Addendum to the Technical Drainage Study For Brinley Middle School Replacement

July 2023

Prepared for:

CCSD
1180 Military Tribute Place
Henderson, NV 89074

Prepared by:

LOCHSA ENGINEERING
6345 South Jones Boulevard, Suite 100
Las Vegas, Nevada 89118
(702) 365-9312

Lochsa Job # 221095

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Brinley Middle School Replacement Date: July 26, 2023

Location of Development: a) Descriptive (Cross Streets) North/South: Jones Blvd.

East/West: Smoke Ranch Rd.

b) Section: 14 Township: 20 SOUTH Range: 60 EAST

c) APN : 138-14-802-005

Name of Owner: School Board of Trustees - CCSD

Telephone No.: (702) 799-8710 Fax No.: E-Mail Address: N/A

Address: 1180 Military Tribute Place Henderson, NV 89074

Contact Person-Name: CHRIS BLAKE, EI **Telephone No.:** 702-365-9312

* **E-Mail Address:** CHRIS.BLAKE@LOCHSA.COM **Fax No.:** 702-365-9317

Firm: LOCHSA ENGINEERING

Address: 6345 S JONES BLVD STE 100 LAS VEGAS NV 89118

Type of Land Development/Land Disturbance Process:

	Rezoning		Subdivision Map		Clearing and Grading Only
	Parcel Map		Planned Unit Development		Other (Please specify below)
	Large Parcel Map	✔	Building Permit		

1. Total Owned Land Area: At Site: 18.19+/- ACRES Being Developed/Disturbed: 17.09+/- ACRES
2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☐ **Yes**** ☑ **No**
3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☑ **Yes**** ☐ **No**
4. Proposed type of development (Residential, Commercial, Etc.): School
5. Approximate upstream land area which drains to the subject site: 200+/- ACRES (along perimeter of Site)
6. Has the site drainage been evaluated in the past? ☐ **YES** ☑ **NO** If yes, please identify documentation:
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: NEAR SOUTHEAST CORNER OF SITE TO SMOKE RANCH RD.
8. Briefly describe your proposed schedule for the subject project: ASAP

PROFESSIONAL ENGINEER - STATE OF NEVADA
EDGAR LEÓN
Exp: 12-31-23
CIVIL
No. 21493
8-1-23

Engineer's Seal

Submit this form as part of the required drainage study to the local entity which has jurisdiction over the subject property. This form may provide sufficient information to serve as the Conceptual Drainage Study.

***New Required Field**

****Review and concurrence of the Clark County Regional Flood Control District is required.**

Revision	Date

Local Entity File No.

REFERENCE:

STANDARD FORM 1

Updated 05/01/2008

T 702-365-9312 | F 702-365-9317
6345 S Jones Blvd, Suite 100
Las Vegas, NV 89118

Lochsa engineering

July 27, 2023

Albert Sung, P.E.
City of Las Vegas Public Works Department
(Flood Control Division)
495 S. Main Street
Las Vegas, NV 89101

Subject: **Addendum to the Technical Drainage Study for Brinley Middle School Replacement**
Lochsa Job No. 221095

Mr. Sung:

This letter certifies that all items provided on the **Addendum to the Technical Drainage Study for Brinley Middle School Replacement** electronic submittal matches the paper version bound into the study.

Respectfully submitted,

LOCHSA ENGINEERING

E León

Edgar León, P.E.

PROFESSIONAL ENGINEER STATE OF NEVADA
EDGAR LEÓN
Exp: 12-31-23
CIVIL
No. 21493
8-1-23

Comment Letter

CITY OF LAS VEGAS **INTER-OFFICE MEMORANDUM**				**DATE:** **June 21, 2023**
TO: **Land Development Services** Department of Building & Safety				**FROM:** Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: **Brinley Middle School Replacement**			**COPIES TO:** Lochsa Engineering
Cross Streets:	NEC of Smoke Ranch Road & Maverick St.			School Board of Trustee - CCSD
File Number:	F:\Depot\DSMemos\DS5678A.doc			Bart Anderson, P.E., DevCo
Parcel Number:	138-14-802-005			CCRFCD
Zoning Action:	23-0242-SDR1 & 23-0242-VAR1			
FEMA Flood Zone	YES	NO	**X**	
Proposed Storm Drain	YES	NO	**X**	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	5/31/2023	6/21/2023	See Comments Below	$400.00	5295619: $400
			TOTAL FEES (LDDRS):	**$400.00**	**----**

REMARKS:

The Drainage Study for the subject project has been reviewed and:

	is approved subject to conformance to all City standards and the following conditions:
X	must be resubmitted or supplemented including the following:
	is conditionally approved subject to Clark County Regional Flood Control District concurrence.
	is conditionally approved subject to Clark County Public Works Department concurrence.

1. Provide a copy of the zoning/planning conditions associated with this site (**23-0242-SDR1 & 23-0242-VAR1**) with the next submittal to verify compliance with conditions. *Flood Control* will not issue conditional approval of the drainage study without the associated zoning/planning conditions (issued by the *City Council*). Any associated conditions of approval that revise the site drainage parameters will require that the drainage study be revised and resubmitted.

2. Sites with a grade difference of 2 feet above or below existing are required to have approval from the *City Planning and Development Department*. The engineer must submit copies of the grading plans and detail sheet with a letter justifying the grade difference to the *City Planning Department* (229-6301). The engineer must provide Planning approval with the next submittal.

3. The site is adjacent to or crosses an existing or proposed *Clark County Regional Flood Control District* (CCRFCD) master planned facility. Therefore, CCRFCD concurrence is required prior to final approval of the drainage study.

   Please note that effective March 15, 2019, the CCRFCD adopted new requirements for drainage study concurrence submittal. Follow the link below for specific guidance.

   http://gustfront.ccrfcd.org/LandDev/LandDev.aspx

4. **Sheet DR2**: It is proposed to discharge Subbasins "ND3+ND6" of Q_{10}/Q_{100}=7/13 cfs at CPD2 to an existing parking lot in the adjacent ballfield of the church. However, this outflow does not happen in the existing condition, ie, the adjacent church will be receiving more flows during storm events. Either maintain the same flows going into the adjacent site or obtain a notarized letter of acknowledging the increased flow from the adjacent property owner prior to the final approval of the subject drainage study.

5. **Phase 2 Grading Plans**: Cross sections, for example, *H/C6.04* has been shown on the *Overall Sheet* which shows the relation between the perimeter street and the onsite features. However, no street TC elevations had been shown on the *Overall Sheet*, therefore, the relative vertical relationship between the street and onsite cannot be verified. Provide as such in the next submittal.

6. **Sheet C2.30.1**: Provide a cross section at *Maverick Street* between *Smoke Ranch Road* and the first driveway entrance in *Maverick*. Since the site is below the adjacent *Maverick Street*, this section shall show some barrier at the back of sidewalk to protect the onsite from drainage in *Maverick Street*.

7. **Sheet C2.30.2**: For the same reasoning as in Comment #6, provide a cross section at *Maverick Street* somewhere south of the driveway entrance.

8. Revise and replace Note #6 of the "*Stormwater Management Notes*" on all grading plans with the following note as Standard Note No. 6:

   Post-Construction BMPs (PCBMPs) / Control Measures noted on the Grading Plans are mandatory permanent regulatory stormwater pollution controls. These PCBMPs must be installed per the approved plans and must be permanently maintained.

9. Add a note in all pertinent sheets for the construction of all storm drain drop inlets per a newly adopted USDCCA Drawing No. 421 (*Stormwater Quality Management Stamp and Sign Detail*).

NOTE: Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the *Nevada Division of Environmental Protection* a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see http://ndep.nv.gov/bwpc/storm01.htm or call (775) 687-9429.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Update and accepted by the *City of Las Vegas Flood Control Section*. Additionally, final approval of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the *City of Las Vegas* reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

END OF REMARKS
AYS

T/R/S: T20S/R60E/14
AREA L14

Civil
Flood Control
Structural
Surveying
Traffic

Lochsa engineering

July 31, 2023

Albert Sung, P.E.
Flood Control Project Engineer
Department of Public Works
495 S. Main Street
Las Vegas, NV 89101

Subject: Addendum to Technical Drainage Study for Brinley Middle School Replacement
APN: 138-14-802-005
File #: DS5678A
(Lochsa Engineering Project No. 221095)

Dear Albert Sung,

Lochsa Engineering is in receipt of your comment letter, dated: June 21, 2023, for the above referenced project.

