

APPENDIX D
REVISED PRELIMINARY LANDSLIDE GRADING AND DRAINAGE STUDY

Revised Preliminary Landslide Grading and Drainage Study

Burek Residence
20 Old Ranch Road
Laguna Niguel, California 92677

Related Permit Numbers(s):

SDP 24-1003

Prepared by:

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November 11 2024



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Exhibits:

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Figure 2: Undeveloped Condition Drainage Map

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Appendix A: Undeveloped Condition Calculations

Appendix B: Proposed Graded Condition Calculations

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November 11, 2024

20 Old Ranch Road Landslide Grading Drainage Report

PROJECT INTRODUCTION:

This proposed hillside slope landslide repair project is located at 20 Old Ranch Road, Laguna Niguel, California 92677, as shown on the Vicinity Map included as Figure 1. The Approximate 13.0 acre RS-1 Rural Residential District zoned property is owned by Ron and Heather Burek Living Trust.

An existing natural hillside, consisting of native brush and grassland groundcover, lies below the existing Burek residence at 20 Old Ranch Road. Consistent with the two adjacent properties, a landslide rupture surface has been identified on this project for which an application for the grading to remove the rupture surface has been submitted under a separate permit. Further grading under this permit application is required to achieve the required slope stability factor of safety of 1.5:1.

This project consists of the grading of approximately 8.2 hillside acres and installing drainage improvements to excavate and add additional fill to buttress the existing landslide. The purpose of this Drainage Study is to support the project grading permit process and the final grading configuration.

FINAL GRADING CONFIGURATION

The proposed final grading configuration consists of reconstructing slopes, slope benching, slope maintenance access paths, and slope drains to limit the potential of future erosion. A basin will be located at the northerly end of the project to control sediment. The proposed project consists of earthwork, drainage and landscape improvements only.

METHOD OF ANALYSIS:

The residence at 20 Old Ranch Road is located above an existing hillside that contains a center ridge that splits hillside flows to natural arroyos draining to the southeast and northeast corners of the property. The northeasterly arroyo drains into an existing 24" Reinforced Concrete Pipe (RCP). The southeasterly arroyo drains into an existing 30" RCP. Both piped systems are part of the City of San Juan Capistrano maintained storm drain system.



This project and the related remedial grading is tributary to both the northeasterly and southeasterly arroyo..

This drainage analysis compares onsite storm flows, including the existing developed residence modeling the existing condition with the flows after proposed remedial grading and slope drainage improvements and configuration.

CIVILCADD/CIVIL DESIGN Engineering Software Orange County Rational Method Hydrology Program was used to calculate and compare flows in both the existing and slope restoration conditions. This method incorporates values for rainfall intensities, runoff coefficients, and drainage areas into the equation $Q=CIA$.

- The property lies within Soils Type "D" per the Orange County Hydrology Manual Soil Type Map.

Results for the 10-Yr, 25-Yr, 50Yr, and 100-Yr events were then compared between the Existing and Proposed Slope Repair configurations.

Undeveloped Condition

The undeveloped conditions are modeled utilizing the property topographic conditions prior to any onsite construction.

The attached Figure 2 represents the Undeveloped Condition Hydrology Map with calculated values.

Proposed Remedial Graded Condition

The proposed remedial slope graded configuration was utilized as the topographical basis for calculating the storm flows. As in the original Undeveloped Condition Analysis, the main drainage flow paths were used to calculate discharges for the comparable storm events at various points of concentration with the common point being the inlet to the existing 24" RCPs at the property's northeast and the 30" RCP at the southeast corners.

The attached Figure 3 represents the Developed Condition Hydrology Map with calculated values.

Results of Analysis

The following table represents a summary of the comparative flows between the Undeveloped and Proposed Remedial Developed Condition for the 10 year, 25 year, 50 year, and 100 year storm events.

RESULTS OF ANALYSIS TABLE			
10-YEAR	UNDEVELOPED CONDITION	REMEDIAL GRADED CONDITION	NET CHANGE
NE Property Corner 24" Storm Drain Inlet	Node A 42.2 cfs	Node 106 43.3 cfs	1.1 cfs
SE Property Corner 30" Storm Drain Inlet	Node B 17.9 cfs	NODE 107 12.3 cfs	-5.6 cfs
25-YEAR	UNDEVELOPED CONDITION	REMEDIAL GRADED CONDITION	NET CHANGE
NE Property Corner 24" Storm Drain Inlet	Node A 51.2 cfs	Node 106 52.6 cfs	1.4 cfs
SE Property Corner 30" Storm Drain Inlet	Node B 21.7 cfs	NODE 107 15.0 cfs	-6.7 cfs
50-YEAR	UNDEVELOPED CONDITION	REMEDIAL GRADED CONDITION	NET CHANGE



NE Property Corner 24" Storm Drain Inlet	Node A 58.2 cfs	Node 106 60.0 cfs	1.8 cfs
SE Property Corner 30" Storm Drain Inlet	Node B 24.6 cfs	Node 107 17.0 cfs	-7.6 cfs
100-YEAR	UNDEVELOPED CONDITION	REMEDIAL GRADED CONDITION	NET CHANGE
NE Property Corner 24" Storm Drain Inlet	Node A 66.4 cfs	Node 106 68.4 cfs	2.0 cfs
SE Property Corner 30" Storm Drain Inlet	Node B 28.1 cfs	Node 107 19.4 cfs	-8.7 cfs

See Appendix A for Pre-Development calculation results
and Appendix B for Post-Development calculation results

As part of remedial slope design, A sediment basin is included to capture and settle silts, organic landscaping debris, and trash that may be found in storm flows typically generated from a single family land use.

HYDRAULIC CALCULATIONS

Rational Method hydrology was used to determine 100-year,50-year, 25-year, and 10-year tributary storm flows in the remedial graded condition. Hydraulic calculations utilizing FHWA Hydraulic Toolbox software was used to size pipes to accommodate these flows.

Appendix C, contains output reports on the sizing of the drainage facilities.

RIP RAP

Energy and velocity reduction concepts were incorporated into the design.

All Rip Rap to be 1/4 Ton 3.3' Thick w/ 1" Crushed Rock 0.75' Thick.

SLOPE PIPE DRAINS

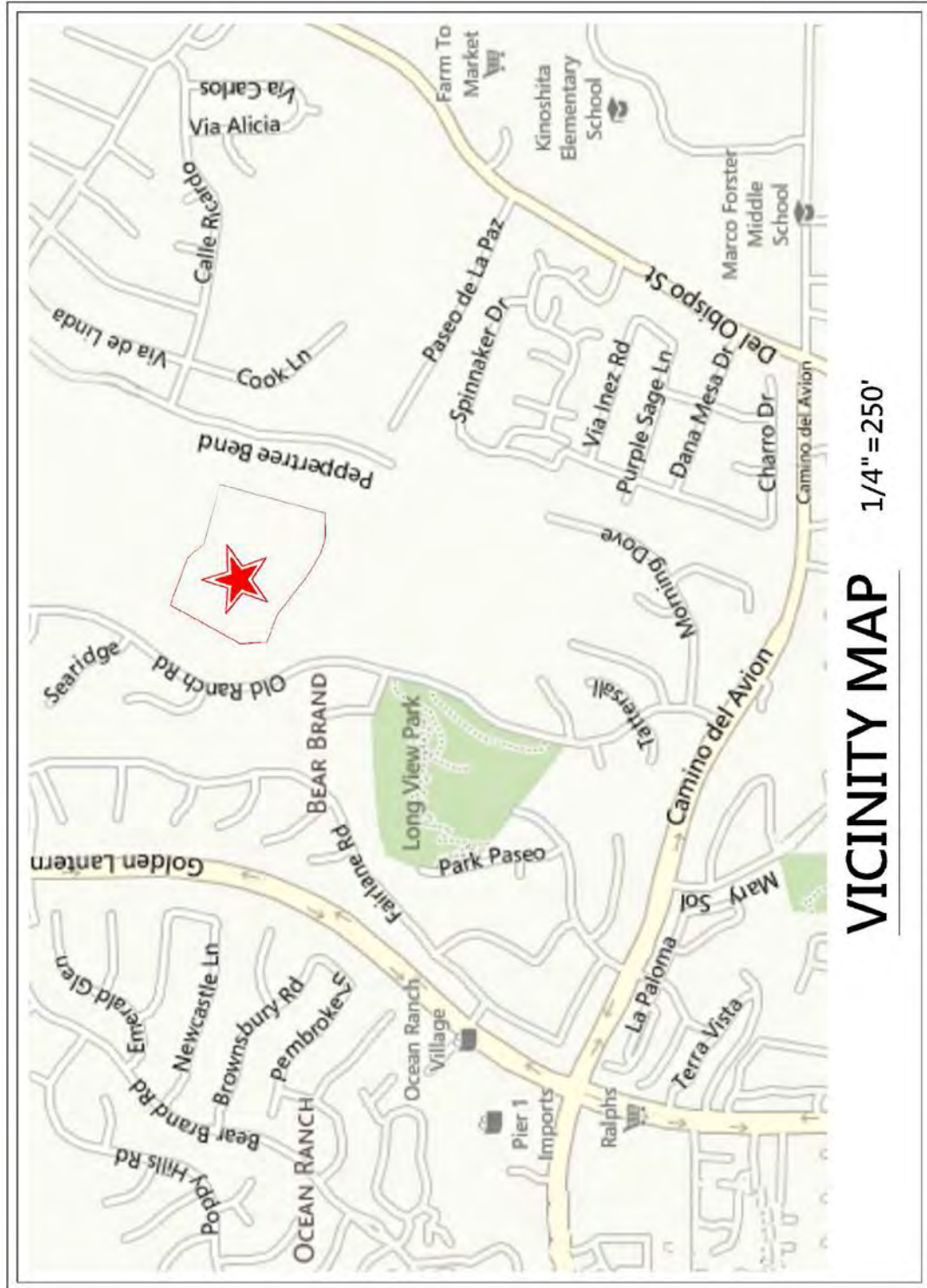
All slope Drain Pipes to be 12" HDPE Pipe

CONCLUSIONS

The project goal is to improve the stability of the existing hillside slope by the removal of the landslide rupture surface and grading of the hillside area. This drainage report provides the basis of design for the related drainage improvements consisting of slope drains, pipes, and rip rap. Reconstructing the slope, installing these drainage improvements, and conducting a regular maintenance routine should accomplish this project goal.

FIGURE 1

VICINITY MAP

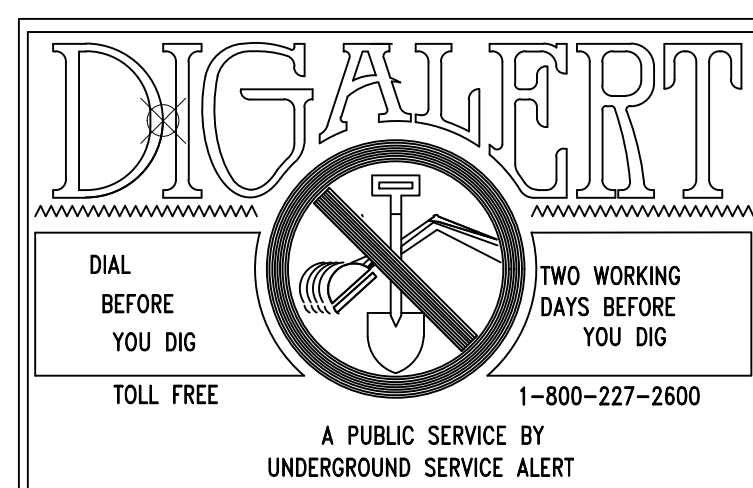
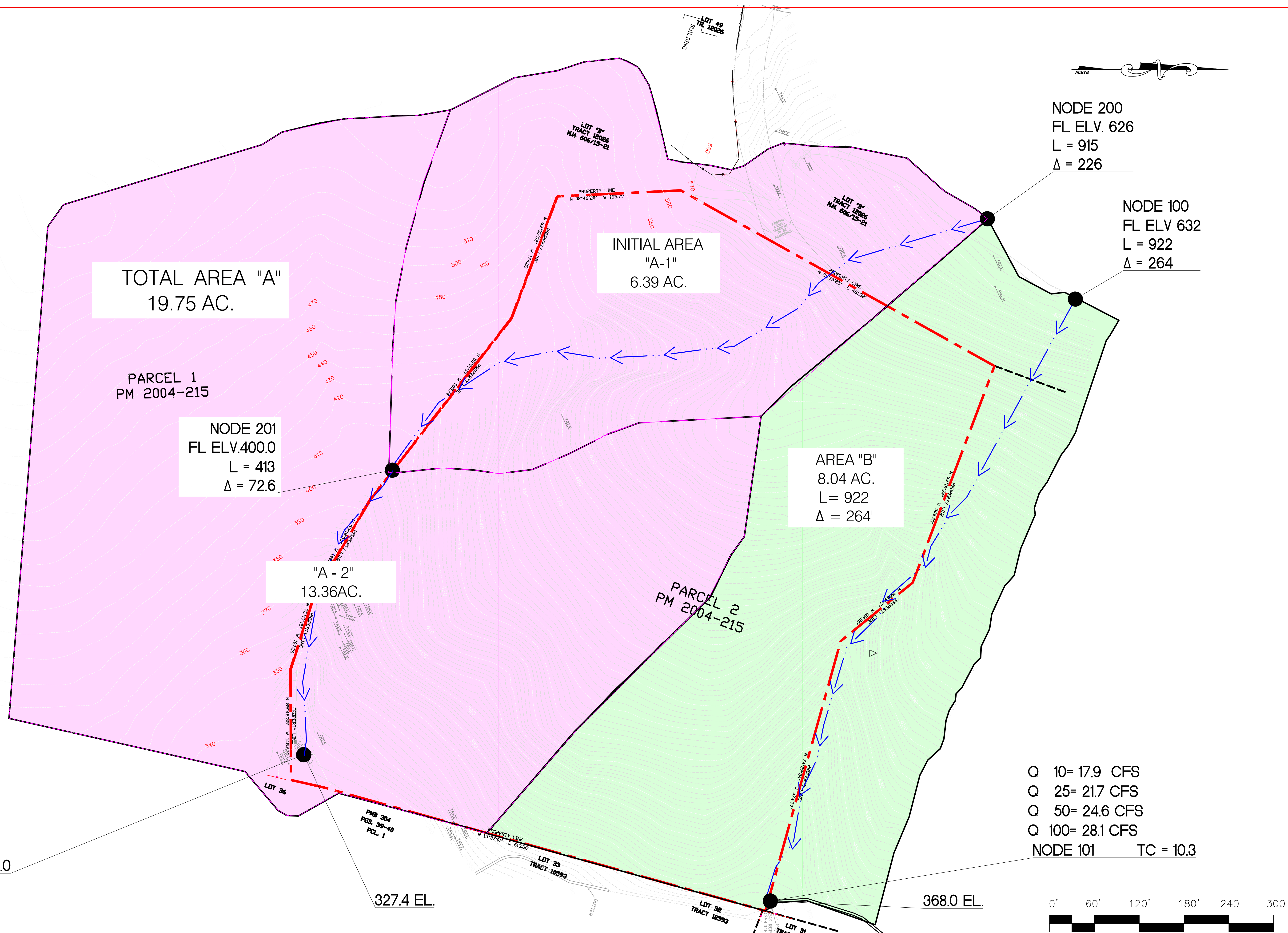


20 OLD RANCH ROAD LAGUNA NIGUEL CA, 92677

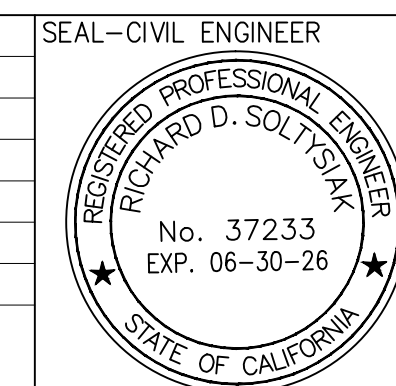
FIGURE 2

UNDEVELOPED CONDITION

DRAINAGE MAP



MARK	BY	DATE
ENGINEER		



PREPARED BY:

BENCHMARK:
COUNTY OF ORANGE
BENCH MARK #3MM2791
ELV. 517.847
NAVD 88 DATUM

DATE: NOV 11, 2024

SCALE: 1" = 60'

20 OLD RANCH ROAD LANDSLIDE GRADING

PRE DEVELOPMENT DRAINAGE AREA PLAN

FOR:
RON AND HEATHER BUREK

W.O.

