CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM			DATE: March 24, 2016
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: **The SEVENTY**		**COPIES TO:** GCW Engineers
Cross Streets:	SWC of Rampart & Alta		Seventy Acres LLC
File Number:	F:\Depot\DSMemos\DS4787A.ZNA.doc		Bart Anderson, P.E., DevCo
Parcel Number:	138-32-301-005, 006, 210-008		CCRFCD
Zoning Action:	SDR-62393; GPA-62387; ZON-62392		
FEMA Flood Zone	YES **X**	NO	
Proposed Storm Drain	YES **X**	NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	3/3/2016 & 3/9/2016	3/23/2016	See Comments Below	$400.00	425231: $400
			TOTAL FEES (LDDRS):	**$400.00**	----

REMARKS: This site development is within a FEMA SPECIAL FLOOD HAZARD AREA, Zone A. No permits of any kind will be issued for this project until a Conditional Letter of Map Revision (CLOMR/CLOMR-F) is received from FEMA.

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 NDOT concurrence.

1. This site development is located within a FEMA SPECIAL FLOOD HAZARD AREA, Zone A. **No permits will be issued until a Conditional Letter of Map Revision (CLOMR/CLOMR-F) is received from FEMA. Permits may be issued upon the receipt of Conditional Letter of Map Revision (CLOMR or CLOMR-F) from FEMA.**

2. A Letter of Map Revision (LOMR/LOMR-F) must be obtained from FEMA after the completion of any project within a FEMA Special Flood Hazard Area, Flood Zone "A". The bonded improvements shall include a line item of **$50,000.00** for the LOMR. The bonded improvements will not be released until the LOMR/LOMR-F is obtained from FEMA and filed with the City of Las Vegas.

3. 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.

4. The site is located within the Flood Zone A and is adjacent to 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.

5. Please obtain necessary 404 permits from US Army Corps of Engineers and provide a copy of the permit to City of Las Vegas Flood Control Section prior to issuance of the grading permit. Contact the St. George Field Office of the US Army Corps of Engineers for permit information.

6. Provide a comparison table between the 2013 MPU flow rates and the proposed condition at key system locations. The system design shall use the greater flow rates in the analysis. Review and revise the flows accordingly and resubmit the updated analysis. Once the updated analysis is confirmed, update the Report, Tables and Exhibits to match the revised flows.

7. Review the Development Area 4 drainage parameters to refine the density of the lot sizes in the various locations to better determine the drainage impacts of this 183 acre area. Update the hydrology of this area to reflect the impacts of the proposed development.

8. The proposed RCB system velocities are excessive and are routinely above 35 fps. This is well above the allowable 25 fps in the HCDDM. Review and revise the RCB design to reduce the velocity to a maximum of 35 fps. Review the overall impacts to the proposed RCB system to take into account the future upstream system extensions to see where the system can be modified to reduce the velocity within the RCB's. Velocities above 25 fps shall include additional design parameters to mitigate the high velocities. Discuss the mitigation options and recommendations for City and CCRFCD approval.

9. The provided WSPG analysis used an *n-value* of 0.015. Provide an additional WSPG analysis of the two main line RCB's using 0.013 for sensitivity analysis to see the impacts to the velocity.

10. Include new cross sections that incorporate the detailed grading plans for the inlet structures within the HEC-RAS analysis.

11. Provide an overall exhibit that shows the entire storm drain system, labels the publically maintained storm drain system and all maintenance access roads on a single sheet.

12. Proposed storm drain laterals have been identified to collect flows from Peccole West Lot 9 and Queensridge Fairway Homes. Extend the storm drain system to collect the 100-year flows from these adjacent subdivisions.

13. The proposed facilities will be a change to the existing CCRFCD Master Plan and will necessitate a Master Plan Change (MPC) with Regional Flood. Flood Control recommends that the MPC be included with the next Master Plan Update and not be a separate submittal with this project. Coordinate the MPC information and requirements with Regional Flood.

14. The referenced FEMA flow rates used in the downstream analysis are slightly lower than the fully developed condition values. Flood Control shall require that the FEMA analysis include the fully developed condition in the CLOMR request for this project.

15. Provide complete *Plans and Project Specifications* for approval by the *City of Las Vegas*. The Structural Plans and Details shall be a part of the Civil Improvement Plan set. This project is considered as a *Capital Improvement Project* (CIP) with developer funding.

16. Structural plans for the proposed storm drain improvements and pertinent flood control facilities must be submitted for review. Provide a soils report, structural calculations and specifications, two wet stamped structural sets, and a grading plan to the *Building Department* for processing. The engineer must provide a copy of *Building Department* approval of the structures to *Flood Control* prior to final acceptance of the drainage study.

17. All proposed improvements associated with the Storm Drain facilities shall be bonded and inspected. This project shall require Special Inspection. Coordinate the requirements of and the Agreements needed for Special Inspection with the Building Department.

18. The proposed improvements show drainage facilities of a size that must be reviewed for access and maintenance concerns. The engineer must submit an extra set of improvement plans to the *City Streets & Sanitation Department* for their review and comments. *Streets & Sanitation Department's* approval must be secured prior to the conditional drainage study approval.

19. Storm drain facilities are located on cut/fill slopes. Revise the slopes and/or the storm drain alignment to maintain 16-foot access roads. Provide a cross section detail of the maintenance access.

20. Provide a minimum 25-foot concrete pad at the inlet structures of the RCB's to allow for proper maintenance. Include 16-foot wide concrete access ramps (10% maximum slope) to the RCB inverts. Provide detailed grading plans for all of the inlet structures as well as grading transitions. Provide cross sections of these facilities.

21. Provide a concrete pad and maintenance access to the inlet structures for the local storm drains. Show the needed drainage easements for these facilities.

22. The plans show preliminary mass grading with collection facilities within the parcels to intercept the flows prior to entering the infrastructure drainage improvements. The inlet collection system needs to incorporate stormwater quality (SWQ) features and Best Management Practices (BMP's) at these interim collection points. Revise to incorporate appropriate SWQ and BMP measures. How will these collection facilities be maintained without graded access to the structures?

23. Provide maintenance access road (12-foot wide with a minimum of 6" Type II) to manholes and discharge structures located outside of the improved roadways.

24. Revise the storm drain lateral layouts to eliminate the main line lateral bends and concrete collars. Provide manholes for change in alignment and grade.

25. Provide plan and profile for all proposed storm drain improvements. Include the Q and HGL on all profiles.

26. Relocate manholes to the sides of the RCB's and at a maximum 400-foot spacing. Provide manhole steps and provide 30-inch manhole covers for access. Show concrete collars for the manholes.

27. Verify and correctly label the existing drainage and sewer easements. Provide an Exhibit that shows the drainage easements that are being Vacated and an Exhibit that shows the proposed easements.

28. Provide for the new public drainage easements (privately maintained by the property owner) for the area of the site impacted by the proposed improvements. The easement shall note that the private drainage improvements are privately maintained and the easement must be dedicated and recorded by separate document prior to the final acceptance of the improvement plans. Provide legal description and an exhibit of the drainage easement to Flood Control and *Mary Wulff* (702-229-2139) of *City of Las Vegas Right of Way Section* for the recordation process after the subject drainage study is conceptually approved.

29. The existing and proposed utility crossings of the storm drain must be shown on the storm drain plan and profiles sheets and on the lateral profiles. Indicate the type of pipe material for water and sewer lines. Review separation requirements between utilities and show all of the utility crossings of the storm drains.

30. Show the size of the proposed riprap areas and include a detail on the plans. Include the Type 2 and geofabric in the detail section. It is noted that the minimum size of a riprap pad is d_{50}=8". Revise all pertinent plans and callouts accordingly.

31. Technical drainage studies are required for each of the future development super pads. The technical drainage studies for the developments may not be submitted until the conditional approval

of this pertinent infrastructure drainage study is obtained. Final approval for the infrastructure study must be obtained prior to conditional approval of the impacted development super pad drainage studies.

32. The proposed on-site drainage facilities are to be privately maintained. Add a note to the grading plan that *"All on-site surface drainage facilities are to be privately maintained."*

33. Complete the Construction Notes on the Grading Plan including pavement section and reference details for the call-outs of proposed improvements, i.e. RCB's, rip-rap, structure details, manholes, inlets, etc.

34. Provide a note on all grading plans: Property Owner is responsible to maintain the best management practices such as but not limited to the removal of accumulated sediment and debris and care of the vegetation.

35. This project currently has no Proposed Buildings or Structures. Should the project propose changes to this design assumption, then the Engineer is to update the drainage study detailing the flood zone impacts and provide addresses for each building in a FEMA Flood Hazard Zone prior to obtaining a grading permit. This information is necessary to insure that the elevation certificates are provided for each address prior to completion of construction. This information is required until such time as a LOMR is approved that removes the development from the SFHA.

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: The engineer must submit the drainage study to FEMA for a Conditional Letter of Map Revision (CLOMR). A favorable CLOMR must be obtained prior to the issuance of any permits. This site is located in a **FEMA Zone A**. *Clark County Regional Flood Control District* (CCRFCD) review and approval is required prior to recordation of final map or issuance of building/grading permits. The Engineer must send a copy of the report to the CCRFCD for review. **The developer/engineer must also obtain a Letter of Map Revision (LOMR) using the approved drainage study as technical support to inform FEMA of the modifications within the flood zone. The approved LOMR must be submitted to the *City of Las Vegas* prior to the release of the bond.** FEMA Elevation Certificates, showing as-built finish floor elevations, must be completed for each building in the FEMA A Zone. The certificate must be submitted to the *City of Las Vegas Flood Control Section* prior to scheduling a framing inspection.

END OF REMARKS
Ays/pbj

T/R/S: T20S/R60E/12
AREA L-32

TECHNICAL DRAINAGE STUDY
FOR
THE SEVENTY

840-050

March 2016

Prepared For:

Seventy Acres LLC, Fore Stars LTD, and 180 Land Co LLC
9775 West Charleston Boulevard
Las Vegas, NV 89117
Phone: (702) 940-6930
Fax: (702) 940-6931

GCW
ENGINEERS \ SURVEYORS

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: The Seventy Date: March 2016

Location of Development a) Descriptive (Cross Streets) North/South: Hualapai Way

East/West: Rampart Boulevard

b) Section: 31, 32 Township: 20S Range: 60E

c) APN: 138-32-301-005, 138-32-301-006 138-32-210-008, 138-32-202-001, 138-31-702-002 and 138-31-801-002

Name of Owner: Seventy Acres LLC, Fore Stars LTD, and 180 Land Co LLC

Telephone No.: 702-940-6930 Fax No. 702-940-6931 E-Mail Address: Not available

Address: 9775 W. Charleston Blvd., Las Vegas, Nevada 89117

Contact Person-Name: Ryan R. Belsick, PE **Telephone No.:** (702) 804-2000

* **E-Mail Address:** rbelsick@gcwengineering.com **Fax No.:** (702) 804-2299

Firm: GCW, Inc

Address: 1555 S. Rainbow Blvd; Las Vegas, NV 89146

Type of Land Development/Land Disturbance

☐	Rezoning	☐	Subdivision Map	☐	Clearing and Grading Only
☐	Parcel Map	☐	Planned Unit Development	☒	Other (Please specify below)
☐	Large Parcel Map	☐	Building Permit	Conceptual Drainage, Rough Grade and Storm Drain	

1. Total Owned Land Area: At Site: +/- 70.52 acres Being Developed/Disturbed: +/- 70.52 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.): Conceptual Drainage, Rough Grade and Storm Drain Improvements
5. Approximate upstream land area which drains to the subject site: +/- 3.73 sq. mi.
6. Has the site drainage been evaluated in the past? ☒ **Yes** ☐ **No** If yes, please identify documentation: Peccole Ranch West Master Study, Queensridge LOMR , Queens Borough Culvert Study
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Existing dual (2) – 12'x12' RCB at northeast corner of site
8. Briefly describe your proposed schedule for the subject project: ASAP

PROFESSIONAL ENGINEER - STATE OF NEVADA
RYAN R. BELSICK
EXP. 12/31/16
CIVIL
No. 14697

3/3/16

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.**

Local Entity File No.

Revision	Date

REFERENCE:

STANDARD FORM 1

F:\Projects\800\840-050\Admin\Forms\SF1-MMC.doc

Updated 05/01/2008

DRAINAGE SUBMITTAL CHECKLIST

Project Name: The Seventy	Map ID:	
Firm Name: GCW, Inc.	Engineer: Ryan R. Belsick	
Address: 1555 S Rainbow Blvd		
City: Las Vegas	State: NV	Zip: 89146
Phone Number: (702) 804-2000	Fax Number: (702) 804-2299	
Property Owner: Seventy Acres LLC, Fore Stars LTD, and 180 Land Co LLC		
Address: 9755 W. Charleston Blvd		
City: Las Vegas	State: NV	Zip: 89177
Reviewed By:	Date Received:	Date Accepted for Review:

The following checklist is intended as a guide for the engineer preparing a Technical Drainage Study to submit to the local entity and Clark County Regional Flood Control District (if necessary). The listed items are the minimum information required prior to the entity performing a review. The engineer will remain responsible to ensure the Technical Drainage Study is prepared within the guidelines as set forth in the Clark County Regional Flood Control District (CCRFCD) Hydrologic Criteria and Drainage Design Manual (MANUAL).

This document is intended as an aid in preparing Technical Drainage Studies. Each study submitted is reviewed for compliance with local and regional criteria. This form is not intended to be all inclusive and does not limit the extent of the information, calculations or exhibits which may be necessary to properly evaluate the intended land use.

If items are not applicable for the subject site, provide N/A.

I. GENERAL REQUIREMENT

Yes	No	
X		Design Manual **Standard Form 1** with the engineer's seal and signature.
X		Design Manual **Standard Form 4**.
X		2 copies of the 24" x 36" Drainage Plan.
	N/A	A notarized letter from the adjacent property owner(s) allowing off-site grading or discharge.

II. MAPS AND EXHIBITS

Yes	No	
X		A copy of a current Flood Insurance Rate Map (FIRM) with the site delineated.
X		A copy of the current CCRFCD Master Plan Update Figure, (F-x), for Flood Control Facilities and Environmental areas with the site delineated.

REFERENCE:	**STANDARD FORM 2**

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

II. MAPS AND EXHIBITS (Continued)

Yes	No	
X		Off-site drainage basin maps for existing, interim and future conditions showing the existing topography, basin boundaries, concentration points, and flows in cfs.
X		On-site drainage basin maps for existing and proposed conditions showing the existing topography, basin boundaries, concentration points, and on-site and off-site flows in cfs.
X		Vicinity Map with local and major cross streets identified and a north arrow.

III. DRAINAGE PLAN

Yes	No	
X		Sheet size: 24" x 36" sealed by a registered engineer in the State of Nevada.
X		Minimum scale: 1" = 60'.
X		Project name.
X		Vicinity Map with local and major cross streets.
X		Revision box.
X		North arrow and bar scale.
X		Engineer's/consultant's address and phone number.
X		Elevation datum and benchmark.
X		Legend for symbols and abbreviations.
X		Cut/fill scarps, where applicable.
X		Street names, grades, widths.
X		Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street.
X		Existing contours encompassing the site and 100 feet beyond with spot elevations for important locations, where appropriate.
	N/A	Minimum finish floor elevations with top-of-curb elevations at upstream end of lot.
	N/A	Proposed typical street sections.

REFERENCE: **STANDARD FORM 2**

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes	No	
	N/A	Streets with off-set crowns.
X		Proposed contours or spot elevations in sufficient detail to exhibit intended drainage patterns and slopes.
X		Property lines.
X		Right-of-way lines and widths, existing and proposed.
X		Existing improvements and their elevations.
X		Delineation of proposed on-site drainage basins indicating area and 10-year and 100-year storm peak flows at basin concentration points.
	N/A	Concentration points and drainage flow direction with Q100 and V100 and D100 in streets.
X		Cumulative flows, velocity, and direction of flow at upstream and downstream ends of site for the 10-year and 100-year flows.
	N/A	Location and cross-section of street capacity calculations.
X		Cross-sectional detail for channels, including cutoff wall locations.
X		Existing and proposed drainage facilities, appurtenances, and connections (i.e., sidewalk, ditches, swales, storm drain systems, unimproved and improved channels, and culverts, etc.) stating size, material, shape, and slope with plan and profile and HGL calculations.
X		Existing and proposed drainage easements and widths shown with sufficient detail. A cross sectional detail must be provided that shows appropriate lining and reinforcement.
X		Location and detail of existing, proposed, and future block wall openings. Minimum size is 16" x 48". Wrought iron gate is required for flows > 10 cfs.
X		Location and detail of flood walls illustrating depth of flow, proposed grouting height, etc.
	N/A	Perimeter retaining wall locations. All existing and proposed walls (retaining screen and flood) must be shown with adjacent ground elevations. Flood walls with 8-inch concrete masonry unit.
	N/A	Building and/or lot numbers.
X		Alignment of all existing, proposed, or future Regional Facilities adjacent to the site.
X		Limits of existing floodplain based on current FIRM or best available information; limits of proposed floodplains based on best available information.

REFERENCE:	STANDARD FORM 2

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes	No	
X		For areas in Zone A, AE, AH, and AO, base flood elevations (BFEs) must be shown for each lot; BFEs may be listed on each lot, or in a table. Finish floor elevations must be a minimum of 18 inches above BFE.
	N/A	Appropriately elevated "humps" 6 inches above the 100 year water surface elevation at site accesses where the intent is to protect the site from the Q100 flows.
	N/A	Street slopes for perimeter and interior streets. The minimum slope is 0.4 percent.
	N/A	Location and detail of best management practice (BMP) for parking lots and low impact development (LID) (if required).

IV. HYDROLOGIC ANALYSIS

Yes	No	
X		Appropriate soil information and Soils Map for existing and future conditions with subbasins and property delineated.
X		Input and output information for existing conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
X		Input and output information for future conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
X		Use of correct precipitation values in and around the McCarran Airport rainfall area.
X		A discussion in the text of the hydrologic analysis justifying subbasin boundaries and cutoffs, supporting assumptions, and calculations.
X		A summary table of stormwater flows showing basin area, Q10 and Q100 for both individual basins and combined basin flows, where applicable.
X		Copies of supporting technical information referenced from a previously approved study and a statement accepting these results.
X		On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners in accordance with current Nevada Drainage Law.
	N/A	Calculation for impervious area for parking lots and LIDs (if required).

REFERENCE:	STANDARD FORM 2

DRAINAGE SUBMITTAL CHECKLIST

V. HYDRAULIC ANALYSIS

Yes	No	
____	N/A	Flow split calculations and supporting documentation or reference for the method of flow split calculations used.
____	N/A	Normal depth street flow calculations and cross section diagrams for all interior and perimeter streets. Provide "d x v" products for the Q100 and Q10 flows representing the worst case for interior and all perimeter streets. Q100 d x v < 8. Q10 d x v < 6 and 12 foot dry lane for rights-of-way > 80 feet. Calculations must be labeled by street name as indicated on the Grading Plan.
____	N/A	A summary table of interior and exterior street capacity calculations showing the street name, Q100 flow, slope, depth of flow, velocity and depth times velocity product and streets needing to meet 12 foot dry lane criteria.
____	N/A	Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.)
X	____	Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set finish floor elevations. Hydraulic calculations must include submerged weir, superelevation and tee intersection losses, where appropriate.
X	____	Provide necessary freeboard requirements to set the finished floor elevations of all proposed buildings, 2 x depth of flow or depth of flow plus 18 inches of freeboard, whichever is less. The minimum requirement is 6 inches above adjacent upstream top of curb. Buildings adjacent to drainage easements must always be provided with 18 inches of freeboard above the Q100 weir height or flow depth, whichever is greater.
X	____	A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones. • Field survey data. • Input and output information. • Plotted cross-sections based on survey with proper encroachments. • A map showing the location of the cross-sections. • Analysis of both sub and super-critical flow segments. • A summary table and a discussion of the results in the text of the report.
X	____	Provide a 50 percent clogging factor in the capacity calculation for drop inlets.
X	____	Hydraulic calculations for culverts and storm drains. D-Load calculations must be provided for storm drain pipes in public rights-of-way, including headwater pool inundation.
X	____	The mitigation of nuisance water, both during construction and in the fully developed condition, must be addressed.
____	N/A	Provide BMP type, size and supporting calculations for parking lots and LIDs (if required).

REFERENCE: | **STANDARD FORM 2**

CITY OF LAS VEGAS

MINIMUM DRAINAGE STUDY CRITERIA
STANDARD FORM 2 CHECKLIST SUPPLEMENT

(Revised 5/18/11)

The following checklist is intended as a supplemental guide for the engineer preparing a Technical Drainage Study submittal to the City of Las Vegas. This supplement focuses on requirements specific to the City of Las Vegas. The requirements presented are in addition to the Clark County Regional Flood Control District (CCRFCD) Manual Standard Form 2. The listed items are the minimum information required prior to the City performing a review. The engineer will remain responsible to ensure the Technical Drainage Study is prepared within the guidelines as set forth in the CCRFCD Hydrologic Criteria and Drainage Design Manual (Design Manual).

An appointment must be made to preview this checklist in conjunction with CCRFCD Standard Form 2 prior to the City accepting a new drainage study for review. The engineer must contact the Flood Control Section at (702) 229-6541 to schedule a submittal appointment.

If items are not applicable for the subject site, provide N/A.

I. GENERAL REQUIREMENT		
Yes	No	
	N/A	A notarized letter from the adjacent property owner(s) allowing off-site grading. (A copy of the letter must be received prior to final acceptance of the drainage study.)
X		Copies of all conditions of approval for development related to this property. (e.g. zoning, use permit, tentative map, etc.) Verify compliance with conditions.
X		An electronic copy of the complete submittal is required to be submitted with one original hard copy of the study. Electronic documents should be on a universal computer-readable digital output device replicating your submittal. An Indexed Portable Document Format (PDF) or Print Ready CAD file formats with a minimum of 300dpi are the desired formats. If figures are in color, they must be scanned in color and saved as a separate file. ________ by initial here, the engineer on record acknowledges that the electronic copy is an identical replicate of the original hard copy submitted to the City of Las Vegas.

II. GRADING PLAN INFORMATION		
Yes	No	
X		(1) 24" X 36" copy of the Grading Plan, (including all Detail Sheets) sealed by the engineer.
X		Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street. Note: Proposed top of curb elevations must be provided for both sides of roadways even if only half street construction is required.
X		Label existing topography at a minimum 5 foot elevation interval including adjacent developments, finished floor elevations of existing buildings and top of existing curbs extending 100 feet* around the perimeter of the site. (*Measured from the centerline of the adjacent roadway.)

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

II. GRADING PLAN INFORMATION		
Yes	No	
X		Proposed on-site and off-site storm drains and other flood control facilities with plan and profile sheets for public storm drains showing the class of pipe, (Class III, IV, V, etc.), design hydraulic grade line, (HGL) and 100 year storm flow. A public drainage easement must be provided over on-site storm drains conveying off-site flows. An overflow path must be provided over all storm drains.
X		All existing and "to be constructed" walls with cross-sections showing wall type, (e.g. block wall, retaining wall, flood wall, etc.), with limits clearly defined, adjacent ground elevations. Wall heights must meet current ordinances and in no case exceed 14 feet above the adjacent property.
	N/A	Street slopes for both interior and perimeter streets. Note: The minimum slope for a roadway is 0.4 percent, a minimum 18-inch storm drain must be provided where minimum slopes cannot be met.
	N/A	Back of lot elevations and lot drainage pattern for all lots including common lots.
X		Sites with a grade difference two feet above or below existing ground are required to have approval from City of Las Vegas Current Planning. Current Planning approval is required prior to final approval of the drainage study.
X		On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners. (The project must pass flows through the site every 600 feet where the project is blocking flow paths.)
	N/A	This project uses a solid grouted stem wall (or approved alternate) at the back of sidewalk to provide erosion protection for landscaped areas where the depth of flow in the roadway exceeds the back of walk elevation. A corresponding cross-section detail is included.
	N/A	Commercial and Common Lot Landscape areas are not allowed to drain over the sidewalk. The grading plans show flow lines with grades and sidewalk under drains for all landscape areas draining to the public ROW.

III. Local Entity Criteria - City of Las Vegas – Manual Section 1600		
Yes	No	
	N/A	Concrete valley gutters are required in parking lots with slopes less than 1 percent. Slopes through cul-de-sac must be at a 1 percent minimum where flow is drained through the cul-de-sac.
X		Ten-foot wide public drainage easements to be privately maintained are allowed for flow less than 20 cfs. The depth of flow entering the easement must be checked using the submerged weir calculation.
X		The limits of the flood zones and the base flood elevations (BFE) must be shown on all grading plans for all developments within a Special Flood Hazard Zone A, AO, AE, etc.
X		Minimum finish floor elevation is 6 inches above highest adjacent top of curb. Finish floor calculations must include allowances for super elevations on curves and velocity head for tee intersections.
X		Finished floor elevations for buildings adjacent to public drainage easements must be a minimum of 18 inches above the Q100 weir of submerged weir elevation, whichever is greater.

III. Local Entity Criteria - City of Las Vegas – Manual Section 1600		
Yes	No	
	N/A	Lots with "B and C Type Drainage" that drain from one lot to another through a drainage easement shall be required to install an underground nuisance drainage system or a 2-foot valley gutter. 16" x 24" minimum block wall openings are required for both options.
	N/A	Bubblers are required across 80 foot and greater ROW streets. When flows exceed 10 cfs, bubblers larger than 18 inches will be required up to a maximum of 36". Inlets must be sized to match the pipe size provided.

- Contact the Flood Control Section regarding the drainage study review fee. These fees are payable at the time of submittal.
- The Drainage Study must be conditionally approved prior to submitting improvement plans to the Civil and Planning Development of the Department of Building and Safety for review.

This document is intended as an **aid** in preparing Technical Drainage Studies for the City of Las Vegas. Each study submitted is reviewed for compliance with local and regional criteria. This form is not intended to be all-inclusive and does not limit the extent of the information, calculations or exhibits which may be necessary to properly evaluate the intended land use.

TECHNICAL DRAINAGE STUDY
FOR
THE SEVENTY

840-050

March 2016

Prepared For:

Seventy Acres LLC, Fore Stars LTD, and 180 Land Co LLC
9775 West Charleston Boulevard
Las Vegas, NV 89117
Phone: (702) 940-6930
Fax: (702) 940-6931

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9775 West Charleston Boulevard
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Fax: (702) 940-6931

Prepared By:

GCW, Inc.
1555 South Rainbow Boulevard
Las Vegas, Nevada 89146
Phone: (702) 804-2000
Fax: (702) 804-2299

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I. INTRODUCTION

Seventy Acres LLC, Fore Stars LTD, and 180 Land Co LLC are proposing to construct The Two Fifty, a multi-family residential and single-family residential development consisting of luxury multi-family and estate lots upon the land currently operated as the Badlands golf course located south of Alta Drive, north of Charleston Road, east of Hualapai Way and west of Rampart Boulevard, in Las Vegas, Nevada. A land use exhibit provided in Appendix A shows the proposed site layout. The project improvements include: 3,020 luxury multi-family units and minimum 1 acre to 5 acre estate lots on the 253 acres of APNs 138-32-301-005 (17.49 acres), 138-32-301-006 (53.03 acres), 138-32-210-008 (2.37 acres), 138-32-202-001 (2.13 acres) 138-31-702-002 (166.99 acres) and 138-31-801-002 (11.28 acres). Onsite storm drain facilities are proposed to convey the offsite flows from the existing storm drain facilities in Hualapai Way and Charleston Boulevard to the existing dual (2) - 12-foot wide by 12-foot high reinforced concrete box culverts (RCBC) in Rampart Boulevard at the Rampart Boulevard and Alta Drive intersection. The Two Fifty development will be constructed in three phases. The 1st phase of development consists of mass grading and storm drain improvements for approximately 70 acres of APNs 138-32-301-005, 138-32-301-006, 138-32-210-008, and 138-32-202-001 (hereafter referred to as The Seventy). The 2nd phase of development includes construction of the luxury multi-family units within The Seventy. The 3rd phase of development includes construction of the estate lots within approximately 180 acres of APNs 138-31-702-002 and 138-31-801-002 (hereafter referred to as The One Eighty). The purpose of this report is to provide a conceptual drainage analysis for The Two Fifty and serve as a technical drainage study for The Seventy to determine the impacts to downstream developments and facilities to establish allowable flow rates and drainage patterns for interior development, and to recommend storm drain facilities to convey storm flow through the project site. This study also addresses the 1st phase of development which includes The Seventy mass grading and onsite storm drain improvements. The 2nd phase of development will be addressed in a future technical drainage study updates and the 3rd phase of development will be addressed in a future technical drainage study for The One Eighty. The following tasks were performed in the preparation of this report:

- Identify and review previous drainage studies for the project site and areas adjacent to the project.
- Identify the existing FEMA floodplain designation for the project site.
- Determine recommended proposed FEMA floodplain designations within the project limits.

- Identify existing and proposed regional drainage facilities within and adjacent to the project site.
- Identify existing drainage areas and storm drain facilities that affect the site.
- Perform field investigation.
- Estimate peak runoff impacting the proposed grading and storm drain improvements during the 10-year and 100-year return period storms for existing and proposed conditions.
- Recommend conceptual drainage facilities for The One Eighty to protect the proposed project and downstream properties from storm runoff.
- Prepare hydraulic analyses for The Seventy storm drain and proposed channel improvements.
- Recommend drainage facilities to protect the proposed project from storm runoff.

GCW has obtained and reviewed technical drainage studies and grading plans from the City of Las Vegas (CLV) for the site and offsite properties adjacent to the site to determine existing conditions offsite and onsite drainage patterns and discharge flows into the site. The studies reviewed include:

1. *Technical Drainage Study for Peccole Ranch Golf Course (Phase II)* (DS 1347)
2. *Technical Drainage Study for Peccole West Commercial Center* (DS 2364)
3. *Technical Drainage Study for Rampart Boulevard* (DS 2696)
4. *Technical Drainage Study Update for Peccole Ranch Golf Course Maintenance Yard* (DS 1626)
5. *Hydrology Study Update for Queensridge Fairway Homes* (DS 2307)
6. *Technical Drainage Study Peccole West Lot 9 (Phase II)* (DS 1630)
7. *Technical Drainage Study for Peccole West Lot 12* (DS 1650)
8. *Technical Drainage Study for Village 12 Hualapai Way Improvements* (DS 1853)
9. *Technical Drainage Study for Hualapai Way Rough Grading, Alta Drive to Charleston Boulevard* (DS 1758)
10. *Technical Drainage Study for Peccole West Lot 11* (DS 1753)
11. *Technical Drainage Study for Peccole Ranch Parcel 19 & 20* (DS 2172)
12. *Technical Drainage Study for San Michelle West* (DS 2226)
13. *Technical Drainage Study for Peccole – Lot 10 Parcel 18* (DS 2203)
14. *Technical Drainage Study for Windsor at Queensridge* (DS 3279)

15. *Technical Drainage Study for Club House* (DS 1555)
16. *Technical Drainage Study for the Versailles* (DS 2236)
17. *Master Drainage Study for Peccole Ranch – Phase II* (DS 1140)
18. *Technical Drainage Study for Badlands Hole 9* (DS 1974)
19. *Technical Drainage Study for Peccole West Business Center* (DS 1856)
20. *Technical Drainage Study for Peccole West Lot 12 (Park Area)* (DS 1929)
21. *Technical Drainage Study for One Queensridge Place (Condo Towers) – Update 2* (DS 3746)
22. *Technical Drainage Study for Apple Drive at Peccole Ranch* (DS 1576)
23. *Technical Drainage Study for Alta Drive at Peccole Ranch* (DS 1588)
24. *Technical Drainage Study for Peccole Ranch Phase II Master Plan* (DS 273)
25. *Conceptual Drainage Study for Peccole Ranch Phase II Master Plan* (DS 1273)

An exhibit showing the name and general location of the adjacent developed areas and referenced studies listed above has been included in Appendix A. In order to identify offsite drainage patterns impacting the proposed site, a field visit was performed to confirm overall existing conditions drainage patterns for the site and offsite adjacent parcels.

Hydraulic information from the following study has been referenced for the purposes of this report:

The Technical Drainage Study for Queens Borough Culvert (Reference 1, hereinafter referred to as the Queens Borough Culvert Study) was approved by the CLV on August 30, 2005. The Queens Borough Culvert Study designed the existing approximately 2,000 linear foot dual (2) - 12-foot wide by 12-foot high RCB storm drain system (CCRFCD Facility APSO 0000) downstream of the existing dual (2) - 12-foot wide by 12-foot-high RCB at the Rampart Boulevard and Alta Drive intersection. Proposed flows discharged from the site will be conveyed by the Queens Borough Culvert Study storm drain north to the Angel Park Detention Basin (CCRFCD Facility APNO 0001). Pertinent referenced material from the Queens Borough Culvert Study has been included in Appendix C. Updates to the Queens Borough Culvert Study included the following:

- *Update to the Technical Drainage Study for Queens Borough Culvert (Reference 2)* – Approved by CLV on December 30, 2005.

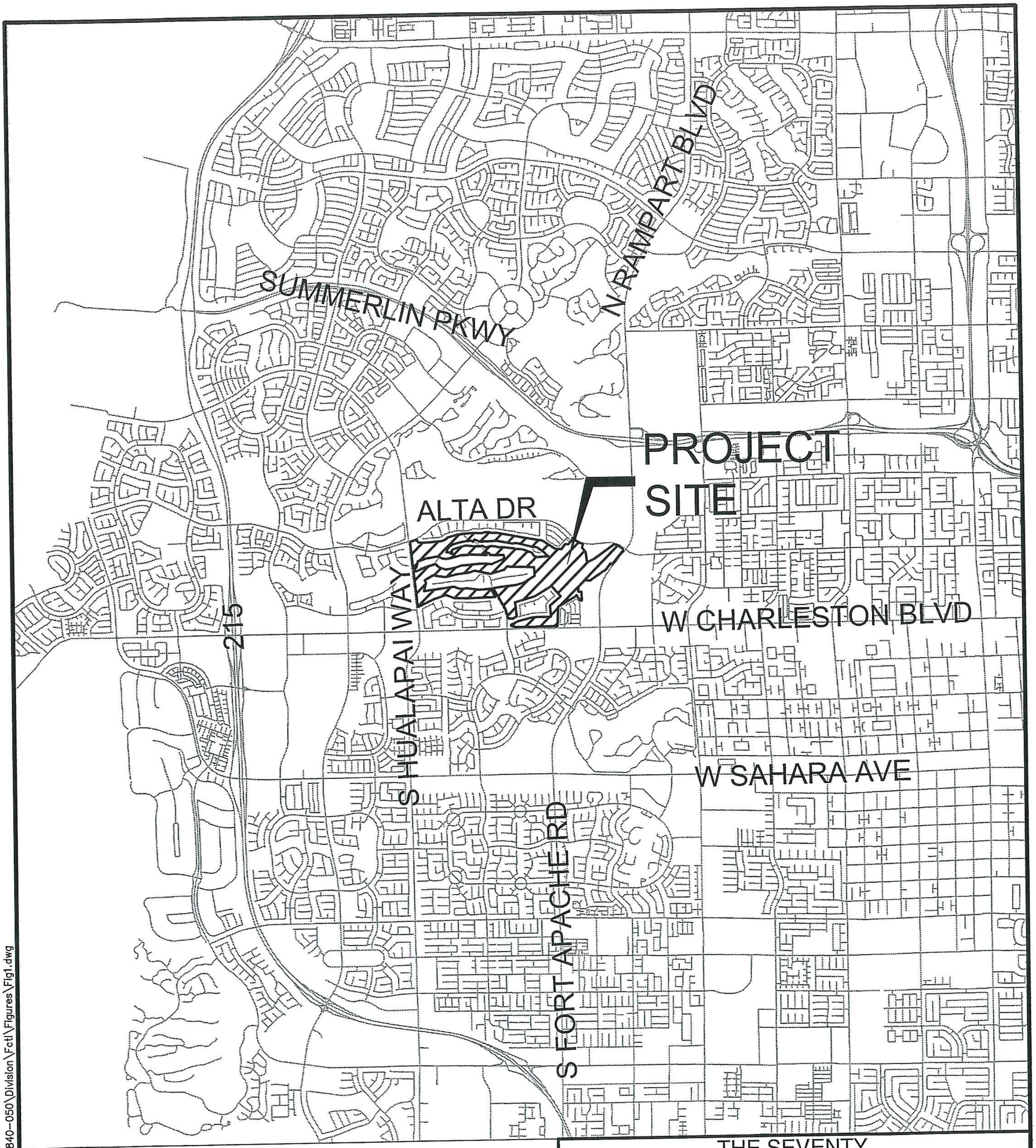
- *Update #2 to the Technical Drainage Study for Queens Borough Culvert (Reference 3*, hereinafter referred to as the Queens Borough Culvert Study Update #2 Study*)* – Approved by CLV on April 21, 2006.

II. LOCATION AND DESCRIPTION

The Seventy is located on approximately 70 acres in Sections 31 and 32, Township 20 South, Range 60 East, M.D.M., in the City of Las Vegas, Nevada. Please refer to Figures 1 and 2 for the vicinity and location of the project site. The site is presently developed as a golf course with existing washes traversing the project site conveying flows from west to east. Offsite flows are conveyed to the site from the west and south through existing reinforced concrete box culverts under Hualapai Way and Charleston Boulevard. Offsite flows from residential subdivisions and commercial development adjacent to the golf course are discharged to the existing golf course as surface flow through existing storm drain and/or drainage easements. The full street improvements are in place for Alta Drive, Charleston Road, Hualapai Way and Rampart Boulevard. For this study, the proposed improvements include mass grading and onsite storm drain facilities. Grading and development of the future onsite development will include multi-family and associated open space and parking area development and will be addressed in a future technical drainage study updates.

III. FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD HAZARD ANALYSIS

Based on the Flood Insurance Rate Map (FIRM) Community Panel 32003C 2145 F dated November 16, 2011, and FIRM Panel 32003 C 2150 E dated September 27, 2002, and revised to reflect the Letter of Map Revision (LOMR) Case No. 06-09-B483P dated September 21, 2006, and LOMR Case No. 06-09-B486P dated October 19, 2006, the project site is crossed by a FEMA-designated Special Flood Hazard Area (SFHA). The proposed improvements will construct closed conduit facilities that will contain and convey the 100-year flow (1% annual chance flood discharge) through The Seventy. Figure 3 shows the site denoted on a portion of the aforementioned FIRM panels. A Conditional Letter of Map Revision (CLOMR) will be obtained from FEMA prior to construction of this project. A LOMR will be obtained from FEMA once construction of the onsite RCB storm drain system is substantially completed and functional.



GRAPHIC SCALE

5000 0 2500 5000

(IN FEET)

1 inch = 5000 ft.

NORTH

THE SEVENTY
SEVENTY ACRES LLC, FORE STARS LTD, AND 180 LAND CO LLC

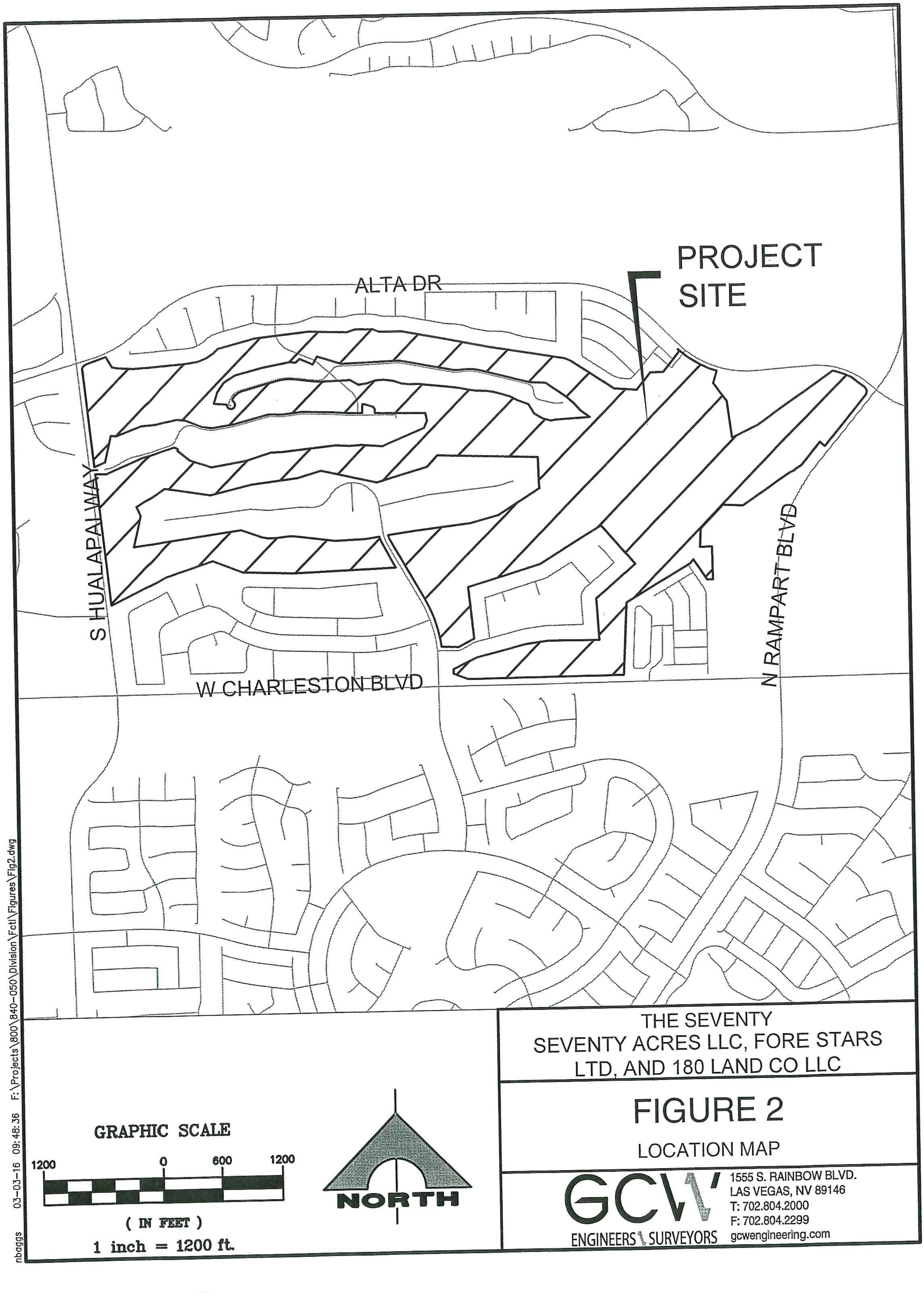
FIGURE 1

VICINITY MAP

GCW ENGINEERS SURVEYORS

1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

nbaggs 03-03-16 09:46:03 F:\Projects\800\840-050\Division\Fctl\Figures\Fig1.dwg



THE SEVENTY
SEVENTY ACRES LLC, FORE STARS LTD, AND 180 LAND CO LLC

FIGURE 2

LOCATION MAP

GCW ENGINEERS SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

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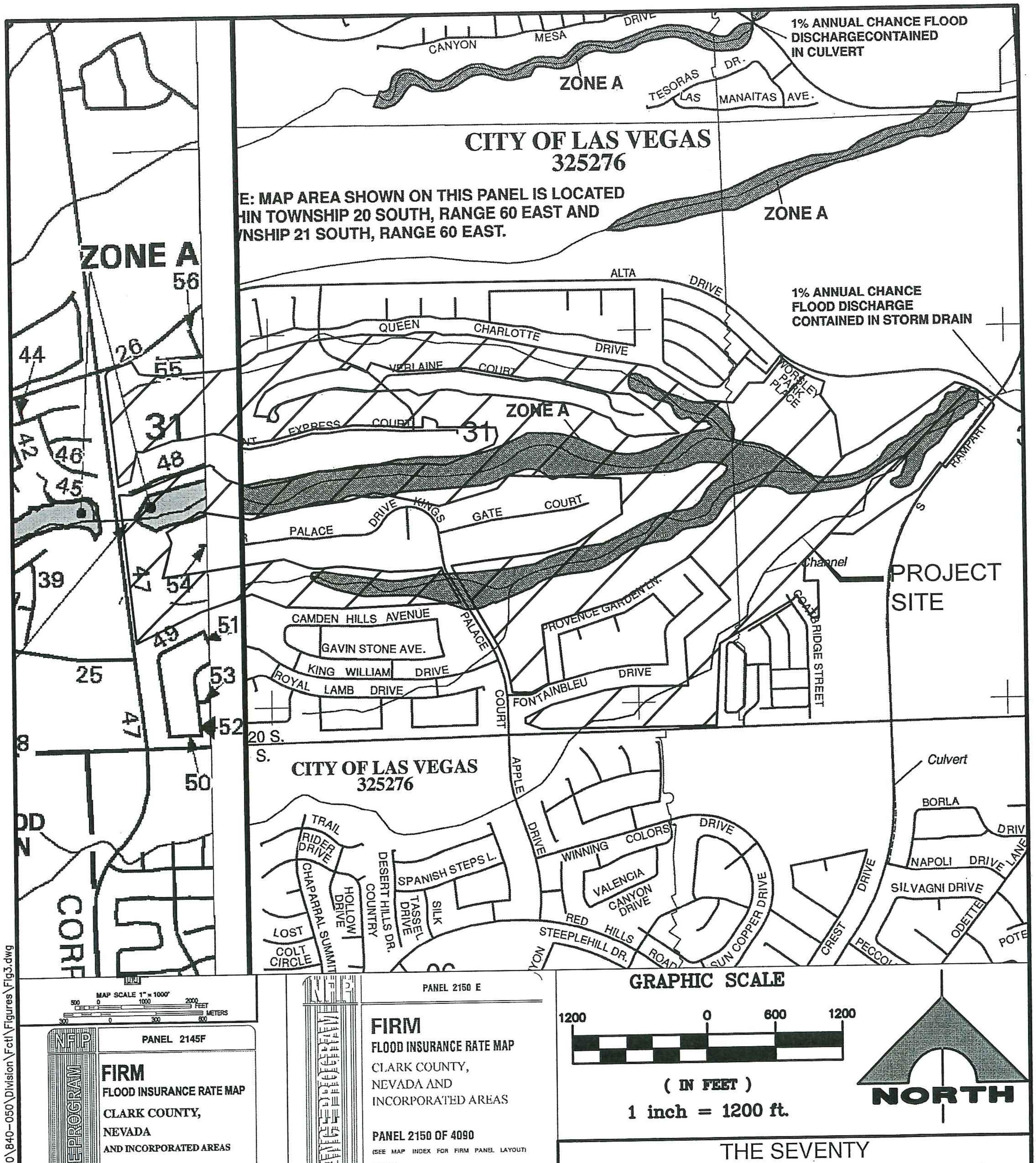

THE SEVENTY SEVENTY ACRES LLC, FORE STARS LTD, AND 180 LAND CO LLC

FIGURE 3

F.I.R.M.

GCW ENGINEERS SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

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IV. CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT (CCRFCD) FACILITIES

Figure 4 is reproduced from Figures F-12 from the *2013 Las Vegas Valley Flood Control Master Plan Update* (Reference 4, hereinafter referred to as the 2013 MPU). The figure depicts the project site in relation to existing and proposed regional facilities. As shown on Figure 4, the following facilities are within or adjacent to the project site:

- Angel Park – South Branch (APSO 0000-0204)
- Angel Park – Peccole 1 (APP1 0000)
- Angel Park – Peccole 2 (APP2 0000)

The Two Fifty project site contains existing CCRFCD Facilities APSO 0050, APSO 0067, and APP2 0000. The existing CCRFCD Facilities within The Two Fifty project site are labeled as natural washes in the 2013 MPU. The One Eighty proposes approximately 4,700 linear feet of CCRFCD Facility APSO 0067 and approximately 2,300 linear feet of CCRFCD Facility APP2 0000 as future RCB storm drain. The Seventy proposes to construct CCRFCD Facility APSO 0050 and approximately 1,900 linear feet of CCRFCD Facility APSO 0067 and approximately 1,485 linear feet of CCRFCD Facility APP2 0000 as RCB storm drain.

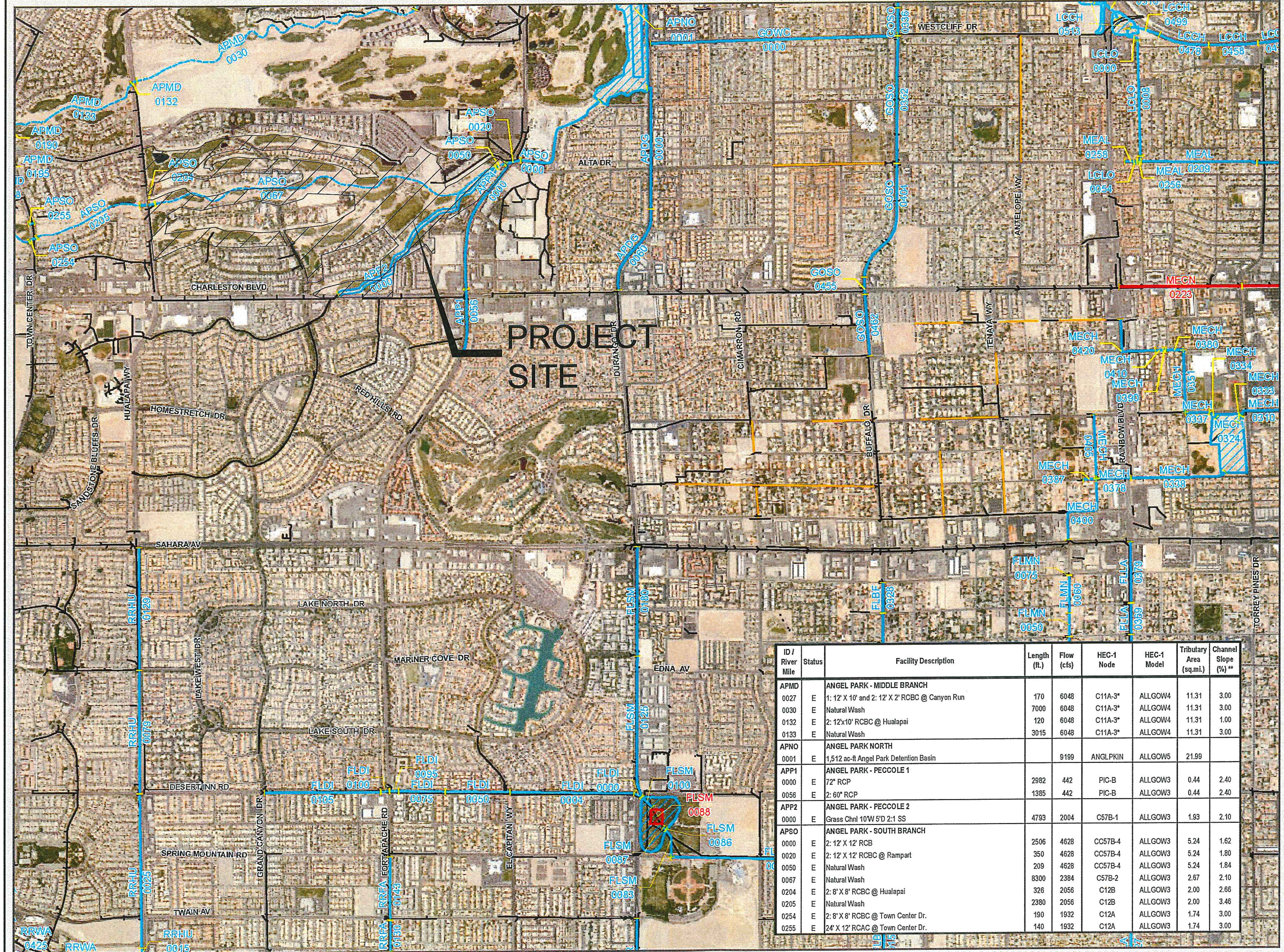
The 2013 MPU flow rates for the proposed CCRFCD Facilities will be superseded by the project specific hydrology presented in this report. Flows conveyed through the site are discharged northeast to existing CCRFCD Facility APSO 0020 located at the Rampart Boulevard and Alta Drive intersection. CCRFCD Facility APSO 0020 is labeled as a dual (2) - 12-foot wide by 12-foot high RCB in the 2013 MPU. CCRFCD Facility APSO 0020 discharges flow east to existing CCRFCD Facility APSO 0000. CCRFCD Facility APSO 0000 is labeled as a dual (2) - 12-foot wide by 12-foot high RCB in the 2013 MPU. CCRFCD Facility APSO 0000 conveys flow northeast to the existing Angel Park Detention Basin. The hydraulic design for CCRFCD Facility APSO 0000 was presented in the Queens Borough Culvert Study. The Angel Park Detention Basin is labeled as CCRFCD Facility APNO 0001.

REGIONAL FLOOD CONTROL DISTRICT

2013
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE F- 30

FLOOD CONTROL FACILITIES



ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
APMD		**ANGEL PARK - MIDDLE BRANCH**						
0027	E	1: 12' X 10' and 2: 12' X 2' RCBC @ Canyon Run	170	6048	C11A-3*	ALLGOW4	11.31	3.00
0030	E	Natural Wash	7000	6048	C11A-3*	ALLGOW4	11.31	3.00
0132	E	2: 12'x10' RCBC @ Hualapai	120	6048	C11A-3*	ALLGOW4	11.31	1.00
0133	E	Natural Wash	3015	6048	C11A-3*	ALLGOW4	11.31	3.00
APNO		**ANGEL PARK NORTH**						
0001	E	1,512 ac-ft Angel Park Detention Basin		9199	ANGLPKIN	ALLGOW5	21.99	
APP1		**ANGEL PARK - PECCOLE 1**						
0000	E	72" RCP	2982	442	PIC-B	ALLGOW3	0.44	2.40
0056	E	2: 60" RCP	1385	442	PIC-B	ALLGOW3	0.44	2.40
APP2		**ANGEL PARK - PECCOLE 2**						
0000	E	Grass Chnl 10'W 5'D 2:1 SS	4793	2004	C57B-1	ALLGOW3	1.93	2.10
APSO		**ANGEL PARK - SOUTH BRANCH**						
0000	E	2: 12' X 12' RCB	2506	4628	CC57B-4	ALLGOW3	5.24	1.62
0020	E	2: 12' X 12' RCBC @ Rampart	350	4628	CC57B-4	ALLGOW3	5.24	1.80
0050	E	Natural Wash	209	4628	CC57B-4	ALLGOW3	5.24	1.84
0067	E	Natural Wash	8300	2384	C57B-2	ALLGOW3	2.67	2.10
0204	E	2: 8' X 8' RCBC @ Hualapai	326	2056	C12B	ALLGOW3	2.00	2.66
0205	E	Natural Wash	2380	2056	C12B	ALLGOW3	2.00	3.46
0254	E	2: 8' X 8' RCBC @ Town Center Dr.	190	1932	C12A	ALLGOW3	1.74	3.00
0255	E	24' X 12' RCAC @ Town Center Dr.	140	1932	C12A	ALLGOW3	1.74	3.00

LEGEND

- Ultimate Development Boundary
- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Local Existing Facilities
- Local Proposed Facilities
- Detention Basin
- Stormdrain
- Lined Channel
- Unlined Channel
- Levee/Dike
- Natural Wash/Floodway
- ID-Mile Separator

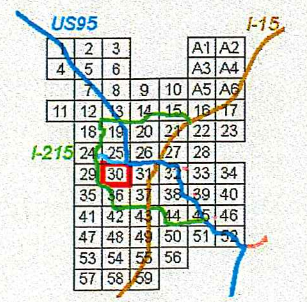
Remove & Replace/Parallel Facilities

Category A	Category B
Channel	Channel
Stormdrain	Stormdrain

FIGURE 4

N

0 500 1,000 2,000 3,000
Feet
Scale: 1 inch = 2,000 feet
Refer to Figure G-2 for Aerial Source(s)



V. HYDROLOGY

The methodology presented in this study is in compliance with the *CCRFCD Hydrologic Criteria and Drainage Design Manual* (Reference 5, hereinafter referred to as the Manual).

Model Description - The drainage subbasins were modeled using the SCS Unit Hydrograph method within the U.S. Army Corps of Engineers *HEC-1 Flood Hydrograph Package* (Reference 6). Since the drainage area for each watershed within the project is less than 8 square miles, an SDN 3 design storm was selected for use in the HEC-1 computer model. The 2013 MPU ALLGOW3.dat HEC-1 model has been referenced and revised for the purposes of this report.

Precipitation – The project site and tributary drainage areas lie outside of the McCarran Rainfall Area as identified in the Manual. Rainfall depths for the project site were calculated utilizing GIS data distributed by the Clark County GISMO (Geographic Information Systems Management Office). The GIS rainfall depths were extracted from the NOAA Rainfall Atlas and have been adjusted according to the approach outlined in Section 500 of the Manual. The adjusted point precipitation values for the onsite drainage subbasins range from 2.88 inches to 3.08 inches for the 100-year storm event and 1.64 inches to 1.76 inches for the 10-year storm events. The rainfall exhibit has been included in Appendix A.

Curve Numbers (CN) – The soils information for the project watershed was referenced from the *Soil Survey of Las Vegas Valley Area, Nevada, Part of Clark County* (Reference 7). This survey delineates families of soil types and the Hydrologic Soil Group (HSG) of each family. A soils map containing the project site is included in Appendix A. The soil classification for the site has been revised since the 2013 MPU was prepared and the soil classification used for the onsite portion of the model has been revised accordingly. A copy of the *Custom Soil Resource Report for the Soil Survey of the Las Vegas Valley Area, Nevada, Part of Clark County* from the U.S. Department of Agriculture and Natural Resource Conservation Service (Reference 7) have been included in Appendix A. The report shows that the project area and offsite subbasins consist of Soil Type 152 (Cave). Soil Type 152 is classified as 100 percent Hydrologic Soil Group (HSG) Type "D". Note that the 2013 MPU hydrology shows Soil Type 152 classified as 5 percent HSG Type "A", 10 percent HSG Type "B", and 85 percent HSG Type "D". As a result of the revisions, CNs for the offsite and onsite existing conditions subbasins are slightly higher than the CNs presented in the 2013 MPU.

The land uses or land covers used for the subbasins shown for the adjacent parcels and The One Eighty portions of the site are referenced from the 2013 MPU. Due to the size of the future estate lots (minimum 1 to 5± acres), curve numbers for the future The One Eighty subbasins will be less than or equal to the curve numbers presented in this report for existing and proposed conditions.

The land uses or land covers used for the developed The Seventy portion of the site consist of "commercial and business." Weighted curve numbers for the subbasins were calculated using GIS. The land covers used for the mass graded portion of the site in the proposed conditions model conservatively assumes "commercial and business" in lieu of "newly graded areas" since the difference in the calculated curve numbers are comparable (commercial CN 95 vs. newly graded CN 94).

Curve numbers for existing and developed conditions basins, as well as a curve number matrix of the soil type and for each land use, are included in Appendix A.

For the given soils, CN values were determined from appropriate columns of Table 602 and 602A of the Manual. Composite CN values of 82 to 95 were determined for the existing and developed conditions onsite subbasins, respectively.

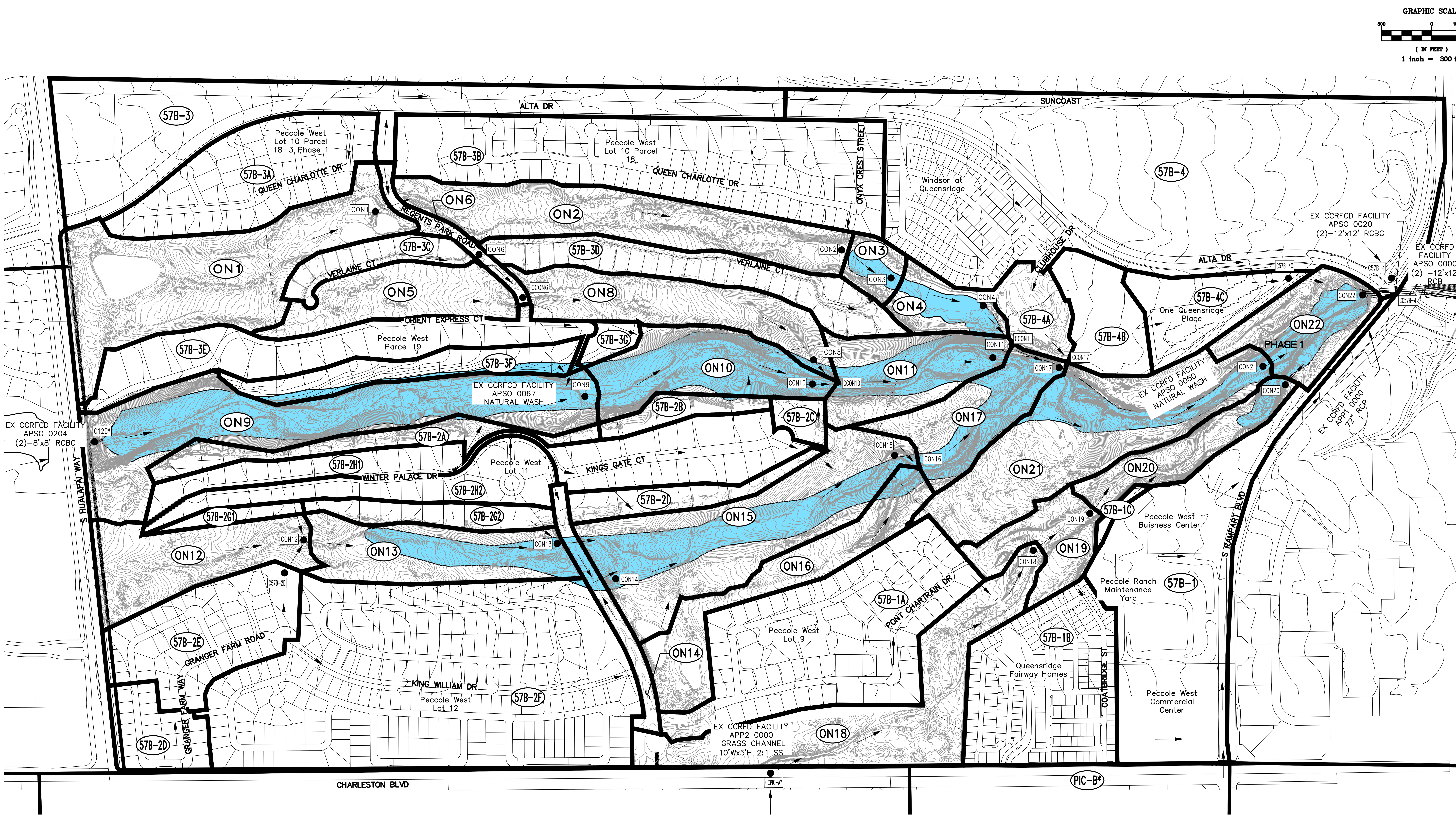
Drainage Areas and Flow Patterns - The subbasins and flow patterns used for the hydrologic modeling were determined from elevations established for the project site in a master grading digital file. Offsite hydrology was determined from research of existing drainage studies for adjacent developments.

Lag Time - The lag time (TLAG) is described as the time between the center of mass of rainfall and the time of peak discharge from a basin. Lag time can be related to time of concentration (T_c) by the following relationship: TLAG = 0.6 (T_c). The time of concentration (T_c) is defined as the time required for runoff to flow from the most hydraulically distant area of the basin to the outlet of the basin or a design point. The procedure for calculating T_c is outlined in Section 602 of the Manual. Lag time calculations for the drainage subbasins have been included in Appendix A on Standard Form 4.

VI. EXISTING CONDITIONS

The site is presently developed as a golf course with existing washes traversing the project site conveying flows from west to east. A site visit was performed to confirm drainage patterns within the site and for parcels adjacent to the site. Offsite flows impact the site from the west and south. Offsite flows are conveyed to the site from the west via an existing dual (2) 8-foot wide by 8-foot high RCBC (CCRFCD Facility APSO 0204) under Hualapai Way. Additionally, offsite flows are conveyed to the site from the south via an existing RCBC under Charleston Boulevard. Offsite flows from residential subdivisions and commercial development adjacent to the golf course are discharged to the existing golf course as surface flow through existing storm drain and/or drainage easements. Flows conveyed through the site are discharged northeast to existing CCRFCD Facility APSO 0020 a dual (2) - 12-foot wide by 12-foot high RCB located at the Rampart Boulevard and Alta Drive intersection.

Figure 5 depicts the subbasins and drainage patterns used in the existing conditions hydrologic analysis. Offsite subbasins west of Hualapai Way and south of Charleston Boulevard are referenced from the 2013 MPU ALLGOW3 HEC-1 Model. The portion of the 2013 MPU tributary to 2013 MPU Concentration Point CC57B-4 located at the intersection of Alta and Rampart has been revised with this report. The model has been revised to determine onsite project specific flow rates and existing conditions flow rates discharged to CCRFCD Facilities APSO 0020 and APSO 0000. Copies of Figures H-29 and H-30 from the 2013 MPU have been included in Appendix C. The results of the Existing Conditions HEC-1 model are summarized in Table 1. A copy of the Existing Conditions HEC-1 model output is included in Appendix A.



SUMMARY OF EXISTING CONDITIONS HEC-1 MODEL			
SB OR CP	AREA (AC)	100 YR (CFS)	10 YR (CFS)
57B-1	31.1	80	40
57B-1A	28.4	54	20
57B-1B	19.3	51	25
57B-1C	0.6	2	1
57B-2A	6.3	14	6
57B-2B	3.0	8	3
57B-2C	1.7	5	2
57B-2D	5.7	16	7
57B-2E	14.5	42	19
57B-2F	57.8	147	69
57B-2G1	1.6	5	2
57B-2G2	4.6	12	5
57B-2H1	18.6	32	13
57B-2H2	10.0	21	9
57B-2I	4.6	12	5
57B-3	30.8	44	28
57B-3A	16.6	36	14
57B-3B	32.8	66	25
57B-3C	4.4	11	4
57B-3D	11.8	26	11
57B-3E	16.0	32	13
57B-3F	7.4	17	7
57B-3G	1.5	4	2
57B-4	82.7	202	101
57B-4A	4.5	8	3
57B-4B	7.1	24	13
57B-4C	7.8	23	12
C12B*	-	2134	990
C57B-2E	-	56	26
C57B-4	-	259	127
C57B-4C	-	47	25
CC57B-4	-	4720	2354
CCON6	-	36	14
CCON10	-	2128	1025
CCON11	-	2227	1065
CCON17	-	2472	1171
CCPIC-A*	-	1895	900
CON1	-	86	32
CON2	-	164	55
CON3	-	189	64
CON4	-	195	66
CON6	-	18	8
CON8	-	54	19
CON9	-	2120	1012
CON10	-	2120**	1015
CON11	-	2128	1017
CON12	-	83	36
CON13	-	118	49
CON14	-	174	79
CON15	-	346	142
CON16	-	367	150
CON17	-	368	153
CON18	-	1912	906
CON19	-	1954	923
CON20	-	1944	923
CON21	-	2493	1177
CON22	-	4209	2065
ON1	25.4	50	18
ON2	17.5	31	11
ON3	2.5	6	2
ON4	4.7	9	3
ON5	9.4	18	7
ON6	2.3	8	4
ON8	12.2	27	9
ON9	25.5	41	14
ON10	11.4	24	8
ON11	10.0	19	7
ON12	11.6	23	8
ON13	12.0	23	8
ON14	3.5	6	2
ON15	22.5	42	15
ON16	11.5	23	8
ON17	9.1	20	7
ON18	20.3	31	10
ON19	6.4	12	4
ON20	6.6	12	4
ON21	22.3	34	12
ON22	8.5	18	6
PIC-B*	282.2	442	205

* Referenced Subbasin/Concentration Point from 2013 MPU

**The HEC-1 node shown identifies the controlling concentration point for the associated facility and is located upstream of this facility due to decreasing peak flow with increasing tributary area caused by storm distribution transitions, depth area reduction factors, or attenuation of flow for routing.

LEGEND

- SUBBASIN BOUNDARY
- OFF1 DRAINAGE SUBBASIN
- CP1 CONCENTRATION POINT
- FLOW DIRECTION
- ZONE A SFHA FLOODPLAIN

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

SEVENTY ACRES LLC, FORE STARS LTD, AND 180 LAND CO LLC

THE SEVENTY

EXISTING CONDITIONS DRAINAGE MAP

DESIGN:
DRAWN:
CHECK:
ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 03-03-16
PLOT TIME: 09:52:53

REV. | DATE | DESCRIPTION | DATE | AGEN. | APP | DATE | GCW | APP | DATE:

DRAWING
FIG5
OF SHTS

TABLE 1
SUMMARY OF EXISTING CONDITIONS HEC-1 MODEL

SB OR CP*	AREA (AC)	100 YR (CFS)	10 YR (CFS)
57B-1	31.1	80	40
57B-1A	28.4	54	20
57B-1B	19.3	51	25
57B-1C	0.6	2	1
57B-2A	6.3	14	6
57B-2B	3.0	8	3
57B-2C	1.7	5	2
57B-2D	5.7	16	7
57B-2E	14.5	42	19
57B-2F	57.8	147	69
57B-2G1	1.6	5	2
57B-2G2	4.6	12	5
57B-2H1	18.6	32	13
57B-2H2	10.0	21	9
57B-2I	4.6	12	5
57B-3	30.8	44	28
57B-3A	16.6	36	14
57B-3B	32.8	66	25
57B-3C	4.4	11	4
57B-3D	11.8	26	11
57B-3E	16.0	32	13
57B-3F	7.4	17	7
57B-3G	1.5	4	2
57B-4	82.7	202	101
57B-4A	4.5	8	3
57B-4B	7.1	24	13
57B-4C	7.8	23	12
C12B*	-	2134	990
C57B-2E	-	56	26
C57B-4	-	259	127
C57B-4C	-	47	25
CC57B-4	-	4720	2354
CCON6	-	36	14
CCON10	-	2128	1025
CCON11	-	2227	1065
CCON17	-	2472	1171
CCPIC-A*	-	1895	900
CON1	-	86	32
CON2	-	164	55
CON3	-	189	64
CON4	-	195	66
CON6	-	18	8
CON8	-	54	19
CON9	-	2120	1012
CON10	-	2120**	1015
CON11	-	2128	1017

TABLE 1
SUMMARY OF EXISTING CONDITIONS HEC-1 MODEL

SB OR CP*	AREA (AC)	100 YR (CFS)	10 YR (CFS)
CON12	-	83	36
CON13	-	118	49
CON14	-	174	79
CON15	-	346	142
CON16	-	367	150
CON17	-	368	153
CON18	-	1912	906
CON19	-	1954	923
CON20	-	1944	923
CON21	-	2493	1177
CON22	-	4209	2065
ON1	25.4	50	18
ON2	17.5	31	11
ON3	2.5	6	2
ON4	4.7	9	3
ON5	9.4	18	7
ON6	2.3	8	4
ON8	12.2	27	9
ON9	25.5	41	14
ON10	11.4	24	8
ON11	10.0	19	7
ON12	11.6	23	8
ON13	12.0	23	8
ON14	3.5	6	2
ON15	22.5	42	15
ON16	11.5	23	8
ON17	9.1	20	7
ON18	20.3	31	10
ON19	6.4	12	4
ON20	6.6	12	4
ON21	22.3	34	12
ON22	8.5	18	6
PIC-B*	282.2	442	205

*See Figure 5

**The HEC-1 node shown identifies the controlling concentration point for the associated facility and is located upstream of this facility due to decreasing peak flow with increasing tributary area caused by storm distribution transitions, depth area reduction factors, or attenuation of flow for routing.

The existing conditions flow rate of 4,720 cfs (Concentration Point CC57B-4) conveyed to the CCRFCD Facilities APSO 0020 and APSO 0000 is slightly greater (<2%) than the 2013 MPU flow rate of 4,628 cfs shown at this location. The increase in flow rate is due to the increase in the CN values as a result of the updated soils classification for the site, and project specific hydrology revisions within the area bounded by Alta Drive, Rampart Boulevard, Charleston Boulevard and Hualapai Way.

VII. PROPOSED CONDITIONS

The Seventy will be mass graded and the proposed onsite storm drain improvements will be constructed during proposed conditions. Proposed conditions drainage patterns are similar to existing conditions. Figure 6A depicts the subbasins and drainage patterns used in the proposed conditions hydrologic analysis. The results of the Proposed Conditions HEC-1 model are summarized in Table 2. A copy of the Proposed Conditions HEC-1 model output is included in Appendix A.

TABLE 2
SUMMARY OF PROPOSED CONDITIONS HEC-1 MODEL

SB OR CP[1]	AREA (AC)	100 YR (CFS)	10 YR (CFS)
57B-1	31.1	80	40
57B-1A	28.4	54	20
57B-1B	19.3	51	25
57B-1C	0.6	2	1
57B-2A	6.3	14	6
57B-2B	3.0	8	3
57B-2C	1.7	5	2
57B-2D	5.7	16	7
57B-2E	14.5	42	19
57B-2F	57.8	147	69
57B-2G1	1.6	5	2
57B-2G2	4.6	12	5
57B-2H1	18.6	32	13
57B-2H2	10.0	21	9
57B-2I	4.6	12	5
57B-3	30.8	63	28
57B-3A	16.6	36	14
57B-3B	32.8	66	25
57B-3C	4.4	11	4
57B-3D	11.8	26	11
57B-3E	16.0	32	13
57B-3F	7.4	17	7
57B-3G	1.5	4	2
57B-4	82.7	202	101
57B-4B	7.1	24	13

TABLE 2
SUMMARY OF PROPOSED CONDITIONS HEC-1 MODEL

SB OR CP[1]	AREA (AC)	100 YR (CFS)	10 YR (CFS)
57B-4C	7.8	23	12
C12B*	-	2134	990
C57B-2E	-	56	26
C57B-4	-	259	127
C57B-4C	-	47	25
CC57B-4	-	4673	2326
CCON10	-	2128	1025
CCON6	-	36	14
CCON18R	-	1933	913
CCPIC-A*	-	1895	900
CDON2	-	2476	1169
CDON3	-	4177	2058
CDON4	-	4177**	2059
CON1	-	86	32
CON2	-	164	55
CON3R	-	191	65
CON6	-	18	8
CON8	-	54	19
CON9	-	2120	1012
CON10	-	2120**	1015
CON11R	-	2130	1026
CON12	-	83	36
CON13	-	118	49
CON14	-	174	79
CON15R	-	344	142
CON16R	-	364	149
CON18R	-	1910	905
CP19	-	1933**	920
CP20	-	1933**	920
CPPH1	-	2450	1153
DON1	10.8	34	18
DON2	19.5	60	31
DON3	21.1	65	34
DON4	17.4	44	23
ON1	25.4	50	18
ON2	17.5	31	11
ON3R	4.1	9	3
ON5	9.4	18	7
ON6	2.3	8	4
ON8	12.2	27	9
ON9	25.5	41	14
ON10	11.4	24	8
ON11R	5.1	11	4
ON12	11.6	23	8
ON13	12.0	23	8
ON14	3.5	6	2
ON15R	21.5	41	14

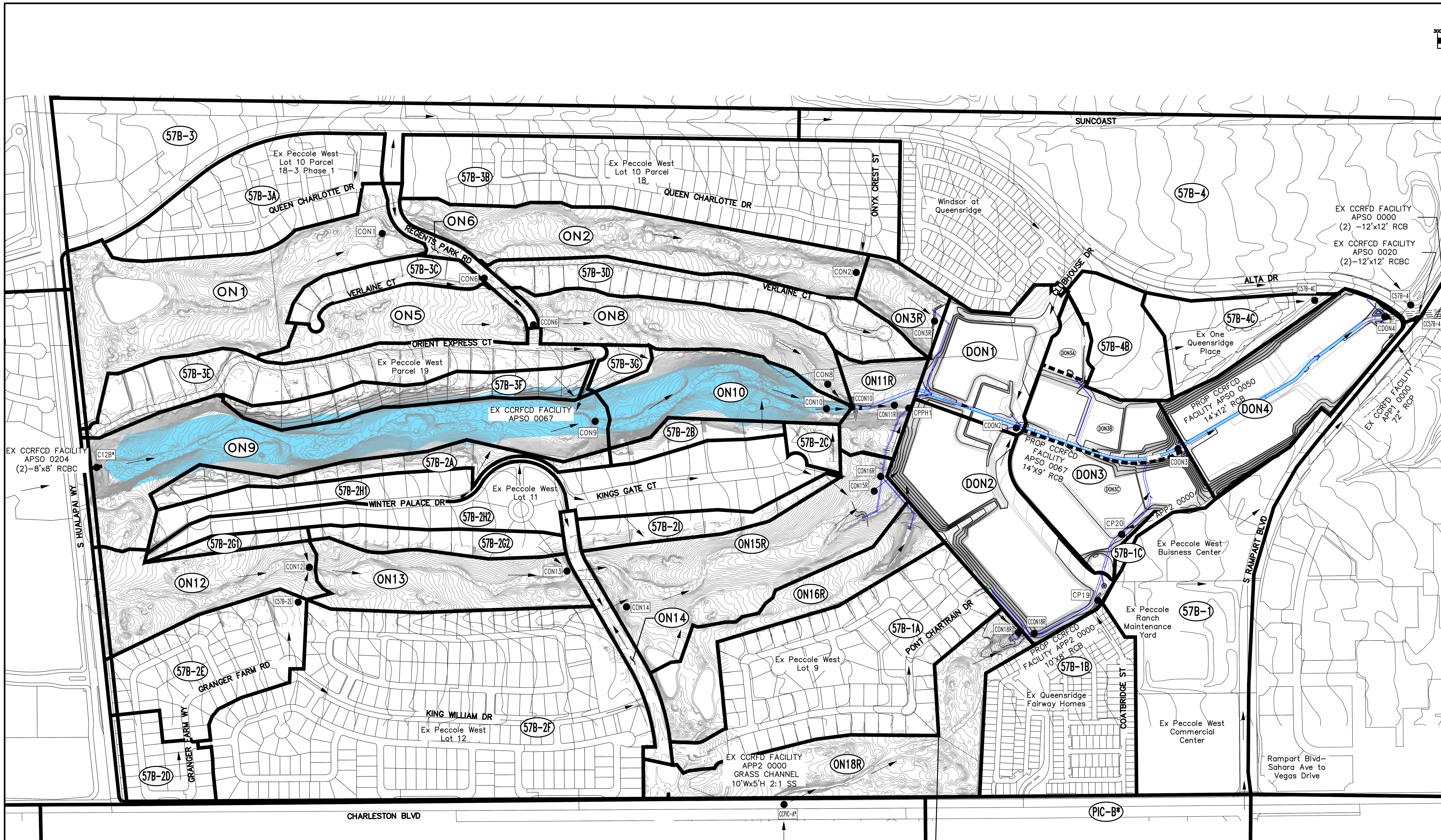
TABLE 2 SUMMARY OF PROPOSED CONDITIONS HEC-1 MODEL			
SB OR CP[1]	AREA (AC)	100 YR (CFS)	10 YR (CFS)
ON16R	10.9	23	8
ON18R	18.5	28	10
PIC-B*	282.2	442	205

[1]See Figure 6A

*Referenced Subbasin/Concentration Point from 2013 MPU

**The HEC-1 node shown identifies the controlling concentration point for the associated facility and is located upstream of this facility due to decreasing peak flow with increasing tributary area caused by storm distribution transitions, depth area reduction factors, or attenuation of flow for routing.

The proposed conditions flow rate of 4,673 cfs (Concentration Point CC57B-4) conveyed to the CCRFCD Facilities APSO 0020 and APSO 0000 is slightly lower than the existing conditions flow rate of 4,720 cfs. Additionally, the proposed conditions flow rate of 4,673 cfs is slightly greater (<1%) than the 2013 MPU flow rate of 4,628 cfs shown at this location. The increase in flow rate is due to the increase in the CN values for onsite subbasins as a result of the updated soils classification for the site and reducing the size of the onsite subbasins for project specific hydrology. The existing CCRFCD Facilities have adequate hydraulic capacity to convey proposed conditions flow rates from the site to the existing Angel Park Detention Basin.



LEGEND

SUBBASIN BOUNDARY

PRORATE SUBBASIN BOUNDARY

OFF1 DRAINAGE SUBBASIN

CP1 CONCENTRATION POINT

FLOW DIRECTION

ZONE A SFHA FLOODPLAIN

SUMMARY OF PROPOSED CONDITIONS HEC-1 MODEL

SB OR CP	AREA (AC)	100 YR (CFS)	10 YR (CFS)
57B-1	31.1	80	40
57B-1A	28.4	54	20
57B-1B	19.3	51	25
57B-1C	0.6	2	1
57B-2A	6.3	14	6
57B-2B	3.0	8	3
57B-2C	1.7	5	2
57B-2D	5.7	16	7
57B-2E	14.5	42	19
57B-2F	57.8	147	69
57B-2G1	1.6	5	2
57B-2G2	4.6	12	5
57B-2H1	18.6	32	13
57B-2H2	10.0	21	9
57B-2I	4.6	12	5
57B-3	30.8	63	28
57B-3A	16.6	36	14
57B-3B	32.8	66	25
57B-3C	4.4	11	4
57B-3D	11.8	26	11
57B-3E	16.0	32	13
57B-3F	7.4	17	7
57B-3G	1.5	4	2
57B-4	82.7	202	101
57B-4B	7.1	24	13
57B-4C	7.8	23	12
C12B*	-	2134	990
C57B-2E	-	56	26
C57B-4	-	259	127
C57B-4C	-	47	25
CC57B-4	-	4673	2326
CCON10	-	2128	1025
CCON6	-	36	14
CCON18R	-	1933	913
CCPIC-A*	-	1895	900
CDON2	-	2476	1169
CDON3	-	4177	2058
CDON4	-	4177**	2059
CON1	-	86	32
CON2	-	164	55
CON3R	-	191	65
CON6	-	18	8
CON8	-	54	19
CON9	-	2120	1012
CON10	-	2120**	1015
CON11R	-	2130	1026
CON12	-	83	36
CON13	-	118	49
CON14	-	174	79
CON15R	-	344	142
CON16R	-	364	149
CON18R	-	1910	905
CP19	-	1933**	920
CP20	-	1933**	920
CPPH1	-	2450	1153
DON1	10.8	34	18
DON2	19.5	60	31
DON3	21.1	65	34
DON4	17.4	44	23
ON1	25.4	50	18
ON2	17.5	31	11
ON3R	4.1	9	3
ON5	9.4	18	7
ON6	2.3	8	4
ON8	12.2	27	9
ON9	25.5	41	14
ON10	11.4	24	8
ON11R	5.1	11	4
ON12	11.6	23	8
ON13	12.0	23	8
ON14	3.5	6	2
ON15R	21.5	41	14
ON16R	10.9	23	8
ON18R	18.5	28	10
PIC-B*	282.2	442	205

*Referenced Subbasin/Concentration Point from 2013 MPU

**The HEC-1 node shown identifies the controlling concentration point for the associated facility and is located upstream of this facility due to decreasing peak flow with increasing tributary area caused by storm distribution transitions, depth area reduction factors, or attenuation of flow for routing.

PROPOSED CONDITIONS PRORATED FLOW SUMMARY

Subbasin*	Q_{100} (cfs)	Area (acres)	cfs/acre
Ultimate Onsites			
Subbasin*	Q_{100} (cfs)	Area (acres)	cfs/acre
DON3	65	21.1	3.08
Proposed Onsite Prorated Basins			
Subbasin*	Q_{100} (cfs)	Area (acres)	cfs/acre
DON3A	6	1.9	3.08
DON3B	23	7.4	3.08
DON3C	36	11.8	3.08
TOTAL	65	21.1	NA

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1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

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THE SEVENTY

PROPOSED CONDITIONS DRAINAGE MAP

DRAWING

FIG6A

OF SHTS

Onsite Mass Grading

Proposed onsite drainage patterns and rough grading are depicted on Figure 6B. Subbasins impacting the proposed rough graded channels have been prorated to determine the specific flow rates to the proposed rough graded channel sections. The prorated flows are based on the total cfs per acre of tributary area. Prorated flows are summarized on Table 3.

TABLE 3
PROPOSED CONDITIONS
PRORATED FLOW SUMMARY

Proposed Onsite Subbasins			
Subbasin[1]	Q_{100} (cfs)	Area (acres)	cfs/acre
DON3	65	21.1	3.08
Proposed Onsite Prorated Subbasins			
Subbasin*	Q_{100} (cfs)	Area (acres)	cfs/acre
DON3A	6	1.9	3.08
DON3B	23	7.4	3.08
DON3C	36	11.8	3.08
TOTAL	65	21.1	NA

[1]See Figures 6A and 6B.

The onsite rough graded ditches are summarized in Table 4. Ditch calculations have been included in Appendix B.

TABLE 4
100-YEAR ROUGH GRADING DITCH CHARACTERISTICS

Ditch[1]	Min Slope (%)	Q_{100} (cfs)	Depth of flow (ft)	Velocity (ft/s)	Bottom Width (ft)	Type	Side Slopes	Lining D50 (in)	Min Depth (ft)	Tributary
Section A	0.65	44	0.54	2.91	24	Trap	9.5:1/5:1	N/A	1.50	DON4
Section B	1.20	44	0.33	2.97	42	Trap	9:1/9:1	N/A	1.50	DON4
Section C	5.85	59	0.33	4.21	42	Trap	3:1/2:1	12	1.50	DON3B + DON3C
Section D	4.28	59	0.36	3.81	42	Trap	3:1/3:1	12	1.50	DON3B + DON3C
Section E	0.50	60	1.08	3.60	10	Trap	8:1/2:1	N/A	2.00	DON2
Section F	0.73	60	1.07	4.64	10	Trap	2:1/2:1	N/A	2.50	DON2
Section G	0.61	34	0.80	3.55	10	Trap	3:1/2:1	N/A	2.00	DON1
Section H (north)	6.15	33	0.56	3.95	0	V-ditch	3:1/50:1	12	2.00	1/2 DON2
Section H (south)	6.15	33	0.57	3.97	0	V-ditch	2:1/50:1	12	2.00	1/2 DON2

[1]See Figures 6A and 6B.

100-YEAR ONSITE DITCH CHARACTERISTICS										
Ditch	Min Slope (%)	Q_{100} (cfs)	Depth of flow (ft)	Velocity (ft/s)	Bottom Width (ft)	Type	Side Slopes	Lining D50 (in)	Min Depth (ft)	Tributary
Section A	0.65	44	0.54	2.91	24	Trap	9.5:1/5:1	N/A	1.50	DON4
Section B	1.20	44	0.33	2.97	42	Trap	9:1/9:1	N/A	1.50	DON4
Section C	5.85	59	0.33	4.21	42	Trap	3:1/2:1	12	1.50	DON3B + DON3C
Section D	4.28	59	0.36	3.81	42	Trap	3:1/3:1	12	1.50	DON3B + DON3C
Section E	0.50	60	1.08	3.60	10	Trap	8:1/2:1	N/A	2.00	DON2
Section F	0.73	60	1.07	4.64	10	Trap	2:1/2:1	N/A	2.50	DON2
Section G	0.61	34	0.80	3.55	10	Trap	3:1/2:1	N/A	2.00	DON1
Section H (north)	6.15	33	0.56	3.95	0	V-ditch	3:1/50:1	12	2.00	1/2 DON2
Section H (south)	6.15	33	0.57	3.97	0	V-ditch	2:1/50:1	12	2.00	1/2 DON2

SUMMARY OF ONSITE SUBBASINS FROM THE PROPOSED CONDITIONS HEC-1 MODEL			
SB OR CP	AREA (AC)	100 YR (CFS)	10 YR (CFS)
DON1	10.8	34	18
DON2	19.5	60	31
DON3	21.1	65	34
DON4	17.4	44	23

PROPOSED CONDITIONS PRORATED FLOW SUMMARY			
Ultimate Onsites			
Subbasin*	Q_{100} (cfs)	Area (acres)	cfs/acre
DON3	65	21.1	3.08
Proposed Onsite Prorated Basins			
Subbasin*	Q_{100} (cfs)	Area (acres)	cfs/acre
DON3A	6	1.9	3.08
DON3B	23	7.4	3.08
DON3C	36	11.8	3.08
TOTAL	65	21.1	NA

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

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DRAWING
FIG6B
OF SHTS

A site visit was performed to determine drainage patterns within APNs 138-32-311-002, 138-32-311-004, and 138-32-311-005. The total area tributary to site from these parcels was determined to be approximately 0.6 acres. The tributary area from these parcels is shown as Subbasin 57B-1C in the existing and proposed conditions hydrologic analyses. Subbasin 57B-1C generates 2 cfs during the 100-year storm event. The total flow is discharged at three locations along the boundary of the site. The discharge from the offsite parcel includes flow from an existing block wall opening, sheet flow from the site, and discharge from a curb opening. An NDOT Type 2 Drop Inlet and stub is proposed to intercept flow from the block wall opening. Two additional 18-inch RCP capped storm drain stubs are provided to intercept flows from these areas in the future. The future improvements for the site will safely convey flows from these adjacent parcels to the onsite storm drain system.

VIII. ULTIMATE CONDITIONS

The Two Fifty and all offsite areas are fully developed during ultimate conditions. Due to the size of the future estate lots (minimum 1 to 5± acres), curve numbers for the future One Eighty subbasins will be less than or equal to the curve numbers presented in this report for existing and proposed conditions. A separate analysis for ultimate conditions was not warranted since all offsite areas tributary to the site upstream of the overall Two Fifty development at Hualapai Way and Charleston Boulevard are already developed in proposed conditions. The proposed conditions flow rate of 4,673 cfs at CC57B-4 is considered to be the ultimate conditions flow rate conveyed to the dual (2) - 12-foot wide by 12-foot high RCB located at the Rampart Boulevard and Alta Drive intersection for the purposes of this report.

IX. STORM DRAIN FACILITIES AND PROTECTION

All proposed flood control facilities have been shown on Figure 7 and the plans included herewith. The design for the proposed facilities has been based on proposed conditions flow rates. Design of the storm drain facilities within the future One Eighty development have been based on normal depth calculations. Proposed mainline and lateral pipe sizes within the future One Eighty development were calculated using normal depth and have been upsized by 6 inches in diameter to provide for losses and future design flexibility. Proposed mainline and lateral RCB sizes include 1 foot of freeboard to account for storm

FLOOD PROTECTION FACILITIES

LOCATION	Q_{100} (cfs)	FACILITY	TRIBUTARY	MPU Q_{100} (cfs)	MPU FACILITY
1	2,130	20'x9' RCB; 14' DEEP MIN SUMP; D50=12";T=24"	CCON10	-	-
2	2,130	15'x9' RCB	CON11R	2384	APSP 0067
3	344	72" RCP; 11.0' DEEP MIN SUMP; D50=12";T=24"	ON15R	-	-
4	23	48" RCP; 3.0' DEEP MIN SUMP; D50=12";T=24"	ON16R	-	-
5	364	72" RCP	CON16R	-	-
6	191	72" RCP	CON3R	-	-
7	2,450	14'x9' RCB	CPPH1	2384	APSP 0067
8A	34	48" RCP; 3.5' DEEP MIN SUMP; D50=12";T=24"	DON1	-	-
8B	60	48" RCP; 4.5' DEEP MIN SUMP; D50=12";T=24"	DON2	-	-
9A	6	24" RCP; 3.5' DEEP MIN SUMP; D50=12";T=24"	DON3A	-	-

LOCATION	Q_{100} (cfs)	FACILITY	TRIBUTARY	MPU Q_{100} (cfs)	MPU FACILITY
9B	2476	14'x9' RCB	CDON2	-	-
10A	23	48" RCP; 3.5' DEEP MIN SUMP; D50=12";T=24"	DON3B	-	-
10B	36	48" RCP; 4' DEEP MIN SUMP; D50=12";T=24"	DON3C	-	-
11	4,177	14'x12' RCB	CDON3	4,628	APS0 0050
12	4,177	14'x12' RCB	CDON3	4,628	APS0 0050
12A	22	24" RCP CAPPED	N/A	-	-
12B	22	24" RCP CAPPED	N/A	-	-
13A	22	36" RCP; 3.5' DEEP MIN SUMP; D50=12";T=24"	1/2 DON4	-	-
13B	22	36" RCP; 3.5' DEEP MIN SUMP; D50=12";T=24"	1/2 DON4	-	-
14	1,910	20'x9' RCB; 12' DEEP MIN SUMP; D50=12";T=24"	CON18R	-	-

LOCATION	Q_{100} (cfs)	FACILITY	TRIBUTARY	MPU Q_{100} (cfs)	MPU FACILITY
15	1,933	10'x8' RCB	CON18R	2,004	APP2 0000
16A	54	EX. CONCRETE DRAINAGE EASEMENT	57B-1A	-	-
16B	54	PROPOSED CONCRETE FLUME	57B-1A	-	-
16C	54	48" RCP	57B-1A	-	-
17	51	42" RCP; 4.5' DEEP MIN SUMP; D50=12";T=24"	57B-1B	-	-
18	1,933	10'x8' RCB	CCON18R	2,004	APP2 0000
19	2	18" RCP; 0.5' DEEP MIN AREA DRAIN; NDOT TYPE 2A	1/2 57B-1C	-	-
20	1,933	10'x8' RCB	CP20	2,004	APP2 0000
21	2	18" RCP; STUB (PLUGGED)	N/A	-	-
22	1,933	10'x8' RCB	CP20	2,004	APP2 0000

LOCATION	Q_{100} (cfs)	FACILITY	TRIBUTARY	MPU Q_{100} (cfs)	MPU FACILITY
23	-	-	-	442	APP1 0000
24	-	-	-	4,628	APSO 0020
25	191	54" RCP	CON3R	-	
26	164	54" RCP	CON2	-	
27	54	36" RCP	CON8	2,384	APSO 0067
28	2,128	11'x9' RCB	CCON10	-	
29	344	66" RCP	CON15R	-	
30	118	48" RCP	CON13	-	
31	1,910	11'x8' RCB	CON8R	2,004	APP2 0000

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1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

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RECOMMENDED STORM DRAIN FACILITIES MAP

DRAWING

FIG7

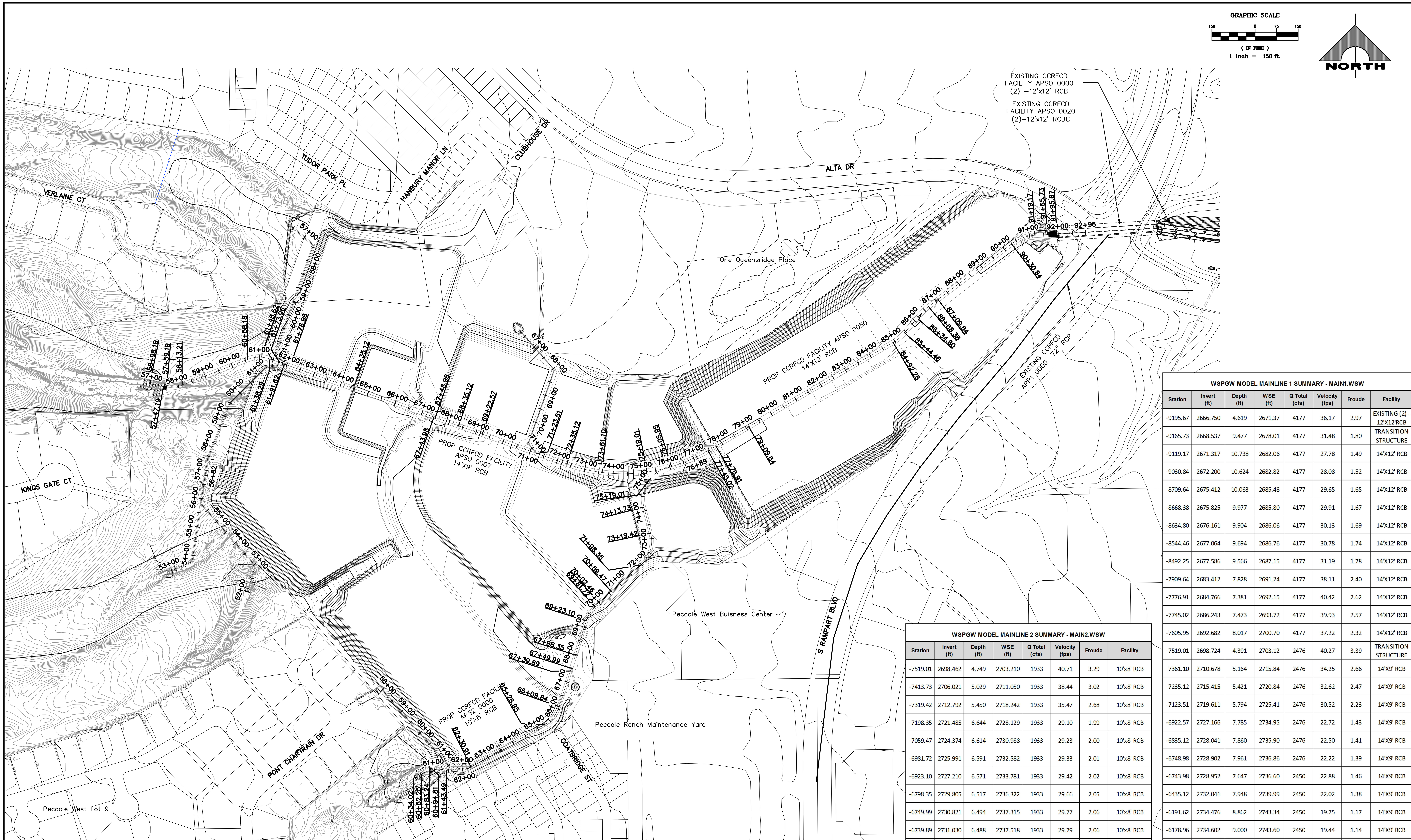
OF SHTS

drain losses. Normal depth calculations with proposed future slopes for The One Eighty recommended facilities have been included in Appendix B. Note that detailed hydraulic analysis for The One Eighty proposed facilities will be required in future technical drainage study submittals for this project. Hydraulic calculations for the recommended facilities have been included in Appendix B.

The Seventy proposed Mainline 1 RCB extends the existing CCRFCD Facility APSO 0020 dual (2) - 12-foot wide by 12-foot high RCB's in Rampart Boulevard approximately 3,500 linear feet west through the proposed site. Mainline 1 consists of an approximately 30 linear feet junction structure; 1,560 linear feet of 14-foot wide by 12-foot high RCB; an 87 linear feet junction structure; 1,345 linear feet of 14-foot wide by 9-foot high RCB; 415 linear feet of 15-foot wide by 9-foot high RCB; a 12 linear feet transition structure; and 49 linear feet of 20-foot wide by 9-foot high RCB improved inlet. Mainline 1 will collect and convey offsite flows generated west and south of the project site northeast to the existing dual (2) - 12-foot wide by 12-foot high RCB located at the Rampart Boulevard and Alta Drive intersection.

Mainline 2 consists of approximately 1,425 linear feet of 10-foot wide by 8-foot high RCB; a 12 linear feet transition structure; and 49 linear feet of 20-foot wide by 9-foot high RCB improved inlet. Mainline 2 will collect and convey offsite flows generated south of the project site north to Mainline 1.

Hydraulic modeling for the proposed RCB storm drain mainlines and RCP laterals were performed with the CIVILDESIGN Corp. WSPGW Water Surface Pressure Gradient Package (Reference 8, hereinafter referred to as WSPGW). Copies of the WSPGW models for the proposed storm drain facilities have been included in Appendix B. Electronic copies of the models have been included on CD in the Appendix. Note that the flows at the concentration points nodes from the proposed conditions HEC-1 Model were used to model the proposed storm drain mainlines. Lateral storm flows in the mainline WSPGW models were adjusted, so the 100-year storm flows in downstream reaches match the concentration point peak flows along the mainline. The WSPGW models labeled ""MAIN1" and "MAIN2" are for the proposed conditions Mainline 1 and Mainline 2 storm drain mainlines, respectively. A summary of the WSPGW results have been shown on Figure 8. The results of the WSPGW Mainline 1 and 2 models are summarized in Tables 5A and 5B, respectively.



WSPGW MODEL MAINLINE 2 SUMMARY - MAIN2.WSW

Station	Invert (ft)	Depth (ft)	WSE (ft)	Q Total (cfs)	Velocity (fps)	Froude	Facility
-7519.01	2698.462	4.749	2703.210	1933	40.71	3.29	10'x8' RCB
-7413.73	2706.021	5.029	2711.050	1933	38.44	3.02	10'x8' RCB
-7319.42	2712.792	5.450	2718.242	1933	35.47	2.68	10'x8' RCB
-7198.35	2721.485	6.644	2728.129	1933	29.10	1.99	10'x8' RCB
-7059.47	2724.374	6.614	2730.988	1933	29.23	2.00	10'x8' RCB
-6981.72	2725.991	6.591	2732.582	1933	29.33	2.01	10'x8' RCB
-6923.10	2727.210	6.571	2733.781	1933	29.42	2.02	10'x8' RCB
-6798.35	2729.805	6.517	2736.322	1933	29.66	2.05	10'x8' RCB
-6749.99	2730.821	6.494	2737.315	1933	29.77	2.06	10'x8' RCB
-6739.89	2731.030	6.488	2737.518	1933	29.79	2.06	10'x8' RCB
-6609.84	2733.736	6.400	2740.136	1933	30.20	2.10	10'x8' RCB
-6526.95	2734.565	6.068	2740.633	1933	31.86	2.28	10'x8' RCB
-6230.91	2740.485	5.194	2745.679	1910	36.77	2.84	10'x8' RCB
-6143.49	2748.869	6.290	2755.159	1910	30.37	2.13	10'x8' RCB
-6094.81	2753.537	8.000	2761.537	1910	23.88	1.49	10'x8' RCB
-6083.24	2754.647	15.899	2770.546	1910	10.61	0.62	TRANSITION STRUCTURE
-6052.25	2757.619	13.190	2770.809	1910	10.61	0.62	20'x9' RCB
-6034.02	2759.370	11.723	2771.094	1910	10.61	0.62	20'x9' RCB

WSPGW MODEL MAINLINE 1 SUMMARY - MAIN1.WSW

Station	Invert (ft)	Depth (ft)	WSE (ft)	Q Total (cfs)	Velocity (fps)	Froude	Facility
-9195.67	2666.750	4.619	2671.37	4177	36.17	2.97	EXISTING (2) - 12'X12'RCB
-9165.73	2668.537	9.477	2678.01	4177	31.48	1.80	TRANSITION STRUCTURE
-9119.17	2671.317	10.738	2682.06	4177	27.78	1.49	14'X12' RCB
-9030.84	2672.200	10.624	2682.82	4177	28.08	1.52	14'X12' RCB
-8709.64	2675.412	10.063	2685.48	4177	29.65	1.65	14'X12' RCB
-8668.38	2675.825	9.977	2685.80	4177	29.91	1.67	14'X12' RCB
-8634.80	2676.161	9.904	2686.06	4177	30.13	1.69	14'X12' RCB
-8544.46	2677.064	9.694	2686.76	4177	30.78	1.74	14'X12' RCB
-8492.25	2677.586	9.566	2687.15	4177	31.19	1.78	14'X12' RCB
-7909.64	2683.412	7.828	2691.24	4177	38.11	2.40	14'X12' RCB
-7776.91	2684.766	7.381	2692.15	4177	40.42	2.62	14'X12' RCB
-7745.02	2686.243	7.473	2693.72	4177	39.93	2.57	14'X12' RCB
-7605.95	2692.682	8.017	2700.70	4177	37.22	2.32	14'X12' RCB
-7519.01	2698.724	4.391	2703.12	2476	40.27	3.39	TRANSITION STRUCTURE
-7361.10	2710.678	5.164	2715.84	2476	34.25	2.66	14'X9' RCB
-7235.12	2715.415	5.421	2720.84	2476	32.62	2.47	14'X9' RCB
-7123.51	2719.611	5.794	2725.41	2476	30.52	2.23	14'X9' RCB
-6922.57	2727.166	7.785	2734.95	2476	22.72	1.43	14'X9' RCB
-6835.12	2728.041	7.860	2735.90	2476	22.50	1.41	14'X9' RCB
-6748.98	2728.902	7.961	2736.86	2476	22.22	1.39	14'X9' RCB
-6743.98	2728.952	7.647	2736.60	2450	22.88	1.46	14'X9' RCB
-6435.12	2732.041	7.948	2739.99	2450	22.02	1.38	14'X9' RCB
-6191.62	2734.476	8.862	2743.34	2450	19.75	1.17	14'X9' RCB
-6178.96	2734.602	9.000	2743.60	2450	19.44	1.14	14'X9' RCB
-6173.96	2734.651	11.911	2746.56	2130	15.78	0.93	JUNCTION STRUCTURE
-6148.62	2734.902	11.822	2746.72	2130	15.78	0.93	15'x9' RCB
-6138.29	2735.004	11.786	2746.79	2130	15.78	0.93	15'x9' RCB
-6058.18	2735.797	12.026	2747.82	2130	15.78	0.93	15'x9' RCB
-5813.21	2738.222	11.166	2749.39	2130	15.78	0.93	15'x9' RCB
-5759.19	2738.757	11.408	2750.17	2130	15.78	0.93	15'x9' RCB
-5747.19	2738.876	13.460	2752.34	2130	11.83	0.70	TRANSITION STRUCTURE
-5698.19	2739.361	13.129	2752.49	2130	11.83	0.70	20'x9' RCB

SEVENTY ACRES LLC, FORE STARS LTD, AND 180 LAND CO LLC

THE SEVENTY

WSPGW EXHIBIT

GCW ENGINEERS SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

PLOT DATE: 03-03-16

DRAWING
FIG8

TABLE 5A WSPGW MODEL MAINLINE 1 SUMMARY - MAIN1.WSW							
Station*	**Invert (ft)**	**Depth (ft)**	**WSE (ft)**	**Q Total (cfs)**	**Velocity (fps)**	**Froude**	**Facility**
-9195.67	2666.750	4.619	2671.37	4177	36.17	2.97	EXISTING (2) – 12'X12'RCB
-9165.73	2668.537	9.477	2678.01	4177	31.48	1.80	TRANSITION STRUCTURE
-9119.17	2671.317	10.738	2682.06	4177	27.78	1.49	14'X12' RCB
-9030.84	2672.200	10.624	2682.82	4177	28.08	1.52	14'X12' RCB
-8709.64	2675.412	10.063	2685.48	4177	29.65	1.65	14'X12' RCB
-8668.38	2675.825	9.977	2685.80	4177	29.91	1.67	14'X12' RCB
-8634.80	2676.161	9.904	2686.06	4177	30.13	1.69	14'X12' RCB
-8544.46	2677.064	9.694	2686.76	4177	30.78	1.74	14'X12' RCB
-8492.25	2677.586	9.566	2687.15	4177	31.19	1.78	14'X12' RCB
-7909.64	2683.412	7.828	2691.24	4177	38.11	2.40	14'X12' RCB
-7776.91	2684.766	7.381	2692.15	4177	40.42	2.62	14'X12' RCB
-7745.02	2686.243	7.473	2693.72	4177	39.93	2.57	14'X12' RCB
-7605.95	2692.682	8.017	2700.70	4177	37.22	2.32	14'X12' RCB
-7519.01	2698.724	4.391	2703.12	2476	40.27	3.39	TRANSITION STRUCTURE
-7361.10	2710.678	5.164	2715.84	2476	34.25	2.66	14'X9' RCB
-7235.12	2715.415	5.421	2720.84	2476	32.62	2.47	14'X9' RCB
-7123.51	2719.611	5.794	2725.41	2476	30.52	2.23	14'X9' RCB
-6922.57	2727.166	7.785	2734.95	2476	22.72	1.43	14'X9' RCB
-6835.12	2728.041	7.860	2735.90	2476	22.50	1.41	14'X9' RCB

TABLE 5A WSPGW MODEL MAINLINE 1 SUMMARY - MAIN1.WSW							
Station*	Invert (ft)	Depth (ft)	WSE (ft)	Q Total (cfs)	Velocity (fps)	Froude	Facility
-6748.98	2728.902	7.961	2736.86	2476	22.22	1.39	14'X9' RCB
-6743.98	2728.952	7.647	2736.60	2450	22.88	1.46	14'X9' RCB
-6435.12	2732.041	7.948	2739.99	2450	22.02	1.38	14'X9' RCB
-6191.62	2734.476	8.862	2743.34	2450	19.75	1.17	14'X9' RCB
-6178.96	2734.602	9.000	2743.60	2450	19.44	1.14	14'X9' RCB
-6173.96	2734.651	11.911	2746.56	2130	15.78	0.93	JUNCTION STRUCTURE
-6148.62	2734.902	11.822	2746.72	2130	15.78	0.93	15'x9' RCB
-6138.29	2735.004	11.786	2746.79	2130	15.78	0.93	15'x9' RCB
-6058.18	2735.797	12.026	2747.82	2130	15.78	0.93	15'x9' RCB
-5813.21	2738.222	11.166	2749.39	2130	15.78	0.93	15'x9' RCB
-5759.19	2738.757	11.408	2750.17	2130	15.78	0.93	15'x9' RCB
-5747.19	2738.876	13.460	2752.34	2130	11.83	0.70	TRANSITION STRUCTURE
-5698.19	2739.361	13.129	2752.49	2130	11.83	0.70	20'x9' RCB

*See Figure 8.

TABLE 5B WSPGW MODEL MAINLINE 2 SUMMARY - MAIN2.WSW							
Station*	Invert (ft)	Depth (ft)	WSE (ft)	Q Total (cfs)	Velocity (fps)	Froude	Facility
-7519.01	2698.462	4.749	2703.210	1933	40.71	3.29	10'x8' RCB
-7413.73	2706.021	5.029	2711.050	1933	38.44	3.02	10'x8' RCB
-7319.42	2712.792	5.450	2718.242	1933	35.47	2.68	10'x8' RCB

TABLE 5B WSPGW MODEL MAINLINE 2 SUMMARY - MAIN2.WSW							
Station*	**Invert (ft)**	**Depth (ft)**	**WSE (ft)**	**Q Total (cfs)**	**Velocity (fps)**	**Froude**	**Facility**
-7198.35	2721.485	6.644	2728.129	1933	29.10	1.99	10'x8' RCB
-7059.47	2724.374	6.614	2730.988	1933	29.23	2.00	10'x8' RCB
-6981.72	2725.991	6.591	2732.582	1933	29.33	2.01	10'x8' RCB
-6923.10	2727.210	6.571	2733.781	1933	29.42	2.02	10'x8' RCB
-6798.35	2729.805	6.517	2736.322	1933	29.66	2.05	10'x8' RCB
-6749.99	2730.821	6.494	2737.315	1933	29.77	2.06	10'x8' RCB
-6739.89	2731.030	6.488	2737.518	1933	29.79	2.06	10'x8' RCB
-6609.84	2733.736	6.400	2740.136	1933	30.20	2.10	10'x8' RCB
-6526.95	2734.565	6.068	2740.633	1933	31.86	2.28	10'x8' RCB
-6230.91	2740.485	5.194	2745.679	1910	36.77	2.84	10'x8' RCB
-6143.49	2748.869	6.290	2755.159	1910	30.37	2.13	10'x8' RCB
-6094.81	2753.537	8.000	2761.537	1910	23.88	1.49	10'x8' RCB
-6083.24	2754.647	15.899	2770.546	1910	10.61	0.62	TRANSITION STRUCTURE
-6052.25	2757.619	13.190	2770.809	1910	10.61	0.62	20'x9' RCB
-6034.02	2759.370	11.723	2771.094	1910	10.61	0.62	20'x9' RCB

*See Figure 8.

Mainline 1

The approved WSPGW model for the existing dual (2) - 12-foot wide by 12-foot high RCBC (CCRFCD Facility APSO 0000) storm drain downstream of the existing dual (2) - 12-foot wide by 12-foot high RCBC (CCRFCD Facility APSO 0020) at the Rampart Boulevard and Alta Drive intersection has been referenced from the Queens Borough Culvert Study. Please note that the approved Queens Borough Culvert Study referenced a design flow rate of 4,497 cfs from the 2002 MPU. As previously stated, the 2013 MPU shows a flow rate of 4,628 cfs and the proposed conditions HEC-1 model presented in this report shows a proposed 100-year flow rate of 4,672 cfs. The approved Queens Borough Culvert Study WSPGW model has been extended south with this report to include the existing CCRFCD Facility APSO 0020 and the proposed Mainline 1 storm drain. The model also includes the junction where an existing 60-inch RCP and 72-inch RCP connect to APSO 0020 in Rampart Boulevard and the proposed condition flow rates at pertinent HEC-1 nodes. Inverts used in the hydraulic calculations for the existing dual (2) - 12-foot wide by 12-foot high RCBC are based on survey and as-built information. The WSPGW Model Stations from the Queens Borough Culvert Study have been included in the Mainline 1 Model and converted to match the proposed Mainline 1 Stationing. The WSPGW Model Station Conversion has been summarized in Table 6. Pertinent referenced material from the Queens Borough Culvert Study has been included in Appendix C.

TABLE 6
WSPGW MODEL STATION CONVERSION SUMMARY – MAIN1.WSW

WSPGW Stations Referenced from Queens Borough Culvert Study	MAIN 1 WSPGW Stations*
-3625.00	-12270.67
-3550.00	-12195.67
-3500.00	-12145.67
-3401.01	-12046.68
-3350.81	-11996.48
-3325.95	-11971.62
-3315.95	-11961.62
-3225.64	-11871.31
-3223.32	-11868.99
-3152.70	-11798.37
-3135.29	-11780.96

TABLE 6 WSPGW MODEL STATION CONVERSION SUMMARY – MAIN1.WSW	
WSPGW Stations Referenced from Queens Borough Culvert Study	**MAIN 1 WSPGW Stations***
-3049.99	-11695.66
-2906.52	-11552.19
-2433.63	-11079.30
-2318.22	-10963.89
-2200.00	-10845.67
-1733.86	-10379.53
-1565.00	-10210.67
-1000.00	-9645.67

*See Figure 8.

The Mainline 1 model shows the existing CCRFCD Facility APSO 0000 has adequate capacity to convey proposed conditions 100-year storm event flow rates to the existing Angel Park Detention Basin. Proposed flow depths and flow velocities within the existing dual (2) - 12-foot wide by 12-foot high RCB are comparable to the approved Queens Borough Culvert Study Design. Approximately 2,819 linear feet of the proposed Mainline 1 RCB storm drain hydraulic grade line will be more than 1-foot below the RCB soffit between the connection to the dual (2) - 12-foot wide by 12-foot high RCB and approximately 197 linear feet downstream of the junction structure with the two 72-inch RCP laterals that connect to the mainline at WSPGW Station -6176.46. The hydraulic grade line is 2.4 feet to 2.9 feet above the 15-foot wide by 9-foot high RCB mainline for approximately 417 linear feet south of the junction with the two 72-inch RCP laterals that connect to Mainline 1 at WSPGW Station -6176.46. However, the hydraulic grade line will be more than 1-foot below finished grade elevation along the storm drain mainline. The maximum flow velocity of 41.04 feet per second occurs in Mainline 1 at WSPGW Station -7519.00.

Per Section 705.7.1.2 in the Manual, all concrete lining shall have a minimum thickness of 7 inches for flow velocities 30 feet per second and greater. Additionally, the pre-cast RCB will have an additional 1-inch of cover over the rebar and a 6,000 psi concrete strength where velocities exceed 25 feet per second.

Mainline 2

Approximately 1,400 linear feet of the proposed Mainline 2 RCB hydraulic grade line will be more than 1-foot below the RCB soffit.

The maximum flow velocity of 40.71 feet per second occurs in Mainline 2 just upstream of the connection to the Mainline 1 junction structure. Per Section 705.7.1.2 in the Manual, all concrete lining shall have a minimum thickness of 7 inches for flow velocities 30 feet per second and greater. Additionally, the pre-cast RCB will have an additional 1-inch of cover over the rebar and a 6,000 psi concrete strength where velocities exceed 25 feet per second.

WSPGW models have been included for proposed laterals extending to collect flows from future onsite development and existing offsite developments. Please refer to tables on Figure 7 for facility flows and sizes.

The proposed onsite ditches will convey the existing flows with a minimum of 1-foot of freeboard. Maximum slope was selected to verify velocity. Flows from the proposed ditches will be conveyed into the proposed Mainline 1 and 2 storm drain systems. Riprap (Minimum: d_{50} = 12 inches, Thickness = 24 inches) has been provided at the lateral sump locations up to the ponding depth, determined by an inlet control calculation. The inlet control calculations have been provided in Appendix B.

Area drains have been provided to collect flows at some of the sump locations. Calculations for the area drains have been included in Appendix B.

X. FEMA CONDITIONAL LETTER OF MAP REVISION (CLOMR)

Hydrologic Summary

As a part of this project development, a CLOMR and Letter of Map Revision (LOMR) will be processed with FEMA to remap the Special Flood Hazard Area (SFHA) that currently routes through the site.

Since this project re-evaluates the existing hydrologic analysis for the subject wash, the project specific existing and proposed condition hydrologic analysis was used as the effective hydrologic model to determine peak flow rates for use in establishing the limits of the revised SFHA.

Existing Condition

See Figure 9 - Existing Conditions HEC-RAS X-Section Map. The main wash through the site labeled Main 1 represents the major conveyance corridor for the mapped Zone A SFHA overlaying the site. Several fingers of the SFHA extend out from Main 1, and will be removed from the SFHA with the CLOMR submittal connected with this study since they are either remnant washes cut-off by upstream improvements or ineffective flow areas inundated by flows in the Main 1. Please note that the existing SFHA does not impact existing development.

Main 1

100-Year Flow at Upstream End = 2,128 cfs (Concentration Point CCON10)

This reach will be the remaining conveyance corridor of the mapped SFHA upon completion of the LOMR remapping.

North Finger

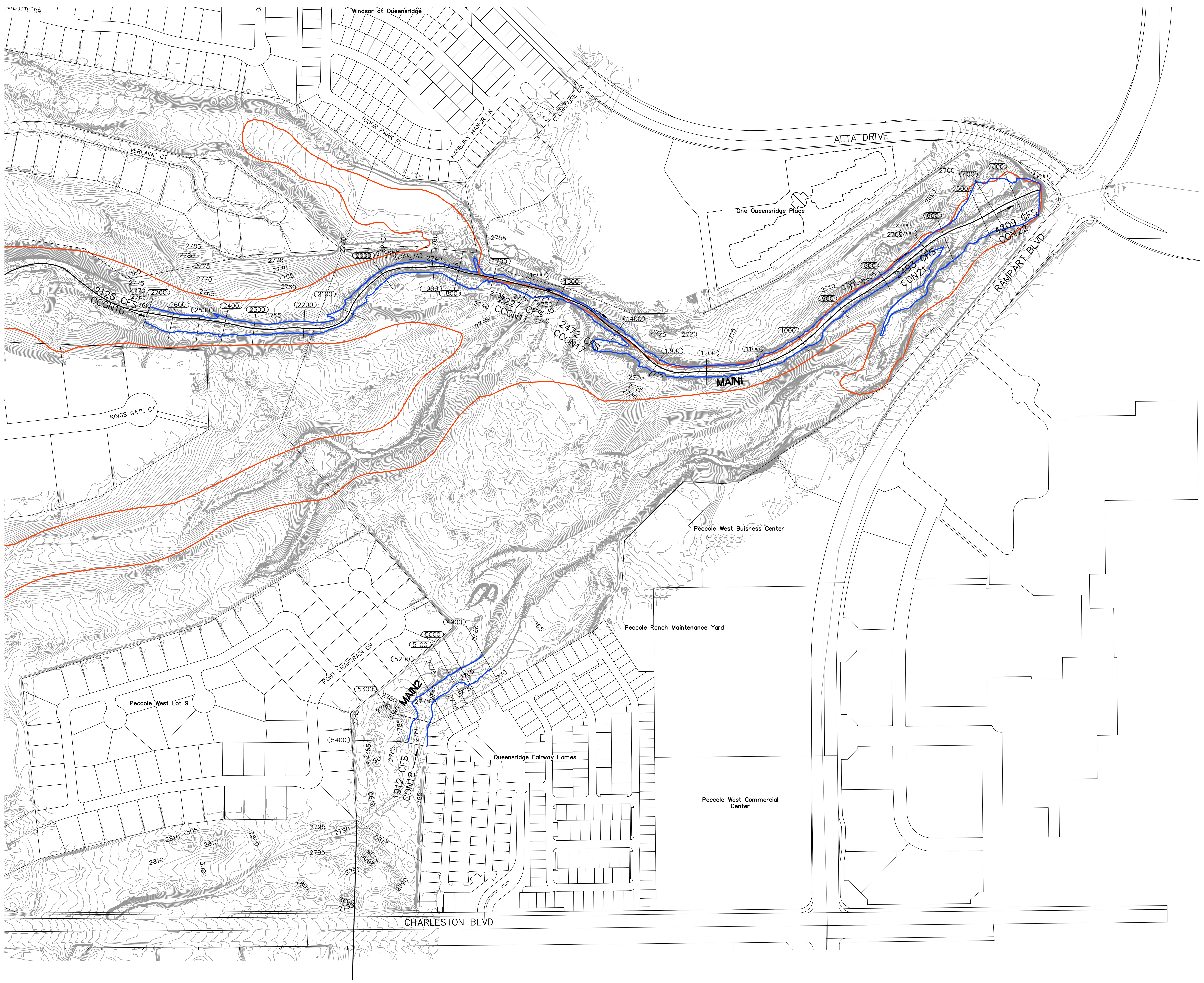
100-Year Flow = 195 cfs (Concentration Point CON4)

A finger of SFHA extends up an existing wash north of Main 1 for approximately 1,000 linear feet. Since this wash is a remnant wash, cut off by Hualapai Way and no longer conveying the historical flows originating from west of Hualapai Way, this finger will be removed from the SFHA. The wash located within an existing golf course conveys local drainage areas, and does not impact existing development.

South Finger

100-Year Flow = 368 cfs (Concentration Point CON17)

Similar to the North Finger, a finger of SFHA extends up an existing wash south of Main 1 for approximately 4,000 linear feet. This wash is also a remnant wash, cut off by Hualapai Way and no longer conveying the historical flows originating from west of Hualapai Way, and will be removed from the SFHA. The wash located within an existing golf course conveys local drainage areas, and does not impact existing development.



GRAPHIC SCALE

(IN FEET)
1 inch = 200 ft.

NORTH

LEGEND

EFFECTIVE FLOODPLAIN LIMITS

EXISTING CONDITION INUNDATION LIMITS

2147 CFS Q100 FLOW

CCON10 HEC-1 CONCENTRATION POINT

FLOW DIRECTION

MAIN1 HEC-RAS REACH

(2200) HEC-RAS STATION LABEL

HEC-RAS CROSS SECTION

MAIN 1 HEC-RAS STATION SUMMARY TABLE

Sta	Q (cfs)	FL Elevation (ft)	W.S. Elevation (ft)	Depth (ft)	Vel (ft/s)	Top Width (ft)	Froude #	Notes
2700	2128	2756.00	2760.89	4.89	10.46	60.70	1.01	Existing Wash
2600	2128	2752.00	2758.31	6.31	9.90	71.48	1.01	Existing Wash
2500	2128	2748.00	2754.37	6.37	10.20	66.36	1.01	Existing Wash
2400	2128	2747.00	2751.80	4.80	9.95	69.59	1.00	Existing Wash
2300	2128	2744.00	2749.36	5.36	11.68	43.51	1.01	Existing Wash
2200	2128	2740.00	2745.49	5.49	11.33	47.51	1.00	Existing Wash
2100	2128	2736.00	2742.08	6.08	11.35	46.89	1.00	Existing Wash
2000	2128	2729.00	2735.65	6.65	11.69	43.15	1.00	Existing Wash
1900	2128	2724.00	2733.14	9.14	8.94	43.40	0.67	Existing Wash
1800	2128	2719.00	2732.45	13.45	8.8	57.08	0.75	Existing Wash
1700	2227	2716.00	2728.08	12.08	15.22	20.20	1.00	Existing Wash
1600	2227	2711.00	2725.34	14.34	11.67	45.98	1.01	Existing Wash
1500	2472	2707.00	2720.77	13.77	14.77	24.93	1.00	Existing Wash
1400	2472	2702.00	2713.84	11.84	14.09	28.74	1.00	Existing Wash
1300	2472	2699.00	2704.43	5.43	11.42	53.98	1.01	Existing Wash
1200	2472	2695.00	2700.84	5.84	12.19	44.49	1.01	Existing Wash
1100	2472	2691.00	2697.30	6.30	12.57	40.56	1.01	Existing Wash
1000	2472	2687.00	2692.52	5.52	11.89	47.97	1.01	Existing Wash
900	2472	2683.00	2689.15	6.15	12.63	39.48	1.00	Existing Wash
800	2493	2679.00	2685.65	6.65	12.43	41.88	1.00	Existing Wash
700	2493	2676.00	2685.62	9.62	7.03	49.85	0.46	Existing Wash
600	2493	2674.00	2685.89	11.89	4.01	133.33	0.24	Existing Wash
500	4209	2672.00	2685.74	13.74	4.33	143.10	0.29	Existing Wash
400	4209	2671.00	2685.77	14.77	3.56	213.18	0.27	Existing Wash
300	4209	2669.00	2685.77	16.77	3.04	178.22	0.19	Existing Wash
200	4209	2668.00	2684.83	16.83	7.74	110.66	0.62	Existing (2)12x12 RCB

MAIN 2 HEC-RAS STATION SUMMARY TABLE

Sta	Q (cfs)	FL Elevation (ft)	W.S. Elevation (ft)	Depth (ft)	Vel (ft/s)	Top Width (ft)	Froude #	Notes
5400	1912	2780.00	2783.62	3.62	9.02	85.33	1.01	Existing Wash
5300	1912	2778.00	2781.81	3.81	10.54	67.57	1.13	Existing Wash
5200	1912	2764.00	2766.49	2.49	27.67	46.38	3.99	Existing Wash
5100	1912	2759.00	2762.99	3.99	16.44	44.34	1.79	Existing Wash
5000	1912	2758.00	2762.37	4.37	12.44	70.25	1.48	Existing Wash
4900	1912	2756.00	2760.64	4.64	10.50	63.82	1.09	Existing Wash

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1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

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EXISTING CONDITIONS HEC-RAS X-SECTION MAP

DRAWING

FIG9

Main 2 Finger

100-Year Flow = 1,944 cfs (Concentration Point CON20)

A short finger extends south near the downstream end of the project at Rampart Boulevard for approximately 300 linear feet. This finger is located completely with the developed portion of the site and will be removed from the SFHA. The flows in this wash will be conveyed and contained in the Mainline 2 underground storm drain to Rampart Boulevard.

Several flow changes occur in the Main 1 wash as the above mentioned fingers combine with Main 1. Table 7 summarizes the effective flow rates used through the Main 1 wash to establish the effective water surface elevations through the Main 1 SFHA used to compare with the proposed condition water surface elevations.

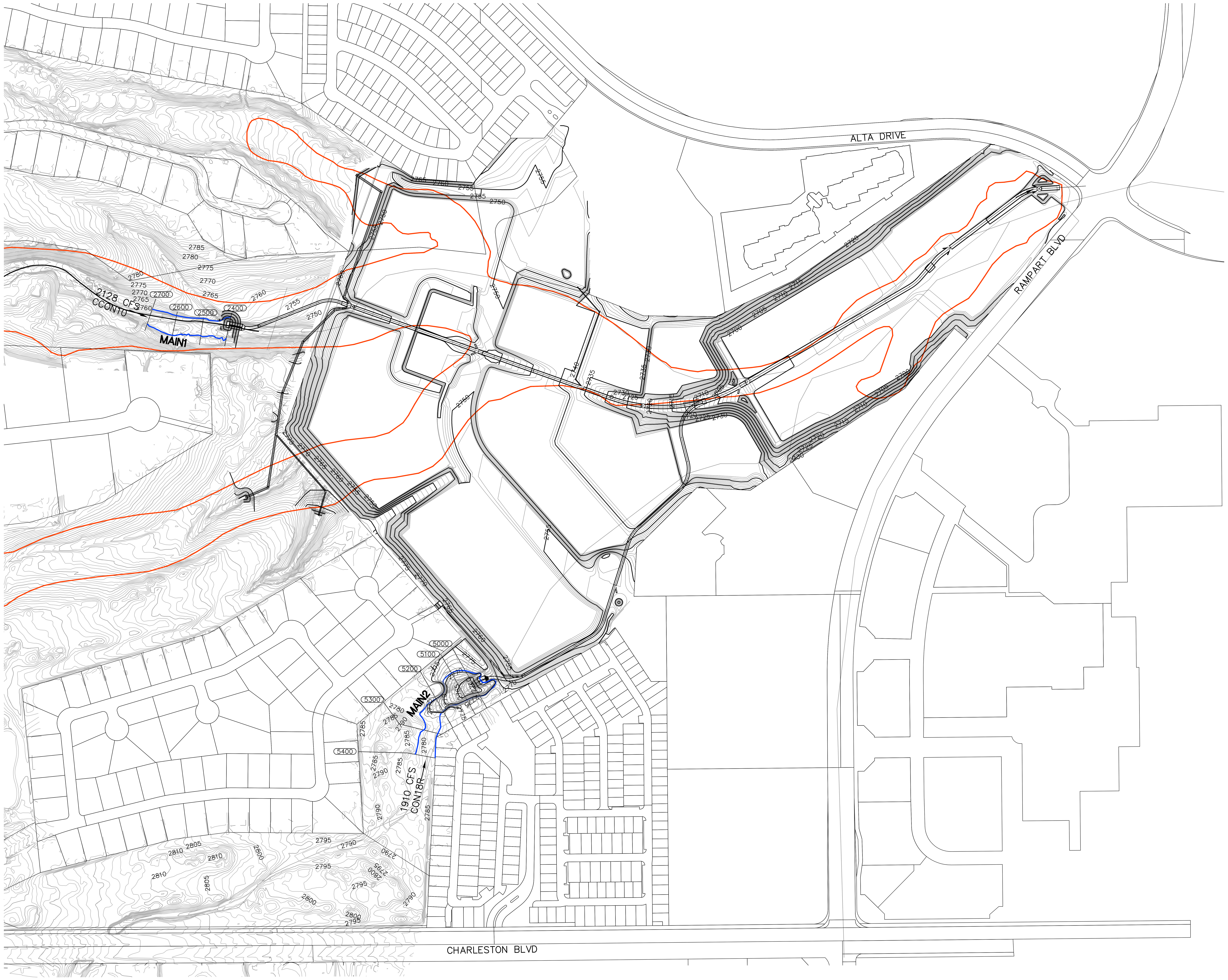
TABLE 7
EFFECTIVE FLOW RATES – MAIN 1 WASH

HEC-RAS River Station*	Effective Flow Rate (cfs)
2700	2,128
1700	2,227
1500	2,472
800	2,493
500	4,209

*See Figure 9.