In response to your comments, the following responses are being offered:

1. **Provide a copy of the zoning/planning conditions associated with this site (23-0242-SDR1 & 23-0242-VAR1) with the next submittal to verify compliance with conditions. *Flood Control* will not issue conditional approval of the drainage study without the associated zoning/planning conditions (issued by the *City Council*). Any associated conditions of approval that revise the site drainage parameters will require that the drainage study be revised and resubmitted.**

Response 1: Noted. We are in the process of acquiring a copy of the zoning/planning conditions associated with this site, and we will make sure to provide you with a copy of the letter upon receipt. We understand that the drainage study may be revised and may need to be resubmitted. The NOFA is expected in 2 weeks. We will submit this now and email you a copy of the NOFA in the coming weeks. We do understand an official TDS Approval is imminent upon receiving the NOFA.

2. Sites with a grade difference of 2 feet above or below existing are required to have approval from the *City Planning and Development Department*. The engineer must submit copies of the grading plans and detail sheet with a letter justifying the grade difference to the *City Planning Department* (229-6301). The engineer must provide Planning approval with the next submittal.

Response 2: **Noted. We have included the Planning approval for justifying the grade difference of 2ft above or below the existing ground.**

3. The site is adjacent to or crosses an existing or proposed *Clark County Regional Flood Control District* (CCRFCD) master planned facility. Therefore, CCRFCD concurrence is required prior to final approval of the drainage study.

   Please note that effective March 15, 2019, the CCRFCD adopted new requirements for drainage study concurrence submittal. Follow the link below for specific guidance.

   http://gustfront.ccrfcd.org/LandDev/LandDev.aspx

Response 3: **Noted. This drainage study will be submitted to CCRFCD for concurrence after we receive the approval drainage letter.**

4. **Sheet DR2**: It is proposed to discharge Subbasins "ND3+ND6" of Q_{10}/Q_{100}=7/13 cfs at CPD2 to an existing parking lot in the adjacent ballfield of the church. However, this outflow does not happen in the existing condition, ie, the adjacent church will be receiving more flows during storm events. Eithe maintain the same flows going into the adjacent site or obtain a notarized letter of acknowledging the increased flow from the adjacent property owner prior to the final approval of the subject drainage study.

Response 4: **Noted. We have revised the grading along the east half of the site to ensure the flows do not discharge to the existing parking lot for the Church. The discharge point is east of the Site now. The Onsite Basins have been adjusted per the revised grading and the plumbing plan to account for the roof drains. We revised developed basins ND6 and ND7 to accommodate the true flow patterns. See revised HEC-1 Analysis (Developed Conditions) and the revised DR2 (Developed Condition Basin Map) in the submittal.**

In lieu of these revisions, we have also revised the existing onsite basins to show the true existing discharge points. Added existing grade tags along the east boundary show an accurate flow path. Onsite basin NX5 and NX6 have been revised. See revised HEC-1 Analysis (Existing Conditions) and the revised DR1 (Existing Condition Basin Map) in the submittal.

From these analyses, the adjacent sites to the east are not receiving more flows during storm events in the developed conditions. Therefore, there is no adverse impact to these properties from existing conditions.

5. **Phase 2 Grading Plans**: Cross sections, for example, *H/C6.04* has been shown on the *Overall Sheet* which shows the relation between the perimeter street and the onsite features. However, no street TC elevations had been shown on the *Overall Sheet*, therefore, the relative vertical relationship between the street and onsite cannot be verified. Provide as such in the next submittal.

Response 5: **Noted. We forgot to add that detail sections on the Phase 2 Grading Sheets. The detail sections are now added on the grading plans for showing the relationships between perimeter streets and onsite features.**

The purpose of the detail sections on the Overall Sheet is to easily show the locations of the detail sections and not for relationship purposes. These will remain for that purpose. The Grading Plans show the detail and relationships for the verification of the detail sections. See Revised Plans.

6. **Sheet C2.30.1**: Provide a cross section at *Maverick Street* between *Smoke Ranch Road* and the first driveway entrance in *Maverick*. Since the site is below the adjacent *Maverick Street*, this section shall show some barrier at the back of sidewalk to protect the onsite from drainage in *Maverick Street*.

Response 6: **Please note that Sheet C2.30.1 is in the Phase 1 area and the added barrier is assumed to exist on Sheet C2.30.1. The callout of the barrier (single course solid grouted CMU Wall) is shown on Sheet C1.30.1 (Phase 1).**

Phase 2 and this area of the Site is considered existing. However, a cross section at *Maverick Street* between Smoke Ranch Road and the first driveway entrance in *Maverick* has been added to Sheet C2.30.1. Since the 100yr flow depth is 0.77ft, we have proposed a barrier using a single course solid grouted CMU wall at the back of sidewalk so the 100yr flow depth (0.77ft) can be contained as it flows south along Maverick Street toward Smoke Ranch Rd. See revised Plans and Detail 'F' on Sheet C6.04 which reflects this section.

7. **Sheet C2.30.2**: For the same reasoning as in Comment #6, provide a cross section at *Maverick Street* somewhere south of the driveway entrance.

Response 7: **A cross section has been added at *Maverick Street*, south of the driveway entrance. Again, since the 100yr flow depth is 0.77ft, we have proposed a barrier using a single course solid grouted CMU wall at the back of sidewalk so the 100yr flow depth (0.77ft) can be contained as it flows south along Maverick Street toward Smoke Ranch Rd. See revised Plans and Detail 'G' on Sheet C6.04 which reflects this section.**

8. Revise and replace Note #6 of the "*Stormwater Management Notes*" on all grading plans with the following note as Standard Note No. 6:

   Post-Construction BMPs (PCBMPs) / Control Measures noted on the Grading Plans are mandatory permanent regulatory stormwater pollution controls. These PCBMPs must be installed per the approved plans and must be permanently maintained.

Response 8: **Note #6 of the *"Stormwater Management Notes"* has been revised accordingly.**

9. Add a note in all pertinent sheets for the construction of all storm drain drop inlets per a newly adopted USDCCA Drawing No. 421 (*Stormwater Quality Management Stamp and Sign Detail*).

Response 9: **This note was <u>not</u> added to our plans since we are not proposing to construct any storm drain drop inlets. We will add this note to future plan submittals when we have proposed inlets.**

If you have any questions or further comments, please contact our office at your convenience.

Sincerely,
Lochsa Engineering

Chris Blake, EI
Hydrologist

Responses to Comments

Comment #2

T 702-365-9312 | F 702-365-9317
6345 S Jones Blvd, Suite 100
Las Vegas, NV 89118

Lochsa engineering

July 10, 2023

City of Las Vegas
Attention: Mark Rex & Romeo Gumarang
Department of Community Development | Public Planning Section
495 S Main Street
Las Vegas, NV 89101

Subject: **Justification Letter**
Proposed Grade Difference of 2-Feet from the Existing Grade
Brinley Middle School @ APN 138-14-802-005
Lochsa #221095

To Whom It May Concern:

This letter is to inform you that Lochsa Engineering anticipates earthwork fill of over 2-feet in areas within the proposed project. Likewise, Lochsa Engineering anticipates earthwork cut over 2 feet around the proposed project.

Lochsa Engineering recently conducted a comparison analysis of the proposed surface to the existing surface. As a result, the earthwork fill is not anticipated to surpass 5.5-feet from the currently existing ground. Also, the earthwork cut is not expected to be more than 9.5-feet from the currently existing ground. The proposed earthwork depicted on the Grading Plan will be needed for the adequate conveyance of stormwater flow away from the proposed project.

We hope that this Justification Letter is adequate. Feel free to contact our office with any questions you may have. Thank you.

