

ADDENDUM #2 TO THE TECHNICAL DRAINAGE STUDY

FOR HICKAM AND LEON WEST AND EAST RESIDENTIAL

BND_21003

DS5497

CITY OF LAS VEGAS

FEBRUARY 2022

Prepared for:

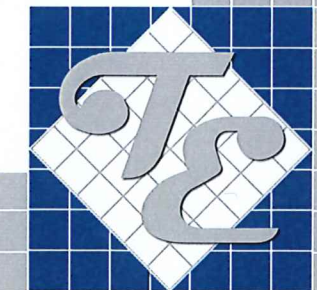
Client Representative BRAD BURNS
BLEND COMMUNITIES I, LLC
9875 WEST LA MANCHA AVENUE
LAS VEGAS, NV 89149
(702) 355-1400
brad.burns@blendcommunities.com



Engineer

's Seal

TANEY & ENGINEERING



6030 S. Jones Blvd.
Las Vegas, NV 89118
Phone (702) 362-8844
Fax (702) 362-5233

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: Hickam and Leon West and East Residential Development Date: Feb 7, 2022

Location of Development: a) Descriptive (Cross Streets) North/South: Leon
East/West: Hickam

b) Section: 1 Township: 20S Range: 60E

c) APN : 138-01-302-002, 003, and 004; 138-01-301-017

Name of Owner: Blend Communities I, LLC

Telephone No.: (702) 355-1400 Fax No.: _____ E-Mail Address: brad.burns@blendcommunities.com

Address: 330 Carousel Pkwy, Henderson, NV 89014

Contact Person-Name: Janelle Klein, P.E., Telephone No.: (702) 362-8844

* E-Mail Address: janelleK@taneycorp.com Fax No.: (702) 362-5233

Firm: Taney Engineering

Address: 6030 S. Jones, Suite 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: 8.16+/- acres Being Developed/Disturbed: 8.16+/- 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.): Residential

5. Approximate upstream land area which drains to the subject site: 35 +/- acres

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: The site will discharge into Leon Avenue and Helen Avenue.

8. Briefly describe your proposed schedule for the subject project: A.S.A.P



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.**

DS5497 Local Entity File No.	Revision	Date

REFERENCE:

STANDARD FORM 1



TANEY ENGINEERING

6030 S. JONES BLVD. LAS VEGAS, NV 89118
PHONE: (702) 362-8844 | FAX: (702) 362-5233
TANEYCORP.COM

Job No. BND_21003

Date: February 7, 2022

JURISDICTION:

Albert Sung, P.E.
Flood Control
City of Las Vegas Public Works
495 South Main Street
Las Vegas, NV 89101

**ADDENDUM #2 to the Technical Drainage Study for HICKAM AND LEON WEST
AND EAST RESIDENTIAL DEVELOPMENT
DS5497B**

Dear Mr. Sung:

Taney Engineering is submitting Addendum #2 in response to comments and questions on the Technical Drainage Study for **HICKAM AND LEON WEST AND EAST Residential Development**. A response to each comment from City of Las Vegas review memorandum dated on December 1, 2021 is provided below.

1. Second Request: Provide a copy of the zoning/planning conditions associated with this site (21-0442-TMP1; 21-0442-VAC1; 21-0442-VAR1; 21-0442-VAR2; 21-0443-TMP1 and 21-0443-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.

The zoning/planning information has been provided in the appendix for review.

2. Figure 6 and Figure 7: Provide a Pima County flow split calculation at the intersection of Hickam Avenue and Helen Avenue to justify the proposed flow rate in the two streets at the intersection.

The flow split has been provided in the appendix. The change of flow in Helen Avenue has been modeled in FlowMaster in the existing and ultimate condition.

Due to the existing grades in Helen Avenue the street had to be transitioned into a cross fall street to show positive grading throughout the curve.

The calculated flow depth in Helen Avenue is 0.56 ft. Twice the depth of flow is 1.12 ft plus edge of pavement flow line of 2229.67 ft gives a flow depth of 2230.79



ft., lower than the existing FF elevation of 2231.50 feet for the existing home east of Helen Avenue.

3. Hickam & Leon West Sheet G1: The proposed edge of pavement at the north end of Leon at 50.57EP appears to be too high and not compatible to the adjacent street grades. Address and resolve in the next submittal.

The grading in Leon has been revised to match the existing grades to the north. See revised grading plan sheets

4. Hickam & Leon East Sheet G1: The proposed north end of curb & gutter in Helen Avenue must transition smoothly to meet the existing curb & gutter. Review and revise accordingly in the next submittal.

The curb and gutter in Helen Avenue grading has been revised to show a smoother surface from north to south in the perimeter street. The grading was revised to show a cross fall street from a smoother transition into the curb. See detail R on the grading plans.

5. A site visit confirmed that there is an existing pedestrian trail along the northern side of Hickam Avenue. Revise Detail Section A/GD1 and all pertinent details in the two subdivisions (East and West) to reflect the existing trail accordingly.

The grading plan has been revised to show the location of the pedestrian trail along the northern right of way of Hickam Avenue.

A copy of the City of Las Vegas Public Works comments has been provided directly following this letter. If you need any additional information, please do not hesitate to call our office.

Sincerely,
TANEY ENGINEERING

Anthony T Henderson
Hydrologist III



HICKAM AND LEON WEST AND EAST
BND_21003

NOFA



**LAS VEGAS
CITY COUNCIL**

CAROLYN G. GOODMAN
Mayor

STAVROS S. ANTHONY
Mayor Pro Tem

MICHELE FIORE

CEDRIC CREAR

BRIAN KNUDSEN

VICTORIA SEAMAN

OLIVIA DIAZ

JORGE CERVANTES
City Manager

DEPARTMENT OF PLANNING

SETH T. FLOYD

DIRECTOR OF
COMMUNITY DEVELOPMENT

CITY HALL

495 S. MAIN ST.

3RD FLOOR

LAS VEGAS, NV 89101

702.229.6301 | VOICE

702.464.2545 | FAX

711 | TTY



cityoflasvegas
lasvegasnevada.gov

December 16, 2021

12/16/21

Vegas Homes, LLC
19333 Collins Avenue, Suite #1708
Sunny Isles Bea, Florida 33160

**RE: ABEYANCE - 21-0443-VAR1 AND 21-0443-TMP1
CITY COUNCIL MEETING OF DECEMBER 15, 2021**

Dear Applicant:

The City Council at a regular meeting held on December 15, 2021 voted to **APPROVE** the following Land Use Entitlement project requests on 3.47 acres at the northwest corner of Hickam Avenue and Helen Avenue (APN 138-01-302-002, 003, and 004), R-E (Residence Estates) Zone, Ward 5 (Crear).

- **21-0443-VAR1 - VARIANCE - TO ALLOW A 38-FOOT WIDE PRIVATE STREET WHERE 47 FEET IS THE MINIMUM REQUIRED FOR A PRIVATE STREET WITHOUT A GATE AND TO ALLOW NO OFFSITE IMPROVEMENTS ON HELEN AVENUE WHERE SUCH ARE REQUIRED**
- **21-0443-TMP1 - TENTATIVE MAP - HICKAM & LEON EAST - FOR A SIX-LOT SINGLE-FAMILY RESIDENTIAL SUBDIVISION**

21-0443-VAR1 approval is subject to the following conditions:

Planning

1. A Variance is hereby approved to allow a 38-foot wide private street where 47 feet is the minimum required for a private street without a gate.
2. Approval of and conformance to the Conditions of Approval for Tentative Map (21-0443-TMP1) shall be required, if approved.
3. This approval shall be void four years from the date of final approval, unless exercised pursuant to the provisions of LVMC Title 19.16. An Extension of Time may be filed for consideration by the City of Las Vegas.

4. All necessary building permits shall be obtained and final inspections shall be completed in compliance with Title 19 and all codes as required by the Department of Building and Safety.
5. These Conditions of Approval shall be affixed to the cover sheet of any plan set submitted for building permit.
6. All City Code requirements and design standards of all City departments must be satisfied, except as modified herein.

Public Works

7. In accordance with Title 19.02.025.F, the applicant shall make a deferral improvement contribution based on urban improvements, prior to the issuance of permits, equal to 50% of the City's bond estimate costs for all deferred improvements with the street light contribution at 25% if a service pedestal is constructed. . If the applicant pays a 100% deferral in lieu of the percentages above, a Covenant Running with Land Agreement shall not be required.
8. Sign and record a Covenant Running with Land agreement for the possible future installation of half-street improvements in accordance with City Standards for all improvements not required to be constructed at this time. Such Covenant Running with Land agreement shall record prior to the issuance of any permits or the recordation of a Final Map for this site, whichever occurs first.

21-0443-TMP1 approval is subject to the following conditions:

Planning

1. All lots within the subdivision will be limited to single-story in height. This condition shall be recorded against the respective properties, by way of recoding a Notice of Condition Affecting Property against each of the parcels specifically burdened by such condition(s) prior to the application for building permits to include the conditions affecting the parcel. Furthermore, the entity making application for a building permit on a parcel specifically burdened by the above condition(s) shall attach the Tentative Map conditions of approval to such building permit application, as well as the entity selling the single-family residence on the parcel that is burdened by the above condition(s) shall provide a disclosure of the above condition(s) to any prospective purchaser of a home on such parcel.