Proposed Condition

See Figure 10 - Proposed Conditions HEC-RAS X-Section Map and Figure 11 - CLOMR Workmap. In the proposed condition, the portion within the project site will be contained within underground storm drain. The proposed floodplain will tie into the existing floodplain approximately 700 linear feet west of the project site as shown on the CLOMR Workmap. Table 8 summarizes the effective flow rates used through the Main 1 wash to establish the effective water surface elevations through the Main 1 SFHA used to compare to proposed condition water surface elevations.



GRAPHIC SCALE

200 0 100 200

(IN FEET)

1 inch = 200 ft.

NORTH

LEGEND

- EFFECTIVE FLOODPLAIN LIMITS
- PROPOSED CONDITION INUNDATION LIMITS
- 2147 CFS — Q100 FLOW
- CCON10 — HEC-1 CONCENTRATION POINT
- FLOW DIRECTION
- MAIN1 — HEC-RAS REACH
- (2200) — HEC-RAS STATION LABEL
- HEC-RAS CROSS SECTION

MAIN 1 HEC-RAS STATION SUMMARY TABLE								
Sta	Q (cfs)	FL Elevation (ft)	W.S. Elevation (ft)	Depth (ft)	Vel (ft/s)	Top Width (ft)	Froude #	Notes
2700	2128	2756.00	2760.90	4.90	10.45	60.71	1.01	Existing Wash
2600	2128	2752.00	2758.31	6.31	9.89	71.49	1.00	Existing Wash
2500	2128	2748.00	2754.39	6.39	10.14	66.45	1.01	Existing Wash
2400	2128	2739.36	2752.49	13.13	3.16	90.29	0.20	Proposed 20x9 RCB

MAIN 2 HEC-RAS STATION SUMMARY TABLE								
Sta	Q (cfs)	FL Elevation (ft)	W.S. Elevation (ft)	Depth (ft)	Vel (ft/s)	Top Width (ft)	Froude #	Notes
5400	1910	2780.00	2783.62	3.62	9.02	85.32	1.01	Existing Wash
5300	1910	2778.00	2781.81	3.81	10.53	67.56	1.13	Existing Wash
5200	1910	2772.00	2774.34	2.34	18.71	54.29	2.40	Existing Wash
5100	1910	2764.00	2771.06	7.06	3.44	129.63	0.29	Existing Wash
5000	1910	2759.39	2771.09	11.70	2.48	127.62	0.18	Proposed 20x9 RCB

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1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
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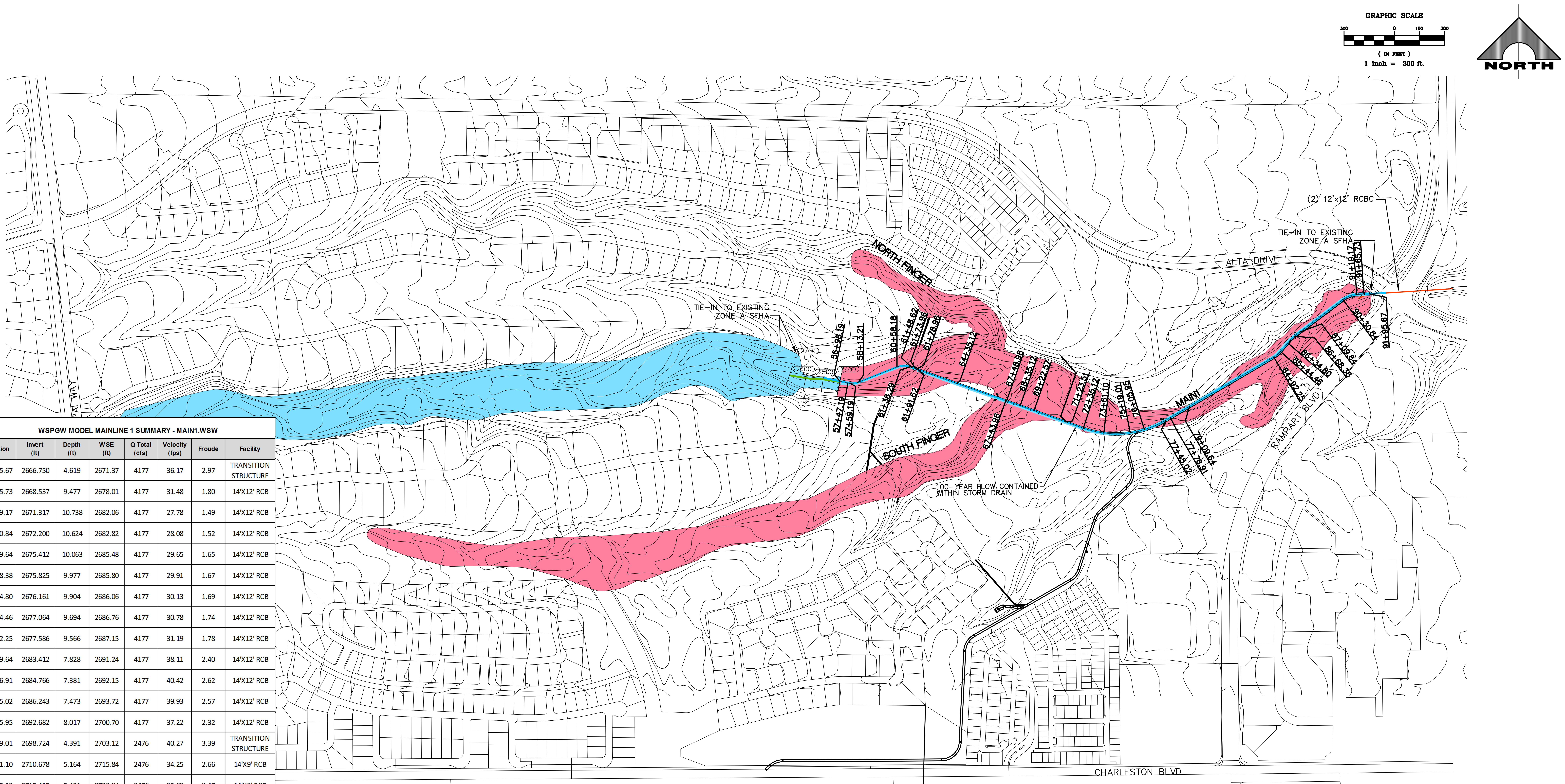
PROPOSED CONDITIONS HEC-RAS X-SECTION MAP

DRAWING

FIG10

OF SHTS



WSPGW MODEL MAINLINE 1 SUMMARY - MAIN1.WSW							
Station	Invert (ft)	Depth (ft)	WSE (ft)	Q Total (cfs)	Velocity (fps)	Froude	Facility
-9195.67	2666.750	4.619	2671.37	4177	36.17	2.97	TRANSITION STRUCTURE
-9165.73	2668.537	9.477	2678.01	4177	31.48	1.80	14'X12' RCB
-9119.17	2671.317	10.738	2682.06	4177	27.78	1.49	14'X12' RCB
-9030.84	2672.200	10.624	2682.82	4177	28.08	1.52	14'X12' RCB
-8709.64	2675.412	10.063	2685.48	4177	29.65	1.65	14'X12' RCB
-8668.38	2675.825	9.977	2685.80	4177	29.91	1.67	14'X12' RCB
-8634.80	2676.161	9.904	2686.06	4177	30.13	1.69	14'X12' RCB
-8544.46	2677.064	9.694	2686.76	4177	30.78	1.74	14'X12' RCB
-8492.25	2677.586	9.566	2687.15	4177	31.19	1.78	14'X12' RCB
-7909.64	2683.412	7.828	2691.24	4177	38.11	2.40	14'X12' RCB
-7776.91	2684.766	7.381	2692.15	4177	40.42	2.62	14'X12' RCB
-7745.02	2686.243	7.473	2693.72	4177	39.93	2.57	14'X12' RCB
-7605.95	2692.682	8.017	2700.70	4177	37.22	2.32	14'X12' RCB
-7519.01	2698.724	4.391	2703.12	2476	40.27	3.39	TRANSITION STRUCTURE
-7361.10	2710.678	5.164	2715.84	2476	34.25	2.66	14'X9' RCB
-7235.12	2715.415	5.421	2720.84	2476	32.62	2.47	14'X9' RCB
-7123.51	2719.611	5.794	2725.41	2476	30.52	2.23	14'X9' RCB
-6922.57	2727.166	7.785	2734.95	2476	22.72	1.43	14'X9' RCB
-6835.12	2728.041	7.860	2735.90	2476	22.50	1.41	14'X9' RCB
-6748.98	2728.902	7.961	2736.86	2476	22.22	1.39	14'X9' RCB
-6743.98	2728.952	7.647	2736.60	2450	22.88	1.46	14'X9' RCB
-6435.12	2732.041	7.948	2739.99	2450	22.02	1.38	14'X9' RCB
-6191.62	2734.476	8.862	2743.34	2450	19.75	1.17	14'X9' RCB
-6178.96	2734.602	9.000	2743.60	2450	19.44	1.14	14'X9' RCB
-6173.96	2734.651	11.911	2746.56	2130	15.78	0.93	JUNCTION STRUCTURE
-6148.62	2734.902	11.822	2746.72	2130	15.78	0.93	15'x9' RCB
-6138.29	2735.004	11.786	2746.79	2130	15.78	0.93	15'x9' RCB
-6058.18	2735.797	12.026	2747.82	2130	15.78	0.93	15'x9' RCB
-5813.21	2738.222	11.166	2749.39	2130	15.78	0.93	15'x9' RCB
-5759.19	2738.757	11.408	2750.17	2130	15.78	0.93	15'x9' RCB
-5747.19	2738.876	13.460	2752.34	2130	11.83	0.70	TRANSITION STRUCTURE
-5698.19	2739.361	13.129	2752.49	2130	11.83	0.70	20'x9' RCB

MAIN 1 HEC-RAS STATION SUMMARY TABLE								
Sta	Q (cfs)	FL Elevation (ft)	W.S. Elevation (ft)	Depth (ft)	Vel (ft/s)	Top Width (ft)	Froude #	Notes
2700	2128	2756.00	2760.90	4.90	10.45	60.71	1.01	Existing Wash
2600	2128	2752.00	2758.31	6.31	9.89	71.49	1.00	Existing Wash
2500	2128	2748.00	2754.39	6.39	10.14	66.45	1.01	Existing Wash
2400	2128	2739.36	2752.49	13.13	3.16	90.29	0.20	Proposed 20x9 RCB

LEGEND

- (2500) HEC-RAS RIVER STATION
- 91+95.6 WSPGW STATION
- ZONE A SFHA FLOODPLAIN
- REMOVED FROM SFHA FLOODPLAIN
- WSPGW FLOWLINE
- HEC-RAS FLOWLINE

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REV. | DATE | DESCRIPTION | DATE | AGEN. APP. | DATE | GCW APP.

DESIGN: DRAWN: CHECK: ISSUE DATE: ISSUE EDITOR: PLOT DATE: 03-03-16 PLOT TIME: 09:38:57

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1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
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THE SEVENTY

CLOMR WORKMAP

DRAWING

FIG 11

OF SHTS

TABLE 8 EFFECTIVE FLOW RATES – MAIN 1 WASH AND RCB		
HEC-RAS River Station*	WSPGW Station**	Effective Flow Rate (cfs)
2700	-	2,128
-	-5698.19	2,132
-	-6194.12	2,452
-	-6702.00	2,478
-	-7588.63	4,179

*See Figure 10.
**See Figure 11.

Hydraulic Modeling

Hydraulic modeling for the proposed channel improvements were performed within the U.S. Army Corps of Engineers HEC-RAS River Analysis System computer program version 4.1.0 (Reference 9). The HEC-RAS model outputs have been provided in Appendix B. Electronic copies of the models have been included on CD.

Existing Condition

The limits of the hydraulic modeling of Main 1 begins approximately 700 feet upstream of the western property line at Station 2700 and extend approximately 3,900 linear feet, east through an unnamed wash through an existing golf course, and terminating at the existing dual (2) - 12-foot wide by 12-foot high RCBCs at the intersection of Rampart Boulevard and Alta Drive at Station 200. This project re-evaluates the existing hydraulic analysis of the unnamed wash. The base cross section geometry used in the hydraulic modeling was determined from existing topography with 1-foot contour intervals. A "sub-critical" flow regime was analyzed for the wash. The starting water surface elevation of 2684.83 feet at Station 200 was determined based on a culvert inlet control calculation at the existing dual (2) - 12-foot wide by 12-foot high RCBCs at the intersection of Rampart Boulevard and Alta Drive (WSE = Invert of pipe + headwater depth = 2666.75 feet + 18.08 feet = 2684.83 feet). A copy of the inlet control calculation has been included in Appendix B.

Proposed Condition

The proposed improvements along the unnamed wash extend between Main 1 Stations 200 and 2400. The improvements consist of reinforced concrete box storm drain through the length of the project and tie into the existing dual (2) - 12-foot wide by 12-foot high RCB at the intersection of Rampart Boulevard and Alta Drive.

HEC-RAS was utilized for open channel and wash portions of the analysis. WSPGW was utilized to evaluate the water surface profile through proposed storm drain. The WSPGW computer program was selected to evaluate the storm sewer system in lieu of HEC-RAS due to its more relevant modeling approach for storm drain systems. Supporting WSPGW hydraulic models are included in Appendix B.

The resulting comparison between existing and proposed condition water surface elevations through the project are summarized in Table 9.

TABLE 9
MAIN 1 WASH - WATER SURFACE ELEVATION COMPARISON TABLE

Existing Condition				Proposed Condition			
Sta*	Q (cfs)	FL Elevation (ft)	W.S. Elevation (ft)	Q (cfs)	FL Elevation (ft)	W.S. Elevation (ft)	Rise in Water Surface Elevation Due to Development (ft)
2700	2,128	2756.00	2760.89	2,128	2756.00	2760.90	0.01
2600	2,128	2752.00	2758.31	2,128	2752.00	2758.31	0.00
2500	2,128	2748.00	2754.37	2,128	2748.00	2754.39	0.02
2400	2,128	2747.00	2751.80	2,128	2739.36	2752.49	0.69
2300	2,128	2744.00	2749.36	1% Annual Chance Flood Discharge Contained in Storm Drain			
2200	2,128	2740.00	2745.49				
2100	2,128	2736.00	2742.08				
2000	2,128	2729.00	2735.65				
1900	2,128	2724.00	2733.14				
1800	2,128	2719.00	2732.45				
1700	2,227	2716.00	2728.08				
1600	2,227	2711.00	2725.34				
1500	2,472	2707.00	2720.77				
1400	2,472	2702.00	2713.84				
1300	2,472	2699.00	2704.43				
1200	2,472	2695.00	2700.84				
1100	2,472	2691.00	2697.30				
1000	2,472	2687.00	2692.52				
900	2,472	2683.00	2689.15				
800	2,493	2679.00	2685.65				
700	2,493	2676.00	2685.62				
600	2,493	2674.00	2685.89				

TABLE 9 MAIN 1 WASH - WATER SURFACE ELEVATION COMPARISON TABLE							
Existing Condition				Proposed Condition			
Sta*	Q (cfs)	FL Elevation (ft)	W.S. Elevation (ft)	Q (cfs)	FL Elevation (ft)	W.S. Elevation (ft)	Rise in Water Surface Elevation Due to Development (ft)
500	4,209	2672.00	2685.74				
400	4,209	2671.00	2685.77				
300	4,209	2669.00	2685.77				
200	4,209	2668.00	2684.83				

*See Figures 9 and 10.

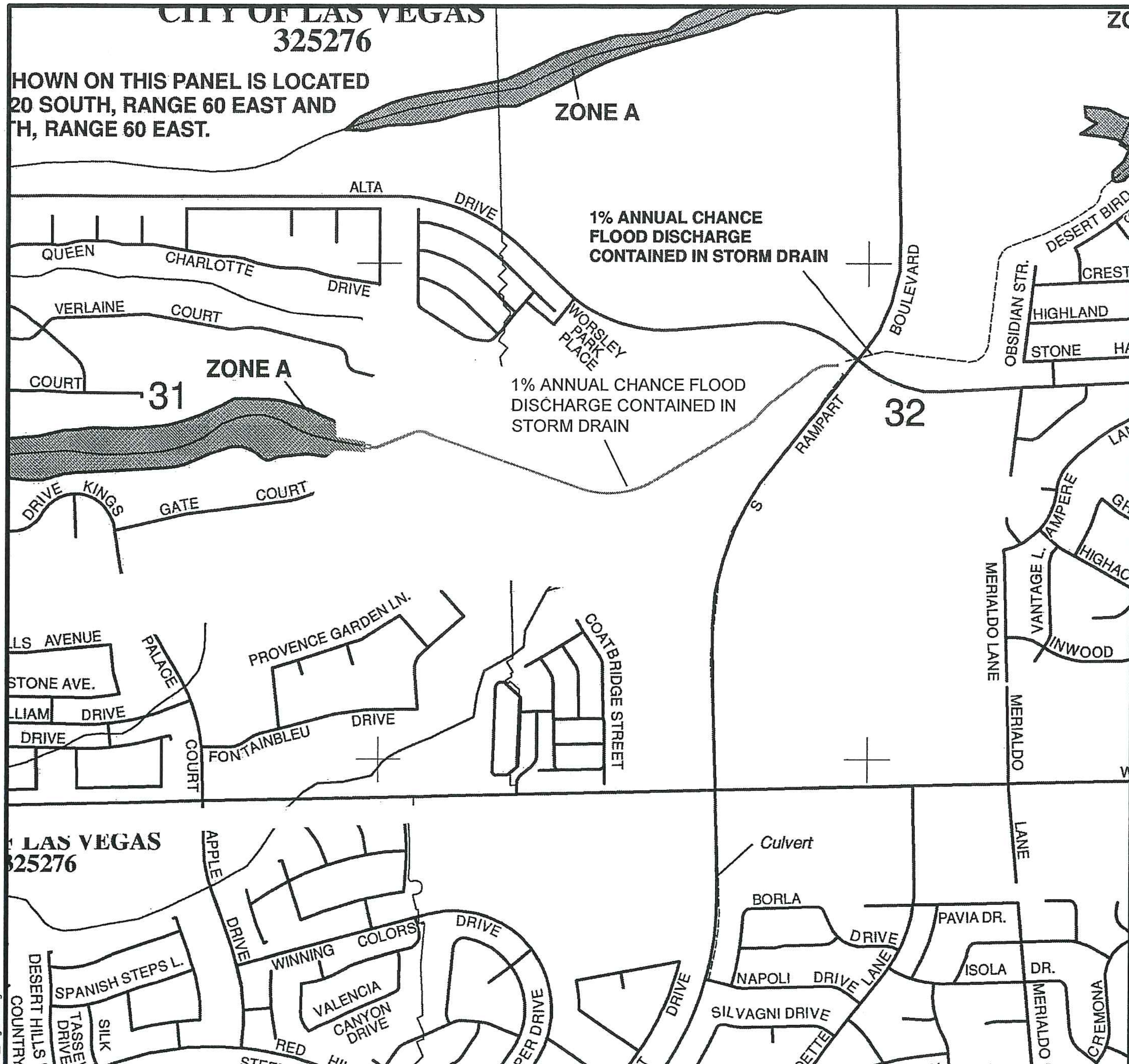
As shown in the table, the proposed improvements tie into the existing water surface elevation at the upstream end and tie into the existing storm drain facility at the downstream end that contains the 1% chance annual flood. The proposed water surface elevations do not exceed the existing water surface elevations by more than 1-foot, or are entirely contained within the proposed storm drain facility.

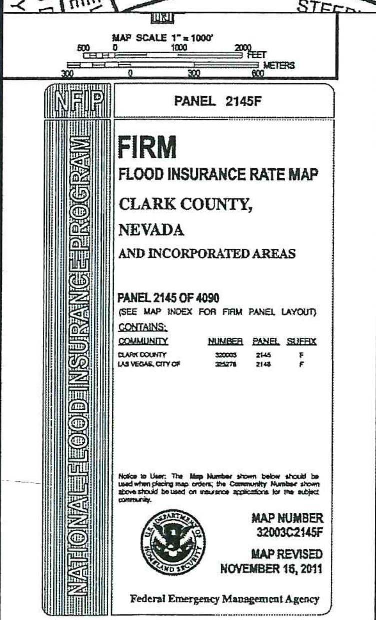
Mapping

The Effective FIRM is shown on Figure 3. The proposed revisions to the Effective FIRM take into account the proposed improvements along the unnamed wash and within the project. The improvements affect the Zone A area.

The upstream tie-in to the Effective FIRM Zone A is located at Station 2700. The upstream tie-in was based on a smooth transition from the proposed floodplain width to the effective floodplain width. The downstream tie-in to the Effective FIRM Zone A is located at the existing dual (2) - 12-foot wide by 12-foot high RCBCs at the intersection of Rampart Boulevard and Alta Drive at Station 200 where the 1% annual chance flood discharge is contained in storm drain downstream of the project site. The proposed FIRM revisions and tie-in locations are shown on Figure 11 - CLOMR Workmap and Figure 12 - Annotated FIRM.

In general, the proposed site grading and storm drain improvements are in conformance with existing drainage patterns and flow values presented in the 2013 MPU and Queens Borough Culvert Study. Therefore, the proposed project will not adversely impact any downstream properties or facilities.




MAP SCALE 1" = 1000'

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2145F

FIRM
FLOOD INSURANCE RATE MAP
CLARK COUNTY, NEVADA
AND INCORPORATED AREAS

PANEL 2145 OF 4090
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CLARK COUNTY	320003	2145	F
LAS VEGAS, CITY OF	325276	2145	F

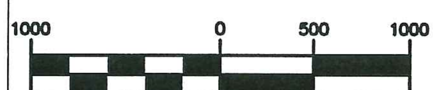
Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
32003C2145F

MAP REVISED
NOVEMBER 16, 2011

Federal Emergency Management Agency

GRAPHIC SCALE



(IN FEET)
1 inch = 1000 ft.

NORTH

THE SEVENTY
SEVENTY ACRES LLC, FORE STARS LTD, AND 180 LAND CO LLC

FIGURE 12

ANNOTATED F.I.R.M.

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ENGINEERS SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

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XI. CONCLUSIONS AND RECOMMENDATIONS

1. Methodology used in this report is in compliance with Clark County Regional Flood Control District (CCRFCD) criteria.

2. The project site is located within a FEMA-designated Special Flood Hazard Area (SFHA) Zone A. However, the 100-year flow (1% annual chance flood discharge) is contained within the proposed RCBs (Mainline 1 and Mainline 2) that transverse the site. Since the flows will be contained within the proposed RCBs, a CLOMR will be obtained from FEMA and a LOMR will be obtained from FEMA once construction of the facilities are substantially complete and functional.

3. CCRFCD Facilities to be constructed with this project include: APSO 0050, APSO 0067 and APP2 0000.

4. The proposed improvements connect to existing CCRFCD Facility APSO 0020.

5. Recommended storm drain facilities proposed with the project are shown on the attached grading plans.

6. The proposed storm drain will vary in size ranging from 18-inch RCP to 72-inch RCP and 10-foot wide by 8-foot high RCB to 14-foot wide by 12-foot high RCB connecting to the existing Rampart Boulevard dual (2) – 12-foot wide by 12-foot high RCB culverts.

7. Methods used to calculate storm runoff and size facilities are in compliance with the Manual.

8. Proposed facilities have been sized based on proposed conditions flow rates.

9. Detailed hydraulic modeling of the proposed Mainline 1 and Mainline 2 from the western boundary of the project site to the existing culverts in Rampart Boulevard shows that the design flows will be contained within the proposed RCBs. The design flows are based on the Proposed Conditions HEC-1 Model flow of 4,673 cfs. The proposed RCB will convey the Proposed Conditions flow with freeboard.

10. Flows conveyed within the onsite Mainline 1 RCB will be discharged into the existing dual (2) – 12-foot wide by 12-foot high RCBs in Rampart Boulevard located at the northeast corner of the project site.

11. Onsite storm drain laterals have been provided as part of this package to provide for future development of The Seventy and The Two Fifty.

12. Proposed onsite ditches/berms will convey onsite flows to be collected and conveyed by the proposed storm drain laterals.

13. Onsite area drains will be connected to the proposed onsite storm drain system that connects into the dual (2) - 12-foot wide by 12-foot high RCBCs.

14. All future onsite finished floors will be designed as required by CLV Criteria.

15. The emergency overflow path for the project will be Rampart Boulevard.

16. The general drainage patterns and flow rates are in general agreement with those specified in the 2013 MPU and the previous Queens Borough Culvert Study.

17. Runoff generated from, or conveyed by, the project will not adversely impact any downstream properties and facilities.

XII. REFERENCES

1. G. C. Wallace, *Technical Drainage Study for Queens Borough Culvert,* August 2005.

2. G. C. Wallace, *Update to the Technical Drainage Study for Queens Borough Culvert,* December 2005.

3. G. C. Wallace, *Update #2 to the Technical Drainage Study for Queens Borough Culvert,* April 2006.

4. *CCRFCD 2013 Las Vegas Valley Flood Control Master Plan Update*, 2013.

5. Clark County Regional Flood Control District (CCRFCD) *Hydrologic Criteria and Drainage Design Manual.* August 1999.

6. U.S. Army Corps of Engineers, *HEC-1 Flood Hydrograph Package.* June 1998.

7. U. S. Department of Agriculture & National Resource Conservation Service, *Soil Survey of Las Vegas Valley Area, Nevada, Part of Clark County*. August 2014. Version 10.

8. U. S. Army Corps of Engineers, WSPGW *Water Surface Pressure Gradient Package.* Version 12.99. 1991-2000.

9. U.S. Army Corps of Engineers, *HEC-RAS River Analysis System.* January 2010. Version 4.1.0.

THE SEVENTY
APPENDIX LAYOUT

Appendix A. Hydrologic Calculations and Information

1. Figure 513 – McCarran Airport Rainfall Area
2. Figure 506 – Rainfall Depth-Duration-Frequency 100-Year, 6-Hour
3. Figure 503 – Rainfall Depth-Duration-Frequency 10-Year, 6-Hour
4. Table 501 – Precipitation Adjustment Ratios
5. Rainfall Exhibits
6. Custom Soils Resource Report
7. Table 602 – 1 of 4 from the CCRFCD Manual
8. Table 602A
9. Revised 2013 MPU Curve Number Matrix
10. Composite Curve Number Calculations
11. Land Plan Exhibit
12. Existing Conditions Standard Form 4
13. Existing Conditions HEC-1 Model
14. Proposed Conditions Standard Form 4
15. Proposed Conditions HEC-1 Model
16. Exhibit A

Appendix B. Hydraulic Calculations and Information

1. Rough Grade Ditch Calculations
2. Conceptual Storm Drain Normal Depth Calculations
3. WSPGW
   a. Queens Borough Culvert to Main 1 WSPGW Station Conversion
   b. Mainline 1
   c. Mainline 1 Laterals
   d. Mainline 2
   e. Mainline 2 Laterals
4. HEC-RAS
   a. Existing Conditions
      i. Main 1
      ii. Main 2
   b. Proposed Conditions
      i. Main 1
      ii. Main 2
5. Area Drain Calculation
6. Inlet Control Calculations
7. D-Load Calculations

Appendix C. Referenced Material (On CD)

1. Referenced Studies and Grading Plans Received From CLV
2. Technical Drainage Study for Queens Borough Culvert Update 2 Supplement
   a. City of Las Vegas Approval Letter
   b. Supplement Letter
   c. WSPGW Model
   d. Improvement Plans
3. 2013 Las Vegas Valley Flood Control Master Plan Update
   a. ALLGOW3 HEC-1 Model Excerpt

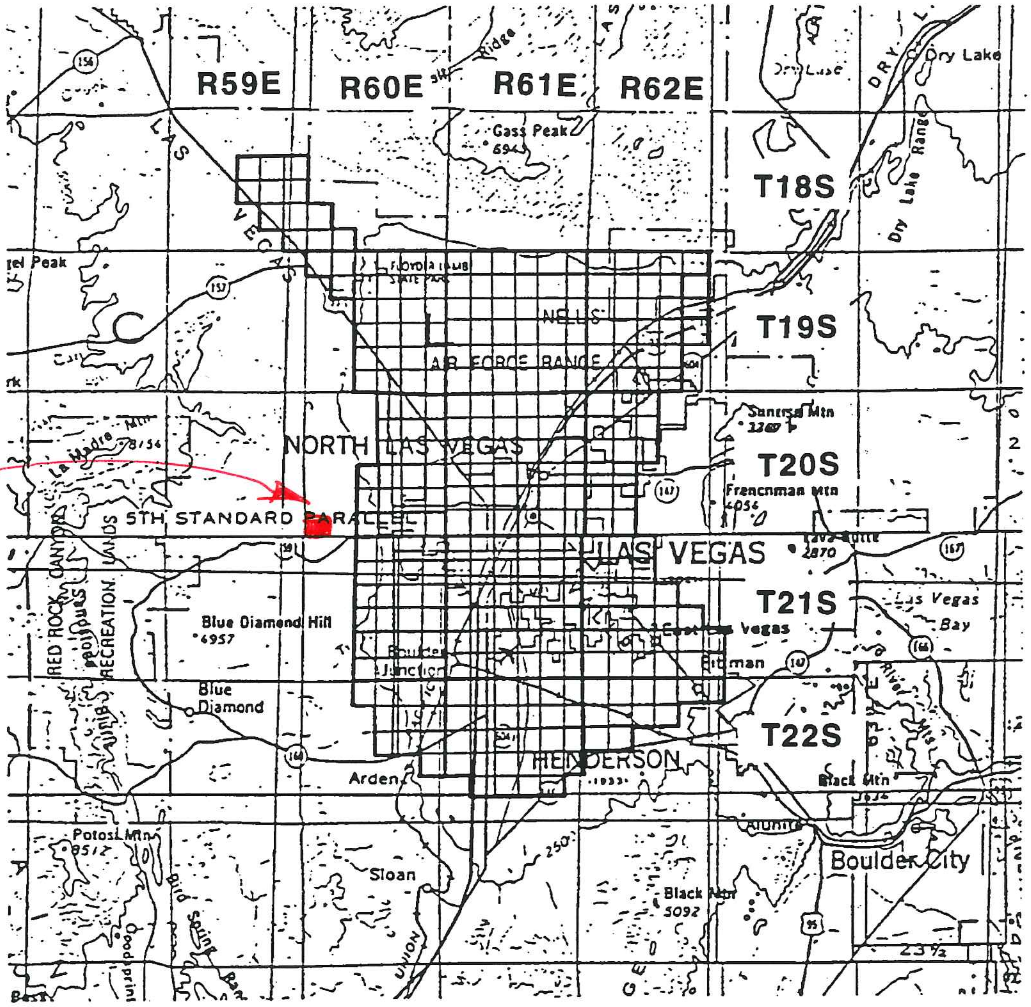
   b. Figure H-29
   c. Figure H-30
4. LOMR Case No. 06-09-BF86P
5. LOMR Case No. 06-09-B483P
6. Improvement Plans from One Queensridge Place (Sheet C10.03)
7. Improvement Plans from Rampart Boulevard (Sheet SD-5)

APPENDIX A

Hydrologic Information

McCARRAN AIRPORT RAINFALL AREA

PROJECT SITE
20 South
60 East
Sections 31&32



TOWNSHIP	RANGE	SECTIONS	TOWNSHIP	RANGE	SECTIONS
18 South	59 East	13-15,22-26,36	20 South	62 East	4-9,16-20,29-32
18 South	60 East	30-32	21 South	60 East	1-4,9-16,21-28,33-36
19 South	60 East	1-6,8-16,21-28,33-36	21 South	61 East	ALL SECTIONS
19 South	61 East	ALL SECTIONS	21 South	62 East	4-9,15-23, 25-36
19 South	62 East	2-11,14-23,27-34	22 South	60 East	1-4,10-15,24
20 South	60 East	1-3,10-15,21-28,33-36	22 South	61 East	1-24,26-29
20 South	61 East	ALL SECTIONS	22 South	62 East	1-10,17-18

Notes:

1. Refer to Table 505 and Figure 516 Depth-Duration- Frequency values in the McCarran Airport Rainfall Area.
2. Refer to Table 506 and Figure 517 for Time-Intensity-Frequency values on the McCarran Airport Rainfall Area.

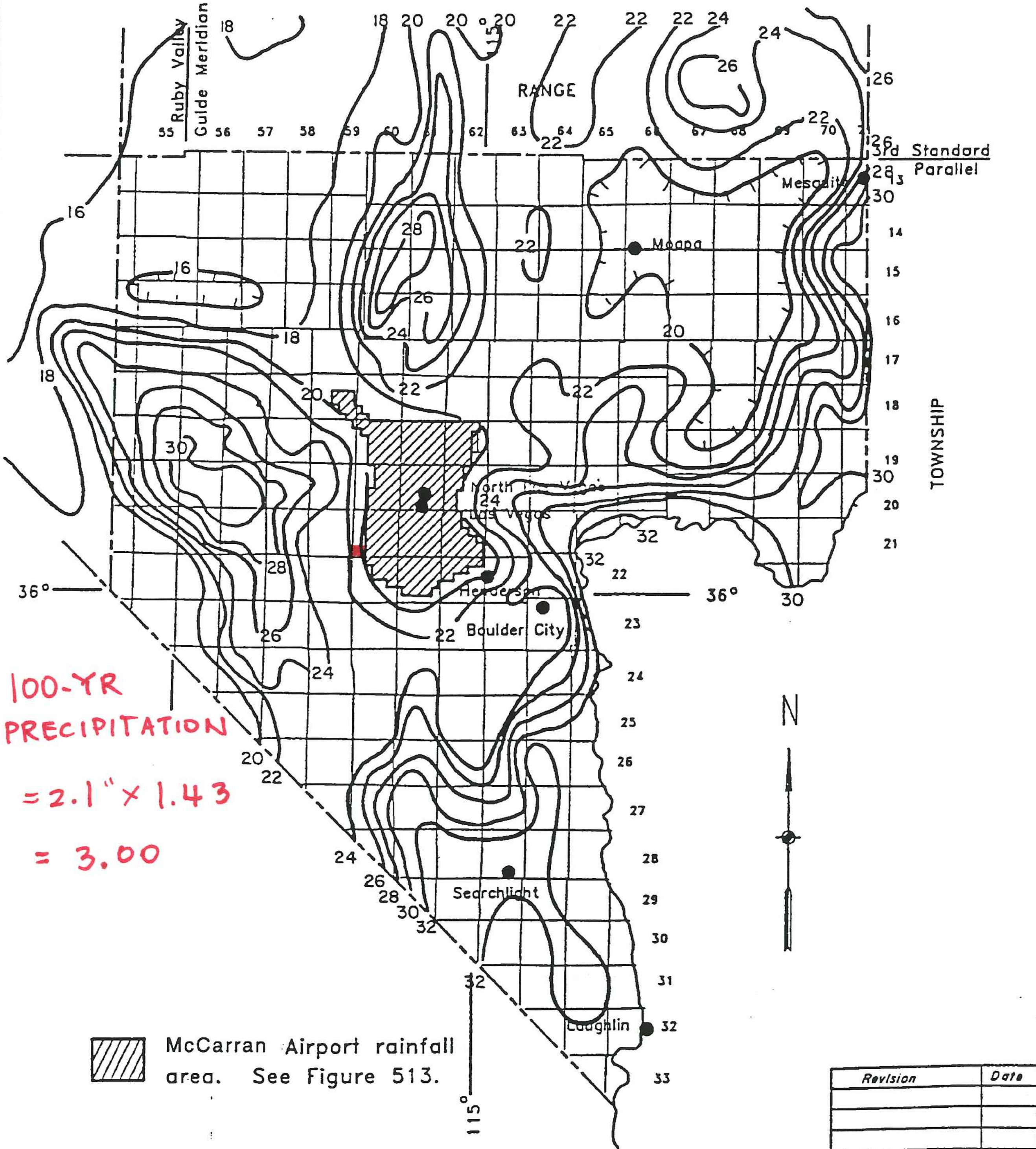
Revision	Date

WRC ENGINEERING

REFERENCE:
USACE, Los Angeles District, 1988

FIGURE 513

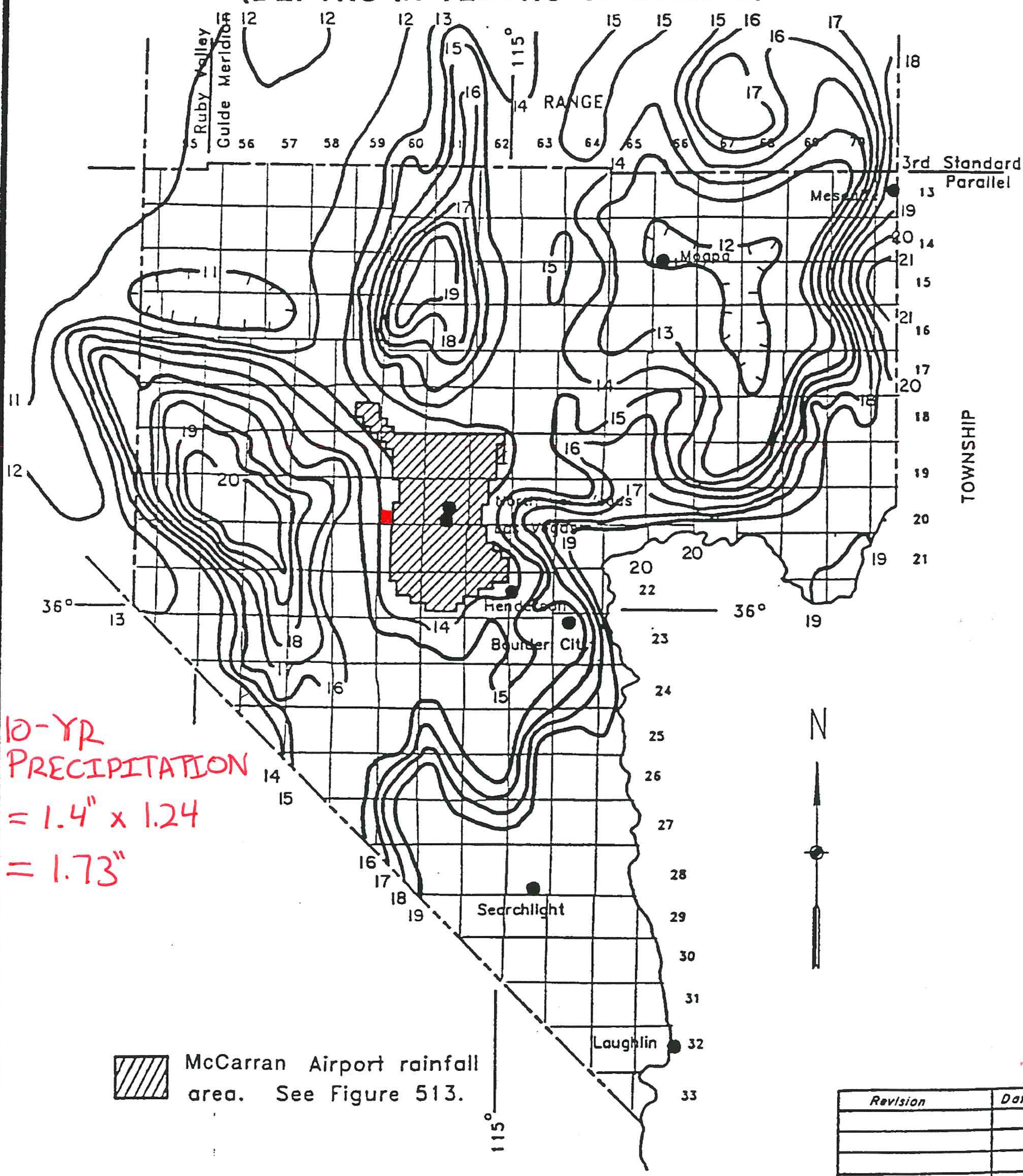
RAINFALL DEPTH-DURATION-FREQUENCY
100-YEAR, 6-HOUR
(DEPTHS IN TENTHS OF INCHES)



100-YR PRECIPITATION
= 2.1" × 1.43
= 3.00

Revision	Date

RAINFALL DEPTH-DURATION-FREQUENCY
10-YEAR, 6-HOUR
(DEPTHS IN TENTHS OF INCHES)



10-YR PRECIPITATION
= 1.4" x 1.24
= 1.73"

Revision	Date

WRC ENGINEERING	REFERENCE: NOAA ATLAS 2, VOLUME VII NEVADA, 1973	FIGURE 503

PRECIPITATION ADJUSTMENT RATIOS

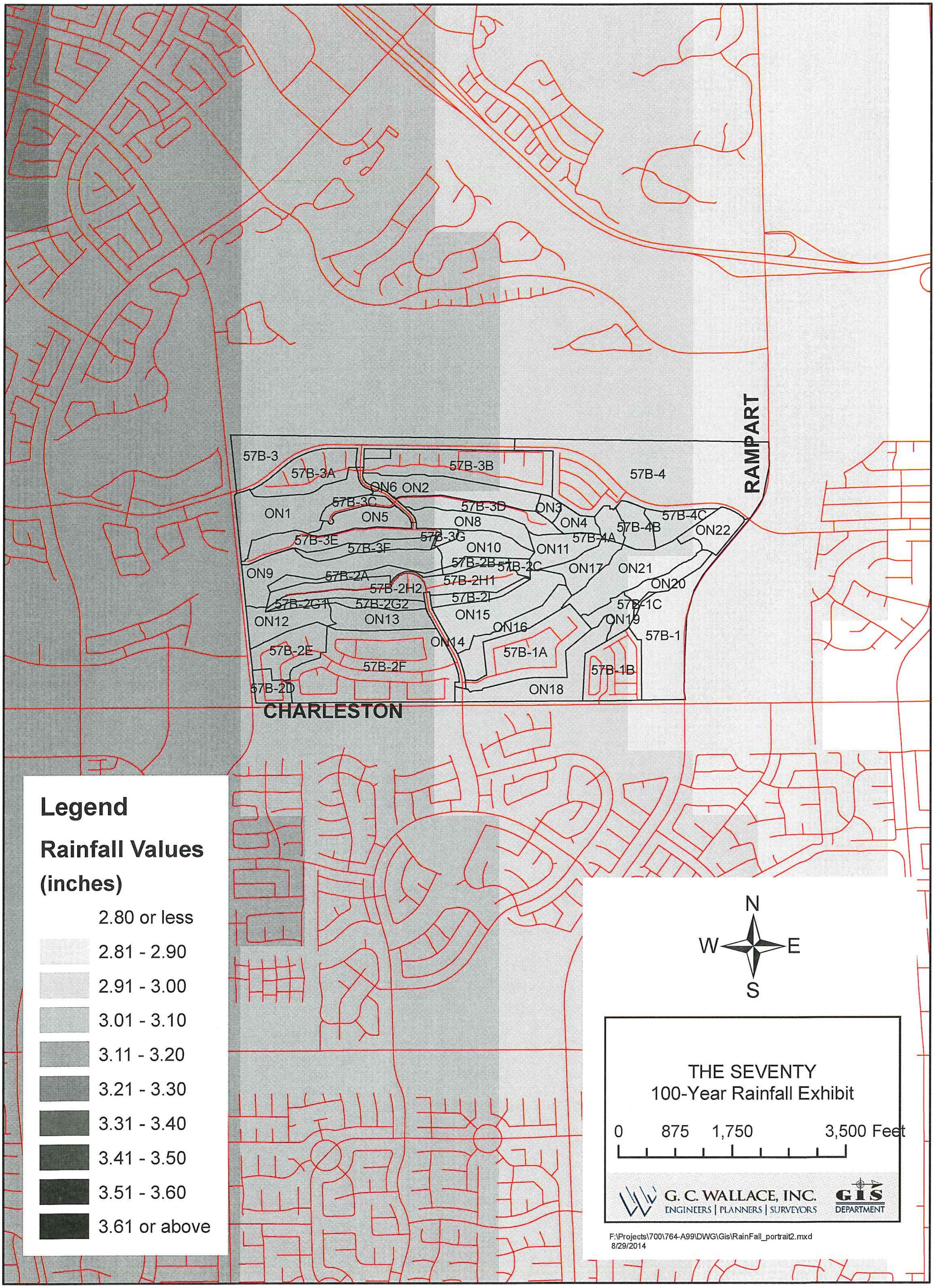
Recurrence Interval	Ratio to NOAA Atlas 2
2-year	1.00
5-year	1.16
10-year	1.24 × 1.4 = 1.73
25-year	1.33
50-year	1.39
100-year	1.43 × 2.1 = 3.00

$$\frac{1.73}{3.00} = 0.57$$

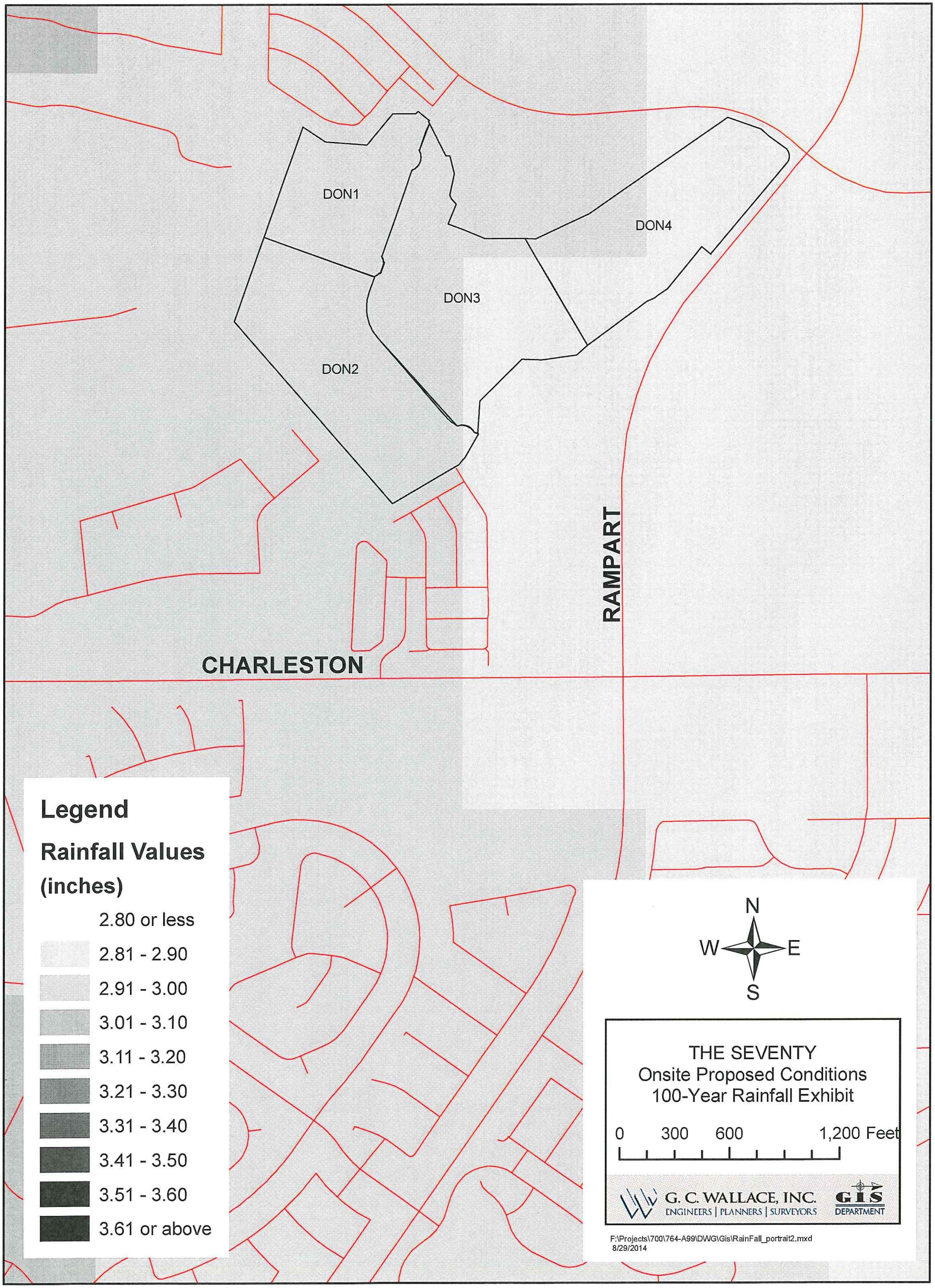
NOTE:

1. Multiply the values obtained from the NOAA Atlas 2 by the above ratios to obtain the adjusted precipitation values.
2. NOAA Atlas 2 values for use with TR-55 shall not be adjusted by the above ratios.
3. Tables 505 and 506 require no adjustments.

Revision	Date



RAMPART
CHARLESTON
57B-3
57B-3A
57B-3B
57B-4
ON6 ON2
57B-3C
ON1
ON5
57B-3D
ON3
ON8
ON4
57B-4B
57B-4C
ON22
57B-3E
57B-3G
57B-3F
ON10
ON11
57B-4A
ON9
57B-2A
57B-2B
57B-2C
ON17
ON21
57B-2H2
57B-2H1
ON20
57B-2G1
57B-2G2
57B-2I
57B-1C
ON12
ON13
ON15
ON19
ON16
57B-1
57B-2E
ON14
57B-1A
57B-2F
57B-1B
57B-2D
ON18
Legend
Rainfall Values
(inches)
2.80 or less
2.81 - 2.90
2.91 - 3.00
3.01 - 3.10
3.11 - 3.20
3.21 - 3.30
3.31 - 3.40
3.41 - 3.50
3.51 - 3.60
3.61 or above
N
W
E
S
THE SEVENTY
100-Year Rainfall Exhibit
0 875 1,750 3,500 Feet
G. C. WALLACE, INC.
ENGINEERS | PLANNERS | SURVEYORS
GIS
DEPARTMENT
F:\Projects\700\764-A99\DWG\Gis\RainFall_portrait2.mxd
8/29/2014


DON1
DON2
DON3
DON4
RAMPART
CHARLESTON
Legend
Rainfall Values
(inches)
2.80 or less
2.81 - 2.90
2.91 - 3.00
3.01 - 3.10
3.11 - 3.20
3.21 - 3.30
3.31 - 3.40
3.41 - 3.50
3.51 - 3.60
3.61 or above
N
W
E
S
THE SEVENTY
Onsite Proposed Conditions
100-Year Rainfall Exhibit
0 300 600 1,200 Feet
G. C. WALLACE, INC.
ENGINEERS | PLANNERS | SURVEYORS
GIS
DEPARTMENT
F:\Projects\700\764-A99\DWG\Gis\RainFall_portrait2.mxd
8/29/2014

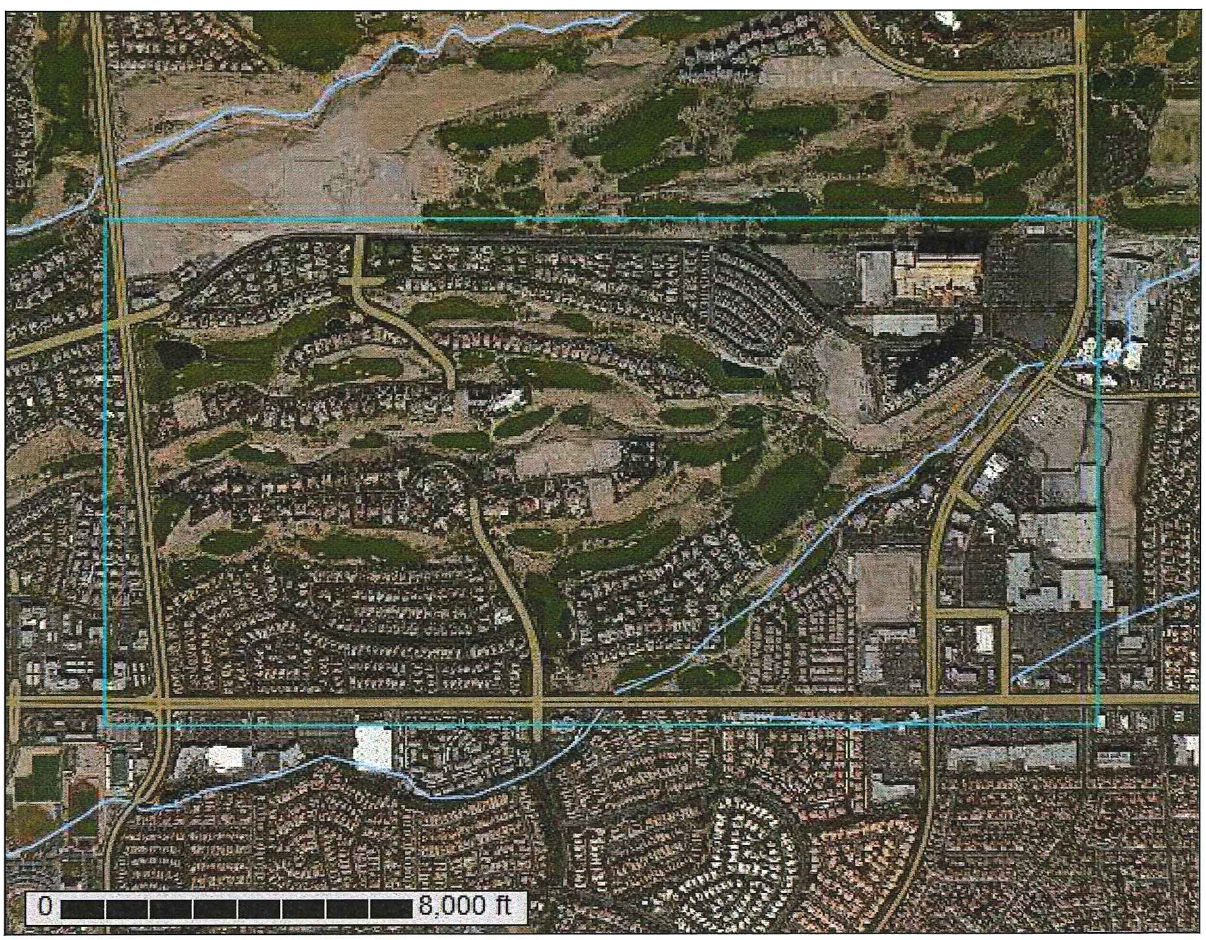
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Las Vegas Valley Area, Nevada, Part of Clark County



February 3, 2016

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map

Map Scale: 1:14,500 if printed on A landscape (11" x 8.5") sheet.

N

0 200 400 800 1200 Meters

0 500 1000 2000 3000 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Las Vegas Valley Area, Nevada, Part of Clark County
Survey Area Data: Version 10, Aug 22, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 7, 2011—Feb 25, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Las Vegas Valley Area, Nevada, Part of Clark County (NV788)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
152	Cave gravelly fine sandy loam, 0 to 4 percent slopes	867.7	100.0%
Totals for Area of Interest		**867.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Las Vegas Valley Area, Nevada, Part of Clark County

152—Cave gravelly fine sandy loam, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: hr9v
Elevation: 2,000 to 4,800 feet
Mean annual precipitation: 4 to 12 inches
Mean annual air temperature: 57 to 70 degrees F
Frost-free period: 180 to 280 days
Farmland classification: Not prime farmland

Map Unit Composition

Cave and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cave

Setting

Landform: Fan remnants
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 12 inches: gravelly fine sandy loam
H2 - 12 to 36 inches: indurated
H3 - 36 to 60 inches: very gravelly sandy loam

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: 4 to 20 inches to petrocalcic
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Gypsum, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 12.0
Available water storage in profile: Very low (about 1.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Other vegetative classification: LIMY 3-5" P.Z. (030XB019NV_3)

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Engineering Properties (Badlands)

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Hydrologic soil group is a group of soils having similar runoff potential under similar storm and cover conditions. The criteria for determining Hydrologic soil group is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Listing HSGs by soil map unit component and not by soil series is a new concept for the engineers. Past engineering references contained lists of HSGs by soil series. Soil series are continually being defined and redefined, and the list of soil series names changes so frequently as to make the task of maintaining a single national list virtually impossible. Therefore, the criteria is now used to calculate the HSG using the component soil properties and no such national series lists will be maintained. All such references are obsolete and their use should be discontinued. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonal high water table, saturated hydraulic conductivity after prolonged wetting, and depth to a layer with a very slow water transmission rate. Changes in soil properties caused by land management or climate changes also cause the hydrologic soil group to change. The influence of ground cover is treated independently. There are four hydrologic soil groups, A, B, C, and D, and three dual groups, A/D, B/D, and C/D. In the dual groups, the first letter is for drained areas and the second letter is for undrained areas.

The four hydrologic soil groups are described in the following paragraphs:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number.

Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

References:

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba).

Engineering Properties–Las Vegas Valley Area, Nevada, Part of Clark County

Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*Pct*	*Pct*					*Pct*	
152—Cave gravelly fine sandy loam, 0 to 4 percent slopes														
Cave	100	D	0-12	Gravelly fine sandy loam	SC-SM, SM	A-2, A-4	0- 0- 0	0- 3- 5	70-80-90	60-68-75	40-53-65	25-33-40	15-20-25	NP-3 -5
			12-36	Indurated	—	—	—	—	—	—	—	—	—	—
			36-60	Gravelly loamy sand, very gravelly sandy loam	GM, GP-GM, SM, SP-SM	A-1, A-2	0- 0- 0	0- 3- 5	35-55-75	30-45-60	20-28-35	10-20-30	0-8 -15	NP

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RUNOFF CURVE NUMBERS
(URBAN AREAS[1])

Cover description		Curve numbers for hydrologic soil group—			
Cover type and hydrologic condition	Average percent impervious area[2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.)[3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only)[4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
See Table 602A					
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation)[5]		77	86	91	94

1 Average runoff condition, and $I_a = 0.2S$.

2 The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system. Impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using Figure 603.

3 CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

4 Composite CN's for natural desert landscaping should be computed using Figure 603 based on the impervious area percentage (CN #98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

5 Composite CN's to use for the design of temporary measures during grading and construction should be computed using Figure 603 based on the degree of development impervious area percentage) and the CN's for the newly graded pervious areas.

Revision	Date

RUNOFF CURVE NUMBERS - RESIDENTIAL DISTRICTS

Average Lot Size or Usage[1]	Percent Impervious[2]	Curve Number for Hydrologic Soil Groups			
		A	B	C	D
Apartments/Condos	72	81	88	91	93
Townhouses/6,000 sq ft lots or less[3]	69	80	87	90	92
7,000 sq ft lots	63	76	84	89	91
8,000 sq ft lots	58	73	82	88	90
10,000 sq ft lots	38	61	75	83	87
14,000 sq ft lots	30	57	72	81	86
20,000 sq ft lots	25	54	70	80	85
40,000 sq ft lots	20	51	68	79	84
* 80,000 sq ft lots	12	46	65	77	82 *

1 Lot size should represent the size of the average lot and not the gross acreage divided by the number of lots.

2 Actual percent impervious value should be compared to selected land use type.

3 In cases where average residential lots are smaller than 6,000 sq ft, commercial/business/industrial land use should be used.

Revision	Date

REFERENCE:

Curve Number Matrix

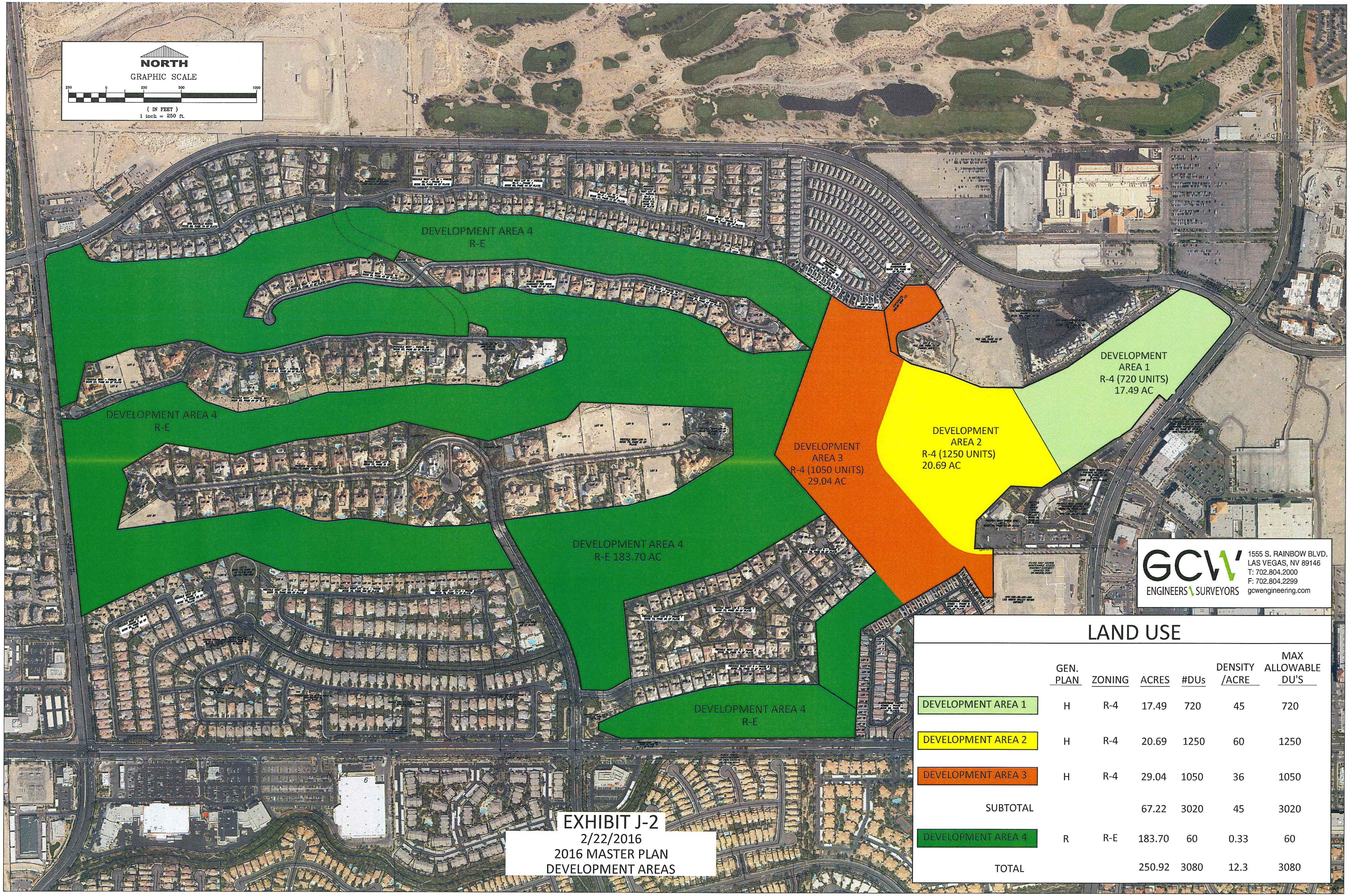
MAP #	COMPONENTS			LAND USE CLASSIFICATION INDEX NUMBER																					
	OPEN DESERT	OPEN GOOD	% IMP	1	2*	3	4	5*	6	7*	8	9*	10	11	12	13	14	15	16	17	18	19	20	21	22
	% --->			100	10	60	35	0	0	0	0	0	15	7	0	0	55	36	19	14	15	10	30	15	20
		% --->		0	85	20	40	71	38	28	15	10	15	8	50	0	20	35	19	14	0	0	0	0	30
			% --->	0	5	20	25	29	62	72	85	90	70	85	50	0	25	29	62	72	85	90	70	85	50
	CN	CN	CN	SOIL TYPE COMPOSITE CN FOR LAND USE TYPE																					
152	88	80	98	88.0	82.0	88.0	87.0	85.0	91.0	93.0	95.0	96.0	94.0	96.0	89.0	30.0	89.0	88.0	93.0	94.0	97.0	97.0	95.0	97.0	91.0

* Please refer to Land Use Shown on MPU H-Maps

PERVIOUS AREA CURVE NUMBERS								
CONDITION 1:	----------->	DESERT SHRUB POOR HYDROLOGIC CONDITION						
CONDITION 2:	----------->	LANDSCAPED, LAWNS, TREES, GOOD HYDROLOGIC CONDITION						
CN VALUES								
		HYDROLOGIC SOIL GROUP						
CONDITION		A	B	C	D	ROCK		
1	----------->	63	77	85	88	90		
2	----------->	39	61	74	80	90		
							CONDITION	CONDITION
	MAP	HYDROLOGIC SOIL GROUP					1	2
	UNIT	%A	%B	%C	%D	%ROCK	CN	CN
	152	0	0	0	100	0	88	80

Orchestra (Phase 1)					
WEIGHTED CURVE NUMBERS					
Proposed Conditions					
Basin	Soil	Percent	CN	Land Use	WCN
57B-1	152	5.0%	82.0	Parks, Golf Courses	93.7
	152	54.0%	93.0	Public Facility, Residential	
	152	41.0%	96.0	Commercial, Retail, Casino, High Rise Condo	
57B-1A	152	100.0%	85.0	Medium Residential	85.0
57B-1B	152	100.0%	93.0	Public Facility, Residential	93.0
57B-1C	152	100.0%	96.0	Commercial, Retail, Casino, High Rise Condo	96.0
57B-2A	152	100.0%	87.0	Low Density Residential	87.0
57B-2B	152	100.0%	87.0	Low Density Residential	87.0
57B-2C	152	100.0%	87.0	Low Density Residential	87.0
57B-2D	152	100.0%	91.0	High Density Residential	91.0
57B-2E	152	100.0%	91.0	High Density Residential	91.0
57B-2F	152	100.0%	91.0	High Density Residential	91.0
57B-2G1	152	100.0%	87.0	Low Density Residential	87.0
57B-2G2	152	100.0%	87.0	Low Density Residential	87.0
57B-2H1	152	100.0%	87.0	Low Density Residential	87.0
57B-2H2	152	100.0%	87.0	Low Density Residential	87.0
57B-2I	152	100.0%	87.0	Low Density Residential	87.0
57B-3	152	29.2%	82.0	Parks, Golf Courses	89.3
	152	9.0%	85.0	Medium Residential	
	152	54.0%	93.0	Public Facility, Residential	
	152	7.8%	96.0	Commercial, Retail, Casino, High Rise Condo	
57B-3A	152	100.0%	85.0	Medium Residential	85.0
57B-3B	152	100.0%	85.0	Medium Residential	85.0
57B-3C	152	100.0%	87.0	Low Density Residential	87.0
57B-3D	152	100.0%	87.0	Low Density Residential	87.0
57B-3E	152	100.0%	87.0	Low Density Residential	87.0
57B-3F	152	100.0%	87.0	Low Density Residential	87.0
57B-3G	152	100.0%	87.0	Low Density Residential	87.0
57B-4	152	8.1%	82.0	Parks, Golf Courses	93.8
	152	0.3%	85.0	Medium Residential	
	152	30.2%	93.0	Public Facility, Residential	
	152	61.3%	96.0	Commercial, Retail, Casino, High Rise Condo	

57B-4B	152	100.0%	96.0	Commercial, Retail, Casino, High Rise Condo	**96.0**
57B-4C	152	100.0%	96.0	Commercial, Retail, Casino, High Rise Condo	**96.0**
ON1	152	100.0%	82.0	Parks, Golf Courses	**82.0**
ON2	152	100.0%	82.0	Parks, Golf Courses	**82.0**
ON3R	152	100.0%	82.0	Parks, Golf Courses	**82.0**
ON5	152	100.0%	82.0	Parks, Golf Courses	**82.0**
ON6	152	100.0%	93.0	Public Facility, Residential	**93.0**
ON8	152	100.0%	82.0	Parks, Golf Courses	**82.0**
ON9	152	100.0%	82.0	Parks, Golf Courses	**82.0**
ON10	152	100.0%	82.0	Parks, Golf Courses	**82.0**
ON11R	152	100.0%	82.0	Parks, Golf Courses	**82.0**
ON12	152	100.0%	82.0	Parks, Golf Courses	**82.0**
ON13	152	100.0%	82.0	Parks, Golf Courses	**82.0**
ON14	152	100.0%	82.0	Parks, Golf Courses	**82.0**
ON15R	152	100.0%	82.0	Parks, Golf Courses	**82.0**
ON16R	152	100.0%	82.0	Parks, Golf Courses	**82.0**
ON18R	152	100.0%	82.0	Parks, Golf Courses	**82.0**
DON1	152	100.0%	95.0	Commercial and business	**95.0**
DON2	152	100.0%	95.0	Commercial and business	**95.0**
DON3	152	100.0%	95.0	Commercial and business	**95.0**
DON4	152	100.0%	95.0	Commercial and business	**95.0**



LAND USE

	GEN. PLAN	ZONING	ACRES	#DUs	DENSITY /ACRE	MAX ALLOWABLE DU'S
DEVELOPMENT AREA 1	H	R-4	17.49	720	45	720
DEVELOPMENT AREA 2	H	R-4	20.69	1250	60	1250
DEVELOPMENT AREA 3	H	R-4	29.04	1050	36	1050
SUBTOTAL			67.22	3020	45	3020
DEVELOPMENT AREA 4	R	R-E	183.70	60	0.33	60
TOTAL			250.92	3080	12.3	3080

EXHIBIT J-2
2/22/2016
2016 MASTER PLAN
DEVELOPMENT AREAS

HYDROLOGIC CRITERIA AND DESIGN MANUAL

TIME OF CONCENTRATION

GCW ENGINEERS SURVEYORS

The Seventy
Existing Conditions

Project No: 840.050
Date: 17-Feb-16
Calculated by: MMC

SUB-BASIN DATA						INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc CHECK URBANIZED BASINS		Tc	Tlag	REMARKS
DESIG: (1)	DEV./EX. (D or E)	CN (16)	K (2)	AREA Ac (3)	AREA Sq Mi (4)	INITIAL LENGTH Feet (5)	SLOPE % (6)	Ti Min (7)	TRAVEL LENGTH Feet (8)	SLOPE % (9a)	V1 VELOCITY fps (9b)	V2 VELOCITY fps (10)	Tt Min (11)	TOTAL LENGTH Feet (12)	Tc = (L/180)+10 Min (13)	Min (14)	Tlag = 0.6Tc/60 Hours (15)	Rainfall:
57B-1	D	93.7	0.8468	31.1	0.0485	250	2.80	5.1	3020	2.2	3.0	4.5	12.2	3270	28.2	17.3	0.173	2.89
57B-1A	D	85	0.7320	28.4	0.0443	370	2.40	9.5	2080	2.3	3.1	4.6	8.4	2450	23.6	17.9	0.179	2.96
57B-1B	D	93	0.8376	19.3	0.0301	100	1.00	4.7	1630	1.0	2.0	3.1	10.3	1730	19.6	15.0	0.150	2.91
57B-1C	D	96	0.8772	0.6	0.0009	50	1.00	2.8	490	1.2	2.2	3.4	3.7	540	13.0	6.5	0.065	2.89
57B-2A	D	87	0.7584	6.3	0.0098	186	13.40	3.5	2700	1.7	2.6	4.0	12.4	2886	26.0	15.9	0.159	3.05
57B-2B	D	87	0.7584	3.0	0.0047	50	2.00	3.5	1400	2.7	3.3	5.0	5.5	1450	18.1	8.9	0.089	2.99
57B-2C	D	87	0.7584	1.7	0.0027	100	1.00	6.1	222	6.8	5.3	8.0	0.7	322	11.8	6.9	0.069	2.96
57B-2D	D	91	0.8112	5.7	0.0088	110	1.00	5.5	1200	1.1	2.1	3.2	7.6	1310	17.3	13.0	0.130	3.09
57B-2E	D	91	0.8112	14.5	0.0227	110	1.00	5.5	1360	3.4	3.7	5.6	4.8	1470	18.2	10.2	0.102	3.08
57B-2F	D	91	0.8112	57.8	0.0902	110	1.00	5.5	3000	2.5	3.2	4.8	11.2	3110	27.3	16.7	0.167	3.03
57B-2G1	D	87	0.7584	1.6	0.0026	35	5.60	2.0	730	2.9	3.4	5.2	3.2	765	14.3	5.2	0.052	3.08
57B-2G2	D	87	0.7584	4.6	0.0073	40	2.50	2.9	1511	2.2	3.0	4.5	6.5	1551	18.6	9.4	0.094	3.03
57B-2H1	D	87	0.7584	18.6	0.0291	300	3.70	6.9	4120	1.1	2.1	3.2	22.7	4420	34.6	29.6	0.296	3.01
57B-2H2	D	87	0.7584	10.0	0.0156	300	2.30	8.1	2500	2.2	3.0	4.5	10.1	2800	25.6	18.2	0.182	3.04
57B-2I	D	87	0.7584	4.6	0.0072	80	7.50	2.8	1575	2.6	3.3	4.9	6.2	1655	19.2	9.0	0.090	2.99
57B-3	D	89.3	0.7888	30.8	0.0481	380	1.30	10.0	4170	2.4	3.1	4.7	15.6	4550	35.3	25.6	0.256	3.06
57B-3A	D	85	0.7320	16.6	0.0259	170	1.00	8.6	1360	2.0	2.9	4.3	6.2	1530	18.5	14.9	0.149	3.07
57B-3B	D	85	0.7320	32.8	0.0513	110	1.00	6.9	2500	2.4	3.1	4.7	9.7	2610	24.5	16.6	0.166	3.00
57B-3C	D	87	0.7584	4.4	0.0069	130	1.00	7.0	1140	2.5	3.2	4.8	4.8	1270	17.1	11.8	0.118	3.05
57B-3D	D	87	0.7584	11.8	0.0184	125	1.00	6.9	2500	2.7	3.3	5.0	9.1	2625	24.6	16.0	0.160	2.99
57B-3E	D	87	0.7584	16.0	0.0251	240	1.00	9.5	3200	2.5	3.2	4.8	11.9	3440	29.1	21.4	0.214	3.06
57B-3F	D	87	0.7584	7.4	0.0116	180	2.70	5.9	2170	2.5	3.2	4.9	8.3	2350	23.1	14.2	0.142	3.05
57B-3G	D	87	0.7584	1.5	0.0023	220	3.20	6.2	260	4.6	4.3	6.6	1.0	480	12.7	7.2	0.072	2.99
57B-4	D	93.8	0.8482	82.7	0.1293	35	2.00	2.1	4890	2.4	3.1	4.7	18.1	4925	37.4	20.2	0.202	2.91
57B-4A	D	82	0.6924	4.5	0.0070	274	4.70	7.3	600	2.5	3.2	4.8	3.0	874	14.9	10.2	0.102	2.93
57B-4B	D	96	0.8772	7.1	0.0110	150	2.70	3.5	860	2.9	3.4	5.2	3.6	1010	15.6	7.1	0.071	2.91
57B-4C	D	96	0.8772	7.8	0.0122	100	1.00	4.0	1560	1.6	2.6	3.9	7.8	1660	19.2	11.8	0.118	2.90
ON1	D	82	0.6924	25.4	0.0397	165	4.20	5.8	2040	3.0	3.5	5.3	7.2	2205	22.3	13.1	0.131	3.08
ON2	D	82	0.6924	17.5	0.0273	180	5.00	5.8	2700	2.5	3.2	4.8	10.2	2880	26.0	15.9	0.159	3.00
ON3	D	82	0.6924	2.5	0.0040	135	12.00	3.7	300	1.7	2.6	4.0	1.9	435	12.4	5.6	0.056	2.96
ON4	D	82	0.6924	4.7	0.0073	150	9.30	4.3	530	1.0	2.0	3.1	4.3	680	13.8	8.6	0.086	2.94
ON5	D	82	0.6924	9.4	0.0147	125	4.00	5.2	1420	2.9	3.4	5.2	5.4	1545	18.6	10.5	0.105	3.05

ON6	D	93	0.8376	2.3	0.0035	20	4.00	1.3	785	1.7	2.6	4.0	4.4	805	14.5	5.7	0.057	3.04
ON8	D	82	0.6924	12.2	0.0190	65	6.20	3.2	1950	8.7	6.0	9.0	4.1	2015	21.2	7.3	0.073	2.99
ON9	D	82	0.6924	25.5	0.0399	290	15.50	5.0	3085	1.0	2.0	3.1	18.2	3375	28.8	23.2	0.232	3.06
ON10	D	82	0.6924	11.4	0.0177	100	29.00	2.4	1460	2.9	3.4	5.2	5.5	1560	18.7	7.9	0.079	2.98
ON11	D	82	0.6924	10.0	0.0157	270	13.70	5.0	1040	1.6	2.6	3.9	5.6	1310	17.3	10.6	0.106	2.95
ON12	D	82	0.6924	11.6	0.0182	225	3.50	7.2	1300	3.1	3.6	5.4	4.8	1525	18.5	12.1	0.121	3.08
ON13	D	82	0.6924	12.0	0.0187	210	7.10	5.5	1540	3.6	3.8	5.8	5.2	1750	19.7	10.7	0.107	3.04
ON14	D	82	0.6924	3.5	0.0054	100	1.00	7.3	1575	0.5	1.4	2.2	14.1	1675	19.3	21.5	0.193	3.00
ON15	D	82	0.6924	22.5	0.0351	120	7.50	4.1	2160	3.3	3.7	5.6	7.2	2280	22.7	11.4	0.114	2.98
ON16	D	82	0.6924	11.5	0.0180	45	45.00	1.4	2200	3.3	3.7	5.6	7.4	2245	22.5	8.8	0.088	2.97
ON17	D	82	0.6924	9.1	0.0143	41	7.30	2.4	1160	3.4	3.7	5.6	4.2	1201	16.7	6.6	0.066	2.93
ON18	D	82	0.6924	20.3	0.0317	175	0.60	11.5	2930	2.5	3.2	4.9	10.9	3105	27.3	22.4	0.224	2.95
ON19	D	82	0.6924	6.4	0.0100	112	1.80	6.4	785	4.2	4.1	6.3	2.8	897	15.0	9.2	0.092	2.92
ON20	D	82	0.6924	6.6	0.0104	200	9.00	5.0	1415	2.0	2.9	4.3	6.4	1615	19.0	11.4	0.114	2.89
ON21	D	82	0.6924	22.3	0.0348	270	1.10	11.7	2222	3.0	3.5	5.3	7.8	2492	23.8	19.5	0.195	2.91
ON22	D	82	0.6924	8.5	0.0133	65	3.10	4.1	970	4.9	4.5	6.8	3.0	1035	15.8	7.1	0.071	2.88

Tc = Ti + Tt   Tlag = 0.6 Tc

$Ti = 1.8\ (1.1 - K)\ L^{1/2} / S^{1/3}$

K = 0.0132 (CN) - 0.39

For the travel time (Tt) calculations,
V1 applies to the first 500 feet of travel distance;
V2 applies to the remaining travel distance.

Existing: $V1 = 14.8*(S/100)^{1/2}$, $V2 = 29.4*(S/100)^{1/2}$

Developed: $V1 = 20.2*(S/100)^{1/2}$, $V2 = 30.6*(S/100)^{1/2}$

REFERENCE: CN values referenced from MPU

STANDARD FORM 4

```
1*****************************************                       *****************************************
 *                                       *                       *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                       *   U.S. ARMY CORPS OF ENGINEERS        *
 *             JUN   1998                *                       *   HYDROLOGIC ENGINEERING CENTER       *
 *           VERSION 4.1                 *                       *        609 SECOND STREET              *
 *                                       *                       *     DAVIS, CALIFORNIA 95616           *
 * RUN DATE   03MAR16  TIME  10:06:06    *                       *        (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

                   *DIAGRAM
*** FREE ***
          1        ID   ***********************************************************************
          2        ID   *  .................................................................  *
          3        ID   *  :                                                               :  *
          4        ID   *  :                  THE SEVENTY                                  :  *
          5        ID   *  :                                                               :  *
          6        ID   *  :                  EXISTING CONDITIONS                          :  *
          7        ID   *  :...............................................................:  *
          8        ID   *  :                  RETURN PERIOD_ _ _ _100 & 10 -YEAR           :  *
          9        ID   *  :                  DISTRIBUTION_ _ _ _ 6-HOUR SDN3              :  *
         10        ID   *  :                  PROJECT NO_ _ _ _ _ 840.050                  :  *
         11        ID   *  :                  FILENAME_ _ _ _ _ _ EXISTING.H1              :  *
         12        ID   *  :                  DATE MODELED_ _ _ _ 2/22/16                  :  *
         13        ID   *  :                  MODELED BY_ _ _ _ _ JAM, MMC, RRD, SHT       :  *
         14        ID   *  :...............................................................:  *
         15        ID   *  :                                                               :  *
         16        ID   *  :...............................................................:  *
         17        ID   ***********************************************************************
         18        ID
         19        ID    REFERENCED HYDROLOGIC MODELS:
         20        ID    2013 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE
         21        ID    CITY OF LAS VEGAS CITY WIDE HYDROLOGY ANALYSIS (PBS&J 1997)
         22        ID    CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT 2008 MASTER PLAN UPDATE
         23        ID    GOWAN WATERSHED (ALL)
         24        ID    RECOMMENDED DRAINAGE SYSTEM WITH ULTIMATE DEVELOPMENT
         25        ID    INPUT FILE = ALLGOW3.DAT
         26        ID    INPUT FILE DATE = MAY 5, 2008
         27        ID    DESIGN STORM = 100-YEAR 6-HR STORM
         28        ID    STORM DISTRIBUTION = SDN #3
         29        ID    MODELED BY PBS&J (MICHELE L. D'ALESSANDRO, E.I., CFM)
         30        ID    CHECKED BY PBS&J (HARSHAL B. DESAI, P.E., CFM)
         31        ID    STORM CENTERING = FULL WATERSHED
         32        ID    JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
         33        ID
         34        ID                             AREA     DARF
         35        ID                             SQ. MI.
         36        ID                             0-0.5    0.99
         37        ID                             0.5-1    0.975
         38        ID                             1-2      0.95
         39        ID                             2-3      0.925
         40        ID                             3-4      0.915
         41        ID                             4-5      0.908
         42        ID                             5-6      0.903
         43        ID                             6-7      0.895
         44        ID                             10yr     0.570
         45        ID
         46        ID  JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)
         47        ID
         48        ID  100-YEAR,  6-HOUR STORM,  SDN3
         49        ID
         50        IT       5       0       0     650
         51        IO       5       0       0
         52        IN       5       0       0
         53        JR    PREC    0.99   0.975    0.95   0.925   0.915   0.908   0.903   0.895   0.570
                   *
1                                       HEC-1 INPUT                                        PAGE  2

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

         54        KK     ON1
         55        KM  OFFSITE BASIN ON1
         56        PB    3.08
         57        BA  0.0397
         58        PC       0    0.02   0.057    0.07   0.087   0.108   0.124    0.13    0.13    0.13
         59        PC    0.13    0.13    0.13   0.133    0.14   0.142   0.148   0.158   0.172   0.181
         60        PC    0.19   0.197   0.199     0.2   0.201   0.204   0.214   0.229   0.241   0.249
         61        PC   0.251   0.256    0.27   0.278   0.281   0.283   0.295   0.322   0.352   0.409
         62        PC   0.499    0.59    0.71   0.744   0.781   0.812   0.819   0.835   0.851   0.856
         63        PC    0.86   0.868   0.876   0.888    0.91   0.926   0.937    0.95    0.97   0.976
         64        PC   0.982   0.985   0.987   0.989    0.99   0.993   0.993   0.994   0.995   0.998
         65        PC   0.998   0.999       1
         66        LS       0      82
```

```
 67           UD     .131
              *

 68           KK  57B-3A
 69           KM  ONSITE BASIN 57B-3A
 70           PB    3.07
 71           BA  0.0259
 72           LS       0        85
 73           UD    .149
              *

 74           KK    CON1
 75           KM  COMBINE 57B-3A AND ON1
 76           HC       2
              *

 77           KK   RCON1
 78           KM  ROUTE CON1 TO CON2
 79           KM    LENGTH  SLOPE   n-VALUE            SHAPE     WIDTH    S-SLOPE
 80           RD     3020    .027     .040        0     TRAP        50        3
              *

 81           KK  57B-3B
 82           KM  OFFSITE BASIN 57B-3B
 83           PB    3.00
 84           BA  0.0513
 85           LS       0        85
 86           UD    .166
              *

 87           KK     ON2
 88           KM  OFFSITE BASIN ON2
 89           PB    3.00
 90           BA  0.0273
 91           LS       0        82
 92           UD    .159
              *
1                                   HEC-1 INPUT                                    PAGE  3

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


 93           KK    CON2
 94           KM  COMBINE CON1, 57B-3B AND ON2
 95           HC       3
              *

 96           KK  57B-3D
 97           KM  OFFSITE BASIN 57B-3D
 98           PB    2.99
 99           BA  0.0184
100           LS       0        87
101           UD    .160
              *

102           KK     ON3
103           KM  ONSITE BASIN ON3
104           PB    2.96
105           BA  0.0040
106           LS       0        82
107           UD    .056
              *

108           KK    CON3
109           KM  COMBINE CON2, 57B-3D AND ON3
110           HC       3
              *

111           KK     ON4
112           KM  OFFSITE BASIN ON4
113           PB    2.94
114           BA  0.0073
115           LS       0        82
116           UD    .086
              *

117           KK    CON4
118           KM  COMBINE CON3 AND ON4
119           HC       2
              *

120           KK     ON5
121           KM  OFFSITE BASIN ON5
122           PB    3.05
123           BA  0.0147
124           LS       0        82
125           UD    .105
              *

126           KK  57B-3C
127           KM  OFFSITE BASIN 57B-3C
128           PB    3.05
129           BA  0.0069
130           LS       0        87
131           UD    .118
              *
1                                   HEC-1 INPUT                                    PAGE  4

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


132           KK     ON6
133           KM  OFFSITE BASIN ON6
134           PB    3.04
135           BA  0.0035
136           LS       0        93
137           UD    .057
              *

138           KK    CON6
139           KM  COMBINE 57B-3C AND ON6
140           HC       2
```

```
            *

 141        KK    CCON6
 142        KM   COMBINE ON5 AND CON6
 143        HC        2
            *

 144        KK   RCCON6
 145        KM   ROUTE CCON6 TO CON8
 146        KM    LENGTH  SLOPE   n-VALUE          SHAPE    WIDTH   S-SLOPE
 147        RD    2015    .037    .040       0     TRAP      20        2
            *

 148        KK      ON8
 149        KM   ONSITE BASIN ON8
 150        PB     2.99
 151        BA   0.0190
 152        LS        0       82
 153        UD     .073
            *

 154        KK     CON8
 155        KM   COMBINE CCON6 AND ON8
 156        HC        2
            *

 157        KK     SW11
 158        BA    0.589
 159        PB     3.34
 160        LS        0     87.8
 161        UD    0.311
            *

 162        KK    RSW11
 163        KM   ROUTE SW11 TO CSW17
 164        KM   FACILITY = ANGEL PARK - CHARLESTON BOULEVARD
 165        KM   FACILITY # = APCB 0064, 0080
 166        KM   LINING = RCB
 167        RD     2338  0.0167   0.015       0    TRAP        7        0
            *
1                                    HEC-1 INPUT                                     PAGE  5

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

 168        KK     SW17
 169        BA    0.356
 170        PB     3.30
 171        LS        0     87.8
 172        UD    0.271
            *

 173        KK    CSW17
 174        KM   COMBINE RSW11 AND SW17
 175        HC        2
            *

 176        KK   RCSW17
 177        KM   ROUTE CSW17 TO CSW18
 178        KM   FACILITY = ANGEL PARK - CHARLESTON BOULEVARD
 179        KM   FACILITY # = APCB 0000,0001,0019,0050
 180        KM   LINING = RCB
 181        RD     3600   0.014   0.015       0    TRAP       11        0
            *

 182        KK     SW18
 183        BA    0.405
 184        PB     3.27
 185        LS        0     86.8
 186        UD    0.271
            *

 187        KK    CSW18
 188        KM   COMBINE RCSW17 AND SW18
 189        HC        2
            *

 190        KK   RCSW18
 191        KM   ROUTE CSW18 TO C12A
 192        KM   FACILITY = ANGEL PARK SOUTH
 193        KM   FACILITY # = APSO 0254,0255,0258,0345,0346; APCB 0000
 194        KM   NATURAL WASH
 195        KM   LENGTH = 5,200
 196        KM   SLOPE = 1.4%
 197        KM   N = 0.040
 198        KM   HYDRAULIC RADIUS = 1.5
 199        KM   VELOCITY =  9.2
 200        RM        2   0.157    0.15
            *

 201        KK      12A
 202        BA    0.392
 203        PB     3.20
 204        LS        0     91.2
 205        UD    0.264
            *
1                                    HEC-1 INPUT                                     PAGE  6

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

 206        KK     C12A
 207        KM   COMBINE 12A AND RCSW18
 208        HC        2
            *

 209        KK    RC12A
 210        KM   ROUTE THRU 12B
 211        KM   FACILITY = ANGEL PARK SOUTH
 212        KM   FACILITY # = APSO 0204, 0205
 213        KM   NATURAL WASH
 214        KM   LENGTH = 2,600
```

```
 215          KM  SLOPE = 3.5%
 216          KM  N = 0.040
 217          KM  HYDRAULIC RADIUS = 1.5
 218          KM  VELOCITY = 14.5
 219          RM       1    0.05     0.15
              *

 220          KK     12B
 221          BA   0.260
 222          PB    3.13
 223          LS       0      91.0
 224          UD   0.233
              *

 225          KK    C12B
 226          KM  COMBINE 12B AND RC12A
 227          HC       2
              *

 228          KK  57B-2A
 229          KM  OFFSITE BASIN 57B-2A
 230          PB    3.05
 231          BA  0.0098
 232          LS       0        87
 233          UD    .159
              *

 234          KK  57B-3F
 235          KM  OFFSITE BASIN 57B-3F
 236          PB    3.05
 237          BA  0.0116
 238          LS       0        87
 239          UD    .142
              *

 240          KK  57B-3E
 241          KM  OFFSITE BASIN 57B-3E
 242          PB    3.06
 243          BA  0.0251
 244          LS       0        87
 245          UD    .214
              *
1                                    HEC-1 INPUT                                         PAGE  7

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

 246          KK     ON9
 247          KM  ONSITE BASIN ON9
 248          PB    3.06
 249          BA  0.0399
 250          LS       0        82
 251          UD    .232
              *

 252          KK     CON9
 253          KM  COMBINE C12B, 57B-2A, 57B-3F, 57B-3E AND ON9
 254          HC       5
              *

 255          KK    RCON9
 256          KM  ROUTE CON9 TO CON10
 257          KM    LENGTH  SLOPE   n-VALUE            SHAPE      WIDTH    S-SLOPE
 258          RD     1540    .030     .040        0     TRAP        50         2
              *

 259          KK  57B-3G
 260          KM  OFFSITE BASIN 57B-3G
 261          PB    2.99
 262          BA  0.0023
 263          LS       0        87
 264          UD    .072
              *

 265          KK  57B-2B
 266          KM  OFFSITE BASIN 57B-2B
 267          PB    2.99
 268          BA  0.0047
 269          LS       0        87
 270          UD    .089
              *

 271          KK  57B-2C
 272          KM  OFFSITE BASIN 57B-2C
 273          PB    2.96
 274          BA  0.0027
 275          LS       0        87
 276          UD    .069
              *

 277          KK    ON10
 278          KM  ONSITE BASIN ON10
 279          PB    2.98
 280          BA  0.0177
 281          LS       0        82
 282          UD    .079
              *
1                                    HEC-1 INPUT                                         PAGE  8

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

 283          KK   CON10
 284          KM  COMBINE C57B-2A, 57B-3G, 57B-2B, 57B-2C AND ON10
 285          HC       5
              *

 286          KK  CCON10
 287          KM  COMBINE CON8 AND CON10
 288          HC       2
              *
```

```
289           KK  RCCON10
290           KM   ROUTE CCON10 TO CON11
291           KM    LENGTH  SLOPE   n-VALUE           SHAPE     WIDTH   S-SLOPE
292           RD     1040    .014     .040      0      TRAP       20        2
              *

293           KK     ON11
294           KM   ONSITE BASIN ON11
295           PB      2.95
296           BA   0.0157
297           LS        0        82
298           UD     .106
              *

299           KK    CON11
300           KM   COMBINE CCON10 AND ON11
301           HC        2
              *

302           KK   CCON11
303           KM   COMBINE CON4 AND CON11
304           HC        2
              *

305           KK   57B-2D
306           KM   OFFSITE BASIN 57B-2D
307           PB      3.09
308           BA   0.0088
309           LS        0        91
310           UD     .130
              *

311           KK   57B-2E
312           KM   OFFSITE BASIN 57B-2E
313           PB      3.08
314           BA   0.0227
315           LS        0        91
316           UD     .102
              *
```



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

317           KK  C57B-2E
318           KM   COMBINE 57B-2D AND 57B-2E
319           HC        2
              *

320           KK  57B-2G1
321           KM   OFFSITE BASIN 57B-2G1
322           PB      3.08
323           BA   0.0026
324           LS        0        87
325           UD     .052
              *

326           KK     ON12
327           KM   ONSITE BASIN ON12
328           PB      3.08
329           BA   0.0182
330           LS        0        82
331           UD     .121
              *

332           KK    CON12
333           KM   COMBINE C57B-2E, 57B-2G1 AND ON12
334           HC        3
              *

335           KK  57B-2G2
336           KM   OFFSITE BASIN 57B-2G2
337           PB      3.03
338           BA   0.0073
339           LS        0        87
340           UD     .094
              *

341           KK     ON13
342           KM   ONSITE BASIN ON13
343           PB      3.04
344           BA   0.0187
345           LS        0        82
346           UD     .107
              *

347           KK    CON13
348           KM   COMBINE CON12, 57B-2G2 AND ON13
349           HC        3
              *

350           KK   57B-2F
351           KM   OFFSITE BASIN 57B-2F
352           PB      3.03
353           BA   0.0902
354           LS        0        91
355           UD     .167
              *
```



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

356           KK  57B-2H2
357           KM   OFFSITE BASIN 57B-2H2
358           PB      3.04
359           BA   0.0156
360           LS        0        87
361           UD     .182
              *

362           KK     ON14
```

```
363          KM  ONSITE BASIN ON14
364          PB    3.00
365          BA  0.0054
366          LS      0       82
367          UD    .193
             *

368          KK   CON14
369          KM  COMBINE C57B-2F, 57B-2H2 AND ON14
370          HC       3
             *

371          KK  RCON14
372          KM  ROUTE CON14 TO CON15
373          KM   LENGTH  SLOPE   n-VALUE          SHAPE    WIDTH   S-SLOPE
374          RD    2160    .032    .040      0     TRAP      20        2
             *

375          KK  57B-2I
376          KM  OFFSITE BASIN 57B-2I
377          PB    2.99
378          BA  0.0072
379          LS      0       87
380          UD    .090
             *

381          KK 57B-2H1
382          KM  OFFSITE BASIN 57B-2H1
383          PB    3.01
384          BA  0.0291
385          LS      0       87
386          UD    .296
             *

387          KK    ON15
388          KM  ONSITE BASIN ON15
389          PB    2.98
390          BA  0.0351
391          LS      0       82
392          UD    .114
             *
1                                     HEC-1 INPUT                               PAGE 11

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

393          KK   CON15
394          KM  COMBINE CON13, CON14, 57B-21, 57B-2H1 AND ON15
395          HC       5
             *

396          KK    ON16
397          KM  ONSITE BASIN ON16
398          PB    2.97
399          BA  0.0180
400          LS      0       82
401          UD    .088
             *

402          KK   CON16
403          KM  COMBINE CON15 AND ON16
404          HC       2
             *

405          KK  RCON16
406          KM  ROUTE CON16 TO CON17
407          KM   LENGTH  SLOPE   n-VALUE          SHAPE    WIDTH   S-SLOPE
408          RD    1050    .036    .040      0     TRAP      20        2
             *

409          KK    ON17
410          KM  ONSITE BASIN ON17
411          PB    2.93
412          BA  0.0143
413          LS      0       82
414          UD    .066
             *

415          KK   CON17
416          KM  COMBINE CON16 AND ON17
417          HC       2
             *

418          KK  RCON17
419          KM  ROUTE CON17 TO CON21
420          KM   LENGTH  SLOPE   n-VALUE          SHAPE    WIDTH   S-SLOPE
421          RD    1160    .027    .040      0     TRAP      30        2
             *

422          KK  57B-4A
423          KM  OFFSITE BASIN 57B-4A
424          PB    2.93
425          BA  0.0070
426          LS      0       82
427          UD    .102
             *
1                                     HEC-1 INPUT                               PAGE 12

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

428          KK  CCON17
429          KM  COMBINE CCON11, CON17 AND 57B-4A
430          HC       3
             *

431          KK    ON21
432          KM  ONSITE BASIN ON21
433          PB    2.91
434          BA  0.0348
435          LS      0       82
436          UD    .195
```

```
              *

 437          KK   CON21
 438          KM  COMBINE CCON17 AND ON21
 439          HC       2
              *

 440          KK   13B-1
 441          BA  0.249
 442          PB    3.19
 443          LS       0     91.6
 444          UD   0.284
              *

 445          KK RC13B-1
 446          KM  ROUTE 13B-1 TO C13B-2
 447          KM  GRIFFITH PARK DRIVE AND HUALAPAI WAY
 448          RD    3000   0.018   0.016       0    TRAP       0      50
              *

 449          KK   13B-2
 450          BA  0.216
 451          PB    3.14
 452          LS       0     89.7
 453          UD   0.231
              *

 454          KK  C13B-2
 455          KM  COMBINE 13B-2 AND RC13B-1
 456          KM  HUALAPAI WAY AND LOCAL FACILITY
 457          HC       2
              *

 458          KK RC13B-2
 459          KM  ROUTE C13B-2 TO CCPIC-A
 460          KM  LINING = GRASS
 461          RD    4900   0.021     0.03       0    TRAP      40       6
              *
1                                         HEC-1 INPUT                                   PAGE 13

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

 462          KK     19A
 463          BA   0.253
 464          PB    3.25
 465          LS       0     89.9
 466          UD   0.351
              *

 467          KK    R19A
 468          KM  ROUTE 19A TO C13A-1
 469          KM  UNNAMED ROAD
 470          RD    4300   0.021   0.016       0    TRAP       0      50
              *

 471          KK   13A-1
 472          BA  0.224
 473          PB    3.19
 474          LS       0     91.4
 475          UD   0.302
              *

 476          KK  C13A-1
 477          KM  COMBINE 13A-1 AND R19A
 478          KM  TOWN CENTER DRIVE AND SWALE
 479          HC       2
              *

 480          KK RC13A-1
 481          KM  ROUTE C13A-1 TO C13A-2
 482          KM  NATURAL WASH
 483          KM  TRAVEL LENGTH = 2,800
 484          KM  SLOPE = 2.1%
 485          KM  N = 0.040
 486          KM  HYDRAULIC RADIUS = 1.5
 487          KM  VELOCITY = 11.4
 488          RM       1   0.068     0.15
              *

 489          KK   13A-2
 490          BA  0.188
 491          PB    3.15
 492          LS       0     90.0
 493          UD   0.236
              *

 494          KK  C13A-2
 495          KM  COMBINE 13A-2 AND RC13A-1
 496          HC       2
              *
1                                         HEC-1 INPUT                                   PAGE 14

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

 497          KK RC13A-2
 498          KM  ROUTE C13A-2 TO CPIC-C
 499          KM  LINING = GRASS
 500          RD    5200   0.015     0.03       0    TRAP      40       4
              *

 501          KK   PIC-C
 502          BA  0.243
 503          PB    3.08
 504          LS       0     90.4
 505          UD   0.373
              *

 506          KK  CPIC-C
 507          KM  COMBINE PIC-C AND RC13A-2
 508          HC       2
```

```
                 *
509              KK RCPIC-C
510              KM  ROUTE CPIC-C TO CPIC-A
511              KM  LINING = GRASS
512              RD     2200   0.025    0.03       0    TRAP       40        4
                 *

513              KK    PIC-A
514              BA   0.359
515              PB    3.03
516              LS       0    91.1
517              UD   0.499
                 *

518              KK   CPIC-A
519              KM   COMBINE RCPIC-C AND PIC-A
520              HC        2
                 *

521              KK CCPIC-A
522              KM   COMBINE CPIC-A AND RC13B-2
523              HC        2
                 *

524              KK     ON18
525              KM   ONSITE BASIN ON18
526              PB     2.95
527              BA   0.0317
528              LS        0        82
529              UD     .224
                 *
1                                 HEC-1 INPUT                                    PAGE 15

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


530              KK    CON18
531              KM   COMBINE CCPIC-A AND ON18
532              HC        2
                 *

533              KK   57B-1A
534              KM   OFFSITE BASIN 57B-1A
535              PB     2.96
536              BA   0.0443
537              LS        0        85
538              UD     .179
                 *

539              KK   57B-1B
540              KM   OFFSITE BASIN 57B-1B
541              PB     2.91
542              BA   0.0301
543              LS        0        93
544              UD     .150
                 *

545              KK     ON19
546              KM   ONSITE BASIN ON19
547              PB     2.92
548              BA   0.0100
549              LS        0        82
550              UD     .092
                 *

551              KK    CON19
552              KM   COMBINE CON18, 57B-1A, 57B-1B AND ON19
553              HC        4
                 *

554              KK   RCON19
555              KM   ROUTE CON19 TO CON20
556              KM     LENGTH  SLOPE   n-VALUE            SHAPE     WIDTH    S-SLOPE
557              RD     1480     .024     .040         0     TRAP       50         2
                 *

558              KK   57B-1C
559              KM   OFFSITE BASIN 57B-1C
560              PB     2.89
561              BA   0.0009
562              LS        0        96
563              UD     .065
                 *

564              KK     ON20
565              KM   ONSITE BASIN ON20
566              PB     2.89
567              BA   0.0104
568              LS        0        82
569              UD     .114
                 *
1                                 HEC-1 INPUT                                    PAGE 16

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


570              KK    CON20
571              KM   COMBINE CON19, 57B-1C AND ON20
572              HC        3
                 *

573              KK   RCON20
574              KM   ROUTE CON20 TO CON22
575              KM     LENGTH  SLOPE   n-VALUE            SHAPE     WIDTH    S-SLOPE
576              RD      700     .063     .040         0     TRAP       30         2
                 *

577              KK   57B-4B
578              KM   OFFSITE BASIN 57B-4B
579              PB     2.91
580              BA   0.0110
```

```
581          LS        0       96
582          UD     .071
             *

583          KK   57B-4C
584          KM   OFFSITE BASIN 57B-4C
585          PB     2.90
586          BA   0.0122
587          LS        0       96
588          UD     .118
             *

589          KK C57B-4C
590          KM   COMBINE 57B-4B AND 57B-4C
591          HC        2
             *

592          KK     ON22
593          KM   ONSITE BASIN ON22
594          PB     2.88
595          BA   0.0133
596          LS        0       82
597          UD     .071
             *

598          KK    CON22
599          KM   COMBINE CON21, CON20, C57B-4C AND ON22
600          HC        4
             *

601          KK    57B-1
602          KM   OFFSITE BASIN 57B-1
603          BA   0.0485
604          BA     2.89
605          LS        0     93.7
606          UD    0.173
             *
1                                    HEC-1 INPUT                                              PAGE 17

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

607          KK    57B-3
608          KM   OFFSITE BASIN 57B-3
609          BA   0.0481
610          PB     3.06
611          LS        0     89.3
612          UD    0.256
             *

613          KK    57B-4
614          KM   OFFSITE BASIN 57B-4
615          BA   0.1293
616          PB     2.91
617          LS        0     93.8
618          UD    0.202
             *

619          KK   C57B-4
620          KM   COMBINE 57B-3 AND 57B-4
621          HC        2
             *

622          KK    PIC-B
623          BA    0.441
624          PB     2.98
625          LS        0     91.1
626          UD    0.471
             *

627          KK   RPIC-B
628          KM   ROUTE PIC-B TO CC57B-4
629          KM   FACILITY = ANGEL PARK - PECCOLE 1
630          KM   FACILITY # = APP1 0000
631          KM   LINING = RCP
632          RD     2982    0.024    0.013        0     CIRC        6
             *

633          KK CC57B-4
634          KM   COMBINE CON22, C57B-1, RPIC-B, AND C57B-4
635          HC        4
             *
636          ZZ
1
             SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE     (V) ROUTING            (--->) DIVERSION OR PUMP FLOW

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

  54         ON1
              .
  68          .        57B-3A
              .             .
              .             .
  74        CON1............
              V
              V
  77       RCON1
              .
  81          .        57B-3B
              .             .
  87          .             .             ON2
              .             .               .
              .             .               .
  93        CON2............................
              .
  96          .        57B-3D
```

```
            .         .
102         .         .       ON3
            .         .         .
108     CON3....................
            .
111         .       ON4
            .         .
117     CON4..........
            .
120         .       ON5
            .         .
126         .         .    57B-3C
            .         .         .
132         .         .         .       ON6
            .         .         .         .
138         .         .      CON6..........
            .         .         .
141         .     CCON6..........
            .         V
            .         V
144         .    RCCON6
            .         .
148         .         .       ON8
            .         .         .
154         .      CON8..........
            .         .
157         .         .      SW11
            .         .         V
            .         .         V
162         .         .     RSW11
            .         .         .
168         .         .         .      SW17
            .         .         .         .
173         .         .     CSW17..........
            .         .         V
            .         .         V
176         .         .    RCSW17
            .         .         .
182         .         .         .      SW18
            .         .         .         .
187         .         .     CSW18..........
            .         .         V
            .         .         V
190         .         .    RCSW18
            .         .         .
201         .         .         .       12A
            .         .         .         .
206         .         .      C12A..........
            .         .         V
            .         .         V
209         .         .     RC12A
            .         .         .
220         .         .         .       12B
            .         .         .         .
225         .         .      C12B..........
            .         .         .
228         .         .         .    57B-2A
            .         .         .         .
234         .         .         .         .    57B-3F
            .         .         .         .         .
240         .         .         .         .         .    57B-3E
            .         .         .         .         .         .
246         .         .         .         .         .         .       ON9
            .         .         .         .         .         .         .
252         .         .      CON9........................................
            .         .         V
            .         .         V
255         .         .     RCON9
            .         .         .
259         .         .         .    57B-3G
            .         .         .         .
265         .         .         .         .    57B-2B
            .         .         .         .         .
271         .         .         .         .         .    57B-2C
            .         .         .         .         .         .
277         .         .         .         .         .         .      ON10
            .         .         .         .         .         .         .
283         .         .     CON10........................................
            .         .         .
286         .    CCON10..........
            .         V
```

```
                  .        V
 289              .    RCCON10
                  .        .
 293              .        .         ON11
                  .        .           .
 299              .     CON11...........
                  .        .
 302        CCON11...........
                  .
 305              .    57B-2D
                  .        .
 311              .        .       57B-2E
                  .        .           .
 317              .   C57B-2E...........
                  .        .
 320              .        .       57B-2G1
                  .        .           .
 326              .        .           .           ON12
                  .        .           .             .
 332              .     CON12.......................
                  .        .
 335              .        .       57B-2G2
                  .        .           .
 341              .        .           .           ON13
                  .        .           .             .
 347              .     CON13.......................
                  .        .
 350              .        .        57B-2F
                  .        .           .
 356              .        .           .       57B-2H2
                  .        .           .           .
 362              .        .           .           .          ON14
                  .        .           .           .            .
 368              .        .        CON14.......................
                  .        .           V
                  .        .           V
 371              .        .       RCON14
                  .        .           .
 375              .        .           .        57B-2I
                  .        .           .           .
 381              .        .           .           .        57B-2H1
                  .        .           .           .           .
 387              .        .           .           .           .         ON15
                  .        .           .           .           .           .
 393              .     CON15...........................................
                  .        .
 396              .        .         ON16
                  .        .           .
 402              .     CON16...........
                  .        V
                  .        V
 405              .    RCON16
                  .        .
 409              .        .         ON17
                  .        .           .
 415              .     CON17...........
                  .        V
                  .        V
 418              .    RCON17
                  .        .
 422              .        .        57B-4A
                  .        .           .
 428        CCON17.......................
                  .
 431              .      ON21
                  .        .
 437         CON21...........
                  .
 440              .     13B-1
                  .        V
                  .        V
 445              .   RC13B-1
                  .        .
 449              .        .        13B-2
                  .        .           .
 454              .    C13B-2...........
                  .        V
                  .        V
 458              .   RC13B-2
                  .        .
```

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    462       .         .       19A
              .         .         V
              .         .         V
    467       .         .      R19A
              .         .         .
              .         .         .
    471       .         .         .     13A-1
              .         .         .         .
              .         .         .         .
    476       .         .    C13A-1..........
              .         .         V
              .         .         V
    480       .         .   RC13A-1
              .         .         .
              .         .         .
    489       .         .         .     13A-2
              .         .         .         .
              .         .         .         .
    494       .         .    C13A-2..........
              .         .         V
              .         .         V
    497       .         .   RC13A-2
              .         .         .
              .         .         .
    501       .         .         .     PIC-C
              .         .         .         .
              .         .         .         .
    506       .         .    CPIC-C..........
              .         .         V
              .         .         V
    509       .         .   RCPIC-C
              .         .         .
              .         .         .
    513       .         .         .     PIC-A
              .         .         .         .
              .         .         .         .
    518       .         .    CPIC-A..........
              .         .         .
              .         .         .
    521       .   CCPIC-A..........
              .         .
              .         .
    524       .         .      ON18
              .         .         .
              .         .         .
    530       .     CON18..........
              .         .
              .         .
    533       .         .    57B-1A
              .         .         .
              .         .         .
    539       .         .         .    57B-1B
              .         .         .         .
              .         .         .         .
    545       .         .         .         .      ON19
              .         .         .         .         .
              .         .         .         .         .
    551       .     CON19..............................
              .         V
              .         V
    554       .    RCON19
              .         .
              .         .
    558       .         .    57B-1C
              .         .         .
              .         .         .
    564       .         .         .      ON20
              .         .         .         .
              .         .         .         .
    570       .     CON20....................
              .         V
              .         V
    573       .    RCON20
              .         .
              .         .
    577       .         .    57B-4B
              .         .         .
              .         .         .
    583       .         .         .    57B-4C
              .         .         .         .
              .         .         .         .
    589       .         .   C57B-4C..........
              .         .         .
              .         .         .
    592       .         .         .      ON22
              .         .         .         .
              .         .         .         .
    598   CON22..............................
              .
              .
    601       .     57B-1
              .         .
              .         .
    607       .         .     57B-3
              .         .         .
              .         .         .
    613       .         .         .     57B-4
              .         .         .         .
              .         .         .         .
    619       .         .    C57B-4..........
              .         .         .
              .         .         .
    622       .         .         .     PIC-B
              .         .         .         V
              .         .         .         V
    627       .         .         .    RPIC-B
              .         .         .         .
              .         .         .         .
    633 CC57B-4..............................

