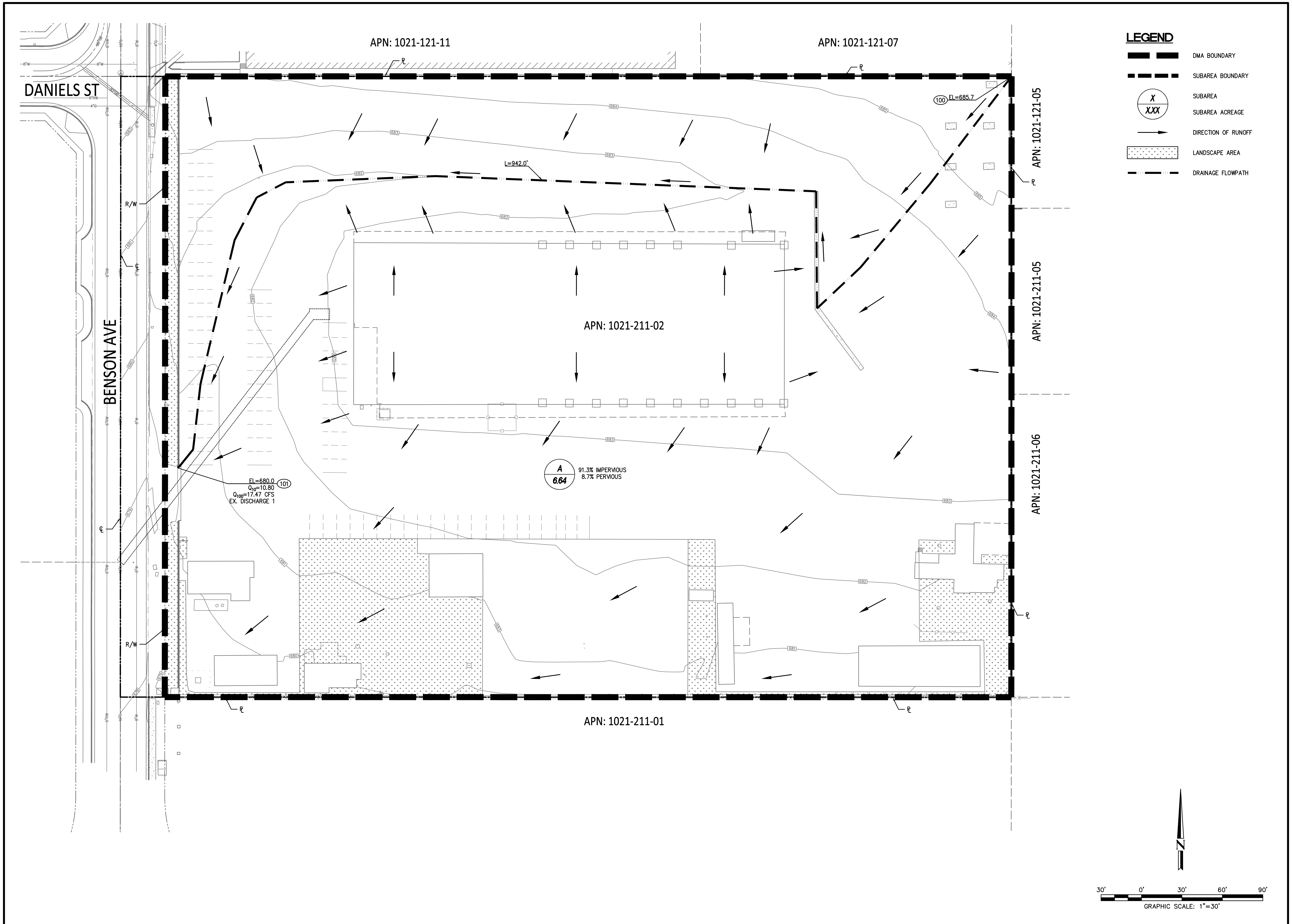
US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

APPENDIX B

Hydrology Maps

Existing Hydrology Map
Proposed Hydrology Map
Proposed Hydrology Subarea Map



PREPARED BY:

DRC Engineering, Inc.
Civil Engineering/Land Surveying/Land Planning

160 S. Old Springs Road
Suite 210
Anaheim Hills, CA 92808
714-685-6860

DREW J. GATES R.C.E. 94249 12/8/23 DATE

NOT FOR CONSTRUCTION

NO.:	REVISION:	DATE:

PROJECT: REXFORD INDUSTRIAL
13925 BENSON AVENUE
CHINO, CA

DRAWING NAME: EXISTING HYDROLOGY MAP

ISSUE:	HYDROLOGY
DATE:	12/8/23
CHECKED: DG	DRAWN: AS
DRAWING FILE:	23646exhm
PROJECT NO.:	23-646
SHEET NUMBER:	1
OF 1 SHEETS	
SCALE:	AS SHOWN

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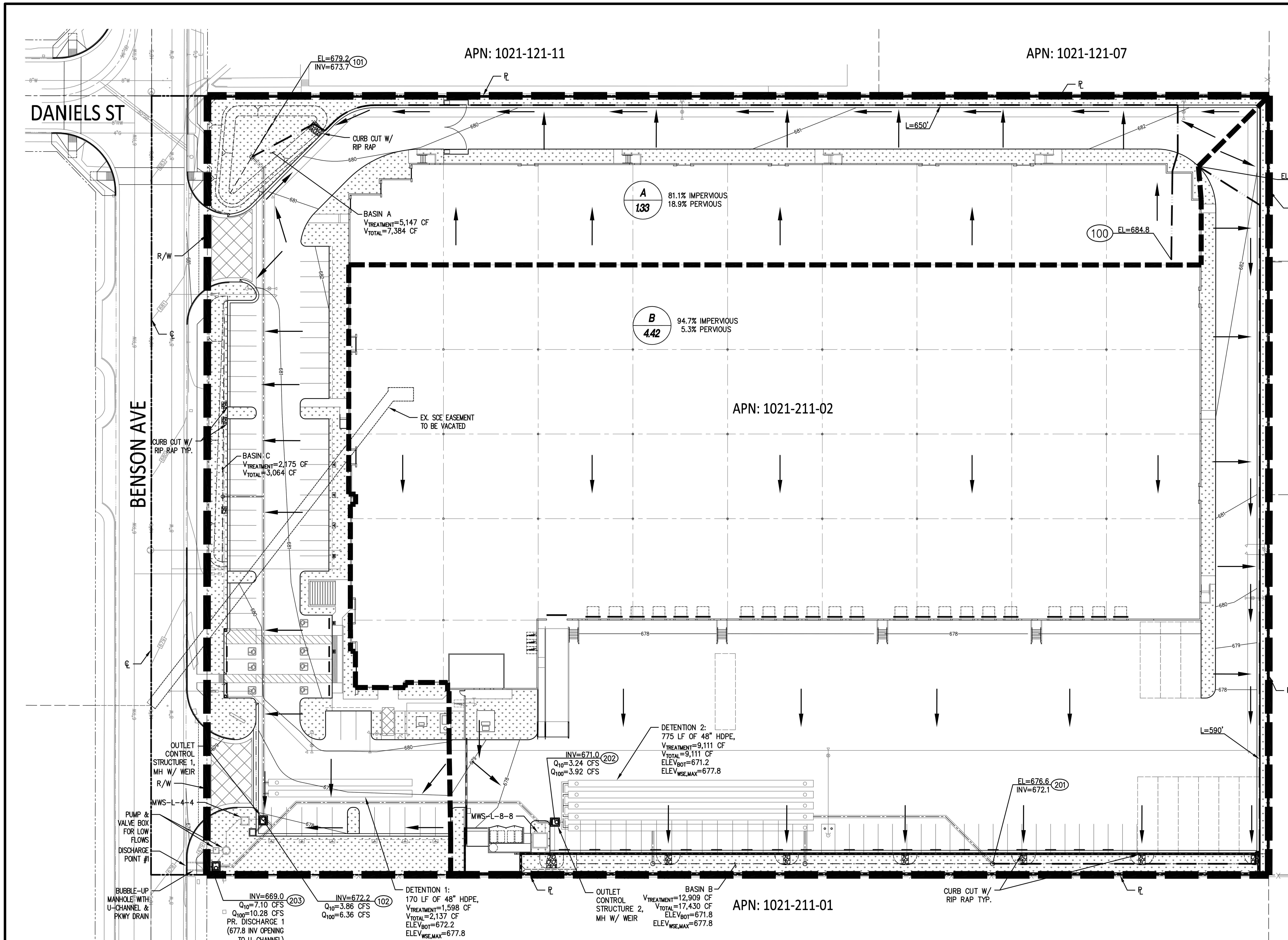
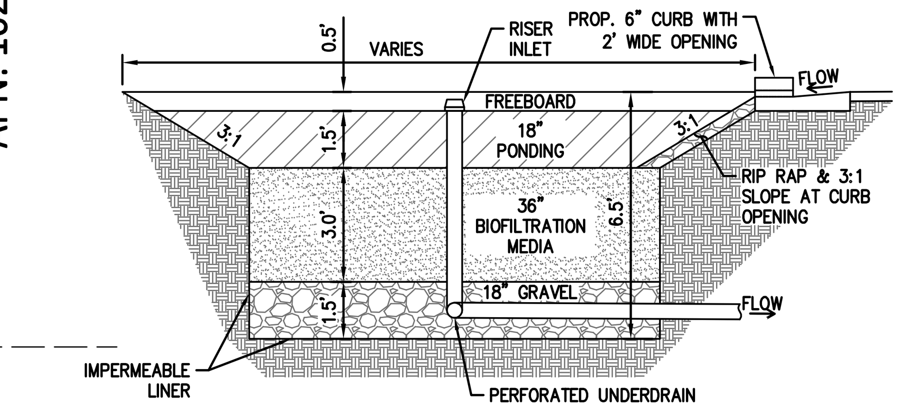


LEGEND

- DMA BOUNDARY
- SUBAREA BOUNDARY
- X / XXX — SUBAREA / SUBAREA ACREAGE
- DIRECTION OF RUNOFF
- LANDSCAPE AREA
- STORM DRAIN FLOW ARROW / STORM DRAIN LINE
- WEIR PLATE / WEIR PLATE — OUTLET CONTROL STRUCTURE MANHOLE
- 2' WIDE CURB CUT OPENING W/ RIP RAP ON SLOPE
- DRAINAGE FLOWPATH

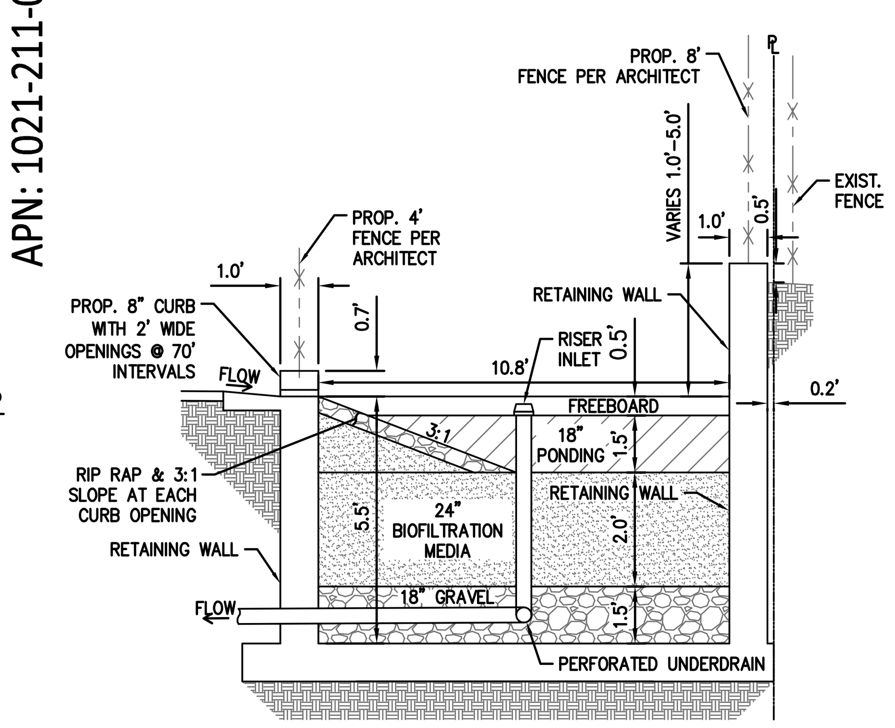
PROPOSED ZONING

M2 (INDUSTRIAL GENERAL)



'BASIN A' BIORETENTION DETAIL

N.T.S.



'BASIN B' PLANTER BOX DETAIL

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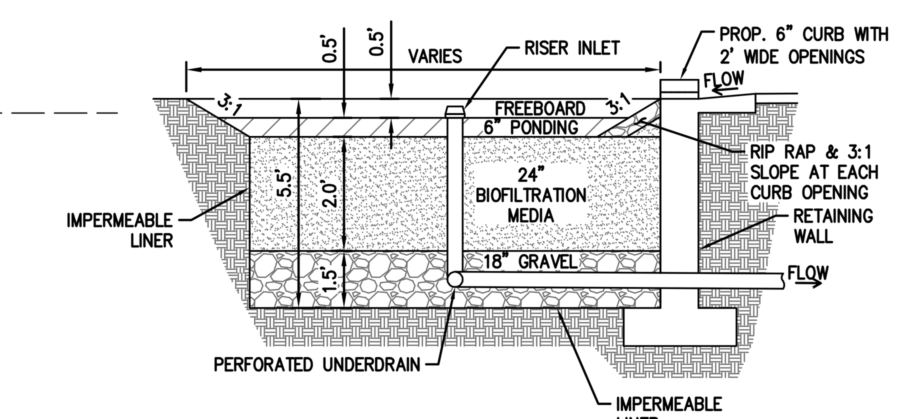
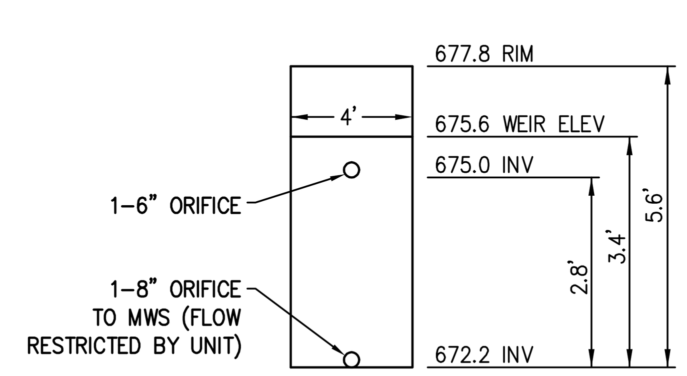


'BASIN C' BIORETENTION DETAIL

N.T.S.



WEIR '1' DETAIL

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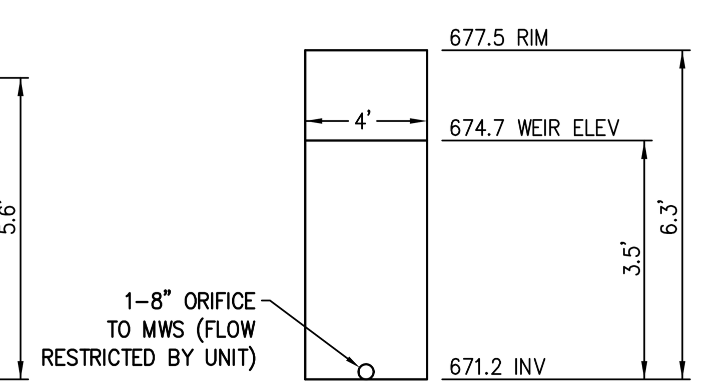

WEIR '2' DETAIL

N.T.S.

Basin B Stage-Storage Volume

Gravel/Media H	3.5
Pond H	2
Width	10.83
Length	435

Stage	Height	Porosity	Inc. Volume	Total Volume
671.80	0.00	40%	0	0
672.30	0.50	40%	942	942
672.80	1.00	40%	942	1884
673.30	1.50	40%	942	2827
673.80	2.00	40%	942	3769
674.30	2.50	40%	942	4711
674.80	3.00	40%	942	5653
675.30	3.50	100%	2356	8009
675.80	4.00	100%	2356	10364
676.30	4.50	100%	2356	12720
676.80	5.00	100%	2356	15075
677.30	5.50	100%	2356	17431

Peak Flow Post Detention Results:

Pr:	Node	10yr	100yr
A	102	3.86	6.36
B	202	3.24	3.92
Total:	203	7.10	10.28

GRAPHIC SCALE: 1"=30'

NOT FOR CONSTRUCTION

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Suite 210
Anaheim Hills, CA 92808
714-685-6860
DREW J. GATES
R.C.E. 94249
12/8/23
DATE

NO.:	REVISION:	DATE:

PROJECT: **REXFORD INDUSTRIAL 13925 BENSON AVENUE CHINO, CA**

DRAWING NAME: **PROPOSED HYDROLOGY MAP**

ISSUE:	HYDROLOGY
DATE:	12/8/23
CHECKED: DG	DRAWN: AS
DRAWING FILE:	23646prhm
PROJECT NO.:	23-646
SHEET NUMBER:	1
OF 1	SHEETS
SCALE:	AS SHOWN

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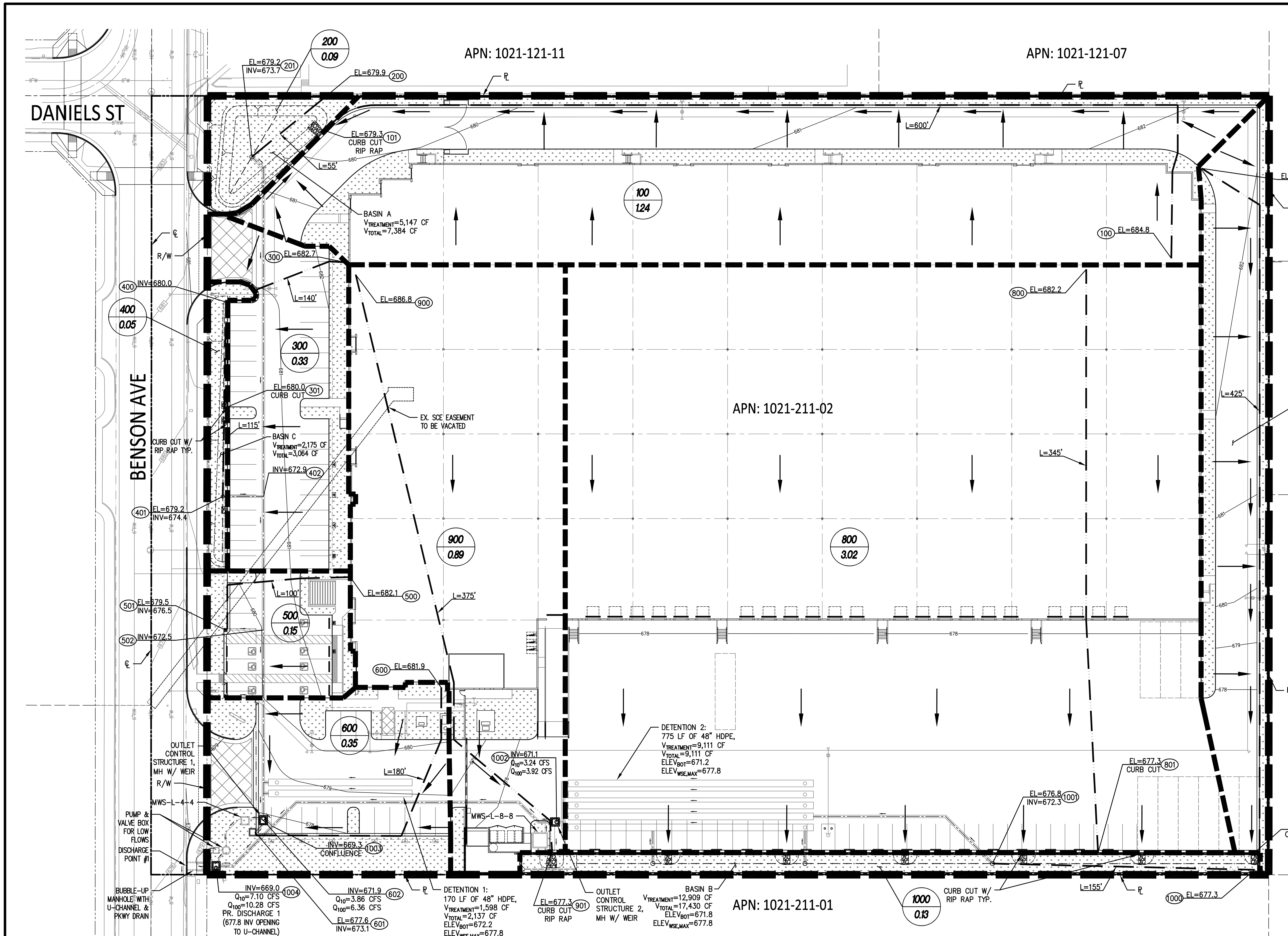
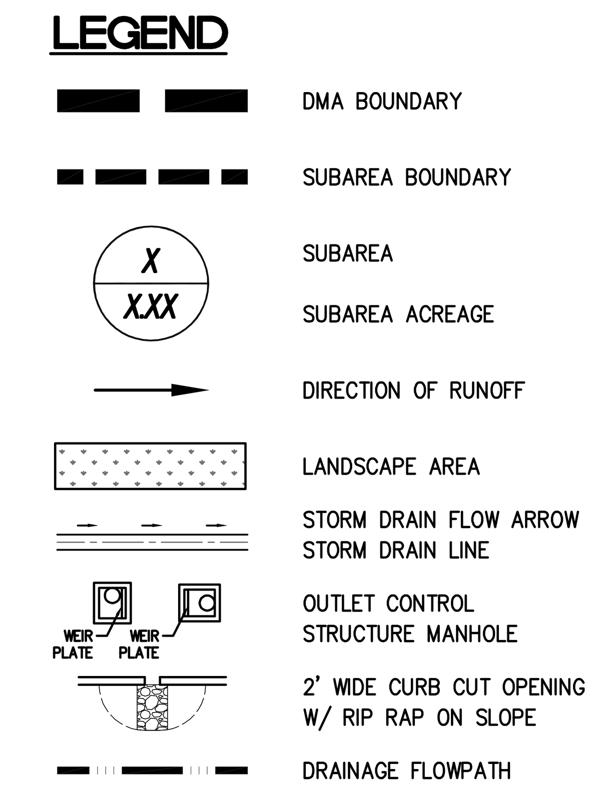
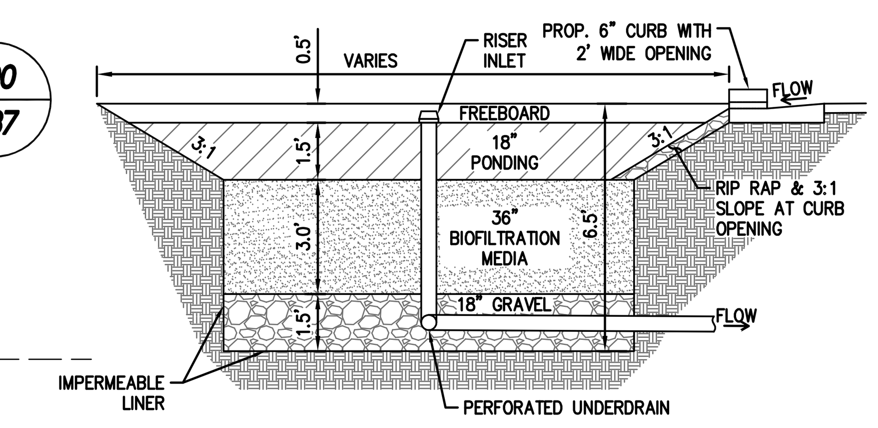




PROPOSED ZONING

M2 (INDUSTRIAL GENERAL)



'BASIN A' BIORETENTION DETAIL

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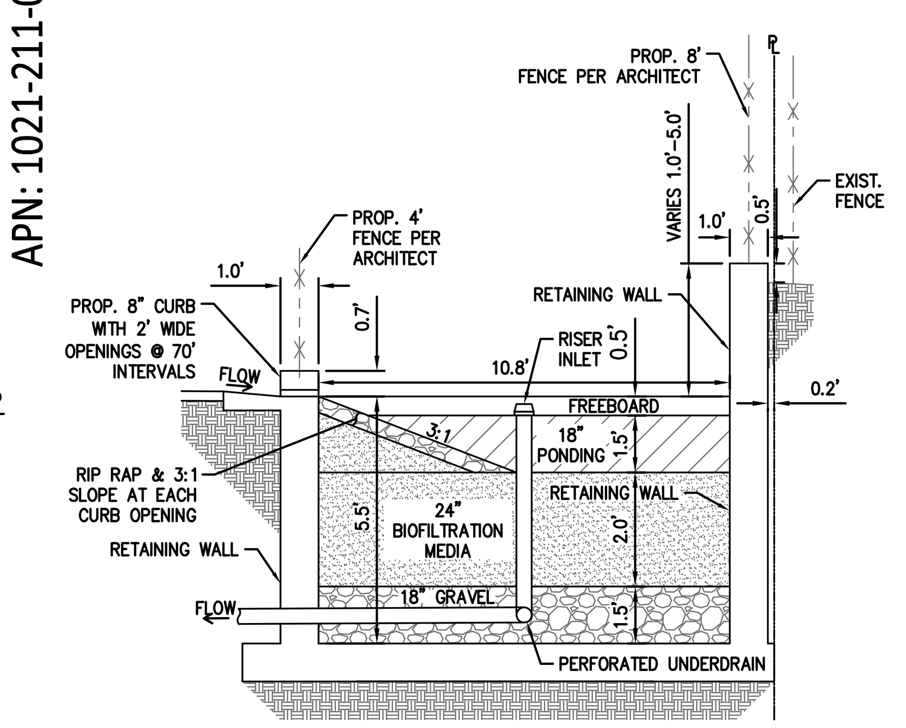

'BASIN B' PLANTER BOX DETAIL

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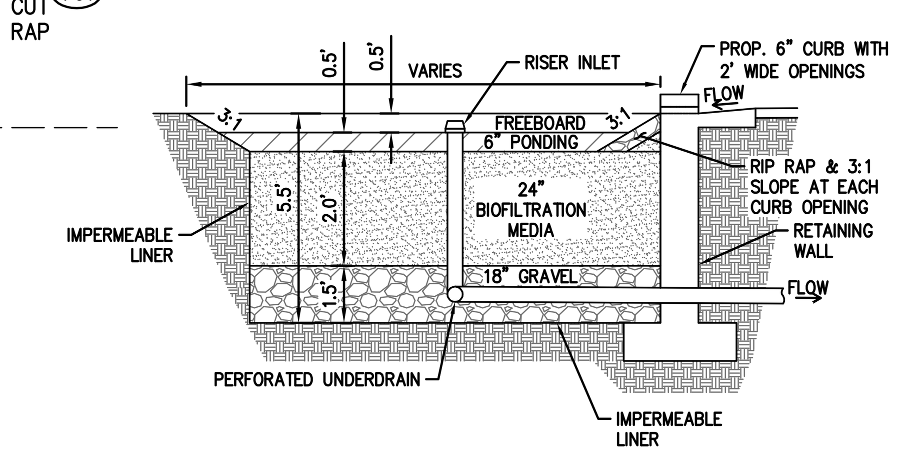

'BASIN C' BIORETENTION DETAIL

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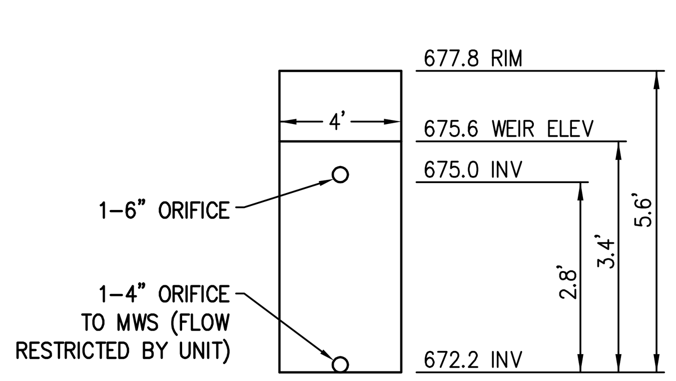

WEIR '1' DETAIL

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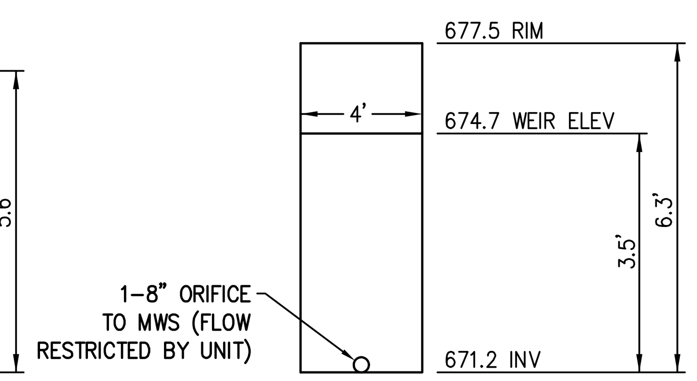

WEIR '2' DETAIL

N.T.S.

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Pond H	2
Width	10.83
Length	435

Stage	Height	Porosity	Inc. Volume	Total Volume
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672.80	1.00	40%	942	1884
673.30	1.50	40%	942	2827
673.80	2.00	40%	942	3769
674.30	2.50	40%	942	4711
674.80	3.00	40%	942	5653
675.30	3.50	100%	2356	8009
675.80	4.00	100%	2356	10364
676.30	4.50	100%	2356	12720
676.80	5.00	100%	2356	15075
677.30	5.50	100%	2356	17431

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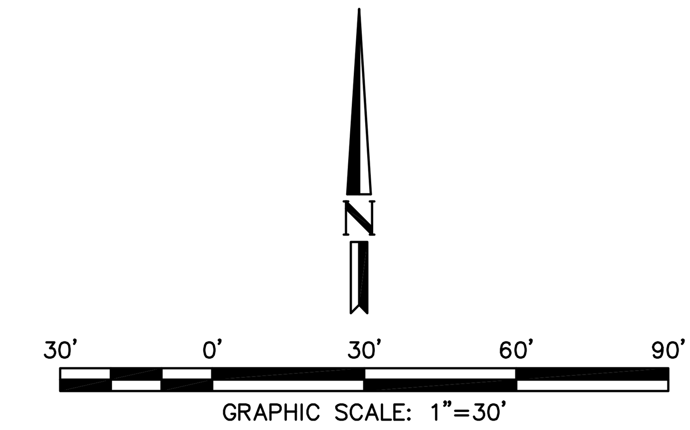
Pr:	Node	10yr	100yr
A	102	3.86	6.36
B	202	3.24	3.92
Total:	203	7.10	10.28



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PREPARED BY:
DRC Engineering, Inc.
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Anaheim Hills, CA 92808
714-685-6860
DREW J. GATES
R.C.E. 94249
12/8/23
DATE

NO.	REVISION:	DATE:

PROJECT: **REXFORD INDUSTRIAL 13925 BENSON AVENUE CHINO, CA**

DRAWING NAME: **PROPOSED SUBAREA MAP**

ISSUE:	HYDROLOGY
DATE:	12/8/23
CHECKED: DG	DRAWN: AS
DRAWING FILE:	23646prhm
PROJECT NO.:	23-646
SHEET NUMBER:	1
OF 1	SHEETS
SCALE:	AS SHOWN

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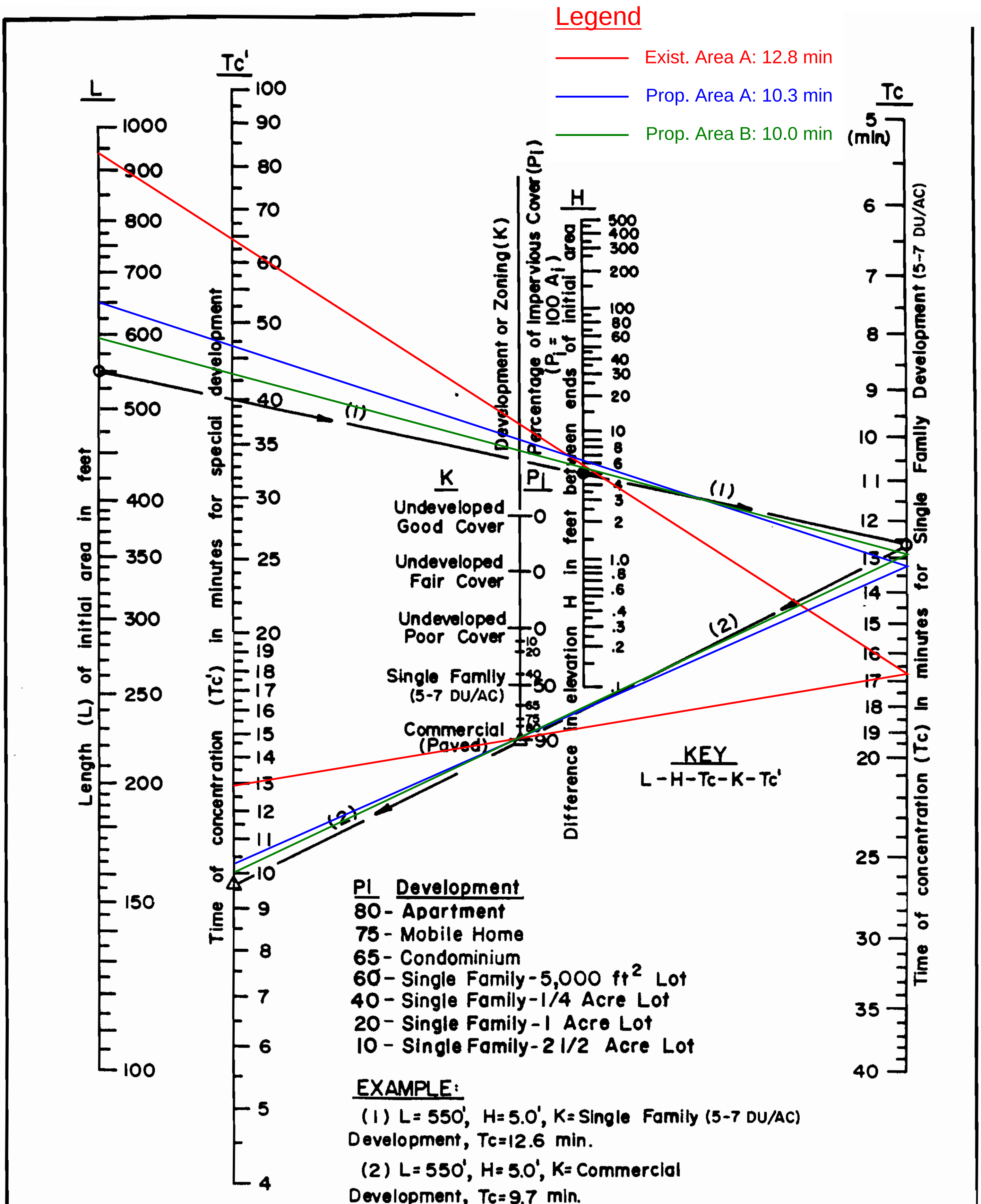
APPENDIX C
Hydrology ToC "Plate D.4" Determination
Existing Condition
Proposed Condition



SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

APPENDIX D
10-year & 100-year Small Area Unit Hydrographs
Existing Condition
Proposed Condition

```
****************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
```



```
                          Analysis prepared by:

                          DRC Engineering, Inc.
                  160 South Old Springs Road, Suite 210
                         Anaheim Hills, CA 92808
                               714-685-6860
```


```
****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  AREA A
  EXISTING CONDITION
  10 YEAR
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC II:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     4.12 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
        1          6.64        9.30            75.       0.470       0.895

    TOTAL AREA (Acres) =      6.64
                              _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.044
                                         _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.105
============================================================================
```

```
****************************************************************************
                      SMALL AREA UNIT HYDROGRAPH MODEL
============================================================================
         (C) Copyright 1989-2015 Advanced Engineering Software (aes)
             Ver. 22.0  Release Date: 07/01/2015  License ID 1510

                            Analysis prepared by:

                            DRC Engineering, Inc.
                   160 South Old Springs Road, Suite 210
                           Anaheim Hills, CA 92808
                                 714-685-6860

****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  AREA A
  EXISTING CONDITION
  10 YEAR
----------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    6.64
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.044
    LOW LOSS FRACTION = 0.105
    TIME OF CONCENTRATION(MIN.) = 12.80
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =  10
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.24
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.62
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.93
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.72
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  2.36
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  4.12

----------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     1.85
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.43

****************************************************************************
  TIME     VOLUME       Q    0.        5.0      10.0      15.0      20.0
 (HOURS)    (AF)      (CFS)
----------------------------------------------------------------------------
  0.21      0.0033      0.37  Q         .         .         .         .
  0.43      0.0098      0.37  Q         .         .         .         .
```

0.64	0.0164	0.38	Q	.	.	.	.
0.85	0.0230	0.38	Q	.	.	.	.
1.07	0.0298	0.38	Q	.	.	.	.
1.28	0.0365	0.39	Q	.	.	.	.
1.49	0.0433	0.39	Q	.	.	.	.
1.71	0.0502	0.39	Q	.	.	.	.
1.92	0.0572	0.39	Q	.	.	.	.
2.13	0.0642	0.40	Q	.	.	.	.
2.35	0.0712	0.40	Q	.	.	.	.
2.56	0.0784	0.41	Q	.	.	.	.
2.77	0.0856	0.41	Q	.	.	.	.
2.99	0.0928	0.41	Q	.	.	.	.
3.20	0.1002	0.42	Q	.	.	.	.
3.41	0.1076	0.42	Q	.	.	.	.
3.63	0.1151	0.43	Q	.	.	.	.
3.84	0.1226	0.43	Q	.	.	.	.
4.05	0.1303	0.43	Q	.	.	.	.
4.27	0.1380	0.44	Q	.	.	.	.
4.48	0.1458	0.44	Q	.	.	.	.
4.69	0.1537	0.45	Q	.	.	.	.
4.91	0.1617	0.45	Q	.	.	.	.
5.12	0.1697	0.46	Q	.	.	.	.
5.33	0.1779	0.46	Q	.	.	.	.
5.55	0.1861	0.47	Q	.	.	.	.
5.76	0.1945	0.48	Q	.	.	.	.
5.97	0.2030	0.48	Q	.	.	.	.
6.19	0.2115	0.49	Q	.	.	.	.
6.40	0.2202	0.50	Q	.	.	.	.
6.61	0.2290	0.50	.Q	.	.	.	.
6.83	0.2379	0.51	.Q	.	.	.	.
7.04	0.2470	0.51	.Q	.	.	.	.
7.25	0.2561	0.52	.Q	.	.	.	.
7.47	0.2654	0.53	.Q	.	.	.	.
7.68	0.2748	0.54	.Q	.	.	.	.
7.89	0.2844	0.55	.Q	.	.	.	.
8.11	0.2941	0.56	.Q	.	.	.	.
8.32	0.3040	0.56	.Q	.	.	.	.
8.53	0.3140	0.58	.Q	.	.	.	.
8.75	0.3242	0.58	.Q	.	.	.	.
8.96	0.3346	0.60	.Q	.	.	.	.
9.17	0.3452	0.60	.Q	.	.	.	.
9.39	0.3560	0.62	.Q	.	.	.	.
9.60	0.3669	0.63	.Q	.	.	.	.
9.81	0.3781	0.64	.Q	.	.	.	.
10.03	0.3895	0.65	.Q	.	.	.	.
10.24	0.4012	0.67	.Q	.	.	.	.
10.45	0.4131	0.68	.Q	.	.	.	.
10.67	0.4252	0.70	.Q	.	.	.	.
10.88	0.4377	0.71	.Q	.	.	.	.
11.09	0.4505	0.74	.Q	.	.	.	.

```
11.31      0.4635      0.75  .Q        .         .         .         .
11.52      0.4770      0.78  .Q        .         .         .         .
11.73      0.4908      0.79  .Q        .         .         .         .
11.95      0.5050      0.82  .Q        .         .         .         .
12.16      0.5198      0.85  .Q        .         .         .         .
12.37      0.5360      0.99  .Q        .         .         .         .
12.59      0.5537      1.01  . Q       .         .         .         .
12.80      0.5719      1.06  . Q       .         .         .         .
13.01      0.5908      1.08  . Q       .         .         .         .
13.23      0.6104      1.14  . Q       .         .         .         .
13.44      0.6308      1.17  . Q       .         .         .         .
13.65      0.6521      1.24  . Q       .         .         .         .
13.87      0.6744      1.28  . Q       .         .         .         .
14.08      0.6980      1.40  . Q       .         .         .         .
14.29      0.7257      1.75  .  Q      .         .         .         .
14.51      0.7577      1.88  .  Q      .         .         .         .
14.72      0.7914      1.95  .  Q      .         .         .         .
14.93      0.8275      2.14  .   Q     .         .         .         .
15.15      0.8664      2.27  .   Q     .         .         .         .
15.36      0.9096      2.64  .    Q    .         .         .         .
15.57      0.9594      3.00  .     Q   .         .         .         .
15.79      1.0197      3.83  .      Q  .         .         .         .
16.00      1.0944      4.64  .        Q.         .         .         .
16.21      1.2305     10.80  .         .         .Q        .         .
16.43      1.3558      3.41  .     Q   .         .         .         .
16.64      1.4074      2.43  .   Q     .         .         .         .
16.85      1.4468      2.04  .   Q     .         .         .         .
17.07      1.4807      1.81  .  Q      .         .         .         .
17.28      1.5084      1.33  . Q       .         .         .         .
17.49      1.5307      1.21  . Q       .         .         .         .
17.71      1.5511      1.11  . Q       .         .         .         .
17.92      1.5700      1.03  . Q       .         .         .         .
18.13      1.5877      0.97  .Q        .         .         .         .
18.35      1.6034      0.81  .Q        .         .         .         .
18.56      1.6172      0.76  .Q        .         .         .         .
18.77      1.6303      0.72  .Q        .         .         .         .
18.99      1.6428      0.69  .Q        .         .         .         .
19.20      1.6547      0.66  .Q        .         .         .         .
19.41      1.6661      0.63  .Q        .         .         .         .
19.63      1.6771      0.61  .Q        .         .         .         .
19.84      1.6876      0.59  .Q        .         .         .         .
20.05      1.6978      0.57  .Q        .         .         .         .
20.27      1.7077      0.55  .Q        .         .         .         .
20.48      1.7173      0.53  .Q        .         .         .         .
20.69      1.7266      0.52  .Q        .         .         .         .
20.91      1.7356      0.51  .Q        .         .         .         .
21.12      1.7444      0.49  Q         .         .         .         .
21.33      1.7530      0.48  Q         .         .         .         .
21.55      1.7614      0.47  Q         .         .         .         .
21.76      1.7695      0.46  Q         .         .         .         .
```

```
 21.97      1.7775      0.45  Q         .         .         .         .
 22.19      1.7853      0.44  Q         .         .         .         .
 22.40      1.7929      0.43  Q         .         .         .         .
 22.61      1.8004      0.42  Q         .         .         .         .
 22.83      1.8078      0.41  Q         .         .         .         .
 23.04      1.8150      0.40  Q         .         .         .         .
 23.25      1.8220      0.40  Q         .         .         .         .
 23.47      1.8290      0.39  Q         .         .         .         .
 23.68      1.8358      0.38  Q         .         .         .         .
 23.89      1.8425      0.38  Q         .         .         .         .
 24.11      1.8491      0.37  Q         .         .         .         .
 24.32      1.8524      0.00  Q         .         .         .         .
----------------------------------------------------------------------------
--------------------------------------------------------------------------------
   TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
   (Note: 100% of Peak Flow Rate estimate assumed to have
   an instantaneous time duration)

   Percentile of Estimated                Duration
       Peak Flow Rate                     (minutes)
   =======================                =========
             0%                             1446.4
            10%                              294.4
            20%                              102.4
            30%                               51.2
            40%                               25.6
            50%                               12.8
            60%                               12.8
            70%                               12.8
            80%                               12.8
            90%                               12.8
```

```
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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                           Analysis prepared by:

                           DRC Engineering, Inc.
                   160 South Old Springs Road, Suite 210
                          Anaheim Hills, CA 92808
                                714-685-6860

****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  AREA A
  EXISTING CONDITION
  100 YEAR
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC III:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     6.39 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
        1          6.64        9.30       75.(AMC II)     0.210       0.951

    TOTAL AREA (Acres) =      6.64
                                _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.020
                                          _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.049
============================================================================
```

```
****************************************************************************
                       SMALL AREA UNIT HYDROGRAPH MODEL
============================================================================
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                            Analysis prepared by:

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                           Anaheim Hills, CA 92808
                                 714-685-6860

****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  AREA A
  EXISTING CONDITION
  100 YEAR
----------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    6.64
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.020
    LOW LOSS FRACTION = 0.049
    TIME OF CONCENTRATION(MIN.) = 12.80
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) = 100
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.38
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.99
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.48
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  2.57
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  3.48
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  6.39

----------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     3.04
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.50

****************************************************************************
  TIME     VOLUME       Q    0.        5.0      10.0      15.0      20.0
 (HOURS)    (AF)      (CFS)
----------------------------------------------------------------------------
  0.21      0.0059      0.66  .Q        .         .         .         .
  0.43      0.0176      0.67  .Q        .         .         .         .
```

0.64	0.0295	0.67	.Q	.	.	.	.
0.85	0.0414	0.68	.Q	.	.	.	.
1.07	0.0534	0.68	.Q	.	.	.	.
1.28	0.0655	0.69	.Q	.	.	.	.
1.49	0.0778	0.70	.Q	.	.	.	.
1.71	0.0901	0.70	.Q	.	.	.	.
1.92	0.1025	0.71	.Q	.	.	.	.
2.13	0.1151	0.71	.Q	.	.	.	.
2.35	0.1277	0.72	.Q	.	.	.	.
2.56	0.1404	0.73	.Q	.	.	.	.
2.77	0.1533	0.73	.Q	.	.	.	.
2.99	0.1663	0.74	.Q	.	.	.	.
3.20	0.1794	0.74	.Q	.	.	.	.
3.41	0.1926	0.75	.Q	.	.	.	.
3.63	0.2059	0.76	.Q	.	.	.	.
3.84	0.2194	0.77	.Q	.	.	.	.
4.05	0.2330	0.77	.Q	.	.	.	.
4.27	0.2467	0.78	.Q	.	.	.	.
4.48	0.2606	0.79	.Q	.	.	.	.
4.69	0.2746	0.80	.Q	.	.	.	.
4.91	0.2888	0.81	.Q	.	.	.	.
5.12	0.3031	0.82	.Q	.	.	.	.
5.33	0.3176	0.82	.Q	.	.	.	.
5.55	0.3322	0.84	.Q	.	.	.	.
5.76	0.3470	0.84	.Q	.	.	.	.
5.97	0.3620	0.86	.Q	.	.	.	.
6.19	0.3771	0.86	.Q	.	.	.	.
6.40	0.3924	0.88	.Q	.	.	.	.
6.61	0.4079	0.88	.Q	.	.	.	.
6.83	0.4237	0.90	.Q	.	.	.	.
7.04	0.4396	0.91	.Q	.	.	.	.
7.25	0.4557	0.92	.Q	.	.	.	.
7.47	0.4720	0.93	.Q	.	.	.	.
7.68	0.4886	0.95	.Q	.	.	.	.
7.89	0.5054	0.96	.Q	.	.	.	.
8.11	0.5225	0.98	.Q	.	.	.	.
8.32	0.5398	0.99	.Q	.	.	.	.
8.53	0.5574	1.01	. Q	.	.	.	.
8.75	0.5752	1.02	. Q	.	.	.	.
8.96	0.5933	1.04	. Q	.	.	.	.
9.17	0.6118	1.05	. Q	.	.	.	.
9.39	0.6305	1.08	. Q	.	.	.	.
9.60	0.6496	1.09	. Q	.	.	.	.
9.81	0.6691	1.12	. Q	.	.	.	.
10.03	0.6889	1.13	. Q	.	.	.	.
10.24	0.7091	1.16	. Q	.	.	.	.
10.45	0.7297	1.18	. Q	.	.	.	.
10.67	0.7508	1.21	. Q	.	.	.	.
10.88	0.7723	1.23	. Q	.	.	.	.
11.09	0.7943	1.27	. Q	.	.	.	.

```
11.31      0.8169       1.29  . Q       .         .         .         .
11.52      0.8400       1.33  . Q       .         .         .         .
11.73      0.8637       1.36  . Q       .         .         .         .
11.95      0.8880       1.41  . Q       .         .         .         .
12.16      0.9130       1.43  . Q       .         .         .         .
12.37      0.9388       1.49  . Q       .         .         .         .
12.59      0.9654       1.52  .  Q      .         .         .         .
12.80      0.9929       1.59  .  Q      .         .         .         .
13.01      1.0214       1.63  .  Q      .         .         .         .
13.23      1.0510       1.72  .  Q      .         .         .         .
13.44      1.0818       1.77  .  Q      .         .         .         .
13.65      1.1140       1.88  .  Q      .         .         .         .
13.87      1.1477       1.95  .  Q      .         .         .         .
14.08      1.1835       2.11  .   Q     .         .         .         .
14.29      1.2242       2.51  .    Q    .         .         .         .
14.51      1.2703       2.72  .    Q    .         .         .         .
14.72      1.3195       2.86  .    Q    .         .         .         .
14.93      1.3727       3.19  .     Q   .         .         .         .
15.15      1.4308       3.40  .     Q   .         .         .         .
15.36      1.4959       3.99  .      Q  .         .         .         .
15.57      1.5742       4.89  .        Q.         .         .         .
15.79      1.6737       6.40  .         . Q       .         .         .
16.00      1.7987       7.77  .         .    Q    .         .         .
16.21      2.0212      17.47  .         .         .         .   Q     .
16.43      2.2254       5.69  .         .Q        .         .         .
16.64      2.3078       3.66  .      Q  .         .         .         .
16.85      2.3666       3.01  .     Q   .         .         .         .
17.07      2.4161       2.61  .    Q    .         .         .         .
17.28      2.4568       2.02  .   Q     .         .         .         .
17.49      2.4907       1.82  .  Q      .         .         .         .
17.71      2.5216       1.68  .  Q      .         .         .         .
17.92      2.5501       1.56  .  Q      .         .         .         .
18.13      2.5767       1.46  . Q       .         .         .         .
18.35      2.6017       1.38  . Q       .         .         .         .
18.56      2.6255       1.31  . Q       .         .         .         .
18.77      2.6480       1.25  . Q       .         .         .         .
18.99      2.6695       1.19  . Q       .         .         .         .
19.20      2.6902       1.15  . Q       .         .         .         .
19.41      2.7100       1.10  . Q       .         .         .         .
19.63      2.7291       1.06  . Q       .         .         .         .
19.84      2.7475       1.03  . Q       .         .         .         .
20.05      2.7654       1.00  .Q        .         .         .         .
20.27      2.7827       0.97  .Q        .         .         .         .
20.48      2.7995       0.94  .Q        .         .         .         .
20.69      2.8159       0.91  .Q        .         .         .         .
20.91      2.8318       0.89  .Q        .         .         .         .
21.12      2.8473       0.87  .Q        .         .         .         .
21.33      2.8624       0.85  .Q        .         .         .         .
21.55      2.8772       0.83  .Q        .         .         .         .
21.76      2.8917       0.81  .Q        .         .         .         .
```

```
  21.97      2.9059      0.79  .Q         .         .         .         .
  22.19      2.9198      0.78  .Q         .         .         .         .
  22.40      2.9334      0.76  .Q         .         .         .         .
  22.61      2.9467      0.75  .Q         .         .         .         .
  22.83      2.9598      0.74  .Q         .         .         .         .
  23.04      2.9727      0.72  .Q         .         .         .         .
  23.25      2.9853      0.71  .Q         .         .         .         .
  23.47      2.9977      0.70  .Q         .         .         .         .
  23.68      3.0099      0.69  .Q         .         .         .         .
  23.89      3.0220      0.68  .Q         .         .         .         .
  24.11      3.0338      0.67  .Q         .         .         .         .
  24.32      3.0397      0.00  Q          .         .         .         .
 ----------------------------------------------------------------------------
-------------------------------------------------------------------------------
   TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
   (Note: 100% of Peak Flow Rate estimate assumed to have
   an instantaneous time duration)

   Percentile of Estimated                Duration
       Peak Flow Rate                     (minutes)
   =======================                =========
              0%                           1446.4
             10%                            256.0
             20%                             89.6
             30%                             51.2
             40%                             25.6
             50%                             12.8
             60%                             12.8
             70%                             12.8
             80%                             12.8
             90%                             12.8
```

```
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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                           Analysis prepared by:

                           DRC Engineering, Inc.
                   160 South Old Springs Road, Suite 210
                          Anaheim Hills, CA 92808
                                714-685-6860

****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  AREA A
  PROPOSED CONDITION
  10 YEAR
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC II:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     4.12 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1          2.22       22.80           75.       0.470      0.825

    TOTAL AREA (Acres) =      2.22
                                   _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.107
                                            _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.175
============================================================================
```

```
*************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL
=========================================================================
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                         Analysis prepared by:

                         DRC Engineering, Inc.
                160 South Old Springs Road, Suite 210
                        Anaheim Hills, CA 92808
                              714-685-6860

*************************************************************************
-------------------------------------------------------------------------

 Problem Descriptions:
  AREA A
  PROPOSED CONDITION
  10 YEAR
-------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    2.22
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.107
    LOW LOSS FRACTION = 0.175
    TIME OF CONCENTRATION(MIN.) = 10.30
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =  10
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.24
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.62
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.93
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.72
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  2.36
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  4.12

-------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.57
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.19

*************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
-------------------------------------------------------------------------
  0.03      0.0000      0.00  Q         .         .         .         .
  0.21      0.0008      0.11  Q         .         .         .         .
```

0.38	0.0024	0.11	Q	.	.	.	.
0.55	0.0041	0.12	Q	.	.	.	.
0.72	0.0057	0.12	Q	.	.	.	.
0.89	0.0074	0.12	Q	.	.	.	.
1.06	0.0090	0.12	Q	.	.	.	.
1.24	0.0107	0.12	Q	.	.	.	.
1.41	0.0124	0.12	Q	.	.	.	.
1.58	0.0141	0.12	Q	.	.	.	.
1.75	0.0158	0.12	Q	.	.	.	.
1.92	0.0175	0.12	Q	.	.	.	.
2.09	0.0193	0.12	Q	.	.	.	.
2.27	0.0210	0.12	Q	.	.	.	.
2.44	0.0228	0.12	Q	.	.	.	.
2.61	0.0246	0.13	Q	.	.	.	.
2.78	0.0264	0.13	Q	.	.	.	.
2.95	0.0282	0.13	Q	.	.	.	.
3.12	0.0300	0.13	Q	.	.	.	.
3.30	0.0318	0.13	Q	.	.	.	.
3.47	0.0337	0.13	Q	.	.	.	.
3.64	0.0355	0.13	Q	.	.	.	.
3.81	0.0374	0.13	Q	.	.	.	.
3.98	0.0393	0.13	Q	.	.	.	.
4.15	0.0412	0.14	Q	.	.	.	.
4.33	0.0431	0.14	Q	.	.	.	.
4.50	0.0451	0.14	Q	.	.	.	.
4.67	0.0470	0.14	Q	.	.	.	.
4.84	0.0490	0.14	Q	.	.	.	.
5.01	0.0510	0.14	Q	.	.	.	.
5.18	0.0530	0.14	Q	.	.	.	.
5.36	0.0551	0.14	Q	.	.	.	.
5.53	0.0571	0.15	Q	.	.	.	.
5.70	0.0592	0.15	Q	.	.	.	.
5.87	0.0613	0.15	Q	.	.	.	.
6.04	0.0634	0.15	Q	.	.	.	.
6.21	0.0655	0.15	Q	.	.	.	.
6.39	0.0677	0.15	Q	.	.	.	.
6.56	0.0699	0.15	Q	.	.	.	.
6.73	0.0721	0.16	Q	.	.	.	.
6.90	0.0743	0.16	Q	.	.	.	.
7.07	0.0765	0.16	Q	.	.	.	.
7.24	0.0788	0.16	Q	.	.	.	.
7.42	0.0811	0.16	Q	.	.	.	.
7.59	0.0835	0.17	Q	.	.	.	.
7.76	0.0858	0.17	Q	.	.	.	.
7.93	0.0882	0.17	Q	.	.	.	.
8.10	0.0906	0.17	Q	.	.	.	.
8.27	0.0931	0.17	Q	.	.	.	.
8.45	0.0956	0.18	Q	.	.	.	.
8.62	0.0981	0.18	Q	.	.	.	.
8.79	0.1006	0.18	Q	.	.	.	.

```
 8.96      0.1032      0.18  Q         .         .         .         .
 9.13      0.1058      0.19  Q         .         .         .         .
 9.30      0.1085      0.19  Q         .         .         .         .
 9.48      0.1112      0.19  Q         .         .         .         .
 9.65      0.1140      0.20  Q         .         .         .         .
 9.82      0.1167      0.20  Q         .         .         .         .
 9.99      0.1196      0.20  Q         .         .         .         .
10.16      0.1225      0.20  Q         .         .         .         .
10.34      0.1254      0.21  Q         .         .         .         .
10.51      0.1284      0.21  Q         .         .         .         .
10.68      0.1314      0.22  Q         .         .         .         .
10.85      0.1345      0.22  Q         .         .         .         .
11.02      0.1377      0.23  Q         .         .         .         .
11.19      0.1409      0.23  Q         .         .         .         .
11.37      0.1442      0.24  Q         .         .         .         .
11.54      0.1475      0.24  Q         .         .         .         .
11.71      0.1510      0.25  Q         .         .         .         .
11.88      0.1545      0.25  Q         .         .         .         .
12.05      0.1581      0.26  .Q        .         .         .         .
12.22      0.1620      0.30  .Q        .         .         .         .
12.40      0.1663      0.31  .Q        .         .         .         .
12.57      0.1707      0.31  .Q        .         .         .         .
12.74      0.1753      0.32  .Q        .         .         .         .
12.91      0.1799      0.33  .Q        .         .         .         .
13.08      0.1847      0.34  .Q        .         .         .         .
13.25      0.1896      0.35  .Q        .         .         .         .
13.43      0.1947      0.37  .Q        .         .         .         .
13.60      0.2000      0.38  .Q        .         .         .         .
13.77      0.2055      0.40  .Q        .         .         .         .
13.94      0.2111      0.41  .Q        .         .         .         .
14.11      0.2174      0.48  .Q        .         .         .         .
14.28      0.2246      0.54  . Q       .         .         .         .
14.45      0.2326      0.57  . Q       .         .         .         .
14.63      0.2409      0.59  . Q       .         .         .         .
14.80      0.2496      0.64  . Q       .         .         .         .
14.97      0.2588      0.66  . Q       .         .         .         .
15.14      0.2686      0.73  . Q       .         .         .         .
15.31      0.2792      0.77  .  Q      .         .         .         .
15.48      0.2912      0.91  .  Q      .         .         .         .
15.66      0.3047      1.00  .  Q      .         .         .         .
15.83      0.3204      1.21  .   Q     .         .         .         .
16.00      0.3404      1.60  .     Q   .         .         .         .
16.17      0.3793      3.88  .         .    Q    .         .         .
16.34      0.4149      1.13  .   Q     .         .         .         .
16.52      0.4287      0.82  .  Q      .         .         .         .
16.69      0.4394      0.69  . Q       .         .         .         .
16.86      0.4487      0.61  . Q       .         .         .         .
17.03      0.4570      0.56  . Q       .         .         .         .
17.20      0.4639      0.42  .Q        .         .         .         .
17.37      0.4696      0.39  .Q        .         .         .         .
```

```
 17.55      0.4749      0.36  .Q        .         .         .         .
 17.72      0.4798      0.34  .Q        .         .         .         .
 17.89      0.4845      0.32  .Q        .         .         .         .
 18.06      0.4889      0.30  .Q        .         .         .         .
 18.23      0.4929      0.25  .Q        .         .         .         .
 18.40      0.4964      0.24  Q         .         .         .         .
 18.58      0.4997      0.23  Q         .         .         .         .
 18.75      0.5030      0.22  Q         .         .         .         .
 18.92      0.5061      0.21  Q         .         .         .         .
 19.09      0.5090      0.21  Q         .         .         .         .
 19.26      0.5119      0.20  Q         .         .         .         .
 19.43      0.5147      0.19  Q         .         .         .         .
 19.61      0.5174      0.19  Q         .         .         .         .
 19.78      0.5200      0.18  Q         .         .         .         .
 19.95      0.5226      0.18  Q         .         .         .         .
 20.12      0.5251      0.17  Q         .         .         .         .
 20.29      0.5275      0.17  Q         .         .         .         .
 20.46      0.5299      0.16  Q         .         .         .         .
 20.64      0.5322      0.16  Q         .         .         .         .
 20.81      0.5344      0.16  Q         .         .         .         .
 20.98      0.5366      0.15  Q         .         .         .         .
 21.15      0.5388      0.15  Q         .         .         .         .
 21.32      0.5409      0.15  Q         .         .         .         .
 21.49      0.5430      0.14  Q         .         .         .         .
 21.67      0.5450      0.14  Q         .         .         .         .
 21.84      0.5470      0.14  Q         .         .         .         .
 22.01      0.5490      0.14  Q         .         .         .         .
 22.18      0.5509      0.13  Q         .         .         .         .
 22.35      0.5528      0.13  Q         .         .         .         .
 22.52      0.5546      0.13  Q         .         .         .         .
 22.69      0.5565      0.13  Q         .         .         .         .
 22.87      0.5583      0.13  Q         .         .         .         .
 23.04      0.5601      0.12  Q         .         .         .         .
 23.21      0.5618      0.12  Q         .         .         .         .
 23.38      0.5635      0.12  Q         .         .         .         .
 23.55      0.5652      0.12  Q         .         .         .         .
 23.73      0.5669      0.12  Q         .         .         .         .
 23.90      0.5686      0.12  Q         .         .         .         .
 24.07      0.5702      0.11  Q         .         .         .         .
 24.24      0.5710      0.00  Q         .         .         .         .
----------------------------------------------------------------------------
-------------------------------------------------------------------------------
   TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
   (Note: 100% of Peak Flow Rate estimate assumed to have
   an instantaneous time duration)

   Percentile of Estimated                 Duration
       Peak Flow Rate                      (minutes)
   =======================                 =========
              0%                            1442.0
```