2. Approval of the Tentative Map shall be for no more than four (4) years. If a Final Map is not recorded on all or a portion of the area embraced by the Tentative Map within four (4) years of the approval of the Tentative Map, this action is void.
3. Approval of Variance (21-0443-VAR1) shall be required, if approved.
4. Street names must be provided in accordance with the City's Street Naming Regulations.
5. A fully operational fire protection system, including fire apparatus roads, fire hydrants, and water supply, shall be installed and shall be functioning prior to construction of any combustible structures.
6. In conjunction with creation, declaration, and recordation of the subject common-interest community, and prior to recordation of the Covenants, Codes, and Restrictions ("CC&R"), or conveyance of any unit within the community, the Developer is required to record a Declaration of Private Maintenance Requirements ("DPMR") as a covenant on all associated properties, and on behalf of all current and future property owners. The DPMR is to include a listing of all privately owned and/or maintained infrastructure improvements, along with assignment of maintenance responsibility for each to the common interest community or the respective individual property owners, and is to provide a brief description of the required level of maintenance for privately maintained components. The DPMR must be reviewed and approved by the City of Las Vegas Department of Field Operations prior to recordation, and must include a statement that all properties within the community are subject to assessment for all associated costs should private maintenance obligations not be met, and the City of Las Vegas be required to provide for said maintenance. Also, the CC&R are to include a statement of obligation of compliance with the DPMR. Following recordation, the Developer is to submit copies of the recorded DPMR and CC&R documents to the City of Las Vegas Department of Field Operations.

Public Works

7. All development is subject to the conditions of City Departments and State Subdivision Statutes.

8. Construct curb and gutter on Helen Avenue from the existing curb and gutter at the north end of this site to Hickam Avenue. All existing paving damaged or removed by this development shall be restored at its original location and to its original width concurrent with development of this site. All other off-site improvements on Helen Avenue and Hickam Avenue are hereby deferred as required by 21-0443-VAR1.
9. Private streets must be granted and labeled on the Final Map for this site as Public Utility Easements (P.U.E.), Public Sewer Easements, and Public Drainage Easements to be privately maintained by the Homeowner's Association.
10. Connect to the public sewer line in Hickam Avenue at a size and location acceptable to the Sanitary Sewer Section of the Department of Public Works.
11. A Drainage Plan and Technical Drainage Study must be submitted to and approved by the Department of Public Works prior to the issuance of any building, grading permits or the recordation of a Final Map, whichever may occur first. Provide and improve all drainageways recommended in the approved drainage plan/study. The developer of this site shall be responsible to construct such neighborhood or local drainage facility improvements as are recommended by the City of Las Vegas Neighborhood Drainage Studies and approved Drainage Plan/Study concurrent with development of this site.
12. The approval of all Public Works related improvements shown on this Tentative Map is in concept only. Specific design and construction details relating to size, type and/or alignment of improvements, including but not limited to street, sewer and drainage improvements, shall be resolved prior to approval of the construction plans by the City. No deviations from adopted City Standards shall be allowed unless specific written approval for such is received from the City Engineer prior to the recordation of a Final Map or the approval of subdivision-related construction plans, whichever may occur first. Approval of this Tentative Map does not constitute approval of any deviations. If such approval cannot be obtained, a revised Tentative Map must be submitted showing elimination of such deviations. Roadway locations and parcel entries are schematic and final studies and engineering improvements designs. Geometric design of Parcel entry points must be approved through the development review of each parcel.

Vegas Homes, LLC
21-0443-VAR1 AND 21-0443-TMP1
Page Five
December 16, 2021

The Notice of Final Action was filed with the Las Vegas City Clerk on December 16, 2021.

Sincerely,



Seth T. Floyd
Director of Community Development
Department of Planning

STF:PL:clb

cc: Mr. Brad Burns
Blend Communities, LLC
9875 West La Mancha Avenue
Las Vegas, Nevada 89149

Ms. Elisha Scrogum
Taney Engineering
6030 South Jones Boulevard
Las Vegas, Nevada 89118



**LAS VEGAS
CITY COUNCIL**

CAROLYN G. GOODMAN
Mayor

STAVROS S. ANTHONY
Mayor Pro Tem

MICHELE FIORE

CEDRIC CREAR

BRIAN KNUDSEN

VICTORIA SEAMAN

OLIVIA DIAZ

JORGE CERVANTES
City Manager

DEPARTMENT OF PLANNING

SETH T. FLOYD

DIRECTOR OF
COMMUNITY DEVELOPMENT

CITY HALL

495 S. MAIN ST.
3RD FLOOR
LAS VEGAS, NV 89101

702.229.6301 | VOICE

702.464.2545 | FAX

711 | TTY



cityoflasvegas
lasvegasnevada.gov

December 16, 2021

RECEIVED
12/16/21

Vegas Homes, LLC
19333 Collins Avenue, Suite #1708
Sunny Isles Beach, Florida 33160

**RE: ABEYANCE - 21-0442-VAR1, 21-0442-VAR2 AND 21-0442-TMP1
CITY COUNCIL MEETING OF DECEMBER 15, 2021**

Dear Applicant:

The City Council at a regular meeting held on December 15, 2021 voted to **APPROVE** the following Land Use Entitlement project requests on 4.69 acres at the northwest corner of Hickam Avenue and Leon Avenue (APN 138-01-301-017), R-E (Residence Estates) Zone, Ward 5 (Crear).

- **21-0442-VAR1** - VARIANCE - TO ALLOW A 38-FOOT WIDE PRIVATE STREET WHERE 47 FEET IS THE MINIMUM REQUIRED FOR A PRIVATE STREET WITHOUT A GATE AND TO ALLOW NO OFFSITE IMPROVEMENTS ON LEON AVENUE WHERE SUCH ARE REQUIRED
- **21-0442-VAR2** - VARIANCE - TO ALLOW A PROPOSED STUB STREET TERMINATION WHERE A CUL-DE-SAC IS REQUIRED
- **21-0442-TMP1** - TENTATIVE MAP - HICKAM & LEON WEST - FOR A NINE-LOT SINGLE-FAMILY RESIDENTIAL SUBDIVISION

21-0442-VAR1 approval is subject to the following conditions:

Planning

1. A Variance is hereby approved to allow a 38-foot wide private street without gates where 47 feet is the minimum required for a private street without a gate.
2. Approval of and conformance to the Conditions of Approval for Variance (21-0442-VAR2) and Tentative Map (21-0442-TMP1) shall be required, if approved.
3. This approval shall be void four years from the date of final approval, unless exercised pursuant to the provisions of LVMC Title 19.16. An Extension of Time may be filed for consideration by the City of Las Vegas.

4. All necessary building permits shall be obtained and final inspections shall be completed in compliance with Title 19 and all codes as required by the Department of Building and Safety.
5. These Conditions of Approval shall be affixed to the cover sheet of any plan set submitted for building permit.
6. All City Code requirements and design standards of all City departments must be satisfied, except as modified herein.

Public Works

7. In accordance with Title 19.02.025.F, the applicant shall make a deferral improvement contribution based on urban improvements, prior to the issuance of permits, equal to 50% of the City's bond estimate costs for all deferred improvements with the street light contribution at 25% if a service pedestal is constructed. If the applicant pays a 100% deferral in lieu of the percentages above, a Covenant Running with Land Agreement shall not be required.
8. Sign and record a Covenant Running with Land agreement for the possible future installation of half-street improvements in accordance with City Standards for all improvements not required to be constructed at this time. Such Covenant Running with Land agreement shall record prior to the issuance of any permits or the recordation of a Final Map for this site, whichever occurs first.

21-0442-VAR2 approval is subject to the following conditions:

Planning

1. A Variance is hereby approved to allow a stub street termination where a cul-de-sac is required.
2. Approval of and conformance to the Conditions of Approval for Variance (21-0442-VAR1) and Tentative Map (21-0442-TMP1) shall be required, if approved.
3. This approval shall be void four years from the date of final approval, unless exercised pursuant to the provisions of LVMC Title 19.16. An Extension of Time may be filed for consideration by the City of Las Vegas.

4. All necessary building permits shall be obtained and final inspections shall be completed in compliance with Title 19 and all codes as required by the Department of Building and Safety.
5. These Conditions of Approval shall be affixed to the cover sheet of any plan set submitted for building permit.
6. All City Code requirements and design standards of all City departments must be satisfied, except as modified herein.

21-0442-TMP1 approval is subject to the following conditions:

Planning

1. All lots within the subdivision will be limited to single-story in height. This condition shall be recorded against the respective properties, by way of recoding a Notice of Condition Affecting Property against each of the parcels specifically burdened by such condition(s) prior to the application for building permits to include the conditions affecting the parcel. Furthermore, the entity making application for a building permit on a parcel specifically burdened by the above condition(s) shall attach the Tentative Map conditions of approval to such building permit application, as well as the entity selling the single-family residence on the parcel that is burdened by the above condition(s) shall provide a disclosure of the above condition(s) to any prospective purchaser of a home on such parcel.
2. A Waiver from Title 19.02 is hereby approved, to allow a 194-foot intersection offset where 220 feet is required.
3. An Exception from Title 19.06 is hereby approved, to allow eight trees where 10 are required within the eastern perimeter landscape buffer.
4. Approval of the Tentative Map shall be for no more than four (4) years. If a Final Map is not recorded on all or a portion of the area embraced by the Tentative Map within four (4) years of the approval of the Tentative Map, this action is void.
5. Approval of Variance (21-0442-VAR1) shall be required, if approved.

