

DS #: 4665

APN: 140-30-401-002

PROJECT: DESERT PINES (UPDATE TO BONANZA SPRINGS)

SUBMITTAL: 1ST..

SCANNED BY/DATE: _____

CHECKED BY/DATE: _____





CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		April 28, 2014
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: Desert Pines (Update to Bonanza Springs)		COPIES TO: L.R. Nelson Consulting Engineers
Cross Streets:	NEQ of Pecos Road & Bonanza Road	Las Vegas Housing Partners LP
File Number:	F:\Depot\DSMemos\DS4665A.doc	Bart Anderson, P.E., DevCo
Parcel Number:	140-30-401-002	
Zoning Action:	SDR-53428	
FEMA Flood Zone	YES NO X	
Proposed Storm Drain	YES NO X	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1 st Submittal	4/15/2014	4/28/2014	See Comments Below	\$400.00	353838: \$400
			TOTAL FEES (LDDRS):	\$400.00	----

REMARKS:

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.
	is conditionally approved subject to Clark County Public Works Department concurrence.

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

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

ays

T/R/S: T20S/R62E/30
AREA N-30



LAS VEGAS
CITY COUNCIL

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MAYOR

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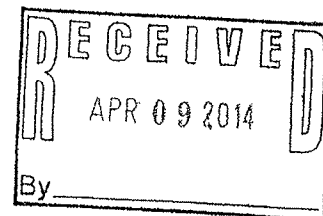
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BOB BEERS

ELIZABETH N. FRETWELL
CITY MANAGER

April 8, 2014



Mr. Robert D. Feibleman
Las Vegas Housing Partners LP
295 East Warm Springs Road, Suite 101
Las Vegas, Nevada 89119

**RE: SDR-53428 [PRJ-50753] - SITE DEVELOPMENT PLAN REVIEW
ADMINISTRATIVE CYCLE - APRIL 2014**

Dear Applicant:

Your request for a Minor Site Development Plan Review FOR A PROPOSED 3,000 SQUARE-FOOT COMMUNITY RECREATION FACILITY (PUBLIC) BUILDING on 12.80 acres at 3750 East Bonanza Road (APN 140-30-401-002), M-3(Medium Density Residential) Zone, Ward 3 (Coffin) [PRJ-50753], has been considered administratively by the Department of Planning staff.

The Department of Planning has administratively **APPROVED** your request subject to the following:

Planning

1. This approval shall be void two years from the date of final approval, unless exercised pursuant to the provisions of LVMC Title 19.16. An Extension of Time may be filed for consideration by the City of Las Vegas.
2. All development shall be in conformance with the site plan and building elevations, date stamped 03/25/14 except as amended by conditions herein.
3. All necessary building permits shall be obtained and final inspections shall be completed in compliance with Title 19 and all codes as required by the Department of Building and Safety.
4. These Conditions of Approval shall be affixed to the cover sheet of any plan set submitted for building permit.
5. All City Code requirements and design standards of all City Departments must be satisfied, except as modified herein.

CITY OF LAS VEGAS
DEPARTMENT OF PLANNING
DEVELOPMENT SERVICES CENTER
333 NORTH RANCHO DRIVE
3RD FLOOR
LAS VEGAS, NEVADA 89106

VOICE 702.229.6301

FAX 702.474.0352

TTY 702.386.9108

www.lasvegasnevada.gov

Mr. Robert D. Feibleman
SDR-53428 [PRJ-50753] - Page Two
April 8, 2014

This action by the Department of Planning staff on April 8, 2014 is final unless a written appeal is filed with the Director of the Department of Planning within ten days of the date of this letter.

Sincerely,

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

Peter Lowenstein, AICP
Planning Supervisor
Case Planning Division

PL:nl

cc:

Mr. Robert D. Feibleman
Nevada HAND
295 East Warm Springs Road, Suite 101
Las Vegas, Nevada 89119

L. R. Nelson Consulting Engineers, Inc.

6765 West Russell Road, Suite 200

Las Vegas, Nevada 89118

Tel: (702) 798-7978 Fax: (702) 451-2296

E-mail: jon.hayslip@LRNENG.COM

Date: April 16, 2014	Fax Number: 382-8551
To: Lucian Nistrea	
Firm Name: City of Las Vegas	
#Pages Transmitted: 3 (Including Cover Sheet)	
Reference: Desert Pines (DS 4665)	
Description of Pages Transmitted: SDR 53428	
Remarks: Please find the attached SDR 53428 City of Las Vegas letter to accompany the drainage study update. Thank you,	
Sent By: Jon Hayslip	