10%	216.3
20%	72.1
30%	30.9
40%	20.6
50%	10.3
60%	10.3
70%	10.3
80%	10.3
90%	10.3

```
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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                          Analysis prepared by:

                          DRC Engineering, Inc.
                  160 South Old Springs Road, Suite 210
                         Anaheim Hills, CA 92808
                               714-685-6860

****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  AREA B
  PROPOSED CONDITION
  10 YEAR
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC II:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     4.12 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
        1          4.42        5.30            75.       0.470       0.916

    TOTAL AREA (Acres) =      4.42

    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.025

    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.084
============================================================================
```

```
*************************************************************************
                     SMALL AREA UNIT HYDROGRAPH MODEL
=========================================================================
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             Ver. 22.0  Release Date: 07/01/2015  License ID 1510

                          Analysis prepared by:

                          DRC Engineering, Inc.
                    160 South Old Springs Road, Suite 210
                         Anaheim Hills, CA 92808
                               714-685-6860

*************************************************************************
-------------------------------------------------------------------------

 Problem Descriptions:
  AREA B
  PROPOSED CONDITION
  10 YEAR
-------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    4.42
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.025
    LOW LOSS FRACTION = 0.084
    TIME OF CONCENTRATION(MIN.) = 10.00
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =  10
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.24
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.62
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.93
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.72
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  2.36
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  4.12

-------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     1.26
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.25

*************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
-------------------------------------------------------------------------
  0.17      0.0017      0.25   .Q        .         .         .         .
  0.33      0.0052      0.25   .Q        .         .         .         .
```

0.50	0.0087	0.26	.Q	.	.	.	.
0.67	0.0122	0.26	.Q	.	.	.	.
0.83	0.0158	0.26	.Q	.	.	.	.
1.00	0.0193	0.26	.Q	.	.	.	.
1.17	0.0229	0.26	.Q	.	.	.	.
1.33	0.0266	0.26	.Q	.	.	.	.
1.50	0.0302	0.27	.Q	.	.	.	.
1.67	0.0339	0.27	.Q	.	.	.	.
1.83	0.0375	0.27	.Q	.	.	.	.
2.00	0.0413	0.27	.Q	.	.	.	.
2.17	0.0450	0.27	.Q	.	.	.	.
2.33	0.0488	0.27	.Q	.	.	.	.
2.50	0.0526	0.28	.Q	.	.	.	.
2.67	0.0564	0.28	.Q	.	.	.	.
2.83	0.0602	0.28	.Q	.	.	.	.
3.00	0.0641	0.28	.Q	.	.	.	.
3.17	0.0680	0.29	.Q	.	.	.	.
3.33	0.0720	0.29	.Q	.	.	.	.
3.50	0.0760	0.29	.Q	.	.	.	.
3.67	0.0800	0.29	.Q	.	.	.	.
3.83	0.0840	0.29	.Q	.	.	.	.
4.00	0.0881	0.30	.Q	.	.	.	.
4.17	0.0922	0.30	.Q	.	.	.	.
4.33	0.0963	0.30	.Q	.	.	.	.
4.50	0.1005	0.30	.Q	.	.	.	.
4.67	0.1047	0.31	.Q	.	.	.	.
4.83	0.1089	0.31	.Q	.	.	.	.
5.00	0.1132	0.31	.Q	.	.	.	.
5.17	0.1175	0.32	.Q	.	.	.	.
5.33	0.1219	0.32	.Q	.	.	.	.
5.50	0.1263	0.32	.Q	.	.	.	.
5.67	0.1307	0.32	.Q	.	.	.	.
5.83	0.1352	0.33	.Q	.	.	.	.
6.00	0.1397	0.33	.Q	.	.	.	.
6.17	0.1443	0.33	.Q	.	.	.	.
6.33	0.1489	0.34	.Q	.	.	.	.
6.50	0.1536	0.34	.Q	.	.	.	.
6.67	0.1583	0.34	.Q	.	.	.	.
6.83	0.1631	0.35	.Q	.	.	.	.
7.00	0.1679	0.35	.Q	.	.	.	.
7.17	0.1728	0.36	.Q	.	.	.	.
7.33	0.1777	0.36	.Q	.	.	.	.
7.50	0.1827	0.36	.Q	.	.	.	.
7.67	0.1877	0.37	.Q	.	.	.	.
7.83	0.1928	0.37	.Q	.	.	.	.
8.00	0.1979	0.38	.Q	.	.	.	.
8.17	0.2032	0.38	.Q	.	.	.	.
8.33	0.2084	0.39	.Q	.	.	.	.
8.50	0.2138	0.39	.Q	.	.	.	.
8.67	0.2192	0.40	.Q	.	.	.	.

```
 8.83      0.2247      0.40  .Q        .         .         .         .
 9.00      0.2303      0.41  .Q        .         .         .         .
 9.17      0.2359      0.41  .Q        .         .         .         .
 9.33      0.2417      0.42  .Q        .         .         .         .
 9.50      0.2475      0.43  .Q        .         .         .         .
 9.67      0.2534      0.43  .Q        .         .         .         .
 9.83      0.2594      0.44  .Q        .         .         .         .
10.00      0.2655      0.44  .Q        .         .         .         .
10.17      0.2717      0.45  .Q        .         .         .         .
10.33      0.2780      0.46  .Q        .         .         .         .
10.50      0.2844      0.47  .Q        .         .         .         .
10.67      0.2909      0.48  .Q        .         .         .         .
10.83      0.2976      0.49  .Q        .         .         .         .
11.00      0.3043      0.49  .Q        .         .         .         .
11.17      0.3112      0.51  . Q       .         .         .         .
11.33      0.3183      0.51  . Q       .         .         .         .
11.50      0.3254      0.53  . Q       .         .         .         .
11.67      0.3328      0.54  . Q       .         .         .         .
11.83      0.3403      0.55  . Q       .         .         .         .
12.00      0.3480      0.56  . Q       .         .         .         .
12.17      0.3564      0.66  . Q       .         .         .         .
12.33      0.3655      0.67  . Q       .         .         .         .
12.50      0.3749      0.69  . Q       .         .         .         .
12.67      0.3845      0.70  . Q       .         .         .         .
12.83      0.3944      0.73  . Q       .         .         .         .
13.00      0.4045      0.74  . Q       .         .         .         .
13.17      0.4150      0.77  .  Q      .         .         .         .
13.33      0.4257      0.79  .  Q      .         .         .         .
13.50      0.4368      0.82  .  Q      .         .         .         .
13.67      0.4483      0.84  .  Q      .         .         .         .
13.83      0.4603      0.89  .  Q      .         .         .         .
14.00      0.4727      0.91  .  Q      .         .         .         .
14.17      0.4872      1.19  .   Q     .         .         .         .
14.33      0.5038      1.23  .   Q     .         .         .         .
14.50      0.5213      1.30  .    Q    .         .         .         .
14.67      0.5395      1.35  .    Q    .         .         .         .
14.83      0.5589      1.46  .    Q    .         .         .         .
15.00      0.5794      1.52  .     Q   .         .         .         .
15.17      0.6014      1.68  .     Q   .         .         .         .
15.33      0.6252      1.78  .      Q  .         .         .         .
15.50      0.6522      2.15  .       Q .         .         .         .
15.67      0.6831      2.34  .        Q.         .         .         .
15.83      0.7183      2.76  .         .Q        .         .         .
16.00      0.7618      3.57  .         .   Q     .         .         .
16.17      0.8427      8.17  .         .         .         . Q       .
16.33      0.9170      2.61  .         Q         .         .         .
16.50      0.9480      1.90  .      Q  .         .         .         .
16.67      0.9721      1.59  .     Q   .         .         .         .
16.83      0.9927      1.40  .    Q    .         .         .         .
17.00      1.0111      1.26  .    Q    .         .         .         .
```

```
 17.17      1.0262      0.94  .   Q      .         .         .         .
 17.33      1.0387      0.87  .   Q      .         .         .         .
 17.50      1.0502      0.81  .   Q      .         .         .         .
 17.67      1.0609      0.76  .   Q      .         .         .         .
 17.83      1.0711      0.72  . Q        .         .         .         .
 18.00      1.0807      0.68  . Q        .         .         .         .
 18.17      1.0893      0.57  . Q        .         .         .         .
 18.33      1.0970      0.54  . Q        .         .         .         .
 18.50      1.1044      0.52  . Q        .         .         .         .
 18.67      1.1114      0.50  . Q        .         .         .         .
 18.83      1.1182      0.48  .Q         .         .         .         .
 19.00      1.1247      0.47  .Q         .         .         .         .
 19.17      1.1310      0.45  .Q         .         .         .         .
 19.33      1.1371      0.44  .Q         .         .         .         .
 19.50      1.1430      0.42  .Q         .         .         .         .
 19.67      1.1487      0.41  .Q         .         .         .         .
 19.83      1.1543      0.40  .Q         .         .         .         .
 20.00      1.1597      0.39  .Q         .         .         .         .
 20.17      1.1650      0.38  .Q         .         .         .         .
 20.33      1.1702      0.37  .Q         .         .         .         .
 20.50      1.1752      0.36  .Q         .         .         .         .
 20.67      1.1801      0.35  .Q         .         .         .         .
 20.83      1.1849      0.35  .Q         .         .         .         .
 21.00      1.1897      0.34  .Q         .         .         .         .
 21.17      1.1943      0.33  .Q         .         .         .         .
 21.33      1.1988      0.33  .Q         .         .         .         .
 21.50      1.2032      0.32  .Q         .         .         .         .
 21.67      1.2076      0.31  .Q         .         .         .         .
 21.83      1.2119      0.31  .Q         .         .         .         .
 22.00      1.2161      0.30  .Q         .         .         .         .
 22.17      1.2202      0.30  .Q         .         .         .         .
 22.33      1.2243      0.29  .Q         .         .         .         .
 22.50      1.2283      0.29  .Q         .         .         .         .
 22.67      1.2322      0.28  .Q         .         .         .         .
 22.83      1.2361      0.28  .Q         .         .         .         .
 23.00      1.2400      0.28  .Q         .         .         .         .
 23.17      1.2437      0.27  .Q         .         .         .         .
 23.33      1.2474      0.27  .Q         .         .         .         .
 23.50      1.2511      0.26  .Q         .         .         .         .
 23.67      1.2547      0.26  .Q         .         .         .         .
 23.83      1.2583      0.26  .Q         .         .         .         .
 24.00      1.2618      0.25  .Q         .         .         .         .
 24.17      1.2636      0.00  Q          .         .         .         .
-----------------------------------------------------------------------------
-------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                 Duration
```

Peak Flow Rate	(minutes)
0%	1440.0
10%	240.0
20%	90.0
30%	40.0
40%	20.0
50%	10.0
60%	10.0
70%	10.0
80%	10.0
90%	10.0

```
************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
========================================================================
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                           Analysis prepared by:

                           DRC Engineering, Inc.
                   160 South Old Springs Road, Suite 210
                          Anaheim Hills, CA 92808
                                714-685-6860

************************************************************************
------------------------------------------------------------------------

 Problem Descriptions:
  AREA A
  PROPOSED CONDITION
  100 YEAR
========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC III:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     6.39 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
        1          2.22       22.80       75.(AMC II)     0.210       0.934

    TOTAL AREA (Acres) =      2.22
                                 _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.048
                                       _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.066
========================================================================
```

```
****************************************************************************
                      SMALL AREA UNIT HYDROGRAPH MODEL
============================================================================
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                           Analysis prepared by:

                           DRC Engineering, Inc.
                   160 South Old Springs Road, Suite 210
                          Anaheim Hills, CA 92808
                                714-685-6860

****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  AREA A
  PROPOSED CONDITION
  100 YEAR
----------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    2.22
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.107
    LOW LOSS FRACTION = 0.175
    TIME OF CONCENTRATION(MIN.) = 10.30
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) = 100
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.38
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.99
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.48
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  2.57
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  3.48
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  6.39

----------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.90
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.29

****************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
----------------------------------------------------------------------------
  0.03      0.0000      0.00  Q         .         .         .         .
  0.21      0.0014      0.19  Q         .         .         .         .
```

0.38	0.0041	0.19	Q	.	.	.	.
0.55	0.0069	0.19	Q	.	.	.	.
0.72	0.0097	0.20	Q	.	.	.	.
0.89	0.0124	0.20	Q	.	.	.	.
1.06	0.0153	0.20	Q	.	.	.	.
1.24	0.0181	0.20	Q	.	.	.	.
1.41	0.0209	0.20	Q	.	.	.	.
1.58	0.0238	0.20	Q	.	.	.	.
1.75	0.0267	0.20	Q	.	.	.	.
1.92	0.0296	0.21	Q	.	.	.	.
2.09	0.0325	0.21	Q	.	.	.	.
2.27	0.0355	0.21	Q	.	.	.	.
2.44	0.0384	0.21	Q	.	.	.	.
2.61	0.0414	0.21	Q	.	.	.	.
2.78	0.0444	0.21	Q	.	.	.	.
2.95	0.0475	0.21	Q	.	.	.	.
3.12	0.0505	0.22	Q	.	.	.	.
3.30	0.0536	0.22	Q	.	.	.	.
3.47	0.0567	0.22	Q	.	.	.	.
3.64	0.0598	0.22	Q	.	.	.	.
3.81	0.0630	0.22	Q	.	.	.	.
3.98	0.0661	0.22	Q	.	.	.	.
4.15	0.0693	0.23	Q	.	.	.	.
4.33	0.0726	0.23	Q	.	.	.	.
4.50	0.0758	0.23	Q	.	.	.	.
4.67	0.0791	0.23	Q	.	.	.	.
4.84	0.0824	0.23	Q	.	.	.	.
5.01	0.0857	0.24	Q	.	.	.	.
5.18	0.0891	0.24	Q	.	.	.	.
5.36	0.0925	0.24	Q	.	.	.	.
5.53	0.0959	0.24	Q	.	.	.	.
5.70	0.0993	0.24	Q	.	.	.	.
5.87	0.1028	0.25	Q	.	.	.	.
6.04	0.1064	0.25	Q	.	.	.	.
6.21	0.1099	0.25	.Q	.	.	.	.
6.39	0.1135	0.25	.Q	.	.	.	.
6.56	0.1171	0.26	.Q	.	.	.	.
6.73	0.1208	0.26	.Q	.	.	.	.
6.90	0.1245	0.26	.Q	.	.	.	.
7.07	0.1282	0.26	.Q	.	.	.	.
7.24	0.1320	0.27	.Q	.	.	.	.
7.42	0.1358	0.27	.Q	.	.	.	.
7.59	0.1396	0.27	.Q	.	.	.	.
7.76	0.1436	0.28	.Q	.	.	.	.
7.93	0.1475	0.28	.Q	.	.	.	.
8.10	0.1515	0.28	.Q	.	.	.	.
8.27	0.1555	0.29	.Q	.	.	.	.
8.45	0.1596	0.29	.Q	.	.	.	.
8.62	0.1638	0.29	.Q	.	.	.	.
8.79	0.1680	0.30	.Q	.	.	.	.

```
 8.96      0.1722      0.30  .Q        .         .         .         .
 9.13      0.1765      0.31  .Q        .         .         .         .
 9.30      0.1809      0.31  .Q        .         .         .         .
 9.48      0.1853      0.31  .Q        .         .         .         .
 9.65      0.1898      0.32  .Q        .         .         .         .
 9.82      0.1944      0.32  .Q        .         .         .         .
 9.99      0.1990      0.33  .Q        .         .         .         .
10.16      0.2037      0.33  .Q        .         .         .         .
10.34      0.2085      0.34  .Q        .         .         .         .
10.51      0.2134      0.34  .Q        .         .         .         .
10.68      0.2183      0.35  .Q        .         .         .         .
10.85      0.2234      0.36  .Q        .         .         .         .
11.02      0.2285      0.37  .Q        .         .         .         .
11.19      0.2337      0.37  .Q        .         .         .         .
11.37      0.2390      0.38  .Q        .         .         .         .
11.54      0.2445      0.39  .Q        .         .         .         .
11.71      0.2500      0.40  .Q        .         .         .         .
11.88      0.2557      0.40  .Q        .         .         .         .
12.05      0.2615      0.42  .Q        .         .         .         .
12.22      0.2674      0.42  .Q        .         .         .         .
12.40      0.2735      0.44  .Q        .         .         .         .
12.57      0.2798      0.44  .Q        .         .         .         .
12.74      0.2862      0.46  .Q        .         .         .         .
12.91      0.2928      0.47  .Q        .         .         .         .
13.08      0.2995      0.49  .Q        .         .         .         .
13.25      0.3066      0.50  .Q        .         .         .         .
13.43      0.3138      0.52  . Q       .         .         .         .
13.60      0.3213      0.54  . Q       .         .         .         .
13.77      0.3291      0.56  . Q       .         .         .         .
13.94      0.3372      0.58  . Q       .         .         .         .
14.11      0.3460      0.66  . Q       .         .         .         .
14.28      0.3559      0.73  . Q       .         .         .         .
14.45      0.3666      0.78  .  Q      .         .         .         .
14.63      0.3779      0.81  .  Q      .         .         .         .
14.80      0.3898      0.87  .  Q      .         .         .         .
14.97      0.4025      0.91  .  Q      .         .         .         .
15.14      0.4162      1.02  .   Q     .         .         .         .
15.31      0.4312      1.10  .   Q     .         .         .         .
15.48      0.4496      1.50  .     Q   .         .         .         .
15.66      0.4724      1.70  .     Q   .         .         .         .
15.83      0.4992      2.08  .       Q .         .         .         .
16.00      0.5331      2.70  .         Q         .         .         .
16.17      0.5970      6.29  .         .         .    Q    .         .
16.34      0.6552      1.92  .      Q  .         .         .         .
16.52      0.6773      1.19  .   Q     .         .         .         .
16.69      0.6925      0.96  .  Q      .         .         .         .
16.86      0.7053      0.84  .  Q      .         .         .         .
17.03      0.7166      0.75  .  Q      .         .         .         .
17.20      0.7262      0.60  . Q       .         .         .         .
17.37      0.7343      0.55  . Q       .         .         .         .
```

```
 17.55      0.7418      0.51  . Q       .         .         .         .
 17.72      0.7489      0.48  .Q        .         .         .         .
 17.89      0.7554      0.45  .Q        .         .         .         .
 18.06      0.7617      0.43  .Q        .         .         .         .
 18.23      0.7676      0.41  .Q        .         .         .         .
 18.40      0.7733      0.39  .Q        .         .         .         .
 18.58      0.7787      0.38  .Q        .         .         .         .
 18.75      0.7840      0.36  .Q        .         .         .         .
 18.92      0.7890      0.35  .Q        .         .         .         .
 19.09      0.7939      0.34  .Q        .         .         .         .
 19.26      0.7986      0.33  .Q        .         .         .         .
 19.43      0.8031      0.32  .Q        .         .         .         .
 19.61      0.8076      0.31  .Q        .         .         .         .
 19.78      0.8119      0.30  .Q        .         .         .         .
 19.95      0.8161      0.29  .Q        .         .         .         .
 20.12      0.8202      0.28  .Q        .         .         .         .
 20.29      0.8242      0.28  .Q        .         .         .         .
 20.46      0.8281      0.27  .Q        .         .         .         .
 20.64      0.8319      0.27  .Q        .         .         .         .
 20.81      0.8356      0.26  .Q        .         .         .         .
 20.98      0.8393      0.26  .Q        .         .         .         .
 21.15      0.8429      0.25  .Q        .         .         .         .
 21.32      0.8464      0.25  Q         .         .         .         .
 21.49      0.8498      0.24  Q         .         .         .         .
 21.67      0.8532      0.24  Q         .         .         .         .
 21.84      0.8566      0.23  Q         .         .         .         .
 22.01      0.8598      0.23  Q         .         .         .         .
 22.18      0.8631      0.23  Q         .         .         .         .
 22.35      0.8662      0.22  Q         .         .         .         .
 22.52      0.8694      0.22  Q         .         .         .         .
 22.69      0.8724      0.22  Q         .         .         .         .
 22.87      0.8755      0.21  Q         .         .         .         .
 23.04      0.8785      0.21  Q         .         .         .         .
 23.21      0.8814      0.21  Q         .         .         .         .
 23.38      0.8843      0.20  Q         .         .         .         .
 23.55      0.8872      0.20  Q         .         .         .         .
 23.73      0.8900      0.20  Q         .         .         .         .
 23.90      0.8928      0.20  Q         .         .         .         .
 24.07      0.8956      0.19  Q         .         .         .         .
 24.24      0.8969      0.00  Q         .         .         .         .
----------------------------------------------------------------------------
--------------------------------------------------------------------------------
   TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
   (Note: 100% of Peak Flow Rate estimate assumed to have
   an instantaneous time duration)

   Percentile of Estimated                 Duration
       Peak Flow Rate                      (minutes)
   =======================                 =========
              0%                            1442.0
```

10%	185.4
20%	61.8
30%	41.2
40%	20.6
50%	10.3
60%	10.3
70%	10.3
80%	10.3
90%	10.3

```
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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                           Analysis prepared by:

                           DRC Engineering, Inc.
                   160 South Old Springs Road, Suite 210
                          Anaheim Hills, CA 92808
                                714-685-6860

****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  AREA B
  PROPOSED CONDITION
  100 YEAR
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC III:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     6.39 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1          4.42        5.30       75.(AMC II)     0.210       0.956

    TOTAL AREA (Acres) =      4.42

    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.011

    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.044
============================================================================
```

```
****************************************************************************
                      SMALL AREA UNIT HYDROGRAPH MODEL
============================================================================
         (C) Copyright 1989-2015 Advanced Engineering Software (aes)
             Ver. 22.0  Release Date: 07/01/2015  License ID 1510

                           Analysis prepared by:

                           DRC Engineering, Inc.
                   160 South Old Springs Road, Suite 210
                          Anaheim Hills, CA 92808
                                714-685-6860

****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  AREA B
  PROPOSED CONDITION
  100 YEAR
----------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    4.42
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.011
    LOW LOSS FRACTION = 0.044
    TIME OF CONCENTRATION(MIN.) = 10.00
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) = 100
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.38
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.99
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.48
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  2.57
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  3.48
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  6.39

----------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     2.04
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.32

****************************************************************************
  TIME     VOLUME       Q    0.        5.0      10.0      15.0      20.0
 (HOURS)    (AF)      (CFS)
----------------------------------------------------------------------------
  0.17      0.0031      0.44  Q         .         .         .         .
  0.33      0.0092      0.45  Q         .         .         .         .
```

0.50	0.0154	0.45	Q	.	.	.	.
0.67	0.0216	0.45	Q	.	.	.	.
0.83	0.0278	0.46	Q	.	.	.	.
1.00	0.0341	0.46	Q	.	.	.	.
1.17	0.0404	0.46	Q	.	.	.	.
1.33	0.0468	0.46	Q	.	.	.	.
1.50	0.0532	0.47	Q	.	.	.	.
1.67	0.0597	0.47	Q	.	.	.	.
1.83	0.0662	0.47	Q	.	.	.	.
2.00	0.0727	0.48	Q	.	.	.	.
2.17	0.0793	0.48	Q	.	.	.	.
2.33	0.0859	0.48	Q	.	.	.	.
2.50	0.0926	0.49	Q	.	.	.	.
2.67	0.0993	0.49	Q	.	.	.	.
2.83	0.1060	0.49	Q	.	.	.	.
3.00	0.1128	0.50	Q	.	.	.	.
3.17	0.1197	0.50	Q	.	.	.	.
3.33	0.1266	0.50	.Q	.	.	.	.
3.50	0.1335	0.51	.Q	.	.	.	.
3.67	0.1405	0.51	.Q	.	.	.	.
3.83	0.1476	0.52	.Q	.	.	.	.
4.00	0.1547	0.52	.Q	.	.	.	.
4.17	0.1619	0.52	.Q	.	.	.	.
4.33	0.1691	0.53	.Q	.	.	.	.
4.50	0.1764	0.53	.Q	.	.	.	.
4.67	0.1837	0.53	.Q	.	.	.	.
4.83	0.1911	0.54	.Q	.	.	.	.
5.00	0.1986	0.54	.Q	.	.	.	.
5.17	0.2061	0.55	.Q	.	.	.	.
5.33	0.2137	0.55	.Q	.	.	.	.
5.50	0.2214	0.56	.Q	.	.	.	.
5.67	0.2291	0.56	.Q	.	.	.	.
5.83	0.2369	0.57	.Q	.	.	.	.
6.00	0.2447	0.57	.Q	.	.	.	.
6.17	0.2527	0.58	.Q	.	.	.	.
6.33	0.2607	0.58	.Q	.	.	.	.
6.50	0.2688	0.59	.Q	.	.	.	.
6.67	0.2769	0.59	.Q	.	.	.	.
6.83	0.2852	0.60	.Q	.	.	.	.
7.00	0.2935	0.61	.Q	.	.	.	.
7.17	0.3019	0.62	.Q	.	.	.	.
7.33	0.3104	0.62	.Q	.	.	.	.
7.50	0.3190	0.63	.Q	.	.	.	.
7.67	0.3277	0.63	.Q	.	.	.	.
7.83	0.3365	0.64	.Q	.	.	.	.
8.00	0.3454	0.65	.Q	.	.	.	.
8.17	0.3544	0.66	.Q	.	.	.	.
8.33	0.3635	0.66	.Q	.	.	.	.
8.50	0.3727	0.67	.Q	.	.	.	.
8.67	0.3820	0.68	.Q	.	.	.	.

```
 8.83      0.3914      0.69  .Q        .         .         .         .
 9.00      0.4010      0.70  .Q        .         .         .         .
 9.17      0.4107      0.71  .Q        .         .         .         .
 9.33      0.4205      0.72  .Q        .         .         .         .
 9.50      0.4305      0.73  .Q        .         .         .         .
 9.67      0.4405      0.74  .Q        .         .         .         .
 9.83      0.4508      0.75  .Q        .         .         .         .
10.00      0.4612      0.76  .Q        .         .         .         .
10.17      0.4717      0.77  .Q        .         .         .         .
10.33      0.4824      0.78  .Q        .         .         .         .
10.50      0.4933      0.80  .Q        .         .         .         .
10.67      0.5044      0.81  .Q        .         .         .         .
10.83      0.5157      0.83  .Q        .         .         .         .
11.00      0.5271      0.84  .Q        .         .         .         .
11.17      0.5388      0.86  .Q        .         .         .         .
11.33      0.5507      0.87  .Q        .         .         .         .
11.50      0.5629      0.89  .Q        .         .         .         .
11.67      0.5752      0.91  .Q        .         .         .         .
11.83      0.5879      0.93  .Q        .         .         .         .
12.00      0.6008      0.95  .Q        .         .         .         .
12.17      0.6140      0.97  .Q        .         .         .         .
12.33      0.6275      0.99  .Q        .         .         .         .
12.50      0.6414      1.03  . Q       .         .         .         .
12.67      0.6557      1.04  . Q       .         .         .         .
12.83      0.6703      1.08  . Q       .         .         .         .
13.00      0.6854      1.11  . Q       .         .         .         .
13.17      0.7010      1.16  . Q       .         .         .         .
13.33      0.7171      1.18  . Q       .         .         .         .
13.50      0.7338      1.24  . Q       .         .         .         .
13.67      0.7511      1.27  . Q       .         .         .         .
13.83      0.7690      1.34  . Q       .         .         .         .
14.00      0.7878      1.38  . Q       .         .         .         .
14.17      0.8090      1.69  .  Q      .         .         .         .
14.33      0.8326      1.74  .  Q      .         .         .         .
14.50      0.8575      1.86  .  Q      .         .         .         .
14.67      0.8836      1.93  .  Q      .         .         .         .
14.83      0.9113      2.10  .   Q     .         .         .         .
15.00      0.9409      2.20  .   Q     .         .         .         .
15.17      0.9729      2.44  .   Q     .         .         .         .
15.33      1.0076      2.60  .    Q    .         .         .         .
15.50      1.0497      3.50  .      Q  .         .         .         .
15.67      1.1001      3.81  .      Q  .         .         .         .
15.83      1.1577      4.56  .        Q.         .         .         .
16.00      1.2294      5.85  .         .Q        .         .         .
16.17      1.3598     13.09  .         .         .     Q   .         .
16.33      1.4793      4.25  .       Q .         .         .         .
16.50      1.5278      2.80  .    Q    .         .         .         .
16.67      1.5630      2.31  .   Q     .         .         .         .
16.83      1.5927      2.01  .   Q     .         .         .         .
17.00      1.6190      1.80  .  Q      .         .         .         .
```

```
 17.17      1.6412      1.42  . Q        .         .         .         .
 17.33      1.6600      1.30  . Q        .         .         .         .
 17.50      1.6773      1.21  . Q        .         .         .         .
 17.67      1.6934      1.13  . Q        .         .         .         .
 17.83      1.7085      1.06  . Q        .         .         .         .
 18.00      1.7228      1.01  . Q        .         .         .         .
 18.17      1.7363      0.96  .Q         .         .         .         .
 18.33      1.7493      0.92  .Q         .         .         .         .
 18.50      1.7616      0.88  .Q         .         .         .         .
 18.67      1.7735      0.85  .Q         .         .         .         .
 18.83      1.7850      0.82  .Q         .         .         .         .
 19.00      1.7961      0.79  .Q         .         .         .         .
 19.17      1.8068      0.77  .Q         .         .         .         .
 19.33      1.8172      0.74  .Q         .         .         .         .
 19.50      1.8273      0.72  .Q         .         .         .         .
 19.67      1.8371      0.70  .Q         .         .         .         .
 19.83      1.8467      0.68  .Q         .         .         .         .
 20.00      1.8560      0.67  .Q         .         .         .         .
 20.17      1.8651      0.65  .Q         .         .         .         .
 20.33      1.8740      0.64  .Q         .         .         .         .
 20.50      1.8827      0.62  .Q         .         .         .         .
 20.67      1.8912      0.61  .Q         .         .         .         .
 20.83      1.8995      0.60  .Q         .         .         .         .
 21.00      1.9077      0.59  .Q         .         .         .         .
 21.17      1.9157      0.58  .Q         .         .         .         .
 21.33      1.9236      0.57  .Q         .         .         .         .
 21.50      1.9313      0.56  .Q         .         .         .         .
 21.67      1.9389      0.55  .Q         .         .         .         .
 21.83      1.9463      0.54  .Q         .         .         .         .
 22.00      1.9537      0.53  .Q         .         .         .         .
 22.17      1.9609      0.52  .Q         .         .         .         .
 22.33      1.9680      0.51  .Q         .         .         .         .
 22.50      1.9750      0.50  .Q         .         .         .         .
 22.67      1.9819      0.50  Q          .         .         .         .
 22.83      1.9887      0.49  Q          .         .         .         .
 23.00      1.9954      0.48  Q          .         .         .         .
 23.17      2.0021      0.48  Q          .         .         .         .
 23.33      2.0086      0.47  Q          .         .         .         .
 23.50      2.0150      0.47  Q          .         .         .         .
 23.67      2.0214      0.46  Q          .         .         .         .
 23.83      2.0277      0.45  Q          .         .         .         .
 24.00      2.0339      0.45  Q          .         .         .         .
 24.17      2.0370      0.00  Q          .         .         .         .
-----------------------------------------------------------------------------
-------------------------------------------------------------------------------
   TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
   (Note: 100% of Peak Flow Rate estimate assumed to have
   an instantaneous time duration)

   Percentile of Estimated                 Duration
```

Peak Flow Rate	(minutes)
0%	1440.0
10%	210.0
20%	70.0
30%	40.0
40%	20.0
50%	10.0
60%	10.0
70%	10.0
80%	10.0
90%	10.0

APPENDIX E
10-year & 100-year Discharge Calculations
Hydraflow Hydrographs
Hydraflow Basin Analysis

Hydraflow Table of Contents

10 - Year

Summary Report **1**
Hydrograph Reports **2**
Hydrograph No. 1, Manual, Area A 2
Hydrograph No. 2, Reservoir, Detention 1 Outflow 3
Pond Report - Detention 1 4
Hydrograph No. 3, Manual, Area B 5
Hydrograph No. 4, Reservoir, Basin B Outflow 6
Pond Report - Basin B 7
Hydrograph No. 5, Reservoir, Detention 2 Outflow 8
Pond Report - Detention 2 9

100 - Year

Summary Report **10**
Hydrograph Reports **11**
Hydrograph No. 1, Manual, Area A 11
Hydrograph No. 2, Reservoir, Detention 1 Outflow 12
Hydrograph No. 3, Manual, Area B 13
Hydrograph No. 4, Reservoir, Basin B Outflow 14
Hydrograph No. 5, Reservoir, Detention 2 Outflow 15

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4

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	Manual	3.880	5	970	24,894	------	------	------	Area A
2	Reservoir	3.861	5	970	23,291	1	675.98	2,075	Detention 1 Outflow
3	Manual	8.170	5	970	55,083	------	------	------	Area B
4	Reservoir	3.239	5	980	55,077	3	674.98	6,523	Basin B Outflow
5	Reservoir	3.240	5	980	46,011	4	675.14	9,659	Detention 2 Outflow

23646 Hydraflow.gpw	Return Period: 10 Year	Wednesday, 12 / 6 / 2023

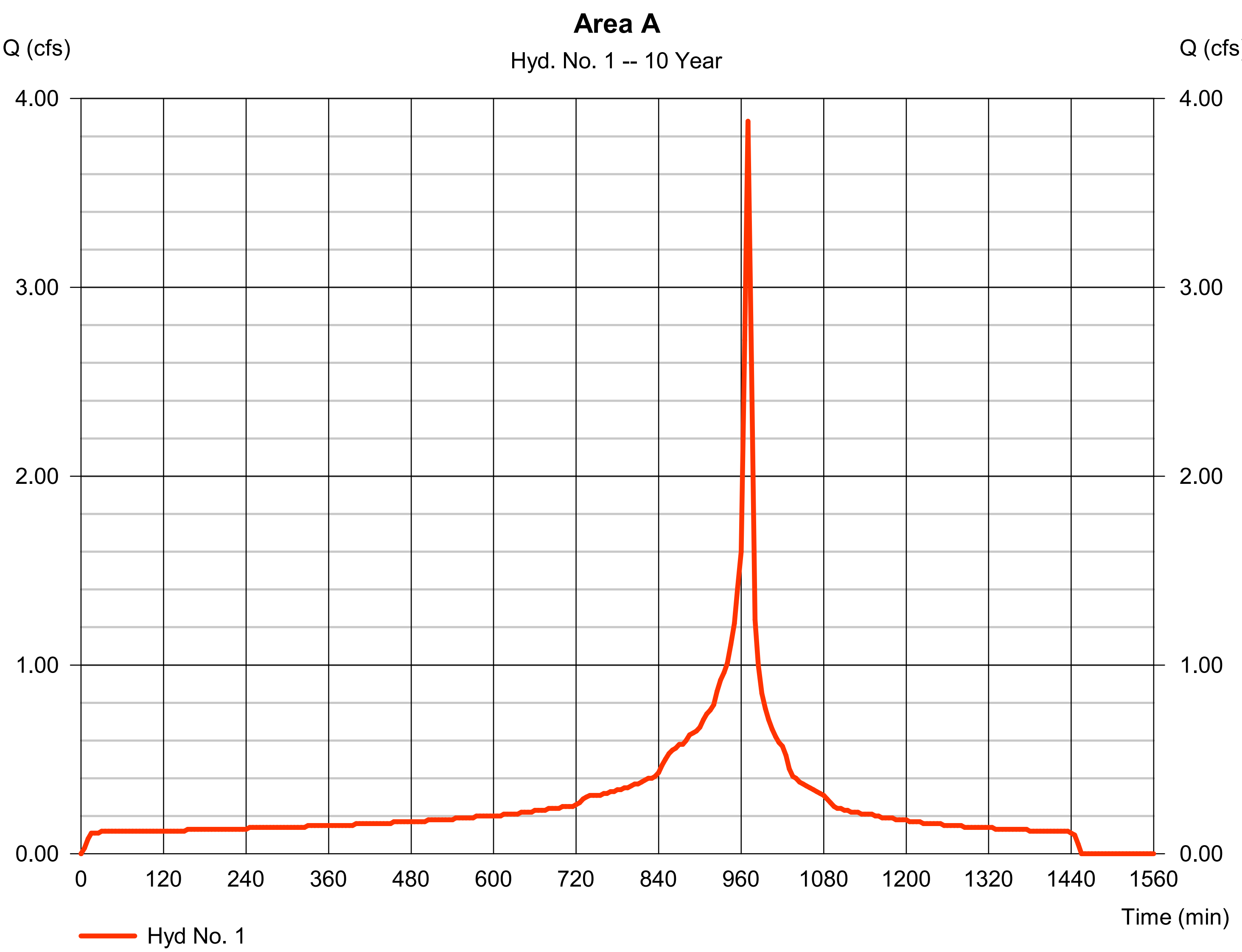
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Wednesday, 12 / 6 / 2023

Hyd. No. 1

Area A

Hydrograph type	= Manual	Peak discharge	= 3.880 cfs
Storm frequency	= 10 yrs	Time to peak	= 970 min
Time interval	= 5 min	Hyd. volume	= 24,894 cuft



Hydrograph Report

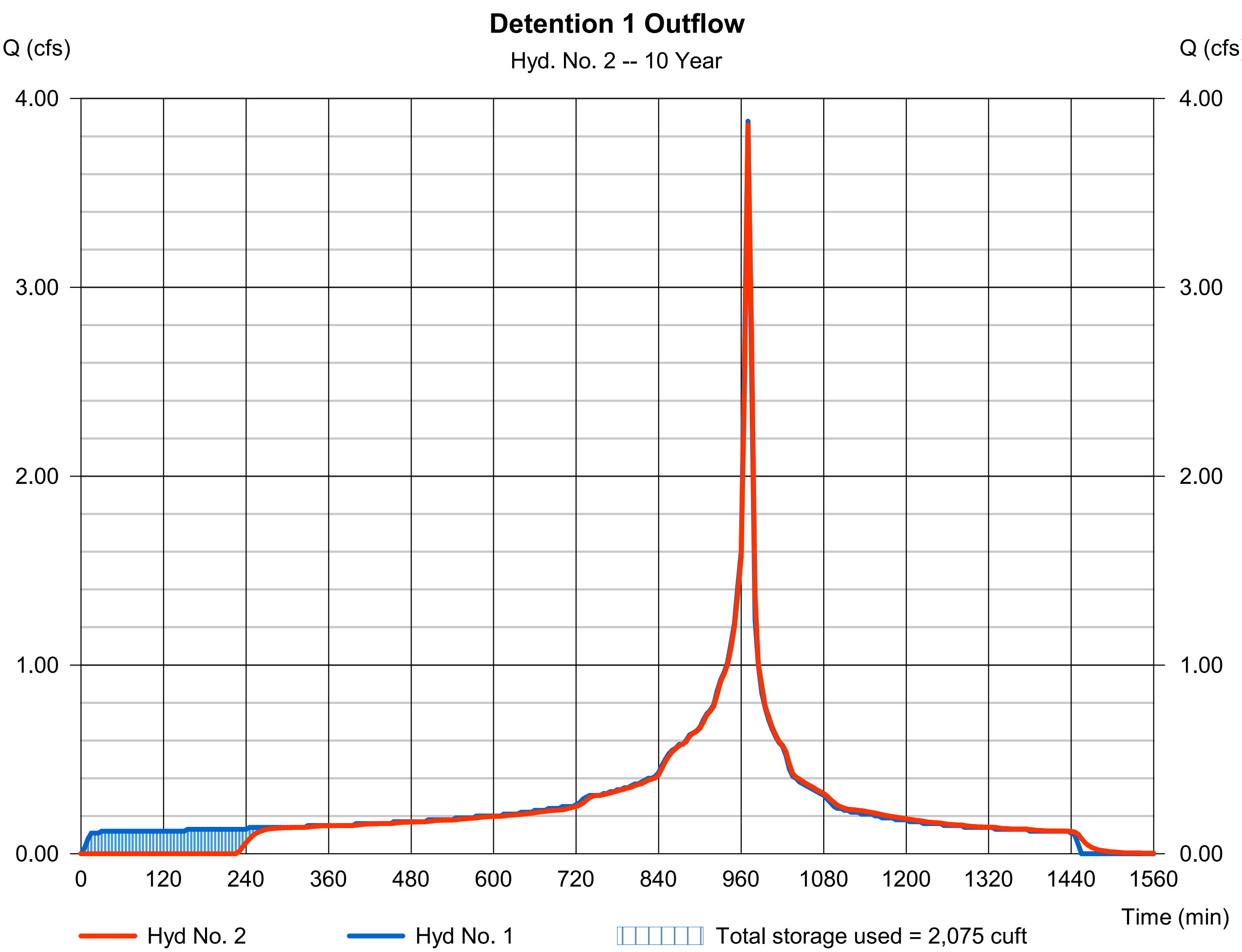
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Wednesday, 12 / 6 / 2023

Hyd. No. 2

Detention 1 Outflow

Hydrograph type	= Reservoir	Peak discharge	= 3.861 cfs
Storm frequency	= 10 yrs	Time to peak	= 970 min
Time interval	= 5 min	Hyd. volume	= 23,291 cuft
Inflow hyd. No.	= 1 - Area A	Max. Elevation	= 675.98 ft
Reservoir name	= Detention 1	Max. Storage	= 2,075 cuft

Storage Indication method used.



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Wednesday, 12 / 6 / 2023

Pond No. 3 - Detention 1

Pond Data

UG Chambers -Invert elev. = 672.20 ft, Rise x Span = 4.00 x 4.00 ft, Barrel Len = 85.00 ft, No. Barrels = 2, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	672.20	n/a	0	0
0.40	672.60	n/a	111	111
0.80	673.00	n/a	193	304
1.20	673.40	n/a	235	539
1.60	673.80	n/a	259	798
2.00	674.20	n/a	270	1,069
2.40	674.60	n/a	270	1,339
2.80	675.00	n/a	259	1,598
3.20	675.40	n/a	235	1,833
3.60	675.80	n/a	193	2,026
4.00	676.20	n/a	111	2,137

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 6.00	Inactive	0.00	0.00
Span (in)	= 6.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 675.00	0.00	0.00	0.00
Length (ft)	= 10.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

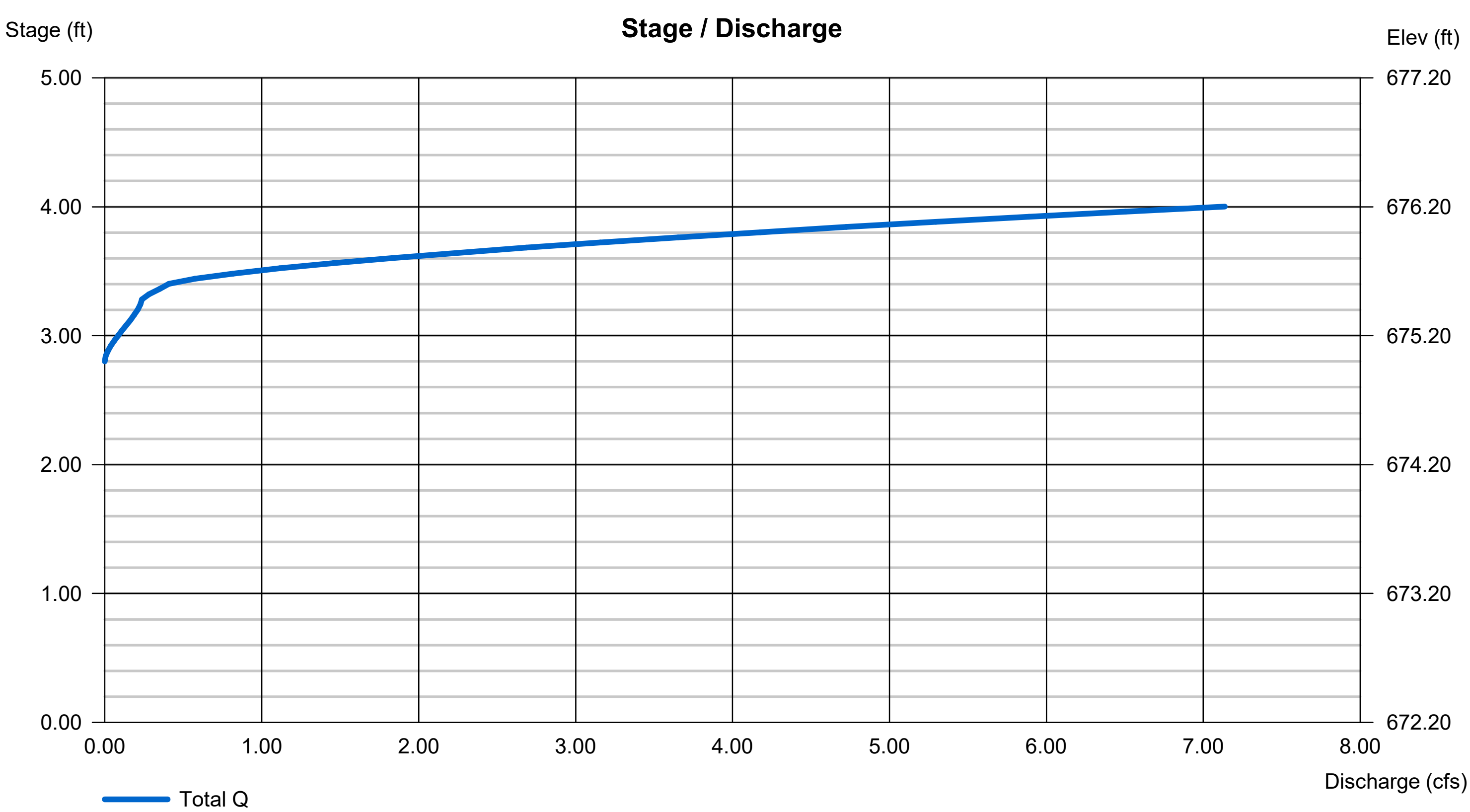
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.00	0.00	0.00	0.00
Crest El. (ft)	= 675.60	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



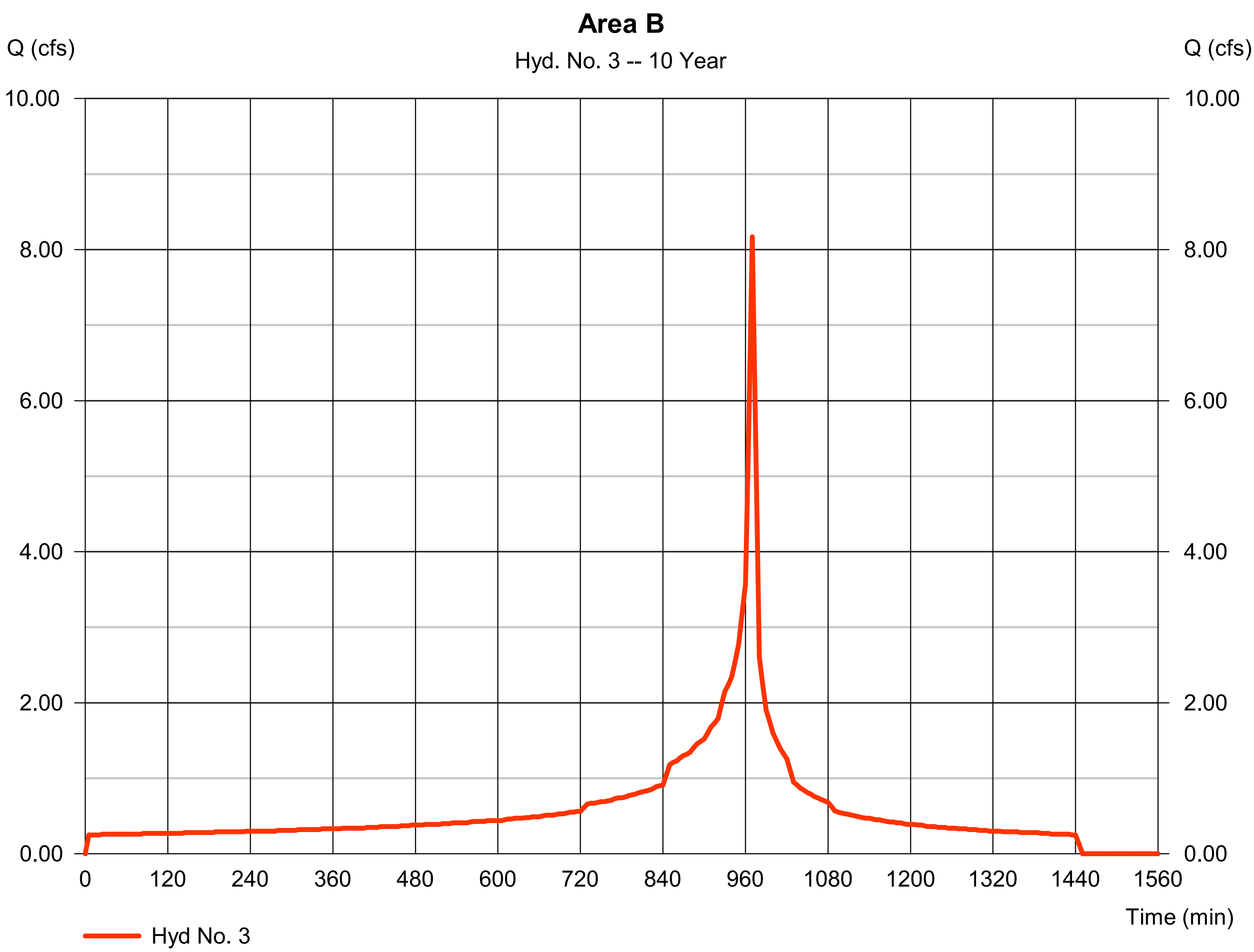
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Wednesday, 12 / 6 / 2023

Hyd. No. 3

Area B

Hydrograph type	= Manual	Peak discharge	= 8.170 cfs
Storm frequency	= 10 yrs	Time to peak	= 970 min
Time interval	= 5 min	Hyd. volume	= 55,083 cuft



Hydrograph Report

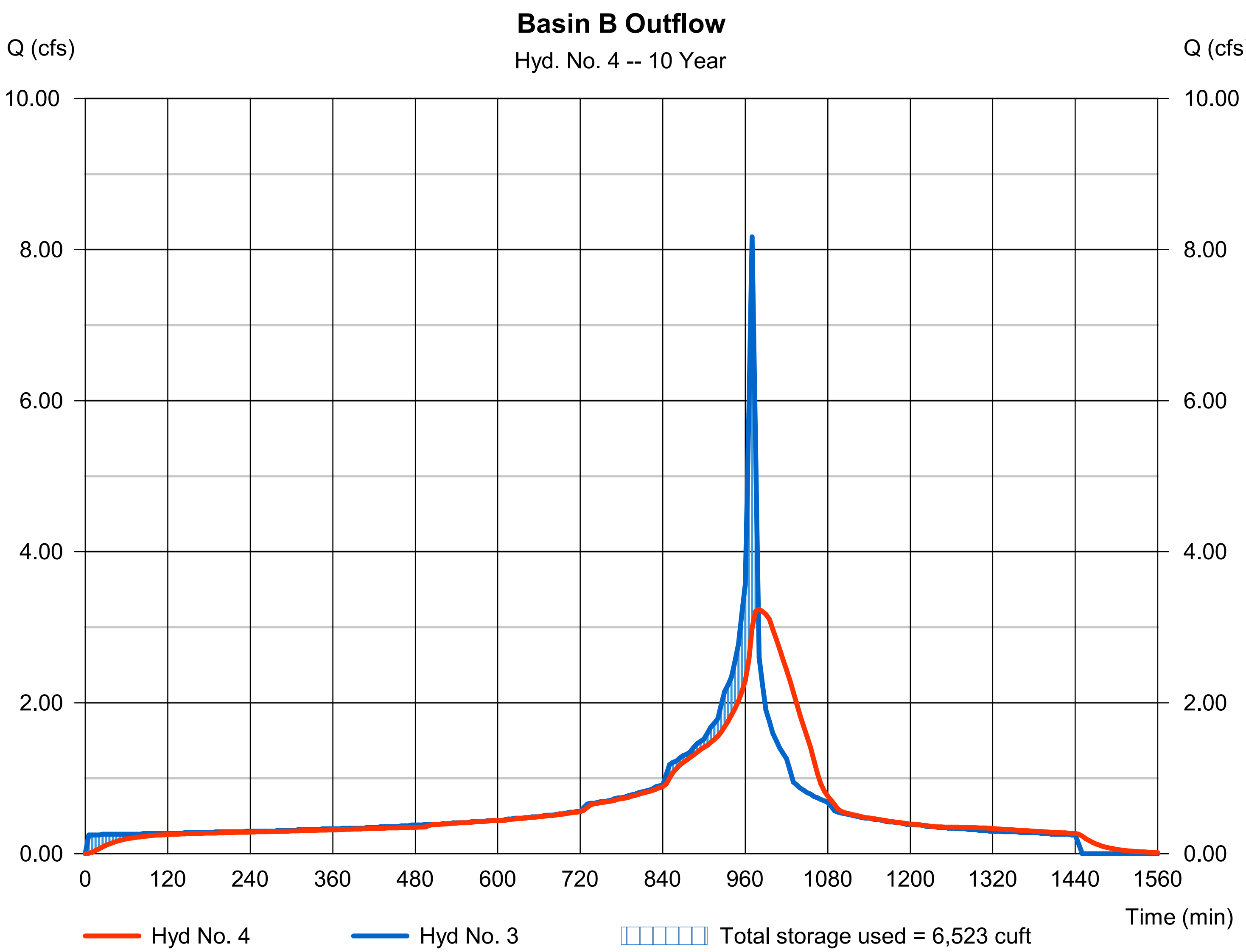
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 — Wednesday, 12 / 6 / 2023

Hyd. No. 4

Basin B Outflow

Hydrograph type	= Reservoir	Peak discharge	= 3.239 cfs
Storm frequency	= 10 yrs	Time to peak	= 980 min
Time interval	= 5 min	Hyd. volume	= 55,077 cuft
Inflow hyd. No.	= 3 - Area B	Max. Elevation	= 674.98 ft
Reservoir name	= Basin B	Max. Storage	= 6,523 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Wednesday, 12 / 6 / 2023

Pond No. 2 - Basin B

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	671.80	n/a	0	0
0.50	672.30	n/a	942	942
1.00	672.80	n/a	942	1,884
1.50	673.30	n/a	943	2,827
2.00	673.80	n/a	942	3,769
2.50	674.30	n/a	942	4,711
3.00	674.80	n/a	942	5,653
3.50	675.30	n/a	2,356	8,009
4.00	675.80	n/a	2,355	10,364
4.50	676.30	n/a	2,356	12,720
5.00	676.80	n/a	2,355	15,075
5.50	677.30	n/a	2,355	17,430

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 6.00	2.00	2.00	0.00
Span (in)	= 6.00	2.00	2.00	0.00
No. Barrels	= 2	9	9	0
Invert El. (ft)	= 671.80	676.30	676.30	0.00
Length (ft)	= 1.00	1.00	1.00	0.00
Slope (%)	= 2.00	2.00	2.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

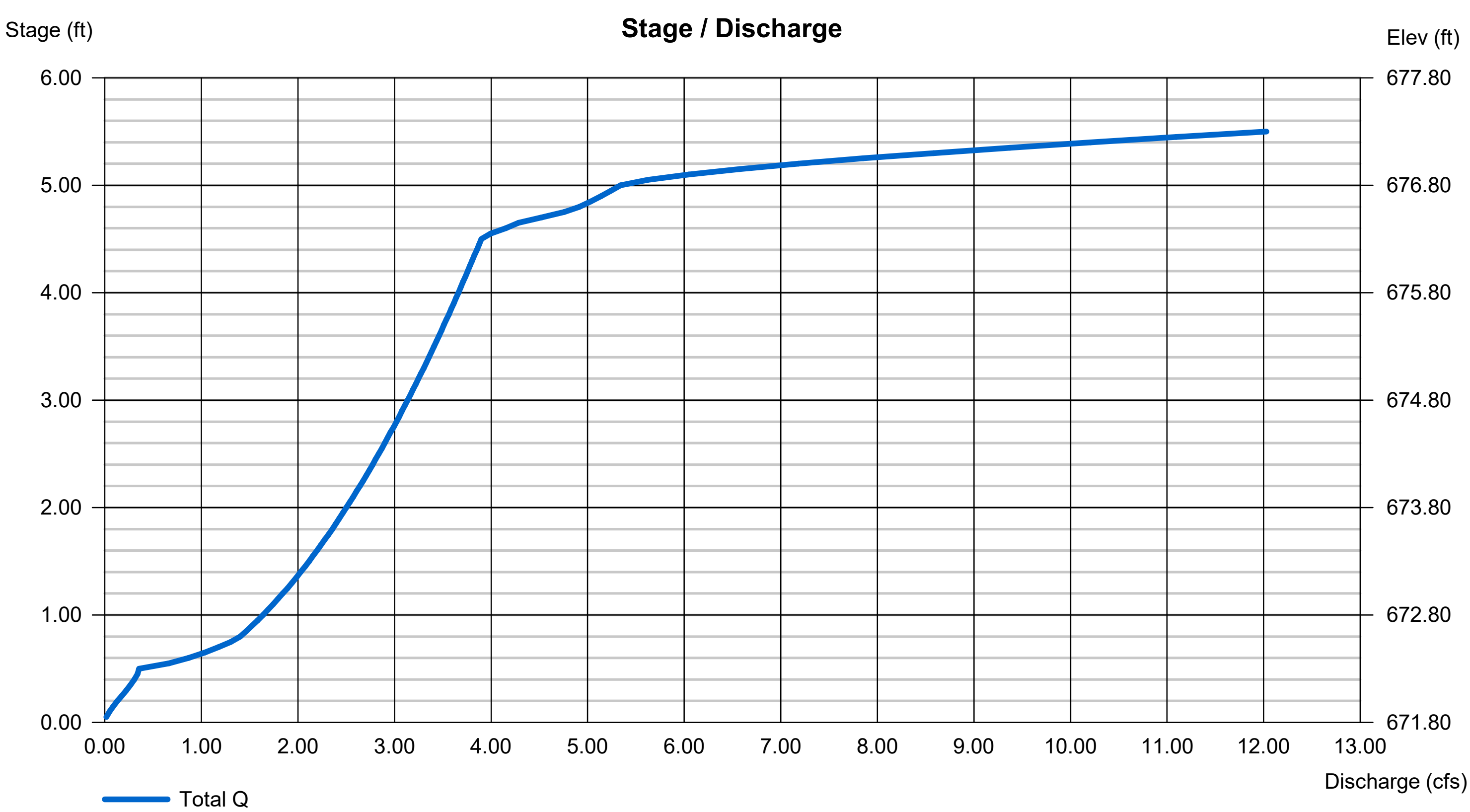
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 2.50	2.50	0.00	0.00
Crest El. (ft)	= 676.80	676.80	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	Rect	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Basin B Stage-Storage Volume

Gravel/Media H	3.5
Pond H	2
Width	10.83
Length	435

Stage	Height	Porosity	Inc. Volume	Total Volume
671.80	0.00	40%	0	0
672.30	0.50	40%	942	942
672.80	1.00	40%	942	1884
673.30	1.50	40%	942	2827
673.80	2.00	40%	942	3769
674.30	2.50	40%	942	4711
674.80	3.00	40%	942	5653
675.30	3.50	100%	2356	8009
675.80	4.00	100%	2356	10364
676.30	4.50	100%	2356	12720
676.80	5.00	100%	2356	15075
677.30	5.50	100%	2356	17431