6. Street names must be provided in accordance with the City's Street Naming Regulations.
7. A fully operational fire protection system, including fire apparatus roads, fire hydrants and water supply, shall be installed and shall be functioning prior to construction of any combustible structures.
8. In conjunction with creation, declaration, and recordation of the subject common-interest community, and prior to recordation of the Covenants, Codes, and Restrictions ("CC&R"), or conveyance of any unit within the community, the Developer is required to record a Declaration of Private Maintenance Requirements ("DPMR") as a covenant on all associated properties, and on behalf of all current and future property owners. The DPMR is to include a listing of all privately owned and/or maintained infrastructure improvements, along with assignment of maintenance responsibility for each to the common interest community or the respective individual property owners, and is to provide a brief description of the required level of maintenance for privately maintained components. The DPMR must be reviewed and approved by the City of Las Vegas Department of Field Operations prior to recordation, and must include a statement that all properties within the community are subject to assessment for all associated costs should private maintenance obligations not be met, and the City of Las Vegas be required to provide for said maintenance. Also, the CC&R are to include a statement of obligation of compliance with the DPMR. Following recordation, the Developer is to submit copies of the recorded DPMR and CC&R documents to the City of Las Vegas Department of Field Operations.
9. All development is subject to the conditions of City Departments and State Subdivision Statutes.

Public Works

10. Coordinate the closure of Leon Avenue with the City Traffic Engineer and the Operations and Maintenance Department. Approved construction drawings shall comply with the recommendations of the City for the closure.
11. Dedicate 30 feet of right-of-way adjacent to this site for the remaining portion of Leon Avenue and dedicate a 15-foot radius at the northwest corner of Hickam Avenue and Leon Avenue on the Final Map for this site.

12. Construct curb and gutter on Leon Avenue from the existing curb and gutter at the north end of this site to Hickam Avenue and appropriate transition paving and overpaving on Leon Avenue concurrent with the development of this site. All existing paving damaged or removed by this development shall be restored at its original location and to its original width concurrent with development of this site. All other off-site improvements on Leon Avenue and Hickam Avenue are hereby deferred as required by 21-0442-VAR1.
13. Private streets must be granted and labeled on the Final Map for this site as Public Utility Easements (P.U.E.), Public Sewer Easements, and Public Drainage Easements to be privately maintained by the Homeowner's Association.
14. Connect to the public sewer line in Hickam Avenue at a size and location acceptable to the Sanitary Sewer Section of the Department of Public Works.
15. A Drainage Plan and Technical Drainage Study must be submitted to and approved by the Department of Public Works prior to the issuance of any building, grading permits or the recordation of a Final Map, whichever may occur first. Provide and improve all drainageways recommended in the approved drainage plan/study. The developer of this site shall be responsible to construct such neighborhood or local drainage facility improvements as are recommended by the City of Las Vegas Neighborhood Drainage Studies and approved Drainage Plan/Study concurrent with development of this site.
16. The approval of all Public Works related improvements shown on this Tentative Map is in concept only. Specific design and construction details relating to size, type and/or alignment of improvements, including but not limited to street, sewer and drainage improvements, shall be resolved prior to approval of the construction plans by the City. No deviations from adopted City Standards shall be allowed unless specific written approval for such is received from the City Engineer prior to the recordation of a Final Map or the approval of subdivision-related construction plans, whichever may occur first. Approval of this Tentative Map does not constitute approval of any deviations. If such approval cannot be obtained, a revised Tentative Map must be submitted showing elimination of such deviations. Roadway locations and parcel entries are schematic and final studies and engineering improvements designs. Geometric design of Parcel entry points must be approved through the development review of each parcel.

Vegas Homes, LLC
21-0442-VAR1, 21-0442-VAR2 AND 21-0442-TMP1
Page Six
December 16, 2021

The Notice of Final Action was filed with the Las Vegas City Clerk on December 16, 2021.

Sincerely,

A handwritten signature in black ink, appearing to read 'S. Floyd', with a stylized flourish at the end.

Seth T. Floyd
Director of Community Development
Department of Planning

STF:PL:clb

cc: Mr. Brad Burns
Blend Communities, LLC
9875 West La Mancha Avenue
Las Vegas, Nevada 89149

Ms. Elisha Scrogum
Taney Engineering
6030 South Jones Boulevard
Las Vegas, Nevada 89118



APPENDIX

APPENDIX A

Comment Letter

APPENDIX B

Figures

APPENDIX C

Hydrologic Calculations

APPENDIX D

Hydraulic Calculations

APPENDIX E

Improvement Plans



APPENDIX A

Comment Letter

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM		DATE: December 1, 2021
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:	COPIES TO:
	Hickam and Leon West and East Residential	Blend Communities I, LLC
Cross Streets:	NWC of Hickam Ave. & Leon Ave. and NWC of Hickam & Helen	Taney Engineering
File Number:	F:\Depot\DSMemos\DS5497B.doc	Bart Anderson, P.E., DevCo
Parcel Number:	138-01-302-002, 003, 004 & 138-01-301-017	
Zoning Action:	21-0442-TMP1; 21-0442-VAC1; 21-0442-VAR1; 21-0442-VAR2; 21-0443-TMP1; 21-0443-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 #
1 st Submittal	9/13/2021	10/11/2021	Not Approved	\$400.00	4450621: \$400
2 nd Submittal	11/4/2021	12/1/2021	See Comments Below	\$400.00	4524880: \$400
			TOTAL FEES (LDDRS):	\$800.00	----

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.

- Second Request:** Provide a copy of the zoning/planning conditions associated with this site (21-0442-TMP1; 21-0442-VAC1; 21-0442-VAR1; 21-0442-VAR2; 21-0443-TMP1 and 21-0443-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.
- Figure 6 and Figure 7:** Provide a Pima County flow split calculation at the intersection of Hickam Avenue and Helen Avenue to justify the proposed flow rate in the two streets at the intersection.
- Hickam & Leon West Sheet G1:** The proposed edge of pavement at the north end of Leon at 50.57EP appears to be too high and not compatible to the adjacent street grades. Address and resolve in the next submittal.
- Hickam & Leon East Sheet G1:** The proposed north end of curb & gutter in Helen Avenue must transition smoothly to meet the existing curb & gutter. Review and revise accordingly in the next submittal.

5. A site visit confirmed that there is an existing pedestrian trail along the northern side of *Hickam Avenue*. Revise *Detail Section A/GD1* and all pertinent details in the two subdivisions (East and West) to reflect the existing trail accordingly.

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.

END OF REMARKS
HDR/JKS

T/R/S: T20S/R60E/S1
AREA L-01



APPENDIX B

Figures

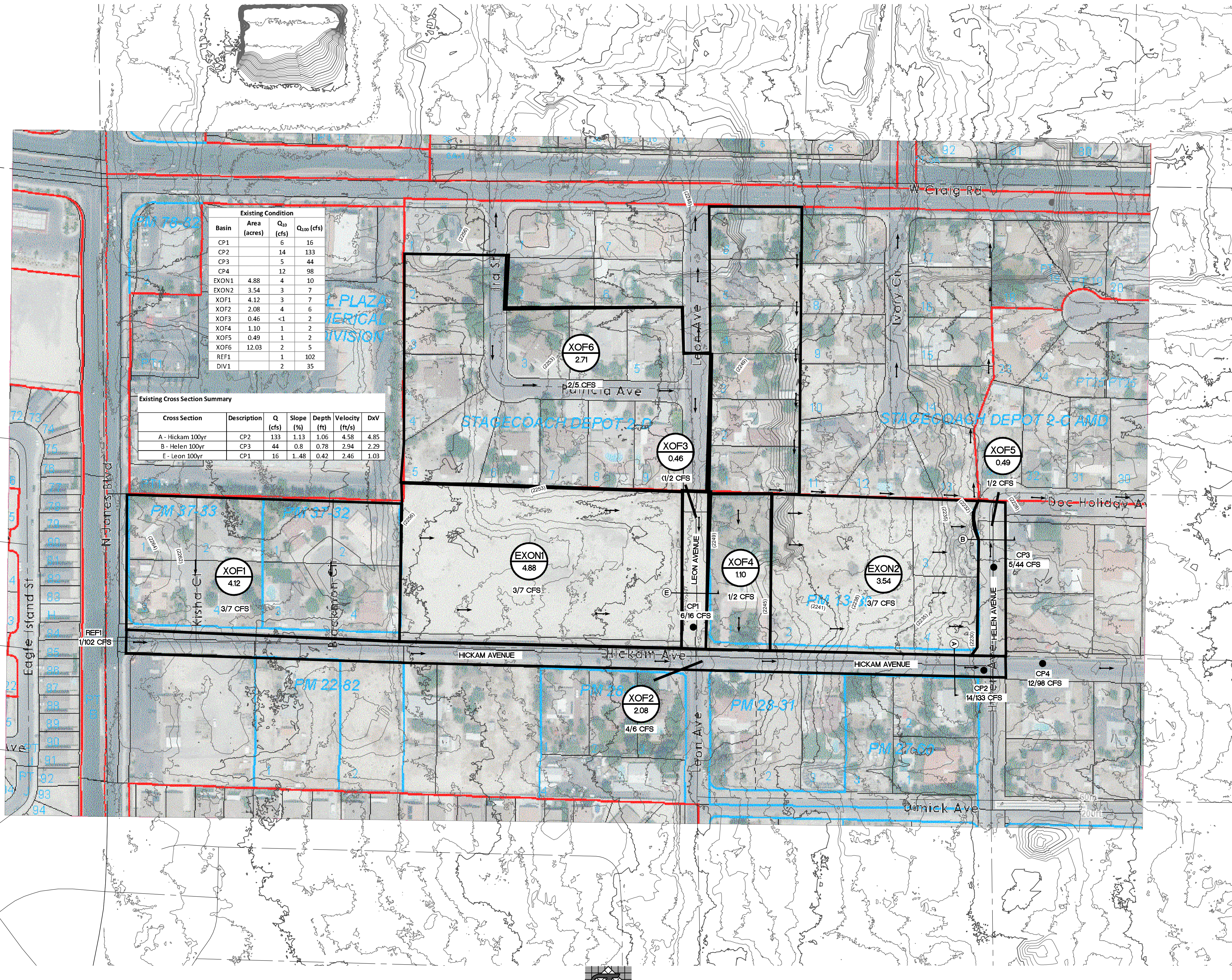


APPENDIX C

Hydrologic Calculations



DRAINAGE FIGURES



Existing Condition			
Basin	Area (acres)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)
CP1		6	16
CP2		14	133
CP3		5	44
CP4		12	98
EXON1	4.88	4	10
EXON2	3.54	3	7
XOF1	4.12	3	7
XOF2	2.08	4	6
XOF3	0.46	<1	2
XOF4	1.10	1	2
XOF5	0.49	1	2
XOF6	12.03	2	5
REF1		1	102
DIV1		2	35