If you do not receive all of the pages indicated above,

Please call: (702) 798-7978

Maximum E-Mail file size – 3 megabytes

L.R. NELSON CONSULTING ENGINEERS

6765 WEST RUSSELL ROAD, SUITE 200

LAS VEGAS, NV 89118

PHONE: (702) 798-7978 FAX: (702) 451-2296

TRANSMITTAL

DATE: Tuesday, April 15, 2014		Technical Drainage Study Update	
TO: Mr. Albert Sung, P.E., Project Engineer			
FIRM/AGENCY NAME: City of Las Vegas – Public Works Flood Control Section 333 N. Rancho Drive 7th Floor Las Vegas, NV 89106			
		PROJECT NUMBER: 818-026-133	
REFERENCE: Desert Pines Update (aka Bonanza Springs – DS1757) – Technical Drainage Study			
Item #	Submitted		
1	One (1) Technical Drainage Study Update		
2	One (1) Technical Drainage Study Update on CD (electronic)		
3	One (1) in the amount of \$400.00 for Technical Drainage Study Review Fee		
SENT BY: Jon Hayslip			
		Received by:	
		Date:	

04/15/14

**TECHNICAL DRAINAGE
STUDY UPDATE
FOR
DESERT PINES
(aka Bonanza Springs)**

**CITY OF LAS VEGAS, NEVADA
Project Number: 818-026-133
August 2013**

Prepared For: Nevada H.A.N.D.
295 Warm Springs Road, Suite 101
Las Vegas, Nevada 89119
Phone: (702) 739-3345
Fax: (702) 739-3305

Prepared By: L.R. Nelson Consulting Engineers
6765 W. Russell Rd., Suite 200
Las Vegas, Nevada 89118
(702) 798-7978

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: DESERT PINES (Activity Building) Date: Apr 15, 2014

Location of Development: a) Descriptive (Cross Streets) North/South: Pecos Road
East/West: Bonanza

b) Section: 30 Township: 20 South Range: 62 East

c) APN : 140-30-401-002

Name of Owner: Las Vegas Housing Partners LP

Telephone No.: (702) 739-3345 Fax No.: 739-3305 E-Mail Address: _____

Address: 295 Warm Springs Road, Suite 101, Las Vegas, NV 89118

Contact Person-Name: Jon Hayslip Telephone No.: 702-798-7978

* E-Mail Address: jon.hayslip@lrneng.com Fax No.: 451-2296

Firm: L. R. Nelson Consulting Engineers, Inc.

Address: 6765 W. Russell Road, Suite 200, Las Vegas, NV 89118

Type of Land Development/Land Disturbance Process:

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

1. Total Owned Land Area: At Site: 12.8 Ac. Being Developed/Disturbed: 7,500 square feet (+/-)

2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☐ Yes** ☒ No

3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☐ Yes** ☒ No

4. Proposed type of development (Residential, Commercial, Etc.): Residential

5. Approximate upstream land area which drains to the subject site: 6.4 (+/-) acres (only interior onsite area)

6. Has the site drainage been evaluated in the past? ☒ YES ☐ NO If yes, please identify documentation: Bonanza Springs (DS 1757) by LR Nelson (1996)

7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Onsite interior drive aisle

8. Briefly describe your proposed schedule for the subject project: As soon as possible.

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

***New Required Field**

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

Revision	Date

Engineer's Seal

Local Entity File No.

REFERENCE:

STANDARD FORM 1

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

Project Name: DESERT PINES

Map ID:

Firm Name: L. R. NELSON CONSULTING

Engineer:

Address: 6765 W. RUSSELL ROAD, SUITE 200

City: LAS VEGAS

State: NEVADA

Zip: 89118

Phone Number: (702) 798-7978

Fax Number: (702) 451-2296

Property Owner: Las Vegas Housing Partners LP

Address: 295 Warm Springs Road, Suite 101

City: Las Vegas

State: NEVADA

Zip: 89118

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.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

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.
- 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.
- N/A 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.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes No

X Existing contours encompassing the site and 100 feet beyond with spot elevations for important locations, where appropriate.

X Minimum finish floor elevations with top-of-curb elevations at upstream end of lot.

N/A Proposed typical street sections.

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.

X Concentration points and drainage flow direction with Q_{100} and V_{100} and D_{100} 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.

X 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.

N/A Existing and proposed drainage easements and widths shown with sufficient detail. A cross sectional detail must be provided that shows appropriate lining and reinforcement.

N/A 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.

N/A Location and detail of flood walls illustrating depth of flow, proposed grouting height, etc.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes No

- 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.
- X Building and/or lot numbers.
- N/A 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.
- N/A 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 Q_{100} flows.
- N/A Street slopes for perimeter and interior streets. The minimum slope is 0.4 percent.