Sincerely,
LOCHSA ENGINEERING

E León
Edgar León, PE

PROFESSIONAL ENGINEER – STATE OF NEVADA
EDGAR LEÓN
EXP.: 12/31/2023
CIVIL
No. 21493
2023.07.25 10:26:18-07'00'

APPROVED
DEPARTMENT OF PLANNING
CITY OF LAS VEGAS, NEVADA
2-Foot Grade Difference Only
rgumarang
Jul 25 2023

Comment #4

Revised Existing Condition Hydrology

DEVELOPMENT: BRINLEY MIDDLE SCHOOL REPLACEMENT
CALCULATED BY: CB
PROJECT NUMBER: 221095

DATE: July 26, 2023

SUB-BASIN DATA				INITIAL/OVERLAND TIME (ti)			TRAVEL TIME (tt)				tc CHECK (URBANIZED BASINS)		FINAL tc	REMARKS			
DESIGN (1)	K (2)	AREA Ac (3)	AREA Sq. Mile (4)	LENGTH Ft (5)	SLOPE % (6)	ti Min (7)	LENGTH Ft (8)	SLOPE % (9)	VELOCITY FPS (10)	tt Min (11)	TOTAL LENGTH Ft (12)	tc =(L/180)+10 Min (13)	Min (14)	CN (15)	tL Hrs (16)	Urbanized? (17)	Soil Type (18)
NX5	0.8264	1.57	0.00245	55	1.8	3.0	690	2.0	1.5	7.4	745	14.1	10.4	92.2	0.104	YES	D
NX6	0.8156	6.36	0.00994	65	1.0	4.1	650	1.1	1.8	6.2	715	14.0	10.3	91.3	0.103	YES	D

ti = 1.8 (1.1 - K) L^(0.5) / S^(1/3)

K = 0.0132 CN - 0.39

tt = L / (60 V)

tc = ti + tt

tL= tLAG = 0.6 tc

LOCATION: Onsite & Offsite
HYDROLOGIC CONDITION: Existing

TRIAL: Final Iteration

Curve Number Calculations
BRINLEY MIDDLE SCHOOL REPLACEMENT

Sub-Basin: **NX5**
Total Area: 1.57 Acres

Land Use/Cover type	Area [A] (acres)	Soil Type	Percentage, P [P]	Curve Number [CN]	Product {CN x P}
Open Space: Poor Condition	1.02	D	65%	89	57.8
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	0.55	D	35%	98	34.3
Total:	1.57	-	100%	-	92.2

Curve Number Calculations
BRINLEY MIDDLE SCHOOL REPLACEMENT

Sub-Basin: **NX6**
Total Area: 6.36 Acres

Land Use/Cover type	Area [A] (acres)	Soil Type	Percentage, P [P]	Curve Number [CN]	Product {CN x P}
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	1.65	D	26%	98	25.4
Open Space: Poor Condition	4.71	D	74%	89	65.9
Total:	6.36	-	100%	-	91.3

AVERAGE VELOCITY

Input Variables					Basin NX5	Basin NX6										
Bottom Width, B, (ft):					4.0	4.0										
Right Side Slope, Zr:					100	100										
Left Side Slope, Zl:					100	100										
Manning's n:					0.020	0.020										
Geometric Slope, So (ft/ft):	0.000	0.000	0.000	0.000	0.020	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Flowrate, Q (cfs) *:					2	8										
						Output Variables										
Normal Depth, Yn (ft):					0.10	0.19										
Area of Flow, A, (sf):					1.29	4.56										
Velocity, V (fps):					1.55	1.76										
Wetted Perimeter, p (ft):					23.08	42.89										
Hydraulic Radius, Rh (ft):					0.06	0.11										
Free SurfaceTop Width, T (ft):					23.08	42.89										
Centroid, Y*, (ft):					0.04	0.07										

*** NOTE : HALF OF THE 100-YEAR STORM RUNOFF FLOWS IS USED TO DETERMINE THE BASIN TRAVEL VELOCITY REQUIRED FOR THE LAG TIME CALCULATIONS**

Revised HEC-1 Analysis

(Existing Conditions)

Peak Flow Summary
Existing Condition

HEC-1 ID	Area (acres)	10-year Flow (cfs)	100-year Flow (cfs)	
NX1	2.46	4	8	
NX2	2.03	4	7	
FD2	15.19	20	42	
FD3	4.31	8	15	
NX3	2.43	5	9	
NX4	2.06	4	7	
SMK	2.74	5	9	
*CLV MPU	-	0	432	
CPX1	-	21	472	(FD3 + NX3 + NX4 + SMK + REF. FLOW)
FD1	5.99	9	18	
NX7	1.28	2	3	
CPX2	-	32	493	(CPX1 + FD1 + ND7)
NX5	1.57	2	4	
NX6	6.36	7	16	

*CLV MPU FIGURE F-15 (APPENDIX C)

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN  1998                 *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   31JUL23  TIME  14:06:55   *
*                                       *
*****************************************
```

X

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

   1          ID
   2          ID        ********** TECHNICAL DRAINAGE STUDY FOR BRINLEY MIDDLE SCHOOL REPLACEME
   3          ID        EXISTING CONDITIONS - ONSITE AND OFFSITE
   4          ID        USING SCS METHODS AND KINEMATIC WAVE ROUTING
   5          ID        MASTER PLAN ADJUSTED 6-HOUR RAINFALL AND STORM DISTRIBUTION
   6          ID
   7          ID        LOCHSA JOB # 221095
   8          ID
   9          ID
  10          ID        INPUT FILE NAME:  X.DAT
  11          ID
  12          ID        JULY 2023
  13          ID
  14          ID        ************************************************************************
  15          ID        ************************************************************************
  16          ID             McCARRAN AIRPORT RAINFALL AREA
  17          ID             10 & 100 YEAR - 6 HOUR STORM EVENT
  18          ID             PRECIPITATION:
  19          ID                 10-YEAR          : 1.58 INCHES
  20          ID                 100-YEAR         : 2.77 INCHES
  21          ID                 10-YEAR/100-YEAR : 1.58/2.77= 0.5704
  22          ID        ************************************************************************
  23          ID        ************************************************************************
              *DIAGRAM
  24          IT       5                    200
  25          IO       5       0
  26          IN       5
  27          JR    PREC   .5704     1.0

  28          KK     NX1
  29          KM   THE BASIN IS A DEVELOPED ONSITE BASIN ON NORTH PORTION OF PARCEL,
  30          KM   DISCHARGING EAST TO ADJACENT EXISTING BASEBALL FIELD
  31          PB   2.770
  32          PC     0.0     .02     .057     .07     .087    .108     .124     .13     .13     .13
  33          PC     .13     .13      .13    .133      .14    .142     .148    .158     .172    .181
  34          PC     .19    .197     .199      .2     .201    .204     .214    .229     .241    .249
  35          PC    .251    .256      .27    .278     .281    .283     .295    .322     .352    .409
  36          PC    .499     .59      .71    .744     .781    .812     .819    .835     .851    .856
  37          PC     .86    .868     .876    .888      .91    .926     .937     .95      .97    .976
  38          PC    .982    .985     .987    .989      .99    .993     .993    .994     .995    .998
  39          PC    .998    .999      1.0
  40          BA  .00384
  41          LS       0    95.0
  42          UD    .083
              *

  43          KK     NX2
  44          KM   EXISTING BASIN WITH ROOFTOP, PAVED AND GRASS, DISCHARGES EAST TO EXIST.
  45          KM   BASEBALL FIELD
  46          BA  .00317
  47          LS       0    94.9
  48          UD   0.050
              *
```