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1***********************************************                                           *********************************************
```

```
*****************************************                    *****************************************
*                                       *                    *                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *  U.S. ARMY CORPS OF ENGINEERS         *
*             JUN    1998               *                    *  HYDROLOGIC ENGINEERING CENTER        *
*           VERSION 4.1                 *                    *        609 SECOND STREET              *
*                                       *                    *     DAVIS, CALIFORNIA 95616           *
*  RUN DATE   03MAR16  TIME  10:06:06   *                    *        (916) 756-1104                 *
*                                       *                    *                                       *
*****************************************                    *****************************************
```

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*****************************************************************
* ........................................................... *
* :                                                         : *
* :             THE SEVENTY                                 : *
* :                                                         : *
* :             EXISTING CONDITIONS                         : *
* :.........................................................: *
* :             RETURN PERIOD_ _ _ _100 & 10 -YEAR          : *
* :             DISTRIBUTION_ _ _ _ 6-HOUR SDN3             : *
* :             PROJECT NO_ _ _ _ _ 840.050                 : *
* :             FILENAME_ _ _ _ _ _ EXISTING.H1             : *
* :             DATE MODELED_ _ _ _ 2/22/16                 : *
* :             MODELED BY_ _ _ _ _ JAM, MMC, RRD, SHT      : *
* :.........................................................: *
* :                                                         : *
* :.........................................................: *
*****************************************************************

 REFERENCED HYDROLOGIC MODELS:
 2013 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE
 CITY OF LAS VEGAS CITY WIDE HYDROLOGY ANALYSIS (PBS&J 1997)
 CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT 2008 MASTER PLAN UPDATE
 GOWAN WATERSHED (ALL)
 RECOMMENDED DRAINAGE SYSTEM WITH ULTIMATE DEVELOPMENT
 INPUT FILE = ALLGOW3.DAT
 INPUT FILE DATE = MAY 5, 2008
 DESIGN STORM = 100-YEAR 6-HR STORM
 STORM DISTRIBUTION = SDN #3
 MODELED BY PBS&J (MICHELE L. D'ALESSANDRO, E.I., CFM)
 CHECKED BY PBS&J (HARSHAL B. DESAI, P.E., CFM)
 STORM CENTERING = FULL WATERSHED
 JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:

                      AREA    DARF
                      SQ. MI.
                      0-0.5   0.99
                      0.5-1   0.975
                      1-2     0.95
                      2-3     0.925
                      3-4     0.915
                      4-5     0.908
                      5-6     0.903
                      6-7     0.895
                      10yr    0.570

JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)

100-YEAR,  6-HOUR STORM,  SDN3

  51 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        650  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      3   0  ENDING DATE
                     NDTIME       0605  ENDING TIME
                      ICENT         19  CENTURY MARK

                  COMPUTATION INTERVAL     .08 HOURS
                       TOTAL TIME BASE   54.08 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
                    .99       .98       .95       .93       .92       .91       .90       .89       .57
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		RATIO 1 .99	RATIO 2 .98	RATIO 3 .95	RATIO 4 .93	RATIO 5 .92	RATIO 6 .91	RATIO 7 .90	RATIO 8 .89	RATIO 9 .57
HYDROGRAPH AT													
+	ON1	.04	1	FLOW	50.	49.	47.	45.	44.	43.	43.	42.	18.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	57B-3A	.03	1	FLOW	36.	35.	34.	32.	32.	31.	31.	31.	14.

				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT +	CON1	.07	1	FLOW	86.	84.	80.	77.	76.	75.	74.	73.	32.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO +	RCON1	.07	1	FLOW	86.	84.	80.	77.	76.	75.	74.	73.	30.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.83
HYDROGRAPH AT +	57B-3B	.05	1	FLOW	66.	65.	62.	59.	58.	58.	57.	56.	25.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	ON2	.03	1	FLOW	31.	30.	29.	28.	27.	27.	27.	26.	11.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT +	CON2	.14	1	FLOW	164.	160.	153.	145.	143.	141.	139.	137.	55.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.75
HYDROGRAPH AT +	57B-3D	.02	1	FLOW	26.	25.	24.	23.	23.	23.	23.	22.	11.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	ON3	.00	1	FLOW	6.	6.	6.	5.	5.	5.	5.	5.	2.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
3 COMBINED AT +	CON3	.17	1	FLOW	189.	185.	177.	169.	165.	163.	161.	159.	64.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.75
HYDROGRAPH AT +	ON4	.01	1	FLOW	9.	9.	9.	8.	8.	8.	8.	8.	3.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT +	CON4	.17	1	FLOW	195.	190.	182.	173.	170.	168.	166.	164.	66.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.75
HYDROGRAPH AT +	ON5	.01	1	FLOW	18.	18.	17.	16.	16.	16.	16.	16.	7.
				TIME	3.50	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	57B-3C	.01	1	FLOW	11.	10.	10.	10.	9.	9.	9.	9.	4.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	ON6	.00	1	FLOW	8.	8.	8.	7.	7.	7.	7.	7.	4.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT +	CON6	.01	1	FLOW	18.	18.	17.	16.	16.	16.	16.	16.	8.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT +	CCON6	.03	1	FLOW	36.	36.	34.	33.	32.	32.	32.	31.	14.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
ROUTED TO +	RCCON6	.03	1	FLOW	34.	33.	32.	31.	30.	30.	30.	29.	14.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT +	ON8	.02	1	FLOW	27.	26.	25.	24.	23.	23.	23.	22.	9.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT +	CON8	.04	1	FLOW	54.	53.	50.	48.	47.	47.	46.	46.	19.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.67
HYDROGRAPH AT +	SW11	.59	1	FLOW	759.	743.	717.	691.	680.	673.	668.	660.	330.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO +	RSW11	.59	1	FLOW	754.	738.	712.	686.	676.	668.	663.	655.	325.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
HYDROGRAPH AT +	SW17	.36	1	FLOW	479.	469.	452.	436.	429.	424.	421.	416.	205.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT +	CSW17	.94	1	FLOW	1221.	1196.	1153.	1111.	1095.	1083.	1075.	1061.	530.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO +	RCSW17	.94	1	FLOW	1211.	1186.	1143.	1101.	1083.	1073.	1063.	1051.	521.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
HYDROGRAPH AT +	SW18	.41	1	FLOW	519.	507.	489.	470.	463.	457.	454.	448.	215.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.75
2 COMBINED AT +	CSW18	1.35	1	FLOW	1718.	1682.	1622.	1562.	1537.	1521.	1508.	1490.	736.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO +	RCSW18	1.35	1	FLOW	1610.	1576.	1520.	1464.	1441.	1426.	1414.	1397.	690.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT +	12A	.39	1	FLOW	576.	565.	547.	529.	521.	516.	513.	507.	272.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT +	C12A	1.74	1	FLOW	2046.	2003.	1932.	1861.	1832.	1813.	1798.	1776.	881.

				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
ROUTED TO +	RC12A	1.74	1	FLOW	2025.	1983.	1913.	1843.	1815.	1796.	1782.	1760.	880.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT +	12B	.26	1	FLOW	387.	380.	367.	355.	350.	347.	344.	340.	182.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT +	C12B	2.00	1	FLOW	2259.	2212.	2134.	2056.	2024.	2002.	1987.	1962.	990.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.92
HYDROGRAPH AT +	57B-2A	.01	1	FLOW	14.	14.	13.	13.	13.	13.	12.	12.	6.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	57B-3F	.01	1	FLOW	17.	17.	16.	16.	15.	15.	15.	15.	7.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	57B-3E	.03	1	FLOW	32.	31.	30.	29.	29.	28.	28.	28.	13.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT +	ON9	.04	1	FLOW	41.	40.	38.	36.	36.	35.	35.	34.	14.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
5 COMBINED AT +	CON9	2.09	1	FLOW	2330.	2281.	2200.	2120.	2087.	2064.	2048.	2023.	1012.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.92
ROUTED TO +	RCON9	2.09	1	FLOW	2307.	2259.	2181.	2103.	2071.	2048.	2032.	2007.	1012.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT +	57B-3G	.00	1	FLOW	4.	4.	4.	4.	4.	4.	3.	3.	2.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT +	57B-2B	.00	1	FLOW	8.	7.	7.	7.	7.	7.	7.	7.	3.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT +	57B-2C	.00	1	FLOW	5.	5.	4.	4.	4.	4.	4.	4.	2.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT +	ON10	.02	1	FLOW	24.	23.	22.	21.	21.	21.	21.	20.	8.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
5 COMBINED AT +	CON10	2.12	1	FLOW	2314.	2266.	2188.	2110.	2077.	2055.	2039.	2014.	1015.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
2 COMBINED AT +	CCON10	2.16	1	FLOW	2335.	2286.	2208.	2128.	2096.	2073.	2057.	2032.	1025.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
ROUTED TO +	RCCON10	2.16	1	FLOW	2331.	2283.	2206.	2124.	2092.	2069.	2052.	2028.	1015.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT +	ON11	.02	1	FLOW	19.	18.	17.	17.	16.	16.	16.	16.	7.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT +	CON11	2.18	1	FLOW	2336.	2288.	2210.	2128.	2096.	2074.	2056.	2032.	1017.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
2 COMBINED AT +	CCON11	2.35	1	FLOW	2443.	2393.	2312.	2227.	2193.	2170.	2152.	2126.	1065.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT +	57B-2D	.01	1	FLOW	16.	15.	15.	14.	14.	14.	14.	14.	7.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	57B-2E	.02	1	FLOW	42.	41.	40.	38.	38.	37.	37.	37.	19.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT +	C57B-2E	.03	1	FLOW	56.	55.	53.	52.	51.	50.	50.	49.	26.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT +	57B-2G1	.00	1	FLOW	5.	5.	5.	5.	5.	4.	4.	4.	2.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT +	ON12	.02	1	FLOW	23.	23.	22.	21.	20.	20.	20.	20.	8.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT +	CON12	.05	1	FLOW	83.	81.	78.	75.	74.	73.	73.	72.	36.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.58
HYDROGRAPH AT +	57B-2G2	.01	1	FLOW	12.	11.	11.	11.	10.	10.	10.	10.	5.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT +	ON13	.02	1	FLOW	23.	23.	22.	21.	21.	20.	20.	20.	8.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT +	CON13	.08	1	FLOW	118.	115.	111.	107.	105.	104.	103.	101.	49.

				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.58
HYDROGRAPH AT +	57B-2F	.09	1	FLOW	147.	145.	140.	135.	133.	132.	131.	129.	69.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	57B-2H2	.02	1	FLOW	21.	21.	20.	19.	19.	19.	19.	18.	9.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	ON14	.01	1	FLOW	6.	5.	5.	5.	5.	5.	5.	5.	2.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.67
3 COMBINED AT +	CON14	.11	1	FLOW	174.	171.	165.	159.	157.	155.	154.	152.	79.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO +	RCON14	.11	1	FLOW	166.	163.	158.	156.	153.	152.	151.	146.	79.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT +	57B-2I	.01	1	FLOW	12.	11.	11.	10.	10.	10.	10.	10.	5.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT +	57B-2H1	.03	1	FLOW	32.	31.	30.	29.	29.	28.	28.	28.	13.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
HYDROGRAPH AT +	ON15	.04	1	FLOW	42.	41.	40.	38.	37.	37.	36.	36.	15.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
5 COMBINED AT +	CON15	.26	1	FLOW	346.	338.	326.	314.	309.	306.	303.	298.	142.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	ON16	.02	1	FLOW	23.	23.	22.	21.	20.	20.	20.	20.	8.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT +	CON16	.28	1	FLOW	367.	359.	345.	333.	327.	324.	321.	316.	150.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO +	RCON16	.28	1	FLOW	354.	346.	333.	320.	315.	311.	309.	303.	149.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.67
HYDROGRAPH AT +	ON17	.01	1	FLOW	20.	20.	19.	18.	18.	17.	17.	17.	7.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT +	CON17	.29	1	FLOW	368.	360.	347.	333.	328.	323.	321.	316.	153.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.67
ROUTED TO +	RCON17	.29	1	FLOW	356.	350.	337.	328.	321.	319.	318.	309.	149.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT +	57B-4A	.01	1	FLOW	8.	8.	8.	7.	7.	7.	7.	7.	3.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.58
3 COMBINED AT +	CCON17	2.65	1	FLOW	2716.	2660.	2567.	2472.	2434.	2407.	2388.	2359.	1171.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.92
HYDROGRAPH AT +	ON21	.03	1	FLOW	34.	33.	32.	30.	30.	29.	29.	29.	12.
				TIME	3.58	3.58	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT +	CON21	2.68	1	FLOW	2740.	2683.	2589.	2493.	2455.	2427.	2408.	2378.	1177.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.92
HYDROGRAPH AT +	13B-1	.25	1	FLOW	354.	347.	336.	325.	321.	318.	315.	312.	169.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.75
ROUTED TO +	RC13B-1	.25	1	FLOW	354.	347.	336.	324.	320.	317.	314.	311.	171.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.83	3.83	3.83
HYDROGRAPH AT +	13B-2	.22	1	FLOW	310.	304.	294.	283.	279.	277.	274.	271.	140.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT +	C13B-2	.47	1	FLOW	634.	622.	602.	581.	573.	567.	563.	557.	294.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO +	RC13B-2	.47	1	FLOW	641.	628.	607.	586.	578.	572.	568.	561.	295.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.92
HYDROGRAPH AT +	19A	.25	1	FLOW	318.	312.	301.	291.	287.	284.	282.	278.	144.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO +	R19A	.25	1	FLOW	319.	313.	302.	292.	288.	285.	283.	280.	146.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT +	13A-1	.22	1	FLOW	308.	303.	293.	283.	279.	277.	275.	272.	147.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
2 COMBINED AT +	C13A-1	.48	1	FLOW	595.	583.	564.	545.	537.	532.	528.	522.	273.

				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
ROUTED TO +	RC13A-1	.48	1	FLOW	581.	569.	551.	532.	524.	519.	515.	509.	268.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT +	13A-2	.19	1	FLOW	272.	267.	258.	249.	246.	243.	241.	238.	124.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT +	C13A-2	.66	1	FLOW	782.	766.	740.	715.	704.	697.	692.	684.	354.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
ROUTED TO +	RC13A-2	.66	1	FLOW	781.	765.	738.	712.	702.	694.	689.	681.	354.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	4.00
HYDROGRAPH AT +	PIC-C	.24	1	FLOW	280.	274.	265.	256.	252.	250.	248.	245.	129.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
2 COMBINED AT +	CPIC-C	.91	1	FLOW	1041.	1020.	985.	951.	937.	927.	920.	909.	462.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
ROUTED TO +	RCPIC-C	.91	1	FLOW	1030.	1009.	975.	940.	922.	915.	908.	896.	461.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	4.00
HYDROGRAPH AT +	PIC-A	.36	1	FLOW	356.	349.	338.	326.	322.	318.	316.	312.	165.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
2 COMBINED AT +	CPIC-A	1.27	1	FLOW	1386.	1359.	1313.	1266.	1243.	1233.	1224.	1208.	625.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	4.00
2 COMBINED AT +	CCPIC-A	1.73	1	FLOW	1997.	1959.	1895.	1830.	1800.	1785.	1772.	1750.	900.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	4.00
HYDROGRAPH AT +	ON18	.03	1	FLOW	31.	30.	29.	27.	27.	26.	26.	26.	10.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT +	CON18	1.76	1	FLOW	2015.	1977.	1912.	1846.	1816.	1801.	1788.	1765.	906.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	4.00
HYDROGRAPH AT +	57B-1A	.04	1	FLOW	54.	53.	51.	48.	48.	47.	47.	46.	20.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	57B-1B	.03	1	FLOW	51.	50.	49.	47.	47.	46.	46.	45.	25.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	ON19	.01	1	FLOW	12.	12.	12.	11.	11.	11.	11.	10.	4.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
4 COMBINED AT +	CON19	1.85	1	FLOW	2059.	2020.	1954.	1886.	1856.	1840.	1826.	1804.	923.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
ROUTED TO +	RCON19	1.85	1	FLOW	2045.	2006.	1941.	1871.	1840.	1824.	1811.	1788.	922.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	4.00
HYDROGRAPH AT +	57B-1C	.00	1	FLOW	2.	2.	2.	2.	2.	2.	2.	2.	1.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT +	ON20	.01	1	FLOW	12.	12.	11.	11.	10.	10.	10.	10.	4.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT +	CON20	1.86	1	FLOW	2048.	2009.	1944.	1874.	1843.	1827.	1814.	1791.	923.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	4.00
ROUTED TO +	RCON20	1.86	1	FLOW	2040.	2001.	1935.	1865.	1834.	1818.	1805.	1781.	920.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	4.00
HYDROGRAPH AT +	57B-4B	.01	1	FLOW	24.	24.	23.	22.	22.	22.	22.	22.	13.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT +	57B-4C	.01	1	FLOW	23.	22.	22.	21.	21.	21.	21.	20.	12.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.58
2 COMBINED AT +	C57B-4C	.02	1	FLOW	47.	46.	45.	43.	43.	43.	42.	42.	25.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT +	ON22	.01	1	FLOW	18.	17.	16.	16.	15.	15.	15.	15.	6.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
4 COMBINED AT +	CON22	4.58	1	FLOW	4729.	4636.	4481.	4318.	4251.	4209.	4177.	4125.	2065.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT +	57B-1	.05	1	FLOW	80.	79.	76.	74.	73.	72.	72.	71.	40.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	57B-3	.05	1	FLOW	63.	62.	60.	58.	57.	56.	56.	55.	28.

				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT +	57B-4	.13	1	FLOW TIME	202. 3.58	198. 3.58	192. 3.58	186. 3.58	184. 3.58	182. 3.58	181. 3.58	179. 3.58	101. 3.58
2 COMBINED AT +	C57B-4	.18	1	FLOW TIME	259. 3.58	254. 3.58	246. 3.67	238. 3.67	235. 3.67	233. 3.67	232. 3.67	229. 3.67	127. 3.67
HYDROGRAPH AT +	PIC-B	.44	1	FLOW TIME	442. 3.92	433. 3.92	419. 3.92	405. 3.92	399. 3.92	395. 3.92	392. 3.92	388. 3.92	205. 3.92
ROUTED TO +	RPIC-B	.44	1	FLOW TIME	439. 3.92	431. 3.92	416. 3.92	402. 3.92	396. 3.92	392. 3.92	390. 3.92	385. 3.92	202. 3.92
4 COMBINED AT +	CC57B-4	5.25	1	FLOW TIME	5339. 3.92	5234. 3.92	5060. 3.92	4878. 3.92	4803. 3.92	4756. 3.92	4720. 3.92	4662. 3.92	2354. 3.92

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SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	INTERPOLATED TO COMPUTATION INTERVAL PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR PLAN = 1 RATIO= .00 RCON1	MANE	5.00	85.62	225.00	1.50	5.00	85.62	225.00	1.50

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5242E+01 EXCESS= .0000E+00 OUTFLOW= .5262E+01 BASIN STORAGE= .6505E-02 PERCENT ERROR= -.5

FOR PLAN = 1 RATIO= .00 RCON1	MANE	5.00	83.65	225.00	1.47	5.00	83.65	225.00	1.47

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5111E+01 EXCESS= .0000E+00 OUTFLOW= .5131E+01 BASIN STORAGE= .6457E-02 PERCENT ERROR= -.5

FOR PLAN = 1 RATIO= .00 RCON1	MANE	5.00	80.35	225.00	1.40	5.00	80.35	225.00	1.40

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4894E+01 EXCESS= .0000E+00 OUTFLOW= .4914E+01 BASIN STORAGE= .6374E-02 PERCENT ERROR= -.5

FOR PLAN = 1 RATIO= .00 RCON1	MANE	5.00	77.02	225.00	1.34	5.00	77.02	225.00	1.34

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4680E+01 EXCESS= .0000E+00 OUTFLOW= .4699E+01 BASIN STORAGE= .6290E-02 PERCENT ERROR= -.5

FOR PLAN = 1 RATIO= .00 RCON1	MANE	5.00	75.69	225.00	1.32	5.00	75.69	225.00	1.32

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4594E+01 EXCESS= .0000E+00 OUTFLOW= .4613E+01 BASIN STORAGE= .6256E-02 PERCENT ERROR= -.5

FOR PLAN = 1 RATIO= .00 RCON1	MANE	5.00	74.75	225.00	1.30	5.00	74.75	225.00	1.30

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4535E+01 EXCESS= .0000E+00 OUTFLOW= .4553E+01 BASIN STORAGE= .6232E-02 PERCENT ERROR= -.5

FOR PLAN = 1 RATIO= .00 RCON1	MANE	5.00	74.08	225.00	1.29	5.00	74.08	225.00	1.29

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4492E+01 EXCESS= .0000E+00 OUTFLOW= .4511E+01 BASIN STORAGE= .6038E-02 PERCENT ERROR= -.5

FOR PLAN = 1 RATIO= .00 RCON1	MANE	5.00	73.00	225.00	1.27	5.00	73.00	225.00	1.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4425E+01 EXCESS= .0000E+00 OUTFLOW= .4442E+01 BASIN STORAGE= .6011E-02 PERCENT ERROR= -.5

FOR PLAN = 1 RATIO= .00 RCON1	MANE	4.00	31.17	228.00	.55	5.00	30.06	230.00	.54

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1896E+01 EXCESS= .0000E+00 OUTFLOW= .1909E+01 BASIN STORAGE= .5556E-02 PERCENT ERROR= -1.0

FOR PLAN = 1 RATIO= .00 RCCON6	MANE	4.25	34.85	216.75	1.61	5.00	33.88	220.00	1.61

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2157E+01 EXCESS= .0000E+00 OUTFLOW= .2162E+01 BASIN STORAGE= .2734E-02 PERCENT ERROR= -.3

FOR PLAN = 1 RATIO= .00 RCCON6	MANE	4.25	34.03	216.75	1.58	5.00	33.16	220.00	1.57

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2106E+01 EXCESS= .0000E+00 OUTFLOW= .2111E+01 BASIN STORAGE= .2708E-02 PERCENT ERROR= -.3

FOR PLAN = 1 RATIO= .00 RCCON6	MANE	4.25	32.67	216.75	1.51	5.00	31.96	220.00	1.51

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CONTINUITY SUMMARY (AC-FT) - INFLOW= .2022E+01 EXCESS= .0000E+00 OUTFLOW= .2026E+01 BASIN STORAGE= .2664E-02 PERCENT ERROR=   -.3

          FOR PLAN = 1  RATIO=  .00
            RCCON6  MANE        4.25     31.31    216.75      1.45      5.00     30.75    220.00       1.45

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1938E+01 EXCESS= .0000E+00 OUTFLOW= .1942E+01 BASIN STORAGE= .2619E-02 PERCENT ERROR=   -.4

          FOR PLAN = 1  RATIO=  .00
            RCCON6  MANE        4.25     30.77    216.75      1.43      5.00     30.27    220.00       1.42

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1905E+01 EXCESS= .0000E+00 OUTFLOW= .1909E+01 BASIN STORAGE= .2601E-02 PERCENT ERROR=   -.4

          FOR PLAN = 1  RATIO=  .00
            RCCON6  MANE        4.25     30.39    216.75      1.41      5.00     29.93    220.00       1.41

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1881E+01 EXCESS= .0000E+00 OUTFLOW= .1886E+01 BASIN STORAGE= .2588E-02 PERCENT ERROR=   -.4

          FOR PLAN = 1  RATIO=  .00
            RCCON6  MANE        4.25     30.11    216.75      1.40      5.00     29.69    220.00       1.39

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1865E+01 EXCESS= .0000E+00 OUTFLOW= .1869E+01 BASIN STORAGE= .2579E-02 PERCENT ERROR=   -.4

          FOR PLAN = 1  RATIO=  .00
            RCCON6  MANE        4.25     29.68    216.75      1.38      5.00     29.30    220.00       1.37

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1838E+01 EXCESS= .0000E+00 OUTFLOW= .1842E+01 BASIN STORAGE= .2564E-02 PERCENT ERROR=   -.4

          FOR PLAN = 1  RATIO=  .00
            RCCON6  MANE        3.75     14.36    221.25       .63      5.00     14.02    220.00        .63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8405E+00 EXCESS= .0000E+00 OUTFLOW= .8424E+00 BASIN STORAGE= .2039E-02 PERCENT ERROR=   -.5

          FOR PLAN = 1  RATIO=  .00
            RSW11   MANE        1.02    755.16    226.24      2.08      5.00    753.82    225.00       2.08

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6522E+02 EXCESS= .0000E+00 OUTFLOW= .6522E+02 BASIN STORAGE= .1654E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RSW11   MANE        1.03    740.95    226.07      2.03      5.00    738.42    225.00       2.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6380E+02 EXCESS= .0000E+00 OUTFLOW= .6381E+02 BASIN STORAGE= .1696E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RSW11   MANE        1.05    714.15    226.19      1.96      5.00    712.14    225.00       1.96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6145E+02 EXCESS= .0000E+00 OUTFLOW= .6145E+02 BASIN STORAGE= .1622E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RSW11   MANE        1.06    686.99    226.38      1.88      5.00    685.95    225.00       1.88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5911E+02 EXCESS= .0000E+00 OUTFLOW= .5911E+02 BASIN STORAGE= .1763E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RSW11   MANE        1.07    677.33    225.62      1.85      5.00    675.73    225.00       1.85

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5818E+02 EXCESS= .0000E+00 OUTFLOW= .5818E+02 BASIN STORAGE= .1832E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RSW11   MANE        1.07    669.72    225.52      1.83      5.00    668.38    225.00       1.83

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5752E+02 EXCESS= .0000E+00 OUTFLOW= .5752E+02 BASIN STORAGE= .1613E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RSW11   MANE        1.08    665.29    226.22      1.82      5.00    663.31    225.00       1.82

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5706E+02 EXCESS= .0000E+00 OUTFLOW= .5706E+02 BASIN STORAGE= .1791E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RSW11   MANE        1.08    656.69    226.27      1.79      5.00    654.91    225.00       1.79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5631E+02 EXCESS= .0000E+00 OUTFLOW= .5632E+02 BASIN STORAGE= .1761E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RSW11   MANE        1.43    328.10    225.73       .88      5.00    324.89    225.00        .88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2754E+02 EXCESS= .0000E+00 OUTFLOW= .2754E+02 BASIN STORAGE= .1787E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCSW17  MANE        1.65   1211.98    225.57      2.06      5.00   1210.68    225.00       2.06
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .1040E+03 EXCESS= .0000E+00 OUTFLOW= .1040E+03 BASIN STORAGE= .3928E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCSW17  MANE         1.66   1187.90     225.78      2.02      5.00   1185.71    225.00        2.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1018E+03 EXCESS= .0000E+00 OUTFLOW= .1018E+03 BASIN STORAGE= .3507E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCSW17  MANE         1.68   1144.91     225.68      1.94      5.00   1143.40    225.00        1.94

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9799E+02 EXCESS= .0000E+00 OUTFLOW= .9800E+02 BASIN STORAGE= .3522E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCSW17  MANE         1.71   1102.37     225.64      1.87      5.00   1101.22    225.00        1.87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9424E+02 EXCESS= .0000E+00 OUTFLOW= .9424E+02 BASIN STORAGE= .3477E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCSW17  MANE         1.72   1087.77     227.00      1.84      5.00   1083.30    225.00        1.84

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9278E+02 EXCESS= .0000E+00 OUTFLOW= .9279E+02 BASIN STORAGE= .3927E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCSW17  MANE         1.73   1077.08     226.26      1.82      5.00   1072.79    225.00        1.82

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9172E+02 EXCESS= .0000E+00 OUTFLOW= .9173E+02 BASIN STORAGE= .3817E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCSW17  MANE         1.73   1069.06     226.95      1.81      5.00   1062.80    225.00        1.81

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9100E+02 EXCESS= .0000E+00 OUTFLOW= .9101E+02 BASIN STORAGE= .3937E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCSW17  MANE         1.74   1055.75     226.36      1.78      5.00   1050.97    225.00        1.78

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8979E+02 EXCESS= .0000E+00 OUTFLOW= .8980E+02 BASIN STORAGE= .3511E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCSW17  MANE         2.30    524.06     227.64       .87      5.00    520.91    225.00         .87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4386E+02 EXCESS= .0000E+00 OUTFLOW= .4387E+02 BASIN STORAGE= .3897E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCON9  MANE         1.67   2325.51     231.44      2.07      5.00   2306.80    235.00        2.07

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2301E+03 EXCESS= .0000E+00 OUTFLOW= .2301E+03 BASIN STORAGE= .3123E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCON9  MANE         1.68   2279.65     231.56      2.02      5.00   2258.94    235.00        2.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2252E+03 EXCESS= .0000E+00 OUTFLOW= .2252E+03 BASIN STORAGE= .2858E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCON9  MANE         1.70   2197.90     232.94      1.95      5.00   2181.01    235.00        1.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2170E+03 EXCESS= .0000E+00 OUTFLOW= .2170E+03 BASIN STORAGE= .2984E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCON9  MANE         1.72   2118.94     232.70      1.87      5.00   2102.63    235.00        1.88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2088E+03 EXCESS= .0000E+00 OUTFLOW= .2088E+03 BASIN STORAGE= .3195E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCON9  MANE         1.73   2088.03     232.28      1.85      5.00   2070.54    235.00        1.85

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2056E+03 EXCESS= .0000E+00 OUTFLOW= .2056E+03 BASIN STORAGE= .2784E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCON9  MANE         1.74   2062.77     233.22      1.83      5.00   2047.86    235.00        1.83

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2033E+03 EXCESS= .0000E+00 OUTFLOW= .2033E+03 BASIN STORAGE= .2736E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCON9  MANE         1.75   2050.03     232.14      1.81      5.00   2032.41    235.00        1.81

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2017E+03 EXCESS= .0000E+00 OUTFLOW= .2017E+03 BASIN STORAGE= .2832E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCON9  MANE         1.75   2021.32     233.22      1.79      5.00   2006.95    235.00        1.79
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .1991E+03 EXCESS= .0000E+00 OUTFLOW= .1991E+03 BASIN STORAGE= .2680E-02 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .00
         RCON9   MANE         2.26   1012.15    235.03      .89     5.00   1012.06    235.00       .89

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9869E+02 EXCESS= .0000E+00 OUTFLOW= .9869E+02 BASIN STORAGE= .3005E-02 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .00
         RCCON10 MANE         1.23   2331.18    234.30     2.05     5.00   2330.90    235.00      2.05

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2358E+03 EXCESS= .0000E+00 OUTFLOW= .2358E+03 BASIN STORAGE= .1329E-02 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .00
         RCCON10 MANE         1.24   2284.11    234.71     2.00     5.00   2283.17    235.00      2.00

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2307E+03 EXCESS= .0000E+00 OUTFLOW= .2307E+03 BASIN STORAGE= .1356E-02 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .00
         RCCON10 MANE         1.26   2205.80    234.98     1.93     5.00   2205.72    235.00      1.93

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2223E+03 EXCESS= .0000E+00 OUTFLOW= .2223E+03 BASIN STORAGE= .1456E-02 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .00
         RCCON10 MANE         1.27   2124.92    235.34     1.86     5.00   2124.05    235.00      1.86

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2139E+03 EXCESS= .0000E+00 OUTFLOW= .2139E+03 BASIN STORAGE= .1320E-02 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .00
         RCCON10 MANE         1.28   2092.66    235.28     1.83     5.00   2091.76    235.00      1.83

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2106E+03 EXCESS= .0000E+00 OUTFLOW= .2106E+03 BASIN STORAGE= .1358E-02 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .00
         RCCON10 MANE         1.28   2069.86    234.86     1.81     5.00   2069.49    235.00      1.81

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2082E+03 EXCESS= .0000E+00 OUTFLOW= .2082E+03 BASIN STORAGE= .1289E-02 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .00
         RCCON10 MANE         1.29   2053.30    235.46     1.79     5.00   2052.26    235.00      1.79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2065E+03 EXCESS= .0000E+00 OUTFLOW= .2065E+03 BASIN STORAGE= .1544E-02 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .00
         RCCON10 MANE         1.29   2028.73    235.17     1.77     5.00   2028.03    235.00      1.77

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2039E+03 EXCESS= .0000E+00 OUTFLOW= .2039E+03 BASIN STORAGE= .1398E-02 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .00
         RCCON10 MANE         1.63   1018.69    237.34      .87     5.00   1014.91    235.00       .87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1007E+03 EXCESS= .0000E+00 OUTFLOW= .1007E+03 BASIN STORAGE= .1586E-02 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .00
         RCON14  MANE         4.25    167.38    221.00     1.99     5.00    166.33    220.00      1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1179E+02 EXCESS= .0000E+00 OUTFLOW= .1181E+02 BASIN STORAGE= .2635E-02 PERCENT ERROR=   -.1

        FOR PLAN = 1  RATIO=  .00
         RCON14  MANE         4.25    164.16    221.00     1.95     5.00    163.07    220.00      1.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1155E+02 EXCESS= .0000E+00 OUTFLOW= .1156E+02 BASIN STORAGE= .2609E-02 PERCENT ERROR=   -.1

        FOR PLAN = 1  RATIO=  .00
         RCON14  MANE         4.25    158.77    221.00     1.88     5.00    157.63    220.00      1.88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1114E+02 EXCESS= .0000E+00 OUTFLOW= .1115E+02 BASIN STORAGE= .2565E-02 PERCENT ERROR=   -.1

        FOR PLAN = 1  RATIO=  .00
         RCON14  MANE         4.00    155.50    220.00     1.81     5.00    155.50    220.00      1.81

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1074E+02 EXCESS= .0000E+00 OUTFLOW= .1075E+02 BASIN STORAGE= .2457E-02 PERCENT ERROR=   -.1

        FOR PLAN = 1  RATIO=  .00
         RCON14  MANE         4.00    153.27    220.00     1.78     5.00    153.27    220.00      1.79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1057E+02 EXCESS= .0000E+00 OUTFLOW= .1059E+02 BASIN STORAGE= .2440E-02 PERCENT ERROR=   -.1

        FOR PLAN = 1  RATIO=  .00
         RCON14  MANE         4.00    151.72    220.00     1.77     5.00    151.72    220.00      1.77
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .1046E+02 EXCESS= .0000E+00 OUTFLOW= .1047E+02 BASIN STORAGE= .2427E-02 PERCENT ERROR=   -.1

         FOR PLAN = 1  RATIO=  .00
           RCON14  MANE        4.00    150.60    220.00      1.75      5.00    150.60    220.00       1.75

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1038E+02 EXCESS= .0000E+00 OUTFLOW= .1039E+02 BASIN STORAGE= .2418E-02 PERCENT ERROR=   -.1

         FOR PLAN = 1  RATIO=  .00
           RCON14  MANE        4.25    146.92    221.00      1.73      5.00    145.67    220.00       1.73

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1024E+02 EXCESS= .0000E+00 OUTFLOW= .1025E+02 BASIN STORAGE= .2466E-02 PERCENT ERROR=   -.1

         FOR PLAN = 1  RATIO=  .00
           RCON14  MANE        5.00     78.65    220.00       .88      5.00     78.65    220.00        .88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5186E+01 EXCESS= .0000E+00 OUTFLOW= .5194E+01 BASIN STORAGE= .2404E-02 PERCENT ERROR=   -.2

         FOR PLAN = 1  RATIO=  .00
           RCON16  MANE        1.69    366.03    216.69      1.76      5.00    353.70    215.00       1.76

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2617E+02 EXCESS= .0000E+00 OUTFLOW= .2617E+02 BASIN STORAGE= .1013E-02 PERCENT ERROR=    .0

         FOR PLAN = 1  RATIO=  .00
           RCON16  MANE        1.71    357.22    216.61      1.72      5.00    345.96    215.00       1.72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2558E+02 EXCESS= .0000E+00 OUTFLOW= .2558E+02 BASIN STORAGE= .1022E-02 PERCENT ERROR=    .0

         FOR PLAN = 1  RATIO=  .00
           RCON16  MANE        1.73    339.51    217.68      1.65      5.00    333.18    215.00       1.65

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2459E+02 EXCESS= .0000E+00 OUTFLOW= .2460E+02 BASIN STORAGE= .9731E-03 PERCENT ERROR=    .0

         FOR PLAN = 1  RATIO=  .00
           RCON16  MANE        1.75    331.60    216.91      1.59      5.00    319.76    215.00       1.59

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2367E+02 EXCESS= .0000E+00 OUTFLOW= .2367E+02 BASIN STORAGE= .1040E-02 PERCENT ERROR=    .0

         FOR PLAN = 1  RATIO=  .00
           RCON16  MANE        1.76    323.47    216.34      1.56      5.00    315.26    215.00       1.56

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2327E+02 EXCESS= .0000E+00 OUTFLOW= .2327E+02 BASIN STORAGE= .9851E-03 PERCENT ERROR=    .0

         FOR PLAN = 1  RATIO=  .00
           RCON16  MANE        1.77    321.71    217.18      1.55      5.00    310.86    215.00       1.55

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2301E+02 EXCESS= .0000E+00 OUTFLOW= .2301E+02 BASIN STORAGE= .9887E-03 PERCENT ERROR=    .0

         FOR PLAN = 1  RATIO=  .00
           RCON16  MANE        1.77    316.30    217.78      1.53      5.00    308.90    215.00       1.53

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2281E+02 EXCESS= .0000E+00 OUTFLOW= .2281E+02 BASIN STORAGE= .1032E-02 PERCENT ERROR=    .0

         FOR PLAN = 1  RATIO=  .00
           RCON16  MANE        1.78    314.00    217.16      1.51      5.00    303.28    215.00       1.51

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2248E+02 EXCESS= .0000E+00 OUTFLOW= .2249E+02 BASIN STORAGE= .1041E-02 PERCENT ERROR=    .0

         FOR PLAN = 1  RATIO=  .00
           RCON16  MANE        2.29    150.40    219.44       .72      5.00    148.93    220.00        .72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1076E+02 EXCESS= .0000E+00 OUTFLOW= .1076E+02 BASIN STORAGE= .1017E-02 PERCENT ERROR=    .0

         FOR PLAN = 1  RATIO=  .00
           RCON17  MANE        2.23    364.75    218.67      1.74      5.00    356.45    220.00       1.74

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2715E+02 EXCESS= .0000E+00 OUTFLOW= .2716E+02 BASIN STORAGE= .1496E-02 PERCENT ERROR=    .0

         FOR PLAN = 1  RATIO=  .00
           RCON17  MANE        2.25    357.02    218.14      1.70      5.00    349.64    220.00       1.70

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2653E+02 EXCESS= .0000E+00 OUTFLOW= .2653E+02 BASIN STORAGE= .1654E-02 PERCENT ERROR=    .0

         FOR PLAN = 1  RATIO=  .00
           RCON17  MANE        2.28    344.14    218.77      1.63      5.00    337.46    220.00       1.63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2553E+02 EXCESS= .0000E+00 OUTFLOW= .2553E+02 BASIN STORAGE= .1878E-02 PERCENT ERROR=    .0

         FOR PLAN = 1  RATIO=  .00
           RCON17  MANE        2.31    330.60    219.64      1.57      5.00    328.28    220.00       1.57
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .2455E+02 EXCESS= .0000E+00 OUTFLOW= .2455E+02 BASIN STORAGE= .1844E-02 PERCENT ERROR=    .0

      FOR PLAN = 1  RATIO=  .00
       RCON17  MANE         2.32    326.22    218.42    1.54    5.00    321.01    220.00    1.54

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2412E+02 EXCESS= .0000E+00 OUTFLOW= .2413E+02 BASIN STORAGE= .1875E-02 PERCENT ERROR=    .0

      FOR PLAN = 1  RATIO=  .00
       RCON17  MANE         2.34    322.39    219.50    1.53    5.00    319.39    220.00    1.53

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2387E+02 EXCESS= .0000E+00 OUTFLOW= .2387E+02 BASIN STORAGE= .1904E-02 PERCENT ERROR=    .0

      FOR PLAN = 1  RATIO=  .00
       RCON17  MANE         2.34    319.55    217.66    1.51    5.00    318.05    220.00    1.52

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2367E+02 EXCESS= .0000E+00 OUTFLOW= .2367E+02 BASIN STORAGE= .1665E-02 PERCENT ERROR=    .0

      FOR PLAN = 1  RATIO=  .00
       RCON17  MANE         2.36    314.02    219.05    1.49    5.00    309.48    220.00    1.49

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2331E+02 EXCESS= .0000E+00 OUTFLOW= .2331E+02 BASIN STORAGE= .1692E-02 PERCENT ERROR=    .0

      FOR PLAN = 1  RATIO=  .00
       RCON17  MANE         3.04    152.09    221.83     .71    5.00    149.27    220.00     .71

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1110E+02 EXCESS= .0000E+00 OUTFLOW= .1110E+02 BASIN STORAGE= .1950E-02 PERCENT ERROR=    .0

      FOR PLAN = 1  RATIO=  .00
       RC13B-1  MANE        5.00    353.60    225.00    2.27    5.00    353.60    225.00    2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3020E+02 EXCESS= .0000E+00 OUTFLOW= .3021E+02 BASIN STORAGE= .1566E-02 PERCENT ERROR=   -.1

      FOR PLAN = 1  RATIO=  .00
       RC13B-1  MANE        5.00    346.83    225.00    2.23    5.00    346.83    225.00    2.23

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2960E+02 EXCESS= .0000E+00 OUTFLOW= .2961E+02 BASIN STORAGE= .1548E-02 PERCENT ERROR=   -.1

      FOR PLAN = 1  RATIO=  .00
       RC13B-1  MANE        5.00    335.54    225.00    2.15    5.00    335.54    225.00    2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2860E+02 EXCESS= .0000E+00 OUTFLOW= .2861E+02 BASIN STORAGE= .1518E-02 PERCENT ERROR=   -.1

      FOR PLAN = 1  RATIO=  .00
       RC13B-1  MANE        5.00    324.25    225.00    2.08    5.00    324.25    225.00    2.08

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2760E+02 EXCESS= .0000E+00 OUTFLOW= .2762E+02 BASIN STORAGE= .1489E-02 PERCENT ERROR=   -.1

      FOR PLAN = 1  RATIO=  .00
       RC13B-1  MANE        5.00    319.73    225.00    2.05    5.00    319.73    225.00    2.05

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2721E+02 EXCESS= .0000E+00 OUTFLOW= .2722E+02 BASIN STORAGE= .1476E-02 PERCENT ERROR=   -.1

      FOR PLAN = 1  RATIO=  .00
       RC13B-1  MANE        5.00    316.57    225.00    2.03    5.00    316.57    225.00    2.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2693E+02 EXCESS= .0000E+00 OUTFLOW= .2694E+02 BASIN STORAGE= .1468E-02 PERCENT ERROR=   -.1

      FOR PLAN = 1  RATIO=  .00
       RC13B-1  MANE        5.00    314.32    230.00    2.01    5.00    314.32    230.00    2.01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2673E+02 EXCESS= .0000E+00 OUTFLOW= .2675E+02 BASIN STORAGE= .1462E-02 PERCENT ERROR=   -.1

      FOR PLAN = 1  RATIO=  .00
       RC13B-1  MANE        5.00    310.89    230.00    1.99    5.00    310.89    230.00    1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2641E+02 EXCESS= .0000E+00 OUTFLOW= .2643E+02 BASIN STORAGE= .1452E-02 PERCENT ERROR=   -.1

      FOR PLAN = 1  RATIO=  .00
       RC13B-1  MANE        5.00    171.06    230.00    1.05    5.00    171.06    230.00    1.05

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1391E+02 EXCESS= .0000E+00 OUTFLOW= .1392E+02 BASIN STORAGE= .1716E-02 PERCENT ERROR=   -.1

      FOR PLAN = 1  RATIO=  .00
       RC13B-2  MANE        5.00    640.80    230.00    2.18    5.00    640.80    230.00    2.18

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5392E+02 EXCESS= .0000E+00 OUTFLOW= .5398E+02 BASIN STORAGE= .5817E-02 PERCENT ERROR=   -.1

      FOR PLAN = 1  RATIO=  .00
       RC13B-2  MANE        5.00    628.20    230.00    2.13    5.00    628.20    230.00    2.13
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .5282E+02 EXCESS= .0000E+00 OUTFLOW= .5288E+02 BASIN STORAGE= .5767E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE         5.00    607.17    230.00      2.06      5.00    607.17    230.00       2.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5100E+02 EXCESS= .0000E+00 OUTFLOW= .5105E+02 BASIN STORAGE= .5683E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE         5.00    586.10    230.00      1.99      5.00    586.10    230.00       1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4918E+02 EXCESS= .0000E+00 OUTFLOW= .4923E+02 BASIN STORAGE= .5597E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE         5.00    578.31    230.00      1.96      5.00    578.31    230.00       1.96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4845E+02 EXCESS= .0000E+00 OUTFLOW= .4850E+02 BASIN STORAGE= .7165E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE         5.00    572.39    230.00      1.94      5.00    572.39    230.00       1.94

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4794E+02 EXCESS= .0000E+00 OUTFLOW= .4799E+02 BASIN STORAGE= .7136E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE         5.00    568.15    230.00      1.92      5.00    568.15    230.00       1.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4758E+02 EXCESS= .0000E+00 OUTFLOW= .4763E+02 BASIN STORAGE= .7115E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE         5.00    561.38    230.00      1.90      5.00    561.38    230.00       1.90

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4700E+02 EXCESS= .0000E+00 OUTFLOW= .4705E+02 BASIN STORAGE= .6748E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE         5.00    295.27    235.00       .98      5.00    295.27    235.00        .98

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2427E+02 EXCESS= .0000E+00 OUTFLOW= .2430E+02 BASIN STORAGE= .7210E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R19A  MANE         5.00    318.89    235.00      2.18      5.00    318.89    235.00       2.18

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2936E+02 EXCESS= .0000E+00 OUTFLOW= .2938E+02 BASIN STORAGE= .2006E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R19A  MANE         5.00    312.72    235.00      2.13      5.00    312.72    235.00       2.13

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2875E+02 EXCESS= .0000E+00 OUTFLOW= .2877E+02 BASIN STORAGE= .1983E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R19A  MANE         5.00    302.45    235.00      2.06      5.00    302.45    235.00       2.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2774E+02 EXCESS= .0000E+00 OUTFLOW= .2776E+02 BASIN STORAGE= .1945E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R19A  MANE         5.00    292.17    235.00      1.98      5.00    292.17    235.00       1.98

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2673E+02 EXCESS= .0000E+00 OUTFLOW= .2675E+02 BASIN STORAGE= .1906E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R19A  MANE         5.00    288.05    235.00      1.95      5.00    288.05    235.00       1.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2633E+02 EXCESS= .0000E+00 OUTFLOW= .2635E+02 BASIN STORAGE= .1891E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R19A  MANE         5.00    285.17    235.00      1.93      5.00    285.17    235.00       1.93

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2605E+02 EXCESS= .0000E+00 OUTFLOW= .2606E+02 BASIN STORAGE= .1880E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R19A  MANE         5.00    283.11    235.00      1.92      5.00    283.11    235.00       1.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2585E+02 EXCESS= .0000E+00 OUTFLOW= .2586E+02 BASIN STORAGE= .1872E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R19A  MANE         5.00    279.82    235.00      1.89      5.00    279.82    235.00       1.89

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2553E+02 EXCESS= .0000E+00 OUTFLOW= .2554E+02 BASIN STORAGE= .1860E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R19A  MANE         5.00    146.43    235.00       .96      5.00    146.43    235.00        .96
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .1300E+02 EXCESS= .0000E+00 OUTFLOW= .1300E+02 BASIN STORAGE= .2023E-02 PERCENT ERROR=    -.1

          FOR PLAN = 1  RATIO=  .00
           RC13A-2  MANE         5.00    780.51    235.00     2.18     5.00    780.51    235.00      2.18

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7731E+02 EXCESS= .0000E+00 OUTFLOW= .7736E+02 BASIN STORAGE= .8795E-02 PERCENT ERROR=    -.1

          FOR PLAN = 1  RATIO=  .00
           RC13A-2  MANE         5.00    764.75    235.00     2.14     5.00    764.75    235.00      2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7572E+02 EXCESS= .0000E+00 OUTFLOW= .7577E+02 BASIN STORAGE= .8721E-02 PERCENT ERROR=    -.1

          FOR PLAN = 1  RATIO=  .00
           RC13A-2  MANE         5.00    738.48    235.00     2.06     5.00    738.48    235.00      2.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7309E+02 EXCESS= .0000E+00 OUTFLOW= .7314E+02 BASIN STORAGE= .8303E-02 PERCENT ERROR=    -.1

          FOR PLAN = 1  RATIO=  .00
           RC13A-2  MANE         5.00    712.20    235.00     1.99     5.00    712.20    235.00      1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7047E+02 EXCESS= .0000E+00 OUTFLOW= .7051E+02 BASIN STORAGE= .8180E-02 PERCENT ERROR=    -.1

          FOR PLAN = 1  RATIO=  .00
           RC13A-2  MANE         5.00    701.68    235.00     1.96     5.00    701.68    235.00      1.96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6942E+02 EXCESS= .0000E+00 OUTFLOW= .6947E+02 BASIN STORAGE= .8130E-02 PERCENT ERROR=    -.1

          FOR PLAN = 1  RATIO=  .00
           RC13A-2  MANE         5.00    694.32    235.00     1.94     5.00    694.32    235.00      1.94

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6869E+02 EXCESS= .0000E+00 OUTFLOW= .6873E+02 BASIN STORAGE= .8095E-02 PERCENT ERROR=    -.1

          FOR PLAN = 1  RATIO=  .00
           RC13A-2  MANE         5.00    689.06    235.00     1.92     5.00    689.06    235.00      1.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6817E+02 EXCESS= .0000E+00 OUTFLOW= .6821E+02 BASIN STORAGE= .7878E-02 PERCENT ERROR=    -.1

          FOR PLAN = 1  RATIO=  .00
           RC13A-2  MANE         5.00    680.64    235.00     1.90     5.00    680.64    235.00      1.90

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6733E+02 EXCESS= .0000E+00 OUTFLOW= .6738E+02 BASIN STORAGE= .7838E-02 PERCENT ERROR=    -.1

          FOR PLAN = 1  RATIO=  .00
           RC13A-2  MANE         5.00    353.55    240.00      .98     5.00    353.55    240.00       .98

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3459E+02 EXCESS= .0000E+00 OUTFLOW= .3462E+02 BASIN STORAGE= .6811E-02 PERCENT ERROR=    -.1

          FOR PLAN = 1  RATIO=  .00
           RCPIC-C  MANE         2.90   1036.21    237.50     2.15     5.00   1029.58    235.00      2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1041E+03 EXCESS= .0000E+00 OUTFLOW= .1041E+03 BASIN STORAGE= .2599E-02 PERCENT ERROR=     .0

          FOR PLAN = 1  RATIO=  .00
           RCPIC-C  MANE         2.92   1018.48    236.21     2.11     5.00   1009.34    235.00      2.11

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1020E+03 EXCESS= .0000E+00 OUTFLOW= .1020E+03 BASIN STORAGE= .2441E-02 PERCENT ERROR=     .0

          FOR PLAN = 1  RATIO=  .00
           RCPIC-C  MANE         2.95    983.10    236.05     2.03     5.00    975.10    235.00      2.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9842E+02 EXCESS= .0000E+00 OUTFLOW= .9843E+02 BASIN STORAGE= .3029E-02 PERCENT ERROR=     .0

          FOR PLAN = 1  RATIO=  .00
           RCPIC-C  MANE         2.99    947.55    235.94     1.96     5.00    940.20    235.00      1.96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9487E+02 EXCESS= .0000E+00 OUTFLOW= .9488E+02 BASIN STORAGE= .2774E-02 PERCENT ERROR=     .0

          FOR PLAN = 1  RATIO=  .00
           RCPIC-C  MANE         3.00    935.30    237.12     1.93     5.00    921.65    235.00      1.93

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9346E+02 EXCESS= .0000E+00 OUTFLOW= .9347E+02 BASIN STORAGE= .2840E-02 PERCENT ERROR=     .0

          FOR PLAN = 1  RATIO=  .00
           RCPIC-C  MANE         3.01    923.69    237.96     1.91     5.00    914.93    235.00      1.91

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9247E+02 EXCESS= .0000E+00 OUTFLOW= .9248E+02 BASIN STORAGE= .2450E-02 PERCENT ERROR=     .0

          FOR PLAN = 1  RATIO=  .00
           RCPIC-C  MANE         3.02    912.75    235.55     1.90     5.00    907.94    235.00      1.89
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .9176E+02 EXCESS= .0000E+00 OUTFLOW= .9177E+02 BASIN STORAGE= .2737E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCPIC-C MANE 3.03 906.65 236.52 1.87 5.00 895.54 235.00 1.87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9064E+02 EXCESS= .0000E+00 OUTFLOW= .9064E+02 BASIN STORAGE= .3045E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCPIC-C MANE 3.82 462.80 240.43 .96 5.00 461.30 240.00 .96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4647E+02 EXCESS= .0000E+00 OUTFLOW= .4648E+02 BASIN STORAGE= .2735E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON19 MANE 1.80 2048.82 237.17 2.11 5.00 2044.69 235.00 2.11

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2079E+03 EXCESS= .0000E+00 OUTFLOW= .2079E+03 BASIN STORAGE= .3173E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON19 MANE 1.81 2010.80 237.05 2.07 5.00 2005.77 235.00 2.07

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2036E+03 EXCESS= .0000E+00 OUTFLOW= .2036E+03 BASIN STORAGE= .3176E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON19 MANE 1.83 1943.99 236.30 1.99 5.00 1940.79 235.00 1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1965E+03 EXCESS= .0000E+00 OUTFLOW= .1965E+03 BASIN STORAGE= .3190E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON19 MANE 1.86 1873.16 237.49 1.92 5.00 1871.11 235.00 1.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1894E+03 EXCESS= .0000E+00 OUTFLOW= .1894E+03 BASIN STORAGE= .3294E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON19 MANE 1.87 1848.15 237.07 1.89 5.00 1840.12 235.00 1.89

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1866E+03 EXCESS= .0000E+00 OUTFLOW= .1866E+03 BASIN STORAGE= .2772E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON19 MANE 1.87 1825.71 235.94 1.87 5.00 1823.96 235.00 1.87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1846E+03 EXCESS= .0000E+00 OUTFLOW= .1846E+03 BASIN STORAGE= .2965E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON19 MANE 1.88 1818.28 236.57 1.86 5.00 1811.20 235.00 1.86

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1832E+03 EXCESS= .0000E+00 OUTFLOW= .1832E+03 BASIN STORAGE= .2898E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON19 MANE 1.89 1789.80 237.66 1.84 5.00 1787.73 235.00 1.84

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1809E+03 EXCESS= .0000E+00 OUTFLOW= .1809E+03 BASIN STORAGE= .2791E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON19 MANE 2.41 925.16 238.68 .94 5.00 921.96 240.00 .94

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9262E+02 EXCESS= .0000E+00 OUTFLOW= .9263E+02 BASIN STORAGE= .3358E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON20 MANE .56 2044.29 235.85 2.10 5.00 2039.68 235.00 2.10

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2087E+03 EXCESS= .0000E+00 OUTFLOW= .2087E+03 BASIN STORAGE= .7328E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON20 MANE .56 2006.18 235.75 2.06 5.00 2000.73 235.00 2.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2044E+03 EXCESS= .0000E+00 OUTFLOW= .2044E+03 BASIN STORAGE= .7376E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON20 MANE .57 1942.31 235.64 1.99 5.00 1935.31 235.00 1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1972E+03 EXCESS= .0000E+00 OUTFLOW= .1972E+03 BASIN STORAGE= .6937E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON20 MANE .58 1871.72 235.79 1.92 5.00 1864.98 235.00 1.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1901E+03 EXCESS= .0000E+00 OUTFLOW= .1901E+03 BASIN STORAGE= .7025E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON20 MANE .58 1840.42 235.43 1.89 5.00 1834.24 235.00 1.89

```
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1873E+03 EXCESS= .0000E+00 OUTFLOW= .1873E+03 BASIN STORAGE= .6843E-03 PERCENT ERROR=   .0

           FOR PLAN = 1  RATIO=  .00
             RCON20  MANE          .58   1826.16    235.58      1.87      5.00   1817.88    235.00        1.87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1853E+03 EXCESS= .0000E+00 OUTFLOW= .1853E+03 BASIN STORAGE= .7252E-03 PERCENT ERROR=   .0

           FOR PLAN = 1  RATIO=  .00
             RCON20  MANE          .58   1813.24    235.58      1.85      5.00   1805.07    235.00        1.85

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1839E+03 EXCESS= .0000E+00 OUTFLOW= .1839E+03 BASIN STORAGE= .6861E-03 PERCENT ERROR=   .0

           FOR PLAN = 1  RATIO=  .00
             RCON20  MANE          .59   1788.45    235.48      1.83      5.00   1781.38    235.00        1.83

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1816E+03 EXCESS= .0000E+00 OUTFLOW= .1816E+03 BASIN STORAGE= .7265E-03 PERCENT ERROR=   .0

           FOR PLAN = 1  RATIO=  .00
             RCON20  MANE          .74    922.05    240.78       .94      5.00    919.90    240.00         .94

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9284E+02 EXCESS= .0000E+00 OUTFLOW= .9284E+02 BASIN STORAGE= .7597E-03 PERCENT ERROR=   .0

           FOR PLAN = 1  RATIO=  .00
             RPIC-B  MANE         1.74    439.87    237.27      2.03      5.00    439.01    235.00        2.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4783E+02 EXCESS= .0000E+00 OUTFLOW= .4783E+02 BASIN STORAGE= .2578E-03 PERCENT ERROR=   .0

           FOR PLAN = 1  RATIO=  .00
             RPIC-B  MANE         1.75    432.13    236.45      1.99      5.00    430.53    235.00        1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4685E+02 EXCESS= .0000E+00 OUTFLOW= .4685E+02 BASIN STORAGE= .2499E-03 PERCENT ERROR=   .0

           FOR PLAN = 1  RATIO=  .00
             RPIC-B  MANE         1.76    417.58    236.27      1.92      5.00    416.38    235.00        1.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4522E+02 EXCESS= .0000E+00 OUTFLOW= .4522E+02 BASIN STORAGE= .2493E-03 PERCENT ERROR=   .0

           FOR PLAN = 1  RATIO=  .00
             RPIC-B  MANE         1.78    403.10    236.14      1.85      5.00    402.16    235.00        1.85

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4360E+02 EXCESS= .0000E+00 OUTFLOW= .4360E+02 BASIN STORAGE= .2464E-03 PERCENT ERROR=   .0

           FOR PLAN = 1  RATIO=  .00
             RPIC-B  MANE         1.78    398.34    236.81      1.83      5.00    396.16    235.00        1.83

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4296E+02 EXCESS= .0000E+00 OUTFLOW= .4296E+02 BASIN STORAGE= .2533E-03 PERCENT ERROR=   .0

           FOR PLAN = 1  RATIO=  .00
             RPIC-B  MANE         1.78    393.51    237.29      1.81      5.00    392.22    235.00        1.81

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4251E+02 EXCESS= .0000E+00 OUTFLOW= .4250E+02 BASIN STORAGE= .2248E-03 PERCENT ERROR=   .0

           FOR PLAN = 1  RATIO=  .00
             RPIC-B  MANE         1.79    390.10    235.85      1.79      5.00    389.58    235.00        1.79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4218E+02 EXCESS= .0000E+00 OUTFLOW= .4218E+02 BASIN STORAGE= .2523E-03 PERCENT ERROR=   .0

           FOR PLAN = 1  RATIO=  .00
             RPIC-B  MANE         1.79    386.39    236.40      1.77      5.00    385.05    235.00        1.77

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4167E+02 EXCESS= .0000E+00 OUTFLOW= .4167E+02 BASIN STORAGE= .2662E-03 PERCENT ERROR=   .0

           FOR PLAN = 1  RATIO=  .00
             RPIC-B  MANE         2.03    203.87    238.08       .91      5.00    202.47    235.00         .91

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2143E+02 EXCESS= .0000E+00 OUTFLOW= .2143E+02 BASIN STORAGE= .2507E-03 PERCENT ERROR=   .0


*** NORMAL END OF HEC-1 ***
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HYDROLOGIC CRITERIA AND DESIGN MANUAL

TIME OF CONCENTRATION

GCW ENGINEERS \ SURVEYORS

The Seventy
Proposed Conditions

Project No: 840-050
Date: 17-Feb-16
Calculated by: MMC

SUB-BASIN DATA						INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc CHECK URBANIZED BASINS		Tc	Tlag	REMARKS
DESIG: (1)	DEV./EX. (D or E)	CN (16)	K (2)	AREA Ac (3)	AREA Sq Mi (4)	INITIAL LENGTH Feet (5)	SLOPE % (6)	Ti Min (7)	TRAVEL LENGTH Feet (8)	SLOPE % (9a)	V1 VELOCITY fps (9b)	V2 VELOCITY fps (10)	Tt Min (11)	TOTAL LENGTH Feet (12)	Tc = (L/180)+10 Min (13)	Min (14)	Tlag = 0.6Tc/60 Hours (15)	Rainfall:
57B-1	D	93.7	0.8468	31.1	0.0485	250	2.80	5.1	3020	2.2	3.0	4.5	12.2	3270	28.2	17.3	0.173	2.89
57B-1A	D	85	0.7320	28.4	0.0443	370	2.40	9.5	2080	2.3	3.1	4.6	8.4	2450	23.6	17.9	0.179	2.96
57B-1B	D	93	0.8376	19.3	0.0301	100	1.00	4.7	1630	1.0	2.0	3.1	10.3	1730	19.6	15.0	0.150	2.91
57B-1C	D	96	0.8772	0.6	0.0009	50	1.00	2.8	490	1.2	2.2	3.4	3.7	540	13.0	6.5	0.065	2.89
57B-2A	D	87	0.7584	6.3	0.0098	186	13.40	3.5	2700	1.7	2.6	4.0	12.4	2886	26.0	15.9	0.159	3.05
57B-2B	D	87	0.7584	3.0	0.0047	50	2.00	3.5	1400	2.7	3.3	5.0	5.5	1450	18.1	8.9	0.089	2.99
57B-2C	D	87	0.7584	1.7	0.0027	100	1.00	6.1	222	6.8	5.3	8.0	0.7	322	11.8	6.9	0.069	2.96
57B-2D	D	91	0.8112	5.7	0.0088	110	1.00	5.5	1200	1.1	2.1	3.2	7.6	1310	17.3	13.0	0.130	3.09
57B-2E	D	91	0.8112	14.5	0.0227	110	1.00	5.5	1360	3.4	3.7	5.6	4.8	1470	18.2	10.2	0.102	3.08
57B-2F	D	91	0.8112	57.8	0.0902	110	1.00	5.5	3000	2.5	3.2	4.8	11.2	3110	27.3	16.7	0.167	3.03
57B-2G1	D	87	0.7584	1.6	0.0026	35	5.60	2.0	730	2.9	3.4	5.2	3.2	765	14.3	5.2	0.052	3.08
57B-2G2	D	87	0.7584	4.6	0.0073	40	2.50	2.9	1511	2.2	3.0	4.5	6.5	1551	18.6	9.4	0.094	3.03
57B-2H1	D	87	0.7584	18.6	0.0291	300	3.70	6.9	4120	1.1	2.1	3.2	22.7	4420	34.6	29.6	0.296	3.01
57B-2H2	D	87	0.7584	10.0	0.0156	300	2.30	8.1	2500	2.2	3.0	4.5	10.1	2800	25.6	18.2	0.182	3.04
57B-2I	D	87	0.7584	4.6	0.0072	80	7.50	2.8	1575	2.6	3.3	4.9	6.2	1655	19.2	9.0	0.090	2.99
57B-3	D	89.3	0.7888	30.8	0.0481	380	1.30	10.0	4170	2.4	3.1	4.7	15.6	4550	35.3	25.6	0.256	3.06
57B-3A	D	85	0.7320	16.6	0.0259	170	1.00	8.6	1360	2.0	2.9	4.3	6.2	1530	18.5	14.9	0.149	3.07
57B-3B	D	85	0.7320	32.8	0.0513	110	1.00	6.9	2500	2.4	3.1	4.7	9.7	2610	24.5	16.6	0.166	3.00
57B-3C	D	87	0.7584	4.4	0.0069	130	1.00	7.0	1140	2.5	3.2	4.8	4.8	1270	17.1	11.8	0.118	3.05
57B-3D	D	87	0.7584	11.8	0.0184	125	1.00	6.9	2500	2.7	3.3	5.0	9.1	2625	24.6	16.0	0.160	2.99
57B-3E	D	87	0.7584	16.0	0.0251	240	1.00	9.5	3200	2.5	3.2	4.8	11.9	3440	29.1	21.4	0.214	3.06
57B-3F	D	87	0.7584	7.4	0.0116	180	2.70	5.9	2170	2.5	3.2	4.9	8.3	2350	23.1	14.2	0.142	3.05
57B-3G	D	87	0.7584	1.5	0.0023	220	3.20	6.2	260	4.6	4.3	6.6	1.0	480	12.7	7.2	0.072	2.99
57B-4	D	93.8	0.8482	82.7	0.1293	35	2.00	2.1	4890	2.4	3.1	4.7	18.1	4925	37.4	20.2	0.202	2.91
57B-4B	D	96	0.8772	7.1	0.0110	150	2.70	3.5	860	2.9	3.4	5.2	3.6	1010	15.6	7.1	0.071	2.91
57B-4C	D	96	0.8772	7.8	0.0122	100	1.00	4.0	1560	1.6	2.6	3.9	7.8	1660	19.2	11.8	0.118	2.90
ON1	D	82	0.6924	25.4	0.0397	165	4.20	5.8	2040	3.0	3.5	5.3	7.2	2205	22.3	13.1	0.131	3.08
ON2	D	82	0.6924	17.5	0.0273	180	5.00	5.8	2700	2.5	3.2	4.8	10.2	2880	26.0	15.9	0.159	3.00
ON3R	D	82	0.6924	4.1	0.0065	135	12.00	3.7	500	1.7	2.6	4.0	3.2	635	13.5	6.9	0.069	2.96
ON5	D	82	0.6924	9.4	0.0147	125	4.00	5.2	1420	2.9	3.4	5.2	5.4	1545	18.6	10.5	0.105	3.05
ON6	D	93	0.8376	2.3	0.0035	20	4.00	1.3	785	1.7	2.6	4.0	4.4	805	14.5	5.7	0.057	3.04
ON8	D	82	0.6924	12.2	0.0190	65	6.20	3.2	1950	8.7	6.0	9.0	4.1	2015	21.2	7.3	0.073	2.99

ON9	D	82	0.6924	25.5	0.0399	290	15.50	5.0	3085	1.0	2.0	3.1	18.2	3375	28.8	23.2	0.232	3.06
ON10	D	82	0.6924	11.4	0.0177	100	29.00	2.4	1460	2.9	3.4	5.2	5.5	1560	18.7	7.9	0.079	2.98
ON11R	D	82	0.6924	5.1	0.0080	270	13.70	5.0	350	1.6	2.6	3.9	2.3	620	13.4	7.3	0.073	2.95
ON12	D	82	0.6924	11.6	0.0182	225	3.50	7.2	1300	3.1	3.6	5.4	4.8	1525	18.5	12.1	0.121	3.08
ON13	D	82	0.6924	12.0	0.0187	210	7.10	5.5	1540	3.6	3.8	5.8	5.2	1750	19.7	10.7	0.107	3.04
ON14	D	82	0.6924	3.5	0.0054	100	1.00	7.3	1575	0.5	1.4	2.2	14.1	1675	19.3	21.5	0.193	3.00
ON15R	D	82	0.6924	21.5	0.0335	120	7.50	4.1	2070	3.3	3.7	5.6	7.0	2190	22.2	11.1	0.111	2.98
ON16R	D	82	0.6924	10.9	0.0171	45	45.00	1.4	2050	3.3	3.7	5.6	6.9	2095	21.6	8.3	0.083	2.97
ON18R	D	82	0.6924	18.5	0.0289	175	0.60	11.5	2565	2.5	3.2	4.9	9.7	2740	25.2	21.2	0.212	2.95
DON1	D	95	0.8640	10.8	0.0169	138	15.50	2.0	1515	1.9	2.8	4.2	7.0	1653	19.2	9.0	0.090	2.93
DON2	D	95	0.8640	19.5	0.0304	100	21.00	1.5	1735	1.7	2.6	4.0	8.3	1835	20.2	9.9	0.099	2.93
DON3	D	95	0.8640	21.1	0.0330	240	5.00	3.8	1530	2.8	3.4	5.1	5.8	1770	19.8	9.7	0.097	2.91
DON4	D	95	0.8640	17.4	0.0272	109	2.80	3.1	1650	0.03	0.3	0.5	60.0	1759	19.8	63.1	0.198	2.88

$Tc = Ti + Tt$ $\quad$ $Tlag = 0.6\ Tc$

$Ti = 1.8\ (1.1 - K)\ L^{1/2} / S^{1/3}$

$K = 0.0132\ (CN) - 0.39$

For the travel time (Tt) calculations,
V1 applies to the first 500 feet of travel distance;
V2 applies to the remaining travel distance.

Existing: $V1 = 14.8*(S/100)^{1/2}$
$V2 = 29.4*(S/100)^{1/2}$

Developed: $V1 = 20.2*(S/100)^{1/2}$
$V2 = 30.6*(S/100)^{1/2}$

REFERENCE: CN values referenced from MPU

STANDARD FORM 4

```
1*********************************************
 *                                           *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)       *
 *           JUN   1998                      *
 *         VERSION 4.1                       *
 *                                           *
 * RUN DATE   03MAR16  TIME  10:06:14        *
 *                                           *
 *********************************************

 *********************************************
 *                                           *
 *   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

                                                                              PAGE  1
1                               HEC-1 INPUT

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

            *DIAGRAM
*** FREE ***
            ID  ***************************************************************
            ID  *  ......................................................:   *
            ID  *  :                                                     :   *
            ID  *  :                 THE SEVENTY                         :   *
            ID  *  :                                                     :   *
            ID  *  :                 PROPOSED CONDITIONS                 :   *
            ID  *  :.....................................................:   *
            ID  *  :                 RETURN PERIOD_ _ _ _100 & 10 -YEAR  :   *
            ID  *  :                 DISTRIBUTION_ _ _ _ 6-HOUR SDN3     :   *
            ID  *  :                 PROJECT NO_ _ _ _ _ 840.050         :   *
            ID  *  :                 FILENAME_ _ _ _ _ _ PROPOSED.H1     :   *
            ID  *  :                 DATE MODELED_ _ _ _ 2/22/16         :   *
            ID  *  :                 MODELED BY_ _ _ _ _ JAM, MMC, RRD, SHT :  *
            ID  *  :.....................................................:   *
            ID  *  :                                                     :   *
            ID  *  :.....................................................:   *
            ID  ***************************************************************
            ID
            ID    REFERENCED HYDROLOGIC MODELS:
            ID    2013 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE
            ID    CITY OF LAS VEGAS CITY WIDE HYDROLOGY ANALYSIS (PBS&J 1997)
            ID    CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT 2008 MASTER PLAN UPDATE
            ID    GOWAN WATERSHED (ALL)
            ID    RECOMMENDED DRAINAGE SYSTEM WITH ULTIMATE DEVELOPMENT
            ID    INPUT FILE = ALLGOW3.DAT
            ID    INPUT FILE DATE = MAY 5, 2008
            ID    DESIGN STORM = 100-YEAR 6-HR STORM
            ID    STORM DISTRIBUTION = SDN #3
            ID    MODELED BY PBS&J (MICHELE L. D'ALESSANDRO, E.I., CFM)
            ID    CHECKED BY PBS&J (HARSHAL B. DESAI, P.E., CFM)
            ID    STORM CENTERING = FULL WATERSHED
            ID    JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
            ID
            ID                         AREA    DARF
            ID                         SQ. MI.
            ID                         0-0.5   0.99
            ID                         0.5-1   0.975
            ID                         1-2     0.95
            ID                         2-3     0.925
            ID                         3-4     0.915
            ID                         4-5     0.908
            ID                         5-6     0.903
            ID                         6-7     0.895
            ID                         10YR    0.570
            ID
            ID  JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)
            ID
            ID  100-YEAR,  6-HOUR STORM,  SDN3
            ID
            IT       5       0       0     700
            IO       5       0       0
            IN       5       0       0
            JR    PREC    0.99   0.975    0.95   0.925   0.915   0.908   0.903   0.895   0.570
            *
                                                                              PAGE  2
1                               HEC-1 INPUT

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

            KK     ON1
            KM  OFFSITE BASIN ON1
            PB    3.08
            BA  0.0397
            PC       0    0.02   0.057    0.07   0.087   0.108   0.124    0.13    0.13    0.13
            PC    0.13    0.13    0.13   0.133    0.14   0.142   0.148   0.158   0.172   0.181
            PC    0.19   0.197   0.199     0.2   0.201   0.204   0.214   0.229   0.241   0.249
            PC   0.251   0.256    0.27   0.278   0.281   0.283   0.295   0.322   0.352   0.409
            PC   0.499    0.59    0.71   0.744   0.781   0.812   0.819   0.835   0.851   0.856
            PC    0.86   0.868   0.876   0.888    0.91   0.926   0.937    0.95    0.97   0.976
            PC   0.982   0.985   0.987   0.989    0.99   0.993   0.993   0.994   0.995   0.998
            PC   0.998   0.999       1
            LS       0      82
```

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  67          UD    .131
              *

  68          KK  57B-3A
  69          KM  ONSITE BASIN 57B-3A
  70          PB    3.07
  71          BA  0.0259
  72          LS       0       85
  73          UD    .149
              *

  74          KK    CON1
  75          KM  COMBINE 57B-3A AND ON1
  76          HC       2
              *

  77          KK   RCON1
  78          KM  ROUTE CON1 TO CON2
  79          KM   LENGTH  SLOPE   n-VALUE         SHAPE    WIDTH   S-SLOPE
  80          RD    3020    .027    .040      0     TRAP      50       3
              *

  81          KK  57B-3B
  82          KM  OFFSITE BASIN 57B-3B
  83          PB    3.00
  84          BA  0.0513
  85          LS       0       85
  86          UD    .166
              *

  87          KK     ON2
  88          KM  OFFSITE BASIN ON2
  89          PB    3.00
  90          BA  0.0273
  91          LS       0       82
  92          UD    .159
              *
1                                       HEC-1 INPUT                                  PAGE  3

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

  93          KK    CON2
  94          KM  COMBINE CON1, 57B-3B AND ON2
  95          HC       3
              *

  96          KK  57B-3D
  97          KM  OFFSITE BASIN 57B-3D
  98          PB    2.99
  99          BA  0.0184
 100          LS       0       87
 101          UD    .160
              *

 102          KK    ON3R
 103          KM  ONSITE BASIN ON3R
 104          PB    2.96
 105          BA  0.0065
 106          LS       0       82
 107          UD    .069
              *

 108          KK   CON3R
 109          KM  COMBINE CON2, 57B-3D AND ON3R
 110          HC       3
              *

 111          KK     ON5
 112          KM  OFFSITE BASIN ON5
 113          PB    3.05
 114          BA  0.0147
 115          LS       0       82
 116          UD    .105
              *

 117          KK  57B-3C
 118          KM  OFFSITE BASIN 57B-3C
 119          PB    3.05
 120          BA  0.0069
 121          LS       0       87
 122          UD    .118
              *

 123          KK     ON6
 124          KM  OFFSITE BASIN ON6
 125          PB    3.04
 126          BA  0.0035
 127          LS       0       93
 128          UD    .057
              *
1                                       HEC-1 INPUT                                  PAGE  4

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

 129          KK    CON6
 130          KM  COMBINE 57B-3C AND ON6
 131          HC       2
              *

 132          KK   CCON6
 133          KM  COMBINE ON5 AND CON6
 134          HC       2
              *

 135          KK  RCCON6
 136          KM  ROUTE CCON6 TO CON8
 137          KM   LENGTH  SLOPE   n-VALUE         SHAPE    WIDTH   S-SLOPE
 138          RD    2015    .037    .040      0     TRAP      20       2
              *
```

```
139        KK     ON8
140        KM  ONSITE BASIN ON8
141        PB    2.99
142        BA  0.0190
143        LS       0       82
144        UD    .073
           *

145        KK    CON8
146        KM  COMBINE CCON6 AND ON8
147        HC       2
           *

148        KK    SW11
149        KM  REFERENCED FROM 2013 MPU
150        BA   0.589
151        PB    3.34
152        LS       0     87.8
153        UD   0.311
           *

154        KK   RSW11
155        KM  REFERENCED FROM 2013 MPU
156        KM  ROUTE SW11 TO CSW17
157        KM  FACILITY = ANGEL PARK - CHARLESTON BOULEVARD
158        KM  FACILITY # = APCB 0064, 0080
159        KM  LINING = RCB
160        RD    2338  0.0167    0.015        0     TRAP        7        0
           *

161        KK    SW17
162        KM  REFERENCED FROM 2013 MPU
163        BA   0.356
164        PB    3.30
165        LS       0     87.8
166        UD   0.271
           *
```



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1

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

167        KK   CSW17
168        KM  REFERENCED FROM 2013 MPU
169        KM  COMBINE RSW11 AND SW17
170        HC       2
           *

171        KK  RCSW17
172        KM  REFERENCED FROM 2013 MPU
173        KM  ROUTE CSW17 TO CSW18
174        KM  FACILITY = ANGEL PARK - CHARLESTON BOULEVARD
175        KM  FACILITY # = APCB 0000,0001,0019,0050
176        KM  LINING = RCB
177        RD    3600   0.014    0.015        0     TRAP       11        0
           *

178        KK    SW18
179        KM  REFERENCED FROM 2013 MPU
180        BA   0.405
181        PB    3.27
182        LS       0     86.8
183        UD   0.271
           *

184        KK   CSW18
185        KM  REFERENCED FROM 2013 MPU
186        KM  COMBINE RCSW17 AND SW18
187        HC       2
           *

188        KK  RCSW18
189        KM  REFERENCED FROM 2013 MPU
190        KM  ROUTE CSW18 TO C12A
191        KM  FACILITY = ANGEL PARK SOUTH
192        KM  FACILITY # = APSO 0254,0255,0258,0345,0346; APCB 0000
193        KM  NATURAL WASH
194        KM  LENGTH = 5,200
195        KM  SLOPE = 1.4%
196        KM  N = 0.040
197        KM  HYDRAULIC RADIUS = 1.5
198        KM  VELOCITY =   9.2
199        RM       2   0.157     0.15
           *

200        KK     12A
201        KM  REFERENCED FROM 2013 MPU
202        BA   0.392
203        PB    3.20
204        LS       0     91.2
205        UD   0.264
           *
```



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1

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

206        KK    C12A
207        KM  REFERENCED FROM 2013 MPU
208        KM  COMBINE 12A AND RCSW18
209        HC       2
           *

210        KK   RC12A
211        KM  REFERENCED FROM 2013 MPU
212        KM  ROUTE THRU 12B
213        KM  FACILITY = ANGEL PARK SOUTH
214        KM  FACILITY # = APSO 0204, 0205
215        KM  NATURAL WASH
216        KM  LENGTH = 2,600
217        KM  SLOPE = 3.5%
218        KM  N = 0.040
```

```
219           KM  HYDRAULIC RADIUS = 1.5
220           KM  VELOCITY = 14.5
221           RM       1    0.05     0.15
              *

222           KK      12B
223           KM  REFERENCED FROM 2013 MPU
224           BA   0.260
225           PB     3.13
226           LS       0      91.0
227           UD   0.233
              *

228           KK     C12B
229           KM  REFERENCED FROM 2013 MPU
230           KM  COMBINE 12B AND RC12A
231           HC       2
              *

232           KK  57B-2A
233           KM  OFFSITE BASIN 57B-2A
234           PB     3.05
235           BA  0.0098
236           LS       0       87
237           UD     .159
              *

238           KK  57B-3F
239           KM  OFFSITE BASIN 57B-3F
240           PB     3.05
241           BA  0.0116
242           LS       0       87
243           UD     .142
              *
```



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

244           KK  57B-3E
245           KM  OFFSITE BASIN 57B-3E
246           PB     3.06
247           BA  0.0251
248           LS       0       87
249           UD     .214
              *

250           KK     ON9
251           KM  ONSITE BASIN ON9
252           PB     3.06
253           BA  0.0399
254           LS       0       82
255           UD     .232
              *

256           KK     CON9
257           KM  COMBINE C12B, 57B-2A, 57B-3F, 57B-3E AND ON9
258           HC       5
              *

259           KK    RCON9
260           KM  ROUTE CON9 TO CON10
261           KM    LENGTH   SLOPE   n-VALUE          SHAPE     WIDTH    S-SLOPE
262           RD     1540    .030     .040      0     TRAP       50        2
              *

263           KK  57B-3G
264           KM  OFFSITE BASIN 57B-3G
265           PB     2.99
266           BA  0.0023
267           LS       0       87
268           UD     .072
              *

269           KK  57B-2B
270           KM  OFFSITE BASIN 57B-2B
271           PB     2.99
272           BA  0.0047
273           LS       0       87
274           UD     .089
              *

275           KK  57B-2C
276           KM  OFFSITE BASIN 57B-2C
277           PB     2.96
278           BA  0.0027
279           LS       0       87
280           UD     .069
              *
```



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

281           KK    ON10
282           KM  ONSITE BASIN ON10
283           PB     2.98
284           BA  0.0177
285           LS       0       82
286           UD     .079
              *

287           KK   CON10
288           KM  COMBINE CON9, 57B-3G, 57B-2B, 57B-2C AND ON10
289           HC       5
              *

290           KK  CCON10
291           KM  COMBINE CON8 AND CON10
292           HC       2
              *
```

```
293          KK    ON11R
294          KM  ONSITE BASIN ON11R
295          PB    2.95
296          BA  0.0080
297          LS       0        82
298          UD    .073
             *

299          KK  CON11R
300          KM  COMBINE CCON10 AND ON11R
301          HC       2
             *

302          KK  57B-2D
303          KM  OFFSITE BASIN 57B-2D
304          PB    3.09
305          BA  0.0088
306          LS       0        91
307          UD    .130
             *

308          KK  57B-2E
309          KM  OFFSITE BASIN 57B-2E
310          PB    3.08
311          BA  0.0227
312          LS       0        91
313          UD    .102
             *

314          KK C57B-2E
315          KM  COMBINE 57B-2D AND 57B-2E
316          HC       2
             *
1                                    HEC-1 INPUT                                    PAGE  9

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

317          KK 57B-2G1
318          KM  OFFSITE BASIN 57B-2G1
319          PB    3.08
320          BA  0.0026
321          LS       0        87
322          UD    .052
             *

323          KK    ON12
324          KM  ONSITE BASIN ON12
325          PB    3.08
326          BA  0.0182
327          LS       0        82
328          UD    .121
             *

329          KK   CON12
330          KM  COMBINE C57B-2E, 57B-2G1 AND ON12
331          HC       3
             *

332          KK 57B-2G2
333          KM  OFFSITE BASIN 57B-2G2
334          PB    3.03
335          BA  0.0073
336          LS       0        87
337          UD    .094
             *

338          KK    ON13
339          KM  ONSITE BASIN ON13
340          PB    3.04
341          BA  0.0187
342          LS       0        82
343          UD    .107
             *

344          KK   CON13
345          KM  COMBINE CON12, 57B-2G2 AND ON13
346          HC       3
             *

347          KK  57B-2F
348          KM  OFFSITE BASIN 57B-2F
349          PB    3.03
350          BA  0.0902
351          LS       0        91
352          UD    .167
             *
1                                    HEC-1 INPUT                                    PAGE 10

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

353          KK 57B-2H2
354          KM  OFFSITE BASIN 57B-2H2
355          PB    3.04
356          BA  0.0156
357          LS       0        87
358          UD    .182
             *

359          KK    ON14
360          KM  ONSITE BASIN ON14
361          PB    3.00
362          BA  0.0054
363          LS       0        82
364          UD    .193
             *

365          KK   CON14
366          KM  COMBINE C57B-2F, 57B-2H2 AND ON14
367          HC       3
             *
```

```
 368          KK   RCON14
 369          KM   ROUTE CON14 TO CON15R
 370          KM     LENGTH  SLOPE   n-VALUE            SHAPE     WIDTH    S-SLOPE
 371          RD      2160    .032     .040       0      TRAP       20         2
              *

 372          KK   57B-2I
 373          KM   OFFSITE BASIN 57B-2I
 374          PB      2.99
 375          BA   0.0072
 376          LS        0        87
 377          UD      .090
              *

 378          KK  57B-2H1
 379          KM   OFFSITE BASIN 57B-2H1
 380          PB      3.01
 381          BA   0.0291
 382          LS        0        87
 383          UD      .296
              *

 384          KK    ON15R
 385          KM   ONSITE BASIN ON15R
 386          PB      2.98
 387          BA   0.0335
 388          LS        0        82
 389          UD      .111
              *
1                                      HEC-1 INPUT                                          PAGE 11

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

 390          KK   CON15R
 391          KM   COMBINE CON13, CON14, 57B-21, 57B-2H1 AND ON15R
 392          HC        5
              *

 393          KK    ON16R
 394          KM   ONSITE BASIN ON16R
 395          PB      2.97
 396          BA   0.0171
 397          LS        0        82
 398          UD      .083
              *

 399          KK   CON16R
 400          KM   COMBINE CON15R AND ON16R
 401          HC        2
              *

 402          KK    CPPH1
 403          KM   COMBINE CON3R, CON11R AND CON16R
 404          HC        3
              *

 405          KK     DON1
 406          KM   ONSITE BASIN DON1
 407          PB      2.93
 408          BA   0.0169
 409          LS        0        95
 410          UD      .090
              *

 411          KK     DON2
 412          KM   ONSITE BASIN DON2
 413          PB      2.93
 414          BA   0.0304
 415          LS        0        95
 416          UD      .099
              *

 417          KK    CDON2
 418          KM   COMBINE CCON16R, CDON1 AND DON2
 419          HC        3
              *

 420          KK   RCDON2
 421          KM   ROUTE CDON2 TO CDON3
 422          KM     LENGTH  SLOPE   n-VALUE            SHAPE     WIDTH    S-SLOPE
 423          RD      1000    .048     .016       0      TRAP       10        50
              *
1                                      HEC-1 INPUT                                          PAGE 12

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

 424          KK    13B-1
 425          KM   REFERENCED FROM 2013 MPU
 426          BA    0.249
 427          PB     3.19
 428          LS        0      91.6
 429          UD    0.284
              *

 430          KK  RC13B-1
 431          KM   REFERENCED FROM 2013 MPU
 432          KM   ROUTE 13B-1 TO C13B-2
 433          KM   GRIFFITH PARK DRIVE AND HUALAPAI WAY
 434          RD     3000   0.018    0.016       0     TRAP          0       50
              *

 435          KK    13B-2
 436          KM   REFERENCED FROM 2013 MPU
 437          BA    0.216
 438          PB     3.14
 439          LS        0      89.7
 440          UD    0.231
              *
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441           KK  C13B-2
442           KM  REFERENCED FROM 2013 MPU
443           KM  COMBINE 13B-2 AND RC13B-1
444           KM  HUALAPAI WAY AND LOCAL FACILITY
445           HC      2
              *

446           KK RC13B-2
447           KM  REFERENCED FROM 2013 MPU
448           KM  ROUTE C13B-2 TO CCPIC-A
449           KM  LINING = GRASS
450           RD    4900   0.021     0.03       0     TRAP      40       6
              *

451           KK      19A
452           KM  REFERENCED FROM 2013 MPU
453           BA   0.253
454           PB     3.25
455           LS        0     89.9
456           UD   0.351
              *

457           KK      R19A
458           KM  REFERENCED FROM 2013 MPU
459           KM  ROUTE 19A TO C13A-1
460           KM  UNNAMED ROAD
461           RD    4300   0.021   0.016       0     TRAP       0      50
              *
1                                         HEC-1 INPUT                                        PAGE 13

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

462           KK    13A-1
463           KM  REFERENCED FROM 2013 MPU
464           BA   0.224
465           PB     3.19
466           LS        0     91.4
467           UD   0.302
              *

468           KK  C13A-1
469           KM  REFERENCED FROM 2013 MPU
470           KM  COMBINE 13A-1 AND R19A
471           KM  TOWN CENTER DRIVE AND SWALE
472           HC       2
              *

473           KK RC13A-1
474           KM  REFERENCED FROM 2013 MPU
475           KM  ROUTE C13A-1 TO C13A-2
476           KM  NATURAL WASH
477           KM  TRAVEL LENGTH = 2,800
478           KM  SLOPE = 2.1%
479           KM  N = 0.040
480           KM  HYDRAULIC RADIUS = 1.5
481           KM  VELOCITY = 11.4
482           RM       1   0.068      0.15
              *

483           KK    13A-2
484           KM  REFERENCED FROM 2013 MPU
485           BA   0.188
486           PB     3.15
487           LS        0     90.0
488           UD   0.236
              *

489           KK  C13A-2
490           KM  REFERENCED FROM 2013 MPU
491           KM  COMBINE 13A-2 AND RC13A-1
492           HC       2
              *

493           KK RC13A-2
494           KM  REFERENCED FROM 2013 MPU
495           KM  ROUTE C13A-2 TO CPIC-C
496           KM  LINING = GRASS
497           RD    5200   0.015     0.03       0     TRAP      40       4
              *

498           KK    PIC-C
499           KM  REFERENCED FROM 2013 MPU
500           BA   0.243
501           PB     3.08
502           LS        0     90.4
503           UD   0.373
              *
1                                         HEC-1 INPUT                                        PAGE 14

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

504           KK  CPIC-C
505           KM  REFERENCED FROM 2013 MPU
506           KM  COMBINE PIC-C AND RC13A-2
507           HC       2
              *

508           KK RCPIC-C
509           KM  REFERENCED FROM 2013 MPU
510           KM  ROUTE CPIC-C TO CPIC-A
511           KM  LINING = GRASS
512           RD    2200   0.025     0.03       0     TRAP      40       4
              *

513           KK    PIC-A
514           KM  REFERENCED FROM 2013 MPU
515           BA   0.359
516           PB     3.03
517           LS        0     91.1
518           UD   0.499
```

```
                *

 519            KK  CPIC-A
 520            KM  REFERENCED FROM 2013 MPU
 521            KM  COMBINE RCPIC-C AND PIC-A
 522            HC      2
                *

 523            KK CCPIC-A
 524            KM  REFERENCED FROM 2013 MPU
 525            KM  COMBINE CPIC-A AND RC13B-2
 526            HC      2
                *

 527            KK    ON18R
 528            KM  ONSITE BASIN ON18R
 529            PB    2.95
 530            BA  0.0289
 531            LS       0         82
 532            UD    .212
                *

 533            KK  CON18R
 534            KM  COMBINE CCPIC-A AND ON18R
 535            HC      2
                *

 536            KK  57B-1A
 537            KM  OFFSITE BASIN 57B-1A
 538            PB    2.96
 539            BA  0.0443
 540            LS       0         85
 541            UD    .179
                *
1                                             HEC-1 INPUT                                          PAGE 15

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

 542            KK CCON18R
 543            KM  COMBINE 57B-1A AND CON18R
 544            HC      2
                *

 545            KKRCCON18R
 546            KM  ROUTE CCON18R TO CDON3
 547            KM    LENGTH  SLOPE   n-VALUE          SHAPE    WIDTH   S-SLOPE
 548            RD    1520    .014     .016       0     TRAP      10       50
                *

 549            KK  57B-1B
 550            KM  OFFSITE BASIN 57B-1B
 551            PB    2.91
 552            BA  0.0301
 553            LS       0         93
 554            UD    .150
                *

 555            KK    CP19
 556            KM  COMBINE CCON18R AND 57B-1B
 557            HC      2
                *

 558            KK  57B-1C
 559            KM  OFFSITE BASIN 57B-1C
 560            PB    2.89
 561            BA  0.0009
 562            LS       0         96
 563            UD    .065
                *

 564            KK    CP20
 565            KM  COMBINE CP19 AND 57B-1C
 566            HC      2
                *

 567            KK    DON3
 568            KM  ONSITE BASIN DON3
 569            PB    2.91
 570            BA  0.0330
 571            LS       0         95
 572            UD    .097
                *

 573            KK   CDON3
 574            KM  COMBINE DON3, CP20 AND CDON2
 575            HC      3
                *
1                                             HEC-1 INPUT                                          PAGE 16

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

 576            KK  RCDON3
 577            KM  ROUTE CDON3 TO CDON4
 578            KM    LENGTH  SLOPE   n-VALUE          SHAPE    WIDTH   S-SLOPE
 579            RD    1500    .003     .016       0     TRAP      15       50
                *

 580            KK    DON4
 581            KM  ONSITE BASIN DON4
 582            PB    2.88
 583            BA  0.0272
 584            LS       0         95
 585            UD    .198
                *

 586            KK  57B-4B
 587            KM  OFFSITE BASIN 57B-4B
 588            PB    2.91
 589            BA  0.0110
 590            LS       0         96
```

```
591            UD    .071
               *

592            KK   57B-4C
593            KM   OFFSITE BASIN 57B-4C
594            PB     2.90
595            BA   0.0122
596            LS        0       96
597            UD     .118
               *

598            KK C57B-4C
599            KM   COMBINE 57B-4B AND 57B-4C
600            HC          2
               *

601            KK    CDON4
602            KM   COMBINE DON4, CDON3 AND C57B-4C
603            HC          3
               *

604            KK    57B-1
605            KM   OFFSITE BASIN 57B-1
606            BA   0.0485
607            PB     2.89
608            LS        0      93.7
609            UD    0.173
               *

610            KK    PIC-B
611            KM   REFERENCED FROM 2013 MPU
612            BA    0.441
613            PB     2.98
614            LS        0      91.1
615            UD    0.471
               *
```



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                                  HEC-1 INPUT
1

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

616            KK   RPIC-B
617            KM   REFERENCED FROM 2013 MPU
618            KM   ROUTE PIC-B TO CC57B-4
619            KM   FACILITY = ANGEL PARK - PECCOLE 1
620            KM   FACILITY # = APP1 0000
621            KM   LINING = RCP
622            RD     2982    0.024    0.013        0     CIRC         6
               *

623            KK    57B-3
624            KM   OFFSITE BASIN 57B-3
625            BA   0.0481
626            PB     3.06
627            LS        0      89.3
628            UD    0.256
               *

629            KK    57B-4
630            KM   OFFSITE BASIN 57B-4
631            BA   0.1293
632            PB     2.91
633            LS        0      93.8
634            UD    0.202
               *

635            KK   C57B-4
636            KM   COMBINE 57B-3 AND 57B-4
637            HC          2
               *

638            KK CC57B-4
639            KM   COMBINE RPIC-B, 57B-1, C57B-4, AND CDON4
640            HC          4
               *

641            ZZ
1
           SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

  54       ON1
            .
            .
  68        .      57B-3A
            .        .
            .        .
  74      CON1...........
            V
            V
  77      RCON1
            .
            .
  81        .      57B-3B
            .        .
            .        .          ON2
  87        .        .           .
            .        .           .
  93      CON2.......................
            .
            .
  96        .      57B-3D
            .        .
            .        .          ON3R
 102        .        .           .
            .        .           .
 108      CON3R......................
            .
```

```
111    .    ON5
       .     .
117    .     .     57B-3C
       .     .       .
123    .     .       .        ON6
       .     .       .         .
129    .     .     CON6.........
       .     .       .
132    .   CCON6.......
       .     V
       .     V
135    .   RCCON6
       .     .
139    .     .     ON8
       .     .      .
145    .   CON8......
       .     .
148    .     .     SW11
       .     .      V
       .     .      V
154    .     .     RSW11
       .     .      .
161    .     .      .         SW17
       .     .      .           .
167    .     .     CSW17..........
       .     .      V
       .     .      V
171    .     .     RCSW17
       .     .      .
178    .     .      .         SW18
       .     .      .           .
184    .     .     CSW18..........
       .     .      V
       .     .      V
188    .     .     RCSW18
       .     .      .
200    .     .      .         12A
       .     .      .          .
206    .     .     C12A..........
       .     .      V
       .     .      V
210    .     .     RC12A
       .     .      .
222    .     .      .         12B
       .     .      .          .
228    .     .     C12B..........
       .     .      .
232    .     .      .         57B-2A
       .     .      .           .
238    .     .      .           .        57B-3F
       .     .      .           .          .
244    .     .      .           .          .        57B-3E
       .     .      .           .          .          .
250    .     .      .           .          .          .        ON9
       .     .      .           .          .          .         .
256    .     .     CON9.....................................................
       .     .      V
       .     .      V
259    .     .     RCON9
       .     .      .
263    .     .      .         57B-3G
       .     .      .           .
269    .     .      .           .        57B-2B
       .     .      .           .          .
275    .     .      .           .          .        57B-2C
       .     .      .           .          .          .
281    .     .      .           .          .          .        ON10
       .     .      .           .          .          .          .
287    .     .     CON10.....................................................
       .     .      .
290    .   CCON10.......
       .     .
293    .     .     ON11R
       .     .       .
299    .   CON11R.......
       .     .
302    .     .     57B-2D
       .     .       .
308    .     .       .        57B-2E
       .     .       .          .
```

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314           .           .     C57B-2E............
              .           .           .
317           .           .           .     57B-2G1
              .           .           .           .
323           .           .           .           .        ON12
              .           .           .           .           .
329           .           .       CON12........................
              .           .           .
332           .           .           .     57B-2G2
              .           .           .           .
338           .           .           .           .        ON13
              .           .           .           .           .
344           .           .       CON13........................
              .           .           .
347           .           .           .      57B-2F
              .           .           .           .
353           .           .           .           .     57B-2H2
              .           .           .           .           .
359           .           .           .           .           .        ON14
              .           .           .           .           .           .
365           .           .           .       CON14........................
              .           .           .           V
              .           .           .           V
368           .           .           .      RCON14
              .           .           .           .
372           .           .           .           .      57B-2I
              .           .           .           .           .
378           .           .           .           .           .     57B-2H1
              .           .           .           .           .           .
384           .           .           .           .           .           .       ON15R
              .           .           .           .           .           .           .
390           .           .      CON15R................................................
              .           .           .
393           .           .           .       ON16R
              .           .           .           .
399           .           .      CON16R............
              .           .           .
402       CPPH1........................
              .
405           .        DON1
              .           .
411           .           .        DON2
              .           .           .
417       CDON2........................
              V
              V
420      RCDON2
              .
424           .       13B-1
              .           V
              .           V
430           .     RC13B-1
              .           .
435           .           .       13B-2
              .           .           .
441           .      C13B-2............
              .           V
              .           V
446           .     RC13B-2
              .           .
451           .           .         19A
              .           .           V
              .           .           V
457           .           .        R19A
              .           .           .
462           .           .           .       13A-1
              .           .           .           .
468           .           .      C13A-1............
              .           .           V
              .           .           V
473           .           .     RC13A-1
              .           .           .
483           .           .           .       13A-2
              .           .           .           .
489           .           .      C13A-2............
              .           .           V
              .           .           V
493           .           .     RC13A-2
              .           .           .
498           .           .           .       PIC-C
              .           .           .           .
504           .           .      CPIC-C............
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                  .           .     V
                  .           .     V
  508             .           .  RCPIC-C
                  .           .     .
                  .           .     .
  513             .           .     .       PIC-A
                  .           .     .         .
                  .           .     .         .
  519             .           .  CPIC-A...........
                  .           .     .
                  .           .     .
  523             .    CCPIC-A...........
                  .           .
                  .           .
  527             .           .    ON18R
                  .           .     .
                  .           .     .
  533             .     CON18R...........
                  .           .
                  .           .
  536             .           .  57B-1A
                  .           .     .
                  .           .     .
  542             .    CCON18R...........
                  .           V
                  .           V
  545             .   RCCON18R
                  .           .
                  .           .
  549             .           .  57B-1B
                  .           .     .
                  .           .     .
  555             .       CP19...........
                  .           .
                  .           .
  558             .           .  57B-1C
                  .           .     .
                  .           .     .
  564             .       CP20...........
                  .           .
                  .           .
  567             .           .     DON3
                  .           .     .
                  .           .     .
  573        CDON3.......................
                  V
                  V
  576       RCDON3
                  .
                  .
  580             .       DON4
                  .           .
                  .           .
  586             .           .  57B-4B
                  .           .     .
                  .           .     .
  592             .           .     .     57B-4C
                  .           .     .         .
                  .           .     .         .
  598             .           . C57B-4C...........
                  .           .     .
                  .           .     .
  601         CDON4.......................
                  .
                  .
  604             .      57B-1
                  .           .
                  .           .
  610             .           .    PIC-B
                  .           .     V
                  .           .     V
  616             .           .  RPIC-B
                  .           .     .
                  .           .     .
  623             .           .     .      57B-3
                  .           .     .         .
                  .           .     .         .
  629             .           .     .         .      57B-4
                  .           .     .         .         .
                  .           .     .         .         .
  635             .           .     .     C57B-4............
                  .           .     .         .
                  .           .     .         .
  638      CC57B-4...................................

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************                         ******************************************
 *                                       *                         *                                        *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                         *   U.S. ARMY CORPS OF ENGINEERS         *
 *             JUN   1998                *                         *   HYDROLOGIC ENGINEERING CENTER        *
 *            VERSION 4.1                *                         *         609 SECOND STREET              *
 *                                       *                         *      DAVIS, CALIFORNIA 95616           *
 *  RUN DATE   24FEB16  TIME  10:49:22   *                         *          (916) 756-1104                *
 *                                       *                         *                                        *
 *****************************************                         ******************************************

                  ****************************************************************
                  * ............................................................ *
                  * :                                                          : *
                  * :              THE SEVENTY                                 : *
                  * :              EHB COMPANIES                               : *
                  * :              PROPOSED CONDITIONS                         : *
                  * :..........................................................: *
                  * :              RETURN PERIOD_ _ _ _100 & 10 -YEAR           : *
                  * :              DISTRIBUTION_ _ _ _ 6-HOUR SDN3              : *
                  * :              PROJECT NO_ _ _ _ _ 840.050                  : *
                  * :              FILENAME_ _ _ _ _ _ PROPOSED.H1              : *
                  * :              DATE MODELED_ _ _ _ 2/22/16                  : *
```

```
* :                MODELED BY_ _ _ _ _ JAM, MMC, RRD, SHT          : *
* :.......................................................... : *
* :                                                            : *
* :.......................................................... : *
*****************************************************************
```

REFERENCED HYDROLOGIC MODELS:
2013 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE
CITY OF LAS VEGAS CITY WIDE HYDROLOGY ANALYSIS (PBS&J 1997)
CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT 2008 MASTER PLAN UPDATE
GOWAN WATERSHED (ALL)
RECOMMENDED DRAINAGE SYSTEM WITH ULTIMATE DEVELOPMENT
INPUT FILE = ALLGOW3.DAT
INPUT FILE DATE = MAY 5, 2008
DESIGN STORM = 100-YEAR 6-HR STORM
STORM DISTRIBUTION = SDN #3
MODELED BY PBS&J (MICHELE L. D'ALESSANDRO, E.I., CFM)
CHECKED BY PBS&J (HARSHAL B. DESAI, P.E., CFM)
STORM CENTERING = FULL WATERSHED
JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:

AREA SQ. MI.	DARF
0-0.5	0.99
0.5-1	0.975
1-2	0.95
2-3	0.925
3-4	0.915
4-5	0.908
5-6	0.903
6-7	0.895
10YR	0.570

JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)

100-YEAR, 6-HOUR STORM, SDN3

```
51 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        700  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE     3    0  ENDING DATE
                    NDTIME       1015  ENDING TIME
                     ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL      .08 HOURS
                     TOTAL TIME BASE    58.25 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
                  .99      .98      .95      .93      .92      .91      .90      .89      .57
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		RATIO 1 .99	RATIO 2 .98	RATIO 3 .95	RATIO 4 .93	RATIO 5 .92	RATIO 6 .91	RATIO 7 .90	RATIO 8 .89	RATIO 9 .57
HYDROGRAPH AT +	ON1	.04	1	FLOW	50.	49.	47.	45.	44.	43.	43.	42.	18.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	57B-3A	.03	1	FLOW	36.	35.	34.	32.	32.	31.	31.	31.	14.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT +	CON1	.07	1	FLOW	86.	84.	80.	77.	76.	75.	74.	73.	32.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO +	RCON1	.07	1	FLOW	86.	84.	80.	77.	76.	75.	74.	73.	30.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.83
HYDROGRAPH AT +	57B-3B	.05	1	FLOW	66.	65.	62.	59.	58.	58.	57.	56.	25.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	ON2	.03	1	FLOW	31.	30.	29.	28.	27.	27.	27.	26.	11.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT +	CON2	.14	1	FLOW	164.	160.	153.	145.	143.	141.	139.	137.	55.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.75
HYDROGRAPH AT +	57B-3D	.02	1	FLOW	26.	25.	24.	23.	23.	23.	23.	22.	11.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58

HYDROGRAPH AT +	ON3R	.01	1	FLOW	9.	9.	9.	8.	8.	8.	8.	8.	3.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
3 COMBINED AT +	CON3R	.17	1	FLOW	191.	187.	178.	170.	167.	165.	163.	161.	65.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.75
HYDROGRAPH AT +	ON5	.01	1	FLOW	18.	18.	17.	16.	16.	16.	16.	16.	7.
				TIME	3.50	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	57B-3C	.01	1	FLOW	11.	10.	10.	10.	9.	9.	9.	9.	4.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	ON6	.00	1	FLOW	8.	8.	8.	7.	7.	7.	7.	7.	4.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT +	CON6	.01	1	FLOW	18.	18.	17.	16.	16.	16.	16.	16.	8.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT +	CCON6	.03	1	FLOW	36.	36.	34.	33.	32.	32.	32.	31.	14.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
ROUTED TO +	RCCON6	.03	1	FLOW	34.	33.	32.	31.	30.	30.	30.	29.	14.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT +	ON8	.02	1	FLOW	27.	26.	25.	24.	23.	23.	23.	22.	9.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT +	CON8	.04	1	FLOW	54.	53.	50.	48.	47.	47.	46.	46.	19.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.67
HYDROGRAPH AT +	SW11	.59	1	FLOW	759.	743.	717.	691.	680.	673.	668.	660.	330.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO +	RSW11	.59	1	FLOW	754.	738.	712.	686.	676.	668.	663.	655.	325.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
HYDROGRAPH AT +	SW17	.36	1	FLOW	479.	469.	452.	436.	429.	424.	421.	416.	205.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT +	CSW17	.94	1	FLOW	1221.	1196.	1153.	1111.	1095.	1083.	1075.	1061.	530.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO +	RCSW17	.94	1	FLOW	1211.	1186.	1143.	1101.	1083.	1073.	1063.	1051.	521.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
HYDROGRAPH AT +	SW18	.41	1	FLOW	519.	507.	489.	470.	463.	457.	454.	448.	215.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.75
2 COMBINED AT +	CSW18	1.35	1	FLOW	1718.	1682.	1622.	1562.	1537.	1521.	1508.	1490.	736.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO +	RCSW18	1.35	1	FLOW	1610.	1576.	1520.	1464.	1441.	1426.	1414.	1397.	690.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT +	12A	.39	1	FLOW	576.	565.	547.	529.	521.	516.	513.	507.	272.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT +	C12A	1.74	1	FLOW	2046.	2003.	1932.	1861.	1832.	1813.	1798.	1776.	881.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
ROUTED TO +	RC12A	1.74	1	FLOW	2025.	1983.	1913.	1843.	1815.	1796.	1782.	1760.	880.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT +	12B	.26	1	FLOW	387.	380.	367.	355.	350.	347.	344.	340.	182.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT +	C12B	2.00	1	FLOW	2259.	2212.	2134.	2056.	2024.	2002.	1987.	1962.	990.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.92
HYDROGRAPH AT +	57B-2A	.01	1	FLOW	14.	14.	13.	13.	13.	13.	12.	12.	6.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	57B-3F	.01	1	FLOW	17.	17.	16.	16.	15.	15.	15.	15.	7.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT +	57B-3E	.03	1	FLOW	32.	31.	30.	29.	29.	28.	28.	28.	13.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT +	ON9	.04	1	FLOW	41.	40.	38.	36.	36.	35.	35.	34.	14.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
5 COMBINED AT +	CON9	2.09	1	FLOW	2330.	2281.	2200.	2120.	2087.	2064.	2048.	2023.	1012.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.92

ROUTED TO	RCON9	2.09	1	FLOW	2307.	2259.	2181.	2103.	2071.	2048.	2032.	2007.	1012.
+				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT	57B-3G	.00	1	FLOW	4.	4.	4.	4.	4.	4.	3.	3.	2.
+				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT	57B-2B	.00	1	FLOW	8.	7.	7.	7.	7.	7.	7.	7.	3.
+				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT	57B-2C	.00	1	FLOW	5.	5.	4.	4.	4.	4.	4.	4.	2.
+				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT	ON10	.02	1	FLOW	24.	23.	22.	21.	21.	21.	21.	20.	8.
+				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
5 COMBINED AT	CON10	2.12	1	FLOW	2314.	2266.	2188.	2110.	2077.	2055.	2039.	2014.	1015.
+				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
2 COMBINED AT	CCON10	2.16	1	FLOW	2335.	2286.	2208.	2128.	2096.	2073.	2057.	2032.	1025.
+				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT	ON11R	.01	1	FLOW	11.	11.	10.	10.	10.	9.	9.	9.	4.
+				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT	CON11R	2.17	1	FLOW	2337.	2288.	2209.	2130.	2098.	2075.	2059.	2033.	1026.
+				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT	57B-2D	.01	1	FLOW	16.	15.	15.	14.	14.	14.	14.	14.	7.
+				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT	57B-2E	.02	1	FLOW	42.	41.	40.	38.	38.	37.	37.	37.	19.
+				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT	C57B-2E	.03	1	FLOW	56.	55.	53.	52.	51.	50.	50.	49.	26.
+				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT	57B-2G1	.00	1	FLOW	5.	5.	5.	5.	5.	4.	4.	4.	2.
+				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT	ON12	.02	1	FLOW	23.	23.	22.	21.	20.	20.	20.	20.	8.
+				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT	CON12	.05	1	FLOW	83.	81.	78.	75.	74.	73.	73.	72.	36.
+				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.58
HYDROGRAPH AT	57B-2G2	.01	1	FLOW	12.	11.	11.	11.	10.	10.	10.	10.	5.
+				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT	ON13	.02	1	FLOW	23.	23.	22.	21.	21.	20.	20.	20.	8.
+				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT	CON13	.08	1	FLOW	118.	115.	111.	107.	105.	104.	103.	101.	49.
+				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.58
HYDROGRAPH AT	57B-2F	.09	1	FLOW	147.	145.	140.	135.	133.	132.	131.	129.	69.
+				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT	57B-2H2	.02	1	FLOW	21.	21.	20.	19.	19.	19.	19.	18.	9.
+				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT	ON14	.01	1	FLOW	6.	5.	5.	5.	5.	5.	5.	5.	2.
+				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.67
3 COMBINED AT	CON14	.11	1	FLOW	174.	171.	165.	159.	157.	155.	154.	152.	79.
+				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO	RCON14	.11	1	FLOW	166.	163.	158.	156.	153.	152.	151.	146.	79.
+				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT	57B-2I	.01	1	FLOW	12.	11.	11.	10.	10.	10.	10.	10.	5.
+				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT	57B-2H1	.03	1	FLOW	32.	31.	30.	29.	29.	28.	28.	28.	13.
+				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
HYDROGRAPH AT	ON15R	.03	1	FLOW	41.	40.	38.	36.	36.	35.	35.	34.	14.
+				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
5 COMBINED AT	CON15R	.26	1	FLOW	344.	337.	324.	312.	307.	304.	301.	297.	142.
+				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT	ON16R	.02	1	FLOW	23.	22.	21.	20.	20.	20.	19.	19.	8.
+				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50

+ 2 COMBINED AT	CON16R	.28	1	FLOW TIME	364. 3.58	356. 3.58	342. 3.58	330. 3.58	325. 3.58	321. 3.58	318. 3.58	313. 3.58	149. 3.58
+ 3 COMBINED AT	CPPH1	2.61	1	FLOW TIME	2692. 3.83	2635. 3.83	2543. 3.83	2450. 3.83	2412. 3.83	2386. 3.83	2366. 3.83	2337. 3.83	1153. 3.83
+ HYDROGRAPH AT	DON1	.02	1	FLOW TIME	34. 3.50	34. 3.50	33. 3.50	32. 3.50	31. 3.50	31. 3.50	31. 3.50	31. 3.50	18. 3.50
+ HYDROGRAPH AT	DON2	.03	1	FLOW TIME	60. 3.50	59. 3.50	57. 3.50	55. 3.50	55. 3.50	54. 3.50	54. 3.50	53. 3.50	31. 3.50
+ 3 COMBINED AT	CDON2	2.66	1	FLOW TIME	2720. 3.83	2663. 3.83	2570. 3.83	2476. 3.83	2438. 3.83	2412. 3.83	2392. 3.83	2363. 3.83	1169. 3.83
+ ROUTED TO	RCDON2	2.66	1	FLOW TIME	2712. 3.83	2655. 3.83	2561. 3.83	2467. 3.83	2429. 3.83	2404. 3.83	2383. 3.83	2353. 3.83	1163. 3.92
+ HYDROGRAPH AT	13B-1	.25	1	FLOW TIME	354. 3.67	347. 3.67	336. 3.67	325. 3.67	321. 3.67	318. 3.67	315. 3.67	312. 3.67	169. 3.75
+ ROUTED TO	RC13B-1	.25	1	FLOW TIME	354. 3.75	347. 3.75	336. 3.75	324. 3.75	320. 3.75	317. 3.75	314. 3.83	311. 3.83	171. 3.83
+ HYDROGRAPH AT	13B-2	.22	1	FLOW TIME	310. 3.67	304. 3.67	294. 3.67	283. 3.67	279. 3.67	277. 3.67	274. 3.67	271. 3.67	140. 3.67
+ 2 COMBINED AT	C13B-2	.47	1	FLOW TIME	634. 3.75	622. 3.75	602. 3.75	581. 3.75	573. 3.75	567. 3.75	563. 3.75	557. 3.75	294. 3.75
+ ROUTED TO	RC13B-2	.47	1	FLOW TIME	641. 3.83	628. 3.83	607. 3.83	586. 3.83	578. 3.83	572. 3.83	568. 3.83	561. 3.83	295. 3.92
+ HYDROGRAPH AT	19A	.25	1	FLOW TIME	318. 3.75	312. 3.75	301. 3.75	291. 3.75	287. 3.75	284. 3.75	282. 3.75	278. 3.75	144. 3.75
+ ROUTED TO	R19A	.25	1	FLOW TIME	319. 3.92	313. 3.92	302. 3.92	292. 3.92	288. 3.92	285. 3.92	283. 3.92	280. 3.92	146. 3.92
+ HYDROGRAPH AT	13A-1	.22	1	FLOW TIME	308. 3.75	303. 3.75	293. 3.75	283. 3.75	279. 3.75	277. 3.75	275. 3.75	272. 3.75	147. 3.75
+ 2 COMBINED AT	C13A-1	.48	1	FLOW TIME	595. 3.83	583. 3.83	564. 3.83	545. 3.83	537. 3.83	532. 3.83	528. 3.83	522. 3.83	273. 3.83
+ ROUTED TO	RC13A-1	.48	1	FLOW TIME	581. 3.92	569. 3.92	551. 3.92	532. 3.92	524. 3.92	519. 3.92	515. 3.92	509. 3.92	268. 3.92
+ HYDROGRAPH AT	13A-2	.19	1	FLOW TIME	272. 3.67	267. 3.67	258. 3.67	249. 3.67	246. 3.67	243. 3.67	241. 3.67	238. 3.67	124. 3.67
+ 2 COMBINED AT	C13A-2	.66	1	FLOW TIME	782. 3.83	766. 3.83	740. 3.83	715. 3.83	704. 3.83	697. 3.83	692. 3.83	684. 3.83	354. 3.83
+ ROUTED TO	RC13A-2	.66	1	FLOW TIME	781. 3.92	765. 3.92	738. 3.92	712. 3.92	702. 3.92	694. 3.92	689. 3.92	681. 3.92	354. 4.00
+ HYDROGRAPH AT	PIC-C	.24	1	FLOW TIME	280. 3.83	274. 3.83	265. 3.83	256. 3.83	252. 3.83	250. 3.83	248. 3.83	245. 3.83	129. 3.83
+ 2 COMBINED AT	CPIC-C	.91	1	FLOW TIME	1041. 3.92	1020. 3.92	985. 3.92	951. 3.92	937. 3.92	927. 3.92	920. 3.92	909. 3.92	462. 3.92
+ ROUTED TO	RCPIC-C	.91	1	FLOW TIME	1030. 3.92	1009. 3.92	975. 3.92	940. 3.92	922. 3.92	915. 3.92	908. 3.92	896. 3.92	461. 4.00
+ HYDROGRAPH AT	PIC-A	.36	1	FLOW TIME	356. 3.92	349. 3.92	338. 3.92	326. 3.92	322. 3.92	318. 3.92	316. 3.92	312. 3.92	165. 3.92
+ 2 COMBINED AT	CPIC-A	1.27	1	FLOW TIME	1386. 3.92	1359. 3.92	1313. 3.92	1266. 3.92	1243. 3.92	1233. 3.92	1224. 3.92	1208. 3.92	625. 4.00
+ 2 COMBINED AT	CCPIC-A	1.73	1	FLOW TIME	1997. 3.92	1959. 3.92	1895. 3.92	1830. 3.92	1800. 3.92	1785. 3.92	1772. 3.92	1750. 3.92	900. 4.00
+ HYDROGRAPH AT	ON18R	.03	1	FLOW TIME	28. 3.67	28. 3.67	27. 3.67	25. 3.67	25. 3.67	25. 3.67	24. 3.67	24. 3.67	10. 3.67
+ 2 COMBINED AT	CON18R	1.76	1	FLOW TIME	2013. 3.92	1975. 3.92	1910. 3.92	1844. 3.92	1814. 3.92	1799. 3.92	1786. 3.92	1763. 3.92	905. 4.00
+ HYDROGRAPH AT	57B-1A	.04	1	FLOW TIME	54. 3.58	53. 3.58	51. 3.58	48. 3.58	48. 3.58	47. 3.58	47. 3.58	46. 3.58	20. 3.58

+ 2 COMBINED AT	CCON18R	1.81	1	FLOW	2037.	1998.	1933.	1866.	1836.	1820.	1807.	1784.	913.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	4.00
+ ROUTED TO	RCCON18R	1.81	1	FLOW	2026.	1983.	1915.	1848.	1823.	1804.	1787.	1767.	913.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	4.00
+ HYDROGRAPH AT	57B-1B	.03	1	FLOW	51.	50.	49.	47.	47.	46.	46.	45.	25.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
+ 2 COMBINED AT	CP19	1.84	1	FLOW	2043.	1999.	1931.	1863.	1838.	1819.	1802.	1782.	920.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	4.00
+ HYDROGRAPH AT	57B-1C	.00	1	FLOW	2.	2.	2.	2.	2.	2.	2.	2.	1.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
+ 2 COMBINED AT	CP20	1.84	1	FLOW	2043.	2000.	1932.	1864.	1839.	1819.	1802.	1782.	920.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	4.00
+ HYDROGRAPH AT	DON3	.03	1	FLOW	65.	64.	62.	60.	59.	59.	58.	58.	34.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
+ 3 COMBINED AT	CDON3	4.53	1	FLOW	4694.	4597.	4440.	4283.	4221.	4177.	4141.	4092.	2057.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
+ ROUTED TO	RCDON3	4.53	1	FLOW	4670.	4572.	4412.	4253.	4186.	4135.	4103.	4063.	2046.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	4.00
+ HYDROGRAPH AT	DON4	.03	1	FLOW	44.	43.	42.	41.	40.	40.	40.	39.	23.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
+ HYDROGRAPH AT	57B-4B	.01	1	FLOW	24.	24.	23.	22.	22.	22.	22.	22.	13.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
+ HYDROGRAPH AT	57B-4C	.01	1	FLOW	23.	22.	22.	21.	21.	21.	21.	20.	12.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.58
+ 2 COMBINED AT	C57B-4C	.02	1	FLOW	47.	46.	45.	43.	43.	43.	42.	42.	25.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
+ 3 COMBINED AT	CDON4	4.58	1	FLOW	4700.	4602.	4441.	4281.	4214.	4162.	4130.	4089.	2059.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	4.00
+ HYDROGRAPH AT	57B-1	.05	1	FLOW	80.	79.	76.	74.	73.	72.	72.	71.	40.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
+ HYDROGRAPH AT	PIC-B	.44	1	FLOW	442.	433.	419.	405.	399.	395.	392.	388.	205.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
+ ROUTED TO	RPIC-B	.44	1	FLOW	439.	431.	416.	402.	396.	392.	390.	385.	202.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
+ HYDROGRAPH AT	57B-3	.05	1	FLOW	63.	62.	60.	58.	57.	56.	56.	55.	28.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
+ HYDROGRAPH AT	57B-4	.13	1	FLOW	202.	198.	192.	186.	184.	182.	181.	179.	101.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
+ 2 COMBINED AT	C57B-4	.18	1	FLOW	259.	254.	246.	238.	235.	233.	232.	229.	127.
				TIME	3.58	3.58	3.67	3.67	3.67	3.67	3.67	3.67	3.67
+ 4 COMBINED AT	CC57B-4	5.25	1	FLOW	5310.	5200.	5020.	4841.	4766.	4709.	4673.	4626.	2326.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	4.00

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SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	INTERPOLATED TO COMPUTATION INTERVAL PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR PLAN = 1 RATIO= RCON1	MANE	.00 5.00	85.62	225.00	1.50	5.00	85.62	225.00	1.50

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5242E+01 EXCESS= .0000E+00 OUTFLOW= .5262E+01 BASIN STORAGE= .6505E-02 PERCENT ERROR= -.5

FOR PLAN = 1 RATIO= RCON1	MANE	.00 5.00	83.65	225.00	1.47	5.00	83.65	225.00	1.47

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5111E+01 EXCESS= .0000E+00 OUTFLOW= .5131E+01 BASIN STORAGE= .6457E-02 PERCENT ERROR= -.5

FOR PLAN = 1 RATIO= RCON1	MANE	.00 5.00	80.35	225.00	1.40	5.00	80.35	225.00	1.40

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CONTINUITY SUMMARY (AC-FT) - INFLOW= .4894E+01 EXCESS= .0000E+00 OUTFLOW= .4914E+01 BASIN STORAGE= .6374E-02 PERCENT ERROR=   -.5

        FOR PLAN = 1  RATIO=  .00
          RCON1  MANE         5.00     77.02    225.00      1.34      5.00     77.02    225.00       1.34

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4680E+01 EXCESS= .0000E+00 OUTFLOW= .4699E+01 BASIN STORAGE= .6290E-02 PERCENT ERROR=   -.5

        FOR PLAN = 1  RATIO=  .00
          RCON1  MANE         5.00     75.69    225.00      1.32      5.00     75.69    225.00       1.32

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4594E+01 EXCESS= .0000E+00 OUTFLOW= .4613E+01 BASIN STORAGE= .6256E-02 PERCENT ERROR=   -.5

        FOR PLAN = 1  RATIO=  .00
          RCON1  MANE         5.00     74.75    225.00      1.30      5.00     74.75    225.00       1.30

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4535E+01 EXCESS= .0000E+00 OUTFLOW= .4553E+01 BASIN STORAGE= .6232E-02 PERCENT ERROR=   -.5

        FOR PLAN = 1  RATIO=  .00
          RCON1  MANE         5.00     74.08    225.00      1.29      5.00     74.08    225.00       1.29

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4492E+01 EXCESS= .0000E+00 OUTFLOW= .4511E+01 BASIN STORAGE= .6038E-02 PERCENT ERROR=   -.5

        FOR PLAN = 1  RATIO=  .00
          RCON1  MANE         5.00     73.00    225.00      1.27      5.00     73.00    225.00       1.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4425E+01 EXCESS= .0000E+00 OUTFLOW= .4442E+01 BASIN STORAGE= .6011E-02 PERCENT ERROR=   -.5

        FOR PLAN = 1  RATIO=  .00
          RCON1  MANE         4.00     31.17    228.00       .55      5.00     30.06    230.00        .54

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1896E+01 EXCESS= .0000E+00 OUTFLOW= .1909E+01 BASIN STORAGE= .5556E-02 PERCENT ERROR=  -1.0

        FOR PLAN = 1  RATIO=  .00
         RCCON6  MANE         4.25     34.85    216.75      1.61      5.00     33.88    220.00       1.61

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2157E+01 EXCESS= .0000E+00 OUTFLOW= .2162E+01 BASIN STORAGE= .2734E-02 PERCENT ERROR=   -.3

        FOR PLAN = 1  RATIO=  .00
         RCCON6  MANE         4.25     34.03    216.75      1.58      5.00     33.16    220.00       1.57

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2106E+01 EXCESS= .0000E+00 OUTFLOW= .2111E+01 BASIN STORAGE= .2708E-02 PERCENT ERROR=   -.3

        FOR PLAN = 1  RATIO=  .00
         RCCON6  MANE         4.25     32.67    216.75      1.51      5.00     31.96    220.00       1.51

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2022E+01 EXCESS= .0000E+00 OUTFLOW= .2026E+01 BASIN STORAGE= .2664E-02 PERCENT ERROR=   -.3

        FOR PLAN = 1  RATIO=  .00
         RCCON6  MANE         4.25     31.31    216.75      1.45      5.00     30.75    220.00       1.45

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1938E+01 EXCESS= .0000E+00 OUTFLOW= .1942E+01 BASIN STORAGE= .2619E-02 PERCENT ERROR=   -.4

        FOR PLAN = 1  RATIO=  .00
         RCCON6  MANE         4.25     30.77    216.75      1.43      5.00     30.27    220.00       1.42

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1905E+01 EXCESS= .0000E+00 OUTFLOW= .1909E+01 BASIN STORAGE= .2601E-02 PERCENT ERROR=   -.4

        FOR PLAN = 1  RATIO=  .00
         RCCON6  MANE         4.25     30.39    216.75      1.41      5.00     29.93    220.00       1.41

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1881E+01 EXCESS= .0000E+00 OUTFLOW= .1886E+01 BASIN STORAGE= .2588E-02 PERCENT ERROR=   -.4

        FOR PLAN = 1  RATIO=  .00
         RCCON6  MANE         4.25     30.11    216.75      1.40      5.00     29.69    220.00       1.39

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1865E+01 EXCESS= .0000E+00 OUTFLOW= .1869E+01 BASIN STORAGE= .2579E-02 PERCENT ERROR=   -.4

        FOR PLAN = 1  RATIO=  .00
         RCCON6  MANE         4.25     29.68    216.75      1.38      5.00     29.30    220.00       1.37

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1838E+01 EXCESS= .0000E+00 OUTFLOW= .1842E+01 BASIN STORAGE= .2564E-02 PERCENT ERROR=   -.4

        FOR PLAN = 1  RATIO=  .00
         RCCON6  MANE         3.75     14.36    221.25       .63      5.00     14.02    220.00        .63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8405E+00 EXCESS= .0000E+00 OUTFLOW= .8424E+00 BASIN STORAGE= .2039E-02 PERCENT ERROR=   -.5

        FOR PLAN = 1  RATIO=  .00
          RSW11  MANE         1.02    755.16    226.24      2.08      5.00    753.82    225.00       2.08
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .6522E+02 EXCESS= .0000E+00 OUTFLOW= .6522E+02 BASIN STORAGE= .1654E-02 PERCENT ERROR=     .0

        FOR PLAN = 1  RATIO=  .00
          RSW11  MANE          1.03    740.95    226.07     2.03     5.00    738.42    225.00     2.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6380E+02 EXCESS= .0000E+00 OUTFLOW= .6381E+02 BASIN STORAGE= .1696E-02 PERCENT ERROR=     .0

        FOR PLAN = 1  RATIO=  .00
          RSW11  MANE          1.05    714.15    226.19     1.96     5.00    712.14    225.00     1.96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6145E+02 EXCESS= .0000E+00 OUTFLOW= .6145E+02 BASIN STORAGE= .1622E-02 PERCENT ERROR=     .0

        FOR PLAN = 1  RATIO=  .00
          RSW11  MANE          1.06    686.99    226.38     1.88     5.00    685.95    225.00     1.88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5911E+02 EXCESS= .0000E+00 OUTFLOW= .5911E+02 BASIN STORAGE= .1763E-02 PERCENT ERROR=     .0

        FOR PLAN = 1  RATIO=  .00
          RSW11  MANE          1.07    677.33    225.62     1.85     5.00    675.73    225.00     1.85

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5818E+02 EXCESS= .0000E+00 OUTFLOW= .5818E+02 BASIN STORAGE= .1832E-02 PERCENT ERROR=     .0

        FOR PLAN = 1  RATIO=  .00
          RSW11  MANE          1.07    669.72    225.52     1.83     5.00    668.38    225.00     1.83

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5752E+02 EXCESS= .0000E+00 OUTFLOW= .5752E+02 BASIN STORAGE= .1613E-02 PERCENT ERROR=     .0

        FOR PLAN = 1  RATIO=  .00
          RSW11  MANE          1.08    665.29    226.22     1.82     5.00    663.31    225.00     1.82

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5706E+02 EXCESS= .0000E+00 OUTFLOW= .5706E+02 BASIN STORAGE= .1791E-02 PERCENT ERROR=     .0

        FOR PLAN = 1  RATIO=  .00
          RSW11  MANE          1.08    656.69    226.27     1.79     5.00    654.91    225.00     1.79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5631E+02 EXCESS= .0000E+00 OUTFLOW= .5632E+02 BASIN STORAGE= .1761E-02 PERCENT ERROR=     .0

        FOR PLAN = 1  RATIO=  .00
          RSW11  MANE          1.43    328.10    225.73      .88     5.00    324.89    225.00      .88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2754E+02 EXCESS= .0000E+00 OUTFLOW= .2754E+02 BASIN STORAGE= .1787E-02 PERCENT ERROR=     .0

        FOR PLAN = 1  RATIO=  .00
          RCSW17  MANE         1.65   1211.98    225.57     2.06     5.00   1210.68    225.00     2.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1040E+03 EXCESS= .0000E+00 OUTFLOW= .1040E+03 BASIN STORAGE= .3928E-02 PERCENT ERROR=     .0

        FOR PLAN = 1  RATIO=  .00
          RCSW17  MANE         1.66   1187.90    225.78     2.02     5.00   1185.71    225.00     2.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1018E+03 EXCESS= .0000E+00 OUTFLOW= .1018E+03 BASIN STORAGE= .3507E-02 PERCENT ERROR=     .0

        FOR PLAN = 1  RATIO=  .00
          RCSW17  MANE         1.68   1144.91    225.68     1.94     5.00   1143.40    225.00     1.94

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9799E+02 EXCESS= .0000E+00 OUTFLOW= .9800E+02 BASIN STORAGE= .3522E-02 PERCENT ERROR=     .0

        FOR PLAN = 1  RATIO=  .00
          RCSW17  MANE         1.71   1102.37    225.64     1.87     5.00   1101.22    225.00     1.87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9424E+02 EXCESS= .0000E+00 OUTFLOW= .9424E+02 BASIN STORAGE= .3477E-02 PERCENT ERROR=     .0

        FOR PLAN = 1  RATIO=  .00
          RCSW17  MANE         1.72   1087.77    227.00     1.84     5.00   1083.30    225.00     1.84

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9278E+02 EXCESS= .0000E+00 OUTFLOW= .9279E+02 BASIN STORAGE= .3927E-02 PERCENT ERROR=     .0

        FOR PLAN = 1  RATIO=  .00
          RCSW17  MANE         1.73   1077.08    226.26     1.82     5.00   1072.79    225.00     1.82

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9172E+02 EXCESS= .0000E+00 OUTFLOW= .9173E+02 BASIN STORAGE= .3817E-02 PERCENT ERROR=     .0

        FOR PLAN = 1  RATIO=  .00
          RCSW17  MANE         1.73   1069.06    226.95     1.81     5.00   1062.80    225.00     1.81

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9100E+02 EXCESS= .0000E+00 OUTFLOW= .9101E+02 BASIN STORAGE= .3937E-02 PERCENT ERROR=     .0

        FOR PLAN = 1  RATIO=  .00
          RCSW17  MANE         1.74   1055.75    226.36     1.78     5.00   1050.97    225.00     1.78
```

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8979E+02 EXCESS= .0000E+00 OUTFLOW= .8980E+02 BASIN STORAGE= .3511E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCSW17 MANE 2.30 524.06 227.64 .87 5.00 520.91 225.00 .87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4386E+02 EXCESS= .0000E+00 OUTFLOW= .4387E+02 BASIN STORAGE= .3897E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON9 MANE 1.67 2325.51 231.44 2.07 5.00 2306.80 235.00 2.07

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2301E+03 EXCESS= .0000E+00 OUTFLOW= .2301E+03 BASIN STORAGE= .3123E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON9 MANE 1.68 2279.65 231.56 2.02 5.00 2258.94 235.00 2.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2252E+03 EXCESS= .0000E+00 OUTFLOW= .2252E+03 BASIN STORAGE= .2858E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON9 MANE 1.70 2197.90 232.94 1.95 5.00 2181.01 235.00 1.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2170E+03 EXCESS= .0000E+00 OUTFLOW= .2170E+03 BASIN STORAGE= .2984E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON9 MANE 1.72 2118.94 232.70 1.87 5.00 2102.63 235.00 1.88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2088E+03 EXCESS= .0000E+00 OUTFLOW= .2088E+03 BASIN STORAGE= .3195E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON9 MANE 1.73 2088.03 232.28 1.85 5.00 2070.54 235.00 1.85

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2056E+03 EXCESS= .0000E+00 OUTFLOW= .2056E+03 BASIN STORAGE= .2784E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON9 MANE 1.74 2062.77 233.22 1.83 5.00 2047.86 235.00 1.83

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2033E+03 EXCESS= .0000E+00 OUTFLOW= .2033E+03 BASIN STORAGE= .2736E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON9 MANE 1.75 2050.03 232.14 1.81 5.00 2032.41 235.00 1.81

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2017E+03 EXCESS= .0000E+00 OUTFLOW= .2017E+03 BASIN STORAGE= .2832E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON9 MANE 1.75 2021.32 233.22 1.79 5.00 2006.95 235.00 1.79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1991E+03 EXCESS= .0000E+00 OUTFLOW= .1991E+03 BASIN STORAGE= .2680E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON9 MANE 2.26 1012.15 235.03 .89 5.00 1012.06 235.00 .89

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9869E+02 EXCESS= .0000E+00 OUTFLOW= .9869E+02 BASIN STORAGE= .3005E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCON14 MANE 4.25 167.38 221.00 1.99 5.00 166.33 220.00 1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1179E+02 EXCESS= .0000E+00 OUTFLOW= .1181E+02 BASIN STORAGE= .2635E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
RCON14 MANE 4.25 164.16 221.00 1.95 5.00 163.07 220.00 1.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1155E+02 EXCESS= .0000E+00 OUTFLOW= .1156E+02 BASIN STORAGE= .2609E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
RCON14 MANE 4.25 158.77 221.00 1.88 5.00 157.63 220.00 1.88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1114E+02 EXCESS= .0000E+00 OUTFLOW= .1115E+02 BASIN STORAGE= .2565E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
RCON14 MANE 4.00 155.50 220.00 1.81 5.00 155.50 220.00 1.81

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1074E+02 EXCESS= .0000E+00 OUTFLOW= .1075E+02 BASIN STORAGE= .2457E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
RCON14 MANE 4.00 153.27 220.00 1.78 5.00 153.27 220.00 1.79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1057E+02 EXCESS= .0000E+00 OUTFLOW= .1059E+02 BASIN STORAGE= .2440E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
RCON14 MANE 4.00 151.72 220.00 1.77 5.00 151.72 220.00 1.77

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CONTINUITY SUMMARY (AC-FT) - INFLOW= .1046E+02 EXCESS= .0000E+00 OUTFLOW= .1047E+02 BASIN STORAGE= .2427E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RCON14  MANE          4.00    150.60    220.00      1.75      5.00    150.60    220.00      1.75

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1038E+02 EXCESS= .0000E+00 OUTFLOW= .1039E+02 BASIN STORAGE= .2418E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RCON14  MANE          4.25    146.92    221.00      1.73      5.00    145.67    220.00      1.73

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1024E+02 EXCESS= .0000E+00 OUTFLOW= .1025E+02 BASIN STORAGE= .2466E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RCON14  MANE          5.00     78.65    220.00       .88      5.00     78.65    220.00       .88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5186E+01 EXCESS= .0000E+00 OUTFLOW= .5194E+01 BASIN STORAGE= .2404E-02 PERCENT ERROR=   -.2

          FOR PLAN = 1  RATIO=  .00
           RCDON2  MANE           .81   2715.41    230.47      1.99      5.00   2711.59    230.00      1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2819E+03 EXCESS= .0000E+00 OUTFLOW= .2819E+03 BASIN STORAGE= .2945E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RCDON2  MANE           .81   2659.57    230.89      1.94      5.00   2655.45    230.00      1.94

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2758E+03 EXCESS= .0000E+00 OUTFLOW= .2758E+03 BASIN STORAGE= .3285E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RCDON2  MANE           .82   2565.17    230.51      1.87      5.00   2560.89    230.00      1.87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2656E+03 EXCESS= .0000E+00 OUTFLOW= .2656E+03 BASIN STORAGE= .3058E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RCDON2  MANE           .83   2471.39    231.01      1.80      5.00   2467.47    230.00      1.80

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2556E+03 EXCESS= .0000E+00 OUTFLOW= .2556E+03 BASIN STORAGE= .2937E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RCDON2  MANE           .83   2432.44    231.09      1.77      5.00   2428.86    230.00      1.77

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2516E+03 EXCESS= .0000E+00 OUTFLOW= .2516E+03 BASIN STORAGE= .2918E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RCDON2  MANE           .83   2408.58    230.88      1.75      5.00   2403.63    230.00      1.75

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2487E+03 EXCESS= .0000E+00 OUTFLOW= .2487E+03 BASIN STORAGE= .3212E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RCDON2  MANE           .84   2387.66    230.52      1.74      5.00   2382.98    230.00      1.74

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2467E+03 EXCESS= .0000E+00 OUTFLOW= .2467E+03 BASIN STORAGE= .2967E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RCDON2  MANE           .84   2357.46    230.40      1.72      5.00   2353.39    230.00      1.72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2435E+03 EXCESS= .0000E+00 OUTFLOW= .2435E+03 BASIN STORAGE= .3233E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RCDON2  MANE          1.00   1168.71    231.97       .84      5.00   1162.81    235.00       .84

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1196E+03 EXCESS= .0000E+00 OUTFLOW= .1196E+03 BASIN STORAGE= .3200E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RC13B-1  MANE         5.00    353.60    225.00      2.27      5.00    353.60    225.00      2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3020E+02 EXCESS= .0000E+00 OUTFLOW= .3021E+02 BASIN STORAGE= .1566E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-1  MANE         5.00    346.83    225.00      2.23      5.00    346.83    225.00      2.23

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2960E+02 EXCESS= .0000E+00 OUTFLOW= .2961E+02 BASIN STORAGE= .1548E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-1  MANE         5.00    335.54    225.00      2.15      5.00    335.54    225.00      2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2860E+02 EXCESS= .0000E+00 OUTFLOW= .2861E+02 BASIN STORAGE= .1518E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-1  MANE         5.00    324.25    225.00      2.08      5.00    324.25    225.00      2.08
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .2760E+02 EXCESS= .0000E+00 OUTFLOW= .2762E+02 BASIN STORAGE= .1489E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-1  MANE          5.00    319.73    225.00      2.05     5.00    319.73    225.00      2.05

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2721E+02 EXCESS= .0000E+00 OUTFLOW= .2722E+02 BASIN STORAGE= .1476E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-1  MANE          5.00    316.57    225.00      2.03     5.00    316.57    225.00      2.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2693E+02 EXCESS= .0000E+00 OUTFLOW= .2694E+02 BASIN STORAGE= .1468E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-1  MANE          5.00    314.32    230.00      2.01     5.00    314.32    230.00      2.01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2673E+02 EXCESS= .0000E+00 OUTFLOW= .2675E+02 BASIN STORAGE= .1462E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-1  MANE          5.00    310.89    230.00      1.99     5.00    310.89    230.00      1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2641E+02 EXCESS= .0000E+00 OUTFLOW= .2643E+02 BASIN STORAGE= .1452E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-1  MANE          5.00    171.06    230.00      1.05     5.00    171.06    230.00      1.05

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1391E+02 EXCESS= .0000E+00 OUTFLOW= .1392E+02 BASIN STORAGE= .1716E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE          5.00    640.80    230.00      2.18     5.00    640.80    230.00      2.18

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5392E+02 EXCESS= .0000E+00 OUTFLOW= .5398E+02 BASIN STORAGE= .5817E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE          5.00    628.20    230.00      2.13     5.00    628.20    230.00      2.13

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5282E+02 EXCESS= .0000E+00 OUTFLOW= .5288E+02 BASIN STORAGE= .5767E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE          5.00    607.17    230.00      2.06     5.00    607.17    230.00      2.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5100E+02 EXCESS= .0000E+00 OUTFLOW= .5105E+02 BASIN STORAGE= .5683E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE          5.00    586.10    230.00      1.99     5.00    586.10    230.00      1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4918E+02 EXCESS= .0000E+00 OUTFLOW= .4923E+02 BASIN STORAGE= .5597E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE          5.00    578.31    230.00      1.96     5.00    578.31    230.00      1.96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4845E+02 EXCESS= .0000E+00 OUTFLOW= .4850E+02 BASIN STORAGE= .7165E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE          5.00    572.39    230.00      1.94     5.00    572.39    230.00      1.94

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4794E+02 EXCESS= .0000E+00 OUTFLOW= .4799E+02 BASIN STORAGE= .7136E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE          5.00    568.15    230.00      1.92     5.00    568.15    230.00      1.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4758E+02 EXCESS= .0000E+00 OUTFLOW= .4763E+02 BASIN STORAGE= .7115E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE          5.00    561.38    230.00      1.90     5.00    561.38    230.00      1.90

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4700E+02 EXCESS= .0000E+00 OUTFLOW= .4705E+02 BASIN STORAGE= .6748E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
           RC13B-2  MANE          5.00    295.27    235.00       .98     5.00    295.27    235.00       .98

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2427E+02 EXCESS= .0000E+00 OUTFLOW= .2430E+02 BASIN STORAGE= .7210E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R19A  MANE          5.00    318.89    235.00      2.18     5.00    318.89    235.00      2.18

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2936E+02 EXCESS= .0000E+00 OUTFLOW= .2938E+02 BASIN STORAGE= .2006E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R19A  MANE          5.00    312.72    235.00      2.13     5.00    312.72    235.00      2.13
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .2875E+02 EXCESS= .0000E+00 OUTFLOW= .2877E+02 BASIN STORAGE= .1983E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
R19A MANE 5.00 302.45 235.00 2.06 5.00 302.45 235.00 2.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2774E+02 EXCESS= .0000E+00 OUTFLOW= .2776E+02 BASIN STORAGE= .1945E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
R19A MANE 5.00 292.17 235.00 1.98 5.00 292.17 235.00 1.98

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2673E+02 EXCESS= .0000E+00 OUTFLOW= .2675E+02 BASIN STORAGE= .1906E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
R19A MANE 5.00 288.05 235.00 1.95 5.00 288.05 235.00 1.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2633E+02 EXCESS= .0000E+00 OUTFLOW= .2635E+02 BASIN STORAGE= .1891E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
R19A MANE 5.00 285.17 235.00 1.93 5.00 285.17 235.00 1.93

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2605E+02 EXCESS= .0000E+00 OUTFLOW= .2606E+02 BASIN STORAGE= .1880E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
R19A MANE 5.00 283.11 235.00 1.92 5.00 283.11 235.00 1.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2585E+02 EXCESS= .0000E+00 OUTFLOW= .2586E+02 BASIN STORAGE= .1872E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
R19A MANE 5.00 279.82 235.00 1.89 5.00 279.82 235.00 1.89

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2553E+02 EXCESS= .0000E+00 OUTFLOW= .2554E+02 BASIN STORAGE= .1860E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
R19A MANE 5.00 146.43 235.00 .96 5.00 146.43 235.00 .96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1300E+02 EXCESS= .0000E+00 OUTFLOW= .1300E+02 BASIN STORAGE= .2023E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
RC13A-2 MANE 5.00 780.51 235.00 2.18 5.00 780.51 235.00 2.18

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7731E+02 EXCESS= .0000E+00 OUTFLOW= .7736E+02 BASIN STORAGE= .8795E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
RC13A-2 MANE 5.00 764.75 235.00 2.14 5.00 764.75 235.00 2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7572E+02 EXCESS= .0000E+00 OUTFLOW= .7577E+02 BASIN STORAGE= .8721E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
RC13A-2 MANE 5.00 738.48 235.00 2.06 5.00 738.48 235.00 2.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7309E+02 EXCESS= .0000E+00 OUTFLOW= .7314E+02 BASIN STORAGE= .8303E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
RC13A-2 MANE 5.00 712.20 235.00 1.99 5.00 712.20 235.00 1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7047E+02 EXCESS= .0000E+00 OUTFLOW= .7051E+02 BASIN STORAGE= .8180E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
RC13A-2 MANE 5.00 701.68 235.00 1.96 5.00 701.68 235.00 1.96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6942E+02 EXCESS= .0000E+00 OUTFLOW= .6947E+02 BASIN STORAGE= .8130E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
RC13A-2 MANE 5.00 694.32 235.00 1.94 5.00 694.32 235.00 1.94

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6869E+02 EXCESS= .0000E+00 OUTFLOW= .6873E+02 BASIN STORAGE= .8095E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
RC13A-2 MANE 5.00 689.06 235.00 1.92 5.00 689.06 235.00 1.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6817E+02 EXCESS= .0000E+00 OUTFLOW= .6821E+02 BASIN STORAGE= .7878E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
RC13A-2 MANE 5.00 680.64 235.00 1.90 5.00 680.64 235.00 1.90

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6733E+02 EXCESS= .0000E+00 OUTFLOW= .6738E+02 BASIN STORAGE= .7838E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00
RC13A-2 MANE 5.00 353.55 240.00 .98 5.00 353.55 240.00 .98

```
CONTINUITY SUMMARY (AC-FT) - INFLOW= .3459E+02 EXCESS= .0000E+00 OUTFLOW= .3462E+02 BASIN STORAGE= .6811E-02 PERCENT ERROR=   -.1

           FOR PLAN = 1  RATIO=  .00
            RCPIC-C  MANE        2.90   1036.21    237.50      2.15      5.00   1029.58    235.00       2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1041E+03 EXCESS= .0000E+00 OUTFLOW= .1041E+03 BASIN STORAGE= .2599E-02 PERCENT ERROR=    .0

           FOR PLAN = 1  RATIO=  .00
            RCPIC-C  MANE        2.92   1018.48    236.21      2.11      5.00   1009.34    235.00       2.11

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1020E+03 EXCESS= .0000E+00 OUTFLOW= .1020E+03 BASIN STORAGE= .2441E-02 PERCENT ERROR=    .0

           FOR PLAN = 1  RATIO=  .00
            RCPIC-C  MANE        2.95    983.10    236.05      2.03      5.00    975.10    235.00       2.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9842E+02 EXCESS= .0000E+00 OUTFLOW= .9843E+02 BASIN STORAGE= .3029E-02 PERCENT ERROR=    .0

           FOR PLAN = 1  RATIO=  .00
            RCPIC-C  MANE        2.99    947.55    235.94      1.96      5.00    940.20    235.00       1.96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9487E+02 EXCESS= .0000E+00 OUTFLOW= .9488E+02 BASIN STORAGE= .2774E-02 PERCENT ERROR=    .0

           FOR PLAN = 1  RATIO=  .00
            RCPIC-C  MANE        3.00    935.30    237.12      1.93      5.00    921.65    235.00       1.93

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9346E+02 EXCESS= .0000E+00 OUTFLOW= .9347E+02 BASIN STORAGE= .2840E-02 PERCENT ERROR=    .0

           FOR PLAN = 1  RATIO=  .00
            RCPIC-C  MANE        3.01    923.69    237.96      1.91      5.00    914.93    235.00       1.91

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9247E+02 EXCESS= .0000E+00 OUTFLOW= .9248E+02 BASIN STORAGE= .2450E-02 PERCENT ERROR=    .0

           FOR PLAN = 1  RATIO=  .00
            RCPIC-C  MANE        3.02    912.75    235.55      1.90      5.00    907.94    235.00       1.89

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9176E+02 EXCESS= .0000E+00 OUTFLOW= .9177E+02 BASIN STORAGE= .2737E-02 PERCENT ERROR=    .0

           FOR PLAN = 1  RATIO=  .00
            RCPIC-C  MANE        3.03    906.65    236.52      1.87      5.00    895.54    235.00       1.87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9064E+02 EXCESS= .0000E+00 OUTFLOW= .9064E+02 BASIN STORAGE= .3045E-02 PERCENT ERROR=    .0

           FOR PLAN = 1  RATIO=  .00
            RCPIC-C  MANE        3.82    462.80    240.43       .96      5.00    461.30    240.00        .96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4647E+02 EXCESS= .0000E+00 OUTFLOW= .4648E+02 BASIN STORAGE= .2735E-02 PERCENT ERROR=    .0

           FOR PLAN = 1  RATIO=  .00
           RCCON18R  MANE        2.10   2025.98    234.81      2.11      5.00   2025.84    235.00       2.11

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2035E+03 EXCESS= .0000E+00 OUTFLOW= .2035E+03 BASIN STORAGE= .9016E-03 PERCENT ERROR=    .0

           FOR PLAN = 1  RATIO=  .00
           RCCON18R  MANE        2.11   1985.99    233.85      2.07      5.00   1982.70    235.00       2.07