FILE NO.

SHEET NO.

1

1 OF 1 SHTS

FIGURE 3

PROPOSED REMEDIAL GRADED

CONDITION

DRAINAGE MAP

AND REMEDIAL GRADING PLN



CITY OF LAGUNA NIGUEL STANDARD GRADING NOTES – FORM 303

- Approved protective measures and temporary drainage provisions shall be used to protect adjoining properties during grading.
- Any existing water wells shall be abandoned in compliance with the specifications approved by County of Orange, Human Services Agency, Division of Environmental Health.
- Any existing oil wells shall be abandoned in compliance with the Orange County Oil Code to the approval of OC Public Works/Regulations Special Service Section.
- Any existing cesspools and septic tanks shall be abandoned in compliance with the California Plumbing Code to the approval of City Planning/Building & Safety Divisions.
- Prior to final approval, the Civil Engineer shall certify to the Building Official the amount of earth moved during the grading operation.
- The permittee shall comply with the Grading Code requirements when an excess of 5,000 cubic yards of each is transported to or from a permitted site on public roadways.
- Asphalt concrete shall be constructed per the requirements of OC Public Works Standard Plan No. 1805.
- Aggregate base section shall be constructed per OC Public Works Standard No. 1804.
- All concrete structures that come in contact with the on-site soils shall be constructed with type V cement, unless deemed unnecessary by soluble sulphate-content tests conducted by the Soil Engineer.
- Export soil must be transported to a legal dump or to a permitted site approved by the City Grading Inspector.
- Slopes exceeding 5' in height shall be planted with approved plant material. In addition, slopes exceeding 15' in height shall be provided with an approved irrigation system, unless otherwise approved by the Planning Division.
- The Grading Contractor shall submit a statement of compliance to the approved Grading Plan prior to final approval.
- Asphalt sections must be per Code: Parking stalls = 3" A/C over 6" A/C, Drives 3" A/C over 10" (Comm.) 12" (Industrial). Or: Prior to rough grade release for Building Permits by the City Grading Inspector, the Soil Engineer shall submit for approval, pavement section recommendations based on 'R' Value analysis of the sub-grade soils, and expected traffic indices.
- Preliminary soil and geology reports and all subsequent reports as approved by the City Grading Inspector.
- All existing drainage courses through this site shall remain open until facilities to handle storm water are approved and functional; however, in any case, the permittee shall be held liable for any damage due to obstructing natural drainage patterns.
- Grading operations including maintenance of equipment within one-half mile of a human occupancy shall not be conducted between the hours of 8 p.m. and 7 a.m. daily, on Sunday or on a Federal Holiday.
- Roof gutters shall be installed to prevent roof drainage from falling on manufactured slopes.
- The permittee shall be given reasonable notice to the owner of adjoining lands and buildings prior to beginning excavations which may affect the lateral and subjacent support of the adjoining property. The notice shall state the intended depth of excavation and when the excavation will commence. The adjoining owner shall be allowed at least 30 days and reasonable access of the permitted property to protect his structure, if he so desires, unless otherwise protected by law.
- EROSION CONTROL**
- In case of emergency, call: RON BUREK Work Phone: (949)633-9917.
(Name)
Home Phone: (949)244-0813.
- Sediments from areas disturbed by construction shall be retained on-site using an effective combination of erosion and sediment controls to the maximum extent practicable, and stockpiles of soil shall be properly contained to minimize sediment transport from the site to streets, sidewalks, gutters, drain inlets or adjacent properties via runoff, vehicle tracking or wind.
- All sediment and construction debris which is tracked or deposited onto public or private sidewalks, gutters or paved roads shall be removed on a daily basis by sweeping or vacuuming and disposed of properly. Sediment and construction debris shall not be washed into the storm drain system, including the gutter and storm drain inlets.
- Sandbags, gravel bags or other effective flow or trap-type barriers shall be used where appropriate to intercept and slow the flow of runoff from the construction site and to trap sediment before it enters the storm drain system, including gutters and inlets. All on-site storm drain inlets shall be protected and off-site inlets shall be protected in areas where construction activity tracks sediment on paved areas or where inlets receive runoff from disturbed areas.
- Equipment and workers for emergency work shall be made available at all times during the rainy season. Necessary materials shall be available on site and stockpiled at convenient locations to facilitate rapid construction of temporary devices when rain is imminent.
- Erosion control devices shall not be moved or modified without the approval of the Building Official.

Work Phone: (949)633-9917.

Home Phone: (949)244-0813.

- ## CONSTRUCTION NOTES

- EXCAVATION
FILL PLACEMENT (NEAT LINE)
REMEDIAL EXCAVATION
(PERFORMED ON LANDSLIDE REPAIR)

LEGAL DESCRIPTION

PROJECT ADDRESS

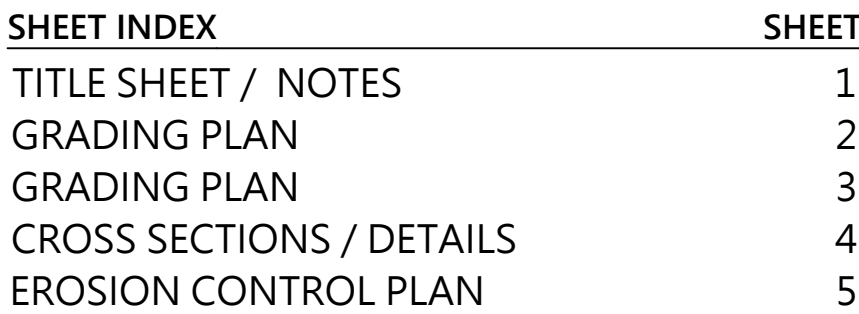
SOILS ENGINEER & GEOLOGIST

OWNER / APPLICANT

131 Calle Iglesia, Suite 200,
San Clemente, CA 92672
Phone#: 949-369-6141
kcolson@lgcgeotechnical.com

CIVIL ENGINEER

RDS and Associates
Rich Soltysiak
30519 Wailea Court
Temecula CA 92595
Phone# 951-691-7706
email: rds11@extreme.com



SHEET NO.

1

1_OF_5_SHTS

BENCHMARK:

O.C.S.B.M: 3LL-5-78
ELV 121.859 FT
DATUM: NAVD 881990 A

Date: APRIL 9 202.

CALE: H: N/A V: N

APN 121-100-81

CITY OF LAGUNA NIGUEL
BUREK RESIDENCE
TITLE SHEET / NOTES

FOR:

d Heather Burek

W.O.

FILE NO

SEAL-ENGINEER



ENGINEERING COMPANY



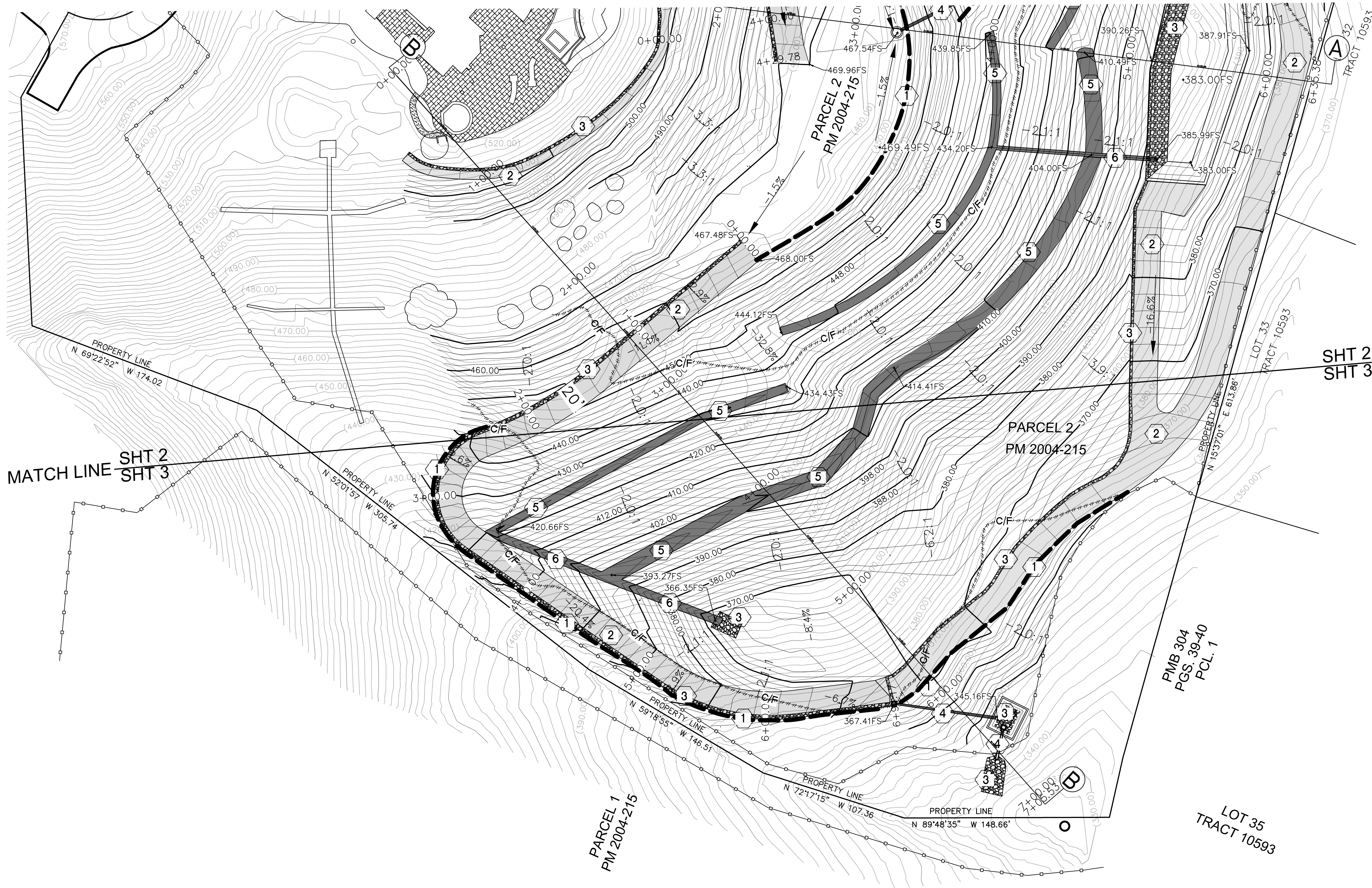
Civil Engineering
Project Management
Construction Management

30519 Wailea Court
Temecula, CA 92592
ph: 951-691-7706
email: rdst1@dslextrreme.com

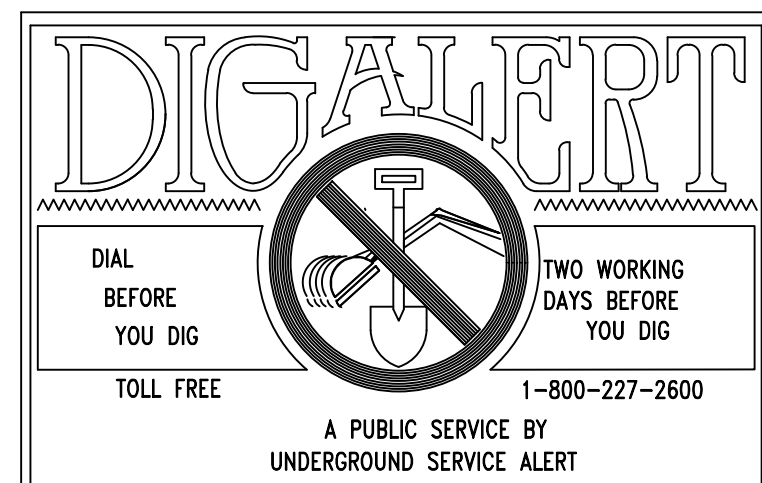
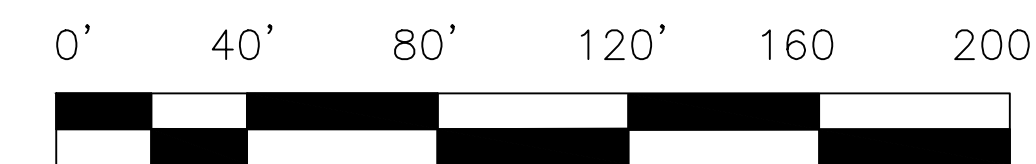
PREPARED BY:
RICHARD SOLTYSIAK

R.C.E. NO.	37233
DATE	EXP. DATE 06/30/24

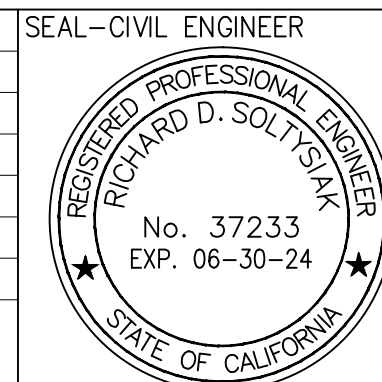
[illegible]



- CONSTRUCTION NOTES
- 1 1' HIGH x 2' WIDE BERM
 - 2 CONSTRUCT 0.5' CLASS II PERVIOUS BASE
 - 3 ROCK RIP RAP (DETAIL B SHT 4)
 - 4 INSTALL HDPE CULVERT
 - 5 TERRACE DRAIN
 - 6 CONCRETE DOWNDRAIN
 - 7 NOT USED
 - 8 NOT USED