Hydrograph Report

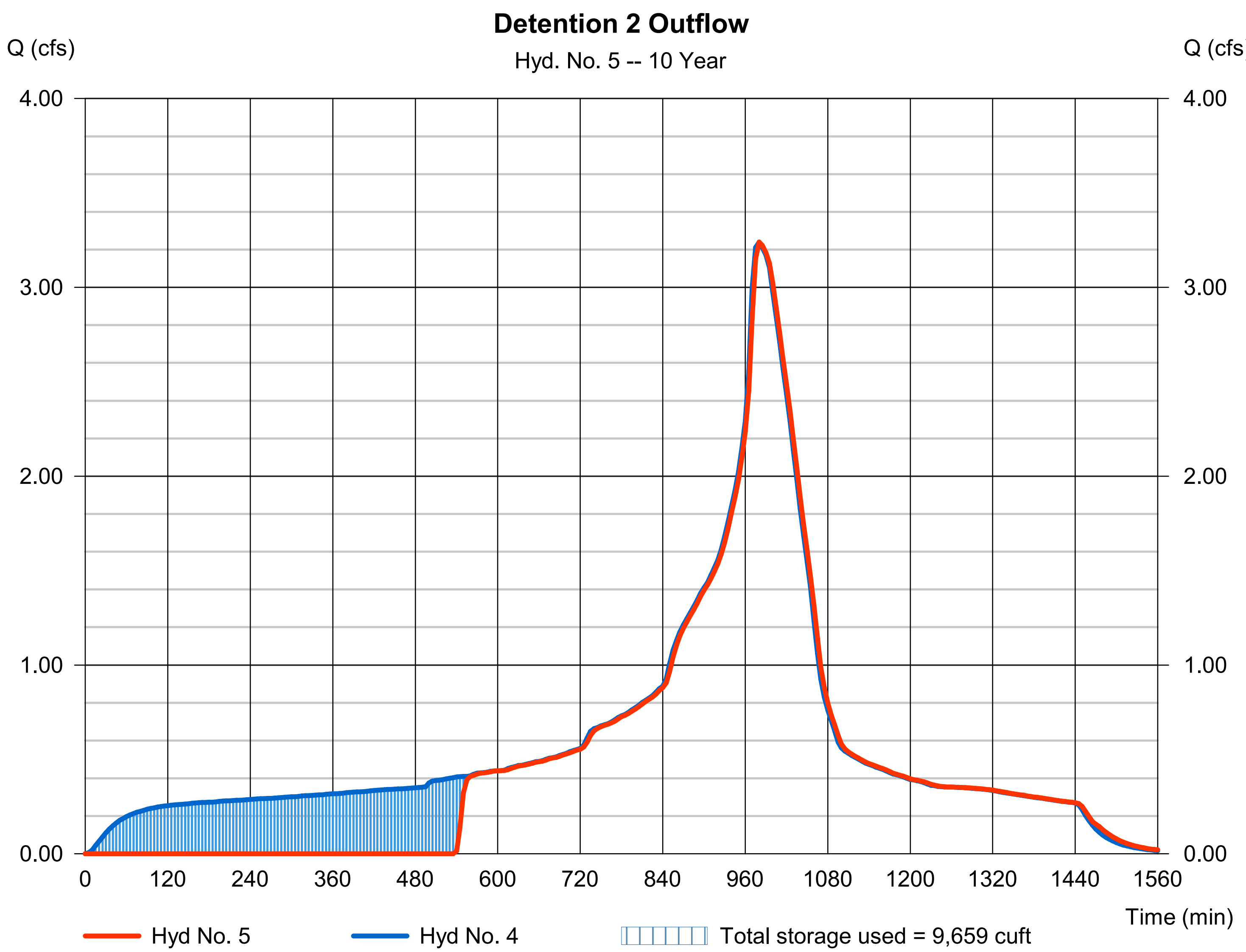
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Wednesday, 12 / 6 / 2023

Hyd. No. 5

Detention 2 Outflow

Hydrograph type	= Reservoir	Peak discharge	= 3.240 cfs
Storm frequency	= 10 yrs	Time to peak	= 980 min
Time interval	= 5 min	Hyd. volume	= 46,011 cuft
Inflow hyd. No.	= 4 - Basin B Outflow	Max. Elevation	= 675.14 ft
Reservoir name	= Detention 2	Max. Storage	= 9,659 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Wednesday, 12 / 6 / 2023

Pond No. 4 - Detention 2

Pond Data

UG Chambers -Invert elev. = 671.20 ft, Rise x Span = 4.00 x 4.00 ft, Barrel Len = 155.00 ft, No. Barrels = 5, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	671.20	n/a	0	0
0.40	671.60	n/a	504	504
0.80	672.00	n/a	880	1,384
1.20	672.40	n/a	1,073	2,457
1.60	672.80	n/a	1,182	3,639
2.00	673.20	n/a	1,233	4,872
2.40	673.60	n/a	1,233	6,105
2.80	674.00	n/a	1,182	7,287
3.20	674.40	n/a	1,072	8,358
3.60	674.80	n/a	879	9,238
4.00	675.20	n/a	503	9,741

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	Inactive	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

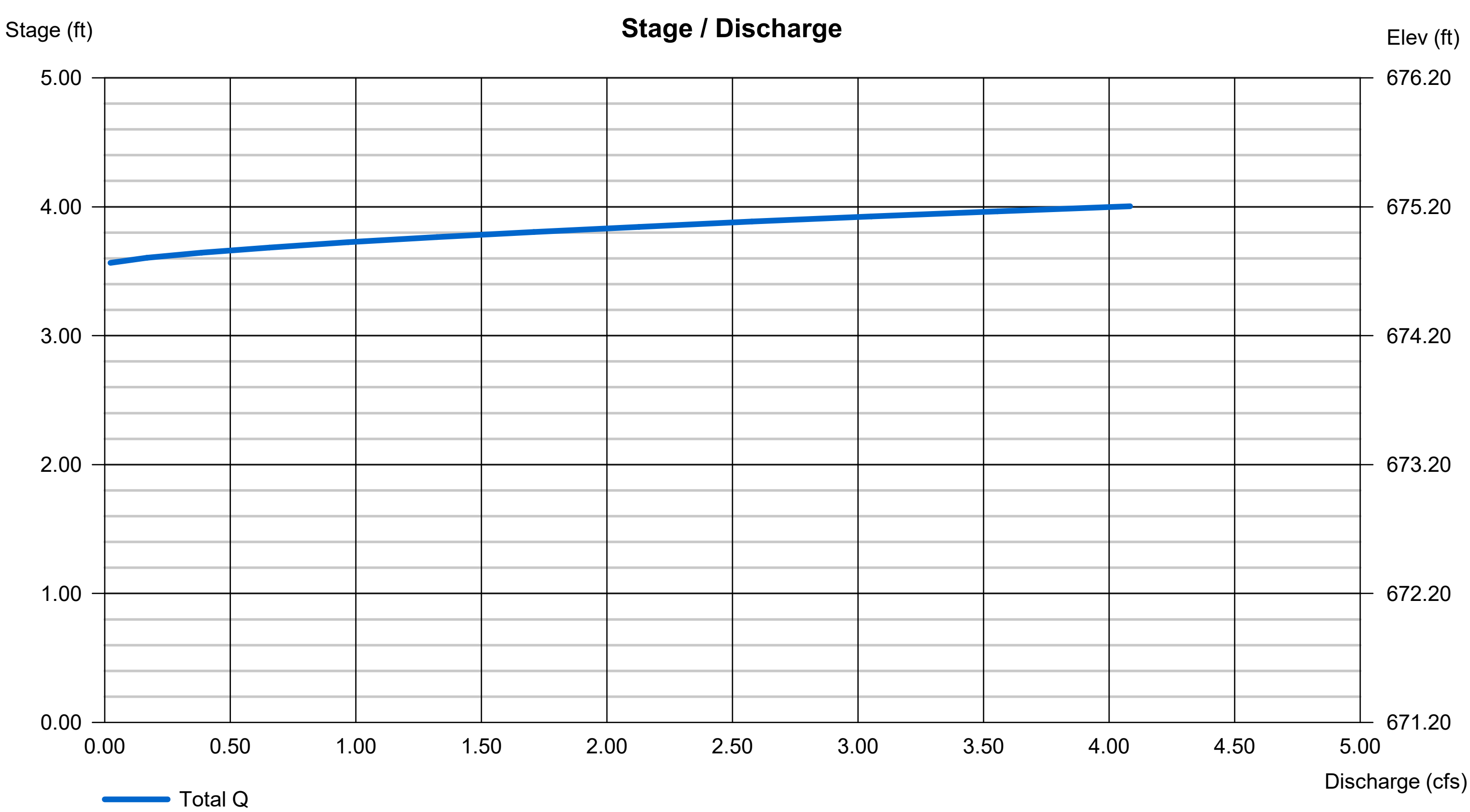
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.00	0.00	0.00	0.00
Crest El. (ft)	= 674.75	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4

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	Manual	6.410	5	970	39,123	------	------	------	Area A
2	Reservoir	6.358	5	970	37,520	1	676.15	2,123	Detention 1 Outflow
3	Manual	13.09	5	970	88,800	------	------	------	Area B
4	Reservoir	3.916	5	980	88,794	3	676.31	12,763	Basin B Outflow
5	Reservoir	3.917	5	985	79,728	4	675.19	9,725	Detention 2 Outflow

23646 Hydraflow.gpw	Return Period: 100 Year	Wednesday, 12 / 6 / 2023

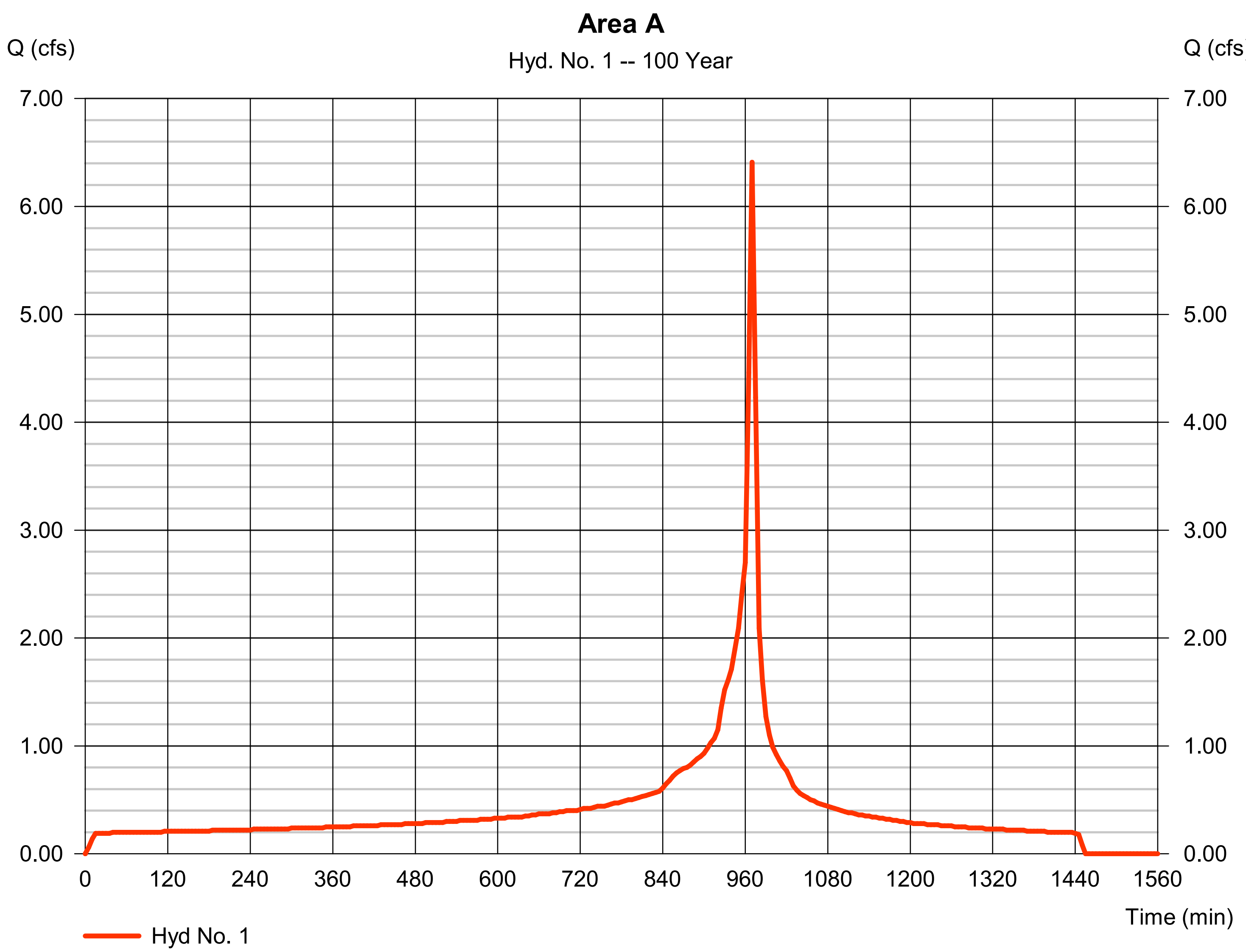
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Wednesday, 12 / 6 / 2023

Hyd. No. 1

Area A

Hydrograph type	= Manual	Peak discharge	= 6.410 cfs
Storm frequency	= 100 yrs	Time to peak	= 970 min
Time interval	= 5 min	Hyd. volume	= 39,123 cuft



Hydrograph Report

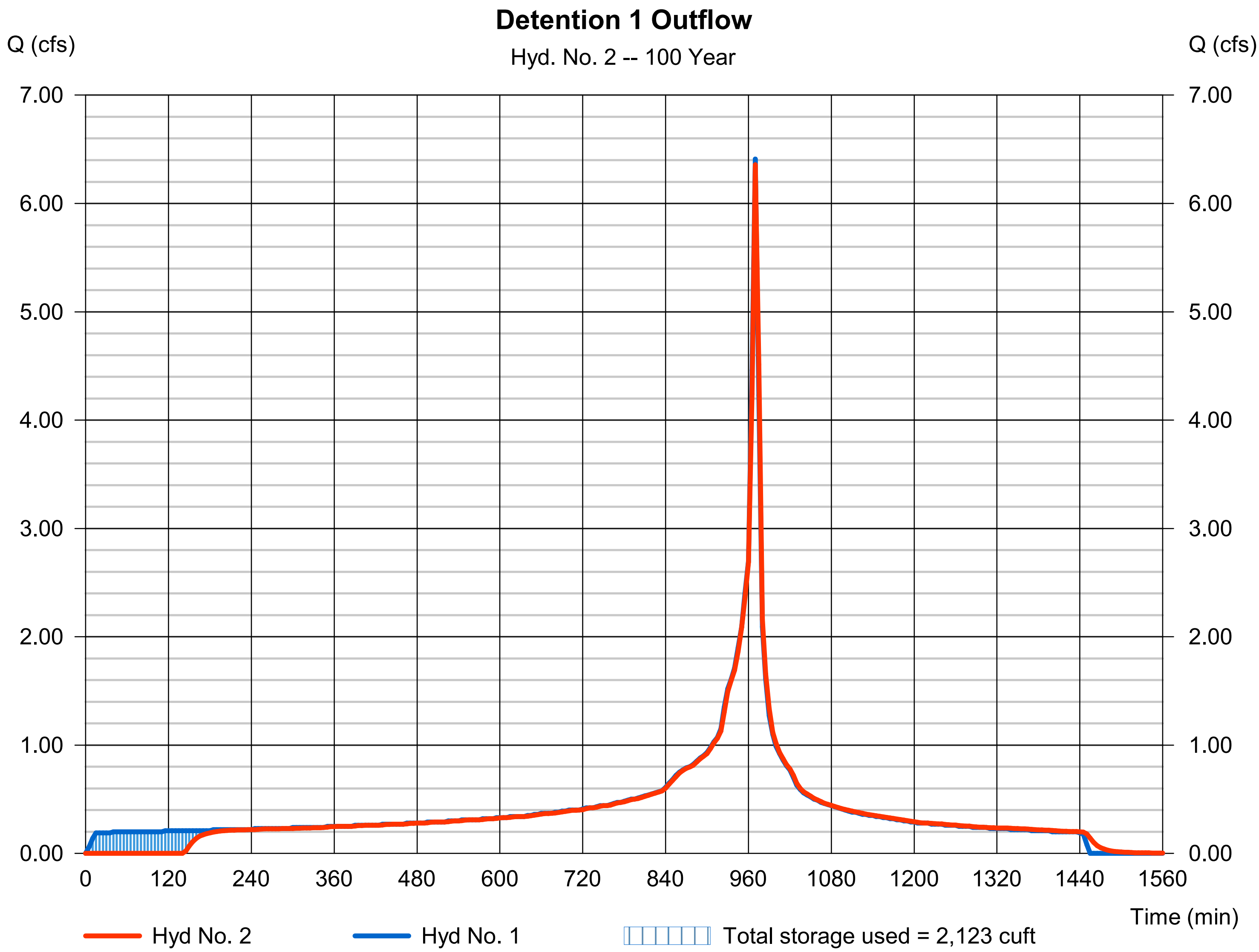
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Wednesday, 12 / 6 / 2023

Hyd. No. 2

Detention 1 Outflow

Hydrograph type	= Reservoir	Peak discharge	= 6.358 cfs
Storm frequency	= 100 yrs	Time to peak	= 970 min
Time interval	= 5 min	Hyd. volume	= 37,520 cuft
Inflow hyd. No.	= 1 - Area A	Max. Elevation	= 676.15 ft
Reservoir name	= Detention 1	Max. Storage	= 2,123 cuft

Storage Indication method used.



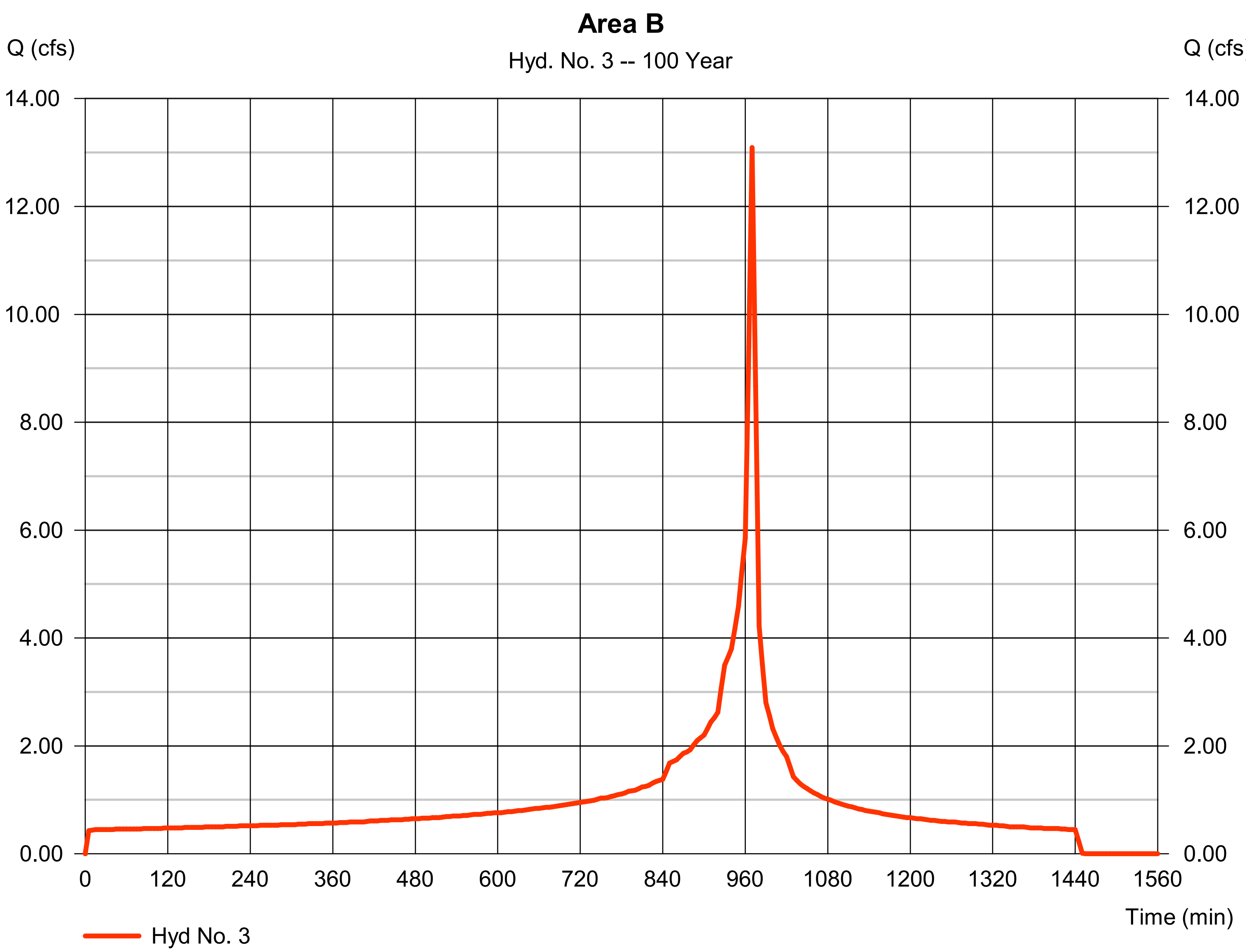
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Wednesday, 12 / 6 / 2023

Hyd. No. 3

Area B

Hydrograph type	= Manual	Peak discharge	= 13.09 cfs
Storm frequency	= 100 yrs	Time to peak	= 970 min
Time interval	= 5 min	Hyd. volume	= 88,800 cuft



Hydrograph Report

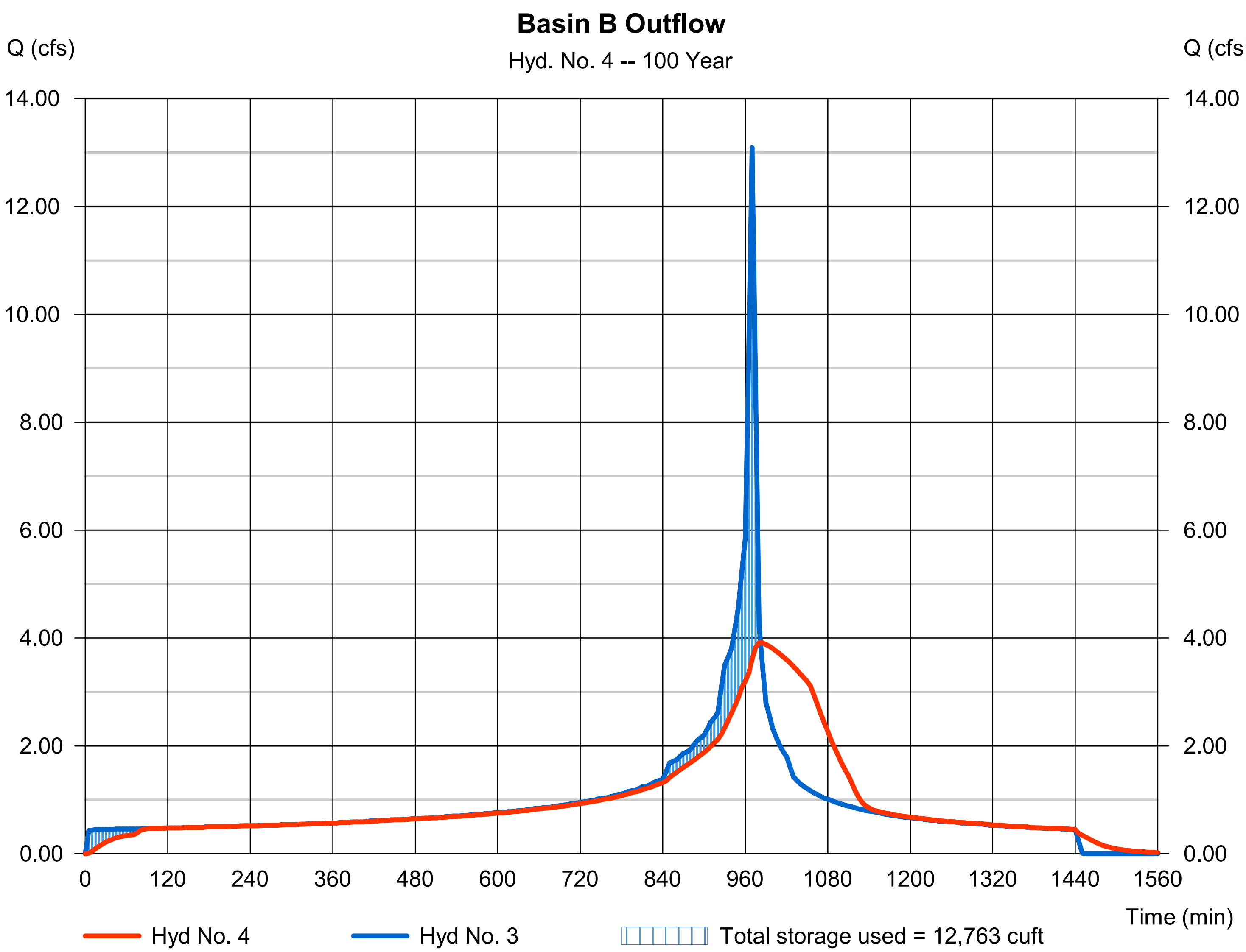
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Wednesday, 12 / 6 / 2023

Hyd. No. 4

Basin B Outflow

Hydrograph type	= Reservoir	Peak discharge	= 3.916 cfs
Storm frequency	= 100 yrs	Time to peak	= 980 min
Time interval	= 5 min	Hyd. volume	= 88,794 cuft
Inflow hyd. No.	= 3 - Area B	Max. Elevation	= 676.31 ft
Reservoir name	= Basin B	Max. Storage	= 12,763 cuft

Storage Indication method used.



Hydrograph Report

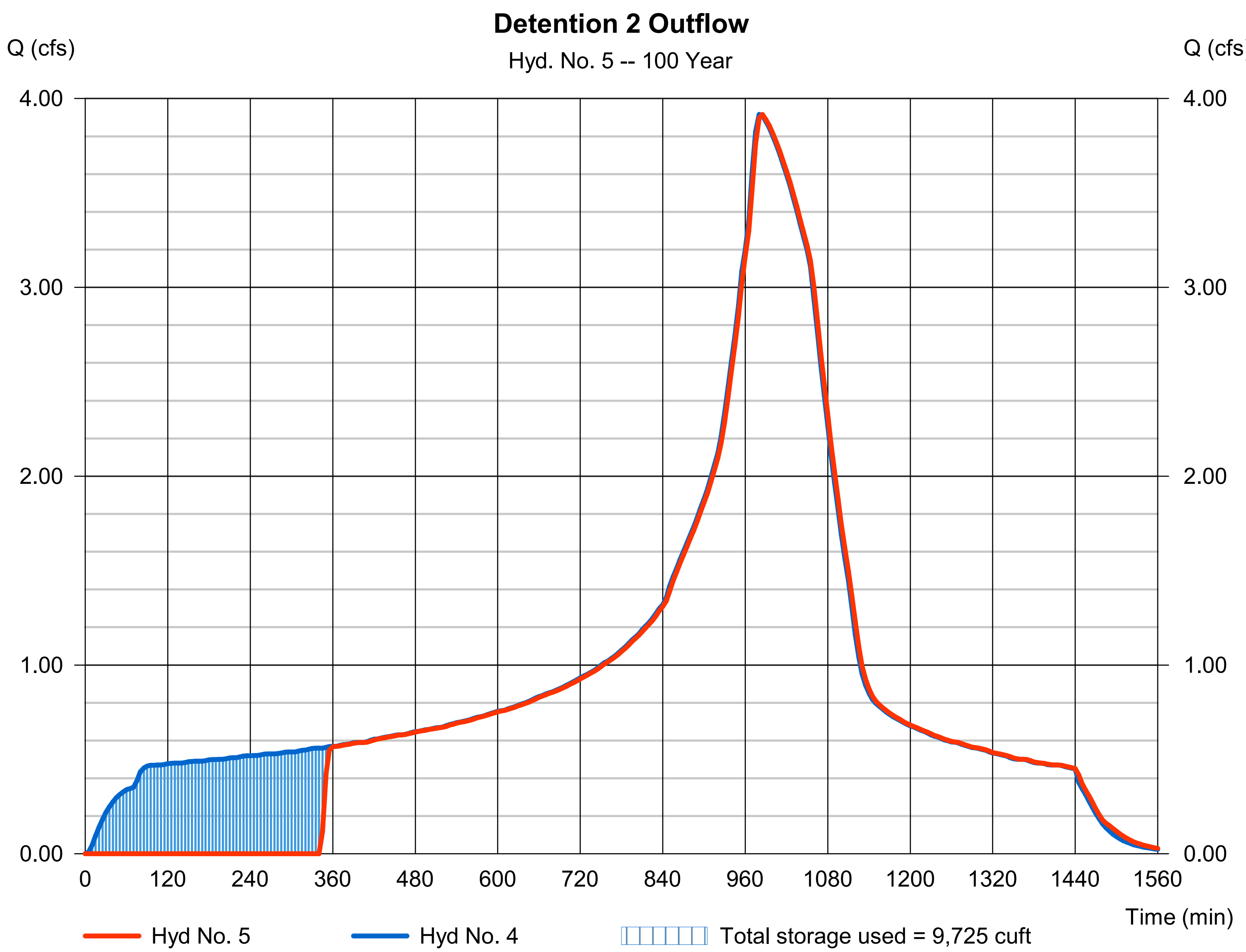
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Wednesday, 12 / 6 / 2023

Hyd. No. 5

Detention 2 Outflow

Hydrograph type	= Reservoir	Peak discharge	= 3.917 cfs
Storm frequency	= 100 yrs	Time to peak	= 985 min
Time interval	= 5 min	Hyd. volume	= 79,728 cuft
Inflow hyd. No.	= 4 - Basin B Outflow	Max. Elevation	= 675.19 ft
Reservoir name	= Detention 2	Max. Storage	= 9,725 cuft

Storage Indication method used.



APPENDIX F
10-year & 100-year Rational Method Calculations
Proposed Condition

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-2015 Advanced Engineering Software (aes)
             Ver. 22.0  Release Date: 07/01/2015  License ID 1510

                           Analysis prepared by:

                           DRC Engineering, Inc.
                   160 South Old Springs Road, Suite 210
                          Anaheim Hills, CA 92808
                                714-685-6860

 ************************** DESCRIPTION OF STUDY **************************
 * REXFORD INDUSTRIAL                                                       *
 * RATIONAL METHOD ANALYSIS                                                 *
 * 10 YEAR STORM EVENT                                                      *
 **************************************************************************

  FILE NAME: 3646P10.DAT
  TIME/DATE OF STUDY: 15:08 12/04/2023
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  5
   1)    5.00;  2.840
   2)   30.00;  1.240
   3)   60.00;  0.927
   4)  180.00;  0.573
   5)  360.00;  0.393
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

+--------------------------------------------------------------------------+
| SUBAREA 100                                                              |
| PROPOSED CONDITION                                                       |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   600.00
  ELEVATION DATA: UPSTREAM(FEET) =    684.80  DOWNSTREAM(FEET) =    679.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.039
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.518
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D        1.24      0.47     0.100    75   10.04
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.47
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.76
  TOTAL AREA(ACRES) =      1.24   PEAK FLOW RATE(CFS) =      2.76

+--------------------------------------------------------------------------+
| NOTE: SUBAREA FLOW INTO ONE (1) CURB CUT OPENING                         |
| SEE RIP RAP CALCULATIONS                                                 |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    201.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.04
  RAINFALL INTENSITY(INCH/HR) =   2.52
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.47
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       1.24
  TOTAL STREAM AREA(ACRES) =       1.24
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.76

+--------------------------------------------------------------------------+
| SUBAREA 200                                                              |
| PROPOSED CONDITION                                                       |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  ELEVATION DATA: UPSTREAM(FEET) =    679.90  DOWNSTREAM(FEET) =    679.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.118
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.448
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "GRASS"                    D        0.09      0.38     1.000    80   11.12
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.38
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.17
  TOTAL AREA(ACRES) =      0.09   PEAK FLOW RATE(CFS) =      0.17

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    201.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.12
  RAINFALL INTENSITY(INCH/HR) =   2.45
  AREA-AVERAGED Fm(INCH/HR) =  0.38
  AREA-AVERAGED Fp(INCH/HR) =  0.38
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =       0.09
  TOTAL STREAM AREA(ACRES) =       0.09
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.17

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.76   10.04    2.518  0.47( 0.05) 0.10       1.2     100.00
      2        0.17   11.12    2.448  0.38( 0.38) 1.00       0.1     200.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.91   10.04    2.518  0.43( 0.07) 0.16       1.3     100.00
      2        2.85   11.12    2.448  0.43( 0.07) 0.16       1.3     200.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       2.91    Tc(MIN.) =    10.04
  EFFECTIVE AREA(ACRES) =       1.32   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.43  AREA-AVERAGED Ap =  0.16
  TOTAL AREA(ACRES) =       1.3
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    201.00 =     600.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    402.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   673.70  DOWNSTREAM(FEET) =   673.10
  FLOW LENGTH(FEET) =   203.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.06
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.91
  PIPE TRAVEL TIME(MIN.) =   1.10    Tc(MIN.) =   11.14
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    402.00 =     803.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    402.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
```

```
============================================================================

+--------------------------------------------------------------------------+
| SUBAREA 300                                                              |
| PROPOSED CONDITION                                                       |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   140.00
  ELEVATION DATA: UPSTREAM(FEET) =    682.70  DOWNSTREAM(FEET) =    680.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.840
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D        0.33      0.47     0.100    75    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.47
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.83
  TOTAL AREA(ACRES) =      0.33   PEAK FLOW RATE(CFS) =      0.83

+--------------------------------------------------------------------------+
| NOTE: SUBAREA FLOW INTO THREE (3) CURB CUT OPENINGS                      |
| SEE RIP RAP CALCULATIONS                                                 |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    401.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.00
  RAINFALL INTENSITY(INCH/HR) =   2.84
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.47
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.33
  TOTAL STREAM AREA(ACRES) =       0.33
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.83

+--------------------------------------------------------------------------+
| SUBAREA 400                                                              |
| PROPOSED CONDITION                                                       |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   115.00
  ELEVATION DATA: UPSTREAM(FEET) =    680.00  DOWNSTREAM(FEET) =    679.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   16.851
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.082
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "GRASS"                    D        0.05      0.38     1.000    80   16.85
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.38
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.08
  TOTAL AREA(ACRES) =      0.05   PEAK FLOW RATE(CFS) =      0.08

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    401.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   16.85
  RAINFALL INTENSITY(INCH/HR) =   2.08
  AREA-AVERAGED Fm(INCH/HR) =  0.38
  AREA-AVERAGED Fp(INCH/HR) =  0.38
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =       0.05
  TOTAL STREAM AREA(ACRES) =       0.05
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.08

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        0.83    5.00    2.840  0.47( 0.05) 0.10       0.3     300.00
      2        0.08   16.85    2.082  0.38( 0.38) 1.00       0.1     400.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        0.86    5.00    2.840  0.44( 0.06) 0.14       0.3     300.00
      2        0.68   16.85    2.082  0.42( 0.09) 0.22       0.4     400.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       0.86    Tc(MIN.) =     5.00
  EFFECTIVE AREA(ACRES) =       0.34   AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.44  AREA-AVERAGED Ap =  0.14
  TOTAL AREA(ACRES) =        0.4
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    401.00 =     140.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   674.40  DOWNSTREAM(FEET) =   673.10
  FLOW LENGTH(FEET) =    24.00   MANNING'S N =  0.013
```

```
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   3.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.80
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.86
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    5.06
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    402.00 =     164.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    402.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        0.86    5.06    2.836  0.44( 0.06) 0.14       0.3     300.00
      2        0.68   16.91    2.078  0.42( 0.09) 0.22       0.4     400.00
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    402.00 =     164.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.91   11.14    2.447  0.43( 0.07) 0.16       1.3     100.00
      2        2.85   12.23    2.377  0.43( 0.07) 0.16       1.3     200.00
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    402.00 =     803.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.40    5.06    2.836  0.44( 0.07) 0.15       0.9     300.00
      2        3.68   11.14    2.447  0.43( 0.07) 0.16       1.7     100.00
      3        3.60   12.23    2.377  0.43( 0.07) 0.17       1.7     200.00
      4        3.16   16.91    2.078  0.43( 0.07) 0.17       1.7     400.00
    TOTAL AREA(ACRES) =          1.7

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =         3.68  Tc(MIN.) =   11.143
  EFFECTIVE AREA(ACRES) =       1.68  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.43  AREA-AVERAGED Ap =  0.17
  TOTAL AREA(ACRES) =        1.7
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    402.00 =     803.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    402.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    502.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   672.90  DOWNSTREAM(FEET) =   672.50
  FLOW LENGTH(FEET) =    79.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.98
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.68
  PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =   11.47
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    502.00 =     882.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    502.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.47
  RAINFALL INTENSITY(INCH/HR) =   2.43
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.43
  AREA-AVERAGED Ap =  0.16
  EFFECTIVE STREAM AREA(ACRES) =       1.68
  TOTAL STREAM AREA(ACRES) =       1.71
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.68

+--------------------------------------------------------------------------+
| SUBAREA 500                                                              |
| PROPOSED CONDITION                                                       |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  ELEVATION DATA: UPSTREAM(FEET) =    682.10  DOWNSTREAM(FEET) =    679.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.840
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D       0.15      0.47     0.100    75    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.47
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.38
  TOTAL AREA(ACRES) =      0.15   PEAK FLOW RATE(CFS) =      0.38

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   676.50  DOWNSTREAM(FEET) =   672.50
  FLOW LENGTH(FEET) =    22.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   1.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.56
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.38
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    5.04
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    502.00 =     122.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    502.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
```

```
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    5.04
 RAINFALL INTENSITY(INCH/HR) =   2.84
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.47
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       0.15
 TOTAL STREAM AREA(ACRES) =       0.15
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.38

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        2.40    5.44    2.812  0.44( 0.07) 0.15       0.9     300.00
     1        3.68   11.47    2.426  0.43( 0.07) 0.16       1.7     100.00
     1        3.60   12.56    2.356  0.43( 0.07) 0.17       1.7     200.00
     1        3.16   17.25    2.056  0.43( 0.07) 0.17       1.7     400.00
     2        0.38    5.04    2.837  0.47( 0.05) 0.10       0.2     500.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        2.63    5.04    2.837  0.44( 0.06) 0.14       1.0     500.00
     2        2.78    5.44    2.812  0.44( 0.06) 0.14       1.1     300.00
     3        4.00   11.47    2.426  0.43( 0.07) 0.16       1.8     100.00
     4        3.91   12.56    2.356  0.43( 0.07) 0.16       1.8     200.00
     5        3.43   17.25    2.056  0.43( 0.07) 0.17       1.9     400.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       4.00    Tc(MIN.) =    11.47
 EFFECTIVE AREA(ACRES) =       1.83   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.43  AREA-AVERAGED Ap =  0.16
 TOTAL AREA(ACRES) =       1.9
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    502.00 =     882.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    502.00 TO NODE    602.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   672.50  DOWNSTREAM(FEET) =   671.90
 FLOW LENGTH(FEET) =   112.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.13
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       4.00
 PIPE TRAVEL TIME(MIN.) =   0.45    Tc(MIN.) =   11.93
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    602.00 =     994.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    602.00 TO NODE    602.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
```

```
  TIME OF CONCENTRATION(MIN.) =   11.93
  RAINFALL INTENSITY(INCH/HR) =   2.40
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.43
  AREA-AVERAGED Ap =  0.16
  EFFECTIVE STREAM AREA(ACRES) =       1.83
  TOTAL STREAM AREA(ACRES) =       1.86
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.00

+--------------------------------------------------------------------------+
| SUBAREA 600                                                              |
| PROPOSED CONDITION                                                       |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    601.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   180.00
  ELEVATION DATA: UPSTREAM(FEET) =    681.90  DOWNSTREAM(FEET) =    677.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.121
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.832
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D        0.35      0.47     0.100    75    5.12
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.47
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.88
  TOTAL AREA(ACRES) =      0.35   PEAK FLOW RATE(CFS) =      0.88

****************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   673.10  DOWNSTREAM(FEET) =   671.90
  FLOW LENGTH(FEET) =      9.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   2.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.65
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.88
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    5.14
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    602.00 =     189.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    602.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.14
  RAINFALL INTENSITY(INCH/HR) =   2.83
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.47
```

```
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.35
  TOTAL STREAM AREA(ACRES) =       0.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.88

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.63    5.54    2.806  0.44( 0.06) 0.14       1.0     500.00
      1        2.78    5.92    2.781  0.44( 0.06) 0.14       1.1     300.00
      1        4.00   11.93    2.397  0.43( 0.07) 0.16       1.8     100.00
      1        3.91   13.01    2.327  0.43( 0.07) 0.16       1.8     200.00
      1        3.43   17.72    2.026  0.43( 0.07) 0.17       1.9     400.00
      2        0.88    5.14    2.831  0.47( 0.05) 0.10       0.3     600.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        3.34    5.14    2.831  0.45( 0.06) 0.13       1.3     600.00
      2        3.49    5.54    2.806  0.45( 0.06) 0.13       1.4     500.00
      3        3.64    5.92    2.781  0.45( 0.06) 0.13       1.4     300.00
      4        4.74   11.93    2.397  0.44( 0.06) 0.15       2.2     100.00
      5        4.63   13.01    2.327  0.44( 0.07) 0.15       2.2     200.00
      6        4.05   17.72    2.026  0.43( 0.07) 0.16       2.2     400.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.74    Tc(MIN.) =    11.93
  EFFECTIVE AREA(ACRES) =       2.18   AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.44  AREA-AVERAGED Ap =  0.15
  TOTAL AREA(ACRES) =        2.2
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    602.00 =     994.00 FEET.

+--------------------------------------------------------------------------+
| NOTE: OUTLET CONTROL STRUCTURE 1                                         |
| PEAK FLOW MITIGATED BY DETENTION 1                                       |
| FOLLOWING IS MANUAL ENTRY FOR MITIGATED PEAK FLOW:                       |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    602.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =   11.93   RAINFALL INTENSITY(INCH/HR) =  2.40
  EFFECTIVE AREA(ACRES) =     2.18
  TOTAL AREA(ACRES) =     2.20        PEAK FLOW RATE(CFS) =      3.86
  AREA-AVERAGED Fm(INCH/HR) =   0.04  AREA-AVERAGED Fp(INCH/HR) =   0.44
  AREA-AVERAGED Ap =  0.10
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
        CONFLUENCE ANALYSES.

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE   1003.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   671.90  DOWNSTREAM(FEET) =   669.30
  FLOW LENGTH(FEET) =     7.00   MANNING'S N =  0.013
```

```
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  20.48
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.86
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   11.94
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE   1003.00 =    1001.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1003.00 TO NODE   1003.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

+--------------------------------------------------------------------------+
| SUBAREA 700                                                              |
| PROPOSED CONDITION                                                       |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    700.00 TO NODE    701.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   425.00
  ELEVATION DATA: UPSTREAM(FEET) =   6825.30  DOWNSTREAM(FEET) =    677.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.840
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D       0.37      0.47     0.100    75    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.47
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.93
  TOTAL AREA(ACRES) =      0.37   PEAK FLOW RATE(CFS) =      0.93

+--------------------------------------------------------------------------+
| NOTE: SUBAREA FLOW INTO ONE (1) CURB CUT OPENING                         |
| SEE RIP RAP CALCULATIONS                                                 |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    701.00 TO NODE   1001.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.00
  RAINFALL INTENSITY(INCH/HR) =   2.84
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.47
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.37
  TOTAL STREAM AREA(ACRES) =       0.37
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.93

+--------------------------------------------------------------------------+
```

```
| SUBAREA 800                                                           |
| PROPOSED CONDITION                                                    |
|                                                                       |
+-----------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    800.00 TO NODE    801.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   345.00
  ELEVATION DATA: UPSTREAM(FEET) =    682.20  DOWNSTREAM(FEET) =    677.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.371
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.688
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D        3.02      0.47     0.100    75    7.37
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.47
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      7.18
  TOTAL AREA(ACRES) =      3.02   PEAK FLOW RATE(CFS) =      7.18

+-----------------------------------------------------------------------+
| NOTE: SUBAREA FLOW INTO SEVEN (7) CURB CUT OPENINGS                   |
| SEE RIP RAP CALCULATIONS                                              |
|                                                                       |
+-----------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    801.00 TO NODE   1001.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.37
  RAINFALL INTENSITY(INCH/HR) =   2.69
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.47
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.02
  TOTAL STREAM AREA(ACRES) =       3.02
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.18

+-----------------------------------------------------------------------+
| SUBAREA 900                                                           |
| PROPOSED CONDITION                                                    |
|                                                                       |
+-----------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    900.00 TO NODE    901.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   375.00
  ELEVATION DATA: UPSTREAM(FEET) =    686.80  DOWNSTREAM(FEET) =    677.30
```

```
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.788
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.726
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D        0.89      0.47     0.100    75    6.79
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.47
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.15
  TOTAL AREA(ACRES) =      0.89   PEAK FLOW RATE(CFS) =      2.15

+--------------------------------------------------------------------------+
| NOTE: SUBAREA FLOW INTO ONE (1) CURB CUT OPENING                         |
| SEE RIP RAP CALCULATIONS                                                 |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    901.00 TO NODE   1001.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.79
  RAINFALL INTENSITY(INCH/HR) =   2.73
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.47
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.89
  TOTAL STREAM AREA(ACRES) =       0.89
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.15

+--------------------------------------------------------------------------+
| SUBAREA 1000                                                             |
| PROPOSED CONDITION                                                       |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE   1000.00 TO NODE   1001.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   155.00
  ELEVATION DATA: UPSTREAM(FEET) =    677.30  DOWNSTREAM(FEET) =    676.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   22.142
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.743
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "GRASS"                    D        0.13      0.38     1.000    80   22.14
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.38
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.16
  TOTAL AREA(ACRES) =      0.13   PEAK FLOW RATE(CFS) =      0.16

****************************************************************************
```

```
  FLOW PROCESS FROM NODE   1001.00 TO NODE   1001.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  4 ARE:
  TIME OF CONCENTRATION(MIN.) =   22.14
  RAINFALL INTENSITY(INCH/HR) =   1.74
  AREA-AVERAGED Fm(INCH/HR) =  0.38
  AREA-AVERAGED Fp(INCH/HR) =  0.38
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =       0.13
  TOTAL STREAM AREA(ACRES) =       0.13
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.16
```

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	0.93	5.00	2.840	0.47(0.05)	0.10	0.4	700.00
2	7.18	7.37	2.688	0.47(0.05)	0.10	3.0	800.00
3	2.15	6.79	2.726	0.47(0.05)	0.10	0.9	900.00
4	0.16	22.14	1.743	0.38(0.38)	1.00	0.1	1000.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 4 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	7.79	5.00	2.840	0.46(0.05)	0.11	3.1	700.00
2	9.83	6.79	2.726	0.46(0.05)	0.11	4.1	900.00
3	10.26	7.37	2.688	0.46(0.05)	0.11	4.3	800.00
4	6.69	22.14	1.743	0.45(0.06)	0.13	4.4	1000.00

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      10.26    Tc(MIN.) =     7.37
  EFFECTIVE AREA(ACRES) =       4.32   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.46  AREA-AVERAGED Ap =  0.11
  TOTAL AREA(ACRES) =        4.4
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE   1001.00 =     425.00 FEET.

+--------------------------------------------------------------------------+
| NOTE: FLOW IS DISTRIBUTED INTO TWO (2) 18" PIPES                         |
| FOLLOWING IS MANUAL PIPE ENTRY                                           |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE   1001.00 TO NODE   1002.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   672.30  DOWNSTREAM(FEET) =   671.10
  FLOW LENGTH(FEET) =   273.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.13
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   2
  PIPE-FLOW(CFS) =      10.26
  PIPE TRAVEL TIME(MIN.) =   1.10    Tc(MIN.) =    8.47
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE   1002.00 =     698.00 FEET.
```

```
+--------------------------------------------------------------------------+
| NOTE: OUTLET CONTROL STRUCTURE 2                                         |
| PEAK FLOW MITIGATED BY DETENTION 2                                       |
| FOLLOWING IS MANUAL ENTRY FOR MITIGATED PEAK FLOW:                       |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE   1002.00 TO NODE   1002.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =    8.47   RAINFALL INTENSITY(INCH/HR) =  2.62
  EFFECTIVE AREA(ACRES) =     4.32
  TOTAL AREA(ACRES) =     4.40        PEAK FLOW RATE(CFS) =      3.24
  AREA-AVERAGED Fm(INCH/HR) =   0.05  AREA-AVERAGED Fp(INCH/HR) =   0.46
  AREA-AVERAGED Ap =  0.11
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
         CONFLUENCE ANALYSES.

****************************************************************************
  FLOW PROCESS FROM NODE   1002.00 TO NODE   1003.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   671.10  DOWNSTREAM(FEET) =   669.30
  FLOW LENGTH(FEET) =   178.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.92
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.24
  PIPE TRAVEL TIME(MIN.) =   0.60    Tc(MIN.) =    9.07
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE   1003.00 =     876.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1003.00 TO NODE   1003.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        3.24    9.07    2.579  0.46( 0.05) 0.11       4.3     700.00
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE   1003.00 =     876.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        3.86   11.94    2.396  0.44( 0.04) 0.10       2.2     100.00
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE   1003.00 =    1001.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        6.40    9.07    2.579  0.45( 0.05) 0.11       6.0     700.00
      2        6.87   11.94    2.396  0.45( 0.05) 0.11       6.5     100.00
    TOTAL AREA(ACRES) =         6.6

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =        6.87  Tc(MIN.) =   11.936
  EFFECTIVE AREA(ACRES) =      6.50  AREA-AVERAGED Fm(INCH/HR) =  0.05
```

```
  AREA-AVERAGED Fp(INCH/HR) =  0.45  AREA-AVERAGED Ap =  0.11
  TOTAL AREA(ACRES) =        6.6
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE   1003.00 =    1001.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1003.00 TO NODE   1004.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   669.30  DOWNSTREAM(FEET) =   669.00
  FLOW LENGTH(FEET) =    40.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.42
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.87
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =   12.06
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE   1004.00 =    1041.00 FEET.

+--------------------------------------------------------------------------+
| DISCHARGE 1                                                              |
| LOW FLOWS: PUMP TO U-CHANNEL                                             |
| HIGH FLOWS: BUBBLE UP IN MANHOLE WITH OPENING TO U-CHANNEL               |
+--------------------------------------------------------------------------+
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        6.6  TC(MIN.) =     12.06
  EFFECTIVE AREA(ACRES) =      6.50  AREA-AVERAGED Fm(INCH/HR)=  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.45  AREA-AVERAGED Ap = 0.107
  PEAK FLOW RATE(CFS)   =       6.87

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        6.40    9.20    2.571  0.45( 0.05) 0.11       6.0     700.00
      2        6.87   12.06    2.388  0.45( 0.05) 0.11       6.5     100.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
____________________________________________________________________________
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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             Ver. 22.0  Release Date: 07/01/2015  License ID 1510

                           Analysis prepared by:

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 ************************* DESCRIPTION OF STUDY *************************
* REXFORD INDUSTRIAL                                                       *
* RATIONAL METHOD ANALYSIS                                                 *
* 100 YEAR STORM EVENT                                                     *
 **************************************************************************

  FILE NAME: 3646P.DAT
  TIME/DATE OF STUDY: 14:50 12/04/2023
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  5
   1)    5.00;  4.560
   2)   30.00;  1.980
   3)   60.00;  1.480
   4)  180.00;  0.856
   5)  360.00;  0.580
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

+--------------------------------------------------------------------------+
| SUBAREA 100                                                              |
| PROPOSED CONDITION                                                       |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   600.00
  ELEVATION DATA: UPSTREAM(FEET) =    684.80  DOWNSTREAM(FEET) =    679.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.039
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.040
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  D        1.24      0.21     0.100    91   10.04
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.21
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      4.49
  TOTAL AREA(ACRES) =      1.24   PEAK FLOW RATE(CFS) =      4.49

+--------------------------------------------------------------------------+
| NOTE: SUBAREA FLOW INTO ONE (1) CURB CUT OPENING                         |
| SEE RIP RAP CALCULATIONS                                                 |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    201.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.04
  RAINFALL INTENSITY(INCH/HR) =   4.04
  AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.21
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       1.24
  TOTAL STREAM AREA(ACRES) =       1.24
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.49

+--------------------------------------------------------------------------+
| SUBAREA 200                                                              |
| PROPOSED CONDITION                                                       |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  ELEVATION DATA: UPSTREAM(FEET) =    679.90  DOWNSTREAM(FEET) =    679.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.118
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.929
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "GRASS"                     D        0.09      0.16     1.000    94   11.12
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.16
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.31
  TOTAL AREA(ACRES) =      0.09   PEAK FLOW RATE(CFS) =      0.31

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    201.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.12
  RAINFALL INTENSITY(INCH/HR) =   3.93
  AREA-AVERAGED Fm(INCH/HR) =  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.16
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =       0.09
  TOTAL STREAM AREA(ACRES) =       0.09
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.31

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        4.49   10.04    4.040  0.21( 0.02) 0.10       1.2     100.00
      2        0.31   11.12    3.929  0.16( 0.16) 1.00       0.1     200.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        4.77   10.04    4.040  0.19( 0.03) 0.16       1.3     100.00
      2        4.67   11.12    3.929  0.19( 0.03) 0.16       1.3     200.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.77    Tc(MIN.) =    10.04
  EFFECTIVE AREA(ACRES) =       1.32   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.19  AREA-AVERAGED Ap =  0.16
  TOTAL AREA(ACRES) =       1.3
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    201.00 =     600.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    402.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   673.70  DOWNSTREAM(FEET) =   673.10
  FLOW LENGTH(FEET) =   203.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.46
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.77
  PIPE TRAVEL TIME(MIN.) =   0.98    Tc(MIN.) =    11.02
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    402.00 =     803.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    402.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
```

```
================================================================================

+------------------------------------------------------------------------------+
| SUBAREA 300                                                                  |
| PROPOSED CONDITION                                                           |
|                                                                              |
+------------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   140.00
  ELEVATION DATA: UPSTREAM(FEET) =    682.70  DOWNSTREAM(FEET) =    680.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.560
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp        Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D        0.33      0.21     0.100    91    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.21
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.35
  TOTAL AREA(ACRES) =      0.33   PEAK FLOW RATE(CFS) =      1.35

+------------------------------------------------------------------------------+
| NOTE: SUBAREA FLOW INTO THREE (3) CURB CUT OPENINGS                          |
| SEE RIP RAP CALCULATIONS                                                     |
|                                                                              |
+------------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    401.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.00
  RAINFALL INTENSITY(INCH/HR) =   4.56
  AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.21
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.33
  TOTAL STREAM AREA(ACRES) =       0.33
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.35

+------------------------------------------------------------------------------+
| SUBAREA 400                                                                  |
| PROPOSED CONDITION                                                           |
|                                                                              |
+------------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   115.00
  ELEVATION DATA: UPSTREAM(FEET) =    680.00  DOWNSTREAM(FEET) =    679.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   16.851
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.337
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "GRASS"                    D        0.05      0.16     1.000    94   16.85
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.16
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.14
  TOTAL AREA(ACRES) =      0.05   PEAK FLOW RATE(CFS) =      0.14

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    401.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   16.85
  RAINFALL INTENSITY(INCH/HR) =   3.34
  AREA-AVERAGED Fm(INCH/HR) =  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.16
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =       0.05
  TOTAL STREAM AREA(ACRES) =       0.05
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.14

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        1.35    5.00    4.560  0.21( 0.02) 0.10       0.3     300.00
      2        0.14   16.85    3.337  0.16( 0.16) 1.00       0.1     400.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        1.41    5.00    4.560  0.19( 0.03) 0.14       0.3     300.00
      2        1.13   16.85    3.337  0.18( 0.04) 0.22       0.4     400.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.41    Tc(MIN.) =     5.00
  EFFECTIVE AREA(ACRES) =       0.34   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.19  AREA-AVERAGED Ap =  0.14
  TOTAL AREA(ACRES) =        0.4
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    401.00 =     140.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   674.40  DOWNSTREAM(FEET) =   673.10
  FLOW LENGTH(FEET) =    24.00   MANNING'S N =  0.013
```

```
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   3.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.71
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.41
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    5.05
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    402.00 =     164.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    402.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q       Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        1.41    5.05    4.555  0.19( 0.03) 0.14       0.3     300.00
      2        1.13   16.91    3.331  0.18( 0.04) 0.22       0.4     400.00
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    402.00 =     164.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
   STREAM       Q       Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        4.77   11.02    3.939  0.19( 0.03) 0.16       1.3     100.00
      2        4.67   12.10    3.827  0.19( 0.03) 0.16       1.3     200.00
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    402.00 =     803.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q       Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        3.94    5.05    4.555  0.19( 0.03) 0.15       1.0     300.00
      2        6.04   11.02    3.939  0.19( 0.03) 0.16       1.7     100.00
      3        5.91   12.10    3.827  0.19( 0.03) 0.17       1.7     200.00
      4        5.18   16.91    3.331  0.19( 0.03) 0.17       1.7     400.00
    TOTAL AREA(ACRES) =         1.7

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =        6.04  Tc(MIN.) =   11.018
  EFFECTIVE AREA(ACRES) =      1.68  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.19  AREA-AVERAGED Ap =  0.17
  TOTAL AREA(ACRES) =        1.7
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    402.00 =     803.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    402.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    502.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   672.90  DOWNSTREAM(FEET) =   672.50
  FLOW LENGTH(FEET) =    79.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.51
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.04
  PIPE TRAVEL TIME(MIN.) =   0.29    Tc(MIN.) =   11.31
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    502.00 =     882.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    502.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.31
  RAINFALL INTENSITY(INCH/HR) =   3.91
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.19
  AREA-AVERAGED Ap =  0.16
  EFFECTIVE STREAM AREA(ACRES) =       1.68
  TOTAL STREAM AREA(ACRES) =       1.71
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.04

+--------------------------------------------------------------------------+
| SUBAREA 500                                                              |
| PROPOSED CONDITION                                                       |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  ELEVATION DATA: UPSTREAM(FEET) =    682.10  DOWNSTREAM(FEET) =    679.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.560
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D        0.15      0.21     0.100    91    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.21
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.61
  TOTAL AREA(ACRES) =      0.15   PEAK FLOW RATE(CFS) =      0.61

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   676.50  DOWNSTREAM(FEET) =   672.50
  FLOW LENGTH(FEET) =    22.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   2.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.87
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.61
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    5.04
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    502.00 =     122.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    502.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
```

```
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==========================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.04
  RAINFALL INTENSITY(INCH/HR) =   4.56
  AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.21
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.15
  TOTAL STREAM AREA(ACRES) =       0.15
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.61

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        3.94    5.38    4.521  0.19( 0.03) 0.15       1.0     300.00
      1        6.04   11.31    3.909  0.19( 0.03) 0.16       1.7     100.00
      1        5.91   12.39    3.797  0.19( 0.03) 0.17       1.7     200.00
      1        5.18   17.21    3.300  0.19( 0.03) 0.17       1.7     400.00
      2        0.61    5.04    4.556  0.21( 0.02) 0.10       0.2     500.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        4.33    5.04    4.556  0.19( 0.03) 0.14       1.0     500.00
      2        4.55    5.38    4.521  0.19( 0.03) 0.14       1.1     300.00
      3        6.56   11.31    3.909  0.19( 0.03) 0.16       1.8     100.00
      4        6.42   12.39    3.797  0.19( 0.03) 0.16       1.8     200.00
      5        5.63   17.21    3.300  0.19( 0.03) 0.17       1.9     400.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       6.56    Tc(MIN.) =    11.31
  EFFECTIVE AREA(ACRES) =       1.83   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.19  AREA-AVERAGED Ap =  0.16
  TOTAL AREA(ACRES) =       1.9
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    502.00 =     882.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    602.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   672.50  DOWNSTREAM(FEET) =   671.90
  FLOW LENGTH(FEET) =   112.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.67
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.56
  PIPE TRAVEL TIME(MIN.) =   0.40    Tc(MIN.) =   11.71
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    602.00 =     994.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    602.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==========================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
```

```
  TIME OF CONCENTRATION(MIN.) =   11.71
  RAINFALL INTENSITY(INCH/HR) =   3.87
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.19
  AREA-AVERAGED Ap =  0.16
  EFFECTIVE STREAM AREA(ACRES) =       1.83
  TOTAL STREAM AREA(ACRES) =       1.86
  PEAK FLOW RATE(CFS) AT CONFLUENCE =        6.56

+--------------------------------------------------------------------------+
| SUBAREA 600                                                              |
| PROPOSED CONDITION                                                       |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    601.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   180.00
  ELEVATION DATA: UPSTREAM(FEET) =    681.90  DOWNSTREAM(FEET) =    677.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.121
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.548
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D        0.35      0.21     0.100    91    5.12
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.21
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.43
  TOTAL AREA(ACRES) =      0.35   PEAK FLOW RATE(CFS) =      1.43

****************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   673.10  DOWNSTREAM(FEET) =   671.90
  FLOW LENGTH(FEET) =      9.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   3.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.80
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.43
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    5.13
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    602.00 =     189.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    602.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.13
  RAINFALL INTENSITY(INCH/HR) =   4.55
  AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.21
```

AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 0.35
TOTAL STREAM AREA(ACRES) = 0.35
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1.43

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	4.33	5.49	4.510	0.19(0.03)	0.14	1.0	500.00
1	4.55	5.81	4.477	0.19(0.03)	0.14	1.1	300.00
1	6.56	11.71	3.868	0.19(0.03)	0.16	1.8	100.00
1	6.42	12.79	3.756	0.19(0.03)	0.16	1.8	200.00
1	5.63	17.62	3.258	0.19(0.03)	0.17	1.9	400.00
2	1.43	5.13	4.546	0.21(0.02)	0.10	0.3	600.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	5.51	5.13	4.546	0.20(0.03)	0.13	1.3	600.00
2	5.74	5.49	4.510	0.20(0.03)	0.13	1.4	500.00
3	5.95	5.81	4.477	0.20(0.03)	0.13	1.5	300.00
4	7.77	11.71	3.868	0.19(0.03)	0.15	2.2	100.00
5	7.59	12.79	3.756	0.19(0.03)	0.15	2.2	200.00
6	6.65	17.62	3.258	0.19(0.03)	0.16	2.2	400.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 7.77 Tc(MIN.) = 11.71
EFFECTIVE AREA(ACRES) = 2.18 AREA-AVERAGED Fm(INCH/HR) = 0.03
AREA-AVERAGED Fp(INCH/HR) = 0.19 AREA-AVERAGED Ap = 0.15
TOTAL AREA(ACRES) = 2.2
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 602.00 = 994.00 FEET.

```
+--------------------------------------------------------------------------+
| NOTE: OUTLET CONTROL STRUCTURE 1                                         |
| PEAK FLOW MITIGATED BY DETENTION 1                                       |
| FOLLOWING IS MANUAL ENTRY FOR MITIGATED PEAK FLOW:                       |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    602.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
```

USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN.) = 11.93 RAINFALL INTENSITY(INCH/HR) = 3.84
EFFECTIVE AREA(ACRES) = 2.18
TOTAL AREA(ACRES) = 2.20 PEAK FLOW RATE(CFS) = 3.86
AREA-AVERAGED Fm(INCH/HR) = 0.04 AREA-AVERAGED Fp(INCH/HR) = 0.44
AREA-AVERAGED Ap = 0.10
NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL CONFLUENCE ANALYSES.

```
****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE   1003.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

ELEVATION DATA: UPSTREAM(FEET) = 671.90 DOWNSTREAM(FEET) = 669.30
FLOW LENGTH(FEET) = 7.00 MANNING'S N = 0.013

```
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  20.48
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.86
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   11.94
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE   1003.00 =    1001.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1003.00 TO NODE   1003.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

+--------------------------------------------------------------------------+
| SUBAREA 700                                                              |
| PROPOSED CONDITION                                                       |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    700.00 TO NODE    701.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   425.00
  ELEVATION DATA: UPSTREAM(FEET) =   6825.30  DOWNSTREAM(FEET) =    677.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.560
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D       0.37      0.21     0.100    91    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.21
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.51
  TOTAL AREA(ACRES) =      0.37   PEAK FLOW RATE(CFS) =      1.51

+--------------------------------------------------------------------------+
| NOTE: SUBAREA FLOW INTO ONE (1) CURB CUT OPENING                         |
| SEE RIP RAP CALCULATIONS                                                 |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    701.00 TO NODE   1001.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.00
  RAINFALL INTENSITY(INCH/HR) =   4.56
  AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.21
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.37
  TOTAL STREAM AREA(ACRES) =       0.37
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.51

+--------------------------------------------------------------------------+
```

```
| SUBAREA 800                                                                |
| PROPOSED CONDITION                                                         |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    800.00 TO NODE    801.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   345.00
  ELEVATION DATA: UPSTREAM(FEET) =    682.20  DOWNSTREAM(FEET) =    677.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.371
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.315
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D        3.02      0.21     0.100    91    7.37
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.21
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     11.67
  TOTAL AREA(ACRES) =      3.02   PEAK FLOW RATE(CFS) =     11.67

+----------------------------------------------------------------------------+
| NOTE: SUBAREA FLOW INTO SEVEN (7) CURB CUT OPENINGS                        |
| SEE RIP RAP CALCULATIONS                                                   |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    801.00 TO NODE   1001.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.37
  RAINFALL INTENSITY(INCH/HR) =   4.32
  AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.21
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.02
  TOTAL STREAM AREA(ACRES) =       3.02
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      11.67

+----------------------------------------------------------------------------+
| SUBAREA 900                                                                |
| PROPOSED CONDITION                                                         |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    900.00 TO NODE    901.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   375.00
  ELEVATION DATA: UPSTREAM(FEET) =    686.80  DOWNSTREAM(FEET) =    677.30
```

```
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.788
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.375
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D       0.89      0.21     0.100    91    6.79
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.21
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      3.49
  TOTAL AREA(ACRES) =      0.89   PEAK FLOW RATE(CFS) =      3.49

+--------------------------------------------------------------------------+
| NOTE: SUBAREA FLOW INTO ONE (1) CURB CUT OPENING                         |
| SEE RIP RAP CALCULATIONS                                                 |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    901.00 TO NODE   1001.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.79
  RAINFALL INTENSITY(INCH/HR) =   4.38
  AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.21
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.89
  TOTAL STREAM AREA(ACRES) =       0.89
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.49

+--------------------------------------------------------------------------+
| SUBAREA 1000                                                             |
| PROPOSED CONDITION                                                       |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE   1000.00 TO NODE   1001.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   155.00
  ELEVATION DATA: UPSTREAM(FEET) =    677.30  DOWNSTREAM(FEET) =    676.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   22.142
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.791
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "GRASS"                    D       0.13      0.16     1.000    94   22.14
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.16
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.31
  TOTAL AREA(ACRES) =      0.13   PEAK FLOW RATE(CFS) =      0.31

****************************************************************************
```

FLOW PROCESS FROM NODE 1001.00 TO NODE 1001.00 IS CODE = 1

>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

==

TOTAL NUMBER OF STREAMS = 4
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 4 ARE:
TIME OF CONCENTRATION(MIN.) = 22.14
RAINFALL INTENSITY(INCH/HR) = 2.79
AREA-AVERAGED Fm(INCH/HR) = 0.16
AREA-AVERAGED Fp(INCH/HR) = 0.16
AREA-AVERAGED Ap = 1.00
EFFECTIVE STREAM AREA(ACRES) = 0.13
TOTAL STREAM AREA(ACRES) = 0.13
PEAK FLOW RATE(CFS) AT CONFLUENCE = 0.31

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	1.51	5.00	4.560	0.21(0.02)	0.10	0.4	700.00
2	11.67	7.37	4.315	0.21(0.02)	0.10	3.0	800.00
3	3.49	6.79	4.375	0.21(0.02)	0.10	0.9	900.00
4	0.31	22.14	2.791	0.16(0.16)	1.00	0.1	1000.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 4 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	12.67	5.00	4.560	0.21(0.02)	0.11	3.1	700.00
2	15.99	6.79	4.375	0.21(0.02)	0.11	4.1	900.00
3	16.70	7.37	4.315	0.21(0.02)	0.11	4.3	800.00
4	10.98	22.14	2.791	0.20(0.03)	0.13	4.4	1000.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 16.70 Tc(MIN.) = 7.37
EFFECTIVE AREA(ACRES) = 4.32 AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.21 AREA-AVERAGED Ap = 0.11
TOTAL AREA(ACRES) = 4.4
LONGEST FLOWPATH FROM NODE 700.00 TO NODE 1001.00 = 425.00 FEET.

+--+
| NOTE: FLOW IS DISTRIBUTED INTO TWO (2) 18" PIPES |
| FOLLOWING IS MANUAL PIPE ENTRY |
+--+

****

FLOW PROCESS FROM NODE 1001.00 TO NODE 1002.00 IS CODE = 41

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

==

ELEVATION DATA: UPSTREAM(FEET) = 672.30 DOWNSTREAM(FEET) = 671.10
FLOW LENGTH(FEET) = 273.00 MANNING'S N = 0.013
ASSUME FULL-FLOWING PIPELINE
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.12
(PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
AT DEPTH = 0.94 * DIAMETER)
GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 2
PIPE-FLOW(CFS) = 16.70
PIPE TRAVEL TIME(MIN.) = 1.10 Tc(MIN.) = 8.47

```
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE   1002.00 =     698.00 FEET.