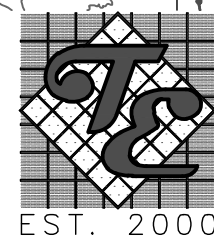
Existing Cross Section Summary						
Cross Section	Description	Q (cfs)	Slope (%)	Depth (ft)	Velocity (ft/s)	DxV
A - Hickam 100yr	CP2	133	1.13	1.06	4.58	4.85
B - Helen 100yr	CP3	44	0.8	0.78	2.94	2.29
E - Leon 100yr	CP1	16	1.48	0.42	2.46	1.03

SCALE: 1" = 100'

100' 50' 0' 100'

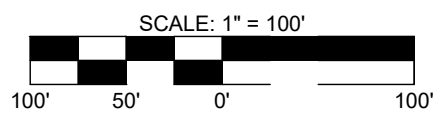
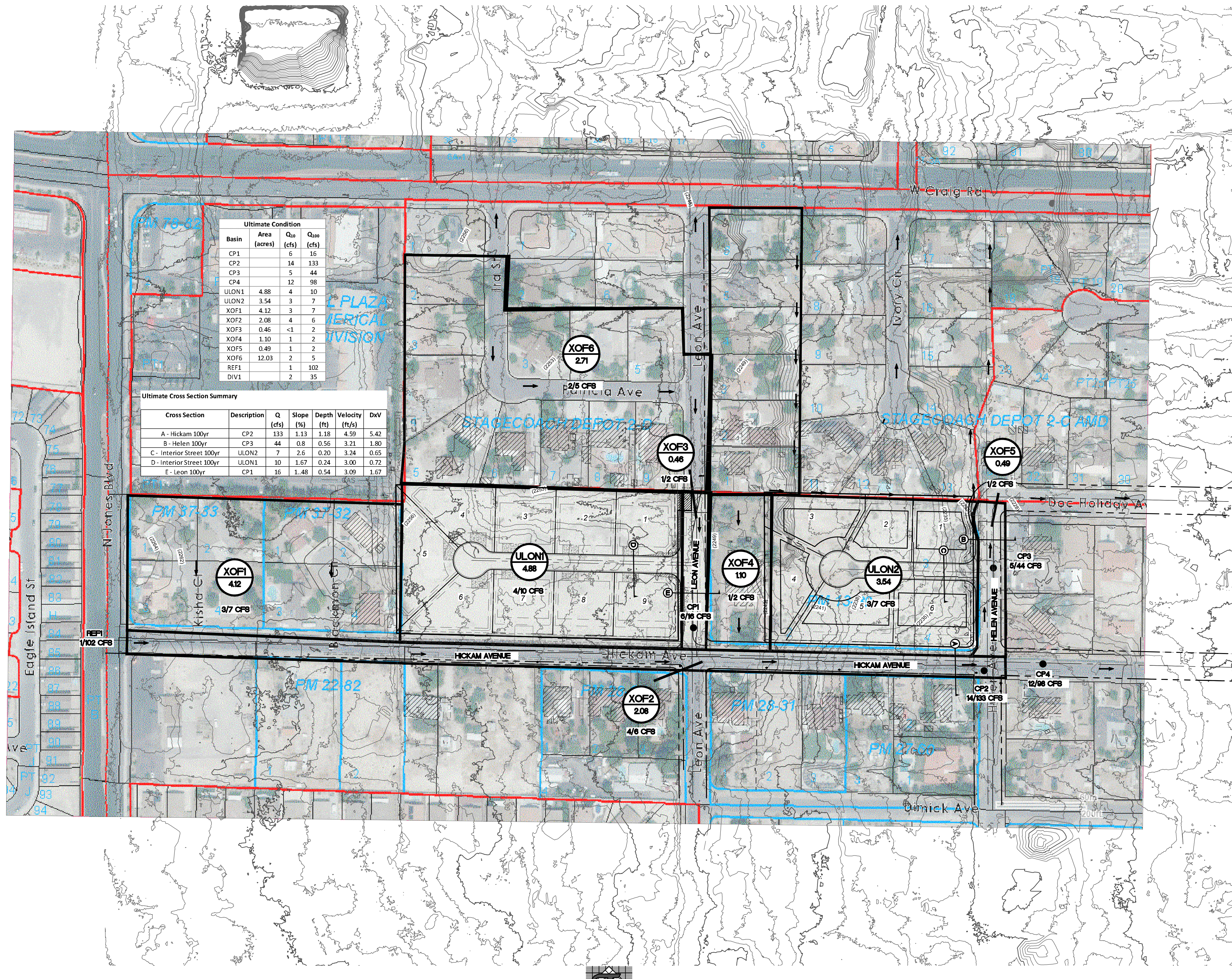
DRAINAGE LEGEND

- BASIN IDENTIFICATION
- BASIN AREA (ACRES)
- BASIN BOUNDARY
- CONCENTRATION POINT
- FLOW PATH
- PROJECT SITE
- CROSS SECTION
- 10-YR/100-YR FLOW (CFS)
- REFERENCE FLOW (CFS)

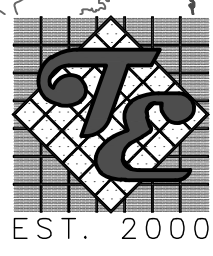


HICKAM AND LEON EXISTING CONDITION

FIGURE 6



DRAINAGE LEGEND	
	BASIN IDENTIFICATION
	BASIN AREA (ACRES)
	BASIN BOUNDARY
	CONCENTRATION POINT
	FLOW PATH
	PROJECT SITE
	CROSS SECTION
	10-YR/100-YR FLOW (CFS)
	REFERENCE FLOW (CFS)



HICKAM AND LEON ULTIMATE CONDITION

FIGURE 7



HICKAM AND LEON WEST AND EAST
BND_21003

HEC-HMS



HICKAM AND LEON WEST AND EAST
BND_21003

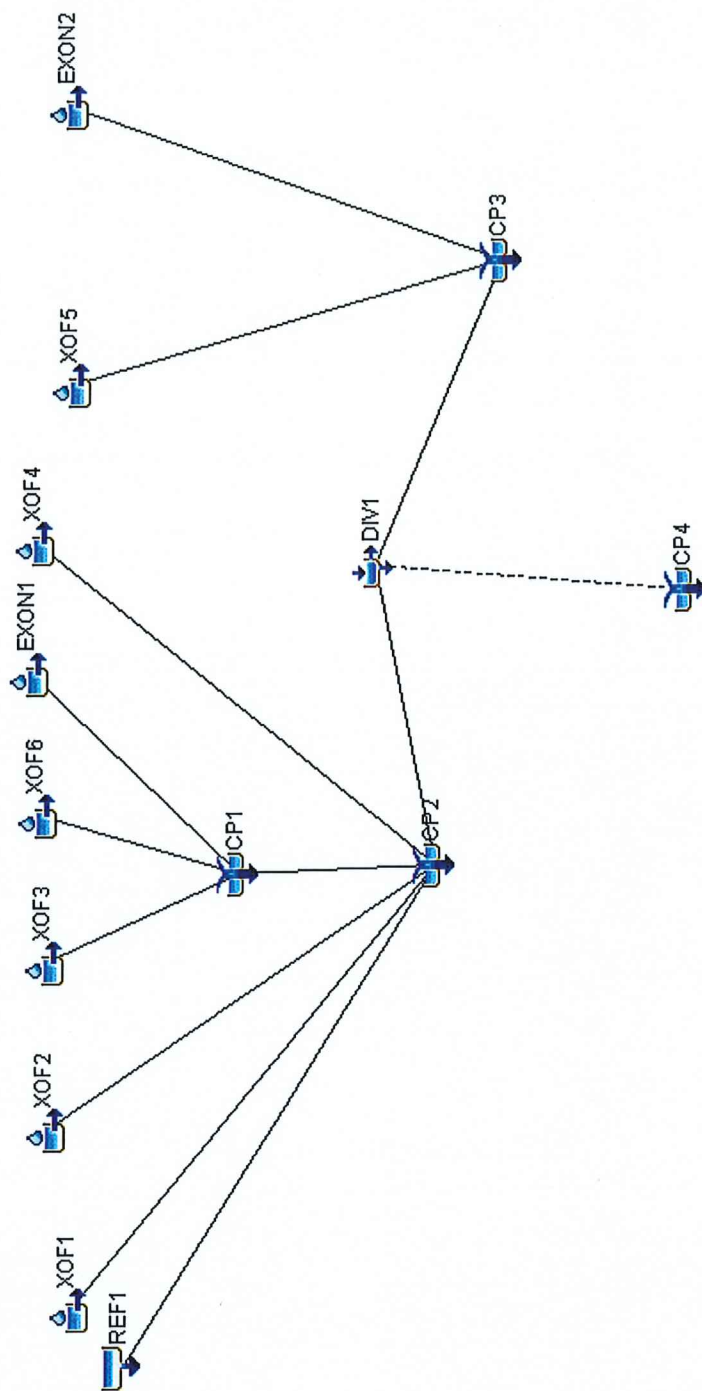
EXISTING CONDITION

Project: HECK-LEO Basin: EX10YR Method: Curve Number Loss

Subbasin	Initial Abstraction (IN)	Curve Number	Impervious (%)
EXON1		86	0.0
EXON2		86	0.0
XOF1		84	0.0
XOF2		98	0.0
XOF3		86	0.0
XOF4		84	0.0
XOF5		98	0.0
XOF6		84	0.0