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1994E+03 EXCESS= .0000E+00 OUTFLOW= .1994E+03 BASIN STORAGE= .8716E-03 PERCENT ERROR=    .0

           FOR PLAN = 1  RATIO=  .00
           RCCON18R  MANE        2.12   1916.18    233.69      2.00      5.00   1915.28    235.00       2.00

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1924E+03 EXCESS= .0000E+00 OUTFLOW= .1924E+03 BASIN STORAGE= .7622E-03 PERCENT ERROR=    .0

           FOR PLAN = 1  RATIO=  .00
           RCCON18R  MANE        2.14   1850.58    237.90      1.93      5.00   1847.74    235.00       1.93

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1855E+03 EXCESS= .0000E+00 OUTFLOW= .1855E+03 BASIN STORAGE= .7102E-03 PERCENT ERROR=    .0

           FOR PLAN = 1  RATIO=  .00
           RCCON18R  MANE        2.15   1823.83    234.59      1.90      5.00   1823.05    235.00       1.90

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1827E+03 EXCESS= .0000E+00 OUTFLOW= .1827E+03 BASIN STORAGE= .9152E-03 PERCENT ERROR=    .0

           FOR PLAN = 1  RATIO=  .00
           RCCON18R  MANE        2.16   1809.04    237.24      1.88      5.00   1803.87    235.00       1.88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1807E+03 EXCESS= .0000E+00 OUTFLOW= .1807E+03 BASIN STORAGE= .8510E-03 PERCENT ERROR=    .0

           FOR PLAN = 1  RATIO=  .00
           RCCON18R  MANE        2.16   1793.44    237.68      1.86      5.00   1786.79    235.00       1.86
```

```
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1794E+03 EXCESS= .0000E+00 OUTFLOW= .1794E+03 BASIN STORAGE= .9037E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCCON18R  MANE        2.17   1768.17    234.09       1.84      5.00   1766.93    235.00       1.84

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1772E+03 EXCESS= .0000E+00 OUTFLOW= .1772E+03 BASIN STORAGE= .7374E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCCON18R  MANE        2.57    914.14    241.11        .94      5.00    913.08    240.00        .94

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9071E+02 EXCESS= .0000E+00 OUTFLOW= .9071E+02 BASIN STORAGE= .7244E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON3  MANE        2.99   4683.42    236.06       2.04      5.00   4670.40    235.00       2.04

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4932E+03 EXCESS= .0000E+00 OUTFLOW= .4932E+03 BASIN STORAGE= .1358E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON3  MANE        3.00   4574.67    237.31       2.00      5.00   4572.21    235.00       2.00

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4827E+03 EXCESS= .0000E+00 OUTFLOW= .4826E+03 BASIN STORAGE= .1409E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON3  MANE        3.03   4426.78    236.38       1.93      5.00   4412.02    235.00       1.93

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4654E+03 EXCESS= .0000E+00 OUTFLOW= .4653E+03 BASIN STORAGE= .1506E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON3  MANE        3.06   4264.36    235.48       1.85      5.00   4253.14    235.00       1.85

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4481E+03 EXCESS= .0000E+00 OUTFLOW= .4481E+03 BASIN STORAGE= .1258E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON3  MANE        3.07   4204.50    236.34       1.83      5.00   4186.33    235.00       1.83

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4412E+03 EXCESS= .0000E+00 OUTFLOW= .4412E+03 BASIN STORAGE= .1350E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON3  MANE        3.08   4155.53    236.97       1.81      5.00   4135.11    235.00       1.81

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4364E+03 EXCESS= .0000E+00 OUTFLOW= .4364E+03 BASIN STORAGE= .1751E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON3  MANE        3.08   4118.34    237.49       1.79      5.00   4102.70    235.00       1.79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4330E+03 EXCESS= .0000E+00 OUTFLOW= .4329E+03 BASIN STORAGE= .1394E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON3  MANE        3.09   4065.99    235.11       1.77      5.00   4062.61    235.00       1.77

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4274E+03 EXCESS= .0000E+00 OUTFLOW= .4274E+03 BASIN STORAGE= .1741E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCDON3  MANE        3.68   2050.84    239.21        .89      5.00   2046.31    240.00        .89

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2140E+03 EXCESS= .0000E+00 OUTFLOW= .2140E+03 BASIN STORAGE= .1324E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RPIC-B  MANE        1.74    439.87    237.27       2.03      5.00    439.01    235.00       2.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4783E+02 EXCESS= .0000E+00 OUTFLOW= .4783E+02 BASIN STORAGE= .2578E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RPIC-B  MANE        1.75    432.13    236.45       1.99      5.00    430.53    235.00       1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4685E+02 EXCESS= .0000E+00 OUTFLOW= .4685E+02 BASIN STORAGE= .2499E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RPIC-B  MANE        1.76    417.58    236.27       1.92      5.00    416.38    235.00       1.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4522E+02 EXCESS= .0000E+00 OUTFLOW= .4522E+02 BASIN STORAGE= .2493E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RPIC-B  MANE        1.78    403.10    236.14       1.85      5.00    402.16    235.00       1.85

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4360E+02 EXCESS= .0000E+00 OUTFLOW= .4360E+02 BASIN STORAGE= .2464E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RPIC-B  MANE        1.78    398.34    236.81       1.83      5.00    396.16    235.00       1.83
```

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4296E+02 EXCESS= .0000E+00 OUTFLOW= .4296E+02 BASIN STORAGE= .2533E-03 PERCENT ERROR= .0

```
FOR PLAN = 1  RATIO=  .00
 RPIC-B  MANE          1.78    393.51    237.29     1.81     5.00    392.22    235.00     1.81
```

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4251E+02 EXCESS= .0000E+00 OUTFLOW= .4250E+02 BASIN STORAGE= .2248E-03 PERCENT ERROR= .0

```
FOR PLAN = 1  RATIO=  .00
 RPIC-B  MANE          1.79    390.10    235.85     1.79     5.00    389.58    235.00     1.79
```

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4218E+02 EXCESS= .0000E+00 OUTFLOW= .4218E+02 BASIN STORAGE= .2523E-03 PERCENT ERROR= .0

```
FOR PLAN = 1  RATIO=  .00
 RPIC-B  MANE          1.79    386.39    236.40     1.77     5.00    385.05    235.00     1.77
```

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4167E+02 EXCESS= .0000E+00 OUTFLOW= .4167E+02 BASIN STORAGE= .2662E-03 PERCENT ERROR= .0

```
FOR PLAN = 1  RATIO=  .00
 RPIC-B  MANE          2.03    203.87    238.08      .91     5.00    202.47    235.00      .91
```

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2143E+02 EXCESS= .0000E+00 OUTFLOW= .2143E+02 BASIN STORAGE= .2507E-03 PERCENT ERROR= .0

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

GRAPHIC SCALE

(IN FEET)
1 inch = 300 ft.

NORTH

LEGEND

#1 REFERENCED STUDY NO.

SUMMARY OF REFERENCED STUDIES	
REFERENCE STUDY NO.	PROJECT TITLE
#1	TECHNICAL DRAINAGE STUDY FOR PECCOLE RANCH GOLF COURSE (PHASE II) (DS 1347)
#2	TECHNICAL DRAINAGE STUDY FOR PECCOLE WEST COMMERCIAL CENTER (DS 2364)
#3	TECHNICAL DRAINAGE STUDY FOR RAMPART BOULEVARD (DS 2696)
#4	TECHNICAL DRAINAGE STUDY UPDATE FOR PECCOLE RANCH GOLF COURSE MAINTENANCE YARD (DS 1626)
#5	HYDROLOGY STUDY UPDATE FOR QUEENSRIDGE FAIRWAY HOMES (DS 2307)
#6	TECHNICAL DRAINAGE STUDY PECCOLE WEST LOT 9 (PHASE II) (DS 1630)
#7	TECHNICAL DRAINAGE STUDY FOR PECCOLE WEST LOT 12 (DS 1650)
#8	TECHNICAL DRAINAGE STUDY FOR VILLAGE 12 HUALAPAI WAY IMPROVEMENTS (DS 1853)
#9	TECHNICAL DRAINAGE STUDY FOR HUALAPAI WAY ROUGH GRADING, ALTA DRIVE TO CHARLESTON BOULEVARD (DS 1758)
#10	TECHNICAL DRAINAGE STUDY FOR PECCOLE WEST LOT 11 (DS 1753)
#11	TECHNICAL DRAINAGE STUDY FOR PECCOLE RANCH PARCEL 19 & 20 (DS 2172)
#12	TECHNICAL DRAINAGE STUDY FOR SAN MICHELLE WEST (DS 2226)
#13	TECHNICAL DRAINAGE STUDY FOR PECCOLE – LOT 10 PARCEL 18 (DS 2203)
#14	TECHNICAL DRAINAGE STUDY FOR WINDSOR AT QUEENSRIDGE (DS 3279)
#15	TECHNICAL DRAINAGE STUDY FOR CLUB HOUSE (DS 1555)
#16	TECHNICAL DRAINAGE STUDY FOR THE VERSAILLES (DS 2236)
#17	MASTER DRAINAGE STUDY FOR PECCOLE RANCH – PHASE II (DS 1140)
#18	TECHNICAL DRAINAGE STUDY FOR BADLANDS HOLE 9 (DS 1974)
#19	TECHNICAL DRAINAGE STUDY FOR PECCOLE WEST BUSINESS CENTER (DS 1856)
#20	TECHNICAL DRAINAGE STUDY FOR PECCOLE WEST LOT 12 (PARK AREA) (DS 1929)
#21	TECHNICAL DRAINAGE STUDY FOR ONE QUEENSRIDGE PLACE (CONDO TOWERS) – UPDATE 2 (DS 3746)
#22	TECHNICAL DRAINAGE STUDY FOR APPLE DRIVE AT PECCOLE RANCH (DS 1576)
#23	TECHNICAL DRAINAGE STUDY FOR ALTA DRIVE AT PECCOLE RANCH (DS 1588)
#24	TECHNICAL DRAINAGE STUDY FOR PECCOLE RANCH PHASE II MASTER PLAN (DS 273)
#25	CONCEPTUAL DRAINAGE STUDY FOR PECCOLE RANCH PHASE II MASTER PLAN (DS 1273)

SEVENTY ACRES LLC, FORE STARS LTD, AND 180 LAND CO LLC

THE SEVENTY

REFERENCED STUDIES

GCW ENGINEERS \ SURVEYORS

1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

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APPENDIX B

Hydraulic Calculations and Information

TRAPEZOIDAL CHANNEL

Section A

Flow "Q"	44	cfs
Manning's "n"	0.025	
Slope (%)	0.65	
Bottom Width	24.0	ft
Side Slope (Lt)	9.5	H:1V
Side Slope (Rt)	5.0	H:1V
Radius	0.0	ft

OUTPUT:

Velocity	2.91	ft/sec
Depth	0.54	ft
Freeboard	0.63	ft
Total Depth	1.17	ft
Froude No.	0.75	ft
Superelevation	0.00	ft

Normal depth calculations using Manning's equation

Fb = 1+0.025Vd^(1/3) Supercritical; 0.5+V^2/2g Subcritical

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TRAPEZOIDAL CHANNEL

Section B

Flow "Q"	44	cfs
Manning's "n"	0.025	
Slope (%)	1.20	
Bottom Width	42.0	ft
Side Slope (Lt)	9.0	H:1V
Side Slope (Rt)	9.0	H:1V
Radius	0.0	ft

OUTPUT:

Velocity	2.97	ft/sec
Depth	0.33	ft
Freeboard	0.64	ft
Total Depth	0.97	ft
Froude No.	0.94	ft
Superelevation	0.00	ft

Normal depth calculations using Manning's equation

Fb = 1+0.025Vd^(1/3) Supercritical; 0.5+V^2/2g Subcritical

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TRAPEZOIDAL CHANNEL

Section C

Flow "Q"	59	cfs
Manning's "n"	0.040	
Slope (%)	5.85	
Bottom Width	42.0	ft
Side Slope (Lt)	3.0	H:1V
Side Slope (Rt)	2.0	H:1V
Radius	0.0	ft

OUTPUT:

Velocity	4.21	ft/sec
Depth	0.33	ft
Freeboard	1.07	ft
Total Depth	1.40	ft
Froude No.	1.30	ft
Superelevation	0.00	ft

Normal depth calculations using Manning's equation

Fb = 1+0.025Vd^(1/3) Supercritical; 0.5+V^2/2g Subcritical

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RIPRAP CHANNEL

Section C

Flow "Q"	59 cfs
Manning's "n"	0.034
Slope (%)	5.85
Bottom Width	42.0 ft
Side Slope (Lt)	3.0 H:1V
Side Slope (Rt)	2.0 H:1V
Specific Gravity	2.5

OUTPUT:

Velocity	4.65 ft/s
Depth	0.30 ft
Freeboard	1.08 ft
Total Depth	1.38 ft
Froude No.	1.51
Riprap Size D50	4.9 in

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TRAPEZOIDAL CHANNEL

Section D

Flow "Q"	59	cfs
Manning's "n"	0.040	
Slope (%)	4.28	
Bottom Width	42.0	ft
Side Slope (Lt)	3.0	H:1V
Side Slope (Rt)	3.0	H:1V
Radius	0.0	ft

OUTPUT:

Velocity	3.81	ft/sec
Depth	0.36	ft
Freeboard	1.07	ft
Total Depth	1.43	ft
Froude No.	1.13	ft
Superelevation	0.00	ft

Normal depth calculations using Manning's equation

Fb = 1+0.025Vd^(1/3) Supercritical; 0.5+V^2/2g Subcritical

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RIPRAP CHANNEL

Section D

Flow "Q"	59	cfs
Manning's "n"	0.033	
Slope (%)	4.28	
Bottom Width	42.0	ft
Side Slope (Lt)	3.0	H:1V
Side Slope (Rt)	3.0	H:1V
Specific Gravity	2.50	

OUTPUT:

Velocity	4.29	ft/s
Depth	0.32	ft
Freeboard	1.07	ft
Total Depth	1.39	ft
Froude No.	1.35	
Riprap Size D50	3.8	in

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TRAPEZOIDAL CHANNEL

Section E

Flow "Q"	60	cfs
Manning's "n"	0.025	
Slope (%)	0.50	
Bottom Width	10.0	ft
Side Slope (Lt)	2.0	H:1V
Side Slope (Rt)	8.0	H:1V
Radius	0.0	ft

OUTPUT:

Velocity	3.60	ft/sec
Depth	1.08	ft
Freeboard	0.70	ft
Total Depth	1.78	ft
Froude No.	0.71	ft
Superelevation	0.00	ft

Normal depth calculations using Manning's equation

Fb = 1+0.025Vd^(1/3) Supercritical; 0.5+V^2/2g Subcritical

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TRAPEZOIDAL CHANNEL

Section F

Flow "Q"	60	cfs
Manning's "n"	0.025	
Slope (%)	0.73	
Bottom Width	10.0	ft
Side Slope (Lt)	2.0	H:1V
Side Slope (Rt)	2.0	H:1V
Radius	0.0	ft

OUTPUT:

Velocity	4.64	ft/sec
Depth	1.07	ft
Freeboard	0.83	ft
Total Depth	1.90	ft
Froude No.	0.86	ft
Superelevation	0.00	ft

Normal depth calculations using Manning's equation

Fb = 1+0.025Vd^(1/3) Supercritical; 0.5+V^2/2g Subcritical

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TRAPEZOIDAL CHANNEL

Section G

Flow "Q"	34	cfs
Manning's "n"	0.025	
Slope (%)	0.61	
Bottom Width	10.0	ft
Side Slope (Lt)	2.0	H:1V
Side Slope (Rt)	3.0	H:1V
Radius	0.0	ft

OUTPUT:

Velocity	3.55	ft/sec
Depth	0.80	ft
Freeboard	0.70	ft
Total Depth	1.50	ft
Froude No.	0.76	ft
Superelevation	0.00	ft

Normal depth calculations using Manning's equation

Fb = 1+0.025Vd^(1/3) Supercritical; 0.5+V^2/2g Subcritical

G. C. WALLACE COMPANIES

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TRAPEZOIDAL CHANNEL

Section H (north half)

Flow "Q"	33	cfs
Manning's "n"	0.040	
Slope (%)	6.15	
Bottom Width	0.0	ft
Side Slope (Lt)	3.0	H:1V
Side Slope (Rt)	50.0	H:1V
Radius	0.0	ft

OUTPUT:

Velocity	3.95	ft/sec
Depth	0.56	ft
Freeboard	1.08	ft
Total Depth	1.64	ft
Froude No.	1.32	ft
Superelevation	0.00	ft

Normal depth calculations using Manning's equation

Fb = 1+0.025Vd^(1/3) Supercritical; 0.5+V^2/2g Subcritical

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RIPRAP CHANNEL

Section H (north half)

Flow "Q"	33	cfs
Manning's "n"	0.034	
Slope (%)	6.15	
Bottom Width	0.0	ft
Side Slope (Lt)	3.0	H:1V
Side Slope (Rt)	50.0	H:1V
Specific Gravity	2.50	

OUTPUT:

Velocity	4.46	ft/s
Depth	0.53	ft
Freeboard	1.09	ft
Total Depth	1.62	ft
Froude No.	1.53	
Riprap Size D50	4.7	in

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TRAPEZOIDAL CHANNEL

Section H (south half)

Flow "Q"	33	cfs
Manning's "n"	0.040	
Slope (%)	6.15	
Bottom Width	0.0	ft
Side Slope (Lt)	2.0	H:1V
Side Slope (Rt)	50.0	H:1V
Radius	0.0	ft

OUTPUT:

Velocity	3.97	ft/sec
Depth	0.57	ft
Freeboard	1.08	ft
Total Depth	1.65	ft
Froude No.	1.31	ft
Superelevation	0.00	ft

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Normal depth calculations using Manning's equation

Fb = 1+0.025Vd^(1/3) Supercritical; 0.5+V^2/2g Subcritical

RIPRAP CHANNEL

Section H (south half)

Flow "Q"	33 cfs
Manning's "n"	0.034
Slope (%)	6.15
Bottom Width	0.0 ft
Side Slope (Lt)	2.0 H:1V
Side Slope (Rt)	50.0 H:1V
Specific Gravity	2.50

OUTPUT:

Velocity	4.48 ft/s
Depth	0.53 ft
Freeboard	1.09 ft
Total Depth	1.62 ft
Froude No.	1.53
Riprap Size D50	4.7 in

G. C. WALLACE COMPANIES
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Worksheet for Facility 25 - 54-inch RCP

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.70	%
Normal Depth	3.69	ft
Diameter	3.69	ft
Discharge	191.00	ft³/s

Results

Diameter	3.69	ft
Normal Depth	3.69	ft
Flow Area	10.72	ft²
Wetted Perimeter	11.61	ft
Hydraulic Radius	0.92	ft
Top Width	0.00	ft
Critical Depth	3.62	ft
Percent Full	100.0	%
Critical Slope	0.02411	ft/ft
Velocity	17.81	ft/s
Velocity Head	4.93	ft
Specific Energy	8.63	ft
Froude Number	0.00	
Maximum Discharge	205.46	ft³/s
Discharge Full	191.00	ft³/s
Slope Full	0.02700	ft/ft
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		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%

Worksheet for Facility 25 - 54-inch RCP

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.69	ft
Critical Depth	3.62	ft
Channel Slope	2.70	%
Critical Slope	0.02411	ft/ft

Cross Section for Facility 25 - 54-inch RCP

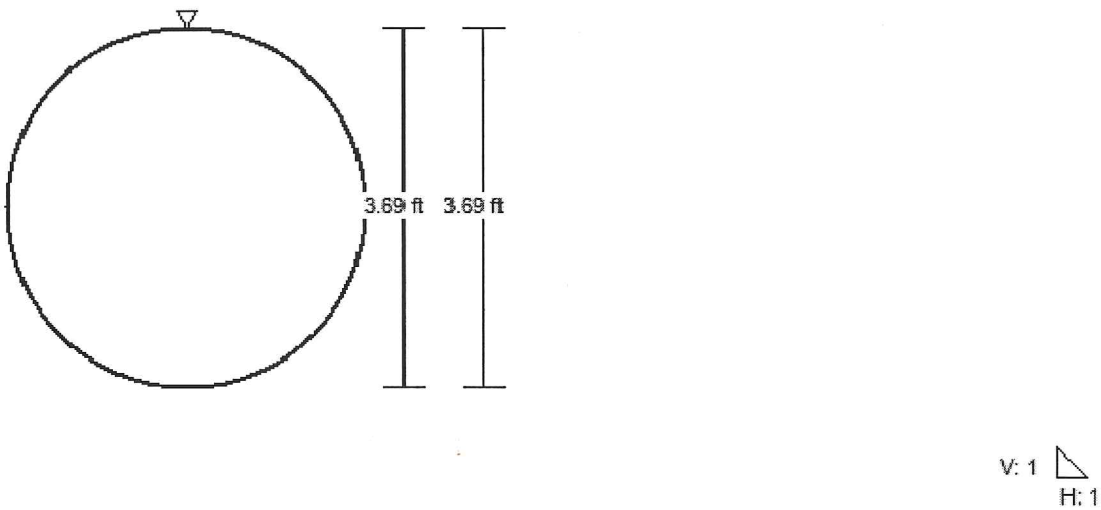
Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.70	%
Normal Depth	3.69	ft
Diameter	3.69	ft
Discharge	191.00	ft³/s

Cross Section Image



Worksheet for Facility 26 - 54-inch RCP

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.50	%
Normal Depth	3.54	ft
Diameter	3.54	ft
Discharge	164.00	ft^3/s

Results

Diameter	3.54	ft
Normal Depth	3.54	ft
Flow Area	9.84	ft^2
Wetted Perimeter	11.12	ft
Hydraulic Radius	0.89	ft
Top Width	0.00	ft
Critical Depth	3.45	ft
Percent Full	100.0	%
Critical Slope	0.02216	ft/ft
Velocity	16.66	ft/s
Velocity Head	4.31	ft
Specific Energy	7.85	ft
Froude Number	0.00	
Maximum Discharge	176.42	ft^3/s
Discharge Full	164.00	ft^3/s
Slope Full	0.02500	ft/ft
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		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%

Worksheet for Facility 26 - 54-inch RCP

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.54	ft
Critical Depth	3.45	ft
Channel Slope	2.50	%
Critical Slope	0.02216	ft/ft

Cross Section for Facility 26 - 54-inch RCP

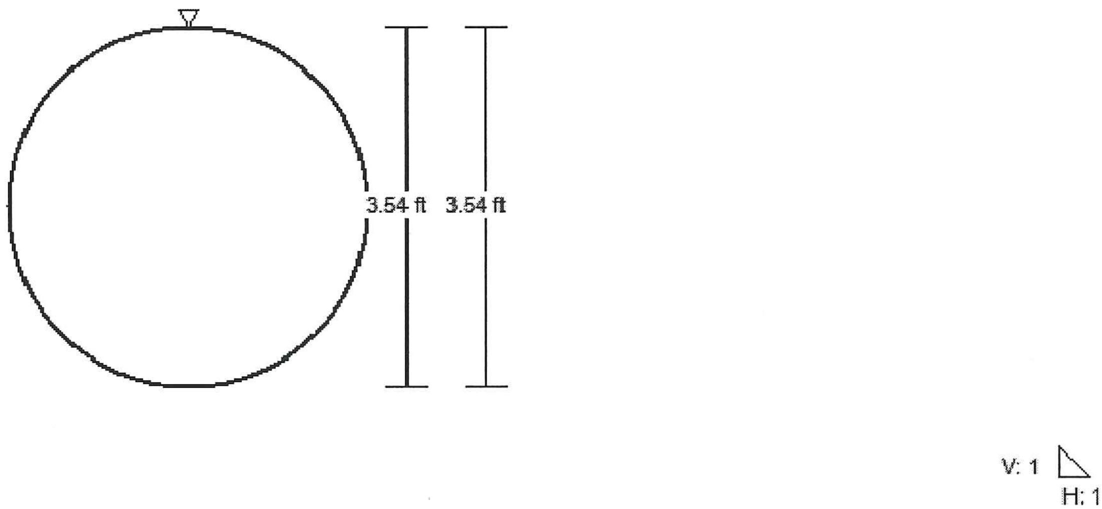
Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.50	%
Normal Depth	3.54	ft
Diameter	3.54	ft
Discharge	164.00	ft^3/s

Cross Section Image



Worksheet for Facility 27- 36-inch RCP

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	4.50	%
Normal Depth	2.09	ft
Diameter	2.09	ft
Discharge	54.00	ft³/s

Results

Diameter	2.09	ft
Normal Depth	2.09	ft
Flow Area	3.43	ft²
Wetted Perimeter	6.57	ft
Hydraulic Radius	0.52	ft
Top Width	0.00	ft
Critical Depth	2.07	ft
Percent Full	100.0	%
Critical Slope	0.04124	ft/ft
Velocity	15.73	ft/s
Velocity Head	3.85	ft
Specific Energy	5.94	ft
Froude Number	0.00	
Maximum Discharge	58.09	ft³/s
Discharge Full	54.00	ft³/s
Slope Full	0.04500	ft/ft
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		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%

Worksheet for Facility 27- 36-inch RCP

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.09	ft
Critical Depth	2.07	ft
Channel Slope	4.50	%
Critical Slope	0.04124	ft/ft

Cross Section for Facility 27- 36-inch RCP

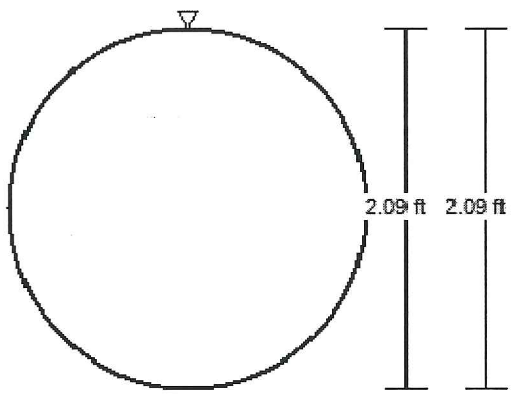
Project Description

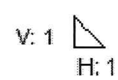
Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	4.50	%
Normal Depth	2.09	ft
Diameter	2.09	ft
Discharge	54.00	ft³/s

Cross Section Image





Worksheet for Facility 28 - 11x9 RCB

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	1.50	%
Height	9.00	ft
Bottom Width	11.00	ft
Discharge	2128.00	ft³/s

Results

Normal Depth	7.41	ft
Flow Area	81.51	ft²
Wetted Perimeter	25.82	ft
Hydraulic Radius	3.16	ft
Top Width	11.00	ft
Critical Depth	10.52	ft
Percent Full	82.3	%
Critical Slope	0.00622	ft/ft
Velocity	26.11	ft/s
Velocity Head	10.59	ft
Specific Energy	18.00	ft
Froude Number	1.69	
Discharge Full	2197.70	ft³/s
Slope Full	0.01600	ft/ft
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
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	82.33	%
Downstream Velocity	Infinity	ft/s

Worksheet for Facility 28 - 11x9 RCB

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	7.41	ft
Critical Depth	10.52	ft
Channel Slope	1.50	%
Critical Slope	0.00622	ft/ft

Cross Section for Facility 28 - 11x9 RCB

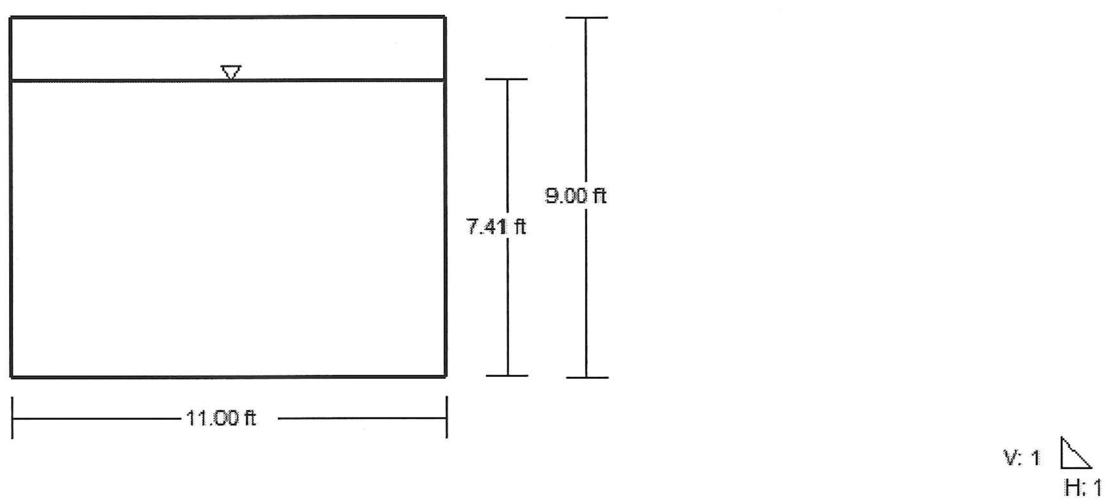
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	1.50	%
Normal Depth	7.41	ft
Height	9.00	ft
Bottom Width	11.00	ft
Discharge	2128.00	ft³/s

Cross Section Image



Worksheet for Facility 29 - 66-inch RCP

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.60	%
Normal Depth	4.64	ft
Diameter	4.64	ft
Discharge	344.00	ft^3/s

Results

Diameter	4.64	ft
Normal Depth	4.64	ft
Flow Area	16.91	ft^2
Wetted Perimeter	14.58	ft
Hydraulic Radius	1.16	ft
Top Width	0.00	ft
Critical Depth	4.55	ft
Percent Full	100.0	%
Critical Slope	0.02329	ft/ft
Velocity	20.35	ft/s
Velocity Head	6.43	ft
Specific Energy	11.07	ft
Froude Number	0.00	
Maximum Discharge	370.05	ft^3/s
Discharge Full	344.00	ft^3/s
Slope Full	0.02600	ft/ft
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		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%

Worksheet for Facility 29 - 66-inch RCP

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	4.64	ft
Critical Depth	4.55	ft
Channel Slope	2.60	%
Critical Slope	0.02329	ft/ft

Cross Section for Facility 29 - 66-inch RCP

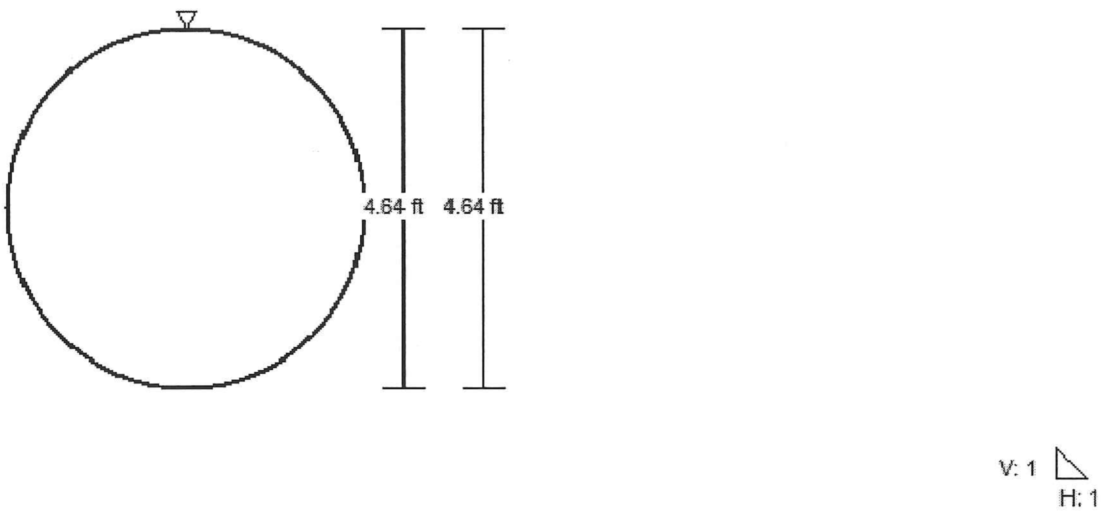
Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.60	%
Normal Depth	4.64	ft
Diameter	4.64	ft
Discharge	344.00	ft^3/s

Cross Section Image



Worksheet for Facility 30 - 48-inch RCP

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.50	%
Normal Depth	3.13	ft
Diameter	3.13	ft
Discharge	118.00	ft³/s

Results

Diameter	3.13	ft
Normal Depth	3.13	ft
Flow Area	7.69	ft²
Wetted Perimeter	9.83	ft
Hydraulic Radius	0.78	ft
Top Width	0.00	ft
Critical Depth	3.04	ft
Percent Full	100.0	%
Critical Slope	0.02208	ft/ft
Velocity	15.34	ft/s
Velocity Head	3.66	ft
Specific Energy	6.79	ft
Froude Number	0.00	
Maximum Discharge	126.95	ft³/s
Discharge Full	118.02	ft³/s
Slope Full	0.02499	ft/ft
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		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%

Worksheet for Facility 30 - 48-inch RCP

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.13	ft
Critical Depth	3.04	ft
Channel Slope	2.50	%
Critical Slope	0.02208	ft/ft

Cross Section for Facility 30 - 48-inch RCP

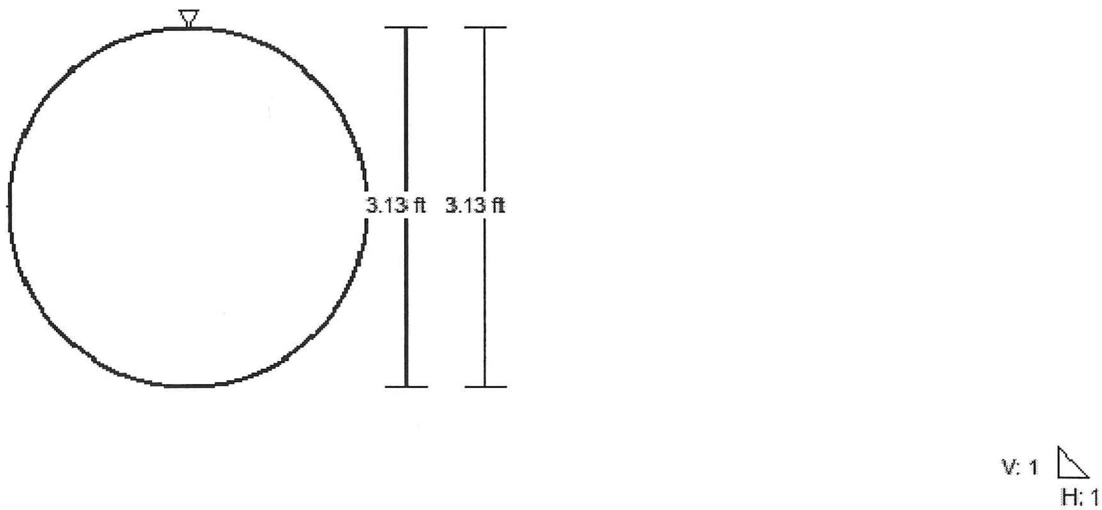
Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.50	%
Normal Depth	3.13	ft
Diameter	3.13	ft
Discharge	118.00	ft^3/s

Cross Section Image



Cross Section for Facility 30 - 48-inch RCP

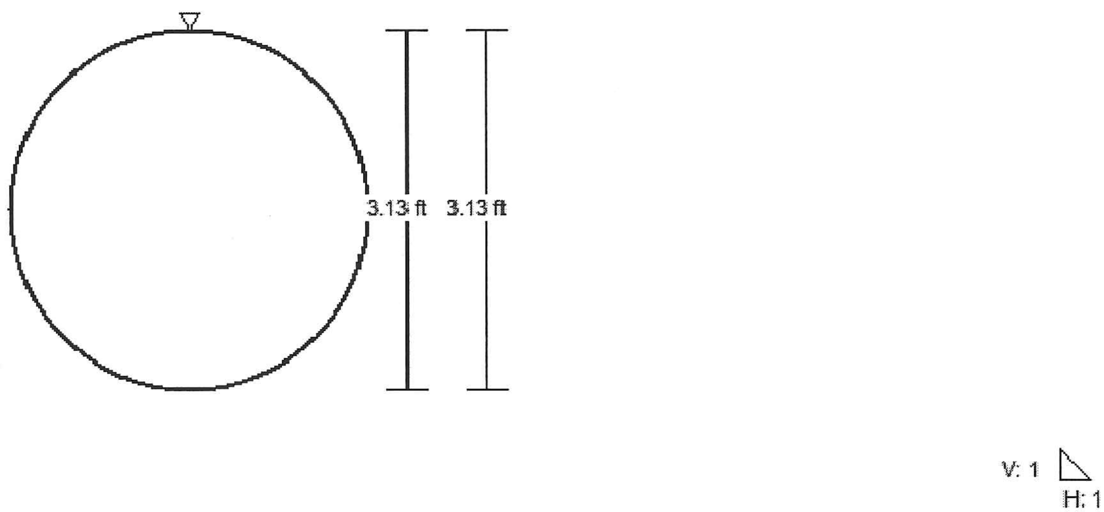
Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.50	%
Normal Depth	3.13	ft
Diameter	3.13	ft
Discharge	118.00	ft^3/s

Cross Section Image



Worksheet for Facility 31 - 11x8 RCB

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	1.50	%
Height	8.00	ft
Bottom Width	11.00	ft
Discharge	1910.00	ft³/s

Results

Normal Depth	6.81	ft
Flow Area	74.96	ft²
Wetted Perimeter	24.63	ft
Hydraulic Radius	3.04	ft
Top Width	11.00	ft
Critical Depth	9.79	ft
Percent Full	85.2	%
Critical Slope	0.00599	ft/ft
Velocity	25.48	ft/s
Velocity Head	10.09	ft
Specific Energy	16.90	ft
Froude Number	1.72	
Discharge Full	1868.81	ft³/s
Slope Full	0.01436	ft/ft
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
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	85.18	%
Downstream Velocity	Infinity	ft/s

Worksheet for Facility 31 - 11x8 RCB

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	6.81	ft
Critical Depth	9.79	ft
Channel Slope	1.50	%
Critical Slope	0.00599	ft/ft

Cross Section for Facility 31 - 11x8 RCB

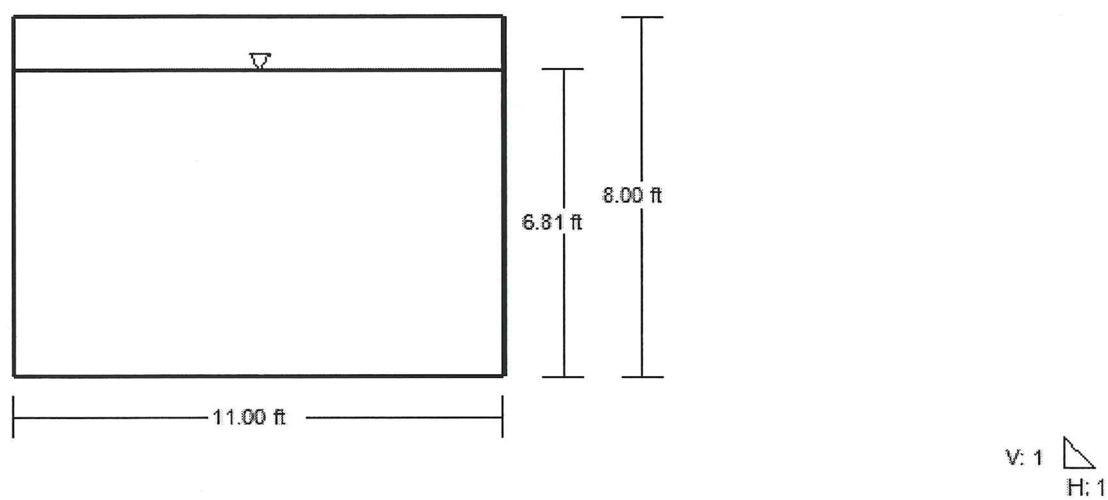
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	1.50	%
Normal Depth	6.81	ft
Height	8.00	ft
Bottom Width	11.00	ft
Discharge	1910.00	ft^3/s

Cross Section Image



WSPGW Stations Referenced from Queens Borough Culvert Study	MAIN 1 WSPGW Stations
-3625.00	-12270.67
-3550.00	-12195.67
-3500.00	-12145.67
-3401.01	-12046.68
-3350.81	-11996.48
-3325.95	-11971.62
-3315.95	-11961.62
-3225.64	-11871.31
-3223.32	-11868.99
-3152.70	-11798.37
-3135.29	-11780.96
-3049.99	-11695.66
-2906.52	-11552.19
-2433.63	-11079.30
-2318.22	-10963.89
-2200.00	-10845.67
-1733.86	-10379.53
-1565.00	-10210.67
-1000.00	-9645.67

WSPGW ANALYSIS

MAIN 1

```
T1 THE SEVENTY
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T3   FILENAME: MAIN1.WSW    JAM
SO -12270.6702614.000  1                         2619.400
TS -12195.6702617.000  2       .035                                        .000
TS -12145.6702617.500  3       .035                                        .000
TS -12046.6802620.750  4       .040                                        .000
TS -11996.4802621.300  5       .015                                        .000
TS -11971.6202621.650  6       .015                                        .000
TS -11961.6202621.810 10       .015                                        .000
R  -11871.3102623.180 10       .015                                        .000
R  -11868.9902623.000 10       .015                                        .000       .000 0
R  -11798.3702625.000 10       .015                                     -40.463
R  -11780.9602625.480 10       .015                                        .000
R  -11695.6602627.860 10       .015                                      48.868
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R  -10210.6702656.610 10       .015                                      90.000
R   -9645.6702659.440 10       .015                                        .000       .000 0
R   -9545.6702659.950 10       .015                                        .000     11.000 0
R   -9400.6702662.767 10       .015                                       0.000
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R   -9195.6702666.750 10       .015                                        .000
WE  -9195.6702666.750 12
TS  -9165.7302668.537 13       .015                                        .000
R   -9119.1702671.317 13       .015                                        .000
R   -9030.8402672.200 13       .015                                      34.000
R   -8709.6402675.412 13       .015                                        .000
R   -8668.3802675.825 13       .015                                        .000
R   -8634.8002676.161 13       .015                                      12.000
R   -8544.4602677.064 13       .015                                        .000
R   -8492.2502677.586 13       .015                                     -19.000
R   -7909.6402683.412 13       .015                                        .000
R   -7776.9102684.766 13       .015                                        .000
R   -7745.0202686.243 13       .015                                        .000
R   -7605.9502692.682 13       .015                                     -15.300
JX  -7519.0102698.724 21 15    .015 1701.000          2700.918              0.0
WX  -7519.0102698.724 14       .015
R   -7361.1002710.678 14       .015                                     -12.600
R   -7235.1202715.415 14       .015                                     -12.400
R   -7123.5102719.611 14       .015                                       0.000
R   -6922.5702727.166 14       .015                                       0.000
R   -6835.1202728.041 14       .015                                       0.000
R   -6748.9802728.902 14       .015                                       0.000
JX  -6743.9802728.952 14 17 17.015    17.000    9.0002731.5302731.530-30.0 30.0    0.00
R   -6435.1202732.041 14       .015                                       0.000
R   -6191.6202734.476 14       .015                                       0.000
R   -6178.9602734.602 14       .015                                       0.000
JX  -6173.9602734.651 19 16 16.015   211.000  109.0002735.1502735.150-30.0 30.0    0.000
R   -6148.6202734.902 19       .015                                       0.000
R   -6138.2902735.004 19       .015                                       0.000
R   -6058.1802735.797 19       .015                                      41.000
R   -5813.2102738.222 19       .015                                        .000
R   -5759.1902738.757 19       .015                                     -28.000
TS  -5747.1902738.876 20       .015                                        .000
R   -5698.1902739.361 20       .015                                        .000
SH  -5698.1902739.361 20                                  .000
CD  10   3   1   1.000  12.000   25.000  .000  .000   .00
CD  11   3   0    .000   9.000   17.000  .000  .000   .00
CD  12   3   0    .000  12.000   25.000  .000  .000   .00
CD  13   3   0    .000  12.000   14.000  .000  .000   .00
CD  14   3   0    .000   9.000   14.000  .000  .000   .00
CD  15   3   0    .000   8.000   10.000  .000  .000   .00
CD  16   4   0    .000   6.000     .000  .000  .000   .00
CD  17   4   0    .000   4.000     .000  .000  .000   .00
CD  18   3   1   1.000   9.000   25.000  .000  .000   .00
CD  19   3   0    .000   9.000   15.000  .000  .000   .00
CD  20   3   0    .000   9.000   20.000  .000  .000   .00
CD  21   3   0    .000   9.000   25.000  .000  .000   .00
CD   1   5   0    .000              .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
CD   2   5   0    .000              .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
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CD   3  5   0    .000              .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
CD   4  5   0    .000              .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
CD   5  5   0    .000              .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
CD   6  5   0    .000              .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
CD   7  5   0    .000              .00   .00   .00   .00   .00   .00   .00   .00   .00   .00
PTS  114    .000 30.000 18.200 25.000 26.100 25.000 33.300 26.000 38.300 26.000
PTS       43.800 25.000 51.800 24.000 61.800 20.000 77.300 17.000 92.800 14.000
PTS      113.100 20.000132.400 25.000140.900 29.000151.700 30.000
PTS  211    .000 35.000 26.300 30.000 37.200 25.000 44.700 25.000 45.700 26.000
PTS       48.500 26.000 51.670 22.000 72.200 17.000 92.000 18.000123.100 32.800
PTS      147.000 35.000
PTS  3 7    .000 35.000 21.900 30.000 47.700 30.000 71.200 18.400 90.600 17.500
PTS      111.000 19.000146.500 37.000
PTS  4 9    .000 35.000 10.420 30.000 19.300 25.000 24.900 22.000 38.600 20.800
PTS       83.700 20.800 87.600 25.000 98.900 30.000100.600 35.000
PTS  5 8    .000 48.000 19.090 48.000 50.850 45.000111.110 21.000159.240 21.000
PTS      159.240 21.000186.970 35.980248.780 40.000
PTS  6 6    .000 49.000 11.030 48.000 54.930 38.000 84.460 22.000136.390 22.000
PTS      173.210 40.000
Q          2130.000    .0
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♀ FILE: MAIN1.WSW   W S P G W - CIVILDESIGN Version 14.08   PAGE 1
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING   Date: 3- 3-2016 Time:10: 3:30

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1.WSW   JAM

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-12270.670	2614.000	7.896	2621.896	4673.00	17.79	4.92	2626.81	.00	9.43	63.36		1		0 .0
TRANS STR	.0400					.0179	1.34	7.90	1.54		.035			IR-OPEN
-12195.670	2617.000	9.000	2626.000	4673.00	12.16	2.29	2628.29	.00	9.00	73.79		2		0 .0
TRANS STR	.0100					.0066	.33	9.00	.94		.035			IR-OPEN
-12145.670	2617.500	10.039	2627.539	4673.00	8.78	1.20	2628.74	.00	7.49	75.16		3		0 .0
TRANS STR	.0328							10.039	.582		.040			IR-OPEN
-12046.680	2620.750	2.538	2623.288	4673.00	32.08	15.98	2639.26	.00	5.81	63.65		4		0 .0
TRANS STR	.0110					.0369	1.85	2.54	3.74		.015			IR-OPEN
-11996.480	2621.300	2.585	2623.885	4673.00	33.62	17.55	2641.44	.00	6.03	59.41		5		0 .0
TRANS STR	.0141					.0409	1.02	2.59	3.87		.015			IR-OPEN
-11971.620	2621.650	2.384	2624.034	4673.00	34.65	18.64	2642.68	.00	5.85	61.21		6		0 .0
TRANS STR	.0160					.0337	.34	2.38	4.11		.015			IR-OPEN
-11961.620	2621.810	6.099	2627.909	4673.00	31.93	15.83	2643.74	.00	10.56	25.00	12.000	25.000	.00	1 1.0
90.311	.0152					.0248	2.24	6.10	2.33	7.23	.015	.00	.00	BOX
-11871.310	2623.180	5.903	2629.083	4673.00	32.99	16.89	2645.98	.00	10.56	25.00	12.000	25.000	.00	1 1.0
2.319	-.0776					.0262	.06	5.90	2.44	.00	.015	.00	.00	BOX
-11868.990	2623.000	5.853	2628.853	4673.00	33.27	17.19	2646.04	12.00	10.56	25.00	12.000	25.000	.00	1 1.0
70.620	.0283					.0263	1.86	12.00	2.47	5.71	.015	.00	.00	BOX

♀ FILE: MAIN1.WSW   W S P G W - CIVILDESIGN Version 14.08   PAGE 2
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING   Date: 3- 3-2016 Time:10: 3:30

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1.WSW   JAM

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-11798.370	2625.000	5.882	2630.882	4673.00	33.10	17.02	2647.90	.00	10.56	25.00	12.000	25.000	.00	1 1.0
17.410	.0276					.0261	.45	5.88	2.46	5.77	.015	.00	.00	BOX
-11780.960	2625.480	5.887	2631.367	4673.00	33.08	16.99	2648.35	12.00	10.56	25.00	12.000	25.000	.00	1 1.0
85.300	.0279					.0259	2.21	12.00	2.45	5.74	.015	.00	.00	BOX
-11695.660	2627.860	5.923	2633.783	4673.00	32.87	16.78	2650.56	.00	10.56	25.00	12.000	25.000	.00	1 1.0
143.470	.0279					.0252	3.61	5.92	2.43	5.74	.015	.00	.00	BOX
-11552.190	2631.860	6.008	2637.868	4673.00	32.41	16.31	2654.18	.40	10.56	25.00	12.000	25.000	.00	1 1.0
204.461	.0278					.0237	4.84	6.41	2.38	5.75	.015	.00	.00	BOX
-11347.730	2637.552	6.213	2643.765	4673.00	31.34	15.25	2659.02	.38	10.56	25.00	12.000	25.000	.00	1 1.0
164.742	.0278					.0213	3.50	6.59	2.26	5.75	.015	.00	.00	BOX
-11182.990	2642.138	6.516	2648.655	4673.00	29.88	13.86	2662.52	.34	10.56	25.00	12.000	25.000	.00	1 1.0
103.688	.0278					.0188	1.94	6.86	2.11	5.75	.015	.00	.00	BOX
-11079.300	2645.025	6.834	2651.859	4673.00	28.49	12.60	2664.46	12.00	10.56	25.00	12.000	25.000	.00	1 1.0
59.925	.0278					.0167	1.00	12.00	1.96	5.75	.015	.00	.00	BOX
-11019.380	2646.693	7.102	2653.795	4673.00	27.42	11.67	2665.47	12.00	10.56	25.00	12.000	25.000	.00	1 1.0
55.485	.0278					.0150	.83	12.00	1.85	5.75	.015	.00	.00	BOX
-10963.890	2648.238	7.449	2655.687	4673.00	26.14	10.61	2666.30	.00	10.56	25.00	12.000	25.000	.00	1 1.0
26.600	.0278					.0135	.36	7.45	1.72	5.75	.015	.00	.00	BOX

♀ FILE: MAIN1.WSW   W S P G W - CIVILDESIGN Version 14.08   PAGE 3
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING   Date: 3- 3-2016 Time:10: 3:30

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1.WSW JAM

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-10937.290	2648.979	7.669	2656.648	4673.00	25.39	10.01	2666.66	.00	10.56	25.00	12.000	25.000	.00	1 1.0
34.373	.0278					.0123	.42	7.67	1.65	5.75	.015	.00	.00	BOX
-10902.920	2649.936	8.044	2657.979	4673.00	24.21	9.10	2667.08	.00	10.56	25.00	12.000	25.000	.00	1 1.0
25.571	.0278					.0109	.28	8.04	1.54	5.75	.015	.00	.00	BOX
-10877.340	2650.648	8.436	2659.084	4673.00	23.08	8.27	2667.36	.00	10.56	25.00	12.000	25.000	.00	1 1.0
18.653	.0278					.0096	.18	8.44	1.43	5.75	.015	.00	.00	BOX
-10858.690	2651.167	8.848	2660.015	4673.00	22.01	7.52	2667.54	.00	10.56	25.00	12.000	25.000	.00	1 1.0
13.021	.0278					.0085	.11	8.85	1.33	5.75	.015	.00	.00	BOX
-10845.670	2651.530	9.280	2660.810	4673.00	20.98	6.84	2667.65	.00	10.56	25.00	12.000	25.000	.00	1 1.0
64.175	.0080					.0080	.51	9.28	1.24	9.28	.015	.00	.00	BOX
-10781.500	2652.043	9.280	2661.323	4673.00	20.98	6.84	2668.16	.00	10.56	25.00	12.000	25.000	.00	1 1.0
401.965	.0080					.0077	3.11	9.28	1.24	9.28	.015	.00	.00	BOX
-10379.530	2655.259	9.526	2664.785	4673.00	20.44	6.49	2671.27	12.00	10.56	25.00	12.000	25.000	.00	1 1.0
43.904	.0080					.0074	.33	12.00	1.19	9.28	.015	.00	.00	BOX
-10335.630	2655.610	9.599	2665.209	4673.00	20.28	6.39	2671.60	12.00	10.56	25.00	12.000	25.000	.00	1 1.0
105.124	.0080					.0069	.73	12.00	1.18	9.28	.015	.00	.00	BOX
-10230.500	2656.451	10.068	2666.519	4673.00	19.34	5.81	2672.33	12.00	10.56	25.00	12.000	25.000	.00	1 1.0
19.832	.0080					.0062	.12	12.00	1.10	9.28	.015	.00	.00	BOX

♀ FILE: MAIN1.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 4
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 3:30

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1.WSW JAM

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-10210.670	2656.610	10.560	2667.170	4673.00	18.44	5.28	2672.45	.00	10.56	25.00	12.000	25.000	.00	1 1.0
77.532	.0050					.0051	.40	10.56	1.02	11.20	.015	.00	.00	BOX
-10133.140	2656.999	11.075	2668.074	4673.00	17.58	4.80	2672.87	.00	10.56	25.00	12.000	25.000	.00	1 1.0
12.322	.0050					.0051	.06	11.08	.95	11.20	.015	.00	.00	BOX
------------------- WARNING - Flow depth near top of box conduit -------------------														
-10120.820	2657.060	11.082	2668.142	4673.00	17.57	4.79	2672.94	.00	10.56	25.00	12.000	25.000	.00	1 1.0
HYDRAULIC JUMP														
------------------- WARNING - Flow depth near top of box conduit -------------------														
-10120.820	2657.060	10.052	2667.113	4673.00	19.37	5.83	2672.94	.00	10.56	25.00	12.000	25.000	.00	1 1.0
41.956	.0050					.0068	.29	10.05	1.10	11.20	.015	.00	.00	BOX
-10078.860	2657.270	9.724	2666.995	4673.00	20.02	6.23	2673.22	.00	10.56	25.00	12.000	25.000	.00	1 1.0
66.513	.0050					.0076	.50	9.72	1.15	11.20	.015	.00	.00	BOX
-10012.350	2657.603	9.272	2666.875	4673.00	21.00	6.85	2673.72	.00	10.56	25.00	12.000	25.000	.00	1 1.0
71.908	.0050					.0085	.61	9.27	1.24	11.20	.015	.00	.00	BOX
-9940.438	2657.963	8.840	2666.804	4673.00	22.02	7.53	2674.34	.00	10.56	25.00	12.000	25.000	.00	1 1.0
73.994	.0050					.0096	.71	8.84	1.33	11.20	.015	.00	.00	BOX

♀ FILE: MAIN1.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 5
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 3:30

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1.WSW JAM

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch

-9866.444	2658.334	8.429	2666.763	4673.00	23.10	8.29	2675.05	.00	10.56	25.00	12.000	25.000	.00	1 1.0
74.374	.0050					.0109	.81	8.43	1.43	11.20	.015	.00	.00	BOX
-9792.070	2658.707	8.037	2666.743	4673.00	24.23	9.11	2675.86	.00	10.56	25.00	12.000	25.000	.00	1 1.0
73.785	.0050					.0123	.91	8.04	1.54	11.20	.015	.00	.00	BOX
-9718.285	2659.076	7.663	2666.739	4673.00	25.41	10.03	2676.76	.00	10.56	25.00	12.000	25.000	.00	1 1.0
72.615	.0050					.0139	1.01	7.66	1.65	11.20	.015	.00	.00	BOX
-9645.670	2659.440	7.306	2666.746	4673.00	26.65	11.03	2677.77	.00	10.56	25.00	12.000	25.000	.00	1 1.0
29.035	.0051					.0151	.44	7.31	1.77	11.11	.015	.00	.00	BOX
-9616.635	2659.588	7.168	2666.756	4673.00	27.16	11.46	2678.21	.00	10.56	25.00	12.000	25.000	.00	1 1.0
70.965	.0051					.0165	1.17	7.17	1.82	11.11	.015	.00	.00	BOX
-9545.670	2659.950	6.834	2666.784	4673.00	28.49	12.60	2679.39	.00	10.56	25.00	12.000	25.000	.00	1 1.0
145.000	.0194					.0172	2.49	6.83	1.96	6.58	.015	.00	.00	BOX
-9400.670	2662.767	6.961	2669.728	4673.00	27.97	12.15	2681.88	.00	10.56	25.00	12.000	25.000	.00	1 1.0
JUNCT STR	.0194					.0215	.11	6.96	1.91		.015	.00	.00	BOX
-9395.670	2662.864	5.401	2668.265	4177.00	32.23	16.13	2684.39	.00	9.80	25.00	12.000	25.000	.00	1 1.0
56.390	.0194					.0268	1.51	5.40	2.49	6.04	.015	.00	.00	BOX
-9339.280	2663.960	5.319	2669.278	4177.00	32.72	16.63	2685.91	.00	9.80	25.00	12.000	25.000	.00	1 1.0
143.610	.0194					.0293	4.21	5.32	2.55	6.04	.015	.00	.00	BOX

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Program Package Serial Number: 7044

WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 3:30

THE SEVENTY

GCW INC. PROJECT# 840.050

FILENAME: MAIN1.WSW JAM

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-9195.670	2666.750	5.071	2671.821	4177.00	34.32	18.29	2690.11	.00	9.80	25.00	12.000	25.000	.00	1 1.0
WALL ENTRANCE														
-9195.670	2666.750	4.619	2671.369	4177.00	36.17	20.31	2691.68	.00	9.54	25.00	12.000	25.000	.00	0 .0
TRANS STR	.0597					.0211	.63	4.62	2.97		.015	.00	.00	BOX
-9165.730	2668.537	9.477	2678.014	4177.00	31.48	15.39	2693.40	.00	12.00	14.00	12.000	14.000	.00	0 .0
13.507	.0597					.0152	.21	9.48	1.80	5.73	.015	.00	.00	BOX
-9152.224	2669.344	9.762	2679.106	4177.00	30.56	14.50	2693.61	.00	12.00	14.00	12.000	14.000	.00	0 .0
18.337	.0597					.0138	.25	9.76	1.72	5.73	.015	.00	.00	BOX
-9133.887	2670.438	10.239	2680.677	4177.00	29.14	13.19	2693.86	.00	12.00	14.00	12.000	14.000	.00	0 .0
14.717	.0597					.0122	.18	10.24	1.60	5.73	.015	.00	.00	BOX
-9119.170	2671.317	10.738	2682.055	4177.00	27.78	11.99	2694.04	12.00	12.00	14.00	12.000	14.000	.00	0 .0
88.330	.0100					.0116	1.03	12.00	1.49	11.34	.015	.00	.00	BOX
-9030.840	2672.200	10.624	2682.824	4177.00	28.08	12.25	2695.07	.00	12.00	14.00	12.000	14.000	.00	0 .0
48.862	.0100					.0119	.58	10.62	1.52	11.34	.015	.00	.00	BOX
-8981.978	2672.689	10.555	2683.243	4177.00	28.27	12.41	2695.65	.00	12.00	14.00	12.000	14.000	.00	0 .0
272.338	.0100					.0128	3.47	10.55	1.53	11.34	.015	.00	.00	BOX
-8709.640	2675.412	10.063	2685.475	4177.00	29.65	13.65	2699.12	.00	12.00	14.00	12.000	14.000	.00	0 .0
41.260	.0100					.0137	.56	10.06	1.65	11.34	.015	.00	.00	BOX

♀ FILE: MAIN1.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 7

Program Package Serial Number: 7044

WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 3:30

THE SEVENTY

GCW INC. PROJECT# 840.050

FILENAME: MAIN1.WSW JAM

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-8668.380	2675.825	9.977	2685.802	4177.00	29.91	13.89	2699.69	12.00	12.00	14.00	12.000	14.000	.00	0 .0

33.580	.0100					.0140	.47	12.00	1.67	11.34	.015	.00	.00	BOX
-8634.800	2676.161	9.904	2686.064	4177.00	30.13	14.09	2700.16	.00	12.00	14.00	12.000	14.000	.00	0 .0
90.340	.0100					.0145	1.31	9.90	1.69	11.34	.015	.00	.00	BOX
-8544.460	2677.064	9.694	2686.758	4177.00	30.78	14.71	2701.47	12.00	12.00	14.00	12.000	14.000	.00	0 .0
52.210	.0100					.0151	.79	12.00	1.74	11.34	.015	.00	.00	BOX
-8492.250	2677.586	9.566	2687.152	4177.00	31.19	15.10	2702.26	.00	12.00	14.00	12.000	14.000	.00	0 .0
37.142	.0100					.0156	.58	9.57	1.78	11.34	.015	.00	.00	BOX
-8455.108	2677.957	9.472	2687.429	4177.00	31.50	15.41	2702.84	.00	12.00	14.00	12.000	14.000	.00	0 .0
161.290	.0100					.0168	2.71	9.47	1.80	11.34	.015	.00	.00	BOX
-8293.818	2679.570	9.031	2688.601	4177.00	33.04	16.95	2705.55	.00	12.00	14.00	12.000	14.000	.00	0 .0
141.259	.0100					.0190	2.69	9.03	1.94	11.34	.015	.00	.00	BOX
-8152.559	2680.983	8.611	2689.594	4177.00	34.65	18.64	2708.24	.00	12.00	14.00	12.000	14.000	.00	0 .0
126.933	.0100					.0215	2.73	8.61	2.08	11.34	.015	.00	.00	BOX
-8025.626	2682.252	8.210	2690.462	4177.00	36.34	20.51	2710.97	.00	12.00	14.00	12.000	14.000	.00	0 .0
115.986	.0100					.0244	2.83	8.21	2.24	11.34	.015	.00	.00	BOX
-7909.640	2683.412	7.828	2691.240	4177.00	38.11	22.56	2713.80	.00	12.00	14.00	12.000	14.000	.00	0 .0
26.177	.0102					.0263	.69	7.83	2.40	11.25	.015	.00	.00	BOX

FILE: MAIN1.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 8
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 3:30

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1.WSW JAM

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-7883.463	2683.679	7.741	2691.421	4177.00	38.54	23.06	2714.49	.00	12.00	14.00	12.000	14.000	.00	0 .0
106.553	.0102					.0285	3.03	7.74	2.44	11.25	.015	.00	.00	BOX
-7776.910	2684.766	7.381	2692.147	4177.00	40.42	25.37	2717.52	.00	12.00	14.00	12.000	14.000	.00	0 .0
31.890	.0463					.0298	.95	7.38	2.62	6.30	.015	.00	.00	BOX
-7745.020	2686.243	7.473	2693.716	4177.00	39.93	24.75	2718.47	1.33	12.00	14.00	12.000	14.000	.00	0 .0
51.663	.0463					.0284	1.47	8.80	2.57	6.30	.015	.00	.00	BOX
-7693.357	2688.635	7.644	2696.279	4177.00	39.03	23.66	2719.94	1.27	12.00	14.00	12.000	14.000	.00	0 .0
87.407	.0463					.0260	2.27	8.92	2.49	6.30	.015	.00	.00	BOX
-7605.950	2692.682	8.017	2700.698	4177.00	37.22	21.51	2722.21	.00	12.00	14.00	12.000	14.000	.00	0 .0
JUNCT STR	.0695					.0457	3.97	9.17	2.32		.015	.00	.00	BOX
-7519.010	2698.724	2.413	2701.137	2476.00	41.04	26.15	2727.29	1.82	6.73	25.00	9.000	25.000	.00	0 .0
WALL EXIT														
-7519.010	2698.724	4.391	2703.115	2476.00	40.27	25.19	2728.30	.98	9.00	14.00	9.000	14.000	.00	0 .0
26.372	.0757					.0428	1.13	5.37	3.39	3.63	.015	.00	.00	BOX
-7492.638	2700.720	4.476	2705.196	2476.00	39.51	24.24	2729.44	.95	9.00	14.00	9.000	14.000	.00	0 .0
54.218	.0757					.0391	2.12	5.42	3.29	3.63	.015	.00	.00	BOX
-7438.420	2704.825	4.694	2709.519	2476.00	37.67	22.04	2731.56	.86	9.00	14.00	9.000	14.000	.00	0 .0
42.758	.0757					.0342	1.46	5.55	3.06	3.63	.015	.00	.00	BOX

FILE: MAIN1.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 9
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 3:30

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1.WSW JAM

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-7395.662	2708.062	4.924	2712.985	2476.00	35.92	20.04	2733.02	.78	9.00	14.00	9.000	14.000	.00	0 .0
34.562	.0757					.0300	1.04	5.70	2.85	3.63	.015	.00	.00	BOX
-7361.100	2710.678	5.164	2715.842	2476.00	34.25	18.21	2734.06	.88	9.00	14.00	9.000	14.000	.00	0 .0

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    3.412    .0376                                                .0279      .10     6.04    2.66    4.64    .015      .00   .00  BOX
-7357.688 2710.806    5.169  2715.975   2476.00   34.21   18.18  2734.15      .87    9.00   14.00    9.000  14.000   .00   0   .0
  122.568    .0376                                                .0262     3.21     6.04    2.65    4.64    .015      .00   .00  BOX
-7235.120 2715.415    5.421  2720.836   2476.00   32.62   16.52  2737.36      .00    9.00   14.00    9.000  14.000   .00   0   .0
   37.062    .0376                                                .0238      .88     5.42    2.47    4.64    .015      .00   .00  BOX
-7198.058 2716.808    5.524  2722.333   2476.00   32.01   15.91  2738.25      .00    9.00   14.00    9.000  14.000   .00   0   .0
   74.548    .0376                                                .0218     1.63     5.52    2.40    4.64    .015      .00   .00  BOX
-7123.510 2719.611    5.794  2725.405   2476.00   30.52   14.47  2739.87      .00    9.00   14.00    9.000  14.000   .00   0   .0
   12.280    .0376                                                .0201      .25     5.79    2.23    4.64    .015      .00   .00  BOX
-7111.230 2720.073    5.849  2725.921   2476.00   30.24   14.20  2740.12      .00    9.00   14.00    9.000  14.000   .00   0   .0
   53.094    .0376                                                .0187      .99     5.85    2.20    4.64    .015      .00   .00  BOX
-7058.136 2722.069    6.134  2728.203   2476.00   28.83   12.91  2741.11      .00    9.00   14.00    9.000  14.000   .00   0   .0
   41.235    .0376                                                .0164      .68     6.13    2.05    4.64    .015      .00   .00  BOX
-7016.901 2723.619    6.434  2730.053   2476.00   27.49   11.73  2741.79      .00    9.00   14.00    9.000  14.000   .00   0   .0
   32.483    .0376                                                .0144      .47     6.43    1.91    4.64    .015      .00   .00  BOX
♀ FILE: MAIN1.WSW                                W S P G W - CIVILDESIGN Version 14.08                                     PAGE  10
                                        Program Package Serial Number: 7044
                                                      WATER SURFACE PROFILE LISTING                    Date: 3- 3-2016  Time:10: 3:30
                            THE SEVENTY
                               GCW INC. PROJECT# 840.050
                                 FILENAME: MAIN1.WSW   JAM
************************************************************************************************************************ ********
         | Invert  | Depth  | Water   |    Q    |  Vel    Vel   |  Energy | Super |Critical|Flow Top|Height/|Base Wt|     |No Wth
 Station |  Elev   |  (FT)  |  Elev   |  (CFS)  | (FPS)   Head  | Grd.El. | Elev  | Depth  | Width  |Dia.-FT|or I.D.| ZL  |Prs/Pip
 L/Elem  |Ch Slope |        |         |         |       SF Ave  |   HF    |SE Dpth|Froude N|Norm Dp |  "N"  | X-Fall| ZR  |Type Ch
*********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|*****|*******
-6984.418 2724.841    6.748  2731.588   2476.00   26.21   10.67  2742.26      .00    9.00   14.00    9.000  14.000   .00   0   .0
   25.718    .0376                                                .0127      .33     6.75    1.78    4.64    .015      .00   .00  BOX
-6958.700 2725.808    7.077  2732.885   2476.00   24.99    9.70  2742.58      .00    9.00   14.00    9.000  14.000   .00   0   .0
   20.298    .0376                                                .0112      .23     7.08    1.66    4.64    .015      .00   .00  BOX
-6938.402 2726.571    7.422  2733.993   2476.00   23.83    8.82  2742.81      .00    9.00   14.00    9.000  14.000   .00   0   .0
   15.832    .0376                                                .0099      .16     7.42    1.54    4.64    .015      .00   .00  BOX
-6922.570 2727.166    7.785  2734.951   2476.00   22.72    8.01  2742.97      .00    9.00   14.00    9.000  14.000   .00   0   .0
   87.450    .0100                                                .0091      .80     7.78    1.43    7.55    .015      .00   .00  BOX
-6835.120 2728.041    7.860  2735.901   2476.00   22.50    7.86  2743.76      .00    9.00   14.00    9.000  14.000   .00   0   .0
   86.140    .0100                                                .0089      .76     7.86    1.41    7.55    .015      .00   .00  BOX
-6748.980 2728.902    7.961  2736.863   2476.00   22.22    7.66  2744.53      .00    9.00   14.00    9.000  14.000   .00   0   .0
JUNCT STR    .0100                                                .0091      .05     7.96    1.39            .015      .00   .00  BOX
-6743.980 2728.952    7.647  2736.599   2450.00   22.88    8.13  2744.73      .00    9.00   14.00    9.000  14.000   .00   0   .0
  308.860    .0100                                                .0090     2.79     7.65    1.46    7.49    .015      .00   .00  BOX
-6435.121 2732.041    7.948  2739.989   2450.00   22.02    7.53  2747.52      .00    9.00   14.00    9.000  14.000   .00   0   .0
   58.804    .0100                                                .0084      .49     7.95    1.38    7.49    .015      .00   .00  BOX
-6376.317 2732.629    8.056  2740.686   2450.00   21.72    7.33  2748.01      .00    9.00   14.00    9.000  14.000   .00   0   .0
  122.954    .0100                                                .0078      .96     8.06    1.35    7.49    .015      .00   .00  BOX
♀ FILE: MAIN1.WSW                                W S P G W - CIVILDESIGN Version 14.08                                     PAGE  11
                                        Program Package Serial Number: 7044
                                                      WATER SURFACE PROFILE LISTING                    Date: 3- 3-2016  Time:10: 3:30
                            THE SEVENTY
                               GCW INC. PROJECT# 840.050
                                 FILENAME: MAIN1.WSW   JAM
************************************************************************************************************************ ********
         | Invert  | Depth  | Water   |    Q    |  Vel    Vel   |  Energy | Super |Critical|Flow Top|Height/|Base Wt|     |No Wth
 Station |  Elev   |  (FT)  |  Elev   |  (CFS)  | (FPS)   Head  | Grd.El. | Elev  | Depth  | Width  |Dia.-FT|or I.D.| ZL  |Prs/Pip
 L/Elem  |Ch Slope |        |         |         |       SF Ave  |   HF    |SE Dpth|Froude N|Norm Dp |  "N"  | X-Fall| ZR  |Type Ch
*********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|*****|*******
-6253.363 2733.859    8.450  2742.308   2450.00   20.71    6.66  2748.97      .00    9.00   14.00    9.000  14.000   .00   0   .0
   61.743    .0100                                                .0069      .42     8.45    1.26    7.49    .015      .00   .00  BOX
                     ------------------- WARNING - Flow depth near top of box conduit -------------------
-6191.620 2734.476    8.862  2743.338   2450.00   19.75    6.06  2749.39      .00    9.00   14.00    9.000  14.000   .00   0   .0
   12.660    .0100                                                .0063      .08     8.86    1.17    7.51    .015      .00   .00  BOX
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-------------------- WARNING - Flow depth near top of box conduit --------------------

-6178.960	2734.602	9.000	2743.602	2450.00	19.44	5.87	2749.47	.00	9.00	14.00	9.000	14.000	.00	0	.0
JUNCT STR	.0098					.0064	.03	9.00	1.14		.015	.00	.00	BOX	
-------------------- WARNING - Flow depth near top of box conduit --------------------															
-6173.960	2734.651	11.911	2746.562	2130.00	15.78	3.87	2750.43	.00	8.56	15.00	9.000	15.000	.00	0	.0
25.340	.0099					.0064	.16	11.91	.93	6.33	.015	.00	.00	BOX	
-6148.620	2734.902	11.822	2746.724	2130.00	15.78	3.87	2750.59	.00	8.56	15.00	9.000	15.000	.00	0	.0
10.330	.0099					.0064	.07	11.82	.93	6.34	.015	.00	.00	BOX	
-6138.290	2735.004	11.786	2746.790	2130.00	15.78	3.87	2750.66	.00	8.56	15.00	9.000	15.000	.00	0	.0
80.110	.0099					.0064	.51	.00	.93	6.33	.015	.00	.00	BOX	

♀ FILE: MAIN1.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 12

Program Package Serial Number: 7044

WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 3:30

THE SEVENTY

GCW INC. PROJECT# 840.050

FILENAME: MAIN1.WSW JAM

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth / Type Ch	Prs/Pip
-6058.180	2735.797	12.026	2747.823	2130.00	15.78	3.87	2751.69	.00	8.56	15.00	9.000	15.000	.00	0	.0
244.970	.0099					.0064	1.57	12.03	.93	6.33	.015	.00	.00	BOX	
-5813.210	2738.222	11.166	2749.388	2130.00	15.78	3.87	2753.25	.00	8.56	15.00	9.000	15.000	.00	0	.0
54.020	.0099					.0064	.35	.00	.93	6.33	.015	.00	.00	BOX	
-5759.190	2738.757	11.408	2750.165	2130.00	15.78	3.87	2754.03	.00	8.56	15.00	9.000	15.000	.00	0	.0
TRANS STR	.0099					.0032	.04	11.41	.93		.015	.00	.00	BOX	
-5747.190	2738.876	13.460	2752.336	2130.00	11.83	2.17	2754.51	.00	7.06	20.00	9.000	20.000	.00	0	.0
49.000	.0099					.0032	.15	13.46	.70	4.89	.015	.00	.00	BOX	
-5698.190	2739.361	13.129	2752.490	2130.00	11.83	2.17	2754.66	.00	7.06	20.00	9.000	20.000	.00	0	.0

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T1 THE SEVENTY
T2   GCW INC. PROJECT# 840.050
T3   FILENAME: MAIN1_FAC3-5.WSW   RRD
SO  -6176.4602735.940 72                            2746.562
R   -6125.5202738.258 72      .013                                 35.000     .000 1
R   -5952.9902747.740 72      .013                                 23.000     .000 1
R   -5743.8102759.237 72      .013                                 13.000     .000 1
R   -5587.2202760.774 72      .013                                   .000     .000 1
JX  -5582.2202760.823 72 48         20.000          2760.800          50.0          0.000
R   -5379.4202762.815 72      .013                                -58.000     .000 1
R   -5286.5602763.873 72      .013                                   .000     .000 0
SH  -5286.5602763.873 72                            2773.753
CD  18  4                1.500
CD  24  4                2.000
CD  30  4                2.500
CD  36  4                3.000
CD  42  4                3.500
CD  48  4                4.000
CD  54  4                4.500
CD  60  4                5.000
CD  72  4                6.000
Q          344.000    .0
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THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC3-5.WSW RRD

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-6176.460	2735.940	10.622	2746.562	364.00	12.87	2.57	2749.14	.00	5.15	.00	6.000	.000	.00	0 .0
4.306	.0455					.0074	.03	.00	.00	2.65	.013	.00	.00	PIPE
-6172.154	2736.136	10.495	2746.631	364.00	12.87	2.57	2749.20	.00	5.15	.00	6.000	.000	.00	0 .0
HYDRAULIC JUMP														
-6172.154	2736.136	2.635	2738.771	364.00	30.45	14.40	2753.17	2.06	5.15	5.96	6.000	.000	.00	0 .0
46.634	.0455					.0465	2.17	4.69	3.79	2.65	.013	.00	.00	PIPE
-6125.520	2738.258	2.631	2740.890	364.00	30.51	14.45	2755.34	.40	5.15	5.95	6.000	.000	.00	0 .0
104.458	.0550					.0440	4.59	3.03	3.80	2.51	.013	.00	.00	PIPE
-6021.062	2743.999	2.723	2746.722	364.00	29.17	13.21	2759.93	.37	5.15	5.97	6.000	.000	.00	0 .0
68.071	.0550					.0388	2.64	3.09	3.56	2.51	.013	.00	.00	PIPE
-5952.991	2747.740	2.825	2750.565	364.00	27.81	12.01	2762.57	.16	5.15	5.99	6.000	.000	.00	0 .0
28.109	.0550					.0351	.99	2.98	3.32	2.51	.013	.00	.00	PIPE
-5924.882	2749.285	2.883	2752.168	364.00	27.08	11.39	2763.56	.15	5.15	6.00	6.000	.000	.00	0 .0
39.964	.0550					.0318	1.27	3.03	3.19	2.51	.013	.00	.00	PIPE
-5884.918	2751.481	2.993	2754.475	364.00	25.82	10.36	2764.83	.13	5.15	6.00	6.000	.000	.00	0 .0
30.694	.0550					.0280	.86	3.13	2.97	2.51	.013	.00	.00	PIPE
-5854.224	2753.168	3.107	2756.276	364.00	24.62	9.41	2765.69	.12	5.15	6.00	6.000	.000	.00	0 .0
24.267	.0550					.0247	.60	3.23	2.76	2.51	.013	.00	.00	PIPE

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC3-5.WSW RRD

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-5829.957	2754.502	3.228	2757.730	364.00	23.48	8.56	2766.29	.11	5.15	5.98	6.000	.000	.00	0 .0
19.644	.0550					.0218	.43	3.34	2.57	2.51	.013	.00	.00	PIPE
-5810.313	2755.582	3.354	2758.936	364.00	22.38	7.78	2766.72	.10	5.15	5.96	6.000	.000	.00	0 .0
16.041	.0550					.0192	.31	3.45	2.39	2.51	.013	.00	.00	PIPE
-5794.272	2756.463	3.488	2759.951	364.00	21.34	7.07	2767.02	.09	5.15	5.92	6.000	.000	.00	0 .0
13.222	.0550					.0170	.22	3.58	2.22	2.51	.013	.00	.00	PIPE
-5781.050	2757.190	3.629	2760.819	364.00	20.35	6.43	2767.25	.08	5.15	5.87	6.000	.000	.00	0 .0
10.886	.0550					.0150	.16	3.71	2.05	2.51	.013	.00	.00	PIPE
-5770.164	2757.789	3.779	2761.568	364.00	19.40	5.85	2767.41	.07	5.15	5.79	6.000	.000	.00	0 .0
8.948	.0550					.0133	.12	3.85	1.90	2.51	.013	.00	.00	PIPE
-5761.216	2758.280	3.938	2762.218	364.00	18.50	5.31	2767.53	.07	5.15	5.70	6.000	.000	.00	0 .0
7.240	.0550					.0119	.09	4.00	1.75	2.51	.013	.00	.00	PIPE
-5753.976	2758.678	4.109	2762.787	364.00	17.64	4.83	2767.62	.06	5.15	5.57	6.000	.000	.00	0 .0
5.770	.0550					.0106	.06	4.17	1.62	2.51	.013	.00	.00	PIPE
-5748.207	2758.995	4.292	2763.287	364.00	16.82	4.39	2767.68	.05	5.15	5.41	6.000	.000	.00	0 .0
4.396	.0550					.0094	.04	4.34	1.48	2.51	.013	.00	.00	PIPE
-5743.810	2759.237	4.491	2763.729	364.00	16.03	3.99	2767.72	.00	5.15	5.21	6.000	.000	.00	0 .0
88.742	.0098					.0086	.76	4.49	1.35	4.32	.013	.00	.00	PIPE

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC3-5.WSW RRD

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-5655.068	2760.108	4.642	2764.750	364.00	15.51	3.73	2768.48	.00	5.15	5.02	6.000	.000	.00	0 .0
53.658	.0098					.0079	.42	4.64	1.26	4.32	.013	.00	.00	PIPE
-5601.410	2760.635	4.878	2765.513	364.00	14.78	3.39	2768.91	.00	5.15	4.68	6.000	.000	.00	0 .0
14.190	.0098					.0072	.10	4.88	1.14	4.32	.013	.00	.00	PIPE
-5587.220	2760.774	5.150	2765.924	364.00	14.09	3.08	2769.01	.00	5.15	4.18	6.000	.000	.00	0 .0
JUNCT STR	.0098					.0078	.04	5.28	1.00		.014	.00	.00	PIPE
-5582.220	2760.823	6.201	2767.024	344.00	12.17	2.30	2769.32	.00	5.03	.00	6.000	.000	.00	0 .0
202.800	.0098					.0066	1.34	.00	.00	4.13	.013	.00	.00	PIPE
-5379.420	2762.815	6.031	2768.846	344.00	12.17	2.30	2771.15	.00	5.03	.00	6.000	.000	.00	0 .0
6.556	.0114					.0066	.04	6.03	.00	3.92	.013	.00	.00	PIPE
-5372.864	2762.890	6.000	2768.890	344.00	12.17	2.30	2771.19	.00	5.03	.00	6.000	.000	.00	0 .0
53.905	.0114					.0061	.33	6.00	.00	3.92	.013	.00	.00	PIPE
-5318.959	2763.504	5.555	2769.059	344.00	12.59	2.46	2771.52	.00	5.03	3.14	6.000	.000	.00	0 .0
HYDRAULIC JUMP														
-5318.959	2763.504	4.533	2768.037	344.00	15.01	3.50	2771.54	.00	5.03	5.16	6.000	.000	.00	0 .0
3.125	.0114					.0078	.02	4.53	1.25	3.92	.013	.00	.00	PIPE
-5315.834	2763.540	4.551	2768.091	344.00	14.95	3.47	2771.56	.00	5.03	5.14	6.000	.000	.00	0 .0
22.388	.0114					.0074	.16	4.55	1.24	3.92	.013	.00	.00	PIPE

♀ FILE: MAIN1_FAC3-5.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 4
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 8: 0

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC3-5.WSW RRD

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-5293.446	2763.795	4.776	2768.571	344.00	14.25	3.15	2771.73	.00	5.03	4.84	6.000	.000	.00	0 .0
6.886	.0114					.0067	.05	4.78	1.12	3.92	.013	.00	.00	PIPE
-5286.560	2763.873	5.031	2768.904	344.00	13.59	2.87	2771.77	.00	5.03	4.42	6.000	.000	.00	0 .0

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T1 THE SEVENTY
T2   GCW INC. PROJECT# 840.050
T3   FILENAME: MAIN1_FAC4.WSW   RRD
SO  -5582.3902760.799 48                          2767.024
R   -5294.8702762.238 48       .013                                       -58.000     .000 1
R   -5198.7702762.718 48       .013                                          .000     .000 0
SH  -5198.7702762.718 48                          2764.678
CD  18  4               1.500
CD  24  4               2.000
CD  30  4               2.500
CD  36  4               3.000
CD  42  4               3.500
CD  48  4               4.000
CD  54  4               4.500
CD  60  4               5.000
CD  72  4               6.000
Q            23.000    .0
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♀ FILE: MAIN1_FAC4.WSW

W S P G W - CIVILDESIGN Version 14.08

Program Package Serial Number: 7044

WATER SURFACE PROFILE LISTING

Date: 3- 3-2016 Time:10: 8:20

THE SEVENTY

GCW INC. PROJECT# 840.050

FILENAME: MAIN1_FAC4.WSW RRD

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-5582.390	2760.799	6.225	2767.024	23.00	1.83	.05	2767.08	.00	1.41	.00	4.000	.000	.00	0 .0
287.520	.0050					.0003	.07	.00	.00	1.29	.013	.00	.00	PIPE
-5294.870	2762.238	4.871	2767.109	23.00	1.83	.05	2767.16	.00	1.41	.00	4.000	.000	.00	0 .0
96.100	.0050					.0003	.02	4.87	.00	1.29	.013	.00	.00	PIPE
-5198.770	2762.718	4.415	2767.133	23.00	1.83	.05	2767.19	.00	1.41	.00	4.000	.000	.00	0 .0

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T1 THE SEVENTY
T2   GCW INC. PROJECT# 840.050
T3   FILENAME: MAIN1_FAC6.WSW   RRD
SO   -6176.4602735.570 72                        2746.562
R    -6144.3102736.331 72      .013                                  60.000     .000 1
R    -5744.3102751.051 72      .013                                 -70.000     .000 1
R    -5616.7902752.326 72      .013                                    .000     .000 0
SH   -5616.7902752.326 72                        2758.140
CD   18   4               1.500
CD   24   4               2.000
CD   30   4               2.500
CD   36   4               3.000
CD   42   4               3.500
CD   48   4               4.000
CD   54   4               4.500
CD   60   4               5.000
CD   72   4               6.000
Q           191.000    .0
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♀ FILE: MAIN1_FAC6.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 1
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 8:40
THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC6.WSW RRD

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-6176.460	2735.570	10.992	2746.562	191.00	6.76	.71	2747.27	.00	3.77	.00	6.000	.000	.00	0 .0
32.150	.0237					.0020	.07	.00	.00	2.23	.013	.00	.00	PIPE
-6144.310	2736.331	10.447	2746.779	191.00	6.76	.71	2747.49	.00	3.77	.00	6.000	.000	.00	0 .0
115.765	.0368					.0020	.24	.00	.00	1.98	.013	.00	.00	PIPE
-6028.545	2740.591	6.494	2747.085	191.00	6.76	.71	2747.79	.00	3.77	.00	6.000	.000	.00	0 .0
HYDRAULIC JUMP														
-6028.545	2740.591	2.060	2742.651	191.00	22.24	7.68	2750.33	.27	3.77	5.70	6.000	.000	.00	0 .0
62.479	.0368					.0305	1.90	2.33	3.19	1.98	.013	.00	.00	PIPE
-5966.065	2742.890	2.102	2744.992	191.00	21.62	7.26	2752.25	.25	3.77	5.72	6.000	.000	.00	0 .0
62.731	.0368					.0275	1.72	2.36	3.07	1.98	.013	.00	.00	PIPE
-5903.334	2745.199	2.177	2747.376	191.00	20.62	6.60	2753.98	.23	3.77	5.77	6.000	.000	.00	0 .0
41.063	.0368					.0241	.99	2.41	2.87	1.98	.013	.00	.00	PIPE
-5862.271	2746.710	2.255	2748.965	191.00	19.66	6.00	2754.96	.21	3.77	5.81	6.000	.000	.00	0 .0
29.630	.0368					.0211	.63	2.47	2.68	1.98	.013	.00	.00	PIPE
-5832.641	2747.800	2.336	2750.136	191.00	18.74	5.45	2755.59	.19	3.77	5.85	6.000	.000	.00	0 .0
22.494	.0368					.0185	.42	2.53	2.50	1.98	.013	.00	.00	PIPE
-5810.147	2748.628	2.421	2751.049	191.00	17.87	4.96	2756.01	.18	3.77	5.89	6.000	.000	.00	0 .0
17.623	.0368					.0163	.29	2.60	2.34	1.98	.013	.00	.00	PIPE

♀ FILE: MAIN1_FAC6.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 2
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 8:40
THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC6.WSW RRD

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-5792.524	2749.277	2.510	2751.787	191.00	17.04	4.51	2756.29	.16	3.77	5.92	6.000	.000	.00	0 .0
14.117	.0368					.0143	.20	2.67	2.18	1.98	.013	.00	.00	PIPE
-5778.407	2749.796	2.602	2752.398	191.00	16.24	4.10	2756.50	.15	3.77	5.95	6.000	.000	.00	0 .0
11.405	.0368					.0126	.14	2.75	2.04	1.98	.013	.00	.00	PIPE
-5767.002	2750.216	2.698	2752.914	191.00	15.49	3.73	2756.64	.14	3.77	5.97	6.000	.000	.00	0 .0
9.224	.0368					.0110	.10	2.83	1.90	1.98	.013	.00	.00	PIPE
-5757.779	2750.555	2.799	2753.354	191.00	14.77	3.39	2756.74	.12	3.77	5.99	6.000	.000	.00	0 .0
7.487	.0368					.0097	.07	2.92	1.77	1.98	.013	.00	.00	PIPE
-5750.292	2750.831	2.904	2753.735	191.00	14.08	3.08	2756.81	.11	3.77	6.00	6.000	.000	.00	0 .0
5.981	.0368					.0085	.05	3.02	1.65	1.98	.013	.00	.00	PIPE
-5744.311	2751.051	3.015	2754.066	191.00	13.43	2.80	2756.86	.00	3.77	6.00	6.000	.000	.00	0 .0
45.678	.0100					.0076	.35	3.01	1.54	2.83	.013	.00	.00	PIPE
-5698.632	2751.508	3.102	2754.610	191.00	12.95	2.60	2757.21	.00	3.77	6.00	6.000	.000	.00	0 .0
36.952	.0100					.0068	.25	3.10	1.46	2.83	.013	.00	.00	PIPE
-5661.681	2751.877	3.222	2755.099	191.00	12.35	2.37	2757.47	.00	3.77	5.98	6.000	.000	.00	0 .0
22.494	.0100					.0060	.14	3.22	1.35	2.83	.013	.00	.00	PIPE
-5639.187	2752.102	3.348	2755.450	191.00	11.77	2.15	2757.60	.00	3.77	5.96	6.000	.000	.00	0 .0
13.408	.0100					.0053	.07	3.35	1.26	2.83	.013	.00	.00	PIPE

♀ FILE: MAIN1_FAC6.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 3
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 8:40

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC6.WSW RRD

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-5625.779	2752.236	3.481	2755.717	191.00	11.22	1.96	2757.67	.00	3.77	5.92	6.000	.000	.00	0 .0
6.968	.0100					.0047	.03	3.48	1.17	2.83	.013	.00	.00	PIPE
-5618.811	2752.306	3.622	2755.928	191.00	10.70	1.78	2757.71	.00	3.77	5.87	6.000	.000	.00	0 .0
2.021	.0100					.0042	.01	3.62	1.08	2.83	.013	.00	.00	PIPE
-5616.790	2752.326	3.773	2756.099	191.00	10.20	1.62	2757.71	.00	3.77	5.80	6.000	.000	.00	0 .0

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T1 THE SEVENTY
T2   GCW INC. PROJECT# 840.050
T3   FILENAME: MAIN1_FAC8A.WSW   SHT
SO   6760.4802731.530 48                              2736.863
R    6836.4802742.000 48      .013                                                0.000     .000 0
SH   6836.4802742.000 48                                .000
CD  18  4               1.500
CD  24  4               2.000
CD  30  4               2.500
CD  36  4               3.000
CD  42  4               3.500
CD  48  4               4.000
CD  54  4               4.500
CD  60  4               5.000
CD  72  4               6.000
Q           34.000   .0
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♀ FILE: MAIN1_FAC8A.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 1
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 8:56

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC8A.WSW SHT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
6760.480	2731.530	5.333	2736.863	34.00	2.71	.11	2736.98	.00	1.73	.00	4.000	.000	.00	0 .0
9.716	.1378					.0006	.01	5.33	.00	.68	.013	.00	.00	PIPE
6770.196	2732.868	4.000	2736.868	34.00	2.71	.11	2736.98	.00	1.73	.00	4.000	.000	.00	0 .0
2.612	.1378					.0005	.00	4.00	.00	.68	.013	.00	.00	PIPE
6772.808	2733.228	3.629	2736.857	34.00	2.84	.13	2736.98	.00	1.73	2.32	4.000	.000	.00	0 .0
.630	.1378					.0005	.00	3.63	.22	.68	.013	.00	.00	PIPE
6773.438	2733.315	3.539	2736.854	34.00	2.89	.13	2736.98	.00	1.73	2.56	4.000	.000	.00	0 .0
HYDRAULIC JUMP														
6773.438	2733.315	.747	2734.063	34.00	20.95	6.82	2740.88	.00	1.73	3.12	4.000	.000	.00	0 .0
6.132	.1378					.0931	.57	.75	5.12	.68	.013	.00	.00	PIPE
6779.571	2734.160	.759	2734.919	34.00	20.46	6.50	2741.42	.00	1.73	3.14	4.000	.000	.00	0 .0
10.557	.1378					.0843	.89	.76	4.95	.68	.013	.00	.00	PIPE
6790.128	2735.614	.785	2736.399	34.00	19.50	5.91	2742.31	.00	1.73	3.18	4.000	.000	.00	0 .0
7.956	.1378					.0737	.59	.79	4.64	.68	.013	.00	.00	PIPE
6798.083	2736.710	.812	2737.522	34.00	18.60	5.37	2742.89	.00	1.73	3.22	4.000	.000	.00	0 .0
6.283	.1378					.0644	.40	.81	4.35	.68	.013	.00	.00	PIPE
6804.367	2737.575	.839	2738.415	34.00	17.73	4.88	2743.30	.00	1.73	3.26	4.000	.000	.00	0 .0
5.088	.1378					.0562	.29	.84	4.07	.68	.013	.00	.00	PIPE

♀ FILE: MAIN1_FAC8A.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 2
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 8:56

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC8A.WSW SHT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
6809.455	2738.276	.868	2739.145	34.00	16.91	4.44	2743.58	.00	1.73	3.30	4.000	.000	.00	0 .0
4.226	.1378					.0492	.21	.87	3.81	.68	.013	.00	.00	PIPE
6813.681	2738.859	.897	2739.756	34.00	16.12	4.03	2743.79	.00	1.73	3.34	4.000	.000	.00	0 .0
3.542	.1378					.0430	.15	.90	3.57	.68	.013	.00	.00	PIPE
6817.223	2739.347	.928	2740.275	34.00	15.37	3.67	2743.94	.00	1.73	3.38	4.000	.000	.00	0 .0
3.009	.1378					.0376	.11	.93	3.35	.68	.013	.00	.00	PIPE
6820.232	2739.761	.960	2740.721	34.00	14.65	3.33	2744.06	.00	1.73	3.42	4.000	.000	.00	0 .0
2.575	.1378					.0329	.08	.96	3.13	.68	.013	.00	.00	PIPE
6822.807	2740.116	.993	2741.109	34.00	13.97	3.03	2744.14	.00	1.73	3.46	4.000	.000	.00	0 .0
2.216	.1378					.0287	.06	.99	2.93	.68	.013	.00	.00	PIPE
6825.023	2740.421	1.027	2741.448	34.00	13.32	2.76	2744.20	.00	1.73	3.49	4.000	.000	.00	0 .0
1.914	.1378					.0251	.05	1.03	2.75	.68	.013	.00	.00	PIPE
6826.937	2740.685	1.062	2741.747	34.00	12.70	2.51	2744.25	.00	1.73	3.53	4.000	.000	.00	0 .0
1.647	.1378					.0220	.04	1.06	2.57	.68	.013	.00	.00	PIPE
6828.584	2740.912	1.099	2742.011	34.00	12.11	2.28	2744.29	.00	1.73	3.57	4.000	.000	.00	0 .0
1.426	.1378					.0192	.03	1.10	2.41	.68	.013	.00	.00	PIPE
6830.010	2741.108	1.137	2742.246	34.00	11.55	2.07	2744.32	.00	1.73	3.61	4.000	.000	.00	0 .0
1.226	.1378					.0168	.02	1.14	2.25	.68	.013	.00	.00	PIPE

♀ FILE: MAIN1_FAC8A.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 3
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 8:56

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC8A.WSW SHT

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
6831.236	2741.277	1.177	2742.454	34.00	11.01	1.88	2744.34	.00	1.73	3.65	4.000	.000	.00	0 .0
1.058	.1378					.0147	.02	1.18	2.11	.68	.013	.00	.00	PIPE
6832.293	2741.423	1.218	2742.641	34.00	10.50	1.71	2744.35	.00	1.73	3.68	4.000	.000	.00	0 .0
.901	.1378					.0129	.01	1.22	1.97	.68	.013	.00	.00	PIPE
6833.195	2741.547	1.261	2742.808	34.00	10.01	1.56	2744.36	.00	1.73	3.72	4.000	.000	.00	0 .0
.770	.1378					.0113	.01	1.26	1.84	.68	.013	.00	.00	PIPE
6833.965	2741.654	1.305	2742.959	34.00	9.54	1.41	2744.37	.00	1.73	3.75	4.000	.000	.00	0 .0
.646	.1378					.0099	.01	1.31	1.73	.68	.013	.00	.00	PIPE
6834.610	2741.742	1.351	2743.094	34.00	9.10	1.29	2744.38	.00	1.73	3.78	4.000	.000	.00	0 .0
.534	.1378					.0087	.00	1.35	1.61	.68	.013	.00	.00	PIPE
6835.144	2741.816	1.399	2743.215	34.00	8.68	1.17	2744.38	.00	1.73	3.82	4.000	.000	.00	0 .0
.432	.1378					.0076	.00	1.40	1.51	.68	.013	.00	.00	PIPE
6835.576	2741.875	1.449	2743.325	34.00	8.27	1.06	2744.39	.00	1.73	3.85	4.000	.000	.00	0 .0
.340	.1378					.0067	.00	1.45	1.41	.68	.013	.00	.00	PIPE
6835.916	2741.922	1.501	2743.424	34.00	7.89	.97	2744.39	.00	1.73	3.87	4.000	.000	.00	0 .0
.256	.1378					.0058	.00	1.50	1.32	.68	.013	.00	.00	PIPE
6836.172	2741.958	1.555	2743.513	34.00	7.52	.88	2744.39	.00	1.73	3.90	4.000	.000	.00	0 .0
.172	.1378					.0051	.00	1.56	1.23	.68	.013	.00	.00	PIPE

♀ FILE: MAIN1_FAC8A.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 4
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 8:56

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC8A.WSW SHT

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
6836.344	2741.981	1.612	2743.594	34.00	7.17	.80	2744.39	.00	1.73	3.92	4.000	.000	.00	0 .0
.102	.1378					.0045	.00	1.61	1.15	.68	.013	.00	.00	PIPE
6836.446	2741.995	1.671	2743.667	34.00	6.84	.73	2744.39	.00	1.73	3.95	4.000	.000	.00	0 .0
.034	.1378					.0040	.00	1.67	1.07	.68	.013	.00	.00	PIPE
6836.480	2742.000	1.734	2743.733	34.00	6.51	.66	2744.39	.00	1.73	3.96	4.000	.000	.00	0 .0

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T1 THE SEVENTY
T2   GCW INC. PROJECT# 840.050
T3   FILENAME: MAIN1_FAC8B.WSW   SHT
SO  -6732.4802731.530 48                         2736.863
R   -6656.4802742.000 48      .013                                              0.000     .000 1
SH  -6656.4802742.000 48                           .000
CD  18  4              1.500
CD  24  4              2.000
CD  30  4              2.500
CD  36  4              3.000
CD  42  4              3.500
CD  48  4              4.000
CD  54  4              4.500
CD  60  4              5.000
CD  72  4              6.000
Q          60.000   .0
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♀ FILE: MAIN1_FAC8B.WSW              W S P G W - CIVILDESIGN Version 14.08                          PAGE    1
                           Program Package Serial Number: 7044
                                         WATER SURFACE PROFILE LISTING                  Date: 3- 3-2016  Time:10: 9:12
                    THE SEVENTY
                         GCW INC. PROJECT# 840.050
                           FILENAME: MAIN1_FAC8B.WSW   SHT
************************************************************************************************************** ********
          | Invert  | Depth  | Water    |   Q     |  Vel    Vel   | Energy  | Super  |Critical|Flow Top|Height/|Base Wt|     |No Wth
 Station  |  Elev   |  (FT)  |  Elev    |  (CFS)  | (FPS)   Head  | Grd.El. |  Elev  | Depth  | Width  |Dia.-FT|or I.D.|  ZL |Prs/Pip
         -|-       -|-      -|-        -|-       -|-      -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-   -|
 L/Elem   |Ch Slope |        |          |         |         SF Ave|   HF    |SE Dpth |Froude N|Norm Dp |  "N"  | X-Fall|  ZR |Type Ch
*********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|*****|*******
          |         |        |          |         |       |       |         |        |        |        |       |       |     |
-6732.480  2731.530   5.333  2736.863     60.00    4.77     .35  2737.22     .00     2.33      .00    4.000    .000    .00   0    .0
         -|-       -|-      -|-        -|-       -|-      -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-   -|-
    3.274     .1378                                       .0017       .01    5.33      .00      .91    .013      .00   .00  PIPE
          |         |        |          |         |       |       |         |        |        |        |       |       |     |
-6729.206  2731.981   4.888  2736.869     60.00    4.77     .35  2737.22     .00     2.33      .00    4.000    .000    .00   0    .0
         -|-       -|-      -|-        -|-       -|-      -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-   -|-
HYDRAULIC JUMP
          |         |        |          |         |       |       |         |        |        |        |       |       |     |
-6729.206  2731.981   1.021  2733.003     60.00   23.70    8.72  2741.73     .00     2.33     3.49    4.000    .000    .00   0    .0
         -|-       -|-      -|-        -|-       -|-      -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-   -|-
     .925     .1378                                       .0850       .08    1.02     4.90      .91    .013      .00   .00  PIPE
          |         |        |          |         |       |       |         |        |        |        |       |       |     |
-6728.280  2732.109   1.024  2733.133     60.00   23.60    8.65  2741.78     .00     2.33     3.49    4.000    .000    .00   0    .0
         -|-       -|-      -|-        -|-       -|-      -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-   -|-
   12.813     .1378                                       .0791      1.01    1.02     4.87      .91    .013      .00   .00  PIPE
          |         |        |          |         |       |       |         |        |        |        |       |       |     |
-6715.467  2733.874   1.059  2734.933     60.00   22.50    7.86  2742.80     .00     2.33     3.53    4.000    .000    .00   0    .0
         -|-       -|-      -|-        -|-       -|-      -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-   -|-
    9.890     .1378                                       .0692       .68    1.06     4.56      .91    .013      .00   .00  PIPE
          |         |        |          |         |       |       |         |        |        |        |       |       |     |
-6705.577  2735.236   1.096  2736.333     60.00   21.46    7.15  2743.48     .00     2.33     3.57    4.000    .000    .00   0    .0
         -|-       -|-      -|-        -|-       -|-      -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-   -|-
    7.927     .1378                                       .0606       .48    1.10     4.27      .91    .013      .00   .00  PIPE
          |         |        |          |         |       |       |         |        |        |        |       |       |     |
-6697.650  2736.328   1.134  2737.462     60.00   20.46    6.50  2743.96     .00     2.33     3.61    4.000    .000    .00   0    .0
         -|-       -|-      -|-        -|-       -|-      -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-   -|-
    6.500     .1378                                       .0530       .34    1.13     4.00      .91    .013      .00   .00  PIPE
          |         |        |          |         |       |       |         |        |        |        |       |       |     |
-6691.151  2737.224   1.174  2738.398     60.00   19.50    5.91  2744.31     .00     2.33     3.64    4.000    .000    .00   0    .0
         -|-       -|-      -|-        -|-       -|-      -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-   -|-
    5.431     .1378                                       .0464       .25    1.17     3.74      .91    .013      .00   .00  PIPE
          |         |        |          |         |       |       |         |        |        |        |       |       |     |
-6685.720  2737.972   1.215  2739.187     60.00   18.60    5.37  2744.56     .00     2.33     3.68    4.000    .000    .00   0    .0
         -|-       -|-      -|-        -|-       -|-      -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-   -|-
    4.594     .1378                                       .0406       .19    1.22     3.50      .91    .013      .00   .00  PIPE
♀ FILE: MAIN1_FAC8B.WSW              W S P G W - CIVILDESIGN Version 14.08                          PAGE    2
                           Program Package Serial Number: 7044
                                         WATER SURFACE PROFILE LISTING                  Date: 3- 3-2016  Time:10: 9:12
                    THE SEVENTY
                         GCW INC. PROJECT# 840.050
                           FILENAME: MAIN1_FAC8B.WSW   SHT
************************************************************************************************************** ********
          | Invert  | Depth  | Water    |   Q     |  Vel    Vel   | Energy  | Super  |Critical|Flow Top|Height/|Base Wt|     |No Wth
 Station  |  Elev   |  (FT)  |  Elev    |  (CFS)  | (FPS)   Head  | Grd.El. |  Elev  | Depth  | Width  |Dia.-FT|or I.D.|  ZL |Prs/Pip
         -|-       -|-      -|-        -|-       -|-      -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-   -|
 L/Elem   |Ch Slope |        |          |         |         SF Ave|   HF    |SE Dpth |Froude N|Norm Dp |  "N"  | X-Fall|  ZR |Type Ch
*********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|*****|*******
          |         |        |          |         |       |       |         |        |        |        |       |       |     |
-6681.126  2738.604   1.257  2739.862     60.00   17.73    4.88  2744.74     .00     2.33     3.71    4.000    .000    .00   0    .0
         -|-       -|-      -|-        -|-       -|-      -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-   -|-
    3.913     .1378                                       .0356       .14    1.26     3.27      .91    .013      .00   .00  PIPE
          |         |        |          |         |       |       |         |        |        |        |       |       |     |
-6677.213  2739.144   1.301  2740.445     60.00   16.91    4.44  2744.88     .00     2.33     3.75    4.000    .000    .00   0    .0
         -|-       -|-      -|-        -|-       -|-      -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-   -|-
    3.344     .1378                                       .0312       .10    1.30     3.06      .91    .013      .00   .00  PIPE
          |         |        |          |         |       |       |         |        |        |        |       |       |     |
-6673.869  2739.604   1.348  2740.952     60.00   16.12    4.03  2744.99     .00     2.33     3.78    4.000    .000    .00   0    .0
         -|-       -|-      -|-        -|-       -|-      -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-   -|-
    2.896     .1378                                       .0273       .08    1.35     2.86      .91    .013      .00   .00  PIPE
          |         |        |          |         |       |       |         |        |        |        |       |       |     |
-6670.973  2740.003   1.395  2741.398     60.00   15.37    3.67  2745.07     .00     2.33     3.81    4.000    .000    .00   0    .0
         -|-       -|-      -|-        -|-       -|-      -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-   -|-
    2.490     .1378                                       .0239       .06    1.40     2.68      .91    .013      .00   .00  PIPE
          |         |        |          |         |       |       |         |        |        |        |       |       |     |
-6668.483  2740.346   1.445  2741.791     60.00   14.65    3.33  2745.13     .00     2.33     3.84    4.000    .000    .00   0    .0
         -|-       -|-      -|-        -|-       -|-      -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-   -|-
    2.151     .1378                                       .0210       .05    1.45     2.50      .91    .013      .00   .00  PIPE
          |         |        |          |         |       |       |         |        |        |        |       |       |     |
-6666.332  2740.643   1.497  2742.140     60.00   13.97    3.03  2745.17     .00     2.33     3.87    4.000    .000    .00   0    .0
         -|-       -|-      -|-        -|-       -|-      -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-   -|-
    1.856     .1378                                       .0184       .03    1.50     2.34      .91    .013      .00   .00  PIPE
          |         |        |          |         |       |       |         |        |        |        |       |       |     |
-6664.476  2740.898   1.551  2742.449     60.00   13.32    2.76  2745.21     .00     2.33     3.90    4.000    .000    .00   0    .0
         -|-       -|-      -|-        -|-       -|-      -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-   -|-
    1.600     .1378                                       .0162       .03    1.55     2.18      .91    .013      .00   .00  PIPE
          |         |        |          |         |       |       |         |        |        |        |       |       |     |
-6662.876  2741.119   1.607  2742.726     60.00   12.70    2.51  2745.23     .00     2.33     3.92    4.000    .000    .00   0    .0
         -|-       -|-      -|-        -|-       -|-      -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-   -|-
    1.366     .1378                                       .0142       .02    1.61     2.04      .91    .013      .00   .00  PIPE
          |         |        |          |         |       |       |         |        |        |        |       |       |     |
-6661.510  2741.307   1.666  2742.973     60.00   12.11    2.28  2745.25     .00     2.33     3.94    4.000    .000    .00   0    .0
         -|-       -|-      -|-        -|-       -|-      -|-     -|-       -|-      -|-      -|-      -|-     -|-     -|-   -|-
    1.166     .1378                                       .0124       .01    1.67     1.90      .91    .013      .00   .00  PIPE
♀ FILE: MAIN1_FAC8B.WSW              W S P G W - CIVILDESIGN Version 14.08                          PAGE    3
                           Program Package Serial Number: 7044
                                         WATER SURFACE PROFILE LISTING                  Date: 3- 3-2016  Time:10: 9:12
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THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC8B.WSW SHT

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-6660.345	2741.468	1.727	2743.195	60.00	11.55	2.07	2745.27	.00	2.33	3.96	4.000	.000	.00	0 .0
.979	.1378					.0109	.01	1.73	1.78	.91	.013	.00	.00	PIPE
-6659.365	2741.603	1.791	2743.394	60.00	11.01	1.88	2745.28	.00	2.33	3.98	4.000	.000	.00	0 .0
.820	.1378					.0096	.01	1.79	1.66	.91	.013	.00	.00	PIPE
-6658.545	2741.716	1.857	2743.573	60.00	10.50	1.71	2745.28	.00	2.33	3.99	4.000	.000	.00	0 .0
.662	.1378					.0085	.01	1.86	1.55	.91	.013	.00	.00	PIPE
-6657.883	2741.807	1.927	2743.734	60.00	10.01	1.56	2745.29	.00	2.33	4.00	4.000	.000	.00	0 .0
.525	.1378					.0074	.00	1.93	1.44	.91	.013	.00	.00	PIPE
-6657.358	2741.879	2.000	2743.879	60.00	9.54	1.41	2745.29	.00	2.33	4.00	4.000	.000	.00	0 .0
.393	.1378					.0066	.00	2.00	1.34	.91	.013	.00	.00	PIPE
-6656.965	2741.933	2.077	2744.010	60.00	9.10	1.29	2745.30	.00	2.33	4.00	4.000	.000	.00	0 .0
.272	.1378					.0058	.00	2.08	1.25	.91	.013	.00	.00	PIPE
-6656.693	2741.971	2.158	2744.129	60.00	8.68	1.17	2745.30	.00	2.33	3.99	4.000	.000	.00	0 .0
.160	.1378					.0051	.00	2.16	1.16	.91	.013	.00	.00	PIPE
-6656.533	2741.993	2.243	2744.236	60.00	8.27	1.06	2745.30	.00	2.33	3.97	4.000	.000	.00	0 .0
.053	.1378					.0045	.00	2.24	1.08	.91	.013	.00	.00	PIPE
-6656.480	2742.000	2.334	2744.333	60.00	7.88	.96	2745.30	.00	2.33	3.94	4.000	.000	.00	0 .0

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T1 THE SEVENTY
T2   GCW INC. PROJECT# 840.050
T3   FILENAME: MAIN1_FAC9A.WSW   SHT
SO  -7116.3802720.753 24                              2725.405
R   -7078.2202721.390 24      .013                                          60.000     .000 1
R   -6805.9002728.200 24      .013                                         -60.000     .000 1
R   -6618.8802747.000 24      .013                                           0.000     .000 0
SH  -6618.8802747.000 24                                 .000
CD  18  4               1.500
CD  24  4               2.000
CD  30  4               2.500
CD  36  4               3.000
CD  42  4               3.500
CD  48  4               4.000
CD  54  4               4.500
CD  60  4               5.000
CD  72  4               6.000
Q             6.000   .0
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♀ FILE: MAIN1_FAC9A.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 1
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 9:29

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC9A.WSW SHT

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-7116.380	2720.753	4.652	2725.405	6.00	1.91	.06	2725.46	.00	.87	.00	2.000	.000	.00	0 .0
38.160	.0167					.0007	.03	.00	.00	.61	.013	.00	.00	PIPE
-7078.220	2721.390	4.054	2725.444	6.00	1.91	.06	2725.50	.00	.87	.00	2.000	.000	.00	0 .0
84.764	.0250					.0007	.06	.00	.00	.55	.013	.00	.00	PIPE
-6993.457	2723.510	2.000	2725.510	6.00	1.91	.06	2725.57	2.00	.87	.00	2.000	.000	.00	0 .0
7.359	.0250					.0007	.00	2.00	.00	.55	.013	.00	.00	PIPE
-6986.097	2723.694	1.814	2725.508	6.00	2.00	.06	2725.57	.00	.87	1.16	2.000	.000	.00	0 .0
4.176	.0250					.0006	.00	1.81	.22	.55	.013	.00	.00	PIPE
-6981.921	2723.798	1.706	2725.504	6.00	2.10	.07	2725.57	.00	.87	1.42	2.000	.000	.00	0 .0
3.337	.0250					.0007	.00	1.71	.26	.55	.013	.00	.00	PIPE
-6978.584	2723.882	1.618	2725.500	6.00	2.20	.08	2725.58	.00	.87	1.57	2.000	.000	.00	0 .0
2.906	.0250					.0008	.00	1.62	.30	.55	.013	.00	.00	PIPE
-6975.679	2723.954	1.540	2725.494	6.00	2.31	.08	2725.58	.00	.87	1.68	2.000	.000	.00	0 .0
2.554	.0250					.0008	.00	1.54	.33	.55	.013	.00	.00	PIPE
-6973.125	2724.018	1.470	2725.489	6.00	2.42	.09	2725.58	.00	.87	1.77	2.000	.000	.00	0 .0
2.280	.0250					.0009	.00	1.47	.36	.55	.013	.00	.00	PIPE
-6970.845	2724.075	1.406	2725.481	6.00	2.54	.10	2725.58	.00	.87	1.83	2.000	.000	.00	0 .0
2.086	.0250					.0011	.00	1.41	.39	.55	.013	.00	.00	PIPE

♀ FILE: MAIN1_FAC9A.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 2
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 9:29

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC9A.WSW SHT

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-6968.759	2724.128	1.346	2725.474	6.00	2.67	.11	2725.58	.00	.87	1.88	2.000	.000	.00	0 .0
1.686	.0250					.0012	.00	1.35	.43	.55	.013	.00	.00	PIPE
-6967.073	2724.170	1.291	2725.461	6.00	2.80	.12	2725.58	.00	.87	1.91	2.000	.000	.00	0 .0
HYDRAULIC JUMP														
-6967.073	2724.170	.554	2724.724	6.00	8.46	1.11	2725.83	.02	.87	1.79	2.000	.000	.00	0 .0
15.837	.0250					.0250	.40	.57	2.37	.55	.013	.00	.00	PIPE
-6951.236	2724.566	.554	2725.120	6.00	8.46	1.11	2726.23	.02	.87	1.79	2.000	.000	.00	0 .0
50.984	.0250					.0256	1.31	.57	2.37	.55	.013	.00	.00	PIPE
-6900.251	2725.841	.547	2726.388	6.00	8.60	1.15	2727.54	.02	.87	1.78	2.000	.000	.00	0 .0
31.144	.0250					.0281	.88	.56	2.42	.55	.013	.00	.00	PIPE
-6869.107	2726.619	.529	2727.148	6.00	9.02	1.26	2728.41	.02	.87	1.76	2.000	.000	.00	0 .0
15.202	.0250					.0321	.49	.55	2.59	.55	.013	.00	.00	PIPE
-6853.905	2727.000	.511	2727.510	6.00	9.46	1.39	2728.90	.02	.87	1.74	2.000	.000	.00	0 .0
10.409	.0250					.0367	.38	.53	2.77	.55	.013	.00	.00	PIPE
-6843.497	2727.260	.494	2727.754	6.00	9.93	1.53	2729.28	.02	.87	1.73	2.000	.000	.00	0 .0
8.010	.0250					.0420	.34	.51	2.96	.55	.013	.00	.00	PIPE
-6835.487	2727.460	.477	2727.937	6.00	10.41	1.68	2729.62	.02	.87	1.70	2.000	.000	.00	0 .0
6.659	.0250					.0480	.32	.50	3.16	.55	.013	.00	.00	PIPE

♀ FILE: MAIN1_FAC9A.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 3
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 9:29

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC9A.WSW SHT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-6828.828	2727.626	.462	2728.089	6.00	10.92	1.85	2729.94	.02	.87	1.69	2.000	.000	.00	0 .0
5.652	.0250					.0549	.31	.49	3.37	.55	.013	.00	.00	PIPE
-6823.176	2727.768	.446	2728.214	6.00	11.45	2.04	2730.25	.03	.87	1.67	2.000	.000	.00	0 .0
5.012	.0250					.0628	.31	.47	3.60	.55	.013	.00	.00	PIPE
-6818.164	2727.893	.432	2728.325	6.00	12.01	2.24	2730.57	.03	.87	1.65	2.000	.000	.00	0 .0
4.458	.0250					.0719	.32	.46	3.84	.55	.013	.00	.00	PIPE
-6813.705	2728.005	.417	2728.422	6.00	12.60	2.46	2730.89	.03	.87	1.63	2.000	.000	.00	0 .0
4.077	.0250					.0823	.34	.45	4.10	.55	.013	.00	.00	PIPE
-6809.628	2728.107	.404	2728.511	6.00	13.21	2.71	2731.22	.03	.87	1.61	2.000	.000	.00	0 .0
3.728	.0250					.0942	.35	.44	4.38	.55	.013	.00	.00	PIPE
-6805.899	2728.200	.391	2728.592	6.00	13.86	2.98	2731.57	.00	.87	1.59	2.000	.000	.00	0 .0
67.802	.1005					.1006	6.82	.39	4.67	.39	.013	.00	.00	PIPE
-6738.097	2735.016	.391	2735.407	6.00	13.86	2.98	2738.39	.00	.87	1.59	2.000	.000	.00	0 .0
41.953	.1005					.0999	4.19	.39	4.67	.39	.013	.00	.00	PIPE
-6696.145	2739.233	.392	2739.625	6.00	13.80	2.96	2742.58	.00	.87	1.59	2.000	.000	.00	0 .0
33.984	.1005					.0930	3.16	.39	4.65	.39	.013	.00	.00	PIPE
-6662.160	2742.650	.405	2743.055	6.00	13.15	2.69	2745.74	.00	.87	1.61	2.000	.000	.00	0 .0
11.954	.1005					.0813	.97	.41	4.35	.39	.013	.00	.00	PIPE

♀ FILE: MAIN1_FAC9A.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 4
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 9:29

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC9A.WSW SHT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-6650.207	2743.851	.419	2744.271	6.00	12.54	2.44	2746.71	.00	.87	1.63	2.000	.000	.00	0 .0
7.052	.1005					.0710	.50	.42	4.08	.39	.013	.00	.00	PIPE
-6643.155	2744.560	.433	2744.993	6.00	11.96	2.22	2747.21	.00	.87	1.65	2.000	.000	.00	0 .0
4.859	.1005					.0621	.30	.43	3.82	.39	.013	.00	.00	PIPE
-6638.295	2745.049	.448	2745.497	6.00	11.40	2.02	2747.52	.00	.87	1.67	2.000	.000	.00	0 .0
3.643	.1005					.0543	.20	.45	3.58	.39	.013	.00	.00	PIPE
-6634.653	2745.415	.463	2745.878	6.00	10.87	1.84	2747.71	.00	.87	1.69	2.000	.000	.00	0 .0
2.841	.1005					.0474	.13	.46	3.35	.39	.013	.00	.00	PIPE
-6631.812	2745.700	.479	2746.179	6.00	10.36	1.67	2747.85	.00	.87	1.71	2.000	.000	.00	0 .0
2.297	.1005					.0415	.10	.48	3.14	.39	.013	.00	.00	PIPE
-6629.515	2745.931	.495	2746.427	6.00	9.88	1.52	2747.94	.00	.87	1.73	2.000	.000	.00	0 .0
1.880	.1005					.0363	.07	.50	2.94	.39	.013	.00	.00	PIPE
-6627.635	2746.120	.512	2746.633	6.00	9.42	1.38	2748.01	.00	.87	1.75	2.000	.000	.00	0 .0
1.560	.1005					.0317	.05	.51	2.75	.39	.013	.00	.00	PIPE
-6626.075	2746.277	.530	2746.807	6.00	8.98	1.25	2748.06	.00	.87	1.77	2.000	.000	.00	0 .0
1.305	.1005					.0278	.04	.53	2.57	.39	.013	.00	.00	PIPE
-6624.770	2746.408	.549	2746.957	6.00	8.57	1.14	2748.10	.00	.87	1.79	2.000	.000	.00	0 .0
1.110	.1005					.0243	.03	.55	2.41	.39	.013	.00	.00	PIPE

♀ FILE: MAIN1_FAC9A.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 5
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 9:29

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC9A.WSW SHT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-6623.660	2746.520	.568	2747.088	6.00	8.17	1.04	2748.12	.00	.87	1.80	2.000	.000	.00	0 .0
.948	.1005					.0213	.02	.57	2.26	.39	.013	.00	.00	PIPE
-6622.712	2746.615	.587	2747.202	6.00	7.79	.94	2748.14	.00	.87	1.82	2.000	.000	.00	0 .0
.789	.1005					.0186	.01	.59	2.11	.39	.013	.00	.00	PIPE
-6621.923	2746.694	.608	2747.302	6.00	7.42	.86	2748.16	.00	.87	1.84	2.000	.000	.00	0 .0
.675	.1005					.0163	.01	.61	1.97	.39	.013	.00	.00	PIPE
-6621.249	2746.762	.629	2747.391	6.00	7.08	.78	2748.17	.00	.87	1.86	2.000	.000	.00	0 .0
.565	.1005					.0143	.01	.63	1.85	.39	.013	.00	.00	PIPE
-6620.684	2746.819	.651	2747.470	6.00	6.75	.71	2748.18	.00	.87	1.87	2.000	.000	.00	0 .0
.469	.1005					.0125	.01	.65	1.73	.39	.013	.00	.00	PIPE
-6620.214	2746.866	.674	2747.540	6.00	6.44	.64	2748.18	.00	.87	1.89	2.000	.000	.00	0 .0
.385	.1005					.0109	.00	.67	1.62	.39	.013	.00	.00	PIPE
-6619.830	2746.905	.698	2747.603	6.00	6.14	.58	2748.19	.00	.87	1.91	2.000	.000	.00	0 .0
.310	.1005					.0096	.00	.70	1.51	.39	.013	.00	.00	PIPE
-6619.520	2746.936	.723	2747.659	6.00	5.85	.53	2748.19	.00	.87	1.92	2.000	.000	.00	0 .0
.242	.1005					.0084	.00	.72	1.41	.39	.013	.00	.00	PIPE
-6619.278	2746.960	.749	2747.709	6.00	5.58	.48	2748.19	.00	.87	1.94	2.000	.000	.00	0 .0
.182	.1005					.0074	.00	.75	1.32	.39	.013	.00	.00	PIPE

♀ FILE: MAIN1_FAC9A.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 6

Program Package Serial Number: 7044

WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 9:29

THE SEVENTY

GCW INC. PROJECT# 840.050

FILENAME: MAIN1_FAC9A.WSW SHT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-6619.096	2746.979	.776	2747.755	6.00	5.32	.44	2748.19	.00	.87	1.95	2.000	.000	.00	0 .0
.127	.1005					.0065	.00	.78	1.23	.39	.013	.00	.00	PIPE
-6618.969	2746.991	.804	2747.795	6.00	5.07	.40	2748.19	.00	.87	1.96	2.000	.000	.00	0 .0
.066	.1005					.0057	.00	.80	1.15	.39	.013	.00	.00	PIPE
-6618.903	2746.998	.834	2747.832	6.00	4.84	.36	2748.20	.00	.87	1.97	2.000	.000	.00	0 .0
.023	.1005					.0050	.00	.83	1.07	.39	.013	.00	.00	PIPE
-6618.880	2747.000	.866	2747.866	6.00	4.60	.33	2748.20	.00	.87	1.98	2.000	.000	.00	0 .0

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T1 THE SEVENTY
T2   GCW INC. PROJECT# 840.050
T3   FILENAME: MAIN1_FAC10A.WSW
SO   7790.9102687.180 48                        2692.147
R    7806.9102689.220 48      .013                                        4.000    .000 1
R    7827.3302695.000 48      .013                                         .000    .000
SH   7827.3302695.000 48                           .000
CD  18  4               1.500
CD  24  4               2.000
CD  30  4               2.500
CD  36  4               3.000
CD  42  4               3.500
CD  48  4               4.000
CD  54  4               4.500
CD  60  4               5.000
CD  72  4               6.000
Q           23.000   .0
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♀ FILE: MAIN1_FAC10A.WSW   W S P G W - CIVILDESIGN Version 14.08   PAGE 1

Program Package Serial Number: 7044

WATER SURFACE PROFILE LISTING   Date: 3- 3-2016 Time:10:10: 8

THE SEVENTY

GCW INC. PROJECT# 840.050

FILENAME: MAIN1_FAC10A.WSW

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
7790.910	2687.180	4.967	2692.147	23.00	1.83	.05	2692.20	.00	1.41	.00	4.000	.000	.00	0 .0
7.622	.1275					.0003	.00	.00	.00	.58	.013	.00	.00	PIPE
7798.532	2688.152	4.000	2692.152	23.00	1.83	.05	2692.20	4.00	1.41	.00	4.000	.000	.00	0 .0
2.866	.1275					.0002	.00	4.00	.00	.58	.013	.00	.00	PIPE
7801.397	2688.517	3.629	2692.146	23.00	1.92	.06	2692.20	.00	1.41	2.32	4.000	.000	.00	0 .0
1.652	.1275					.0002	.00	3.63	.15	.58	.013	.00	.00	PIPE
7803.050	2688.728	3.413	2692.141	23.00	2.01	.06	2692.20	.00	1.41	2.83	4.000	.000	.00	0 .0
1.341	.1275					.0003	.00	3.41	.18	.58	.013	.00	.00	PIPE
7804.391	2688.899	3.236	2692.135	23.00	2.11	.07	2692.20	.00	1.41	3.14	4.000	.000	.00	0 .0
1.172	.1275					.0003	.00	3.24	.20	.58	.013	.00	.00	PIPE
7805.563	2689.048	3.080	2692.128	23.00	2.21	.08	2692.20	.00	1.41	3.37	4.000	.000	.00	0 .0
1.041	.1275					.0003	.00	3.08	.22	.58	.013	.00	.00	PIPE
7806.604	2689.181	2.940	2692.121	23.00	2.32	.08	2692.21	.00	1.41	3.53	4.000	.000	.00	0 .0
.305	.1275					.0003	.00	2.94	.24	.58	.013	.00	.00	PIPE
7806.909	2689.220	2.899	2692.119	23.00	2.36	.09	2692.20	.00	1.41	3.57	4.000	.000	.00	0 .0
HYDRAULIC JUMP														
7806.910	2689.219	.598	2689.817	23.00	19.56	5.94	2695.76	.00	1.41	2.85	4.000	.000	.00	0 .0
1.546	.2831					.1062	.16	.60	5.37	.48	.013	.00	.00	PIPE

♀ FILE: MAIN1_FAC10A.WSW   W S P G W - CIVILDESIGN Version 14.08   PAGE 2

Program Package Serial Number: 7044

WATER SURFACE PROFILE LISTING   Date: 3- 3-2016 Time:10:10: 8

THE SEVENTY

GCW INC. PROJECT# 840.050

FILENAME: MAIN1_FAC10A.WSW

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
7808.456	2689.657	.608	2690.265	23.00	19.07	5.65	2695.91	.00	1.41	2.87	4.000	.000	.00	0 .0
2.635	.2831					.0959	.25	.61	5.19	.48	.013	.00	.00	PIPE
7811.091	2690.403	.628	2691.031	23.00	18.18	5.13	2696.16	.00	1.41	2.91	4.000	.000	.00	0 .0
2.235	.2831					.0837	.19	.63	4.86	.48	.013	.00	.00	PIPE
7813.326	2691.036	.649	2691.685	23.00	17.33	4.67	2696.35	.00	1.41	2.95	4.000	.000	.00	0 .0
1.915	.2831					.0731	.14	.65	4.55	.48	.013	.00	.00	PIPE
7815.241	2691.578	.671	2692.249	23.00	16.53	4.24	2696.49	.00	1.41	2.99	4.000	.000	.00	0 .0
1.654	.2831					.0638	.11	.67	4.27	.48	.013	.00	.00	PIPE
7816.895	2692.046	.694	2692.740	23.00	15.76	3.86	2696.60	.00	1.41	3.03	4.000	.000	.00	0 .0
1.441	.2831					.0558	.08	.69	4.00	.48	.013	.00	.00	PIPE
7818.335	2692.454	.717	2693.171	23.00	15.02	3.51	2696.68	.00	1.41	3.07	4.000	.000	.00	0 .0
1.257	.2831					.0487	.06	.72	3.75	.48	.013	.00	.00	PIPE
7819.593	2692.810	.741	2693.551	23.00	14.33	3.19	2696.74	.00	1.41	3.11	4.000	.000	.00	0 .0
1.101	.2831					.0425	.05	.74	3.51	.48	.013	.00	.00	PIPE
7820.693	2693.121	.766	2693.887	23.00	13.66	2.90	2696.78	.00	1.41	3.15	4.000	.000	.00	0 .0
.965	.2831					.0372	.04	.77	3.29	.48	.013	.00	.00	PIPE
7821.659	2693.395	.792	2694.187	23.00	13.02	2.63	2696.82	.00	1.41	3.19	4.000	.000	.00	0 .0
.848	.2831					.0325	.03	.79	3.08	.48	.013	.00	.00	PIPE