MARK	BY	DATE
ENGINEER		



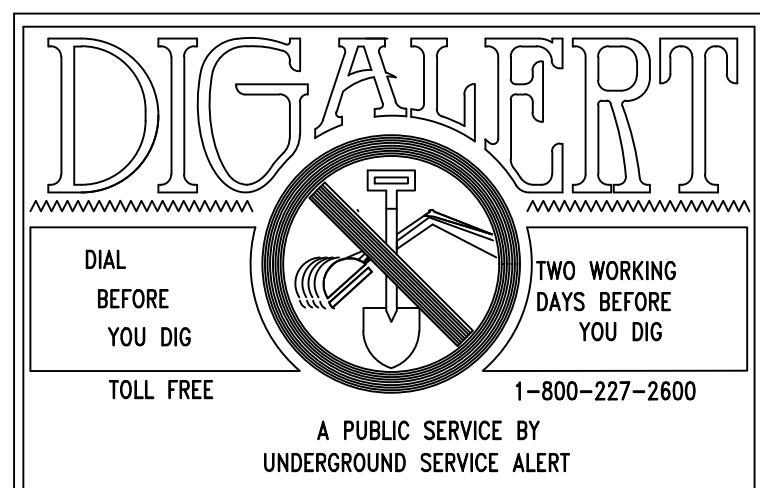
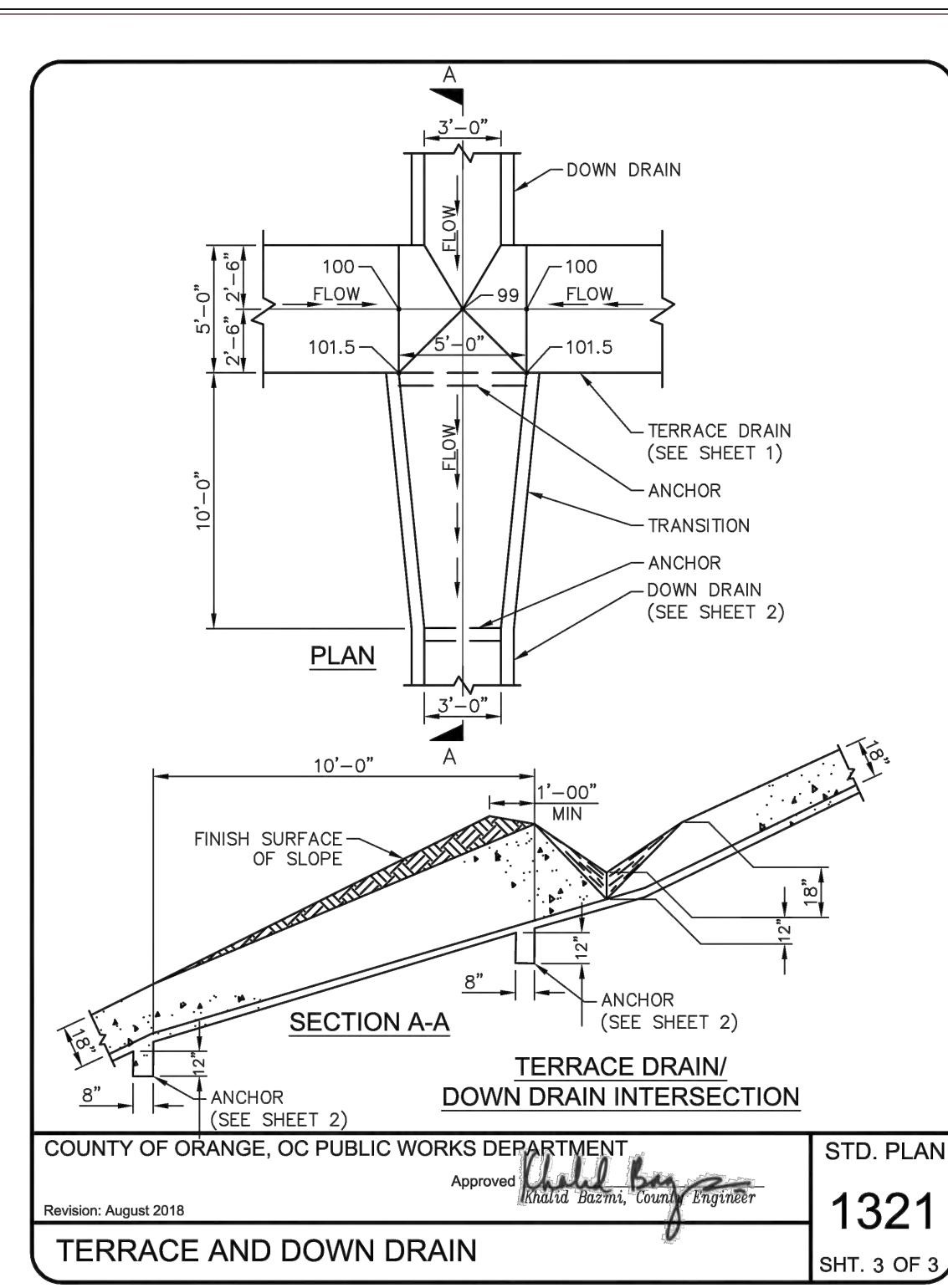
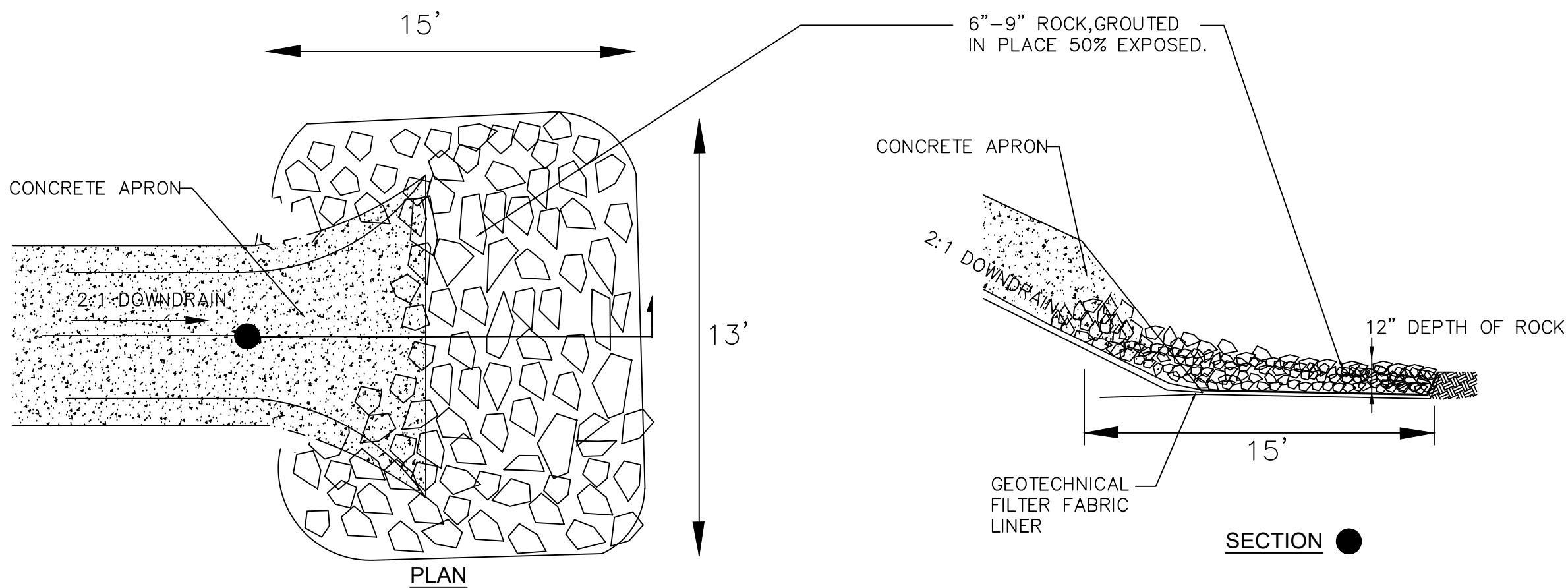
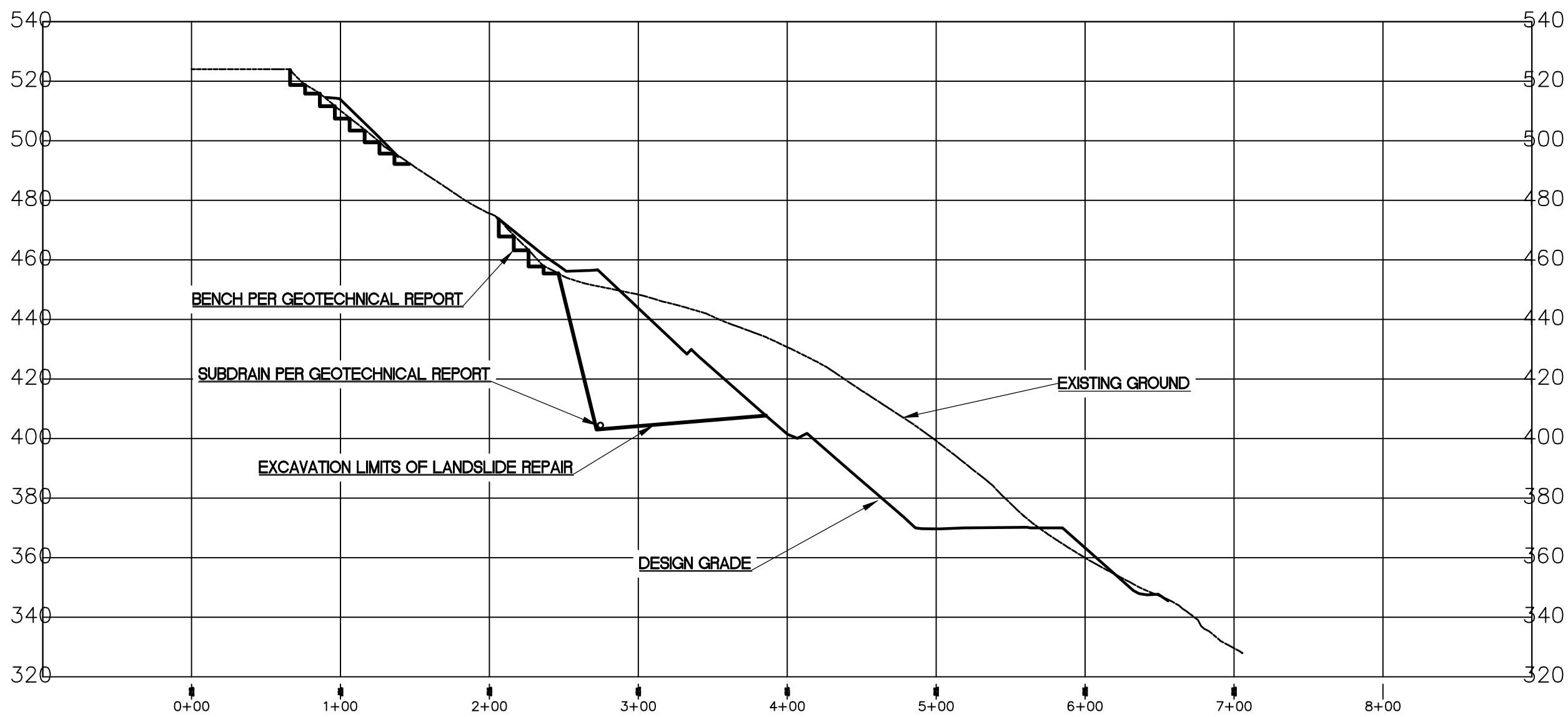
PREPARED BY:
RDS And Associates

Civil Engineering
Project Management
Construction Management

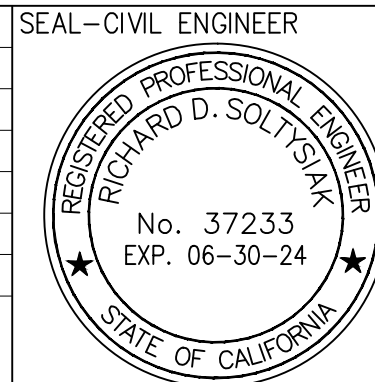
BENCHMARK:
COUNTY OF ORANGE
BENCH MARK #3MM2791
ELV: 517.847
NAVD 88 DATUM
DATE: APRIL 9, 2024
SCALE: 1" = 40'

20 OLD RANCH ROAD LANDSLIDE GRADING
LANDSLIDE REPAIR GRADING PLAN
FOR:
RON AND HEATHER BUREK
W.O.
FILE NO.

SHEET NO.
3
3 OF 5 SHTS



MARK	BY	DATE		
ENGINEER				



PREPARED BY:

RDS And Associates

Civil Engineering
Project Management
Construction Management

BENCHMARK:
COUNTY OF ORANGE
BENCH MARK #3MM2791
ELV: 517.847
NAVD 88 DATUM

DATE: APRIL 9, 2024

SCALE: NTS

20 OLD RANCH ROAD LANDSLIDE GRADING

CROSS SECTIONS/ DETAILS

SHEET NO

4

4 OF 5 SHOTS

FOR:
RON AND HEATHER BUREK

W.O.

FILE NO.

AREA A DEVELOPED CONDITION

- Q 10= 43.3 CFS
Q 25= 52.6 CFS
Q 50= 60.0 CFS
Q 100= 68.4 CFS



208
FL ELV=622
L=857

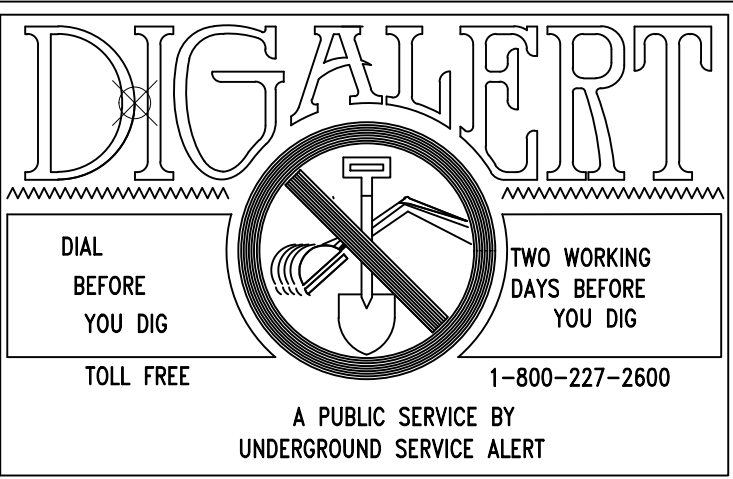
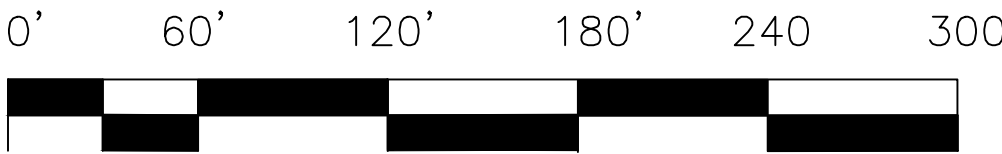
AREA B DEVELOPED CONDITION

- Q 10= 12.3 CFS
Q 25= 15.0 CFS
Q 50= 17.0 CFS
Q 100= 19.4 CFS

RATIONAL METHOD

		I (in/hr)						
		Q100	Q50	Q25	Q10	Q5	Q2	
		6.18	5.44	4.82	4.06	3.19	2.26	
Area	C	Tc	Q100	Q50	Q25	Q10	Q5	Q2
A1	0.34	0.45	0.153	0.15	0.15	0.15	0.15	0.15
A2	0.05	0.45	0.0025	0.14	0.12	0.11	0.09	0.07
A3	0.17	0.92	0.1564	0.07	0.05	0.03	0.02	0.01
A4	0.03	0.95	0.0285	0.18	0.15	0.14	0.12	0.09
A5	0.13	0.50	0.065	0.40	0.35	0.31	0.28	0.21
A6	0.05	0.95	0.0475	0.29	0.26	0.23	0.19	0.15
A7	0.18	0.80	0.144	0.89	0.78	0.69	0.58	0.46
A8	0.1	0.75	0.075	0.46	0.41	0.36	0.30	0.24
A9	0.32	0.45	0.144	0.86	0.78	0.69	0.58	0.46
A10	0.42	0.45	0.189	1.17	1.03	0.91	0.77	0.60
A11	0.49	0.45	0.2205	1.36	1.20	1.06	0.90	0.70
A12	0.02	0.75	0.015	0.09	0.08	0.07	0.06	0.05
A13	0.05	0.95	0.0475	0.29	0.26	0.23	0.19	0.15
A14.1	0.10	0.70	0.112	0.69	0.61	0.54	0.45	0.35
A14.2	0.2	0.85	0.19	1.17	1.03	0.91	0.77	0.60
A15	0.2	0.95	0.19	1.17	1.03	0.91	0.77	0.60
A16	0.2	0.95	0.19	1.17	1.03	0.91	0.77	0.60
A17	0.1	0.95	0.095	0.59	0.52	0.46	0.39	0.30
A18	0.09	0.95	0.0859	0.53	0.46	0.41	0.35	0.27
A19	0.07	0.95	0.0655	0.44	0.38	0.32	0.27	0.21
A20	0.62	0.45	0.3772	2.33	2.05	1.80	1.53	1.20
Total to Detention Basin			16.14	14.19	12.60	10.59	8.33	6.94
Peak flow from Detention Basin			4.54	4.40	4.26	3.94	3.38	2.70

DEVELOPED DATA OBTAINED FROM
2014 APPROVED HYDROLOGY REPORT



MARK	BY	DATE
ENGINEER		



PREPARED BY:

BENCHMARK:
COUNTY OF ORANGE
BENCH MARK #3MM2791
ELV: 517.847
NAVD 88 DATUM

DATE: June 26, 2024
SCALE: 1" = 60'

20 OLD RANCH ROAD LANDSLIDE GRADING

POST DEVELOPMENT DRAINAGE AREA PLAN

FOR: RON AND HEATHER BUREK
W.O.
FILE NO.

SHEET NO.
2
2 OF 2 SHTS

APPENDIX A

UNDEVELOPED CONDITION

RATIONAL CALCULATIONS

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2018
Version 9.0

Rational Hydrology Study, Date: 11/07/24 File Name:
BUREK20EX10A.roc

Burek Residence
10-Yr Hydrology Study
Existing Condition
Area A

RDS and Associates
Program License Serial Number 6673

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 10.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

+++++
Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2) = 89.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
Max Catchment Loss (Fm) = 0.200(In/Hr)
Initial subarea data:
Initial area flow distance = 915.000(Ft.)
Top (of initial area) elevation = 626.000(Ft.)
Bottom (of initial area) elevation = 400.000(Ft.)
Difference in elevation = 226.000(Ft.)
Slope = 0.24699 s(%)= 24.70
 $TC = k(0.525)*[(length^3)/(elevation\ change)]^{0.2}$

Initial area time of concentration = 10.622 min.
 Rainfall intensity = 2.636(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.832
 Subarea runoff = 14.011(CFS)
 Total initial stream area = 6.390(Ac.)