Project: HECK-LEO Basin: EX10YR Method: SCS Transform

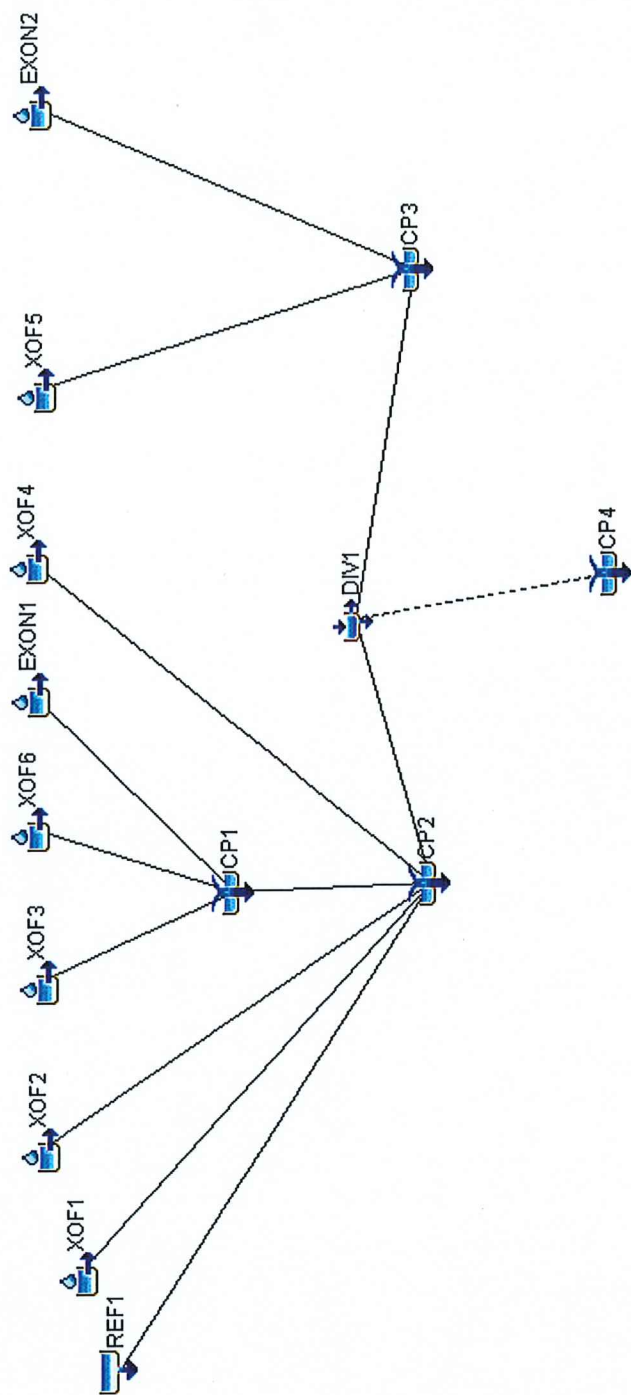
Subbasin	Graph Type	Lag Time (MIN)
EXON1	Standard	6.66
EXON2	Standard	6.00
XOF1	Standard	8.16
XOF2	Standard	6.44
XOF3	Standard	6.0
XOF4	Standard	5.87
XOF5	Standard	3.0
XOF6	Standard	6.87



Project: HECK-LEO Simulation Run: EX10YR

Start of Run: 01Jan2018, 00:00 Basin Model: EX10YR
End of Run: 01Jan2018, 12:00 Meteorologic Model: 10YR
Compute Time: 07Feb2022, 10:43:15 Control Specifications: 6HRRRAIN-12HRRUN

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
CP1	0.0125	6	01Jan2018, 03:35	0.3
CP2	Not Specified	14	01Jan2018, 03:35	1.8
CP3	Not Specified	5	01Jan2018, 03:35	0.2
CP4	0.0000	12	01Jan2018, 03:30	1.8
DIV1	Not Specified	2	01Jan2018, 03:35	0.0
EXON1	0.0076	4	01Jan2018, 03:35	0.2
EXON2	0.0055	3	01Jan2018, 03:35	0.2
REF1	Not Specified	1	01Jan2018, 00:00	1.0
XOF1	0.0064	3	01Jan2018, 03:35	0.2
XOF2	0.0033	4	01Jan2018, 03:30	0.2
XOF3	0.0007	0	01Jan2018, 03:35	0.0
XOF4	0.0017	1	01Jan2018, 03:35	0.0
XOF5	0.0008	1	01Jan2018, 03:30	0.1
XOF6	0.0042	2	01Jan2018, 03:35	0.1



Project: HECK-LEO Simulation Run: EX100YR

Start of Run: 01Jan2018, 00:00 Basin Model: EX100YR
End of Run: 01Jan2018, 12:00 Meteorologic Model: 100YR
Compute Time: 07Feb2022, 10:41:41 Control Specifications: 6HRRAIN-12HRRUN

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
CP1	0.0125	16	01Jan2018, 03:30	1.0
CP2	Not Specified	133	01Jan2018, 03:35	103.2
CP3	Not Specified	44	01Jan2018, 03:30	6.5
CP4	0.0000	98	01Jan2018, 00:00	97.2
DIV1	Not Specified	35	01Jan2018, 03:35	6.0
EXON1	0.0076	10	01Jan2018, 03:35	0.6
EXON2	0.0055	7	01Jan2018, 03:30	0.4
REF1	Not Specified	102	01Jan2018, 00:00	101.2
XOF1	0.0064	7	01Jan2018, 03:35	0.5
XOF2	0.0033	6	01Jan2018, 03:30	0.4
XOF3	0.0007	2	01Jan2018, 03:30	0.1
XOF4	0.0017	2	01Jan2018, 03:30	0.1
XOF5	0.0008	2	01Jan2018, 03:30	0.1
XOF6	0.0042	5	01Jan2018, 03:35	0.3



HICKAM AND LEON WEST AND EAST
BND_21003

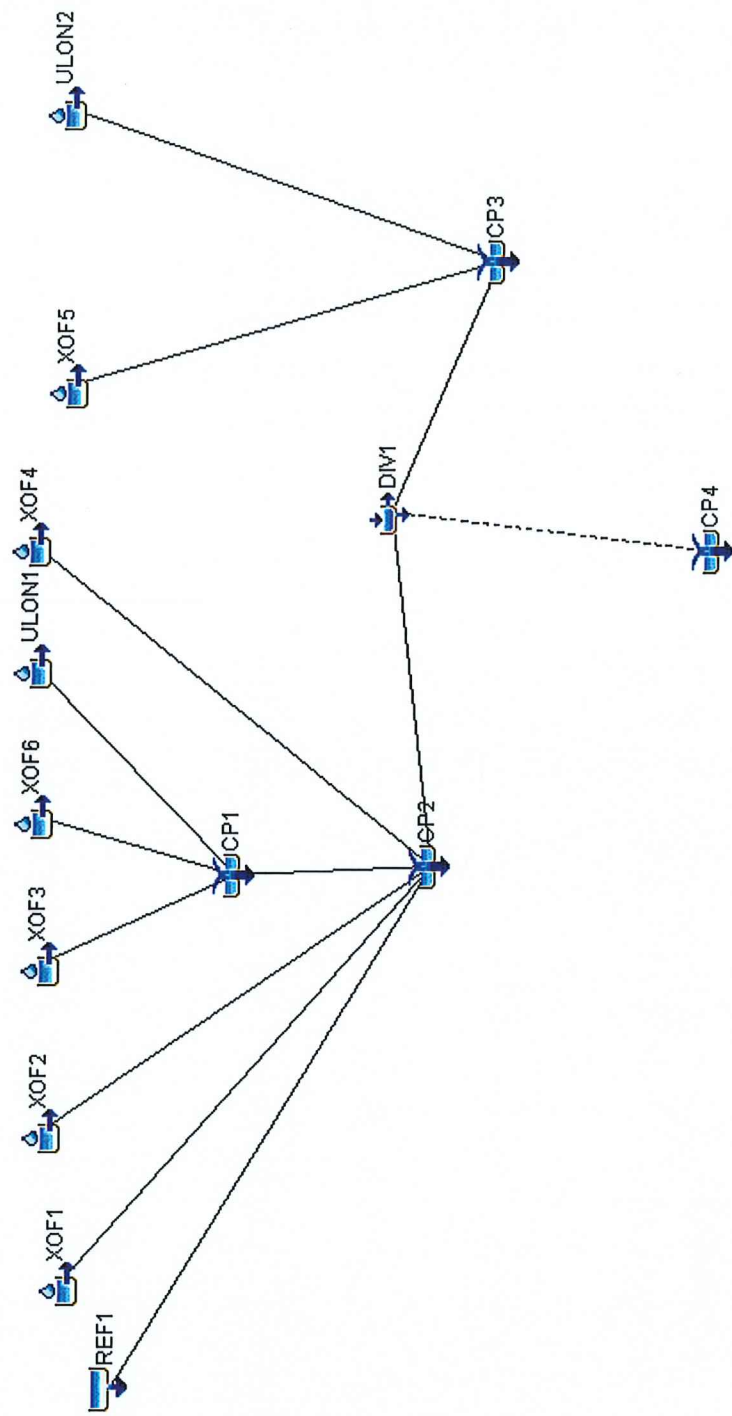
ULTIMATE CONDITION

Project: HECK-LEO Basin: UL10YR Method: Curve Number Loss

Subbasin	Initial Abstraction (IN)	Curve Number	Impervious (%)
ULON1		86	0.0
ULON2		86	0.0
XOF1		84	0.0
XOF2		98	0.0
XOF3		86	0.0
XOF4		84	0.0
XOF5		98	0.0
XOF6		84	0.0