♀ FILE: MAIN1_FAC10A.WSW   W S P G W - CIVILDESIGN Version 14.08   PAGE 3

Program Package Serial Number: 7044

WATER SURFACE PROFILE LISTING   Date: 3- 3-2016 Time:10:10: 8

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC10A.WSW

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
7822.506	2693.635	.819	2694.454	23.00	12.42	2.39	2696.85	.00	1.41	3.23	4.000	.000	.00	0 .0
.745	.2831					.0284	.02	.82	2.89	.48	.013	.00	.00	PIPE
7823.251	2693.845	.847	2694.692	23.00	11.84	2.18	2696.87	.00	1.41	3.27	4.000	.000	.00	0 .0
.654	.2831					.0248	.02	.85	2.71	.48	.013	.00	.00	PIPE
7823.905	2694.030	.876	2694.906	23.00	11.29	1.98	2696.89	.00	1.41	3.31	4.000	.000	.00	0 .0
.573	.2831					.0217	.01	.88	2.53	.48	.013	.00	.00	PIPE
7824.478	2694.193	.906	2695.099	23.00	10.76	1.80	2696.90	.00	1.41	3.35	4.000	.000	.00	0 .0
.502	.2831					.0190	.01	.91	2.37	.48	.013	.00	.00	PIPE
7824.980	2694.335	.937	2695.272	23.00	10.26	1.64	2696.91	.00	1.41	3.39	4.000	.000	.00	0 .0
.438	.2831					.0166	.01	.94	2.22	.48	.013	.00	.00	PIPE
7825.418	2694.459	.969	2695.428	23.00	9.78	1.49	2696.91	.00	1.41	3.43	4.000	.000	.00	0 .0
.380	.2831					.0145	.01	.97	2.08	.48	.013	.00	.00	PIPE
7825.798	2694.566	1.002	2695.569	23.00	9.33	1.35	2696.92	.00	1.41	3.47	4.000	.000	.00	0 .0
.325	.2831					.0127	.00	1.00	1.95	.48	.013	.00	.00	PIPE
7826.123	2694.658	1.037	2695.696	23.00	8.90	1.23	2696.92	.00	1.41	3.51	4.000	.000	.00	0 .0
.282	.2831					.0111	.00	1.04	1.83	.48	.013	.00	.00	PIPE
7826.405	2694.738	1.072	2695.810	23.00	8.48	1.12	2696.93	.00	1.41	3.54	4.000	.000	.00	0 .0
.236	.2831					.0097	.00	1.07	1.71	.48	.013	.00	.00	PIPE

♀ FILE: MAIN1_FAC10A.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 4
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10:10: 8

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC10A.WSW

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
7826.642	2694.805	1.109	2695.914	23.00	8.09	1.02	2696.93	.00	1.41	3.58	4.000	.000	.00	0 .0
.194	.2831					.0085	.00	1.11	1.60	.48	.013	.00	.00	PIPE
7826.836	2694.860	1.148	2696.008	23.00	7.71	.92	2696.93	.00	1.41	3.62	4.000	.000	.00	0 .0
.159	.2831					.0074	.00	1.15	1.50	.48	.013	.00	.00	PIPE
7826.995	2694.905	1.188	2696.093	23.00	7.35	.84	2696.93	.00	1.41	3.66	4.000	.000	.00	0 .0
.124	.2831					.0065	.00	1.19	1.40	.48	.013	.00	.00	PIPE
7827.119	2694.940	1.230	2696.170	23.00	7.01	.76	2696.93	.00	1.41	3.69	4.000	.000	.00	0 .0
.095	.2831					.0057	.00	1.23	1.31	.48	.013	.00	.00	PIPE
7827.214	2694.967	1.273	2696.240	23.00	6.68	.69	2696.93	.00	1.41	3.73	4.000	.000	.00	0 .0
.065	.2831					.0050	.00	1.27	1.23	.48	.013	.00	.00	PIPE
7827.279	2694.986	1.318	2696.304	23.00	6.37	.63	2696.93	.00	1.41	3.76	4.000	.000	.00	0 .0
.041	.2831					.0044	.00	1.32	1.15	.48	.013	.00	.00	PIPE
7827.320	2694.997	1.364	2696.361	23.00	6.08	.57	2696.93	.00	1.41	3.79	4.000	.000	.00	0 .0
.010	.2831					.0038	.00	1.36	1.07	.48	.013	.00	.00	PIPE
7827.330	2695.000	1.414	2696.414	23.00	5.79	.52	2696.93	.00	1.41	3.82	4.000	.000	.00	0 .0

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T1 THE SEVENTY
T2   GCW INC. PROJECT# 840.050
T3   FILENAME: MAIN1_FAC10B.WSW
SO  -7762.9102686.410 48                           2692.147
R   -7746.9102687.580 48      .013                                  28.340    .000 1
R   -7707.3402694.000 48      .013                                    .000    .000
SH  -7707.3402694.000 48                             .000
CD  18  4               1.500
CD  24  4               2.000
CD  30  4               2.500
CD  36  4               3.000
CD  42  4               3.500
CD  48  4               4.000
CD  54  4               4.500
CD  60  4               5.000
CD  72  4               6.000
Q           36.000   .0
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♀ FILE: MAIN1_FAC10B.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 1
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10:31:10
THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC10B.WSW

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-7762.910	2686.410	5.737	2692.147	36.00	2.86	.13	2692.27	.00	1.79	.00	4.000	.000	.00	0 .0
16.000	.0731					.0006	.01	.00	.00	.82	.013	.00	.00	PIPE
-7746.910	2687.580	4.598	2692.178	36.00	2.86	.13	2692.31	.00	1.79	.00	4.000	.000	.00	0 .0
3.698	.1622					.0006	.00	4.60	.00	.68	.013	.00	.00	PIPE
-7743.212	2688.180	4.000	2692.180	36.00	2.86	.13	2692.31	.00	1.79	.00	4.000	.000	.00	0 .0
2.209	.1622					.0006	.00	4.00	.00	.68	.013	.00	.00	PIPE
-7741.003	2688.538	3.629	2692.167	36.00	3.00	.14	2692.31	.00	1.79	2.32	4.000	.000	.00	0 .0
1.025	.1622					.0006	.00	3.63	.23	.68	.013	.00	.00	PIPE
-7739.978	2688.705	3.452	2692.157	36.00	3.12	.15	2692.31	.00	1.79	2.75	4.000	.000	.00	0 .0
HYDRAULIC JUMP														
-7739.978	2688.705	.829	2689.533	36.00	19.12	5.68	2695.21	.00	1.79	3.24	4.000	.000	.00	0 .0
.856	.1622					.0699	.06	.83	4.42	.68	.013	.00	.00	PIPE
-7739.121	2688.844	.834	2689.677	36.00	18.93	5.57	2695.24	.00	1.79	3.25	4.000	.000	.00	0 .0
4.885	.1622					.0646	.32	.83	4.36	.68	.013	.00	.00	PIPE
-7734.236	2689.636	.863	2690.499	36.00	18.05	5.06	2695.56	.00	1.79	3.29	4.000	.000	.00	0 .0
4.075	.1622					.0565	.23	.86	4.09	.68	.013	.00	.00	PIPE
-7730.161	2690.297	.892	2691.189	36.00	17.21	4.60	2695.79	.00	1.79	3.33	4.000	.000	.00	0 .0
3.430	.1622					.0494	.17	.89	3.83	.68	.013	.00	.00	PIPE

♀ FILE: MAIN1_FAC10B.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 2
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10:31:10
THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC10B.WSW

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-7726.731	2690.854	.923	2691.777	36.00	16.41	4.18	2695.96	.00	1.79	3.37	4.000	.000	.00	0 .0
2.932	.1622					.0432	.13	.92	3.59	.68	.013	.00	.00	PIPE
-7723.799	2691.329	.954	2692.283	36.00	15.65	3.80	2696.09	.00	1.79	3.41	4.000	.000	.00	0 .0
2.511	.1622					.0377	.09	.95	3.36	.68	.013	.00	.00	PIPE
-7721.288	2691.737	.987	2692.724	36.00	14.92	3.46	2696.18	.00	1.79	3.45	4.000	.000	.00	0 .0
2.168	.1622					.0330	.07	.99	3.14	.68	.013	.00	.00	PIPE
-7719.120	2692.089	1.021	2693.110	36.00	14.23	3.14	2696.25	.00	1.79	3.49	4.000	.000	.00	0 .0
1.879	.1622					.0289	.05	1.02	2.94	.68	.013	.00	.00	PIPE
-7717.241	2692.394	1.056	2693.450	36.00	13.56	2.86	2696.31	.00	1.79	3.53	4.000	.000	.00	0 .0
1.625	.1622					.0252	.04	1.06	2.76	.68	.013	.00	.00	PIPE
-7715.615	2692.657	1.093	2693.750	36.00	12.93	2.60	2696.35	.00	1.79	3.57	4.000	.000	.00	0 .0
1.420	.1622					.0221	.03	1.09	2.58	.68	.013	.00	.00	PIPE
-7714.195	2692.888	1.130	2694.018	36.00	12.33	2.36	2696.38	.00	1.79	3.60	4.000	.000	.00	0 .0
1.222	.1622					.0193	.02	1.13	2.41	.68	.013	.00	.00	PIPE
-7712.973	2693.086	1.170	2694.256	36.00	11.76	2.15	2696.40	.00	1.79	3.64	4.000	.000	.00	0 .0
1.061	.1622					.0169	.02	1.17	2.26	.68	.013	.00	.00	PIPE
-7711.913	2693.258	1.211	2694.469	36.00	11.21	1.95	2696.42	.00	1.79	3.68	4.000	.000	.00	0 .0
.918	.1622					.0148	.01	1.21	2.11	.68	.013	.00	.00	PIPE

♀ FILE: MAIN1_FAC10B.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 3
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10:31:10

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC10B.WSW

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-7710.995	2693.407	1.253	2694.660	36.00	10.69	1.77	2696.43	.00	1.79	3.71	4.000	.000	.00	0 .0
.786	.1622					.0130	.01	1.25	1.98	.68	.013	.00	.00	PIPE
-7710.209	2693.534	1.297	2694.832	36.00	10.19	1.61	2696.44	.00	1.79	3.74	4.000	.000	.00	0 .0
.667	.1622					.0114	.01	1.30	1.85	.68	.013	.00	.00	PIPE
-7709.542	2693.643	1.343	2694.986	36.00	9.72	1.47	2696.45	.00	1.79	3.78	4.000	.000	.00	0 .0
.560	.1622					.0100	.01	1.34	1.73	.68	.013	.00	.00	PIPE
-7708.982	2693.733	1.391	2695.125	36.00	9.26	1.33	2696.46	.00	1.79	3.81	4.000	.000	.00	0 .0
.470	.1622					.0087	.00	1.39	1.62	.68	.013	.00	.00	PIPE
-7708.513	2693.810	1.440	2695.250	36.00	8.83	1.21	2696.46	.00	1.79	3.84	4.000	.000	.00	0 .0
.376	.1622					.0077	.00	1.44	1.51	.68	.013	.00	.00	PIPE
-7708.137	2693.871	1.492	2695.363	36.00	8.42	1.10	2696.46	.00	1.79	3.87	4.000	.000	.00	0 .0
.296	.1622					.0067	.00	1.49	1.41	.68	.013	.00	.00	PIPE
-7707.840	2693.919	1.546	2695.465	36.00	8.03	1.00	2696.47	.00	1.79	3.90	4.000	.000	.00	0 .0
.224	.1622					.0059	.00	1.55	1.32	.68	.013	.00	.00	PIPE
-7707.616	2693.955	1.602	2695.557	36.00	7.66	.91	2696.47	.00	1.79	3.92	4.000	.000	.00	0 .0
.158	.1622					.0052	.00	1.60	1.23	.68	.013	.00	.00	PIPE
-7707.458	2693.981	1.660	2695.641	36.00	7.30	.83	2696.47	.00	1.79	3.94	4.000	.000	.00	0 .0
.090	.1622					.0045	.00	1.66	1.15	.68	.013	.00	.00	PIPE

♀ FILE: MAIN1_FAC10B.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 4
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10:31:10

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC10B.WSW

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-7707.368	2693.995	1.721	2695.717	36.00	6.96	.75	2696.47	.00	1.79	3.96	4.000	.000	.00	0 .0
.028	.1622					.0040	.00	1.72	1.07	.68	.013	.00	.00	PIPE
-7707.340	2694.000	1.786	2695.786	36.00	6.63	.68	2696.47	.00	1.79	3.98	4.000	.000	.00	0 .0

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T1 THE SEVENTY
T2   GCW INC. PROJECT# 840.050
T3   FILENAME: MAIN1_FAC12A.WSW   SHT
SO   8723.6402677.000 24                          2685.475
R    8739.6402678.080 24       .013                                 0.000     .000 0
SH   8739.6402678.080 24                             .000
CD  18  4               1.500
CD  24  4               2.000
CD  30  4               2.500
CD  36  4               3.000
CD  42  4               3.500
CD  48  4               4.000
CD  54  4               4.500
CD  60  4               5.000
CD  72  4               6.000
Q           22.000   .0
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MAIN1_FAC12A.OUT

FILE: MAIN1_FAC12A.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 1

Program Package Serial Number: 7044

WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10:11:40

THE SEVENTY

GCW INC. PROJECT# 840.050

FILENAME: MAIN1_FAC12A.WSW SHT

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
8723.640	2677.000	8.475	2685.475	22.00	7.00	.76	2686.24	.00	1.68	.00	2.000	.000	.00	0 .0
16.000	.0675					.0095	.15	8.48	.00	.85	.013	.00	.00	PIPE
8739.640	2678.080	7.546	2685.626	22.00	7.00	.76	2686.39	.00	1.68	.00	2.000	.000	.00	0 .0

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T1 THE SEVENTY
T2   GCW INC. PROJECT# 840.050
T3   FILENAME: MAIN1_FAC12B.WSW   SHT
SO  -8695.6402677.000 24                          2685.475
R   -8679.6402678.080 24       .013                                          0.000     .000 0
SH  -8679.6402678.080 24                             .000
CD  18  4              1.500
CD  24  4              2.000
CD  30  4              2.500
CD  36  4              3.000
CD  42  4              3.500
CD  48  4              4.000
CD  54  4              4.500
CD  60  4              5.000
CD  72  4              6.000
Q           22.000    .0
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                                                            MAIN1_FAC12B.OUT
♀ FILE: MAIN1_FAC12B.WSW                          W S P G W - CIVILDESIGN Version 14.08                                      PAGE    1
                                     Program Package Serial Number: 7044
                                                     WATER SURFACE PROFILE LISTING                    Date: 3- 3-2016  Time:10:14:41
                                THE SEVENTY
                                   GCW INC. PROJECT# 840.050
                                     FILENAME: MAIN1_FAC12B.WSW    SHT
************************************************************************************************************************ ********
          | Invert  | Depth  | Water   |    Q    |  Vel     Vel  |  Energy  | Super  |Critical|Flow Top|Height/|Base Wt|     |No Wth
 Station  |  Elev   |  (FT)  |  Elev   |  (CFS)  | (FPS)    Head |  Grd.El. |  Elev  | Depth  | Width  |Dia.-FT|or I.D.|  ZL |Prs/Pip
         -|-       -|-      -|-       -|-       -|-      -|-    -|-        -|-      -|-      -|-      -|-     -|-     -|-   -|
 L/Elem   |Ch Slope |        |         |         |        SF Ave|    HF    |SE Dpth |Froude N|Norm Dp |  "N"  | X-Fall|  ZR |Type Ch
*********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|*****|*******
          |         |        |         |         |               |          |        |        |        |       |       |     |
-8695.640  2677.000   8.475  2685.475     22.00     7.00     .76  2686.24     .00    1.68      .00    2.000    .000   .00   0    .0
         -|-       -|-      -|-       -|-       -|-      -|-    -|-        -|-      -|-      -|-      -|-     -|-     -|-   -|-
   16.000    .0675                                          .0095     .15     8.48     .00      .85    .013     .00   .00  PIPE
          |         |        |         |         |               |          |        |        |        |       |       |     |
-8679.640  2678.080   7.546  2685.626     22.00     7.00     .76  2686.39     .00    1.68      .00    2.000    .000   .00   0    .0
         -|-       -|-      -|-       -|-       -|-      -|-    -|-        -|-      -|-      -|-      -|-     -|-     -|-   -|-
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T1 THE SEVENTY
T2   GCW INC. PROJECT# 840.050
T3   FILENAME: MAIN1_FAC13A.WSW
SO  -9166.0602668.400 36                     2675.655
R   -9136.0602672.900 36      .013                               14.000    .000 1
R   -9121.9202675.020 36      .013                                 .000    .000
SH  -9121.9202675.020 36                        .000
CD  18  4              1.500
CD  24  4              2.000
CD  30  4              2.500
CD  36  4              3.000
CD  42  4              3.500
CD  48  4              4.000
CD  54  4              4.500
CD  60  4              5.000
CD  72  4              6.000
Q          22.000   .0
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THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC13A.WSW

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-9166.060	2668.400	7.255	2675.655	22.00	3.11	.15	2675.81	.00	1.51	.00	3.000	.000	.00	0 .0
28.701	.1500					.0011	.03	.00	.00	.59	.013	.00	.00	PIPE
-9137.358	2672.705	3.000	2675.705	22.00	3.11	.15	2675.86	3.00	1.51	.00	3.000	.000	.00	0 .0
1.299	.1500					.0010	.00	3.00	.00	.59	.013	.00	.00	PIPE
-9136.060	2672.900	2.796	2675.696	22.00	3.21	.16	2675.86	.00	1.51	1.51	3.000	.000	.00	0 .0
1.103	.1499					.0010	.00	2.80	.27	.59	.013	.00	.00	PIPE
-9134.957	2673.065	2.616	2675.681	22.00	3.36	.18	2675.86	.00	1.51	2.00	3.000	.000	.00	0 .0
.437	.1499					.0010	.00	2.62	.33	.59	.013	.00	.00	PIPE
-9134.521	2673.131	2.542	2675.673	22.00	3.44	.18	2675.86	.00	1.51	2.16	3.000	.000	.00	0 .0
HYDRAULIC JUMP														
-9134.521	2673.131	.837	2673.968	22.00	13.65	2.89	2676.86	.00	1.51	2.69	3.000	.000	.00	0 .0
1.113	.1499					.0362	.04	.84	3.11	.59	.013	.00	.00	PIPE
-9133.407	2673.298	.854	2674.152	22.00	13.26	2.73	2676.88	.00	1.51	2.71	3.000	.000	.00	0 .0
1.858	.1499					.0325	.06	.85	2.99	.59	.013	.00	.00	PIPE
-9131.549	2673.576	.884	2674.460	22.00	12.64	2.48	2676.94	.00	1.51	2.74	3.000	.000	.00	0 .0
1.603	.1499					.0285	.05	.88	2.79	.59	.013	.00	.00	PIPE
-9129.946	2673.817	.915	2674.732	22.00	12.05	2.26	2676.99	.00	1.51	2.76	3.000	.000	.00	0 .0
1.385	.1499					.0249	.03	.92	2.61	.59	.013	.00	.00	PIPE

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC13A.WSW

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-9128.562	2674.024	.947	2674.971	22.00	11.49	2.05	2677.02	.00	1.51	2.79	3.000	.000	.00	0 .0
1.198	.1499					.0218	.03	.95	2.44	.59	.013	.00	.00	PIPE
-9127.363	2674.204	.980	2675.184	22.00	10.96	1.86	2677.05	.00	1.51	2.81	3.000	.000	.00	0 .0
1.028	.1499					.0191	.02	.98	2.29	.59	.013	.00	.00	PIPE
-9126.335	2674.358	1.015	2675.374	22.00	10.45	1.70	2677.07	.00	1.51	2.84	3.000	.000	.00	0 .0
.887	.1499					.0168	.01	1.02	2.14	.59	.013	.00	.00	PIPE
-9125.448	2674.491	1.051	2675.542	22.00	9.96	1.54	2677.08	.00	1.51	2.86	3.000	.000	.00	0 .0
.763	.1499					.0147	.01	1.05	2.00	.59	.013	.00	.00	PIPE
-9124.686	2674.606	1.088	2675.694	22.00	9.50	1.40	2677.09	.00	1.51	2.88	3.000	.000	.00	0 .0
.645	.1499					.0129	.01	1.09	1.87	.59	.013	.00	.00	PIPE
-9124.041	2674.702	1.127	2675.830	22.00	9.06	1.27	2677.10	.00	1.51	2.91	3.000	.000	.00	0 .0
.539	.1499					.0113	.01	1.13	1.75	.59	.013	.00	.00	PIPE
-9123.502	2674.783	1.168	2675.951	22.00	8.64	1.16	2677.11	.00	1.51	2.93	3.000	.000	.00	0 .0
.452	.1499					.0099	.00	1.17	1.63	.59	.013	.00	.00	PIPE
-9123.050	2674.851	1.210	2676.061	22.00	8.23	1.05	2677.11	.00	1.51	2.94	3.000	.000	.00	0 .0
.366	.1499					.0087	.00	1.21	1.52	.59	.013	.00	.00	PIPE
-9122.684	2674.906	1.254	2676.160	22.00	7.85	.96	2677.12	.00	1.51	2.96	3.000	.000	.00	0 .0
.281	.1499					.0076	.00	1.25	1.42	.59	.013	.00	.00	PIPE

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC13A.WSW

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-9122.402	2674.948	1.301	2676.249	22.00	7.48	.87	2677.12	.00	1.51	2.97	3.000	.000	.00	0 .0
.217	.1499					.0067	.00	1.30	1.33	.59	.013	.00	.00	PIPE
-9122.186	2674.980	1.349	2676.330	22.00	7.14	.79	2677.12	.00	1.51	2.98	3.000	.000	.00	0 .0
.152	.1499					.0059	.00	1.35	1.24	.59	.013	.00	.00	PIPE
-9122.033	2675.003	1.399	2676.402	22.00	6.80	.72	2677.12	.00	1.51	2.99	3.000	.000	.00	0 .0
.085	.1499					.0052	.00	1.40	1.15	.59	.013	.00	.00	PIPE
-9121.948	2675.016	1.452	2676.468	22.00	6.49	.65	2677.12	.00	1.51	3.00	3.000	.000	.00	0 .0
.028	.1499					.0046	.00	1.45	1.08	.59	.013	.00	.00	PIPE
-9121.920	2675.020	1.508	2676.528	22.00	6.18	.59	2677.12	.00	1.51	3.00	3.000	.000	.00	0 .0

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T1 THE SEVENTY
T2    GCW INC. PROJECT# 840.050
T3    FILENAME: MAIN1_FAC13B.WSW
SO    9187.8102668.400 36                           2675.655
R     9208.6502669.840 36      .013                                               24.240     .000 1
R     9238.3302671.880 36      .013                                                 .000     .000
SH    9238.3302671.880 36                              .000
CD  18  4               1.500
CD  24  4               2.000
CD  30  4               2.500
CD  36  4               3.000
CD  42  4               3.500
CD  48  4               4.000
CD  54  4               4.500
CD  60  4               5.000
CD  72  4               6.000
Q            22.000    .0
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MAIN1_FAC13B.OUT

♀ FILE: MAIN1_FAC13B.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 1

Program Package Serial Number: 7044

WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10:16:54

THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN1_FAC13B.WSW

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
9187.810	2668.400	7.255	2675.655	22.00	3.11	.15	2675.81	.00	1.51	.00	3.000	.000	.00	0 .0
20.841	.0691					.0011	.02	.00	.00	.72	.013	.00	.00	PIPE
9208.650	2669.840	5.861	2675.701	22.00	3.11	.15	2675.85	.00	1.51	.00	3.000	.000	.00	0 .0
29.680	.0687					.0011	.03	5.86	.00	.72	.013	.00	.00	PIPE
9238.330	2671.880	3.853	2675.733	22.00	3.11	.15	2675.88	.00	1.51	.00	3.000	.000	.00	0 .0

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WSPGW ANALYSIS

MAIN 2

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T1 THE SEVENTY
T2   GCW INC. PROJECT# 840.050
T3   FILENAME: MAIN2-RCB2.WSW   SHT
SO  -7519.0102698.462 15                            2703.115
R   -7413.7302706.021 15       .015                                          89.000
R   -7319.4202712.792 15       .015                                            .000
R   -7198.3502721.485 15       .015                                         -62.000
R   -7059.4702724.374 15       .015                                            .000
R   -6981.7202725.991 15       .015                                            .000
R   -6923.1002727.210 15       .015                                          30.000
R   -6798.3502729.805 15       .015                                            .000
R   -6749.9902730.821 15       .015                                            .000
R   -6739.8902731.030 15       .015                                          30.000
R   -6609.8402733.736 15       .015                                            .000
R   -6526.9502734.565 15       .015                                         -42.000
JX  -6230.9102740.485 15 48    .015    23.000          2740.485              30.0
R   -6143.4902748.869 15       .015                                            .000
R   -6094.8102753.537 15       .015                                         -45.000
TS  -6083.2402754.647 18       .015                                            .000
R   -6052.2502757.619 18       .015                                          25.000
R   -6034.0202759.370 18       .015                                          41.800
SH  -6034.0202759.370 18                                 .000
CD  10  3   1   1.000  12.000   25.000  .000  .000   .00
CD  11  3   0    .000   9.000   17.000  .000  .000   .00
CD  12  3   0    .000  12.000   25.000  .000  .000   .00
CD  13  3   0    .000  12.000   15.000  .000  .000   .00
CD  14  3   0    .000   9.000   12.000  .000  .000   .00
CD  15  3   0    .000   8.000   10.000  .000  .000   .00
CD  16  4   0    .000   6.000     .000  .000  .000   .00
CD  17  4   0    .000   4.000     .000  .000  .000   .00
CD  18  3   0    .000   9.000   20.000  .000  .000   .00
CD  19  3   0    .000   9.000   20.000  .000  .000   .00
CD  48  4   0    .000   4.000     .000  .000  .000   .00
Q          1910.000   .0
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♀ FILE: MAIN2.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 1
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 2-2016 Time: 6:22:33
THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN2-RCB2.WSW SHT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-7519.010	2698.462	4.749	2703.210	1933.00	40.71	25.73	2728.94	8.00	8.00	10.00	8.000	10.000	.00	0 .0
21.536	.0718					.0509	1.10	8.00	3.29	4.20	.015	.00	.00	BOX
-7497.474	2700.008	4.795	2704.803	1933.00	40.31	25.24	2730.04	8.00	8.00	10.00	8.000	10.000	.00	0 .0
83.744	.0718					.0472	3.95	8.00	3.24	4.20	.015	.00	.00	BOX
-7413.730	2706.021	5.029	2711.050	1933.00	38.44	22.94	2733.99	.00	8.00	10.00	8.000	10.000	.00	0 .0
43.842	.0718					.0424	1.86	5.03	3.02	4.20	.015	.00	.00	BOX
-7369.888	2709.169	5.196	2714.365	1933.00	37.20	21.49	2735.85	.00	8.00	10.00	8.000	10.000	.00	0 .0
50.468	.0718					.0381	1.92	5.20	2.88	4.20	.015	.00	.00	BOX
-7319.420	2712.792	5.450	2718.242	1933.00	35.47	19.53	2737.78	8.00	8.00	10.00	8.000	10.000	.00	0 .0
6.813	.0718					.0354	.24	8.00	2.68	4.20	.015	.00	.00	BOX
-7312.607	2713.281	5.491	2718.772	1933.00	35.21	19.25	2738.02	8.00	8.00	10.00	8.000	10.000	.00	0 .0
38.146	.0718					.0330	1.26	8.00	2.65	4.20	.015	.00	.00	BOX
-7274.460	2716.020	5.759	2721.779	1933.00	33.57	17.50	2739.28	8.00	8.00	10.00	8.000	10.000	.00	0 .0
30.661	.0718					.0291	.89	8.00	2.47	4.20	.015	.00	.00	BOX
-7243.800	2718.222	6.040	2724.261	1933.00	32.01	15.91	2740.17	8.00	8.00	10.00	8.000	10.000	.00	0 .0
24.969	.0718					.0257	.64	8.00	2.30	4.20	.015	.00	.00	BOX
-7218.831	2720.014	6.334	2726.349	1933.00	30.52	14.46	2740.81	8.00	8.00	10.00	8.000	10.000	.00	0 .0
20.481	.0718					.0227	.47	8.00	2.14	4.20	.015	.00	.00	BOX

♀ FILE: MAIN2.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 2
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 2-2016 Time: 6:22:33
THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN2-RCB2.WSW SHT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-7198.350	2721.485	6.644	2728.129	1933.00	29.10	13.15	2741.27	.00	8.00	10.00	8.000	10.000	.00	0 .0
138.880	.0208					.0214	2.98	6.64	1.99	6.71	.015	.00	.00	BOX
-7059.470	2724.374	6.614	2730.988	1933.00	29.23	13.27	2744.25	.00	8.00	10.00	8.000	10.000	.00	0 .0
77.750	.0208					.0217	1.68	6.61	2.00	6.71	.015	.00	.00	BOX
-6981.720	2725.991	6.591	2732.582	1933.00	29.33	13.36	2745.94	8.00	8.00	10.00	8.000	10.000	.00	0 .0
58.620	.0208					.0218	1.28	8.00	2.01	6.71	.015	.00	.00	BOX
-6923.100	2727.210	6.571	2733.781	1933.00	29.42	13.44	2747.22	.00	8.00	10.00	8.000	10.000	.00	0 .0
124.750	.0208					.0222	2.77	6.57	2.02	6.71	.015	.00	.00	BOX
-6798.350	2729.805	6.517	2736.322	1933.00	29.66	13.66	2749.98	.00	8.00	10.00	8.000	10.000	.00	0 .0
48.360	.0210					.0225	1.09	6.52	2.05	6.68	.015	.00	.00	BOX
-6749.990	2730.821	6.494	2737.315	1933.00	29.77	13.76	2751.07	8.00	8.00	10.00	8.000	10.000	.00	0 .0
10.100	.0207					.0226	.23	8.00	2.06	6.72	.015	.00	.00	BOX
-6739.890	2731.030	6.488	2737.518	1933.00	29.79	13.78	2751.30	.00	8.00	10.00	8.000	10.000	.00	0 .0
130.050	.0208					.0231	3.00	6.49	2.06	6.71	.015	.00	.00	BOX
-6609.840	2733.736	6.400	2740.136	1933.00	30.20	14.17	2754.30	1.25	8.00	10.00	8.000	10.000	.00	0 .0
9.033	.0100					.0236	.21	7.65	2.10	8.00	.015	.00	.00	BOX
-6600.807	2733.826	6.364	2740.190	1933.00	30.37	14.33	2754.52	1.27	8.00	10.00	8.000	10.000	.00	0 .0
73.857	.0100					.0254	1.87	7.63	2.12	8.00	.015	.00	.00	BOX

♀ FILE: MAIN2.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 3
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 2-2016 Time: 6:22:33
THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN2-RCB2.WSW SHT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip

L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-6526.950	2734.565	6.068	2740.633	1933.00	31.86	15.76	2756.39	.00	8.00	10.00	8.000	10.000	.00	0 .0
JUNCT STR	.0200					.0333	9.85	6.07	2.28		.015	.00	.00	BOX
-6230.910	2740.485	5.194	2745.679	1910.00	36.77	21.00	2766.67	.00	8.00	10.00	8.000	10.000	.00	0 .0
.523	.0959					.0396	.02	5.19	2.84	3.75	.015	.00	.00	BOX
-6230.387	2740.535	5.198	2745.734	1910.00	36.74	20.96	2766.70	.00	8.00	10.00	8.000	10.000	.00	0 .0
28.127	.0959					.0372	1.05	5.20	2.84	3.75	.015	.00	.00	BOX
-6202.259	2743.233	5.452	2748.685	1910.00	35.03	19.06	2767.74	.00	8.00	10.00	8.000	10.000	.00	0 .0
23.230	.0959					.0328	.76	5.45	2.64	3.75	.015	.00	.00	BOX
-6179.029	2745.461	5.718	2751.179	1910.00	33.40	17.32	2768.50	.00	8.00	10.00	8.000	10.000	.00	0 .0
19.349	.0959					.0289	.56	5.72	2.46	3.75	.015	.00	.00	BOX
-6159.681	2747.316	5.997	2753.313	1910.00	31.85	15.75	2769.06	.00	8.00	10.00	8.000	10.000	.00	0 .0
16.190	.0959					.0255	.41	6.00	2.29	3.75	.015	.00	.00	BOX
-6143.490	2748.869	6.290	2755.159	1910.00	30.37	14.32	2769.48	8.00	8.00	10.00	8.000	10.000	.00	0 .0
.647	.0959					.0239	.02	8.00	2.13	3.75	.015	.00	.00	BOX
-6142.842	2748.931	6.303	2755.234	1910.00	30.30	14.26	2769.49	8.00	8.00	10.00	8.000	10.000	.00	0 .0
13.462	.0959					.0225	.30	8.00	2.13	3.75	.015	.00	.00	BOX
-6129.380	2750.222	6.611	2756.833	1910.00	28.89	12.96	2769.79	8.00	8.00	10.00	8.000	10.000	.00	0 .0
11.255	.0959					.0199	.22	8.00	1.98	3.75	.015	.00	.00	BOX

♀ FILE: MAIN2.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 4

Program Package Serial Number: 7044

WATER SURFACE PROFILE LISTING Date: 3- 2-2016 Time: 6:22:33

THE SEVENTY

GCW INC. PROJECT# 840.050

FILENAME: MAIN2-RCB2.WSW SHT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-6118.125	2751.301	6.933	2758.235	1910.00	27.55	11.78	2770.02	8.00	8.00	10.00	8.000	10.000	.00	0 .0
9.358	.0959					.0176	.16	8.00	1.84	3.75	.015	.00	.00	BOX
-6108.767	2752.199	7.272	2759.470	1910.00	26.27	10.71	2770.18	8.00	8.00	10.00	8.000	10.000	.00	0 .0
7.706	.0959					.0156	.12	8.00	1.72	3.75	.015	.00	.00	BOX
		-------------------- WARNING - Flow depth near top of box conduit --------------------												
-6101.061	2752.938	7.627	2760.564	1910.00	25.04	9.74	2770.30	8.00	8.00	10.00	8.000	10.000	.00	0 .0
6.250	.0959					.0173	.11	8.00	1.60	3.75	.015	.00	.00	BOX
		-------------------- WARNING - Flow depth near top of box conduit --------------------												
-6094.810	2753.537	8.000	2761.537	1910.00	23.88	8.85	2770.39	.00	8.00	10.00	8.000	10.000	.00	0 .0
TRANS STR	.0959					.0025	.03	8.00	1.49		.015	.00	.00	BOX
-6083.240	2754.647	15.899	2770.546	1910.00	10.61	1.75	2772.29	.00	6.57	20.00	9.000	20.000	.00	0 .0
30.990	.0959					.0025	.08	.00	.62	2.14	.015	.00	.00	BOX
-6052.250	2757.619	13.190	2770.809	1910.00	10.61	1.75	2772.56	.00	6.57	20.00	9.000	20.000	.00	0 .0
18.230	.0961					.0025	.05	.00	.62	2.13	.015	.00	.00	BOX
-6034.020	2759.370	11.723	2771.094	1910.00	10.61	1.75	2772.84	.00	6.57	20.00	9.000	20.000	.00	0 .0

♀

WSPGW ANALYSIS

MAINLINE 2 LATERALS

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T1 THE TWO FIFTY
T2   GCW INC. PROJECT# 840.050
T3   FILENAME: MAIN-RCP6.WSW   SHT
SO  -6230.9302741.000 48                          2748.635
R   -6157.6002742.480 48       .013                              -48.500    .000 1
R   -5802.5302764.240 48       .013                                0.000    .000 0
SH  -5802.5302764.240 48                              .000
CD  18  4              1.500
CD  24  4              2.000
CD  30  4              2.500
CD  36  4              3.000
CD  42  4              3.500
CD  48  4              4.000
CD  54  4              4.500
CD  60  4              5.000
CD  72  4              6.000
Q          54.000   .0
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FILE: MAIN2-RCP6.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 1

Program Package Serial Number: 7044

WATER SURFACE PROFILE LISTING Date: 2-24-2016 Time: 5:34: 1

THE TWO FIFTY

GCW INC. PROJECT# 840.050

FILENAME: MAIN-RCP6.WSW SHT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-6230.930	2741.000	7.635	2748.635	54.00	4.30	.29	2748.92	.00	2.21	.00	4.000	.000	.00	0 .0
73.330	.0202					.0014	.10	.00	.00	1.40	.013	.00	.00	PIPE
-6157.600	2742.480	6.315	2748.795	54.00	4.30	.29	2749.08	.00	2.21	.00	4.000	.000	.00	0 .0
34.604	.0613					.0014	.05	6.32	.00	1.05	.013	.00	.00	PIPE
-6122.996	2744.601	4.243	2748.844	54.00	4.30	.29	2749.13	.00	2.21	.00	4.000	.000	.00	0 .0
HYDRAULIC JUMP														
-6122.996	2744.601	1.054	2745.654	54.00	20.43	6.48	2752.13	.00	2.21	3.52	4.000	.000	.00	0 .0
5.583	.0613					.0613	.34	1.05	4.16	1.05	.013	.00	.00	PIPE
-6117.414	2744.943	1.054	2745.996	54.00	20.43	6.48	2752.47	.00	2.21	3.52	4.000	.000	.00	0 .0
143.660	.0613					.0583	8.38	1.05	4.16	1.05	.013	.00	.00	PIPE
-5973.753	2753.747	1.081	2754.828	54.00	19.69	6.02	2760.85	.00	2.21	3.55	4.000	.000	.00	0 .0
54.188	.0613					.0519	2.81	1.08	3.95	1.05	.013	.00	.00	PIPE
-5919.565	2757.068	1.118	2758.186	54.00	18.78	5.48	2763.66	.00	2.21	3.59	4.000	.000	.00	0 .0
28.844	.0613					.0454	1.31	1.12	3.70	1.05	.013	.00	.00	PIPE
-5890.721	2758.835	1.157	2759.992	54.00	17.90	4.98	2764.97	.00	2.21	3.63	4.000	.000	.00	0 .0
19.126	.0613					.0397	.76	1.16	3.46	1.05	.013	.00	.00	PIPE
-5871.595	2760.007	1.197	2761.204	54.00	17.07	4.53	2765.73	.00	2.21	3.66	4.000	.000	.00	0 .0
13.930	.0613					.0348	.48	1.20	3.24	1.05	.013	.00	.00	PIPE

FILE: MAIN2-RCP6.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 2

Program Package Serial Number: 7044

WATER SURFACE PROFILE LISTING Date: 2-24-2016 Time: 5:34: 1

THE TWO FIFTY

GCW INC. PROJECT# 840.050

FILENAME: MAIN-RCP6.WSW SHT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-5857.665	2760.861	1.239	2762.100	54.00	16.28	4.11	2766.21	.00	2.21	3.70	4.000	.000	.00	0 .0
10.701	.0613					.0304	.33	1.24	3.03	1.05	.013	.00	.00	PIPE
-5846.964	2761.517	1.283	2762.800	54.00	15.52	3.74	2766.54	.00	2.21	3.73	4.000	.000	.00	0 .0
8.522	.0613					.0267	.23	1.28	2.83	1.05	.013	.00	.00	PIPE
-5838.441	2762.039	1.328	2763.367	54.00	14.80	3.40	2766.77	.00	2.21	3.77	4.000	.000	.00	0 .0
6.911	.0613					.0234	.16	1.33	2.65	1.05	.013	.00	.00	PIPE
-5831.530	2762.463	1.375	2763.838	54.00	14.11	3.09	2766.93	.00	2.21	3.80	4.000	.000	.00	0 .0
5.685	.0613					.0205	.12	1.38	2.48	1.05	.013	.00	.00	PIPE
-5825.846	2762.811	1.424	2764.235	54.00	13.45	2.81	2767.04	.00	2.21	3.83	4.000	.000	.00	0 .0
4.718	.0613					.0180	.08	1.42	2.32	1.05	.013	.00	.00	PIPE
-5821.128	2763.100	1.475	2764.575	54.00	12.83	2.55	2767.13	.00	2.21	3.86	4.000	.000	.00	0 .0
3.935	.0613					.0157	.06	1.48	2.16	1.05	.013	.00	.00	PIPE
-5817.193	2763.341	1.528	2764.869	54.00	12.23	2.32	2767.19	.00	2.21	3.89	4.000	.000	.00	0 .0
3.267	.0613					.0138	.05	1.53	2.02	1.05	.013	.00	.00	PIPE
-5813.926	2763.542	1.584	2765.125	54.00	11.66	2.11	2767.24	.00	2.21	3.91	4.000	.000	.00	0 .0
2.744	.0613					.0121	.03	1.58	1.89	1.05	.013	.00	.00	PIPE
-5811.182	2763.710	1.641	2765.351	54.00	11.12	1.92	2767.27	.00	2.21	3.94	4.000	.000	.00	0 .0
2.260	.0613					.0106	.02	1.64	1.76	1.05	.013	.00	.00	PIPE

FILE: MAIN2-RCP6.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 3

Program Package Serial Number: 7044

WATER SURFACE PROFILE LISTING Date: 2-24-2016 Time: 5:34: 1

THE TWO FIFTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN-RCP6.WSW SHT

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-5808.921	2763.848	1.701	2765.549	54.00	10.60	1.74	2767.29	.00	2.21	3.96	4.000	.000	.00	0 .0
1.841	.0613					.0093	.02	1.70	1.65	1.05	.013	.00	.00	PIPE
-5807.081	2763.961	1.764	2765.725	54.00	10.11	1.59	2767.31	.00	2.21	3.97	4.000	.000	.00	0 .0
1.492	.0613					.0082	.01	1.76	1.54	1.05	.013	.00	.00	PIPE
-5805.588	2764.052	1.829	2765.882	54.00	9.64	1.44	2767.32	.00	2.21	3.99	4.000	.000	.00	0 .0
1.148	.0613					.0072	.01	1.83	1.43	1.05	.013	.00	.00	PIPE
-5804.440	2764.123	1.898	2766.021	54.00	9.19	1.31	2767.33	.00	2.21	3.99	4.000	.000	.00	0 .0
.858	.0613					.0064	.01	1.90	1.33	1.05	.013	.00	.00	PIPE
-5803.582	2764.176	1.970	2766.146	54.00	8.76	1.19	2767.34	.00	2.21	4.00	4.000	.000	.00	0 .0
.599	.0613					.0056	.00	1.97	1.24	1.05	.013	.00	.00	PIPE
-5802.983	2764.212	2.045	2766.257	54.00	8.35	1.08	2767.34	.00	2.21	4.00	4.000	.000	.00	0 .0
.346	.0613					.0049	.00	2.05	1.16	1.05	.013	.00	.00	PIPE
-5802.637	2764.233	2.124	2766.357	54.00	7.96	.98	2767.34	.00	2.21	3.99	4.000	.000	.00	0 .0
.107	.0613					.0043	.00	2.12	1.08	1.05	.013	.00	.00	PIPE
-5802.530	2764.240	2.209	2766.448	54.00	7.59	.89	2767.34	.00	2.21	3.98	4.000	.000	.00	0 .0

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T1 THE SEVENTY
T2   GCW INC. PROJECT# 840.050
T3   FILENAME: MAIN2_FAC16C.WSW   SHT
SO  -6220.9102741.560 48                      2745.679
R   -6157.5802745.110 48      .013                                   -48.500    .000 1
R   -5802.5102764.240 48      .013                                     0.000    .000 0
SH  -5802.5102764.240 48                         .000
CD  18  4             1.500
CD  24  4             2.000
CD  30  4             2.500
CD  36  4             3.000
CD  42  4             3.500
CD  48  4             4.000
CD  54  4             4.500
CD  60  4             5.000
CD  72  4             6.000
Q         54.000   .0
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♀ FILE: MAIN2_FAC16C.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 1
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 1:21
THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN2_FAC16C.WSW SHT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-6220.910	2741.560	1.082	2742.642	54.00	19.67	6.01	2748.65	.57	2.21	3.55	4.000	.000	.00	0 .0
63.330	.0561					.0545	3.45	1.65	3.95	1.08	.013	.00	.00	PIPE
-6157.581	2745.110	1.089	2746.198	54.00	19.51	5.91	2752.11	.00	2.21	3.56	4.000	.000	.00	0 .0
37.031	.0539					.0539	2.00	1.09	3.90	1.09	.013	.00	.00	PIPE
-6120.550	2747.105	1.089	2748.194	54.00	19.51	5.91	2754.10	.00	2.21	3.56	4.000	.000	.00	0 .0
147.574	.0539					.0511	7.55	1.09	3.90	1.09	.013	.00	.00	PIPE
-5972.976	2755.056	1.118	2756.174	54.00	18.78	5.48	2761.65	.00	2.21	3.59	4.000	.000	.00	0 .0
53.987	.0539					.0454	2.45	1.12	3.70	1.09	.013	.00	.00	PIPE
-5918.988	2757.964	1.157	2759.121	54.00	17.90	4.98	2764.10	.00	2.21	3.63	4.000	.000	.00	0 .0
29.132	.0539					.0397	1.16	1.16	3.46	1.09	.013	.00	.00	PIPE
-5889.856	2759.534	1.197	2760.731	54.00	17.07	4.53	2765.26	.00	2.21	3.66	4.000	.000	.00	0 .0
19.329	.0539					.0348	.67	1.20	3.24	1.09	.013	.00	.00	PIPE
-5870.527	2760.575	1.239	2761.814	54.00	16.28	4.11	2765.93	.00	2.21	3.70	4.000	.000	.00	0 .0
14.085	.0539					.0304	.43	1.24	3.03	1.09	.013	.00	.00	PIPE
-5856.442	2761.334	1.283	2762.617	54.00	15.52	3.74	2766.36	.00	2.21	3.73	4.000	.000	.00	0 .0
10.843	.0539					.0267	.29	1.28	2.83	1.09	.013	.00	.00	PIPE
-5845.599	2761.918	1.328	2763.247	54.00	14.80	3.40	2766.65	.00	2.21	3.77	4.000	.000	.00	0 .0
8.589	.0539					.0234	.20	1.33	2.65	1.09	.013	.00	.00	PIPE

♀ FILE: MAIN2_FAC16C.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 2
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 1:21
THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN2_FAC16C.WSW SHT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-5837.010	2762.381	1.375	2763.756	54.00	14.11	3.09	2766.85	.00	2.21	3.80	4.000	.000	.00	0 .0
6.945	.0539					.0205	.14	1.38	2.48	1.09	.013	.00	.00	PIPE
-5830.064	2762.755	1.424	2764.179	54.00	13.45	2.81	2766.99	.00	2.21	3.83	4.000	.000	.00	0 .0
5.690	.0539					.0180	.10	1.42	2.32	1.09	.013	.00	.00	PIPE
-5824.374	2763.062	1.475	2764.537	54.00	12.83	2.55	2767.09	.00	2.21	3.86	4.000	.000	.00	0 .0
4.699	.0539					.0157	.07	1.48	2.16	1.09	.013	.00	.00	PIPE
-5819.675	2763.315	1.528	2764.843	54.00	12.23	2.32	2767.17	.00	2.21	3.89	4.000	.000	.00	0 .0
3.871	.0539					.0138	.05	1.53	2.02	1.09	.013	.00	.00	PIPE
-5815.804	2763.524	1.584	2765.108	54.00	11.66	2.11	2767.22	.00	2.21	3.91	4.000	.000	.00	0 .0
3.231	.0539					.0121	.04	1.58	1.89	1.09	.013	.00	.00	PIPE
-5812.573	2763.698	1.641	2765.339	54.00	11.12	1.92	2767.26	.00	2.21	3.94	4.000	.000	.00	0 .0
2.647	.0539					.0106	.03	1.64	1.76	1.09	.013	.00	.00	PIPE
-5809.925	2763.840	1.701	2765.542	54.00	10.60	1.74	2767.29	.00	2.21	3.96	4.000	.000	.00	0 .0
2.147	.0539					.0093	.02	1.70	1.65	1.09	.013	.00	.00	PIPE
-5807.778	2763.956	1.764	2765.720	54.00	10.11	1.59	2767.31	.00	2.21	3.97	4.000	.000	.00	0 .0
1.734	.0539					.0082	.01	1.76	1.54	1.09	.013	.00	.00	PIPE
-5806.044	2764.050	1.829	2765.879	54.00	9.64	1.44	2767.32	.00	2.21	3.99	4.000	.000	.00	0 .0
1.331	.0539					.0072	.01	1.83	1.43	1.09	.013	.00	.00	PIPE

♀ FILE: MAIN2_FAC16C.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 3
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 1:21
THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN2_FAC16C.WSW SHT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-5804.714	2764.121	1.898	2766.020	54.00	9.19	1.31	2767.33	.00	2.21	3.99	4.000	.000	.00	0 .0
.992	.0539					.0064	.01	1.90	1.33	1.09	.013	.00	.00	PIPE

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-5803.722  2764.175   1.970  2766.145   54.00   8.76   1.19  2767.34   .00   2.21   4.00   4.000   .000   .00   0   .0
     .690     .0539                                  .0056      .00  1.97   1.24   1.09    .013    .00   .00  PIPE
-5803.031  2764.212   2.045  2766.257   54.00   8.35   1.08  2767.34   .00   2.21   4.00   4.000   .000   .00   0   .0
     .398     .0539                                  .0049      .00  2.05   1.16   1.09    .013    .00   .00  PIPE
-5802.633  2764.233   2.124  2766.357   54.00   7.96    .98  2767.34   .00   2.21   3.99   4.000   .000   .00   0   .0
     .124     .0539                                  .0043      .00  2.12   1.08   1.09    .013    .00   .00  PIPE
-5802.510  2764.240   2.209  2766.448   54.00   7.59    .89  2767.34   .00   2.21   3.98   4.000   .000   .00   0   .0
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T1 THE SEVENTY
T2   GCW INC. PROJECT# 840.050
T3   FILENAME: MAIN1_FAC17.WSW
SO  -6739.9902733.420 42                        2737.518
R   -6682.9002744.240 42      .013                                          .000     .000
SH  -6682.9002744.240 42                          .000
CD  18  4              1.500
CD  24  4              2.000
CD  30  4              2.500
CD  36  4              3.000
CD  42  4              3.500
CD  48  4              4.000
CD  54  4              4.500
CD  60  4              5.000
CD  72  4              6.000
Q           51.000   .0
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MAIN2_FAC17.OUT

♀ FILE: MAIN2_FAC17.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 1

Program Package Serial Number: 7044

WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 3:42

THE SEVENTY

GCW INC. PROJECT# 840.050

FILENAME: MAIN1_FAC17.WSW

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-6739.990	2733.420	.930	2734.350	51.00	24.89	9.62	2743.97	.00	2.23	3.09	3.500	.000	.00	0 .0
1.454	.1895					.1067	.16	.93	5.39	.81	.013	.00	.00	PIPE
-6738.536	2733.696	.934	2734.630	51.00	24.72	9.49	2744.12	.00	2.23	3.10	3.500	.000	.00	0 .0
9.182	.1895					.0990	.91	.93	5.34	.81	.013	.00	.00	PIPE
-6729.354	2735.436	.966	2736.402	51.00	23.57	8.63	2745.03	.00	2.23	3.13	3.500	.000	.00	0 .0
7.295	.1895					.0867	.63	.97	5.00	.81	.013	.00	.00	PIPE
-6722.059	2736.818	1.000	2737.818	51.00	22.48	7.84	2745.66	.00	2.23	3.16	3.500	.000	.00	0 .0
5.966	.1895					.0759	.45	1.00	4.68	.81	.013	.00	.00	PIPE
-6716.093	2737.949	1.035	2738.984	51.00	21.43	7.13	2746.12	.00	2.23	3.19	3.500	.000	.00	0 .0
4.973	.1895					.0664	.33	1.04	4.38	.81	.013	.00	.00	PIPE
-6711.120	2738.892	1.071	2739.963	51.00	20.43	6.48	2746.45	.00	2.23	3.23	3.500	.000	.00	0 .0
4.204	.1895					.0581	.24	1.07	4.09	.81	.013	.00	.00	PIPE
-6706.917	2739.688	1.108	2740.796	51.00	19.48	5.89	2746.69	.00	2.23	3.26	3.500	.000	.00	0 .0
3.583	.1895					.0509	.18	1.11	3.83	.81	.013	.00	.00	PIPE
-6703.333	2740.367	1.147	2741.515	51.00	18.58	5.36	2746.87	.00	2.23	3.29	3.500	.000	.00	0 .0
3.078	.1895					.0446	.14	1.15	3.58	.81	.013	.00	.00	PIPE
-6700.255	2740.951	1.188	2742.139	51.00	17.71	4.87	2747.01	.00	2.23	3.31	3.500	.000	.00	0 .0
2.664	.1895					.0391	.10	1.19	3.35	.81	.013	.00	.00	PIPE

♀ FILE: MAIN2_FAC17.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 2

Program Package Serial Number: 7044

WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 3:42

THE SEVENTY

GCW INC. PROJECT# 840.050

FILENAME: MAIN1_FAC17.WSW

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-6697.591	2741.456	1.230	2742.686	51.00	16.89	4.43	2747.11	.00	2.23	3.34	3.500	.000	.00	0 .0
2.309	.1895					.0343	.08	1.23	3.13	.81	.013	.00	.00	PIPE
-6695.282	2741.893	1.274	2743.167	51.00	16.10	4.03	2747.19	.00	2.23	3.37	3.500	.000	.00	0 .0
2.006	.1895					.0300	.06	1.27	2.93	.81	.013	.00	.00	PIPE
-6693.276	2742.273	1.320	2743.594	51.00	15.35	3.66	2747.25	.00	2.23	3.39	3.500	.000	.00	0 .0
1.745	.1895					.0264	.05	1.32	2.73	.81	.013	.00	.00	PIPE
-6691.532	2742.604	1.368	2743.972	51.00	14.64	3.33	2747.30	.00	2.23	3.42	3.500	.000	.00	0 .0
1.523	.1895					.0231	.04	1.37	2.55	.81	.013	.00	.00	PIPE
-6690.009	2742.893	1.417	2744.310	51.00	13.96	3.02	2747.33	.00	2.23	3.44	3.500	.000	.00	0 .0
1.317	.1895					.0203	.03	1.42	2.38	.81	.013	.00	.00	PIPE
-6688.691	2743.142	1.469	2744.611	51.00	13.31	2.75	2747.36	.00	2.23	3.45	3.500	.000	.00	0 .0
1.141	.1895					.0178	.02	1.47	2.23	.81	.013	.00	.00	PIPE
-6687.550	2743.359	1.523	2744.882	51.00	12.69	2.50	2747.38	.00	2.23	3.47	3.500	.000	.00	0 .0
.985	.1895					.0157	.02	1.52	2.08	.81	.013	.00	.00	PIPE
-6686.565	2743.545	1.579	2745.124	51.00	12.10	2.27	2747.40	.00	2.23	3.48	3.500	.000	.00	0 .0
.839	.1895					.0138	.01	1.58	1.94	.81	.013	.00	.00	PIPE
-6685.726	2743.704	1.638	2745.343	51.00	11.53	2.07	2747.41	.00	2.23	3.49	3.500	.000	.00	0 .0
.709	.1895					.0121	.01	1.64	1.81	.81	.013	.00	.00	PIPE

♀ FILE: MAIN2_FAC17.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 3

Program Package Serial Number: 7044

WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 3:42

THE SEVENTY

GCW INC. PROJECT# 840.050

FILENAME: MAIN1_FAC17.WSW

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-6685.017	2743.839	1.700	2745.539	51.00	11.00	1.88	2747.42	.00	2.23	3.50	3.500	.000	.00	0 .0
.591	.1895					.0107	.01	1.70	1.68	.81	.013	.00	.00	PIPE

-6684.426	2743.951	1.765	2745.716	51.00	10.49	1.71	2747.42	.00	2.23	3.50	3.500	.000	.00	0	.0
.484	.1895					.0094	.00	1.77	1.57	.81	.013	.00	.00	PIPE	
-6683.942	2744.042	1.833	2745.875	51.00	10.00	1.55	2747.43	.00	2.23	3.50	3.500	.000	.00	0	.0
.387	.1895					.0083	.00	1.83	1.46	.81	.013	.00	.00	PIPE	
-6683.556	2744.116	1.904	2746.020	51.00	9.53	1.41	2747.43	.00	2.23	3.49	3.500	.000	.00	0	.0
.292	.1895					.0073	.00	1.90	1.36	.81	.013	.00	.00	PIPE	
-6683.263	2744.171	1.979	2746.150	51.00	9.09	1.28	2747.43	.00	2.23	3.47	3.500	.000	.00	0	.0
.206	.1895					.0064	.00	1.98	1.26	.81	.013	.00	.00	PIPE	
-6683.058	2744.210	2.058	2746.268	51.00	8.67	1.17	2747.43	.00	2.23	3.45	3.500	.000	.00	0	.0
.120	.1895					.0057	.00	2.06	1.17	.81	.013	.00	.00	PIPE	
-6682.938	2744.233	2.142	2746.375	51.00	8.26	1.06	2747.43	.00	2.23	3.41	3.500	.000	.00	0	.0
.038	.1895					.0050	.00	2.14	1.08	.81	.013	.00	.00	PIPE	
-6682.900	2744.240	2.232	2746.472	51.00	7.87	.96	2747.44	.00	2.23	3.36	3.500	.000	.00	0	.0

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T1 THE SEVENTY
T2   GCW INC. PROJECT# 840.050
T3   FILENAME: MAIN2_FAC19.WSW   SHT
SO  -7049.3802726.520 18                          2731.195
R   -7032.6802728.880 18      .013                                        60.000     .000 1
R   -7003.6802736.320 18      .013                                        30.000     .000 0
SH  -7003.6802736.320 18                              .000
CD  18  4               1.500
CD  24  4               2.000
CD  30  4               2.500
CD  36  4               3.000
CD  42  4               3.500
CD  48  4               4.000
CD  54  4               4.500
CD  60  4               5.000
CD  72  4               6.000
Q           2.000   .0
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♀ FILE: MAIN2_FAC19.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 1
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 2:58
THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN2_FAC19.WSW SHT

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-7049.380	2726.520	4.675	2731.195	2.00	1.13	.02	2731.21	.00	.53	.00	1.500	.000	.00	0 .0
16.700	.1413					.0004	.01	.00	.00	.23	.013	.00	.00	PIPE
-7032.680	2728.880	2.325	2731.205	2.00	1.13	.02	2731.23	.00	.53	.00	1.500	.000	.00	0 .0
3.225	.2566					.0004	.00	.00	.00	.20	.013	.00	.00	PIPE
-7029.455	2729.707	1.500	2731.207	2.00	1.13	.02	2731.23	1.50	.53	.00	1.500	.000	.00	0 .0
.534	.2566					.0003	.00	1.50	.00	.20	.013	.00	.00	PIPE
-7028.921	2729.844	1.360	2731.205	2.00	1.19	.02	2731.23	.00	.53	.87	1.500	.000	.00	0 .0
.304	.2566					.0003	.00	1.36	.15	.20	.013	.00	.00	PIPE
-7028.617	2729.922	1.280	2731.202	2.00	1.24	.02	2731.23	.00	.53	1.06	1.500	.000	.00	0 .0
.252	.2566					.0004	.00	1.28	.18	.20	.013	.00	.00	PIPE
-7028.365	2729.987	1.213	2731.200	2.00	1.31	.03	2731.23	.00	.53	1.18	1.500	.000	.00	0 .0
.121	.2566					.0004	.00	1.21	.20	.20	.013	.00	.00	PIPE
-7028.245	2730.018	1.155	2731.173	2.00	1.37	.03	2731.20	.00	.53	1.26	1.500	.000	.00	0 .0
HYDRAULIC JUMP														
-7028.245	2730.018	.200	2730.218	2.00	14.27	3.16	2733.38	.12	.53	1.02	1.500	.000	.00	0 .0
6.129	.2566					.2316	1.42	.32	6.78	.20	.013	.00	.00	PIPE
-7022.115	2731.591	.207	2731.798	2.00	13.53	2.84	2734.64	.11	.53	1.03	1.500	.000	.00	0 .0
4.458	.2566					.2002	.89	.31	6.31	.20	.013	.00	.00	PIPE

♀ FILE: MAIN2_FAC19.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 2
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 2:58
THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN2_FAC19.WSW SHT

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-7017.657	2732.734	.214	2732.948	2.00	12.90	2.58	2735.53	.10	.53	1.05	1.500	.000	.00	0 .0
2.785	.2566					.1748	.49	.31	5.91	.20	.013	.00	.00	PIPE
-7014.872	2733.449	.221	2733.670	2.00	12.30	2.35	2736.02	.09	.53	1.06	1.500	.000	.00	0 .0
1.978	.2566					.1527	.30	.31	5.54	.20	.013	.00	.00	PIPE
-7012.895	2733.956	.229	2734.185	2.00	11.72	2.13	2736.32	.08	.53	1.08	1.500	.000	.00	0 .0
1.518	.2566					.1333	.20	.31	5.20	.20	.013	.00	.00	PIPE
-7011.377	2734.346	.236	2734.582	2.00	11.18	1.94	2736.52	.08	.53	1.09	1.500	.000	.00	0 .0
1.201	.2566					.1163	.14	.31	4.87	.20	.013	.00	.00	PIPE
-7010.176	2734.654	.244	2734.898	2.00	10.66	1.76	2736.66	.07	.53	1.11	1.500	.000	.00	0 .0
.983	.2566					.1016	.10	.31	4.56	.20	.013	.00	.00	PIPE
-7009.193	2734.906	.252	2735.158	2.00	10.16	1.60	2736.76	.06	.53	1.12	1.500	.000	.00	0 .0
.815	.2566					.0887	.07	.32	4.28	.20	.013	.00	.00	PIPE
-7008.378	2735.115	.261	2735.376	2.00	9.69	1.46	2736.83	.06	.53	1.14	1.500	.000	.00	0 .0
.690	.2566					.0776	.05	.32	4.01	.20	.013	.00	.00	PIPE
-7007.688	2735.292	.270	2735.562	2.00	9.24	1.33	2736.89	.06	.53	1.15	1.500	.000	.00	0 .0
.590	.2566					.0678	.04	.33	3.76	.20	.013	.00	.00	PIPE
-7007.098	2735.444	.279	2735.723	2.00	8.81	1.20	2736.93	.05	.53	1.17	1.500	.000	.00	0 .0
.509	.2566					.0592	.03	.33	3.52	.20	.013	.00	.00	PIPE

♀ FILE: MAIN2_FAC19.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 3
Program Package Serial Number: 7044
WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 2:58
THE SEVENTY
GCW INC. PROJECT# 840.050
FILENAME: MAIN2_FAC19.WSW SHT

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-7006.589	2735.574	.288	2735.862	2.00	8.40	1.10	2736.96	.05	.53	1.18	1.500	.000	.00	0 .0
.437	.2566					.0517	.02	.33	3.30	.20	.013	.00	.00	PIPE

-7006.152	2735.686	.298	2735.984	2.00	8.01	1.00	2736.98	.04	.53	1.20	1.500	.000	.00	0 .0
.381	.2566					.0452	.02	.34	3.09	.20	.013	.00	.00	PIPE
-7005.771	2735.784	.308	2736.092	2.00	7.63	.91	2737.00	.04	.53	1.21	1.500	.000	.00	0 .0
.329	.2566					.0395	.01	.35	2.89	.20	.013	.00	.00	PIPE
-7005.442	2735.868	.319	2736.187	2.00	7.28	.82	2737.01	.04	.53	1.23	1.500	.000	.00	0 .0
.292	.2566					.0345	.01	.36	2.71	.20	.013	.00	.00	PIPE
-7005.150	2735.943	.329	2736.272	2.00	6.94	.75	2737.02	.03	.53	1.24	1.500	.000	.00	0 .0
.248	.2566					.0302	.01	.36	2.54	.20	.013	.00	.00	PIPE
-7004.903	2736.007	.341	2736.348	2.00	6.62	.68	2737.03	.03	.53	1.26	1.500	.000	.00	0 .0
.221	.2566					.0264	.01	.37	2.38	.20	.013	.00	.00	PIPE
-7004.682	2736.063	.352	2736.415	2.00	6.31	.62	2737.03	.03	.53	1.27	1.500	.000	.00	0 .0
.189	.2566					.0230	.00	.38	2.23	.20	.013	.00	.00	PIPE
-7004.493	2736.112	.364	2736.476	2.00	6.02	.56	2737.04	.03	.53	1.29	1.500	.000	.00	0 .0
.161	.2566					.0202	.00	.39	2.09	.20	.013	.00	.00	PIPE
-7004.332	2736.153	.377	2736.530	2.00	5.74	.51	2737.04	.02	.53	1.30	1.500	.000	.00	0 .0
.140	.2566					.0176	.00	.40	1.95	.20	.013	.00	.00	PIPE

♀ FILE: MAIN2_FAC19.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 4

Program Package Serial Number: 7044

WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 2:58

THE SEVENTY

GCW INC. PROJECT# 840.050

FILENAME: MAIN2_FAC19.WSW SHT

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-7004.191	2736.189	.390	2736.579	2.00	5.47	.46	2737.04	.02	.53	1.32	1.500	.000	.00	0 .0
.121	.2566					.0154	.00	.41	1.83	.20	.013	.00	.00	PIPE
-7004.070	2736.220	.403	2736.623	2.00	5.21	.42	2737.05	.02	.53	1.33	1.500	.000	.00	0 .0
.100	.2566					.0135	.00	.42	1.71	.20	.013	.00	.00	PIPE
-7003.970	2736.246	.417	2736.663	2.00	4.97	.38	2737.05	.02	.53	1.34	1.500	.000	.00	0 .0
.081	.2566					.0118	.00	.44	1.60	.20	.013	.00	.00	PIPE
-7003.889	2736.266	.432	2736.698	2.00	4.74	.35	2737.05	.02	.53	1.36	1.500	.000	.00	0 .0
.068	.2566					.0103	.00	.45	1.50	.20	.013	.00	.00	PIPE
-7003.821	2736.284	.447	2736.731	2.00	4.52	.32	2737.05	.02	.53	1.37	1.500	.000	.00	0 .0
.052	.2566					.0091	.00	.46	1.40	.20	.013	.00	.00	PIPE
-7003.770	2736.297	.463	2736.760	2.00	4.31	.29	2737.05	.01	.53	1.39	1.500	.000	.00	0 .0
.041	.2566					.0079	.00	.48	1.31	.20	.013	.00	.00	PIPE
-7003.729	2736.308	.479	2736.787	2.00	4.11	.26	2737.05	.01	.53	1.40	1.500	.000	.00	0 .0
.027	.2566					.0069	.00	.49	1.23	.20	.013	.00	.00	PIPE
-7003.701	2736.315	.496	2736.811	2.00	3.92	.24	2737.05	.01	.53	1.41	1.500	.000	.00	0 .0
.019	.2566					.0061	.00	.51	1.15	.20	.013	.00	.00	PIPE
-7003.683	2736.320	.513	2736.833	2.00	3.74	.22	2737.05	.01	.53	1.42	1.500	.000	.00	0 .0
.002	.2566					.0053	.00	.52	1.07	.20	.013	.00	.00	PIPE

♀ FILE: MAIN2_FAC19.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 5

Program Package Serial Number: 7044

WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 2:58

THE SEVENTY

GCW INC. PROJECT# 840.050

FILENAME: MAIN2_FAC19.WSW SHT

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-7003.680	2736.320	.533	2736.853	2.00	3.55	.20	2737.05	.01	.53	1.44	1.500	.000	.00	0 .0

♀

```
T1 THE SEVENTY
T2   GCW INC. PROJECT# 840.050
T3   FILENAME: MAIN2_FAC21.WSW   SHT
SO  -7308.6402713.300 18                          2718.250
R   -7289.4202713.684 18       .013                                         0.000     .000 0
SH  -7289.4202713.684 18                            .000
CD  18  4              1.500
CD  24  4              2.000
CD  30  4              2.500
CD  36  4              3.000
CD  42  4              3.500
CD  48  4              4.000
CD  54  4              4.500
CD  60  4              5.000
CD  72  4              6.000
Q           2.000   .0
```

MAIN2_FAC21.OUT

♀ FILE: MAIN2_FAC21.WSW W S P G W - CIVILDESIGN Version 14.08 PAGE 1

Program Package Serial Number: 7044

WATER SURFACE PROFILE LISTING Date: 3- 3-2016 Time:10: 0:25

THE SEVENTY

GCW INC. PROJECT# 840.050

FILENAME: MAIN2_FAC21.WSW SHT

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-7308.640	2713.300	4.950	2718.250	2.00	1.13	.02	2718.27	.00	.53	.00	1.500	.000	.00	0 .0
19.220	.0200					.0004	.01	4.95	.00	.37	.013	.00	.00	PIPE
-7289.420	2713.684	4.573	2718.257	2.00	1.13	.02	2718.28	.00	.53	.00	1.500	.000	.00	0 .0

♀

HEC-RAS ANALYSIS

EXISTING CONDITIONS MAIN 1

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

PROJECT DATA
Project Title: Main 1 - Existing Condition
Project File : EXIST3.prj
Run Date and Time: 2/29/2016 11:05:34 AM

Project in English units

PLAN DATA

Plan Title: Main1
Plan File : f:\Projects\800\840-050\Division\Fctl\Calcs\HEC-RAS\01-Main1\EXIST3.p02

Geometry Title: Main1
Geometry File : f:\Projects\800\840-050\Division\Fctl\Calcs\HEC-RAS\01-Main1\EXIST3.G01

Flow Title : Main1
Flow File : f:\Projects\800\840-050\Division\Fctl\Calcs\HEC-RAS\01-Main1\EXIST3.F01

Plan Summary Information:

Number of:	Cross Sections =	26	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	0	Lateral Structures =	0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed at all cross sections
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Main1
Flow File : f:\Projects\800\840-050\Division\Fctl\Calcs\HEC-RAS\01-Main1\EXIST3.F01

Flow Data (cfs)

River	Reach	RS	PF 1
Unamed Wash	Main1	2700	2128

Unnamed Wash	Main1	1700	2227
Unnamed Wash	Main1	1500	2472
Unnamed Wash	Main1	800	2493
Unnamed Wash	Main1	500	4209

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Unnamed Wash	Main1	PF 1	Critical	Known WS = 2684.83

GEOMETRY DATA

Geometry Title: Main1
Geometry File : f:\Projects\800\840-050\Division\Fctl\Calcs\HEC-RAS\01-Main1\EXIST3.G01

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 2700

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2769	4.32	2768	8.89	2767	14.12	2766	19.18	2765
24.32	2764	29.44	2763	34.62	2762	39.85	2761	45	2760
48.3	2759	51.08	2758	54.15	2757	58.29	2756	74.22	2756
77.45	2757	80.08	2758	90.95	2758	94.1	2757	95.07	2757
97.37	2758	99.58	2759	100.37	2760	101.18	2761	101.97	2762
103.09	2763	105.64	2764	108.63	2765	112.52	2766	116.09	2767
119.56	2768	127.49	2769						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	127.49	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	127.49	95.75	98.69	107.97	.1	.3

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 2600

INPUT
Description:
Station Elevation Data num= 34

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2765	3.19	2764	6.31	2763	9.41	2762	12.03	2761
12.88	2760	13.83	2759	14.76	2758	15.74	2757	16.76	2756
17.69	2755	18.58	2754	22.83	2752	32.12	2752	37.82	2754
43.67	2755	52.8	2756	66.54	2757	66.62	2758	66.71	2759
68.82	2761	68.85	2761	70.78	2759	71.78	2758	72.75	2757
86.93	2757	90.38	2758	91.7	2759	92.96	2760	94.15	2761
99.48	2762	104.49	2763	110.14	2764	115.64	2765		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	115.64	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	115.64	101.86	103.65	108.71	.1	.3

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 2500

INPUT
Description:
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2761	.38	2760	.75	2759	1.17	2758	1.89	2756
2.3	2755	2.68	2754	3.06	2753	3.44	2752	9.58	2748
17.77	2748	34.89	2752	60.1	2753	67.24	2754	71.71	2755
76.74	2756	84.67	2758	93.68	2759	99.64	2760	104.45	2761

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	104.45	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	104.45	108.74	100.43	96.31	.1	.3

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 2400

INPUT
Description:
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2758	15.42	2758	18.34	2757	21.01	2756	23.33	2755
24.99	2754	26.51	2753	29.64	2751	31.2	2750	33.06	2749
35.06	2748	37.36	2747	68.67	2749	90.83	2749	95.4	2751
98.61	2752	104.46	2754	109.02	2755	118.84	2756	121.79	2757
123.77	2758	126.1	2759	128.13	2759				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	128.13	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	128.13	109.52	114.22	121.17	.1	.3

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 2300

INPUT
Description:
Station Elevation Data num= 33

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2757	13.08	2756	20.71	2755	24.77	2754	28.47	2753
32.13	2752	33.53	2751	34.62	2750	35.7	2749	36.76	2748
37.76	2747	39.95	2746	42.62	2745	49.66	2744	64.78	2744
70.38	2745	73.02	2746	74.87	2747	76.67	2748	78.26	2749
79.83	2750	83.9	2751	88.3	2752	92.1	2753	95.71	2754
99.67	2755	104.09	2756	108.38	2757	112.21	2758	115.85	2759
119.41	2760	122.82	2761	126.24	2762				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	126.24	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	126.24	191.53	193.81	198.19	.1	.3

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 2200

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2752	8.53	2751	25.12	2749	33.08	2748	37.76	2747
41.77	2746	47.66	2745	50.99	2744	52.82	2743	54.58	2742
57.55	2741	61.05	2740	78.87	2740	83.65	2741	87.38	2742
89.14	2743	90.4	2744	91.6	2745	93.05	2746	95	2747
96.89	2748	98.01	2749	99.17	2750	100.55	2751	101.91	2752
103.89	2753	105.52	2754	107.21	2755	109.78	2756	113.41	2757
118.47	2758	127.18	2759						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	127.18	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	127.18	113.96	200.13	254.43	.1	.3

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 2100

INPUT
Description:
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2748	9.24	2747	16.89	2746	26.59	2744	37.05	2742
40.48	2741	42.68	2740	44.83	2739	47.03	2738	55.78	2736
78.8	2738	79.56	2739	80.33	2740	81.25	2741	83.37	2742
85.58	2743	93.92	2746	96.58	2747	132.68	2749	132.68	2751

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	132.68	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	132.68	231.94	197.1	162.04	.1	.3

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 2000

INPUT
Description:
Station Elevation Data num= 36

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2755	3.69	2754	10.93	2752	15.12	2751	19.95	2750
25.24	2749	30.66	2748	36.25	2747	40.5	2746	43.7	2745
46.08	2744	47.48	2743	48.3	2742	49.03	2741	49.79	2740
50.49	2739	51.12	2738	51.7	2737	52.34	2736	52.87	2735
53.42	2734	54.05	2733	54.84	2732	56.08	2731	57.36	2730
58.7	2729	72.73	2729	74.05	2730	77.94	2731	82.11	2732
84.74	2733	87.34	2734	89.95	2735	107.65	2737	116.39	2738
137.36	2739								

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.035	116.39	.03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

0	137.36	231.62	197.66	162.89		.1	.3

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 1900

INPUT
Description:
Station Elevation Data num= 54

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2760	7.86	2759	8.62	2758	9.33	2757	10.1	2756
12.21	2754	14.17	2753	16.04	2752	17.72	2751	19.29	2750
22.45	2748	24.24	2747	26.07	2746	27.89	2745	29.73	2744
31.59	2743	33.35	2742	35.09	2741	37.27	2740	39.81	2739
42.41	2738	43.87	2737	44.98	2736	46.08	2735	46.55	2734
47.14	2733	47.96	2732	49.45	2730	50.64	2729	51.77	2728
52.93	2727	54.04	2726	55.19	2725	56.32	2724	69.55	2724
69.74	2725	69.88	2726	70.03	2727	70.55	2728	72.22	2729
75.51	2729	80.71	2729	83.34	2730	86.02	2731	88.45	2732
90.22	2733	91.95	2734	94.33	2735	96.69	2736	99.84	2737
102.86	2738	105.74	2739	124.05	2740	124.05	2741		

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.035	105.74	.03

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	124.05	122.47	101.94	85.19	.1	.3

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 1800

INPUT
Description:
Station Elevation Data num= 53

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2740	3.91	2746	13.58	2747	27.29	2747	40.79	2744
44.66	2743	46.27	2742	47.87	2741	49.53	2740	51.08	2739
54.43	2737	56.3	2736	58.22	2735	60.13	2734	63.04	2732
64.1	2731	64.52	2730	64.99	2729	65.44	2728	66.35	2726
66.79	2725	67.28	2724	67.73	2723	68.2	2722	69.12	2720
75.66	2719	79.29	2721	79.87	2722	80.21	2723	80.48	2724
80.76	2725	81.02	2726	81.44	2727	82.21	2728	83.08	2729
83.9	2730	84.67	2731	86.85	2732	92.81	2732	94.63	2732
100.04	2732	102.44	2731	104.77	2730	115.2	2730	116.94	2731
118.67	2732	120.41	2733	122.2	2734	125.27	2735	129.23	2736
133.96	2737	139.92	2738	148.25	2737				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	148.25	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	148.25	140.2	137.49	140.54	.1	.3

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 1700

INPUT
Description:
Station Elevation Data num= 37

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2737	1.25	2737	11.94	2735	15.37	2734	18.84	2733

```
   22.36    2732   26.44    2731   32.09    2730    36.2    2729   39.93    2726
    40.4    2725   40.83    2724   41.29    2723   42.62    2720   43.08    2719
   43.53    2718   43.95    2717   44.26    2716   52.91    2717   52.98    2718
   53.05    2719   53.18    2720   53.54    2722   54.25    2723   54.56    2724
   54.58    2725    54.7    2726   55.93    2727   57.21    2728    61.3    2729
    62.1    2730   62.82    2731   64.63    2731   65.76    2730   72.27    2730
   75.99    2731   92.39    2732

Manning's n Values          num=        3
     Sta   n Val      Sta   n Val      Sta   n Val
       0    .035        0    .035    92.39    .035

Bank Sta: Left    Right     Lengths: Left Channel    Right      Coeff Contr.    Expan.
             0    92.39             145.9  141.68   135.05               .1        .3

CROSS SECTION


RIVER: Unnamed Wash
REACH: Main1                RS: 1600

INPUT
Description:
Station Elevation Data      num=       41
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    2730     .84    2730    3.34    2729    5.76    2728    8.34    2727
   10.96    2726   13.73    2725   16.56    2724    18.7    2723   19.54    2722
   20.05    2721    20.5    2720   20.95    2719    21.4    2718   21.81    2717
    22.7    2715   23.18    2714   23.61    2713    24.1    2712   25.18    2711
   32.35    2711   32.43    2712   32.46    2713   32.51    2714   32.51    2715
   32.55    2716   32.61    2717   32.63    2718   32.73    2719   32.76    2720
   32.87    2721      33    2722   33.08    2723   33.17    2724   41.32    2725
   47.05    2724   57.68    2725   64.05    2727   72.68    2728   75.19    2729
   79.21    2730

Manning's n Values          num=        3
     Sta   n Val      Sta   n Val      Sta   n Val
       0    .035        0    .035    79.21    .035

Bank Sta: Left    Right     Lengths: Left Channel    Right      Coeff Contr.    Expan.
             0    79.21            132.22  129.11    128.4               .1        .3

CROSS SECTION


RIVER: Unnamed Wash
REACH: Main1                RS: 1500

INPUT
Description:
Station Elevation Data      num=       54
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    2739    5.25    2739   10.38    2738   11.16    2737   11.88    2736
   12.54    2735   13.99    2733   15.85    2732   19.53    2730   20.91    2729
    22.3    2728   25.12    2726   26.47    2725   27.51    2723   27.95    2722
   28.38    2721   28.86    2720   29.24    2719   29.73    2718   30.09    2717
   30.55    2716   30.96    2715   31.37    2714   31.75    2713   32.14    2712
   32.55    2711   32.96    2710   36.88    2707   40.43    2707   40.71    2708
   41.04    2709    41.4    2710   41.76    2711   42.06    2712   42.35    2713
   42.61    2714   42.89    2715   43.12    2716   44.34    2717   46.18    2718
   48.75    2719   51.54    2720   53.99    2721   56.32    2722   58.52    2723
   60.88    2724    63.2    2725   65.05    2726   66.91    2727   68.83    2728
   70.84    2729   73.94    2730   79.58    2732   81.97    2733

Manning's n Values          num=        3
     Sta   n Val      Sta   n Val      Sta   n Val
       0    .035        0    .035    81.97    .035

Bank Sta: Left    Right     Lengths: Left Channel    Right      Coeff Contr.    Expan.
             0    81.97            270.26  260.99   251.15               .1        .3
```

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 1400

INPUT
Description:
Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2720	6.86	2719	11.59	2718	21.44	2715	25.17	2713
30.02	2710	30.88	2709	31.6	2708	33	2706	33.73	2705
34.42	2704	41.24	2702.26	42.26	2702	45.17	2702	45.29	2704
45.32	2705	45.5	2708	45.52	2709	45.55	2710	46.41	2711
48.5	2712	50.57	2713	52.69	2714	55.15	2715	70.98	2715
75.09	2714	78.35	2713	81.16	2712	84.24	2711	87.41	2710
90.89	2709								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	90.89	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	90.89	197.2	199.44	199.87	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
70.98	90.89	2715

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 1300

INPUT
Description:
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2712	4.99	2710	14.86	2706	17.55	2705	22.21	2704
27.42	2703	29.49	2702	31.48	2701	36.81	2700	41.74	2699
45.01	2699	64.83	2699	67.91	2700	70.18	2701	71.28	2702
72.3	2703	73.52	2704	75.03	2705	76.39	2706	77.9	2707
81.18	2709	84.68	2711	89.2	2713	90.51	2714	91.21	2715
91.91	2716	92.61	2717	93.31	2718	94.06	2719		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	94.06	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	94.06	170	195.8	223.9	.1	.3

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 1200

INPUT
Description:
Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2716	.24	2716	10.59	2714	13.66	2713	16.72	2712
19.16	2711	19.86	2710	20.62	2709	21.34	2708	22.05	2707
22.77	2706	23.47	2705	24.18	2704	24.9	2703	25.61	2702
26.28	2701	27.17	2700	29.23	2699	30.97	2698	35.17	2696
37.91	2695	64.52	2696	67.8	2697	69.22	2698	70.64	2699
70.83	2700	70.92	2701	71.09	2702	71.2	2703	71.31	2704
71.7	2705	72.21	2706	72.72	2707	73.17	2708	73.65	2709
74.08	2710	74.34	2711	77.17	2712	80.26	2713	86.35	2715
100	2716								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	100	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	100	199.59	208.99	220.51	.1	.3

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 1100

INPUT
Description:
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2707	5.35	2707	8.38	2706	9.68	2705	12.44	2703
13.93	2702	15.38	2701	17.01	2700	18.58	2699	21.52	2697
22.94	2696	26.14	2694	29.68	2693	34.53	2692	38.4	2691
56.38	2691	57.13	2692	57.9	2693	59.43	2695	60.24	2696
61.29	2697	62.43	2698	63.9	2699	65.12	2700	66.01	2701
66.45	2702	66.68	2703	66.92	2704	74.91	2705		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	74.91	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	74.91	173.12	189.13	202.7	.1	.3

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 1000

INPUT
Description:
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2700	1.85	2697	4.99	2695	7.03	2694	9.01	2693
15.23	2690	17.81	2689	23.14	2688	37.9	2687.36	46.38	2687
53.45	2687	55.47	2688	56.45	2689	56.76	2690	57.1	2691
57.5	2692	59.29	2694	60.1	2695	60.84	2696	61.57	2697
62.25	2698	62.94	2699	67.06	2701	69.55	2702	72.11	2703
72.82	2704	73.47	2705	75.18	2707	77.09	2708	82.18	2709

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	82.18	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	82.18	200.05	199.88	200.05	.1	.3

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 900

INPUT
Description:
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2697	2.01	2696	6.96	2693	8.56	2692	9.68	2691
10.78	2690	11.92	2689	13	2688	14.12	2687	15.2	2686
16.3	2685	17.24	2684	26.67	2683	30.04	2683	41.4	2683
45.22	2684	46.68	2685	47.87	2686	48.94	2687	50.02	2688
51.05	2689	52.27	2690	53.58	2691	54.05	2692	54.3	2693

54.53	2694	61.14	2696	68.17	2697	76.52	2697

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	76.52	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	76.52	200.06	199.87	200.06	.1	.3

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 800

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2695	5.28	2694	9.97	2693	16.15	2691	17.35	2690
18.64	2689	19.91	2688	21.18	2687	22.6	2686	24.45	2685
26.51	2684	28.59	2683	29.67	2682	30.77	2681	31.87	2680
41.31	2679	45.06	2679	53.43	2679	55.64	2680	57.69	2681
59.22	2682	60.74	2683	62.39	2684	64.07	2685	65.7	2686
67.32	2687	69.12	2688	70.94	2689	72.73	2690	76.3	2692
78.37	2693	88.81	2695						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	88.81	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	88.81	200	199.91	200	.1	.3

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 700

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2692	13.46	2690	20.83	2689	24.82	2688	26.72	2687
27.64	2686	28.5	2685	29.4	2684	30.34	2683	31.24	2682
32.5	2681	33.91	2680	35.36	2679	36.22	2678	37	2677
40.67	2676	49.89	2676	60.98	2676	63.89	2677	65.31	2678
66.7	2679	68.22	2680	70.18	2681	72.05	2682	73.98	2683
75.51	2684	76.92	2685	78.38	2686	79.79	2687	82.47	2688
85.76	2689	93.54	2689						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	93.54	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	93.54	105.58	90.05	91.05	.1	.3

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 600

INPUT
Description:
Station Elevation Data num= 53

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2691	2.03	2691	4.75	2690	14.29	2689	26.04	2688
33.69	2687	34.32	2686	34.69	2685	35.04	2684	35.4	2683

35.71	2682	36.05	2681	36.46	2680	37.14	2679	39.75	2678
42.44	2677	44.85	2676	46.95	2675	49.06	2674	61.8	2674
76.28	2675	80.1	2676	83.77	2677	89.32	2679	91.29	2680
93.62	2681	96.54	2682	98.84	2683	106.09	2683	110.53	2682
112.97	2682	122.92	2682	123.43	2681	124.01	2680	124.46	2679
124.94	2678	125.31	2677	125.68	2676	126.77	2675	128.15	2674
139.97	2675	142.29	2676	144.19	2677	146.82	2678	149.09	2679
151.09	2680	153.17	2681	156.53	2682	159.47	2683	165.89	2685
167.92	2686	170.23	2687	172.74	2688				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	172.74	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	172.74	165.96	163.56	169.79	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
106.09	172.74	2690	F

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 500

INPUT
Description:
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2687	16.29	2686	33.47	2685	48.37	2684	54.57	2683
62.81	2681	65.1	2680	67.73	2679	70.01	2678	72.24	2677
73.94	2676	77.08	2673	90.18	2672.27	94.92	2672	106.5	2672
113.63	2673	126.37	2676	128.11	2677	129.52	2678	131.24	2679
134.08	2680	139.43	2681	153.77	2683	159.91	2684	162.55	2685
164.37	2686	166.37	2687	168.53	2688	187.05	2690		

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.03	48.37	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	187.05	58.23	51.31	62.51	.1	.3

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 400

INPUT
Description:
Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2688.01	6.8	2685	9.24	2684	16.28	2683	28.94	2683
32.59	2684	36.71	2685	41.98	2685	55.92	2684	78.44	2684
97.61	2684	98.46	2683	100.13	2681	100.9	2680	101.76	2679
102.54	2678	103.66	2677	105.88	2676	108.08	2675	110.35	2674
112.62	2673	114.93	2672	118.66	2671	154.09	2671	157.32	2672
159.33	2673	161.13	2674	161.97	2675	162.88	2676	163.89	2677
164.96	2678	166.09	2679	167.41	2680	171.11	2683	177.76	2683
204.74	2683	212.73	2684	215.85	2685	218.94	2686	222.3	2687
235.52	2689								

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.03	97.61	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	235.52	116.72	99.89	88.03	.1	.3

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 300

INPUT
Description:
Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2686.85	10.18	2687	26.16	2686	56.92	2685	67.77	2683
72.93	2682	74.69	2681	75.93	2680	77.09	2679	78.28	2678
80.13	2677	81.83	2676	83.53	2675	85.1	2674	89.88	2672
92.95	2671	96.11	2670	99.27	2669	125.7	2669	131	2670
133.85	2671	140.06	2673	144.25	2674	149.79	2676	153.27	2677
159.33	2679	162.93	2680	173.51	2681	187.26	2682	195.52	2683
202	2684	207.73	2685	212.52	2686	216.49	2687	220.29	2688

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.03	56.92	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	220.29	145.1	100.88	52	.1	.3

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1 RS: 200

INPUT
Description:
Station Elevation Data num= 49

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2693	1.64	2692	3.32	2691	5.46	2690	7.61	2689
9.35	2688	11.06	2687	12.77	2686	14.47	2685	16.25	2684
18.24	2683	23	2682	25.51	2681	28.74	2680	31.03	2679
31.44	2678	32.35	2676	33	2675	33.89	2674	34.55	2673
35.14	2672	35.58	2671	36.12	2670	36.63	2669	37.08	2668
38.91	2668	40.82	2668	41.23	2669	41.7	2670	42.11	2671
42.85	2672	43.48	2673	44.25	2674	46.26	2675	49.04	2676
59.12	2678	63.36	2679	66.9	2680	70.72	2681	82.01	2682
117.78	2683	123.57	2684	125.81	2685	127.96	2686	130.18	2687
132.3	2688	134.11	2689	135.75	2690	137.7	2691		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	137.7	.035

Bank Sta: Left	Right	Coeff Contr.	Expan.
0	137.7	.3	.5

SUMMARY OF MANNING'S N VALUES

River:Unnamed Wash

Reach	River Sta.	n1	n2	n3
Main1	2700	.035	.035	.035
Main1	2600	.035	.035	.035
Main1	2500	.035	.035	.035
Main1	2400	.035	.035	.035
Main1	2300	.035	.035	.035
Main1	2200	.035	.035	.035
Main1	2100	.035	.035	.035
Main1	2000	.035	.03	
Main1	1900	.035	.03	
Main1	1800	.035	.035	.035

Main1	1700	.035	.035	.035
Main1	1600	.035	.035	.035
Main1	1500	.035	.035	.035
Main1	1400	.035	.035	.035
Main1	1300	.035	.035	.035
Main1	1200	.035	.035	.035
Main1	1100	.035	.035	.035
Main1	1000	.035	.035	.035
Main1	900	.035	.035	.035
Main1	800	.035	.035	.035
Main1	700	.035	.035	.035
Main1	600	.035	.035	.035
Main1	500	.03	.035	
Main1	400	.03	.035	
Main1	300	.03	.035	
Main1	200	.035	.035	.035

SUMMARY OF REACH LENGTHS

River: Unnamed Wash

Reach	River Sta.	Left	Channel	Right
Main1	2700	95.75	98.69	107.97
Main1	2600	101.86	103.65	108.71
Main1	2500	108.74	100.43	96.31
Main1	2400	109.52	114.22	121.17
Main1	2300	191.53	193.81	198.19
Main1	2200	113.96	200.13	254.43
Main1	2100	231.94	197.1	162.04
Main1	2000	231.62	197.66	162.89
Main1	1900	122.47	101.94	85.19
Main1	1800	140.2	137.49	140.54
Main1	1700	145.9	141.68	135.05
Main1	1600	132.22	129.11	128.4
Main1	1500	270.26	260.99	251.15
Main1	1400	197.2	199.44	199.87
Main1	1300	170	195.8	223.9
Main1	1200	199.59	208.99	220.51
Main1	1100	173.12	189.13	202.7
Main1	1000	200.05	199.88	200.05
Main1	900	200.06	199.87	200.06
Main1	800	200	199.91	200
Main1	700	105.58	90.05	91.05
Main1	600	165.96	163.56	169.79
Main1	500	58.23	51.31	62.51
Main1	400	116.72	99.89	88.03
Main1	300	145.1	100.88	52
Main1	200			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Unnamed Wash

Reach	River Sta.	Contr.	Expan.
Main1	2700	.1	.3
Main1	2600	.1	.3
Main1	2500	.1	.3
Main1	2400	.1	.3
Main1	2300	.1	.3
Main1	2200	.1	.3
Main1	2100	.1	.3
Main1	2000	.1	.3
Main1	1900	.1	.3

Main1	1800	.1	.3
Main1	1700	.1	.3
Main1	1600	.1	.3
Main1	1500	.1	.3
Main1	1400	.1	.3
Main1	1300	.1	.3
Main1	1200	.1	.3
Main1	1100	.1	.3
Main1	1000	.1	.3
Main1	900	.1	.3
Main1	800	.1	.3
Main1	700	.1	.3
Main1	600	.1	.3
Main1	500	.1	.3
Main1	400	.1	.3
Main1	300	.1	.3
Main1	200	.3	.5

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Main1

River: Unnamed Wash   Reach: Main1   RS: 2700   Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: Unnamed Wash   Reach: Main1   RS: 2600   Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning:Divided flow computed for this cross-section.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: Unnamed Wash   Reach: Main1   RS: 2500   Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: Unnamed Wash   Reach: Main1   RS: 2400   Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: Unnamed Wash Reach: Main1 RS: 2300 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: Unnamed Wash Reach: Main1 RS: 2200 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: Unnamed Wash Reach: Main1 RS: 2100 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: Unnamed Wash Reach: Main1 RS: 2000 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: Unnamed Wash Reach: Main1 RS: 1800 Profile: PF 1
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
River: Unnamed Wash Reach: Main1 RS: 1700 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.

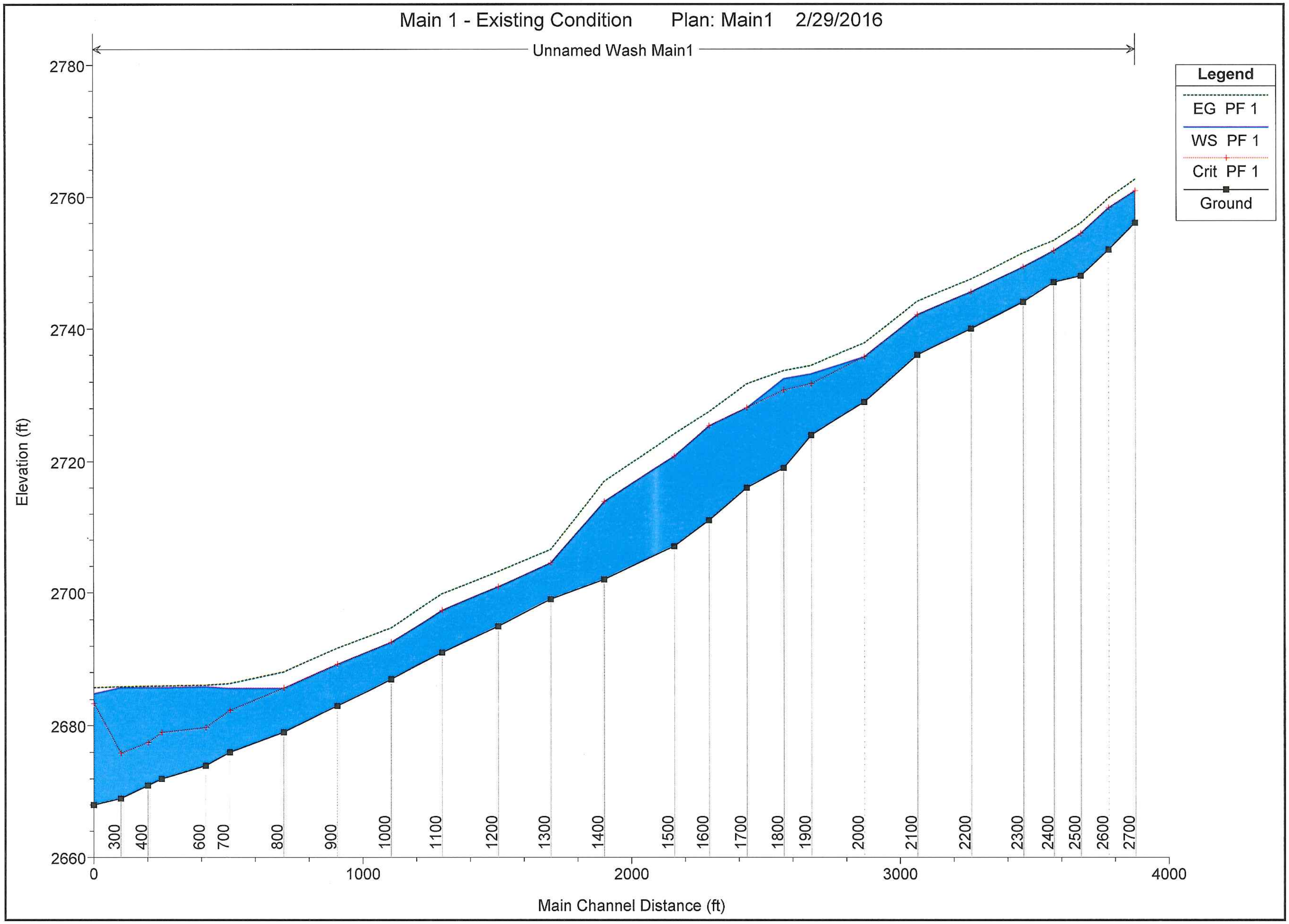
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: Unnamed Wash Reach: Main1 RS: 1600 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: Unnamed Wash Reach: Main1 RS: 1500 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: Unnamed Wash Reach: Main1 RS: 1400 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: Unnamed Wash Reach: Main1 RS: 1300 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: Unnamed Wash Reach: Main1 RS: 1200 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

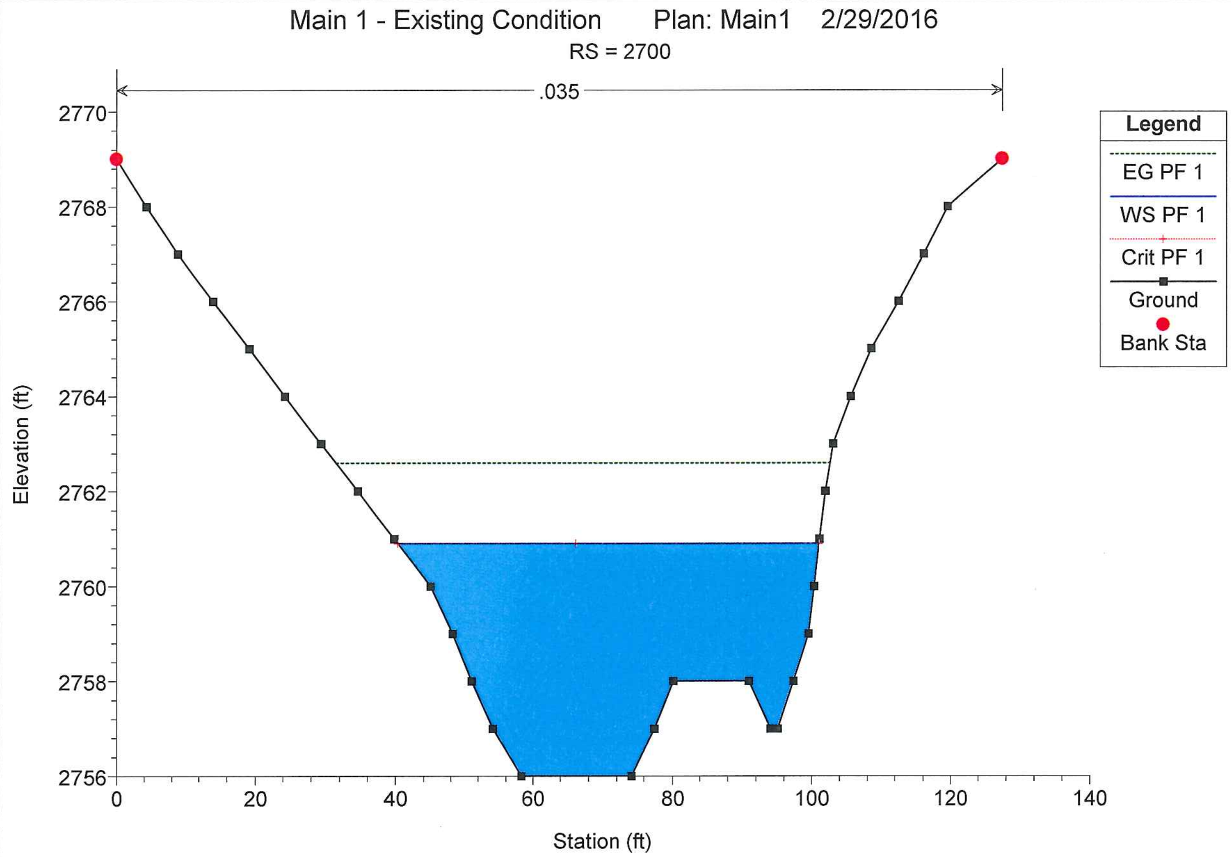
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: Unnamed Wash Reach: Main1 RS: 1100 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: Unnamed Wash Reach: Main1 RS: 1000 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: Unnamed Wash Reach: Main1 RS: 900 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: Unnamed Wash Reach: Main1 RS: 800 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
River: Unnamed Wash Reach: Main1 RS: 700 Profile: PF 1
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: Unnamed Wash Reach: Main1 RS: 600 Profile: PF 1
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: Unnamed Wash Reach: Main1 RS: 300 Profile: PF 1
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

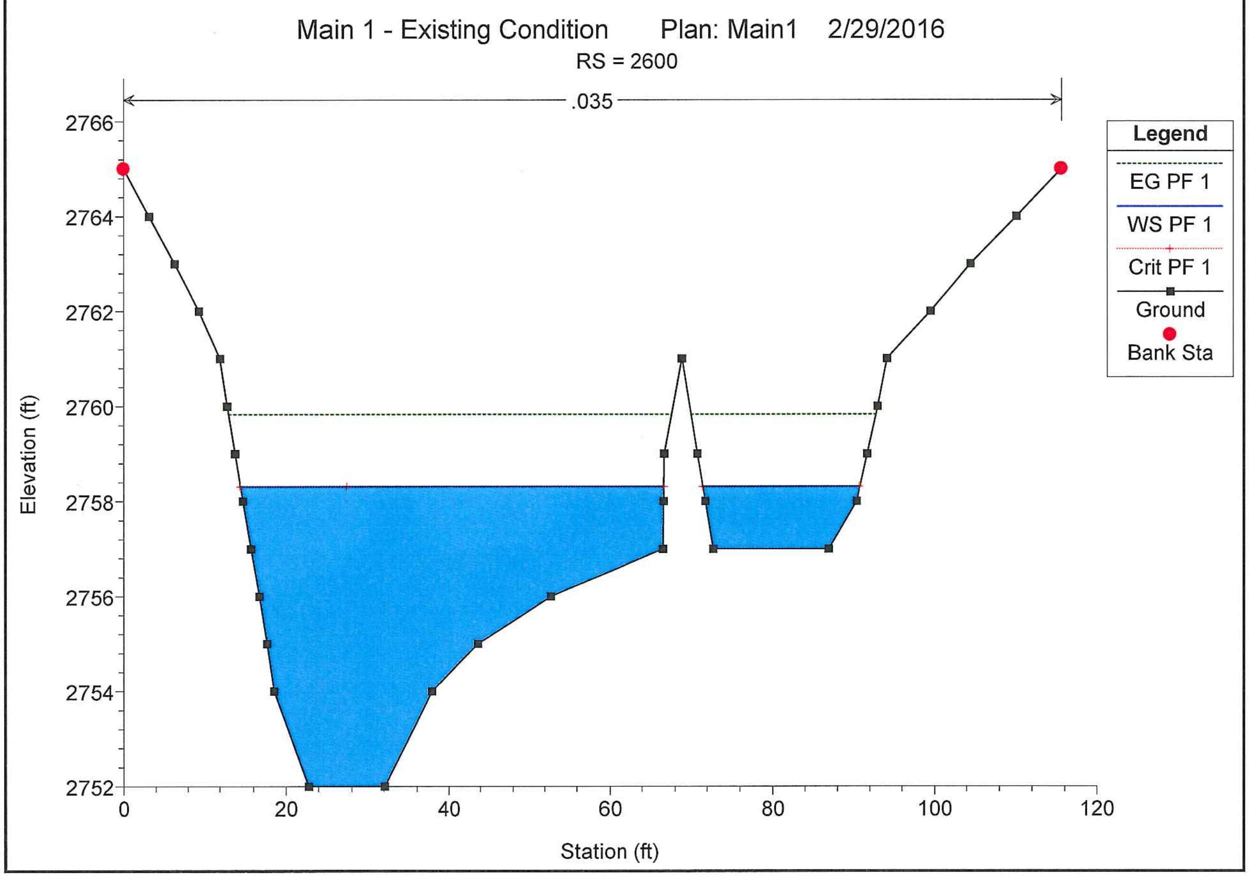
HEC-RAS Plan: Main1 River: Unnamed Wash Reach: Main1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main1	2700	PF 1	2128.00	2756.00	2760.89	2760.89	2762.59	0.012774	10.46	203.44	60.70	1.01
Main1	2600	PF 1	2128.00	2752.00	2758.31	2758.31	2759.83	0.013663	9.90	214.95	71.48	1.01
Main1	2500	PF 1	2128.00	2748.00	2754.37	2754.37	2755.99	0.013412	10.20	208.57	66.36	1.01
Main1	2400	PF 1	2128.00	2747.00	2751.80	2751.80	2753.34	0.012747	9.95	213.77	69.59	1.00
Main1	2300	PF 1	2128.00	2744.00	2749.36	2749.36	2751.48	0.012119	11.68	182.19	43.51	1.01
Main1	2200	PF 1	2128.00	2740.00	2745.49	2745.49	2747.48	0.012174	11.33	187.75	47.51	1.00
Main1	2100	PF 1	2128.00	2736.00	2742.08	2742.08	2744.08	0.012150	11.35	187.55	46.89	1.00
Main1	2000	PF 1	2128.00	2729.00	2735.65	2735.65	2737.77	0.012614	11.69	181.96	43.15	1.00
Main1	1900	PF 1	2128.00	2724.00	2733.14	2731.64	2734.38	0.005770	8.94	237.92	43.40	0.67
Main1	1800	PF 1	2128.00	2719.00	2732.45	2730.71	2733.66	0.008664	8.80	241.76	57.08	0.75
Main1	1700	PF 1	2227.00	2716.00	2728.08	2728.08	2731.68	0.019678	15.22	146.31	20.20	1.00
Main1	1600	PF 1	2227.00	2711.00	2725.34	2725.34	2727.46	0.018419	11.67	190.81	45.98	1.01
Main1	1500	PF 1	2472.00	2707.00	2720.77	2720.77	2724.15	0.018525	14.77	167.39	24.93	1.00
Main1	1400	PF 1	2472.00	2702.00	2713.84	2713.84	2716.92	0.016275	14.09	175.47	28.74	1.00
Main1	1300	PF 1	2472.00	2699.00	2704.43	2704.43	2706.46	0.012057	11.42	216.42	53.98	1.01
Main1	1200	PF 1	2472.00	2695.00	2700.84	2700.84	2703.15	0.012205	12.19	202.78	44.49	1.01
Main1	1100	PF 1	2472.00	2691.00	2697.30	2697.30	2699.76	0.012233	12.57	196.64	40.56	1.01
Main1	1000	PF 1	2472.00	2687.00	2692.52	2692.52	2694.72	0.012304	11.89	207.98	47.97	1.01
Main1	900	PF 1	2472.00	2683.00	2689.15	2689.15	2691.63	0.011974	12.63	195.65	39.48	1.00
Main1	800	PF 1	2493.00	2679.00	2685.65	2685.65	2688.05	0.011853	12.43	200.60	41.88	1.00
Main1	700	PF 1	2493.00	2676.00	2685.62	2682.23	2686.39	0.002350	7.03	354.61	49.85	0.46
Main1	600	PF 1	2493.00	2674.00	2685.89	2679.63	2686.14	0.000568	4.01	621.90	133.33	0.24
Main1	500	PF 1	4209.00	2672.00	2685.74	2678.92	2686.03	0.000687	4.33	971.83	143.10	0.29
Main1	400	PF 1	4209.00	2671.00	2685.77	2677.39	2685.97	0.000532	3.56	1181.20	213.18	0.27
Main1	300	PF 1	4209.00	2669.00	2685.77	2675.79	2685.92	0.000296	3.04	1382.45	178.22	0.19
Main1	200	PF 1	4209.00	2668.00	2684.83	2683.29	2685.76	0.004590	7.74	543.77	110.66	0.62

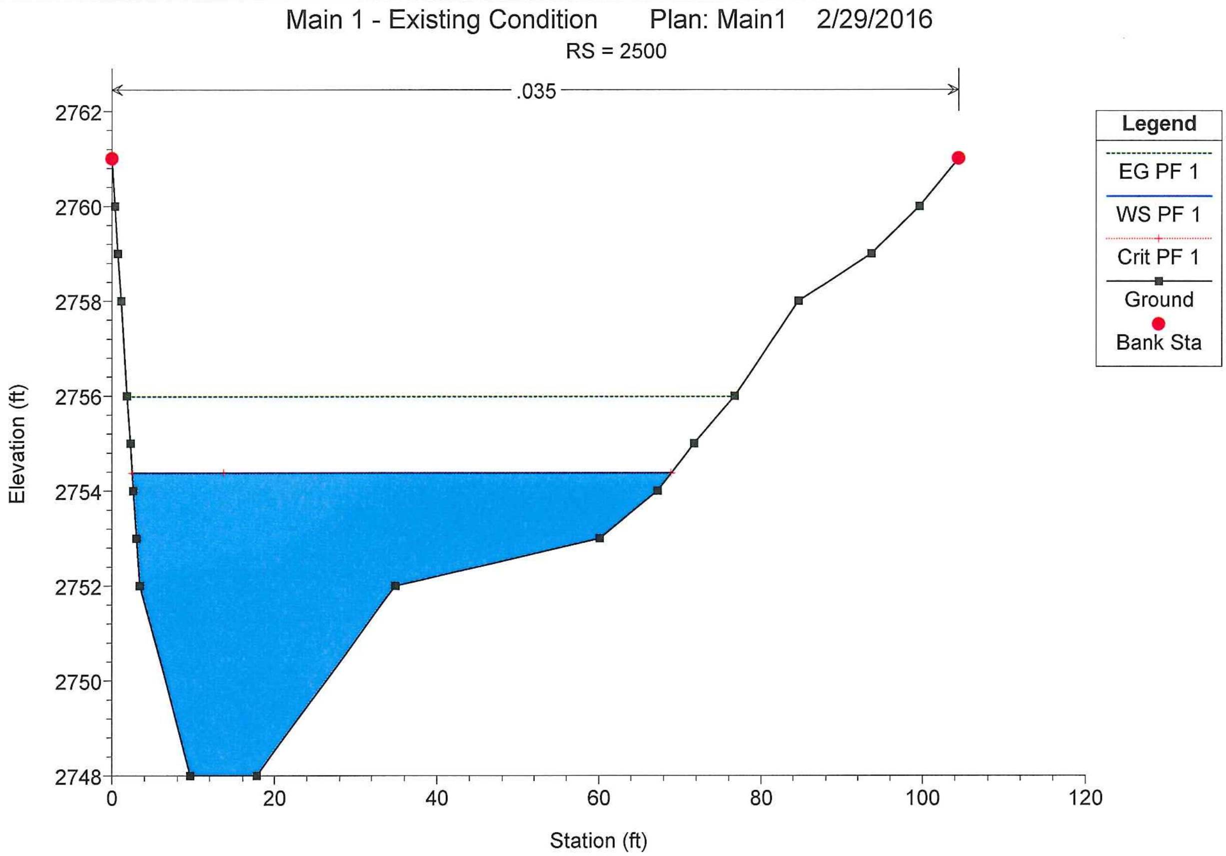

Main 1 - Existing Condition Plan: Main1 2/29/2016
Unnamed Wash Main1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2780
2760
2740
2720
2700
2680
2660
Main Channel Distance (ft)
0
1000
2000
3000
4000
300
400
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
2400
2500
2600
2700



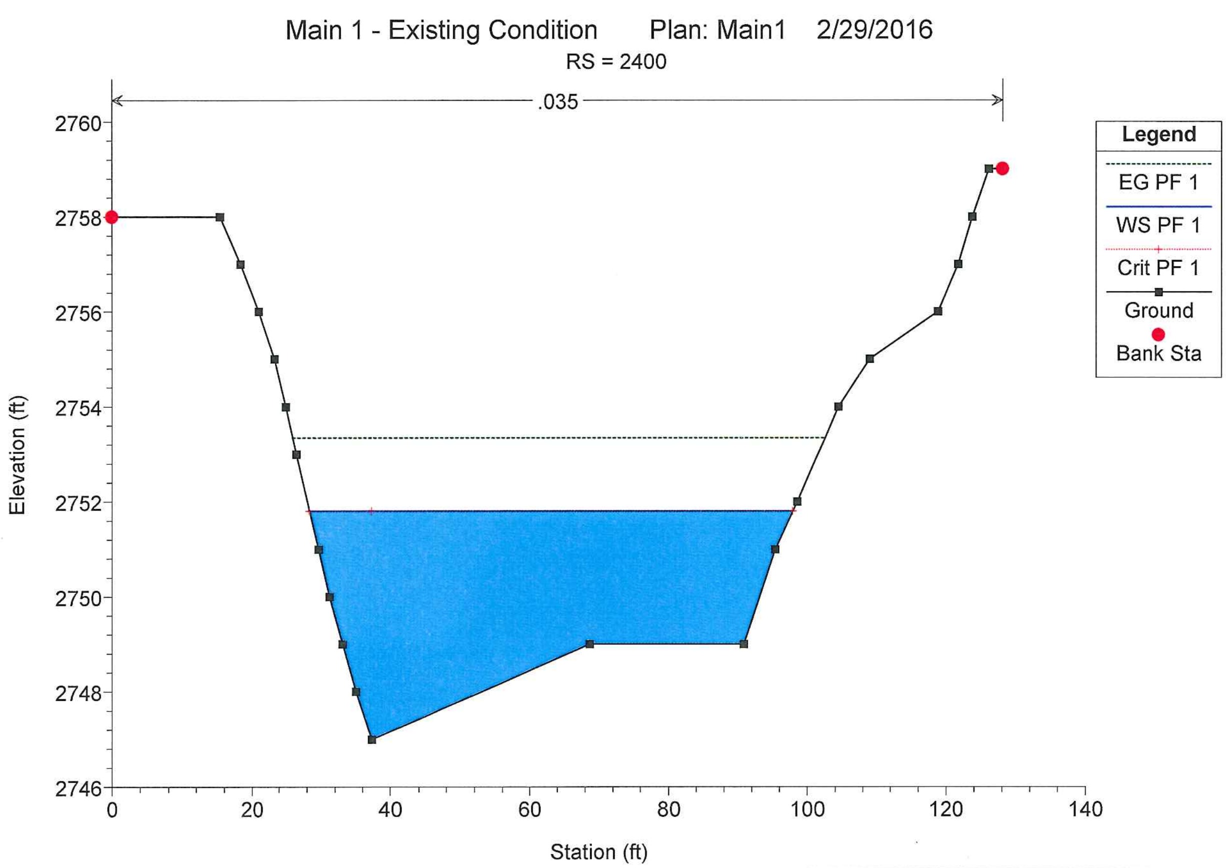
Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 2700
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2756
2758
2760
2762
2764
2766
2768
2770
Station (ft)
0
20
40
60
80
100
120
140



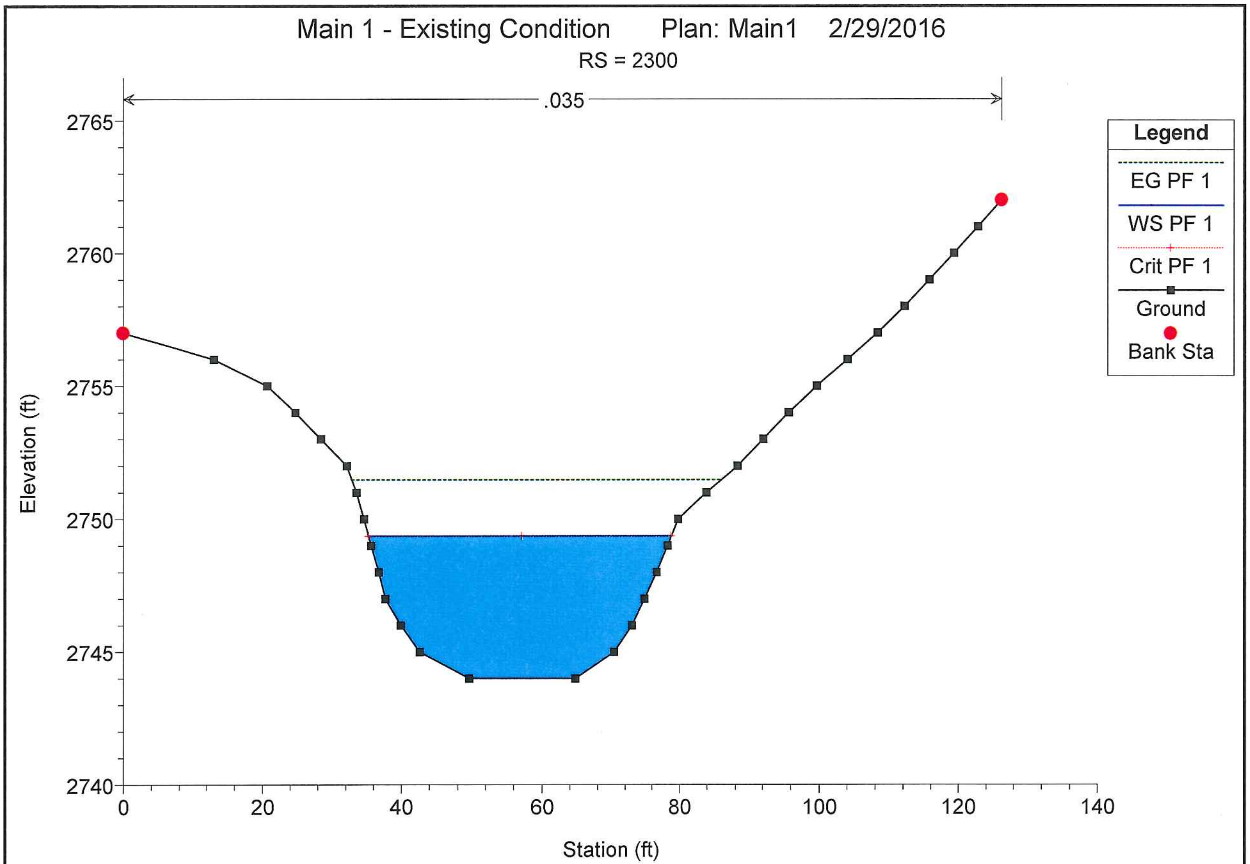
Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 2600
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2752
2754
2756
2758
2760
2762
2764
2766
Station (ft)
0
20
40
60
80
100
120

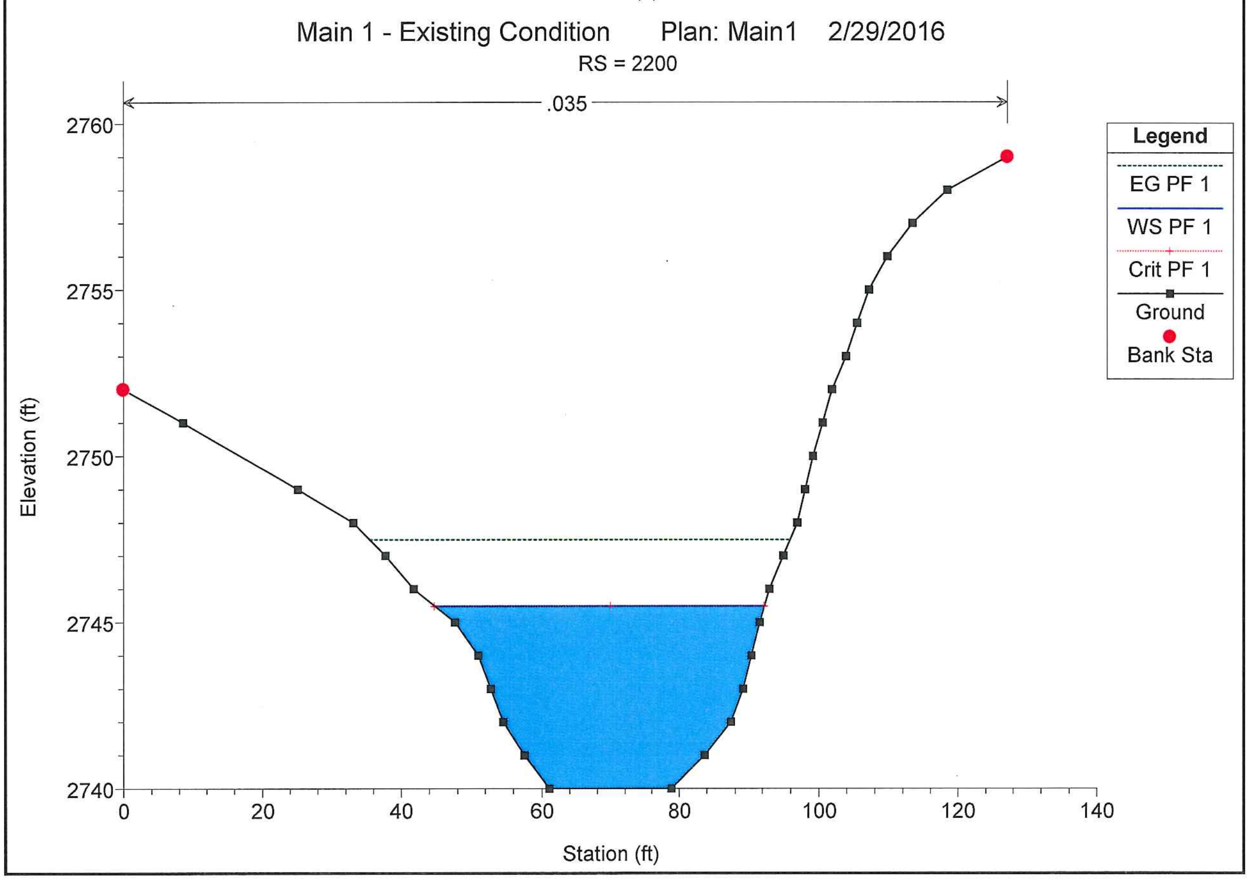


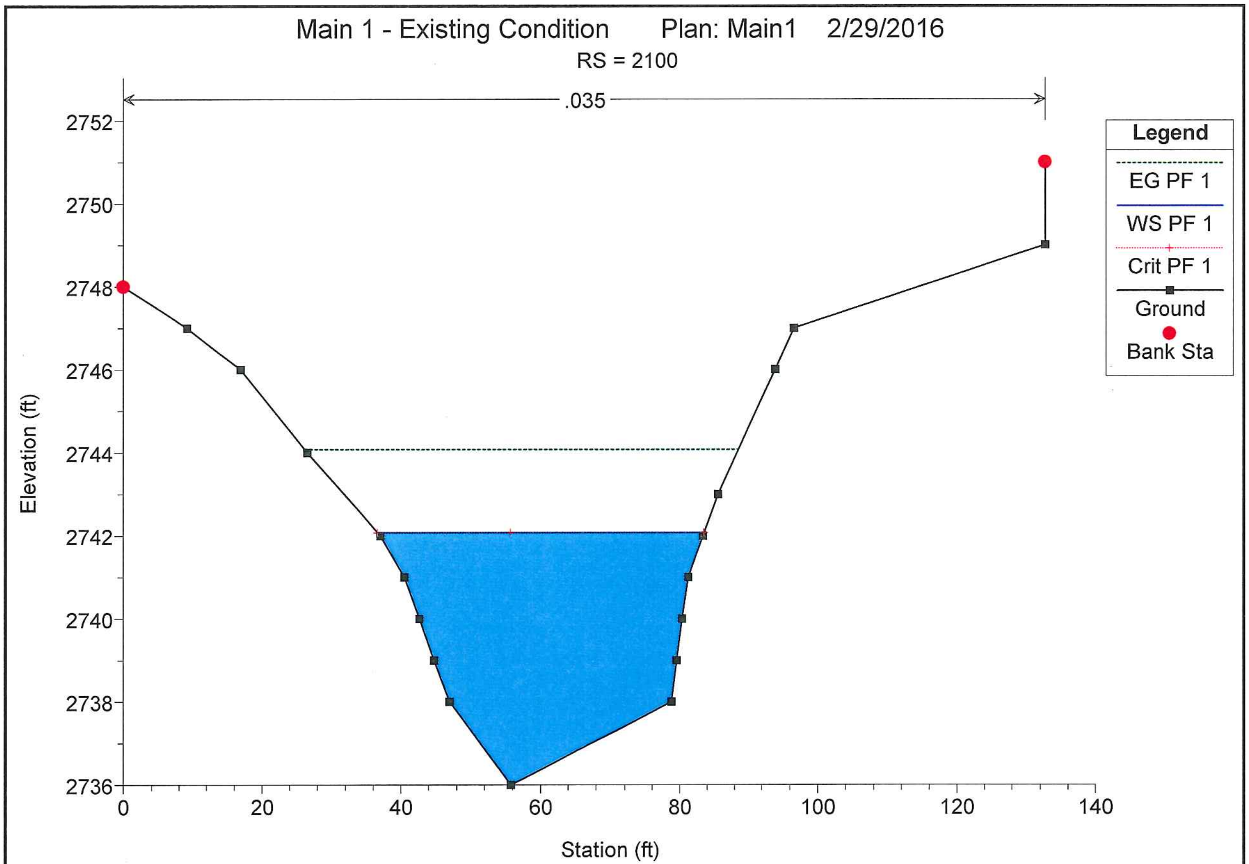
Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 2500
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2762
2760
2758
2756
2754
2752
2750
2748
0
20
40
60
80
100
120



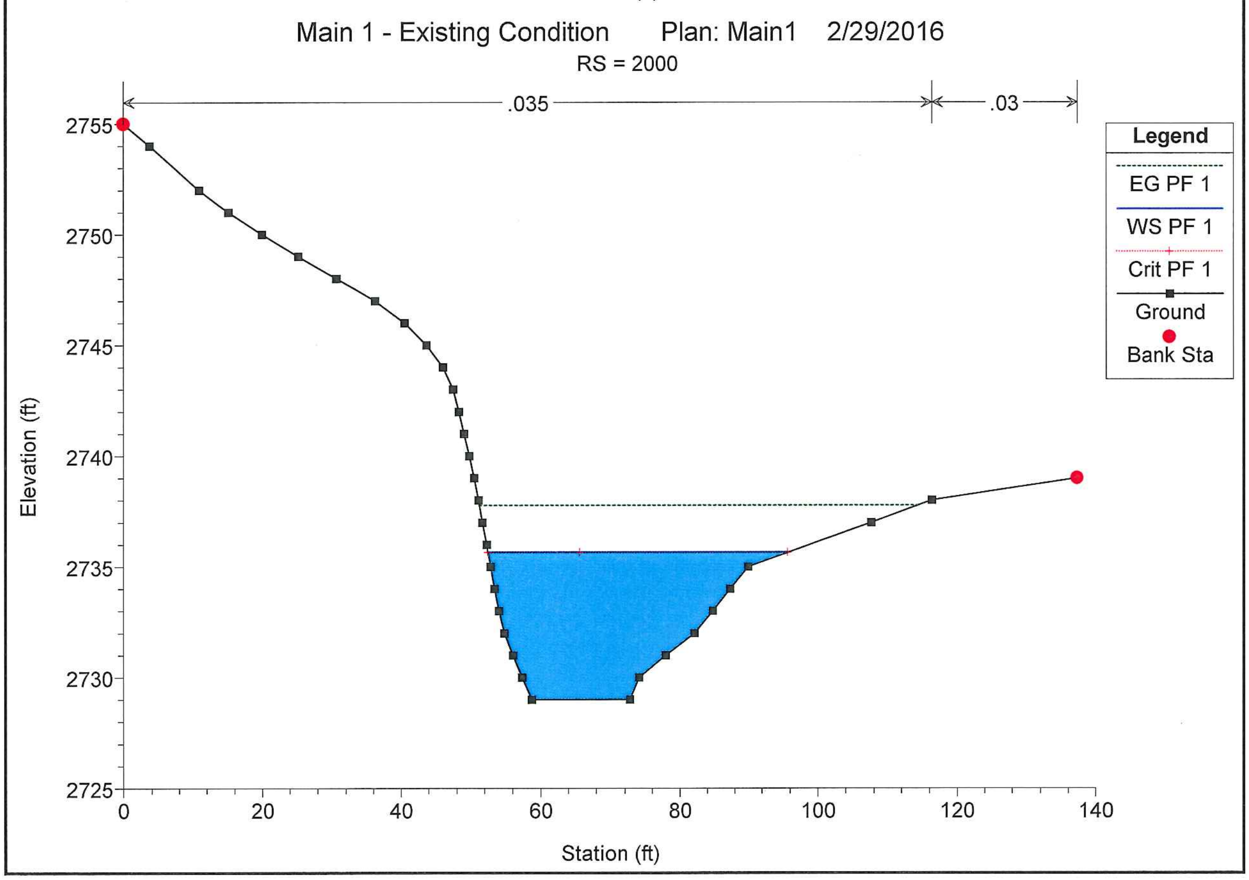
Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 2400
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2760
2758
2756
2754
2752
2750
2748
2746
0
20
40
60
80
100
120
140


Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 2300
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2765
2760
2755
2750
2745
2740
0
20
40
60
80
100
120
140
Station (ft)