+--------------------------------------------------------------------------+
| NOTE: OUTLET CONTROL STRUCTURE 2                                         |
| PEAK FLOW MITIGATED BY DETENTION 2                                       |
| FOLLOWING IS MANUAL ENTRY FOR MITIGATED PEAK FLOW:                       |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE   1002.00 TO NODE   1002.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =    8.29   RAINFALL INTENSITY(INCH/HR) =  4.22
  EFFECTIVE AREA(ACRES) =     4.32
  TOTAL AREA(ACRES) =     4.40        PEAK FLOW RATE(CFS) =      3.24
  AREA-AVERAGED Fm(INCH/HR) =   0.05  AREA-AVERAGED Fp(INCH/HR) =   0.46
  AREA-AVERAGED Ap =  0.11
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
         CONFLUENCE ANALYSES.

****************************************************************************
  FLOW PROCESS FROM NODE   1002.00 TO NODE   1003.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   671.10  DOWNSTREAM(FEET) =   669.30
  FLOW LENGTH(FEET) =   178.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.92
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.24
  PIPE TRAVEL TIME(MIN.) =   0.60    Tc(MIN.) =    8.89
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE   1003.00 =     876.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1003.00 TO NODE   1003.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        3.24    8.89    4.158  0.46( 0.05) 0.11       4.3     700.00
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE   1003.00 =     876.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        3.86   11.94    3.844  0.44( 0.04) 0.10       2.2     100.00
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE   1003.00 =    1001.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        6.35    8.89    4.158  0.45( 0.05) 0.11       5.9     700.00
      2        6.85   11.94    3.844  0.45( 0.05) 0.11       6.5     100.00
    TOTAL AREA(ACRES) =         6.6

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
```

```
  PEAK FLOW RATE(CFS) =        6.85  Tc(MIN.) =   11.936
  EFFECTIVE AREA(ACRES) =      6.50  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.45  AREA-AVERAGED Ap =  0.11
  TOTAL AREA(ACRES) =        6.6
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE   1003.00 =    1001.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1003.00 TO NODE   1004.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   669.30  DOWNSTREAM(FEET) =   669.00
  FLOW LENGTH(FEET) =    40.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.42
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.85
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =   12.06
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE   1004.00 =    1041.00 FEET.

+--------------------------------------------------------------------------+
| DISCHARGE 1                                                              |
| LOW FLOWS: PUMP TO U-CHANNEL                                             |
| HIGH FLOWS: BUBBLE UP IN MANHOLE WITH OPENING TO U-CHANNEL               |
+--------------------------------------------------------------------------+
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        6.6  TC(MIN.) =     12.06
  EFFECTIVE AREA(ACRES) =      6.50  AREA-AVERAGED Fm(INCH/HR)=  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.45  AREA-AVERAGED Ap = 0.107
  PEAK FLOW RATE(CFS)   =       6.85

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
      1        6.35    9.02    4.145  0.45( 0.05) 0.11       5.9     700.00
      2        6.85   12.06    3.832  0.45( 0.05) 0.11       6.5     100.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX G

100-year Hydraulic Capacity Calculations

Curb Inlet Analysis
Grate Inlet Analysis
Riser Inlet Analysis
Curb Cut Opening FlowMaster Analysis
Rip Rap Calculations (and SD County Dwg. D-40)

French Valley Crossings
Curb Opening Catch Basin
100 Year Storm Event

Catch Basin Node Number	Opening Length ft	Opening Height ft	Ponding Depth ft	Q_{100} cfs	Area acres	Q/L cfs/ft	Minimum Length ft
601	4.00	0.50	0.50	1.43	0.35	1.10	1.30

Reference: Bureau of Public Roads "Nomograph for Capacity of Curb - Sump Condition - Table L"

Rexford Industrial Grate Inlet Analysis 100 Year Storm Event								
Catch Basin Node Number	Clogging %	Catch Basin Length ft	Catch Basin Width ft	Actual Perimeter ft	Effective Perimeter ft	Q_{100} cfs	Q/P cfs/ft	Head ft
501[1]	33%	1.00	1.00	4.00	2.68	0.31	0.11	0.11

Reference: Bureau of Public Roads "Capacity of Grate Inlet in Sump"

[1]Surface runoff divided between two inlets

Rexford Industrial
Riser Inlet Analysis
100 Year Storm Event

BioPond	Node #	Circular Riser Clogging %	Circular Riser Diameter in	Actual Perimeter ft	Effective Perimeter ft	Q_{100} cfs	Q/P cfs/ft	Head[2] ft	Bottom of Pond elev	Top of Riser elev	W.S.E. of Pond elev	Top of Pond elev
A	201	25%	30	7.85	5.89	4.77	0.81	0.42	677.7	679.2	679.6	679.7
B	1001[1]	25%	30	7.85	5.89	5.57	0.95	0.46	675.3	676.8	677.3	677.3
C	401	25%	30	7.85	5.89	1.41	0.24	0.19	678.7	679.2	679.4	679.7

[1]Surface runoff divided between three inlets

[2]Head derived from weir equation using effective perimeter of the riser opening diameter

Worksheet for NODE 101 - Curb Cut

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.020 ft/ft
Bottom Width	2.00 ft
Discharge	4.49 cfs

Results

Normal Depth	4.1 in
Flow Area	0.7 ft²
Wetted Perimeter	2.7 ft
Hydraulic Radius	3.1 in
Top Width	2.00 ft
Critical Depth	6.5 in
Critical Slope	0.005 ft/ft
Velocity	6.52 ft/s
Velocity Head	0.66 ft
Specific Energy	1.01 ft
Froude Number	1.960
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	4.1 in
Critical Depth	6.5 in
Channel Slope	0.020 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for NODE 301 - Curb Cut x3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.020 ft/ft
Bottom Width	6.00 ft
Discharge	1.35 cfs

Results

Normal Depth	0.9 in
Flow Area	0.5 ft²
Wetted Perimeter	6.2 ft
Hydraulic Radius	0.9 in
Top Width	6.00 ft
Critical Depth	1.4 in
Critical Slope	0.005 ft/ft
Velocity	2.90 ft/s
Velocity Head	0.13 ft
Specific Energy	0.21 ft
Froude Number	1.838
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.9 in
Critical Depth	1.4 in
Channel Slope	0.020 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for NODE 701 - Curb Cut

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.020	ft/ft
Bottom Width	2.00	ft
Discharge	1.51	cfs

Results

Normal Depth	2.0	in
Flow Area	0.3	ft^2
Wetted Perimeter	2.3	ft
Hydraulic Radius	1.7	in
Top Width	2.00	ft
Critical Depth	3.1	in
Critical Slope	0.005	ft/ft
Velocity	4.46	ft/s
Velocity Head	0.31	ft
Specific Energy	0.48	ft
Froude Number	1.910	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.0	in
Length	0.0	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.0	in
Critical Depth	3.1	in
Channel Slope	0.020	ft/ft
Critical Slope	0.005	ft/ft

Worksheet for NODE 801 - Curb Cut x7

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.020 ft/ft
Bottom Width	14.00 ft
Discharge	11.67 cfs

Results

Normal Depth	2.0 in
Flow Area	2.4 ft²
Wetted Perimeter	14.3 ft
Hydraulic Radius	2.0 in
Top Width	14.00 ft
Critical Depth	3.3 in
Critical Slope	0.004 ft/ft
Velocity	4.89 ft/s
Velocity Head	0.37 ft
Specific Energy	0.54 ft
Froude Number	2.088
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	2.0 in
Critical Depth	3.3 in
Channel Slope	0.020 ft/ft
Critical Slope	0.004 ft/ft

Worksheet for NODE 901 - Curb Cut

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.020 ft/ft
Bottom Width	2.00 ft
Discharge	3.49 cfs

Results

Normal Depth	3.5 in
Flow Area	0.6 ft²
Wetted Perimeter	2.6 ft
Hydraulic Radius	2.7 in
Top Width	2.00 ft
Critical Depth	5.5 in
Critical Slope	0.005 ft/ft
Velocity	5.99 ft/s
Velocity Head	0.56 ft
Specific Energy	0.85 ft
Froude Number	1.955
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

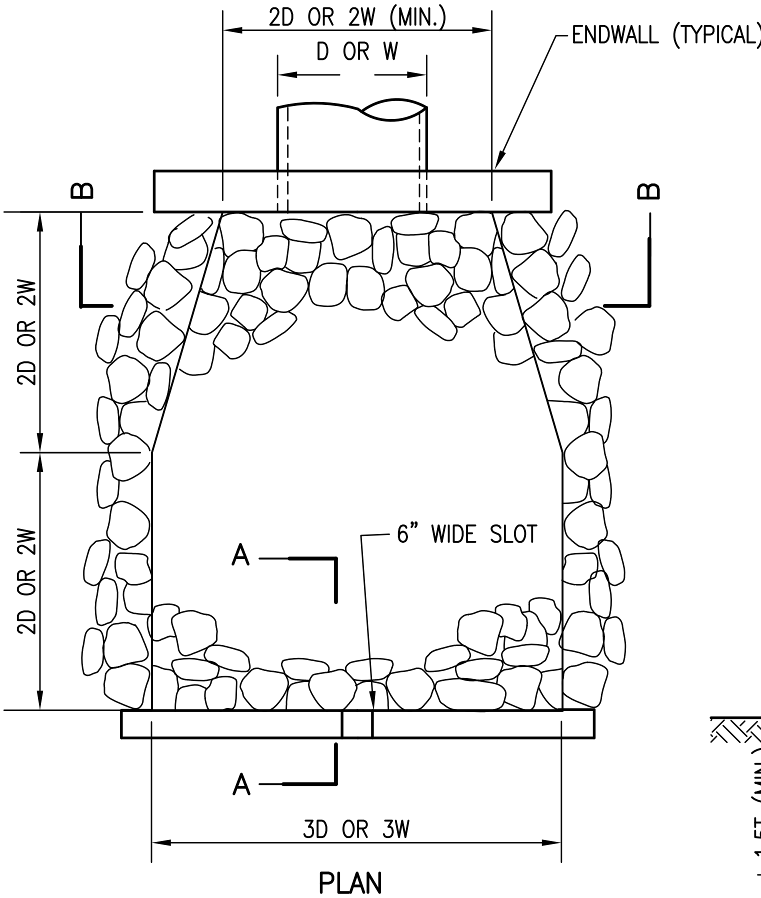
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.5 in
Critical Depth	5.5 in
Channel Slope	0.020 ft/ft
Critical Slope	0.005 ft/ft

French Valley Crossings Rip Rap Calculations 100 Year Storm Event											
Curb Cut	Opening				Ponding		Rip-Rap				
Rip Rap	No.	Width	Height	Q_{100}	Depth[1]	Velocity[1]	Rock Class	Thickness	Length	Width	
Node No.	#	ft	ft	cfs	ft	ft/s		ft	ft	ft	
101	1	2.00	0.50	4.49	0.34	6.52	No. 2 Backing	1.1	8	6	
301[2]	3	2.00	0.50	0.45	0.08	2.90	No. 2 Backing	1.1	3	4	
701[2]	1	2.00	0.67	1.51	0.17	4.46	No. 2 Backing	1.1	6	4	
801[2]	7	2.00	0.67	1.67	0.17	4.89	No. 2 Backing	1.1	6	4	
901	1	2.00	0.67	3.49	0.29	5.99	No. 2 Backing	1.1	8	6	

Reference: San Diego County Drainage Design Manual July 2005, See Dwg. D-40

[1]Ponding depth and Velocity calculated using Bentley FlowMaster channel worksheets

[2]For non-erosive flow (less than 6 ft/s) rip-rap is not required. To be conservative, reduced length rip-rap based on geometric conditions still provided



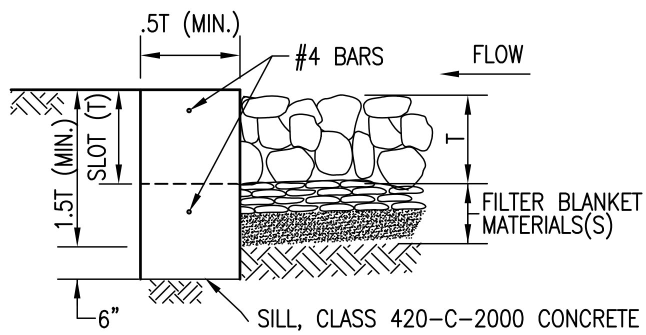
PLAN

TABLE 7–1 (BELOW) PER JULY 2005
SAN DIEGO COUNTY DRAINAGE DESIGN MANUAL

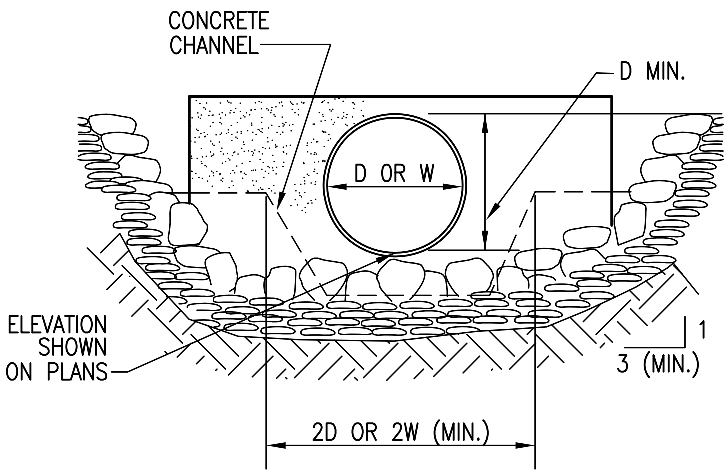
DESIGN VELOCITY (FT/SEC) *	ROCK CLASS	RIP–RAP THICKNESS "T" (MIN)
6–10	NO. 2 BACKING	1.1 FT
10–12	1/4 TON	2.7 FT
12–14	1/2 TON	3.5 FT
14–16	1 TON	4.4 FT
16–18	2 TON	5.4 FT

* OVER 20 FT/SEC REQUIRES SPECIAL DESIGN

D = PIPE DIAMETER ø
W = BOTTOM WIDTH OF CHANNEL



SECTION A–A



SECTION B–B

NOTES

1. PLANS SHALL SPECIFY:
   (A) ROCK CLASS AND RIP–RAP THICKNESS (T). T SHALL BE AT LEAST 1.5 TIMES THE NOMINAL EQUIVALENT DIAMETER OF STONE (d_{50}) OF THE SPECIFIED RIP–RAP.
   (B) FILTER BLANKET MATERIAL, NUMBER OF LAYERS AND THICKNESS.
2. RIP–RAP SHALL BE EITHER QUARRY STONE OR BROKEN CONCRETE (IF SHOWN ON PLANS). COBBLES ARE NOT ACCEPTABLE.
3. RIP–RAP SHALL BE PLACED OVER FILTER BLANKET MATERIAL, WHICH MAY BE EITHER GRANULAR MATERIAL OR NON–WOVEN GEOTEXTILE FILTER FABRIC; MATERIAL AT WEIGHT SPECIFIED IN PLANS OR SPECIFICATIONS.
4. SEE TABLE 200–1.7 IN THE SAN DIEGO REGIONAL SUPPLEMENT TO GREENBOOK FOR SELECTION OF FILTER BLANKET.
5. RIP–RAP ENERGY DISSIPATERS SHALL BE DESIGNATED AS EITHER TYPE 1 OR TYPE 2. TYPE 1 SHALL BE WITH CONCRETE SILL; TYPE 2 SHALL BE WITHOUT SILL.

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Edited	T.R.	T. Regello	10/15
Edited	M.W.	M. Widelski	10/18
Reviewed	RP	S. Engeda	03/22

SAN DIEGO REGIONAL STANDARD DRAWING

RIP RAP
ENERGY DISSIPATER

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

03/24/2022
Chairperson R.C.E. 52241 Date

DRAWING NUMBER **D-40**

APPENDIX H
Geotech Report & Infiltration Testing

GEOTECHNICAL EXPLORATION REPORT
PROPOSED INDUSTRIAL BUILDING
13925 BENSON AVENUE
CHINO, CALIFORNIA

Prepared For **REXFORD INDUSTRIAL REALTY AND MANAGEMENT, INC.**
11620 WILSHIRE BOULEVARD, SUITE 1000
LOS ANGELES, CALIFORNIA 90025

Prepared By **LEIGHTON CONSULTING, INC.**
2600 MICHELSON DRIVE, SUITE 400
IRVINE, CALIFORNIA 92612

Project No. 13807.001

March 17, 2023

Leighton Consulting, Inc.
A Leighton Group Company

March 17, 2023

Project No. 13807.001

Rexford Industrial Realty & Management, Inc.
11620 Wilshire Boulevard, Suite 1000
Los Angeles, California 90025

Attention: Mr. Corey Guerrero

Subject: Geotechnical Exploration Report
Proposed Industrial Building
13925 Benson Avenue
Chino, California

In response to your request and authorization, Leighton Consulting, Inc. (Leighton) has prepared this geotechnical exploration report for the subject project. Based on review of the *Conceptual Site Plan* (A1-0), dated July 19, 2022, we understand the proposed development will include a new one-story industrial building constructed at-grade with a total building area of 150,000 square feet. The proposed building is planned to include dock-high truck loading on the southern side of the building with associated surface parking on the west, south, and east sides of the building. San Bernardino County Fire Department access is also planned around the entire building. Ancillary improvements will likely consist of utility infrastructure, pavement, flatwork, and landscaping.

The purpose of our geotechnical exploration was to evaluate the subsurface conditions at the site, identify potential geologic and seismic hazards that may impact the project, and provide geotechnical recommendations for design and construction of the proposed improvements as currently planned.

Based on the results of our study, the project is considered feasible from a geotechnical standpoint. This report presents the results of our exploration, conclusions and geotechnical design recommendations for the proposed development.

We appreciate the opportunity to be of service to you on this project. If you have any questions or if we can be of further service, please contact us at ***(866) LEIGHTON***; or specifically at the phone extensions or e-mail addresses listed below.

Respectfully submitted,

LEIGHTON CONSULTING, INC.

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ECB/JMP/CCK/lr

Distribution: (1) Addressee

TABLE OF CONTENTS

Section **Page**

1.0 INTRODUCTION ... 1

1.1 Site Description and Proposed Development ... 1
1.2 Purpose and Scope ... 2

2.0 GEOTECHNICAL FINDINGS ... 5

2.1 Regional Geologic Setting ... 5
2.2 Surficial Geology ... 5
2.3 Subsurface Soil Conditions ... 5

2.3.1 Expansive Soil Characteristics ... 6
2.3.2 Soil Corrosivity ... 7
2.3.3 Soil Compressibility ... 7
2.3.4 Shear Strength ... 7
2.3.5 Excavation Characteristics ... 8

2.4 Groundwater Conditions ... 8

2.4.1 Infiltration ... 8

2.5 Surface Fault Rupture ... 10
2.6 Strong Ground Shaking ... 10
2.7 Liquefaction Potential ... 11
2.8 Seismically-Induced Settlement ... 12
2.9 Lateral Spreading ... 12
2.10 Earthquake-Induced Landsliding ... 12
2.11 Flooding ... 13
2.12 Seiches and Tsunamis ... 13
2.13 Methane ... 13

3.0 GEOTECHNICAL DESIGN RECOMMENDATIONS ... 14

3.1 Site Grading ... 14

3.1.1 Site Preparation ... 15
3.1.2 Removals and Overexcavations ... 15
3.1.3 Excavation Bottom Preparation ... 16
3.1.4 Fill Materials ... 16
3.1.5 Fill Placement and Compaction ... 17
3.1.6 Shrinkage ... 17
3.1.7 Reuse of Concrete and Asphalt Rubble ... 17

3.2 Foundation Design ... 18
3.3 Slabs-on-Grade ... 19
3.4 Cement Type and Corrosion Protection ... 20
3.5 Retaining Walls ... 20

3.5.1 Sliding and Overturning 21
3.5.2 Drainage 21
3.6 Paving 22
3.6.1 Asphalt Concrete 22
3.6.2 Portland Cement Concrete Paving 23
3.6.3 Base Course 23
3.7 Temporary Excavations 24
3.8 Trench Backfill 24
3.9 Drainage and Landscaping 25
3.10 Additional Geotechnical Services 25
4.0 LIMITATIONS 26
5.0 REFERENCES 27

Tables

Table 1 – Measured (Unfactored) Infiltration Rate 9
Table 2 – 2022 CBC Based Ground Motion Parameters (Mapped Values) 11
Table 3 – Retaining Wall Design Earth Pressures 20
Table 4 – Asphalt Concrete Pavement Sections 22
Table 5 – PCC Pavement Sections 23

Attachments

Important Information About Your Geotechnical Engineering Report Rear of Text

Figure 1 – Site Location Map Rear of Text
Figure 2 – Exploration Location Map Rear of Text
Figure 3 – Regional Geology Map Rear of Text
Figure 4 – Regional Fault Map and Historical Seismicity Map Rear of Text
Figure 5 – Flood Hazard Zone Map Rear of Text
Figure 6 – Dam Inundation Map Rear of Text
Figure 7 – Retaining Wall Backfill and Subdrain Detail (EI≤50) Rear of Text

Appendix A – Exploration Logs
Appendix B – Percolation Test Data
Appendix C – Laboratory Test Results
Appendix D – Earthwork and Grading Guide Specifications

1.0 INTRODUCTION

1.1 Site Description and Proposed Development

The project site is located at 13925 Benson Avenue in the city of Chino, San Bernardino County, California. The site location (latitude 34.0003°, longitude -117.6792°) and immediate vicinity are shown on Figure 1, *Site Location Map.*

The project site is rectangular in shape and covers approximately 6.6 acres. The site is bordered by Benson Avenue to the west, existing industrial properties to the north and east, and a Southern California Edison (SCE) substation to the south. Access to the site is via Benson Avenue from the west. The site is currently occupied by one (1) existing industrial building with several mobile trailers, storage containers, various equipment storage areas, and associated paved surface parking and access.

The project site is relatively flat with sheet flow generally directed to the south over paved surfaces to curbs and gutters. Review of the United States Geological Survey (USGS) 7.5-Minute Ontario Quadrangle (USGS, 1981) indicates the ground surface at the site is between approximately Elevation (El.) +680 to +690 feet mean sea level (msl).

Based on review of historic aerial photographs (NETR, 2023), the site was vacant, undeveloped land until at least 1966. Between approximately 1966 and 1972, the existing building located in the central portion of the site was constructed to its current configuration.

Based on *Conceptual Site Plan* (Sheet A1-0), dated July 19, 2022, and discussions with you, we understand the proposed development concept for the site consists of a new one-story industrial building constructed at-grade with a total building area of 150,000 square feet. The proposed building is planned to include dock-high truck loading on the southern side of the building with associated surface parking on the west, south, and east sides of the building. San Bernardino County Fire Department access is also planned around the entire building. Ancillary improvements will likely consist of utility infrastructure, pavement, flatwork, and landscaping. Preliminary structural loading information was not yet available at the time this report was prepared.

1.2 Purpose and Scope

The purpose of our geotechnical exploration was to evaluate the subsurface conditions at the site relative to the proposed development concept and provide geotechnical recommendations to aid in the design and construction for the project as currently planned. The scope of this geotechnical exploration included the following tasks:

- *Background Review* – We reviewed readily available in-house geotechnical reports, literature, aerial photographs, and maps relevant to the site. We evaluated geological hazards and potential geotechnical issues that may significantly impact the site. The documents reviewed are listed in Section 5.0.

- *Pre-Field Exploration Activities* – A site visit was performed by a member of our technical staff to mark the proposed exploration locations. Dig Alert (811) was notified to locate and mark existing underground utilities prior to our subsurface exploration.

- *Field Exploration* – Our subsurface exploration was performed on February 7, 2023 and included drilling, logging, and sampling of five (5) hollow-stem auger borings (designated LB-1 through LB-5) to approximate depths between 31½ and 51½ feet below the existing ground surface (bgs). Two (2) additional borings (designated LP-1 and LP-2) were drilled to an approximate depth of 10 feet bgs, respectively, for subsequent percolation testing. The approximate locations of the explorations are shown on Figure 2, *Exploration Location Map.* The boring logs are presented in Appendix A, *Exploration Logs.*

  During drilling of the hollow-stem auger borings, bulk and drive samples were obtained from the borings for geotechnical laboratory testing. Driven ring samples were collected from the borings using a Modified California ring-lined sampler conducted in accordance with ASTM Test Method D 3550. Standard Penetration Tests (SPTs) were also performed within the borings in accordance with ASTM Test Method D 1586. Samples were collected at 2½ and 5-foot intervals throughout the depth of exploration. In both test methods, the sampler is driven below the bottom of the borehole by a 140-pound weight (hammer) free-falling 30 inches. The drilling rig was equipped with an automatic hammer to provide greater consistency in the drop height and striking frequency. The number of blows to drive the sampler the final 12-inches of the 18-inch drive interval is termed the “blowcount” or SPT N-value. The N-values provide a measure of relative density in granular (non-cohesive) soils and comparative consistency in cohesive soils. The number of blows per 6 inches of penetration was recorded on the boring logs, see Appendix A, *Exploration Logs*.

The borings were logged in the field by a geologist from our firm. Each soil sample collected was reviewed and described in accordance with the Unified Soil Classification System (USCS). The samples were sealed and packaged for transportation to our laboratory. After completion of drilling, the borings were backfilled with soil cuttings and patched with cold-mix asphalt concrete at the surface.

- *Percolation Testing* – Borings LP-1 and LP-2 were converted to temporary percolation test wells upon completion of drilling and sampling. The test wells consisted of 2-inch slotted (0.020”) PVC well casing surrounded by #3 Monterey Sand placed in the annulus of the well within the test zone. In-situ percolation testing was performed on February 8, 2023 in general accordance with *San Bernardino County Technical Guidance Document (TGD) for Water Quality Management Plans* (2013). The results of the percolation testing are presented in Appendix B, *Percolation Test Data*. Refer to the discussion of infiltration rate presented in Section 2.4.1, *Infiltration*. Upon completion of the percolation testing, the well casing was removed from each boring and the borings were backfilled with soil cuttings and patched at the surface with cold-mix asphalt concrete to match existing site conditions.

- *Laboratory Testing* – Laboratory tests were performed on selected soil samples obtained from the borings during our field investigation. The laboratory testing program was designed to evaluate the physical and engineering characteristics of the onsite soil. Tests performed during this investigation include:

  - In- situ Moisture Content and Dry Density (ASTM D2216 and ASTM D2937);
  - Maximum Dry Density (ASTM D 1557);
  - Expansion Index (ASTM D 4829);
  - Atterberg Limits (ASTM D 4318);
  - Direct Shear (ASTM D 3080);
  - Consolidation (ASTM D 2435);
  - R-value; and
  - Corrosivity Suite – pH, Sulfate, Chloride, and Resistivity (California Test Methods 417, 422, and 532/643).

Results of the in-situ moisture content and dry density testing are presented on the boring logs in Appendix A. Other laboratory test results are presented in Appendix C, *Laboratory Test Results*

- *Engineering Analysis* – The data obtained from our background review and field exploration were evaluated and analyzed to develop recommendations for the proposed development.

- *Report Preparation* – This report presents our findings, conclusions, and recommendations for the proposed development.

2.0 GEOTECHNICAL FINDINGS

2.1 Regional Geologic Setting

The project site is located in the southwestern portion of the Chino Basin in the northern portion of the Peninsular Ranges geomorphic province of California. Major structural features surround this region, including the Cucamonga fault and the San Gabriel Mountains to the north, the Chino fault and Puente/Chino Hills to the west, and the San Jacinto fault to the east. This is an area of large-scale crustal disturbance as the relatively northwestward moving Peninsular Ranges province collides with the Transverse Ranges province (San Gabriel Mountains) to the north. Several active and potentially active faults have been mapped in the region and are believed to accommodate compression associated with this collision. The Sierra Madre fault, a major structural feature along the southern flank of the San Gabriel Mountains, is located approximately 9.5 miles northwest of the site. This fault, as well as other faults in the region, has the potential for generating strong ground motions at the project site. Further discussion of faulting relative to the site is provided in Section 3.1, Faulting and Seismicity, of this report.

The site is located in an area underlain by thick accumulations of alluvial sand, silt, gravel, cobbles, and boulders eroded from the mountains and deposited in the site vicinity by the Santa Ana River and smaller tributaries such as the San Antonio Creek and Cucamonga Creek (Morton and Miller, 2006; Dibblee, 2002).

2.2 Surficial Geology

The Quaternary-age deposits that cover the floor and margins of the Chino Basin at the surface are mapped to be composed primarily of recent (middle Holocene) young alluvial fan deposits. These young sediments consist predominately of slightly to moderately consolidated silt, sand and coarse-grained sand to boulder alluvial deposits derived from the surrounding mountains and hills with finer clays and silts deposited into the basin over the broad floodplain. The surficial geologic units mapped in the vicinity of the project site are shown on Figure 3, *Regional Geology Map*.

2.3 Subsurface Soil Conditions

Based on our subsurface explorations, the site is underlain by a layer of undocumented artificial fill materials (Afu) overlying Quaternary-aged (middle Holocene) young alluvial fan deposits (Qyf). A layer of undocumented artificial fill

(Afu) on the order of approximately 2 to 3 feet in thickness was encountered at the explored locations overlying natural alluvial soils. The fill materials encountered generally consist of dark brown silty sand and are likely associated with the existing and previous site improvements. Localized thicker accumulations of the fill materials should be anticipated between explored locations during future earthwork construction, particularly below the existing structures. Since there is no documentation for the placement, compaction and testing of the existing fill onsite, the artificial fill is considered undocumented and unsuitable for structural support in its current condition.

Below the artificial fill materials, Quaternary-aged young alluvial fan deposits (Qyf) were encountered in the borings to the maximum depth explored (51½ feet bgs). The alluvial materials encountered generally consist of light gray to grayish brown, moist, soft to hard clay, silt, and silty clay to light gray to yellowish brown, moist, medium dense to very dense silty sand and sand with variable amounts of gravel.

Detailed descriptions of the subsurface soils encountered in the borings are presented on the logs included in Appendix A. Some of the engineering properties of these soils are described in the following sections. The locations of the borings are shown on Figure 2.

2.3.1 Expansive Soil Characteristics

Expansive soils contain significant amounts of clay particles that swell considerably when wetted and which shrink when dried. Foundations constructed on these soils are subject to uplifting forces caused by the swelling. Without proper mitigation measures, heaving and cracking of both building foundations and slabs-on-grade could result.

One (1) near-surface bulk soil sample obtained during our subsurface exploration was tested for expansion potential. The test results indicate an Expansion Index (EI) value of 6 (“very low” potential for expansion). The Expansion Index laboratory test results are included in Appendix C of this report.

Variance in expansion potential of onsite soil is anticipated; therefore, additional testing is recommended upon completion of site grading and excavation to confirm the expansion potential presented in this report. For purposes of this report and based upon visual characterization of alluvial materials at approximate foundation depth, very low expansion potential of site materials may be considered to support design and verified upon completion of earthwork grading.

2.3.2 Soil Corrosivity

One (1) near-surface bulk soil sample obtained during our subsurface exploration was tested for corrosivity to assess corrosion potential to buried concrete. The chemical analysis test results for the onsite soil from our geotechnical exploration are included in Appendix C of this report.

The test results indicate a soluble sulfate concentration of 156 parts per million (ppm), chloride content of 40 ppm, pH value of 7.80, and minimum resistivity value of 5,600 ohm-cm.

The results of the resistivity tests indicate the underlying soil is mildly corrosive to buried ferrous metals per ASTM STP 1013. Based on the measured water-soluble sulfate contents from the soil samples, concrete in contact with the soil is expected to have moderate exposure to sulfate attack (S1) per ACI 318 (ACI, 2014). The samples tested for water-soluble chloride content indicate a low potential for corrosion of steel in concrete due to the chloride content of the soil. Concrete below grade is assigned a chloride exposure class C1 due to its likely exposure to moisture.

2.3.3 Soil Compressibility

Three (3) samples of the onsite soils recovered from the borings were subjected to consolidation testing to evaluate the compressibility of these materials under assumed loads representative of anticipated structural bearing stresses. The results of testing indicate these soils exhibit a low to moderate compressibility potential. The results of testing are presented in Appendix C.

2.3.4 Shear Strength

Evaluation of the shear strength characteristics of the soils included laboratory direct shear testing on three (3) samples of the onsite soils recovered from the borings. The results of testing are included in Appendix

C as well as summary graphs that provide values of angle of internal friction (ø) and cohesion (c) for use in geotechnical analysis.

2.3.5 Excavation Characteristics

Based on our subsurface explorations performed at the site and our experience from grading jobs in the vicinity of the site, we anticipate the onsite artificial fill and alluvial materials can generally be excavated using conventional excavation equipment in good operating condition.

The soils within the planned excavation depths are variable, and locally consist of layers that contain granular, unconsolidated soils with little or no cementation and few fines. These materials are prone to cave in or collapse in unshored excavations. See Section 3.7, *Temporary Excavations* for additional information on soil type and excavation characteristics.

2.4 Groundwater Conditions

Groundwater was not encountered during our subsurface exploration performed at the site to the maximum depth of 51½ feet bgs. Based on review of information available from the Chino Basin Watermaster (2016), groundwater depth at the site is anticipated to be greater than 100 feet bgs. In addition, based on review of available information from the California Department of Water Resources (DWR, 2023) for a nearby groundwater monitoring well located approximately 2.1 miles east of the project site (Local Well Name CHINO-1208672), the shallowest groundwater level measured for a monitoring period between September 2011 and April 2022 was approximately 135 feet bgs in April 2020.

Based on these findings, groundwater is not expected to pose a constraint during or after construction. Fluctuations of the groundwater level, localized zones of perched water, and an increase in soil moisture, should be anticipated during and following the rainy seasons or periods of locally intense rainfall or storm water runoff, or from stormwater infiltration.

2.4.1 Infiltration

Percolation testing was performed in temporary wells installed within borings LP-1 and LP-2 located in the southwestern and southeastern portions of the site to evaluate the infiltration characteristics of subsurface soils. The percolation tests were conducted in general accordance with the *San*

Bernardino County Technical Guidance Document (TGD) for Water Quality Management Plans (2013). Results of the percolation testing are presented in Appendix B. The test locations and zones tested are shown on Figure 2.

A boring percolation test is useful for field measurements of the infiltration rate of soils, and is suited for testing when the design depth of the infiltration device is deeper than current existing grades, especially in areas where it is difficult to dig test pits, or where the depths of these test pits would be considerably deep. At the subject site, testing consisted of advancing the borings to general depths anticipated for the invert of typical infiltration devices.

The falling-head test method was employed for test wells LP-1 and LP-2 in which the volume of discharge was calculated by adding the total volume of water that dropped within the PVC pipe and within the annulus, and incorporating a porosity reduction factor to account for the porosity of the annulus material. The flow area was based on the average water height within the slotted pipe section of the test well. The infiltration rate was calculated by dividing the rate of discharge by the infiltration surface area, or flow area.

Detailed results of the field testing and measured infiltration rate for the tests performed are presented in Appendix B. The test results are summarized in the table below:

Table 1 – Measured (Unfactored) Infiltration Rate

Test Well Designation	Approximate Depth of Test Zone (feet bgs)	Measured Infiltration Rate (inches per hour)
LP-1	5 to 10	0.09
LP-2	5 to 10	0.05

Based on the results of our field percolation testing that was performed at the site, the measured (unfactored) infiltration rates for the two (2) tests performed were 0.09 inch per hour (LP-1) and 0.05 inch per hour (LP-2), respectively. According to the *San Bernardino County Technical Guidance Document (TGD) for Water Quality Management Plans* (2013), the measured infiltration rate at both test well locations do **not** meet the minimum feasibility criteria of 0.3 inch per hour. Therefore, due to the unfavorable infiltration characteristics of the subsurface at the tested locations and depths, stormwater infiltration is not feasible at the subject site.

2.5 Surface Fault Rupture

Our review of available literature indicates that no known active faults have been mapped across the site, and the site is **not** located within a currently established *Alquist-Priolo Earthquake Fault Zone* (CGS, 2018; Bryant and Hart, 2007). Therefore, a surface fault rupture hazard evaluation is not mandated for this site and the potential for surface fault rupture at the site is expected to be low.

The location of the closest active faults to the site was evaluated using the United States Geological Survey (USGS) Earthquake Hazards Program National Seismic Hazard Maps (USGS, 2008b). The closest active faults to the site with the potential for surface fault rupture are the Chino fault, San Jose fault and Elsinore Fault Zone located approximately 2.4 miles, 6.5 miles and 8.7 miles from the site, respectively. The San Andreas fault, which is the largest active fault in California, is approximately 22 miles northeast of the site. Major regional faults with surface expression in proximity to the site are shown on Figure 4, *Regional Fault and Historic Seismicity Map*.

2.6 Strong Ground Shaking

The principal seismic hazard to the site is ground shaking resulting from an earthquake occurring along any of several major active and potentially active faults in southern California (Figure 4). The intensity of ground shaking at a given location depends primarily upon the earthquake magnitude, the distance from the source, and the site response characteristics.

Accordingly, design of the project should be performed in accordance with all applicable current codes and standards utilizing the appropriate seismic design parameters to reduce seismic risk as defined by California Geological Survey (CGS) Chapter 2 of Special Publication 117A (CGS, 2008). The 2022 edition of the California Building Code (CBC) is the current edition of the code. Through compliance with these regulatory requirements and the utilization of appropriate seismic design parameters selected by the design professionals, potential effects relating to seismic shaking can be reduced.

The following code-based seismic parameters should be considered for design under the 2022 CBC:

Table 2 – 2022 CBC Based Ground Motion Parameters (Mapped Values)

Categorization/Coefficient	Value
Site Latitude	34.0003°
Site Longitude	-117.6792°
Site Class	D
Mapped Spectral Response Acceleration at Short Period (0.2 sec), S_S	1.682 g
Mapped Spectral Response Acceleration at Long Period (1 sec), S_1	0.6 g
Short Period (0.2 sec) Site Coefficient, F_a	1.0
Long Period (1 sec) Site Coefficient, F_v	1.7[1]
Adjusted Spectral Response Acceleration at Short Period (0.2 sec), S_{MS}	1.682 g
Adjusted Spectral Response Acceleration at Long Period (1 sec), S_{M1}	1.02 g[1]
Design Spectral Response Acceleration at Short Period (0.2 sec), S_{DS}	1.122 g
Design Spectral Response Acceleration at Long Period (1 sec), S_{D1}	0.68 g[1]
Site-adjusted geometric mean Peak Ground Acceleration, PGA_M	0.757 g

[1]See Section 11.4.8 of ASCE 7-16. A site-specific ground motion hazard analysis in accordance with Section 21.2 of ASCE 7-16 is required for this site. Per Supplement 3 to ASCE 7-16, a site-specific ground motion hazard analysis is not required where the value of the parameters SM1 and SD1 in the table are increased by 50%.

2.7 Liquefaction Potential

The term liquefaction is generally referenced to loss of strength and stiffness in soils due to build-up of pore water pressure when subject to cyclic or monotonic loading. Both sandy and clayey soils are susceptible to loss of strength and stiffness. Because of the difference in strength characteristic and methods for evaluating strength loss potential for granular and clayey soils, the term liquefaction is used for granular soils while cyclic softening is used for fine-grained soils (i.e. clays and plastic silts).

In general, adverse effects of liquefaction or cyclic softening include excessive ground settlement, loss of bearing support for structural foundations, and seismically-induced lateral ground deformations such as lateral spreading. Depending upon the relative thickness of the liquefied strata with respect to overlying non-liquefiable soils, other potentially adverse effects such as ground oscillation and ground fissuring may occur.

The project site is in an area that has not been evaluated by the CGS for liquefaction hazard or earthquake-induced landslide hazard. However, based on review of the *San Bernardino County Land Use Plan – Geologic Hazard Overlays* map (San Bernardino County, 2010), the project site is **not** located within a liquefaction susceptibility zone. In addition, groundwater was not encountered during our subsurface investigation to the maximum depth explored of approximately 51½ feet bgs and current depth to groundwater is anticipated to be greater than 100 feet bgs. Based on these findings, liquefaction is not considered a hazard at the site.

2.8 Seismically-Induced Settlement

Seismically-induced settlement consists of dynamic settlement of unsaturated soil (above groundwater) and liquefaction-induced settlement (below groundwater). These settlements occur primarily within low density sandy soil due to reduction in volume during and shortly after an earthquake event.

Based on our evaluation of the onsite natural soils below the anticipated bearing grade of the proposed structure, the potential total seismically-induced settlement is estimated to be less than ½ inch. The differential/settlement can be taken as half the total settlement over a horizontal distance of 30 feet.

2.9 Lateral Spreading

Liquefaction may also cause lateral spreading. For lateral spreading to occur, the liquefiable zone must be continuous, unconstrained laterally, and free to move along gently sloping ground toward an unconfined area. Since liquefaction is not considered a hazard at the site and the site is constrained laterally, earthquake-induced lateral spreading is also not considered a hazard at the site.

2.10 Earthquake-Induced Landsliding

The project site is located in an area that has not been evaluated by the CGS for earthquake-induced landslide hazard. However, based on review of the *San Bernardino County Land Use Plan – Geologic Hazard Overlays* map (San Bernardino County, 2010), the project site is **not** located within a landslide susceptibility zone. Based on this consideration, the potential for seismically-induced landslide hazard at the site is not considered a hazard at the site.

2.11 Flooding

According to a Federal Emergency Management Agency (FEMA) flood insurance rate map (FEMA, 2008), the project site is located within an area identified as having a 0.2 percent annual chance flood hazard. Accordingly, the project site **is** located within a 500-year flood hazard zone as shown on Figure 5, *Flood Hazard Zone Map*. Regionally, storm runoff flow is generally directed to the south.

Earthquake-induced flooding can be caused by failure of dams or other water-retaining structures as a result of earthquakes. As shown on Figure 6, the site is **not** mapped within a dam inundation zone. Therefore, the risk of seismically-induced flooding due to dam failure is considered low.

2.12 Seiches and Tsunamis

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. Tsunamis are waves generated in large bodies of water by fault displacement or major ground movement. Based on the absence of an enclosed water body near the site and the inland location of the site, seiche and tsunami risks at the site are considered nil.

2.13 Methane

Based on review of State of California Geologic Energy Management Division (CalGEM) records, the project site is **not** located within an oil field boundary and there are no documented oil wells onsite (CalGEM, 2023). The nearest documented oil well to the site is located approximately 0.5 miles northwest of the site (API# 0407100142; Lease by C.S. Summar, Well No. 1) and is reported as idle (CalGEM, 2023). Based on these findings, the potential for methane hazard at the site is low.

3.0 GEOTECHNICAL DESIGN RECOMMENDATIONS

Based on this study, we conclude that the proposed development for the subject site is feasible from a geotechnical standpoint, provided that the recommendations presented in this report are properly incorporated in design and construction.

The proposed structure may be supported on shallow spread-type foundations established in engineered fill or undisturbed natural soils. The floor slab may be supported directly on grade. There may be existing underground utilities that will also be impacted. Information on these utilities should be provided to Leighton for evaluation.

All existing undocumented fill is recommended to be removed from the proposed building pad and other structural improvement areas prior to placement of engineered fill. We estimate removal and recompaction of existing undocumented fill materials will generally be on the order of approximately 2 to 3 feet below existing grades across the site. Localized areas anticipated to require deeper removals, in particular beneath existing building. The lateral extent of overexcavation beyond foundations should be equal to the depth of overexcavation below the proposed foundations.

The recommendations below are based upon the exhibited geotechnical engineering properties of the soils and their anticipated response both during and after construction. Additional exploration and/or evaluation may be required in the future once more detailed development plans become available. The recommendations are also based upon proper field observation and testing during construction. The project geotechnical engineer should be notified of suspected variances in field conditions to determine the effect upon the recommendations subsequently presented. These recommendations are considered minimal and may be superseded by more restrictive requirements of the civil and structural engineers, the City of Chino, the County of San Bernardino and other governing agencies.

Leighton should review the grading plans, foundation plans and project specifications as they become available to verify that the recommendations presented in this report have been incorporated into the plans for this project.

3.1 Site Grading

Earthwork for the project is expected to consist of surcharging and removal of unsuitable soil materials, excavation, and placement of compacted fill. We recommend that earthwork on the site be performed in accordance with the recommendations presented in this report and the project specifications as prepared by others. The *Earthwork and Grading Guide Specifications* included in Appendix D may be used for guidance in developing the project specifications. If conflict arises, the recommendations in Appendix D shall be superseded by the project specifications, recommendations contained in this report and/or the County of San Bernardino Guidelines, whichever is more stringent. All site grading should be performed in accordance with the applicable local codes and in accordance with the project specifications that are prepared by the appropriate design professional.

3.1.1 <u>Site Preparation</u>

Prior to construction, the site should be cleared of any vegetation, trash, and/or debris within the area of proposed grading. These materials should be removed from the site. Any underground obstructions onsite should be removed. Efforts should be made to locate any existing utility lines to be removed or rerouted where interfering with the proposed construction. Any resulting cavities should be properly backfilled and compacted. After the site is cleared, the soils should be carefully observed for the removal of all unsuitable deposits. All undocumented fill or man-made debris, unsuitable native soils and former foundation remnants should be excavated and removed from the proposed building/structure footprint prior to placement of engineered fill.

3.1.2 <u>Removals and Overexcavations</u>

To provide uniform foundation support and reduce the potential for excessive static settlement, all existing undocumented fill and any unsuitable soil, as deemed by the geotechnical engineer, should be removed to expose suitable native soils and replaced as engineered fill below the proposed building and other structural improvements. Based on our field explorations, we estimate removals of existing undocumented fill will be approximately 2 to 3 feet below existing grades across the site. Localized areas may require deeper removals as determined during grading by a representative of the geotechnical engineer depending on observed subsurface conditions. Unexplored portions of the site, including areas beneath existing building, in areas of existing utilities, and areas disturbed during demolition of existing buildings and improvements may also require deeper removals. The lateral extent of removals and overexcavation beyond foundations should be equal to the depth of overexcavation below the proposed foundations.

The depth of overexcavation in non-structural areas planned for new pavement construction is recommended to be 2 feet below the current grade or planned subgrade elevation to develop a suitable bearing subgrade for pavement support. Deeper overexcavations in localized areas may be recommended during grading by a representative of the geotechnical engineer depending on observed subsurface conditions. Preparation limited to 2 feet of overexcavation below subgrade may result in the need for increased pavement maintenance and periodic repairs where existing undocumented fill is left in place below the recommended overexcavation depth of 2 feet. Alternatively, removals can be performed such that all undocumented fill is removed to expose suitable natural soils (alluvium) and replaced as engineered fill.

3.1.3 Excavation Bottom Preparation

All excavation bottoms or removal bottoms should be observed by a representative of the geotechnical engineer prior to placement of fill or other improvements to determine that geotechnically suitable soil is exposed. Excavation bottoms observed to be suitable for fill placement or other improvements should be scarified to a depth of at least 8 inches, moisture-conditioned as necessary to achieve a moisture content within 2 percentage points of optimum moisture content, and then compacted to a minimum of 90 percent of the laboratory derived maximum density as determined by ASTM Test Method D 1557 (Modified Proctor).

3.1.4 Fill Materials

Onsite soil that is free of construction debris, organics, cobbles, boulders, rubble, or rock larger than 6 inches in largest dimension is suitable to be used as fill for support of structures. Oversized materials larger than 6 inches in diameter encountered during site grading may require special handling, and may be placed in non-structural areas or areas of deep fill at depth below anticipated excavations such as for any footings, utilities, future developments, etc. Any imported fill soil should be approved by the geotechnical engineer prior to import or use onsite.

3.1.5 Fill Placement and Compaction

Fill soils should be placed in thin, loose lifts, moisture-conditioned to within 2 percent of optimum moisture content and compacted using appropriate equipment and methods to achieve to a minimum of 90 percent of the maximum dry density as determined by ASTM Test Method D 1557. Aggregate base should be compacted to a minimum of 95 percent relative compaction.

3.1.6 Shrinkage

The change in volume of excavated and recompacted soil varies according to soil type and location. This volume change is represented as a percentage increase (bulking) or decrease (shrinkage) in volume of fill after removal and recompaction. Field and laboratory data used in our calculations included laboratory-measured maximum dry density for the general soil type encountered at the subject site, the measured in-place densities of near surface soils encountered and our experience.

Based upon the results of the in-place density and the moisture-density relationship exhibited by representative bulk samples of the near surface soils, recompaction of the soils is anticipated to result in volume shrinkage in the range of 10 to 15 percent. The estimated shrinkage does not include material losses due to removal of organic material or other unsuitable bearing materials (debris, rubble, oversize material greater than 6-inches) and the actual shrinkage that occurs during grading may vary throughout the site.

3.1.7 Reuse of Concrete and Asphalt Rubble

If encountered during site clearing and/or during preparation activities, construction rubble (i.e., Portland cement concrete and asphalt concrete) may be incorporated in the proposed development. For use as structural fill, the processed material should be crushed to develop a relatively well-graded mixture with a maximum particle size of 3-inch nominal diameter. Concrete rubble should be free of rebar and processed asphalt pavement rubble may be used if mixed with the existing base course (where present). Processed material may be used as structural fill if uniformly mixed with onsite soils in proportion of 1 part processed material to 3 parts soil. For use as pavement base course, crushed material should satisfy gradation requirements of Section 200-2.4 of the *Standard Specifications for Public Works Construction* (Greenbook), 2021 Edition. Such materials must be free of and segregated from any hazardous materials and/or organic material of any kind.

3.2 Foundation Design

Conventional spread footings established in engineered fill or undisturbed natural soils may be used to support the proposed building. Footings should be embedded a minimum 12 inches below the lowest adjacent grade. An average allowable soil bearing pressure of 3,000 pounds per square foot (psf) may be used for footings with a minimum width of 12 inches for continuous footings and 18 inches for isolated footings.

A one-third increase in the bearing value for short duration loading, such as wind or seismic forces may be used. The ultimate bearing capacity can be taken as 9,000 psf, which does not incorporate a factor of safety. A resistance factor of 0.5 should be used for initial bearing capacity evaluation with factored loads.

The recommended bearing values are net values, and the weight of concrete in the mat foundation can be taken as 50 pounds per cubic foot (pcf); the weight of soil backfill can be neglected when determining the downward loads.

The allowable bearing capacity for shallow footings is based on a total static settlement of ½ inch. Differential settlement can be taken as half the total settlement over a horizontal distance of 30 feet.

For static loading, 50 pounds per cubic inch (pci) may be assumed as the modulus of subgrade reaction (*k*). For seismic loading, a *k* value of 150 pci may be assumed.

Since settlement is a function of footing size and contact bearing pressure, differential settlement can be expected between adjacent columns or walls where a large differential loading condition exists. Once developed by the structural engineer, we should review total dead and sustained live loads for each column including plan location and span distance, to evaluate if differential settlements between dissimilarly loaded columns will be tolerable. Excessive differential settlement can be mitigated with the use of reduced bearing pressures, deeper footing embedment, possibly changing overexcavation schemes and using imported base material under spread footings, or possibly other methods.

Resistance to lateral loads will be provided by a combination of friction between the soil and structure interface and passive pressure acting against the vertical portion of the footings structures. For calculating lateral resistance, a passive pressure of 250 psf per foot of depth to a maximum of 2,500 psf and a frictional coefficient of 0.30 may be used. Note that the passive and frictional coefficients do not include a factor of safety. The frictional resistance and the passive resistance of the soils can be combined without reduction in determining the total lateral resistance.

3.3 Slabs-on-Grade

Concrete slabs may be designed using a modulus of subgrade reaction of 100 pci provided the subgrade is prepared as described in Section 3.1. From a geotechnical standpoint, we recommend slab-on-grade be a minimum 5 inches thick with No. 3 rebar placed at the center of the slab at 24 inches on center in each direction. The structural engineer should design the actual thickness and reinforcement based on anticipated loading conditions. Where moisture-sensitive floor coverings or equipment is planned, the slabs should be protected by a minimum 10-mil-thick vapor barrier between the slab and subgrade. A coefficient of friction of 0.35 can be used between the floor slab and the vapor barrier.

Minor cracking of concrete after curing due to drying and shrinkage is normal and should be expected; however, concrete is often aggravated by a high water/cement ratio, high concrete temperature at the time of placement, small nominal aggregate size, and rapid moisture loss due to hot, dry, and/or windy weather conditions during placement and curing. Cracking due to temperature and moisture fluctuations can also be expected. The use of low-slump concrete or low water/cement ratios can reduce the potential for shrinkage cracking. Additionally, our experience indicates that the use of reinforcement in slabs and foundations can generally reduce the potential but not eliminate for concrete cracking.

To reduce the potential for excessive cracking, concrete slabs-on-grade should be provided with construction or weakened plane joints at frequent intervals. Joints should be laid out to form approximately square panels.

3.4 Cement Type and Corrosion Protection

Based on the results of laboratory testing, concrete structures in contact with the onsite soil are expected to have moderate exposure to water-soluble sulfates in the soil (Exposure Class S1). Common Type II cement may be used for concrete construction onsite and the concrete should be designed in accordance with CBC 2022 requirements. However, concrete exposed to recycled water should be designed using Type V cement.

Based on our laboratory testing, the onsite soil is considered mildly corrosive to ferrous metals. Ferrous pipe should be avoided by using high-density polyethylene (HDPE) or other non-ferrous pipe when possible. Ferrous pipe, if used, should be protected by polyethylene bags, tap or coatings, di-electric fittings or other means to separate the pipe from onsite soils.

3.5 Retaining Walls

Recommended lateral earth pressures are provided as equivalent fluid unit weights, in psf/ft. or pcf. These values do not contain an appreciable factor of safety, so the structural engineer should apply the applicable factors of safety and/or load factors during design.

Onsite soils are likely suitable to be used as retaining wall backfill due to its very low expansion potential, field and laboratory verification are recommended before use. However, site soils can be variable in composition, clast size and expansive characteristics. Should site soil be considered for reuse behind retaining walls, it should be tested to ensure Expansion potential is less than 20 (EI<20). Recommended lateral earth pressures for retaining walls backfilled with sandy soils with drained conditions as shown on Figure 7, *Retaining Wall Backfill and Subdrain Detail* are as follows:

Table 3 – Retaining Wall Design Earth Pressures

Retaining Wall Condition (Level Backfill)	Equivalent Fluid Pressure (pounds-per-cubic-foot)*
Active (cantilever)	35
At-Rest (braced)	60
Passive Resistance (compacted fill)	250
Seismic Increment (add to active pressure)	25

*Only for level and drained properly compacted backfill

Walls that are free to rotate or deflect may be designed using active earth pressure. For basement walls or walls that are fixed against rotation, the at-rest pressure should be used. For seismic condition, the pressure should be distributed as an inverted triangular distribution and the dynamic thrust should be applied at a height of 0.6H above the base of the wall.

3.5.1 Sliding and Overturning

Total depth of retained earth for design of walls and for uplift resistance, should be measured as the vertical height of the stem below the ground surface at the wall face for stem design, or measured at the heel of the footing for overturning and sliding. A soil unit weight of 120 pcf may be assumed for calculating the actual weight of the soil over the wall footing, if drained, or 60 pcf if submerged, for properly compacted backfill.

3.5.2 Drainage

Adequate drainage may be provided by a subdrain system positioned behind the walls. Typically, this system consists of a 4-inch minimum diameter perforated pipe placed near the base of the wall (perforations placed downward). The pipe should be bedded and backfilled with pervious backfill material described in Section 300-3.6 of the *Standard Specifications for Public Works Construction* (Greenbook), 2021 Edition. This pervious backfill should extend at least 2 feet out from the wall and to within 2 feet of the outside finished grade. This pervious backfill and pipe should be wrapped in filter fabric, such as Mirafi 140N or equivalent, placed as described in Section 300-8.1 of the *Standard Specifications for Public Works Construction* (Greenbook), 2021 Edition. The subdrain outlet should be connected to a free-draining outlet or sump.