1 HEC-1 INPUT PAGE 2

```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

  49          KK     FD2
  50          KM   EXISTING BASIN WEST OF SITE (RESIDENCES), DISCHARGES NORTH ALONG MAVERICK
  51          BA  .02373
  52          LS       0    93.0
  53          UD   0.099
              *

  54          KK     FD3
  55          KM   EXISTING BASIN WEST OF SITE (RESIDENCES), DISCHARGES SOUTH ALONG MAVERICK
  56          BA  .00673
  57          LS       0    94.7
  58          UD   0.050
              *

  59          KK     NX3
  60          KM   EXISTING SITE ON WEST CENTRAL; DRAINING WEST TO MAVERIK STREET
```

```
61          BA  .00380
62          LS     0    97.3
63          UD  0.052
            *

64          KK    NX4
65          KM  SOUTHWEST EXISTING SCHOOL SITE; DISCHARGES SOUTHEAST TO EXIST. DRIVEWAY
66          BA  .00322
67          LS     0    96.8
68          UD  0.054
            *

69          KK    SMK
70          KM  EXIST. STREET BASIN SOUTH OF SITE AND RESIDENCES; DISCHARGES EAST
71          BA  .00428
72          LS     0    96.5
73          UD  0.068
            *

74          KK   CPX1
75          KM  COMBINE REF. CLV MPU FLOW, FD3, NX3, NX4 AND SMK FOR FLOWS DISCHARGING EAST A
76          HC     4
            *

77          KK    FD1
78          KM  OFFSITE BASIN SOUTH OF SITE; DRAINING NORTH TO SMOKE RANCH RD.
79          BA  .00936
80          LS     0    94.8
81          UD  0.097
            *

82          KK    NX7
83          KM  SOUTH SLIVER PORTION OF SITE, DISCHARGING EAST AND SOUTH TO SMOKE RANCH
84          BA  .00200
85          LS     0    91.1
86          UD  0.094
            *
```



```
LINE        ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

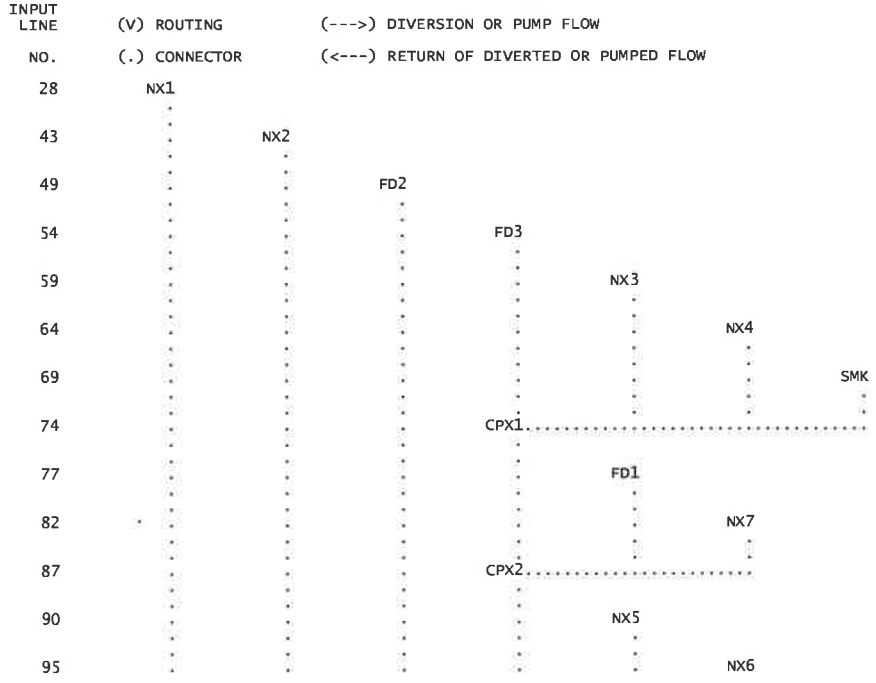
87          KK   CPX2
88          KM  COMBINE CPX1, FD1 AND NX7 FOR FLOWS DISCHARGING EAST ALONG SMOKE RANCH
89          HC     3
            *

90          KK    NX5
91          KM  CENTRAL PORTION OF SITE, DISCHARGING EAST TO PROPERTY LINE
92          BA  .00245
93          LS     0    92.2
94          UD  0.104
            *

95          KK    NX6
96          KM  EAST END OF SITE, DRAINING NORTHEAST TO EXIST. BASEBALL FIELD
97          BA  .00994
98          LS     0    91.3
99          UD  0.103
            *

100         ZZ
```

1 SCHEMATIC DIAGRAM OF STREAM NETWORK



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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1**************************************
 *                                    *
 *   FLOOD HYDROGRAPH PACKAGE (HEC-1) *
 *             JUN  1998              *
 *          VERSION 4.1               *
```

```
**************************************
*                                    *
*    U.S. ARMY CORPS OF ENGINEERS    *
*    HYDROLOGIC ENGINEERING CENTER   *
*          609 SECOND STREET         *
```

X

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*                                          *
*  RUN DATE   31JUL23  TIME  14:06:55       *
*                                          *
********************************************
```

```
*       DAVIS, CALIFORNIA 95616            *
*          (916) 756-1104                  *
*                                          *
********************************************
```

********** TECHNICAL DRAINAGE STUDY FOR BRINLEY MIDDLE SCHOOL REPLACEME
EXISTING CONDITIONS - ONSITE AND OFFSITE
USING SCS METHODS AND KINEMATIC WAVE ROUTING
MASTER PLAN ADJUSTED 6-HOUR RAINFALL AND STORM DISTRIBUTION

LOCHSA JOB # 221095

INPUT FILE NAME: X.DAT

JULY 2023

****
****
McCARRAN AIRPORT RAINFALL AREA
10 & 100 YEAR - 6 HOUR STORM EVENT
PRECIPITATION:
10-YEAR : 1.58 INCHES
100-YEAR : 2.77 INCHES
10-YEAR/100-YEAR : 1.58/2.77= 0.5704
****
****

```
  25 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                       NMIN           5  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME         0000  STARTING TIME
                         NQ         200  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      1    0  ENDING DATE
                     NDTIME        1635  ENDING TIME
                      ICENT          19  CENTURY MARK

                  COMPUTATION INTERVAL      .08 HOURS
                       TOTAL TIME BASE    16.58 HOURS

          ENGLISH UNITS
               DRAINAGE AREA          SQUARE MILES
               PRECIPITATION DEPTH    INCHES
               LENGTH, ELEVATION      FEET
               FLOW                   CUBIC FEET PER SECOND
               STORAGE VOLUME         ACRE-FEET
               SURFACE AREA           ACRES
               TEMPERATURE            DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                     .57      1.00
1
```

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .57	RATIO 2 1.00
HYDROGRAPH AT						
+	NX1	.00	1	FLOW	4.	8.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	NX2	.00	1	FLOW	4.	7.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	FD2	.02	1	FLOW	20.	42.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	FD3	.01	1	FLOW	8.	15.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	NX3	.00	1	FLOW	5.	9.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	NX4	.00	1	FLOW	4.	7.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	SMK	.00	1	FLOW	5.	9.
				TIME	3.50	3.50
4 COMBINED AT						
+	CPX1	.02	1	FLOW	21.	40.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	FD1	.01	1	FLOW	9.	18.
				TIME	3.50	3.50

(Fig. F-15)

+ CLV MPH (0/432) = $\frac{Q_{10}}{21}$ $\frac{Q_{100}}{472}$

HYDROGRAPH AT							
+	NX7	.00	1	FLOW	2.	3.	
				TIME	3.50	3.50	
3 COMBINED AT							
+	CPX2	.03	1	FLOW	32.	61.	+ CLV MP4 (0/432) = Q10/32 Q100/493
				TIME	3.50	3.50	
HYDROGRAPH AT							
+	NX5	.00	1	FLOW	2.	4.	
				TIME	3.50	3.50	
HYDROGRAPH AT							
+	NX6	.01	1	FLOW	7.	16.	
				TIME	3.50	3.50	

*** NORMAL END OF HEC-1 ***

Revised Developed Condition Hydrology

DEVELOPMENT: BRINLEY MIDDLE SCHOOL REPLACEMENT
CALCULATED BY: CB
PROJECT NUMBER: 221095

DATE: July 26, 2023

SUB-BASIN DATA				INITIAL/OVERLAND TIME (ti)			TRAVEL TIME (tt)				tc CHECK (URBANIZED BASINS)		FINAL tc	REMARKS			
DESIGN (1)	K (2)	AREA Ac (3)	AREA Sq. Mile (4)	LENGTH Ft (5)	SLOPE % (6)	ti Min (7)	LENGTH Ft (8)	SLOPE % (9)	VELOCITY FPS (10)	tt Min (11)	TOTAL LENGTH Ft (12)	tc =(L/180)+10 Min (13)	Min (14)	CN (15)	tL Hrs (16)	Urbanized? (17)	Soil Type (18)
ND3	0.9036	1.03	0.00161	30	1.0	1.9	370	1.4	1.6	3.8	400	12.2	5.8	98.0	0.058	YES	D
ND4	0.8824	1.68	0.00263	30	3.0	1.5	445	1.8	2.1	3.5	475	12.6	5.0	96.4	0.050	YES	D
ND5	0.8771	4.99	0.00780	50	1.1	2.7	750	1.4	3.2	3.9	800	14.4	6.6	96.0	0.066	YES	D
ND6	0.8881	2.30	0.00359	40	28.0	0.8	680	0.8	2.2	5.2	720	14.0	6.0	96.8	0.060	YES	D
ND7	0.8774	2.62	0.00409	40	4.0	1.6	340	0.9	2.3	2.4	380	12.1	4.0	96.0	0.050	YES	D

ti = 1.8 (1.1 - K) L^(0.5) / S^(1/3)

K = 0.0132 CN - 0.39

tt = L / (60 V)

tc = ti + tt

tL= tLAG = 0.6 tc

LOCATION: Onsite & Offsite
HYDROLOGIC CONDITION: Developed

TRIAL: Final Iteration

Curve Number Calculations
BRINLEY MIDDLE SCHOOL REPLACEMENT

Sub-Basin: **ND3**
Total Area: 1.03 Acres

Land Use/Cover type	Area [A] (acres)	Soil Type	Percentage, P [P]	Curve Number [CN]	Product {CN x P}
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	1.03	D	100%	98	98.0
Total:	1.03	-	100%	-	98.0