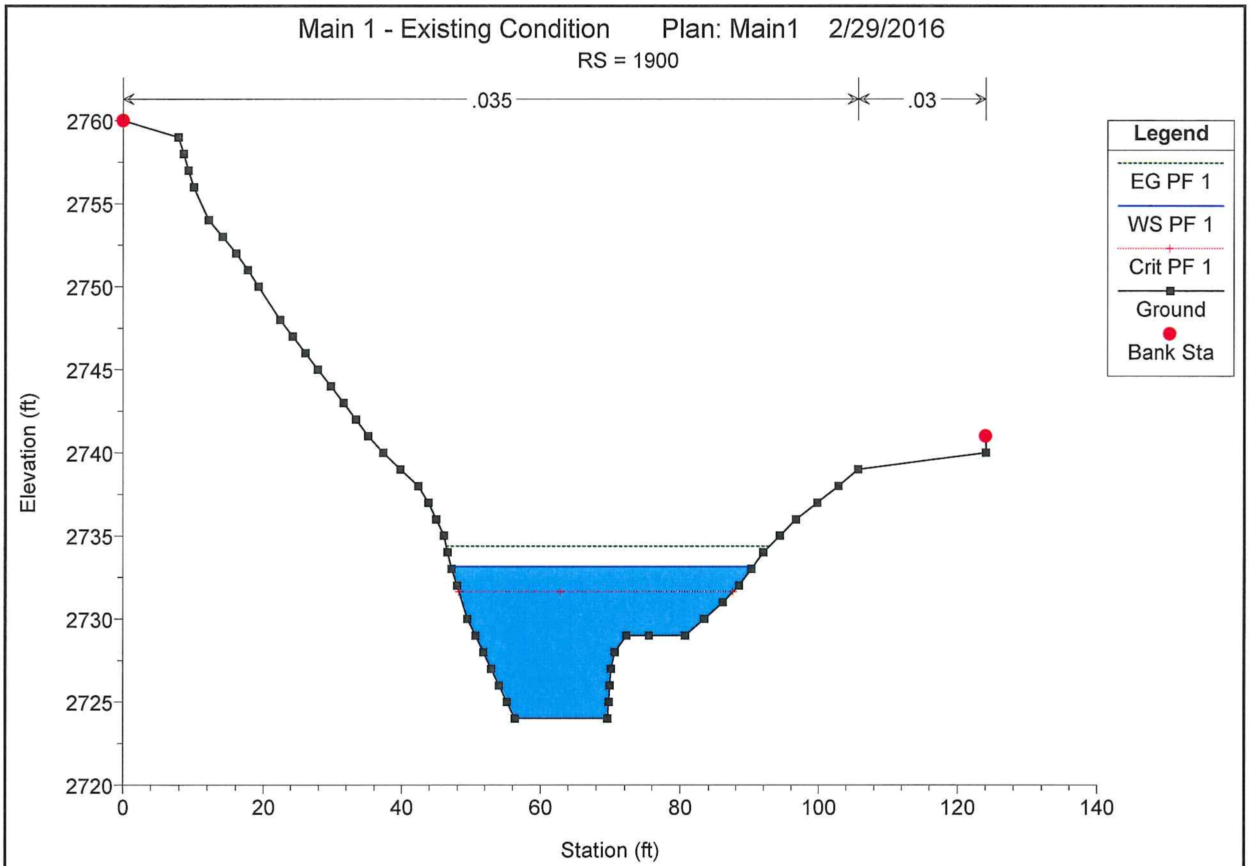

Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 2200
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2760
2755
2750
2745
2740
0
20
40
60
80
100
120
140
Station (ft)



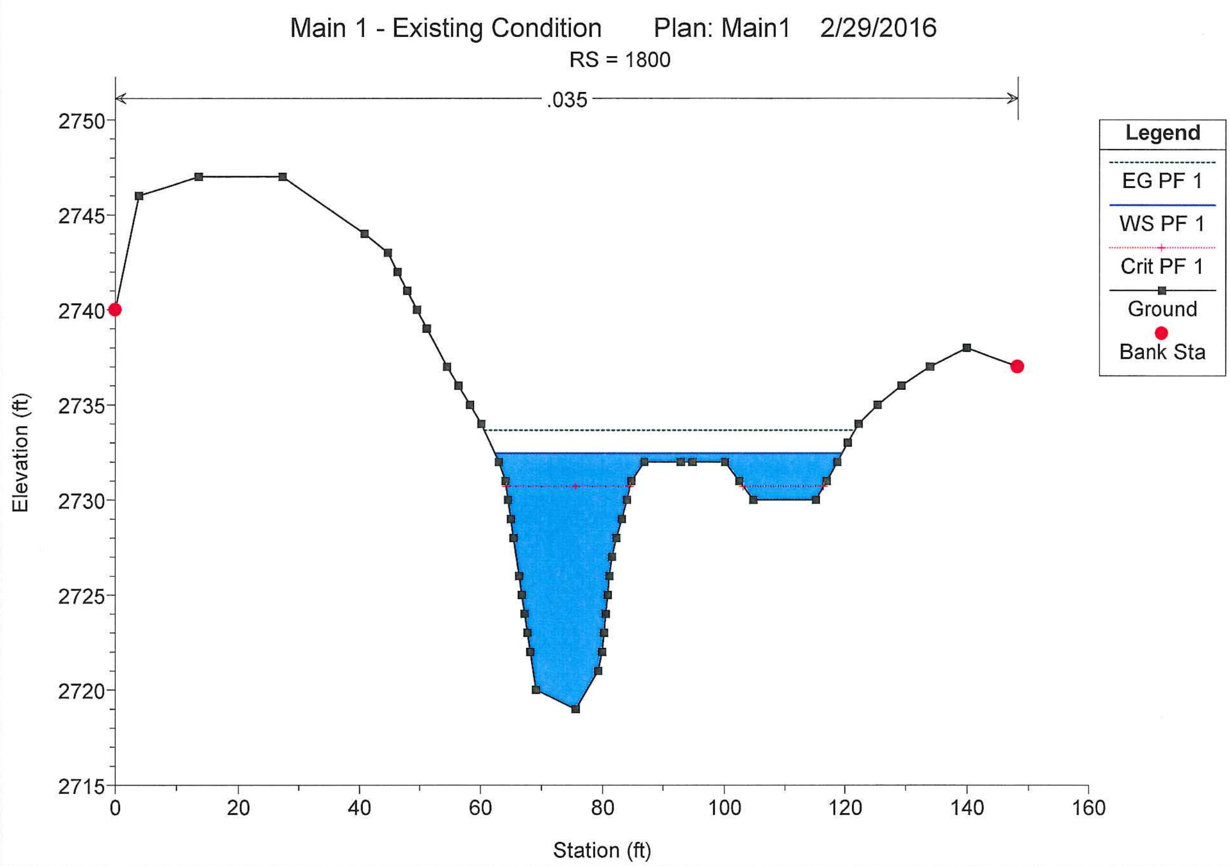
Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 2100
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2736
2738
2740
2742
2744
2746
2748
2750
2752
0
20
40
60
80
100
120
140
Station (ft)



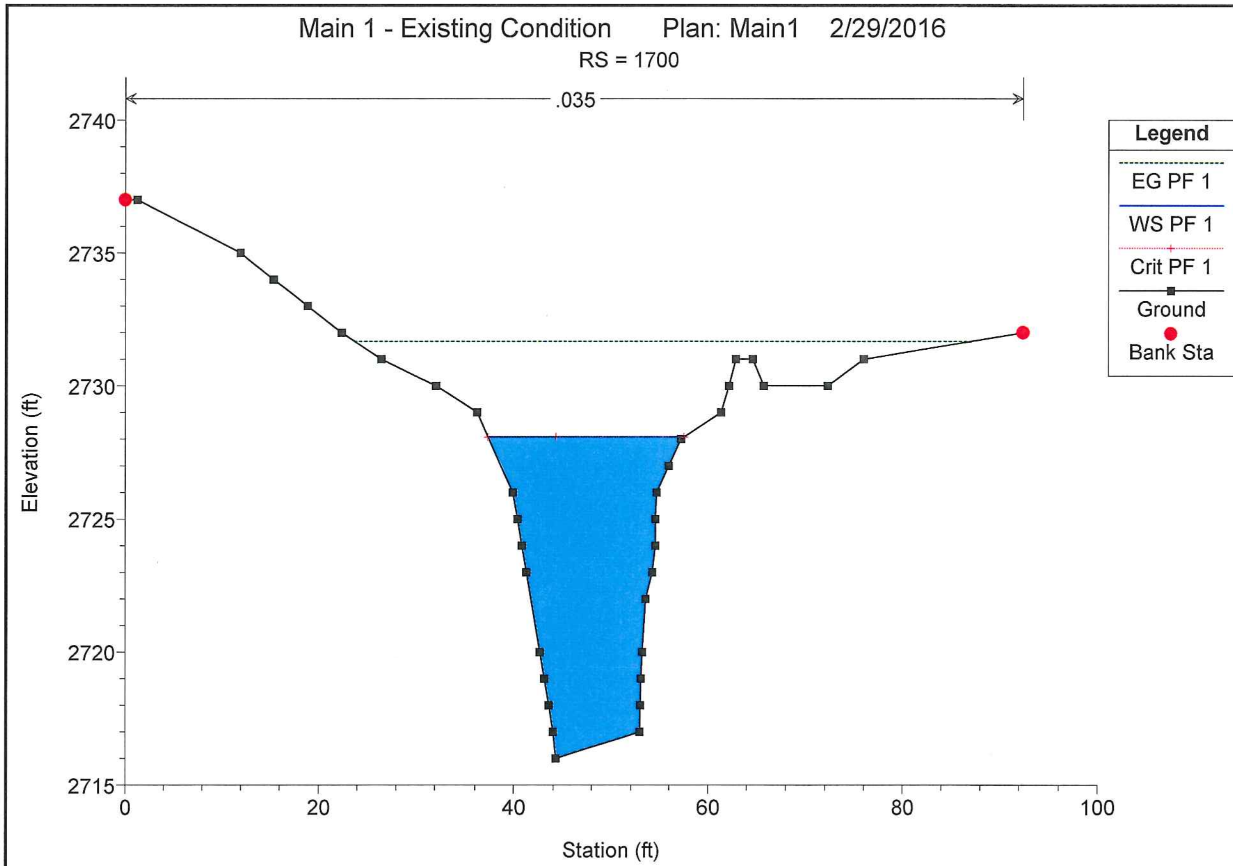
Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 2000
.035
.03
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2725
2730
2735
2740
2745
2750
2755
0
20
40
60
80
100
120
140
Station (ft)



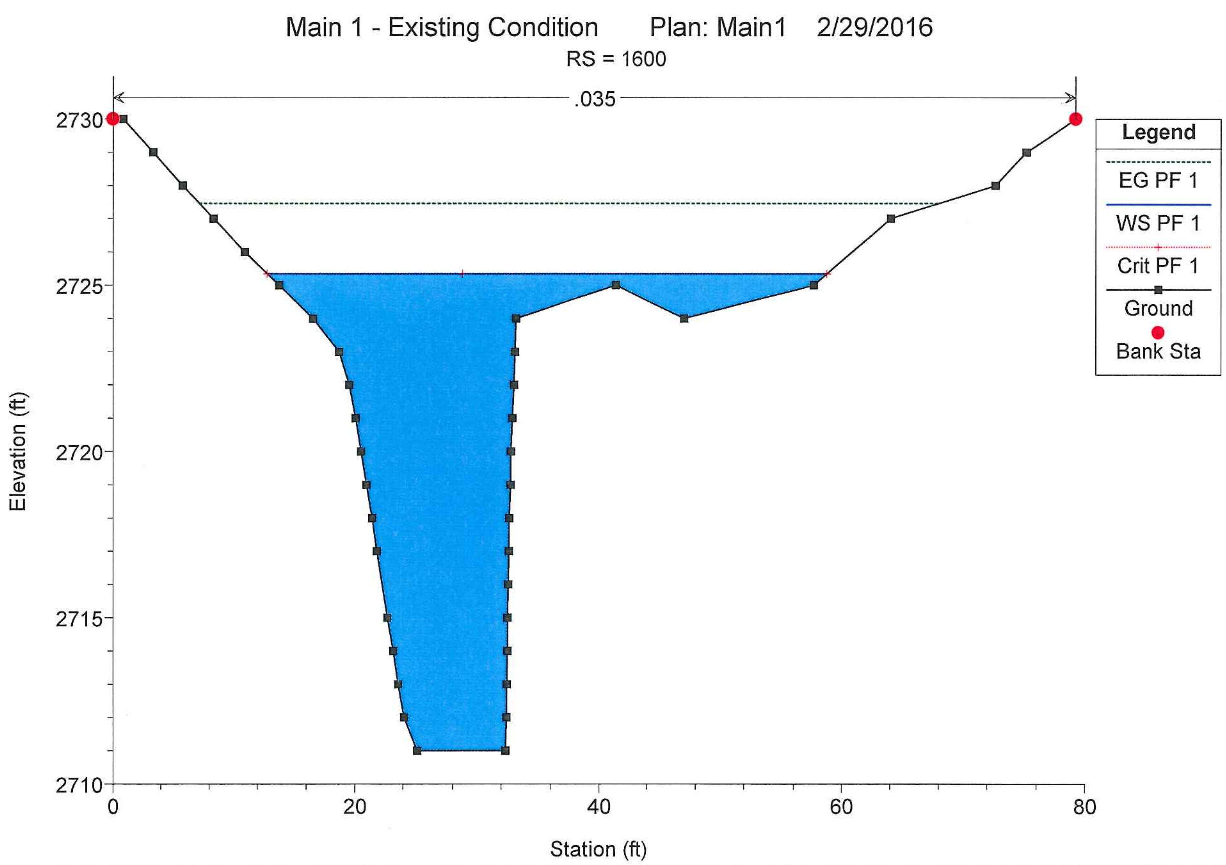
Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 1900
.035
.03
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2760
2755
2750
2745
2740
2735
2730
2725
2720
0
20
40
60
80
100
120
140
Station (ft)



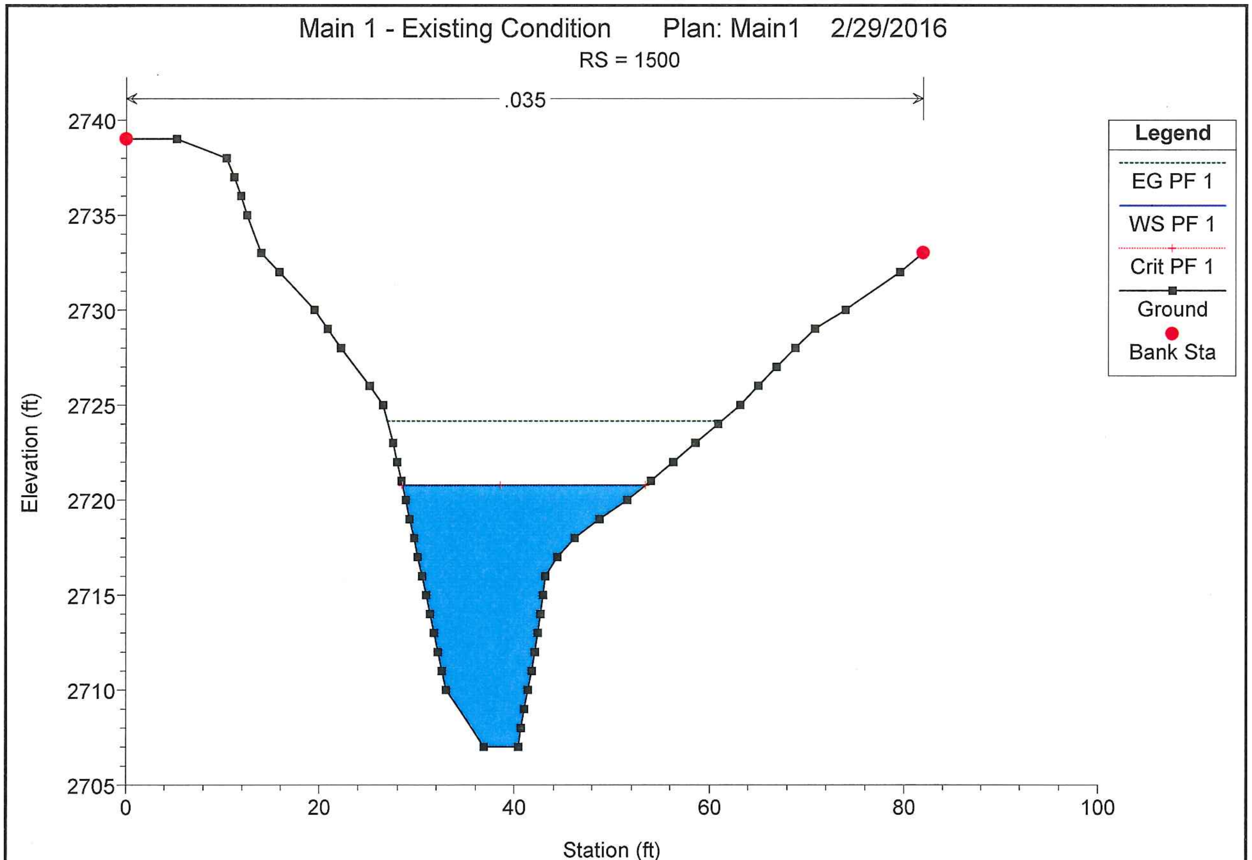
Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 1800
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2750
2745
2740
2735
2730
2725
2720
2715
0
20
40
60
80
100
120
140
160
Station (ft)

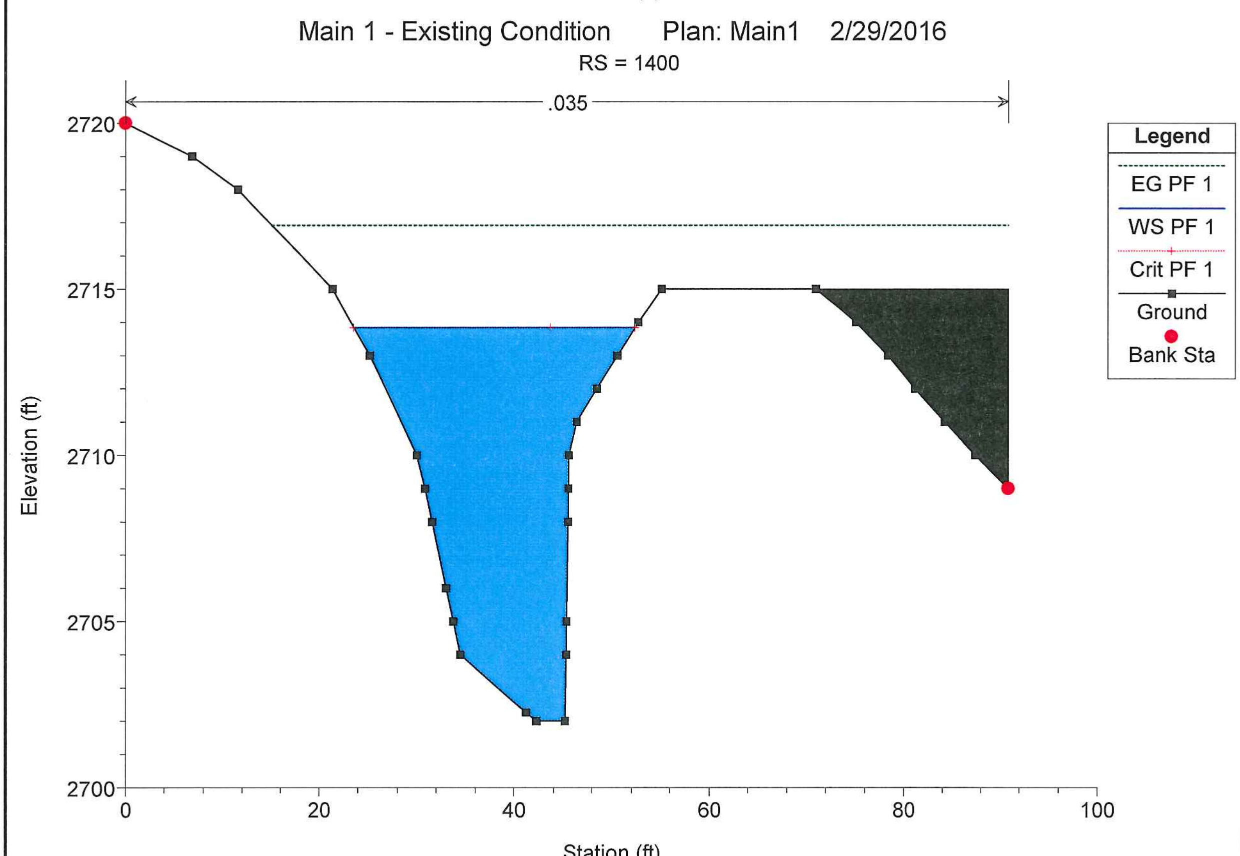


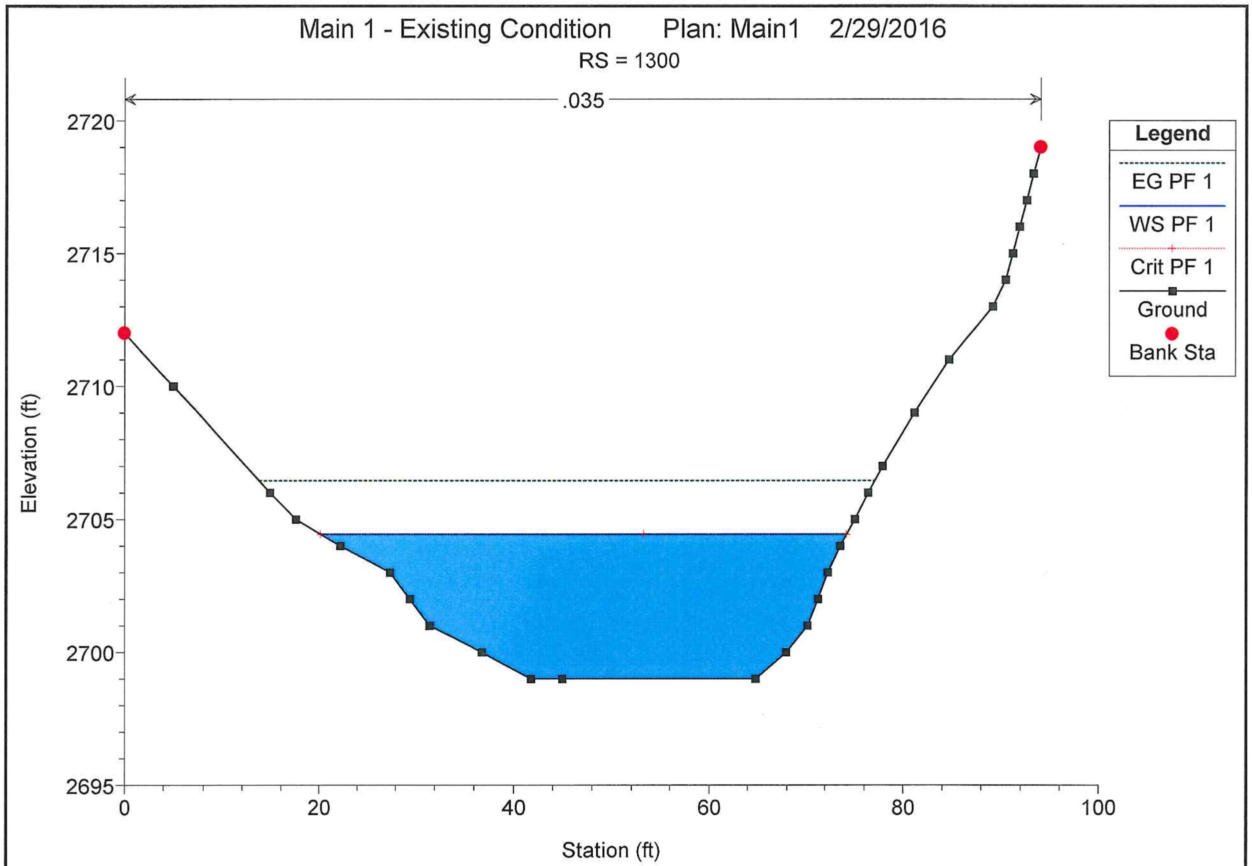
Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 1700
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2740
2735
2730
2725
2720
2715
0
20
40
60
80
100
Station (ft)

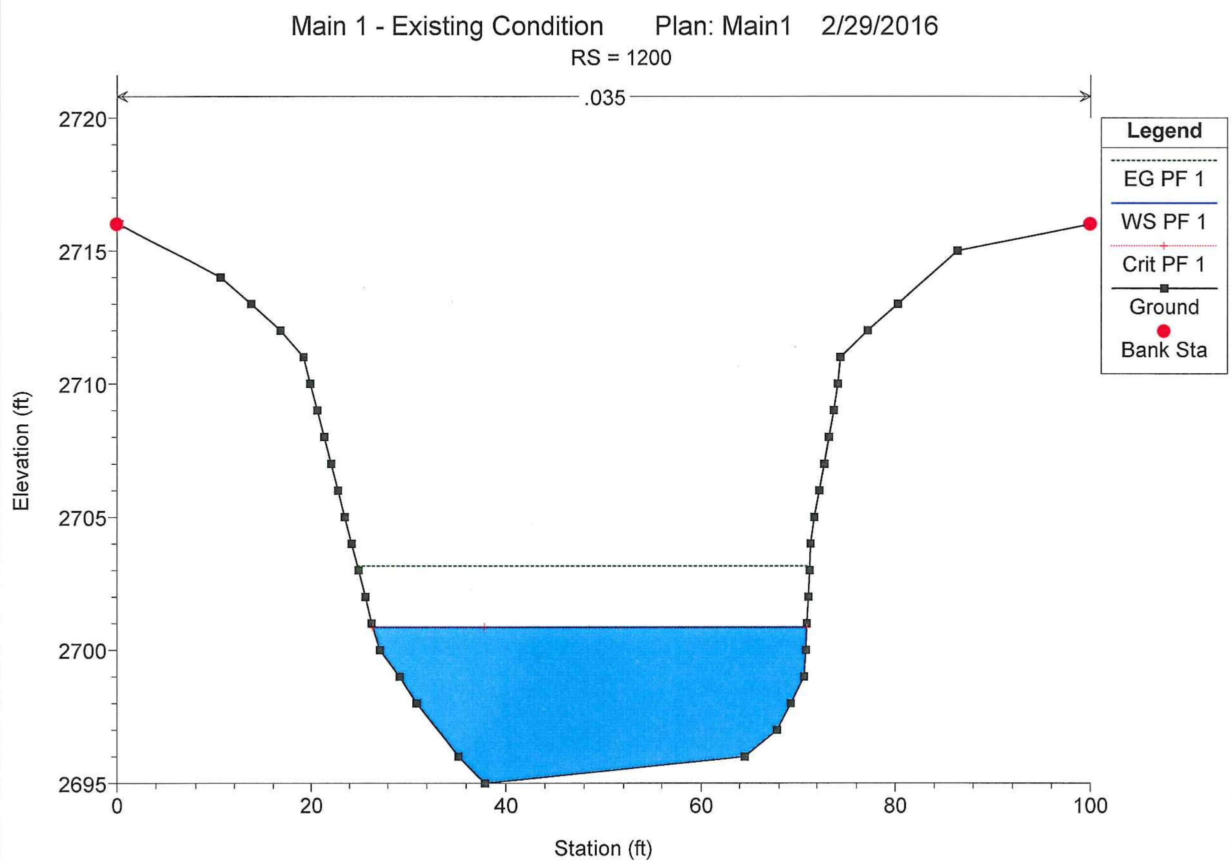


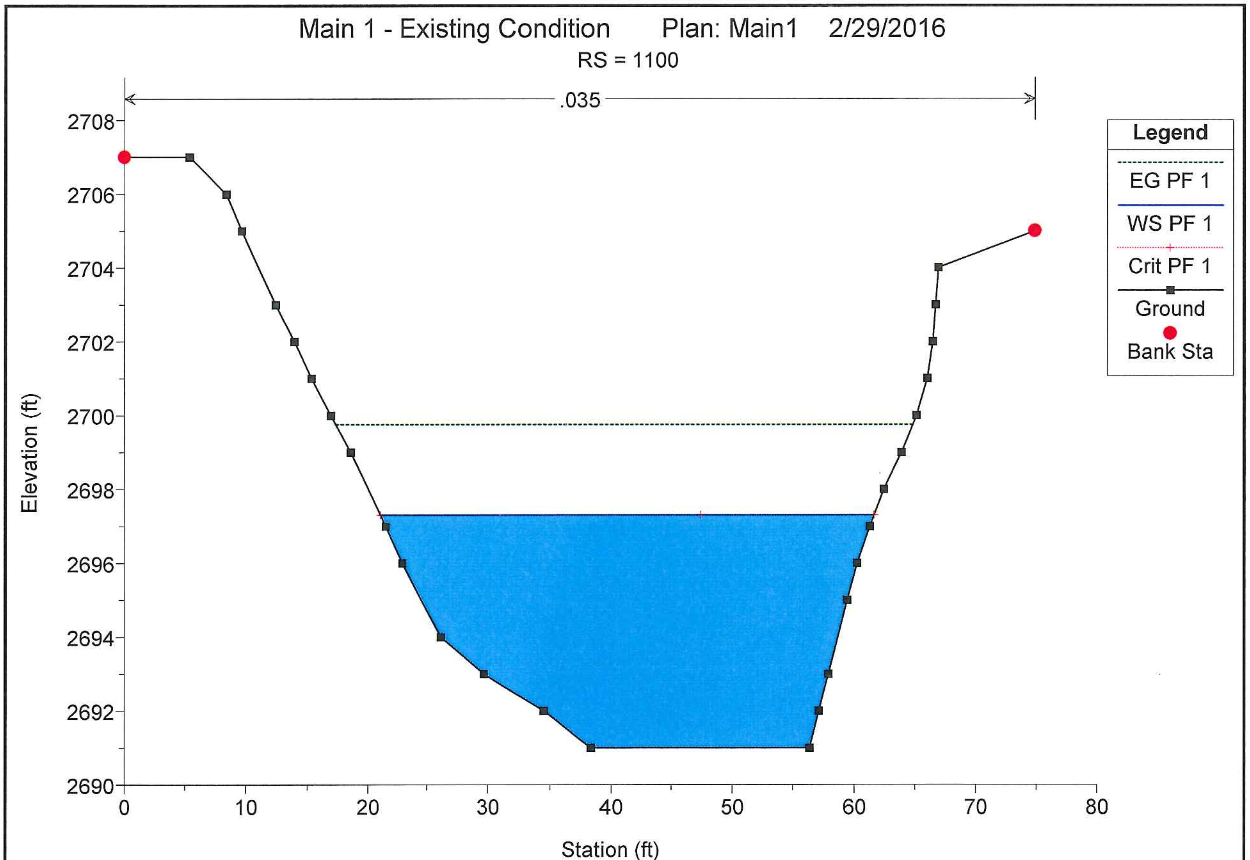
Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 1600
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2730
2725
2720
2715
2710
0
20
40
60
80
Station (ft)


Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 1500
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2740
2735
2730
2725
2720
2715
2710
2705
0
20
40
60
80
100

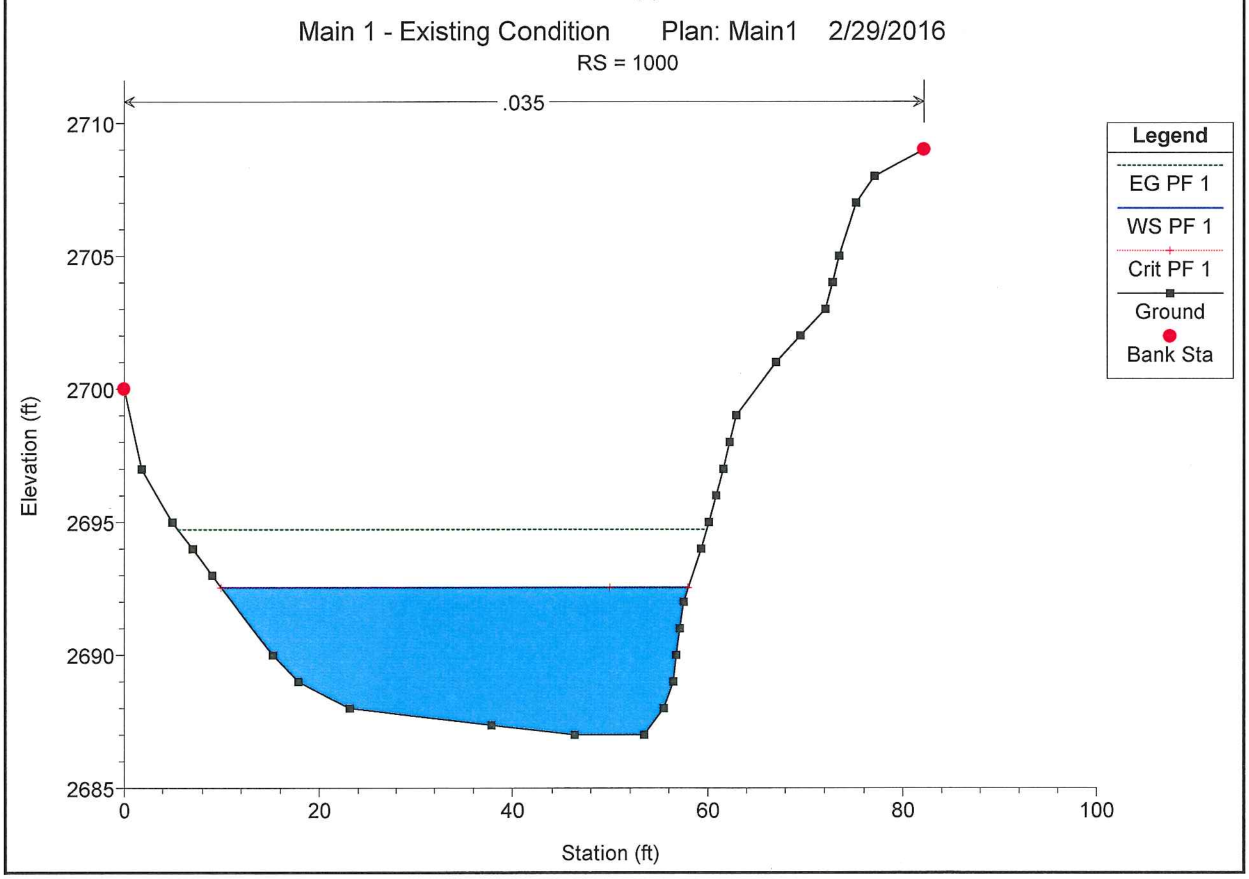

Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 1400
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2720
2715
2710
2705
2700
0
20
40
60
80
100


Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 1300
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2695
2700
2705
2710
2715
2720
Station (ft)
0
20
40
60
80
100

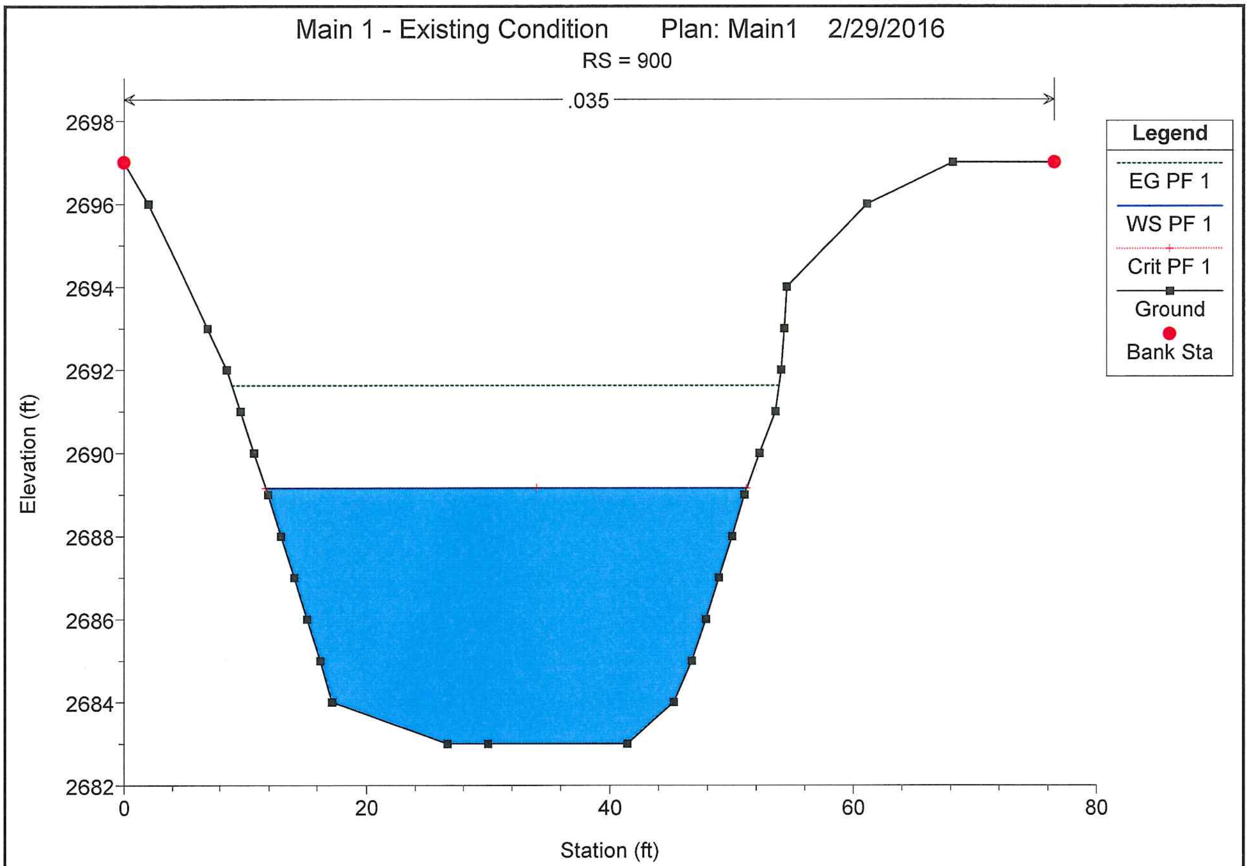

Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 1200
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2695
2700
2705
2710
2715
2720
Station (ft)
0
20
40
60
80
100

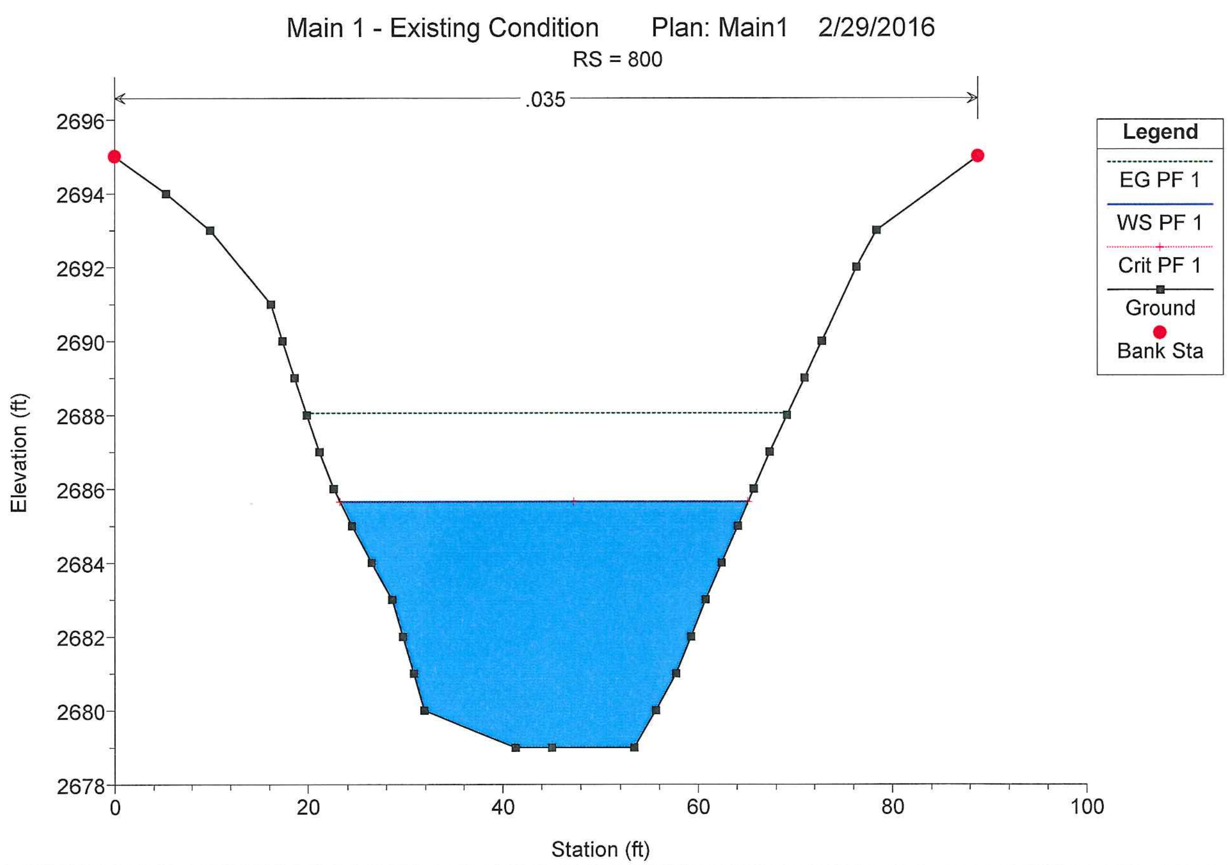


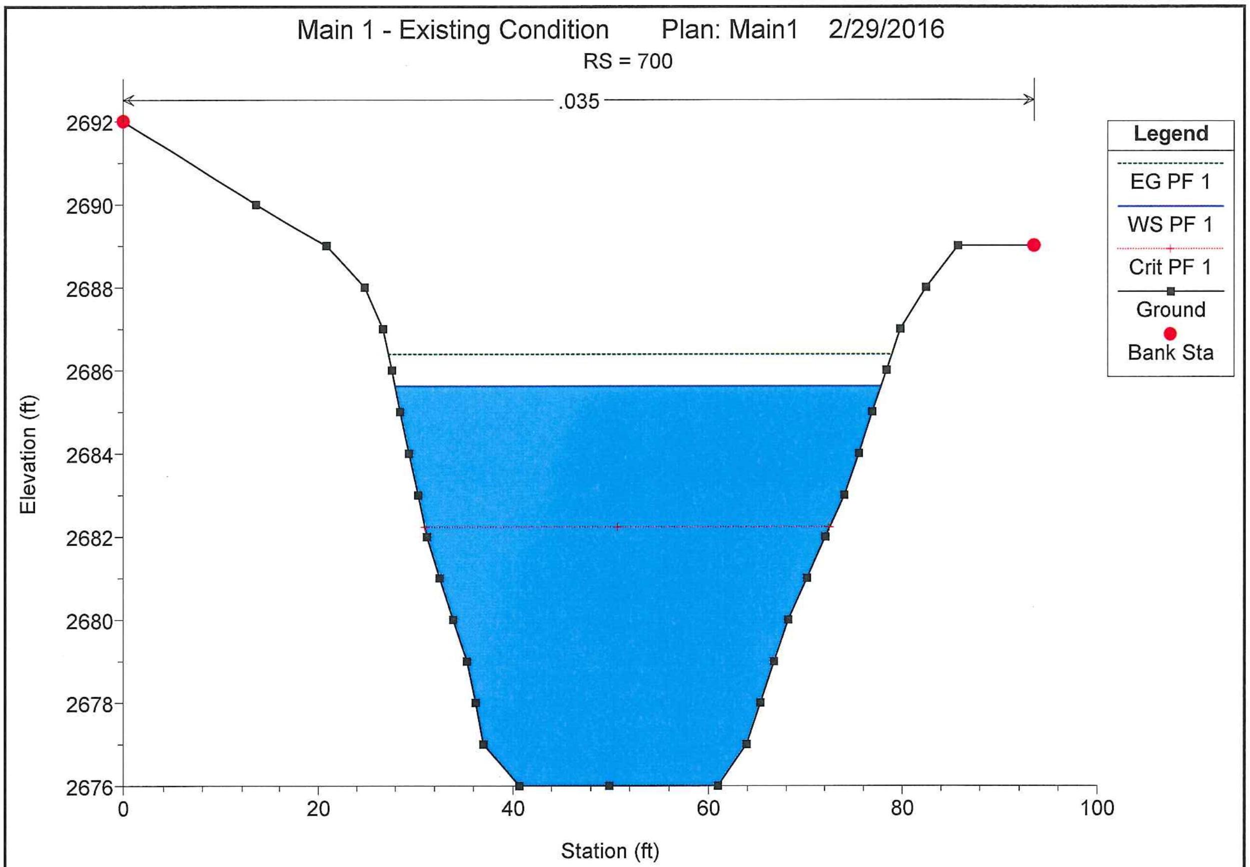
Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 1100
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2708
2706
2704
2702
2700
2698
2696
2694
2692
2690
0
10
20
30
40
50
60
70
80



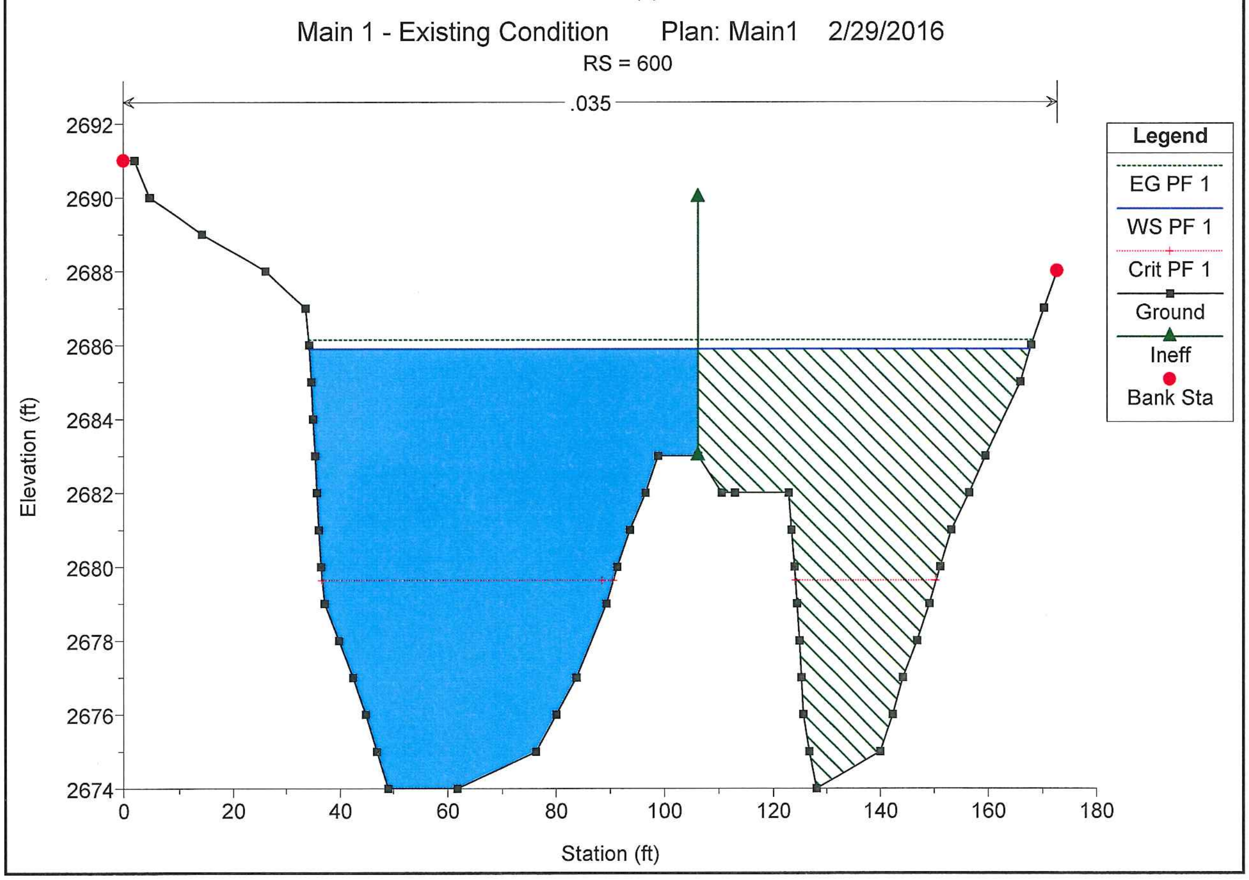
Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 1000
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2710
2705
2700
2695
2690
2685
0
20
40
60
80
100


Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 900
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2682
2684
2686
2688
2690
2692
2694
2696
2698
0
20
40
60
80
Station (ft)

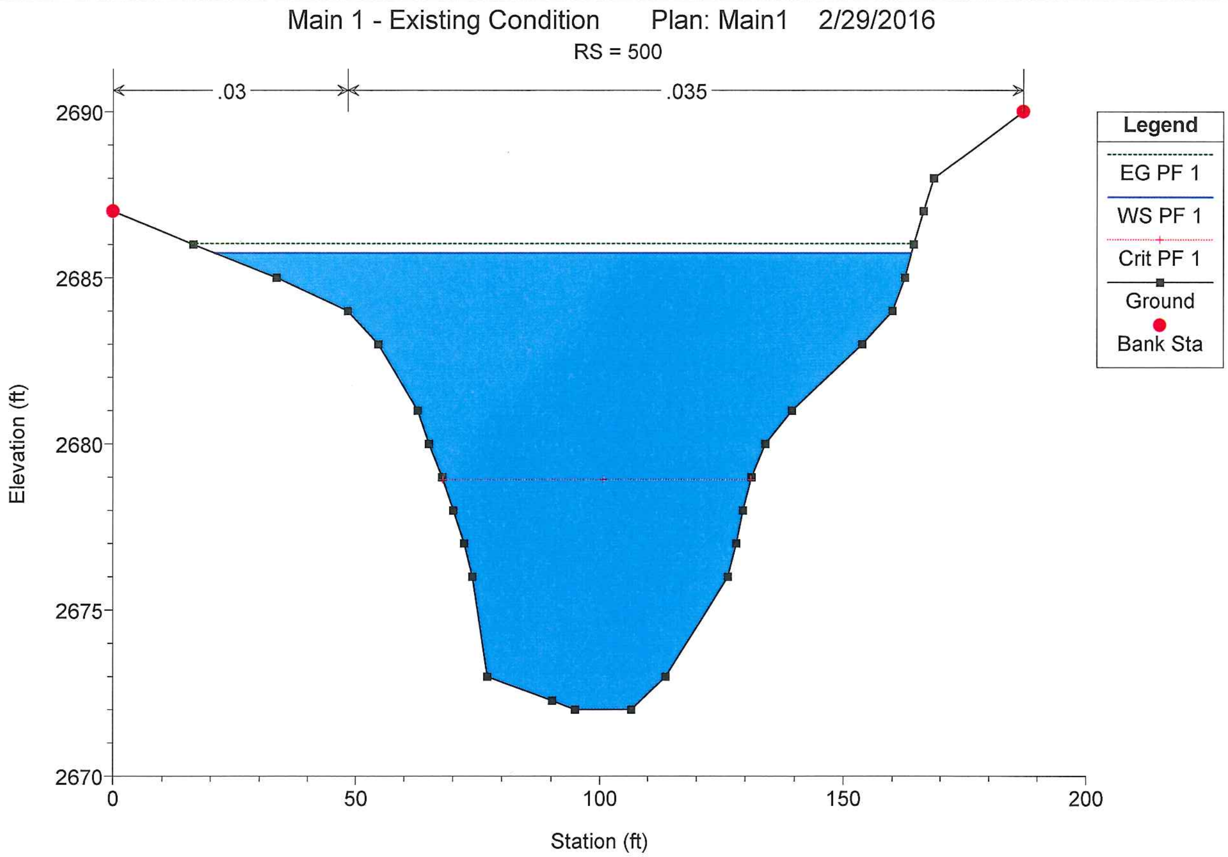

Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 800
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2678
2680
2682
2684
2686
2688
2690
2692
2694
2696
0
20
40
60
80
100
Station (ft)



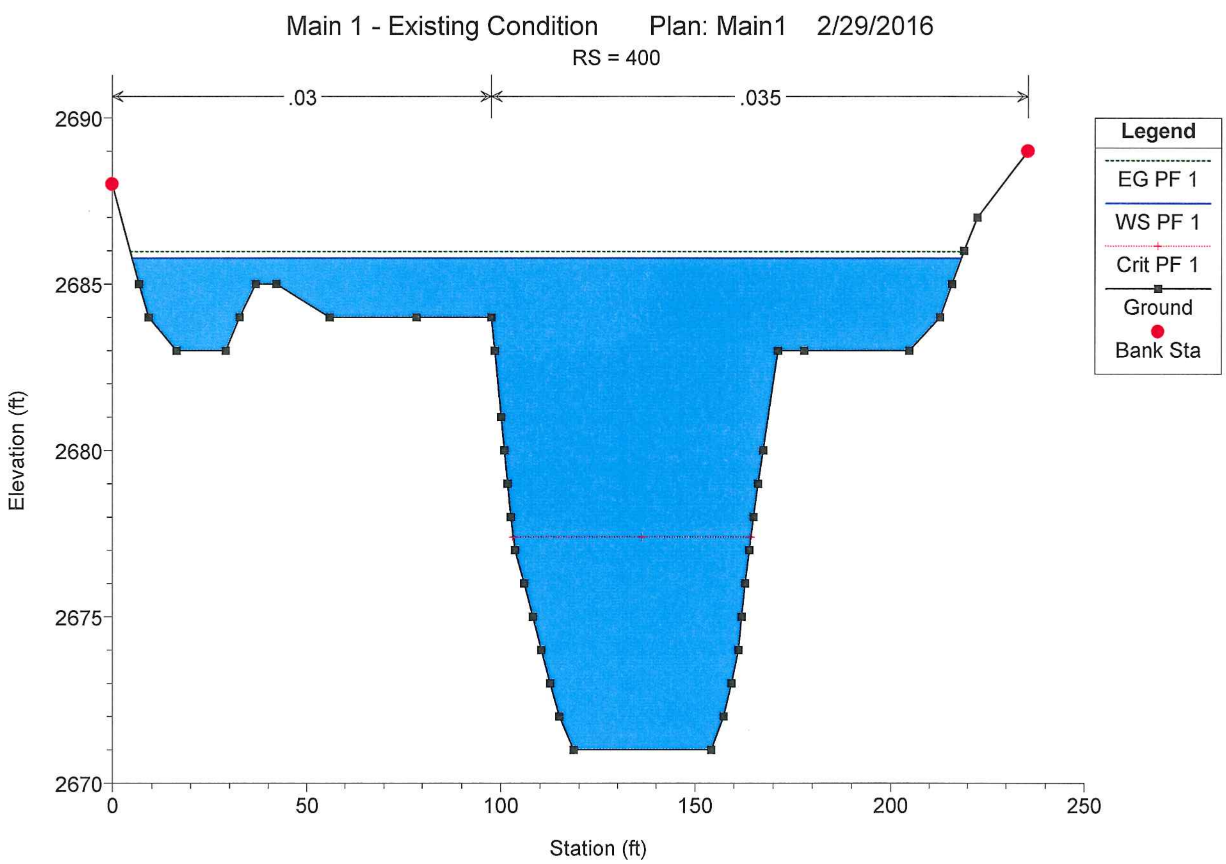
Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 700
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2692
2690
2688
2686
2684
2682
2680
2678
2676
0
20
40
60
80
100
Station (ft)



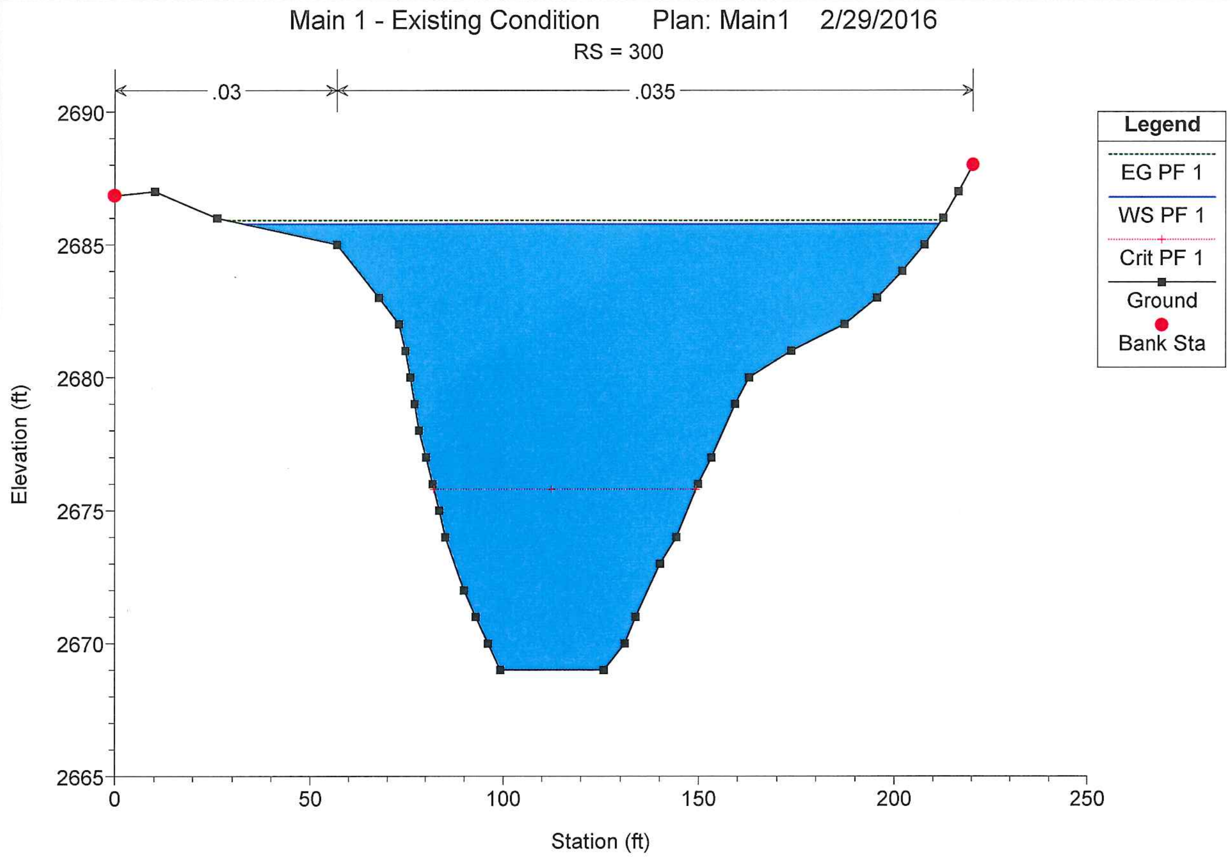
Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 600
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
2692
2690
2688
2686
2684
2682
2680
2678
2676
2674
0
20
40
60
80
100
120
140
160
180
Station (ft)

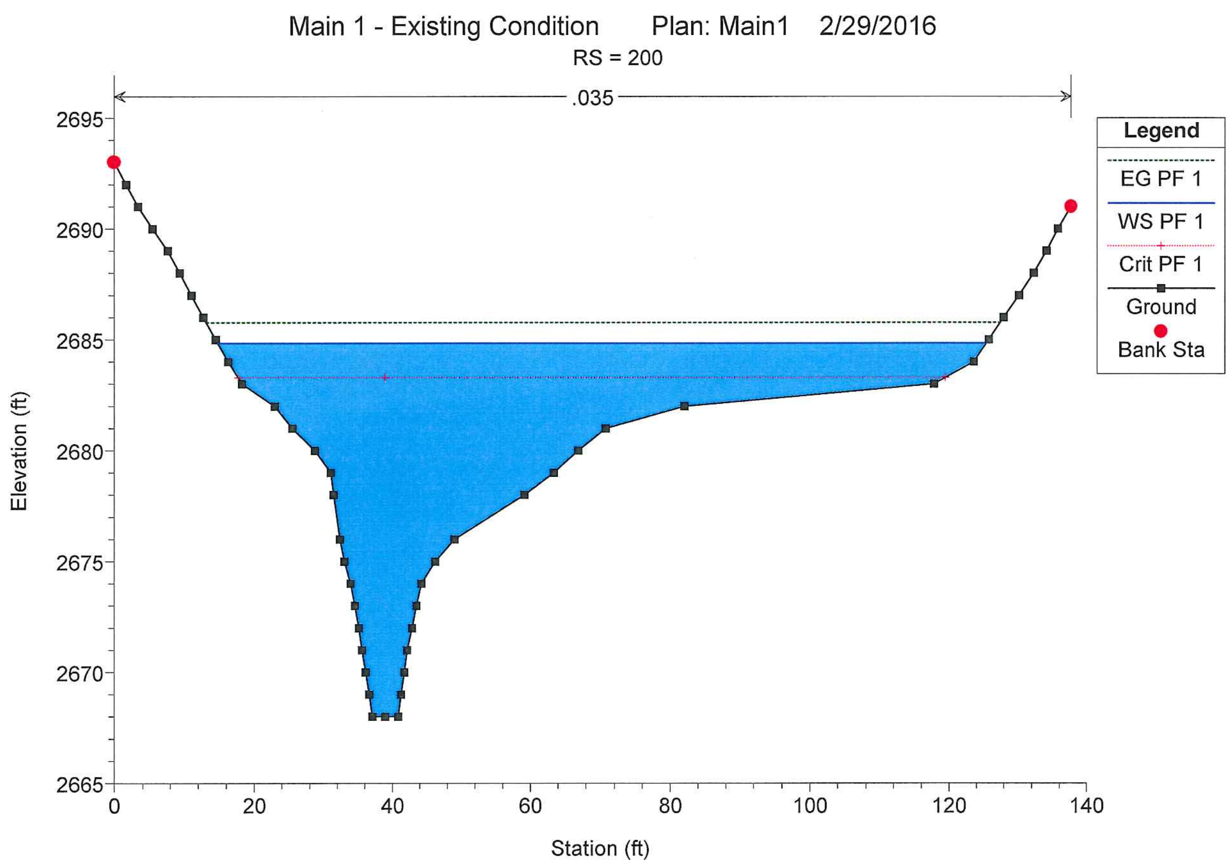


Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 500
.03
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2670
2675
2680
2685
2690
0
50
100
150
200



Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 400
.03
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2670
2675
2680
2685
2690
0
50
100
150
200
250


Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 300
.03
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2690
2685
2680
2675
2670
2665
0
50
100
150
200
250
Station (ft)


Main 1 - Existing Condition Plan: Main1 2/29/2016
RS = 200
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2695
2690
2685
2680
2675
2670
2665
0
20
40
60
80
100
120
140
Station (ft)

HEC-RAS ANALYSIS

EXISTING CONDITIONS MAIN 2

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

PROJECT DATA
Project Title: Main 2 - Existing Condition
Project File : EXISTINGSOUTHWASH.prj
Run Date and Time: 2/29/2016 11:00:05 AM

Project in English units

PLAN DATA

Plan Title: Main2 Existing
Plan File : f:\Projects\800\840-050\Division\Fctl\Calcs\HEC-RAS\02-Main2\EXISTINGSOUTHWASH.P01

Geometry Title: Main2 Existing
Geometry File : f:\Projects\800\840-050\Division\Fctl\Calcs\HEC-RAS\02-Main2\EXISTINGSOUTHWASH.G01

Flow Title : Main2 Existing
Flow File : f:\Projects\800\840-050\Division\Fctl\Calcs\HEC-RAS\02-Main2\EXISTINGSOUTHWASH.F01

Plan Summary Information:

Number of:	Cross Sections	= 6	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed at all cross sections
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Main2 Existing
Flow File : f:\Projects\800\840-050\Division\Fctl\Calcs\HEC-RAS\02-Main2\EXISTINGSOUTHWASH.F01

Flow Data (cfs)

River	Reach	RS	PF 1
Unnamed Lateral	Lateral 1	5400	1912

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Unnamed Lateral	Lateral 1	PF 1	Critical	Normal S = 0.011

GEOMETRY DATA

Geometry Title: Main2 Existing
Geometry File : f:\Projects\800\840-050\Division\Fctl\Calcs\HEC-RAS\02-Main2\EXISTINGSOUTHWASH.G01

CROSS SECTION

RIVER: Unnamed Lateral
REACH: Lateral 1 RS: 5400

INPUT
Description:
Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2787	2.95	2786	6.53	2785	38.23	2784	42.43	2784
54.94	2785	58.99	2786	63.69	2787	68.44	2788	75.94	2788
80.04	2787	83.41	2786	87.97	2785	100.26	2785	104.72	2786
134.14	2786	154.63	2786	158.25	2786	164.28	2785	169.88	2784
175.32	2783	181.95	2783	193.11	2783	197.84	2784	204.19	2784
237.35	2781	254.68	2780	258.39	2780	275	2780.8	293.68	2780.8
293.68	2787								

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	54.94	.03	237.35	.035	293.68	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	293.68	211	96	93.25	.1	.3

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
169.88	197.84	2784	169.88	197.84	2782

CROSS SECTION

RIVER: Unnamed Lateral
REACH: Lateral 1 RS: 5300

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2783	5.22	2782	10.85	2781	52.66	2781	56.83	2782
60.59	2783	64.22	2784	67.89	2785	71.65	2786	75.71	2787
79.72	2788	83.93	2789	89.08	2790	94.88	2791	108.85	2790
117.91	2789	120.88	2789	131.44	2789	136.09	2788	140.07	2787
143.78	2786	147.88	2785	154.19	2784	198.1	2782	205.69	2781
212	2780	213.74	2779	230.55	2778	231.24	2778	246.2	2779
267.09	2779	267.09	2785						

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	56.83	.03	212	.035	267.09	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	267.09	181.6	103	49.77	.1	.3

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	60.59	2783	0	60.59	2780

CROSS SECTION

RIVER: Unnamed Lateral
REACH: Lateral 1 RS: 5200

INPUT
Description:
Station Elevation Data num= 36

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2778	6.35	2777	64.02	2777	65.52	2778	78.35	2779
102.26	2779	110.95	2777	112.68	2776	118.85	2775	119.4	2774
119.81	2773	120.22	2772	120.68	2771	121.1	2770	121.53	2769
121.99	2768	123.78	2767	127.96	2766	152.34	2765	160.08	2764
171.08	2764	171.58	2765	172.09	2766	172.47	2767	172.89	2768
173.22	2769	173.57	2770	174.17	2772	174.49	2773	174.77	2774
175.81	2775	186.5	2776	209.86	2777	217.39	2777	238.13	2777
246.61	2777								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	78.35	.03	102.26	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	246.61	101.72	101.18	99.54	.1	.3

CROSS SECTION

RIVER: Unnamed Lateral
REACH: Lateral 1 RS: 5100

INPUT
Description:
Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2778.55	6.02	2776	7.94	2775	9.49	2774	23.17	2774
71.71	2775	74.37	2775	93.06	2774	109.68	2773	110.14	2772
110.57	2771	110.99	2770	111.35	2769	114.85	2768	119.16	2767
123.19	2766	126.75	2765	130.16	2764	134.46	2762	136.12	2761
140.9	2760	144.37	2760	148.44	2761	150.35	2761	154.69	2760
161.59	2759	164.24	2759	169.63	2760	173.1	2761	175.15	2762
176.7	2763	199.05	2764	199.21	2765	199.37	2766	199.53	2767
199.62	2768	199.79	2769	199.92	2770	200.06	2771	200.4	2772
205.81	2773	212.2	2774	215.84	2775	241.01	2775	245.76	2774
263.63	2774	263.63	2780						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	215.84	.03	241.01	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	263.63	49.87	50.66	49.68	.1	.3

CROSS SECTION

RIVER: Unnamed Lateral
REACH: Lateral 1 RS: 5000

INPUT
Description:
Station Elevation Data num= 38

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2776	.2	2776	2.69	2775	4.37	2774	10.52	2773
12.97	2773	63.61	2773	107.83	2773	128.27	2772	131.15	2771
131.75	2770	132.33	2769	132.94	2768	133.52	2767	134.1	2766

134.69	2765	135.28	2764	135.86	2763	136.47	2762	137.01	2761
137.58	2760	139.32	2759	141.34	2758	156.37	2758	161.79	2759
169.28	2760	173.97	2761	194.87	2762	206.23	2762	208.36	2765
208.68	2766	209.01	2767	209.33	2768	209.62	2769	210.13	2771
217.27	2772	267.37	2773	267.37	2776				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	267.37	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	267.37	99.31	100.71	99.87	.1	.3

CROSS SECTION

RIVER: Unnamed Lateral
REACH: Lateral 1 RS: 4900

INPUT
Description:
Station Elevation Data num= 37

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2771	22.9	2771	44.41	2770	56.5	2770	80.02	2770
110.42	2769	112.53	2768	112.7	2767	112.95	2766	113.16	2765
113.62	2764	117.02	2763	118.49	2762	119.53	2761	120.36	2760
121.19	2759	122.01	2758	122.82	2757	124.21	2756	141.49	2756
146.47	2757	149.64	2758	159.38	2759	174.05	2759	183.11	2759
183.46	2760	183.75	2761	184.03	2762	184.31	2763	184.65	2764
184.94	2765	185.27	2766	185.58	2767	185.84	2768	190.13	2769
226.92	2770	236.19	2771						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	236.19	.035

Bank Sta: Left	Right	Coeff Contr.	Expan.
0	236.19	.1	.3

SUMMARY OF MANNING'S N VALUES

River:Unnamed Lateral

Reach	River Sta.	n1	n2	n3	n4
Lateral 1	5400	.035	.03	.035	.035
Lateral 1	5300	.035	.03	.035	.035
Lateral 1	5200	.035	.03	.035	
Lateral 1	5100	.035	.03	.035	
Lateral 1	5000	.035	.035	.035	
Lateral 1	4900	.035	.035	.035	

SUMMARY OF REACH LENGTHS

River: Unnamed Lateral

Reach	River Sta.	Left	Channel	Right
Lateral 1	5400	211	96	93.25
Lateral 1	5300	181.6	103	49.77
Lateral 1	5200	101.72	101.18	99.54
Lateral 1	5100	49.87	50.66	49.68
Lateral 1	5000	99.31	100.71	99.87
Lateral 1	4900			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Unnamed Lateral

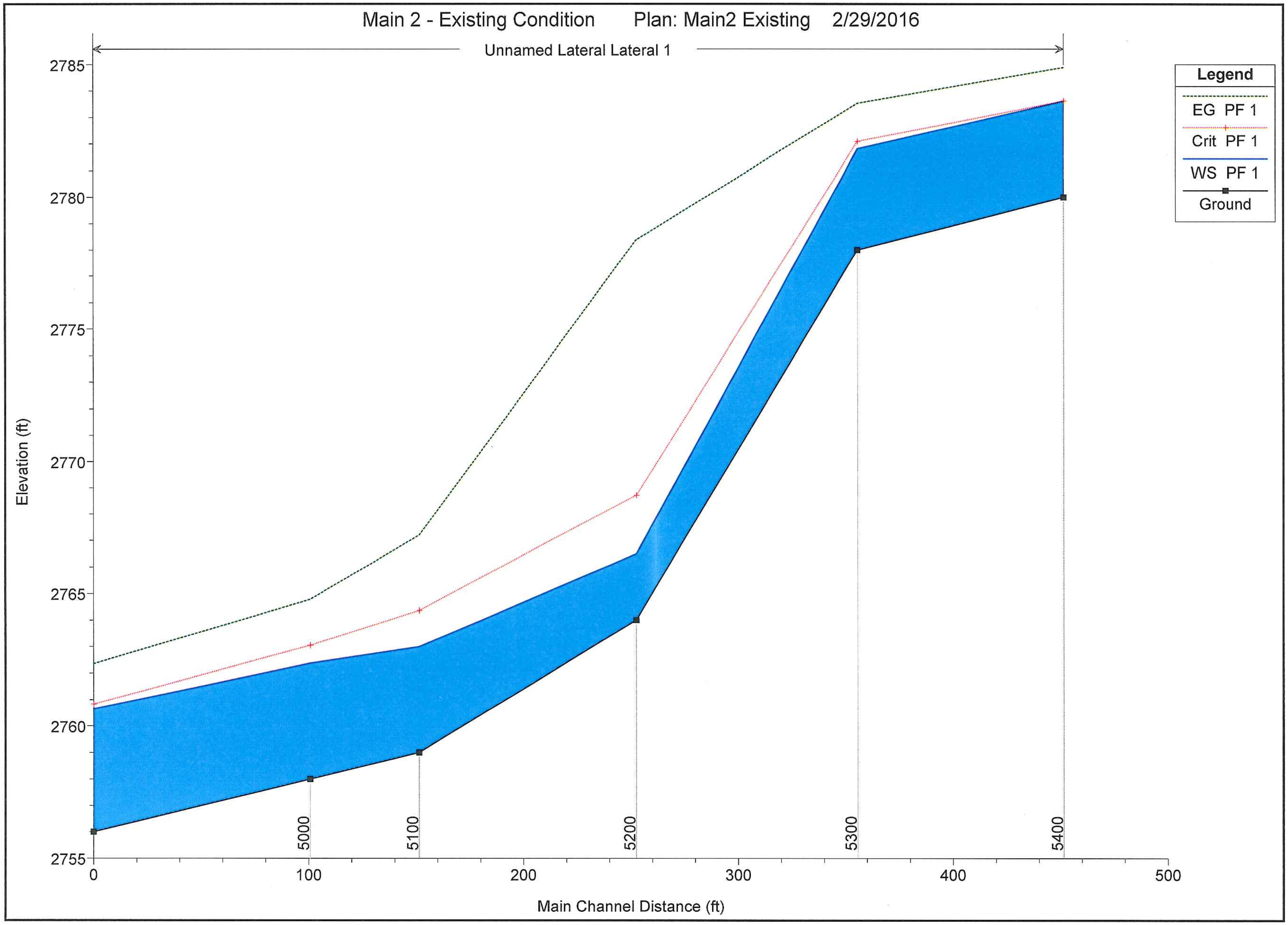
Reach	River Sta.	Contr.	Expan.
Lateral 1	5400	.1	.3
Lateral 1	5300	.1	.3
Lateral 1	5200	.1	.3
Lateral 1	5100	.1	.3
Lateral 1	5000	.1	.3
Lateral 1	4900	.1	.3

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : 2

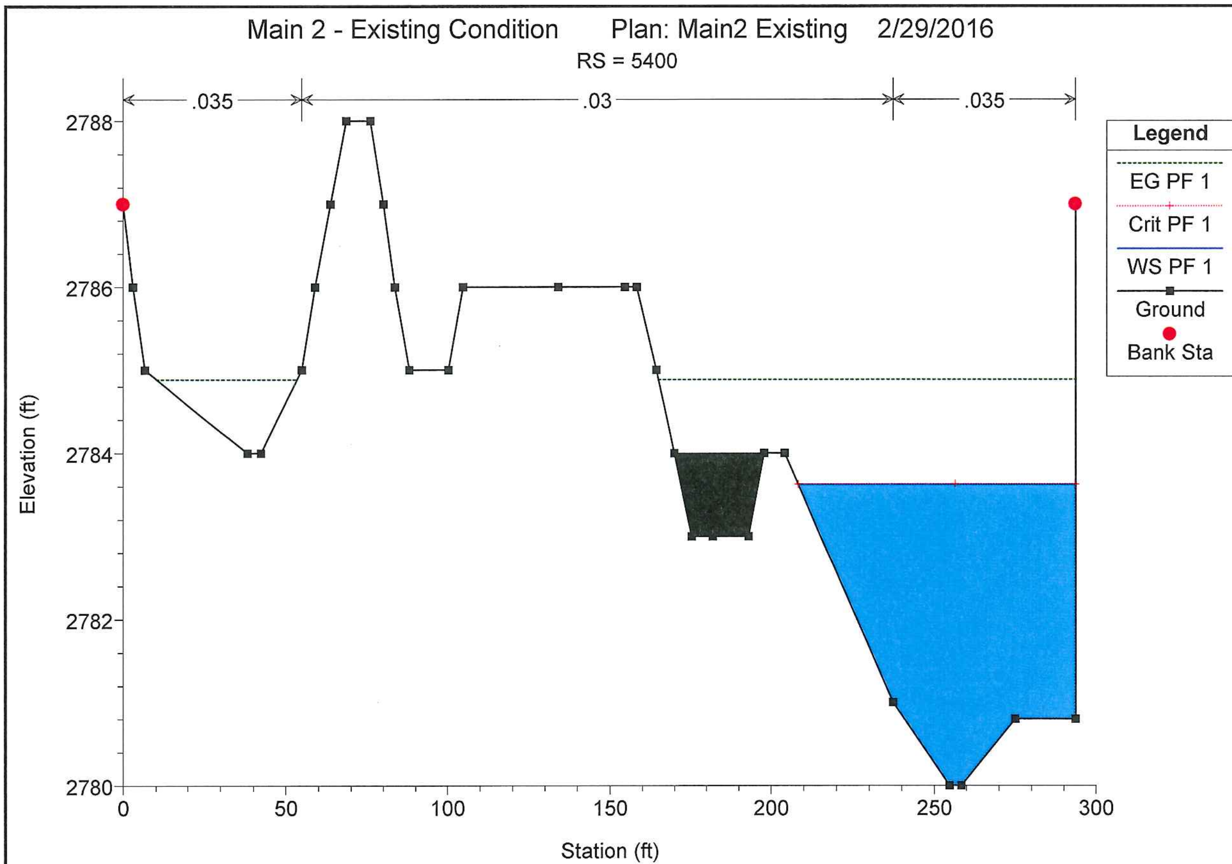
River: Unnamed Lateral Reach: Lateral 1 RS: 5400 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: Unnamed Lateral Reach: Lateral 1 RS: 5300 Profile: PF 1
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: Unnamed Lateral Reach: Lateral 1 RS: 5200 Profile: PF 1
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: Unnamed Lateral Reach: Lateral 1 RS: 5100 Profile: PF 1
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: Unnamed Lateral Reach: Lateral 1 RS: 5000 Profile: PF 1
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: Unnamed Lateral Reach: Lateral 1 RS: 4900 Profile: PF 1
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

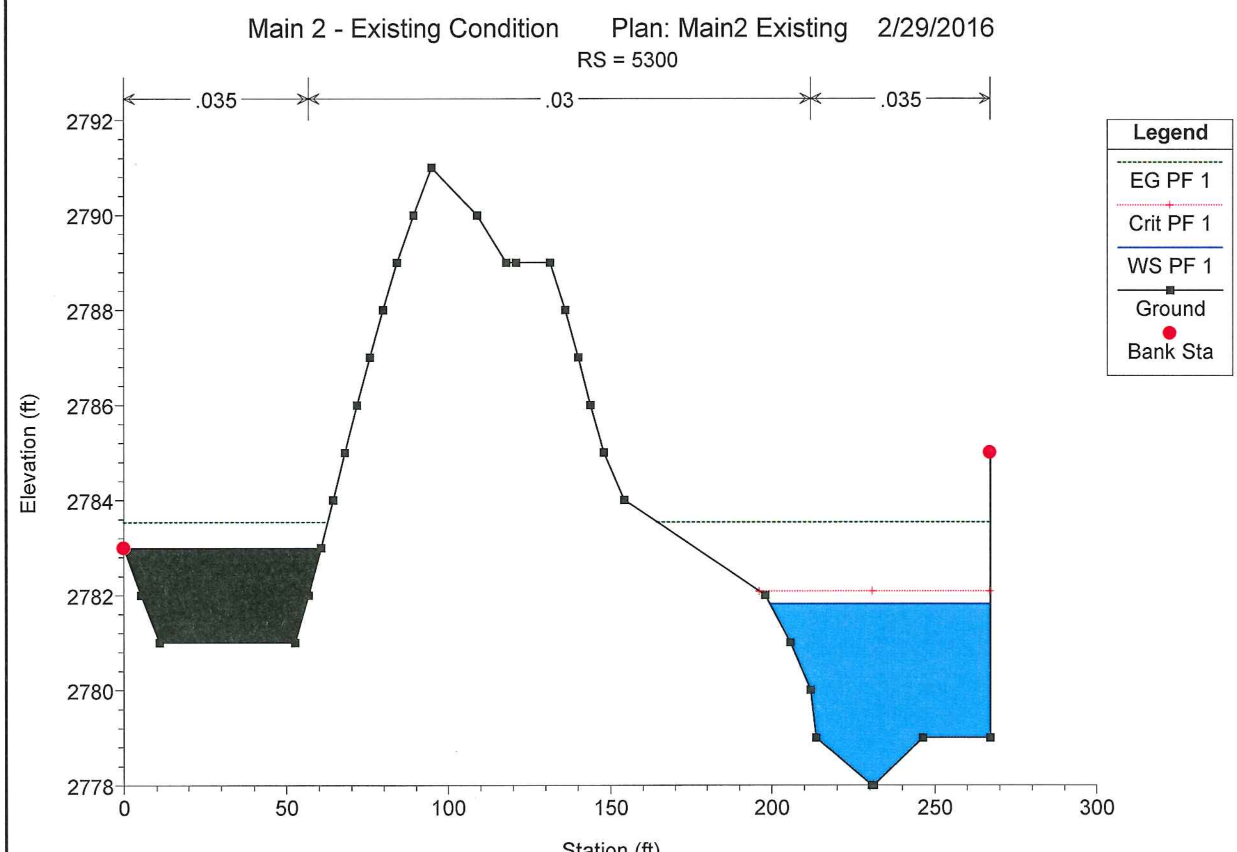
HEC-RAS Plan: 2 River: Unnamed Lateral Reach: Lateral 1 Profile: PF 1

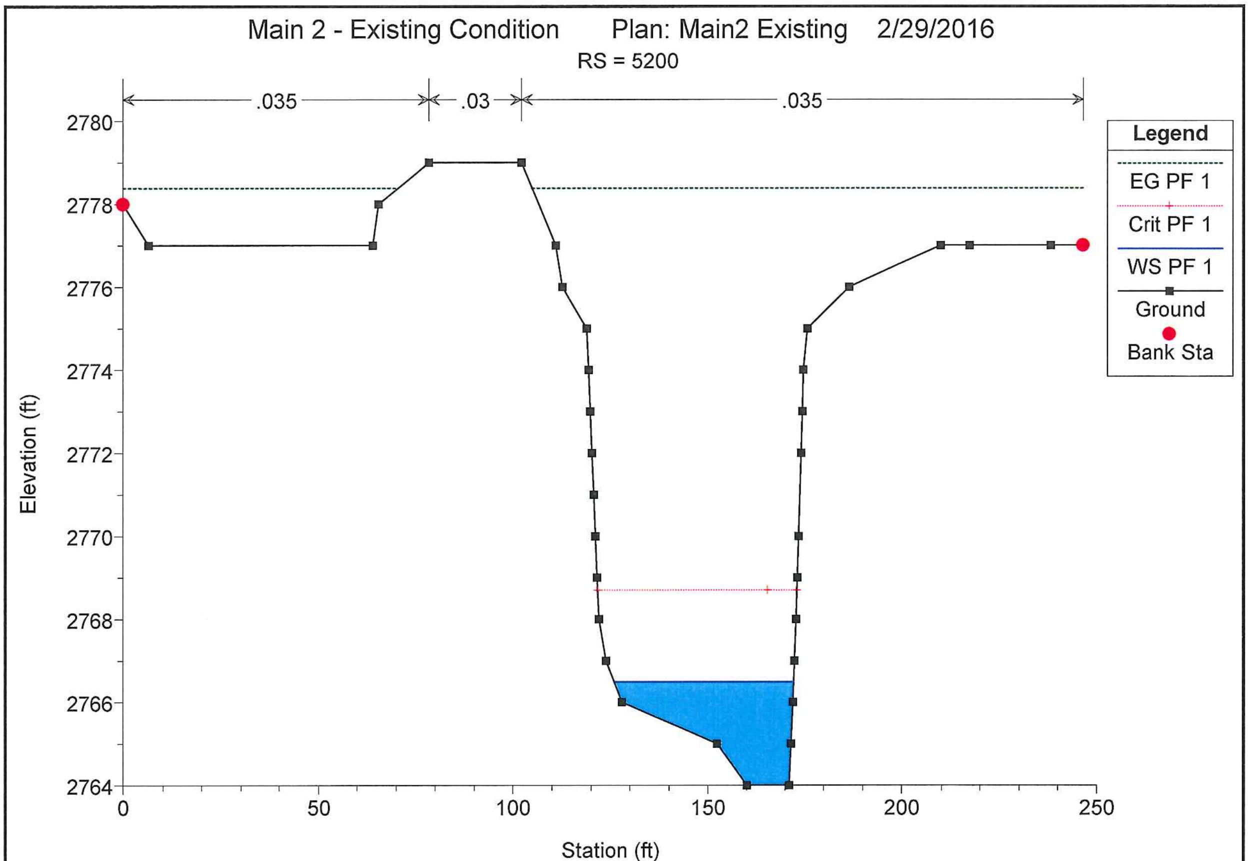
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Lateral 1	5400	PF 1	1912.00	2780.00	2783.62	2783.63	2784.89	0.012091	9.02	211.90	85.33	1.01
Lateral 1	5300	PF 1	1912.00	2778.00	2781.81	2782.08	2783.54	0.015582	10.54	181.43	67.57	1.13
Lateral 1	5200	PF 1	1912.00	2764.00	2766.49	2768.70	2778.38	0.261843	27.67	69.11	46.38	3.99
Lateral 1	5100	PF 1	1912.00	2759.00	2762.99	2764.36	2767.18	0.043559	16.44	116.28	44.34	1.79
Lateral 1	5000	PF 1	1912.00	2758.00	2762.37	2763.03	2764.77	0.031622	12.44	153.65	70.25	1.48
Lateral 1	4900	PF 1	1912.00	2756.00	2760.64	2760.82	2762.35	0.016226	10.50	182.15	63.82	1.09

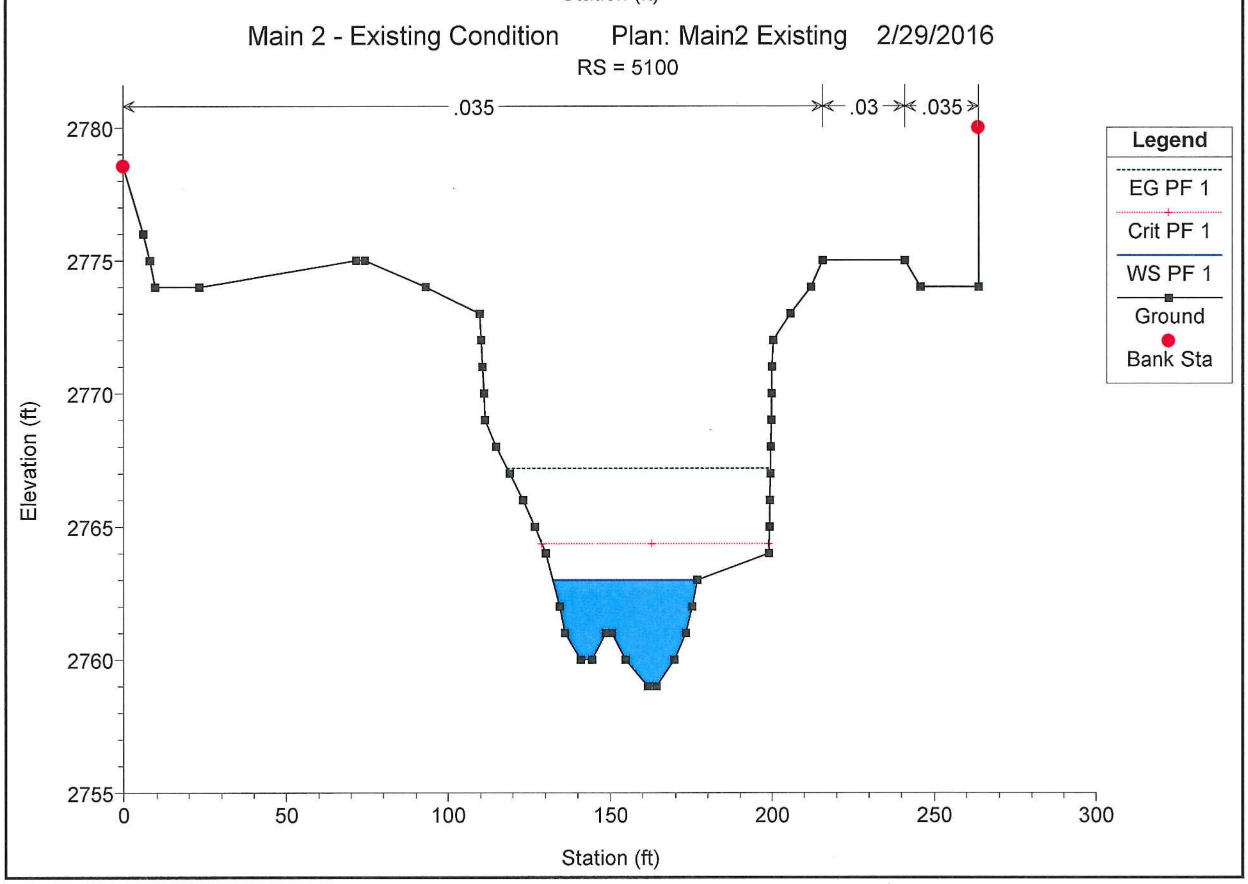


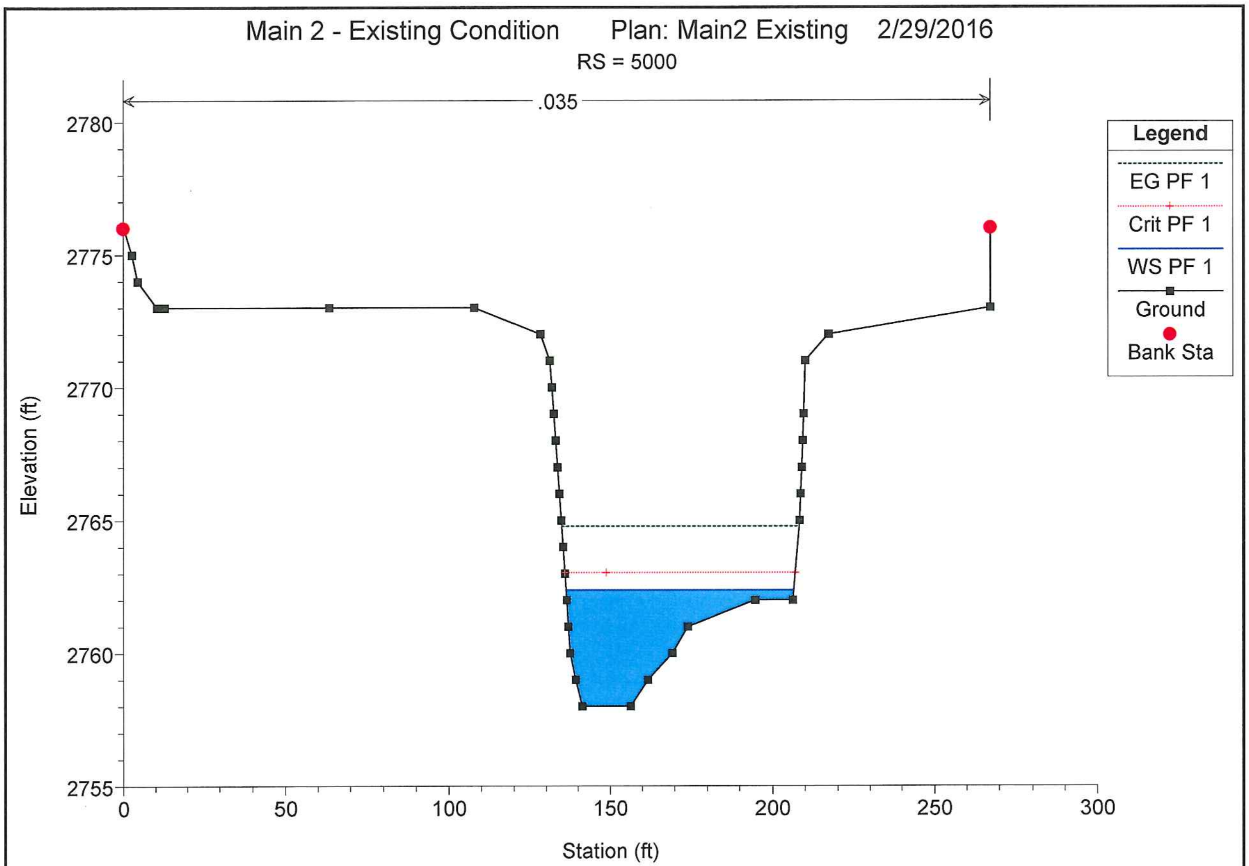
Main 2 - Existing Condition Plan: Main2 Existing 2/29/2016
Unnamed Lateral Lateral 1
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Elevation (ft)
2785
2780
2775
2770
2765
2760
2755
5000
5100
5200
5300
5400
0
100
200
300
400
500
Main Channel Distance (ft)

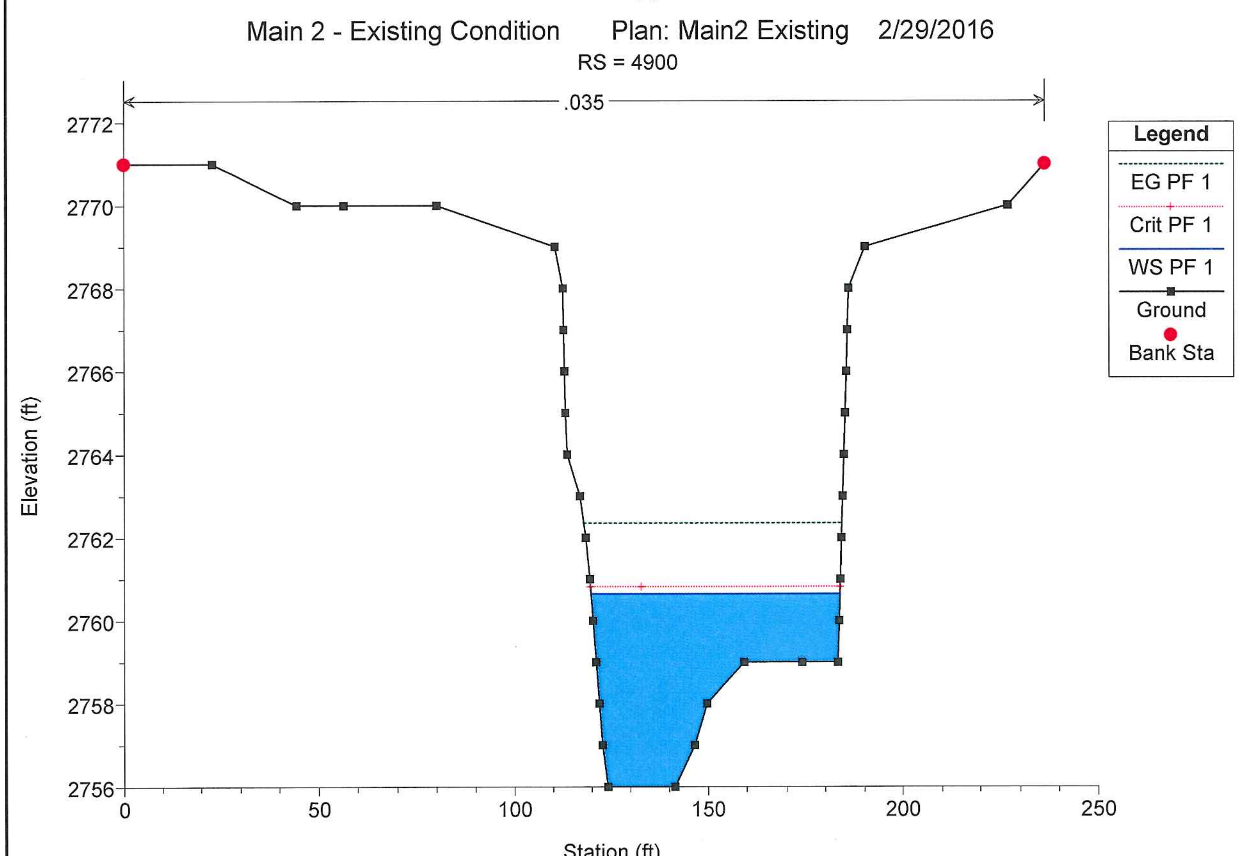

Main 2 - Existing Condition Plan: Main2 Existing 2/29/2016
RS = 5400
.035
.03
.035
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2788
2786
2784
2782
2780
0
50
100
150
200
250
300
Station (ft)


Main 2 - Existing Condition Plan: Main2 Existing 2/29/2016
RS = 5300
.035
.03
.035
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2792
2790
2788
2786
2784
2782
2780
2778
0
50
100
150
200
250
300
Station (ft)


Main 2 - Existing Condition Plan: Main2 Existing 2/29/2016
RS = 5200
.035
.03
.035
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2780
2778
2776
2774
2772
2770
2768
2766
2764
0
50
100
150
200
250
Station (ft)


Main 2 - Existing Condition Plan: Main2 Existing 2/29/2016
RS = 5100
.035
.03
.035
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2780
2775
2770
2765
2760
2755
0
50
100
150
200
250
300
Station (ft)


Main 2 - Existing Condition Plan: Main2 Existing 2/29/2016
RS = 5000
.035
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2780
2775
2770
2765
2760
2755
0
50
100
150
200
250
300
Station (ft)


Main 2 - Existing Condition Plan: Main2 Existing 2/29/2016
RS = 4900
.035
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2772
2770
2768
2766
2764
2762
2760
2758
2756
0
50
100
150
200
250
Station (ft)

HEC-RAS ANALYSIS

PROPOSED CONDITIONS MAIN 1

```
                        HEC-RAS Version 4.1.0 Jan 2010
                        U.S. Army Corps of Engineers
                        Hydrologic Engineering Center
                             609 Second Street
                             Davis, California

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

PROJECT DATA
Project Title: Main 1 - Proposed Condition
Project File : PROP3.prj
Run Date and Time: 3/2/2016 4:20:31 PM

Project in English units

PLAN DATA

Plan Title: Current model
Plan File : f:\Projects\800\840-050\Division\Fctl\Calcs\HEC-RAS\01-Main1\PROP3.P01

Geometry Title: Main 1 Proposed
Geometry File : f:\Projects\800\840-050\Division\Fctl\Calcs\HEC-RAS\01-Main1\PROP3.G01

Flow Title : 0 Flow Profiles
Flow File : f:\Projects\800\840-050\Division\Fctl\Calcs\HEC-RAS\01-Main1\PROP3.F01

Plan Summary Information:

Number of:					
	Cross Sections	= 4	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed at all cross sections
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: 0 Flow Profiles
Flow File : f:\Projects\800\840-050\Division\Fctl\Calcs\HEC-RAS\01-Main1\PROP3.F01

Flow Data (cfs)

River	Reach	RS	PF 1
Unnamed Wash	Main1-Prop	2700	2128

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Unnamed Wash	Main1-Prop	PF 1	Critical	Known WS = 2752.49

GEOMETRY DATA

Geometry Title: Main 1 Proposed
Geometry File : f:\Projects\800\840-050\Division\Fctl\Calcs\HEC-RAS\01-Main1\PROP3.G01

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1-Prop RS: 2700

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2769	4.32	2768	8.89	2767	14.12	2766	19.18	2765
24.32	2764	29.44	2763	34.62	2762	39.85	2761	45	2760
48.3	2759	51.08	2758	54.15	2757	58.29	2756	74.22	2756
77.45	2757	80.08	2758	90.95	2758	94.1	2757	95.07	2757
97.37	2758	99.58	2759	100.37	2760	101.18	2761	101.97	2762
103.09	2763	105.64	2764	108.63	2765	112.52	2766	116.09	2767
119.56	2768	127.49	2769						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	127.49	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	127.49	95.75	98.69	107.97	.1	.3

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1-Prop RS: 2600

INPUT
Description:
Station Elevation Data num= 34

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2765	3.19	2764	6.31	2763	9.41	2762	12.03	2761
12.88	2760	13.83	2759	14.76	2758	15.74	2757	16.76	2756
17.69	2755	18.58	2754	22.83	2752	32.12	2752	37.82	2754
43.67	2755	52.8	2756	66.54	2757	66.62	2758	66.71	2759
68.82	2761	68.85	2761	70.78	2759	71.78	2758	72.75	2757
86.93	2757	90.38	2758	91.7	2759	92.96	2760	94.15	2761
99.48	2762	104.49	2763	110.14	2764	115.64	2765		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	115.64	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	115.64	101.86	103.65	108.71	.1	.3

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1-Prop RS: 2500

INPUT
Description:
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2761	.38	2760	.75	2759	1.17	2758	1.89	2756
2.3	2755	2.68	2754	3.06	2753	3.44	2752	9.58	2748
17.77	2748	34.89	2752	60.1	2753	67.24	2754	71.71	2755
76.74	2756	84.67	2758	93.68	2759	99.64	2760	104.45	2761

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	104.45	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	104.45	108.74	100.43	96.31	.1	.3

CROSS SECTION

RIVER: Unnamed Wash
REACH: Main1-Prop RS: 2400

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2758	33	2739.36	55	2739.36	74	2749	90.83	2749
95.4	2751	98.61	2752	104.46	2754	109.02	2755	118.84	2756
121.79	2757	123.77	2758	126.1	2759	128.13	2759		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	128.13	.035

Bank Sta: Left	Right	Coeff Contr.	Expan.
0	128.13	.3	.5

SUMMARY OF MANNING'S N VALUES

River:Unnamed Wash

Reach	River Sta.	n1	n2	n3
Main1-Prop	2700	.035	.035	.035
Main1-Prop	2600	.035	.035	.035
Main1-Prop	2500	.035	.035	.035
Main1-Prop	2400	.035	.035	.035

SUMMARY OF REACH LENGTHS

River: Unnamed Wash

Reach	River Sta.	Left	Channel	Right
Main1-Prop	2700	95.75	98.69	107.97
Main1-Prop	2600	101.86	103.65	108.71
Main1-Prop	2500	108.74	100.43	96.31
Main1-Prop	2400			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Unnamed Wash

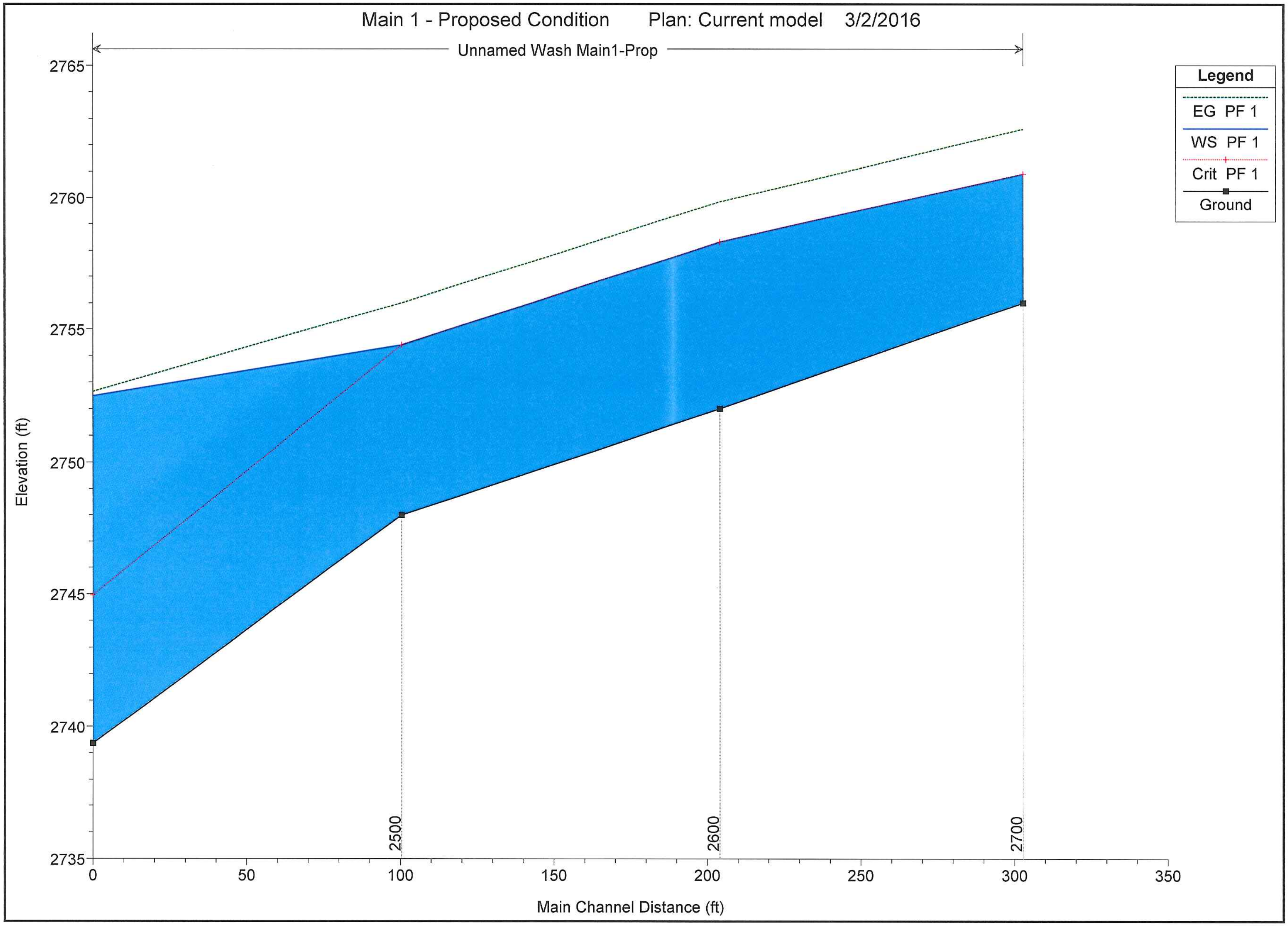
Reach	River Sta.	Contr.	Expan.
Main1-Prop	2700	.1	.3
Main1-Prop	2600	.1	.3
Main1-Prop	2500	.1	.3
Main1-Prop	2400	.3	.5

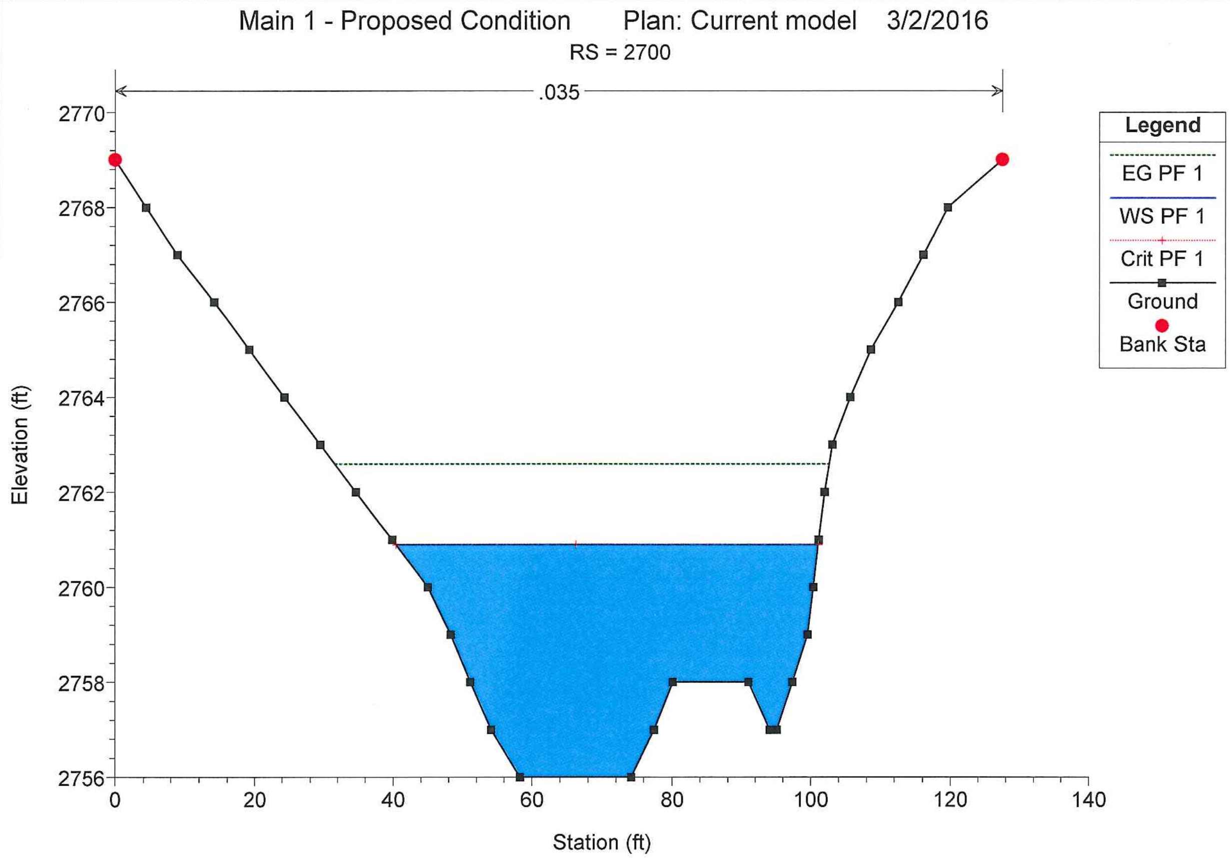
ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Current mode

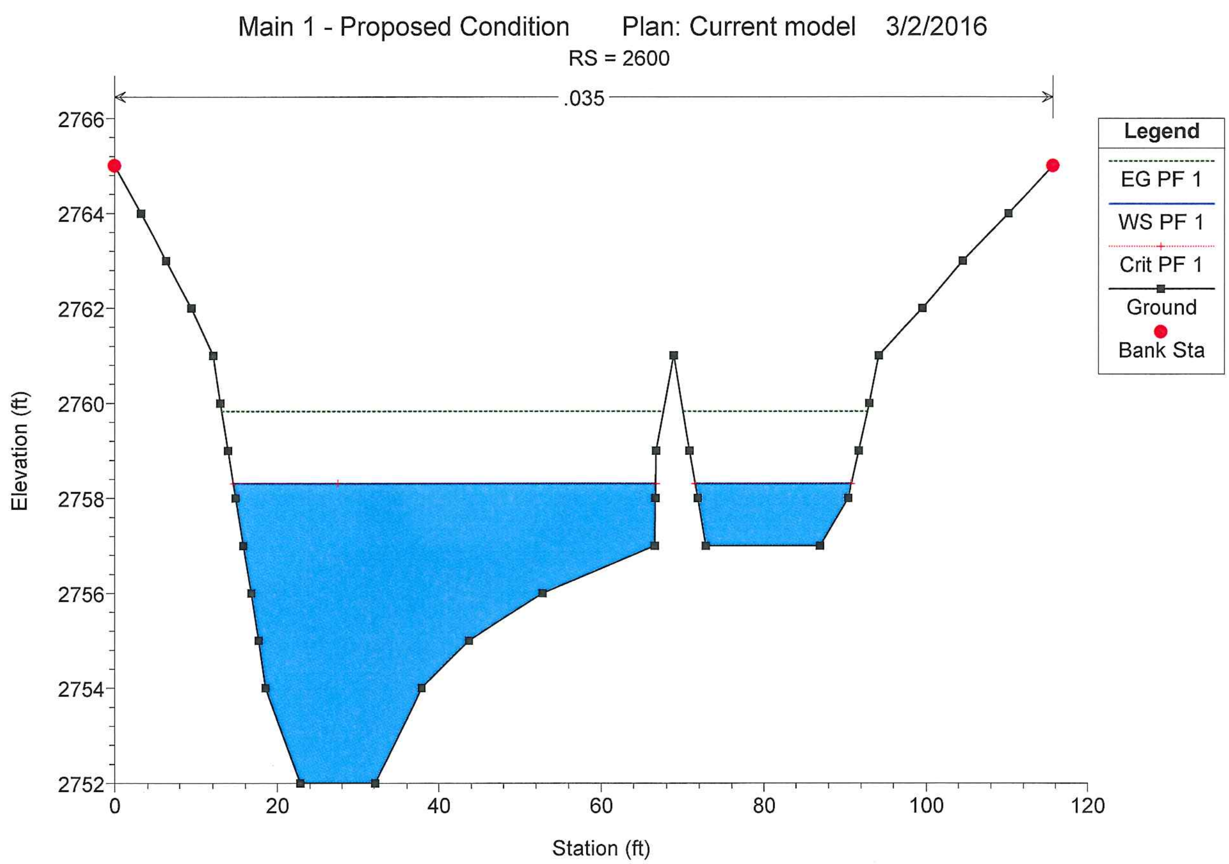
River: Unnamed Wash Reach: Main1-Prop RS: 2700 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: Unnamed Wash Reach: Main1-Prop RS: 2600 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning:Divided flow computed for this cross-section.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
River: Unnamed Wash Reach: Main1-Prop RS: 2500 Profile: PF 1
Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

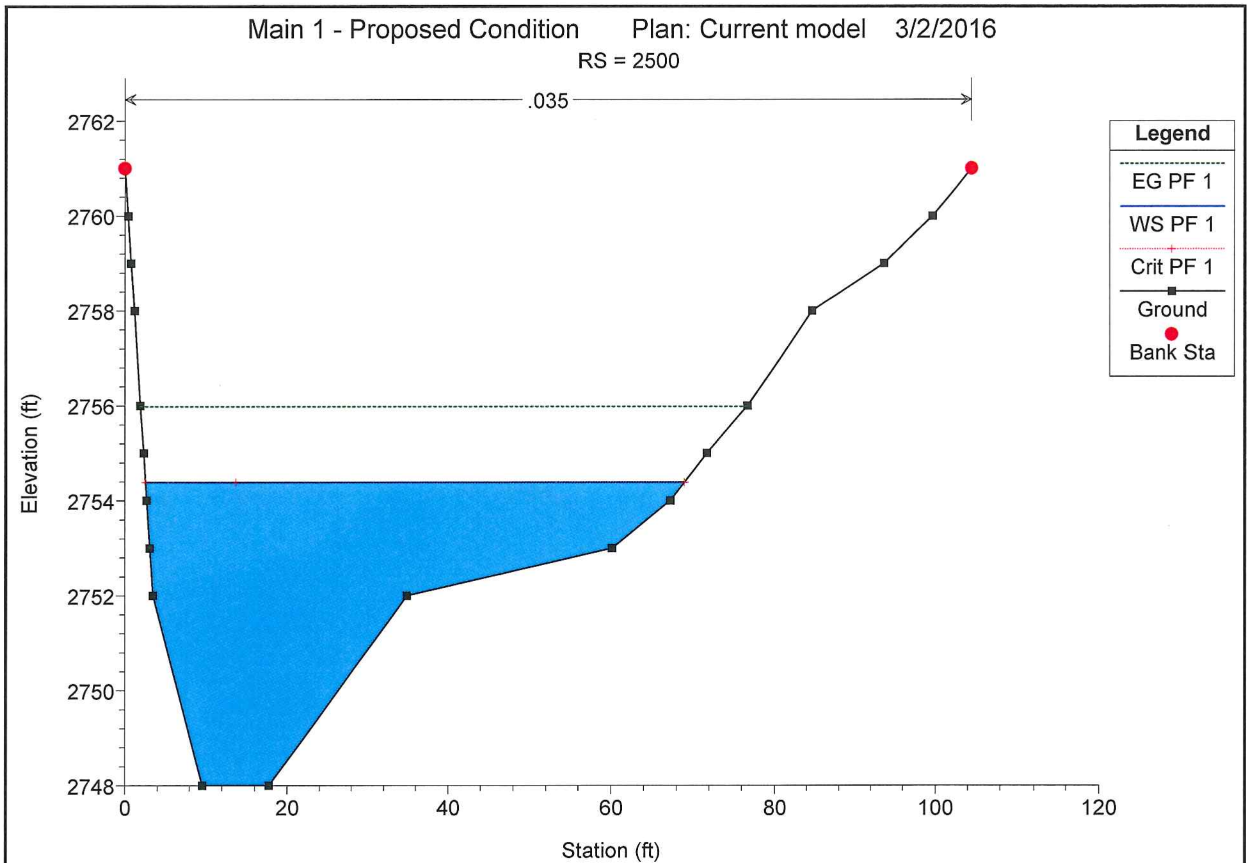
HEC-RAS Plan: Current mode River: Unnamed Wash Reach: Main1-Prop Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main1-Prop	2700	PF 1	2128.00	2756.00	2760.90	2760.90	2762.59	0.012742	10.45	203.62	60.71	1.01
Main1-Prop	2600	PF 1	2128.00	2752.00	2758.31	2758.31	2759.83	0.013626	9.89	215.14	71.49	1.00
Main1-Prop	2500	PF 1	2128.00	2748.00	2754.39	2754.39	2755.99	0.013172	10.14	209.83	66.45	1.01
Main1-Prop	2400	PF 1	2128.00	2739.36	2752.49	2744.95	2752.65	0.000417	3.16	672.99	90.29	0.20

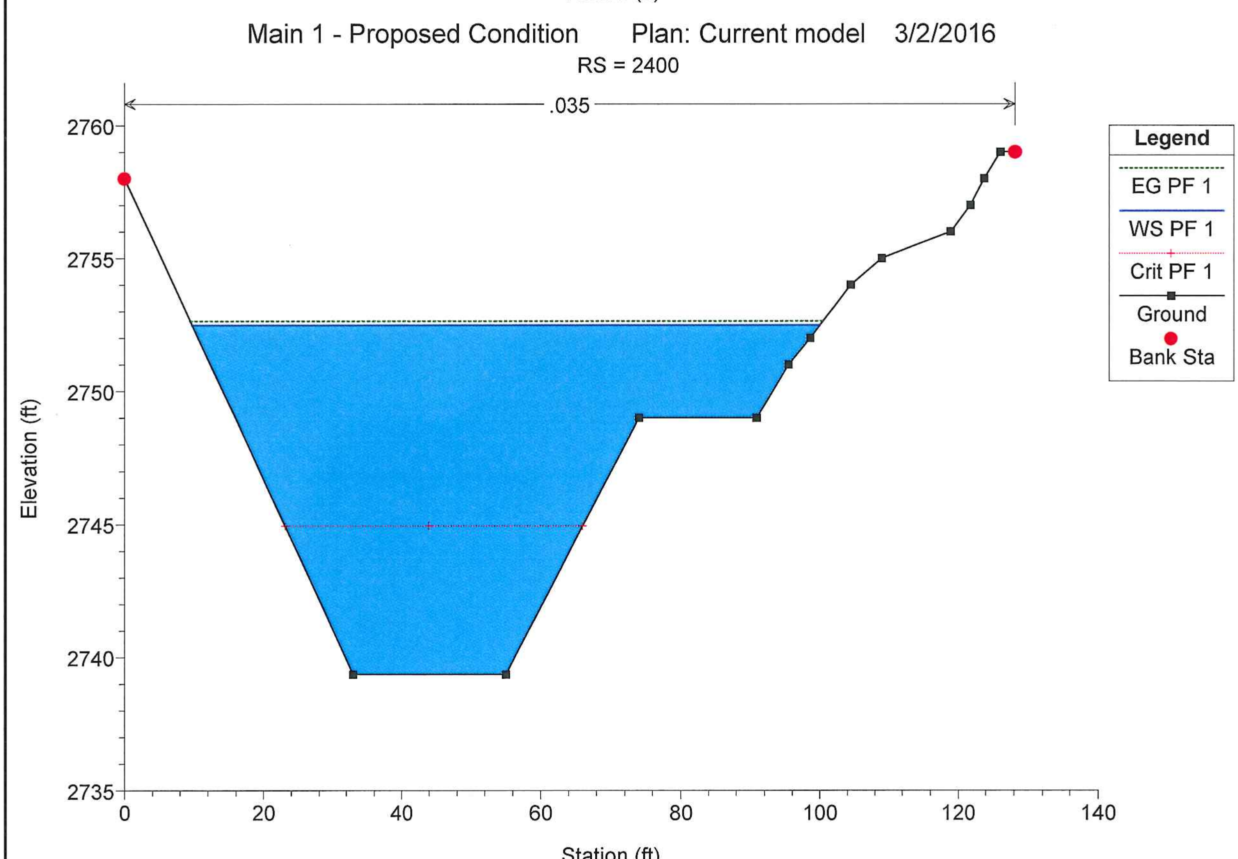

Main 1 - Proposed Condition Plan: Current model 3/2/2016
Unnamed Wash Main1-Prop
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2735
2740
2745
2750
2755
2760
2765
Main Channel Distance (ft)
0
50
100
150
200
250
300
350
2500
2600
2700


Main 1 - Proposed Condition Plan: Current model 3/2/2016
RS = 2700
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Main 1 - Proposed Condition Plan: Current model 3/2/2016
RS = 2600
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)



Main 1 - Proposed Condition Plan: Current model 3/2/2016
RS = 2500
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2762
2760
2758
2756
2754
2752
2750
2748
0
20
40
60
80
100
120



Main 1 - Proposed Condition Plan: Current model 3/2/2016
RS = 2400
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2760
2755
2750
2745
2740
2735
0
20
40
60
80
100
120
140

HEC-RAS ANALYSIS

PROPOSED CONDITIONS MAIN 2

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

PROJECT DATA
Project Title: Main 2 - Proposed Condition
Project File : PROPOSEDSOUTHWASH.prj
Run Date and Time: 3/3/2016 9:32:32 AM

Project in English units

PLAN DATA

Plan Title: Main 2
Plan File : f:\Projects\800\840-050\Division\Fctl\Calcs\HEC-RAS\02-Main2\PROPOSEDSOUTHWASH.P01

Geometry Title: Main 2
Geometry File : f:\Projects\800\840-050\Division\Fctl\Calcs\HEC-RAS\02-Main2\PROPOSEDSOUTHWASH.G01

Flow Title : Main 2
Flow File : f:\Projects\800\840-050\Division\Fctl\Calcs\HEC-RAS\02-Main2\PROPOSEDSOUTHWASH.F01

Plan Summary Information:

Number of:					
	Cross Sections	= 5	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	0

Computational Information
- Water surface calculation tolerance = 0.01
- Critical depth calculation tolerance = 0.01
- Maximum number of iterations = 20
- Maximum difference tolerance = 0.3
- Flow tolerance factor = 0.001

Computation Options
- Critical depth computed at all cross sections
- Conveyance Calculation Method: At breaks in n values only
- Friction Slope Method: Average Conveyance
- Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Main 2
Flow File : f:\Projects\800\840-050\Division\Fctl\Calcs\HEC-RAS\02-Main2\PROPOSEDSOUTHWASH.F01

Flow Data (cfs)

River	Reach	RS	PF 1
Unnamed Lateral	Lateral 1	5400	1910

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Unnamed Lateral	Lateral 1	PF 1	Critical	Known WS = 2771.09

GEOMETRY DATA

Geometry Title: Main 2
Geometry File : f:\Projects\800\840-050\Division\Fctl\Calcs\HEC-RAS\02-Main2\PROPOSEDSOUTHWASH.G01

CROSS SECTION

RIVER: Unnamed Lateral
REACH: Lateral 1 RS: 5400

INPUT
Description:
Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2787	2.95	2786	6.53	2785	38.23	2784	42.43	2784
54.94	2785	58.99	2786	63.69	2787	68.44	2788	75.94	2788
80.04	2787	83.41	2786	87.97	2785	100.26	2785	104.72	2786
134.14	2786	154.63	2786	158.25	2786	164.28	2785	169.88	2784
175.32	2783	181.95	2783	193.11	2783	197.84	2784	204.19	2784
237.35	2781	254.68	2780	258.39	2780	275	2780.8	293.68	2780.8
293.68	2787								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	54.94	.03	237.35	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	293.68	211	96	93.25	.1	.3

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
169.88	197.84	2784	169.88	197.84	2782

CROSS SECTION

RIVER: Unnamed Lateral
REACH: Lateral 1 RS: 5300

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2783	5.22	2782	10.85	2781	52.66	2781	56.83	2782
60.59	2783	64.22	2784	67.89	2785	71.65	2786	75.71	2787
79.72	2788	83.93	2789	89.08	2790	94.88	2791	108.85	2790
117.91	2789	120.88	2789	131.44	2789	136.09	2788	140.07	2787
143.78	2786	147.88	2785	154.19	2784	198.1	2782	205.69	2781
212	2780	213.74	2779	230.55	2778	231.24	2778	246.2	2779
267.09	2779	267.09	2785						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	56.83	.03	212	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	267.09	181.6	103	49.77	.1	.3

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	60.71	2783	0	60.71	2780

CROSS SECTION

RIVER: Unnamed Lateral
REACH: Lateral 1 RS: 5200

INPUT
Description:
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2778	.01	2778	6.64	2777	64.28	2777	65.78	2778
78.35	2779	102.26	2779	109.54	2778	111.21	2777	112.94	2776
121.87	2774	126.21	2773	140.34	2772	167.67	2772	170.61	2773
173.68	2774	176.47	2775	179.06	2776	189.98	2777	210.1	2777
217.68	2777	237.76	2777	243.02	2777	246.61	2777	246.61	2780

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	65.78	.03	109.54	.035	112.94	.04	179.06	.035
246.61	.035								

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	246.61	101.72	101.18	99.54	.1	.3

CROSS SECTION

RIVER: Unnamed Lateral
REACH: Lateral 1 RS: 5100

INPUT
Description:
Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2778.55	5.55	2776	7.72	2775	28.24	2774	43.78	2773
56.32	2772	71.95	2771	86.42	2770	96.57	2769	104.89	2768
117.08	2767	128.49	2766	139.73	2765	153.97	2764	179.84	2764
183.7	2765	186.61	2766	189.33	2767	191.36	2768	194.16	2769
197.58	2770	200.46	2771	203	2772	206.01	2773	211.83	2774
215.87	2775	241.04	2775	245.71	2774	257.55	2774	263.63	2774
263.63	2780								

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	56.32	.04	203	.035	263.63	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	263.63	49.87	50.66	49.68	.1	.3

CROSS SECTION

RIVER: Unnamed Lateral
REACH: Lateral 1 RS: 5000

INPUT
Description:
Station Elevation Data num= 33

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2776	1.02	2776	3.79	2775	32.75	2774	53.22	2773
70.53	2772	92.22	2771	110.68	2770	116.83	2769	121.85	2768
127.31	2767	130.63	2766	133.74	2765	136.6	2764	143.25	2763
149.02	2762	153.27	2761	157.12	2759.39	177.14	2759.39	181.95	2761
185.81	2762	191.56	2763	195.69	2764	199.22	2765	202.35	2766
205.46	2767	208.48	2768	211.28	2769	214.18	2770	217.33	2771
223.48	2772	267.37	2772	267.37	2776				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	70.53	.04	223.48	.035

Bank Sta: Left	Right	Coeff Contr.	Expan.
0	267.37	.3	.5

SUMMARY OF MANNING'S N VALUES

River:Unnamed Lateral

Reach	River Sta.	n1	n2	n3	n4	n5	n6
Lateral 1	5400	.035	.03	.035			
Lateral 1	5300	.035	.03	.035			
Lateral 1	5200	.035	.03	.035	.04	.035	.035
Lateral 1	5100	.035	.04	.035	.035		
Lateral 1	5000	.035	.04	.035			

SUMMARY OF REACH LENGTHS

River: Unnamed Lateral

Reach	River Sta.	Left	Channel	Right
Lateral 1	5400	211	96	93.25
Lateral 1	5300	181.6	103	49.77
Lateral 1	5200	101.72	101.18	99.54
Lateral 1	5100	49.87	50.66	49.68
Lateral 1	5000			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Unnamed Lateral

Reach	River Sta.	Contr.	Expan.
Lateral 1	5400	.1	.3
Lateral 1	5300	.1	.3
Lateral 1	5200	.1	.3
Lateral 1	5100	.1	.3
Lateral 1	5000	.3	.5

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Current mode

River: Unnamed Lateral Reach: Lateral 1 RS: 5300 Profile: PF 1
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: Unnamed Lateral Reach: Lateral 1 RS: 5200 Profile: PF 1
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.

River: Unnamed Lateral Reach: Lateral 1 RS: 5100 Profile: PF 1

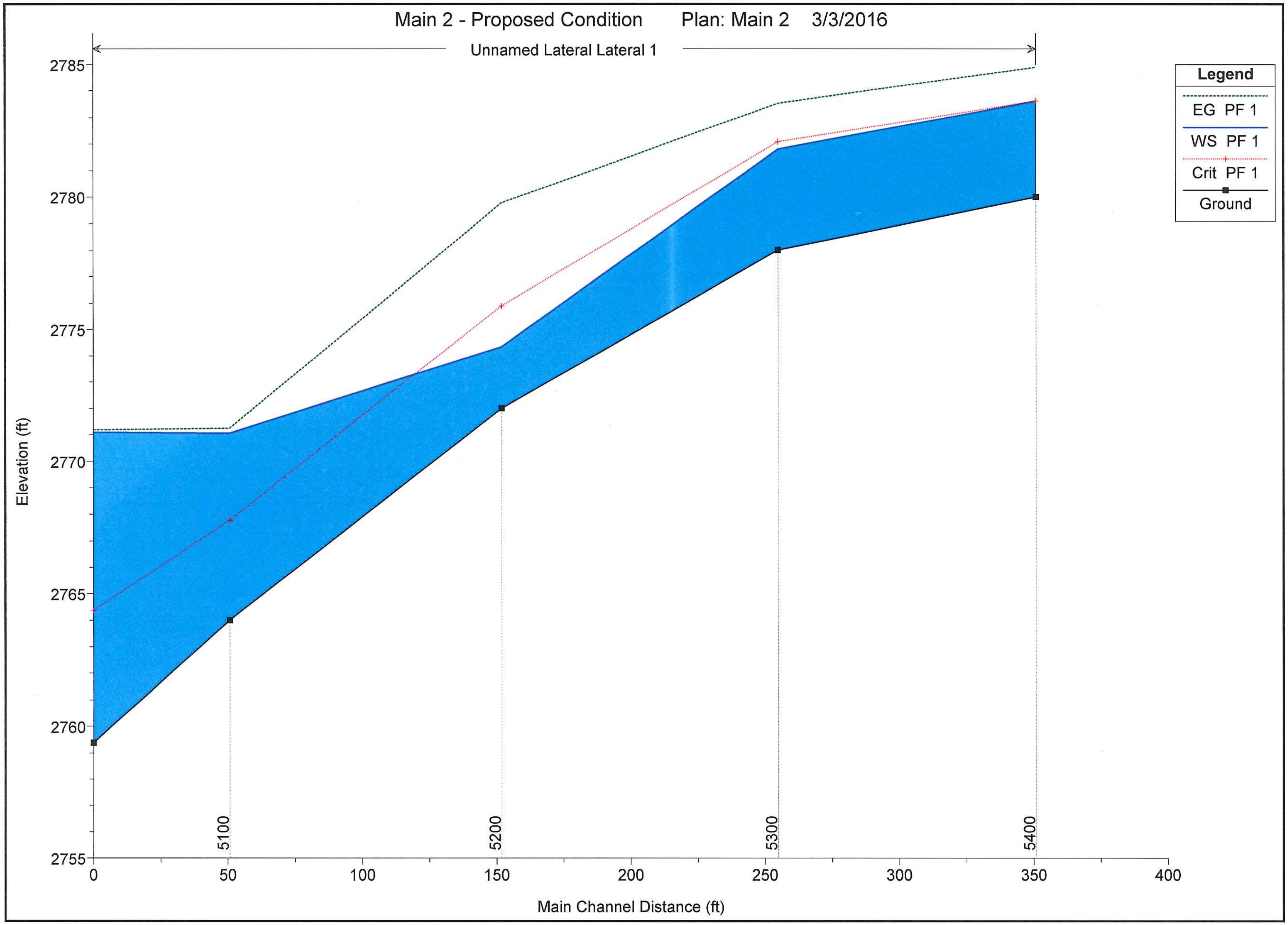
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

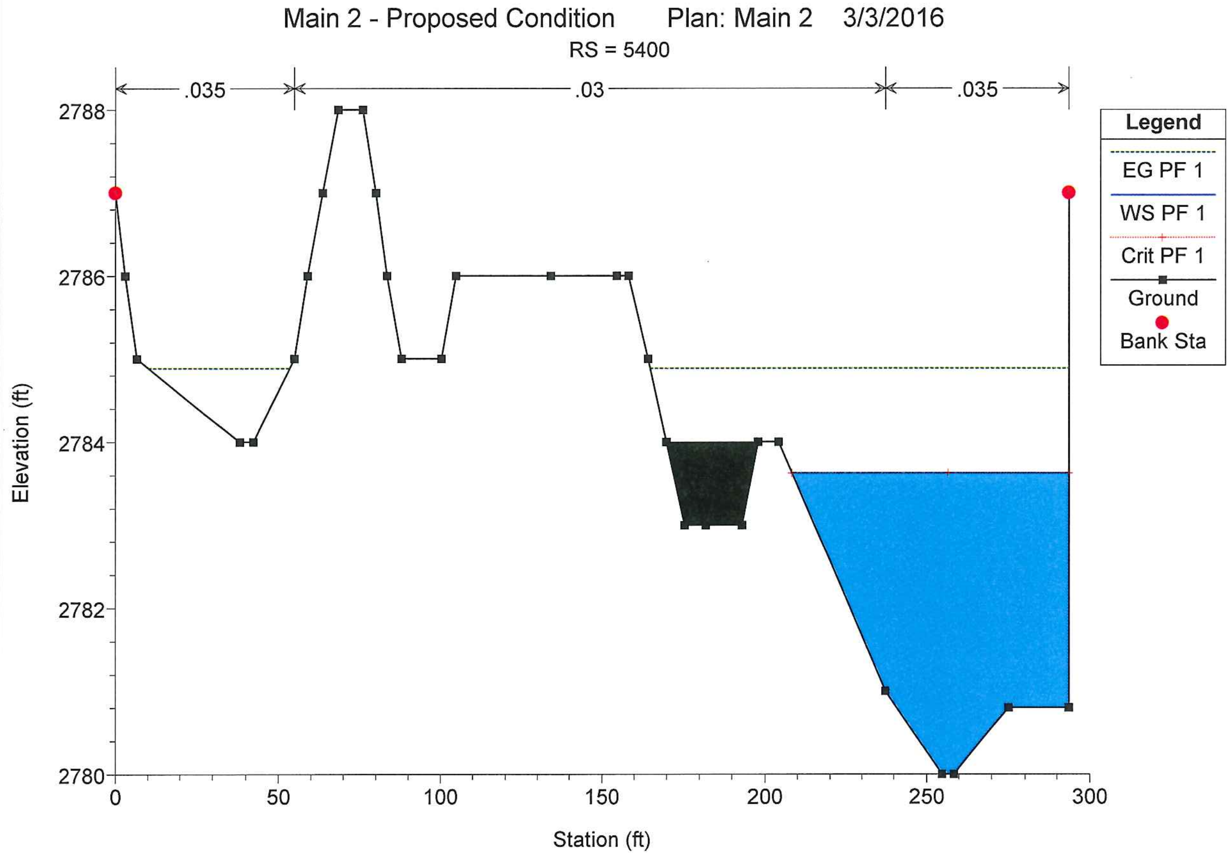
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

HEC-RAS Plan: Current mode River: Unnamed Lateral Reach: Lateral 1 Profile: PF 1

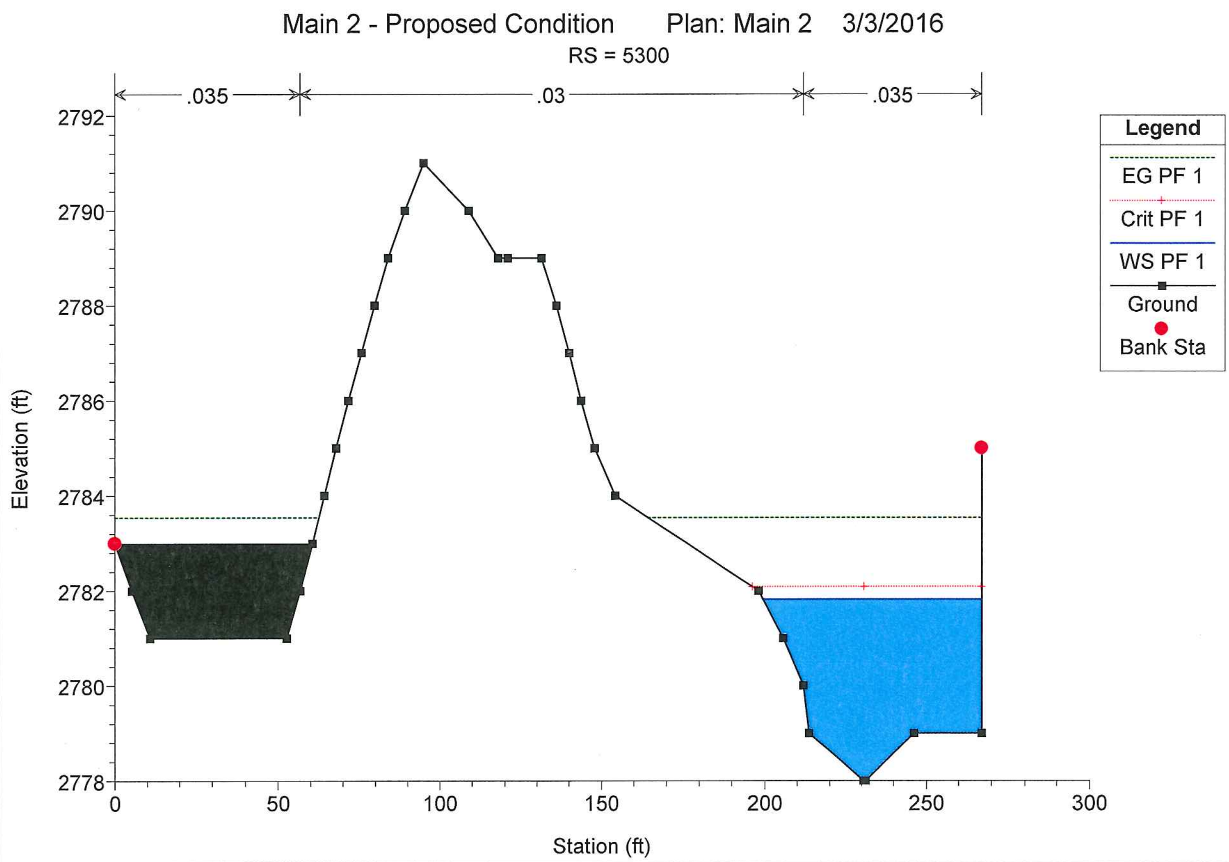
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Lateral 1	5400	PF 1	1910.00	2780.00	2783.62	2783.62	2784.89	0.012079	9.02	211.82	85.32	1.01
Lateral 1	5300	PF 1	1910.00	2778.00	2781.81	2782.08	2783.53	0.015570	10.53	181.35	67.56	1.13
Lateral 1	5200	PF 1	1910.00	2772.00	2774.34	2775.89	2779.78	0.110770	18.71	102.10	54.29	2.40
Lateral 1	5100	PF 1	1910.00	2764.00	2771.06	2767.76	2771.25	0.001256	3.44	554.72	129.63	0.29
Lateral 1	5000	PF 1	1910.00	2759.39	2771.09	2764.36	2771.19	0.000416	2.48	771.61	127.62	0.18



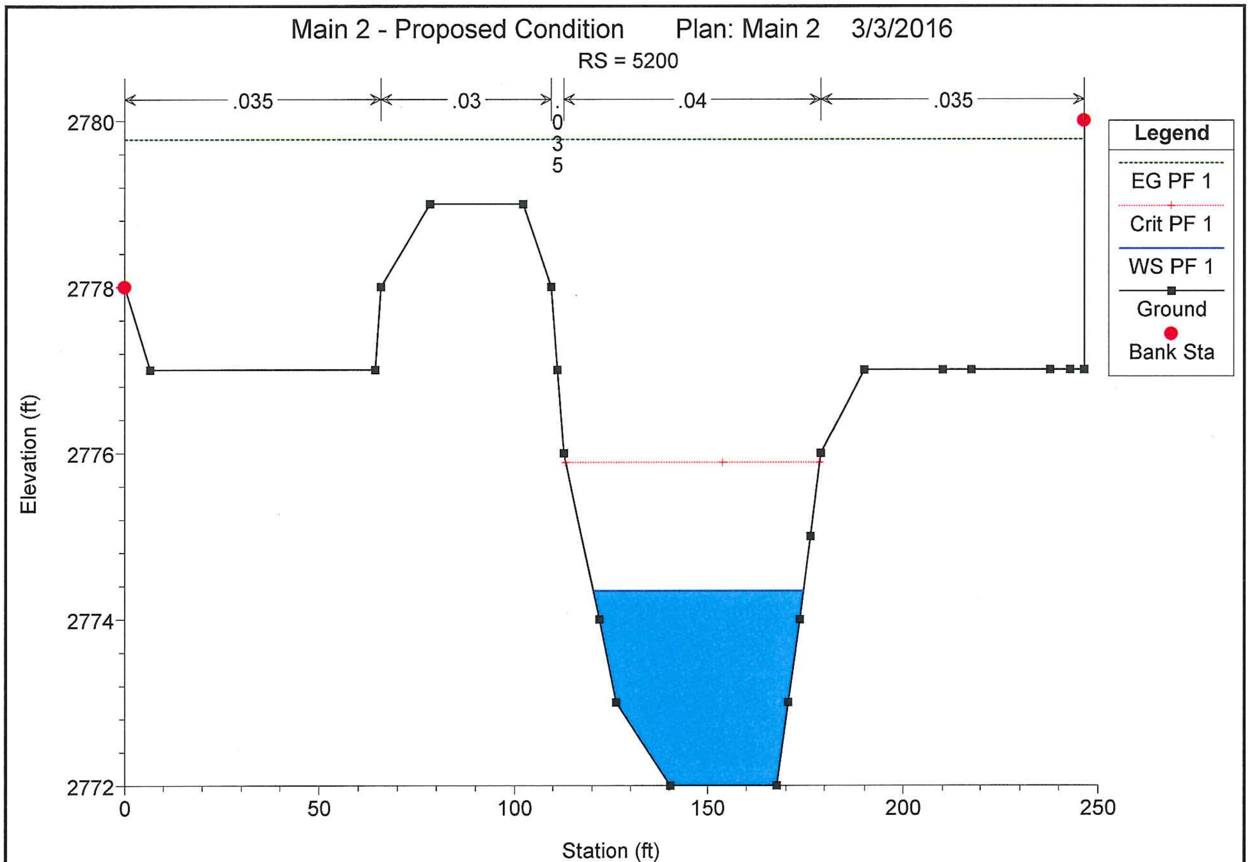
Main 2 - Proposed Condition Plan: Main 2 3/3/2016
Unnamed Lateral Lateral 1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2785
2780
2775
2770
2765
2760
2755
5100
5200
5300
5400
0
50
100
150
200
250
300
350
400
Main Channel Distance (ft)



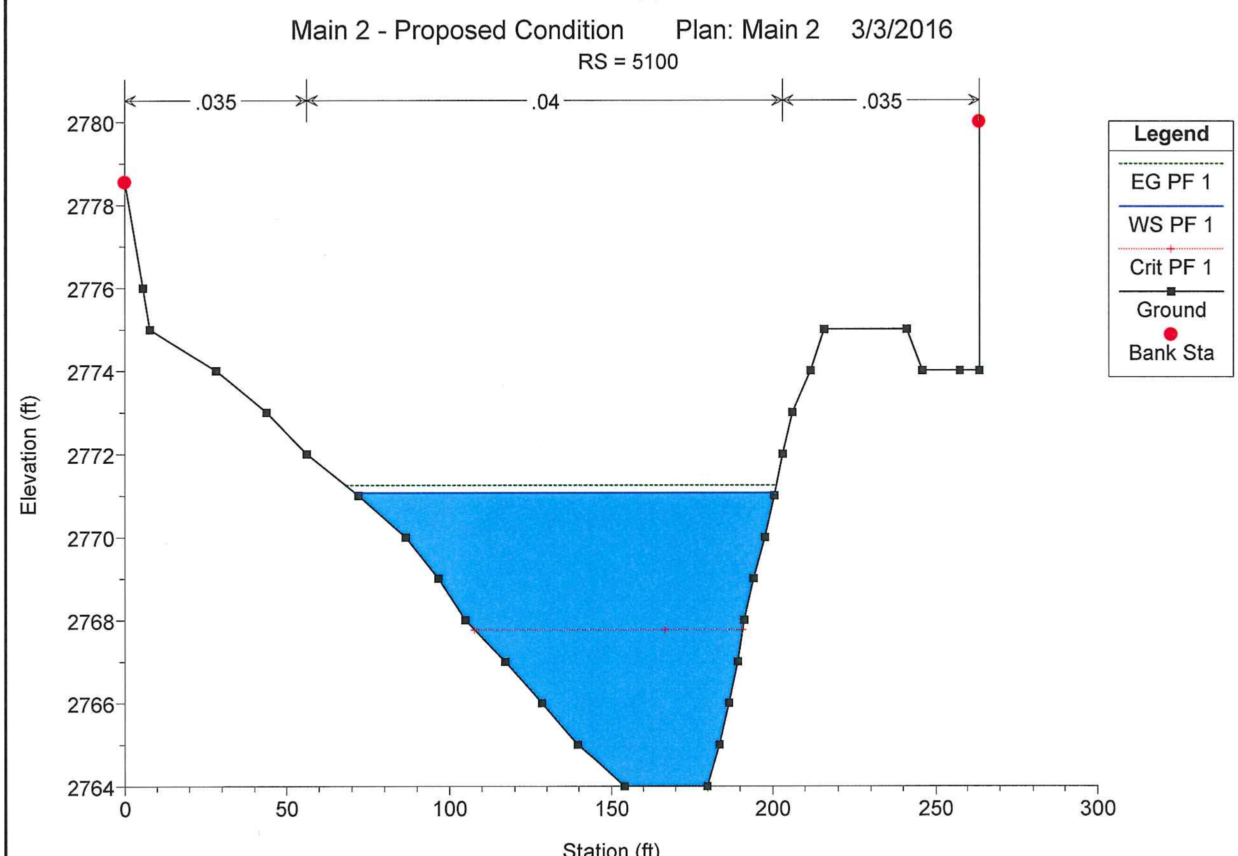
Main 2 - Proposed Condition Plan: Main 2 3/3/2016
RS = 5400
.035
.03
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta



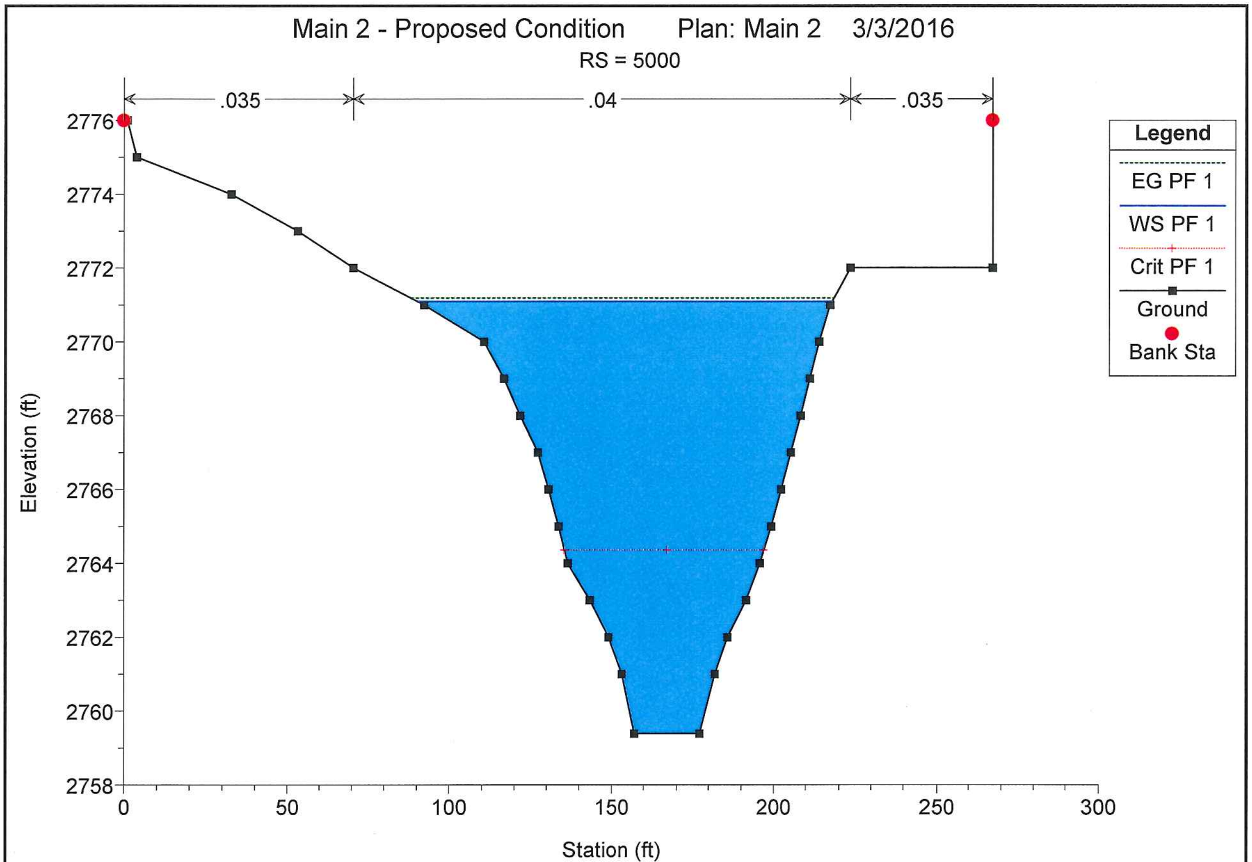
Main 2 - Proposed Condition Plan: Main 2 3/3/2016
RS = 5300
.035
.03
.035
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta



Main 2 - Proposed Condition Plan: Main 2 3/3/2016
RS = 5200
.035
.03
.035
.04
.035
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2772
2774
2776
2778
2780
0
50
100
150
200
250



Main 2 - Proposed Condition Plan: Main 2 3/3/2016
RS = 5100
.035
.04
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2764
2766
2768
2770
2772
2774
2776
2778
2780
0
50
100
150
200
250
300


Main 2 - Proposed Condition Plan: Main 2 3/3/2016
RS = 5000
.035
.04
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2776
2774
2772
2770
2768
2766
2764
2762
2760
2758
0
50
100
150
200
250
300
Station (ft)

PROPOSED NDOT TYPE 2 DROP INLET W/ 18" RCP

FACILITY #2

	WEIR		ORIFICE
Q100 =	1	Q100 =	1
L =	8.69	CLEAR AREA =	3.5
		C =	0.65
CLOGGING FACTOR	50%	CLOGGING FACTOR	50%
ASSUME H1 =	0.19	ASSUME H1 =	0.19
C (FOR H1) =	2.7		
$Q_F = CL(H)^{3/2}$	1.0	Q = CA(64.4 H)1/2	6.1

CONTROL = WEIR

Q INT = 1.0

Note: H1 is measured from the top of the grate. Orifice calculations accounts for the 3-inch thickness of the grate

PIPE CULVERT

57B-1A: 48-inch RCP

INPUT

Pipe Diameter	48	in
Number of Pipes	1	
Length	355.0	ft
Slope	6.13	%
Manning's 'n'	0.013	
Flow "Q"	54	cfs
Entrance Coef.	0.35	
Tail Water	0	ft

INLET

Thin Edge	3.41	ft
Sq. Edge	3.16	ft
Beveled	3.03	ft
Tapered	3.27	ft.

OUTLET

Head Water	N/A	ft
Critical	2.21	ft
Velocity	4.30	ft/s

G. C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS

PIPE CULVERT

DON1: 48-INCH RCP

INPUT

Pipe Diameter	48	in
Number of Pipes	1	
Length	30.0	ft
Slope	3.57	%
Manning's 'n'	0.013	
Flow "Q"	34	cfs
Entrance Coef.	0.35	
Tail Water	0	ft

INLET

Thin Edge	2.53	ft
Sq. Edge	2.39	ft
Beveled	2.34	ft
Tapered	2.53	ft.

OUTLET

Head Water	N/A	ft
Critical	1.73	ft
Velocity	2.71	ft/s

G. C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS

PIPE CULVERT

DON2: 48-inch RCP

INPUT

Pipe Diameter	48	in
Number of Pipes	1	
Length	30.0	ft
Slope	3.57	%
Manning's 'n'	0.013	
Flow "Q"	60	cfs
Entrance Coef.	0.35	
Tail Water	0	ft

INLET

Thin Edge	3.73	ft
Sq. Edge	3.45	ft
Beveled	3.29	ft
Tapered	3.46	ft.

OUTLET

Head Water	N/A	ft
Critical	2.33	ft
Velocity	4.77	ft/s

G. C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS

PIPE CULVERT

1/4 DON3: 24-INCH RCP

INPUT

Pipe Diameter	24	in
Number of Pipes	1	
Length	127.0	ft
Slope	0.30	%
Manning's 'n'	0.013	
Flow "Q"	16	cfs
Entrance Coef.	0.35	
Tail Water	0	ft

INLET

Thin Edge	2.58	ft
Sq. Edge	2.37	ft
Beveled	2.20	ft
Tapered	2.20	ft.

OUTLET

Head Water	2.52	ft
Critical	1.44	ft
Velocity	5.09	ft/s

G. C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS

PIPE CULVERT

DON3: 48-INCH RCP

INPUT

Pipe Diameter	48	in
Number of Pipes	1	
Length	30.0	ft
Slope	2.00	%
Manning's 'n'	0.013	
Flow "Q"	33	cfs
Entrance Coef.	0.35	
Tail Water	0	ft

INLET

Thin Edge	2.52	ft
Sq. Edge	2.38	ft
Beveled	2.33	ft
Tapered	2.48	ft.

OUTLET

Head Water	N/A	ft
Critical	1.71	ft
Velocity	2.63	ft/s

G. C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS

PIPE CULVERT

DON3: 48-INCH RCP

INPUT

Pipe Diameter	48	in
Number of Pipes	1	
Length	30.0	ft
Slope	2.00	%
Manning's 'n'	0.013	
Flow "Q"	38	cfs
Entrance Coef.	0.35	
Tail Water	0	ft

INLET

Thin Edge	2.76	ft
Sq. Edge	2.59	ft
Beveled	2.52	ft
Tapered	2.69	ft.

OUTLET

Head Water	N/A	ft
Critical	1.84	ft
Velocity	3.02	ft/s

G. C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS

PIPE CULVERT

DON4

INPUT

Pipe Diameter	36	in
Number of Pipes	1	
Length	30.0	ft
Slope	2.00	%
Manning's 'n'	0.013	
Flow "Q"	22	cfs
Entrance Coef.	0.35	
Tail Water	0	ft

INLET

Thin Edge	2.32	ft
Sq. Edge	2.17	ft
Beveled	2.09	ft
Tapered	2.22	ft.

OUTLET

Head Water	N/A	ft
Critical	1.51	ft
Velocity	3.11	ft/s

G. C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS

PIPE CULVERT

CON3R: 72-inch RCP

INPUT

Pipe Diameter	72	in
Number of Pipes	1	
Length	115.7	ft
Slope	1.00	%
Manning's 'n'	0.013	
Flow "Q"	191	cfs
Entrance Coef.	0.35	
Tail Water	0	ft

INLET

Thin Edge	6.29	ft
Sq. Edge	5.81	ft
Beveled	5.50	ft
Tapered	5.63	ft.

OUTLET

Head Water	4.92	ft
Critical	3.77	ft
Velocity	6.76	ft/s

G. C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS

BOX CULVERT

CCON10_20x9RCB

INPUT

Width of Box	20.00	ft
Height of Box	9.00	ft
Number of Barrels	1	
Length	50.00	ft
Slope	0.99	%
Manning's 'n'	0.015	
Flow "Q"	2128	cfs
Entrance Coef.	0.35	
Tail Water	0	ft

Non Standard Box Span

INLET

45d WWall	12.08	ft
Sq. Edge	12.72	ft
Beveled	11.71	ft
Tapered	58.70	ft

OUTLET

Head Water	10.62	ft
Critical	7.06	ft
Velocity	11.82	ft/s

G. C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS

PIPE CULVERT

CON15R: 72-inch RCP

INPUT

Pipe Diameter	72	in
Number of Pipes	1	
Length	92.9	ft
Slope	1.14	%
Manning's 'n'	0.013	
Flow "Q"	344	cfs
Entrance Coef.	0.35	
Tail Water	0	ft

INLET

Thin Edge	11.39	ft
Sq. Edge	9.88	ft
Beveled	8.85	ft
Tapered	8.27	ft.

OUTLET

Head Water	8.17	ft
Critical	5.03	ft
Velocity	12.17	ft/s

G. C. WALLACE COMPANIES
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BOX CULVERT

CON18R_20x9RCB

INPUT

Width of Box	20.00	ft
Height of Box	9.00	ft
Number of Barrels	1	
Length	18.23	ft
Slope	9.59	%
Manning's 'n'	0.015	
Flow "Q"	1910	cfs
Entrance Coef.	0.35	
Tail Water	0	ft

Non Standard Box Span

INLET

45d WWall	10.26	ft
Sq. Edge	10.85	ft
Beveled	9.92	ft
Tapered	42.32	ft

OUTLET

Head Water	8.44	ft
Critical	6.57	ft
Velocity	10.61	ft/s

G. C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS

PIPE CULVERT

ON16R: 48-inch RCP

INPUT

Pipe Diameter	48	in
Number of Pipes	1	
Length	96.1	ft
Slope	0.50	%
Manning's 'n'	0.013	
Flow "Q"	23	cfs
Entrance Coef.	0.35	
Tail Water	0	ft

INLET

Thin Edge	2.04	ft
Sq. Edge	1.96	ft
Beveled	1.93	ft
Tapered	2.03	ft.

OUTLET

Head Water	N/A	ft
Critical	1.41	ft
Velocity	1.83	ft/s

G. C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS

BOX CULVERT

CON22: Existing (2)12x12RCB

INPUT

Width of Box	12.00	ft
Height of Box	12.00	ft
Number of Barrels	2	
Length	100.00	ft
Slope	1.00	%
Manning's 'n'	0.013	
Flow "Q"	4209	cfs
Entrance Coef.	0.35	
Tail Water	0	ft

INLET

45d WWall	17.07	ft
Sq. Edge	18.08	ft ←
Beveled	16.49	ft
Tapered	15.40	ft

OUTLET

Head Water	14.78	ft
Critical	12.00	ft
Velocity	14.61	ft/s

G. C. WALLACE COMPANIES
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INV = 2666.75
18.08
2684.83 WSE

8320 old courthouse road • vienna, virginia 22180
© april 1979 (revised)

design data 7

depth to top of pipe, not invert

american concrete pipe association

CONCRETE PIPE SELECTION: Trench Installations

Trench conduits are usually installed in relatively narrow trenches excavated in undisturbed soil and backfilled to the original ground surface.

When a rigid conduit is installed in a narrow trench and backfilled, the backfill material will tend to settle. This downward movement generates frictional forces along the trench walls, which act upward to help support the weight of the backfill material. The magnitude of the frictional forces depends on the unit weight of the backfill material w, the value of Rankine's lateral pressure ratio K, and the coefficient of sliding friction μ' between the backfill material and the trench walls.

The backfill load on a conduit installed in a trench condition is equal to the weight of the mass of fill material within the trench less the summation of the frictional load transfers, and is expressed by the equation:

$$W_d = C_d \, w \, B_d^2$$

where

W_d=backfill load, pounds per linear foot
C_d=load coefficient for trench condition
w=unit weight of backfill material, pounds per cubic foot
B_d=width of trench at the top of the conduit, feet

Figures 2 through 5, based on the above equation, enable a direct determination of backfill load for a given trench width and depth of cover. As the trench width increases for a given depth of cover and pipe diameter, a point is reached at which an embankment condition develops. The curves showing pipe size indicate the limiting trench width for each pipe diameter beyond which greater trench widths will not affect the load. When this condition occurs, the load on the conduit remains constant. This load should be determined by the intersection of the vertical line representing the depth of cover and the dashed line representing the particular pipe diameter under consideration. For intermediate pipe sizes not shown in *Figures 2 through 5*, interpolation should be used.

The field supporting strength of a concrete pipe line is dependent on the inherent strength of the pipe, the type of foundation on which the pipe is installed and the compaction of the sidefill material adjacent to the pipe. A common method used to determine the inherent strength of a pipe is the three-edge bearing test, in which the pipe is subjected to concentrated loads at the crown and invert. The load that a pipe will support under this condition of loading is called the *three-edge bearing strength* and is expressed in pounds per linear foot.

ASTM Specification C14 covers three strength classes for non-reinforced concrete pipe — Class 1, 2 and 3. These three classes are specified to meet ultimate loads, expressed in terms of minimum strength in three-edge-bearing as listed in *Table I*.

TABLE I: Strength Requirements Non-reinforced Concrete Pipe ASTM C14

Pipe Diameter, Inches	Minimum Three-Edge Bearing Strengths, Pounds per Linear Foot		
	Class 1	Class 2	Class 3
4	1500	2000	2400
6	1500	2000	2400
8	1500	2000	2400
10	1600	2000	2400
12	1800	2250	2600
15	2000	2600	2900
18	2200	3000	3300
21	2400	3300	3850
24	2600	3600	4400
27	2800	3950	4600
30	3000	4300	4750
33	3150	4400	4875
36	3300	4500	5000

Another means of expressing pipe strength is in terms of D-load. The D-load of a pipe is the supporting strength of a pipe loaded under three-edge-bearing test conditions expressed in pounds per linear foot per foot of inside diameter. Thus the bearing strength may be converted to D-load by dividing by the inside diameter in feet.

ASTM Specification C76 specifies five strength classes reinforced concrete pipe. These strength classes are expressed in terms of D-load at 0.01-inch crack and for ultimate load. The D-load to produce the 0.01-inch crack $D_{0.01}$ is the maximum load applied to the concrete pipe before a crack occurs having a width of 0.01-inch measured at close intervals, throughout a length of at least 1-foot. The D-load to produce ultimate load D_u is the maximum three-edge-bearing test load carried by a pipe, expressed as D-load. *Table II* lists 0.01-inch crack and ultimate D-loads for the strength classes covered by ASTM Specification C76.

TABLE II: Strength Requirements Reinforced Concrete Pipe ASTM C76

Strength Class	Minimum D-Load in Three-Edge Bearing Pounds per Linear Foot per Foot of Internal Diameter	
	0.01 Inch Crack-$D_{0.01}$	Ultimate-D_u
I	800	1200
II	1000	1500
III	1350	2000
IV	2000	3000
V	3000	3750

Class III 0-1350
Class IV 1350-2000
Class V 2000-3000

PROGRAM SAMM

D-LOAD REQUIREMENTS FOR A 24 IN. DIAMETER CIRCULAR PIPE

****

?IPE DATA

DIAMETER (in.)	24.00
WALL B, THICKNESS (in.)	3.000

(NSTALLATION CONDITIONS

MINIMUM DEPTH OF FILL (ft.)	1.00
MAXIMUM DEPTH OF FILL (ft.)	20.00
SOIL DENSITY (lb/cu. ft.)	140.0
SPECIFIED BEDDING FACTOR	1.90
INSTALLATION TYPE	TRENCH
TRENCH WIDTH (ft.)	6.50
SOIL LATERAL PRESSURE/FRICTION TERM (KMU')	0.0165
PARAMETERS TO COMPUTE TRANSITION WIDTH	
POSITIVE PROJECTION RATIO	1.00
POSITIVE SETTLEMENT RATIO	0.50
SOIL LATERAL PRESSURE/FRICTION TERM (KMU)	0.1924
SOIL LATERAL PRESSURE COEFICIENT	0.33

^DDITIONAL LOADS

LIVE LOAD	AASHTO HS-20
NO SURCHARGE LOAD	

?ACTORS OF SAFETY

FACTOR OF SAFETY ON 0.01 INCH CRACK D-LOAD (EARTH,LIVE) 1.00; 1.00

FACTOR OF SAFETY ON ULTIMATE LOAD (EARTH,LIVE) IN ACCORDANCE WITH ASTM C 76

DL.01 LESS THAN 2000 LBS/FT/FT	1.5
DL.01 GREATER THAN 3000 LBS/FT/FT	1.25
DL.01 BETWEEN 2000 AND 3000 LBS/FT/FT	INTERPOLATED

ESULTS OF ANALYSIS