Project: HECK-LEO Basin: UL10YR Method: SCS Transform

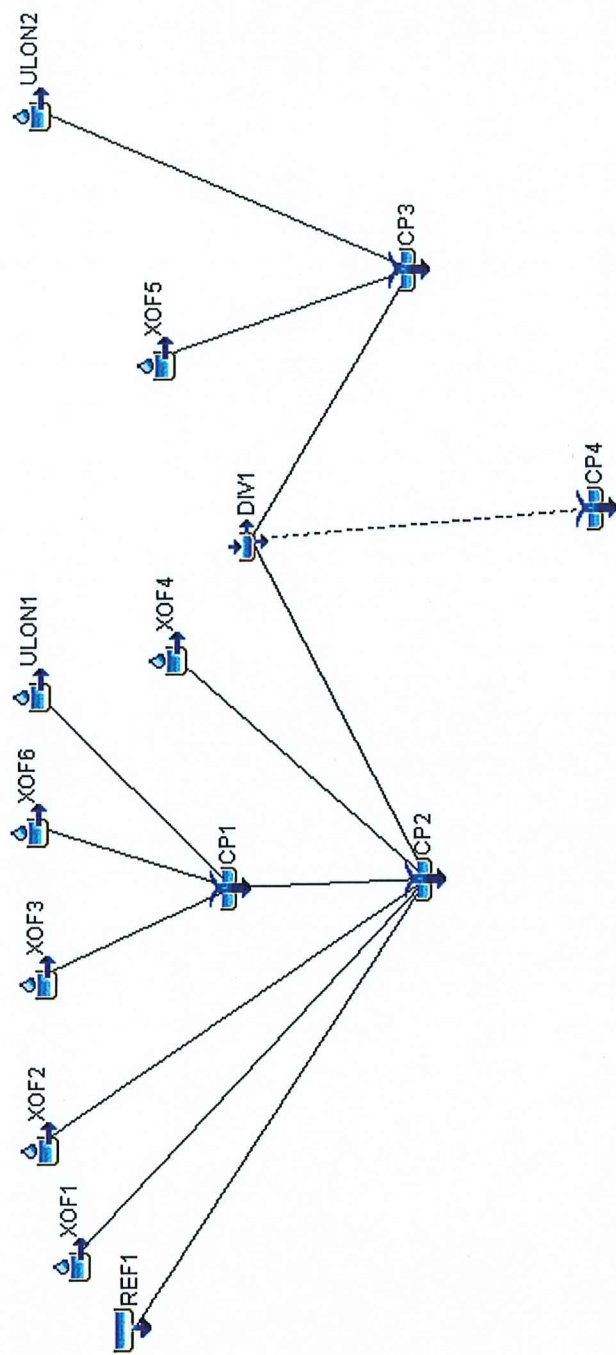
Subbasin	Graph Type	Lag Time (MIN)
ULON1	Standard	7.60
ULON2	Standard	5.93
XOF1	Standard	8.16
XOF2	Standard	6.44
XOF3	Standard	3.02
XOF4	Standard	5.87
XOF5	Standard	3.0
XOF6	Standard	6.87



Project: HECK-LEO Simulation Run: UL10YR

Start of Run: 01Jan2018, 00:00 Basin Model: UL10YR
End of Run: 01Jan2018, 12:00 Meteorologic Model: 10YR
Compute Time: 07Feb2022, 10:44:54 Control Specifications: 6HRRRAIN-12HRRUN

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
CP1	0.0125	6	01Jan2018, 03:35	0.3
CP2	Not Specified	14	01Jan2018, 03:35	1.8
CP3	Not Specified	5	01Jan2018, 03:35	0.2
CP4	0.0000	12	01Jan2018, 03:30	1.8
DIV1	Not Specified	2	01Jan2018, 03:35	0.0
REF1	Not Specified	1	01Jan2018, 00:00	1.0
ULON1	0.0076	4	01Jan2018, 03:35	0.2
ULON2	0.0055	3	01Jan2018, 03:30	0.2
XOF1	0.0064	3	01Jan2018, 03:35	0.2
XOF2	0.0033	4	01Jan2018, 03:30	0.2
XOF3	0.0007	0	01Jan2018, 03:30	0.0
XOF4	0.0017	1	01Jan2018, 03:35	0.0
XOF5	0.0008	1	01Jan2018, 03:30	0.1
XOF6	0.0042	2	01Jan2018, 03:35	0.1



Project: HECK-LEO Simulation Run: UL100YR

Start of Run: 01Jan2018, 00:00 Basin Model: UL100YR
End of Run: 01Jan2018, 12:00 Meteorologic Model: 100YR
Compute Time: 07Feb2022, 10:45:50 Control Specifications: 6SHRRAIN-12HRRUN

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
CP1	0.0125	16	01Jan2018, 03:35	1.0
CP2	Not Specified	133	01Jan2018, 03:35	103.2
CP3	Not Specified	44	01Jan2018, 03:30	6.5
CP4	0.0000	98	01Jan2018, 00:00	97.2
DIV1	Not Specified	35	01Jan2018, 03:35	6.0
REF1	Not Specified	102	01Jan2018, 00:00	101.2
ULON1	0.0076	10	01Jan2018, 03:35	0.6
ULON2	0.0055	7	01Jan2018, 03:30	0.4
XOF1	0.0064	7	01Jan2018, 03:35	0.5
XOF2	0.0033	6	01Jan2018, 03:30	0.4
XOF3	0.0007	2	01Jan2018, 03:30	0.1
XOF4	0.0017	2	01Jan2018, 03:30	0.1
XOF5	0.0008	2	01Jan2018, 03:30	0.1
XOF6	0.0042	5	01Jan2018, 03:35	0.3



APPENDIX D

Hydraulic Calculations



FLOW SPLIT CALCULATIONS

Flow Split Calculation

Description: Flow split at the intersection of Hickam and Helen - 10 YR
Project: Hickam and Helen
Reference: From the Pima County Drainage Manual (Tuscon, Arizona)
Date: 2/7/2022

Main Road: Hickam
Side Road: Helen

100-yr Flow in Main Street (Q_T) = 14 cfs

Depth of Flow in Main Street (d_{100}) = 0.45 ft
Main Street 10-yr Flow between Curb Face (Q_M) = 14.0 cfs
Ave. Depth of Flow to Side Street, $d_{100} - 0.5'$, (y_o) = 0.00 ft
Estimated Left Overbank Flow (Q_{LOB}) = 0.00 cfs
Estimated Right Overbank Flow (Q_{ROB}) = 0.00 cfs

(Refer to FlowMaster Calculations
Section B 100YR)

$$Q_L = 0.042 * [(Q_M^{0.93} * W_{SS}^{0.85}) / (S_M^{0.41} * W_M^{0.79})] \quad (\text{Equation 12.3})$$

Solving for Q_L , where:

$$\begin{aligned} S_M &= 0.011 \text{ ft/ft} && [\text{Main street slope}] \\ W_M &= 50 \text{ ft} && [\text{Main street width between face-of-curbs}] \\ W_{SS} &= 50 \text{ ft} && [\text{Side street width between face-of-curbs}] \\ Q_L &= 3.9 \text{ cfs} && [\text{Lateral flow into the side street}] \end{aligned}$$

Equation 12.4 is used to calculate the maximum amount of "overbank" flow which will also turn and flow down the side street. Note that if Q_0 from Equation 12.4 is positive and is greater than the actual overbank flow, it should be assumed that all of the actual overbank flow turns and flows down the side street. Also, if Q_0 calculated from Equation 12.4 is negative, it should be assumed that no overbank flow turns and flows down the side street.

$$Q_0 = 46.8(y_o * W_{SS} * S_{SS}^{0.5}) - Q_L \quad (\text{Equation 12.4})$$

Solving for Q_0 , where:

$$\begin{aligned} S_{SS} &= 0.0080 \text{ ft/ft} && [\text{Side street Slope}] \\ Q_0 &= -3.9 \text{ cfs} && [\text{Overbank flow intercepted by the side street}] \end{aligned}$$

If $Q_0 > Q_{OB}$, assume HALF of the actual overbank flow goes to side street

$$Q_{OB} = Q_{LOB} + Q_{ROB}$$

$$Q_{OB} = -3.93 \text{ cfs}$$

$$Q_{SS} = Q_{OB} + Q_L$$

Helen $Q_{SS} = \pm 2 \text{ cfs}$ [Total Developed 100-yr flow entering the side street]

$$Q_{MS} = Q_T - Q_{SS}$$

Hickam $Q_{MS} = \pm 12 \text{ cfs}$ [Total Developed 100-yr flow remaining in main street]

Flow Split Calculation

Description: Flow split at the intersection of Hickam and Helen - 100 YR
Project: Hickam and Helen
Reference: From the Pima County Drainage Manual (Tuscon, Arizona)
Date: 2/7/2022