Curve Number Calculations
BRINLEY MIDDLE SCHOOL REPLACEMENT

Sub-Basin: **ND4**
Total Area: 1.68 Acres

Land Use/Cover type	Area [A] (acres)	Soil Type	Percentage, P [P]	Curve Number [CN]	Product {CN x P}
Natural desert landscaping (pervious areas only)	0.27	D	16%	88	14.1
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	1.41	D	84%	98	82.3
Total:	1.68	-	100%	-	96.4

Curve Number Calculations
BRINLEY MIDDLE SCHOOL REPLACEMENT

Sub-Basin: **ND5**
Total Area: 4.99 Acres

Land Use/Cover type	Area [A] (acres)	Soil Type	Percentage, P [P]	Curve Number [CN]	Product {CN x P}
Natural desert landscaping (pervious areas only)	1.00	D	20%	88	17.6
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	3.99	D	80%	98	78.4
Total:	4.99	-	100%	-	96.0

Curve Number Calculations
BRINLEY MIDDLE SCHOOL REPLACEMENT

Sub-Basin: **ND6**
Total Area: 2.30 Acres

Land Use/Cover type	Area [A] (acres)	Soil Type	Percentage, P [P]	Curve Number [CN]	Product {CN x P}
Natural desert landscaping (pervious areas only)	0.27	D	12%	88	10.3
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	2.03	D	88%	98	86.5
Total:	2.30	-	100%	-	96.8

Curve Number Calculations
BRINLEY MIDDLE SCHOOL REPLACEMENT

Sub-Basin: **ND7**
Total Area: 2.62 Acres

Land Use/Cover type	Area [A] (acres)	Soil Type	Percentage, P [P]	Curve Number [CN]	Product {CN x P}
Natural desert landscaping (pervious areas only)	0.52	D	20%	88	17.5
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	2.10	D	80%	98	78.5
Total:	2.62	-	100%	-	96.0

AVERAGE VELOCITY

Input Variables				Basin ND3	Basin ND4	Basin ND5	Basin ND6	Basin ND7								
Bottom Width, B, (ft):				3.0	2.0	2.0	2.0	2.0								
Right Side Slope, Zr:				100	100	50	50	50								
Left Side Slope, Zl:				100	0	0	0	0								
Manning's n:				0.016	0.018	0.016	0.016	0.016								
Geometric Slope, So (ft/ft):	0.000	0.000	0.000	0.014	0.018	0.014	0.008	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Flowrate, Q (cfs) *:				2	3	8.5	4	4.5								
Output Variables																
Normal Depth, Yn (ft):				0.10	0.15	0.29	0.23	0.24								
Area of Flow, A, (sf):				1.25	1.42	2.63	1.85	1.93								
Velocity, V (fps):				1.60	2.11	3.23	2.16	2.33								
Wetted Perimeter, p (ft):				22.53	17.12	16.65	13.98	14.29								
Hydraulic Radius, Rh (ft):				0.06	0.08	0.16	0.13	0.14								
Free SurfaceTop Width, T (ft):				22.53	16.97	16.36	13.74	14.04								
Centroid, Y*, (ft):				0.04	0.06	0.11	0.09	0.09								

*** NOTE : HALF OF THE 100-YEAR STORM RUNOFF FLOWS IS USED TO DETERMINE THE BASIN TRAVEL VELOCITY REQUIRED FOR THE LAG TIME CALCULATIONS**

Revised HEC-1 Analysis

(Developed Conditions)

Peak Flow Summary
Developed Condition

HEC-1 ID	Area (acres)	10-year Flow (cfs)	100-year Flow (cfs)	
ND1	4.47	5	12	
NI2	0.24	<1	1	
FD2	15.19	20	42	
CPD1	-	20	42	(NI2 + FD2)
ND3	1.03	2	4	
ND6	2.30	4	8	
CPD2	-	6	12	(ND3 + ND6)
NI8	0.27	<1	1	
FD3	4.31	8	15	
NI9	0.59	1	2	
SMK	2.74	5	9	
*CLV MPU	-	0	432	
CPD3	-	14	459	(NI8 + FD3 + NI9 + SMK + REF. FLOW)
ND4	1.68	3	6	
ND5	4.99	9	17	
CPD4	-	12	23	(ND4 + ND5)
FD1	5.99	9	18	
ND7	2.62	5	9	
CPD5	-	40	508	(CPD3 + CPD4 + FD1 + ND7 + REF. FLOW)

*CLV MPU FIGURE F-15 (APPENDIX C)

d

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN  1998                 *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   25JUL23  TIME  13:44:04   *
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*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDRDLDGIC ENGINEERING CENTER      *
*         609 SECOND STREET             *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X       XXXXX  X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PRDGRAM REPLACES ALL PREVIDUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIDNS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATIDN
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
    1         ID
    2         ID        ********** TECHNICAL DRAINAGE STUDY FOR BRINLEY MIDDLE SCHOOL REPLACEME
    3         ID        INTERIM / DEVELDPED CONDITION - ONSITE AND OFFSITE
    4         ID        USING SCS METHDDS AND KINEMATIC WAVE ROUTING
    5         ID        MASTER PLAN ADJUSTED 6-HOUR RAINFALL AND STORM DISTRIBUTION
    6         ID
    7         ID        LOCHSA JDB # 221095
    8         ID
    9         ID
   10         ID        INPUT FILE NAME:  D.DAT
   11         ID
   12         ID        JULY 2023
   13         ID
   14         ID        ************************************************************************
   15         ID        ************************************************************************
   16         ID             McCARRAN AIRPORT RAINFALL AREA
   17         ID             10 & 100 YEAR - 6 HOUR STORM EVENT
   18         ID             PRECIPITATION:
   19         ID                 10-YEAR          : 1.58 INCHES
   20         ID                 100-YEAR         : 2.77 INCHES
   21         ID                 10-YEAR/100-YEAR : 1.58/2.77= 0.5704
   22         ID        ************************************************************************
   23         ID        ************************************************************************
              *DIAGRAM
   24         IT       5                    200
   25         IO       5       0
   26         IN       5
   27         JR    PREC   .5704     1.0

   28         KK     ND1
   29         KM   THE BASIN IS A DEVELOPED DNSITE BASIN ON NORTH PORTION OF PARCEL,
   30         KM   DISCHARGING EAST TO ADJACENT EXISTING BASEBALL FIELD
   31         PB   2.770
   32         PC     0.0     .02     .057     .07     .087     .108     .124     .13     .13     .13
   33         PC     .13     .13     .133     .14     .142     .148     .158     .172    .181
   34         PC     .19    .197     .199      .2     .201     .204     .214     .229    .241    .249
   35         PC    .251    .256      .27     .278    .281     .283     .295     .322    .352    .409
   36         PC    .499     .59      .71     .744    .781     .812     .819     .835    .851    .856
   37         PC     .86    .868     .876     .888     .91     .926     .937     .95     .97     .976
   38         PC    .982    .985     .987     .989     .99     .993     .993     .994    .995    .998
   39         PC    .998    .999      1.0
   40         BA  .00698
   41         LS       0    90.1
   42         UD    .072
              *

   43         KK     NI2
   44         KM   DVEELDPED LANDSCAPING AREA ALONG MAVERICK; DISCHARGES WEST TO MAVERICK
   45         BA  .00038
   46         LS       0    88.0
   47         UD   0.056
              *
```



```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

   48         KK     FD2
   49         KM   EXISTING BASIN WEST OF SITE (RESIDENCES), DISCHARGES NORTH ALONG MAVERICK
   50         BA  .02373
   51         LS       0    93.0
   52         UD   0.099
              *

   53         KK    CPD1
   54         KM   COMBINE NI2 & FD2 IN MAVERICK; DISCHARGES NORTH ALDNG MAVERICK
   55         HC       2
              *

   56         KK     ND3
   57         KM   DEVELOPED BASIN OF ATHLETIC COURTS; DRAINING EAST
   58         BA  .00161
   59         LS       0    98.0
   60         UD   0.058
```

```
                *
          61    KK     ND6
          62    KM   DEVELOPED BASIN DF DRIVE ISLE AND BLDG.; DRAINING EAST
          63    BA  .00359
          64    LS       0     96.8
          65    UD    0.060
                *
          66    KK    CPD2
          67    KM   COMBINE ND3 & ND6; DISCHARGES EAST
          68    HC       2
                *
          69    KK     NI8
          70    KM   DEVELOPED LANDSCAPING AREA ALONG MAVERICK; DISCHARGES WEST TO MAVERICK
          71    BA  .00042
          72    LS       0     88.0
          73    UD    0.050
                *
          74    KK     FD3
          75    KM   EXISTING BASIN WEST OF SITE (RESIDENCES), DISCHARGES SOUTH ALONG MAVERICK
          76    BA  .00673
          77    LS       0     94.7
          78    UD    0.050
                *
          79    KK     NI9
          80    KM   EXISTING DEVELDPED SITE; DISCHARGES SOUTH TD SMOKE RANCH RD.
          81    BA  .00092
          82    LS       0     92.7
          83    UD    0.050
                *
1                                                HEC-1 INPUT                                                PAGE  3

        LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

          84    KK     SMK
          85    KM   EXIST. STREET BASIN SOUTH OF SITE AND RESIDENCES; DISCHARGES EAST
          86    BA  .00428
          87    LS       0     96.5
          88    UD    0.068
                *
          89    KK    CPD3
          90    KM   CDMBINE REF. CLV MPU FLDW (0/432CFS), NI8, FD3, NI9 AND SMK; DISCHARGES EAST
          91    HC       4
                *
          92    KK     ND4
          93    KM   CENTRAL PORTIDN DF SITE CONSISTS OF ATHLETCI CDURTS, DISCHARGING EAST TO PARK
          94    BA  .00263
          95    LS       0     96.4
          96    UD    0.050
                *
          97    KK     ND5
          98    KM   CENTRAL PORTION OF SITE, DISCHARGING SOUTH TO SMOKE RANCH
          99    BA  .00780
         100    LS       0     96.0
         101    UD    0.066
                *
         102    KK    CPD4
         103    KM   COMBINE ND4 AND ND5; DISCHARGES SOUTH THROUGH CENTRAL DRIVEWAY
         104    HC       2
                *
         105    KK     FD1
         106    KM   OFFSITE BASIN SOUTH OF SITE; DRAINING NDRTH TO SMOKE RANCH RD.
         107    BA  .00936
         108    LS       0     94.8
         109    UD    0.097
                *
         110    KK     ND7
         111    KM   SOUTHEAST PORTION DF SITE, DISCHARGING SOUTH TO SMDKE RANCH
         112    BA  .00409
         113    LS       0     96.0
         114    UD    0.050
                *
         115    KK    CPD5
         116    KM   COMBINE CPD3, CPD4, FD1 AND ND7 IN SMOKE RANCH; DISCHARGING EAST ALONG SMOKE
         117    HC       4
                *
         118    ZZ
1
              SCHEMATIC DIAGRAM OF STREAM NETWORK

  INPUT
   LINE      (V) ROUTING          (---->) OIVERSION OR PUMP FLOW

    NO.      (.) CONNECTOR        (<----) RETURN OF DIVERTED OR PUMPED FLOW

     28         ND1
                  .
                  .
     43           .         NI2
                  .          .
                  .          .
     48           .          .         FD2
                  .          .          .
                  .          .          .
     53           .        CPD1.........
                  .          .
                  .          .
     56           .          .         ND3
                  .          .          .
                  .          .          .
     61           .          .          .         ND6
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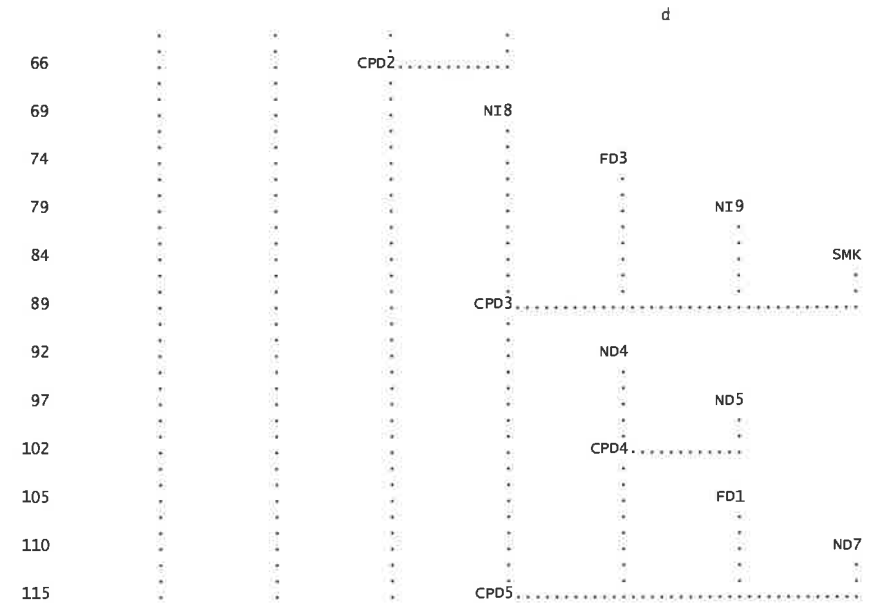

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1**********
* *
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* *
* RUN DATE 25JUL23 TIME 13:44:04 *
* *
****

****
* *
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *
* *
****

********** TECHNICAL DRAINAGE STUDY FOR BRINLEY MIDDLE SCHOOL REPLACEME
INTERIM / DEVELOPED CONDITION - ONSITE AND OFFSITE
USING SCS METHODS AND KINEMATIC WAVE ROUTING
MASTER PLAN ADJUSTED 6-HOUR RAINFALL AND STORM DISTRIBUTION

LOCHSA JOB # 221095

INPUT FILE NAME: D.DAT

JULY 2023

****
****
McCARRAN AIRPORT RAINFALL AREA
10 & 100 YEAR - 6 HOUR STORM EVENT
PRECIPITATION:
10-YEAR : 1.58 INCHES
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10-YEAR/100-YEAR : 1.58/2.77= 0.5704
****
****

25 IO OUTPUT CONTROL VARIABLES
IPRNT 5 PRINT CONTROL
IPLOT 0 PLOT CONTROL
QSCAL 0. HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA
NMIN 5 MINUTES IN COMPUTATION INTERVAL
IDATE 1 0 STARTING DATE
ITIME 0000 STARTING TIME
NQ 200 NUMBER OF HYDROGRAPH ORDINATES
NDDATE 1 0 ENDING DATE
NDTIME 1635 ENDING TIME
ICENT 19 CENTURY MARK

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 16.58 HOURS

ENGLISH UNITS
DRAINAGE AREA SQUARE MILES
PRECIPITATION DEPTH INCHES
LENGTH, ELEVATION FEET
FLOW CUBIC FEET PER SECOND
STORAGE VOLUME ACRE-FEET
SURFACE AREA ACRES
TEMPERATURE DEGREES FAHRENHEIT

JP MULTI-PLAN OPTION
NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
.57 1.00

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES

d
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .57	RATIO 2 1.00
HYDROGRAPH AT						
+	ND1	.01	1	FLOW	5.	12.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	NI2	.00	1	FLOW	0.	1.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	FD2	.02	1	FLOW	20.	42.
				TIME	3.50	3.50
2 COMBINED AT						
+	CPD1	.02	1	FLOW	20.	42.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ND3	.00	1	FLOW	2.	4.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ND6	.00	1	FLOW	4.	8.
				TIME	3.50	3.50
2 COMBINED AT						
+	CPD2	.01	1	FLOW	6.	12.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	NI8	.00	1	FLOW	0.	1.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	FD3	.01	1	FLOW	8.	15.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	NI9	.00	1	FLOW	1.	2.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	SMK	.00	1	FLOW	5.	9.
				TIME	3.50	3.50
4 COMBINED AT						
+	CPD3	.01	1	FLOW	14.	27.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ND4	.00	1	FLOW	3.	6.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ND5	.01	1	FLOW	9.	17.
				TIME	3.50	3.50
2 COMBINED AT						
+	CPD4	.01	1	FLOW	12.	23.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	FD1	.01	1	FLOW	9.	18.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ND7	.00	1	FLOW	5.	9.
				TIME	3.50	3.50
4 COMBINED AT						
+	CPD5	.04	1	FLOW	40.	76.
				TIME	3.50	3.50

Q10 Q100
+CLV MPU (0/432) = 14 459

Q10 Q100
+CLV MPU (0/432) = 40 508

*** NORMAL END OF HEC-1 ***

Revised Hydraulic Calculations

(Developed Conditions)

On-Site Sections
(Developed Condition)

Hydraulic Cross-Section Identifier	100-Year Flow [Q100] (cfs)	100-Year Velocity [v] (fps)	100-Year Flow Depth [d] (ft)	100-Year [v] x [d]
A	6	2.51	0.59	1.48
B	17	2.33	0.36	0.84
C	2	2.14	0.41	0.88