IV. HYDROLOGIC ANALYSIS (USED REFERENCED DS 1757)

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, Q_{10} and Q_{100} 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.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

V. HYDRAULIC ANALYSIS

Yes No

<u>N/A</u>	Flow split calculations and supporting documentation or reference for the method of flow split calculations used.
<u>X</u>	Normal depth street flow calculations and cross section diagrams for all interior and perimeter streets. Provide "d x v" products for the Q_{100} and Q_{10} flows representing the worst case for interior and all perimeter streets. $Q_{100} d \times v \leq 8$. $Q_{10} d \times v \leq 6$ and 12 foot dry lane for rights-of-way ≥ 80 feet. Calculations must be labeled by street name as indicated on the Grading Plan.
<u>X</u>	A summary table of interior and exterior street capacity calculations showing the street name, Q_{100} flow, slope, depth of flow, velocity and depth times velocity product and streets needing to meet 12 foot dry lane criteria.
<u>N/A</u>	Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.)
<u>N/A</u>	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.
<u>X</u>	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 Q_{100} weir height or flow depth, which ever is greater.
<u>N/A</u>	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.
<u>N/A</u>	Provide a 50 percent clogging factor in the capacity calculation for drop inlets.
<u>N/A</u>	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.
<u>X</u>	The mitigation of nuisance water, both during construction and in the fully developed condition, must be addressed.

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 (CCRFCDD) 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 CCRFCDD Hydrologic Criteria and Drainage Design Manual (Design Manual).

An appointment must be made to preview this checklist in conjunction with CCRFCDD 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	
	N/A	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.
	N/A	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.
	N/A	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.
	N/A	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.
	N/A	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.
	N/A	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.

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

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.

April 15, 2014

Mr. Albert Sung, P.E.
Flood Control Project Engineer
Department of Public Works
City of Las Vegas
333 N. Rancho Drive
7th Floor
Las Vegas, Nevada 89107

**Technical Drainage Study: Desert Pines Update
(aka Bonanza Springs DS 1757)**

Dear Mr. Sung:

Submitted herewith for your review and approval is one (1) bond copy and one (1) electronic copy of the *Technical Drainage Study Update for Bonanza Pines* project.

The update to the original drainage study, Bonanza Springs (DS1757) prepared by L. R. Nelson Consulting Engineers in 1996 and approved by the City of Las Vegas Flood Control Section, April 30, 1996. The purpose of this update is to modify the onsite area, specifically removal of the existing half-court basketball area and replace it with 7,500 square feet recreation area that included a single freestanding building and shaded ramada for the residents. The reminder of the onsite and offsite area will remain unchanged for this Update.

This document, together with the concepts and designs presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization and adaptation by L.R. Nelson Consulting Engineers shall be without liability to L.R. Nelson Consulting Engineers.

If you have any questions regarding this Study, please contact our office at (702) 798-7978.

Sincerely,

Jon Hayslip, P.E., CFM
Flood Control Manager

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I. INTRODUCTION

A. Study Overview and Purpose

This study is intended to serve as the technical hydrology study for the proposed Update to the *Bonanza Pines* development. The original site is approximately 12.8 (+/-) acres of apartment property and the proposed changes affect approximately 7,500 square feet. The proposed changes consist of removal of the existing half-court basketball area and replace it with 3,200 (+/-) s.f. recreation building and 630 (+/-) s.f. free standing Ramada shade structure for the residents.

The original drainage study was known as Bonanza Springs (DS1757) prepared by L. R. Nelson Consulting Engineers in 1996 and approved by the City of Las Vegas Flood Control Section, April 30, 1996.

This technical drainage study update is a stand-alone document that presents the findings of a hydrologic analysis of the site and contributing watershed area. Flow rates are computed for the *10- and 100-Year Design Storm* to be used to in the design of flood protection facilities as recommended by current criteria and regulatory agency requirements. This study has been conducted in accordance with the criteria set forth by the Clark County Regional Flood Control District's (CCRFCD) *Hydrologic Criteria and Drainage Design Manual* (Reference #2).

B. Location

The project area is within the South Half of the Southwest Quarter (SW 1/4) of Section 30, Township 20 South, Range 62 East, Mount Diablo Meridian, City of Las Vegas, Nevada as viewed from the Clark County Assessor's Parcel Map. The north boundary of the existing development is Harris Avenue, the existing Champion Center on the East boundary, Bonanza Road on the South and multi-family residential and commercial center on the West. The general *Vicinity Map* is shown on Figure 1 in Appendix A.

The Assessor's Parcel Number (APN) for the proposed apartment development is 140-30-401-002 is located on the *Site Location Map* shown on Figure 2 in Appendix A.