Miradrain, Geotech Drainage Panels, or Enkadrain drainage geocomposites, or similar, may be used for wall drainage as an alternative to the Class 2 Permeable Material or drain rock backfill, particularly where horizontal space is limited adjacent to shoring (where walls are cast against shoring). These drainage panels should be connected to the perforated drainpipe at the base of the wall.

3.6 Paving

To provide support for paving, the subgrade soils should be prepared as recommended in the Section 3.1. Compaction of the subgrade, including trench backfills, to at least 90 percent of the maximum dry density as determined by ASTM Test Method D 1557, and achieving a firm, hard, and unyielding surface will be important for paving support. The preparation of the paving area subgrade should be performed immediately prior to placement of the base course. Proper drainage of the paved areas should be provided since this will reduce moisture infiltration into the subgrade and increase the life of the paving.

3.6.1 Asphalt Concrete

The required paving and base thicknesses will depend on the expected wheel loads and volume of traffic (Traffic Index or TI). Assuming that the paving subgrade will consist of engineered fill with an R-value greater than 40, compacted to at least 90 percent of the maximum dry density as determined by ASTM Test Method D 1557 as recommended, the minimum recommended paving thicknesses are presented in the following table. Results of R-value testing on a near surface samples of existing onsite soils indicate a value of 46.

Table 4 – Asphalt Concrete Pavement Sections

Traffic Index	Asphalt Concrete (inches)	Base Course (inches)
5	3	4
6	4	4½
7	4	7
8	4	9½
9	6	8½

The asphalt paving sections were determined using the Caltrans design method. We can determine the recommended paving and base course thicknesses for other Traffic Indices if required. Careful inspection is recommended to verify that the recommended thicknesses or greater are achieved, and that proper construction procedures are followed.

3.6.2 Portland Cement Concrete Paving

We have assumed that onsite soils will have an R-value of at least 45, which will need to be verified after the completion of site grading.

Portland cement concrete (PCC) paving sections were determined in accordance with procedures developed by the Portland Cement Association. Concrete paving sections for a range of Traffic Indices are presented in the following table. We have assumed that the Portland cement concrete will have a compressive strength of at least 4,000 pounds per square inch.

Table 5 – PCC Pavement Sections

Traffic Index	PCC (inches)	Base Course (inches)
5	5½	4
6	6½	4
7	7	4
8	7½	4
9	8	4

The paving should be provided with control joints or expansion joints at regular intervals no more than 15 feet in each direction. Load transfer devices, such as dowels or keys, are recommended at joints in the paving to reduce possible offsets. The paving sections in the above table have been developed based on the strength of unreinforced concrete. Steel reinforcing may be added to the paving to reduce cracking and to prolong the life of the paving.

3.6.3 Base Course

The base course for both asphalt concrete and Portland cement concrete paving should meet the specifications for Class 2 Aggregate Base as defined in Section 26 of the latest edition of the State of California, Department of Transportation, Standard Specifications. Alternatively, the base course could meet the specifications for untreated base as defined in Section 200-2 of the latest edition of the *Standard Specifications for Public Works Construction* (Greenbook), 2021 Edition. The base course should be compacted to a minimum of 95 percent of the maximum dry density as determined by ASTM Test Method D 1557.

3.7 Temporary Excavations

All temporary excavations, including utility trenches, retaining wall excavations, and foundation excavations should be performed in accordance with project plans, specifications, and all OSHA requirements. Excavations 4 feet or deeper should be laid back or shored in accordance with OSHA requirements before personnel are allowed to enter.

No surcharge loads should be permitted within a horizontal distance equal to the height of cut or 5 feet, whichever is greater from the top of the cut, unless the cut is shored appropriately. Excavations that extend below an imaginary plane inclined at 45 degrees below the edge of any adjacent existing site foundation should be properly shored to maintain support of the adjacent structure.

Temporary excavations should be treated in accordance with the State of California version of OSHA excavation regulations, Construction Safety Orders for Excavation General Requirements, Article 6, Section 1541, effective October 1, 1995. The sides of excavations should be shored or sloped in accordance with OSHA regulations. OSHA allows the sides of unbraced excavations, up to a maximum height of 20 feet, to be cut to a ¾H:1V (horizontal:vertical) slope for Type A soils, 1H:1V for Type B soils, and 1½H:1V for Type C soils. Near-surface onsite soils are to be considered Type B soils.

During construction, the soil conditions should be regularly evaluated to verify that conditions are as anticipated. The contractor shall be responsible for providing the "competent person" required by OSHA standards to evaluate soil conditions. Close coordination between the competent person and the geotechnical engineer should be maintained to facilitate construction while providing safe excavations.

3.8 Trench Backfill

Utility trenches should be backfilled with compacted fill in accordance with Sections 306-1 and 306-6 of the *Standard Specifications for Public Works Construction* (Greenbook), 2021 Edition. Utility trenches can be backfilled with onsite sandy material free of rubble, debris, organic and oversized material up to (≤) 3-inches in largest dimension. Prior to backfilling trenches, pipes should be bedded in and covered with either:

(1) **Sand:** A uniform, sand material that has a Sand Equivalent (SE) greater-than-or-equal-to (≥) 30, passing the No. 4 U.S. Standard Sieve (or as specified by the pipe manufacturer), water densified in place, or

(2) **CLSM:** Controlled Low Strength Material (CLSM) conforming to Section 201-6 of the *Standard Specifications for Public Works Construction,* (Greenbook), 2021 Edition. CLSM should not be jetted.

Pipe bedding should extend at least 4 inches below the pipeline invert and at least 12 inches over the top of the pipeline. Native and clean fill soils can be used as backfill over the pipe bedding zone, and should be placed in thin lifts, moisture conditioned above optimum, and mechanically compacted to at least 90 percent relative compaction, relative to the ASTM D 1557 laboratory maximum density.

3.9 Drainage and Landscaping

Building walls below grade should be waterproofed or at least damp proofed, depending upon the degree of moisture protection desired. Surface drainage should be designed to direct water away from foundations and toward approved drainage devices. Irrigation of landscaping should be controlled to maintain, as much as possible, consistent moisture content sufficient to provide healthy plant growth without overwatering.

3.10 Additional Geotechnical Services

Leighton should review the grading plans, foundation plans, and specifications when they are available to verify that the recommendations presented in this report have been properly interpreted and incorporated.

Geotechnical observation and testing should be provided during the following activities:

- Grading and excavation of the site;
- Subgrade Preparation;
- Compaction of all fill materials;
- Utility trench backfilling and compaction;
- Footing excavation and slab-on-grade preparation;
- Pavement subgrade and base preparation;
- Placement of asphalt concrete and/or concrete; and
- When any unusual conditions are encountered.

4.0 LIMITATIONS

This geotechnical exploration does not address the potential for encountering hazardous soil at this site. In addition, this report was necessarily based in part upon data obtained from a limited number of observances, site visits, soil samples, tests, analyses, histories of occurrences, spaced subsurface explorations and limited information on historical events and observations. Such information is, by necessity, incomplete. Please also refer ASFE's *Important Information About Your Geotechnical Report* (included at the rear of the text), presenting additional information and limitations regarding geotechnical engineering studies and reports. The nature of many sites is such that differing soil or geologic conditions can be present within small distances and under varying climatic conditions. Changes in subsurface conditions can and do occur over time. Therefore, the findings, conclusions, and recommendations presented in this report are only valid if Leighton Consulting, Inc. has the opportunity to observe subsurface conditions during grading and construction, to confirm that our data are representative for the site. Leighton Consulting, Inc. should also review the construction plans and project specifications, when available, to comment on the geotechnical aspects.

This report was prepared using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical consultants practicing at this time in San Bernardino County. We do not make any warranty, either expressed or implied.

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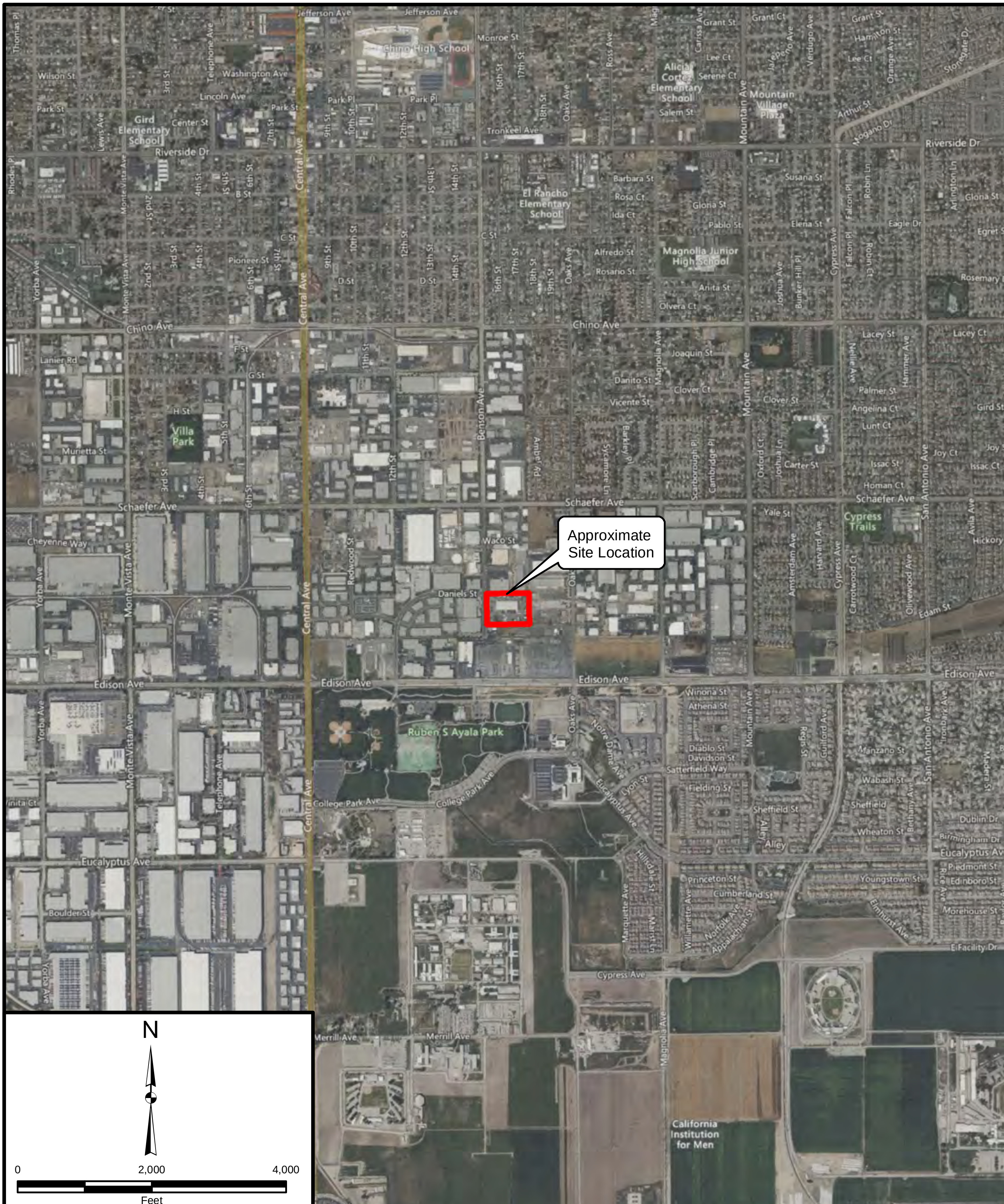

Project: 13807.001	Eng/Geol: CCK/JMP
Scale: 1 " = 2,000 '	Date: March 2023

Reference: © 2023 Microsoft Corporation © 2022 Maxar ©CNES (2022) Distribution Airbus

SITE LOCATION MAP

Proposed Industrial Building
13925 Benson Avenue
Chino, California

FIGURE 1

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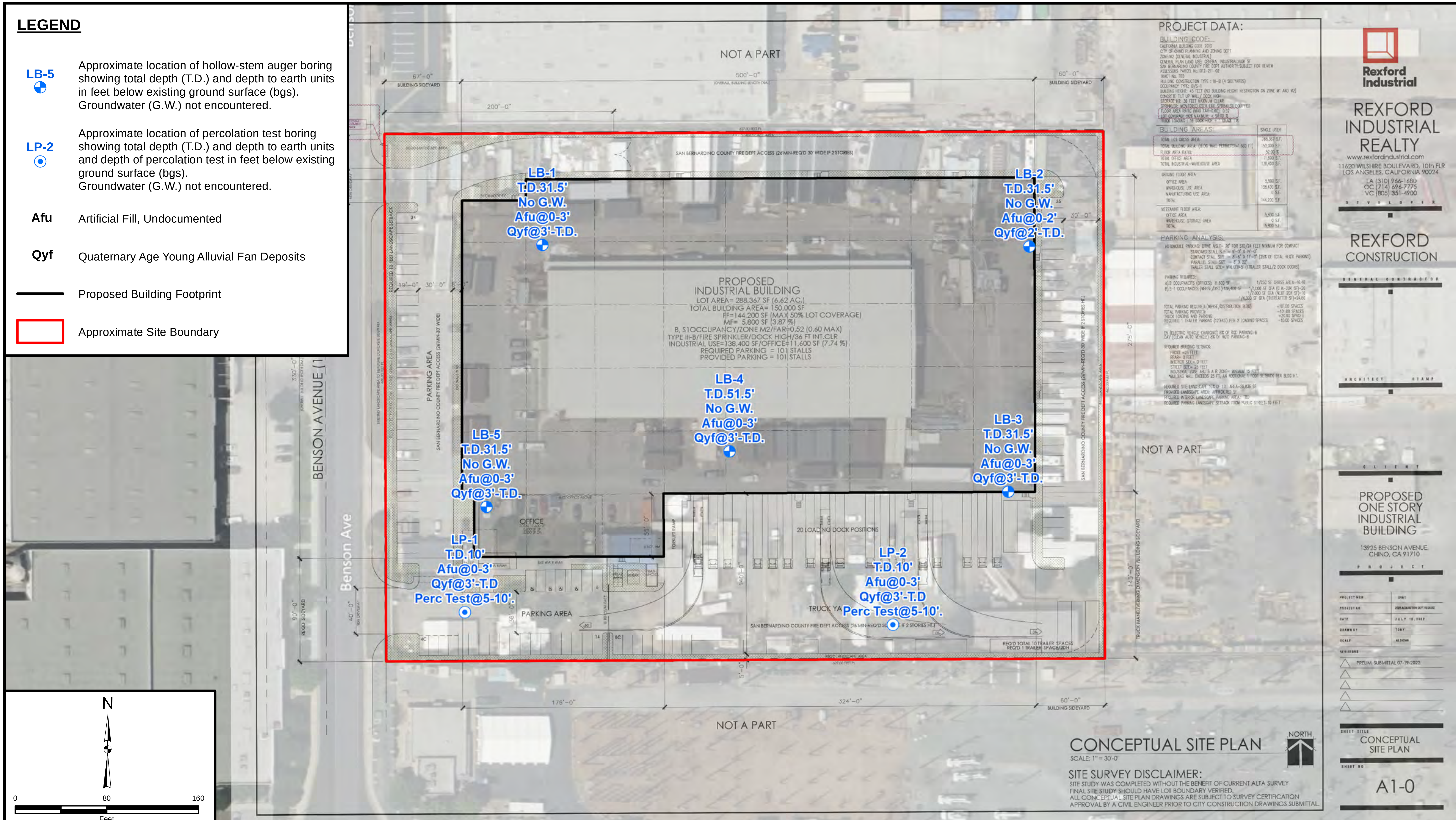
LEGEND

LB-5	Approximate location of hollow-stem auger boring showing total depth (T.D.) and depth to earth units in feet below existing ground surface (bgs). Groundwater (G.W.) not encountered.
LP-2	Approximate location of percolation test boring showing total depth (T.D.) and depth to earth units and depth of percolation test in feet below existing ground surface (bgs). Groundwater (G.W.) not encountered.
Afu	Artificial Fill, Undocumented
Qyf	Quaternary Age Young Alluvial Fan Deposits
(black line)	Proposed Building Footprint
(red box)	Approximate Site Boundary



Project: 13807.001	Eng/Geol: CCK/JMP
Scale: 1 " = 80 '	Date: March 2023
Reference: As Shown	

EXPLORATION LOCATION MAP

Proposed Industrial Building
13925 Benson Avenue
Chino, California

FIGURE 2

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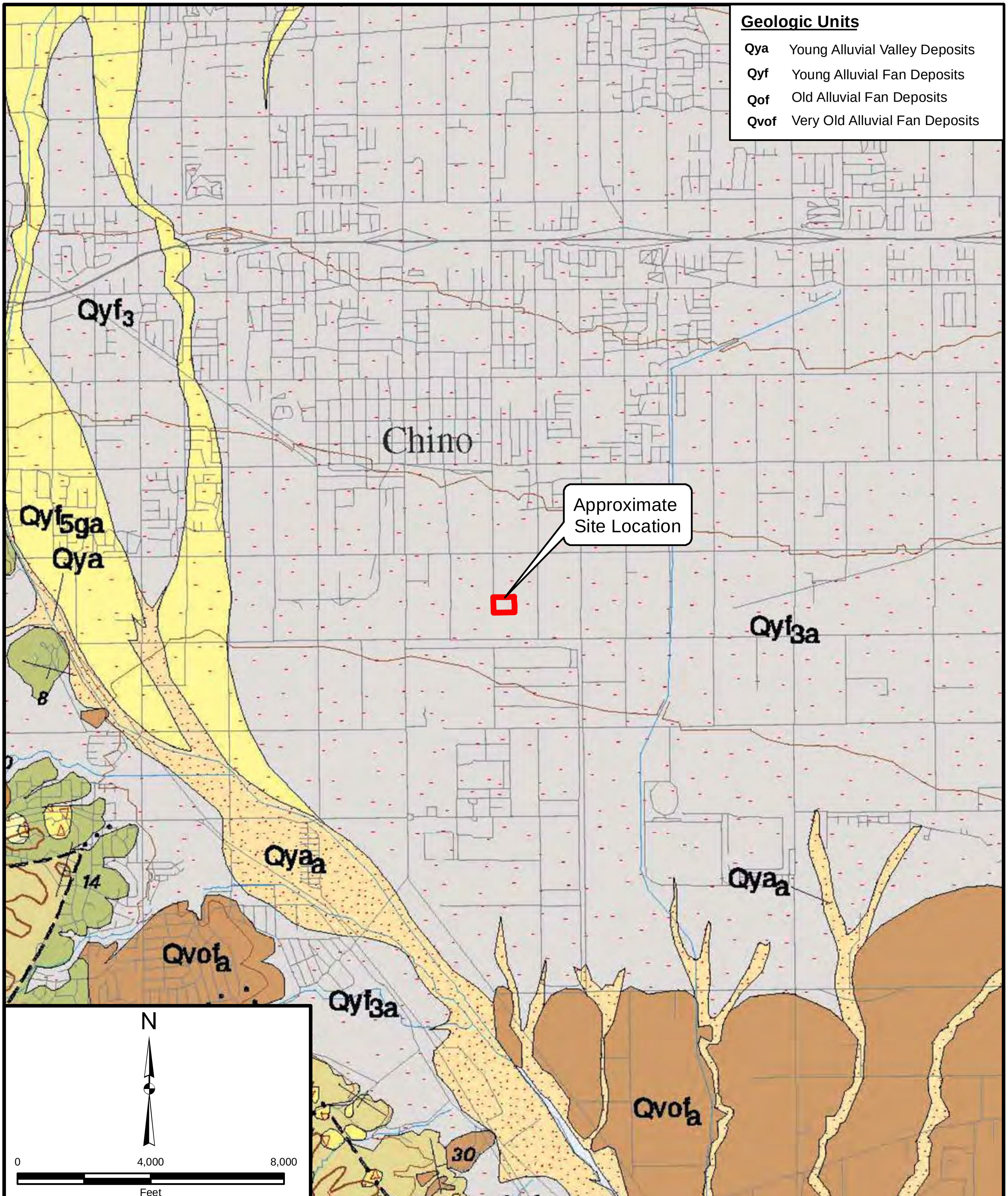

Project: 13807.001	Eng/Geol: CCK/JMP
Scale: 1 " = 4,000 '	Date: March 2023

Reference:
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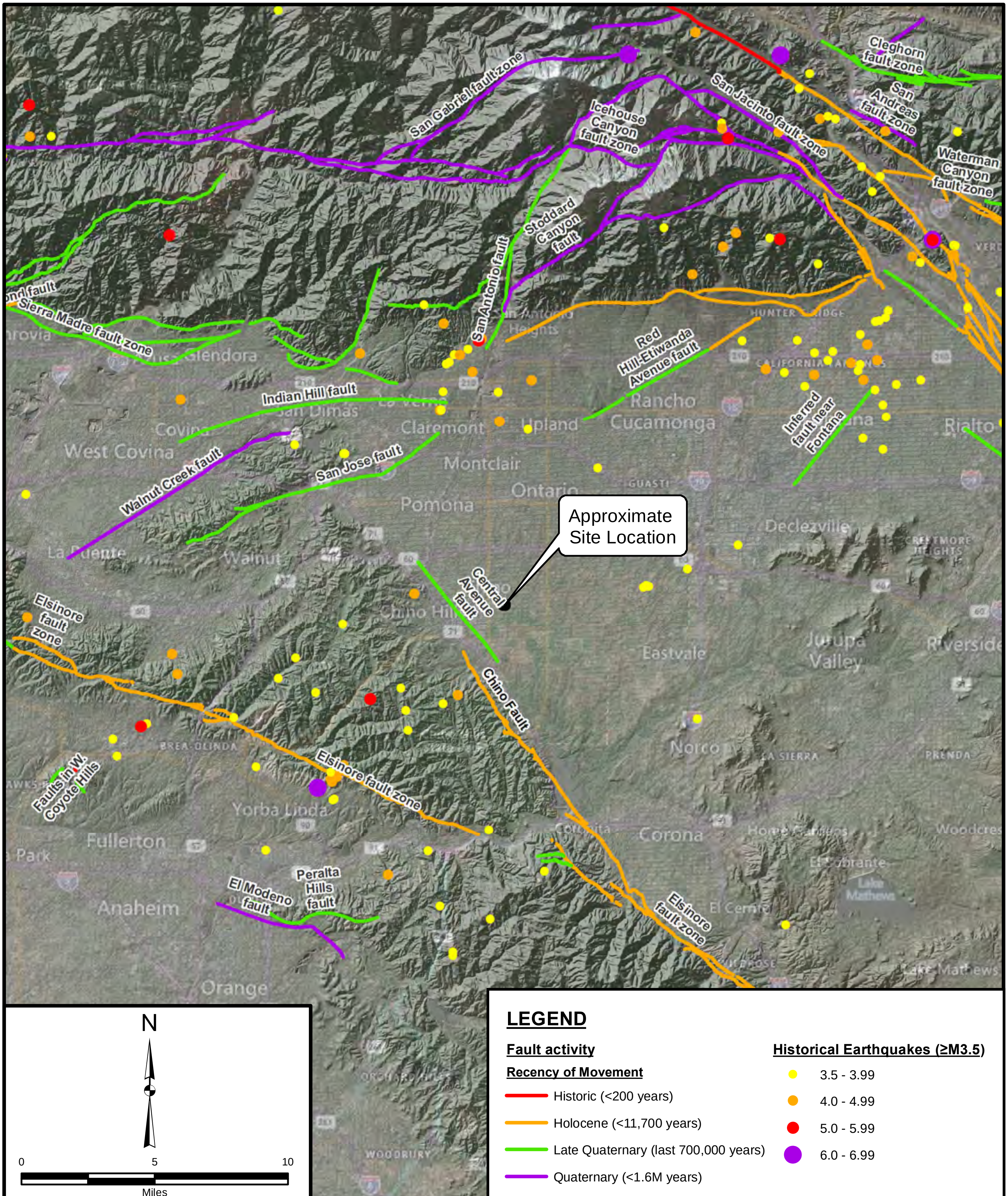
REGIONAL GEOLOGY MAP

Proposed Industrial Building
13925 Benson Avenue
Chino, California

FIGURE 3

Leighton



Project: 13807.001	Eng/Geol: CCK/JMP	REGIONAL FAULT AND HISTORICAL SEISMICITY MAP Proposed Industrial Building 13925 Benson Avenue Chino, California	FIGURE 4
Scale: 1 " = 5 miles	Date: March 2023		Leighton

Basemap Reference: © 2023 Microsoft Corporation
Earthstar Geographics SIO © 2022 TomTom
Seismicity Data Reference: maps.conservation.ca.gov

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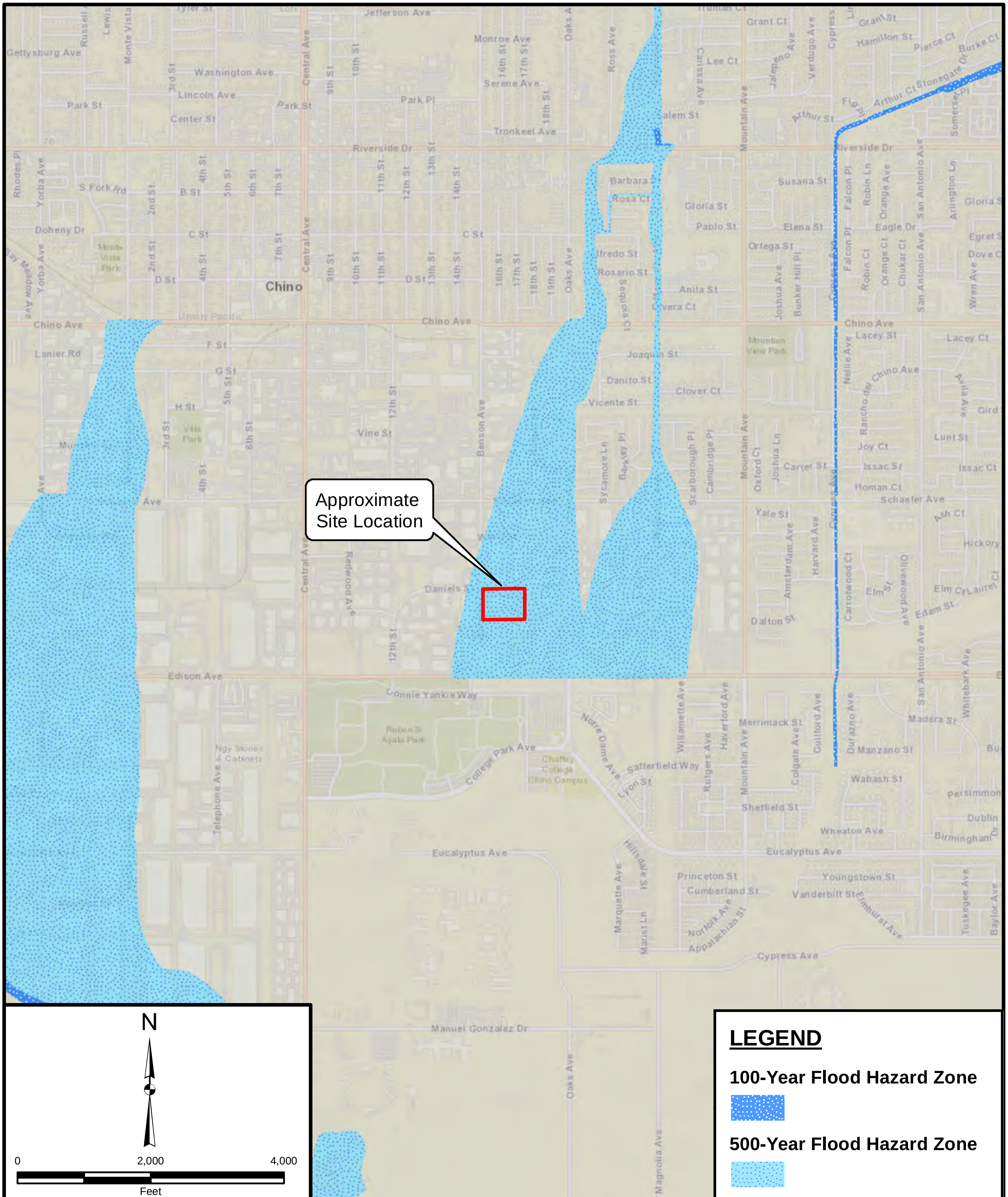

Project: 13807.001	Eng/Geol: CCK/JMP
Scale: 1 " = 2,000 '	Date: March 2023

Reference: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
FEMA (http://www.fema.gov/index.shtm), DWR (http://www.dwr.ca.gov)

FLOOD HAZARD ZONE MAP

Proposed Industrial Building
13925 Benson Avenue
Chino, California

FIGURE 5

Leighton

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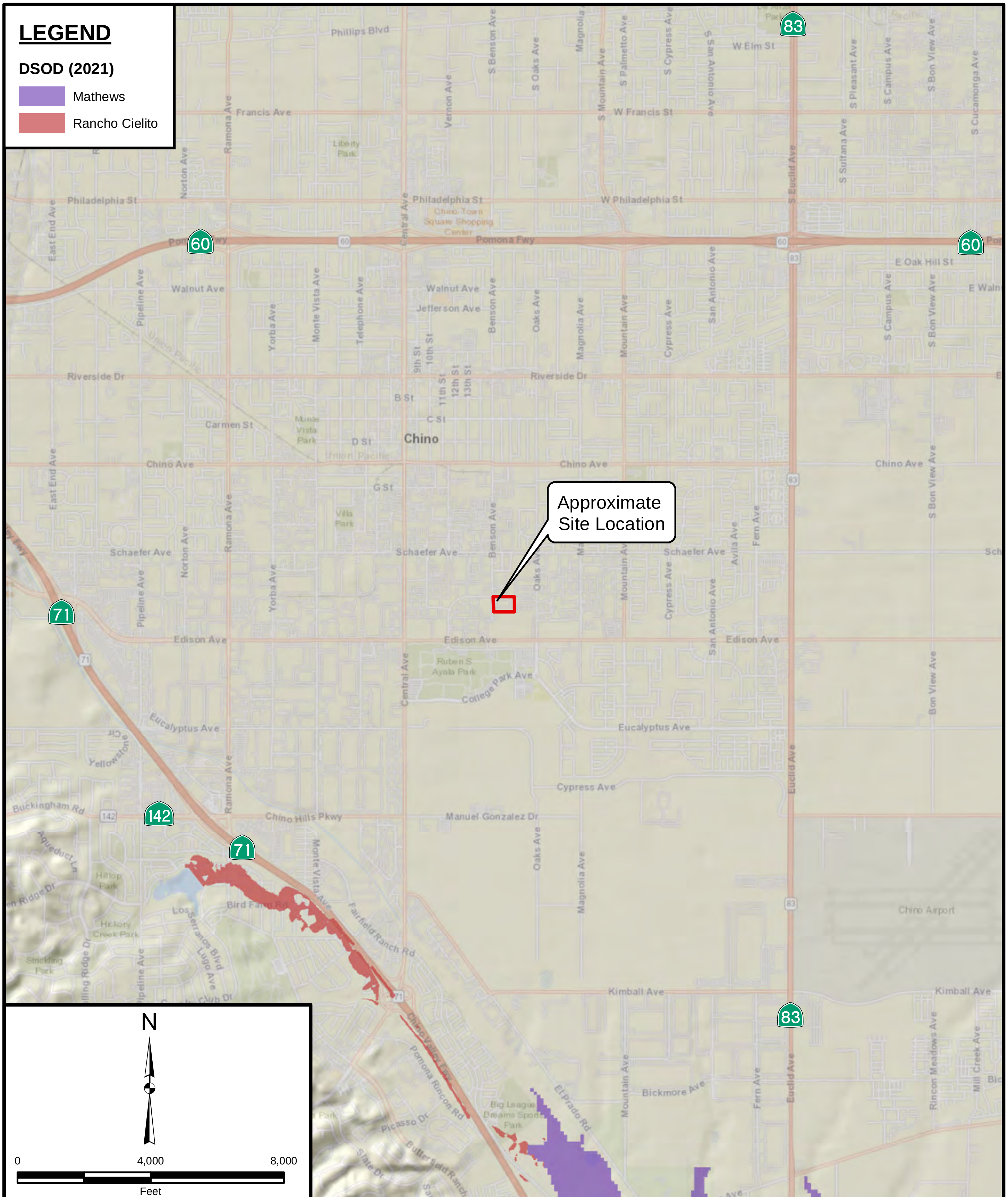

Project: 13807.001	Eng/Geol: CCK/JMP
Scale: 1 " = 4,000 '	Date: March 2023

Base Map: ESRI ArcGIS Online 2023
Reference: Office of Emergency Services (2007),
Dept of Safety of Dams (2021)
National Inventory of Dams, Army Corps of Engrs (2021)

DAM INUNDATION MAP

Proposed Industrial Building
13925 Benson Avenue
Chino, California

FIGURE 6

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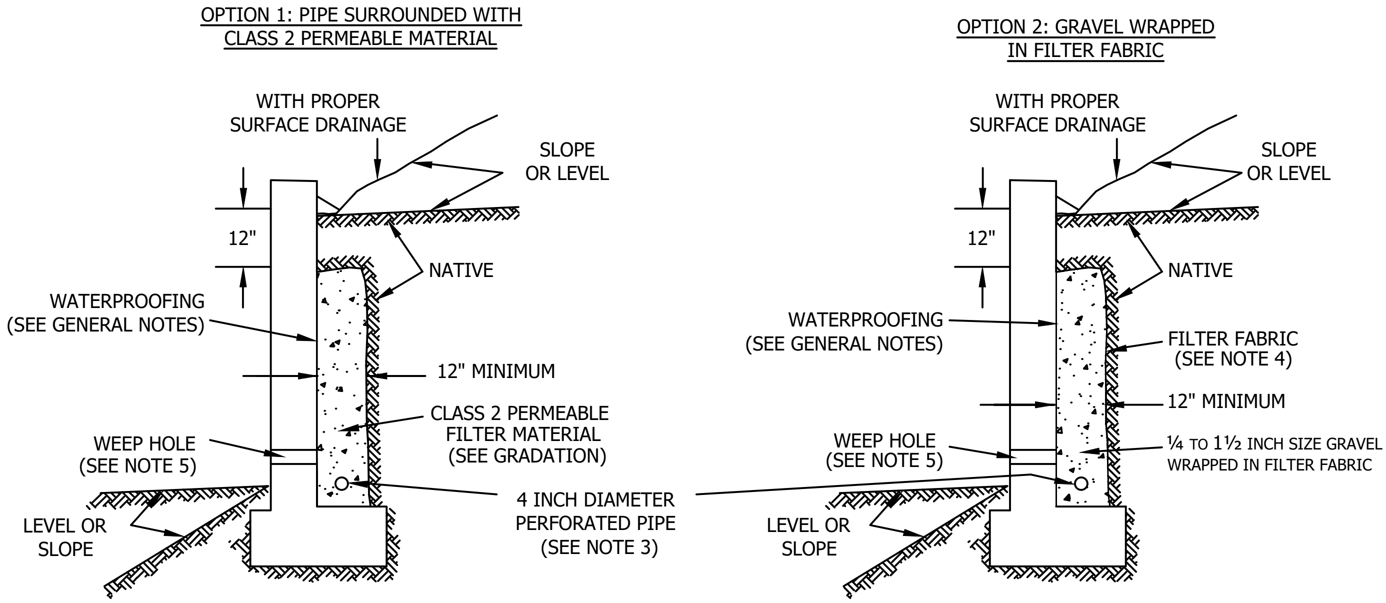
SUBDRAIN OPTIONS AND BACKFILL WHEN NATIVE MATERIAL HAS EXPANSION INDEX OF ≤50



Class 2 Filter Permeable Material Gradation
Per Caltrans Specifications

Sieve Size	Percent Passing
1"	100
3/4"	90-100
3/8"	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

GENERAL NOTES:

* Waterproofing should be provided where moisture nuisance problem through the wall is undesirable.
* Water proofing of the walls is not under purview of the geotechnical engineer
* All drains should have a gradient of 1 percent minimum
*Outlet portion of the subdrain should have a 4-inch diameter solid pipe discharged into a suitable disposal area designed by the project engineer. The subdrain pipe should be accessible for maintenance (rodding)
*Other subdrain backfill options are subject to the review by the geotechnical engineer and modification of design parameters.

Notes:
1) Sand should have a sand equivalent of 30 or greater and may be densified by water jetting.
2) 1 Cu. ft. per ft. of 1/4- to 1 1/2-inch size gravel wrapped in filter fabric
3) Pipe type should be ASTM D1527 Acrylonitrile Butadiene Styrene (ABS) SDR35 or ASTM D1785 Polyvinyl Chloride plastic (PVC), Schedule 40, Armco A2000 PVC, or approved equivalent. Pipe should be installed with perforations down. Perforations should be 3/8 inch in diameter placed at the ends of a 120-degree arc in two rows at 3-inch on center (staggered)
4) Filter fabric should be Mirafi 140NC or approved equivalent.
5) Weephole should be 3-inch minimum diameter and provided at 10-foot maximum intervals. If exposure is permitted, weepholes should be located 12 inches above finished grade. If exposure is not permitted such as for a wall adjacent to a sidewalk/curb, a pipe under the sidewalk to be discharged through the curb face or equivalent should be provided. For a basement-type wall, a proper subdrain outlet system should be provided.
6) Retaining wall plans should be reviewed and approved by the geotechnical engineer.
7) Walls over six feet in height are subject to a special review by the geotechnical engineer and modifications to the above requirements.

RETAINING WALL BACKFILL AND SUBDRAIN DETAIL FOR WALLS 6 FEET OR LESS IN HEIGHT

WHEN NATIVE MATERIAL HAS EXPANSION INDEX OF ≤50

Leighton

FIGURE 7

APPENDIX A

EXPLORATION LOGS

GEOTECHNICAL BORING LOG LB-1

Project No.	13807.001	**Date Drilled**	2-7-23
Project	Rexford Chino Benson Avenue	**Logged By**	MM
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	682'
Location	See Figure 2 - Exploration Location Map	**Sampled By**	MM

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0							SM	@Surface: 3" asphalt concrete, no base **Undocumented Artificial Fill (Afu)** @3": Silty SAND, dark brown, fine sand, moist	
680								SM	**Quaternary Age Young Alluvial Fan Deposits (Qyf)**	
	5			S-1	3 6 7		12		@5': Silty SAND, light gray, medium dense, fine sand, moist	
675				R-2	4 5 5	100	22	CL	@7.5': Lean CLAY, light gray, medium stiff, medium plasticity, moist, FeO staining, CaCO3 nodules	
	10			S-3	1 1 1		19		@10': Lean CLAY, olive brown, soft, medium plasticity, moist, FeO staining, CaCO3 precipitate and nodules	AL
670										
	15			R-4	3 9 13	117	16		@15': Lean CLAY, brown, very stiff, medium plasticity, moist, abundant MnO spots	
665										
	20			S-5	2 6 6		17	SC	@20': Clayey SAND, yellow brown, medium dense, fine sand, moist, FeO staining, few MnO spots, Lean CLAY in shoe	
660										
	25			R-6	3 7 14	104	19	ML	@25': Sandy SILT, yellow brown, very stiff, fine sand, FeO staining, micaceous	
655										
	30									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LB-1

Project No.	13807.001	**Date Drilled**	2-7-23
Project	Rexford Chino Benson Avenue	**Logged By**	MM
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	682'
Location	See Figure 2 - Exploration Location Map	**Sampled By**	MM

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	30			S-7	6 10 12		13	SM	@30': Silty SAND, yellow brown, dense, fine sand, moist, oxidation throughout	
650									**T.D. 31.5' bgs** **No groundwater encountered during drilling** **Backfilled with soil cuttings and patched with cold-mix asphalt concrete**	
	35									
645										
	40									
640										
	45									
635										
	50									
630										
	55									
625										
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG LB-2

Project No.	13807.001	**Date Drilled**	2-7-23
Project	Rexford Chino Benson Avenue	**Logged By**	MM
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	684'
Location	See Figure 2 - Exploration Location Map	**Sampled By**	MM

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0			B-1				SM	@Surface: 2.5" asphalt concrete, no base **Undocumented Artificial Fill (Afu)** @2.5": Silty SAND, dark brown, fine sand, moist	
								ML	**Quaternary Age Young Alluvial Fan Deposits (Qyf)** @2': SILT w/ Sand, gray brown, moist	
680	5			R-1	6 14 16	117	10	SM	@5': Silty SAND, gray brown, medium dense, fine sand, trace fine subangular gravel, moist	
				S-2	2 3 4		18	ML	@7.5': SILT, gray brown, stiff, moist, micaceous, trace MnO spots, few FeO stains	
675	10			R-3	4 4 6	104	20	CL	@10': Lean CLAY, gray brown, medium stiff, moist, micaceous, few FeO veins	
670	15			S-4	2 4 7		18	SC	@15': Clayey SAND, brown, medium dense, medium plasticity, moist, few FeO veins	
665	20			R-5	3 6 9	94	25	CL	@20': Lean CLAY, gray brown, very stiff, medium plasticity, moist, laminated, FeO staining along laminations, trace MnO spots	
660	25			S-6	2 4 8		27	SC	@25': Clayey SAND, gray brown, medium dense, medium plasticity, moist, FeO staining throughout, trace MnO spots	
655	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

Leighton

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG LB-2

Project No.	13807.001	**Date Drilled**	2-7-23
Project	Rexford Chino Benson Avenue	**Logged By**	MM
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	684'
Location	See Figure 2 - Exploration Location Map	**Sampled By**	MM

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	Soil Description	Type of Tests
	30			R-7	3 8 16	112	20	CL	@30': Lean CLAY, gray brown, very stiff, few fine to coarse subrounded gravel, medium plasticity, moist, FeO staining	
									T.D. 31.5' bgs **No groundwater encountered during drilling** **Backfilled with soil cuttings and patched with cold-mix asphalt concrete**	
650										
	35									
645										
	40									
640										
	45									
635										
	50									
630										
	55									
625										
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LB-3

Project No.	13807.001	**Date Drilled**	2-7-23
Project	Rexford Chino Benson Avenue	**Logged By**	MM
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	683'
Location	See Figure 2 - Exploration Location Map	**Sampled By**	MM

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N–S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0							SM	@Surface: 4" asphalt concrete, no base **Undocumented Artificial Fill (Afu)** @4": Silty SAND, dark brown, fine sand, moist	
680								ML	**Quaternary Age Young Alluvial Fan Deposits (Qyf)** @3': SILT, gray brown, moist	
	5			S-1	7 7 7		18		@5': SILT, light gray, trace light orange oxidation, very stiff, slightly moist, trace pores	
675				R-2	5 9 10	101	13		@7.5': Sandy SILT, light gray, very stiff, slightly moist, dark brown silty sand pocket, transitions to light brown Silty SAND w/ depth	
	10			S-3	2 2 3		17		@10': SILT, gray brown, medium stiff, moist, FeO staining, micaceous	
670										
	15			R-4	3 5 7	108	18	ML-CL CL	@15': Silty CLAY, brown, stiff, moist, FeO staining, micaceous @16': Lean CLAY, brown, stiff, low-medium plasticity, moist, FeO staining	
665										
	20			S-5	1 3 6		25		@20': Lean CLAY, brown, stiff, low plasticity, moist, FeO staining, micaceous	
660										
	25			R-6	3 6 12	95	27		@25': Lean CLAY, gray brown, stiff, low plasticity, moist, FeO veins and spots, micaceous	
655										
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LB-3

Project No.	13807.001	**Date Drilled**	2-7-23
Project	Rexford Chino Benson Avenue	**Logged By**	MM
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	683'
Location	See Figure 2 - Exploration Location Map	**Sampled By**	MM

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
									This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.	
	30			S-7	1 3 5		19		@30': Lean CLAY, brown, stiff, low plasticity, moist, trace MnO spots	
									T.D. 31.5' bgs **No groundwater encountered during drilling** **Backfilled with soil cuttings and patched with cold-mix asphalt concrete**	
650										
	35									
645										
	40									
640										
	45									
635										
	50									
630										
	55									
625										
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LB-4

Project No.	13807.001	**Date Drilled**	2-7-23
Project	Rexford Chino Benson Avenue	**Logged By**	MM
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	681'
Location	See Figure 2 - Exploration Location Map	**Sampled By**	MM

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0								@Surface: 3.5" asphalt concrete, no base	
680				B-1				SM	**Undocumented Artificial Fill (Afu)** @3.5": Silty SAND, very dark yellowish brown, mostly fine sand, moist	MD,EI, DS,CN, RV,CR
								ML	**Quaternary Age Young Alluvial Fan Deposits (Qyf)** @3': Sandy SILT, gray brown, slightly moist to moist	
675	5			R-1	12 13 13	108	17		@5': Sandy SILT, brown, very stiff, fine sand, trace fine subrounded gravel and coarse sand, slightly moist	DS,CN
				S-2	4 3 2		16	CL	@7.5': Lean CLAY, gray brown, medium stiff, fine sand, slightly moist, trace oxide veins	
								ML-CL	@8.5': Clayey SILT, gray brown, medium stiff, no plasticity, moist, abundant MnO spotting	
670	10			R-3	3 5 8	101	20	ML	@10': Sandy SILT, brown, stiff, trace coarse subrounded gravel, no plasticity, moist, micaceous, faint FeO spotting throughout	DS
665	15			S-4	2 3 3			CL	@15': Lean CLAY, olive brown, medium stiff, low plasticity, moist, FeO spotting, trace MnO spots	AL
660	20			R-5	3 7 12	95	26		@20': Lean CLAY, gray brown, very stiff, low plasticity, moist, FeO spotting/pinpoints	
655	25			S-6	7 9 9		9	SM	@25': Silty SAND, light brown, medium dense, mostly fine sand, trace medium subangular gravel, moist, FeO veining throughout	
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LB-4

Project No.	13807.001	**Date Drilled**	2-7-23
Project	Rexford Chino Benson Avenue	**Logged By**	MM
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	681'
Location	See Figure 2 - Exploration Location Map	**Sampled By**	MM

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
650	30			R-7	6 6 12	111	18	SC	@30': Clayey Sand, light gray brown, medium dense, mostly fine sand, trace coarse sand, moist, FeO veins, trace MnO spots	
645	35			S-8	13 25 30		5	SM	@35': Silty SAND, light brown, very dense, fine to coarse sand, fine to coarse subangular gravel, moist, FeO staining throughout	
								CL	Transitions to Lean CLAY, light gray brown, laminated, FeO-staining along laminations, moist	
640	40			R-9	8 14 18	111	10	SM	@40': Silty SAND, gray brown, medium dense, fine to coarse sand, few fine to coarse gravel, FeO staining, moist, mostly fine grained sand in show w/ laminated Lean CLAY interbedded	
635	45			S-10	4 8 18		32	CL	@45': Lean CLAY, brown, hard, few silt, trace to few fine sand, low plasticity, moist to very moist, micaceous, trace FeO staining	
630	50			R-11	6 11 12	102	23		@50': Lean CLAY, light gray, very stiff, low plasticity, moist, trace CaCO3 deposits, trace to few FeO spots/veins, trace burrows	
									T.D. 51.5' bgs **No groundwater encountered during drilling** **Backfilled with soil cuttings and patched with cold-mix asphalt concrete**	
625	55									
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
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- H HYDROMETER
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- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LB-5

Project No.	13807.001	**Date Drilled**	2-7-23
Project	Rexford Chino Benson Avenue	**Logged By**	MM
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	681'
Location	See Figure 2 - Exploration Location Map	**Sampled By**	MM

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0			B-1				SM	@Surface: 3" asphalt concrete, no base **Undocumented Artificial Fill (Afu)** @3": Silty SAND, dark brown, fine sand, moist	
680										
								ML	**Quaternary Age Young Alluvial Fan Deposits (Qyf)** @3': Sandy SILT, light gray, fine sand, slightly moist	
675	5			R-1	6 13 16	113	14		@5': SILT, light gray, medium dense, little fine sand, slightly moist, CaCO3 nodules	
				S-2	2 3 5		20	CL	@7.5': Lean CLAY, light gray, stiff, slightly moist	
670	10			R-3	2 3 7	100	22		@10': Lean CLAY, olive brown, medium stiff, low to medium plasticity, moist, FeO veins	AL,CN
665	15			S-4	push 1 2		22		@15': Lean CLAY, olive brown, soft, medium plasticity, moist, trace FeO veins	AL
660	20			R-5	2 3 7	94	27		@20': Lean CLAY, yellow brown, medium stiff, medium plasticity, FeO veins	
655	25			S-6	4 6 5		12	SM	@25': Silty SAND, yellow brown, medium dense, mostly fine sand, FeO staining throughout	
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

Leighton

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GEOTECHNICAL BORING LOG LB-5

Project No.	13807.001	**Date Drilled**	2-7-23
Project	Rexford Chino Benson Avenue	**Logged By**	MM
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	681'
Location	See Figure 2 - Exploration Location Map	**Sampled By**	MM

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
650	30			R-7	5 9 17	118	13	SC	@30': Clayey SAND, brown, medium dense, fine sand, trace medium to coarse sand, moist	
645	35								**T.D. 31.5' bgs** **No groundwater encountered during drilling** **Backfilled with soil cuttings and patched with cold-mix asphalt concrete**	
640	40									
635	45									
630	50									
625	55									
	60									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LP-1

Project No.	13807.001	**Date Drilled**	2-7-23
Project	Rexford Chino Benson Avenue	**Logged By**	MM
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	682'
Location	See Figure 2 - Exploration Location Map	**Sampled By**	MM

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N–S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
682	0							SM	@Surface: 3" asphalt concrete, no base **Undocumented Artificial Fill (Afu)** @3": Silty SAND, dark brown, fine sand, moist	
680								ML	**Quaternary Age Young Alluvial Fan Deposits (Qyf)** @3': SILT with sand, light gray, slightly moist	
	5			S-1	5 6 7		13		@5': SILT, light gray, very stiff, moist, few fine sand, trace fine gravel	
675				S-2	2 2 3		17		@8': SILT, light gray, medium stiff, moist, few fine sand, abundant FeO veins	
	10								**T.D. 10' bgs** **No groundwater encountered during drilling** **Installed temporary test well using 2-inch diameter pipe** **Solid pipe from 0-5 feet bgs and 0.020-inch slotted pipe from 5-10 feet bgs** **No. 3 Monterey SAND placed in annulus from 4-10 feet bgs** **Upon completion of percolation test, removed pipe and backfilled with soil cuttings and patched with cold-mix asphalt concrete**	
670	15									
665	20									
660	25									
655	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

Leighton

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GEOTECHNICAL BORING LOG LP-2

Project No.	13807.001	**Date Drilled**	2-7-23
Project	Rexford Chino Benson Avenue	**Logged By**	MM
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	682'
Location	See Figure 2 - Exploration Location Map	**Sampled By**	MM

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0							SM	@Surface: 3" asphalt concrete over 2" base **Undocumented Artificial Fill (Afu)** @3": Silty SAND, dark brown, fine sand	
680								ML	**Quaternary Age Young Alluvial Fan Deposits (Qyf)** @3': SILT with sand, light gray, moist	
	5			S-1	2 4 3		18	CL	@5': Lean CLAY, light gray, stiff, moist, no to low plasticity, trace FeO staining	
675				S-2	2 2 3		19		@8': medium stiff	
	10								**T.D. 10' bgs** **No groundwater encountered during drilling** **Installed temporary test well using 2-inch diameter pipe** **Solid pipe from 0-5 feet bgs and 0.020-inch slotted pipe from 5-10 feet bgs** **No. 3 Monterey SAND placed in annulus from 4-10 feet bgs** **Upon completion of percolation test, removed pipe and backfilled with soil cuttings and patched with cold-mix asphalt concrete**	
670										
	15									
665										
	20									
660										
	25									
655										
	30									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
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- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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APPENDIX B

PERCOLATION TEST DATA

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Boring Percolation Test Data Sheet

Project Number:	13807.001	**Test Hole Number:**	LP-1
Project Name:	Rexford Benson Chino	**Date Excavated:**	2/7/2023
Earth Description:	Alluvium	**Date Tested:**	2/8/2023
Liquid Description:	Tap water	**Depth of boring (ft):**	10
Tested By:	MM	**Radius of boring (in):**	4
Time Interval Standard		**Radius of casing (in):**	1
Start Time for Pre-Soak:	2/7/2023 14:00	**Length of slotted of casing (ft):**	5
Start Time for Standard:	7:37	**Depth to Initial Water Depth (ft):**	4
Standard Time Interval Between Readings, mins:	30	**Porosity of Annulus Material, *n* :**	0.35
		Bentonite Plug at Bottom:	No

Field Percolation Data - Falling Head Test

Reading	Time	Time Interval, Δt (min.)	Initial/Final Depth to Water (ft.)	Initial/Final Water Height, H_0/H_f (in.)	Total Water Drop, Δd (in.)	Infiltration Rate (in./hr.)
1	7:37	30	4.32	68.2	2.5	0.06
	8:07		4.53	65.6		
2	8:07	30	4.53	65.6	3.1	0.07
	8:37		4.79	62.5		
3	8:37	30	4.79	62.5	2.5	0.06
	9:07		5.00	60.0		
4	9:07	30	5.00	60.0	2.8	0.07
	9:37		5.23	57.2		
5	9:38	30	5.00	60.0	3.5	0.09
	10:08		5.29	56.5		
6	10:09	30	5.00	60.0	3.4	0.09
	10:39		5.28	56.6		
7	10:40	30	5.00	60.0	3.5	0.09
	11:20		5.29	56.5		
8	11:22	30	5.00	60.0	3.4	0.09
	11:52		5.28	56.6		

Infiltration Rate (I) = Discharge Volume/Surface Area of Test Section/Time Interval

Measured Infiltration Rate, I (Average of Last 3 Readings) = **0.09** **in./hr.**

Boring Percolation Test Data Sheet

Project Number:	13807.001	**Test Hole Number:**	LP-2
Project Name:	Rexford Benson Chino	**Date Excavated:**	2/7/2023
Earth Description:	Alluvium	**Date Tested:**	2/8/2023
Liquid Description:	Tap water	**Depth of boring (ft):**	10
Tested By:	MM	**Radius of boring (in):**	4
Time Interval Standard		**Radius of casing (in):**	1
Start Time for Pre-Soak:	2/7/2023 14:37	**Length of slotted of casing (ft):**	5
Start Time for Standard:	7:12	**Depth to Initial Water Depth (ft):**	5
Standard Time Interval Between Readings, mins:	30	**Porosity of Annulus Material, *n* :**	0.35
		Bentonite Plug at Bottom:	No

Field Percolation Data - Falling Head Test

Reading	Time	Time Interval, Δt (min.)	Initial/Final Depth to Water (ft.)	Initial/Final Water Height, H_0/H_f (in.)	Total Water Drop, Δd (in.)	Infiltration Rate (in./hr.)
1	7:12	30	5.00	60.0	1.8	0.05
	7:42		5.15	58.2		
2	7:45	30	5.00	60.0	1.8	0.05
	8:15		5.15	58.2		
3	8:17	30	5.00	60.0	1.7	0.04
	8:47		5.14	58.3		
4	8:48	31	5.00	60.0	1.9	0.05
	9:19		5.16	58.1		
5	9:20	30	5.00	60.0	1.8	0.05
	9:50		5.15	58.2		
6	9:51	30	5.00	60.0	1.8	0.05
	10:21		5.15	58.2		
7	10:24	30	5.00	60.0	1.9	0.05
	10:54		5.16	58.1		
8	10:56	30	5.00	60.0	1.8	0.05
	11:26		5.15	58.2		

Infiltration Rate (I) = Discharge Volume/Surface Area of Test Section/Time Interval

Measured Infiltration Rate, I (Average of Last 3 Readings) = 0.05 in./hr.

APPENDIX C

LABORATORY TEST RESULTS

Leighton

MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	Rexford/13925 Benson Ave/Geo	Tested By:	MRV/FLM	Date:	02/16/23
Project No.:	13807.001	Checked By:	M. Vinet	Date:	03/03/23
Boring No.:	LB-4	Depth (ft.):	0 - 5.0		
Sample No.:	B-1				
Soil Identification:	Silty Sand (SM), Very Dark Yellowish Brown.				

Preparation Method: [X] Moist [ ] Dry

[X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft³) 0.03340

Ram Weight = 10 lb.; Drop = 18 in.

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	5470	5605	5645	5593		
Weight of Mold (g)	3524	3524	3524	3524		
Net Weight of Soil (g)	1946	2081	2121	2069		
Wet Weight of Soil + Cont. (g)	1255.3	1353.0	1390.0	1342.1		
Dry Weight of Soil + Cont. (g)	1191.2	1264.5	1280.5	1220.0		
Weight of Container (g)	276.8	280.2	280.5	277.7		
Moisture Content (%)	7.0	9.0	11.0	13.0		
Wet Density (pcf)	128.4	137.4	140.0	136.6		
Dry Density (pcf)	120.0	126.0	126.2	120.9		

Maximum Dry Density (pcf) **126.8** **Optimum Moisture Content (%)** **10.0**

PROCEDURE USED

[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

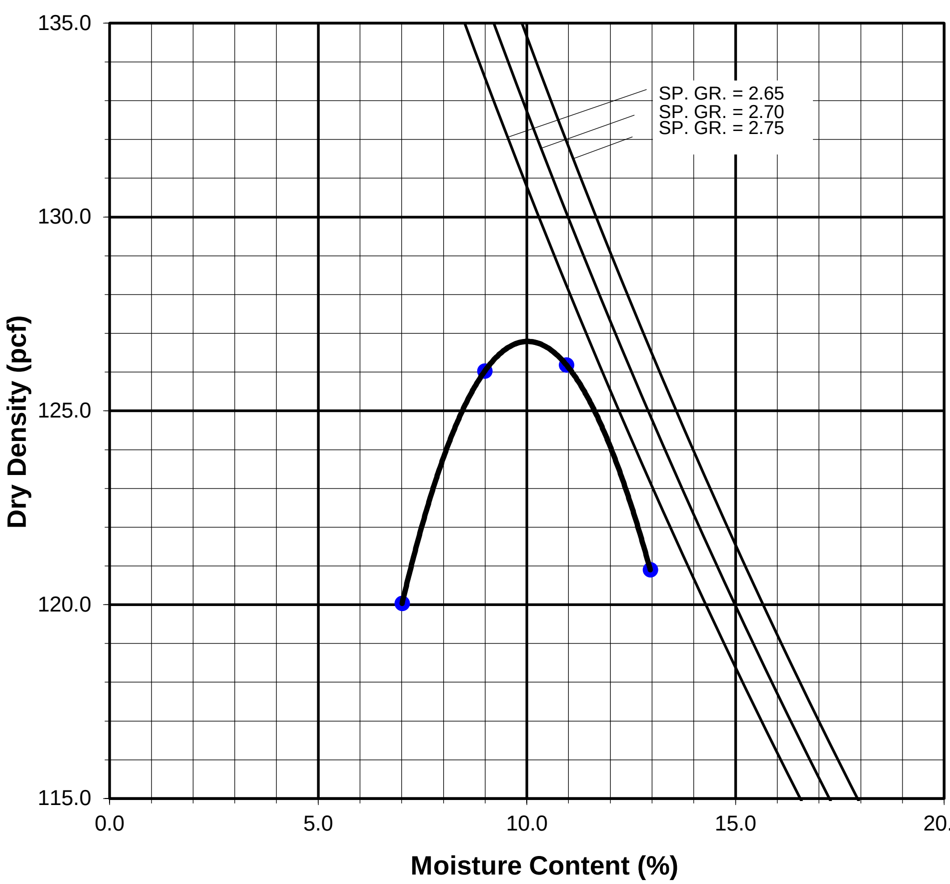
[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:

GR:SA:FI

Atterberg Limits:

LL,PL,PI



Compaction; LB-4, B-1 (02-07-23)

Leighton

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	Rexford/13925 Benson Ave/Geo	Tested By: M. Vinet	Date: 2/22/23
Project No. :	13807.001	Checked By: M. Vinet	Date: 2/23/23
Boring No.:	LB-4	Depth: 0 - 5.0	
Sample No. :	B-1	Location: N/A	
Sample Description:	Silty Sand (SM), Very Dark Yellowish Brown.		

Dry Wt. of Soil + Cont. (gm.)	2512.3
Wt. of Container No. (gm.)	0.0
Dry Wt. of Soil (gm.)	2512.3
Weight Soil Retained on #4 Sieve	22.1
Percent Passing # 4	99.1

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	1.0060
Wt. Comp. Soil + Mold (gm.)	608.0	642.0
Wt. of Mold (gm.)	209.0	209.0
Specific Gravity (Assumed)	2.70	2.70
Container No.	10	10
Wet Wt. of Soil + Cont. (gm.)	350.1	642.0
Dry Wt. of Soil + Cont. (gm.)	324.1	364.4
Wt. of Container (gm.)	50.1	209.0
Moisture Content (%)	9.5	18.8
Wet Density (pcf)	120.4	129.8
Dry Density (pcf)	109.9	109.3
Void Ratio	0.534	0.543
Total Porosity	0.348	0.352
Pore Volume (cc)	72.0	73.3
Degree of Saturation (%) [S meas]	**48.1**	**93.6**

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h.