+++++
 Process from Point/Station 101.000 to Point/Station 102.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

 Estimated mean flow rate at midpoint of channel = 28.123(CFS)
 Depth of flow = 0.226(Ft.), Average velocity = 14.751(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	4.00
2	8.00	0.00
3	16.00	0.00
4	24.00	4.00

Manning's 'N' friction factor = 0.015

Sub-Channel flow = 28.123(CFS)
 ' ' flow top width = 8.902(Ft.)
 ' ' velocity = 14.751(Ft/s)
 ' ' area = 1.907(Sq.Ft)
 ' ' Froude number = 5.617

Upstream point elevation = 400.000(Ft.)
 Downstream point elevation = 327.400(Ft.)
 Flow length = 413.000(Ft.)
 Travel time = 0.47 min.
 Time of concentration = 11.09 min.
 Depth of flow = 0.226(Ft.)
 Average velocity = 14.751(Ft/s)
 Total irregular channel flow = 28.123(CFS)
 Irregular channel normal depth above invert elev. = 0.226(Ft.)
 Average velocity of channel(s) = 14.751(Ft/s)
 Adding area flow to channel
 UNDEVELOPED (poor cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 89.00
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
 Max Catchment Loss (Fm) = 0.200(In/Hr)
 Rainfall intensity = 2.572(In/Hr) for a 10.0 year storm

Effective runoff coefficient used for area, (total area with modified rational method) ($Q=KCIA$) is $C = 0.830$
Subarea runoff = 28.152(CFS) for 13.360(Ac.)
Total runoff = 42.163(CFS) Total area = 19.75(Ac.)
Area averaged F_m value = 0.200(In/Hr)
Depth of flow = 0.287(Ft.), Average velocity = 17.137(Ft/s)
End of computations, total study area = 19.75 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction (A_p) = 1.000
Area averaged SCS curve number (AMC 2) = 89.0

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2018
Version 9.0
Rational Hydrology Study, Date: 11/07/24 File Name:
burek20ex25a.roc

Burek Residence
25-Yr Hydrology Study
Existing Condition
Area A

RDS and Associates
Program License Serial Number 6673

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 25.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

+++++
Process from Point/Station 100.000 to Point/Station
101.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2) = 89.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
Max Catchment Loss (Fm) = 0.200(In/Hr)
Initial subarea data:
Initial area flow distance = 915.000(Ft.)
Top (of initial area) elevation = 626.000(Ft.)
Bottom (of initial area) elevation = 400.000(Ft.)
Difference in elevation = 226.000(Ft.)

Slope = 0.24699 s(%)= 24.70
 TC = $k(0.525)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 10.622 min.
 Rainfall intensity = 3.149(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.843
 Subarea runoff = 16.960(CFS)
 Total initial stream area = 6.390(Ac.)

++++++
 Process from Point/Station 101.000 to Point/Station 102.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 34.102(CFS)
 Depth of flow = 0.253(Ft.), Average velocity = 15.847(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :
 Point number 'X' coordinate 'Y' coordinate
 1 0.00 4.00
 2 8.00 0.00
 3 16.00 0.00
 4 24.00 4.00
 Manning's 'N' friction factor = 0.015

Sub-Channel flow = 34.102(CFS)
 ' ' flow top width = 9.012(Ft.)
 ' ' velocity= 15.847(Ft/s)
 ' ' area = 2.152(Sq.Ft)
 ' ' Froude number = 5.715

Upstream point elevation = 400.000(Ft.)
 Downstream point elevation = 327.400(Ft.)
 Flow length = 413.000(Ft.)
 Travel time = 0.43 min.
 Time of concentration = 11.06 min.
 Depth of flow = 0.253(Ft.)
 Average velocity = 15.847(Ft/s)
 Total irregular channel flow = 34.102(CFS)
 Irregular channel normal depth above invert elev. = 0.253(Ft.)
 Average velocity of channel(s) = 15.847(Ft/s)
 Adding area flow to channel
 UNDEVELOPED (poor cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 89.00
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)

Max Catchment Loss (Fm) = 0.200(In/Hr)
 Rainfall intensity = 3.078(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area, (total area with
 modified rational method)($Q=KCIA$) is $C = 0.842$
 Subarea runoff = 34.204(CFS) for 13.360(Ac.)
 Total runoff = 51.163(CFS) Total area = 19.75(Ac.)
 Area averaged Fm value = 0.200(In/Hr)
 Depth of flow = 0.322(Ft.), Average velocity = 18.393(Ft/s)
 End of computations, total study area = 19.75 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.
 Note: These figures do not consider reduced effective area
 effects caused by confluences in the rational equation.

Area averaged pervious area fraction(A_p) = 1.000
 Area averaged SCS curve number (AMC 2) = 89.0

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2018
Version 9.0
Rational Hydrology Study, Date: 11/07/24 File Name:
burek20ex50a.roc

Burek Residence
50-Yr Hydrology Study
Existing Condition
Area A

RDS AND Associates
Program License Serial Number 6673

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 50.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

+++++
Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2) = 89.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
Max Catchment Loss (Fm) = 0.200(In/Hr)
Initial subarea data:
Initial area flow distance = 915.000(Ft.)
Top (of initial area) elevation = 626.000(Ft.)
Bottom (of initial area) elevation = 400.000(Ft.)
Difference in elevation = 226.000(Ft.)
Slope = 0.24699 s(%)= 24.70
 $TC = k(0.525)*[(length^3)/(elevation\ change)]^{0.2}$

Initial area time of concentration = 10.622 min.
 Rainfall intensity = 3.550(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.849
 Subarea runoff = 19.264(CFS)
 Total initial stream area = 6.390(Ac.)

+++++
 Process from Point/Station 101.000 to Point/Station 102.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 38.769(CFS)
 Depth of flow = 0.273(Ft.), Average velocity = 16.616(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	4.00
2	8.00	0.00
3	16.00	0.00
4	24.00	4.00

Manning's 'N' friction factor = 0.015

Sub-Channel flow = 38.769(CFS)
 ' ' flow top width = 9.092(Ft.)
 ' ' velocity = 16.616(Ft/s)
 ' ' area = 2.333(Sq.Ft)
 ' ' Froude number = 5.780

Upstream point elevation = 400.000(Ft.)
 Downstream point elevation = 327.400(Ft.)
 Flow length = 413.000(Ft.)
 Travel time = 0.41 min.
 Time of concentration = 11.04 min.
 Depth of flow = 0.273(Ft.)
 Average velocity = 16.616(Ft/s)
 Total irregular channel flow = 38.769(CFS)
 Irregular channel normal depth above invert elev. = 0.273(Ft.)
 Average velocity of channel(s) = 16.616(Ft/s)
 Adding area flow to channel
 UNDEVELOPED (poor cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 89.00
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
 Max Catchment Loss (Fm) = 0.200(In/Hr)
 Rainfall intensity = 3.474(In/Hr) for a 50.0 year storm

Effective runoff coefficient used for area, (total area with modified rational method) ($Q=KCIA$) is $C = 0.848$
Subarea runoff = 38.925(CFS) for 13.360(Ac.)
Total runoff = 58.188(CFS) Total area = 19.75(Ac.)
Area averaged F_m value = 0.200(In/Hr)
Depth of flow = 0.347(Ft.), Average velocity = 19.272(Ft/s)
End of computations, total study area = 19.75 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction(A_p) = 1.000
Area averaged SCS curve number (AMC 2) = 89.0

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2018
Version 9.0
Rational Hydrology Study, Date: 11/07/24 File Name:
burek20ex100a.roc

Burek Residence
100-Yr Hydrology Study
Existing Condition
Area A

RDS And Associates
Program License Serial Number 6673

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 100.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

+++++
Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2) = 89.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
Max Catchment Loss (Fm) = 0.200(In/Hr)
Initial subarea data:
Initial area flow distance = 915.000(Ft.)
Top (of initial area) elevation = 626.000(Ft.)
Bottom (of initial area) elevation = 400.000(Ft.)
Difference in elevation = 226.000(Ft.)
Slope = 0.24699 s(%)= 24.70
 $TC = k(0.525)*[(length^3)/(elevation\ change)]^{0.2}$

Initial area time of concentration = 10.622 min.
 Rainfall intensity = 4.018(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.855
 Subarea runoff = 21.957(CFS)
 Total initial stream area = 6.390(Ac.)

+++++
 Process from Point/Station 101.000 to Point/Station 102.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 44.219(CFS)
 Depth of flow = 0.295(Ft.), Average velocity = 17.439(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	4.00
2	8.00	0.00
3	16.00	0.00
4	24.00	4.00

Manning's 'N' friction factor = 0.015

Sub-Channel flow = 44.219(CFS)
 ' ' flow top width = 9.181(Ft.)
 ' ' velocity = 17.439(Ft/s)
 ' ' area = 2.536(Sq.Ft)
 ' ' Froude number = 5.848

Upstream point elevation = 400.000(Ft.)
 Downstream point elevation = 327.400(Ft.)
 Flow length = 413.000(Ft.)
 Travel time = 0.39 min.
 Time of concentration = 11.02 min.
 Depth of flow = 0.295(Ft.)
 Average velocity = 17.439(Ft/s)
 Total irregular channel flow = 44.219(CFS)
 Irregular channel normal depth above invert elev. = 0.295(Ft.)
 Average velocity of channel(s) = 17.439(Ft/s)
 Adding area flow to channel
 UNDEVELOPED (poor cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 89.00
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
 Max Catchment Loss (Fm) = 0.200(In/Hr)
 Rainfall intensity = 3.935(In/Hr) for a 100.0 year storm

Effective runoff coefficient used for area, (total area with modified rational method) ($Q=KCIA$) is $C = 0.854$
Subarea runoff = 44.429(CFS) for 13.360(Ac.)
Total runoff = 66.386(CFS) Total area = 19.75(Ac.)
Area averaged F_m value = 0.200(In/Hr)
Depth of flow = 0.375(Ft.), Average velocity = 20.209(Ft/s)
End of computations, total study area = 19.75 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction(A_p) = 1.000
Area averaged SCS curve number (AMC 2) = 89.0

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2018
Version 9.0
Rational Hydrology Study, Date: 11/05/24 File Name:
Burek20ex10B.roc

Burek Residence
10-Yr Hydrology Study
Existing Condition
Area B

RDS and Associates
Program License Serial Number 6673

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 10.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

+++++
Process from Point/Station 200.000 to Point/Station 201.000
**** INITIAL AREA EVALUATION ****

SCS curve number for soil(AMC 2) = 89.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
Max Catchment Loss (Fm) = 0.200(In/Hr)
Initial subarea data:
Initial area flow distance = 922.000(Ft.)
Top (of initial area) elevation = 632.000(Ft.)
Bottom (of initial area) elevation = 368.000(Ft.)
Difference in elevation = 264.000(Ft.)
Slope = 0.28633 s(%)= 28.63
 $TC = k(0.525)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 10.344 min.
Rainfall intensity = 2.677(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.833
Subarea runoff = 17.920(CFS)
Total initial stream area = 8.040(Ac.)

End of computations, total study area = 8.04 (Ac.)

The following figures may
be used for a unit hydrograph study of the same area.

Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(A_p) = 1.000

Area averaged SCS curve number (AMC 2) = 89.0

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2018
Version 9.0
Rational Hydrology Study, Date: 11/05/24 File Name:
burek20ex25b.roc

Burek Residence
25-Year Hydrology Study
Existing Condition
Area B

RDS and Associates
Program License Serial Number 6673

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 25.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

+++++
Process from Point/Station 200.000 to Point/Station 201.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2) = 89.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
Max Catchment Loss (Fm) = 0.200(In/Hr)
Initial subarea data:
Initial area flow distance = 922.000(Ft.)
Top (of initial area) elevation = 632.000(Ft.)
Bottom (of initial area) elevation = 368.000(Ft.)
Difference in elevation = 264.000(Ft.)
Slope = 0.28633 s(%)= 28.63
 $TC = k(0.525)*[(length^3)/(elevation\ change)]^{0.2}$

Initial area time of concentration = 10.344 min.
Rainfall intensity = 3.197(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area ($Q=KCIA$) is $C = 0.844$
Subarea runoff = 21.684(CFS)
Total initial stream area = 8.040(Ac.)
End of computations, total study area = 8.04 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(A_p) = 1.000
Area averaged SCS curve number (AMC 2) = 89.0

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2018 Version 9.0

Rational Hydrology Study, Date: 11/05/24 File Name:

Burek20ex50B.roc

Burek Residence
50-Yr Hydrology Study
Existing Condition
Area B

RDS and Associates
Program License Serial Number 6673

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 50.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

+++++
Process from Point/Station 200.000 to Point/Station 201.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2) = 89.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
Max Catchment Loss (Fm) = 0.200(In/Hr)
Initial subarea data:
Initial area flow distance = 922.000(Ft.)
Top (of initial area) elevation = 632.000(Ft.)
Bottom (of initial area) elevation = 368.000(Ft.)
Difference in elevation = 264.000(Ft.)
Slope = 0.28633 s(%)= 28.63
TC = $k(0.525)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 10.344 min.
Rainfall intensity = 3.603(In/Hr) for a 50.0 year storm

Effective runoff coefficient used for area ($Q=KCIA$) is $C = 0.850$

Subarea runoff = 24.626(CFS)

Total initial stream area = 8.040(Ac.)

End of computations, total study area = 8.04 (Ac.)

The following figures may

be used for a unit hydrograph study of the same area.

Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction(A_p) = 1.000

Area averaged SCS curve number (AMC 2) = 89.0

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2018
Version 9.0
Rational Hydrology Study, Date: 11/05/24 File Name:
Burek20ex100B.roc

Burek Residence
Slope Repair Hydrology
Area B
100-Yr

RDS and Associates
Program License Serial Number 6673

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 100.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++++
Process from Point/Station 200.000 to Point/Station 201.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2) = 89.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
Max Catchment Loss (Fm) = 0.200(In/Hr)
Initial subarea data:
Initial area flow distance = 922.000(Ft.)
Top (of initial area) elevation = 632.000(Ft.)
Bottom (of initial area) elevation = 368.000(Ft.)
Difference in elevation = 264.000(Ft.)
Slope = 0.28633 s(%)= 28.63
 $TC = k(0.525)*[(length^3)/(elevation\ change)]^{0.2}$

Initial area time of concentration = 10.344 min.
Rainfall intensity = 4.079(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area ($Q=KCIA$) is $C = 0.856$
Subarea runoff = 28.072(CFS)
Total initial stream area = 8.040(Ac.)
End of computations, total study area = 8.04 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(A_p) = 1.000
Area averaged SCS curve number (AMC 2) = 89.0

APPENDIX B

PROPOSED REMEDIAL GRADED CONDITION

RATIONAL CALCULATIONS

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2018
Version 9.0
Rational Hydrology Study, Date: 11/08/24 File Name:
burek20dev10.roc

Burek Residence
10-Yr Hydrology Study
Developed Condition
Area A

RDS and Associates
Program License Serial Number 6673

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 10.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

+++++
Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2) = 84.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
Max Catchment Loss (Fm) = 0.200(In/Hr)
Initial subarea data:
Initial area flow distance = 529.000(Ft.)
Top (of initial area) elevation = 560.000(Ft.)
Bottom (of initial area) elevation = 420.000(Ft.)
Difference in elevation = 140.000(Ft.)
Slope = 0.26465 s(%)= 26.47
 $TC = k(0.706)*[(length^3)/(elevation\ change)]^{0.2}$

Initial area time of concentration = 11.315 min.
 Rainfall intensity = 2.542(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.829
 Subarea runoff = 6.493(CFS)
 Total initial stream area = 3.080(Ac.)