C. Existing Site Description

The existing 12.8 acre site is currently developed as a multi-family residential constructed based upon the design provided L. R. Nelson Consulting Engineers. The development has been in existence since 1996/1997 time frame. Currently the area proposed for revision is the location of the tennis court and former play ground as shown in the following pictures.

Photo 1: Existing Onsite Condition (looking across former playground area)



Photo 2: Existing Onsite Condition (looking across tennis court)



D. CCRFCD Master Plan Information

As shown on the Figure 4 in Appendix A which references 2013 Las Vegas Valley Flood Control Master Plan Update (MPU) Figure F-27, the site is adjacent to a proposed MPU facility, *Las Vegas Wash – Bonanza (LVBZ0114)*, 2: 12-ft by 6-ft reinforced box culvert (RCB). Figure 4 in Appendix A shows the existing site location in reference to the identified regional flood control facility. According to the Clark County Regional Flood Control District *10-Year Capital Improvement Program Fiscal Year 2014 through Fiscal Year 2023*, the proposed regional flood control facility is not identified for funding and construction within this time frame.

The existing site boundary is delineated on Figure 4 and the location of the proposed building area improvements are highlighted inside developed area.

E. FEMA Flood Plain Information

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Community-Panel Number 32003C 2186F and 32003C 2187F, revised to reflect Letter of Map Revision (LOMR) dated May 17, 2012 for the latter panel. Based upon a review of this information, the site is located within a Zone 'X'. A Zone 'X' is described by FEMA as an area outside the 0.2% annual chance floodplain. A map depicting the FEMA flood zones in the vicinity of the site is included in Appendix A of this study. The site boundary has been provided on Figure 5 and 6, *Flood Insurance Rate Map*.

F. City of Las Vegas Northwest Neighborhood Flood Control Master Plan

The City Wide study was referenced for offsite drainage patterns and the 10- and 100- year street flows adjacent to the site based on the information provided by City of Las Vegas Flood Control documents. As shown on Figure 5A and 5B in Appendix A (referenced CLV Figure E-5 & E-11), the site is a part of basin BN10. The existing and future conditions show a flow of 312 and 931 cfs for the 10- and 100-year storm events at the intersection of Pecos and Bonanza (Figure 5B).

Under the future conditions as shown in Figure 6A and 6B (referenced CLV Figure F-5 & F-11), the 10- and 100-Year flow rates are 59 and 131 cfs located at the eastern watershed boundary (and property line shown on Figure 6B) adjacent to the site within the Bonanza Road.

Figures 6A and 6B in Appendix A indicates there is no local storm drain adjacent to the existing site within Bonanza Road and Harris Avenue.

G. Previous Drainage Studies

The following technical drainage studies listed below were referenced in preparation for this study:

- *Technical Drainage Study for Bonanza Pines and addenda*, by L. R. Nelson Consulting Engineers, Inc. February 1996, DS1757.
- *Technical Drainage Study for Bonanza Pines Update #1*, by L. R. Nelson Consulting Engineers, Inc. March 1996, DS1757.

Based upon a review of the above mention study by L.R. Nelson Consulting Engineers it appears these studies meet the minimum criteria and concur with the results. The proposed recreation building and ramada improvements are located within basin FUT-2 as shown in Figure D-1 of the referenced study. This Study has provided the pertinent portions of these referenced drainage studies and are included in Appendix D.

II. METHODOLOGY

A. Compliance with Regulations

This Update to the 1996 Study utilized the originally approved flow rates as the hydrologic analysis was conducted in accordance with the Clark County standards and the criteria set forth by Clark County Regional Flood Control District (CCRFCDD) *Hydrologic Criteria and Drainage Design Manual* (HC&DDM), prepared by WRC Engineering 1991. The hydrologic methods used in the original Study remain the same as provided in the updated HC&DDM updated by Montgomery 1999. The hydrologic parameters were updated to current HC&DDM.

B. Hydrologic Analysis

1. Rainfall Criteria

Based upon the approved referenced drainage study, the site is located within the McCarran Airport Rainfall Area as indicated on Figure 513 of the HC&DDM. The depth-duration-frequency values for the 6-hour, 10- and 100-Year storm events were obtained from Table 505 and are summarized below in Table 1, McCarran Airport Rainfall Values. Since the site encompasses less than 8-square miles a Storm Distribution Number three (SDN #3) was used for the HEC-1 model. No Depth-Area-Reduction factors were used since the onsite watershed area is approximately 0.02 square miles.