```
SSSSSSSSS  AAAAAAAAA  MMM    MMM  MMM    MMM
SS         AA     AA  MM M M MM   MM M M MM
SSSSSSSSS  AAAAAAAAA  MM  M  MM   MM  M  MM
       SS  AA     AA  MM     MM   MM     MM
SSSSSSSSS  AA     AA  MM     MM   MM     MM
```

P R O G R A M   S A M M

AMERICAN CONCRETE PIPE ASSOCIATION
VERSION 2.0 - 1 SEPTEMBER 1990

Program SAMM computes earth loads on concrete pipe in accordance with the methods presented in the Concrete Pipe Design Manual (March 1990) and the Concrete Pipe Handbook (January 1988), published by the American Concrete Pipe Association. The user must select input values suitable to his specific installation. The information presented in the computer output is for review, interpetation, application and approval by a qualified engineer who must assume full responsibility for verifying that said output is appropriate and correct. There are no express or implied warranties. The use of this product does not constitute endorsement by ACPA or any other agents.

PIPE DEPTH (ft.)	------EARTH LOAD----- ARCHING FACTOR	>TRANS	LOAD (lb/ft)	LIVE LOAD (lb/ft)	SURCH LOAD (lb/ft)	TOTAL LOAD (lb/ft)	BED FACT	REQUIRED D-LOAD (lb/ft/ft) 0.01 in.	ULT.
1.0	1.08	Y	378.	3008.	0.	3386.	1.90	891.	1337.
1.5	1.12	Y	591.	2400.	0.	2991.	1.90	787.	1181.
2.0	1.17	Y	820.	1781.	0.	2600.	1.90	684.	1026.
2.5	1.22	Y	1067.	1269.	0.	2336.	1.90	615.	922.
3.0	1.27	Y	1334.	927.	0.	2261.	1.90	595.	893.
3.5	1.33	Y	1623.	763.	0.	2386.	1.90	628.	942.
4.0	1.38	Y	1935.	641.	0.	2575.	1.90	678.	1017.
4.5	1.44	Y	2272.	546.	0.	2818.	1.90	742.	1112.
5.0	1.46	Y	2562.	472.	0.	3034.	1.90	798.	1197.
5.5	1.47	Y	2827.	412.	0.	3239.	1.90	852.	1278.
6.0	1.47	Y	3091.	363.	0.	3454.	1.90	909.	1363.
6.5	1.47	Y	3356.	322.	0.	3678.	1.90	968.	1452.
7.0	1.48	Y	3625.	288.	0.	3913.	1.90	1030.	1545.
7.5	1.48	Y	3889.	260.	0.	4149.	1.90	1092.	1638.
8.0	1.48	Y	4153.	235.	0.	4388.	1.90	1155.	1732.
8.5	1.48	Y	4417.	214.	0.	4631.	1.90	1219.	1828.
9.0	1.49	Y	4682.	195.	0.	4877.	1.90	1283.	1925.
9.5	1.49	Y	4946.	179.	0.	5125.	1.90	1349.	2023.
10.0	1.49	Y	5210.	165.	0.	5375.	1.90	1414.	2122.
10.5	1.49	Y	5474.	152.	0.	5627.	1.90	1481.	2221.
11.0	1.49	Y	5738.	141.	0.	5880.	1.90	1547.	2321.
1.5	1.49	Y	6003.	131.	0.	6134.	1.90	1614.	2421.
12.0	1.49	Y	6267.	122.	0.	6389.	1.90	1681.	2522.
12.5	1.49	Y	6531.	114.	0.	6645.	1.90	1749.	2623.
13.0	1.49	Y	6795.	107.	0.	6902.	1.90	1816.	2725.
13.5	1.49	Y	7060.	100.	0.	7160.	1.90	1884.	2826.

IV

14.0	1.49	Y	7324.	94.	0.	7418.	1.90	1952.	2928.
14.5	1.50	Y	7588.	89.	0.	7677.	1.90	2020.	3020.
15.0	1.50	Y	7853.	84.	0.	7937.	1.90	2089.	3087.
15.5	1.50	Y	8117.	79.	0.	8196.	1.90	2157.	3151.
6.0	1.49	Y	8369.	75.	0.	8444.	1.90	2222.	3210.
16.5	1.49	Y	8633.	71.	0.	8704.	1.90	2291.	3269.
17.0	1.50	Y	8897.	68.	0.	8964.	1.90	2359.	3327.
17.5	1.50	Y	9160.	64.	0.	9225.	1.90	2428.	3382.
18.0	1.50	Y	9424.	61.	0.	9485.	1.90	2496.	3435.
18.5	1.50	Y	9688.	58.	0.	9746.	1.90	2565.	3485.
19.0	1.50	Y	9952.	56.	0.	10008.	1.90	2634.	3533.
19.5	1.50	Y	10216.	53.	0.	10269.	1.90	2702.	3579.
20.0	1.50	Y	10480.	51.	0.	10530.	1.90	2771.	3622.

DATE: / /

DESIGNER:

PROGRAM SAMM-

PROGRAM SAMM

D-LOAD REQUIREMENTS FOR A 36 IN. DIAMETER CIRCULAR PIPE

****

P I P E   D A T A

DIAMETER (in.)	36.00
WALL B, THICKNESS (in.)	4.000

I N S T A L L A T I O N   C O N D I T I O N S

MINIMUM DEPTH OF FILL (ft.)	1.00
MAXIMUM DEPTH OF FILL (ft.)	20.00
SOIL DENSITY (lb/cu. ft.)	140.0
SPECIFIED BEDDING FACTOR	1.90
INSTALLATION TYPE	TRENCH
TRENCH WIDTH (ft.)	7.67
SOIL LATERAL PRESSURE/FRICTION TERM (KMU')	0.1650
PARAMETERS TO COMPUTE TRANSITION WIDTH	
POSITIVE PROJECTION RATIO	1.00
POSITIVE SETTLEMENT RATIO	0.50
SOIL LATERAL PRESSURE/FRICTION TERM (KMU)	0.1650
SOIL LATERAL PRESSURE COEFICIENT	0.33

A D D I T I O N A L   L O A D S

LIVE LOAD	AASHTO HS-20
NO SURCHARGE LOAD	

F A C T O R S   O F   S A F E T Y

FACTOR OF SAFETY ON 0.01 INCH CRACK D-LOAD (EARTH,LIVE)	1.00; 1.00
FACTOR OF SAFETY ON ULTIMATE LOAD (EARTH,LIVE) IN ACCORDANCE WITH ASTM C 76	
DL.01 LESS THAN 2000 LBS/FT/FT	1.5
DL.01 GREATER THAN 3000 LBS/FT/FT	1.25
DL.01 BETWEEN 2000 AND 3000 LBS/FT/FT	INTERPOLATED

RESULTS OF ANALYSIS

```
SSSSSSSSS   AAAAAAAAA   MMM    MMM   MMM    MMM
SS          AA      AA  MM M M MM    MM M M MM
SSSSSSSSS   AAAAAAAAA   MM  M  MM    MM  M  MM
       SS   AA      AA  MM     MM    MM     MM
SSSSSSSSS   AA      AA  MM     MM    MM     MM
```

PROGRAM SAMM

AMERICAN CONCRETE PIPE ASSOCIATION
VERSION 2.0 - 1 SEPTEMBER 1990

Program SAMM computes earth loads on concrete pipe in accordance with the methods presented in the Concrete Pipe Design Manual (March 1990) and the Concrete Pipe Handbook (January 1988), published by the American Concrete Pipe Association. The user must select input values suitable to his specific installation. The information presented in the computer output is for review, interpetation, application and approval by a qualified engineer who must assume full responsibility for verifying that said output is appropriate and correct. There are no express or implied warranties. The use of this product does not constitute endorsement by ACPA or any other agents.

	PIPE DEPTH (ft.)	------EARTH LOAD------ ARCHING FACTOR	>TRANS	LOAD (lb/ft)	LIVE LOAD (lb/ft)	SURCH LOAD (lb/ft)	TOTAL LOAD (lb/ft)	BED FACT	REQUIRED D-LOAD 0.01 in. (lb/ft/ft)	ULT.
	1.0	1.05	Y	537.	2814.	0.	3351.	1.90	588.	882.
	2.0	1.10	Y	1125.	2326.	0.	3450.	1.90	605.	908.
	3.0	1.15	Y	1768.	1227.	0.	2995.	1.90	525.	788.
	4.0	1.20	Y	2472.	857.	0.	3329.	1.90	584.	876.
III	5.0	1.26	Y	3241.	637.	0.	3878.	1.90	680.	1021.
	6.0	1.33	Y	4084.	494.	0.	4577.	1.90	803.	1205.
	7.0	1.39	Y	5006.	395.	0.	5400.	1.90	947.	1421.
	8.0	1.43	Y	5871.	323.	0.	6194.	1.90	1087.	1630.
	9.0	1.43	Y	6630.	270.	0.	6899.	1.90	1210.	1816.
	10.0	1.44	Y	7387.	229.	0.	7616.	1.90	1336.	2004.
	11.0	1.44	Y	8154.	197.	0.	8351.	1.90	1465.	2198.
	12.0	1.45	Y	8911.	171.	0.	9082.	1.90	1593.	2390.
	13.0	1.45	Y	9668.	150.	0.	9817.	1.90	1722.	2584.
IV	14.0	1.45	Y	10424.	132.	0.	10557.	1.90	1852.	2778.
	15.0	1.45	Y	11181.	118.	0.	11298.	1.90	1982.	2973.
	16.0	1.45	Y	11937.	106.	0.	12043.	1.90	2113.	3110.
	17.0	1.45	Y	12693.	95.	0.	12789.	1.90	2244.	3229.
	18.0	1.46	N	13446.	86.	0.	13533.	1.90	2374.	3339.
V	19.0	1.43	N	13930.	79.	0.	14009.	1.90	2458.	3405.
	20.0	1.40	N	14394.	72.	0.	14466.	1.90	2538.	3466.

DATE: / /

DESIGNER:

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SSSSSSSSS   AAAAAAAAA   MMM     MMM    MMM     MMM
SS          AA      AA  MM M M MM      MM M M MM
SSSSSSSSS   AAAAAAAAA   MM   M   MM    MM   M   MM
       SS   AA      AA  MM       MM    MM       MM
SSSSSSSSS   AA      AA  MM       MM    MM       MM
```

P R O G R A M   S A M M

AMERICAN CONCRETE PIPE ASSOCIATION
VERSION 2.0 - 1 SEPTEMBER 1990

Program SAMM computes earth loads on concrete pipe in accordance with the methods presented in the Concrete Pipe Design Manual (March 1990) and the Concrete Pipe Handbook (January 1988), published by the American Concrete Pipe Association. The user must select input values suitable to his specific installation. The information presented in the computer output is for review, interpetation, application and approval by a qualified engineer who must assume full responsibility for verifying that said output is appropriate and correct. There are no express or implied warranties. The use of this product does not constitute endorsement by ACPA or any other agents.

DATE:

DESIGNER:

PROGRAM SAMM
D-LOAD REQUIREMENTS FOR A 48 IN. DIAMETER CIRCULAR PIPE
****

P I P E   D A T A

DIAMETER (in.)	48.00
WALL B, THICKNESS (in.)	5.000

I N S T A L L A T I O N   C O N D I T I O N S

MINIMUM DEPTH OF FILL (ft.)	0.50
MAXIMUM DEPTH OF FILL (ft.)	20.00
SOIL DENSITY (lb/cu. ft.)	140.0
SPECIFIED BEDDING FACTOR	1.90
INSTALLATION TYPE	TRENCH
TRENCH WIDTH (ft.)	8.83
SOIL LATERAL PRESSURE/FRICTION TERM (KMU')	0.1650
PARAMETERS TO COMPUTE TRANSITION WIDTH	
POSITIVE PROJECTION RATIO	1.00
POSITIVE SETTLEMENT RATIO	0.50
SOIL LATERAL PRESSURE/FRICTION TERM (KMU)	0.1924
SOIL LATERAL PRESSURE COEFICIENT	0.33

A D D I T I O N A L   L O A D S

LIVE LOAD	AASHTO HS-20
NO SURCHARGE LOAD	

F A C T O R S   O F   S A F E T Y

FACTOR OF SAFETY ON 0.01 INCH CRACK D-LOAD (EARTH,LIVE) 1.00; 1.00
FACTOR OF SAFETY ON ULTIMATE LOAD (EARTH,LIVE) IN ACCORDANCE WITH ASTM C 76

DL.01 LESS THAN 2000 LBS/FT/FT	1.5
DL.01 GREATER THAN 3000 LBS/FT/FT	1.25
DL.01 BETWEEN 2000 AND 3000 LBS/FT/FT	INTERPOLATED

ESULTS OF ANALYSIS

```
SSSSSSSSS   AAAAAAAAA   MMM    MMM   MMM    MMM
SS          AA     AA   MM M M MM    MM M M MM
SSSSSSSSS   AAAAAAAAA   MM  M  MM    MM  M  MM
       SS   AA     AA   MM     MM    MM     MM
SSSSSSSSS   AA     AA   MM     MM    MM     MM
```

P R O G R A M   S A M M

AMERICAN CONCRETE PIPE ASSOCIATION
VERSION 2.0 - 1 SEPTEMBER 1990

Program SAMM computes earth loads on concrete pipe in accordance with the methods presented in the Concrete Pipe Design Manual (March 1990) and the Concrete Pipe Handbook (January 1988), published by the American Concrete Pipe Association. The user must select input values suitable to his specific installation. The information presented in the computer output is for review, interpetation, application and approval by a qualified engineer who must assume full responsibility for verifying that said output is appropriate and correct. There are no express or implied warranties. The use of this product does not constitute endorsement by ACPA or any other agents.

	PIPE DEPTH (ft.)	EARTH LOAD ARCHING FACTOR	EARTH LOAD >TRANS	EARTH LOAD LOAD (lb/ft)	LIVE LOAD (lb/ft)	SURCH LOAD (lb/ft)	TOTAL LOAD (lb/ft)	BED FACT	REQUIRED D-LOAD 0.01 in. (lb/ft/ft)	REQUIRED D-LOAD ULT. (lb/ft/ft)
	0.5	1.02	Y	345.	2584.	0.	2929.	1.90	385.	578.
	1.0	1.04	Y	704.	2331.	0.	3035.	1.90	399.	599.
	1.5	1.06	Y	1078.	2623.	0.	3701.	1.90	487.	731.
	2.0	1.08	Y	1467.	2475.	0.	3942.	1.90	519.	778.
	2.5	1.11	Y	1872.	1994.	0.	3866.	1.90	509.	763.
	3.0	1.13	Y	2293.	1474.	0.	3766.	1.90	496.	743.
	3.5	1.15	Y	2731.	1226.	0.	3957.	1.90	521.	781.
	4.0	1.18	Y	3187.	1039.	0.	4226.	1.90	556.	834.
	4.5	1.20	Y	3662.	893.	0.	4555.	1.90	599.	899.
	5.0	1.23	Y	4156.	778.	0.	4933.	1.90	649.	974.
	5.5	1.25	Y	4670.	684.	0.	5353.	1.90	704.	1057.
	6.0	1.28	Y	5204.	606.	0.	5811.	1.90	765.	1147.
	6.5	1.31	Y	5761.	542.	0.	6303.	1.90	829.	1244.
III	7.0	1.34	Y	6340.	487.	0.	6827.	1.90	898.	1348.
	7.5	1.37	Y	6943.	441.	0.	7384.	1.90	972.	1457.
	8.0	1.40	Y	7570.	401.	0.	7971.	1.90	1049.	1573.
	8.5	1.43	Y	8222.	366.	0.	8589.	1.90	1130.	1695.
	9.0	1.46	Y	8884.	336.	0.	9220.	1.90	1213.	1820.
	9.5	1.46	Y	9394.	309.	0.	9703.	1.90	1277.	1915.
	10.0	1.47	Y	9917.	286.	0.	10203.	1.90	1343.	2014.
	10.5	1.47	Y	10429.	265.	0.	10694.	1.90	1407.	2111.
	11.0	1.47	Y	10940.	246.	0.	11187.	1.90	1472.	2208.
	11.5	1.47	Y	11452.	230.	0.	11681.	1.90	1537.	2306.
IV	12.0	1.47	N	11954.	215.	0.	12169.	1.90	1601.	2402.
	12.5	1.46	N	12345.	201.	0.	12546.	1.90	1651.	2476.
	13.0	1.45	N	12729.	189.	0.	12918.	1.90	1700.	2550.

13.5	1.43	N	13106.	177.	0.	13283.	1.90	1748.	2622.
14.0	1.42	N	13475.	167.	0.	13643.	1.90	1795.	2693.
14.5	1.41	N	13838.	158.	0.	13996.	1.90	1842.	2762.
15.0	1.40	N	14195.	149.	0.	14344.	1.90	1887.	2831.
15.5	1.39	N	14544.	141.	0.	14685.	1.90	1932.	2898.
16.0	1.38	N	14887.	134.	0.	15021.	1.90	1976.	2965.
16.5	1.36	N	15224.	127.	0.	15351.	1.90	2020.	3020.
17.0	1.35	N	15555.	121.	0.	15676.	1.90	2063.	3062.
17.5	1.34	N	15879.	115.	0.	15994.	1.90	2105.	3102.
18.0	1.33	N	16197.	110.	0.	16307.	1.90	2146.	3140.
18.5	1.32	N	16510.	105.	0.	16615.	1.90	2186.	3177.
19.0	1.31	N	16817.	100.	0.	16917.	1.90	2226.	3213.
19.5	1.30	N	17118.	96.	0.	17213.	1.90	2265.	3247.
20.0	1.29	N	17413.	92.	0.	17505.	1.90	2303.	3280.

DATE: / /

DESIGNER:

PROGRAM SAMM
D-LOAD REQUIREMENTS FOR A 72 IN. DIAMETER CIRCULAR PIPE

****

P I P E   D A T A

DIAMETER (in.)	72.00
WALL B, THICKNESS (in.)	7.000

I N S T A L L A T I O N   C O N D I T I O N S

MINIMUM DEPTH OF FILL (ft.)	1.00
MAXIMUM DEPTH OF FILL (ft.)	25.00
SOIL DENSITY (lb/cu. ft.)	140.0
SPECIFIED BEDDING FACTOR	1.90
INSTALLATION TYPE	TRENCH
TRENCH WIDTH (ft.)	11.17
SOIL LATERAL PRESSURE/FRICTION TERM (KMU')	0.1650
PARAMETERS TO COMPUTE TRANSITION WIDTH	
POSITIVE PROJECTION RATIO	1.00
POSITIVE SETTLEMENT RATIO	0.50
SOIL LATERAL PRESSURE/FRICTION TERM (KMU)	0.1924
SOIL LATERAL PRESSURE COEFICIENT	0.33

A D D I T I O N A L   L O A D S

LIVE LOAD	AASHTO HS-20
NO SURCHARGE LOAD	

F A C T O R S   O F   S A F E T Y

FACTOR OF SAFETY ON 0.01 INCH CRACK D-LOAD (EARTH,LIVE) 1.00; 1.00
FACTOR OF SAFETY ON ULTIMATE LOAD (EARTH,LIVE) IN ACCORDANCE WITH ASTM C 76

DL.01 LESS THAN 2000 LBS/FT/FT	1.5
DL.01 GREATER THAN 3000 LBS/FT/FT	1.25
DL.01 BETWEEN 2000 AND 3000 LBS/FT/FT	INTERPOLATED

R E S U L T S   O F   A N A L Y S I S

	PIPE DEPTH (ft.)	------EARTH LOAD----- ARCHING FACTOR	>TRANS	LOAD (lb/ft)	LIVE LOAD (lb/ft)	SURCH LOAD (lb/ft)	TOTAL LOAD (lb/ft)	BED FACT	REQUIRED D-LOAD (lb/ft/ft) 0.01 in.	ULT.
	1.0	1.03	Y	1031.	1735.	0.	2766.	1.90	243.	364.
	1.5	1.04	Y	1567.	2580.	0.	4147.	1.90	364.	546.
	2.0	1.06	Y	2118.	2185.	0.	4303.	1.90	377.	566.
	2.5	1.07	Y	2684.	1810.	0.	4494.	1.90	394.	591.
	3.0	1.09	Y	3266.	1574.	0.	4840.	1.90	425.	637.
	3.5	1.10	Y	3863.	1509.	0.	5373.	1.90	471.	707.
	4.0	1.12	Y	4477.	1327.	0.	5804.	1.90	509.	764.
	4.5	1.13	Y	5107.	1148.	0.	6255.	1.90	549.	823.
	5.0	1.15	Y	5755.	1005.	0.	6759.	1.90	593.	889.
	5.5	1.16	Y	6420.	888.	0.	7308.	1.90	641.	962.
	6.0	1.18	Y	7103.	791.	0.	7894.	1.90	692.	1039.
	6.5	1.20	Y	7805.	710.	0.	8515.	1.90	747.	1120.
	7.0	1.21	Y	8525.	642.	0.	9167.	1.90	804.	1206.
III	7.5	1.23	Y	9266.	583.	0.	9849.	1.90	864.	1296.
	8.0	1.25	Y	10026.	532.	0.	10558.	1.90	926.	1389.
	8.5	1.27	Y	10808.	488.	0.	11295.	1.90	991.	1486.
	9.0	1.29	Y	11610.	449.	0.	12059.	1.90	1058.	1587.
	9.5	1.30	Y	12435.	414.	0.	12849.	1.90	1127.	1691.
	10.0	1.32	Y	13281.	384.	0.	13665.	1.90	1199.	1798.
	10.5	1.34	N	14117.	357.	0.	14474.	1.90	1270.	1905.
	11.0	1.33	N	14686.	333.	0.	15019.	1.90	1317.	1976.
	11.5	1.32	N	15247.	311.	0.	15558.	1.90	1365.	2047.
	12.0	1.31	N	15800.	291.	0.	16091.	1.90	1411.	2117.
	12.5	1.30	N	16344.	273.	0.	16618.	1.90	1458.	2187.
	13.0	1.29	N	16881.	257.	0.	17138.	1.90	1503.	2255.
	13.5	1.29	N	17409.	242.	0.	17652.	1.90	1548.	2323.
	14.0	1.28	N	17930.	229.	0.	18159.	1.90	1593.	2389.
	14.5	1.27	N	18444.	216.	0.	18660.	1.90	1637.	2455.
	15.0	1.26	N	18949.	205.	0.	19154.	1.90	1680.	2520.
IV	15.5	1.25	N	19448.	194.	0.	19642.	1.90	1723.	2584.
	16.0	1.24	N	19939.	185.	0.	20123.	1.90	1765.	2648.
	16.5	1.23	N	20422.	176.	0.	20598.	1.90	1807.	2710.
	17.0	1.23	N	20899.	167.	0.	21066.	1.90	1848.	2772.
	17.5	1.22	N	21369.	160.	0.	21528.	1.90	1888.	2833.
	18.0	1.21	N	21832.	152.	0.	21984.	1.90	1928.	2893.
	18.5	1.20	N	22288.	146.	0.	22433.	1.90	1968.	2952.
	19.0	1.19	N	22737.	139.	0.	22876.	1.90	2007.	3007.
	19.5	1.18	N	23180.	133.	0.	23313.	1.90	2045.	3044.
	20.0	1.18	N	23616.	128.	0.	23744.	1.90	2083.	3081.
V	20.5	1.17	N	24046.	123.	0.	24168.	1.90	2120.	3116.
	21.0	1.16	N	24469.	118.	0.	24587.	1.90	2157.	3151.
	21.5	1.15	N	24887.	113.	0.	25000.	1.90	2193.	3184.
	22.0	1.15	N	25298.	109.	0.	25407.	1.90	2229.	3216.
	22.5	1.14	N	25703.	105.	0.	25808.	1.90	2264.	3246.
	23.0	1.13	N	26102.	101.	0.	26203.	1.90	2299.	3276.
	23.5	1.12	N	26496.	97.	0.	26593.	1.90	2333.	3305.
	24.0	1.12	N	26883.	94.	0.	26977.	1.90	2366.	3333.

24.5	1.11	N	27265.	91.	0.	27356.	1.90	2400.	3360.
25.0	1.10	N	27642.	87.	0.	27729.	1.90	2432.	3386.

DATE: / /

DESIGNER:

APPENDIX C

Referenced Material and Supporting Documents (On CD)

SUPPLEMENT NO. 1 TO THE 2nd UPDATE TO THE TECHNICAL DRAINAGE STUDY FOR QUEENS BOROUGH CULVERT

619.295

MARCH 2006

Prepared for:

JMA Architecture Studios
10150 Covington Cross Drive
Las Vegas, Nevada 89144
Phone: (702) 731- 2033
Fax: (702) 731- 2039

Prepared by:

G. C. Wallace, Inc.
1555 S. Rainbow Blvd.
Las Vegas, Nevada 89146
Phone: (702) 804-2000
Fax: (702) 804-2297

619.295

RECEIVED

APR 26 2006

G.C. WALLACE

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM		**DATE:** April 21, 2006
TO: **Land Development Services** Department of Public Works		**FROM:** Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Technical Drainage Study for:	**COPIES TO:**
Queens Borrough Culvert (Plans AKA : The Village at Queensridge Culvert)		G. C. Wallace, Inc.
Cross Streets:	NEC of Alta Drive & Rampart Boulevard	JMA Architecture
File Number:	F:\Depot\DSMEMOS\DS3674F.ZNA.doc	Bart Anderson, P.E., DevCo
Parcel Number:	138-32-601-003	CCRFCD
FEMA Flood Zone	YES X NO	
Proposed Storm Drain	YES X NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Trn. No.
1st Submittal	10/25/2004	11/9/2004	Not Approved	$400.00	11413: $400
2nd Submittal	12/6/2004	12/20/2004	See Comments Below	$400.00	13199: $400
3rd Submittal	3/4/2005	3/18/2005	Conditionally Approved	N/C	--
4th Submittal	8/9/2005	8/23/2005	See Comments Below	$400.00	27281: $400
5th Submittal	12/15/2005	12/30/2005	See Comments Below	$400.00	35359: $400
6th Submittal	2/28/2006 3/30/2006 & 4/20/2006	4/21/2006	See Comments Below	N/C	N/C
			TOTAL FEES (LDDRS):	**$1,600.00**	**----**

REMARKS: 6th Submittal: Revised the on-site RCB alignment at the northeast corner of the site. Revised the RCB outfall structure, to include additional grading within Angel Park and the relocation of the concrete access road.

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

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

1. The existing 48'-public drainage easement (Doc # 20051129:04185) must be vacated and a new easement dedicated to reflect the revised storm drain location. Provide a new legal description and exhibit to the Right-of-Way Section with a copy to Flood Control for review and approval. The revised easement must record concurrently with the vacated easement. The new easement must record prior to the final approval of the future technical drainage study needed for onsite development or approval of any final maps. **It is noted that the public drainage easement must be privately maintained both on the surface and within the box culvert.**

2. The revised plans for the storm drain system (CLV # 107y4889-CUL) must be submitted to Land Development for approval of this proposed revision.

3. The engineer has provided a copy of the FEMA Conditional Letter of Map Revision (CLOMR), Case No. 05-09-0420R for the subject project. The engineer is advised that they are required to obtain FEMA approval for this revision as well as the completed "As-Built" condition in order to obtain the Letter of Map Revision (LOMR). **The approved LOMR must be submitted to the City of Las Vegas prior to the release of the bond.**

NOTE: **The engineer must submit the drainage study to FEMA for a Conditional Letter of Map Revision (CLOMR). A favorable CLOMR must be obtained prior to the issuance of any permits.** This site is located in a **FEMA Zone A**. Clark County Regional Flood Control District (CCRFCD) review and approval is required prior to recordation of final map or issuance of building/grading permits. The Engineer must send a copy of the report to the CCRFCD for review. **The developer/engineer must also obtain a Letter of Map Revision (LOMR) using the approved drainage study as technical support to inform FEMA of the modifications within the flood zone. The approved LOMR must be submitted to the City of Las Vegas prior to the release of the bond.** FEMA Elevation Certificates, showing as-built finish floor elevations, must be completed for each building in the FEMA A Zone. The certificate must be submitted to the City of Las Vegas Flood Control Section prior to scheduling a framing inspection.

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
B&H/ays/pbj

T/R/S: T20S/R60E/32
AREA L-32

ENGINEERS PLANNERS SURVEYORS

G. C. WALLACE, INC.

619.295

March 30, 2006

Writer's Contact Information:
804-2029

Albert Sung, PE
Flood Control Project Manager
City of Las Vegas Land Development Services
731 South Fourth Street
Las Vegas, Nevada 89101

Re: Supplement No. 1 to the 2nd Update to the Technical Drainage Study for Queens Borough Culvert (DS3674)

Dear Mr. Sung:

The purpose of this letter is to amend the design submitted within the 2nd *Update to the Technical Drainage Study for Queens Borough Culvert* (DS3674). The proposed amendments are at the City of Las Vegas' request and are as follows:

> The existing embankment, located approximately 180 feet east of the RCB headwall, will be removed. Since removal of this embankment section produces increased flow velocity within the channel, a 95-foot long riprap pad (d50 = 24-inches; thickness = 48-inches) is proposed at the RCB outlet. The WSPGW calculations have been revised to model the embankment removal.
>
> As a result of the proposed channel improvements, the RCB access road alignment has been shifted. The revised access road cross-section detail and profile are provided with the grading packet. The proposed revisions do not adversely impact the adjacent properties or downstream facilities and are in agreement with the City of Las Vegas' drainage criteria.

Copies of the water surface profile model, RCB outlet protection calculations, and proposed grading plans are provided in the Appendix.

If you have any questions or require additional information, please contact me at 804-2029.

Very truly yours,

G. C. WALLACE, INC.

Cindy Kinzer, EI
Designer

Christopher M. Luquette, PE, CFM
Project Manager
Flood Control Division

CML/CK/jj

Enc.

c: Roy Clark, GCW

G:\619-295\admin\ltr\clv-Suplmnt1-2UPDATE-QueensBoro-ck-cl-3-30-06.doc

FILE: QB12X12-U2.WSW

W S P G W - CIVILDESIGN Version 14.06
Program Package Serial Number: 1622
WATER SURFACE PROFILE LISTING
QUEENSBOROUGH CULVERT - JMA ARCH STUDIOS
GCWALLACE PROJECT # 619.295
FILENAME: QB12X12-U2.WSW CJK

Date: 3-16-2006 Time:10: 6: 6

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-3625.000	14.000	7.834	21.834	4497.00	17.38	4.69	26.53	.00	9.28	62.96		1		0 .0
TRANS STR OPEN	.0400					.0187	1.41	7.83	1.51		.035			IR-
-3550.000	17.000	8.266	25.266	4497.00	13.55	2.85	28.12	.00	8.27	58.19		2		0 .0
TRANS STR OPEN	.0100					.0070	.35	8.27	1.00		.035			IR-
-3500.000	17.500	10.031	27.531	4497.00	8.46	1.11	28.64	.00	7.33	75.12		3		0 .0
TRANS STR OPEN	.0328							10.031	.561		.040			IR-
-3401.010	20.750	2.481	23.231	4497.00	31.66	15.56	38.79	.00	5.67	63.50		4		0 .0
TRANS STR OPEN	.0110					.0371	1.86	2.48	3.73		.015			IR-
-3350.810	21.300	2.522	23.822	4497.00	33.25	17.16	40.99	.00	5.89	59.13		5		0 .0
TRANS STR OPEN	.0141					.0413	1.03	2.52	3.87		.015			IR-
-3325.950	21.650	2.323	23.973	4497.00	34.29	18.26	42.23	.00	5.71	60.97		6		0 .0
TRANS STR OPEN	.0160					.0340	.34	2.32	4.12		.015			IR-
-3315.950	21.810	5.925	27.735	4497.00	31.62	15.53	43.26	.00	10.29	25.00	12.000	25.000	.00	1 1.0
90.310	.0152					.0249	2.24	5.93	2.34	7.02	.015	.00	.00	BOX
-3225.640	23.180	5.731	28.911	4497.00	32.69	16.60	45.51	.00	10.29	25.00	12.000	25.000	.00	1 1.0
2.320	-.0776					.0263	.06	5.73	2.46	.00	.015	.00	.00	BOX
-3223.320	23.000	5.682	28.682	4497.00	32.98	16.89	45.57	12.00	10.29	25.00	12.000	25.000	.00	1 1.0
70.620	.0283					.0264	1.86	12.00	2.49	5.55	.015	.00	.00	BOX

Program Package Serial Number: 1622

WATER SURFACE PROFILE LISTING

Date: 3-16-2006 Time:10: 6: 6

QUEENSBOROUGH CULVERT - JMA ARCH STUDIOS

GCWALLACE PROJECT # 619.295

FILENAME: QB12X12-U2.WSW CJK

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-3152.700	25.000	5.709	30.709	4497.00	32.82	16.73	47.44	.00	10.29	25.00	12.000	25.000	.00	1 1.0
17.410	.0276					.0262	.46	5.71	2.47	5.60	.015	.00	.00	BOX
-3135.290	25.480	5.714	31.194	4497.00	32.79	16.70	47.89	12.00	10.29	25.00	12.000	25.000	.00	1 1.0
85.300	.0279					.0260	2.21	12.00	2.47	5.58	.015	.00	.00	BOX
-3049.990	27.860	5.748	33.608	4497.00	32.60	16.50	50.11	.00	10.29	25.00	12.000	25.000	.00	1 1.0
143.470	.0279					.0253	3.63	5.75	2.45	5.58	.015	.00	.00	BOX
-2906.520	31.860	5.829	37.689	4497.00	32.15	16.05	53.73	.40	10.29	25.00	12.000	25.000	.00	1 1.0
203.401	.0278					.0238	4.83	6.22	2.39	5.58	.015	.00	.00	BOX
-2703.119	37.523	6.024	43.546	4497.00	31.11	15.02	58.57	.37	10.29	25.00	12.000	25.000	.00	1 1.0
165.794	.0278					.0214	3.54	6.39	2.28	5.58	.015	.00	.00	BOX
-2537.325	42.138	6.318	48.456	4497.00	29.66	13.66	62.11	.34	10.29	25.00	12.000	25.000	.00	1 1.0
103.695	.0278					.0188	1.95	6.65	2.12	5.58	.015	.00	.00	BOX
-2433.630	45.025	6.626	51.651	4497.00	28.28	12.42	64.07	12.00	10.29	25.00	12.000	25.000	.00	1 1.0
60.182	.0278					.0168	1.01	12.00	1.98	5.58	.015	.00	.00	BOX
-2373.448	46.700	6.888	53.588	4497.00	27.20	11.49	65.08	12.00	10.29	25.00	12.000	25.000	.00	1 1.0
55.228	.0278					.0150	.83	12.00	1.86	5.58	.015	.00	.00	BOX
-2318.220	48.238	7.224	55.462	4497.00	25.94	10.45	65.91	.00	10.29	25.00	12.000	25.000	.00	1 1.0
26.702	.0278					.0136	.36	7.22	1.74	5.58	.015	.00	.00	BOX

Program Package Serial Number: 1622

WATER SURFACE PROFILE LISTING Date: 3-16-2006 Time:10: 6: 6

QUEENSBOROUGH CULVERT - JMA ARCH STUDIOS

GCWALLACE PROJECT # 619.295

FILENAME: QB12X12-U2.WSW CJK

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-2291.518	48.982	7.440	56.421	4497.00	25.19	9.85	66.27	.00	10.29	25.00	12.000	25.000	.00	1 1.0
34.206	.0278					.0123	.42	7.44	1.66	5.58	.015	.00	.00	BOX
-2257.313	49.934	7.803	57.737	4497.00	24.01	8.95	66.69	.00	10.29	25.00	12.000	25.000	.00	1 1.0
25.506	.0278					.0109	.28	7.80	1.55	5.58	.015	.00	.00	BOX
-2231.807	50.644	8.184	58.828	4497.00	22.90	8.14	66.97	.00	10.29	25.00	12.000	25.000	.00	1 1.0
18.679	.0278					.0096	.18	8.18	1.44	5.58	.015	.00	.00	BOX
-2213.128	51.164	8.583	59.748	4497.00	21.83	7.40	67.15	.00	10.29	25.00	12.000	25.000	.00	1 1.0
13.128	.0278					.0085	.11	8.58	1.34	5.58	.015	.00	.00	BOX
-2200.000	51.530	9.002	60.532	4497.00	20.81	6.73	67.26	.00	10.29	25.00	12.000	25.000	.00	1 1.0
60.785	.0080					.0080	.49	9.00	1.25	9.00	.015	.00	.00	BOX
-2139.215	52.016	9.002	61.018	4497.00	20.81	6.73	67.75	.00	10.29	25.00	12.000	25.000	.00	1 1.0
405.355	.0080					.0077	3.13	9.00	1.25	9.00	.015	.00	.00	BOX
-1733.860	55.259	9.255	64.514	4497.00	20.24	6.36	70.88	12.00	10.29	25.00	12.000	25.000	.00	1 1.0
54.700	.0080					.0074	.40	12.00	1.20	9.00	.015	.00	.00	BOX
-1679.160	55.697	9.355	65.051	4497.00	20.03	6.23	71.28	12.00	10.29	25.00	12.000	25.000	.00	1 1.0
95.423	.0080					.0069	.65	12.00	1.18	9.00	.015	.00	.00	BOX
-1583.737	56.460	9.811	66.271	4497.00	19.10	5.66	71.93	12.00	10.29	25.00	12.000	25.000	.00	1 1.0
18.737	.0080					.0061	.11	12.00	1.10	9.00	.015	.00	.00	BOX

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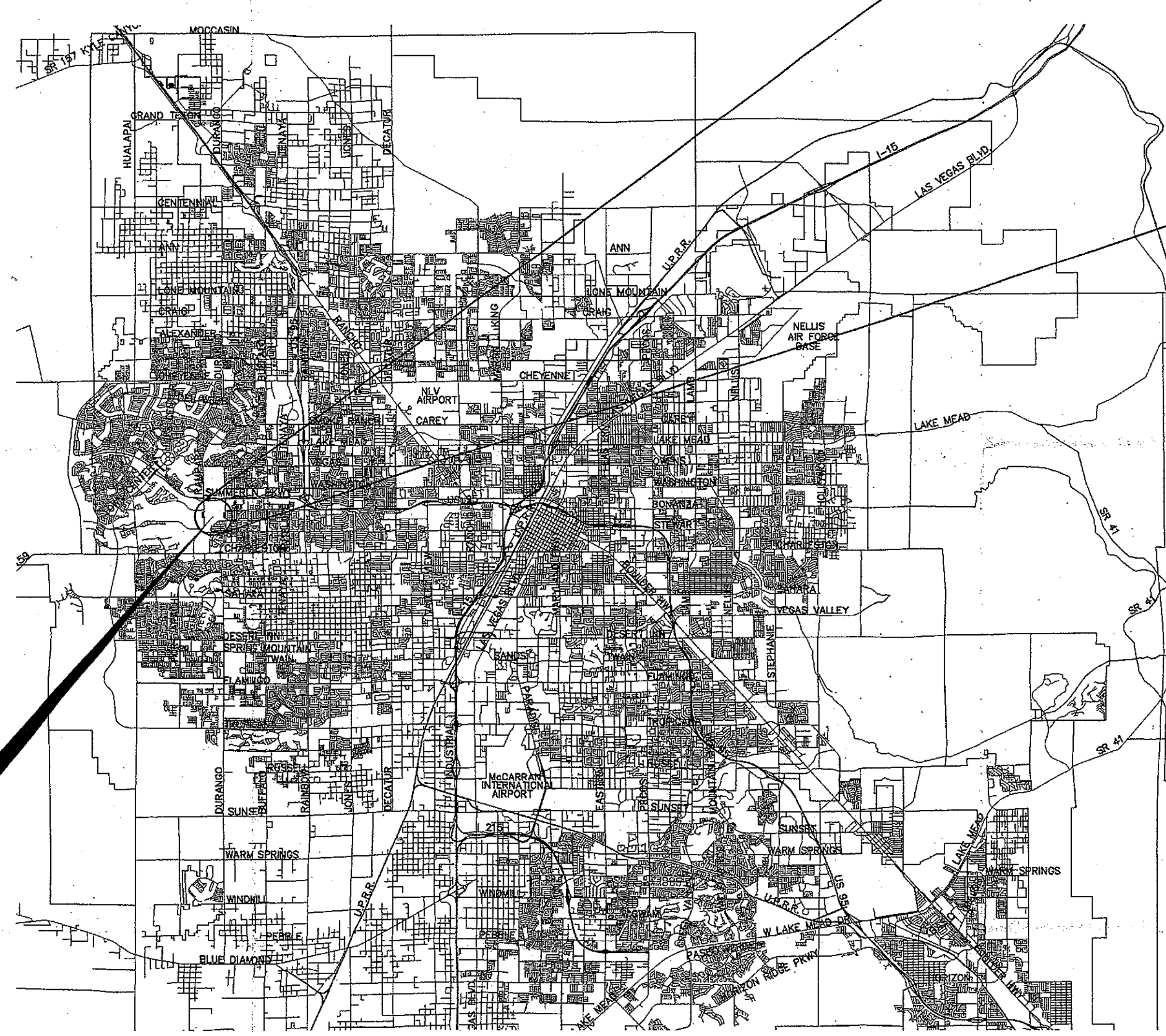
Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
-1565.000	56.610	10.291	66.901	4497.00	18.21	5.15	72.05	.00	10.29	25.00	12.000	25.000	.00	1 1.0
88.377	.0050					.0051	.45	10.29	1.02	10.85	.015	.00	.00	BOX
-1476.623	57.053	10.793	67.846	4497.00	17.36	4.68	72.53	.00	10.29	25.00	12.000	25.000	.00	1 1.0
257.531	.0050					.0050	1.29	10.79	.95	10.85	.015	.00	.00	BOX
-1219.092	58.343	10.853	69.196	4497.00	17.26	4.63	73.82	.00	10.29	25.00	12.000	25.000	.00	1 1.0
219.092	.0050					.0050	1.10	10.85	.94	10.85	.015	.00	.00	BOX
WARNING - Flow depth near top of box conduit														
-1000.000	59.440	10.853	70.293	4497.00	17.26	4.63	74.92	.00	10.29	25.00	12.000	25.000	.00	1 1.0

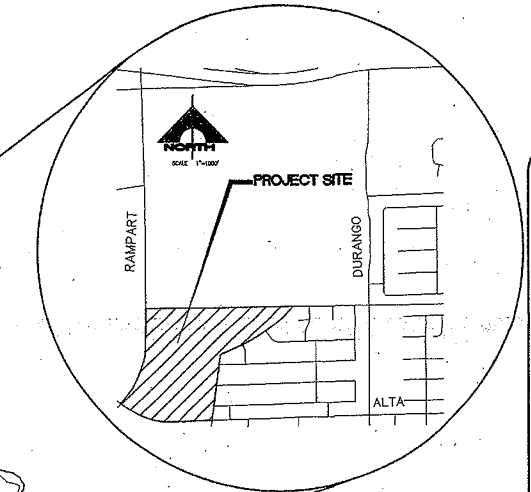
IMPROVEMENT PLANS
FOR
THE VILLAGE AT QUEENSRIDGE CULVERT

CITY OF LAS VEGAS
STATE OF NEVADA
APN# 138-32-601-003

NORTH
SCALE 1"=10,000'

PROJECT LOCATION





NOTE: ALL LAND SURFACE AREA DISTURBANCES OVER 1 ACRE REQUIRE A STORMWATER DISCHARGE PERMIT ISSUED BY THE NEVADA DIVISION OF ENVIRONMENTAL PROTECTION (NDEP). 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. A STORMWATER DISCHARGE PERMIT APPLICATION AND ASSOCIATED INFORMATION MAY BE DOWNLOADED FROM THE WEB SITE: HTTP://WWW.STATE.NV.US/NDEP/BWPC/STORM01.HTM PROJECTS THAT DISTURB MORE THAN ONE ACRE OF LAND MUST SUBMIT TO NDEP A "NOTICE OF INTENT" FOR INCLUSION UNDER STORMWATER PERMIT NO. NVR100000 ALONG WITH THE APPROPRIATE FILING FEE.

BASIS OF BEARING

SOUTH 00°32'07" EAST, BEING THE BEARING OF THE CENTERLINE OF "RAMPART BOULEVARD" AS SHOWN BY MAP THEREOF ON FILE IN FILE 64, PAGE 93 OF SURVEYS IN THE COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA, LYING WITHIN THE NORTH HALF (N 1/2) OF SECTION 32, TOWNSHIP 20 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA.

BENCHMARK

RIVET AND PLATE IN TOP OF CURB @ TOWN CENTER AND VILLAGE CENTER ON WEST EDGE OF ROUNDABOUT.

CITY OF LAS VEGAS BENCHMARK OLVOO 32E6
LOCATED ON THE NORTHEAST CORNER OF ALTA DR. AND UPPER HILL.
NAVD 88 ELEVATION = 814.1281 METERS, 2671.02 FEET
SUMMERLIN ELEVATION: 2726.11 FEET

NOTE: ADD 2.27' TO THE CURRENTLY USED SUMMERLIN BENCHMARK TO EQUAL TO THE APPROVED CITY OF LAS VEGAS BENCHMARK.

APPROVALS

CITY OF LAS VEGAS

"APPROVAL OF THESE PLANS BY THE CITY ENGINEER IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHTS-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS EXCEPT THOSE SPECIFICALLY LISTED UNDER "DEVIATIONS FROM STANDARDS." THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN "DEVIATION FROM STANDARDS" IN FAVOR OF THE SUMMERLIN IMPROVEMENT STANDARDS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA."

CHARLES KAJKOWSKI, JR.; P.E. #4784 — DATE
CITY ENGINEER

CITY OF LAS VEGAS, NEVADA

M. MARGO WHEELER, AICP, ~~DIRECTOR OF PLANNING AND DEVELOPMENT~~ DIRECTOR OF PLANNING AND DEVELOPMENT — DATE
THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE ~~PLANNING AND DEVELOPMENT~~ DEPARTMENT

C.L.V. FIRE DEPARTMENT — 7.29.05 DATE

NEVADA POWER CO. — DATE
NEVADA POWER COMPANY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATES WITH THIS PROJECT. NEVADA POWER COMPANY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY/CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISION'S RULES AND REGULATIONS.

SPRINT — DATE
"THE AFFIXED SPRINT NEVADA APPROVAL DOES NOT ASSUMED OR GUARANTEE LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICT WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES AND/OR PUBLIC UTILITY COMMISSION RULES AND REGULATIONS"

SOUTHWEST GAS CORP. — DATE

COX COMMUNICATIONS LAS VEGAS, INC. — DATE

LAS VEGAS VALLEY WATER DISTRICT — SEE SHEET C-X, C-X, C-X — DATE
PROJ. #XXXXX

INDEX OF DRAWINGS

PECCOLE NEVADA CORPORATION
851 SOUTH RAMPART BLVD
LAS VEGAS NV 89145
(702) 933-1111

G.C. WALLACE, INC.
Engineering/Planners/Surveyors
1555 SOUTH RAINBOW BLVD. / LAS VEGAS, NEVADA 89146

JMA ARCHITECTURE STUDIOS
10150 COVINGTON CROSS
LAS VEGAS NV 89144
(702)731-2033

Avoid cutting underground utility lines. It's costly.
Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

Call before you UnderGround
1-702-455-7511
1-702-229-6611

CLV DWG #

PROFESSIONAL ENGINEER - STATE OF NEVADA - ROY D. CLARK - CIVIL - No. 8354 - Exp. 12/31/2006

DATE: 7/29/05
8/5/05

REV	DATE	DESCRIPTION	DATE	AGEN. APP	DATE	GCW. APP

ISSUED FOR DRAINAGE SUBMITTAL

DESIGN:
DRAWN:
CHECK:
ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 07-29-05
PLOT TIME: 08:27:02

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD., LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299
G:\619-295\dwg\Improv\DRAINAGE\QUEEc001.dwg emendoza

THE VILLAGE AT QUEENSRIDGE CULVERT
JMA ARCHITECTURE STUDIOS
COVER SHEET

DRAWING
C-1
1 OF 11 SHTS

CITY OF LAS VEGAS GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA", LATEST ISSUE; THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, CLARK COUNTY AREA NEVADA", LATEST REVISED EDITION; THE "SUMMERLIN IMPROVEMENT STANDARDS" FOR WORK IN THE SUMMERLIN AREA; AND OTHER APPLICABLE APPROVED STANDARDS ISSUED BY THE CONTROLLING AGENCY; THE UNIFORM BUILDING CODE; AND ALL LOCAL CITY CODES AND ORDINANCES APPLICABLE, EXCEPT AS NOTED ON THIS SHEET AS "DEVIATIONS FROM STANDARDS".
2. THE EXISTENCE AND LOCATION OF ANY OVERHEAD OR UNDERGROUND UTILITY LINES, PIPES, OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A RESEARCH OF THE AVAILABLE RECORDS. EXISTING UTILITIES AS SHOWN FROM CLV PLANS LIBRARY ARE APPROXIMATE AND FOR RECORD PURPOSES. EXISTING UTILITIES ARE LOCATED ON PLANS ONLY FOR THE CONVENIENCE OF THE CONTRACTOR. EXISTING UTILITY SERVICE LATERALS MAY NOT BE SHOWN ON THE PLANS. THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, LOCATE ALL UNDERGROUND AND OVERHEAD INTERFERENCE'S WHICH MAY AFFECT HIS OPERATION DURING CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD UTILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COST AND LIABILITY IN CONNECTION THEREWITH.
3. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING UTILITY LINES, STRUCTURES AND STREET IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE, FROM DAMAGE, AND ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REQUIRED OR REPLACED SATISFACTORY TO THE CITY ENGINEER AND OWNING UTILITY COMPANY AT THE EXPENSE OF THE CONTRACTOR.
4. ALL CONSTRUCTION SHALL BE SHOWN ON THESE PLANS, ANY REVISIONS SHALL HAVE THE PRIOR WRITTEN APPROVAL OF THE CITY ENGINEER.
5. TYPE V CEMENT SHALL BE USED IN ALL OFF-SITE CONCRETE WORK. CONCRETE TO BE 3000 P.S.I. MINIMUM @28 DAYS. MIX DESIGN TO BE APPROVED BY THE CITY ENGINEER, PRIOR TO THE USE ON THE PROJECT.
6. PERMITS ARE REQUIRED FOR ANY WORK IN THE PUBLIC RIGHT-OF-WAY. THE CONTRACTOR SHALL SECURE ALL PERMITS AND INSPECTIONS REQUIRED FOR THIS CONSTRUCTION.
7. EXPANSION JOINTS REQUIRED, MAXIMUM EVERY 150' IN EXTRUDED-TYPE CURB, PER SUMMERLIN IMPROVEMENT STANDARDS.
8. AC PAVEMENT TO BE ONE-HALF INCH (1/2") ABOVE LIP OF ALL GUTTERS AFTER COMPACTION, EXCEPT AT SIDEWALK RAMPS AND CROSS GUTTERS.
9. CURB AND GUTTER FOUND TO BE UNACCEPTABLE TO THE CITY OF LAS VEGAS SHALL BE REMOVED AND REPLACED PER SUMMERLIN STANDARD DRAWING S-47.
10. SIDEWALK RAMPS SHALL BE CONSTRUCTED IN EACH QUADRANT OF AN INTERSECTION PER STANDARD SUMMERLIN DRAWINGS. EXACT LOCATION OF RAMPS MAY BE ADJUSTED IN THE FIELD BY A CITY INSPECTOR.
11. CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITIONS BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE FOR PROPER DRAINAGE AND FOR INGRESS AND EGRESS TO NEW CONSTRUCTION. THE EXTENT OF TRANSITIONS TO BE AS SHOWN ON PLANS.
12. ALL GRADING WORK SHALL CONFORM TO THE SOILS REPORT AS PREPARED BY TERRACON, PROJECT NO. 64965481, APPROVED BY THE CITY ENGINEER AND AS SHOWN ON THESE PLANS.
13. EXACT LOCATION OF ALL SAWCUT LINES MAY BE ADJUSTED OR DETERMINED IN THE FIELD BY A CITY OF LAS VEGAS ENGINEER IF LOCATION ON PLANS IS NOT CLEARLY SHOWN, OR EXISTING PAVEMENT CONDITION REQUIRES RELOCATIONS.
14. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PROTECT EXISTING PERMANENT SURVEY MONUMENTS. ANY MONUMENTS DISTURBED SHALL BE REPLACED AND ADJUSTED PER AVAILABLE RECORDS IN ACCORDANCE WITH N.R.S. NO. 625.550.
15. UTILITY COMPANY METER BOXES, MANHOLE LIDS, VALVE COVERS, ETC., SHALL BE LOCATED OUT OF DRIVEWAYS, DRIVEWAY APRONS, FLOWLINES, AND CROSS GUTTERS UNLESS WRITTEN APPROVAL IS GRANTED BY THE UTILITY COMPANY AND THE CITY ENGINEER.
16. WALL NOTES: ALL WALLS, NEW OR EXISTING, ARE ONLY SHOWN ON CIVIL PLANS FOR THE PURPOSE OF REVIEWING GRADING RELATIONSHIPS; FLOOD CONTROL AND SIGHT DISTANCE AT INTERSECIONS. NEW WALLS REQUIRE A SEPARATE PERMIT AND FLOOD CONTROL AND SIGHT DISTANCE AT INTERSECTIONS. NEW WALLS REQUIRE A SEPARATE PERMIT AND INSPECTION BY THE BUILDING DEPARTMENT.
17. ASPHALT MIX DESIGN MUST BE SUBMITTED AND APPROVED BY THE CITY ENGINEER PRIOR TO THE PLACEMENT OF ASPHALT WITHIN CITY RIGHT-OF-WAY.
18. CONTRACTOR SHALL ADJUST ALL NEW AND EXISTING INLETS, VALVE BOXES, MANHOLE RIMS, AND SEWER CLEAN OUTS, ETC. TO FINISH GRADE AS APPLICABLE WHETHER OR NOT THEY ARE SHOWN ON THE PLANS.
19. MATERIALS, HANDLING AND PLACEMENT OF PORTLAND CEMENT CONCRETE SHALL BE IN ACCORDANCE WITH APPLICABLE SECTIONS OF NDOT OR THE CLARK COUNTY AREA SPECIFICATIONS (AS APPLICABLE) AND THE PLANS AND DETAILS SHOWN HEREON.

CITY OF LAS VEGAS GRADING NOTES

1. IN THE EVENT THAT ANY UNFORESEEN CONDITIONS NOT COVERED BY THESE NOTES ARE ENCOUNTERED DURING GRADING OPERATIONS, THE OWNER/ENGINEER SHALL BE IMMEDIATELY NOTIFIED FOR DIRECTION.
2. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PERFORM ALL NECESSARY CUTS AND FILLS WITHIN THE LIMITS OF THIS PROJECT AND THE RELATED OFF-SITE WORK, SO AS TO GENERATE THE DESIRED SUBGRADE, FINISH GRADES AND SLOPES.
3. CONTRACTOR SHALL TAKE FULL RESPONSIBILITY FOR ALL EXCAVATION. ADEQUATE SHORING SHALL BE DESIGNED AND PROVIDED BY THE CONTRACTOR TO PREVENT UNDERMINING OF ANY ADJACENT FEATURES OR FACILITIES AND/OR CAVING OF THE EXCAVATION.
4. THE CONTRACTOR IS WARNED THAT AN EARTHWORK BALANCE WAS NOT NECESSARILY THE INTENT OF THIS PROJECT. ANY ADDITIONAL MATERIAL REQUIRED OR LEFTOVER MATERIAL FOLLOWING EARTHWORK OPERATIONS BECOMES THE RESPONSIBILITY OF THE CONTRACTOR.
5. THE GRADING CONTRACTOR IS RESPONSIBLE TO COORDINATE WITH THE OWNER TO PROVIDE FOR THE REQUIREMENTS OF THE PROJECT STORM WATER POLLUTION PREVENTION PLAN (SWPPP) AND ASSOCIATED PERMIT.
6. CONTRACTOR SHALL GRADE TO THE LINES AND ELEVATIONS SHOWN ON THE PLANS WITHIN THE FOLLOWING HORIZONTAL AND VERTICAL TOLERANCES AND DEGREES OF COMPACTION, IN THE AREAS INDICATED:

	HORIZONTAL	VERTICAL	COMPACTION
A. PAVEMENT AREA SUBGRADE	0.1'+	+0.0' TO -0.1'	SEE SOILS REPORT
B. ENGINEERED FILL	0.5'+	+0.1' TO -0.1'	SEE SOILS REPORT

COMPACTION TESTING WILL BE PERFORMED BY THE OWNER OR HIS REPRESENTATIVE.

7. ALL CUT AND FILL SLOPES SHALL BE PROTECTED UNTIL EFFECTIVE EROSION CONTROL HAS BEEN ESTABLISHED.
8. THE USE OF POTABLE WATER WITHOUT A SPECIAL PERMIT FOR BUILDING OR CONSTRUCTION PURPOSES INCLUDING CONSOLIDATION OF BACKFILL OR DUST CONTROL IS PROHIBITED. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS FOR CONSTRUCTION WATER.
9. THE CONTRACTOR SHALL MAINTAIN THE STREETS, SIDEWALKS AND ALL OTHER PUBLIC RIGHT-OF-WAY IN A CLEAN, SAFE AND USABLE CONDITION. ALL SPILLS OF SOIL, ROCK OR CONSTRUCTION DEBRIS SHALL BE PROMPTLY REMOVED FROM THE PUBLICLY OWNED PROPERTY DURING CONSTRUCTION AND UPON COMPLETION OF THE PROJECT. ALL ADJACENT PROPERTY, PRIVATE OR PUBLIC, SHALL BE MAINTAINED IN A CLEAN, SAFE AND USABLE CONDITION.
10. IN THE EVENT THAT ANY TEMPORARY CONSTRUCTION ITEM IS REQUIRED THAT IS NOT SHOWN ON THESE DRAWINGS, THE OWNER AGREES TO PROVIDE AND INSTALL SUCH ITEM AT HIS OWN EXPENSE AT THE DIRECTION OF THE CITY ENGINEER. TEMPORARY CONSTRUCTION INCLUDES DITCHES, BERMS, ROAD SIGNS AND BARRICADES, ETC.

CITY OF LAS VEGAS SEWER NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS AND THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS' CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA, AS AMENDED. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO BE AWARE OF THE CONTENTS OF THE ABOVE SPECIFICATIONS.
2. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PERFORM CONSTRUCTION AS PER PLANS. ANY ADDITIONS, DELETIONS, OR CHANGES SHALL FIRST MEET WITH THE APPROVAL OF THE CITY ENGINEER.
3. CHISEL "S" OR "G" IN CURBS WHERE SEWER OR GAS LATERALS PASS UNDER THE CURB.
4. POLYVINYL (PVC) SEWER PIPE SHALL MEET ASTM D-3034 SDR 35 SPECIFICATIONS, INSTALLED WITH SAND BEDDING AND BACKFILL OF TYPE II AGGREGATE BASE.
5. ALL MANHOLES PAVED IN STREETS EIGHTY (80') FOOT R/W AND LARGER SHALL HAVE CONCRETE COLLARS. STREETS LESS THAN EIGHTY (80') FOOT R/W WILL REQUIRE RETROFIT IF PAVING DOES NOT CONFORM TO CITY STANDARDS AT THE MANHOLE.
6. TEE SADDLES SHALL BE USED TO CONNECT SEWER LATERALS TO EXISTING MAIN LINES UP TO TWELVE INCH (12") DIAMETER. CONNECTIONS TO FIFTEEN INCH (15") OR LARGER MAINS SHALL REQUIRE SPECIAL PROCEDURES. IN LINE "Y" 'S SHALL BE USED ON LINES TWELVE INCHES (12") OR ABOVE.
7. WATER MAINS SHALL BE PROTECTED IN ACCORDANCE WITH LVVWD STANDARDS WHENEVER A SEWER MAIN CROSSES OVER A WATER MAIN OR THE SEWER IS LESS THAN EIGHTEEN INCH (18") UNDER A WATER MAIN.
8. ALL CONTRACTORS INSTALLING SEWER MAINS THAT WILL BE UNDER THE JURISDICTION OF THE CITY OF LAS VEGAS MUST BE STATE OF NEVADA CLASS "A" CONTRACTORS.
9. THE CITY OF LAS VEGAS WILL NOT ACCEPT ANY SEWER MAINS WHICH HAVE A VERTICAL DEFLECTION OF MORE THAN ONE TENTH (0.1) OF A FOOT FROM THE APPROVED CONSTRUCTION PLANS AT ANY LOCATION. SEWER MAINS FOUND TO EXCEED THIS TOLERANCE WILL HAVE TO BE REPAIRED OR REMOVED OR REPLACED TO THE SATISFACTION OF THE CITY ENGINEER PRIOR TO ACCEPTANCE BY THE CITY OF LAS VEGAS.
10. INSTALLATION OF CURVED SEWER REQUIRES THE USE OF C-900 PVC PIPE WHICH ALLOWS FOR PIPE DEFLECTION AT THE JOINTS.

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CITY OF LAS VEGAS FIRE DEPARTMENT NOTES

1. ALL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH THE CITY OF LAS VEGAS FIRE DEPARTMENT'S ORDINANCE # 5667, "HYDRANT SPECIFICATIONS", AND "HYDRANT INSTALLATION SPECIFICATION".
2. AUTHORIZED HYDRANTS FOR THIS PROJECT ARE:
   - A. KENNEDY – GUARDIAN MODELS K81A AND K81D
   - B. MUELLER – SUPER CENTURION 250 MODEL A-423
   - C. CLOW – MEDALLION MODEL F-2546LVD
   - D. U.S. PIPE – METROFLOW/M-03
   - E. TROY VALVE – PATRIOT MODEL PT8100N NEVADA HYDRANT
3. ON ANY RESIDENTIAL OR COMMERCIAL INSTALLATIONS FIRE HYDRANTS SHALL BE INSTALLED AND FIRE APPARATUS ACCESS ROADS SHALL BE MAINTAINED BEFORE COMMENCEMENT OF ANY COMBUSTIBLE CONSTRUCTION. ALL FIRE HYDRANTS SHALL BE IN GOOD WORKING ORDER AND SHALL BE CAPABLE OF DELIVERING THE REQUIRED FIRE FLOW.
4. TO IDENTIFY THE FIRE HYDRANT LOCATIONS, CONTRACTOR SHALL PLACE A BLUE REFLECTIVE MARKER AT THE CENTER LINE OF STREET ADJACENT TO THE FIRE HYDRANTS AS REQUIRED BY ORDINANCE # 5667.
5. ALL UNDERGROUND INSPECTIONS, PRESSURE AND FLUSH VERIFICATIONS OF ALL FIRE HYDRANTS AND FIRE LINES, SHALL BE CONDUCTED BEFORE COVERING THE LINES. CALL THE CITY OF LAS VEGAS INSPECTION HOT-LINE AT 229-2071 TO REQUEST AN INSPECTION BY THE CITY OF LAS VEGAS FIRE DEPARTMENT.
6. PAINTING OF THE CURBS AND FIRE HYDRANTS AND ALL OTHER WORK NECESSARY AS REQUIRED BY ORDINANCE # 5667, FOR THE PROTECTION OF FIRE HYDRANTS FROM PHYSICAL DAMAGE, SHALL BE COMPLETED BEFORE APPROVAL BY THE CITY OF LAS VEGAS FIRE DEPARTMENT.
7. A PERMIT IS REQUIRED FROM THE CITY OF LAS VEGAS FIRE DEPARTMENT FOR THE ON-SITE WATER LINES AND FIRE HYDRANTS. THE PERMIT AND CONTRACTOR'S MATERIAL AND TEST CERTIFICATE FOR UNDERGROUND PIPING FORM SHALL BE OBTAINED FROM THE FIRE PROTECTION ENGINEER BEFORE COMMENCEMENT OF WORK.
8. PRIVATE FIRE HYDRANTS SHALL BE PAINTED RED.
9. PRIOR TO THE FINAL OCCUPANCY, A FLOW TEST MUST BE WITNESSED BY THE CITY OF LAS VEGAS FIRE DEPARTMENT TO VERIFY AVAILABILITY OF THE REQUIRED FIRE FLOW.
10. ALL ON-SITE UNDERGROUND WATER MAINS AND MATERIALS SHALL BE U.L. LISTED, A.W.W.A. APPROVED, AND SHALL BE RATED FOR THE APPROPRIATE WORKING PRESSURE.
11. FIRE HYDRANTS SPACING SHALL BE:
    RESIDENTIAL – 500 FEET UNSPRINKLERED; 600 FEET SPRINKLERED.
    COMMERCIAL – 300 FEET UNSPRINKLERED; 400 FEET SPRINKLERED.
12. WHERE NEW WATER MAINS ARE EXTENDED ALONG STREETS OR NEW STREETS ARE INSTALLED WHERE FIRE HYDRANTS ARE NOT NEEDED FOR PROTECTION OF THE STRUCTURES, FIRE HYDRANTS SHALL BE INSTALLED AT MAXIMUM 1,000 FOOT SPACING, TO PROVIDE FOR TRANSPORTATION HAZARDS. WHERE STREETS ARE PROVIDED WITH MEDIAN DIVIDERS OR HAVE FOUR OR MORE TRAFFIC LANES AND HAVE A TRAFFIC COUNT OF MORE THAN 30,000 PER DAY, HYDRANTS ARE REQUIRED ON EACH SIDE OF THE STREET SPACED AT 500 FEET ON AN ALTERNATING BASIS.
13. NO FIRE HYDRANTS SHALL BE LOCATED WITHIN THE REQUIRED RADIUS OF A CUL-DE-SAC OR WITHIN 20 FEET OF THE PERIMETER OF THE RADIUS OF THE CUL-DE-SAC.
14. NO FIRE HYDRANT SHALL BE LOCATED WITHIN 6 FEET OF ANY CURB RETURN, DRIVEWAY, POWER POLE, STREET LIGHT OR ANY OTHER OBSTRUCTION.
15. THE MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A ONE-TWO FAMILY DWELLING SHALL NOT EXCEED 300 FEET, AS MEASURED BY AN APPROVED ROUTE.
16. THE MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A FIRE DEPARTMENT CONNECTION (FDC) SHALL NOT EXCEED 100 FEET, AS MEASURED BY AN APPROVED ROUTE.
17. THE MAXIMUM DISTANCE FROM A FIRE HYDRANT TO THE END OF A DEAD-END STREET SHALL NOT EXCEED 200 FEET.
18. TWO SOURCES OF SUPPLY ARE REQUIRED WHENEVER THERE ARE 4 OR MORE FIRE HYDRANTS/SPRINKLER LEAD-INS ARE INSTALLED ON A SINGLE SYSTEM. SECTIONAL CONTROL VALVES SHALL BE INSTALLED SO THAT NO MORE THAN 2 FIRE HYDRANTS CAN BE OUT OF SERVICE DUE TO A BREAK IN A WATER MAIN.
19. ALL FIRE APPARATUS ACCESS ROADS SHALL BE PAVED TO PROVIDE ALL-WEATHER DRIVING CAPABILITIES, AND SHALL BE DESIGNED AND MAINTAINED TO SUPPORT THE IMPOSED LOADS OF THE FIRE APPARATUS.
20. THE GRADIENT FOR THE FIRE APPARATUS ACCESS ROADS SHALL NOT EXCEED 12%. ANGLES OF APPROACH AND ANGLES OF DEPARTURE SHALL NOT EXCEED 6% FOR 25 FEET PRIOR TO OR AFTER THE GRADE CHANGE. ADJACENT TO THE STRUCTURES GRADIENT SHALL NOT EXCEED 6%.
21. THE TURNING RADIUS OF THE FIRE APPARATUS ACCESS ROADS SHALL BE NO LESS THAN 52 FEET OUTSIDE AND 28 FEET INSIDE TURNING RADIUS.
22. VERTICAL CLEARANCE OF ALL FIRE APPARATUS ACCESS ROADS SHALL BE NOT LESS THAN 13 FEET 6 INCHES.
23. FIRE DEPARTMENT ACCESS ROADS IN ALL RESIDENTIAL DEVELOPMENTS (EXCEPT FOR THE APARTMENT BUILDINGS) SHALL HAVE A MINIMUM UNOBSTRUCTED WIDTH OF NOT LESS THAN 36 FEET FLOW LINE TO THE FLOW LINE (THIS WIDTH MAY BE REDUCED TO 24 FEET, IF ALL BUILDINGS FRONTING THE STREET ARE SPRINKLERED) FOR MAIN RESIDENTIAL STREETS, WITH PARKING PERMITTED ON BOTH SIDES OF THE STREET. PRIVATE DRIVE AISLES, DRIVEWAYS, ETC. SHALL BE ALLOWED TO BE REDUCED TO A MINIMUM WIDTH OF 24 FEET WIDE FLOW LINE TO THE FLOW LINE WHEN SERVING NO MORE THAN 6 RESIDENCES, AND WHEN ON STREET PARKING IS DISALLOWED.
24. ALL FIRE APPARATUS ACCESS ROADS IN COMMERCIAL DEVELOPMENTS AND APARTMENT COMPLEXES SHALL HAVE A MINIMUM UNOBSTRUCTED WIDTH OF NOT LESS THAN 24 FEET (FLOW LINE TO THE FLOW LINE), PROVIDED NO PARKING IS ALLOWED ON EITHER SIDE; 32 FEET (FLOW LINE TO THE FLOW LINE) IF PARALLEL PARKING IS ALLOWED ON ONE SIDE ONLY; AND 40 FEET (FLOW LINE TO THE FLOW LINE), IF PARALLEL PARKING IS ALLOWED ON BOTH SIDES. THESE WIDTHS MAY BE REDUCED BY 4 FEET IF ALL BUILDINGS ARE SPRINKLERED.
25. A FIRE DEPARTMENT ACCESS ROAD SHALL EXTEND TO WITHIN 50 FEET OF A SINGLE EXTERIOR DOOR PROVIDING ACCESS TO THE INTERIOR OF THE BUILDING.
26. A FIRE APPARATUS ACCESS ROAD SHALL BE REQUIRED WHEN ANY PORTION OF AN EXTERIOR WALL OF THE FIRST STORY IS LOCATED MORE THAN 150 FEET FROM A FIRE DEPARTMENT VEHICLE ACCESS. THIS DISTANCE COULD BE INCREASED TO 250 FEET IF THE BUILDING IS SPRINKLERED.
27. APPROVED SECONDARY FIRE APPARATUS ACCESS SHALL BE PROVIDED FOR 100 OR MORE DWELLING UNITS, ROAD(S) WITH DEAD-ENDS OR WITH A SINGLE POINT OF ACCESS IN EXCESS OF 600 FEET, AND FOR ALL COMMERCIAL, INDUSTRIAL, AND MULTI-FAMILY RESIDENTIAL DEVELOPMENTS.
28. ALL DEAD-END FIRE APPARATUS ACCESS ROADS AND/OR FIRE LANES, PUBLIC OR PRIVATE, IN EXCESS OF 150 FEET IN LENGTH SHALL BE PROVIDED WITH AN APPROVED TURN AROUND AREA HAVING A MINIMUM DIAMETER OF 81 FEET.
29. ALL FIRE APPARATUS ACCESS ROADS SHALL BE MARKED BY PLACING APPROVED SIGNS AT THE START OF THE DESIGNATED FIRE LANE, ONE SIGN AT THE END OF THE FIRE LANE AND WITH SIGNS AT INTERVALS 100 FEET ALONG ALL DESIGNATED FIRE LANES. SIGNS TO BE PLACED ON BOTH SIDES OF AN ACCESS ROADWAY IF NEEDED TO PREVENT PARKING ON EITHER SIDE. SIGNS TO BE INSTALLED NO HIGHER THAN 10 FEET OR LESS THAN 6 FEET FROM ROADWAY LEVEL. THE CURB ALONG OR ON THE PAVEMENT OR CEMENT IF A CURB IS NOT PROVIDED SHALL BE PAINTED WITH A RED WEATHER RESISTANT PAINT IN ADDITION TO THE SIGNS.
30. ELECTRICALLY CONTROLLED ACCESS GATES SHALL BE PROVIDED WITH AN APPROVED EMERGENCY VEHICLE DETECTOR/RECEIVER SYSTEM. SAID SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH THE CITY OF LAS VEGAS GUIDELINES FOR AUTOMATIC EMERGENCY VEHICLE ACCESS GATES.

CITY FIRE MARSHALL DATE

REVISED 03/19/04

CITY OF LAS VEGAS STREETLIGHT NOTES

1. ALL STREET LIGHTING INSTALLATIONS SHALL BE IN ACCORDANCE WITH THE STREET LIGHTING PLANS, THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST REVISION, AND THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST REVISION.
2. NO DEVIATION OF STREET LIGHT, PULL BOX, CONDUITS (ETC.) LOCATIONS SHALL BE PERMITTED WITHOUT WRITTEN APPROVAL OF THE TRAFFIC/ELECTRICAL FIELD OPERATIONS DIVISION AND THE CITY ENGINEER. ANY DEVIATION FROM THE PLAN LOCATION WILL REQUIRE COMPLIANCE WITH SECTION 623.L0.03 (E) OF THE SPECIFICATIONS.
3. ALL EXISTING STREET LIGHTING SHALL REMAIN OPERATIONAL DURING CONSTRUCTION.
4. ALL EMPTY CONDUIT SHALL HAVE PULL STRINGS INSTALLED PRIOR TO FINAL INSPECTION.
5. ANY STRUCTURE SUCH AS BLOCK WALLS, CHAIN LINK FENCES, RETAINING WALLS, ETC., SHALL LEAVE A MINIMUM CLEARANCE OF EIGHTEEN INCHES (18") TO THE FACE OF STREET LIGHTING POLE ON ALL SIDES WHEN STREETLIGHT IS INSTALLED BEHIND SIDEWALK, AND SHALL AT NO TIME COMPLETELY ENCLOSE THE STREET LIGHTING POLE.
6. AS-BUILT DRAWINGS SHALL BE SUPPLIED TO THE ELECTRICAL SERVICES SECTION PRIOR TO ANY PRE-FINAL INSPECTION. THE AS-BUILT DRAWING NEEDS TO BE STAMPED AS-BUILT AND SIGNED BY THE PREPARER.
7. SERVICE POINT SHALL BE COORDINATED WITH NEVADA POWER COMPANY, AND WHEREVER POSSIBLE, BE LOCATED NEAR THE CENTER OF THE CIRCUIT. SERVICE POINTS SHALL BE SHOWN ON THE PLANS.
8. IT SHALL BE ASSUMED THAT IN THE ABSENCE OF AN EXISTING, WORKABLE CIRCUIT TO ATTACH TO, ALL INSTALLATIONS SHALL REQUIRE A NEW SERVICE FOR OPERATION OF THE CIRCUIT.
9. WHEREVER THERE IS AN OVERHEAD UTILITY THAT MAY CONFLICT WITH THE INSTALLATION OF STREET LIGHTING CIRCUITS AND/OR POLES, THESE CONFLICTS MUST BE RESOLVED BETWEEN THE DEVELOPER AND THE UTILITIES INVOLVED BEFORE STREETLIGHT BASES ARE INSTALLED AT NO EXPENSE TO THE CITY OF LAS VEGAS.
10. THE CONTRACTOR SHALL FURNISH COMPLETE SERVICE TO TRANSFORMERS AND CONTROL SYSTEMS IF REQUIRED ON PLANS.

LAS VEGAS VALLEY WATER DISTRICT STANDARD NOTES

LVVWD PROJECT#________

1. NO WORK SHALL BEGIN UNTIL THE WATER PLANS HAVE BEEN APPROVED FOR CONSTRUCTION BY THE LVVWD. FOLLOWING WATER PLAN APPROVAL, NOTICE SHALL BE GIVEN TO THE LVVWD COMMUNICATION SUPPORT CENTER (258-7171) TWO (2) WORKING DAYS PRIOR TO THE START OF CONSTRUCTION. FOR FUTURE INSPECTIONS, NOTICE MUST BE GIVEN BY 2:00 P.M. THE BUSINESS DAY PRIOR TO THE REQUESTED LVVWD
   WHEN REQUESTING INSPECTIONS, PLEASE REFER TO THE PROJECT # IDENTIFIED ABOVE.
2. ALL WORK SHALL CONFORM TO LVVWD STANDARD PLATES, DRAWINGS, AND SPECIFICATIONS, AND TO THE 2003 EDITION OF THE UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR POTABLE WATER SYSTEMS
3. ALL WORK, EXCEPT AS MODIFIED BY THESE PLANS OR BY NOTE 2 ABOVE, SHALL BE DONE IN ACCORDANCE WITH THE MOST RECENT DRAFT OR EDITION OF THE UNIFORM STANDARD SPECIFICATION FOR PUBLIC WORKS CONSTRUCTION OFFSITE IMPROVEMENT, CLARK COUNTY AREA.
4. A SINGLE PIPE MATERIAL SHALL BE USED THROUGHOUT THE PROJECT UNLESS OTHERWISE APPROVED BY (UDACS).
5. ALL SERVICE LATERALS TWO (2) INCHES IN DIAMETER AND SMALLER SHALL BE TYPE K COPPER TUBING WITH LVVWD APPROVED SERVICE SADDLES.
6. ALL WATER METER BOXES SHALL BE LOCATED OUTSIDE OF DRIVEWAY AREAS.
7. ALL VALVES SHALL BE LOCATED OUTSIDE OF DRIVEWAYS, VALLEY AND CURB GUTTERS.
8. ALL WATER AND STORM DRAIN OR SANITARY SEWER CROSSINGS SHALL CONFORM TO SECTION 2.19 OF THE 2003 EDITION OF THE UDACS.
9. ALL WATER FACILITIES SHALL BE FILLED, DISINFECTED, PRESSURE TESTED, FLUSHED, FILLED, AND AN ACCEPTABLE WATER SAMPLE OBTAINED, PRIOR TO CONNECTION TO THE LVVWD DISTRIBUTION SYSTEM.
10. THE CONTRACTOR MUST OBTAIN ALL METERS TWO (2) INCHES AND SMALLER FROM LVVWD CENTRAL STORES. TELEPHONE 258-3152 OR 258-3802, TWO (2) WORKING DAYS PRIOR TO METER PICKUP.
11. ANY INTERRUPTION OF SERVICE MUST BE APPROVED BY THE LVVWD INSPECTION DIVISION PRIOR TO SHUTDOWN. PROPER WRITTEN NOTIFICATION MUST BE GIVEN TO ALL AFFECTED CUSTOMERS.
12. ALL WATER FACILITY CONSTRUCTION MATERIALS USED MUST BE AS LISTED ON THE LVVWD PRE-APPROVED MATERIALS AND MANUFACTURER'S LISTING FOR NEW FACILITIES, LATEST REVISION, OR SPECIFICALLY APPROVED ON THESE PLANS.
13. TELEPHONE "CALL BEFORE YOU DIG" AT 1-800-227-2600.

LAS VEGAS VALLEY WATER DISTRICT DATE

CITY OF LAS VEGAS TRAFFIC NOTES

1. ALL CONSTRUCTION SIGNING, BARRICADING AND TRAFFIC DELINEATION SHALL CONFORM TO THE "MANUAL ON UNIFORM TRAFFIC DEVICES", LATEST EDITION.
2. THE STREET SIGN CONTRACTOR SHALL OBTAIN STREET NAMES AND BLOCK NUMBERING FROM THE PLANNING DEPARTMENT PRIOR TO CONSTRUCTION.
3. BEFORE ANY WORK IS STARTED IN THE RIGHT-OF-WAY, THE CONTRACTOR SHALL INSTALL ALL ADVANCED WARNING SIGNS FOR THE CONSTRUCTION ZONES. THE CONTRACTOR SHALL INSTALL TEMPORARY STOP SIGNS AT ALL NEW STREET ENCROACHMENTS INTO EXISTING CITY STREETS WHERE WARRANTED IMMEDIATELY AFTER FIRST GRADING WORK IS ACCOMPLISHED, AND SHALL MAINTAIN SAID SIGNS UNTIL PERMANENT SIGNS ARE INSTALLED.
4. WHEN A DESIGNATED "SAFE ROUTE TO SCHOOL" IS ENCROACHED UPON BY A CONSTRUCTION WORK ZONE AND PUBLIC WORKS STAFF IDENTIFIES A NEED FOR STUDENTS TO BE ASSISTED IN THE SAFE CROSSING THROUGH THAT WORK ZONE, THE CONTRACTOR SHALL BE REQUIRED TO PROVIDE A QUALIFIED "CROSSING GUARD". THE GUARD SHALL BE PRESENT FOR THE FULL DURATION OF TIME THAT CHILDREN ARE LIKELY TO BE PRESENT.
5. IF THE IMPROVEMENTS NECESSITATE THE OBLITERATION, TEMPORARY OBSTRUCTION, TEMPORARY REMOVAL OR RELOCATION OF ANY EXISTING TRAFFIC PAVEMENT MARKING, SUCH PAVEMENT MARKING SHALL BE RESTORED OR REPLACED WITH LIKE MATERIALS TO THE SATISFACTION OF THE CITY TRAFFIC ENGINEER.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL PERMANENT SIGNS SHOWN ON THE PLANS. STREET NAMES SIGNS SHALL CONFORM IN THEIR ENTIRETY TO CURRENT CITY STANDARDS. ALL OTHER SIGNS SHALL BE STANDARD SIZE UNLESS OTHERWISE SPECIFIED ON THE PLANS. ALL SIGN POSTS SHALL BE INSTALLED IN ACCORDANCE WITH THE CURRENT CITY STANDARDS.
7. WHEN A PROPOSED STREET LIGHT STANDARD IS LOCATED WITHIN FIVE (5') FEET OF ANY PROPOSED SIGN SHOWN ON THE PLANS TO BE MOUNTED ON A SIGNPOST, THE SIGN SHALL BE MOUNTED ON THE STREET LIGHT STANDARD AND THE SIGNPOST SHALL BE ELIMINATED.
8. ALL PERMANENT TRAFFIC CONTROL DEVICES CALLED FOR HEREON SHALL BE IN PLACE AND IN FINAL POSITION PRIOR TO ALLOWING ANY PUBLIC TRAFFIC ONTO THE PORTIONS OF THE ROAD(S) BEING IMPROVED HEREUNDER; REGARDLESS OF TEH STATUS OF COMPLETION OF PAVING OR OTHER OFF-SITE IMPROVEMENTS CALLED FOR BY THESE PLANS.
9. STREET SIGNS AND STOP SIGNS SHALL BE INSTALLED PER CITY STANDARD SPECIFICATIONS FOR PLACEMENT OF STREET NAME SIGNS.
10. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY TRAFFIC CONTROL DEVICES AND FLAGGERS TO ENSURE THE SAFETY OF THE PUBLIC IN OR AROUND THE WORK AREA. THE CONTRACTOR SHALL HAVE A CERTIFIED ATSSA TRAFFIC CONTROL T TECHNICIAN OR IMSA WORK ZONE SAFETY SPECIALIST SET-UP, MAINTAIN AND/OR REMOVE ALL TRAFFIC CONTROL DEVICES IN THE CITY OF LAS VEGAS RIGHTS OF WAY.
11. WORK IN THE PUBLIC STREETS, ONCE BEGUN, SHALL BE EXPEDITED TO COMPLETION SO AS TO PROVIDE MINIMUM INCONVENIENCE TO ADJACENT PROPERTY OWNERS AND TO TO THE TRAVELING PUBLIC.
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING CITIZENS AREA TRANSIT (C.A.T.) IF THE CONSTRUCTION INTERRUPTS OR RELOCATES A BUS STOP OR HAS AN ADVERSE EFFECT ON BUS SERVICE ON THAT STREET TO ARRANGE FOR TEMPORARY RELOCATION OF STOP.
13. GUARDS SHALL BE OBTAINED BY CONTACTING THE METROPOLITAN POLICE DEPARTMENT SPECIAL EVENTS UNIT (PHONE NO: 229-3442) WHO WILL PROVIDE OFFICERS PROPERLY TRAINED IN TRAFFIC CONTROL. FEES FOR THE USE OF THESE OFFICERS SHALL BE SET UP BY METRO AND WILL BE PAID BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE FOR ALL ARRANGEMETNS WITH METRO.
14. ANY WORK WITHIN 300' OF A SIGNALIZED INTERSECTION WILL BE NIGHT WORK, UNLESS DIRECTED BY THE CITY OF LAS VEGAS TRAFFIC ENGINEER.

DEVIATION FROM STANDARDS

NONE – (PUBLIC)

BASIS OF BEARING

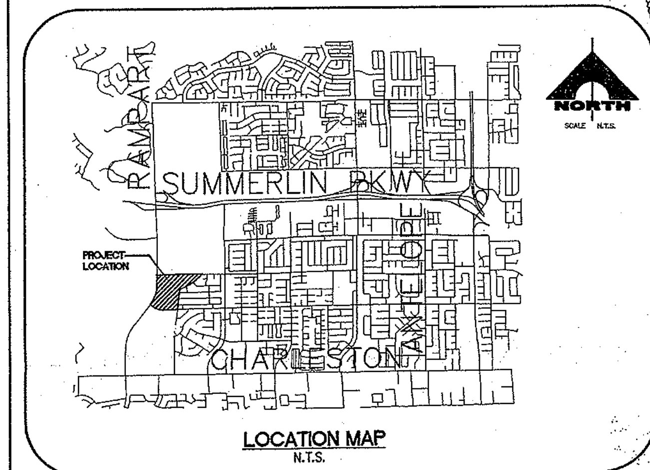
SOUTH 00°32'07" EAST, BEING THE BEARING OF THE CENTERLINE OF "RAMPART BOULEVARD" AS SHOWN BY MAP THEREOF ON FILE IN FILE 64, PAGE 93 OF SURVEYS IN THE COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA, LYING WITHIN THE NORTH HALF (N 1/2) OF SECTION 32, TOWNSHIP 20 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA.

BENCHMARK

RIVET AND PLATE IN TOP OF CURB @ TOWN CENTER AND VILLAGE CENTER ON WEST EDGE OF ROUNDABOUT.

CITY OF LAS VEGAS BENCHMARK OLV00 32E6
LOCATED ON THE NORTHEAST CORNER OF ALTA DR. AND UPPER HILL.
NAVD 88 ELEVATION = 814.1281 METERS, 2671.02 FEET
SUMMERLIN ELEVATION: 2726.11 FEET

NOTE: ADD 2.27' TO THE CURRENTLY USED SUMMERLIN BENCHMARK TO EQUAL TO THE APPROVED CITY OF LAS VEGAS BENCHMARK.



LOCATION MAP
N.T.S.

LEGEND AND ABBREVIATIONS

(1)	DETAIL DRAWING NUMBER
$\frac{1}{-}$	DRAWING NUMBER FOR DETAIL DRAWN ON SAME SHEET
$\frac{1}{7}$	DRAWING NUMBER FOR DETAIL WITH REFERENCE TO IT'S SHEET
	INDICATES SEWER MANHOLE IN PROFILE
	INDICATES STORM DRAIN MANHOLE IN PROFILE
$\frac{(60.5)}{TC}$	EXIST. ELEVATION
$\frac{60.5}{TC}$	PROPOSED ELEVATION
(2356.1) ×	EXIST. SPOT ELEVATION
$\frac{[60.5]}{TC}$	AS-BUILT ELEVATION
	SUBDIVISION BOUNDARY
	EASEMENT LINE
	FUTURE LINE
	STREET CENTERLINE
	CONCRETE CURB & GUTTER
	EXISTING IMPROVEMENTS
	EXISTING ASPHALT
(2612)	EXISTING GROUND CONTOURS
34	FINISH GROUND CONTOUR
	DRAINAGE FLOW LINE
	RETAINING WALL
	EXISTING BLOCK WALL
50	EXISTING LOT NUMBER
50	LOT NUMBER
PAD=100.0	PAD ELEVATION
F.F.=100.67	FINISH FLOOR ELEVATION
	SCARP
(00.0)	EXISTING PAD ELEVATION
(1)	BLOCK NUMBER
	PROPERTY LINE
	FIRE HYDRANT

ABBREVIATIONS

HOA = HOME OWNER ASSOCIATION
W = WATER
SS = SEWER
G = GAS
SD = STORM DRAIN
SL = STREET LIGHT
SMH = SEWER MANHOLE
SDMH = STORM DRAIN MH
CLV = CITY OF LAS VEGAS
LVVWD = LAS VEGAS VALLEY WATER DISTRICT
EX = EXISTING
FL = FLOW LINE
HP = HIGH POINT
R/W = RIGHT-OF-WAY
TC = TOP BACK OF CURB
FG = FINISHED GRADE
BCR = BEGIN CURB RETURN
DS = DOWN SPOUT
USDCCA = UNIFORM STADARD DRAWING CLARK COUNTY AREA
CF = CURB FACE
BW = BACK OF WALK
FS = FINISH SURFACE
NG = NATURAL GRADE
FF = FINISH FLOOR
GB = GRADE BREAK
FUT = FUTURE
EP = EDGE OF PAVEMENT
NP = NEVADA POWER
UDACS = UNIFORM DESIGN AND CONSTRUCTION STANDARDS
TR = TOP OF RETAINING
FNC = FENCE
HDPE = HIGH DENSITY POLYEHTYLENE

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Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

CALL BEFORE YOU DO UNDERGROUND
Call before you UnderGround
1-702-455-7511
1-702-229-6611

CLV DWG #

DESIGN:
DRAWN:
CHECK:
ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 07-22-05
PLOT TIME: 11:07:26

REV | DATE | DESCRIPTION

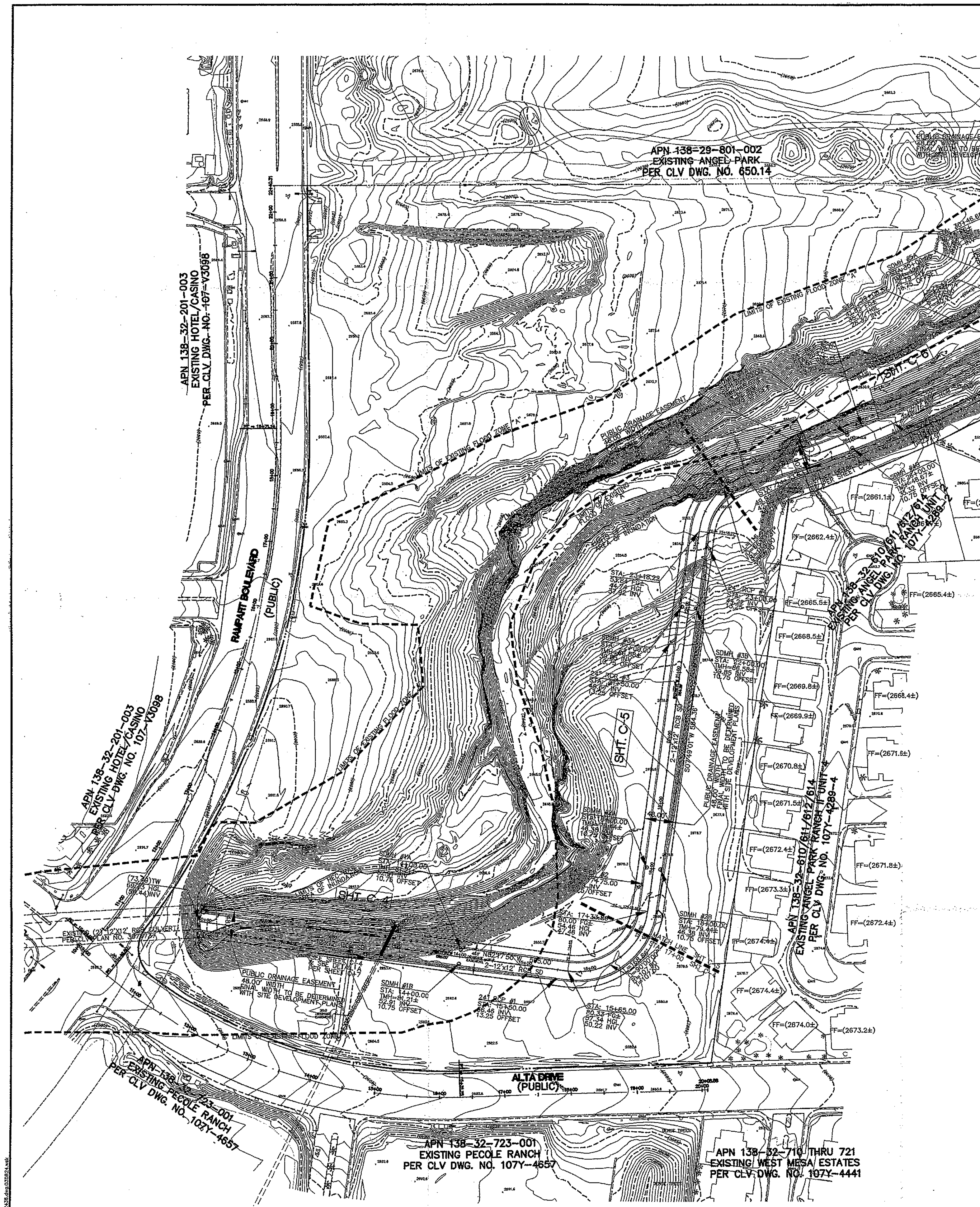
ISSUED FOR DRAINAGE SUBMITTAL

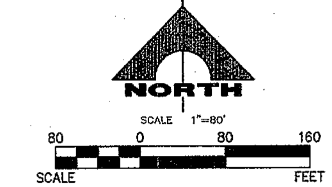
G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

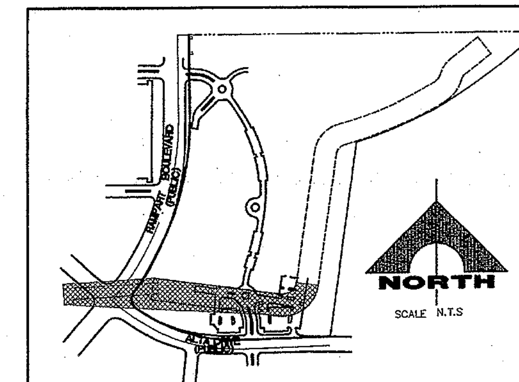
G:\619-295\dwg\Improv\DRAINAGE\QUEEc002.dwg kremus

THE VILLAGE AT QUEENSRIDGE CULVERT
JMA ARCHITECTURE STUDIOS
GENERAL NOTES

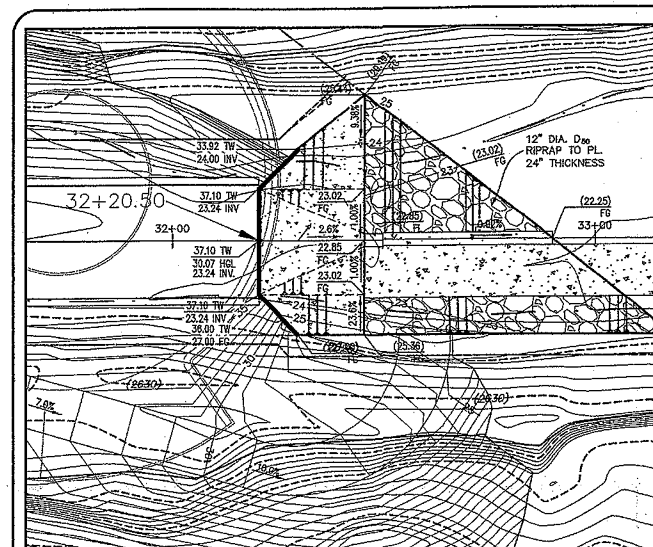
DRAWING
C-2
2 OF 11 SHTS







KEYMAP
N.T.S.



DETAIL 1
1"=20'

STORM DRAIN QUANTITIES (PUBLIC)

12'x12' RCB	4387 LF.
SDMH	10 EA.
24" RCP STORM DRAIN.	60 LF.
12" RIP-RAP.	3644 SF.
3' WIDE CONCRETE VALLEY GUTTER.	144 LF.
HEADWALL	1 EA.
TYPE II GRAVEL BASE.	2544 CY.
4" ASPHALTIC CONCRETE PAVING	121 SY.

DRAINAGE CERTIFICATION

I CERTIFY THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE WITH THE CITY OF LAS VEGAS FOR THIS PROJECT, DS 3674.ZNA.

ROY D. CLARK	8354 P.E. NO.	DATE

BASIS OF BEARING

SOUTH 00°32'07" EAST, BEING THE BEARING OF THE CENTERLINE OF "RAMPART BOULEVARD" AS SHOWN BY MAP THEREOF ON FILE IN FILE 64, PAGE 93 OF SURVEYS IN THE COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA, LYING WITHIN THE NORTH HALF (N 1/2) OF SECTION 32, TOWNSHIP 20 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA.

BENCHMARK

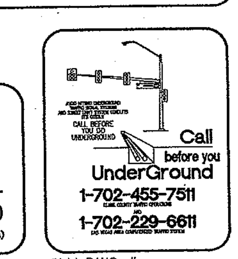
RIVET AND PLATE IN TOP OF CURB @ TOWN CENTER AND VILLAGE CENTER ON WEST EDGE OF ROUNDABOUT.

CITY OF LAS VEGAS BENCHMARK OLVOO 32E6
LOCATED ON THE NORTHEAST CORNER OF ALTA DR. AND UPPER HILL.
NAVD 88 ELEVATION = 814.1281 METERS, 2671.02 FEET
SUMMERLIN ELEVATION: 2726.11 FEET

NOTE: ADD 2.27' TO THE CURRENTLY USED SUMMERLIN BENCHMARK TO EQUAL TO THE APPROVED CITY OF LAS VEGAS BENCHMARK.

NOTE

THIS PROJECT SITE IS LOCATED WITHIN "THE LIMITS OF EXISTING FLOOD ZONE A".



ENGINEER – STATE OF NEVADA – PROFESSIONAL
ROY D. CLARK
CIVIL
No. 8354
DATE: 8/8/05

REV	DATE	DESCRIPTION	DATE	AGEN. APP.	DATE	GCW. APP.