+++++
 Process from Point/Station 100.000 to Point/Station 101.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 3.080(Ac.)
 Runoff from this stream = 6.493(CFS)
 Time of concentration = 11.31 min.
 Rainfall intensity = 2.542(In/Hr)
 Area averaged loss rate (Fm) = 0.2000(In/Hr)
 Area averaged Pervious ratio (Ap) = 1.0000
 Program is now starting with Main Stream No. 2

+++++
 Process from Point/Station 200.000 to Point/Station 101.000
 **** USER DEFINED FLOW INFORMATION AT A POINT ****

UNDEVELOPED (average cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 84.00
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
 Max Catchment Loss (Fm) = 0.200(In/Hr)
 Rainfall intensity = 4.060(In/Hr) for a 10.0 year storm
 User specified values are as follows:
 TC = 5.00 min. Rain intensity = 4.06(In/Hr)
 Total area = 4.21(Ac.) Total runoff = 3.94(CFS)

+++++
 Process from Point/Station 200.000 to Point/Station 101.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.066(Ft.), Average velocity = 7.325(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :
 Point number 'X' coordinate 'Y' coordinate

1	0.00	4.00
2	8.00	0.00
3	16.00	0.00
4	24.00	4.00

Manning's 'N' friction factor = 0.020

 Sub-Channel flow = 3.940(CFS)
 ' ' flow top width = 8.265(Ft.)
 ' ' velocity = 7.325(Ft/s)
 ' ' area = 0.538(Sq.Ft)
 ' ' Froude number = 5.060

Upstream point elevation = 520.000(Ft.)
 Downstream point elevation = 420.000(Ft.)
 Flow length = 268.000(Ft.)
 Travel time = 0.61 min.
 Time of concentration = 5.61 min.
 Depth of flow = 0.066(Ft.)
 Average velocity = 7.325(Ft/s)
 Total irregular channel flow = 3.940(CFS)
 Irregular channel normal depth above invert elev. = 0.066(Ft.)
 Average velocity of channel(s) = 7.325(Ft/s)

+++++
 Process from Point/Station 200.000 to Point/Station 101.000
 ***** CONFLUENCE OF MAIN STREAMS *****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 4.210(Ac.)
 Runoff from this stream = 3.940(CFS)
 Time of concentration = 5.61 min.
 Rainfall intensity = 3.800(In/Hr)
 Area averaged loss rate (Fm) = 0.2000(In/Hr)
 Area averaged Pervious ratio (Ap) = 1.0000
 Summary of stream data:

Stream No.	Area (Ac.)	Flow rate (CFS)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
------------	------------	-----------------	----------	------------	----------------------------

1	3.08	6.493	11.31	0.200	2.542
2	4.21	3.940	5.61	0.200	3.800

Qmax(1) =
 1.000 * 1.000 * 6.493) +
 0.651 * 1.000 * 3.940) + = 9.056

Qmax(2) =
 1.537 * 0.496 * 6.493) +

$$1.000 * 1.000 * 3.940) + = 8.888$$

Total of 2 main streams to confluence:

Flow rates before confluence point:

7.493 4.940

Maximum flow rates at confluence using above data:

9.056 8.888

Area of streams before confluence:

3.080 4.210

Effective area values after confluence:

7.290 5.737

Results of confluence:

Total flow rate = 9.056(CFS)

Time of concentration = 11.315 min.

Effective stream area after confluence = 7.290(Ac.)

Study area average Pervious fraction(Ap) = 1.000

Study area average soil loss rate(Fm) = 0.200(In/Hr)

Study area total = 7.29(Ac.)

+++++

Process from Point/Station 101.000 to Point/Station 102.000

**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 26.135(CFS)

Depth of flow = 0.257(Ft.), Average velocity = 11.950(Ft/s)

***** Irregular Channel Data *****

Information entered for subchannel number 1 :

Point number 'X' coordinate 'Y' coordinate

1 0.00 4.00

2 8.00 0.00

3 16.00 0.00

4 24.00 4.00

Manning's 'N' friction factor = 0.020

Sub-Channel flow = 26.136(CFS)

' ' flow top width = 9.028(Ft.)

' ' velocity= 11.950(Ft/s)

' ' area = 2.187(Sq.Ft)

' ' Froude number = 4.279

Upstream point elevation = 420.000(Ft.)

Downstream point elevation = 327.400(Ft.)

Flow length = 531.100(Ft.)

Travel time = 0.74 min.

Time of concentration = 12.06 min.

Depth of flow = 0.257(Ft.)
 Average velocity = 11.950(Ft/s)
 Total irregular channel flow = 26.135(CFS)
 Irregular channel normal depth above invert elev. = 0.257(Ft.)
 Average velocity of channel(s) = 11.950(Ft/s)
 Adding area flow to channel
 UNDEVELOPED (average cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 84.00
 Pervious ratio(A_p) = 1.0000 Max loss rate(F_p) = 0.200(In/Hr)
 Max Catchment Loss (F_m) = 0.200(In/Hr)
 Rainfall intensity = 2.452(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area, (total area with
 modified rational method)($Q=KCIA$) is $C = 0.827$
 Subarea runoff = 34.230(CFS) for 14.070(Ac.)
 Total runoff = 43.286(CFS) Total area = 21.36(Ac.)
 Area averaged F_m value = 0.200(In/Hr)
 Depth of flow = 0.346(Ft.), Average velocity = 14.374(Ft/s)
 End of computations, total study area = 21.36 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.
 Note: These figures do not consider reduced effective area
 effects caused by confluences in the rational equation.

Area averaged pervious area fraction(A_p) = 1.000
 Area averaged SCS curve number (AMC 2) = 84.0

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2018
Version 9.0
Rational Hydrology Study, Date: 11/08/24 File Name:
burek20dev25.roc

Burek Residence
25-Yr Hydrology Study
Developed Condition
Area A

RDS ad Associates
Program License Serial Number 6673

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 25.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

+++++
Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2) = 84.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
Max Catchment Loss (Fm) = 0.200(In/Hr)
Initial subarea data:
Initial area flow distance = 529.000(Ft.)
Top (of initial area) elevation = 560.000(Ft.)
Bottom (of initial area) elevation = 420.000(Ft.)
Difference in elevation = 140.000(Ft.)
Slope = 0.26465 s(%)= 26.47
 $TC = k(0.706)*[(length^3)/(elevation\ change)]^{0.2}$

Initial area time of concentration = 11.315 min.
 Rainfall intensity = 3.038(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.841
 Subarea runoff = 7.868(CFS)
 Total initial stream area = 3.080(Ac.)

 Process from Point/Station 100.000 to Point/Station 101.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 3.080(Ac.)
 Runoff from this stream = 7.868(CFS)
 Time of concentration = 11.31 min.
 Rainfall intensity = 3.038(In/Hr)
 Area averaged loss rate (Fm) = 0.2000(In/Hr)
 Area averaged Pervious ratio (Ap) = 1.0000

 Process from Point/Station 200.000 to Point/Station 101.000
 **** USER DEFINED FLOW INFORMATION AT A POINT ****

UNDEVELOPED (poor cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 89.00
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
 Max Catchment Loss (Fm) = 0.200(In/Hr)
 Rainfall intensity = 4.824(In/Hr) for a 25.0 year storm
 User specified values are as follows:
 TC = 5.00 min. Rain intensity = 4.82(In/Hr)
 Total area = 4.21(Ac.) Total runoff = 4.26(CFS)

 Process from Point/Station 200.000 to Point/Station 101.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.054(Ft.), Average velocity = 9.780(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	4.00
2	8.00	0.00

3 16.00 0.00
 4 24.00 4.00
 Manning's 'N' friction factor = 0.018

 Sub-Channel flow = 4.260(CFS)
 ' ' flow top width = 8.215(Ft.)
 ' ' velocity= 9.780(Ft/s)
 ' ' area = 0.436(Sq.Ft)
 ' ' Froude number = 7.485

Upstream point elevation = 520.000(Ft.)
 Downstream point elevation = 330.400(Ft.)
 Flow length = 268.000(Ft.)
 Travel time = 0.46 min.
 Time of concentration = 5.46 min.
 Depth of flow = 0.054(Ft.)
 Average velocity = 9.780(Ft/s)
 Total irregular channel flow = 4.260(CFS)
 Irregular channel normal depth above invert elev. = 0.054(Ft.)
 Average velocity of channel(s) = 9.780(Ft/s)

+++++
 Process from Point/Station 200.000 to Point/Station 101.000
 ***** CONFLUENCE OF MINOR STREAMS *****

 Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 4.210(Ac.)
 Runoff from this stream = 4.260(CFS)
 Time of concentration = 5.46 min.
 Rainfall intensity = 4.591(In/Hr)
 Area averaged loss rate (Fm) = 0.2000(In/Hr)
 Area averaged Pervious ratio (Ap) = 1.0000
 Summary of stream data:

Stream No.	Area (Ac.)	Flow rate (CFS)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	3.08	7.868	11.31	0.200	3.038
2	4.21	4.260	5.46	0.200	4.591
Qmax(1) =					
	1.000 *	1.000 *	7.868)	+	
	0.646 *	1.000 *	4.260)	+	10.622
Qmax(2) =					
	1.547 *	0.482 *	7.868)	+	
	1.000 *	1.000 *	4.260)	+	10.130

Total of 2 streams to confluence:

Flow rates before confluence point:

7.868 4.260

Maximum flow rates at confluence using above data:

10.622 10.130

Area of streams before confluence:

3.080 4.210

Effective area values after confluence:

7.290 5.695

Results of confluence:

Total flow rate = 10.622(CFS)

Time of concentration = 11.315 min.

Effective stream area after confluence = 7.290(Ac.)

Study area average Pervious fraction(Ap) = 1.000

Study area average soil loss rate(Fm) = 0.200(In/Hr)

Study area total (this main stream) = 7.29(Ac.)

+++++

Process from Point/Station 101.000 to Point/Station 102.000

**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 31.584(CFS)

Depth of flow = 0.287(Ft.), Average velocity = 12.814(Ft/s)

***** Irregular Channel Data *****

Information entered for subchannel number 1 :

Point number 'X' coordinate 'Y' coordinate

1 0.00 4.00

2 8.00 0.00

3 16.00 0.00

4 24.00 4.00

Manning's 'N' friction factor = 0.020

Sub-Channel flow = 31.584(CFS)

' ' flow top width = 9.150(Ft.)

' ' velocity= 12.814(Ft/s)

' ' area = 2.465(Sq.Ft)

' ' Froude number = 4.351

Upstream point elevation = 420.000(Ft.)

Downstream point elevation = 327.400(Ft.)

Flow length = 531.100(Ft.)

Travel time = 0.69 min.

Time of concentration = 12.01 min.

Depth of flow = 0.287(Ft.)

Average velocity = 12.814(Ft/s)

Total irregular channel flow = 31.584(CFS)

Irregular channel normal depth above invert elev. = 0.287(Ft.)

Average velocity of channel(s) = 12.814(Ft/s)

Adding area flow to channel
 UNDEVELOPED (average cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 84.00
 Pervious ratio(A_p) = 1.0000 Max loss rate(F_p)= 0.200(In/Hr)
 Max Catchment Loss (F_m) = 0.200(In/Hr)
 Rainfall intensity = 2.938(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area, (total area with
 modified rational method)($Q=KCIA$) is $C = 0.839$
 Subarea runoff = 42.016(CFS) for 14.070(Ac.)
 Total runoff = 52.637(CFS) Total area = 21.36(Ac.)
 Area averaged F_m value = 0.200(In/Hr)
 Depth of flow = 0.389(Ft.), Average velocity = 15.422(Ft/s)
 End of computations, total study area = 21.36 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.
 Note: These figures do not consider reduced effective area
 effects caused by confluences in the rational equation.

 Area averaged pervious area fraction(A_p) = 1.000
 Area averaged SCS curve number (AMC 2) = 85.0

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2018
Version 9.0
Rational Hydrology Study, Date: 11/08/24 File Name:
burek20dev50.roc

Burek Residence
50-Yr Hydrology Study
Developed Condition
Area A

RDS and Associates
Program License Serial Number 6673

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 50.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

+++++
Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2) = 84.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
Max Catchment Loss (Fm) = 0.200(In/Hr)
Initial subarea data:
Initial area flow distance = 529.000(Ft.)
Top (of initial area) elevation = 560.000(Ft.)
Bottom (of initial area) elevation = 420.000(Ft.)
Difference in elevation = 140.000(Ft.)
Slope = 0.26465 s(%)= 26.47
 $TC = k(0.706)*[(length^3)/(elevation\ change)]^{0.2}$

Initial area time of concentration = 11.315 min.
 Rainfall intensity = 3.425(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.847
 Subarea runoff = 8.939(CFS)
 Total initial stream area = 3.080(Ac.)

+++++
 Process from Point/Station 100.000 to Point/Station 101.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 3.080(Ac.)
 Runoff from this stream = 8.939(CFS)
 Time of concentration = 11.31 min.
 Rainfall intensity = 3.425(In/Hr)
 Area averaged loss rate (Fm) = 0.2000(In/Hr)
 Area averaged Pervious ratio (Ap) = 1.0000

+++++
 Process from Point/Station 200.000 to Point/Station 101.000
 **** USER DEFINED FLOW INFORMATION AT A POINT ****

RESIDENTIAL(2.5 acre lot)
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 75.00
 Pervious ratio(Ap) = 0.9000 Max loss rate(Fp)= 0.200(In/Hr)
 Max Catchment Loss (Fm) = 0.180(In/Hr)
 Rainfall intensity = 5.437(In/Hr) for a 50.0 year storm
 User specified values are as follows:
 TC = 5.00 min. Rain intensity = 5.44(In/Hr)
 Total area = 4.21(Ac.) Total runoff = 4.40(CFS)

+++++
 Process from Point/Station 200.000 to Point/Station 101.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.058(Ft.), Average velocity = 9.291(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	4.00
2	8.00	0.00

3 16.00 0.00
 4 24.00 4.00
 Manning's 'N' friction factor = 0.020

 Sub-Channel flow = 4.400(CFS)
 ' ' flow top width = 8.233(Ft.)
 ' ' velocity = 9.291(Ft/s)
 ' ' area = 0.474(Sq.Ft)
 ' ' Froude number = 6.827

Upstream point elevation = 520.000(Ft.)
 Downstream point elevation = 330.400(Ft.)
 Flow length = 268.000(Ft.)
 Travel time = 0.48 min.
 Time of concentration = 5.48 min.
 Depth of flow = 0.058(Ft.)
 Average velocity = 9.291(Ft/s)
 Total irregular channel flow = 4.400(CFS)
 Irregular channel normal depth above invert elev. = 0.058(Ft.)
 Average velocity of channel(s) = 9.291(Ft/s)

+++++
 Process from Point/Station 200.000 to Point/Station 101.000
 ***** CONFLUENCE OF MINOR STREAMS *****

 Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 4.210(Ac.)
 Runoff from this stream = 4.400(CFS)
 Time of concentration = 5.48 min.
 Rainfall intensity = 5.162(In/Hr)
 Area averaged loss rate (Fm) = 0.1800(In/Hr)
 Area averaged Pervious ratio (Ap) = 0.9000
 Summary of stream data:

Stream No.	Area (Ac.)	Flow rate (CFS)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	3.08	8.939	11.31	0.200	3.425
2	4.21	4.400	5.48	0.180	5.162
Qmax(1) =					
	1.000 *	1.000 *	8.939)	+	
	0.651 *	1.000 *	4.400)	+	11.805
Qmax(2) =					
	1.539 *	0.484 *	8.939)	+	
	1.000 *	1.000 *	4.400)	+	11.063

Total of 2 streams to confluence:

Flow rates before confluence point:

8.939 4.400

Maximum flow rates at confluence using above data:

11.805 11.063

Area of streams before confluence:

3.080 4.210

Effective area values after confluence:

7.290 5.702

Results of confluence:

Total flow rate = 11.805(CFS)

Time of concentration = 11.315 min.

Effective stream area after confluence = 7.290(Ac.)

Study area average Pervious fraction(A_p) = 0.942

Study area average soil loss rate(F_m) = 0.188(In/Hr)

Study area total (this main stream) = 7.29(Ac.)

+++++

Process from Point/Station 101.000 to Point/Station 102.000

**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 35.872(CFS)

Depth of flow = 0.310(Ft.), Average velocity = 13.425(Ft/s)

***** Irregular Channel Data *****

Information entered for subchannel number 1 :

Point number 'X' coordinate 'Y' coordinate

1 0.00 4.00

2 8.00 0.00

3 16.00 0.00

4 24.00 4.00

Manning's 'N' friction factor = 0.020

Sub-Channel flow = 35.872(CFS)

' ' flow top width = 9.240(Ft.)