Table 1: McCarran Airport Rainfall Values

10-Year 6-Hour (in)	100-Year 6-Hour (in)
1.58	2.77

2. Runoff Computations

The Soil Conservation Service or SCS dimensionless unit hydrograph method provided within the HEC-1 model was utilized to compute design storm hydrographs. The **U.S. Army Corps of Engineers HEC-1, Flood Hydrograph Package Computer Model**, June 1998 Version 4.1 was utilized to model the surface runoff estimate of a given watershed to rainfall. The HEC-1 program represents the watershed as an interconnected system of hydraulic components. Each component represents an aspect of the rainfall runoff process within a portion of the watershed. The smaller portion is referred to as a sub-basin. The computed hydrographs from each sub-basin are then combined at appropriate locations to obtain the final discharge hydrograph. The HEC-1 parameter calculations are located in Appendix B of this study.

Lag Time T_L is defined as the time measured from the centroid of effective rainfall to the peak of the outflow hydrograph. It is a measure of the watershed's response time and is a coherent property to basin length, slope, roughness characteristics and land use. The lag-times for this study were estimated by calculating the drainage basins' time of concentration, T_C . The time of concentration consists of two components; the initial overland flow time, t_i , and the gutter or channel flow time, t_c . The equation for the time of concentration is $T_C = t_i + t_c$. The equation for lag time is $T_L = 0.6T_C$. Standard Form 4 from the CCRFCDD HC&DDM was utilized to establish the T_L for input into the HEC-1 models and is included in Appendix B for review.

For the existing and developed onsite conditions, the SCS method described above was used for the hydrologic analysis within the HEC-1 computer software.

3. Soils Classification

The Hydrologic Soil Group (HSG) information provided in the referenced drainage study remains unchanged. HSG 'C' was utilized for the Curve Number analysis. In the original analysis, a CN value of 90 was utilized for the multi-family development within the HEC-1 analysis. With the update to the 1999 HC&DDM, the CN value for the multi-family development is 91 for Apartments/Condos per Table 602A.

C. Hydraulic Analysis

Bentley Systems FlowMaster computer software was used to compute the normal depth and velocity for the onsite area for the computed 100-Year flow rate. The software uses Manning's Equation to determine the results used to calculate depth times velocity values required by the HC&DDM.

III. DRAINAGE DEVELOPMENT DESCRIPTIONS

A. Drainage Description

The site is completely developed and flow patterns established remain unchanged. The proposed onsite revisions occurred within basin FUT-2 of the originally approved drainage study. Portions of the referenced drainage study are included in Appendix D showing the area proposed for revision.

Onsite flow is routed to the drive aisle where it is conveyed by grade to Bonanza Road. Drainage patterns for the proposed recreation building and ramada shade structure will route flow away from the buildings as shown on the including grading plan. The drainage basin map is shown as Figure D-1 in Appendix

B. Hydrologic Analysis Description

The original hydrologic analysis was updated to incorporate the current methods of practice for the entire site and proposed revisions. The original HEC-1 analysis results are shown in column 1 provided in the reference study. The basin information from the original Standard Form 4 was updated to determine new T_L for input into the HEC-1 and included in Appendix B from the referenced HEC-1 May 1991 version to the current June 1998 version and summarized below in column 2. The final revision was to incorporate the updated CN values and T_L to determine the estimated 10- and 100-Year flow rates for the site summarized in the following table.

Table 2: Onsite Runoff Summary

HEC-1 ID/ Basin Name	10/100-YR Flow ¹ (cfs)	10/100-YR Flow ² (cfs)	10/100-YR Flow ³ (cfs)
FUT-1	6/13	5/12	6/12
FUT-2	6/13	6/13	6/14
FUT-3	2/5	2/5	3/6
COMBINED	14/31	13/30	14/31

¹ Original referenced HEC-1 computed flow rates HEC-1 May 1991 Version – See Appendix D

² Updated HEC-1 using original Standard Form 4 data implemented into current Standard Form 4 – See Appendix B

³ Updated HEC-1 using current Standard Form 4 and updated CN values – See Appendix B

Based upon the results of the HEC-1 analysis, the estimated computed 10- and 100-Year flow rate remains unchanged from the originally approved drainage study.

C. Drive Aisle Depth of Flow Calculations

Onsite drive aisle calculations are provided for the 100-Year, 6-hour design storm summarized in the following table. The hydraulic calculations are included in Appendix C.

Table 3: Onsite Drive Aisle Depth of Flow Calculations

Street	Slope (%)	Q ₁₀₀ (cfs)	D ₁₀₀ (ft)	V ₁₀₀ (ft/s)	DV
Section 1	0.37	12	0.42	1.95	0.8
Section 2	0.50	14.7	0.46	2.37	1.1

The 100-year flow rate in Section 1 assumed the flow rate from basin FUT-1, while Section 2 assumed FUT-1 and 1/3 of FUT-2 to compute the depth and velocity at the upstream side of the proposed recreation building.

Based upon the above calculations, the follow table summarized the estimated freeboard on the high side of the building for the 100-Year flow within the drive aisle as shown on the enclosed drainage plan in Appendix A.