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
2/22/23	9:00	1.0	0	0.5000
2/22/23	9:10	1.0	10	0.5000
	Add Distilled Water to the Specimen			
2/23/23	8:00	1.0	1370	0.5060
2/23/23	9:00	1.0	1430	0.5060

Expansion Index (EI meas)	=	((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	6.0
Expansion Index (Report)	=	Nearest Whole Number or Zero (0) if Initial Height is > than Final Height	**6**

Rev. 03-08

ATTERBERG LIMITS
ASTM D 4318

Project Name:	Rexford/13925 Benson Ave/Geo	Tested By:	M. Vinet	Date:	02/27/23
Project No. :	13807.001	Input By:	M. Vinet	Date:	02/28/23
Boring No.:	LB-1	Checked By:	M. Vinet		
Sample No.:	S-3	Depth (ft.)	10.0		
Soil Identification:	Lean Clay (CL), Olive Brown.				

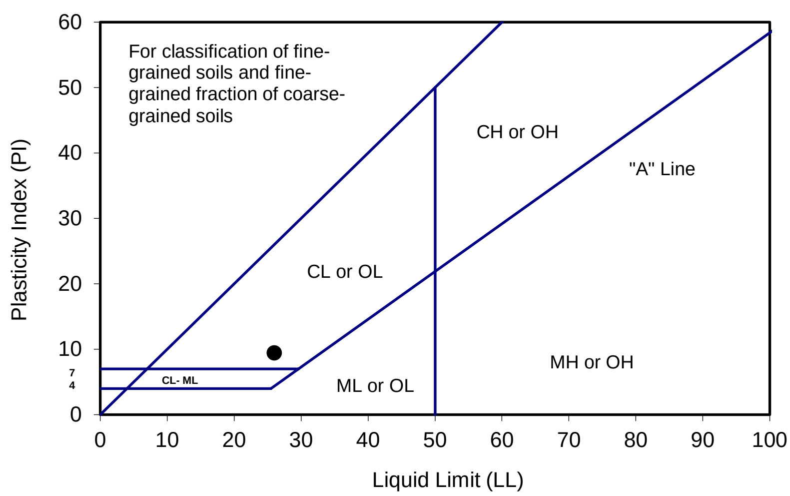
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			15	22	31	
Wet Wt. of Soil + Cont. (g)	21.19	21.02	23.71	24.84	27.58	
Dry Wt. of Soil + Cont. (g)	20.13	20.00	21.56	22.52	24.75	
Wt. of Container (g)	13.77	13.79	13.67	13.69	13.65	
Moisture Content (%) [Wn]	16.67	16.43	27.25	26.27	25.50	

Liquid Limit	**26**
Plastic Limit	**17**
Plasticity Index	**9**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 4.38

One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



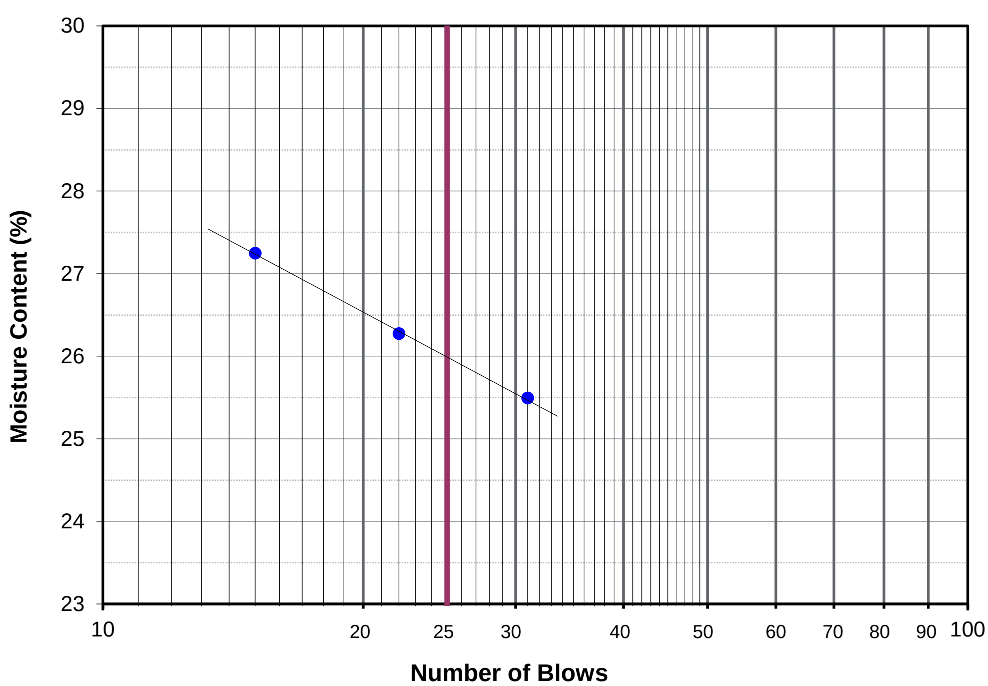
PROCEDURES USED

☐ Wet Preparation
Multipoint - Wet

☒ Dry Preparation
Multipoint - Dry

☒ Procedure A
Multipoint Test

☐ Procedure B
One-point Test



ATTERBERG LIMITS

ASTM D 4318

Project Name:	Rexford/13925 Benson Ave/Geo	Tested By:	M. Vinet	Date:	02/27/23
Project No. :	13807.001	Input By:	M. Vinet	Date:	02/28/23
Boring No.:	LB-4	Checked By:	M. Vinet		
Sample No.:	S-4	Depth (ft.)	15.0		
Soil Identification:	Lean Clay (CL), Olive Brown.				

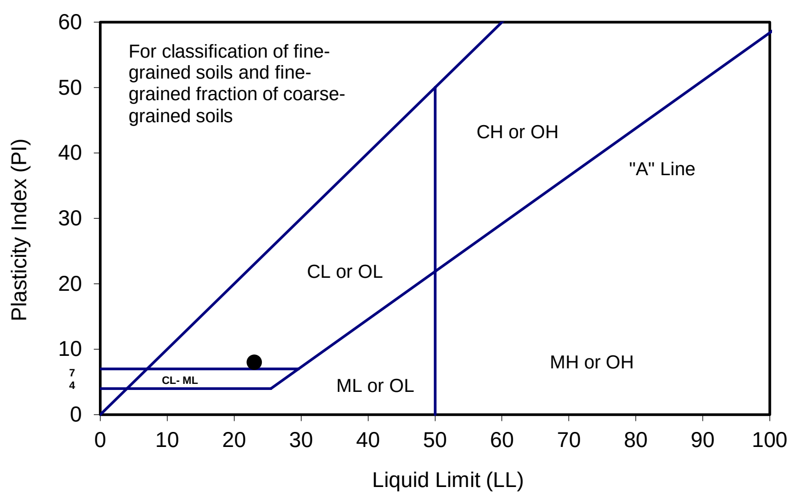
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			15	25	35	
Wet Wt. of Soil + Cont. (g)	23.77	21.58	25.69	25.53	28.49	
Dry Wt. of Soil + Cont. (g)	22.48	20.54	23.38	23.37	25.87	
Wt. of Container (g)	13.76	13.66	13.67	13.78	13.75	
Moisture Content (%) [Wn]	14.79	15.12	23.79	22.52	21.62	

Liquid Limit	**23**
Plastic Limit	**15**
Plasticity Index	**8**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) | 2.19

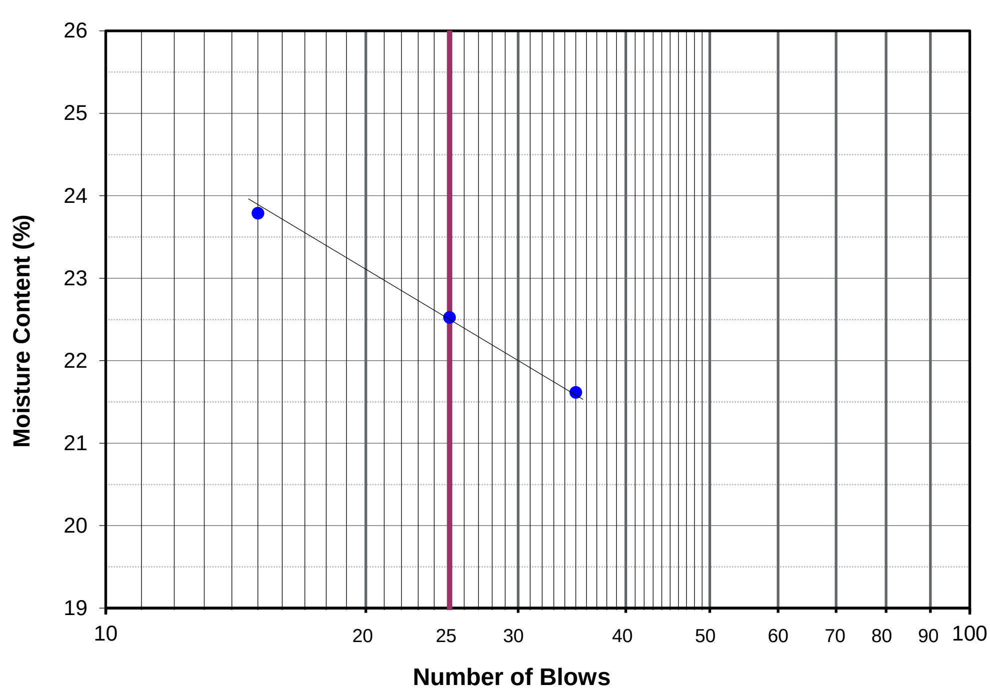
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



ATTERBERG LIMITS
ASTM D 4318

Leighton

Project Name:	Rexford/13925 Benson Ave/Geo	Tested By:	F. Mina	Date:	02/22/23
Project No. :	13807.001	Input By:	M. Vinet	Date:	02/28/23
Boring No.:	LB-5	Checked By:	M. Vinet		
Sample No.:	R-3	Depth (ft.)	10.0		
Soil Identification:	Lean Clay (CL), Olive Brown.				

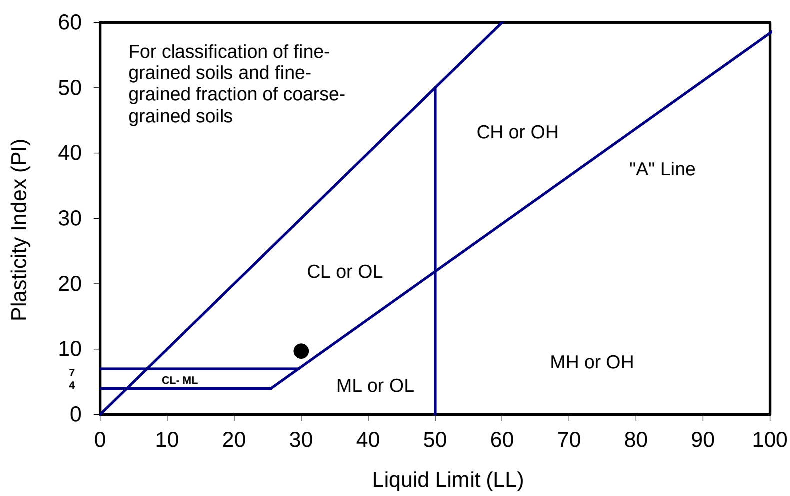
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			15	25	35	
Wet Wt. of Soil + Cont. (g)	28.45	21.32	22.62	21.76	24.02	
Dry Wt. of Soil + Cont. (g)	25.95	20.06	20.50	19.93	21.74	
Wt. of Container (g)	13.76	13.77	13.70	13.74	13.76	
Moisture Content (%) [Wn]	20.51	20.03	31.18	29.56	28.57	

Liquid Limit	**30**
Plastic Limit	**20**
Plasticity Index	**10**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 7.3

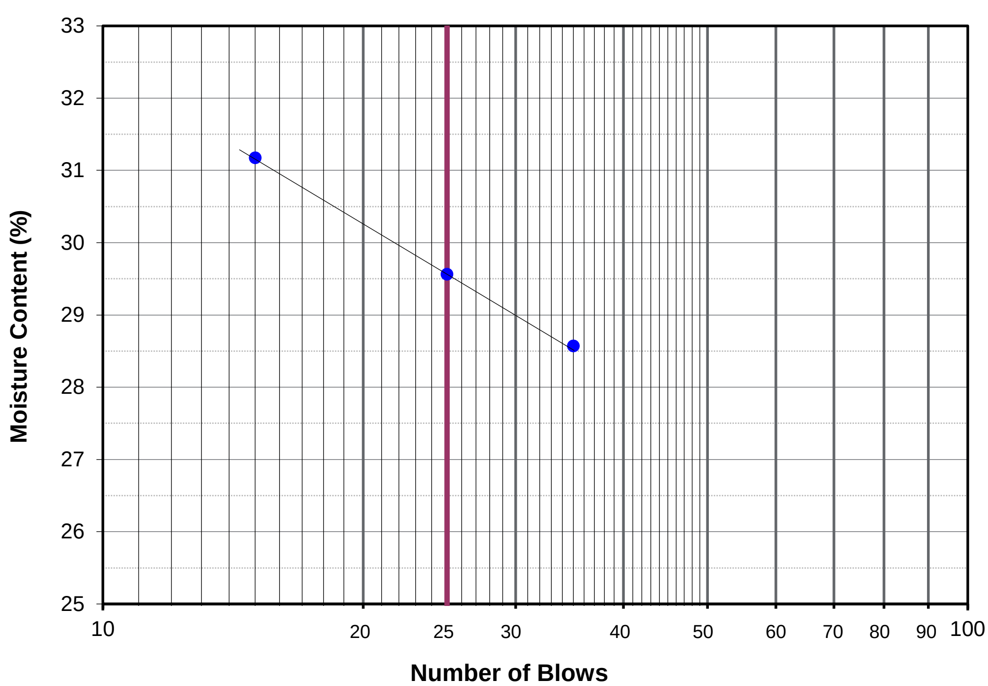
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



ATTERBERG LIMITS
ASTM D 4318

Project Name:	Rexford/13925 Benson Ave/Geo	Tested By:	F. Mina	Date:	02/22/23
Project No. :	13807.001	Input By:	M. Vinet	Date:	02/28/23
Boring No.:	LB-5	Checked By:	M. Vinet		
Sample No.:	S-4	Depth (ft.)	15.0		
Soil Identification:	Lean Clay (CL), Olive Brown.				

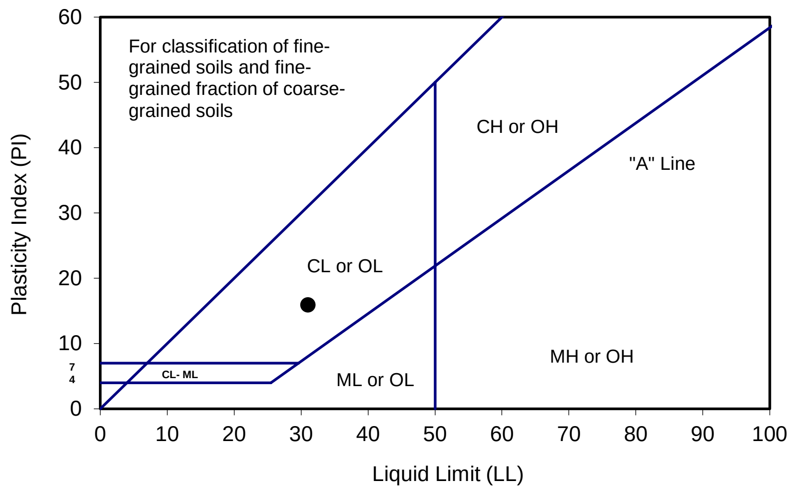
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			15	25	35	
Wet Wt. of Soil + Cont. (g)	23.27	26.29	22.33	21.59	23.68	
Dry Wt. of Soil + Cont. (g)	22.00	24.66	20.16	19.70	21.41	
Wt. of Container (g)	13.67	13.73	13.71	13.66	13.75	
Moisture Content (%) [Wn]	15.25	14.91	33.64	31.29	29.63	

Liquid Limit	**31**
Plastic Limit	**15**
Plasticity Index	**16**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) | 8.03

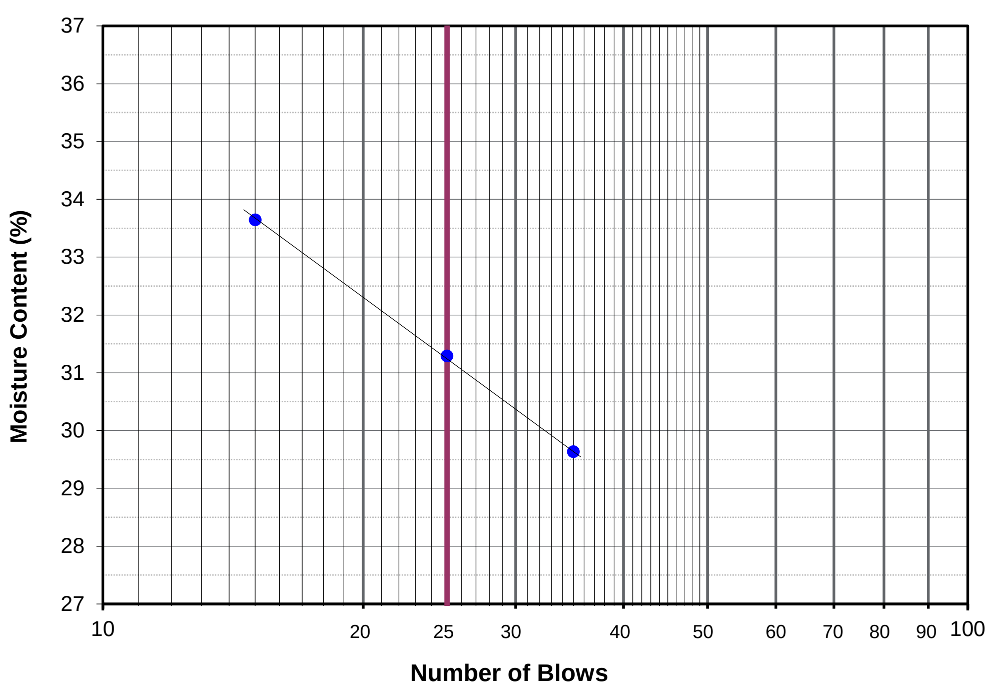
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test

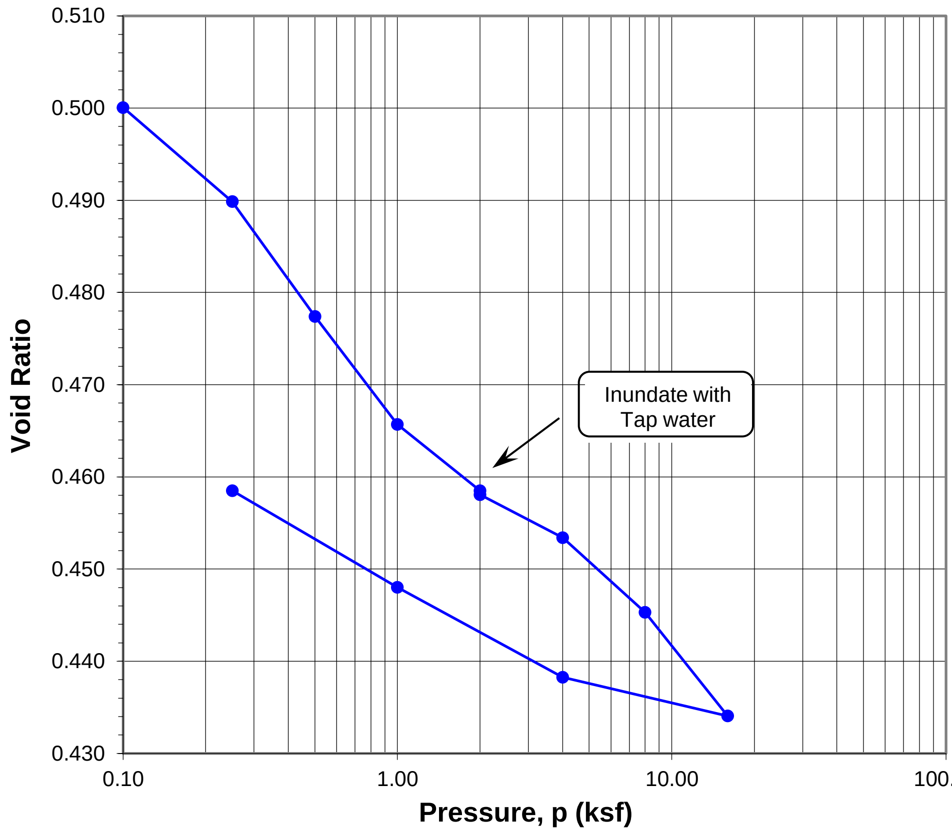


ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

ASTM D 2435

Project Name:	Rexford/13925 Benson Ave/Geo	Tested By:	M. Vinet	Date:	02/23/23
Project No.:	13807.001	Checked By:	M. Vinet	Date:	03/08/23
Boring No.:	LB-4	Depth (ft.):	0 - 5.0		
Sample No.:	B-1	Sample Type:	90% Remold		
Soil Identification:	Silty Sand (SM), Very Dark Yellowish Brown.				

Sample Diameter (in.):	2.415
Sample Thickness (in.):	1.000
Weight of Sample + ring (g):	194.00
Weight of Ring (g):	43.21
Height after consol. (in.):	0.9723
Before Test	
Wt. of Wet Sample+Cont. (g):	288.64
Wt. of Dry Sample+Cont. (g):	262.89
Weight of Container (g):	32.76
Initial Moisture Content (%)	11.2
Initial Dry Density (pcf)	112.8
Initial Saturation (%):	61
Initial Vertical Reading (in.)	0.0000
After Test	
Wt. of Wet Sample+Cont. (g):	251.27
Wt. of Dry Sample+Cont. (g):	230.32
Weight of Container (g):	50.58
Final Moisture Content (%)	15.34
Final Dry Density (pcf):	116.8
Final Saturation (%):	93
Final Vertical Reading (in.)	0.0310
Specific Gravity (assumed):	2.71
Water Density (pcf):	62.43

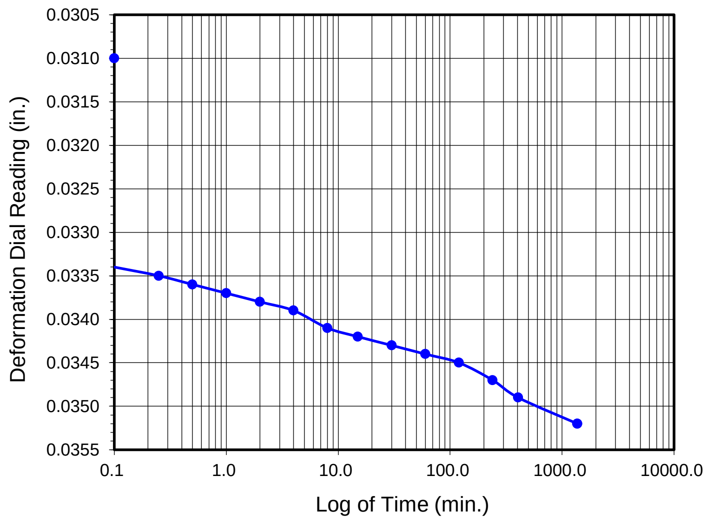


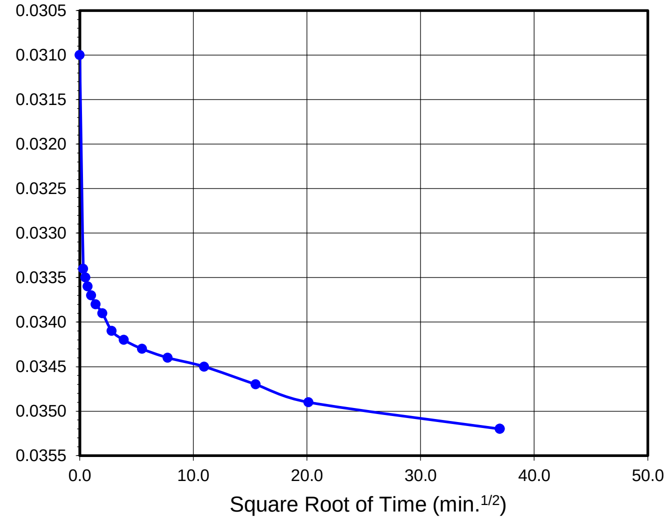
Pressure (p) (ksf)	Final Reading (in.)	Apparent Thickness (in.)	Load Compliance (%)	Deformation % of Sample Thickness	Void Ratio	Corrected Deforma-tion (%)
0.10	0.0000	1.0000	0.00	0.00	0.500	0.00
0.25	0.0072	0.9928	0.04	0.72	0.490	0.68
0.50	0.0160	0.9840	0.09	1.60	0.477	1.51
1.00	0.0248	0.9752	0.19	2.48	0.466	2.29
2.00	0.0296	0.9704	0.19	2.96	0.459	2.77
2.00	0.0310	0.9690	0.30	3.10	0.458	2.80
4.00	0.0352	0.9648	0.41	3.52	0.453	3.11
8.00	0.0420	0.9580	0.55	4.20	0.445	3.65
16.00	0.0512	0.9488	0.72	5.12	0.434	4.40
4.00	0.0468	0.9532	0.56	4.68	0.438	4.12
1.00	0.0391	0.9609	0.44	3.91	0.448	3.47
0.25	0.0310	0.9690	0.33	3.10	0.459	2.77

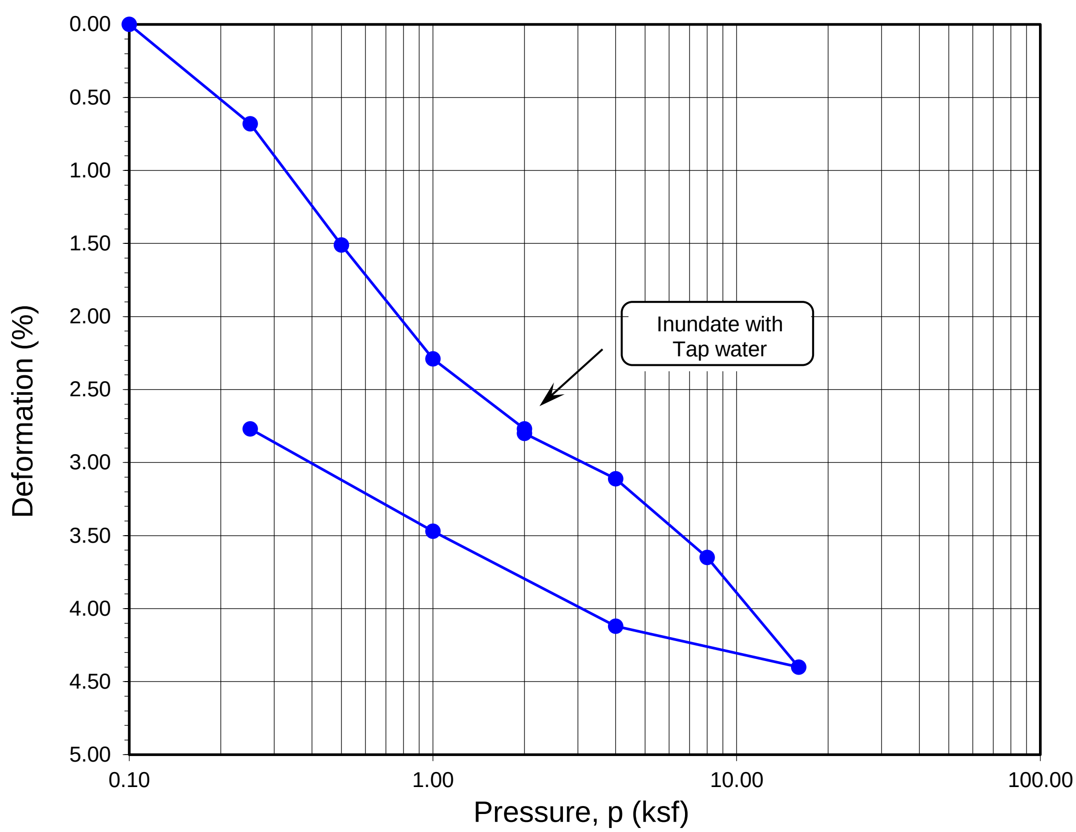
Time Readings @ 4.0 ksf

Date	Time	Elapsed Time (min)	Square Root of Time	Dial Rdgs. (in.)
3/3/23	8:15:00	0.0	0.0	0.0310
3/3/23	8:15:06	0.1	0.3	0.0334
3/3/23	8:15:15	0.2	0.5	0.0335
3/3/23	8:15:30	0.5	0.7	0.0336
3/3/23	8:16:00	1.0	1.0	0.0337
3/3/23	8:17:00	2.0	1.4	0.0338
3/3/23	8:19:00	4.0	2.0	0.0339
3/3/23	8:23:00	8.0	2.8	0.0341
3/3/23	8:30:00	15.0	3.9	0.0342
3/3/23	8:45:00	30.0	5.5	0.0343
3/3/23	9:15:00	60.0	7.7	0.0344
3/3/23	10:15:00	120.0	11.0	0.0345
3/3/23	12:15:00	240.0	15.5	0.0347
3/3/23	15:00:00	405.0	20.1	0.0349
3/4/23	7:03:00	1368.0	37.0	0.0352
3/4/23	7:03:00	1368.0	37.0	0.0352

Time Readings @ 4.0 ksf







Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
LB-4	**B-1**	**0 - 5.0**	**11.2**	**15.3**	**112.8**	**116.8**	**0.500**	**0.459**	**61**	**93**

Soil Identification: Silty Sand (SM), Very Dark Yellowish Brown.

Leighton

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

Project No.: 13807.001

Rexford/13925 Benson Ave/Geo

03-23

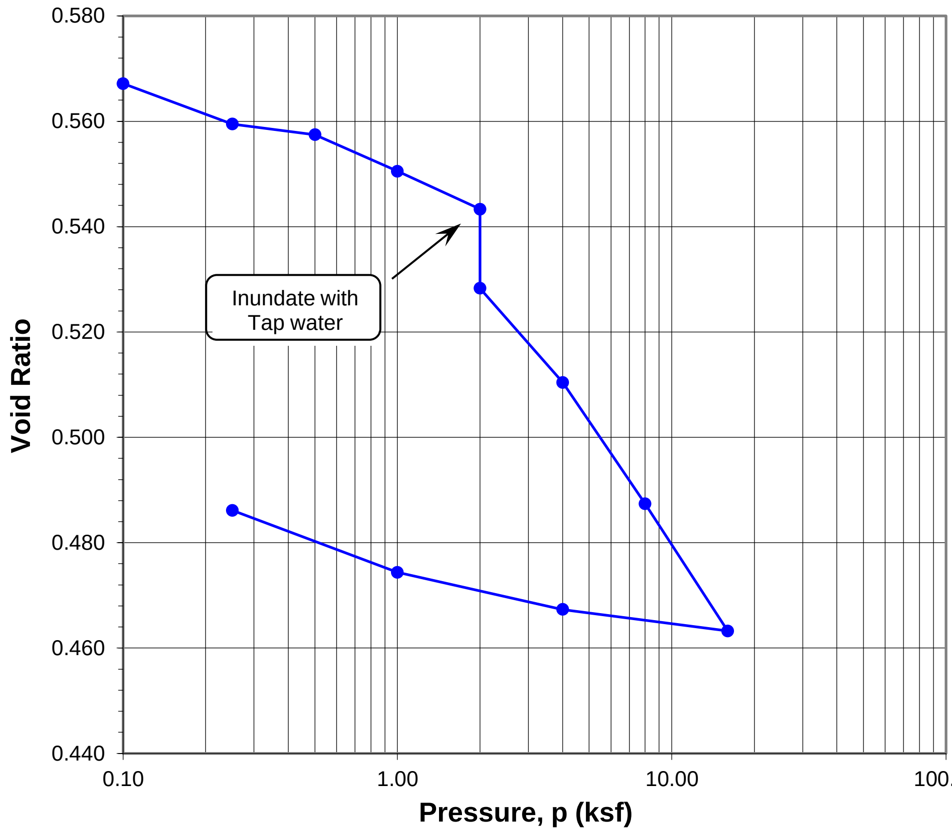
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

ASTM D 2435

Leighton

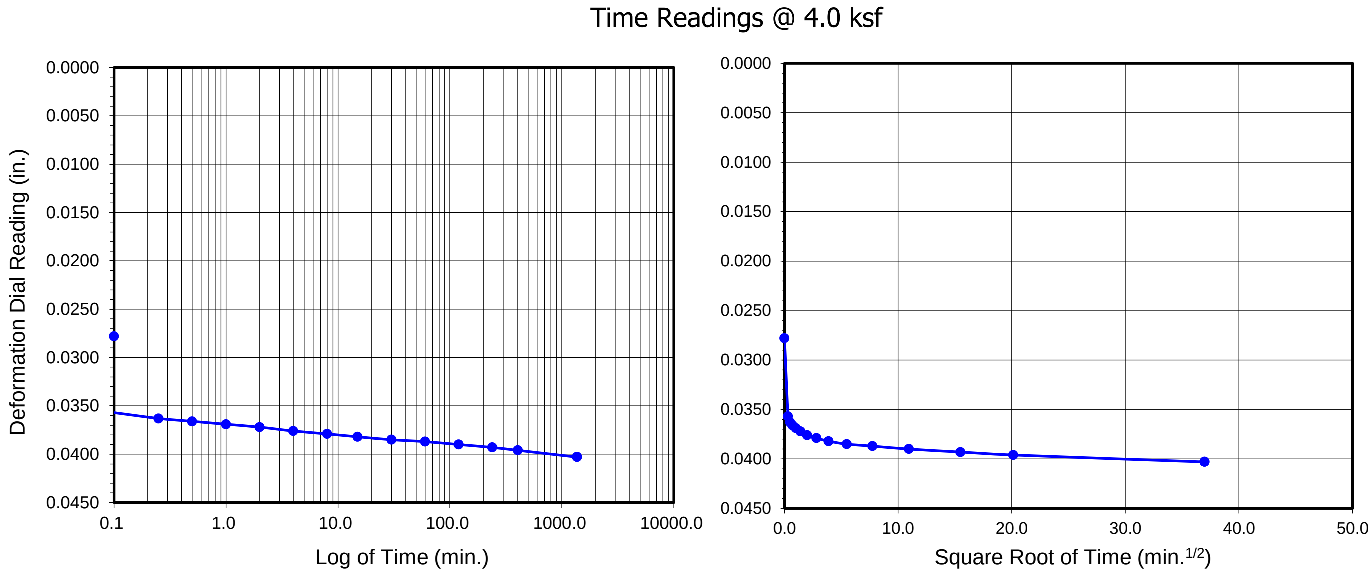
Project Name:	Rexford/13925 Benson Ave/Geo	Tested By:	M. Vinet	Date:	02/22/23
Project No.:	13807.001	Checked By:	M. Vinet	Date:	03/08/23
Boring No.:	LB-4	Depth (ft.):	5.0		
Sample No.:	R-1	Sample Type:	Ring		
Soil Identification:	Sandy Silt s(ML), Brown.				

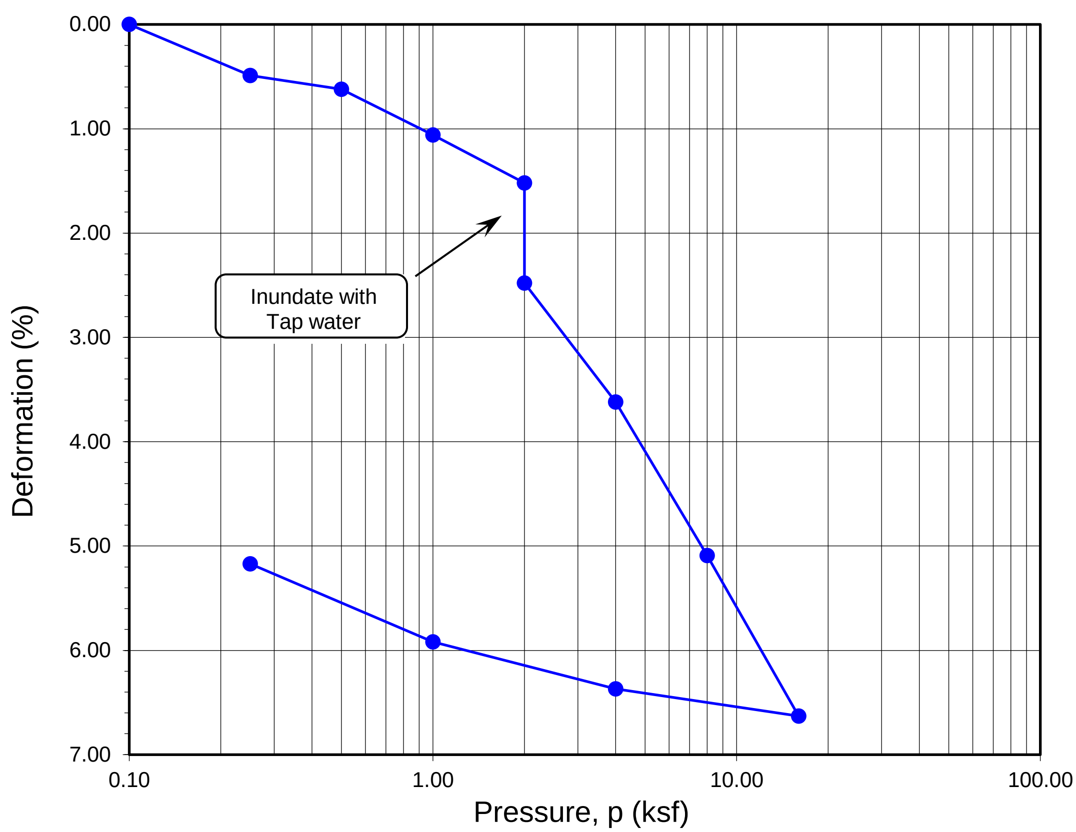
Sample Diameter (in.):	2.415
Sample Thickness (in.):	1.000
Weight of Sample + ring (g):	197.43
Weight of Ring (g):	45.36
Height after consol. (in.):	0.9483
Before Test	
Wt. of Wet Sample+Cont. (g):	192.22
Wt. of Dry Sample+Cont. (g):	171.43
Weight of Container (g):	50.20
Initial Moisture Content (%)	17.1
Initial Dry Density (pcf)	108.0
Initial Saturation (%):	82
Initial Vertical Reading (in.)	0.0000
After Test	
Wt. of Wet Sample+Cont. (g):	249.18
Wt. of Dry Sample+Cont. (g):	226.95
Weight of Container (g):	49.80
Final Moisture Content (%)	16.87
Final Dry Density (pcf):	115.6
Final Saturation (%):	99
Final Vertical Reading (in.)	0.0550
Specific Gravity (assumed):	2.71
Water Density (pcf):	62.43



Pressure (p) (ksf)	Final Reading (in.)	Apparent Thickness (in.)	Load Compliance (%)	Deformation % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.10	0.0000	1.0000	0.00	0.00	0.567	0.00
0.25	0.0053	0.9947	0.04	0.53	0.559	0.49
0.50	0.0071	0.9929	0.09	0.71	0.557	0.62
1.00	0.0125	0.9875	0.19	1.25	0.551	1.06
2.00	0.0171	0.9829	0.19	1.71	0.543	1.52
2.00	0.0278	0.9722	0.30	2.78	0.528	2.48
4.00	0.0403	0.9597	0.41	4.03	0.510	3.62
8.00	0.0564	0.9436	0.55	5.64	0.487	5.09
16.00	0.0735	0.9265	0.72	7.35	0.463	6.63
4.00	0.0693	0.9307	0.56	6.93	0.467	6.37
1.00	0.0636	0.9364	0.44	6.36	0.474	5.92
0.25	0.0550	0.9450	0.33	5.50	0.486	5.17

Time Readings @ 4.0 ksf				
Date	Time	Elapsed Time (min)	Square Root of Time	Dial Rdgs. (in.)
3/2/23	8:15:00	0.0	0.0	0.0278
3/2/23	8:15:06	0.1	0.3	0.0357
3/2/23	8:15:15	0.2	0.5	0.0363
3/2/23	8:15:30	0.5	0.7	0.0366
3/2/23	8:16:00	1.0	1.0	0.0369
3/2/23	8:17:00	2.0	1.4	0.0372
3/2/23	8:19:00	4.0	2.0	0.0376
3/2/23	8:23:00	8.0	2.8	0.0379
3/2/23	8:30:00	15.0	3.9	0.0382
3/2/23	8:45:00	30.0	5.5	0.0385
3/2/23	9:15:00	60.0	7.7	0.0387
3/2/23	10:15:00	120.0	11.0	0.0390
3/2/23	12:15:00	240.0	15.5	0.0393
3/2/23	15:00:00	405.0	20.1	0.0396
3/3/23	7:03:00	1368.0	37.0	0.0403
3/3/23	7:03:00	1368.0	37.0	0.0403





Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
LB-4	**R-1**	**5**	**17.1**	**16.9**	**108.0**	**115.6**	**0.567**	**0.486**	**82**	**99**

Soil Identification: Sandy Silt s(ML), Brown.

Leighton

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

ASTM D 2435

Project No.: 13807.001

Rexford/13925 Benson Ave/Geo

03-23

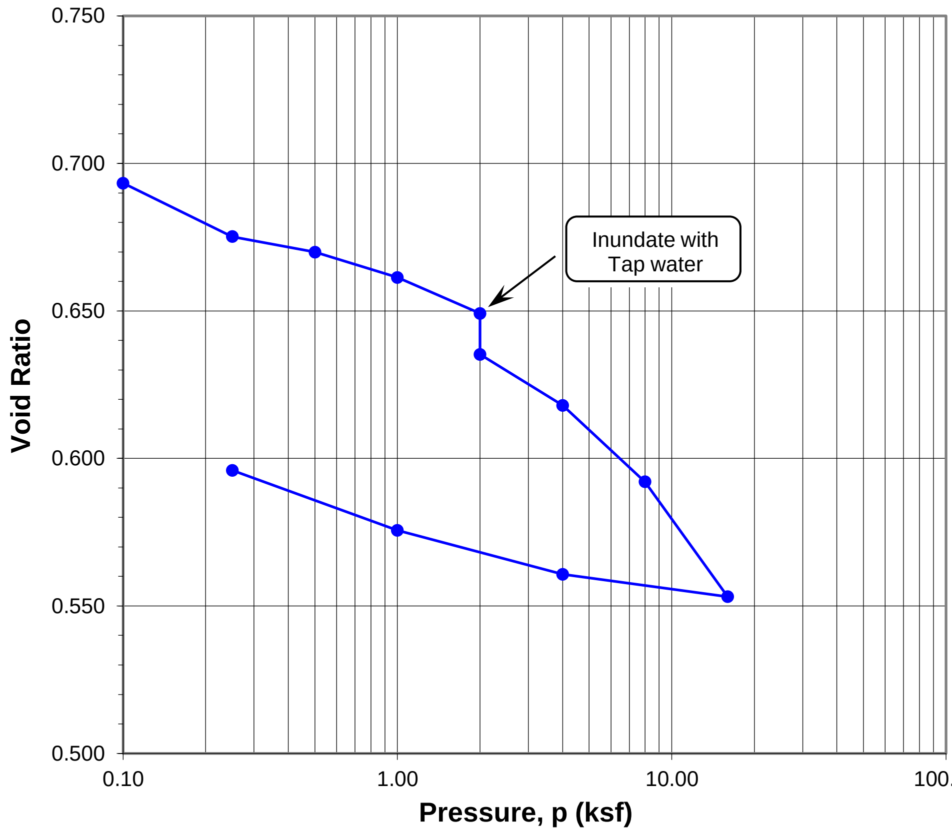
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

ASTM D 2435

Leighton

Project Name:	Rexford/13925 Benson Ave/Geo	Tested By: M. Vinet	Date: 02/23/23
Project No.:	13807.001	Checked By: M. Vinet	Date: 03/08/23
Boring No.:	LB-5	Depth (ft.): 10.0	
Sample No.:	R-3	Sample Type: Ring	
Soil Identification:	Lean Clay (CL), Olive Gray.		

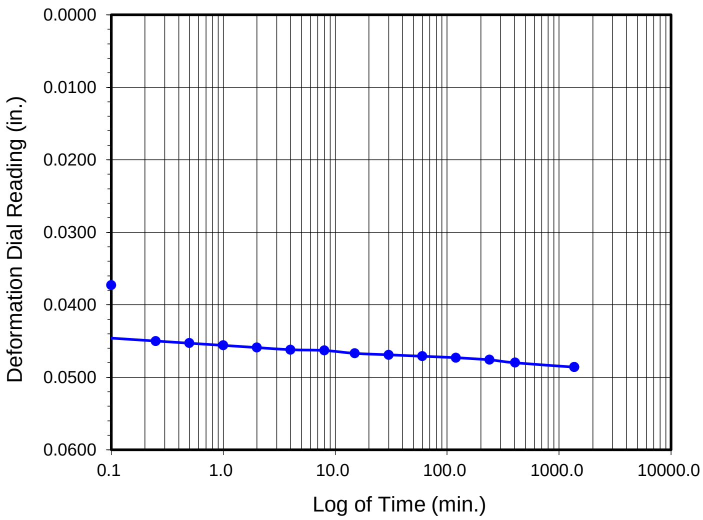
Sample Diameter (in.):	2.415
Sample Thickness (in.):	1.000
Weight of Sample + ring (g):	190.71
Weight of Ring (g):	44.21
Height after consol. (in.):	0.9425
Before Test	
Wt. of Wet Sample+Cont. (g):	350.41
Wt. of Dry Sample+Cont. (g):	296.42
Weight of Container (g):	50.38
Initial Moisture Content (%)	21.9
Initial Dry Density (pcf)	99.9
Initial Saturation (%):	86
Initial Vertical Reading (in.)	0.0000
After Test	
Wt. of Wet Sample+Cont. (g):	239.70
Wt. of Dry Sample+Cont. (g):	211.25
Weight of Container (g):	49.80
Final Moisture Content (%)	24.27
Final Dry Density (pcf):	103.5
Final Saturation (%):	103
Final Vertical Reading (in.)	0.0608
Specific Gravity (assumed):	2.71
Water Density (pcf):	62.43

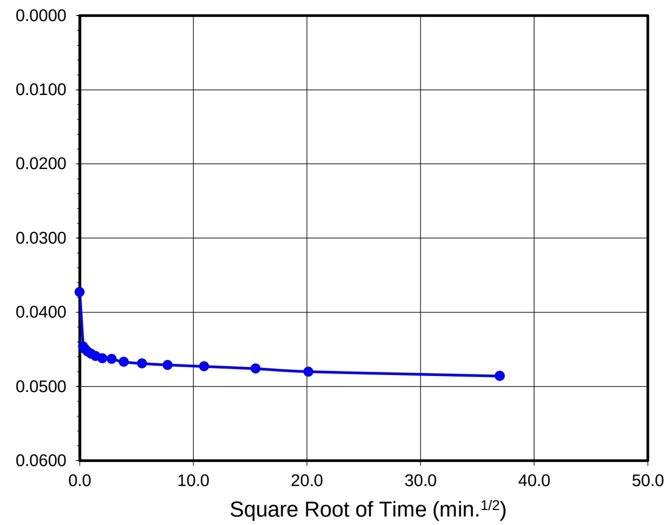


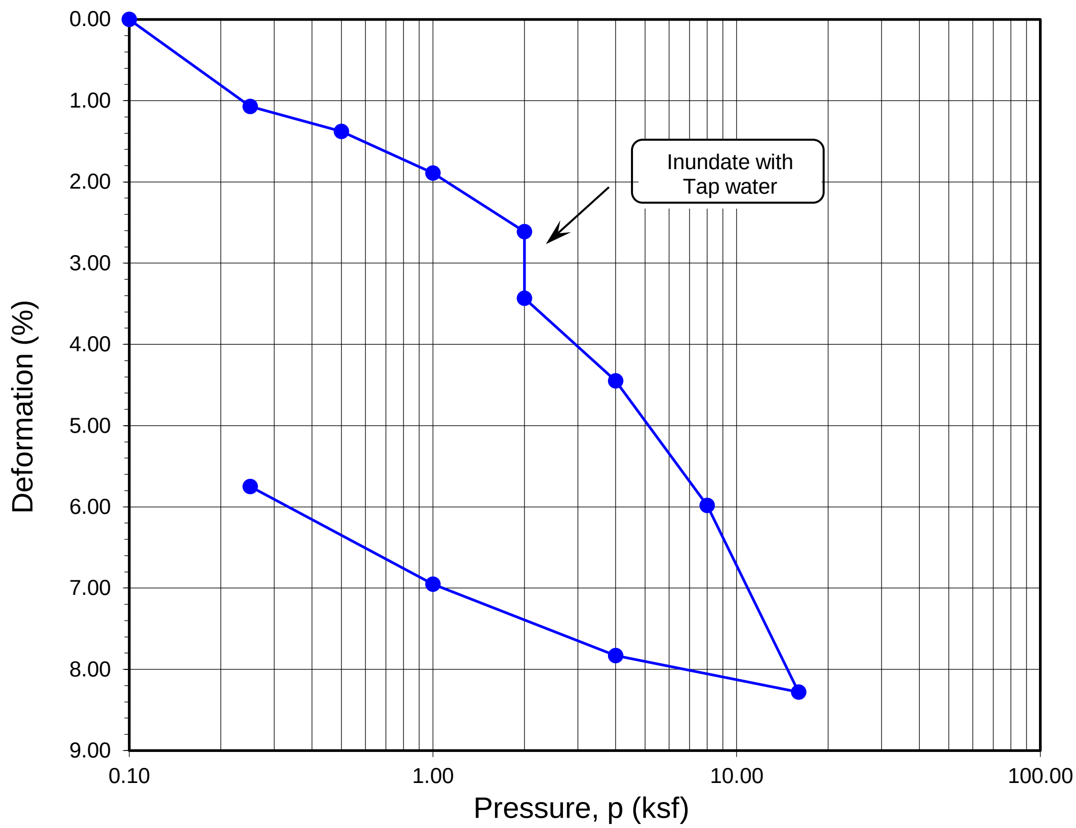
Pressure (p) (ksf)	Final Reading (in.)	Apparent Thickness (in.)	Load Compliance (%)	Deformation % of Sample Thickness	Void Ratio	Corrected Deforma-tion (%)
0.10	0.0000	1.0000	0.00	0.00	0.693	0.00
0.25	0.0111	0.9889	0.04	1.11	0.675	1.07
0.50	0.0147	0.9853	0.09	1.47	0.670	1.38
1.00	0.0208	0.9792	0.19	2.08	0.661	1.89
2.00	0.0280	0.9720	0.19	2.80	0.649	2.61
2.00	0.0373	0.9627	0.30	3.73	0.635	3.43
4.00	0.0486	0.9514	0.41	4.86	0.618	4.45
8.00	0.0653	0.9347	0.55	6.53	0.592	5.98
16.00	0.0900	0.9100	0.72	9.00	0.553	8.28
4.00	0.0839	0.9161	0.56	8.39	0.561	7.83
1.00	0.0739	0.9261	0.44	7.39	0.576	6.95
0.25	0.0608	0.9392	0.33	6.08	0.596	5.75

Time Readings @ 4.0 ksf				
Date	Time	Elapsed Time (min)	Square Root of Time	Dial Rdgs. (in.)
3/6/23	8:15:00	0.0	0.0	0.0373
3/6/23	8:15:06	0.1	0.3	0.0446
3/6/23	8:15:15	0.2	0.5	0.0450
3/6/23	8:15:30	0.5	0.7	0.0453
3/6/23	8:16:00	1.0	1.0	0.0456
3/6/23	8:17:00	2.0	1.4	0.0459
3/6/23	8:19:00	4.0	2.0	0.0462
3/6/23	8:23:00	8.0	2.8	0.0463
3/6/23	8:30:00	15.0	3.9	0.0467
3/6/23	8:45:00	30.0	5.5	0.0469
3/6/23	9:15:00	60.0	7.7	0.0471
3/6/23	10:15:00	120.0	11.0	0.0473
3/6/23	12:15:00	240.0	15.5	0.0476
3/6/23	15:00:00	405.0	20.1	0.0480
3/7/23	7:03:00	1368.0	37.0	0.0486
3/7/23	7:03:00	1368.0	37.0	0.0486

Time Readings @ 4.0 ksf







Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
LB-5	**R-3**	**10**	**21.9**	**24.3**	**99.9**	**103.5**	**0.693**	**0.596**	**86**	**103**

Soil Identification: Lean Clay (CL), Olive Gray.

Leighton

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

Project No.: 13807.001

Rexford/13925 Benson Ave/Geo

03-23

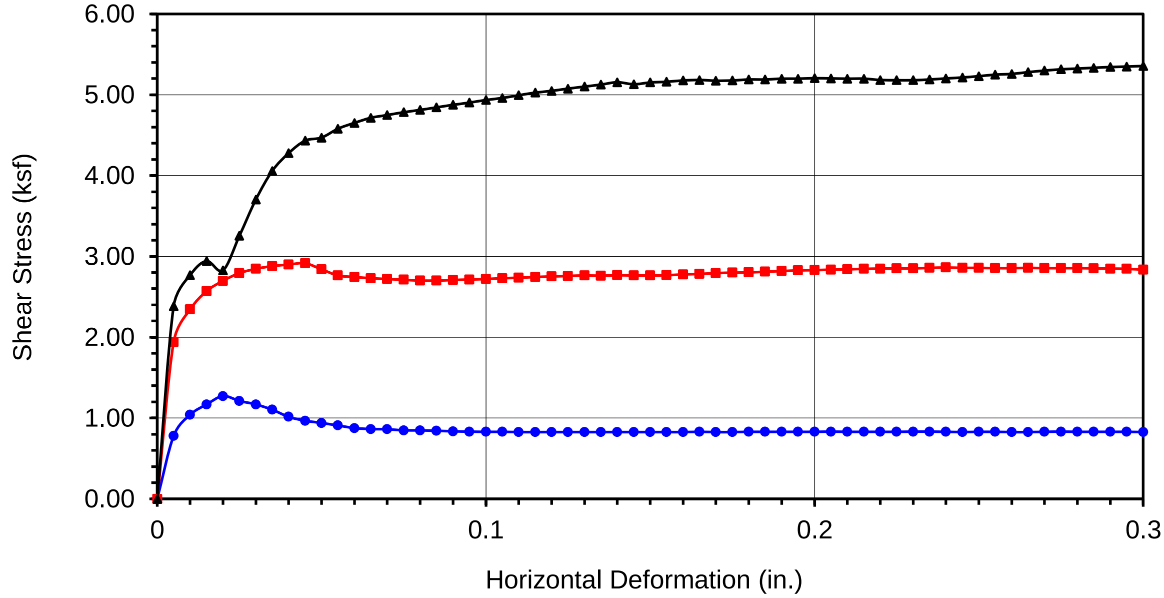
DIRECT SHEAR TEST

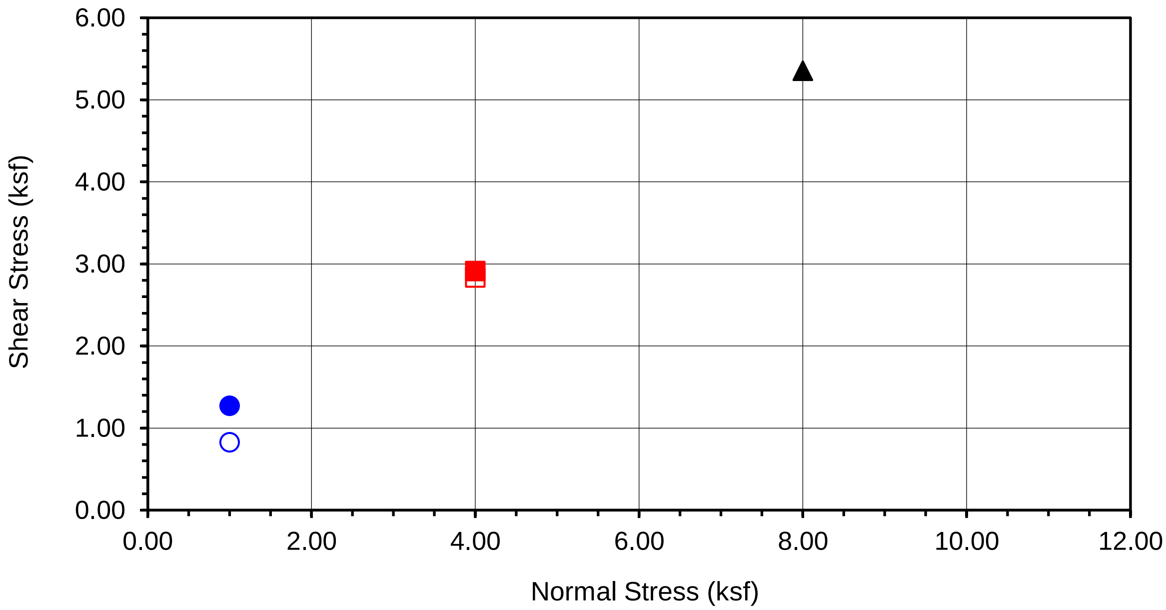
Consolidated Drained - ASTM D 3080

Project Name:	Rexford/13925 Benson Ave/Geo	Tested By:	M. Vinet	Date:	02/23/23
Project No.:	13807.001	Checked By:	M. Vinet	Date:	03/03/23
Boring No.:	LB-4	Sample Type:	90% Remold		
Sample No.:	B-1	Depth (ft.):	0 - 5.0		

Soil Identification: Silty Sand (SM), Very Dark Yellowish Brown.

Sample Diameter(in):	2.415	2.415	2.415
Sample Thickness(in.):	1.000	1.000	1.000
Weight of Sample + ring(gm):	193.01	197.16	196.23
Weight of Ring(gm):	41.80	45.52	45.84
Before Shearing			
Weight of Wet Sample+Cont.(gm):	288.64	288.64	288.64
Weight of Dry Sample+Cont.(gm):	262.89	262.89	262.89
Weight of Container(gm):	32.76	32.76	32.76
Vertical Rdg.(in): Initial	0.0000	0.2500	0.2500
Vertical Rdg.(in): Final	-0.0014	0.2624	0.2756
After Shearing			
Weight of Wet Sample+Cont.(gm):	209.45	210.53	208.40
Weight of Dry Sample+Cont.(gm):	185.68	186.34	184.32
Weight of Container(gm):	50.22	50.39	49.83
Specific Gravity (Assumed):	2.70	2.70	2.70
Water Density(pcf):	62.43	62.43	62.43





Boring No.	**LB-4**
Sample No.	**B-1**
Depth (ft)	**0 - 5.0**
Sample Type: 90% Remold	
Soil Identification: Silty Sand (SM), Very Dark Yellowish Brown.	

Normal Stress (kip/ft²)	1.000	4.000	8.000
Peak Shear Stress (kip/ft²)	● 1.272	■ 2.915	▲ 5.356
Shear Stress @ End of Test (ksf)	○ 0.826	□ 2.836	△ 5.356
Deformation Rate (in./min.)	0.0033	0.0033	0.0033
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	11.19	11.19	11.19
Dry Density (pcf)	113.1	113.4	112.5
Saturation (%)	61.6	62.1	60.6
Soil Height Before Shearing (in.)	0.9986	0.9876	0.9744
Final Moisture Content (%)	17.5	17.8	17.9

Leighton

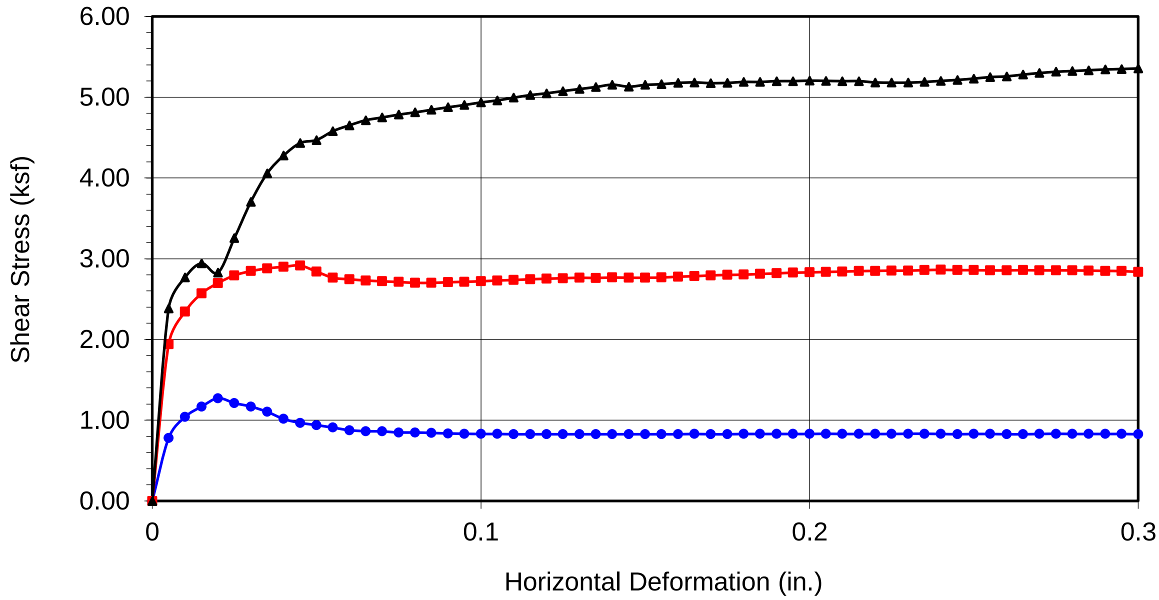
DIRECT SHEAR TEST RESULTS

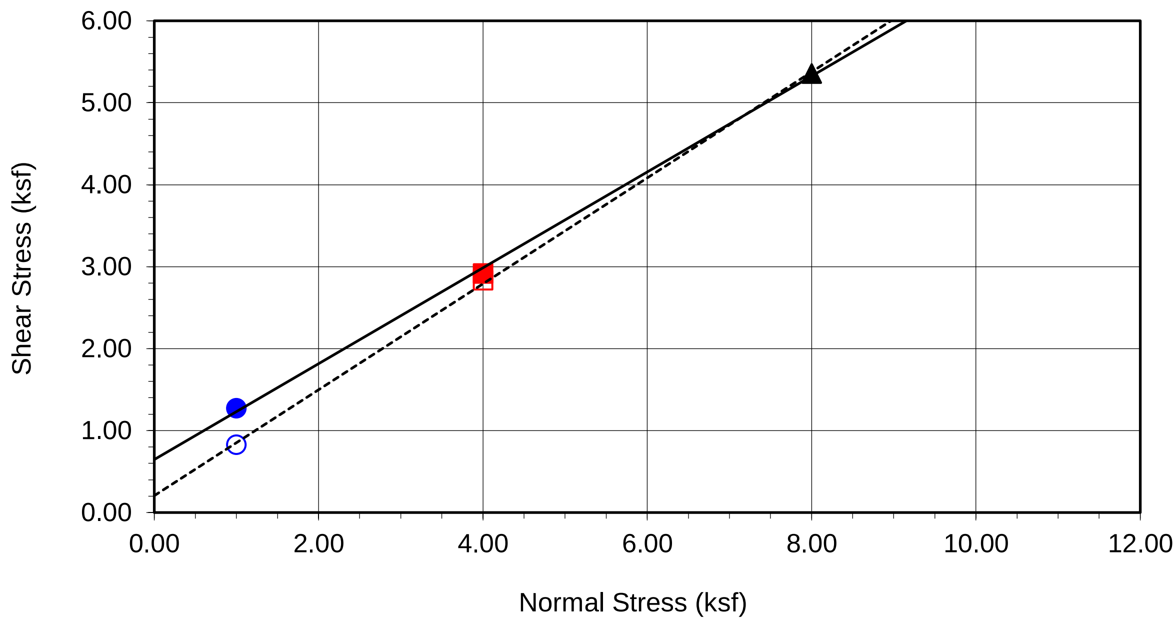
Consolidated Drained - ASTM D 3080

Project No.: 13807.001

Rexford/13925 Benson Ave/Geo

02-23





Boring No.	**LB-4**
Sample No.	**B-1**
Depth (ft)	**0 - 5.0**
Sample Type:	90% Remold

Soil Identification:
Silty Sand (SM), Very Dark Yellowish Brown.