' ' velocity = 13.425(Ft/s)

' ' area = 2.672(Sq.Ft)

' ' Froude number = 4.400

Upstream point elevation = 420.000(Ft.)

Downstream point elevation = 327.400(Ft.)

Flow length = 531.100(Ft.)

Travel time = 0.66 min.

Time of concentration = 11.97 min.

Depth of flow = 0.310(Ft.)

Average velocity = 13.425(Ft/s)

Total irregular channel flow = 35.872(CFS)

Irregular channel normal depth above invert elev. = 0.310(Ft.)

Average velocity of channel(s) = 13.425(Ft/s)

Adding area flow to channel
 UNDEVELOPED (average cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 84.00
 Pervious ratio(A_p) = 1.0000 Max loss rate(F_p)= 0.200(In/Hr)
 Max Catchment Loss (F_m) = 0.200(In/Hr)
 Rainfall intensity = 3.317(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for area, (total area with
 modified rational method)($Q=KCIA$) is $C = 0.847$
 Subarea runoff = 48.188(CFS) for 14.070(Ac.)
 Total runoff = 59.993(CFS) Total area = 21.36(Ac.)
 Area averaged F_m value = 0.196(In/Hr)
 Depth of flow = 0.420(Ft.), Average velocity = 16.158(Ft/s)
 End of computations, total study area = 21.36 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.
 Note: These figures do not consider reduced effective area
 effects caused by confluences in the rational equation.

 Area averaged pervious area fraction(A_p) = 0.980
 Area averaged SCS curve number (AMC 2) = 82.2

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2018
Version 9.0
Rational Hydrology Study, Date: 11/08/24 File Name:
burek20dev100.roc

Burek Residence
100-Yr Hydrology Study
Developed Condition
Area A

RDS and Associates
Program License Serial Number 6673

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 100.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

+++++
Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2) = 84.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
Max Catchment Loss (Fm) = 0.200(In/Hr)
Initial subarea data:
Initial area flow distance = 529.000(Ft.)
Top (of initial area) elevation = 560.000(Ft.)
Bottom (of initial area) elevation = 420.000(Ft.)
Difference in elevation = 140.000(Ft.)
Slope = 0.26465 s(%)= 26.47
 $TC = k(0.706)*[(length^3)/(elevation\ change)]^{0.2}$

Initial area time of concentration = 11.315 min.
 Rainfall intensity = 3.875(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.854
 Subarea runoff = 10.187(CFS)
 Total initial stream area = 3.080(Ac.)

+++++
 Process from Point/Station 100.000 to Point/Station 101.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 3.080(Ac.)
 Runoff from this stream = 10.187(CFS)
 Time of concentration = 11.31 min.
 Rainfall intensity = 3.875(In/Hr)
 Area averaged loss rate (Fm) = 0.2000(In/Hr)
 Area averaged Pervious ratio (Ap) = 1.0000

+++++
 Process from Point/Station 200.000 to Point/Station 101.000
 **** USER DEFINED FLOW INFORMATION AT A POINT ****

RESIDENTIAL(2.5 acre lot)
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 75.00
 Pervious ratio(Ap) = 0.9000 Max loss rate(Fp)= 0.200(In/Hr)
 Max Catchment Loss (Fm) = 0.180(In/Hr)
 Rainfall intensity = 6.187(In/Hr) for a 100.0 year storm
 User specified values are as follows:
 TC = 5.00 min. Rain intensity = 6.19(In/Hr)
 Total area = 4.21(Ac.) Total runoff = 4.54(CFS)

+++++
 Process from Point/Station 200.000 to Point/Station 101.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.072(Ft.), Average velocity = 7.743(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	4.00
2	8.00	0.00

3 16.00 0.00
 4 24.00 4.00
 Manning's 'N' friction factor = 0.020

 Sub-Channel flow = 4.540(CFS)
 ' ' flow top width = 8.288(Ft.)
 ' ' velocity= 7.743(Ft/s)
 ' ' area = 0.586(Sq.Ft)
 ' ' Froude number = 5.130

Upstream point elevation = 520.000(Ft.)
 Downstream point elevation = 420.000(Ft.)
 Flow length = 268.000(Ft.)
 Travel time = 0.58 min.
 Time of concentration = 5.58 min.
 Depth of flow = 0.072(Ft.)
 Average velocity = 7.743(Ft/s)
 Total irregular channel flow = 4.540(CFS)
 Irregular channel normal depth above invert elev. = 0.072(Ft.)
 Average velocity of channel(s) = 7.743(Ft/s)

+++++
 Process from Point/Station 200.000 to Point/Station 101.000
 ***** CONFLUENCE OF MINOR STREAMS *****

 Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 4.210(Ac.)
 Runoff from this stream = 4.540(CFS)
 Time of concentration = 5.58 min.
 Rainfall intensity = 5.812(In/Hr)
 Area averaged loss rate (Fm) = 0.1800(In/Hr)
 Area averaged Pervious ratio (Ap) = 0.9000
 Summary of stream data:

Stream No.	Area (Ac.)	Flow rate (CFS)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	3.08	10.187	11.31	0.200	3.875
2	4.21	4.540	5.58	0.180	5.812
Qmax(1) =					
	1.000 *	1.000 *	10.187)	+	
	0.656 *	1.000 *	4.540)	+	13.166
Qmax(2) =					
	1.527 *	0.493 *	10.187)	+	
	1.000 *	1.000 *	4.540)	+	12.207

Total of 2 streams to confluence:

Flow rates before confluence point:

10.187 4.540

Maximum flow rates at confluence using above data:

13.166 12.207

Area of streams before confluence:

3.080 4.210

Effective area values after confluence:

7.290 5.728

Results of confluence:

Total flow rate = 13.166(CFS)

Time of concentration = 11.315 min.

Effective stream area after confluence = 7.290(Ac.)

Study area average Pervious fraction(Ap) = 0.942

Study area average soil loss rate(Fm) = 0.188(In/Hr)

Study area total (this main stream) = 7.29(Ac.)

+++++

Process from Point/Station 101.000 to Point/Station 102.000

**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 40.775(CFS)

Depth of flow = 0.334(Ft.), Average velocity = 14.066(Ft/s)

***** Irregular Channel Data *****

Information entered for subchannel number 1 :

Point number 'X' coordinate 'Y' coordinate

1 0.00 4.00

2 8.00 0.00

3 16.00 0.00

4 24.00 4.00

Manning's 'N' friction factor = 0.020

Sub-Channel flow = 40.776(CFS)

' ' flow top width = 9.338(Ft.)

' ' velocity= 14.066(Ft/s)

' ' area = 2.899(Sq.Ft)

' ' Froude number = 4.449

Upstream point elevation = 420.000(Ft.)

Downstream point elevation = 327.400(Ft.)

Flow length = 531.100(Ft.)

Travel time = 0.63 min.

Time of concentration = 11.94 min.

Depth of flow = 0.334(Ft.)

Average velocity = 14.066(Ft/s)

Total irregular channel flow = 40.775(CFS)

Irregular channel normal depth above invert elev. = 0.334(Ft.)

Average velocity of channel(s) = 14.066(Ft/s)

Adding area flow to channel
 UNDEVELOPED (average cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 84.00
 Pervious ratio(A_p) = 1.0000 Max loss rate(F_p)= 0.200(In/Hr)
 Max Catchment Loss (F_m) = 0.200(In/Hr)
 Rainfall intensity = 3.757(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area, (total area with
 modified rational method)($Q=KCIA$) is $C = 0.853$
 Subarea runoff = 55.283(CFS) for 14.070(Ac.)
 Total runoff = 68.448(CFS) Total area = 21.36(Ac.)
 Area averaged F_m value = 0.196(In/Hr)
 Depth of flow = 0.454(Ft.), Average velocity = 16.930(Ft/s)
 End of computations, total study area = 21.36 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.
 Note: These figures do not consider reduced effective area
 effects caused by confluences in the rational equation.

 Area averaged pervious area fraction(A_p) = 0.980
 Area averaged SCS curve number (AMC 2) = 82.2

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2018
Version 9.0
Rational Hydrology Study, Date: 11/10/24 File Name:
burek20dev10b.roc

Burek Residence
Developed Hydrology
Area B
10-Yr Storm

RDS And Associates
Program License Serial Number 6673

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 10.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

+++++
Process from Point/Station 200.000 to Point/Station 201.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2) = 84.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
Max Catchment Loss (Fm) = 0.200(In/Hr)
Initial subarea data:
Initial area flow distance = 358.000(Ft.)
Top (of initial area) elevation = 520.000(Ft.)
Bottom (of initial area) elevation = 491.500(Ft.)
Difference in elevation = 28.500(Ft.)
Slope = 0.07961 s(%)= 7.96
 $TC = k(0.706)*[(length^3)/(elevation\ change)]^{0.2}$

Initial area time of concentration = 12.307 min.
 Rainfall intensity = 2.423(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.826
 Subarea runoff = 1.480(CFS)
 Total initial stream area = 0.740(Ac.)

+++++
 Process from Point/Station 201.000 to Point/Station 202.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

 Estimated mean flow rate at midpoint of channel = 1.860(CFS)
 Depth of flow = 0.119(Ft.), Average velocity = 7.000(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	0.50
2	1.00	0.00
3	3.00	0.00
4	4.00	0.50

Manning's 'N' friction factor = 0.018

Sub-Channel flow = 1.860(CFS)
 ' ' flow top width = 2.475(Ft.)
 ' ' velocity = 7.000(Ft/s)
 ' ' area = 0.266(Sq.Ft)
 ' ' Froude number = 3.765

Upstream point elevation = 491.500(Ft.)
 Downstream point elevation = 469.000(Ft.)
 Flow length = 155.000(Ft.)
 Travel time = 0.37 min.
 Time of concentration = 12.68 min.
 Depth of flow = 0.119(Ft.)
 Average velocity = 7.000(Ft/s)
 Total irregular channel flow = 1.860(CFS)
 Irregular channel normal depth above invert elev. = 0.119(Ft.)
 Average velocity of channel(s) = 7.000(Ft/s)
 Adding area flow to channel
 UNDEVELOPED (average cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 84.00
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
 Max Catchment Loss (Fm) = 0.200(In/Hr)
 Rainfall intensity = 2.382(In/Hr) for a 10.0 year storm

Effective runoff coefficient used for area, (total area with modified rational method) (Q=KCIA) is C = 0.824
 Subarea runoff = 0.719(CFS) for 0.380(Ac.)
 Total runoff = 2.200(CFS) Total area = 1.12(Ac.)
 Area averaged Fm value = 0.200(In/Hr)
 Depth of flow = 0.131(Ft.), Average velocity = 7.422(Ft/s)

 Process from Point/Station 202.000 to Point/Station 203.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 469.000(Ft.)
 Downstream point/station elevation = 448.000(Ft.)
 Pipe length = 136.00(Ft.) Manning's N = 0.009
 No. of pipes = 1 Required pipe flow = 2.200(CFS)
 Given pipe size = 12.00(In.)
 Calculated individual pipe flow = 2.200(CFS)
 Normal flow depth in pipe = 2.67(In.)
 Flow top width inside pipe = 9.99(In.)
 Critical Depth = 7.60(In.)
 Pipe flow velocity = 16.87(Ft/s)
 Travel time through pipe = 0.13 min.
 Time of concentration (TC) = 12.81 min.

 Process from Point/Station 203.000 to Point/Station 204.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 2.828(CFS)
 Depth of flow = 0.425(Ft.), Average velocity = 2.924(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	0.50
2	2.00	0.00
3	3.00	0.00
4	4.00	0.50

Manning's 'N' friction factor = 0.025

Sub-Channel flow = 2.828(CFS)
 ' ' flow top width = 3.551(Ft.)
 ' ' velocity = 2.924(Ft/s)
 ' ' area = 0.967(Sq.Ft)
 ' ' Froude number = 0.987

Upstream point elevation = 448.000(Ft.)

Downstream point elevation = 447.000(Ft.)
 Flow length = 69.000(Ft.)
 Travel time = 0.39 min.
 Time of concentration = 13.20 min.
 Depth of flow = 0.425(Ft.)
 Average velocity = 2.924(Ft/s)
 Total irregular channel flow = 2.828(CFS)
 Irregular channel normal depth above invert elev. = 0.425(Ft.)
 Average velocity of channel(s) = 2.924(Ft/s)
 Adding area flow to channel
 UNDEVELOPED (average cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 84.00
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
 Max Catchment Loss (Fm) = 0.200(In/Hr)
 Rainfall intensity = 2.327(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area,(total area with
 modified rational method)(Q=KCIA) is C = 0.823
 Subarea runoff = 1.170(CFS) for 0.640(Ac.)
 Total runoff = 3.369(CFS) Total area = 1.76(Ac.)
 Area averaged Fm value = 0.200(In/Hr)
 Depth of flow = 0.462(Ft.), Average velocity = 3.061(Ft/s)

++++++
 Process from Point/Station 204.000 to Point/Station 205.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 447.000(Ft.)
 Downstream point elevation = 382.000(Ft.)
 Channel length thru subarea = 147.000(Ft.)
 Channel base width = 0.000(Ft.)
 Slope or 'Z' of left channel bank = 1.000
 Slope or 'Z' of right channel bank = 1.000
 Estimated mean flow rate at midpoint of channel = 4.786(CFS)
 Manning's 'N' = 0.015
 Maximum depth of channel = 1.500(Ft.)
 Flow(q) thru subarea = 4.786(CFS)
 Depth of flow = 0.485(Ft.), Average velocity = 20.336(Ft/s)
 Channel flow top width = 0.970(Ft.)
 Flow Velocity = 20.34(Ft/s)
 Travel time = 0.12 min.
 Time of concentration = 13.32 min.
 Critical depth = 1.070(Ft.)
 Adding area flow to channel
 UNDEVELOPED (average cover) subarea

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 84.00
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
 Max Catchment Loss (Fm) = 0.200(In/Hr)
 Rainfall intensity = 2.315(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area,(total area with
 modified rational method)(Q=KCIA) is C = 0.822
 Subarea runoff = 2.798(CFS) for 1.480(Ac.)
 Total runoff = 6.167(CFS) Total area = 3.24(Ac.)
 Area averaged Fm value = 0.200(In/Hr)
 Depth of flow = 0.534(Ft.), Average velocity = 21.667(Ft/s)
 Critical depth = 1.188(Ft.)

++++++
 Process from Point/Station 205.000 to Point/Station 206.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 382.000(Ft.)
 Downstream point/station elevation = 365.000(Ft.)
 Pipe length = 93.00(Ft.) Manning's N = 0.009
 No. of pipes = 1 Required pipe flow = 6.167(CFS)
 Given pipe size = 12.00(In.)
 Calculated individual pipe flow = 6.167(CFS)
 Normal flow depth in pipe = 4.35(In.)
 Flow top width inside pipe = 11.53(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 24.04(Ft/s)
 Travel time through pipe = 0.06 min.
 Time of concentration (TC) = 13.39 min.

++++++
 Process from Point/Station 205.000 to Point/Station 206.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 3.240(Ac.)
 Runoff from this stream = 6.167(CFS)
 Time of concentration = 13.39 min.
 Rainfall intensity = 2.309(In/Hr)
 Area averaged loss rate (Fm) = 0.2000(In/Hr)
 Area averaged Pervious ratio (Ap) = 1.0000
 Program is now starting with Main Stream No. 2

+++++
 Process from Point/Station 208.000 to Point/Station 206.000
 ***** INITIAL AREA EVALUATION *****

UNDEVELOPED (average cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 84.00
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
 Max Catchment Loss (Fm) = 0.200(In/Hr)
 Initial subarea data:
 Initial area flow distance = 857.000(Ft.)
 Top (of initial area) elevation = 622.000(Ft.)
 Bottom (of initial area) elevation = 365.000(Ft.)
 Difference in elevation = 257.000(Ft.)
 Slope = 0.29988 s(%)= 29.99
 $TC = k(0.706)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 13.385 min.
 Rainfall intensity = 2.309(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.822
 Subarea runoff = 6.131(CFS)
 Total initial stream area = 3.230(Ac.)