Onsite Section A - Developed Condition - 100year
Worksheet for Irregular Channel

Project Description	
Worksheet	Onsite Section A - Developed Condition (100yr)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	.004000	ft/ft
Discharge	6.00	cfs

ND3(4) + ¼ ND6(2) = 8cfs

Options	
Current Roughness Meth	oved Lotter's Method
Open Channel Weighting	oved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coefficie	0.014	
Water Surface Elev	72.06	ft
Elevation Range	.47 to 73.36	
Flow Area	2.4	ft²
Wetted Perimeter	10.07	ft
Top Width	9.43	ft
Actual Depth	0.59	ft
Critical Elevation	72.03	ft
Critical Slope	0.005247	ft/ft
Velocity	2.51	ft/s
Velocity Head	0.10	ft
Specific Energy	72.16	ft
Froude Number	0.88	
Flow Type	Subcritical	

d100

V100

D x V < 8 ok

FF = 72.75'

WSE = 72.06'

d100 + .59'

72.65' < 72.75' (FF)

FF meets

Calculation Messages:
Water elevation exceeds lowest end station by 0.88922483e-1 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+30.50	0.016
0+30.50	0+32.50	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	73.36
0+30.50	71.64
0+30.50	71.60
0+32.00	71.47
0+32.00	71.97
0+32.50	71.97

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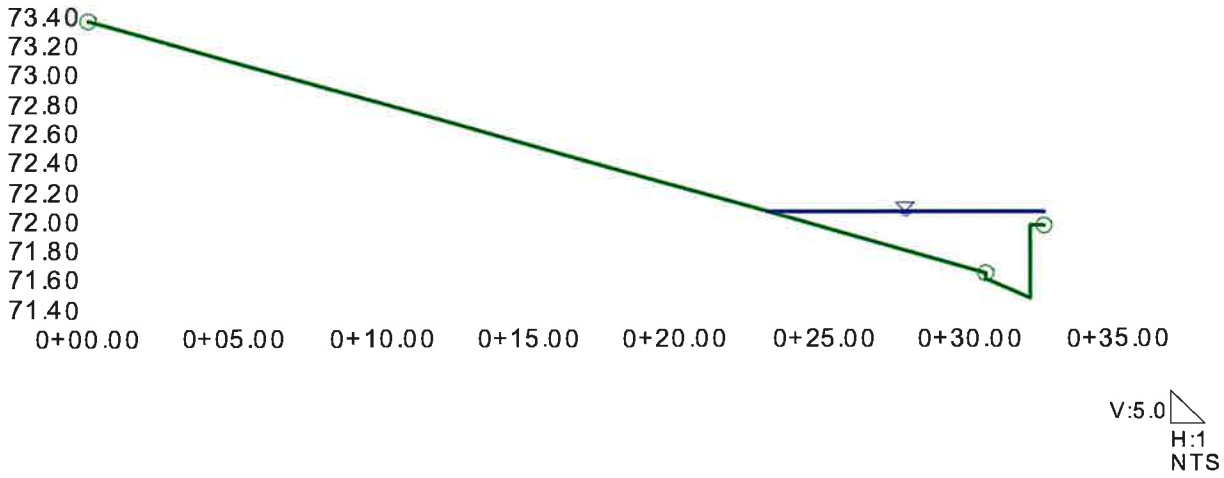
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666
Project Engineer: Hani Noshi

Onsite Section A - Developed Condition - 100year
Cross Section for Irregular Channel

Project Description	
Worksheet	Onsite Section A - Developed Conditior
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficiel	0.014	
Slope	0.004000	ft/ft
Water Surface Elev	72.06	ft
Elevation Range	.47 to 73.36	
Discharge	6.00	cfs



Onsite Section B - Developed Condition - 100year
Worksheet for Irregular Channel

Project Description	
Worksheet	Onsite Section B - Developed Condition (100yr)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	.006000	ft/ft
Discharge	17.00	cfs

← NOS (very conservative using entire basin flow)

Options	
Current Roughness Meth	oved Lotter's Method
Open Channel Weighting	oved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coefficie	0.016	
Water Surface Elev	72.04	ft
Elevation Range	.68 to 72.36	
Flow Area	7.3	ft²
Wetted Perimeter	40.08	ft
Top Width	39.50	ft
Actual Depth	0.36	ft ← d_{100}
Critical Elevation	72.03	ft
Critical Slope	0.006619	ft/ft
Velocity	2.33	ft/s ← V_{100}
Velocity Head	0.08	ft
Specific Energy	72.12	ft
Froude Number	0.96	
Flow Type	Subcritical	

$D \times V < 8$ OK ✓

FF = 72.75'

WSE = 72.04'
$+ d_{100}$ .36'
72.40' < 72.75' (FF)

FF MEETS ✓

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+02.00	0.013
0+02.00	0+40.00	0.016
0+40.00	0+40.50	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	72.18
0+00.50	72.18
0+00.50	71.68
0+02.00	71.81
0+02.00	71.85
0+40.00	71.86
0+40.00	72.36
0+40.50	72.36

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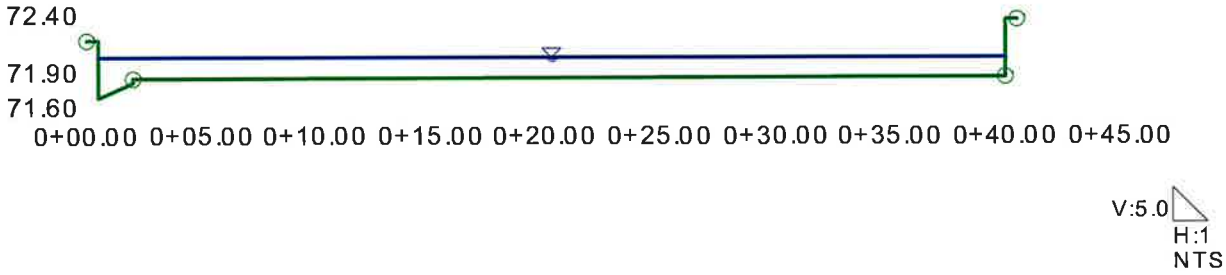
Onsite Section B - Developed Condition - 100year
Cross Section for Irregular Channel

Project Description	
Worksheet	Onsite Section B - Developed Conditior
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficiel	0.016	
Slope	0.006000	ft/ft
Water Surface Elev	72.04	ft
Elevation Range	.68 to 72.36	
Discharge	17.00	cfs



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Onsite Section C - Developed Condition - 100year
Worksheet for Irregular Channel

Project Description	
Worksheet	Onsite Section C - Developed Condition (100yr)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	.005000	ft/ft
Discharge	2.00	cfs

← Conservative since at very upstream portion of BASIN near High Pt.

Options	
Current Roughness Meth	oved Lotter's Method
Open Channel Weighting	oved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coefficie	0.015	
Water Surface Elev	68.63	ft
Elevation Range	.22 to 70.63	
Flow Area	0.9	ft²
Wetted Perimeter	5.55	ft
Top Width	5.09	ft
Actual Depth	0.41	ft ← d_{100}
Critical Elevation	68.61	ft
Critical Slope	0.006567	ft/ft
Velocity	2.14	ft/s ← V_{100}
Velocity Head	0.07	ft
Specific Energy	68.70	ft
Froude Number	0.88	
Flow Type	Subcritical	

$D \times V < 8$ OK

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+02.00	0.013
0+02.00	0+28.50	0.016
0+28.50	0+29.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	68.72
0+00.50	68.72
0+00.50	68.22
0+02.00	68.35
0+02.00	68.39
0+28.50	70.13
0+28.50	70.63
0+29.00	70.63

FF = 71.00'

WSE = 68.63'

$+ d_{100}$ .41'