Table 4: Freeboard Calculations

Street	D ₁₀₀ (ft)	2xD ₁₀₀ (ft)	WSE	FF	F _b (ft)
Section 1	0.42	0.84	91.87	92.80	0.93
Section 2	0.46	0.92	90.86	92.80	1.94

Based upon the above FlowMaster calculations for the onsite conditions, the computed 100-Year design storm flow rates are contained within the drive aisle areas and the minimum finish floor criterion is met for the proposed recreation building addition.

IV. CONCLUSIONS

Based upon a comparison of the original and updated hydrologic analysis, the overall site 10- and 100-Year flow rates remain unchanged. The proposed recreation building and ramada shade structure will not increase the runoff into Bonanza Road.

The proposed recreation building finished floor elevation is elevated greater than twice the depth of flow within the adjacent drive aisles shown in Table 4 as required in § 304.4 (E)(1). The project is not located within a Special Flood Hazard Area. The Update to the originally approved drainage study meets the minimum criteria of the CCRFCD HC&DDM.

V. RECOMMENDATIONS

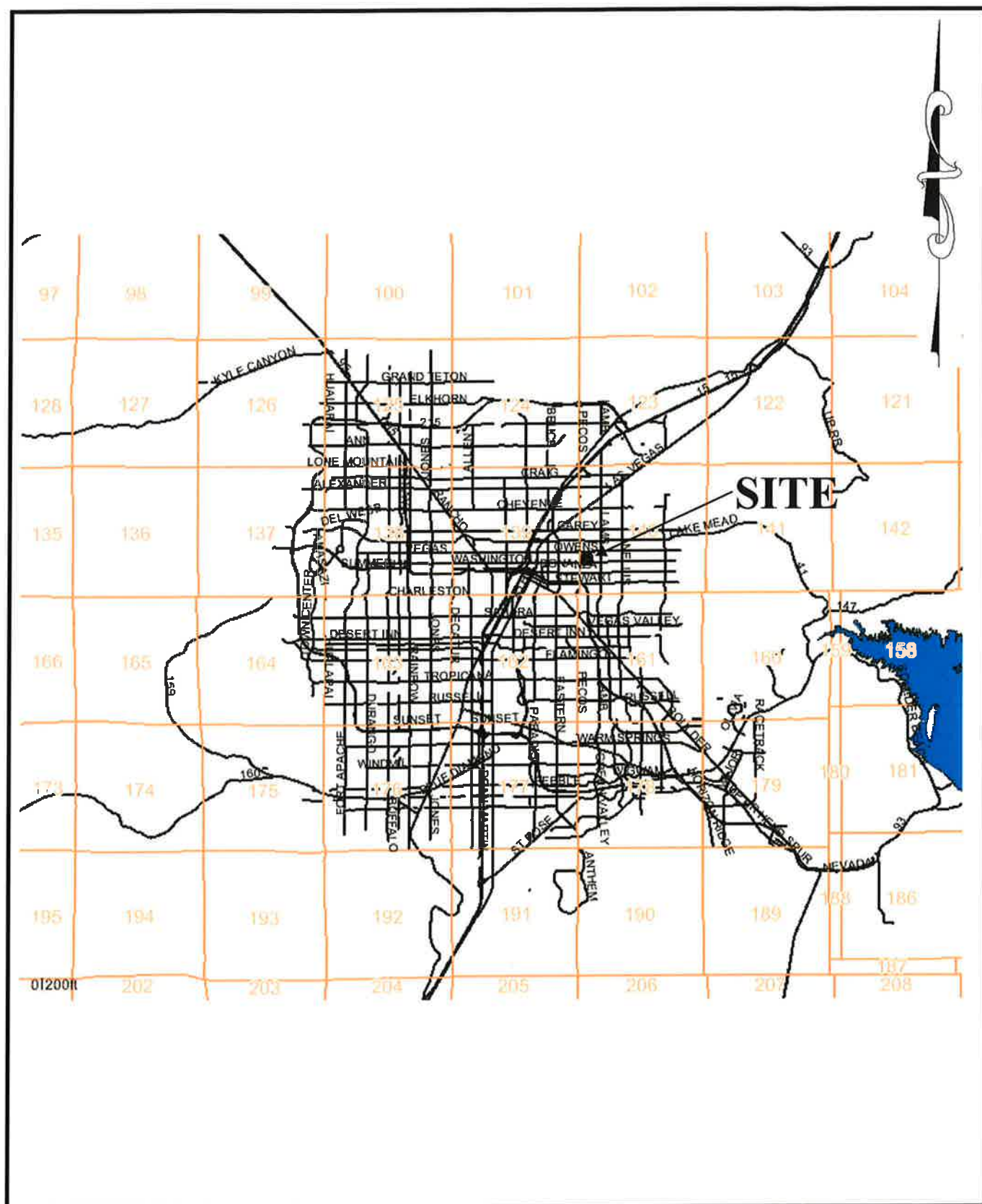
The following recommendations are provided to facilitate safety, both public and private, for the proposed recreation building and ramada shade structure.