+++++
 Process from Point/Station 208.000 to Point/Station 206.000
 ***** CONFLUENCE OF MAIN STREAMS *****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 3.230(Ac.)
 Runoff from this stream = 6.131(CFS)
 Time of concentration = 13.38 min.
 Rainfall intensity = 2.309(In/Hr)
 Area averaged loss rate (Fm) = 0.2000(In/Hr)
 Area averaged Pervious ratio (Ap) = 1.0000
 Summary of stream data:

Stream No.	Area (Ac.)	Flow rate (CFS)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	3.24	6.167	13.39	0.200	2.309
2	3.23	6.131	13.38	0.200	2.309

Qmax(1) =
 1.000 * 1.000 * 6.167) +

$$\begin{array}{rcll}
 & 1.000 * & 1.000 * & 6.131) + = & 12.297 \\
 Q_{\max}(2) = & 1.000 * & 1.000 * & 6.167) + & \\
 & 1.000 * & 1.000 * & 6.131) + = & 12.298
 \end{array}$$

Total of 2 main streams to confluence:

Flow rates before confluence point:

7.167 7.131

Maximum flow rates at confluence using above data:

12.297 12.298

Area of streams before confluence:

3.240 3.230

Effective area values after confluence:

6.470 6.469

Results of confluence:

Total flow rate = 12.298(CFS)

Time of concentration = 13.385 min.

Effective stream area after confluence = 6.469(Ac.)

Study area average Pervious fraction(A_p) = 1.000

Study area average soil loss rate(F_m) = 0.200(In/Hr)

Study area total = 6.47(Ac.)

End of computations, total study area = 6.47 (Ac.)

The following figures may

be used for a unit hydrograph study of the same area.

Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction(A_p) = 1.000

Area averaged SCS curve number (AMC 2) = 84.0

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2018
Version 9.0
Rational Hydrology Study, Date: 11/10/24 File Name:
burek20dev25b.roc

Burek Residence
Developed Hydrology
Area B
25-Year Storm

RDS and Associates
Program License Serial Number 6673

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 25.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

+++++
Process from Point/Station 200.000 to Point/Station 201.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2) = 84.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
Max Catchment Loss (Fm) = 0.200(In/Hr)
Initial subarea data:
Initial area flow distance = 358.000(Ft.)
Top (of initial area) elevation = 520.000(Ft.)
Bottom (of initial area) elevation = 491.500(Ft.)
Difference in elevation = 28.500(Ft.)
Slope = 0.07961 s(%)= 7.96
 $TC = k(0.706)*[(length^3)/(elevation\ change)]^{0.2}$

Initial area time of concentration = 12.307 min.
 Rainfall intensity = 2.897(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.838
 Subarea runoff = 1.796(CFS)
 Total initial stream area = 0.740(Ac.)

+++++
 Process from Point/Station 201.000 to Point/Station 202.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 2.257(CFS)
 Depth of flow = 0.133(Ft.), Average velocity = 7.489(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	0.50
2	1.00	0.00
3	3.00	0.00
4	4.00	0.50

Manning's 'N' friction factor = 0.018

Sub-Channel flow = 2.258(CFS)
 ' ' flow top width = 2.532(Ft.)
 ' ' velocity = 7.489(Ft/s)
 ' ' area = 0.301(Sq.Ft)
 ' ' Froude number = 3.825

Upstream point elevation = 491.500(Ft.)
 Downstream point elevation = 469.000(Ft.)
 Flow length = 155.000(Ft.)
 Travel time = 0.34 min.
 Time of concentration = 12.65 min.
 Depth of flow = 0.133(Ft.)
 Average velocity = 7.489(Ft/s)
 Total irregular channel flow = 2.257(CFS)
 Irregular channel normal depth above invert elev. = 0.133(Ft.)
 Average velocity of channel(s) = 7.489(Ft/s)
 Adding area flow to channel
 UNDEVELOPED (average cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 84.00
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
 Max Catchment Loss (Fm) = 0.200(In/Hr)
 Rainfall intensity = 2.852(In/Hr) for a 25.0 year storm

Effective runoff coefficient used for area, (total area with modified rational method)(Q=KCIA) is C = 0.837
 Subarea runoff = 0.877(CFS) for 0.380(Ac.)
 Total runoff = 2.673(CFS) Total area = 1.12(Ac.)
 Area averaged Fm value = 0.200(In/Hr)
 Depth of flow = 0.147(Ft.), Average velocity = 7.938(Ft/s)

 Process from Point/Station 202.000 to Point/Station 203.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 469.000(Ft.)
 Downstream point/station elevation = 448.000(Ft.)
 Pipe length = 136.00(Ft.) Manning's N = 0.009
 No. of pipes = 1 Required pipe flow = 2.673(CFS)
 Given pipe size = 12.00(In.)
 Calculated individual pipe flow = 2.673(CFS)
 Normal flow depth in pipe = 2.95(In.)
 Flow top width inside pipe = 10.33(In.)
 Critical Depth = 8.41(In.)
 Pipe flow velocity = 17.86(Ft/s)
 Travel time through pipe = 0.13 min.
 Time of concentration (TC) = 12.78 min.

 Process from Point/Station 203.000 to Point/Station 204.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 3.437(CFS)
 Depth of flow = 0.466(Ft.), Average velocity = 3.077(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	0.50
2	2.00	0.00
3	3.00	0.00
4	4.00	0.50

Manning's 'N' friction factor = 0.025

Sub-Channel flow = 3.437(CFS)
 ' ' flow top width = 3.796(Ft.)
 ' ' velocity = 3.077(Ft/s)
 ' ' area = 1.117(Sq.Ft)
 ' ' Froude number = 0.999

Upstream point elevation = 448.000(Ft.)

Downstream point elevation = 447.000(Ft.)
 Flow length = 69.000(Ft.)
 Travel time = 0.37 min.
 Time of concentration = 13.15 min.
 Depth of flow = 0.466(Ft.)
 Average velocity = 3.077(Ft/s)
 Total irregular channel flow = 3.437(CFS)
 Irregular channel normal depth above invert elev. = 0.466(Ft.)
 Average velocity of channel(s) = 3.077(Ft/s)
 Adding area flow to channel
 UNDEVELOPED (average cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 84.00
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
 Max Catchment Loss (Fm) = 0.200(In/Hr)
 Rainfall intensity = 2.790(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area,(total area with
 modified rational method)(Q=KCIA) is C = 0.835
 Subarea runoff = 1.429(CFS) for 0.640(Ac.)
 Total runoff = 4.103(CFS) Total area = 1.76(Ac.)
 Area averaged Fm value = 0.200(In/Hr)
 Depth of flow = 0.505(Ft.), Average velocity = 3.233(Ft/s)
 ++++++
 Process from Point/Station 204.000 to Point/Station 205.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 447.000(Ft.)
 Downstream point elevation = 382.000(Ft.)
 Channel length thru subarea = 147.000(Ft.)
 Channel base width = 0.000(Ft.)
 Slope or 'Z' of left channel bank = 1.000
 Slope or 'Z' of right channel bank = 1.000
 Estimated mean flow rate at midpoint of channel = 5.828(CFS)
 Manning's 'N' = 0.015
 Maximum depth of channel = 1.500(Ft.)
 Flow(q) thru subarea = 5.828(CFS)
 Depth of flow = 0.522(Ft.), Average velocity = 21.362(Ft/s)
 Channel flow top width = 1.045(Ft.)
 Flow Velocity = 21.36(Ft/s)
 Travel time = 0.11 min.
 Time of concentration = 13.27 min.
 Critical depth = 1.164(Ft.)
 Adding area flow to channel
 UNDEVELOPED (average cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 84.00
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
 Max Catchment Loss (Fm) = 0.200(In/Hr)
 Rainfall intensity = 2.776(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area,(total area with
 modified rational method)(Q=KCIA) is C = 0.835
 Subarea runoff = 3.410(CFS) for 1.480(Ac.)
 Total runoff = 7.513(CFS) Total area = 3.24(Ac.)
 Area averaged Fm value = 0.200(In/Hr)
 Depth of flow = 0.575(Ft.), Average velocity = 22.763(Ft/s)
 Critical depth = 1.281(Ft.)

++++++
 Process from Point/Station 205.000 to Point/Station 206.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 382.000(Ft.)
 Downstream point/station elevation = 365.000(Ft.)
 Pipe length = 93.00(Ft.) Manning's N = 0.009
 No. of pipes = 1 Required pipe flow = 7.513(CFS)
 Given pipe size = 12.00(In.)
 Calculated individual pipe flow = 7.513(CFS)
 Normal flow depth in pipe = 4.83(In.)
 Flow top width inside pipe = 11.77(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 25.36(Ft/s)
 Travel time through pipe = 0.06 min.
 Time of concentration (TC) = 13.33 min.

++++++
 Process from Point/Station 205.000 to Point/Station 206.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 3.240(Ac.)
 Runoff from this stream = 7.513(CFS)
 Time of concentration = 13.33 min.
 Rainfall intensity = 2.769(In/Hr)
 Area averaged loss rate (Fm) = 0.2000(In/Hr)
 Area averaged Pervious ratio (Ap) = 1.0000
 Program is now starting with Main Stream No. 2

+++++

Process from Point/Station 208.000 to Point/Station 206.000
 ***** INITIAL AREA EVALUATION *****

UNDEVELOPED (average cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 84.00
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
 Max Catchment Loss (Fm) = 0.200(In/Hr)
 Initial subarea data:
 Initial area flow distance = 857.000(Ft.)
 Top (of initial area) elevation = 622.000(Ft.)
 Bottom (of initial area) elevation = 365.000(Ft.)
 Difference in elevation = 257.000(Ft.)
 Slope = 0.29988 s(%)= 29.99
 $TC = k(0.706) * [(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 13.385 min.
 Rainfall intensity = 2.763(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.835
 Subarea runoff = 7.450(CFS)
 Total initial stream area = 3.230(Ac.)

+++++
 Process from Point/Station 208.000 to Point/Station 206.000
 ***** CONFLUENCE OF MAIN STREAMS *****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 3.230(Ac.)
 Runoff from this stream = 7.450(CFS)
 Time of concentration = 13.38 min.
 Rainfall intensity = 2.763(In/Hr)
 Area averaged loss rate (Fm) = 0.2000(In/Hr)
 Area averaged Pervious ratio (Ap) = 1.0000
 Summary of stream data:

Stream No.	Area (Ac.)	Flow rate (CFS)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	3.24	7.513	13.33	0.200	2.769
2	3.23	7.450	13.38	0.200	2.763

Qmax(1) =
 $1.000 * 1.000 * 7.513 +$
 $1.003 * 0.996 * 7.450 + = 14.951$
 Qmax(2) =

$$\begin{array}{rclcl} 0.997 * & 1.000 * & 7.513) + & & \\ 1.000 * & 1.000 * & 7.450) + = & & 14.944 \end{array}$$

Total of 2 main streams to confluence:

Flow rates before confluence point:

8.513 8.450

Maximum flow rates at confluence using above data:

14.951 14.944

Area of streams before confluence:

3.240 3.230

Effective area values after confluence:

6.457 6.470

Results of confluence:

Total flow rate = 14.951(CFS)

Time of concentration = 13.329 min.

Effective stream area after confluence = 6.457(Ac.)

Study area average Pervious fraction(A_p) = 1.000

Study area average soil loss rate(F_m) = 0.200(In/Hr)

Study area total = 6.47(Ac.)

End of computations, total study area = 6.47 (Ac.)

The following figures may

be used for a unit hydrograph study of the same area.

Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction(A_p) = 1.000

Area averaged SCS curve number (AMC 2) = 84.0

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2018
Version 9.0
Rational Hydrology Study, Date: 11/10/24 File Name:
burek20dev50b.roc

Burek Residence
Developed Hydrology
Area B
50-Yr Storm

RDS and Associates
Program License Serial Number 6673

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 50.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

+++++
Process from Point/Station 200.000 to Point/Station 201.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2) = 84.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
Max Catchment Loss (Fm) = 0.200(In/Hr)
Initial subarea data:
Initial area flow distance = 358.000(Ft.)
Top (of initial area) elevation = 520.000(Ft.)
Bottom (of initial area) elevation = 491.500(Ft.)
Difference in elevation = 28.500(Ft.)
Slope = 0.07961 s(%)= 7.96
 $TC = k(0.706)*[(length^3)/(elevation\ change)]^{0.2}$

Initial area time of concentration = 12.307 min.
 Rainfall intensity = 3.266(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.845
 Subarea runoff = 2.042(CFS)
 Total initial stream area = 0.740(Ac.)

+++++
 Process from Point/Station 201.000 to Point/Station 202.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

 Estimated mean flow rate at midpoint of channel = 2.566(CFS)
 Depth of flow = 0.143(Ft.), Average velocity = 7.827(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	0.50
2	1.00	0.00
3	3.00	0.00
4	4.00	0.50

Manning's 'N' friction factor = 0.018

Sub-Channel flow = 2.566(CFS)
 ' ' flow top width = 2.573(Ft.)
 ' ' velocity = 7.827(Ft/s)
 ' ' area = 0.328(Sq.Ft)
 ' ' Froude number = 3.864

Upstream point elevation = 491.500(Ft.)
 Downstream point elevation = 469.000(Ft.)
 Flow length = 155.000(Ft.)
 Travel time = 0.33 min.
 Time of concentration = 12.64 min.
 Depth of flow = 0.143(Ft.)
 Average velocity = 7.827(Ft/s)
 Total irregular channel flow = 2.566(CFS)
 Irregular channel normal depth above invert elev. = 0.143(Ft.)
 Average velocity of channel(s) = 7.827(Ft/s)
 Adding area flow to channel
 UNDEVELOPED (average cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 84.00
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
 Max Catchment Loss (Fm) = 0.200(In/Hr)
 Rainfall intensity = 3.217(In/Hr) for a 50.0 year storm

Effective runoff coefficient used for area, (total area with modified rational method) (Q=KCIA) is C = 0.844
 Subarea runoff = 1.000(CFS) for 0.380(Ac.)
 Total runoff = 3.041(CFS) Total area = 1.12(Ac.)
 Area averaged Fm value = 0.200(In/Hr)
 Depth of flow = 0.158(Ft.), Average velocity = 8.294(Ft/s)

 Process from Point/Station 202.000 to Point/Station 203.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 469.000(Ft.)
 Downstream point/station elevation = 448.000(Ft.)
 Pipe length = 136.00(Ft.) Manning's N = 0.009
 No. of pipes = 1 Required pipe flow = 3.041(CFS)
 Given pipe size = 12.00(In.)
 Calculated individual pipe flow = 3.041(CFS)
 Normal flow depth in pipe = 3.15(In.)
 Flow top width inside pipe = 10.55(In.)
 Critical Depth = 8.97(In.)
 Pipe flow velocity = 18.53(Ft/s)
 Travel time through pipe = 0.12 min.
 Time of concentration (TC) = 12.76 min.

 Process from Point/Station 203.000 to Point/Station 204.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 3.883(CFS)
 Depth of flow = 0.493(Ft.), Average velocity = 3.176(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	0.50
2	2.00	0.00
3	3.00	0.00
4	4.00	0.50

Manning's 'N' friction factor = 0.025

Sub-Channel flow = 3.883(CFS)
 ' ' flow top width = 3.959(Ft.)
 ' ' velocity = 3.176(Ft/s)
 ' ' area = 1.223(Sq.Ft)
 ' ' Froude number = 1.007

Upstream point elevation = 448.000(Ft.)