ISSUED FOR DRAINAGE SUBMITTAL

DESIGN:
DRAWN:
CHECK:
ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 08-08-05
PLOT TIME: 10:08:11

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299
G:\619-295\dwg\Improv\DRAINAGE\QUEEc003.dwg emendoza

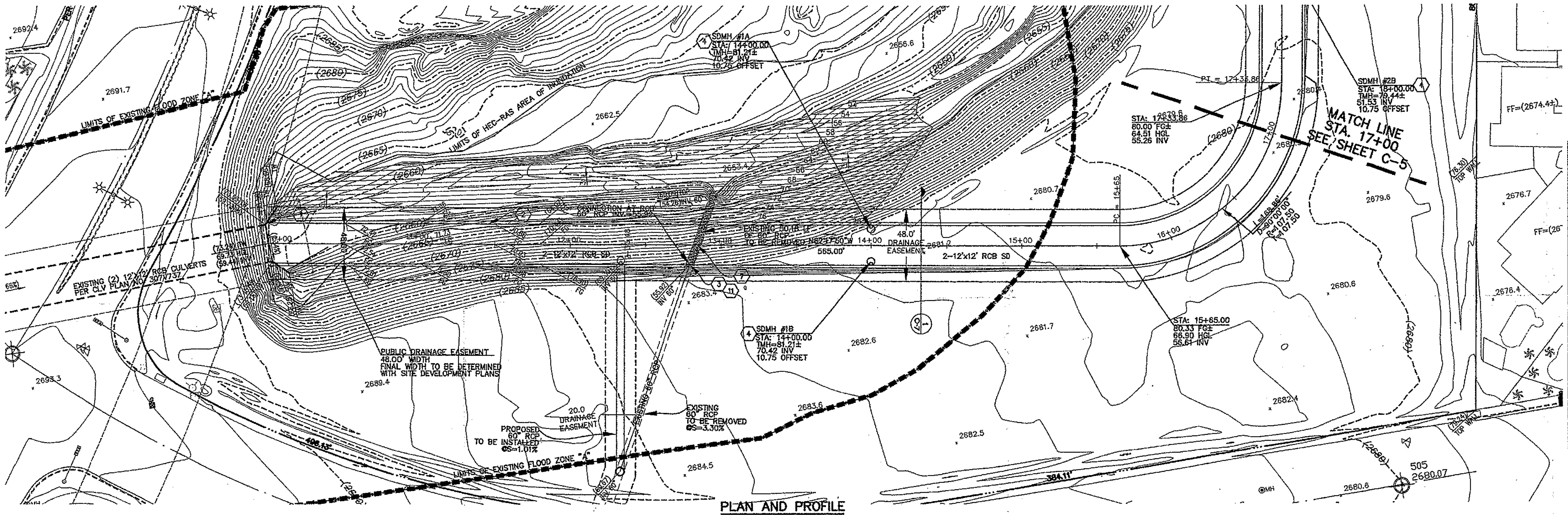
THE VILLAGE AT QUEENSRIDGE CULVERT

JMA ARCHITECTURE STUDIOS

MASTER GRADING PLAN

DRAWING
C-3
3 OF 11 SHTS

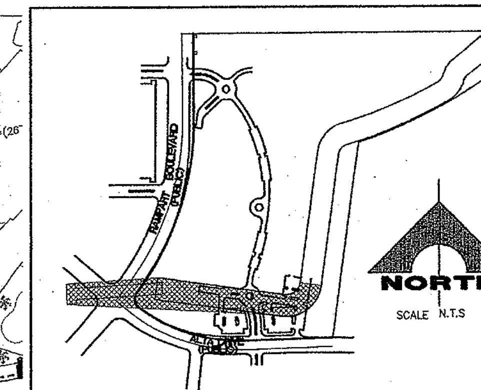
CLV DWG #



PLAN AND PROFILE

SCALE
HORIZ. 1" = 40'
VERT. 1" = 4'

NORTH
SCALE 1"=40'



NORTH
SCALE N.T.S

KEYMAP

N.T.S.

BASIS OF BEARING

SOUTH 00°32'07" EAST, BEING THE BEARING OF THE CENTERLINE OF "RAMPART BOULEVARD" AS SHOWN BY MAP THEREOF ON FILE IN FILE 64, PAGE 93 OF SURVEYS IN THE COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA, LYING WITHIN THE NORTH HALF (N 1/2) OF SECTION 32, TOWNSHIP 20 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA.

BENCHMARK

RIVET AND PLATE IN TOP OF CURB @ TOWN CENTER AND VILLAGE CENTER ON WEST EDGE OF ROUNDABOUT.

CITY OF LAS VEGAS BENCHMARK OLV00 32E6
LOCATED ON THE NORTHEAST CORNER OF ALTA DR. AND UPPER HILL.
NAVD 88 ELEVATION = 814.1281 METERS, 2671.02 FEET

SUMMERLIN ELEVATION: 2728.11 FEET

NOTE: ADD 2.27' TO THE CURRENTLY USED SUMMERLIN BENCHMARK TO EQUAL TO THE APPROVED CITY OF LAS VEGAS BENCHMARK.

GRADING CONSTRUCTION NOTES

1. CONTRACTOR TO MATCH TO EXISTING 2-12'x12' RCB CULVERT.
2. CONSTRUCT 2-12'x12' RCB CULVERT PER NDOT DETAIL B-20.1.3 & TRENCH RCB SECTION PER DETAIL 1, SHEET C-7.
3. CONTRACTOR TO FIELD VERIFY LOCATION OF EXISTING 60" RCP.
4. INSTALL 60" STORM DRAIN MANHOLE PER CLARK COUNTY STANDARD DRAWING #403.
5. INSTALL 24" CLASS V RCP STUB PER DETAIL 2, SHEET C-7.
6. INSTALL 24" CLASS IV RCP STUB PER DETAIL 2, SHEET C-7.
7. INSTALL EQUALIZATION CHAMBER PER DETAIL A, SHEET C-7.
8. CONTRACTOR TO FIELD VERIFY LOCATION OF EXISTING 18" RCP.
9. CONSTRUCT RCB CULVERT TYPE I HEADWALLS PER NDOT DETAIL B-20.1.5.
10. NOT USED
11. CONSTRUCT LATERAL PER DETAIL 2, SHEET C-7.
12. CONCRETE PAD PER DETAIL "C" SHEET C-7.

NOTE

THIS PROJECT SITE IS LOCATED WITHIN "THE LIMITS OF EXISTING FLOOD ZONE A".

CLV DWG #

THE VILLAGE AT QUEENSRIDGE CULVERT
JMA ARCHITECTURE STUDIOS
STORM DRAIN PLAN AND PROFILE
STA. 10+00.00 TO 17+00.00

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

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DESIGN: JO/OGS
DRAWN: OGS
CHECK: RDC
ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 12-13-05
PLOT TIME: 11:31:43

REV	DATE	DESCRIPTION	DATE	AGEN. APP	DATE	GCW. APP
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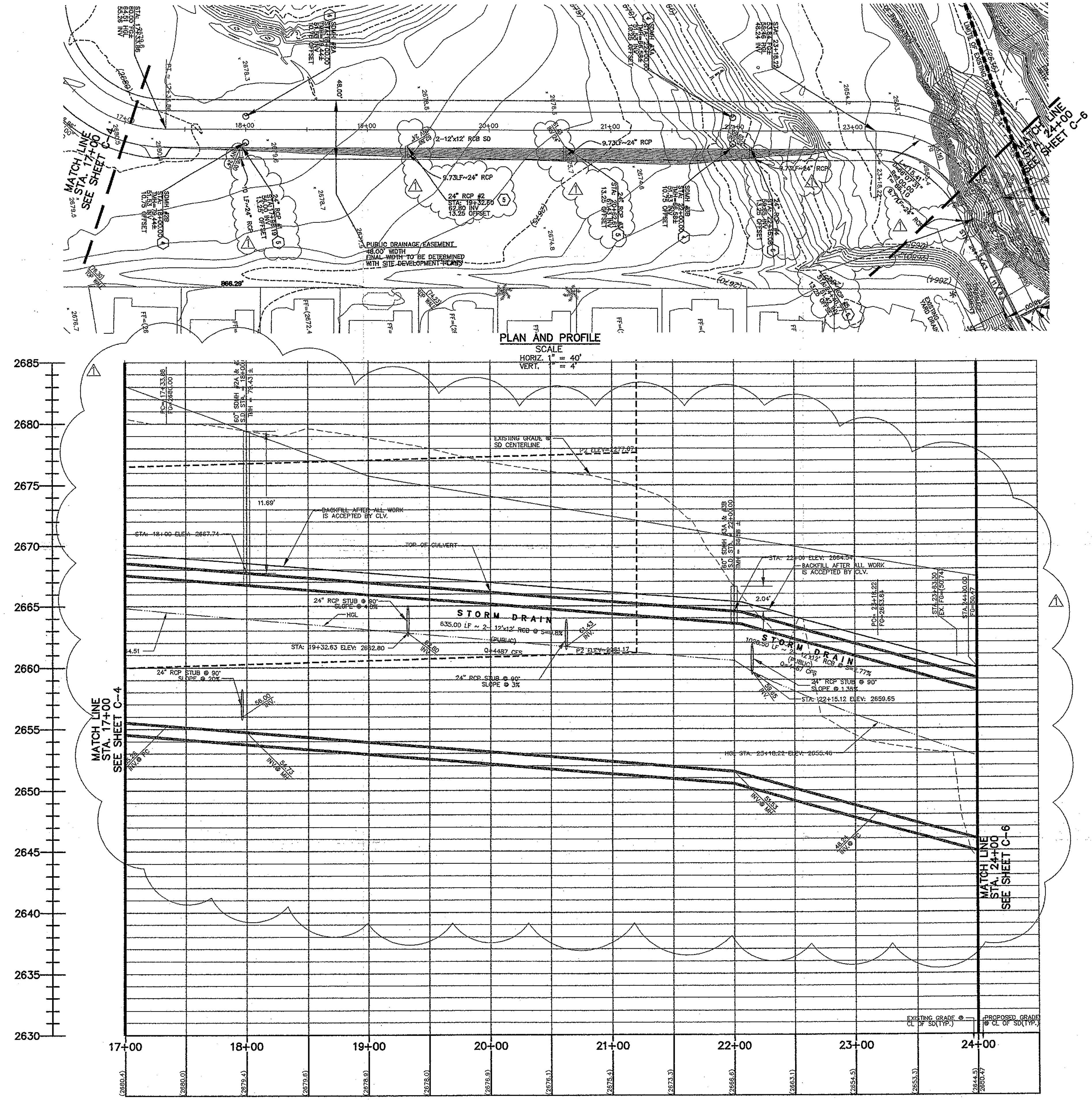
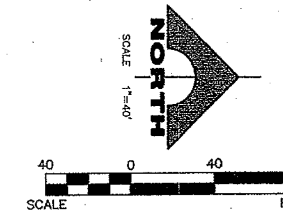
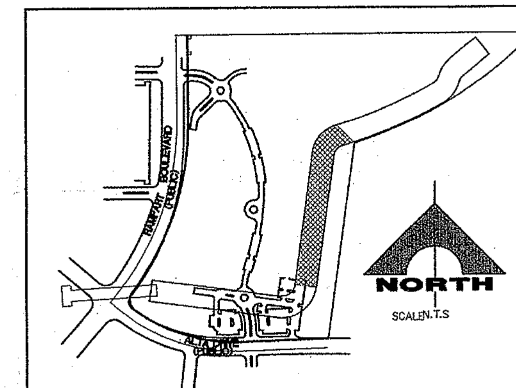
ISSUED FOR DRAINAGE SUBMITTAL

DATE: 12/14/05

DRAWING
C-4
4 OF 11 SHTS







KEYMAP

N.T.S.

BASIS OF BEARING

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BENCHMARK

RIVET AND PLATE IN TOP OF CURB @ TOWN CENTER AND VILLAGE CENTER ON WEST EDGE OF ROUNDABOUT.

CITY OF LAS VEGAS BENCHMARK OLV00 32E6
LOCATED ON THE NORTHEAST CORNER OF ALTA DR. AND UPPER HILL
NAVD 88 ELEVATION = 814.1281 METERS, 2671.02 FEET
SUMMERLIN ELEVATION: 2726.11 FEET

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GRADING CONSTRUCTION NOTES

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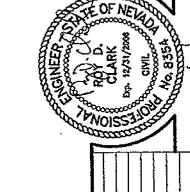
3. CONTRACTOR TO FIELD VERIFY LOCATION OF EXISTING 60" RCP.
4. INSTALL 60" STORM DRAIN MANHOLE PER NDOT DETAIL R-4.7.1. OR CLARK COUNTY STANDARD DRAWING #403.
5. INSTALL 24" CLASS V RCP STUB PER DETAIL 2, SHEET C-7.
6. INSTALL 24" CLASS IV RCP STUB PER DETAIL 2, SHEET C-7.
7. INSTALL EQUALIZATION CHAMBER PER DETAIL A, SHEET C-7.
8. CONTRACTOR TO FIELD VERIFY LOCATION OF EXISTING 18" RCP.
9. CONSTRUCT RCB CULVERT TYPE I HEADWALLS PER NDOT DETAIL B-20.1.5.
10. NOT USED
11. CONSTRUCT LATERAL PER DETAIL 2, SHEET C-7.
12. CONCRETE PAD PER DETAIL "C" SHEET C-7.

NOTE

12' X 12' BOX IS DESIGNED FOR MAX 20' OF FILL PER NEVADA DEPARTMENT OF TRANSPORTATION STANDARDS.

NOTE

THIS PROJECT SITE IS LOCATED WITHIN "THE LIMITS OF EXISTING FLOOD ZONE A".



CLV DWG #

THE VILLAGE AT QUEENSRIDGE CULVERT

JMA ARCHITECTURE STUDIOS

STORM DRAIN PLAN AND PROFILE
STA. 17+00.00 TO 24+00.00

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

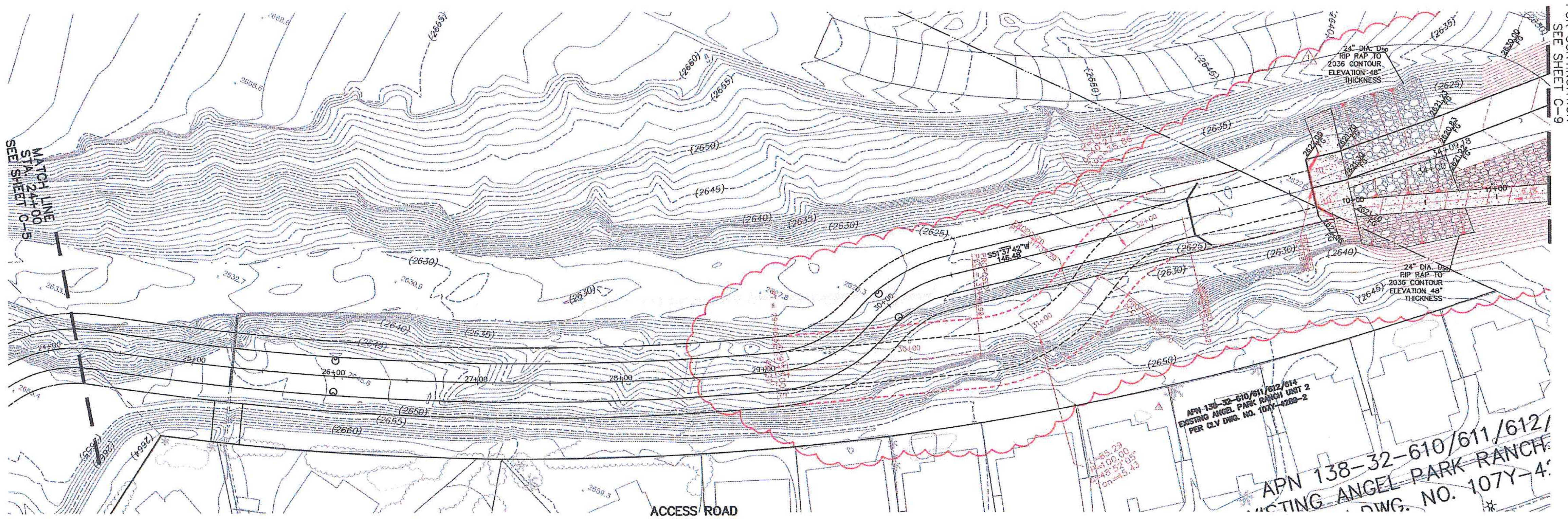
G:\619-295\dwg\Improv\DRAINAGE\QUEEc005.dwg emendoza

DESIGN: JO/OGS/EMEN
DRAWN: OGS/EMEN
CHECK: RDC
ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 12-13-05
PLOT TIME: 11:30:45

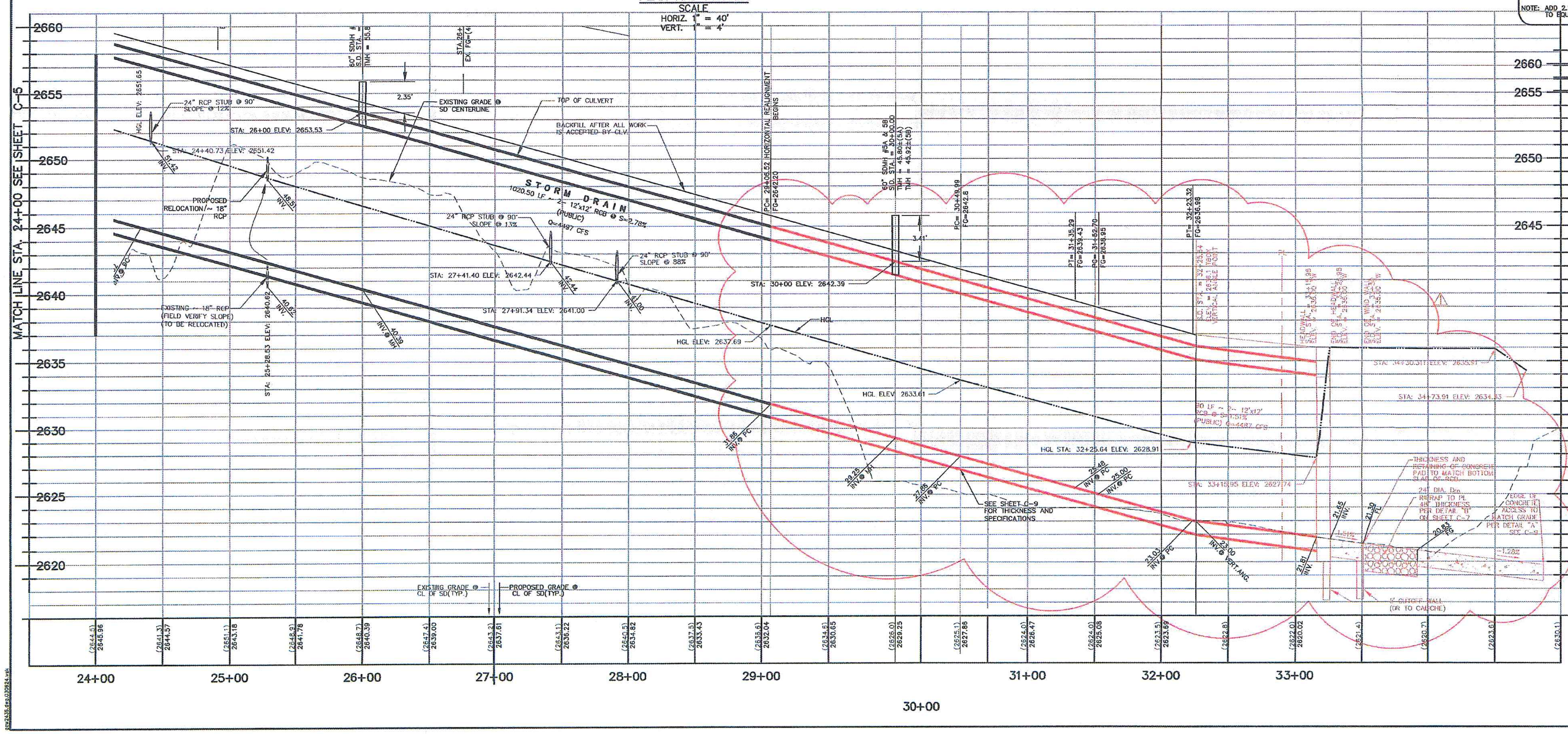
REV	DATE	DESCRIPTION
1	12-7-05	REVICE SLOPE ON CULVERT

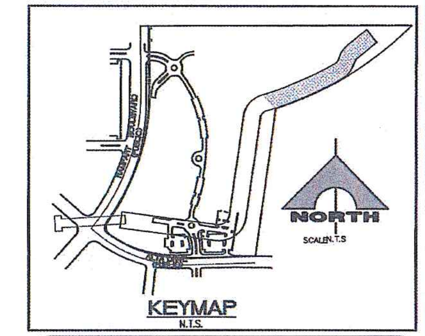
ISSUED FOR DRAINAGE SUBMITTAL

DRAWING
C-5
5 OF 11 SHTS



ACCESS ROAD
PLAN AND PROFILE
SCALE
HORIZ. 1" = 40'
VERT. 1" = 4'





KEYMAP
N.T.S.

BASIS OF BEARING

SOUTH 00°32'07" EAST, BEING THE BEARING OF THE CENTERLINE OF "RAMPART BOULEVARD" AS SHOWN BY MAP THEREOF ON FILE IN FILE 64, PAGE 93 OF SURVEYS IN THE COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA, LYING WITHIN THE NORTH HALF (N 1/2) OF SECTION 32, TOWNSHIP 20 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA.

BENCHMARK

RIVET AND PLATE IN TOP OF CURB @ TOWN CENTER AND VILLAGE CENTER ON WEST EDGE OF ROUNDABOUT.

CITY OF LAS VEGAS BENCHMARK OLVOO 32E6
LOCATED ON THE NORTHEAST CORNER OF ALTA DR. AND UPPER HILL.
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NOTE: ADD 2.27' TO THE CURRENTLY USED SUMMERLIN BENCHMARK TO EQUAL TO THE APPROVED CITY OF LAS VEGAS BENCHMARK.

GRADING CONSTRUCTION NOTES

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6. INSTALL 24" CLASS IV RCP STUB PER DETAIL 2, SHEET C-7.
7. INSTALL EQUALIZATION CHAMBER PER DETAIL A, SHEET C-7.
8. CONTRACTOR TO FIELD VERIFY LOCATION OF EXISTING 18" RCP.
9. CONSTRUCT RCB CULVERT TYPE I HEADWALLS PER NDOT DETAIL B-20.1.5.
10. NOT USED
11. CONSTRUCT LATERAL PER DETAIL 2, SHEET C-7.
12. CONCRETE PAD PER DETAIL "C" SHEET C-7.

NOTE

THIS PROJECT SITE IS LOCATED WITHIN "THE LIMITS OF EXISTING FLOOD ZONE A".

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

Avoid cutting underground utility lines. It's costly.
Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)

Call before you UnderGround
1-702-455-7511
1-702-229-6611

CLV DWG # 107Y-4889-CUL

ISSUED FOR DRAINAGE SUBMITTAL

REV DATE DESCRIPTION DATE AGEN. APP.

DESIGN: JO/OGS
DRAWN: OGS
CHECK: RDC
ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 03-29-06
PLOT TIME: 13:16:45

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299
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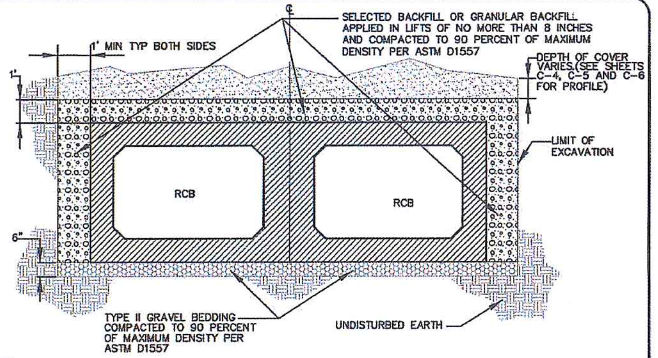
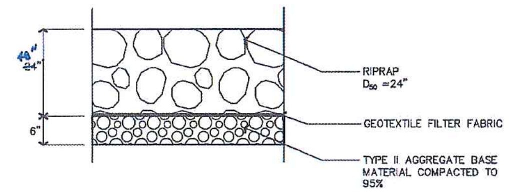
THE VILLAGE AT QUEENSBRIDGE CULVERT
JMA ARCHITECTURE STUDIOS
STORM DRAIN PLAN AND PROFILE
STA. 24+00.00 TO 33+00.00

DRAWING
C-6
6 OF 11 SHTS

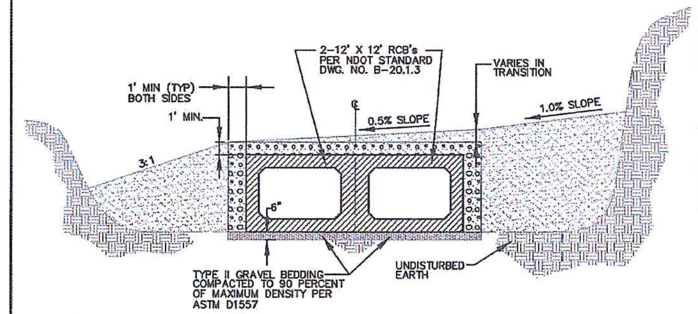


NOTES
1. SLOPE TRENCH SIDES IN ACCORDANCE WITH THE CLARK COUNTY STANDARD SPECIFICATIONS SECTION 208.03.01

TYPICAL RCB TRENCH SECTION (1)
NOT TO SCALE

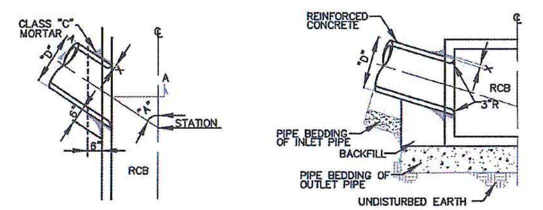


RIP RAP (B)
NOT TO SCALE



NOTES
1. SLOPE TRENCH SIDES IN ACCORDANCE WITH THE CLARK COUNTY STANDARD SPECIFICATIONS SECTION 208.03.01

RCB SECTION AT OUTLET (A-A)
NOT TO SCALE

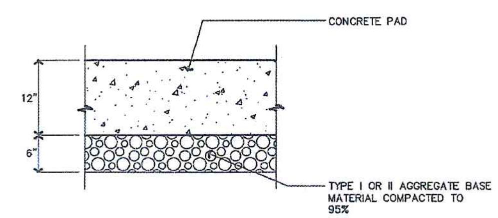


PLAN

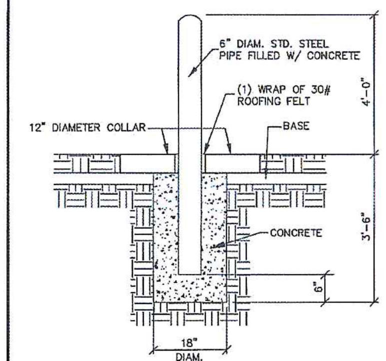
SECTION A-A

NOTES
1. ANGLE "A" SHALL BE BETWEEN 45° AND 90°.
2. DIMENSION "D" SHALL BE EQUAL TO OR LESS THAN 1/2 THE INSIDE DIAMETER OF THE MAINLINE PIPE.
3. DIMENSION "X" SHALL BE 1" MINIMUM AND 3" MAXIMUM.
4. BURN OR CHIP END OF INLET PIPE FLUSH WITH INNER SURFACE OF MAINLINE PIPE, ROUND EDGES OF MAINLINE AND INLET PIPES.
5. REFER TO STRUCTURAL DRAWINGS FOR ADDITIONAL REINFORCEMENT IN RCB WALL.

PIPE TO RCB JUNCTION STRUCTURE DETAIL (2)
NOT TO SCALE

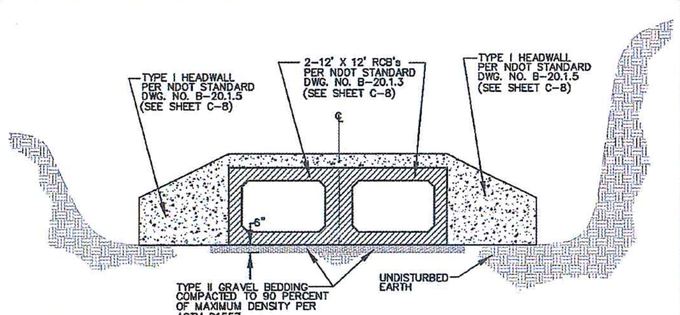


CONCRETE PAD (C)
NOT TO SCALE



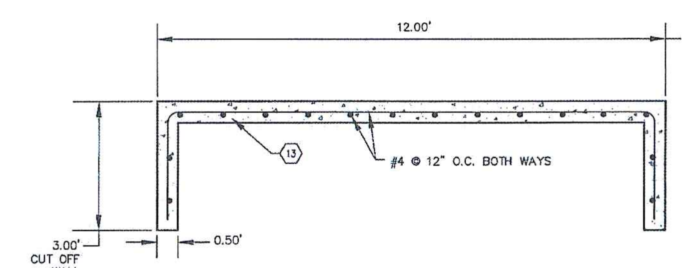
NOTES
1. BOLLARDS TO BE 4" SCH. 40 STEEL PIPE, 7'-0" LONG AND FILLED WITH CONCRETE.
2. PLACE 6" WIDE, YELLOW CLASS 4 REFLECTIVE TAPE (PER STANDARD SPECIFICATIONS, SECTION 716), 4" DOWN FROM TOP, FOR FULL DIAMETER ON ALL BOLLARDS.
3. CONTRACTOR TO ASSURE THAT BOLLARDS ARE PLACED TO ALLOW FULL ACCESS TO THE PROTECTED FACILITY.

BOLLARD POLE DETAIL (D)
NOT TO SCALE

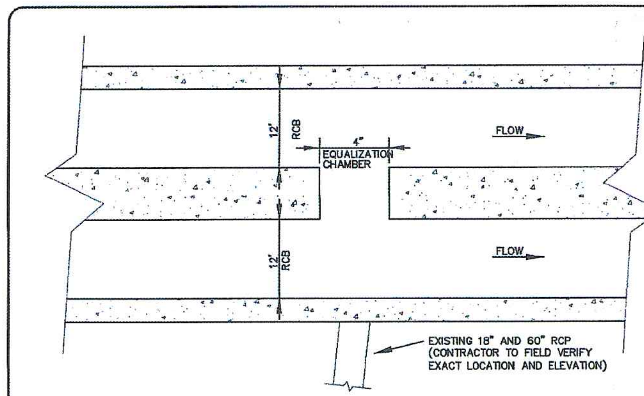


NOTES
1. SLOPE TRENCH SIDES IN ACCORDANCE WITH THE CLARK COUNTY STANDARD SPECIFICATIONS SECTION 208.03.01

HEADWALL DETAIL (3)
NOT TO SCALE



ACCESS ROAD DETAIL (E)
NOT TO SCALE



EQUALIZATION CHAMBER DETAIL (A)
NOT TO SCALE

gcw2435.dwg.030624.wsk

BASIS OF BEARING

SOUTH 00°32'07" EAST, BEING THE BEARING OF THE CENTERLINE OF "RAMPART BOULEVARD" AS SHOWN BY MAP THEREOF ON FILE IN FILE 64, PAGE 93 OF SURVEYS IN THE COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA, LYING WITHIN THE NORTH HALF (N 1/2) OF SECTION 32, TOWNSHIP 20 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA.

BENCHMARK

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CITY OF LAS VEGAS BENCHMARK OLV00 32E6
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NOTE
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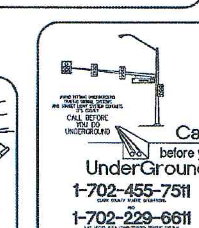


CLV DWG #

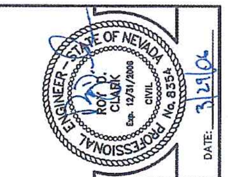
THE VILLAGE AT QUEENSRIDGE CULVERT
JMA ARCHITECTURE STUDIOS
DETAILS SHEET

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299
G:\619-295\drainage\DRAINAGE111405\QUEEc007.dwg Emendozo

DESIGN: JO/OGS
DRAWN: OGS
CHECK: RDC
ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 03-29-06
PLOT TIME: 13:19:56

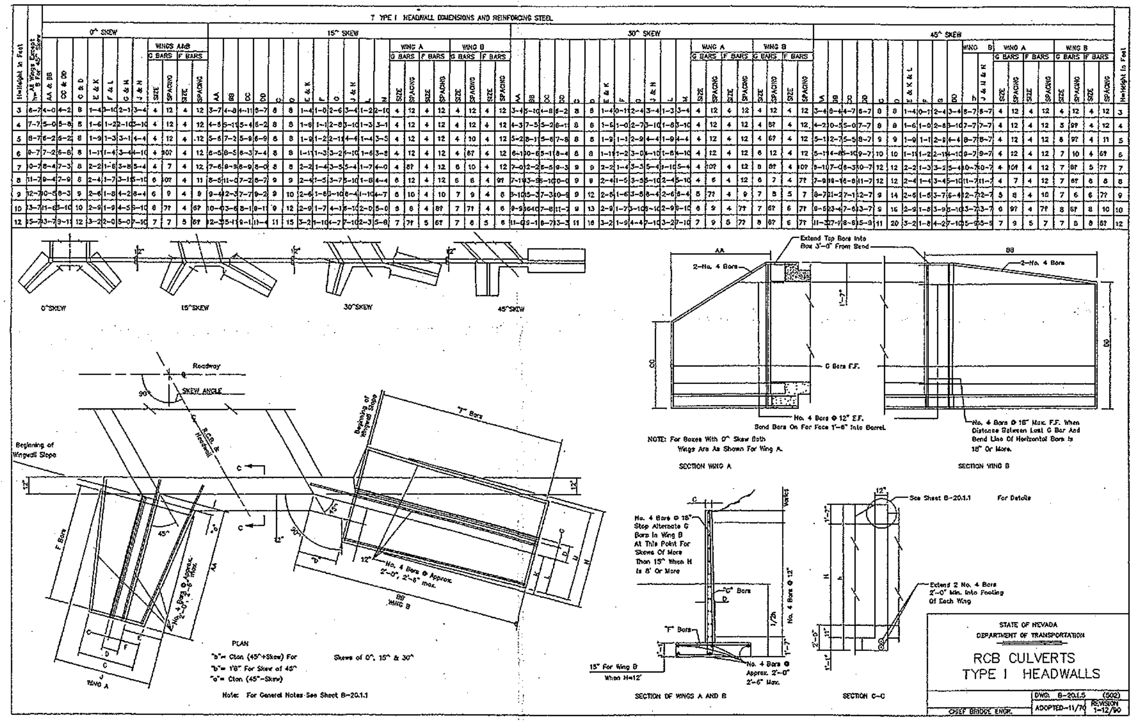
REV	DATE	DESCRIPTION	DATE	AGEN.	APP.	DATE	GCW.	APP.

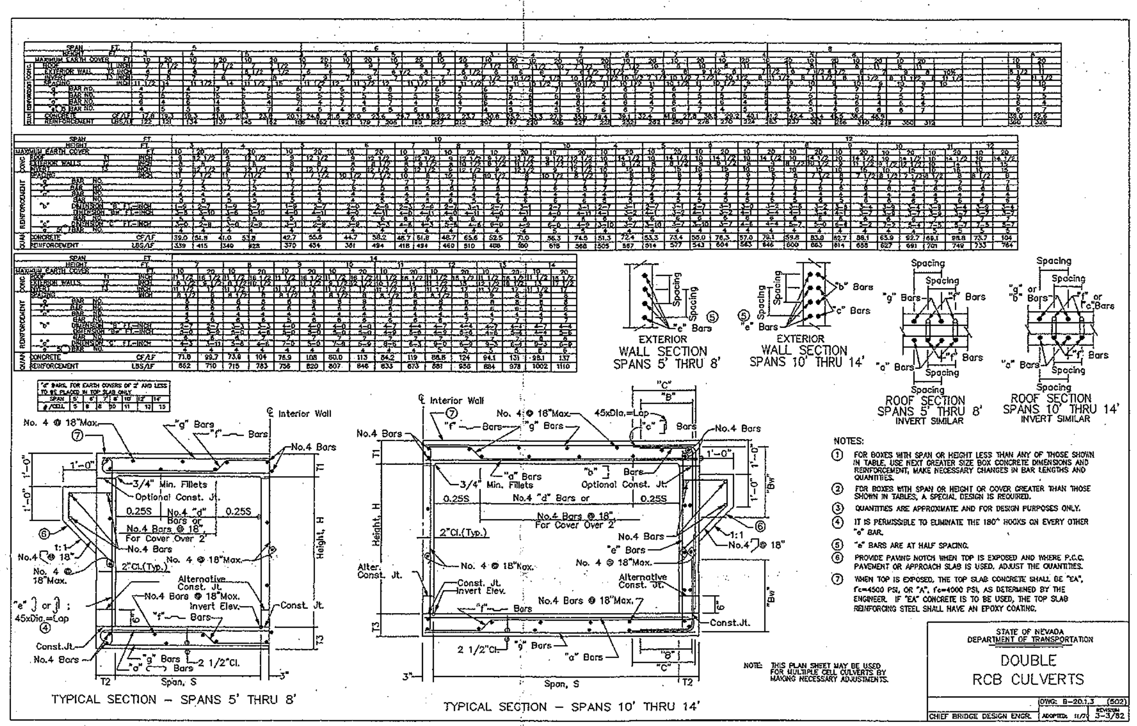
ISSUED FOR DRAINAGE SUBMITTAL



DATE: 3/29/06

DRAWING
C-7
7 OF 11 SHTS





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BENCHMARK

RIVET AND PLATE IN TOP OF CURB @ TOWN CENTER AND VILLAGE CENTER ON WEST EDGE OF ROUNDABOUT.

CITY OF LAS VEGAS BENCHMARK 0LV00 32E6
LOCATED ON THE NORTHEAST CORNER OF ALTA DR. AND UPPER HILL.
NAVD 88 ELEVATION = 814.1281 METERS, 2871.02 FEET
SUMMERLIN ELEVATION: 2726.11 FEET

NOTE: ADD 2.27' TO THE CURRENTLY USED SUMMERLIN BENCHMARK TO EQUAL TO THE APPROVED CITY OF LAS VEGAS BENCHMARK.

NOTE

THIS PROJECT SITE IS LOCATED WITHIN "THE LIMITS OF EXISTING FLOOD ZONE A".

Call before you Dig. 1-800-227-2600

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD. 1-702-227-2929

Call before you UnderGround 1-702-455-7511 1-702-229-6611

CLV DWG #

THE VILLAGE AT QUEENSRIDGE CULVERT

JMA ARCHITECTURE STUDIOS

DETAILS SHEET

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

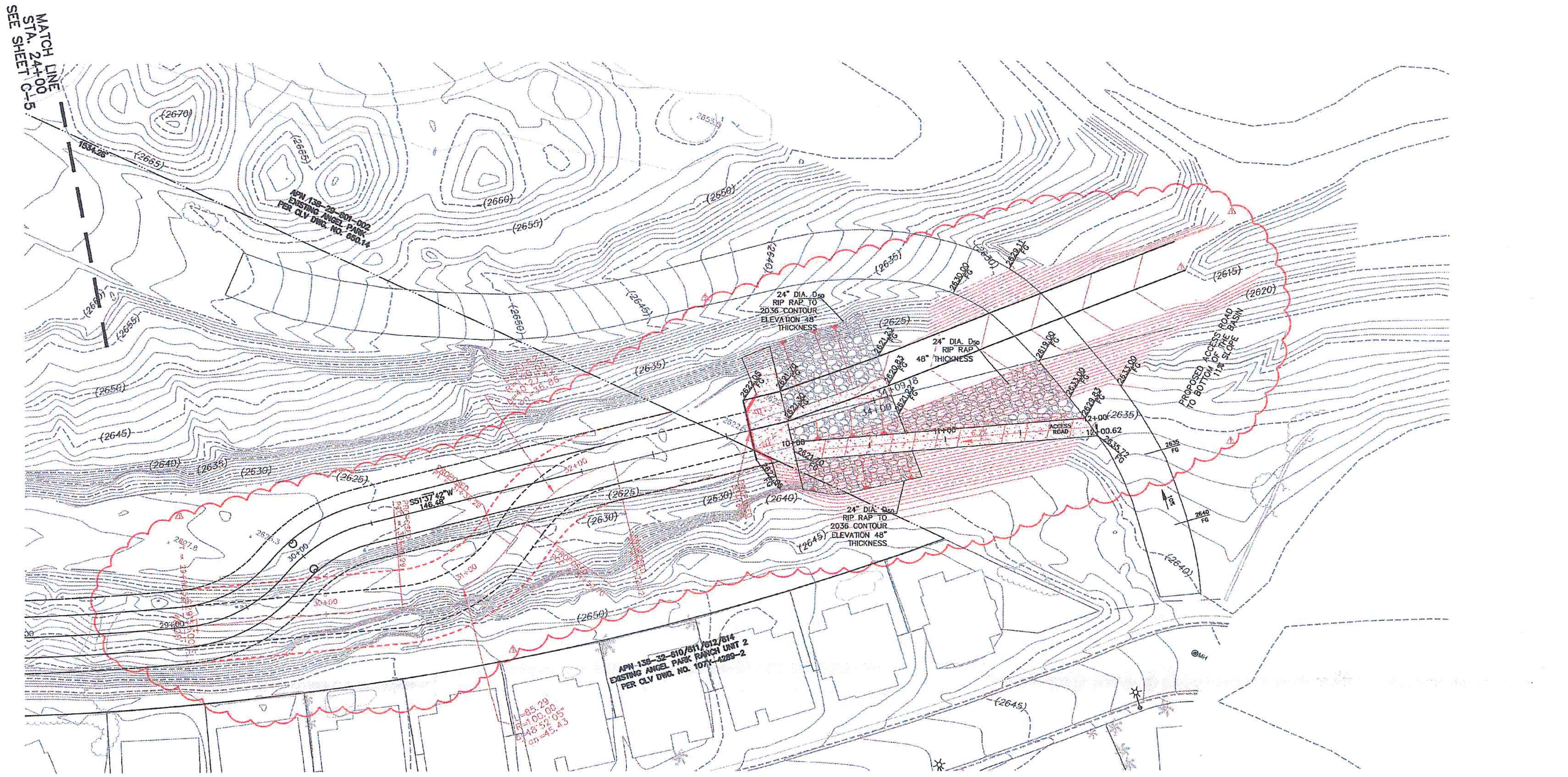
G:\619-295\dwg\improv\DRAINAGE\QUEEc008.dwg kremus

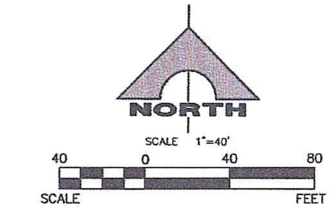
DESIGN: JO/OGS
DRAWN: OGS
CHECK: RDC
ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 07-22-05
PLOT TIME: 10:48:55

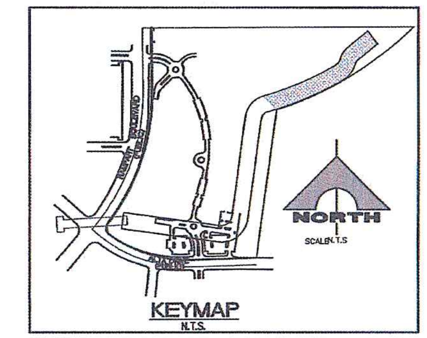
REV	DATE	DESCRIPTION	DATE	AGEN. APP.	DATE	CCW. APP.

ISSUED FOR DRAINAGE SUBMITTAL

DRAWING
C-8
8 OF 11 SHTS







BASIS OF BEARING

SOUTH 00°32'07" EAST, BEING THE BEARING OF THE CENTERLINE OF "RAMPART BOULEVARD" AS SHOWN BY MAP THEREOF ON FILE IN FILE 64, PAGE 93 OF SURVEYS IN THE COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA, LYING WITHIN THE NORTH HALF (N 1/2) OF SECTION 32, TOWNSHIP 20 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA.

BENCHMARK

RIVET AND PLATE IN TOP OF CURB @ TOWN CENTER AND VILLAGE CENTER ON WEST EDGE OF ROUNDABOUT.

CITY OF LAS VEGAS BENCHMARK OLV00 32E6
LOCATED ON THE NORTHEAST CORNER OF ALTA DR. AND UPPER HILL.
NAVD 88 ELEVATION = 814.1281 METERS, 2671.02 FEET

SUMMERLIN ELEVATION: 2726.11 FEET

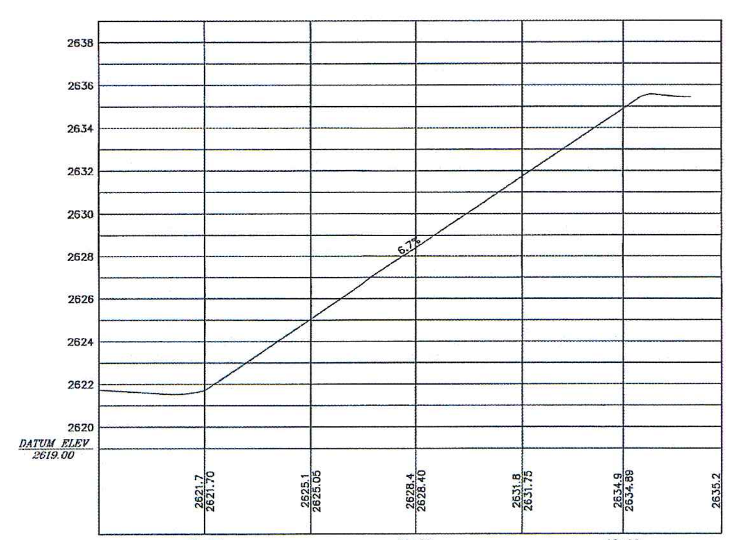
NOTE: ADD 2.27' TO THE CURRENTLY USED SUMMERLIN BENCHMARK TO EQUAL TO THE APPROVED CITY OF LAS VEGAS BENCHMARK.

NOTE

THIS PROJECT SITE IS LOCATED WITHIN "THE LIMITS OF EXISTING FLOOD ZONE A".

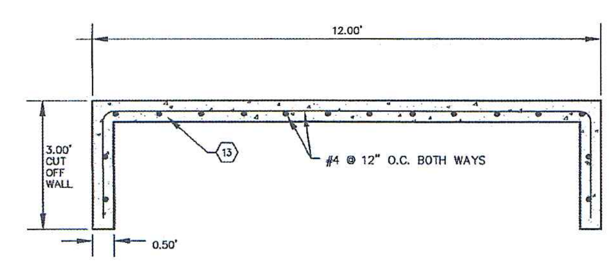
ACCESS ROAD PLAN AND PROFILE

SCALE
HORIZ. 1" = 40'
VERT. 1" = 4'



GRADING CONSTRUCTION NOTES

1. CONTRACTOR TO MATCH TO EXISTING 2-12'x12' RCB CULVERT.
2. CONSTRUCT 2-12'x12' RCB CULVERT PER NDOT DETAIL B-20.1.3 & TRENCH RCB SECTION PER DETAIL 1, SHEET C-7.
3. CONTRACTOR TO FIELD VERIFY LOCATION OF EXISTING 60" RCP.
4. INSTALL 60" STORM DRAIN MANHOLE PER CLARK COUNTY STANDARD DRAWING #403.
5. INSTALL 24" CLASS V RCP STUB PER DETAIL 2, SHEET C-7.
6. INSTALL 24" CLASS IV RCP STUB PER DETAIL 2, SHEET C-7.
7. INSTALL EQUALIZATION CHAMBER PER DETAIL A, SHEET C-7.
8. CONTRACTOR TO FIELD VERIFY LOCATION OF EXISTING 18" RCP.
9. CONSTRUCT RCB CULVERT TYPE I HEADWALLS PER NDOT DETAIL B-20.1.5.
10. NOT USED
11. CONSTRUCT LATERAL PER DETAIL 2, SHEET C-7.
12. CONCRETE PAD PER DETAIL "C" SHEET C-7.
13. 6" CLASS "A" CONCRETE, #4 BARS 12" O.C. BOTH WAYS AT THE CENTER OF SLAB. SEE DETAIL ON SHEET C-9.



ACCESS ROAD DETAIL
SECTION 'A'

CLV DWG # 107Y-4889-CUL

THE VILLAGE AT QUEENSRIDGE CULVERT
JMA ARCHITECTURE STUDIOS
CHANNEL REGRADING PLAN
STA. 24+00.00 TO 33+00.00

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299
G:\619-295\drainage\DRAINAGE111405\QUEEc006.dwg Emendoza

DESIGN: JO/OGS
DRAWN: OGS
CHECK: RDC
ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 03-29-06
PLOT TIME: 13:17:07

REV	DATE	DESCRIPTION	DATE	AGEN. APP.	DATE	GCW. APP.
1	2/14/06	HORIZONTAL ALIGNMENT REVISION AND REGRADE CHANNEL				

ISSUED FOR DRAINAGE SUBMITTAL

PROFESSIONAL ENGINEER – STATE OF NEVADA
ROY D. CLARK
CIVIL
No. 8354
Exp. 12/31/2008

DATE: 3/29/06

DRAWING
C-9
9 OF 11 SHTS

```
1*****************************************                                                   ***************************************
 *                                       *                                                   *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                   *  U.S. ARMY CORPS OF ENGINEERS       *
 *              JUN   1998               *                                                   *  HYDROLOGIC ENGINEERING CENTER      *
 *           VERSION 4.1                 *                                                   *        609 SECOND STREET            *
 *                                       *                                                   *     DAVIS, CALIFORNIA 95616         *
 * RUN DATE   23JUN08  TIME  10:11:08    *                                                   *        (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

                       *DIAGRAM
 *** FREE ***
           1           ID   CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT 2008 MASTER PLAN UPDATE
           2           ID   GOWAN WATERSHED (ALL)
           3           ID   RECOMMENDED DRAINAGE SYSTEM WITH ULTIMATE DEVELOPMENT
           4           ID   INPUT FILE = ALLGOW3.DAT
           5           ID   INPUT FILE DATE = MAY 5, 2008
           6           ID   DESIGN STORM = 100-YEAR 6-HR STORM
           7           ID   STORM DISTRIBUTION = SDN #3
           8           ID   MODELED BY PBS&J (MICHELE L. D'ALESSANDRO, E.I., CFM)
           9           ID   CHECKED BY PBS&J (HARSHAL B. DESAI, P.E., CFM)
          10           ID   STORM CENTERING = FULL WATERSHED
          11           ID
          12           ID   REFERENCED HYDROLOGIC MODELS:
          13           ID   CITY OF LAS VEGAS CITY WIDE HYDROLOGY ANALYSIS (PBS&J 1997)
          14           ID   NORTHWEST NEIGHBORHOOD STUDY PHASE 1 (PBS&J 1997)
          15           ID   RESPONSE TO COMMENTS ON THE 2006 SUMMERLIN WEST PLANNING AREA FLOOD
          16           ID   CONTROL MASTER PLAN UPDATE (G.C. WALLACE 2006)
          17           ID   3RD RESPONSE TO COMMENTS ON THE 2006 SUMMERLIN WEST PLANNING AREA FLOOD
          18           ID   CONTROL MASTER PLAN UPDATE (G.C. WALLACE 2006)
          19           ID   SUPPLEMENT FOR THE 2006 SUMMERLIN WEST PLANNING AREA FLOOD CONTROL
          20           ID   MASTER PLAN UPDATE (G.C. WALLACE 2006)
          21           ID   GOWAN OUTFALL - LONE MOUNTAIN BRANCH PRELIMINARY DESIGN REPORT
          22           ID   (G.C. WALLACE 2007)
          23           ID   LONE MOUNTAIN WESTERN BELTWAY DETENTION BASIN PARAMETERS (RECEIVED
          24           ID   FROM G.C. WALLACE ON JANUARY 31, 2008)
          25           ID   US 95/RANCHO FIS RESTUDY (PBS&J 1998)
          26           ID   JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
          27           ID
          28           ID                          AREA    DARF
          29           ID                          SQ. MI.
          30           ID                          0-0.5   0.99
          31           ID                          0.5-1   0.975
          32           ID                          1-2     0.95
          33           ID                          2-3     0.925
          34           ID                          3-4     0.915
          35           ID                          4-5     0.908
          36           ID                          5-6     0.903
          37           ID                          6-7     0.895
          38           ID                          7-8     0.885
          39           ID
          40           ID  JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)
          41           ID
          42           ID  100-YEAR,  6-HOUR STORM,  SDN3
          43           ID
          44           IT       5       0       0     650
          45           IO       5       0       0
          46           IN       5       0       0
          47           JR    PREC    0.99   0.975    0.95   0.925   0.915   0.908   0.903   0.895   0.885
                       *
1                                          HEC-1 INPUT                                              PAGE  2

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


          48           KK  LV29-C
          49           BA   0.277
          50           PB    2.80
          51           PC       0    0.02   0.057    0.07   0.087   0.108   0.124    0.13    0.13    0.13
          52           PC    0.13    0.13    0.13   0.133    0.14   0.142   0.148   0.158   0.172   0.181
          53           PC    0.19   0.197   0.199     0.2   0.201   0.204   0.214   0.229   0.241   0.249
          54           PC   0.251   0.256    0.27   0.278   0.281   0.283   0.295   0.322   0.352   0.409
          55           PC   0.499    0.59    0.71   0.744   0.781   0.812   0.819   0.835   0.851   0.856
          56           PC    0.86   0.868   0.876   0.888    0.91   0.926   0.937    0.95    0.97   0.976
          57           PC   0.982   0.985   0.987   0.989    0.99   0.993   0.993   0.994   0.995   0.998
          58           PC   0.998   0.999       1
          59           LS       0    90.6
          60           UD   0.409
                       *

          61           KK RLV29-C
          62           KM  ROUTE LV29-C TO CLV30-C
          63           KM  FACILITY = GOWAN - TENAYA BRANCH
          64           KM  FACILITY # = GOTE 0000
```

```
         1850          KM   CONVERTED TO MUSKINGUM-CUNGE TO ACHIEVE STABILITY
         1851          RD     1559     0.02     0.04        0     TRAP      100        3
                       *
1                                                HEC-1 INPUT                                          PAGE 50

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

         1852          KK     SW11
         1853          BA    0.589
         1854          PB     3.34
         1855          LS        0     87.8
         1856          UD    0.311
                       *

         1857          KK    RSW11
         1858          KM   ROUTE SW11 TO CSW17
         1859          KM   FACILITY = ANGEL PARK - CHARLESTON BOULEVARD
         1860          KM   FACILITY # = APCB 0064, 0080
         1861          KM   LINING = RCB
         1862          RD     2338  0.0167    0.015        0     TRAP        7        0
                       *

         1863          KK     SW17
         1864          BA    0.356
         1865          PB     3.30
         1866          LS        0     87.8
         1867          UD    0.271
                       *

         1868          KK    CSW17
         1869          KM   COMBINE RSW11 AND SW17
         1870          HC        2
                       *

         1871          KK   RCSW17
         1872          KM   ROUTE CSW17 TO CSW18
         1873          KM   FACILITY = ANGEL PARK - CHARLESTON BOULEVARD
         1874          KM   FACILITY # = APCB 0000,0001,0019,0050
         1875          KM   LINING = RCB
         1876          RD     3600   0.014    0.015        0     TRAP       11        0
                       *

         1877          KK     SW18
         1878          BA    0.405
         1879          PB     3.27
         1880          LS        0     86.8
         1881          UD    0.271
                       *

         1882          KK    CSW18
         1883          KM   COMBINE RCSW17 AND SW18
         1884          HC        2
                       *

         1885          KK   RCSW18
         1886          KM   ROUTE CSW18 TO C12A
         1887          KM   FACILITY = ANGEL PARK SOUTH
         1888          KM   FACILITY # = APSO 0254,0255,0258,0345,0346; APCB 0000
         1889          KM   NATURAL WASH
         1890          KM   LENGTH = 5,200
         1891          KM   SLOPE = 1.4%
1                                                HEC-1 INPUT                                          PAGE 51

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

         1892          KM   N = 0.040
         1893          KM   HYDRAULIC RADIUS = 1.5
         1894          KM   VELOCITY =  9.2
         1895          RM        2   0.157     0.15
                       *

         1896          KK      12A
         1897          BA    0.392
         1898          PB     3.20
         1899          LS        0     91.2
         1900          UD    0.264
                       *

         1901          KK     C12A
         1902          KM   COMBINE 12A AND RCSW18
         1903          HC        2
                       *

         1904          KK    RC12A
         1905          KM   ROUTE THRU 12B
         1906          KM   FACILITY = ANGEL PARK SOUTH
         1907          KM   FACILITY # = APSO 0204, 0205
         1908          KM   NATURAL WASH
         1909          KM   LENGTH = 2,600
         1910          KM   SLOPE = 3.5%
         1911          KM   N = 0.040
         1912          KM   HYDRAULIC RADIUS = 1.5
         1913          KM   VELOCITY = 14.5
         1914          RM        1     0.05     0.15
                       *

         1915          KK      12B
         1916          BA    0.260
         1917          PB     3.13
         1918          LS        0     91.0
         1919          UD    0.233
                       *

         1920          KK     C12B
         1921          KM   COMBINE 12B AND RC12A
         1922          HC        2
                       *

         1923          KK    RC12B
         1924          KM   ROUTE C12B TO C57B-3
         1925          KM   FACILITY = ANGEL PARK SOUTH
```

Begin Reference

```
      1926          KM  FACILITY # = APSO 0067
      1927          KM  NATURAL WASH
      1928          KM  LENGTH = 6,000
      1929          KM  SLOPE = 2.3%
      1930          KM  N = 0.040
      1931          KM  HYDRAULIC RADIUS = 1.5
      1932          KM  VELOCITY =  11.8
      1933          RM       2   0.141    0.15
                    *
1                                          HEC-1 INPUT                                          PAGE 52

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


      1934          KK   57B-3
      1935          BA   0.310
      1936          PB    3.04
      1937          LS       0      82.1
      1938          UD   0.332
                    *

      1939          KK  C57B-3
      1940          KM  COMBINE RC12B AND 57B-3
      1941          HC       2
                    *

      1942          KK RC57B-3
      1943          KM  ROUTE C57B-3 TO C57B-2
      1944          KM  FACILITY = ANGEL PARK SOUTH
      1945          KM  FACILITY # = APSO 0067
      1946          KM  NATURAL WASH
      1947          KM  LENGTH = 1,300
      1948          KM  SLOPE = 1.7%
      1949          KM  N = 0.040
      1950          KM  HYDRAULIC RADIUS = 1.5
      1951          KM  VELOCITY =  10.2
      1952          RM       0   0.035    0.15
                    *

      1953          KK   57B-2
      1954          BA   0.362
      1955          PB    3.02
      1956          LS       0      84.1
      1957          UD   0.332
                    *

      1958          KK  C57B-2
      1959          KM  COMBINE 57B-2 AND RC57B-3
      1960          HC       2
                    *

      1961          KK RC57B-2
      1962          KM  ROUTE C57B-2 TO CC57B-1
      1963          KM  FACILITY = ANGEL PARK SOUTH
      1964          KM  FACILITY # = APSO 0067
      1965          KM  NATURAL WASH
      1966          KM  LENGTH = 1,000
      1967          KM  SLOPE = 1.8%
      1968          KM  N = 0.040
      1969          KM  HYDRAULIC RADIUS = 1.5
      1970          KM  VELOCITY =  10.5
      1971          RM       0   0.027    0.15
                    *
1                                          HEC-1 INPUT                                          PAGE 53

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


      1972          KK   13B-1
      1973          BA   0.249
      1974          PB    3.19
      1975          LS       0      91.6
      1976          UD   0.284
                    *

      1977          KK RC13B-1
      1978          KM  ROUTE 13B-1 TO C13B-2
      1979          KM  GRIFFITH PARK DRIVE AND HUALAPAI WAY
      1980          RD    3000   0.018   0.016        0     TRAP       0       50
                    *

      1981          KK   13B-2
      1982          BA   0.216
      1983          PB    3.14
      1984          LS       0      89.7
      1985          UD   0.231
                    *

      1986          KK  C13B-2
      1987          KM  COMBINE 13B-2 AND RC13B-1
      1988          KM  HUALAPAI WAY AND LOCAL FACILITY
      1989          HC       2
                    *

      1990          KK RC13B-2
      1991          KM  ROUTE C13B-2 TO CCPIC-A
      1992          KM  LINING = GRASS
      1993          RD    4900   0.021    0.03        0     TRAP      40        6
                    *

      1994          KK     19A
      1995          BA   0.253
      1996          PB    3.25
      1997          LS       0      89.9
      1998          UD   0.351
                    *

      1999          KK    R19A
      2000          KM  ROUTE 19A TO C13A-1
      2001          KM  UNNAMED ROAD
      2002          RD    4300   0.021   0.016        0     TRAP       0       50
                    *
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2003           KK   13A-1
2004           BA   0.224
2005           PB    3.19
2006           LS       0     91.4
2007           UD   0.302
               *
1                                        HEC-1 INPUT                                PAGE 54

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


2008           KK  C13A-1
2009           KM  COMBINE 13A-1 AND R19A
2010           KM  TOWN CENTER DRIVE AND SWALE
2011           HC       2
               *

2012           KK RC13A-1
2013           KM  ROUTE C13A-1 TO C13A-2
2014           KM  NATURAL WASH
2015           KM  TRAVEL LENGTH = 2,800
2016           KM  SLOPE = 2.1%
2017           KM  N = 0.040
2018           KM  HYDRAULIC RADIUS = 1.5
2019           KM  VELOCITY = 11.4
2020           RM       1   0.068     0.15
               *

2021           KK   13A-2
2022           BA   0.188
2023           PB    3.15
2024           LS       0     90.0
2025           UD   0.236
               *

2026           KK  C13A-2
2027           KM  COMBINE 13A-2 AND RC13A-1
2028           HC       2
               *

2029           KK RC13A-2
2030           KM  ROUTE C13A-2 TO CPIC-C
2031           KM  LINING = GRASS
2032           RD    5200   0.015     0.03       0    TRAP      40       4
               *

2033           KK   PIC-C
2034           BA   0.243
2035           PB    3.08
2036           LS       0     90.4
2037           UD   0.373
               *

2038           KK  CPIC-C
2039           KM  COMBINE PIC-C AND RC13A-2
2040           HC       2
               *

2041           KK RCPIC-C
2042           KM  ROUTE CPIC-C TO CPIC-A
2043           KM  LINING = GRASS
2044           RD    2200   0.025     0.03       0    TRAP      40       4
               *
1                                        HEC-1 INPUT                                PAGE 55

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


2045           KK   PIC-A
2046           BA   0.359
2047           PB    3.03
2048           LS       0     91.1
2049           UD   0.499
               *

2050           KK  CPIC-A
2051           KM  COMBINE RCPIC-C AND PIC-A
2052           HC       2
               *

2053           KK CCPIC-A
2054           KM  COMBINE CPIC-A AND RC13B-2
2055           HC       2
               *

2056           KKRCCPIC-A
2057           KM  ROUTE CCPIC-A TO C57B-1
2058           KM  FACILITY = ANGEL PARK - PECCOLE 2
2059           KM  FACILITY # = APP2 0000
2060           KM  LINING = GRASS
2061           RD    4793   0.021     0.03       0    TRAP      10       2
               *

2062           KK   57B-1
2063           BA   0.197
2064           PB    2.92
2065           LS       0     85.5
2066           UD   0.277
               *

2067           KK  C57B-1
2068           KM  COMBINE 57B-1 AND RCCPIC-A
2069           HC       2
               *

2070           KK CC57B-1
2071           KM  COMBINE C57B-1 AND RC57B-2
2072           HC       2
               *

2073           KKRCC57B-1
```

```
2074          KM  ROUTE CC57B-1 TO C57B-4
2075          KM  FACILITY = ANGEL PARK - SOUTH BRANCH
2076          KM  FACILITY # = APSO 0050
2077          KM  LINING = NATURAL WASH
2078          RD     300  0.0184    0.04       0    TRAP     100       3
              *
```

1 HEC-1 INPUT PAGE 56

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

2079          KK   57B-4
2080          BA   0.200
2081          PB     2.91
2082          LS       0     90.0
2083          UD   0.233
              *

2084          KK  C57B-4
2085          KM  COMBINE RCC57B-1 AND 57B-4
2086          HC        2
              *

2087          KK   PIC-B
2088          BA   0.441
2089          PB     2.98
2090          LS       0     91.1
2091          UD   0.471
              *

2092          KK  RPIC-B
2093          KM  ROUTE PIC-B TO CC57B-4
2094          KM  FACILITY = ANGEL PARK - PECCOLE 1
2095          KM  FACILITY # = APP1 0000
2096          KM  LINING = RCP
2097          RD    2982   0.024   0.013       0    CIRC       6
              *

2098          KK CC57B-4
2099          KM  COMBINE RPIC-B AND C57B-4
2100          HC        2
              *
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END Reference

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2101          KKRCC57B-4
2102          KM  ROUTE CC57B-4 TO ANGLPKIN
2103          KM  FACILITY = ANGEL PARK SOUTH
2104          KM  FACILITY # = APSO 0000, 0020
2105          KM  LINING = RCB
2106          RD    2857  0.0162   0.015       0    TRAP      24       0
              *

2107          KK     38A
2108          BA   0.353
2109          PB     2.86
2110          LS       0     91.6
2111          UD   0.399
              *

2112          KK    R38A
2113          KM  ROUTE 38A TO C38B
2114          KM  FACILITY = ANGEL PARK - DURANGO
2115          KM  FACILITY # = APDG 0000,0060
2116          KM  LINING = RCP
2117          RD    4500  0.0096   0.015       0    CIRC       6
              *
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

2118          KK     38B
2119          BA   0.440
2120          PB     2.82
2121          LS       0     92.9
2122          UD   0.375
              *

2123          KK    C38B
2124          KM  COMBINE 38B AND R38A
2125          KM  DUCHARME AND DURANGO
2126          HC        2
              *

2127          KK    57BA
2128          BA   0.317
2129          PB     2.96
2130          LS       0     78.2
2131          UD   0.436
              *

2132          KK   R57BA
2133          KM  ROUTE 57BA TO C3C
2134          KM  RAMPART BOULEVARD
2135          RD     500    0.02   0.016       0    TRAP       0      50
              *

2136          KK      3C
2137          BA   0.153
2138          PB     2.90
2139          LS       0     93.1
2140          UD   0.246
              *

2141          KK     C3C
2142          KM  COMBINE 3C AND R57BA
2143          KM  RAMPART AND REGENT LAS VEGAS
2144          HC        2
              *

2145          KK    RC3C
2146          KM  ROUTE C3C TO ANGLPKIN
2147          KM  LINING = UNLINED
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1837            .           .           .       SF2-C
1842            .           .      CSF2-C............
                .           .           V
1845            .           .     RCSF2-C
1852            .           .           .        SW11
                .           .           .           V
1857            .           .           .       RSW11
1863            .           .           .           .        SW17
1868            .           .           .       CSW17............
                .           .           .           V
1871            .           .           .      RCSW17
1877            .           .           .           .        SW18
1882            .           .           .       CSW18............
                .           .           .           V
1885            .           .           .      RCSW18
1896            .           .           .           .         12A
1901            .           .           .        C12A............
                .           .           .           V
1904            .           .           .       RC12A
1915            .           .           .           .         12B
1920            .           .           .        C12B............
                .           .           .           V
1923            .           .           .       RC12B
1934            .           .           .           .       57B-3
1939            .           .           .      C57B-3............
                .           .           .           V
1942            .           .           .     RC57B-3
1953            .           .           .           .       57B-2
1958            .           .           .      C57B-2............
                .           .           .           V
1961            .           .           .     RC57B-2
1972            .           .           .           .       13B-1
                .           .           .           .           V
1977            .           .           .           .     RC13B-1
1981            .           .           .           .           .       13B-2
1986            .           .           .           .      C13B-2............
                .           .           .           .           V
1990            .           .           .           .     RC13B-2
1994            .           .           .           .           .         19A
                .           .           .           .           .           V
1999            .           .           .           .           .        R19A
2003            .           .           .           .           .           .       13A-1
2008            .           .           .           .           .      C13A-1............
                .           .           .           .           .           V
2012            .           .           .           .           .     RC13A-1
2021            .           .           .           .           .           .       13A-2
2026            .           .           .           .           .      C13A-2............
                .           .           .           .           .           V
2029            .           .           .           .           .     RC13A-2
2033            .           .           .           .           .           .       PIC-C
                .           .           .           .           .           .           .
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Begin Reference

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                                                            ALLGOW3.OUT
2038            .           .           .           .           .      CPIC-C............
                .           .           .           .           .           v
                .           .           .           .           .           v
2041            .           .           .           .           .     RCPIC-C
2045            .           .           .           .           .           .       PIC-A
2050            .           .           .           .           .      CPIC-A............
2053            .           .           .           .     CCPIC-A............
                .           .           .           .           v
                .           .           .           .           v
2056            .           .           .           .    RCCPIC-A
2062            .           .           .           .           .       57B-1
2067            .           .           .           .      C57B-1............
2070            .           .           .     CC57B-1............
                .           .           .           v
                .           .           .           v
2073            .           .           .    RCC57B-1
2079            .           .           .           .       57B-4
2084            .           .           .      C57B-4............
2087            .           .           .           .       PIC-B
                .           .           .           .           v
                .           .           .           .           v
2092            .           .           .           .      RPIC-B
2098            .           .           .     CC57B-4............    * End Reference
                .           .           .           v
                .           .           .           v
2101            .           .           .    RCC57B-4
2107            .           .           .           .         38A
                .           .           .           .           v
                .           .           .           .           v
2112            .           .           .           .        R38A
2118            .           .           .           .           .         38B
2123            .           .           .           .        C38B............
2127            .           .           .           .           .        57BA
                .           .           .           .           .           v
                .           .           .           .           .           v
2132            .           .           .           .           .       R57BA
2136            .           .           .           .           .           .          3C
2141            .           .           .           .           .         C3C............
                .           .           .           .           .           v
                .           .           .           .           .           v
2145            .           .           .           .           .        RC3C
2150            .           .           .           .           .           .          AP
2155            .           .    ANGLPKIN................................................
                .           .           v
                .           .           v
2160            .           .    ANGLPKDB
                .           .           v
                .           .           v
2181            .           .    ANGLPKOT
2187            .           .           .      GD34AB
2192            .           .     CGD34AB............
                .           .           v
                .           .           v
2196            .           .    RCGD34AB
2202            .           .           .      GD34AC
2207            .           .     CGD34AC............
2211            .    CCGD34AC............
                .           v
                .           v
2216            .    RCGD34AC
2222            .           .         K-C
2233            .           .           .------->   DCHEY
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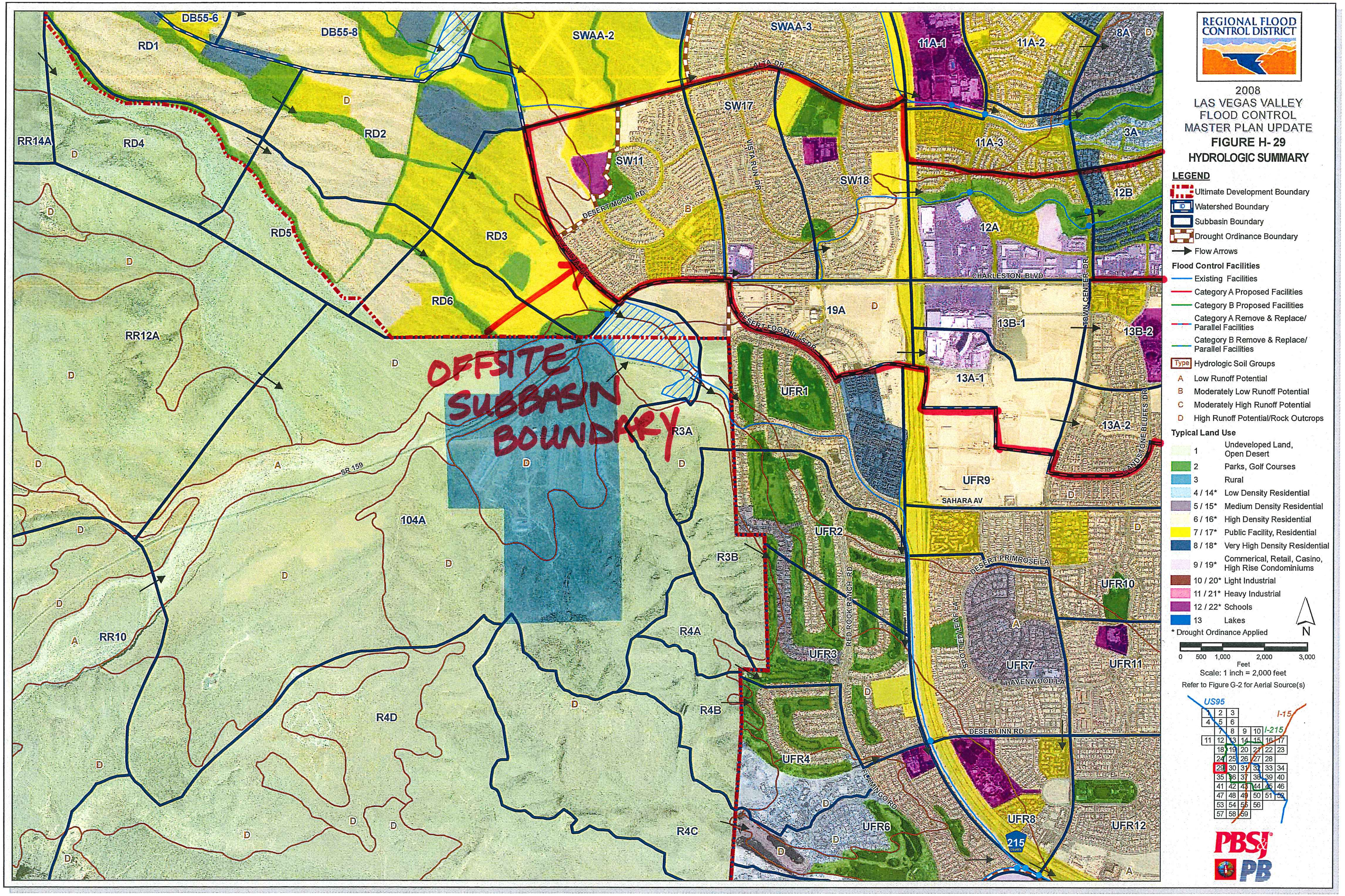
2 COMBINED AT +	C8B-1	1.14	1	FLOW	1246.	1219.	1173.	1128.	1111.	1098.	1089.	1075.	1056.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO +	RC8B-1	1.14	1	FLOW	1222.	1195.	1152.	1110.	1090.	1081.	1071.	1055.	1040.
				TIME	3.83	3.75	3.83	3.83	3.83	3.83	3.83	3.83	3.83
HYDROGRAPH AT +	8B-2	.42	1	FLOW	574.	564.	547.	530.	523.	518.	515.	510.	503.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
2 COMBINED AT +	C8B-2	1.56	1	FLOW	1795.	1758.	1697.	1632.	1610.	1593.	1578.	1562.	1533.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO +	RC8B-2	1.56	1	FLOW	1774.	1736.	1681.	1618.	1593.	1582.	1565.	1547.	1522.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
HYDROGRAPH AT +	11A-2	.29	1	FLOW	433.	424.	409.	394.	388.	384.	381.	376.	370.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO +	R11A-2	.29	1	FLOW	422.	413.	393.	378.	372.	368.	365.	360.	354.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT +	8A	.31	1	FLOW	384.	375.	361.	347.	341.	337.	335.	330.	324.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT +	C8A	.60	1	FLOW	805.	788.	755.	725.	713.	705.	700.	690.	679.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
ROUTED TO +	RC8A	.60	1	FLOW	751.	734.	704.	675.	664.	657.	651.	643.	632.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
HYDROGRAPH AT +	3B-2A	.24	1	FLOW	329.	322.	311.	300.	295.	292.	290.	286.	282.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT +	C3B-2A	.84	1	FLOW	1040.	1018.	977.	939.	924.	914.	907.	895.	880.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
2 COMBINED AT +	CC3B-2A	2.40	1	FLOW	2803.	2743.	2644.	2540.	2505.	2476.	2453.	2428.	2384.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO +	RCC3B-2A	2.40	1	FLOW	2769.	2725.	2623.	2515.	2493.	2463.	2431.	2413.	2367.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
HYDROGRAPH AT +	3B-2B	.27	1	FLOW	271.	265.	254.	244.	240.	237.	235.	231.	227.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
2 COMBINED AT +	C3B-2B	2.67	1	FLOW	3025.	2975.	2863.	2746.	2720.	2687.	2653.	2632.	2582.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
2 COMBINED AT +	CC3B-2B	14.42	1	FLOW	10916.	10721.	10381.	10032.	9913.	9809.	9738.	9637.	9486.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
ROUTED TO +	RCC3B-2B	14.42	1	FLOW	10822.	10623.	10284.	9931.	9814.	9701.	9639.	9527.	9379.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT +	SF2-C	.39	1	FLOW	294.	287.	275.	263.	259.	255.	253.	249.	245.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
2 COMBINED AT +	CSF2-C	14.81	1	FLOW	11116.	10909.	10559.	10195.	10073.	9957.	9891.	9776.	9623.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
ROUTED TO +	RCSF2-C	14.81	1	FLOW	11007.	10789.	10429.	10061.	9937.	9831.	9758.	9650.	9507.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	4.00	4.00	4.00

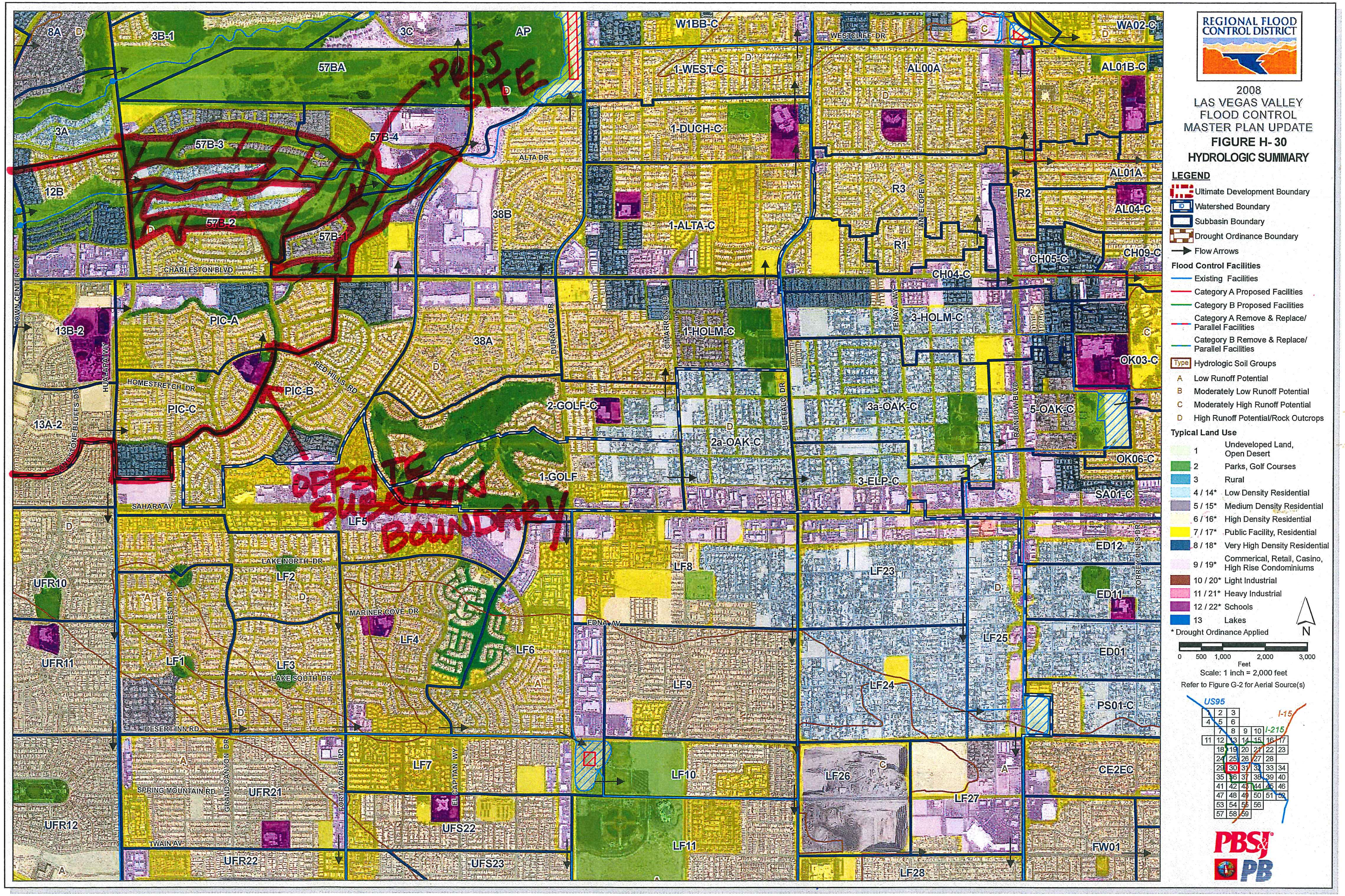
Begin Reference

HYDROGRAPH AT +	SW11	.59	1	FLOW	759.	743.	717.	691.	680.	673.	668.	660.	649.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO +	RSW11	.59	1	FLOW	754.	738.	712.	686.	676.	668.	663.	655.	644.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
HYDROGRAPH AT +	SW17	.36	1	FLOW	479.	469.	452.	436.	429.	424.	421.	416.	409.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT +	CSW17	.94	1	FLOW	1221.	1196.	1153.	1111.	1095.	1083.	1075.	1061.	1044.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO +	RCSW17	.94	1	FLOW	1211.	1186.	1143.	1101.	1083.	1073.	1063.	1051.	1035.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
HYDROGRAPH AT +	SW18	.41	1	FLOW	519.	507.	489.	470.	463.	457.	454.	448.	440.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT +	CSW18	1.35	1	FLOW	1718.	1682.	1622.	1562.	1537.	1521.	1508.	1490.	1467.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75

ROUTED TO +	RCSW18	1.35	1	FLOW	1610.	1576.	1520.	1464.	1441.	1426.	1414.	1397.	1375.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT +	12A	.39	1	FLOW	576.	565.	547.	529.	521.	516.	513.	507.	500.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT +	C12A	1.74	1	FLOW	2046.	2003.	1932.	1861.	1832.	1813.	1798.	1776.	1748.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
ROUTED TO +	RC12A	1.74	1	FLOW	2025.	1983.	1913.	1843.	1815.	1796.	1782.	1760.	1732.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT +	12B	.26	1	FLOW	387.	380.	367.	355.	350.	347.	344.	340.	335.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT +	C12B	2.00	1	FLOW	2259.	2212.	2134.	2056.	2024.	2002.	1987.	1962.	1931.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
ROUTED TO +	RC12B	2.00	1	FLOW	2194.	2148.	2073.	1998.	1967.	1946.	1931.	1907.	1877.
				TIME	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
HYDROGRAPH AT +	57B-3	.31	1	FLOW	267.	260.	248.	237.	233.	230.	227.	224.	219.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
2 COMBINED AT +	C57B-3	2.31	1	FLOW	2394.	2344.	2261.	2177.	2144.	2120.	2104.	2077.	2044.
				TIME	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
ROUTED TO +	RC57B-3	2.31	1	FLOW	2375.	2325.	2242.	2158.	2125.	2101.	2085.	2058.	2025.
				TIME	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
HYDROGRAPH AT +	57B-2	.36	1	FLOW	338.	329.	316.	302.	297.	293.	291.	286.	281.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
2 COMBINED AT +	C57B-2	2.67	1	FLOW	2626.	2570.	2477.	2384.	2347.	2321.	2302.	2273.	2236.
				TIME	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
ROUTED TO +	RC57B-2	2.67	1	FLOW	2609.	2553.	2460.	2367.	2330.	2304.	2285.	2256.	2219.
				TIME	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
HYDROGRAPH AT +	13B-1	.25	1	FLOW	354.	347.	336.	325.	321.	318.	315.	312.	307.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
ROUTED TO +	RC13B-1	.25	1	FLOW	354.	347.	336.	324.	320.	317.	314.	311.	307.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.83	3.83	3.83
HYDROGRAPH AT +	13B-2	.22	1	FLOW	310.	304.	294.	283.	279.	277.	274.	271.	267.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT +	C13B-2	.47	1	FLOW	634.	622.	602.	581.	573.	567.	563.	557.	549.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO +	RC13B-2	.47	1	FLOW	641.	628.	607.	586.	578.	572.	568.	561.	553.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
HYDROGRAPH AT +	19A	.25	1	FLOW	318.	312.	301.	291.	287.	284.	282.	278.	274.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO +	R19A	.25	1	FLOW	319.	313.	302.	292.	288.	285.	283.	280.	276.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT +	13A-1	.22	1	FLOW	308.	303.	293.	283.	279.	277.	275.	272.	268.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
2 COMBINED AT +	C13A-1	.48	1	FLOW	595.	583.	564.	545.	537.	532.	528.	522.	514.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
ROUTED TO +	RC13A-1	.48	1	FLOW	581.	569.	551.	532.	524.	519.	515.	509.	502.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT +	13A-2	.19	1	FLOW	272.	267.	258.	249.	246.	243.	241.	238.	235.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT +	C13A-2	.66	1	FLOW	782.	766.	740.	715.	704.	697.	692.	684.	673.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
ROUTED TO +	RC13A-2	.66	1	FLOW	781.	765.	738.	712.	702.	694.	689.	681.	670.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT +	PIC-C	.24	1	FLOW	280.	274.	265.	256.	252.	250.	248.	245.	241.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
2 COMBINED AT +	CPIC-C	.91	1	FLOW	1041.	1020.	985.	951.	937.	927.	920.	909.	895.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92

ROUTED TO +	RCPIC-C	.91	1	FLOW	1030.	1009.	975.	940.	922.	915.	908.	896.	881.	
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	
HYDROGRAPH AT +	PIC-A	.36	1	FLOW	356.	349.	338.	326.	322.	318.	316.	312.	308.	
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	
2 COMBINED AT +	CPIC-A	1.27	1	FLOW	1386.	1359.	1313.	1266.	1243.	1233.	1224.	1208.	1188.	
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	
2 COMBINED AT +	CCPIC-A	1.73	1	FLOW	1997.	1959.	1895.	1830.	1800.	1785.	1772.	1750.	1723.	
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	
ROUTED TO +	RCCPIC-A	1.73	1	FLOW	1974.	1921.	1874.	1792.	1776.	1769.	1758.	1721.	1690.	
				TIME	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	
HYDROGRAPH AT +	57B-1	.20	1	FLOW	199.	194.	186.	179.	176.	174.	172.	170.	167.	
				TIME	3.67	3.67	3.67	3.67	3.75	3.75	3.75	3.75	3.75	
2 COMBINED AT +	C57B-1	1.93	1	FLOW	2106.	2049.	2004.	1912.	1900.	1876.	1862.	1824.	1791.	
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	4.00	4.00	4.00	
2 COMBINED AT +	CC57B-1	4.60	1	FLOW	4702.	4591.	4447.	4268.	4213.	4179.	4148.	4080.	4011.	
				TIME	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	
ROUTED TO +	RCC57B-1	4.60	1	FLOW	4694.	4583.	4439.	4260.	4205.	4170.	4139.	4071.	4002.	
				TIME	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	
HYDROGRAPH AT +	57B-4	.20	1	FLOW	262.	257.	248.	239.	236.	233.	231.	229.	225.	
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	
2 COMBINED AT +	C57B-4	4.80	1	FLOW	4813.	4700.	4553.	4371.	4314.	4278.	4246.	4177.	4107.	
				TIME	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	
HYDROGRAPH AT +	PIC-B	.44	1	FLOW	442.	433.	419.	405.	399.	395.	392.	388.	382.	
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	
ROUTED TO +	RPIC-B	.44	1	FLOW	439.	431.	416.	402.	396.	392.	390.	385.	379.	
Flow to Rampart + Alta Intersection →				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	
2 COMBINED AT +	CC57B-4	5.24	1	FLOW	5243.	5122.	4961.	4765.	4702.	4663.	4628.	4554.	4479.	END Ref.
				TIME	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	
ROUTED TO +	RCC57B-4	5.24	1	FLOW	5225.	5104.	4944.	4747.	4686.	4644.	4606.	4534.	4460.	
				TIME	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	
HYDROGRAPH AT +	38A	.35	1	FLOW	374.	367.	355.	343.	338.	335.	333.	329.	324.	
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	
ROUTED TO +	R38A	.35	1	FLOW	368.	364.	350.	337.	333.	331.	330.	327.	320.	
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	
HYDROGRAPH AT +	38B	.44	1	FLOW	492.	483.	467.	452.	446.	442.	439.	434.	428.	
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	
2 COMBINED AT +	C38B	.79	1	FLOW	856.	842.	810.	784.	775.	769.	764.	753.	740.	
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	
HYDROGRAPH AT +	57BA	.32	1	FLOW	186.	180.	171.	163.	159.	157.	155.	152.	149.	
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	
ROUTED TO +	R57BA	.32	1	FLOW	185.	179.	171.	162.	158.	156.	154.	151.	148.	
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	
HYDROGRAPH AT +	3C	.15	1	FLOW	218.	214.	207.	201.	198.	196.	195.	193.	190.	
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	
2 COMBINED AT +	C3C	.47	1	FLOW	358.	350.	335.	322.	316.	312.	309.	305.	299.	
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	
ROUTED TO +	RC3C	.47	1	FLOW	358.	350.	336.	322.	316.	312.	310.	305.	300.	
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	
HYDROGRAPH AT +	AP	.67	1	FLOW	450.	438.	418.	398.	390.	385.	381.	375.	367.	
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	
5 COMBINED AT +	ANGLPKIN	21.99	1	FLOW	17682.	17317.	16736.	16120.	15911.	15749.	15645.	15449.	15212.	
				TIME	3.92	3.92	3.92	4.00	4.00	4.00	4.00	4.00	4.00	
ROUTED TO +	ANGLPKDB	21.99	1	FLOW	5746.	5406.	4785.	4149.	3879.	3713.	3566.	3372.	3116.	
				TIME	5.42	5.42	5.58	5.67	5.75	5.75	5.75	5.83	5.92	
			** PEAK STAGES IN FEET **											
			1	STAGE	2620.18	2620.13	2620.04	2619.94	2619.88	2619.85	2619.82	2619.79	2619.74	
				TIME	5.42	5.42	5.58	5.67	5.75	5.75	5.75	5.83	5.92	


REGIONAL FLOOD CONTROL DISTRICT
2008
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE
FIGURE H- 29
HYDROLOGIC SUMMARY
LEGEND
Ultimate Development Boundary
Watershed Boundary
Subbasin Boundary
Drought Ordinance Boundary
Flow Arrows
Flood Control Facilities
Existing Facilities
Category A Proposed Facilities
Category B Proposed Facilities
Category A Remove & Replace/ Parallel Facilities
Category B Remove & Replace/ Parallel Facilities
Type Hydrologic Soil Groups
A Low Runoff Potential
B Moderately Low Runoff Potential
C Moderately High Runoff Potential
D High Runoff Potential/Rock Outcrops
Typical Land Use
1 Undeveloped Land, Open Desert
2 Parks, Golf Courses
3 Rural
4 / 14* Low Density Residential
5 / 15* Medium Density Residential
6 / 16* High Density Residential
7 / 17* Public Facility, Residential
8 / 18* Very High Density Residential
9 / 19* Commerical, Retail, Casino, High Rise Condominiums
10 / 20* Light Industrial
11 / 21* Heavy Industrial
12 / 22* Schools
13 Lakes
* Drought Ordinance Applied
N
0 500 1,000 2,000 3,000
Feet
Scale: 1 inch = 2,000 feet
Refer to Figure G-2 for Aerial Source(s)
US95
I-15
I-215
PBSJ
PB
OFFSITE SUBBASIN BOUNDARY
DB55-6
DB55-8
SWAA-2
SWAA-3
11A-1
11A-2
8A
3A
11A-3
12B
12A
13B-1
13B-2
13A-1
13A-2
19A
SW11
SW17
SW18
RD1
RD2
RD3
RD4
RD5
RD6
RR14A
RR12A
RR10
104A
R3A
R3B
R4A
R4B
R4C
R4D
UFR1
UFR2
UFR3
UFR4
UFR6
UFR7
UFR8
UFR9
UFR10
UFR11
UFR12
SR 159
ALTA DR
DESERT MOON RD
VISTA RUN DR
CHARLESTON BLVD
DESERT FOOTHILLS DR
TOWN CENTER DR
ANDSTONE BLUFFS DR
SAHARA AV
DESERT PRIMROSE LA
RED ROCK RANCH RD
HAVENWOOD LA
DESERT INN RD
215


REGIONAL FLOOD CONTROL DISTRICT
2008
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE
FIGURE H- 30
HYDROLOGIC SUMMARY
LEGEND
Ultimate Development Boundary
Watershed Boundary
Subbasin Boundary
Drought Ordinance Boundary
Flow Arrows
Flood Control Facilities
Existing Facilities
Category A Proposed Facilities
Category B Proposed Facilities
Category A Remove & Replace/ Parallel Facilities
Category B Remove & Replace/ Parallel Facilities
Type Hydrologic Soil Groups
A Low Runoff Potential
B Moderately Low Runoff Potential
C Moderately High Runoff Potential
D High Runoff Potential/Rock Outcrops
Typical Land Use
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8 / 18* Very High Density Residential
9 / 19* Commerical, Retail, Casino, High Rise Condominiums
10 / 20* Light Industrial
11 / 21* Heavy Industrial
12 / 22* Schools
13 Lakes
* Drought Ordinance Applied
N
0 500 1,000 2,000 3,000
Feet
Scale: 1 inch = 2,000 feet
Refer to Figure G-2 for Aerial Source(s)
US95
I-15
I-215
PBS&J
PB
PROJ SITE
OFFSITE SUBBASIN BOUNDARY
8A
3B-1
3C
AP
57BA
3A
57B-3
57B-4
12B
57B-2
57B-1
38B
CHARLESTON BLVD
ALTA DR
W1BB-C
1-WEST-C
1-DUCH-C
1-ALTA-C
AL00A
R3
R1
R2
WA02-C
AL01B-C
AL01A
AL04-C
CH09-C
CH05-C
CH04-C
13B-2
PIC-A
PIC-B
PIC-C
38A
HOMESTRETCH DR
RED HILLS RD
13A-2
1-HOLM-C
3-HOLM-C
OK03-C
2-GOLF-C
1-GOLF
2a-OAK-C
3a-OAK-C
5-OAK-C
OK06-C
3-ELP-C
SA01-C
SAHARA AV
LF5
LF2
LF8
LF23
ED12
UFR10
UFR11
LAKE NORTH DR
MARINER COVE DR
LF4
LF6
LF1
LF3
LAKE SOUTH DR
EDNA AV
LF9
LF24
LF25
ED11
ED01
PS01-C
DESERT INN RD
LF7
LF10
LF26
LF27
CE2EC
UFR12
UFR21
SPRING MOUNTAIN RD
UFS22
TWAIN AV
UFR22
UFS23
LF11
LF28
FW01
DURANGO DR
BUFFALO DR
TENAYA WY
RAINBOW BLVD
TORREY PINES DR
FORT APACHE RD
GRAND CANYON DR
EL CAPITAN WY
WESTCLIFF DR
ANTELOPE WY

Federal Emergency Management Agency
Washington, D.C. 20472

OCT 19 2006

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

The Honorable Oscar B. Goodman
Mayor, City of Las Vegas
City Hall, 10th Floor
400 Stewart Avenue
Las Vegas, NV 89101

IN REPLY REFER TO:
Case No.: 06-09-BF86P
Follows Conditional
Case No.: 05-09-0420R
Community Name: City of Las Vegas, NV
Community No.: 325276
Effective Date of
This Revision: OCT 19 2006

Dear Mayor Goodman:

The Flood Insurance Rate Map for your community has been revised by this Letter of Map Revision (LOMR). Please use the enclosed annotated map panel(s) revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals issued in your community.

Additional documents are enclosed which provide information regarding this LOMR. Please see the List of Enclosures below to determine which documents are included. Other attachments specific to this request may be included as referenced in the Determination Document. If you have any questions regarding floodplain management regulations for your community or the National Flood Insurance Program (NFIP) in general, please contact the Consultation Coordination Officer for your community. If you have any technical questions regarding this LOMR, please contact the Director, Federal Insurance and Mitigation Division of the Department of Homeland Security's Federal Emergency Management Agency (FEMA) in Oakland, California, at (510) 627-7175, or the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP). Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Sincerely,

Kevin C. Long

Kevin C. Long, CFM, Project Engineer
Engineering Management Section
Mitigation Division

For: William R. Blanton Jr., CFM, Chief
Engineering Management Section
Mitigation Division

List of Enclosures:

- Letter of Map Revision Determination Document
- Annotated Flood Insurance Rate Map

cc: Mr. Randy Fultz, P.E., CFM
Assistant City Engineer
City of Las Vegas

Mr. Kevin Eubanks, P.E., CFM
Assistant General Manager
Clark County Regional Flood Control District

Mr. Michael Ludwig, P.E., Project Manager
G.C. Wallace, Inc.

 | Issue Date: OCT 1 9 2006 | Effective Date: OCT 1 9 2006 | Case No.: 06-09-BF86P | LOMR-APP

Follows Conditional Case No.: 05-09-0420R

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	City of Las Vegas Clark County Nevada COMMUNITY NO.: 325276	STORM DRAIN	HYDRAULIC ANALYSIS HYDROLOGIC ANALYSIS
IDENTIFIER	Village at Queensridge	APPROXIMATE LATITUDE & LONGITUDE: 36.168, -115.286 SOURCE: USGS QUADRANGLE DATUM: NAD 83	

ANNOTATED MAPPING ENCLOSURES	ANNOTATED STUDY ENCLOSURES
TYPE: FIRM* NO.: 32003C2145 E DATE: September 27, 2002	NO REVISION TO THE FLOOD INSURANCE STUDY REPORT

Enclosures reflect changes to flooding sources affected by this revision.
* FIRM - Flood Insurance Rate Map; ** FBFM - Flood Boundary and Floodway Map; *** FHBM - Flood Hazard Boundary Map

FLOODING SOURCE(S) & REVISED REACH(ES)

Unnamed Wash - from approximately 2,200 feet downstream to approximately 100 feet downstream of Rampart Boulevard

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
Unnamed Wash	Zone A	Contained	NONE	YES

* BFEs - Base Flood Elevations

DETERMINATION

This document provides the determination from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) regarding a request for a Letter of Map Revision (LOMR) for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the Flood Insurance Study (FIS) report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Kevin C. Long

Kevin C. Long, CFM, Project Engineer
Engineering Management Section
Mitigation Division

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

NFIP regulations Subparagraph 60.3(b)(7) requires communities to ensure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management ordinances; therefore, responsibility for maintenance of the altered or relocated watercourse, including any related appurtenances such as bridges, culverts, and other drainage structures, rests with your community. We may request that your community submit a description and schedule of maintenance activities necessary to ensure this requirement.

COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance discharges computed in the submitted hydrologic model. Future development of projects upstream could cause increased discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on discharges and could, therefore, indicate that greater flood hazards exist in this area.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State/Commonwealth law have been obtained. State/Commonwealth or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State/Commonwealth or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Kevin C. Long

Kevin C. Long, CFM, Project Engineer
Engineering Management Section
Mitigation Division

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Sally M. Ziolkowski
Director, Federal Insurance and Mitigation Division
Federal Emergency Management Agency, Region IX
1111 Broadway Street, Suite 1200
Oakland, CA 94607-4052
(510) 627-7175

STATUS OF THE COMMUNITY NFIP MAPS

We will not physically revise and republish the FIRM for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panel(s) warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Kevin C. Long

Kevin C. Long, CFM, Project Engineer
Engineering Management Section
Mitigation Division

Page 4 of 4	Issue Date: OCT 19 2006	Effective Date: OCT 19 2006	Case No.: 06-09-BF86P	LOMR-APP

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

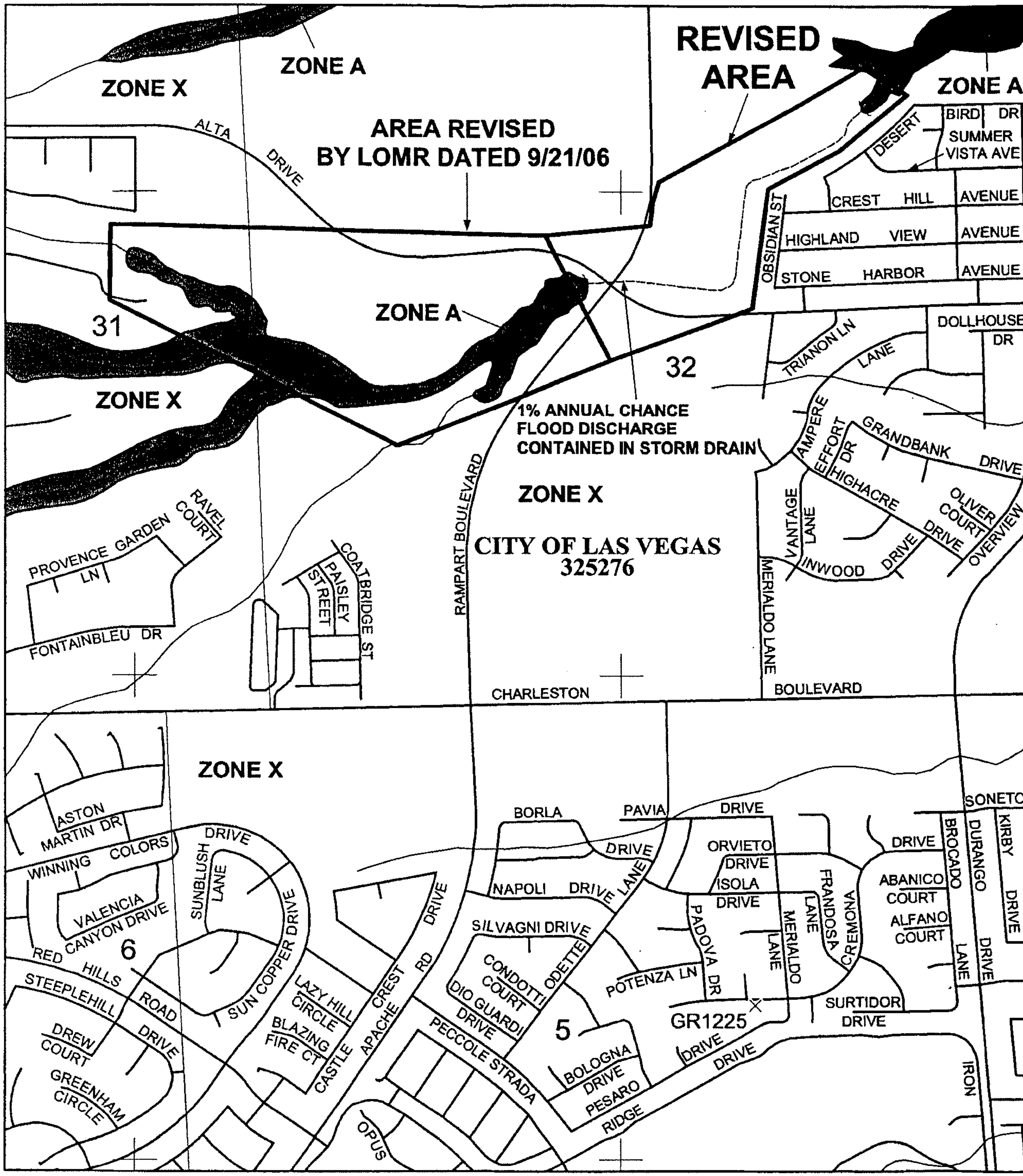
This revision is effective as of the date of this letter. Any requests to review or alter this determination should be made within 30 days and must be based on scientific or technical data.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Kevin C. Long

Kevin C. Long, CFM, Project Engineer
Engineering Management Section
Mitigation Division

109770 10.3.1.0609BF86 102-D



Legend

1% annual chance (100-Year) Floodplain

1% annual chance (100-Year) Floodway

0.2% annual chance (500-Year) Floodplain

N

MAP SCALE 1" = 1000'

500 0 1000 FEET

300 0 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2145 E

FIRM
FLOOD INSURANCE RATE MAP

CLARK COUNTY, NEVADA

AND INCORPORATED AREAS

PANEL 2145 OF 4090

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CLARK COUNTY, UNINCORPORATED AREAS	320003	2145	E
LAS VEGAS, CITY OF	325276	2145	E

REVISED TO REFLECT LOMR EFFECTIVE OCT 19 2006

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
32003C2145 E

MAP REVISED
SEPTEMBER 27, 2002

Federal Emergency Management Agency

Federal Emergency Management Agency

Washington, D.C. 20472

SEP 2 1 2006

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

The Honorable Oscar Goodman
Mayor, City of Las Vegas
400 Stewart Avenue
Las Vegas, NV 89101

IN REPLY REFER TO:
Case No.: 06-09-B483P
Community Name: City of Las Vegas, NV
Community No.: 325276
Effective Date of This Revision: SEP 2 1 2006

Dear Mayor Goodman:

The Flood Insurance Rate Map for your community has been revised by this Letter of Map Revision (LOMR). Please use the enclosed annotated map panel(s) revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals issued in your community.

Additional documents are enclosed which provide information regarding this LOMR. Please see the List of Enclosures below to determine which documents are included. Other attachments specific to this request may be included as referenced in the Determination Document. If you have any questions regarding floodplain management regulations for your community or the National Flood Insurance Program (NFIP) in general, please contact the Consultation Coordination Officer for your community. If you have any technical questions regarding this LOMR, please contact the Director, Federal Insurance and Mitigation Division of the Department of Homeland Security's Federal Emergency Management Agency (FEMA) in Oakland, California, at (510) 627-7175, or the FEMA Map Assistance Center, toll free, at 1-877-336-2627 (1-877-FEMA MAP). Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Sincerely,

Kevin C Long

Kevin C. Long, CFM, Project Engineer
Engineering Management Section
Mitigation Division

For: William R. Blanton Jr., CFM, Chief
Engineering Management Section
Mitigation Division

List of Enclosures:

Letter of Map Revision Determination Document
Annotated Flood Insurance Rate Map

cc: Mr. Randy Fultz, P.E.
Assistant City Engineer
City of Las Vegas

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Assistant General Manager
Clark County Regional Flood Control District

Mr. Michael J. Ludwig, P.E.
Project Manager
Flood Control District
G.C. Wallace, Inc.

Page 1 of 4	Issue Date: SEP 2 1 2006	Effective Date: SEP 2 1 2006	Case No.: 06-09-B483P	LOMR-APP

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	City of Las Vegas Clark County Nevada COMMUNITY NO.: 325276	CULVERT	HYDRAULIC ANALYSIS HYDROLOGIC ANALYSIS NEW TOPOGRAPHIC DATA
IDENTIFIER	Queensridge Place	APPROXIMATE LATITUDE & LONGITUDE: 36.165, -115.293 SOURCE: USGS QUADRANGLE DATUM: NAD 83	

ANNOTATED MAPPING ENCLOSURES	ANNOTATED STUDY ENCLOSURES
TYPE: FIRM* NO.: 32003C2145E DATE: September 27, 2002	NO REVISION TO THE FLOOD INSURANCE STUDY REPORT

Enclosures reflect changes to flooding sources affected by this revision.
* FIRM - Flood Insurance Rate Map; ** FBFM - Flood Boundary and Floodway Map; *** FHBM - Flood Hazard Boundary Map

FLOODING SOURCE(S) & REVISED REACH(ES)

Unnamed Wash - from approximately 3,600 feet upstream to approximately 100 feet downstream of South Rampart Boulevard

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
Unnamed Wash	Zone A	Zone A	YES	YES
	Zone A	Contained	NONE	YES

* BFEs - Base Flood Elevations

DETERMINATION

This document provides the determination from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) regarding a request for a Letter of Map Revision (LOMR) for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the Flood Insurance Study (FIS) report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Kevin C. Long

Kevin C. Long, CFM, Project Engineer
Engineering Management Section
Mitigation Division

106979 10.3.1.0609B483 102-I-C

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

NFIP regulations Subparagraph 60.3(b)(7) requires communities to ensure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management ordinances; therefore, responsibility for maintenance of the altered or relocated watercourse including any related appurtenances such as bridges, culverts, and other drainage structures rests with your community. We may request that your community submit a description and schedule of maintenance activities necessary to ensure this requirement.

COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance discharges computed in the submitted hydrologic model. Future development of projects upstream could cause increased discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on discharges and could, therefore, indicate that greater flood hazards exist in this area.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State/Commonwealth law have been obtained. State/Commonwealth or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State/Commonwealth or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

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LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Sally M. Ziolkowski
Director, Federal Insurance and Mitigation Division
Federal Emergency Management Agency, Region IX
1111 Broadway Street, Suite 1200
Oakland, CA 94607-4052
(510) 627-7175

STATUS OF THE COMMUNITY NFIP MAPS

We will not physically revise and republish the FIRM for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panel(s) warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

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Mitigation Division

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

This revision is effective as of the date of this letter. Any requests to review or alter this determination should be made within 30 days and must be based on scientific or technical data.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

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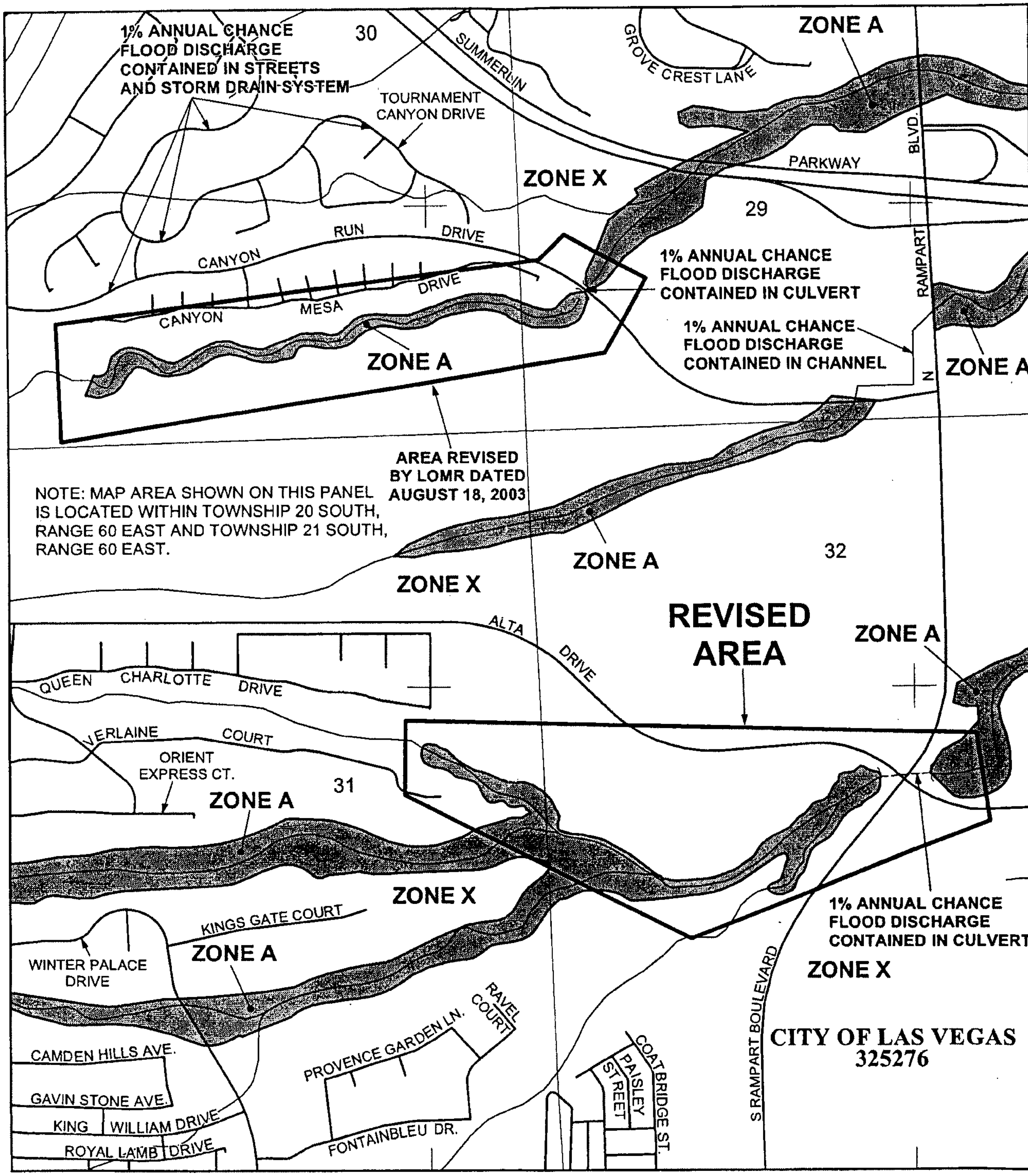


Legend

1% annual chance (100-Year) Floodplain

1% annual chance (100-Year) Floodway

0.2% annual chance (500-Year) Floodplain

N

MAP SCALE 1" = 1000'

500 0 1000 FEET

300 0 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2145E

FIRM
FLOOD INSURANCE RATE MAP

CLARK COUNTY, NEVADA
AND INCORPORATED AREAS

PANEL 2145 OF 4090
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY NUMBER PANEL SUFFIX

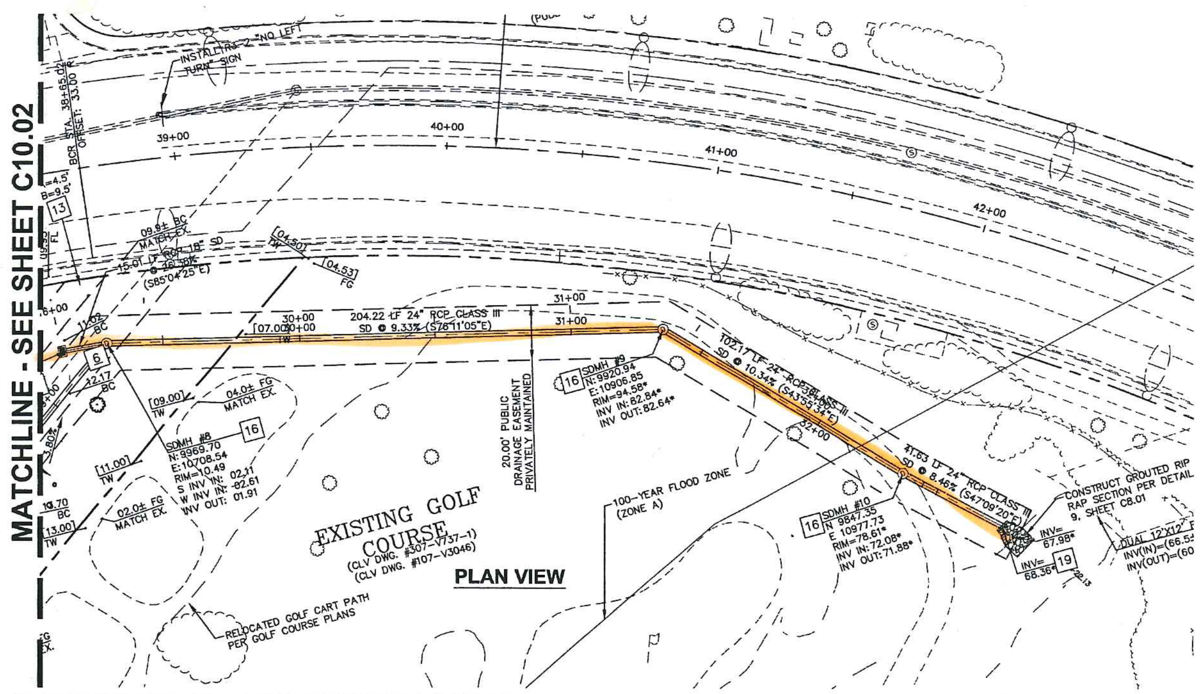
REVISED TO REFLECT LOMR EFFECTIVE SEP 21 2006

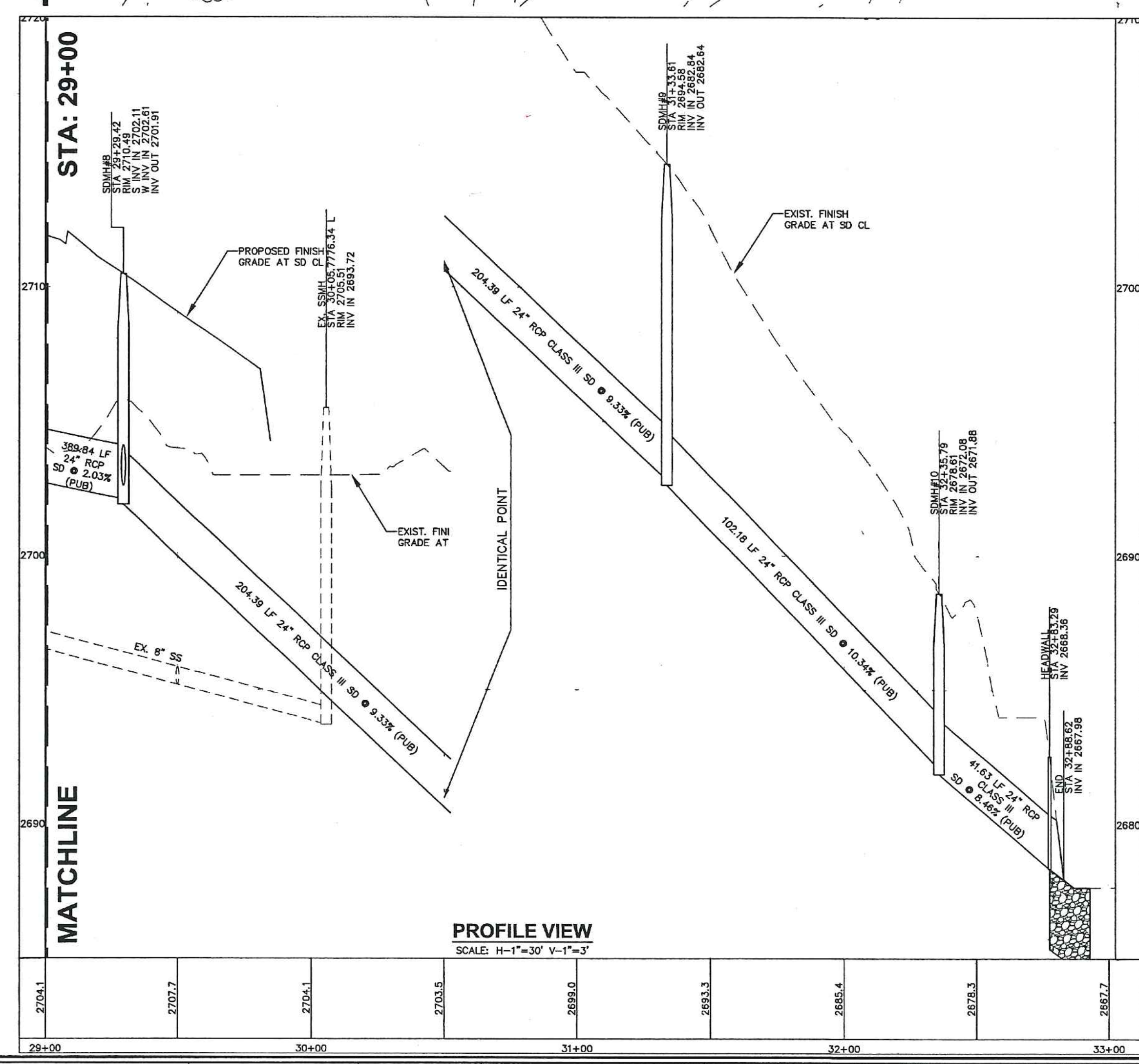
Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

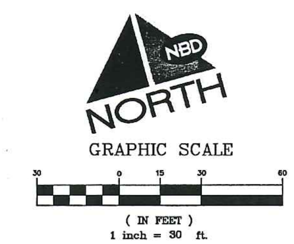
MAP NUMBER
32003C2145 E

MAP REVISED
SEPTEMBER 27, 2002

Federal Emergency Management Agency







ELEVATION NOTE:

ADD 2700 TO ALL ELEVATIONS UNLESS INDICATED BY A *. ELEVATIONS WITH AN * ADD 2600.

CONSTRUCTION NOTES:

(NOT ALL KEY NOTES ARE USED ON THIS DRAWING)

1 CONSTRUCT "L" TYPE CURB AND GUTTER PER C.C.A.U.S.D. #216.

2 CONSTRUCT "A" TYPE CURB PER C.C.A.U.S.D. #219.

3 CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 2–C8.00.

4 CONSTRUCT 3' VALLEY GUTTER PER DETAIL 1–C8.00.

5 CONSTRUCT GARDEN AREA PER ARCHITECTURAL PLANS.

6 LANDSCAPE AREA, SEE LANDSCAPE ARCHITECT PLANS.

7 SEE SHEETS C7.00 AND C7.01 FOR RETAINNG WALL PROFILES AND DETAILS. REFER TO SHEETS C2.00 THROUGH CC2.04 FOR HORIZONTAL CONTROL.

8 CONSTRUCT 8' SCREEN WALL PER DETAIL 4–C8.00.

9 CONSTRUCT 5' CONCRETE SIDEWALK PER C.C.A.U.S.D. #234.

10 CONSTRUCT COMMERCIAL/INDUSTRIAL DRIVEWAY PER C.C.A.U.S.D. #225 WITH GEOMETRIC PER C.C.A.U.S.D. #222A. CONSTRUCT 8' CROSS GUTTER PER C.C.A.U.S.D. #228.

11 CONSTRUCT 2' WIDE CONCRETE FLUME PER DETAIL 7–C8.00.

12 CONSTRUCT HANDICAP RAMP PER DETAIL 6–C8.00.

13 CONSTRUCT SIDEWALK RAMP CASE I PER C.C.A.U.S.D. #235 (DETECTABLE WARNINGS SHALL BE THE FULL DEPTH OF THE RAMP – YELLOW IN COLOR).

14 PARKING STRUCTURE WALL SEE STRUCTURAL PLANS (FOR FUTURE PARKING STRUCTURE)

15 CONSTRUCT RETAINING WALL PER SECTION 1–C7.01.

16 INSTALL 48" STANDARD ECCENTRIC MANHOLE PER C.C.A.U.S.D. No. 403 WITH MANHOLE COVER AND RING PER C.C.A.U.S.D. No. 409.

17 CONSTRUCT CAST IN PLACE CONCRETE TRENCH DRAIN PER DETAIL 2 SHEET C8.00

18 INSTALL JENSEN PRECAST 24"x36" CURB INLET (MODEL No. 2436–4R) WITH CAST IRON FRAME GRATE, AND HOOD. SEE DETAIL 5 SHEET C8.00.

19 CONSTRUCT HEADWALL PER NDOT DWG #R–2.5.1.

20 CONSTRUCT TRENCH BACKFILL SECTION PER C.C.A.U.S.D. #504 AND D.C.S.W.C.S. #SD–16A.

21 CONSTRUCT 24"X24" PILASTER PER DETAIL "5" SHEET C7.01.

22 INSTALL PRE–CAST BUMPER STOP PER C.C.A.U.S.D. #238.

BENCHMARK:

CITY OF LAS VEGAS, NO.0LV00 32C4, RIVET & PLATE IN TOP OF CURB @ SE CORNER OF RAMPART & ALTA.
ELEVATION 2693.06 FT. 820.8455 M. (NAVD 88)

BASIS OF BEARINGS:

S39D51'15"W, BEING THE CENTERLINE OF RAMPART BLVD. AS SHOWN ON SUBDIVISION MAP BOOK 77 PAGE 23 OF PLATS. SECTION 32, TOWNSHIP 20 SOUTH RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY NEVADA.

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL SYSTEMS AND STREET LIGHT SYSTEM CONDUITS, IT'S COSTLY
Call before you UnderGround
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS and
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

Avoid overhead power line contact. It's costly.
Call before you OVERHEAD
1-702-593-6111

Avoid cutting underground utility lines. It's costly.
Call before you Dig
1-800-227-2600

LEGEND

CL OR SURVEY LINE	EASEMENT LINE	HEAVY AC PVMT.	MANHOLES & DESCRIPTIONS	CAP	DESCRIPTION:	BO VALVE	CLEAN OUT	FDC	FIRE HYDRANT	GATE VALVE	REDUCER	100w HPS STREETLIGHT	150w HPS STREETLIGHT	200w HPS STREETLIGHT	250w HPS STREETLIGHT	400w HPS STREETLIGHT	5' CONTOUR LINE	1' CONTOUR LINE	EDGE OF PVMT.	"A" TYPE CURBS	"L" TYPE CURBS	WALLS	FENCES	SPOT ELEVATIONS	SIGNS
PROPERTY LINE	SAWCUT LINE	LIGHT AC PVMT.	Ⓢ = SANITARY SEWER Ⓔ = ELECTRICAL		EXISTING:												(2210)							(12.34)	
ROW LINE	SCARP LINE	CONC. PVMT.	Ⓓ = STORM DRAIN Ⓣ = TELEPHONE		PROPOSED:												2210	2211						12.34 BC	

JMA ARCHITECTURE STUDIOS

Nevada By Design
ENGINEERING CONSULTANTS
3515 East Harmon Avenue
Las Vegas, NV 89121
Phone (702) 938-1525 - Fax (702) 938-1530
www.nvbydesign.com

DRAWN BY:	DMZ	SCALE:	1" = 30'
DESIGNED BY:	CLN	JOB NUMBER:	04281
CHECK BY:	CLN	DATE	5/16/05

REV: DESCRIPTION: DATE: BY:

PROJECT: ONE QUEENSRIDGE PLACE

DRAWING TITLE: STORM DRAIN PLAN & PROFILE

SEAL:

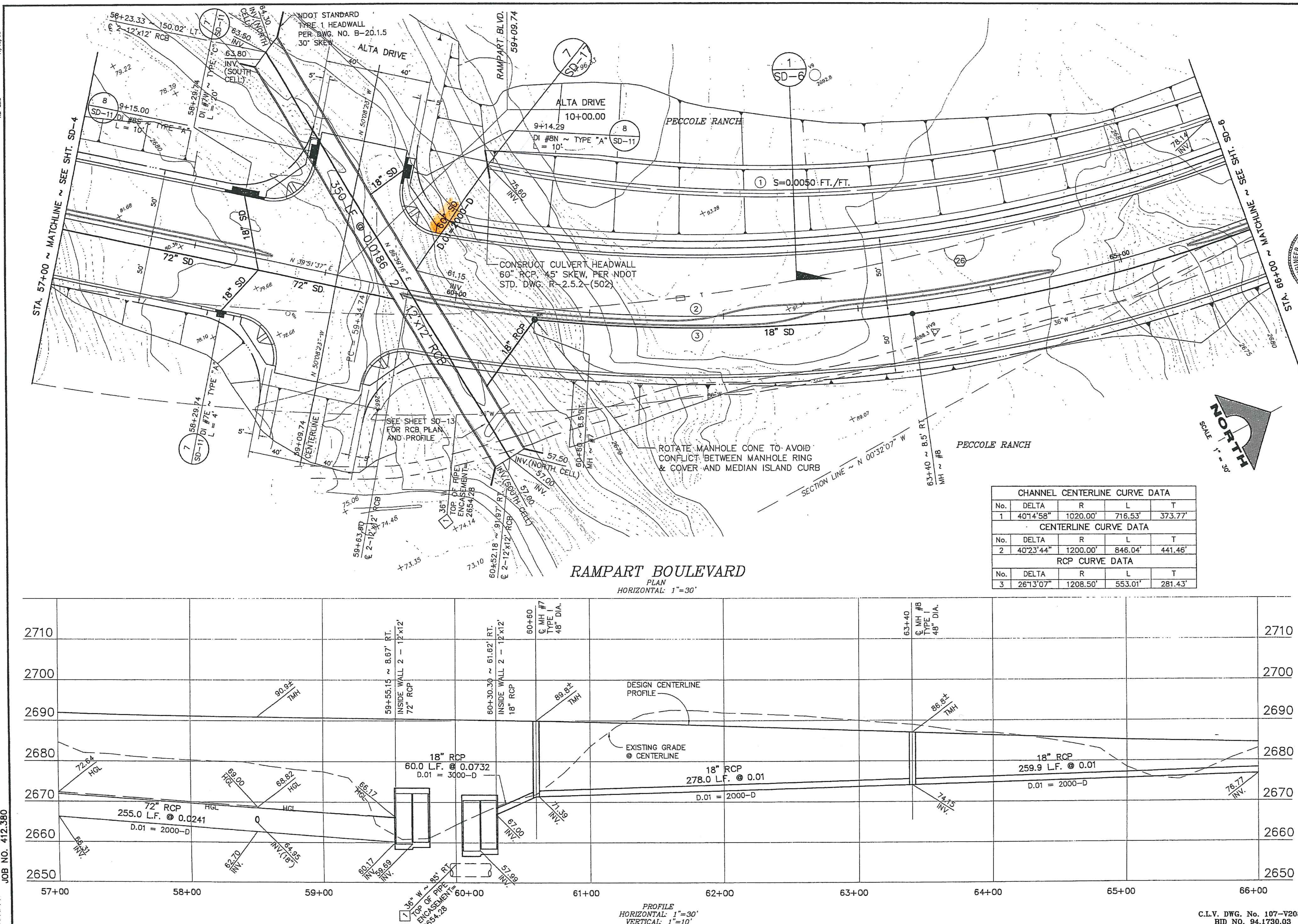
SHEET NO.: C10.03

SHEET 32 OF 33

DRAWING NUMBER

10TY4883 ©2000

8 - 2 - 26



CHANNEL CENTERLINE CURVE DATA				
No.	DELTA	R	L	T
1	40°14'58"	1020.00'	716.53'	373.77'

CENTERLINE CURVE DATA				
No.	DELTA	R	L	T
2	40°23'44"	1200.00'	846.04'	441.46'

RCP CURVE DATA				
No.	DELTA	R	L	T
3	26°13'07"	1208.50'	553.01'	281.43'

C.L.V. DWG. No. 107-V2088
BID NO. 94.1730.03

JOB NO. 412.380

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

CITY OF LAS VEGAS
RAMPART BOULEVARD
STORM DRAIN PLAN & PROFILE
STA. 57+00 TO STA. 66+00

SHEET SD-5
SHT 23 OF 116