Main Road: Hickam
Side Road: Helen

100-yr Flow in Main Street (Q_T) = 133 cfs

Depth of Flow in Main Street (d_{100}) = 0.82 ft
Main Street 100-yr Flow between Curb Face (Q_M) = 120.0 cfs
Ave. Depth of Flow to Side Street, $d_{100} - 0.5'$, (y_o) = 0.32 ft
Estimated Left Overbank Flow (Q_{LOB}) = 6.50 cfs
Estimated Right Overbank Flow (Q_{ROB}) = 6.50 cfs

(Refer to FlowMaster Calculations
Section B 100YR)

$$Q_L = 0.042 * [(Q_M^{0.93} * W_{SS}^{0.85}) / (S_M^{0.41} * W_M^{0.79})] \quad (\text{Equation 12.3})$$

Solving for Q_L , where:

$$\begin{aligned} S_M &= 0.011 \text{ ft/ft} && [\text{Main street slope}] \\ W_M &= 50 \text{ ft} && [\text{Main street width between face-of-curbs}] \\ W_{SS} &= 50 \text{ ft} && [\text{Side street width between face-of-curbs}] \\ Q_L &= 29.0 \text{ cfs} && [\text{Lateral flow into the side street}] \end{aligned}$$

Equation 12.4 is used to calculate the maximum amount of "overbank" flow which will also turn and flow down the side street. Note that if Q_0 from Equation 12.4 is positive and is greater than the actual overbank flow, it should be assumed that all of the actual overbank flow turns and flows down the side street. Also, if Q_0 calculated from Equation 12.4 is negative, it should be assumed that no overbank flow turns and flows down the side street.

$$Q_0 = 46.8(y_o * W_{SS} * S_{SS}^{0.5}) - Q_L \quad (\text{Equation 12.4})$$

Solving for Q_0 , where:

$$\begin{aligned} S_{SS} &= 0.0080 \text{ ft/ft} && [\text{Side street Slope}] \\ Q_0 &= 38.0 \text{ cfs} && [\text{Overbank flow intercepted by the side street}] \end{aligned}$$

If $Q_0 > Q_{OB}$, assume HALF of the actual overbank flow goes to side street

$$Q_{OB} = Q_{LOB} + Q_{ROB}$$

$$Q_{OB} = 13.00 \text{ cfs}$$

$$Q_{SS} = Q_{OB} + Q_L$$

Helen $Q_{SS} = \pm 35 \text{ cfs}$ [Total Developed 100-yr flow entering the side street]

$$Q_{MS} = Q_T - Q_{SS}$$

Hickam $Q_{MS} = \pm 98 \text{ cfs}$ [Total Developed 100-yr flow remaining in main street]

Worksheet for HICKAM AVE 60' R/W 10YR

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.011 ft/ft
Discharge	14.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.17
0+30.00	0.63
0+53.00	0.17
0+54.50	0.00
0+54.50	0.50
0+55.00	0.50
0+60.00	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.60)	(0+07.00, 0.17)	0.013
(0+07.00, 0.17)	(0+53.00, 0.17)	0.016
(0+53.00, 0.17)	(0+60.00, 0.60)	0.013

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.45 ft
Roughness Coefficient	0.016
Elevation	0.45 ft
Elevation Range	0.00 to 0.63 ft
Flow Area	4.9 ft ²
Wetted Perimeter	31.44 ft
Hydraulic Radius	0.15 ft
Top Width	30.52 ft

Worksheet for HICKAM AVE 60' R/W 10YR

Results

Normal Depth	0.45 ft
Critical Depth	0.48 ft
Critical Slope	0.007 ft/ft
Velocity	2.88 ft/s
Velocity Head	0.13 ft
Specific Energy	0.57 ft
Froude Number	1.269
Flow Type	Supercritical

GVF Input Data

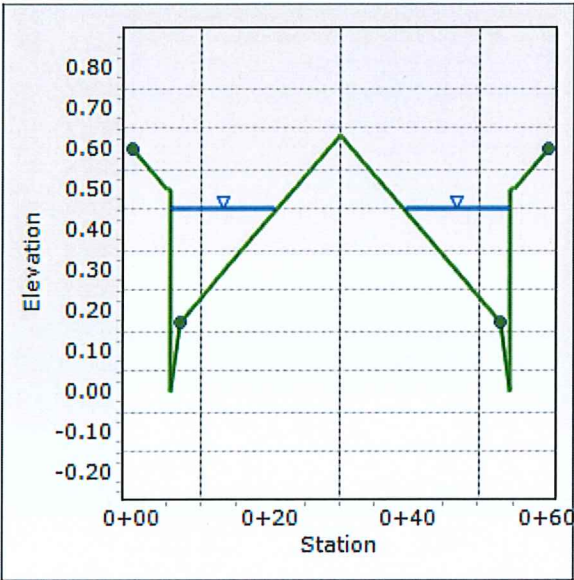
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.00 ft
Profile Description	
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.45 ft
Critical Depth	0.48 ft
Channel Slope	0.011 ft/ft
Critical Slope	0.007 ft/ft

Cross Section for HICKAM AVE 60' R/W 10YR

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.011 ft/ft
Normal Depth	0.45 ft
Discharge	14.00 cfs



Worksheet for HICKAM AVE 60' R/W 10YR NC

Project Description	
Friction Method	Manning
Solve For	Formula
	Discharge
Input Data	
Channel Slope	0.011 ft/ft
Normal Depth	0.45 ft

Section Definitions

Station (ft)	Elevation (ft)
0+05.50	0.50
0+05.50	0.00
0+07.00	0.17
0+30.00	0.63
0+53.00	0.17
0+54.50	0.00
0+54.50	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+05.50, 0.50)	(0+07.00, 0.17)	0.013
(0+07.00, 0.17)	(0+53.00, 0.17)	0.016
(0+53.00, 0.17)	(0+54.50, 0.50)	0.013

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Discharge	13.97 cfs
Roughness Coefficient	0.016
Elevation Range	0.00 to 0.63 ft
Flow Area	4.9 ft ²
Wetted Perimeter	31.44 ft
Hydraulic Radius	0.15 ft
Top Width	30.52 ft
Normal Depth	0.45 ft
Critical Depth	0.48 ft
Critical Slope	0.007 ft/ft
Velocity	2.87 ft/s
Velocity Head	0.13 ft

Worksheet for HICKAM AVE 60' R/W 10YR NC

Results

Specific Energy	0.57 ft
Froude Number	1.267
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.00 ft
Profile Description	
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.45 ft
Critical Depth	0.48 ft
Channel Slope	0.011 ft/ft
Critical Slope	0.007 ft/ft

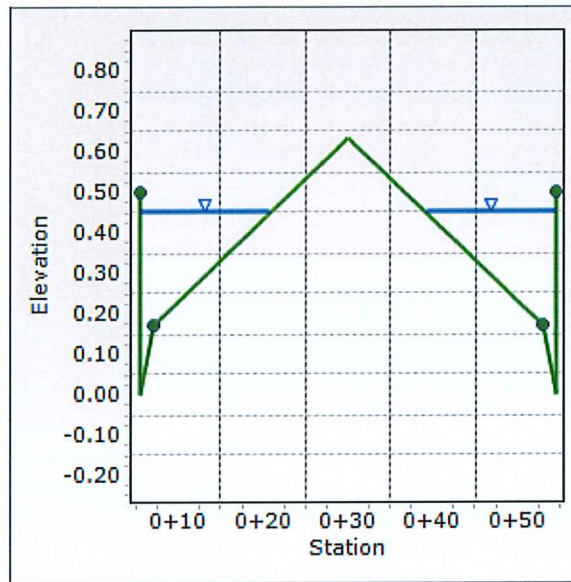
Cross Section for HICKAM AVE 60' R/W 10YR NC

Project Description

Friction Method	Manning
	Formula
Solve For	Discharge

Input Data

Channel Slope	0.011 ft/ft
Normal Depth	0.45 ft
Discharge	13.97 cfs



Worksheet for HICKAM AVE 60' R/W 100YR

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.011 ft/ft
Discharge	133.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.17
0+30.00	0.63
0+53.00	0.17
0+54.50	0.00
0+54.50	0.50
0+55.00	0.50
0+60.00	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.60)	(0+07.00, 0.17)	0.013
(0+07.00, 0.17)	(0+53.00, 0.17)	0.016
(0+53.00, 0.17)	(0+60.00, 0.60)	0.013

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.82 ft
Roughness Coefficient	0.015
Elevation	0.82 ft
Elevation Range	0.00 to 0.63 ft
Flow Area	24.3 ft ²
Wetted Perimeter	61.46 ft
Hydraulic Radius	0.39 ft
Top Width	60.00 ft

Worksheet for HICKAM AVE 60' R/W 100YR

Results

Normal Depth	0.82 ft
Critical Depth	0.95 ft
Critical Slope	0.004 ft/ft
Velocity	5.48 ft/s
Velocity Head	0.47 ft
Specific Energy	1.28 ft
Froude Number	1.520
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

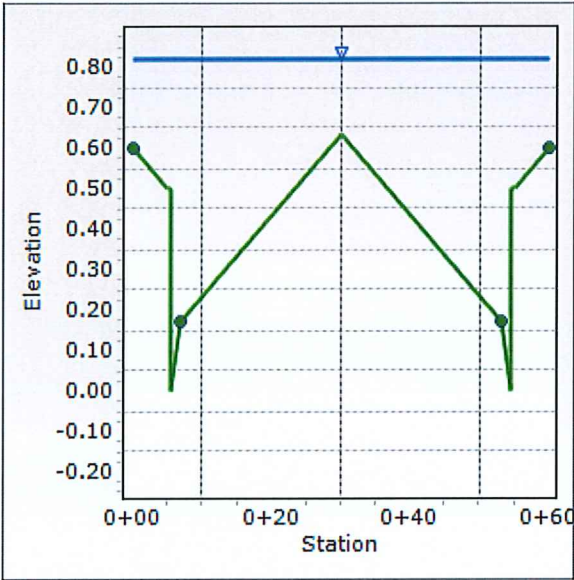
GVF Output Data

Upstream Depth	0.00 ft
Profile Description	
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.82 ft
Critical Depth	0.95 ft
Channel Slope	0.011 ft/ft
Critical Slope	0.004 ft/ft