Downstream point elevation = 447.000(Ft.)
 Flow length = 69.000(Ft.)
 Travel time = 0.36 min.
 Time of concentration = 13.12 min.
 Depth of flow = 0.493(Ft.)
 Average velocity = 3.176(Ft/s)
 Total irregular channel flow = 3.883(CFS)
 Irregular channel normal depth above invert elev. = 0.493(Ft.)
 Average velocity of channel(s) = 3.176(Ft/s)
 Adding area flow to channel
 UNDEVELOPED (average cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 84.00
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
 Max Catchment Loss (Fm) = 0.200(In/Hr)
 Rainfall intensity = 3.149(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for area,(total area with
 modified rational method)(Q=KCIA) is C = 0.843
 Subarea runoff = 1.631(CFS) for 0.640(Ac.)
 Total runoff = 4.672(CFS) Total area = 1.76(Ac.)
 Area averaged Fm value = 0.200(In/Hr)
 Depth of flow = 0.530(Ft.), Average velocity = 3.405(Ft/s)
 !!Warning: Water is above left or right bank elevations

++++++
 Process from Point/Station 204.000 to Point/Station 205.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 447.000(Ft.)
 Downstream point elevation = 382.000(Ft.)
 Channel length thru subarea = 147.000(Ft.)
 Channel base width = 0.000(Ft.)
 Slope or 'Z' of left channel bank = 1.000
 Slope or 'Z' of right channel bank = 1.000
 Estimated mean flow rate at midpoint of channel = 6.636(CFS)
 Manning's 'N' = 0.015
 Maximum depth of channel = 1.500(Ft.)
 Flow(q) thru subarea = 6.636(CFS)
 Depth of flow = 0.548(Ft.), Average velocity = 22.067(Ft/s)
 Channel flow top width = 1.097(Ft.)
 Flow Velocity = 22.07(Ft/s)
 Travel time = 0.11 min.
 Time of concentration = 13.23 min.
 Critical depth = 1.219(Ft.)
 Adding area flow to channel

UNDEVELOPED (average cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 84.00
 Pervious ratio(A_p) = 1.0000 Max loss rate(F_p)= 0.200(In/Hr)
 Max Catchment Loss (F_m) = 0.200(In/Hr)
 Rainfall intensity = 3.134(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for area,(total area with
 modified rational method)($Q=KCIA$) is $C = 0.843$
 Subarea runoff = 3.885(CFS) for 1.480(Ac.)
 Total runoff = 8.557(CFS) Total area = 3.24(Ac.)
 Area averaged F_m value = 0.200(In/Hr)
 Depth of flow = 0.603(Ft.), Average velocity = 23.515(Ft/s)
 Critical depth = 1.352(Ft.)

++++++
 Process from Point/Station 205.000 to Point/Station 206.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 382.000(Ft.)
 Downstream point/station elevation = 365.000(Ft.)
 Pipe length = 93.00(Ft.) Manning's $N = 0.009$
 No. of pipes = 1 Required pipe flow = 8.557(CFS)
 Given pipe size = 12.00(In.)
 Calculated individual pipe flow = 8.557(CFS)
 Normal flow depth in pipe = 5.20(In.)
 Flow top width inside pipe = 11.89(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 26.26(Ft/s)
 Travel time through pipe = 0.06 min.
 Time of concentration (TC) = 13.29 min.

++++++
 Process from Point/Station 205.000 to Point/Station 206.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 3.240(Ac.)
 Runoff from this stream = 8.557(CFS)
 Time of concentration = 13.29 min.
 Rainfall intensity = 3.126(In/Hr)
 Area averaged loss rate (F_m) = 0.2000(In/Hr)
 Area averaged Pervious ratio (A_p) = 1.0000
 Program is now starting with Main Stream No. 2

+++++
 Process from Point/Station 208.000 to Point/Station 206.000
 ***** INITIAL AREA EVALUATION *****

UNDEVELOPED (average cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 84.00
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
 Max Catchment Loss (Fm) = 0.200(In/Hr)
 Initial subarea data:
 Initial area flow distance = 857.000(Ft.)
 Top (of initial area) elevation = 622.000(Ft.)
 Bottom (of initial area) elevation = 365.000(Ft.)
 Difference in elevation = 257.000(Ft.)
 Slope = 0.29988 s(%)= 29.99
 $TC = k(0.706)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 13.385 min.
 Rainfall intensity = 3.114(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.842
 Subarea runoff = 8.472(CFS)
 Total initial stream area = 3.230(Ac.)

+++++
 Process from Point/Station 208.000 to Point/Station 206.000
 ***** CONFLUENCE OF MAIN STREAMS *****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 3.230(Ac.)
 Runoff from this stream = 8.472(CFS)
 Time of concentration = 13.38 min.
 Rainfall intensity = 3.114(In/Hr)
 Area averaged loss rate (Fm) = 0.2000(In/Hr)
 Area averaged Pervious ratio (Ap) = 1.0000
 Summary of stream data:

Stream No.	Area (Ac.)	Flow rate (CFS)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	3.24	8.557	13.29	0.200	3.126
2	3.23	8.472	13.38	0.200	3.114

Qmax(1) =

$$\begin{array}{rcll}
 & 1.000 * & 1.000 * & 8.557) + \\
 & 1.004 * & 0.993 * & 8.472) + = & 17.005 \\
 Q_{\max}(2) = & 0.996 * & 1.000 * & 8.557) + \\
 & 1.000 * & 1.000 * & 8.472) + = & 16.992
 \end{array}$$

Total of 2 main streams to confluence:

Flow rates before confluence point:

9.557 9.472

Maximum flow rates at confluence using above data:

17.005 16.992

Area of streams before confluence:

3.240 3.230

Effective area values after confluence:

6.448 6.470

Results of confluence:

Total flow rate = 17.005(CFS)

Time of concentration = 13.292 min.

Effective stream area after confluence = 6.448(Ac.)

Study area average Pervious fraction(A_p) = 1.000

Study area average soil loss rate(F_m) = 0.200(In/Hr)

Study area total = 6.47(Ac.)

End of computations, total study area = 6.47 (Ac.)

The following figures may

be used for a unit hydrograph study of the same area.

Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction(A_p) = 1.000

Area averaged SCS curve number (AMC 2) = 84.0

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2018
Version 9.0
Rational Hydrology Study, Date: 11/10/24 File Name:
burek20dev100b.roc

Burek Residence
Developed Hydrology
Area B
100-Yr Storm

RDS and Associates
Program License Serial Number 6673

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 100.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

+++++
Process from Point/Station 200.000 to Point/Station 201.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2) = 84.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
Max Catchment Loss (Fm) = 0.200(In/Hr)
Initial subarea data:
Initial area flow distance = 358.000(Ft.)
Top (of initial area) elevation = 520.000(Ft.)
Bottom (of initial area) elevation = 491.500(Ft.)
Difference in elevation = 28.500(Ft.)
Slope = 0.07961 s(%)= 7.96
 $TC = k(0.706)*[(length^3)/(elevation\ change)]^{0.2}$

Initial area time of concentration = 12.307 min.
 Rainfall intensity = 3.693(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.851
 Subarea runoff = 2.326(CFS)
 Total initial stream area = 0.740(Ac.)

 Process from Point/Station 201.000 to Point/Station 202.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 2.923(CFS)
 Depth of flow = 0.155(Ft.), Average velocity = 8.184(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	0.50
2	1.00	0.00
3	3.00	0.00
4	4.00	0.50

Manning's 'N' friction factor = 0.018

Sub-Channel flow = 2.923(CFS)
 ' ' flow top width = 2.619(Ft.)
 ' ' velocity = 8.184(Ft/s)
 ' ' area = 0.357(Sq.Ft)
 ' ' Froude number = 3.905

Upstream point elevation = 491.500(Ft.)
 Downstream point elevation = 469.000(Ft.)
 Flow length = 155.000(Ft.)
 Travel time = 0.32 min.
 Time of concentration = 12.62 min.
 Depth of flow = 0.155(Ft.)
 Average velocity = 8.184(Ft/s)
 Total irregular channel flow = 2.923(CFS)
 Irregular channel normal depth above invert elev. = 0.155(Ft.)
 Average velocity of channel(s) = 8.184(Ft/s)
 Adding area flow to channel
 UNDEVELOPED (average cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 84.00
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
 Max Catchment Loss (Fm) = 0.200(In/Hr)
 Rainfall intensity = 3.640(In/Hr) for a 100.0 year storm

Effective runoff coefficient used for area, (total area with modified rational method)(Q=KCIA) is C = 0.851
 Subarea runoff = 1.141(CFS) for 0.380(Ac.)
 Total runoff = 3.467(CFS) Total area = 1.12(Ac.)
 Area averaged Fm value = 0.200(In/Hr)
 Depth of flow = 0.171(Ft.), Average velocity = 8.669(Ft/s)

 Process from Point/Station 202.000 to Point/Station 203.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 469.000(Ft.)
 Downstream point/station elevation = 448.000(Ft.)
 Pipe length = 136.00(Ft.) Manning's N = 0.009
 No. of pipes = 1 Required pipe flow = 3.467(CFS)
 Given pipe size = 12.00(In.)
 Calculated individual pipe flow = 3.467(CFS)
 Normal flow depth in pipe = 3.36(In.)
 Flow top width inside pipe = 10.78(In.)
 Critical Depth = 9.55(In.)
 Pipe flow velocity = 19.24(Ft/s)
 Travel time through pipe = 0.12 min.
 Time of concentration (TC) = 12.74 min.

 Process from Point/Station 203.000 to Point/Station 204.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 4.428(CFS)
 Depth of flow = 0.520(Ft.), Average velocity = 3.333(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	0.50
2	2.00	0.00
3	3.00	0.00
4	4.00	0.50

Manning's 'N' friction factor = 0.025

Sub-Channel flow = 4.428(CFS)
 ' ' flow top width = 4.000(Ft.)
 ' ' velocity = 3.333(Ft/s)
 ' ' area = 1.329(Sq.Ft)
 ' ' Froude number = 1.019

Upstream point elevation = 448.000(Ft.)

Downstream point elevation = 447.000(Ft.)
 Flow length = 69.000(Ft.)
 Travel time = 0.35 min.
 Time of concentration = 13.09 min.
 Depth of flow = 0.520(Ft.)
 Average velocity = 3.333(Ft/s)
 Total irregular channel flow = 4.428(CFS)
 Irregular channel normal depth above invert elev. = 0.520(Ft.)
 Average velocity of channel(s) = 3.333(Ft/s)
 !!Warning: Water is above left or right bank elevations
 Adding area flow to channel
 UNDEVELOPED (average cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 84.00
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
 Max Catchment Loss (Fm) = 0.200(In/Hr)
 Rainfall intensity = 3.565(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area,(total area with
 modified rational method)(Q=KCIA) is C = 0.850
 Subarea runoff = 1.863(CFS) for 0.640(Ac.)
 Total runoff = 5.330(CFS) Total area = 1.76(Ac.)
 Area averaged Fm value = 0.200(In/Hr)
 Depth of flow = 0.559(Ft.), Average velocity = 3.590(Ft/s)

++++++
 Process from Point/Station 204.000 to Point/Station 205.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 447.000(Ft.)
 Downstream point elevation = 382.000(Ft.)
 Channel length thru subarea = 147.000(Ft.)
 Channel base width = 0.000(Ft.)
 Slope or 'Z' of left channel bank = 1.000
 Slope or 'Z' of right channel bank = 1.000
 Estimated mean flow rate at midpoint of channel = 7.572(CFS)
 Manning's 'N' = 0.015
 Maximum depth of channel = 1.500(Ft.)
 Flow(q) thru subarea = 7.572(CFS)
 Depth of flow = 0.576(Ft.), Average velocity = 22.807(Ft/s)
 Channel flow top width = 1.152(Ft.)
 Flow Velocity = 22.81(Ft/s)
 Travel time = 0.11 min.
 Time of concentration = 13.19 min.
 Critical depth = 1.289(Ft.)
 Adding area flow to channel
 UNDEVELOPED (average cover) subarea

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 84.00
 Pervious ratio(A_p) = 1.0000 Max loss rate(F_p)= 0.200(In/Hr)
 Max Catchment Loss (F_m) = 0.200(In/Hr)
 Rainfall intensity = 3.549(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area,(total area with
 modified rational method)($Q=KCIA$) is $C = 0.849$
 Subarea runoff = 4.434(CFS) for 1.480(Ac.)
 Total runoff = 9.764(CFS) Total area = 3.24(Ac.)
 Area averaged F_m value = 0.200(In/Hr)
 Depth of flow = 0.634(Ft.), Average velocity = 24.304(Ft/s)
 Critical depth = 1.422(Ft.)

++++++
 Process from Point/Station 205.000 to Point/Station 206.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 382.000(Ft.)
 Downstream point/station elevation = 365.000(Ft.)
 Pipe length = 93.00(Ft.) Manning's N = 0.009
 No. of pipes = 1 Required pipe flow = 9.764(CFS)
 Given pipe size = 12.00(In.)
 Calculated individual pipe flow = 9.764(CFS)
 Normal flow depth in pipe = 5.60(In.)
 Flow top width inside pipe = 11.97(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 27.18(Ft/s)
 Travel time through pipe = 0.06 min.
 Time of concentration (TC) = 13.25 min.

++++++
 Process from Point/Station 205.000 to Point/Station 206.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 3.240(Ac.)
 Runoff from this stream = 9.764(CFS)
 Time of concentration = 13.25 min.
 Rainfall intensity = 3.540(In/Hr)
 Area averaged loss rate (F_m) = 0.2000(In/Hr)
 Area averaged Pervious ratio (A_p) = 1.0000
 Program is now starting with Main Stream No. 2

++++++
 Process from Point/Station 208.000 to Point/Station 206.000
 ***** INITIAL AREA EVALUATION *****

UNDEVELOPED (average cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2) = 84.00
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.200(In/Hr)
 Max Catchment Loss (Fm) = 0.200(In/Hr)
 Initial subarea data:
 Initial area flow distance = 857.000(Ft.)
 Top (of initial area) elevation = 622.000(Ft.)
 Bottom (of initial area) elevation = 365.000(Ft.)
 Difference in elevation = 257.000(Ft.)
 Slope = 0.29988 s(%)= 29.99
 $TC = k(0.706)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 13.385 min.
 Rainfall intensity = 3.519(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.849
 Subarea runoff = 9.649(CFS)
 Total initial stream area = 3.230(Ac.)

++++++
 Process from Point/Station 208.000 to Point/Station 206.000
 ***** CONFLUENCE OF MAIN STREAMS *****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 3.230(Ac.)
 Runoff from this stream = 9.649(CFS)
 Time of concentration = 13.38 min.
 Rainfall intensity = 3.519(In/Hr)
 Area averaged loss rate (Fm) = 0.2000(In/Hr)
 Area averaged Pervious ratio (Ap) = 1.0000
 Summary of stream data:

Stream No.	Area (Ac.)	Flow rate (CFS)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	3.24	9.764	13.25	0.200	3.540
2	3.23	9.649	13.38	0.200	3.519

Qmax(1) =
 1.000 * 1.000 * 9.764) +

$$\begin{array}{rcll}
 & 1.006 * & 0.990 * & 9.649) + = & 19.376 \\
 Q_{\max}(2) = & 0.994 * & 1.000 * & 9.764) + & \\
 & 1.000 * & 1.000 * & 9.649) + = & 19.354
 \end{array}$$

Total of 2 main streams to confluence:

Flow rates before confluence point:

10.764 10.649

Maximum flow rates at confluence using above data:

19.376 19.354

Area of streams before confluence:

3.240 3.230

Effective area values after confluence:

6.438 6.470

Results of confluence:

Total flow rate = 19.376(CFS)

Time of concentration = 13.250 min.

Effective stream area after confluence = 6.438(Ac.)

Study area average Pervious fraction(A_p) = 1.000

Study area average soil loss rate(F_m) = 0.200(In/Hr)

Study area total = 6.47(Ac.)

End of computations, total study area = 6.47 (Ac.)

The following figures may

be used for a unit hydrograph study of the same area.

Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction(A_p) = 1.000

Area averaged SCS curve number (AMC 2) = 84.0

APPENDIX C

MISC HYDRAULIC

CALCULATIONS

Hydraulic Analysis Report

Project Data

Project Title: 20 Old Ranch Road
Designer: Rich Soltysiak
Project Date: Wednesday, August 14, 2024
Project Units: U.S. Customary Units
Notes:

Channel Analysis: Channel Analysis

Notes:

Input Parameters

Channel Type: Circular
Pipe Diameter: 1.0000 ft
Longitudinal Slope: 0.1500 ft/ft
Manning's n: 0.0150
Depth: 1.0000 ft

Result Parameters

Flow: 11.9589 cfs Max Flow
Area of Flow: 0.7854 ft²
Wetted Perimeter: 3.1416 ft
Hydraulic Radius: 0.2500 ft
Average Velocity: 15.2265 ft/s
Top Width: 0.0000 ft
Froude Number: 0.0000
Critical Depth: 0.9970 ft
Critical Velocity: 15.2307 ft/s
Critical Slope: 0.1432 ft/ft
Critical Top Width: 0.11 ft
Calculated Max Shear Stress: 9.3600 lb/ft²
Calculated Avg Shear Stress: 2.3400 lb/ft²