Strength Parameters

	C (psf)	ϕ (°)
Peak	647	30
Ultimate	206	33

Normal Stress (kip/ft²)	1.000	4.000	8.000
Peak Shear Stress (kip/ft²)	● 1.272	■ 2.915	▲ 5.356
Shear Stress @ End of Test (ksf)	○ 0.826	□ 2.836	△ 5.356
Deformation Rate (in./min.)	0.0033	0.0033	0.0033
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	11.19	11.19	11.19
Dry Density (pcf)	113.1	113.4	112.5
Saturation (%)	61.6	62.1	60.6
Soil Height Before Shearing (in.)	0.9986	0.9876	0.9744
Final Moisture Content (%)	17.5	17.8	17.9

Leighton

DIRECT SHEAR TEST RESULTS
Consolidated Drained - ASTM D 3080

Project No.: 13807.001

Rexford/13925 Benson Ave/Geo

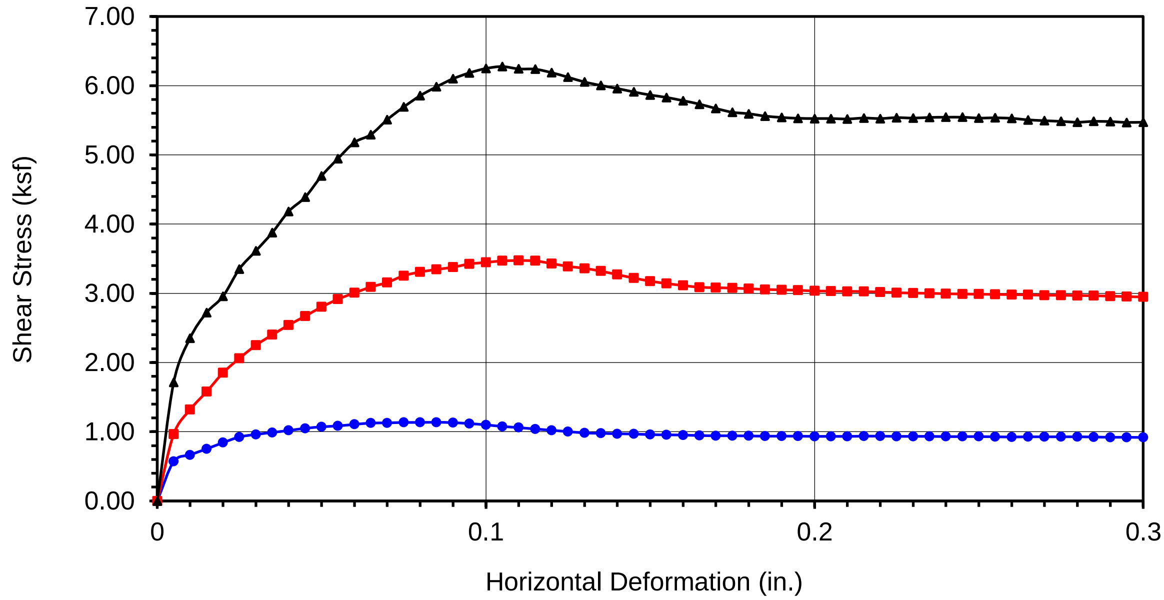
02-23

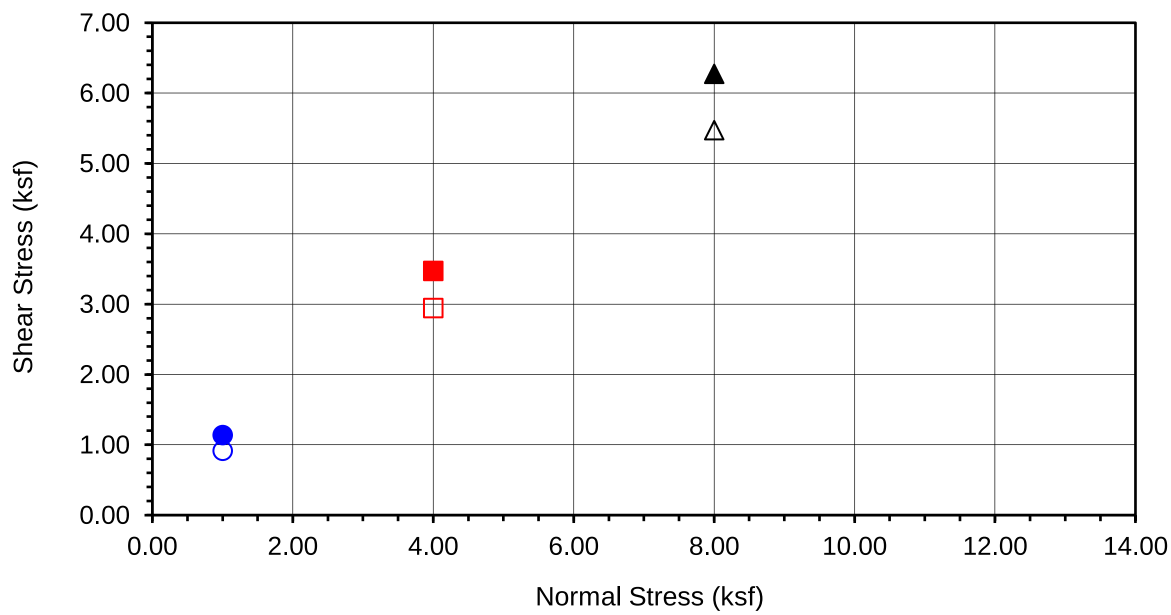
DIRECT SHEAR TEST

Consolidated Drained - ASTM D 3080

Project Name:	Rexford/13925 Benson Ave/Geo	Tested By:	M. Vinet	Date:	02/22/23
Project No.:	13807.001	Checked By:	M. Vinet	Date:	03/03/23
Boring No.:	LB-4	Sample Type:	Ring		
Sample No.:	R-1	Depth (ft.):	5.0		
Soil Identification:	Sandy Silt s(ML), Brown.				

Sample Diameter(in):	2.415	2.415	2.415
Sample Thickness(in.):	1.000	1.000	1.000
Weight of Sample + ring(gm):	188.23	194.86	206.87
Weight of Ring(gm):	44.50	46.07	54.46
Before Shearing			
Weight of Wet Sample+Cont.(gm):	192.22	192.22	192.22
Weight of Dry Sample+Cont.(gm):	171.43	171.43	171.43
Weight of Container(gm):	50.20	50.20	50.20
Vertical Rdg.(in): Initial	0.0000	0.2500	0.2500
Vertical Rdg.(in): Final	-0.0078	0.2784	0.2842
After Shearing			
Weight of Wet Sample+Cont.(gm):	198.30	200.79	206.13
Weight of Dry Sample+Cont.(gm):	173.27	177.48	184.49
Weight of Container(gm):	51.25	50.69	51.48
Specific Gravity (Assumed):	2.70	2.70	2.70
Water Density(pcf):	62.43	62.43	62.43





Boring No.	**LB-4**
Sample No.	**R-1**
Depth (ft)	**5**
Sample Type: Ring	
Soil Identification: Sandy Silt s(ML), Brown.	

Normal Stress (kip/ft²)	1.000	4.000	8.000
Peak Shear Stress (kip/ft²)	● 1.137	■ 3.474	▲ 6.276
Shear Stress @ End of Test (ksf)	○ 0.917	□ 2.946	△ 5.472
Deformation Rate (in./min.)	0.0025	0.0025	0.0025
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	17.15	17.15	17.15
Dry Density (pcf)	102.0	105.6	108.2
Saturation (%)	71.0	77.7	83.0
Soil Height Before Shearing (in.)	0.9922	0.9716	0.9658
Final Moisture Content (%)	20.5	18.4	16.3

Leighton

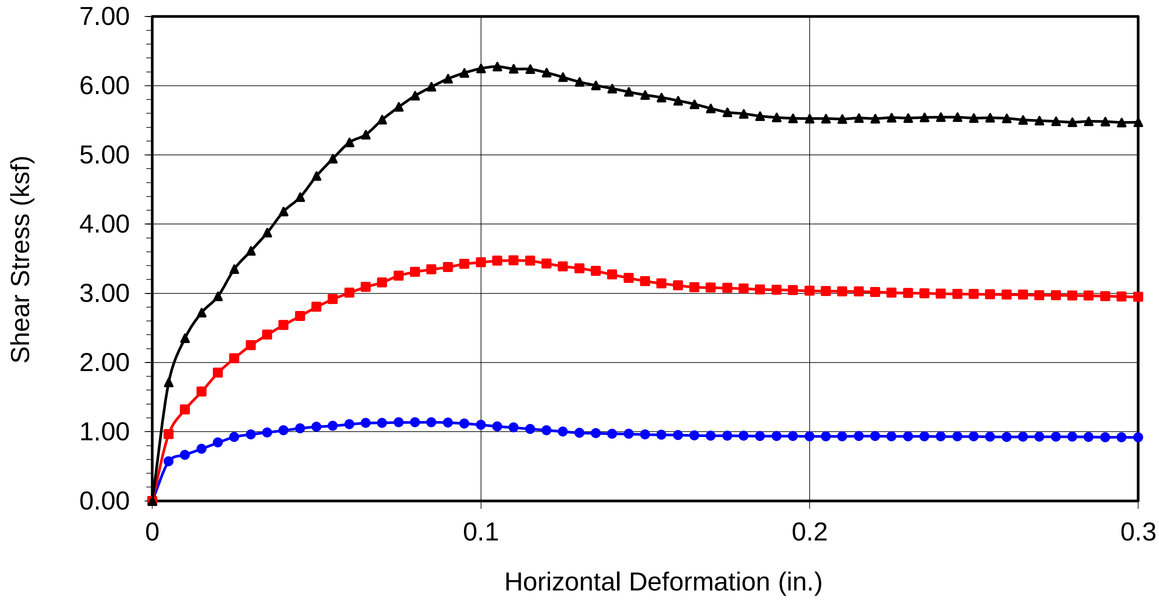
DIRECT SHEAR TEST RESULTS

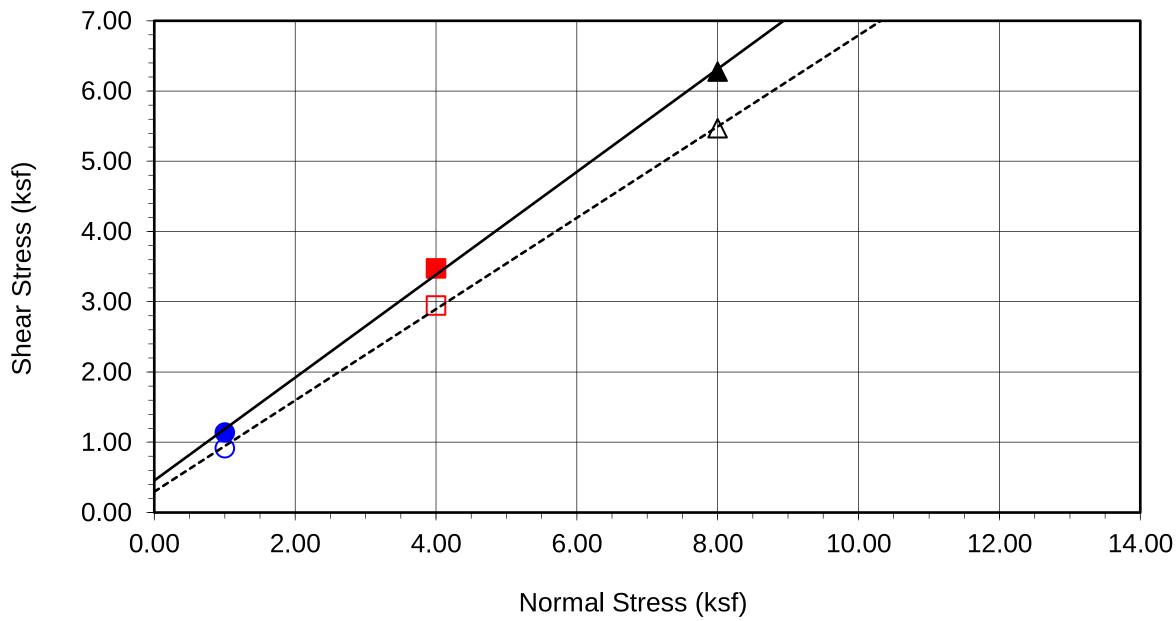
Consolidated Drained - ASTM D 3080

Project No.: 13807.001

Rexford/13925 Benson Ave/Geo

02-23





Boring No.	**LB-4**
Sample No.	**R-1**
Depth (ft)	**5**
Sample Type:	Ring

Soil Identification:
Sandy Silt s(ML), Brown.

Strength Parameters

	C (psf)	ϕ (°)
Peak	456	36
Ultimate	296	33

Normal Stress (kip/ft²)	1.000	4.000	8.000
Peak Shear Stress (kip/ft²)	● 1.137	■ 3.474	▲ 6.276
Shear Stress @ End of Test (ksf)	○ 0.917	□ 2.946	△ 5.472
Deformation Rate (in./min.)	0.0025	0.0025	0.0025
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	17.15	17.15	17.15
Dry Density (pcf)	102.0	105.6	108.2
Saturation (%)	71.0	77.7	83.0
Soil Height Before Shearing (in.)	0.9922	0.9716	0.9658
Final Moisture Content (%)	20.5	18.4	16.3

Leighton

DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

Project No.: 13807.001

Rexford/13925 Benson Ave/Geo

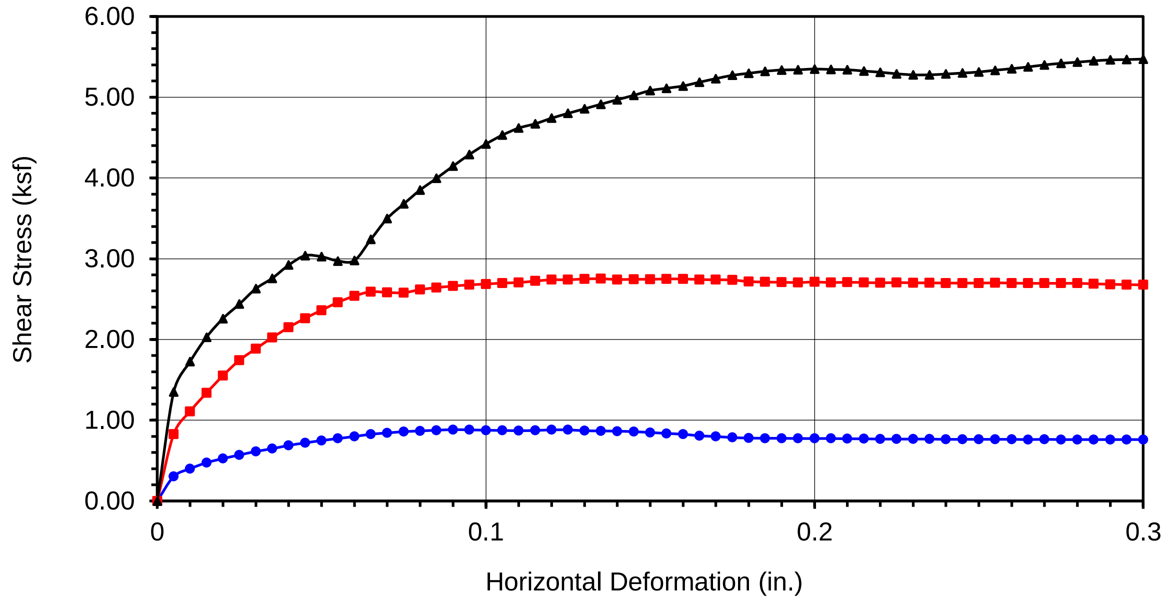
02-23

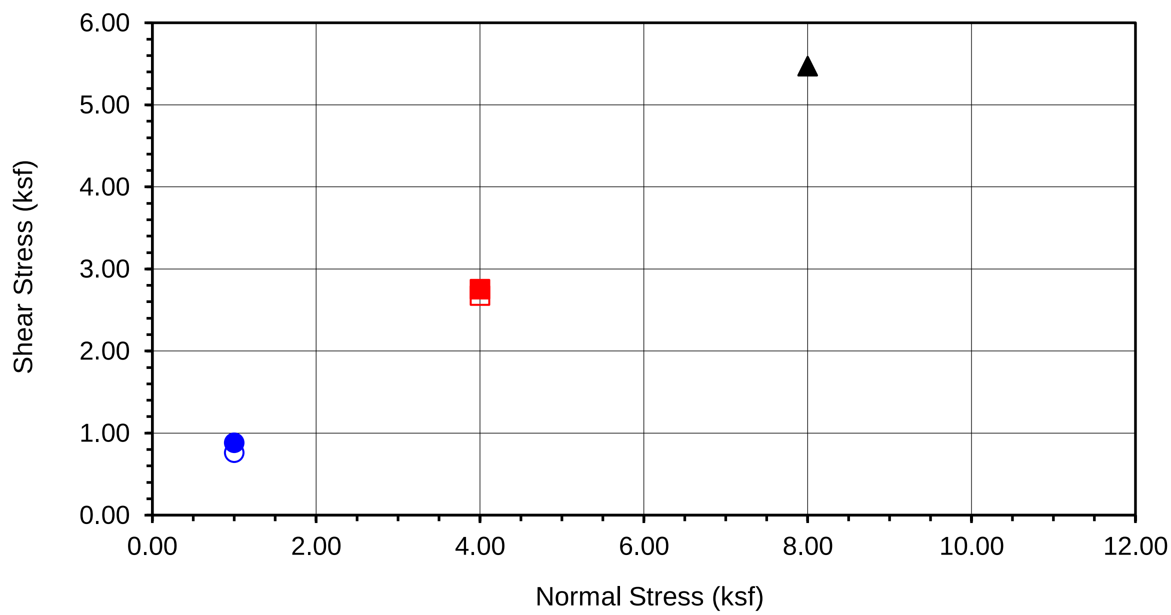
DIRECT SHEAR TEST

Consolidated Drained - ASTM D 3080

Project Name:	Rexford/13925 Benson Ave/Geo	Tested By:	M. Vinet	Date:	02/23/23
Project No.:	13807.001	Checked By:	M. Vinet	Date:	03/03/23
Boring No.:	LB-4	Sample Type:	Ring		
Sample No.:	R-3	Depth (ft.):	10.0		
Soil Identification:	Sandy Silt s(ML), Brown.				

Sample Diameter(in):	2.415	2.415	2.415
Sample Thickness(in.):	1.000	1.000	1.000
Weight of Sample + ring(gm):	186.56	191.96	195.26
Weight of Ring(gm):	37.67	43.91	45.66
Before Shearing			
Weight of Wet Sample+Cont.(gm):	185.26	185.26	185.26
Weight of Dry Sample+Cont.(gm):	162.56	162.56	162.56
Weight of Container(gm):	50.56	50.56	50.56
Vertical Rdg.(in): Initial	0.0000	0.2500	0.2500
Vertical Rdg.(in): Final	-0.0061	0.2828	0.3004
After Shearing			
Weight of Wet Sample+Cont.(gm):	201.66	198.77	200.73
Weight of Dry Sample+Cont.(gm):	171.88	170.22	172.32
Weight of Container(gm):	50.59	50.55	49.79
Specific Gravity (Assumed):	2.70	2.70	2.70
Water Density(pcf):	62.43	62.43	62.43





Boring No.	**LB-4**
Sample No.	**R-3**
Depth (ft)	**10**

Sample Type:

Ring

Soil Identification:
Sandy Silt s(ML), Brown.

Normal Stress (kip/ft²)	1.000	4.000	8.000
Peak Shear Stress (kip/ft²)	● 0.883	■ 2.752	▲ 5.472
Shear Stress @ End of Test (ksf)	○ 0.760	□ 2.676	△ 5.472
Deformation Rate (in./min.)	0.0025	0.0025	0.0025
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	20.27	20.27	20.27
Dry Density (pcf)	103.0	102.4	103.4
Saturation (%)	85.9	84.6	86.9
Soil Height Before Shearing (in.)	0.9939	0.9672	0.9496
Final Moisture Content (%)	24.6	23.9	23.2

Leighton

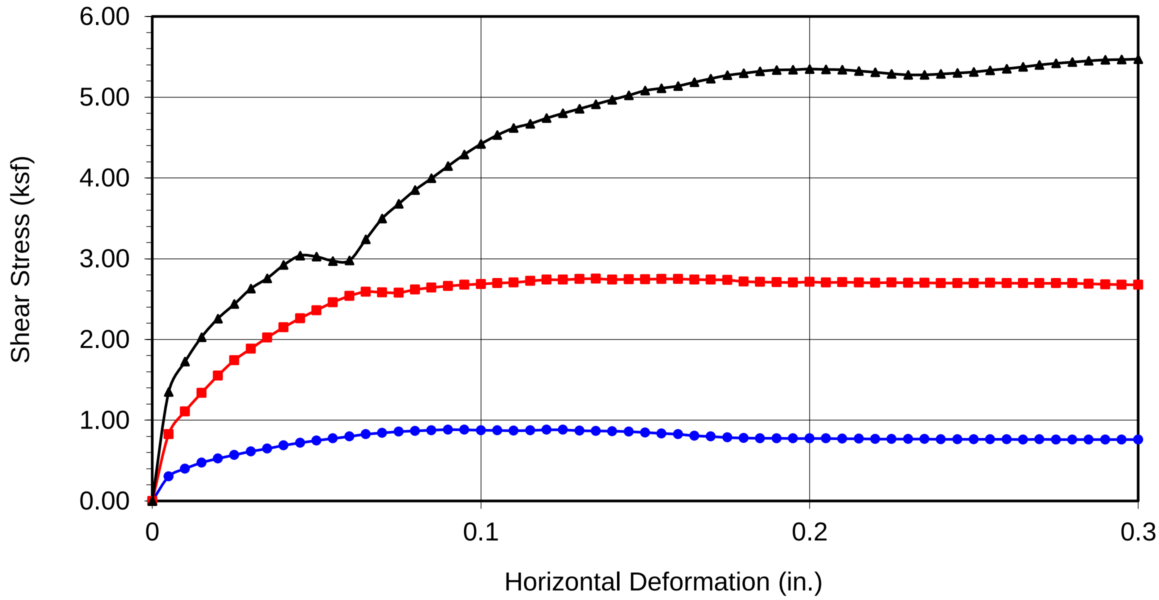
DIRECT SHEAR TEST RESULTS

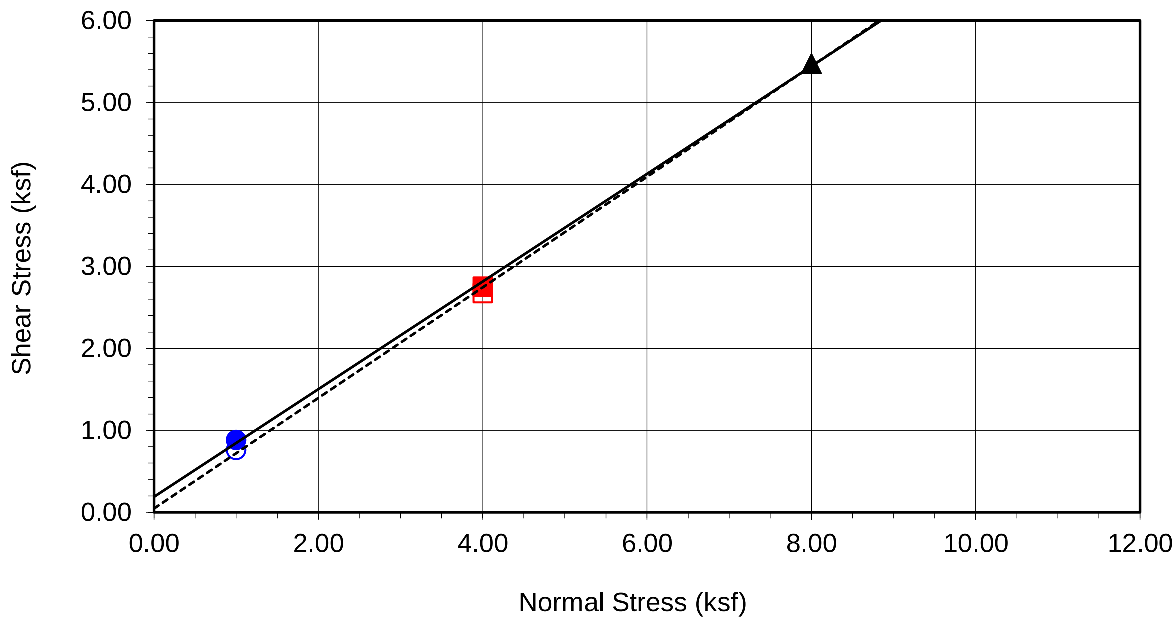
Consolidated Drained - ASTM D 3080

Project No.: 13807.001

Rexford/13925 Benson Ave/Geo

02-23





Boring No.	**LB-4**
Sample No.	**R-3**
Depth (ft)	**10**
Sample Type:	Ring

Soil Identification:
Sandy Silt s(ML), Brown.

Strength Parameters

	C (psf)	ϕ (°)
Peak	189	33
Ultimate	46	34

Normal Stress (kip/ft²)	1.000	4.000	8.000
Peak Shear Stress (kip/ft²)	● 0.883	■ 2.752	▲ 5.472
Shear Stress @ End of Test (ksf)	○ 0.760	□ 2.676	△ 5.472
Deformation Rate (in./min.)	0.0025	0.0025	0.0025
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	20.27	20.27	20.27
Dry Density (pcf)	103.0	102.4	103.4
Saturation (%)	85.9	84.6	86.9
Soil Height Before Shearing (in.)	0.9939	0.9672	0.9496
Final Moisture Content (%)	24.6	23.9	23.2

Leighton

DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

Project No.: 13807.001

Rexford/13925 Benson Ave/Geo

02-23

TESTS for SULFATE CONTENT CHLORIDE CONTENT and pH of SOILS

Project Name: Rexford/13925 Benson Ave/Geo — Tested By : M. Vinet — Date: 02/27/23

Project No. : 13807.001 — Checked By: M. Vinet — Date: 03/03/23

Boring No.	LB-4			
Sample No.	B-1			
Sample Depth (ft)	0 - 5.0			
Soil Identification:	Silty Sand (SM)			
Wet Weight of Soil + Container (g)	100.00			
Dry Weight of Soil + Container (g)	100.00			
Weight of Container (g)	0.00			
Moisture Content (%)	0.00			
Weight of Soaked Soil (g)	100.00			

SULFATE CONTENT, DOT California Test 417, Part II

Beaker No.	1			
Crucible No.	1			
Furnace Temperature (°C)	850			
Time In / Time Out	Timer			
Duration of Combustion (min)	45			
Wt. of Crucible + Residue (g)	25.0399			
Wt. of Crucible (g)	25.0361			
Wt. of Residue (g) (A)	0.0038			
PPM of Sulfate (A) x 41150	156.37			
PPM of Sulfate, Dry Weight Basis	**156**			

CHLORIDE CONTENT, DOT California Test 422

ml of Extract For Titration (B)	30			
ml of $AgNO_3$ Soln. Used in Titration (C)	0.6			
PPM of Chloride (C -0.2) * 100 * 30 / B	40			
PPM of Chloride, Dry Wt. Basis	**40**			

pH TEST, DOT California Test 643

pH Value	**7.80**			
Temperature °C	21.0			

SOIL RESISTIVITY TEST

DOT CA TEST 643

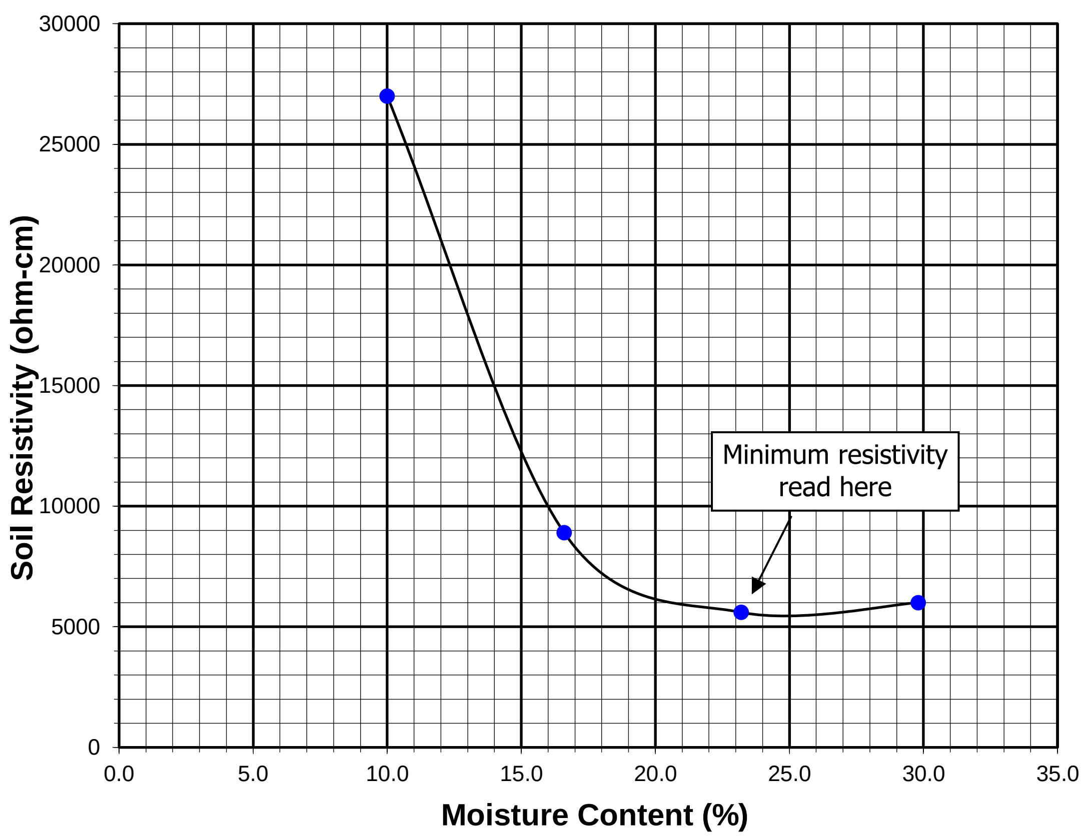
Project Name:	Rexford/13925 Benson Ave/Geo	Tested By :	M. Vinet Date: 02/28/23
Project No. :	13807.001	Checked By:	M. Vinet Date: 03/03/23
Boring No.:	LB-4	Depth (ft.) :	0 - 5.0
Sample No. :	B-1		
Soil Identification:*	Silty Sand (SM)		

*California Test 643 requires soil specimens to consist only of portions of samples passing through the No. 8 US Standard Sieve before resistivity testing. Therefore, this test method may not be representative for coarser materials.

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	50	10.00	27000	27000
2	83	16.60	8900	8900
3	116	23.20	5600	5600
4	149	29.80	6000	6000
5				

Moisture Content (%) (MCi)	0.00
Wet Wt. of Soil + Cont. (g)	100.00
Dry Wt. of Soil + Cont. (g)	100.00
Wt. of Container (g)	0.00
Container No.	A
Initial Soil Wt. (g) (Wt)	500.00
Box Constant	1.000
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 643	
5600	**23.2**	**156**	**40**	**7.80**	**21.0**



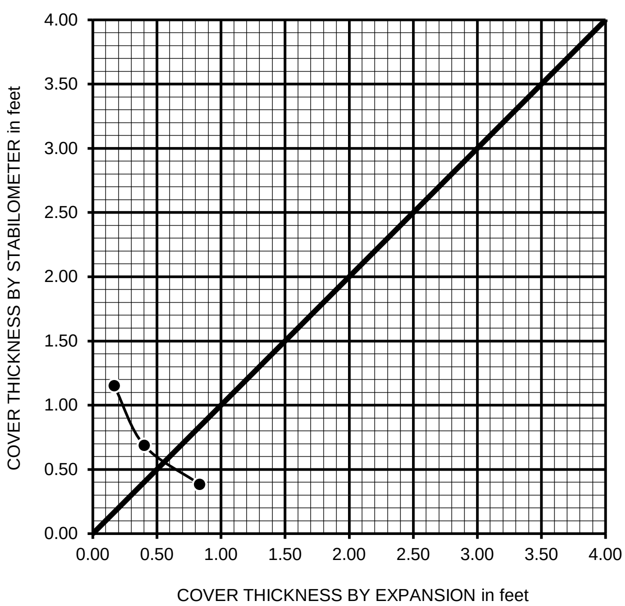
R-VALUE TEST RESULTS
DOT CA Test 301

PROJECT NAME:	Rexford/13925 Benson Ave/Geo	PROJECT NUMBER:	13807.001
BORING NUMBER:	LB-4	DEPTH (FT.):	0 - 5.0
SAMPLE NUMBER:	B-1	TECHNICIAN:	F. Mina
SAMPLE DESCRIPTION:	Silty Sand (SM), Very Dark Yellowish Brown.	DATE COMPLETED:	2/28/2023

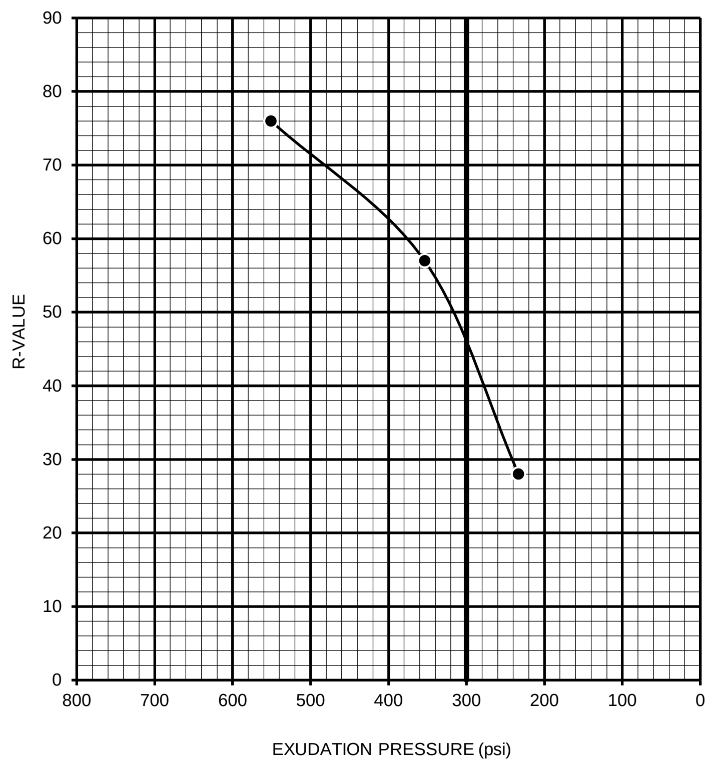
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	11.0	12.0	13.0
HEIGHT OF SAMPLE, Inches	2.49	2.51	2.55
DRY DENSITY, pcf	112.7	112.3	110.9
COMPACTOR PRESSURE, psi	250	225	200
EXUDATION PRESSURE, psi	551	354	233
EXPANSION, Inches x 10exp-4	25	12	5
STABILITY Ph 2,000 lbs (160 psi)	23	45	90
TURNS DISPLACEMENT	4.61	4.77	4.90
R-VALUE UNCORRECTED	76	57	28
R-VALUE CORRECTED	76	57	28

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.38	0.69	1.15
EXPANSION PRESSURE THICKNESS, ft.	0.83	0.40	0.17

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	66
R-VALUE BY EXUDATION:	46
EQUILIBRIUM R-VALUE:	46

APPENDIX D

EARTHWORK AND GRADING GUIDE SPECIFICATIONS

Leighton

APPENDIX D

LEIGHTON CONSULTING, INC.
EARTHWORK AND GRADING GUIDE SPECIFICATIONS

TABLE OF CONTENTS

Section **Appendix D Page**

D-1.0 GENERAL 1

D-1.1 Intent 1
D-1.2 Role of Leighton Consulting, Inc. 1
D-1.3 The Earthwork Contractor 1

D-2.0 PREPARATION OF AREAS TO BE FILLED 2

D-2.1 Clearing and Grubbing 2
D-2.2 Processing 3
D-2.3 Overexcavation 3
D-2.4 Benching 3
D-2.5 Evaluation/Acceptance of Fill Areas 3

D-3.0 FILL MATERIAL 4

D-3.1 Fill Quality 4
D-3.2 Oversize 4
D-3.3 Import 4

D-4.0 FILL PLACEMENT AND COMPACTION 4

D-4.1 Fill Layers 4
D-4.2 Fill Moisture Conditioning 5
D-4.3 Compaction of Fill 5
D-4.4 Compaction of Fill Slopes 5
D-4.5 Compaction Testing 5
D-4.6 Compaction Test Locations 5

D-5.0 EXCAVATION 6

D-6.0 TRENCH BACKFILLS 6

D-6.1 Safety 6
D-6.2 Bedding and Backfill 6
D-6.3 Lift Thickness 7

Leighton

D-1.0 GENERAL

D-1.1 Intent

These Earthwork and Grading Guide Specifications are for grading and earthwork shown on the current, approved grading plan(s) and/or indicated in the Leighton Consulting, Inc. geotechnical report(s). These Guide Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the project-specific recommendations in the geotechnical report shall supersede these Guide Specifications. Leighton Consulting, Inc. shall provide geotechnical observation and testing during earthwork and grading. Based on these observations and tests, Leighton Consulting, Inc. may provide new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

D-1.2 Role of Leighton Consulting, Inc.

Prior to commencement of earthwork and grading, Leighton Consulting, Inc. shall meet with the earthwork contractor to review the earthwork contractor's work plan, to schedule sufficient personnel to perform the appropriate level of observation, mapping and compaction testing. During earthwork and grading, Leighton Consulting, Inc. shall observe, map, and document subsurface exposures to verify geotechnical design assumptions. If observed conditions are found to be significantly different than the interpreted assumptions during the design phase, Leighton Consulting, Inc. shall inform the owner, recommend appropriate changes in design to accommodate these observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include (1) natural ground after clearing to receiving fill but before fill is placed, (2) bottoms of all "remedial removal" areas, (3) all key bottoms, and (4) benches made on sloping ground to receive fill.

Leighton Consulting, Inc. shall observe moisture-conditioning and processing of the subgrade and fill materials, and perform relative compaction testing of fill to determine the attained relative compaction. Leighton Consulting, Inc. shall provide *Daily Field Reports* to the owner and the Contractor on a routine and frequent basis.

D-1.3 The Earthwork Contractor

The earthwork contractor (Contractor) shall be qualified, experienced and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Guide Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing grading and backfilling in accordance with the current, approved plans and specifications.

The Contractor shall inform the owner and Leighton Consulting, Inc. of changes in work schedules at least one working day in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that Leighton Consulting, Inc. is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish earthwork and grading in accordance with the applicable grading codes and agency ordinances, these Guide Specifications, and recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of Leighton Consulting, Inc., unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, adverse weather, etc., are resulting in a quality of work less than required in these specifications, Leighton Consulting, Inc. shall reject the work and may recommend to the owner that earthwork and grading be stopped until unsatisfactory condition(s) are rectified.

D-2.0 PREPARATION OF AREAS TO BE FILLED

D-2.1 <u>Clearing and Grubbing</u>

Vegetation, such as brush, grass, roots and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies and Leighton Consulting, Inc.. Care should be taken not to encroach upon or otherwise damage native and/or historic trees designated by the Owner or appropriate agencies to remain. Pavements, flatwork or other construction should not extend under the “drip line” of designated trees to remain.

Leighton Consulting, Inc. shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 3 percent of organic materials (by dry weight: ASTM D 2974). Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area. As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

D-2.2 Processing

Existing ground that has been declared satisfactory for support of fill, by Leighton Consulting, Inc., shall be scarified to a minimum depth of 6 inches (15 cm). Existing ground that is not satisfactory shall be over-excavated as specified in the following Section D-2.3. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

D-2.3 Overexcavation

In addition to removals and over-excavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be over-excavated to competent ground as evaluated by Leighton Consulting, Inc. during grading. All undocumented fill soils under proposed structure footprints should be excavated

D-2.4 Benching

Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), (>20 percent grade) the ground shall be stepped or benched. The lowest bench or key shall be a minimum of 15 feet (4.5 m) wide and at least 2 feet (0.6 m) deep, into competent material as evaluated by Leighton Consulting, Inc.. Other benches shall be excavated a minimum height of 4 feet (1.2 m) into competent material or as otherwise recommended by Leighton Consulting, Inc.. Fill placed on ground sloping flatter than 5:1 (horizontal to vertical units), (<20 percent grade) shall also be benched or otherwise over-excavated to provide a flat subgrade for the fill.

D-2.5 Evaluation/Acceptance of Fill Areas

All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by Leighton Consulting, Inc. as suitable to receive fill. The Contractor shall obtain a written acceptance (*Daily Field Report*) from Leighton Consulting, Inc. prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys and benches.

D-3.0 FILL MATERIAL

D-3.1 Fill Quality

Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by Leighton Consulting, Inc. prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to Leighton Consulting, Inc. or mixed with other soils to achieve satisfactory fill material.

D-3.2 Oversize

Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 6 inches (15 cm), shall not be buried or placed in fill unless location, materials and placement methods are specifically accepted by Leighton Consulting, Inc.. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 feet (3 m) measured vertically from finish grade, or within 2 feet (0.61 m) of future utilities or underground construction.

D-3.3 Import

If importing of fill material is required for grading, proposed import material shall meet the requirements of Section D-3.1, and be free of hazardous materials (“contaminants”) and rock larger than 3-inches (8 cm) in largest dimension. All import soils shall have an Expansion Index (EI) of 20 or less and a sulfate content no greater than (≤) 500 parts-per-million (ppm). A representative sample of a potential import source shall be given to Leighton Consulting, Inc. at least four full working days before importing begins, so that suitability of this import material can be determined and appropriate tests performed.

D-4.0 FILL PLACEMENT AND COMPACTION

D-4.1 Fill Layers

Approved fill material shall be placed in areas prepared to receive fill, as described in Section D-2.0, above, in near-horizontal layers not exceeding 8 inches (20 cm) in loose thickness. Leighton Consulting, Inc. may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers, and only if the building officials with the appropriate jurisdiction approve. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

D-4.2 Fill Moisture Conditioning

Fill soils shall be watered, dried back, blended and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM) Test Method D 1557.

D-4.3 Compaction of Fill

After each layer has been moisture-conditioned, mixed, and evenly spread, each layer shall be uniformly compacted to not-less-than (≥) 90 percent of the maximum dry density as determined by ASTM Test Method D 1557. In some cases, structural fill may be specified (see project-specific geotechnical report) to be uniformly compacted to at-least (≥) 95 percent of the ASTM D 1557 modified Proctor laboratory maximum dry density. For fills thicker than (>) 15 feet (4.5 m), the portion of fill deeper than 15 feet below proposed finish grade shall be compacted to 95 percent of the ASTM D 1557 laboratory maximum density. Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

D-4.4 Compaction of Fill Slopes

In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by back rolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet (1 to 1.2 m) in fill elevation, or by other methods producing satisfactory results acceptable to Leighton Consulting, Inc.. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of the ASTM D 1557 laboratory maximum density.

D-4.5 Compaction Testing

Field-tests for moisture content and relative compaction of the fill soils shall be performed by Leighton Consulting, Inc.. Location and frequency of tests shall be at our field representative(s) discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

D-4.6 Compaction Test Locations

Leighton Consulting, Inc. shall document the approximate elevation and horizontal coordinates of each density test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that Leighton

Consulting, Inc. can determine the test locations with sufficient accuracy. Adequate grade stakes shall be provided.

D-5.0 EXCAVATION

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by Leighton Consulting, Inc. during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by Leighton Consulting, Inc. based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, then observed and reviewed by Leighton Consulting, Inc. prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by Leighton Consulting, Inc..

D-6.0 TRENCH BACKFILLS

D-6.1 Safety

The Contractor shall follow all OSHA and Cal/OSHA requirements for safety of trench excavations. Work should be performed in accordance with Article 6 of the *California Construction Safety Orders*, 2009 Edition or more current (see also: http://www.dir.ca.gov/title8/sb4a6.html).

D-6.2 Bedding and Backfill

All utility trench bedding and backfill shall be performed in accordance with applicable provisions of the 2018 Edition of the *Standard Specifications for Public Works Construction* (Green Book). Bedding material shall have a Sand Equivalent greater than 30 (SE>30). Bedding shall be placed to 1-foot (0.3 m) over the top of the conduit, and densified by jetting in areas of granular soils, if allowed by the permitting agency. Otherwise, the pipe-bedding zone should be backfilled with Controlled Low Strength Material (CLSM) consisting of at least one sack of Portland cement per cubic-yard of sand, and conforming to Section 201-6 of the 2018 Edition of the *Standard Specifications for Public Works Construction* (Green Book). Backfill over the bedding zone shall be placed and densified mechanically to a minimum of 90 percent of relative compaction (ASTM D 1557) from 1 foot (0.3 m) above the top of the conduit to the surface. Backfill above the pipe zone shall **not** be jetted. Jetting of the bedding around the conduits shall be observed by Leighton Consulting, Inc. and backfill above the pipe zone (bedding) shall be observed and tested by Leighton Consulting, Inc..

D-6.3 Lift Thickness

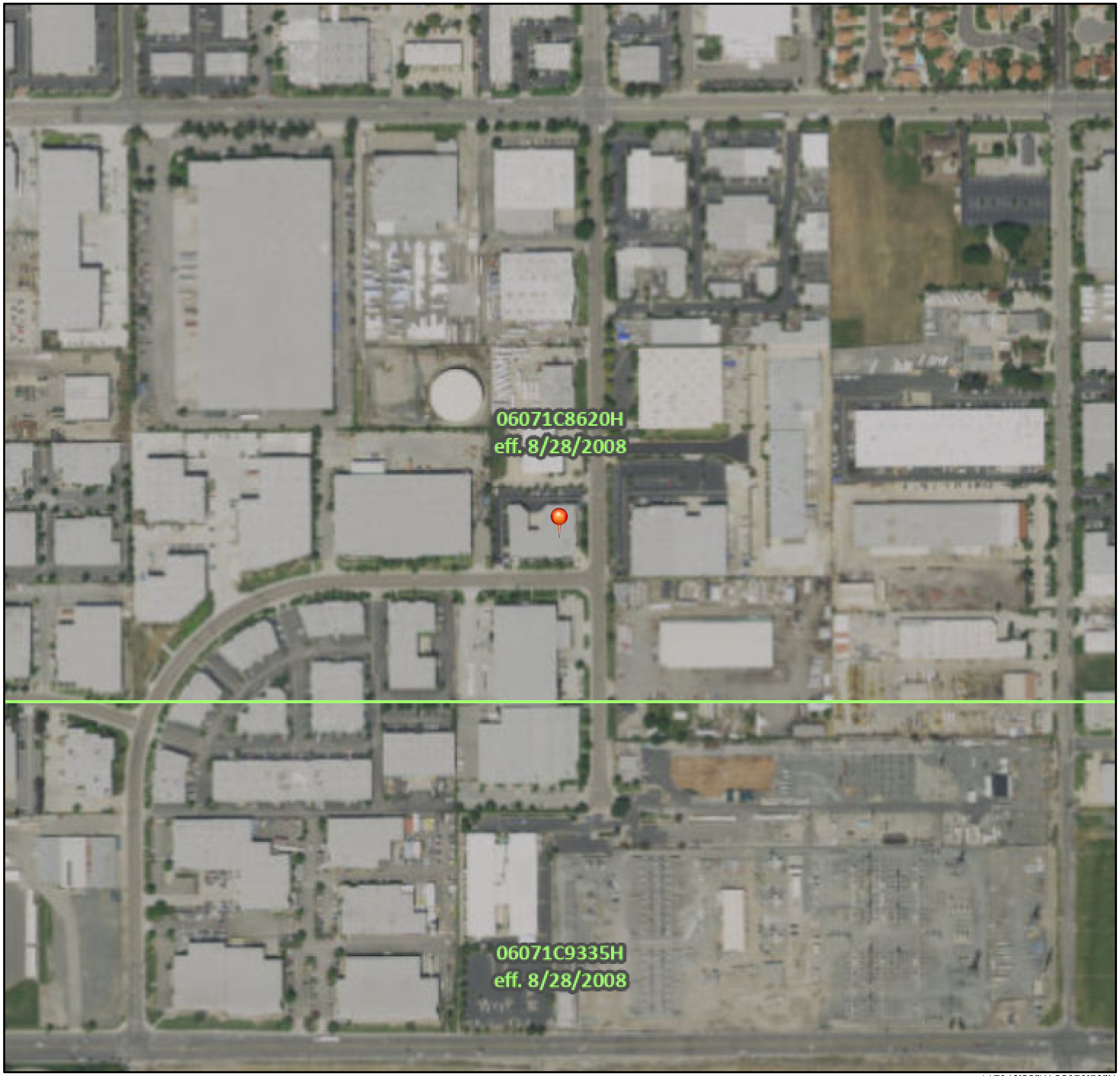
Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to Leighton Consulting, Inc. that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method, and only if the building officials with the appropriate jurisdiction approve.

APPENDIX I
FEMA Firmette Flood Zone Map

National Flood Hazard Layer FIRMette

FEMA

117°41'10"W 34°0'19"N



117°40'32"W 33°59'50"N

Feet
0 250 500 1,000 1,500 2,000

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- B 20.2 / 17.5 — Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 — Coastal Transect
- 513 — Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/11/2023 at 6:13 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX J
Preliminary Pump Specifications

WEIL 3-Inch Submersible Wastewater Pump 2441DS

Submersible Wastewater Pump Association SWPA MEMBER

Heavy duty pump for commercial and industrial applications.
Pump clear water, gray water, effluent and wastewater with solids up to 2-inch diameter.

Disch. Size	3 Inch
Disch. Type	ANSI
Solids Max.	2 Inch
Mounting Style	2613 Removal

Pump

Case - Cast Iron
Impeller - Cast Iron
Stainless Steel Hardware

Options

Bronze Impeller
316 Stainless Steel Impeller 316
Stainless Steel Case
Additional Power Cable Lengths
High-temperature motor
Stainless Steel Lifting Cable

Motor

Double Opposed Seal Mechanical Seal
- Upper seal faces Carbon against Ceramic
- Lower seal faces Silicon Carbide against Silicon Carbide

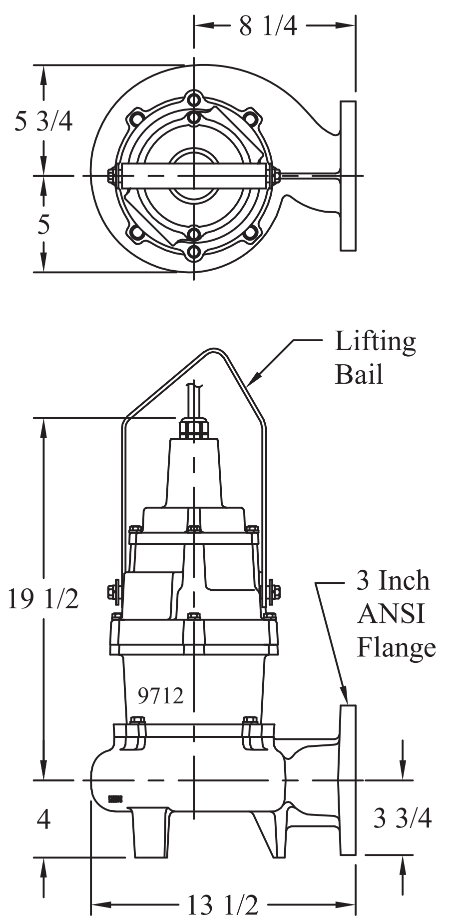
Air-Filled Hermetically Sealed
Shaft - Stainless Steel Series 300
Motor Shell - Cast Iron
Insulation - Class F
Ball Bearings - 2 - Double Sealed
Power Cable Length - 20 ft
Three-phase motor
- 1750 RPM
- 60 Hz, 208-230 or 460 volts

Single-phase capacitor start motor
- 1750 RPM
- 60 Hz, 115 or 208-230 volts
  Automatic reset thermal
  and overload protection
- 1 1/2 HP Max single phase

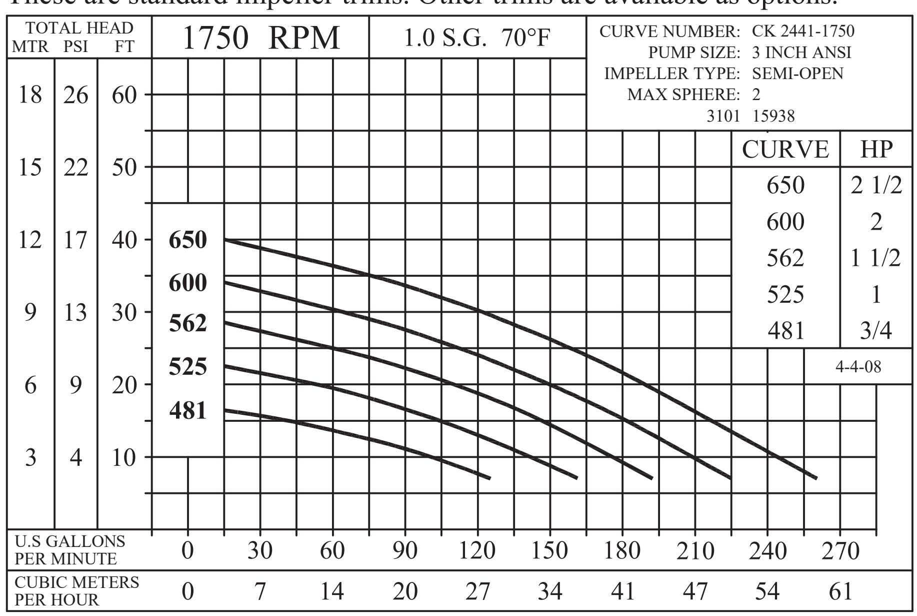
Capacities - Wet Wells		
Dia or Side Inches	Gallons per Foot of Depth	
	Round	Square
18	13	17
24	24	30
30	37	47
36	53	67
48	94	120
60	147	187
72	212	269

Flow - To prevent solids from settling out	
Discharge Pipe Size Dia Inches	Minimum Flow GPM
2	25
3	50
4	90

Good wet well design
Maximum 10 starts per hour.
Minimum run time - 1 1/2 minutes.



Impeller curves are Non-Overloading at any point on curve.
These are standard impeller trims. Other trims are available as options.