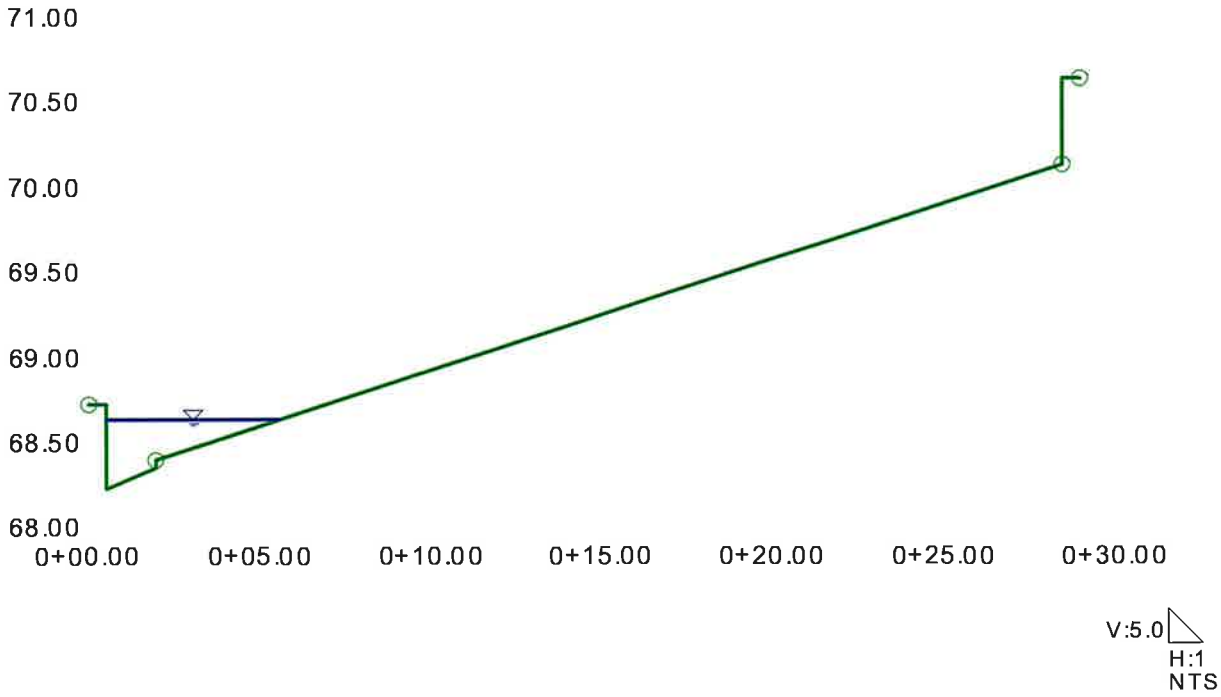
69.04' < 71.00' (FF)

FF MEETS ✓

Onsite Section C - Developed Condition - 100year
Cross Section for Irregular Channel

Project Description	
Worksheet	Onsite Section C - Developed Conditior
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficie	0.015	
Slope	0.005000	ft/ft
Water Surface Elev	68.63	ft
Elevation Range	.22 to 70.63	
Discharge	2.00	cfs



Street Flow Summary
(Developed Condition)

10-year, 6-hour Storm

Street	Right of Way Width (ft)	Hydraulic Cross-Section Identifier	10-Year Flow [Q10] (cfs)	10-Year Velocity [v] (fps)	10-Year Flow Depth [d] (ft)	10-Year Velocity x Depth [v x d]	Dry Lane Width (within 1/2 ROW) (ft)
Smoke Ranch Road	100	5	14	3.70	0.56	2.07	Meets
Smoke Ranch Road	100	6	40	3.85	0.64	2.46	20.10
Maverick Street	60	7	20	2.71	0.57	1.54	N/A
Maverick Street	60	8	9	1.51	0.67	1.01	N/A

Street Flow Summary
(Developed Condition)

100-year, 6-hour Storm

Street	Right of Way Width (ft)	Hydraulic Cross-Section Identifier	100-Year Flow [Q100] (cfs)	100-Year Velocity [v] (fps)	100-Year Flow Depth [d] (ft)	100-Year Velocity x Depth [v x d]
Smoke Ranch Road	100	5	459	7.94	1.40	11.12
Smoke Ranch Road	100	6	508	8.01	1.26	10.09
Maverick Street	60	7	42	3.49	0.66	2.30
Maverick Street	60	8	16	1.71	0.77	1.32

Street Section 6 - Developed Condition - Smoke Ranch Road - 10year
Worksheet for Irregular Channel

Project Description	
Worksheet	Street Section 6 - Developed Condition - Smoke Ranch
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

h (10yr)

Input Data		
Slope	.013000	ft/ft
Discharge	40.00	cfs

CPD5

Options	
Current Roughness Meth	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coefficie	0.015	
Water Surface Elev	66.45	ft
Elevation Range	.81 to 66.86	
Flow Area	10.4	ft²
Wetted Perimeter	51.36	ft
Top Width	50.23	ft
Actual Depth	0.64	ft
Critical Elevation	66.52	ft
Critical Slope	0.005580	ft/ft
Velocity	3.85	ft/s
Velocity Head	0.23	ft
Specific Energy	66.68	ft
Froude Number	1.49	
Flow Type	Supercritical	

d_{10}

V_{10}

$D \times V < 6$ OK

Calculation Messages:
Water elevation exceeds lowest end station by 0.39216953e-1 ft.
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+93.00	0.016
0+93.00	1+00.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	66.41
0+05.00	66.31
0+05.50	66.31
0+05.50	65.81
0+07.00	65.94
0+07.00	65.98
0+50.00	66.86

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Street Section 6 - Developed Condition - Smoke Ranch Road - 10year
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+93.00	66.13
0+93.00	66.09
0+94.50	65.96
0+94.50	66.46
0+95.00	66.46
1+00.00	66.56

Street Section 6 - Developed Condition - Smoke Ranch Road - 10year
Cross Section for Irregular Channel

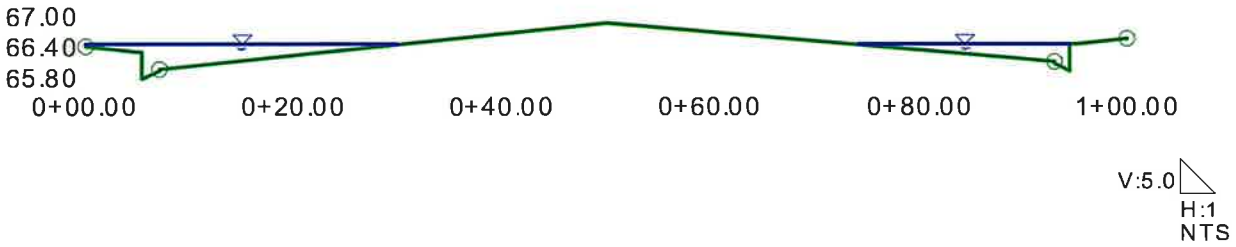
Project Description	
Worksheet	Street Section 6 - Developed Condition - Smoke Ranc
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficie	0.015	
Slope	0.013000	ft/ft
Water Surface Elev	66.45	ft
Elevation Range	65.81 to 66.86	
Discharge	40.00	cfs

dry lane = $\frac{66.86' - 66.45'}{.0204} = 20.10'$

dry lane meets

20.10'



V:5.0
H:1
NTS

Street Section 6 - Developed Condition - Smoke Ranch Road - 100year
Worksheet for Irregular Channel

Project Description	
Worksheet	Street Section 6 - Developed Condition - Smoke Ranch (100yr)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	.013000	ft/ft
Discharge	508.00	cfs

← CPDS

Options	
Current Roughness Meth	oved Lotter's Method
Open Channel Weighting	oved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coefficie	0.015	
Water Surface Elev	67.07	ft
Elevation Range	.81 to 66.86	
Flow Area	63.4	ft²
Wetted Perimeter	102.29	ft
Top Width	100.00	ft
Actual Depth	1.26	ft ← d_{100}
Critical Elevation	67.37	ft
Critical Slope	0.003671	ft/ft
Velocity	8.01	ft/s ← V_{100}
Velocity Head	1.00	ft
Specific Energy	68.07	ft
Froude Number	1.77	
Flow Type	Supercritical	

$D \times V \geq 8'$

However, this is AN existing condition & inlet capture is ignored.. Also A regional FACILITY is going to be installed to replace the existing 60" RCP in SMOKE RANCH by FACILITY ID LVSR0496

(The existing 100yr depth is 1.25', where developed is 1.26'. – (MINIMAL impact))

Calculation Messages:
Water elevation exceeds lowest end station by 0.66363843 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+93.00	0.016
0+93.00	1+00.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	66.41
0+05.00	66.31
0+05.50	66.31
0+05.50	65.81
0+07.00	65.94
0+07.00	65.98
0+50.00	66.86
0+93.00	66.13

Street Section 6 - Developed Condition - Smoke Ranch Road - 100year
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+93.00	66.09
0+94.50	65.96
0+94.50	66.46
0+95.00	66.46
1+00.00	66.56

Street Section 6 - Developed Condition - Smoke Ranch Road - 100year
Cross Section for Irregular Channel

Project Description	
Worksheet	Street Section 6 - Developed Condition - Smoke Ranch
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.015	
Slope	0.013000	ft/ft
Water Surface Elev	67.07	ft
Elevation Range	65.81 to 66.86	
Discharge	508.00	cfs