1. Construct of the recreation building and ramada shade structure at the proposed finished floor elevation as shown on the enclosed grading plan.
2. Construction on the proposed swales and onsite 4" x 4" drains crossing sidewalk areas as shown on the enclosed grading plan.

V. REFERENCES

1. *CCRFCD Flood Control Master Plan*, by P.B.S. & J., Inc. and PB, Inc., 2008, with CCRFCD 2013 F-Series Revisions.
2. *CCRFCD Hydrologic Criteria and Drainage Design Manual*, WRC Engineering, 1999.
3. *Flood Insurance Rate Map, Community Panel Number 32003C 2186F and 32003C 2187F*, revised to reflect Letter of Map Revision (LOMR) dated May 17, 2012 for the latter panel.
4. *City of Las Vegas Central Neighborhood Flood Control Master Plan*, by P.B.S. & J., Inc., March 2005.

Appendix A: Figures

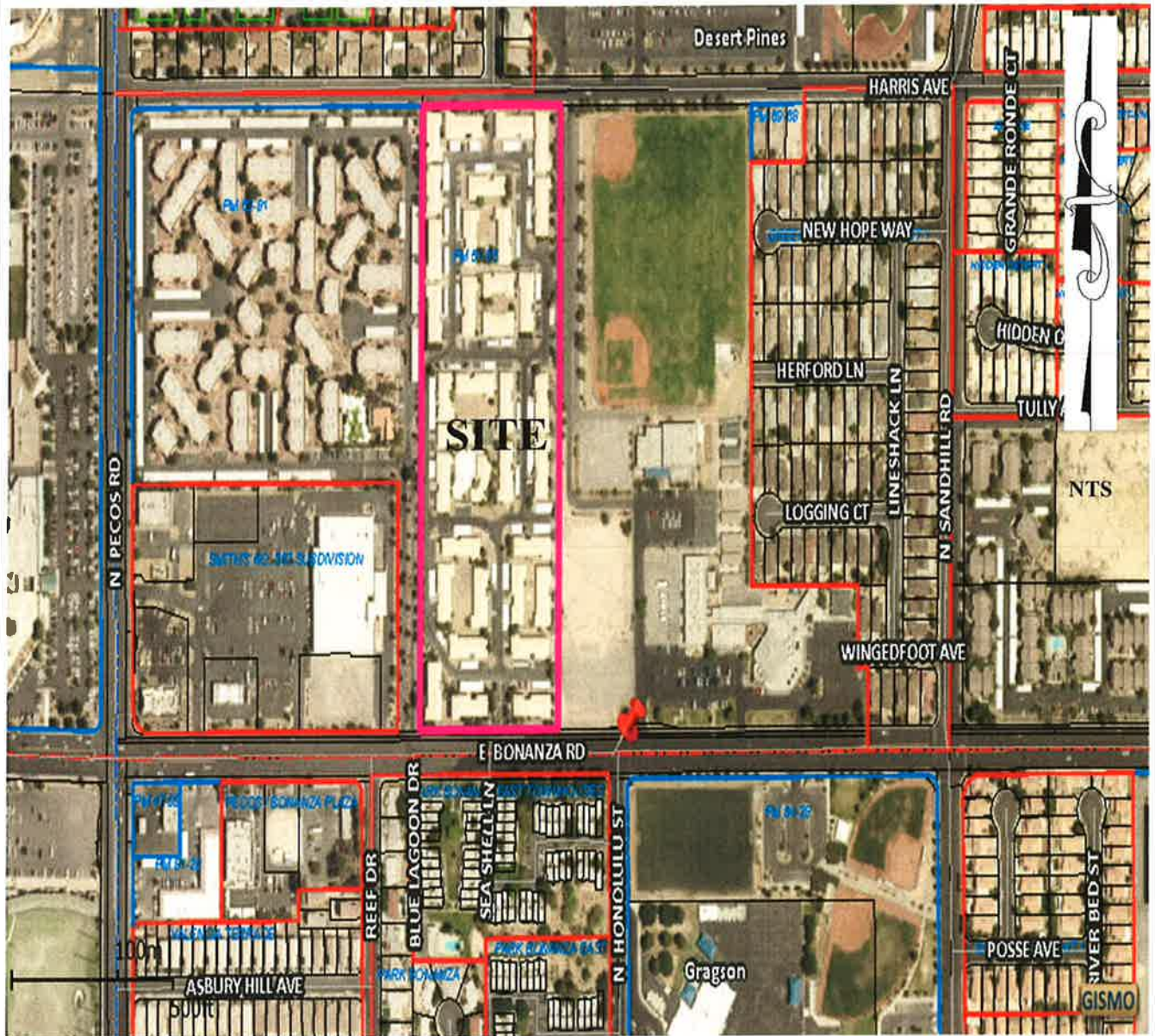


L.R. Nelson
Consulting Engineers
6765 W. Russell Rd., Suite 200
Las Vegas, NV 89118