Customer :
Reference :

Pump Performance Datasheet

Wilo Quotation System 23.3.1

Item number	: 001	Size	: Weil 3-2441-1750
Service	:	Stages	: 1
Quantity	: 1	Based on curve number	: CK-2441-1750 Rev 0.0
Quote number	: 852370	Article Number	:
		Date last saved	: 30 Nov 2023 11:39 AM

Operating Conditions

Flow, rated	: 110.0 USgpm
Differential head / pressure, rated (requested)	: 11.62 ft
Differential head / pressure, rated (actual)	: 11.63 ft
Suction pressure, rated / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Site Supply Frequency	: 60 Hz

Performance

Speed criteria	: Synchronous
Speed, rated	: 1750 rpm
Impeller diameter, rated	: 5.13 in
Impeller diameter, maximum	: 6.50 in
Impeller diameter, minimum	: 4.80 in
Efficiency	: 38.90 %
NPSH required / margin required	: - / 0.00 ft
Ns (imp. eye flow) / Nss (imp. eye flow)	: 2,059 / - US Units
MCSF	: 15.00 USgpm
Head, maximum, rated diameter	: 19.51 ft
Head rise to shutoff	: 70.36 %
Flow, best eff. point	: 103.6 USgpm
Flow ratio, rated / BEP	: 106.21 %
Diameter ratio (rated / max)	: 78.85 %
Head ratio (rated dia / max dia)	: 37.17 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Liquid

Liquid type	: Water
Additional liquid description	:
Solids Diameter, required / pump max	: 0.00 in / 2.00 in
Solids concentration, by volume	: 0.00 %
Temperature, max	: 68.00 deg F
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity, rated	: 1.00 cP
Vapor pressure, rated	: 0.34 psi.a

Material

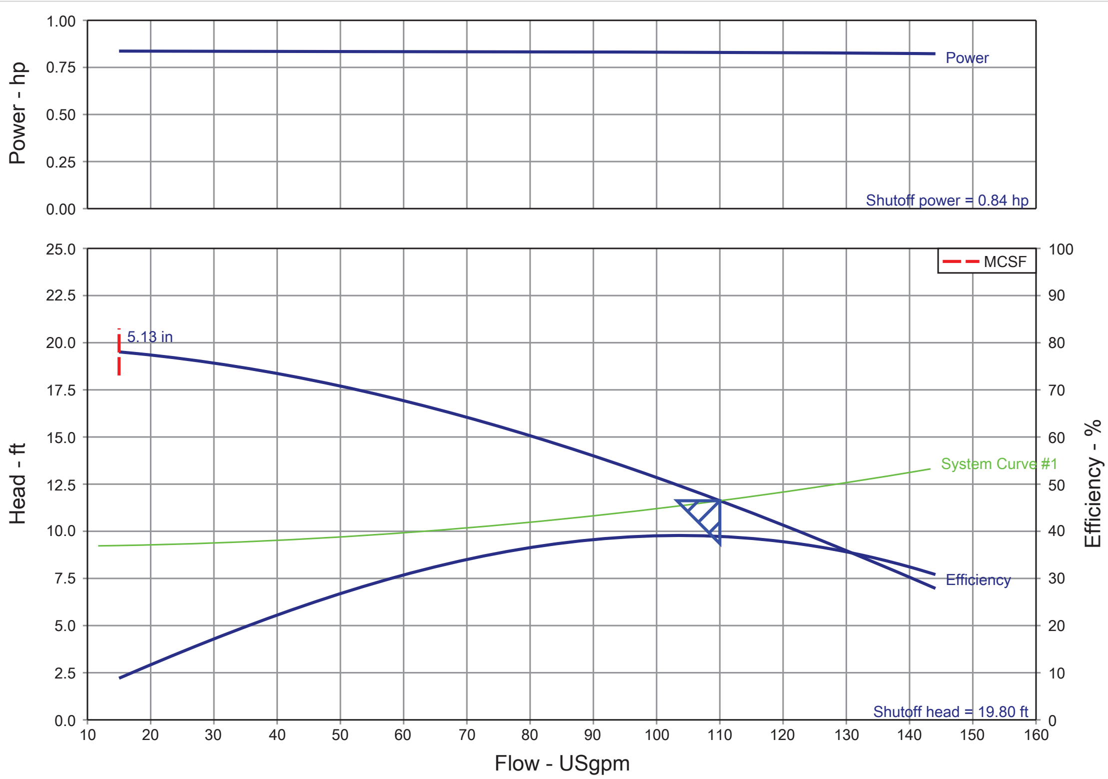
Material selected	: Standard

Pressure Data

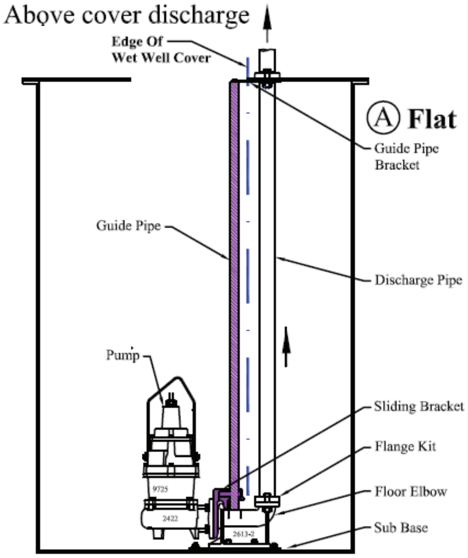
Maximum working pressure	: 8.44 psi.g
Maximum allowable working pressure	: N/A
Maximum allowable suction pressure	: N/A
Hydrostatic test pressure	: N/A

Driver & Power Data (@Max density)

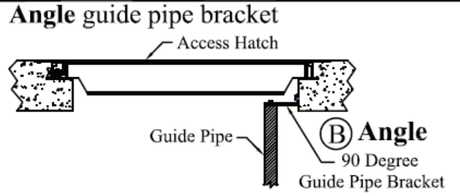
Driver sizing specification	: Rated power
Margin over specification	: 0.00 %
Service factor	: 1.00
Power, hydraulic	: 0.32 hp
Power, rated	: 0.83 hp
Power, maximum, rated diameter	: 0.84 hp
Minimum recommended motor rating	: 1.00 hp / 0.75 kW



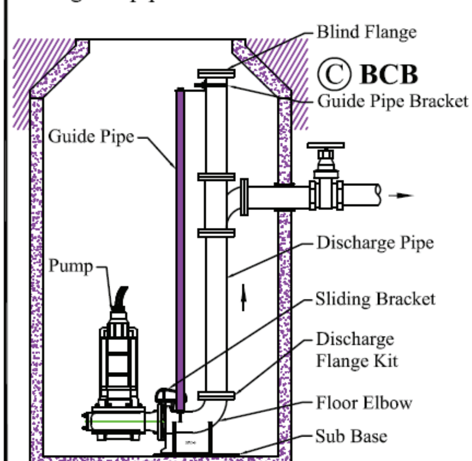
Flat guide pipe bracket
Above cover discharge



Angle guide pipe bracket



BCB guide pipe bracket



Discharge Flange Kit - For Floor Elbow
Includes - Flange, Gasket and Hardware
Weil = 2 bolt oval configuration

Order Number	Material	Pipe Type	Flange Type
2613K203	Cast Iron	Plain End	Weil
2613K943	316 SS	Plain End	Weil
2613K103	Cast Iron	Threaded	Weil
2613K105	Cast Iron	Threaded	ANSI
2613K953	316 SS	Threaded	ANSI

Intermediate Guide Pipe Bracket:

205.666.001	Intermediate Guide Pipe Bracket

System Includes:
- Discharge Floor Elbow - one
- Sliding Bracket - one
  - Iron or
  - Bronze for use with Explosion Proof Motors
    - 316 Stainless Steel
- Guide Pipe Bracket - one
  - A - Flat (cover mount) - bolts to wet well cover or
  - B - Angle 90º (side mount) bolts to vertical side wall or
  - C - BCB Bracket - Duplex or Simplex mounts to discharge pipe(s) - see pg 2 diagrams

Not Included:
- Discharge Pipe - (3 inch schedule 40)
- Guide Pipe - (2 inch schedule 40)

Options:
- Discharge Flange Kit for Floor Elbow
- Intermediate Guide Pipe Bracket
- Sub Base for Floor Elbow
- Level Control Lifting Assembly for BCB Duplex Bracket

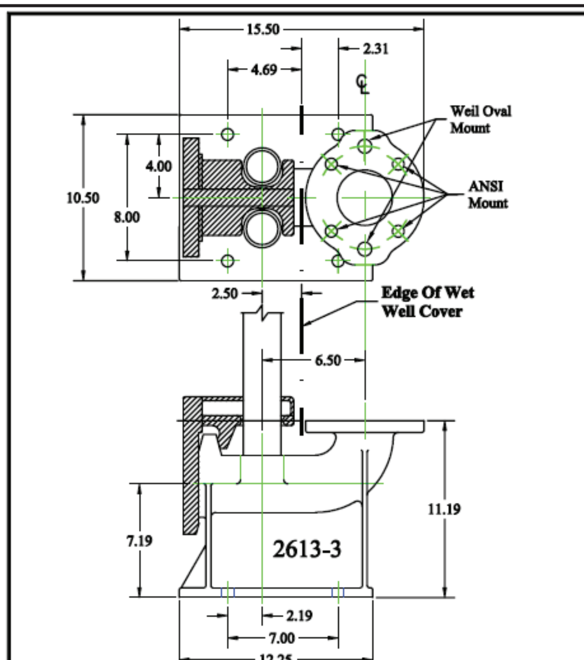
Removal System:

Simplex

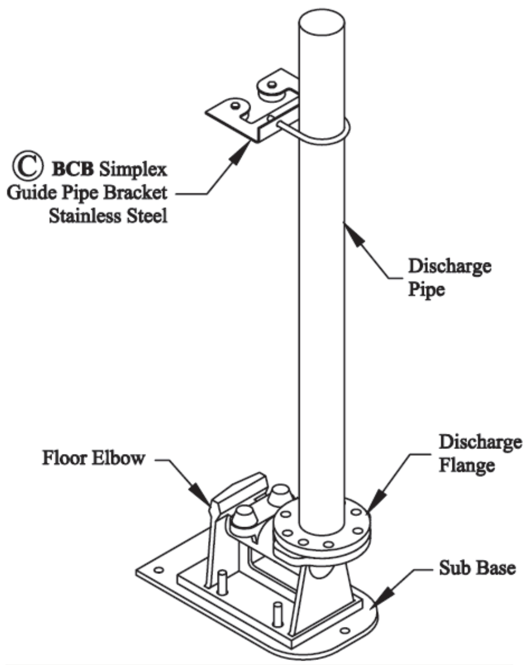
Order Number	Floor Elbow	Sliding Bracket	Guide Pipe Bracket	Mount Type	Weight Lbs.
2613K1022	Iron	Iron	Flat	Cover	92
2613K2022	Iron	Bronze	Flat	Cover	92
2613K9103	316 SS	316 SS	Flat	Cover	92
2613K5012	Iron	Iron	Angle	Side	92
2613K6033	Iron	Bronze	Angle	Side	92
2613K9123	316 SS	316 SS	Angle	Side	92
2613K3022	Iron	Iron	BCB	Pipe	92
2613K4022	Iron	Bronze	BCB	Pipe	92
2613K9133	316 SS	316 SS	BCB	Pipe	92

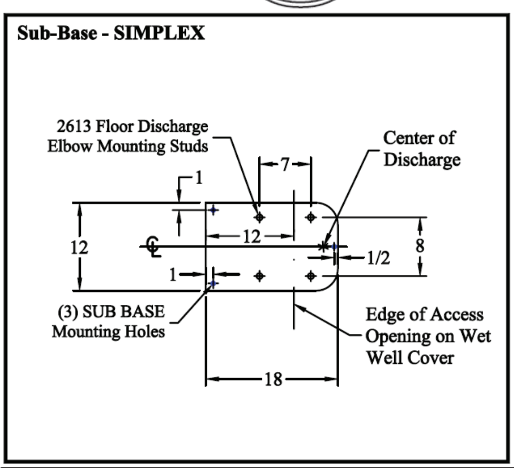
Duplex - BCB System

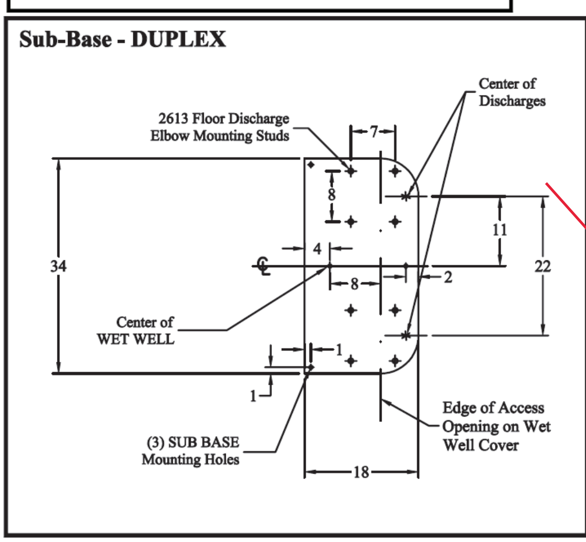
Order Number	Floor Elbow	Sliding Bracket	Guide Pipe Bracket	Mount Type	Weight Lbs.
2613K7022	Iron	Iron	Pipe	BCB	184
2613K7032	Iron	Bronze	Pipe	BCB	184
2613K9723	316 SS	316 SS	Pipe	BCB	184



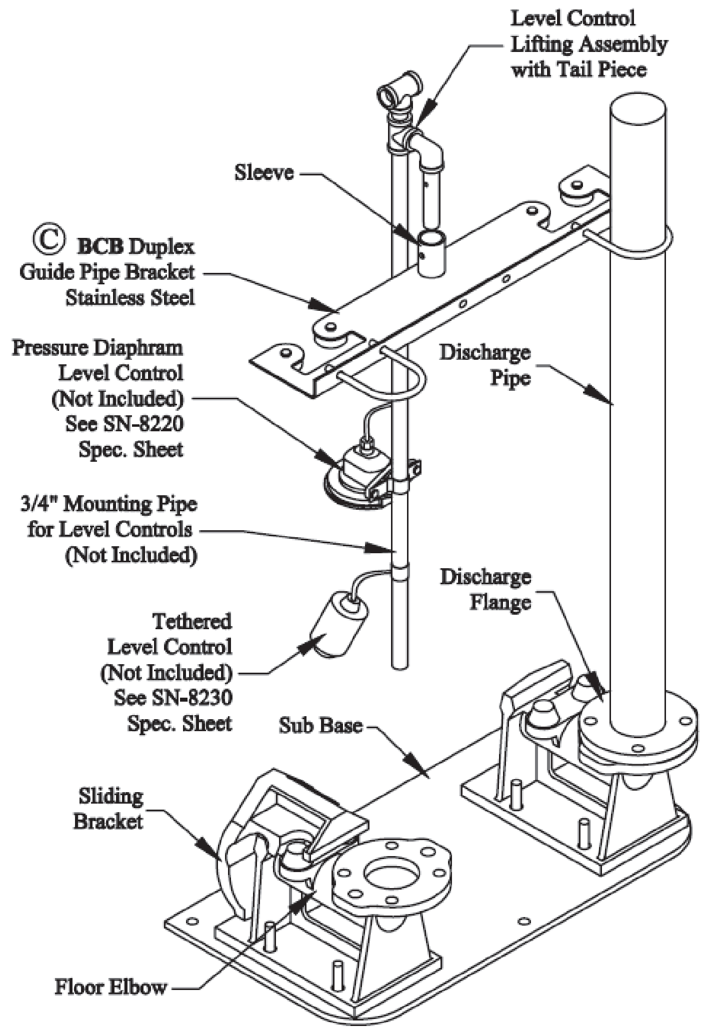
BCB - Simplex







BCB - Duplex



Sub Base for Simplex/Duplex Installations

Epoxy Coated or Stainless Steel sub base with stainless steel studs is used to locate and install the 2613 discharge floor elbows in a wet well. Mounting locations match standard Weil 8804/8815 wet well covers and 2616 valves. Three 9/16 holes for bolting to the wet well floor. Waterproof adhesive 3M Marine 5200 could be used instead of bolting.

Order Number	Style	Material	Stud Size	Pump Size	Min. Wet Well Diameter
2613K603 2613K923	Simplex Simplex	Epoxy Coated 304 SS	1/2” 1/2”	7” case 9” case	30” 36”
2613K502 2613K903	Duplex Duplex	Epoxy Coated 304 SS	1/2” 1/2”	7” case 9” case	42” 48”

Level Control Lifting Assembly
(Duplex BCB systems only)
Does not include level control switches or mounting pipe.
See SN-8220 and SN-8230

Order Number	
2613K801	Level Control Lifting Assembly with Tailpiece

WEIL Tethered Level Control 8233

Float Switch

The 8233 level controls utilize pole mounted tethered switches. The pole may be suspended from either a wet well cover or a bracket fastened to the wall of the wet well.

Each tethered switch includes a cord grip and strap mount for mounting to a 3/4 inch or 1 inch pole.

The 8233 tethered switch is normally open, closing on liquid rise. Use with Weil 8100 Control Panels. The switch is not rated for motor loads.
- Single-pole switch has 16/2 cord with 2 wires, black/white
- 115 volt, 3 amp pilot duty

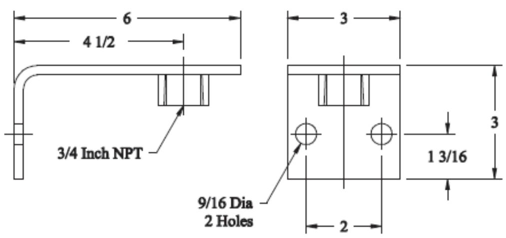
Duplex System

Lead pump starts when the liquid level activates Switch FS2. The lead pump will run until the liquid level deactivates Switch FS1.

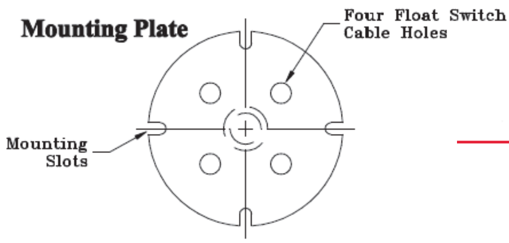
The Lag pump will start if the liquid level activates Switch FS3. Both pumps continue to run until the liquid level deactivates Switch FS1.

If the liquid level activates Switch FSA the high water alarm circuit will turn on.

Mounting Bracket



Mounting Plate



Configuration	Switches Required
Simplex	2
Simplex with Alarm	3
Duplex	3
Duplex with Alarm	4

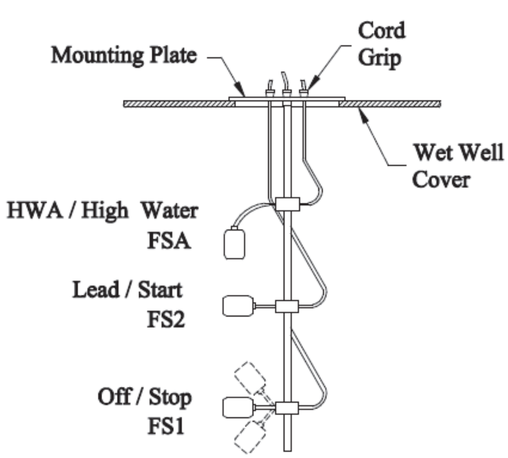
8233 Tethered Float Switch

Order Number	Type of Assembly	Cord Length (Ft.)	Approx. Wt. (Lbs.)
8233K1006	Switch only with cord grip	20	4
8233K1014	Switch only with cord grip	40	6
8233K1016	Switch only with cord grip	60	8
8233K1018	Switch only with cord grip	80	10
8233K1020	Switch only with cord grip	100	12

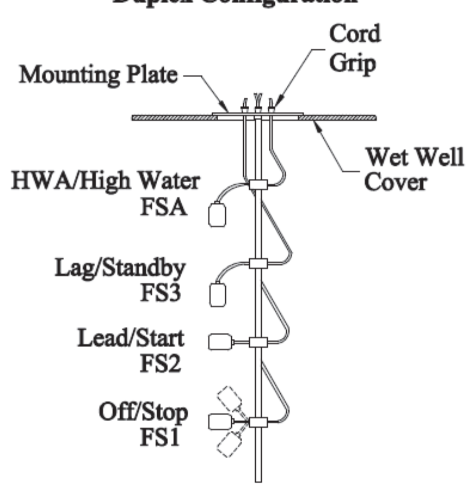
8233 Options

Option	Description
314.399.000	Mounting Bracket - For sidewall suspends 3/4 inch pipe from wet well wall. Pipe Not included.
315.445.001	Mounting Plate - Round 8-inch diameter with four holes for level control cable cord grips. Suspends 3/4 or 1 inch pipe from mounting plate. Pipe Not included. Fastens to wet well cover with fasteners.
304.331.096	Mounting Pipe - 3/4 inch schedule 40, 10 feet long. Threaded on one end.
303.935.103	Mounting Pipe - 1 inch schedule 40, 10 feet long. Threaded on one end.

Simplex Configuration



Duplex Configuration



How to order: Specify Model Number and Wet Well Depth. F.O.B. Cedarburg (Milwaukee), Wisconsin

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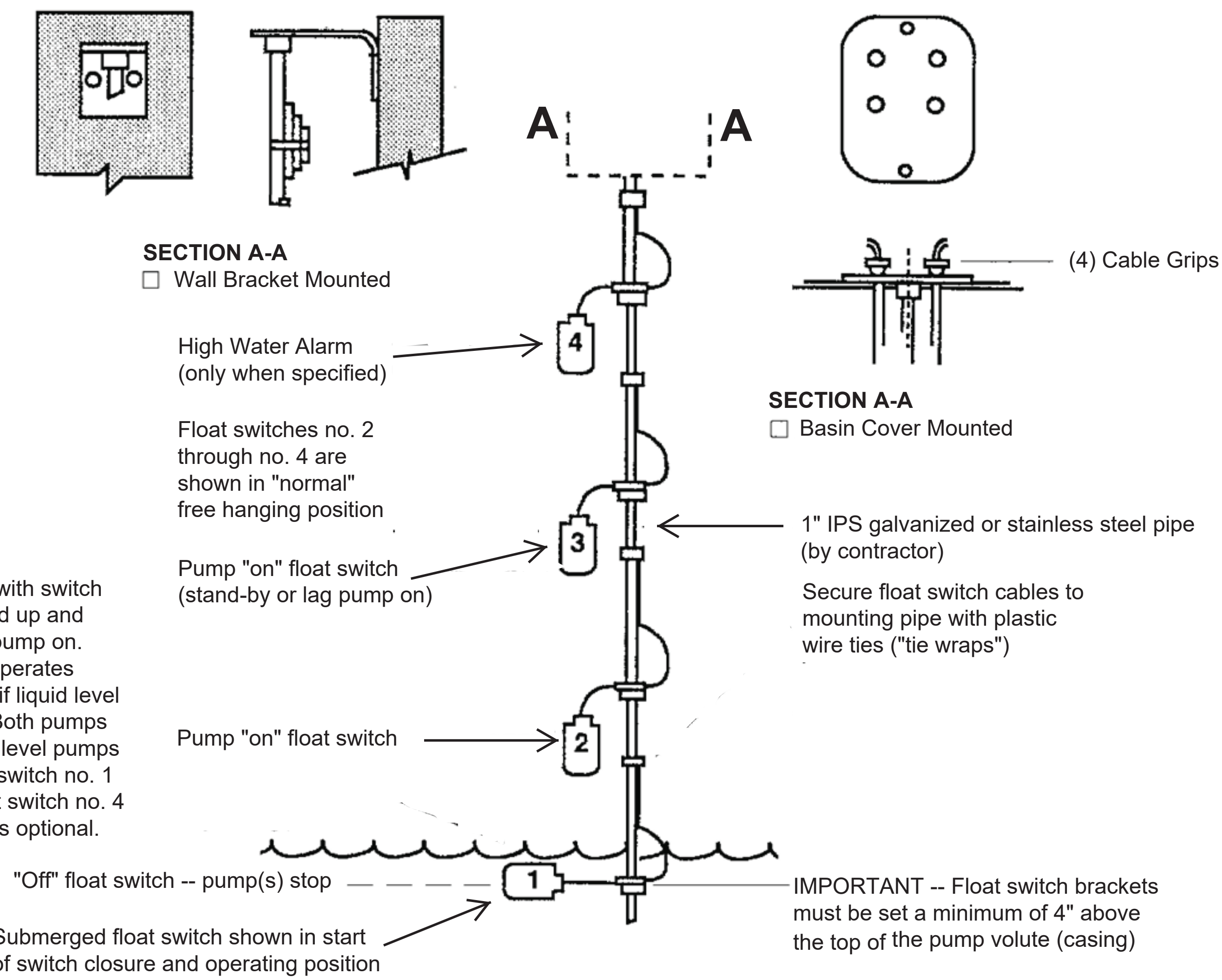
MECHANICAL FLOAT SWITCH INSTALLATION INSTRUCTIONS
DUPLEX - 4 FLOAT SWITCHES



SEQUENCE

Float switch no. 2 (with switch no. 1 already floated up and closed) turns lead pump on. Float switch no. 3 operates second (lag) pump if liquid level continues to rise. Both pumps turn off when liquid level pumps down and the float switch no. 1 circuit opens. Float switch no. 4 (high water alarm) is optional.

In determining the correct spacing of the float switches, please follow these steps:

1) Set float switch no. 4 "high water alarm level" at least 2" below the lowest inlet.
2) Float switch no. 3 "standby" should be set directly below float switch no. 4, with the float switches at least 90 degrees apart to prevent the lower no. 3 switch from hitting or entangling with the upper no. 4 switch as it rises with the liquid.
3) Float switch no. 2 "pump on" should be set 3"- 4" below switch no. 3.
4) Float switch no. 1 "pumps stop" ("off") must be set a minimum of 4" above the top of the pump volute (casing).
5) Check complete installation to see that none of the float switches hit the basin wall, the pumps, piping, or valves. This check should be made with the float switches in both "on" and "off" positions.

NOTE: *Float switches are not to be installed evenly spaced as shown. Spacing between float switch no. 1 and no. 2 determines the pump run time. This should be at least 2 minutes.*

1) If floats are close enough to touch, then the floats should be offset from each other to prevent any possible obstruction/entanglement.
2) ALL CABLES SHOULD BE SECURED NEATLY TO THE FLOAT POLE TO PREVENT ANY OBSTRUCTION.
3) Do not run float cables through the upper float bracket hole.

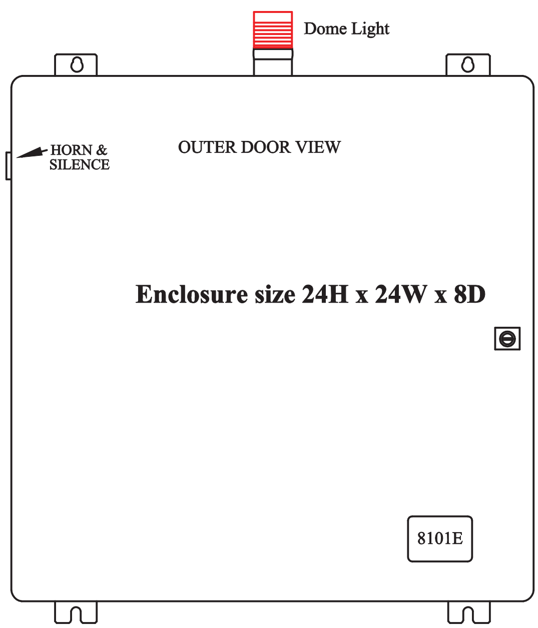
QUESTIONS? Call 1-800-74-PUMPS

WEIL Duplex Alternating Pump Control Panel 8101E

Duplex

Two Independent Control Circuits
Type 4 Double Door Dead Front Enclosure

- The 8101E Duplex panel has complete electrical separation of the control circuits for both pumps. It is a specification grade panel that utilizes single-pole level controls.
- Each pump has an independent control circuit power supply. Each pump control circuit also serves as backup for the other pump control circuit.
- Panel can be operated at 50 or 60 Hertz power.
- Type 4 enclosure for indoor or outdoor use. Provides protection against falling rain, splashing water or hose directed water; undamaged by the formation of ice on the enclosure.
- Exceeds Type 1, 3R and 12 requirements.
- Select level controls
  - 8213 Lever
  - 8220 Pressure Diaphragm
  - 8230 Tethered Float
- Requires one 8213 lever or four 8220 or 8230 level switches - three switches for level control and one switch for the high water.



Panel Includes
- U/L Listed Label
- LED Lights, hour meter, switches, and test buttons are on inner door.
- One lockable panel disconnect; through-the-door with door interlock on inner door. The mechanical interlock prevents the door from being opened when the disconnect is in the ON position. Lock is not provided.
- Padlocking hasp - on outer door, padlock not included.
- Two Industrial duty contactors.
- Two lockable pump disconnects, on motor overload protectors. Lock is not provided.
- Electric Alternator has a 3 position selector switch; that locks the pumps in Auto, Pump 1-2 or Pump 2-1 sequencing.
- Two Overloads - one per pump. Ambient compensated bimetallic (Class 10) motor overload circuit protector. Instantaneous magnetic trip for short circuit protection. Single-phase short circuit protection for three-phase motors. Field adjustable within the amp range.
- Two Control transformers with fused primary and fused secondary on all three-phase and single-phase 208 and 230-volt. Single-phase 115-volt has two fused control circuits.
- Pump run switches - one per pump. Three position TOA (test-off-automatic) with spring return to off from test.
- Green light indicates power to pump motor. One light per pump.
- White light indicates control power on. One light per control circuit.
- Red overload light indicates motor overload condition and pump is off. Light remains on and pump remains off until rest. One light per pump.
- Hour meters; non resetting meters indicates total pump run time.
- General Alarm Fault and Pump Run Status isolated contacts.
- High Water Alarm System Type 4X. Hold finger over hole of horn for 1-2 seconds and remove to silence horn (95 dB).
  - Red HWA light and alarm test button on inner door.
  - Two isolated contacts for remote monitoring and/or to use as a connection to a phone dialer.
- Alarm LED Dome Light - Lexan, red flashing on top of enclosure. Light indicates a general fault condition; overload, high water, moisture sensor or over temp condition. Light remains on until condition is corrected.
- Control Terminal board, numbered and wired.
- Layout and schematic CAD diagrams are provided. Installer connections at terminal board are clearly marked.

Motor Protrector Amp Range	Order Number			Approx. Weight Lbs.
	Single-Phase 115 Volts	Single-phase 208 or 230 Volts	Three-Phase 208, 230,460 Volts	
1.0 - 1.6	8101E-L-016	8101E-D-016	8101E-T-016	86
1.6 - 2.5	8101E-L-025	8101E-D-025	8101E-T-025	86
2.5 - 4.0	8101E-L-040	8101E-D-040	8101E-T-040	86
4.0 - 6.3	8101E-L-063	8101E-D-063	8101E-T-063	86
6.3 - 10.0	8101E-L-100	8101E-D-100	8101E-T-100	86
10.0 - 16.0	8101E-L-160	8101E-D-160	8101E-T-160	86
16.0 - 20.0	8101E-L-200	8101E-D-200	8101E-T-200	88
20.0 - 25.0	8101E-L-250	8101E-D-250	8101E-T-250	88
*25.0 - 32.0	8101E-L-320	8101E-D-320	8101E-T-320	101
*32.0 - 40.0	8101E-L-400	8101E-D-400	8101E-T-400	101
*40.0 - 50.0	8101E-L-500	8101E-D-500	8101E-T-500	116

*Includes 2nd disconnect and larger enclosure

Options:

8100K7079 Type 4X 304 Stainless Steel outer enclosure

8100K7222D Option is for a duplex set of pumps with standard Non-Explosion-Proof Motors (9712 & 9725).
- Moisture sensor relay and test buttons only. Two yellow lights indicate moisture in the pump motor.

8100K7224D Option is for a duplex set of pumps with standard Non-Explosion-Proof Motors (9706, 9709, & 9727).
- Moisture sensor relay and test button. Two yellow lights indicate moisture in the pump motor.
- Temperature limiter circuit shuts down pump motor when motor temperature is sensed. The temperature limiter circuit automatically resets when the motor temperature falls to a normal temperature operating range. Two Blue lights indicates motor over temperature.

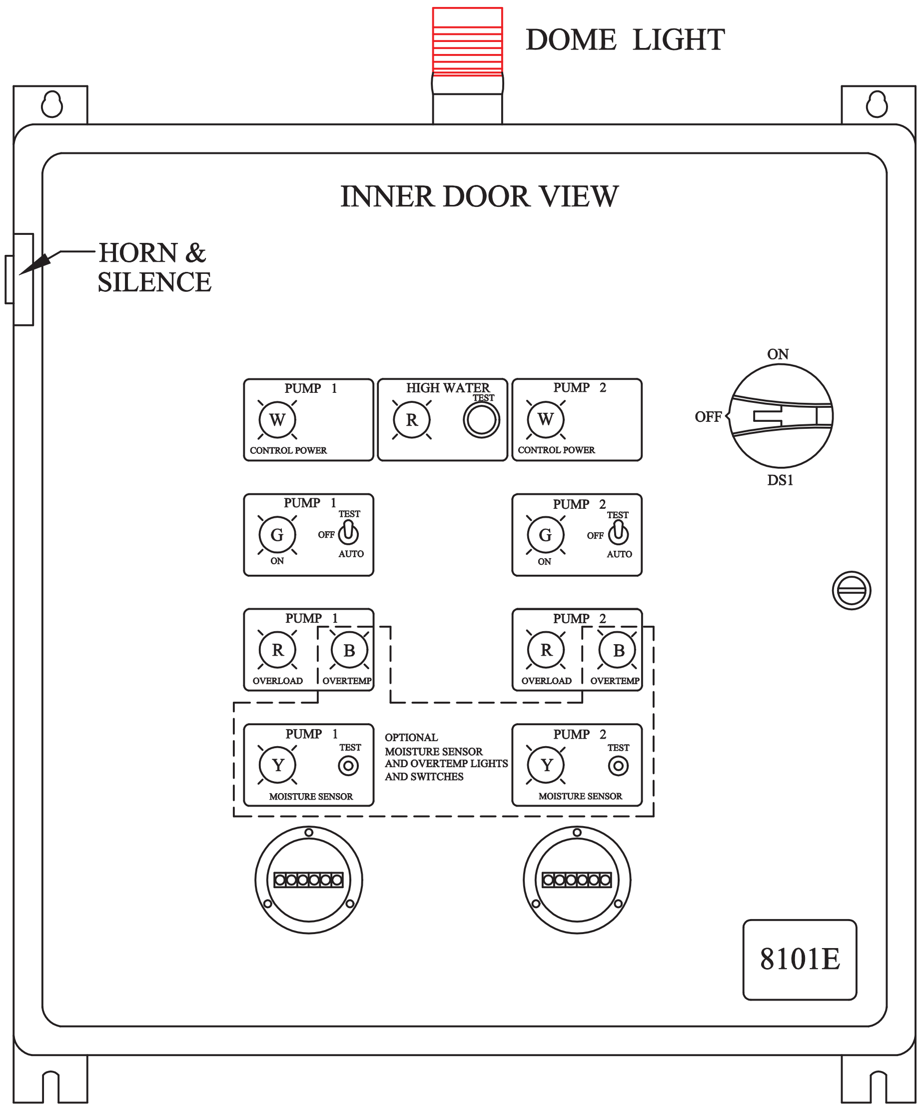
How to Order: Specify the Order Number, System Phase and Voltage, Pump Motor HP and any options.
F.O.B. Cedarburg (Milwaukee), Wisconsin

WEIL Duplex Alternating Pump Control Panel 8101E

Duplex

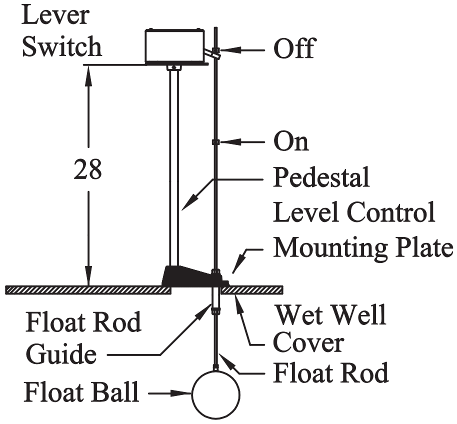
Two Independant Control Circuits

Type 4 Double Door Dead Front Enclosure

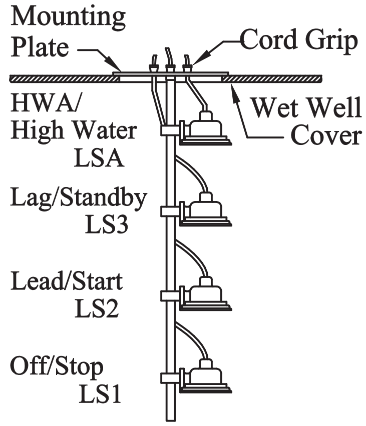


Use any of the three level controls with duplex control panel.

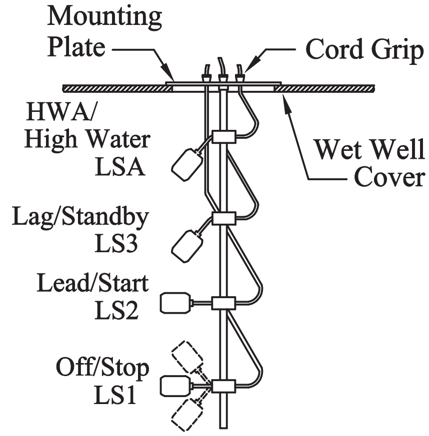
8213 Lever

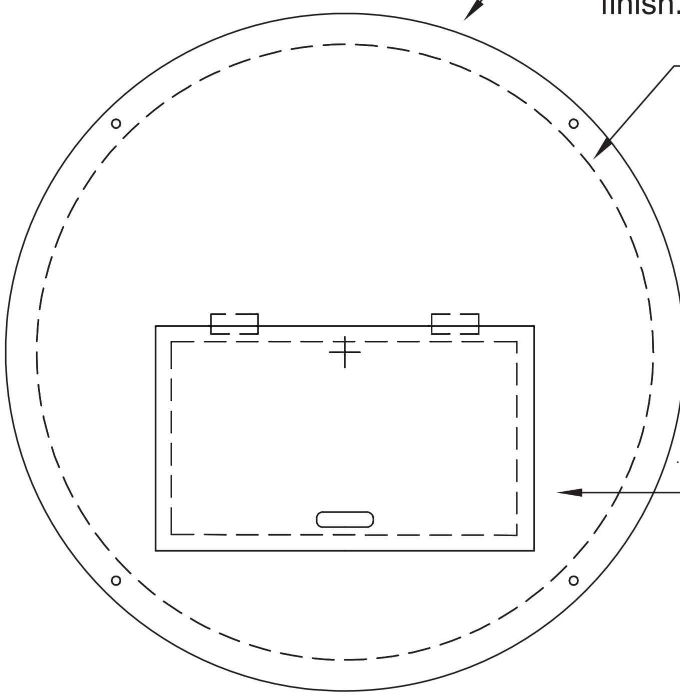


8220 Pressure Diaphragm



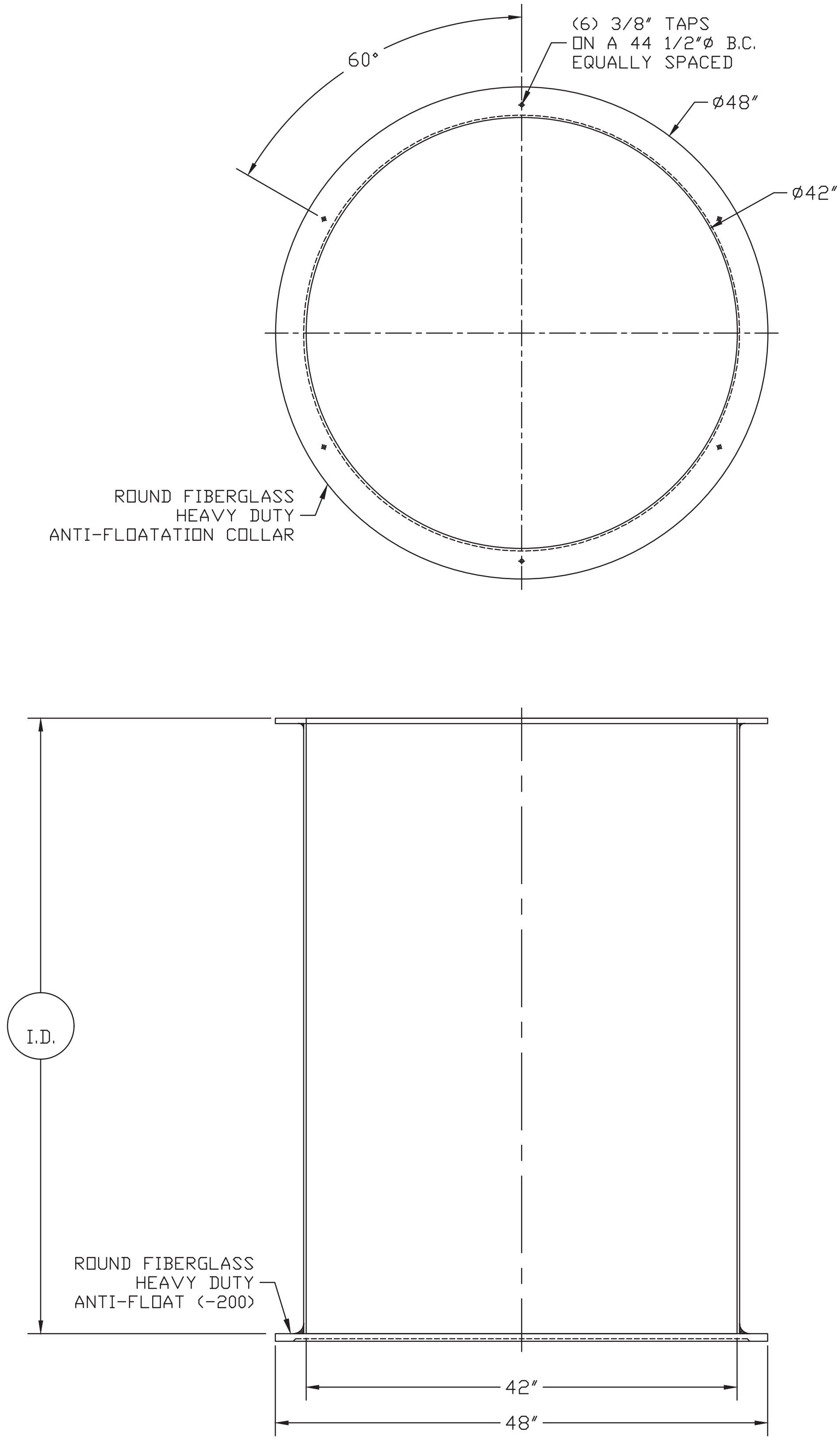
8230 Tethered





PROJECT: Rexford Insustrial	weil aquatronics Engineered Pumps and Hydronic Equipment Phone: 800-747-8677 Fax: 818-247-0083			
LOCATION: Chino				
ITEM: SP Cover				
CONTRACTOR:	DWG: 78.HAD.PTW	BY: RFB	Date: 11/30/23	Scale: NTS

PART/PRINT #:	PART DESCRIPTION:	DATE:
GB-42-200	42"ø FIBERGLASS BASIN W/ ROUND HEAVY DUTY ANTI-FLOATATION COLLAR	08/14/19



	DRAWN BY:	SCALE:	REVISION#:	SIGNATURE:
AK INDUSTRIES INC. 2055 PIDCO DR. PLYMOUTH, IN. 46563 PHONE:(574) 936-6022	A.HARTUNG J.CONLEY	NOT TO SCALE		

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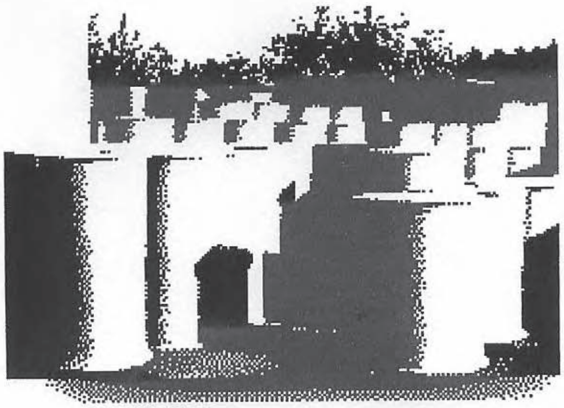
Treating Water as a Resource™

Fiberglass Basins

Protect groundwater and the environment with Weil Aquatronics light weight, maintenance-free fiberglass basins.



Featuring

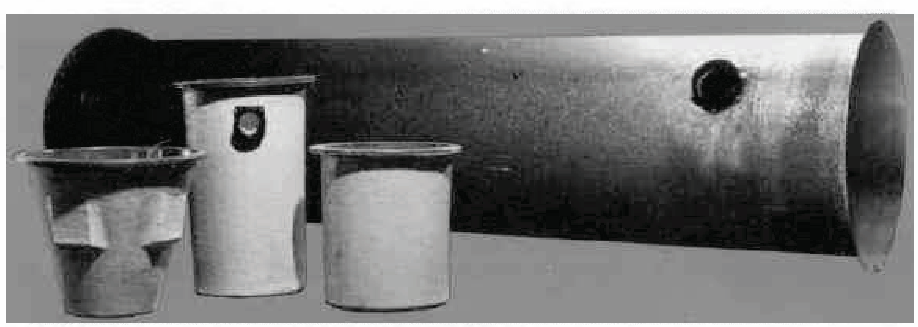
- Tremendous strength-to-weight ratio
- Non-corrosive and non-contaminating
- Quality and durability
- Wide range of sizes and configurations
- Maintenance-free for long term performance
- Size range18"-72" diameter, up to 21' deep
- Can be built in sections for on-site assembly

Weil Aquatronics fiberglass basins are well proven in hundreds of installations, handling everything from storm water to raw sewage to contaminated waste. These basins are manufactured to National Bureau of Standards PS-15-69 and ASTM-D-4097 requirements. Standard resins are resistant to attack from normal domestic sewage. Special premium resins are available for chemical waste and corrosive applications.

Basin walls have a minimum flexural strength of 12,000 PSI per ASTM D790, a tensile strength of 10,500 PSI per ASTMD638, and an ASTM D695 compression strength of 15,000 PSI.

Applications

- Sump and sewage wet wells
- Condensate receivers
- Catch basins
- Blow-off basins
- Holding tanks
- Valve boxes
- Secondary containment vessels
- Above ground and buried
- Potable and fire water storage



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environ™

Installation Instructions
Flexible Entry Boots

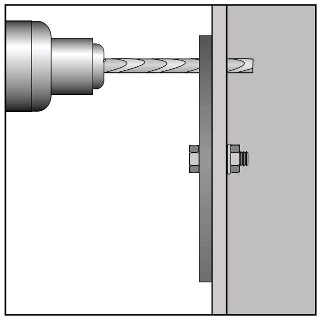
REINFORCED PIPE FITTINGS
(SEE BASIN DWG FOR SIZES)

Flexible Entry Boots

These one-piece rubber boots are designed to seal pipe and conduit entries for both flat and curved surfaces. For proper installation, the appropriate size fabrication template should be used for accurate hole drilling. The recommended sizes of hole saws must be used for the given *Flexible Entry Boot* size.

Step #1

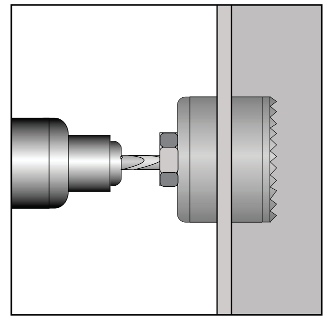
Locate the center entry point in the flat wall section of the sump base and drill a 5/16" hole. Install the *Entry Boot Template* to the sump base wall using a 1/4" bolt and nut. Drill out one hole of the appropriate bolt hole circle for the size boot to be installed using the same 5/16" drill bit. Insert a second 1/4" bolt and nut through this hole to secure the template. Continue to drill the remaining holes of the bolt hole pattern. After drilling, remove the template from the sump base wall.



Step #2

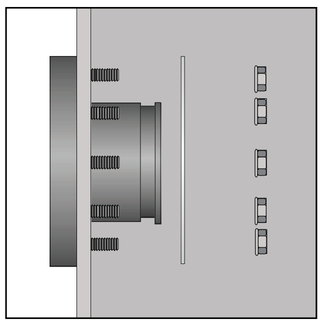
Drill out the entry boot opening by using the appropriate size hole saw. After drilling out opening, clean rough edges with a razor knife or deburing tool.

Hole Saw	Flexible Entry Boots
1-3/4"	Small profile FEB-3075
2-3/8"	Large profile FEB-3075
2-3/8"	FEB-3050, 3100, 3150, 3157
3"	FEB-5150
4-1/4"	FEB-6150, 6200, 6300
5-1/2"	FEB-7360, 7390, 7400
5-1/2"	SAB-7400
5-1/2"	GDB-4515, 4520, 4530, 7450
Sabre Saw	FEB-8600



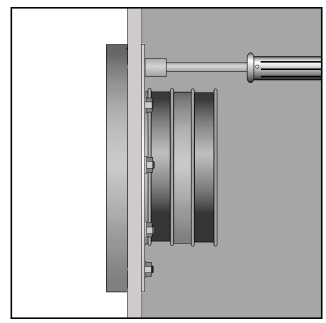
Step #3

Install the entry boot from outside the sump by inserting the studs through the bolt holes. From the inside of the sump, install the compression ring over the studs and install nuts by hand.



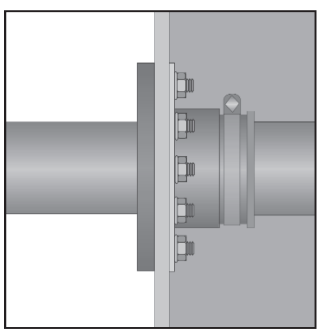
Step #4

In a clockwise or counter clockwise pattern, gradually tighten all of the nuts evenly to 60 inch lbs. Several passes may be necessary as the rubber will compress. To prevent deforming the boots, do not exceed 60 inch lbs.



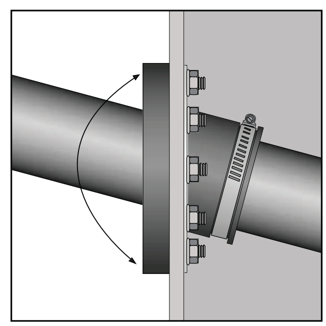
Step #5

Insert the appropriate sized pipe or conduit into the flexible boot from the outside of the sump. After the pipe or conduit has been positioned, install the band clamp around the boot and tighten to 30 in. lbs.



Angled Entries

The flexible entry boot is designed to permit angled pipe or conduit entries up to 15° off the centerline. Angles greater than 15° could prevent the boot from sealing around the pipe or conduit, and will void the product warranty.

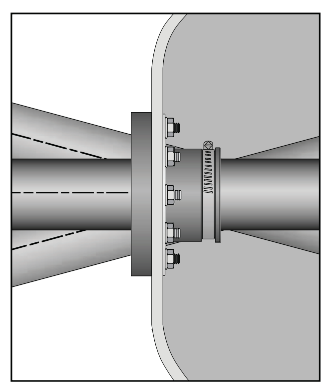


WARNING

Keep all fiberglass cleaning solvents away from boots. These types of solvents could cause severe damage.

Fiberglass Surfaces

Flexible Entry Boots may be installed on round surfaces which have a diameter greater than 30". The installation procedures are the same as described above except, extra care shall be taken to properly hand sand the surface to be bonded. Make sure all raised sections of FRP are minimized and remove all sharp edges. The 5/16" bolt holes should be made slightly larger after initial drilling. This can be accomplished by moving the 5/16" bit from side to side in each bolt hole after the *Entry Boot Template* has been removed. Tighten down each nut in stages so the boot flange and compression ring can evenly conform to the rounded surface and achieve a positive seal.



IMPORTANT

The recommended hole saw size must always be used for proper installation of the *Flexible Entry Boot* and maintain the product warranty.

A hydrostatic test must be performed to ensure a positive seal.

Environ Products, Inc. • 3250 US 70 Business West • Smithfield, NC 27577 • Tel: (919) 359-3400
Fax: (919) 359-3687 • Customer Service: (800) 833-1883 • www.envproduct.com •

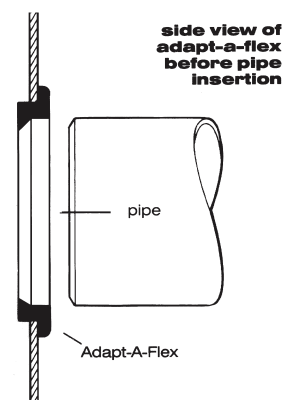
Flexible fittings: Inlet, vent, & electrical
(see basin dwg for sizes)

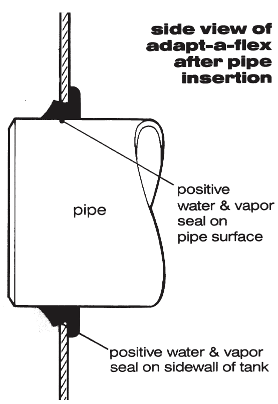
AK INDUSTRIES, INC.

Adaptaflex Fittings

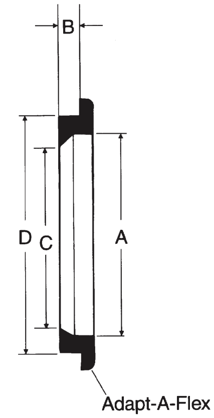
Instantly provides a water and vapor seal on either curved or flat surfaces!

- Ease of Installation
- Weather and Corrosion Resistant
- No Bolts or Gaskets Required
- Requires No Sealants
- Durable PVC Composition
- Available in 3/8" through 6" sizes
- Works with Steel Pipe, Schedule 35 and 40 Plastic Pipe





Number		A	B	C	Hole D	Saw Size
GA-375AAF	3/8"	.068	.200	.045	1.050	1"
GA-050AAF	1/2"	.086	.240	.630	1.310	1-1/4"
GA-075AAF	3/4"	1.040	.240	.820	1.310	1-1/4"
GA-100AAF	1"	1.300	.220	1.050	1.780	1-3/4"
GA-125AAF	1-1/4"	1.630	.230	1.350	3.050	3"
GA-150AAF	1-1/2"	1.870	.230	1.560	3.050	3"
GA-200AAF	2"	2.300	.250	2.000	3.050	3"
GA-300AAF	3"	3.450	.250	3.100	4.010	4"
GA-400AAF35	4" SDR 35	4.270	.250	3.800	5.025	5"
GA-400AAF40	4"	4.450	.250	4.120	5.060	5"
GA-600AAF35	6" SDR 35	6.200	.250	5.850	7.205	7"
GA-600AAF40	6"	6.450	.250	6.125	7.060	7"



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Fax: 818-247-0083
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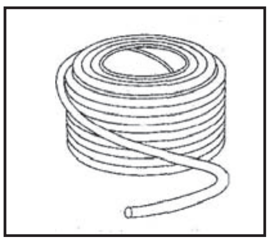
Gastight Sealing of Weil Aquatronics Basin Covers

Basin covers supplied by Weil Aquatronics are provided with rope-type caulking material. This material, properly installed, will provide a gastight seal between covers and frames, between access doors and covers, and any other flat mating surfaces on the cover.

We supply M-D Building Materials rope-type caulking material, part number 71522 (gray –30' linear feet); however, any waterproof rope-type caulking material would be sufficient.



REPLACEABLE CORD WEATHERSTRIP

This weatherstrip cord is easily installed by pressing into the gap to be filled. This product can be used both inside and outside. Can be cut to length to fit your application. Available in 30' and 90' rolls.

Item No.	Width	Height	Length	Finish
71522	n/ a	n/ a	360"	Gray

Installation & Maintenance:

1. Clean surfaces to be sealed.
2. Apply caulking material as required. Normally one bead of material is sufficient to provide a gastight seal, however large or irregular surfaces may require more than one bead of material to provide a proper seal.
3. Mating surfaces that are unsealed (access doors, inspection plates, etc.) should have the existing material removed. Then clean the sealing surfaces and apply new sealing material.

weil aquatronics
Engineered Pumps
and Hydronic Equipment

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FIBERGLASS SUMP BASINS
INSTALLATION INSTRUCTIONS

1. **Excavation Dimensions**: Excavation shall be 6" deeper than the depth of the basin, below finish grade and done in such a manner as to preserve the undisturbed state of bearing soils at the bottom. Diameter of excavation shall be sufficient to allow for necessary external pipe connections with a minimum **12"** greater than the basin diameter.

2. Backfill Materials:
   a. The backfill materials shall be inert, free flowing granular soil such as clean sand or gravel (1/4" mesh or finer).
   b. Acceptable backfill includes "stone dust" from rock crushing operation provided it possesses all the characteristics of free flowing sand and contains less than 20% by weight passing the No. 200 mesh sieve. Soil fines must be non-plastic.
   c. Silts, clays, organic soil, granulated cinder, slag and similar corrosive material shall not be used. Backfill shall be free of organic material, loam, trash, snow, ice, stones, rubble, etc.
   d. A free flowing material is essential for preparation of the support bed and for backfilling in order to provide complete and proper support for the bottom and sides of the basin.

3. **Pipe Connections**: Make necessary pipe connection in approved manner. Connection may be threaded, caulked joints, no-hub or other specified approved method.

4. Backfill as follows:
   a. If the hole is flooded, the water level shall be pumped down to maximum depth of 3 inches before preparing the bed and placing the basin. Water level shall be maintained below bottom of the basin until the excavation is backfilled and until there is adequate safety against uplift.
   b. The first layer of backfill is the base for the basin and shall be at least 6" thick.
   c. Place the basin on the bed and after aligning and leveling, push additional fill under and around the basin and compact by tarnping to a uniform depth of 12" around the basin. This insures that the established grade and level of the basin will be maintained during remainder of the backfilling operation.
   d. Backfill shall be continued in one foot layers with specified backfill uniformly distributed and compacted around the basin.
   e. Concrete encasement in lieu of backfill is **NOT** recommended.

5. **Cover**: The cover shall be bolted in place with an approved gasket material to effect a gas tight seal. Basins installed in traffic areas must have separate curb frames imbedded in finish floor and not in contact with any portion of the basin.

NOTE: In accordance with City of Los Angeles General Approval:
"Sump pumps shall not rest on the bottom of the sump unless the bottom is supported on a suitable level concrete base."

BACKFILLING

BACKFILL MATERIAL. Backfill material should be clean, well-granulated, free-flowing, noncorrosive, and inert. It should be free of ice, snow, debris, rock, or organic material, all of which could damage the tank and interfere with the compaction of the backfill material. The largest particles should not be larger than 3/4 inch. Not more than 3 percent (by weight) should pass through a #8 sieve, and the backfill material should conform to ASTM C-33, Paragraph 9.1 requirements. Approved backfill materials include:

- Pea Gravel, naturally-rounded particles with a minimum diameter of 1/8 inch and a maximum diameter of 3/4 inch.
- Crushed Rock, washed and free-flowing angular particles between 1/8 inch and 1/2 inch in size.

PLACEMENT AND COMPACTION OF BACKFILL. compaction of backfill materials should be adequate to ensure the support of the tank, and to prevent movement or settlement. Backfill materials should be place in 12 inch lifts and compacted to a minimum soil modulus of 700 pounds per square inch (psi).

SUPPORTING PIPING, EQUIPMENT AND ACCESSORIES. Support for piping, equipment and other accessories must be provided during backfilling. Using the basin to support piping, equipment, cribbing, bracing or blocking is never permitted. During backfilling, temporary supporting materials must be carefully installed and removed to prevent damage to the basin, piping or equipment.

WARNING! Using the basin to support any loading carried or created by piping, equipment, cribbing, bracing or blocking is never permitted.

ANCHORAGE

GENERAL. When basin installations are located in areas subject to high water tables or flooding, provisions should be made to prevent the basins, either empty or filled, from floating. The buoyancy force to be offset is determined primarily by the volume of the basin. The principle offsetting factors include:

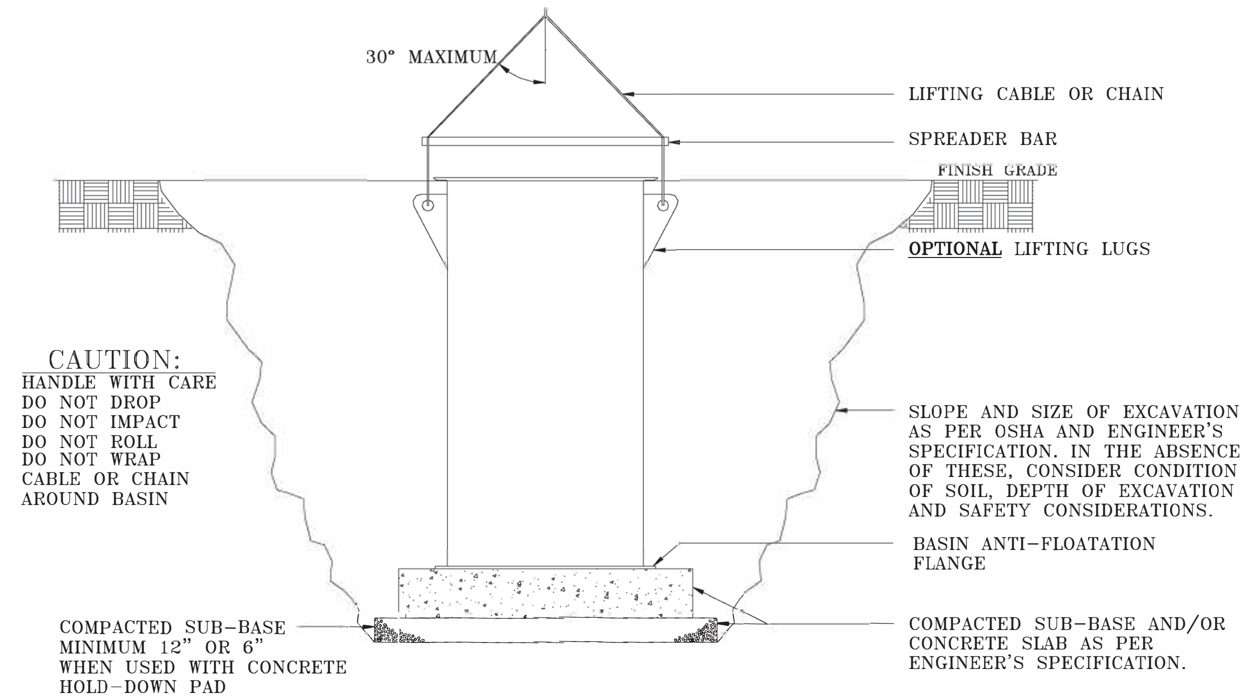
- Backfill materials.
- Concrete hold-down pad.
- Friction between the tank, backfill materials and the surrounding soil.

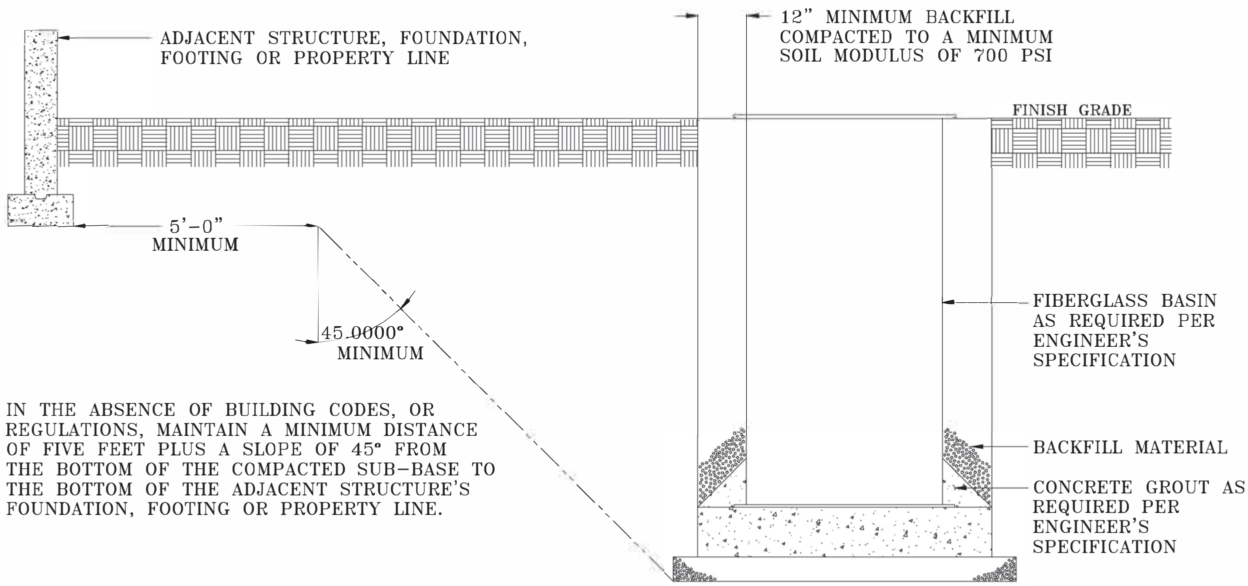
METHODS OF ANCHORAGE. All methods of anchoring basins use the weight of the backfill materials to offset the buoyancy forces. The use of supplemental mechanical anchoring methods (a concrete hold-down pad) increases the amount of backfill ballast which is mechanically attached to the basin. The recommended method of attachment is to pour concrete grout over the basin's anti-floatation flange and concrete hold-down pad (see attached illustration).

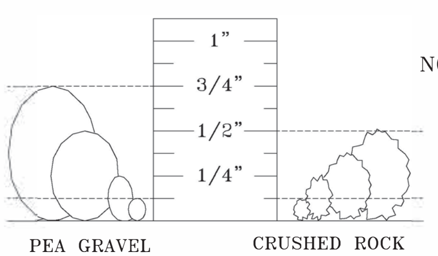
ANCHORAGE REQUIREMENTS. Requirements for anchorage, thickness of concrete hold-down pads, as well as the size of anchors and reinforcement must be calculated for each installation based on the environmental conditions of that specific installation.

WARNING! Use "submerged" material weights when calculating anchorage requirements. Example: weight of concrete (150 pounds per cubic foot) minus the weight of the water 62.4 pounds per cubic foot) equals a "submerged" weight of 87.6 pounds per cubic foot.

FIBERGLASS BASIN INSTALLATION REFERENCE GUIDE







BACKFILL MATERIAL REQUIREMENTS

NOTE:

The intent of these installation instructions and illustrations is to ensure that damage or premature failure to the basin will not occur. These installation instructions and illustrations are NOT intended to preclude normal safety procedures which should be followed to prevent injury to personnel. SAFE INSTALLATION PROCEDURES SHALL BE ENTIRELY THE RESPONSIBILITY OF THE INSTALLER.