Cross Section for HICKAM AVE 60' R/W 100YR

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.011 ft/ft
Normal Depth	0.82 ft
Discharge	133.00 cfs



Worksheet for HICKAM AVE 60' R/W 100YR NC

Project Description	
Friction Method	Manning
	Formula
Solve For	Discharge
Input Data	
Channel Slope	0.011 ft/ft
Normal Depth	0.82 ft

Section Definitions

Station (ft)	Elevation (ft)
0+05.50	0.50
0+05.50	0.00
0+07.00	0.17
0+30.00	0.63
0+53.00	0.17
0+54.50	0.00
0+54.50	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+05.50, 0.50)	(0+07.00, 0.17)	0.013
(0+07.00, 0.17)	(0+53.00, 0.17)	0.016
(0+53.00, 0.17)	(0+54.50, 0.50)	0.013

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Discharge	120.38 cfs
Roughness Coefficient	0.016
Elevation Range	0.00 to 0.63 ft
Flow Area	21.5 ft ²
Wetted Perimeter	50.67 ft
Hydraulic Radius	0.42 ft
Top Width	49.00 ft
Normal Depth	0.82 ft
Critical Depth	0.95 ft
Critical Slope	0.005 ft/ft
Velocity	5.59 ft/s
Velocity Head	0.49 ft

Worksheet for HICKAM AVE 60' R/W 100YR NC

Results

Specific Energy	1.31 ft
Froude Number	1.488
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.00 ft
Profile Description	
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.82 ft
Critical Depth	0.95 ft
Channel Slope	0.011 ft/ft
Critical Slope	0.005 ft/ft

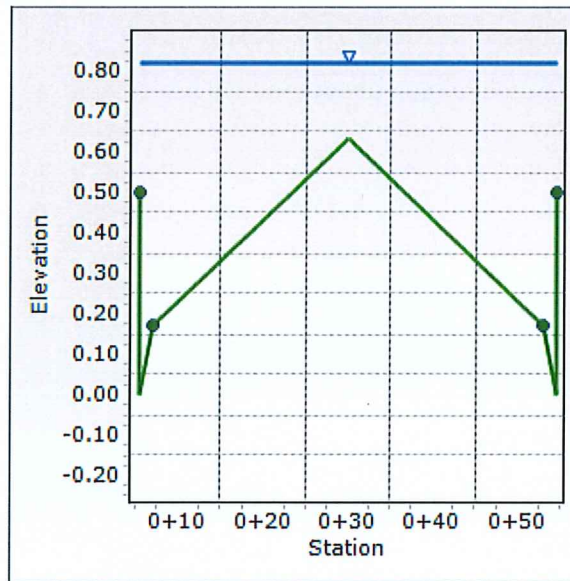
Cross Section for HICKAM AVE 60' R/W 100YR NC

Project Description

Friction Method	Manning
Solve For	Formula
	Discharge

Input Data

Channel Slope	0.011 ft/ft
Normal Depth	0.82 ft
Discharge	120.38 cfs





STREET FLOW CALCULATIONS

Worksheet for B - HELEN AVE - EX

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.008 ft/ft
Discharge	44.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+10.00	10.00
0+15.00	9.90
0+15.50	9.90
0+15.50	9.40
0+17.00	9.53
0+17.00	9.57
0+40.00	10.03
0+56.00	9.71
0+63.00	9.21
0+70.00	9.71

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+10.00, 10.00)	(0+17.00, 9.57)	0.013
(0+17.00, 9.57)	(0+56.00, 9.71)	0.016
(0+56.00, 9.71)	(0+70.00, 9.71)	0.025

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.78 ft
Roughness Coefficient	0.018
Elevation	9.99 ft
Elevation Range	9.21 to 10.03 ft
Flow Area	15.0 ft ²
Wetted Perimeter	56.79 ft
Hydraulic Radius	0.26 ft
Top Width	55.92 ft
Normal Depth	0.78 ft

Worksheet for B - HELEN AVE - EX

Results

Critical Depth	0.78 ft
Critical Slope	0.008 ft/ft
Velocity	2.94 ft/s
Velocity Head	0.13 ft
Specific Energy	0.92 ft
Froude Number	1.000
Flow Type	Critical

GVF Input Data

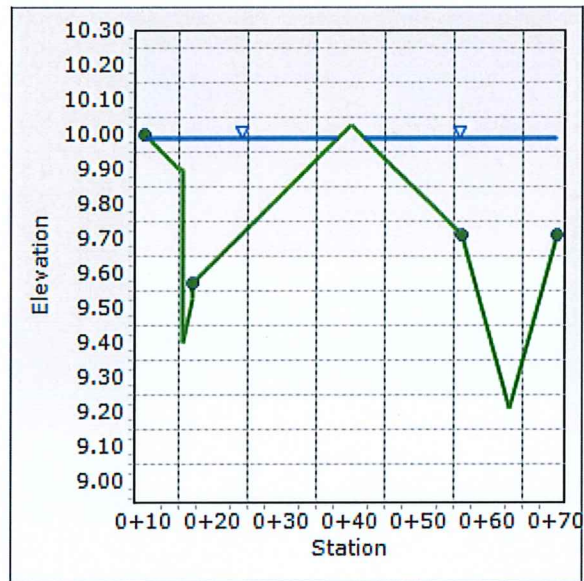
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.78 ft
Critical Depth	0.78 ft
Channel Slope	0.008 ft/ft
Critical Slope	0.008 ft/ft

Cross Section for B - HELEN AVE - EX

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.008 ft/ft
Normal Depth	0.78 ft
Discharge	44.00 cfs



Worksheet for B- HELEN AVE-UL SLANT

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.008 ft/ft
Discharge	44.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+10.00	10.00
0+15.00	9.90
0+15.50	9.90
0+15.50	9.40
0+17.00	9.53
0+17.00	9.57
0+56.00	8.79
0+70.00	9.07

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+10.00, 10.00)	(0+17.00, 9.57)	0.013
(0+17.00, 9.57)	(0+56.00, 8.79)	0.016
(0+56.00, 8.79)	(0+70.00, 9.07)	0.025

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.56 ft
Roughness Coefficient	0.020
Elevation	9.35 ft
Elevation Range	8.79 to 10.00 ft
Flow Area	13.7 ft²
Wetted Perimeter	42.25 ft
Hydraulic Radius	0.32 ft
Top Width	41.96 ft
Normal Depth	0.56 ft
Critical Depth	0.56 ft
Critical Slope	0.008 ft/ft

Worksheet for B- HELEN AVE-UL SLANT

Results

Velocity	3.21 ft/s
Velocity Head	0.16 ft
Specific Energy	0.72 ft
Froude Number	0.992
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.56 ft
Critical Depth	0.56 ft
Channel Slope	0.008 ft/ft
Critical Slope	0.008 ft/ft

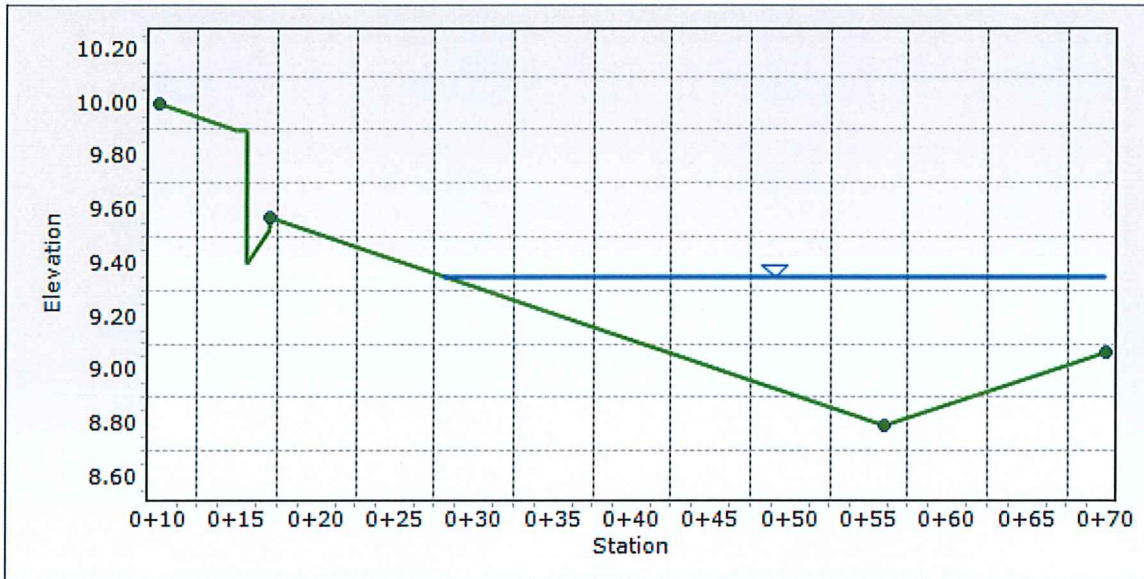
Cross Section for B- HELEN AVE-UL SLANT

Project Description

Friction Method	Manning
	Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.008 ft/ft
Normal Depth	0.56 ft
Discharge	44.00 cfs





APPENDIX E

Improvement Plans