DESERT PINES

NEVADA HAND

Figure 1
Vicinity Map



L.R. Nelson
Consulting Engineers
6765 W. Russell Rd., Suite 200
Las Vegas, NV 89118

DESERT PINES
NEVADA HAND

Figure 2
Site Location Map

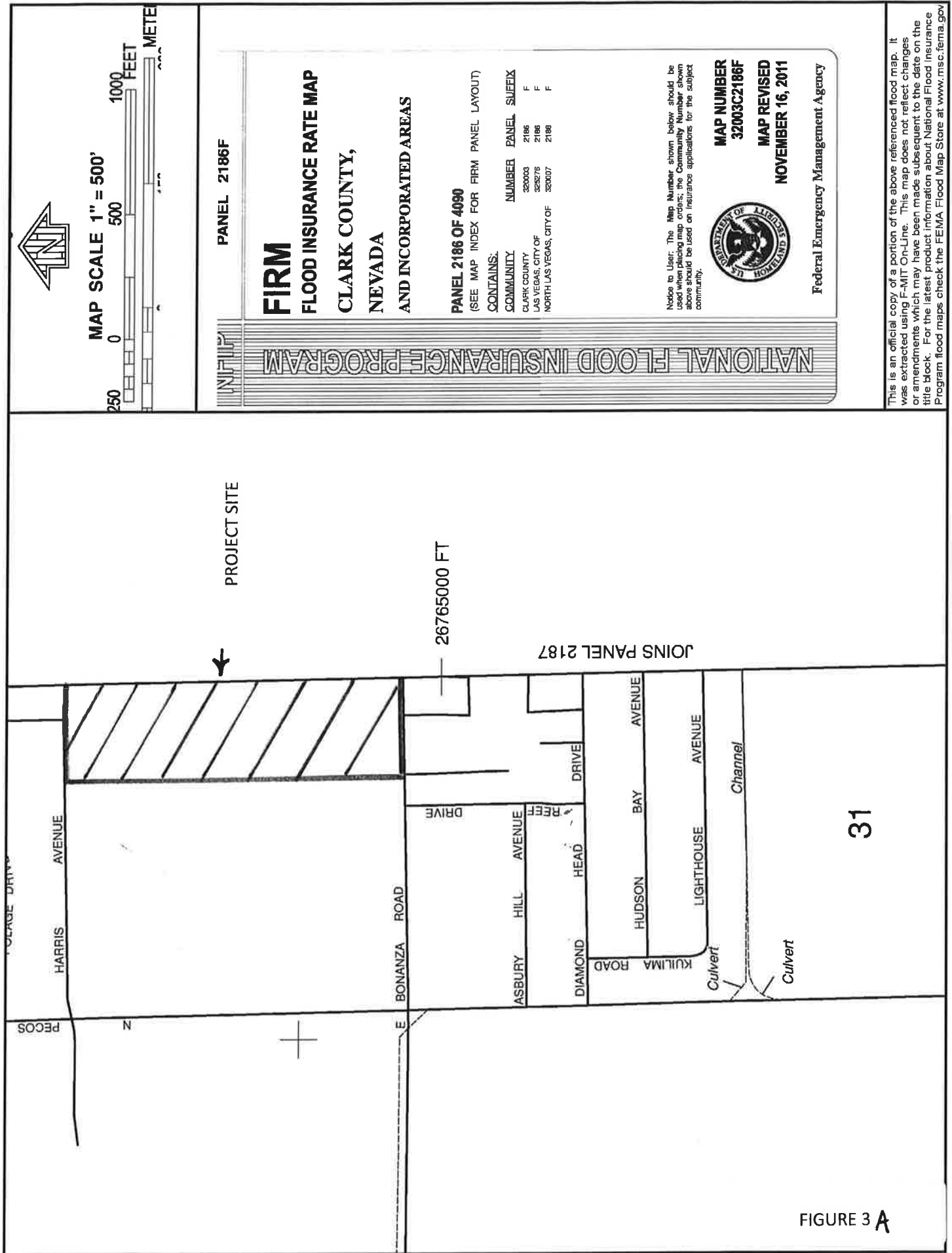
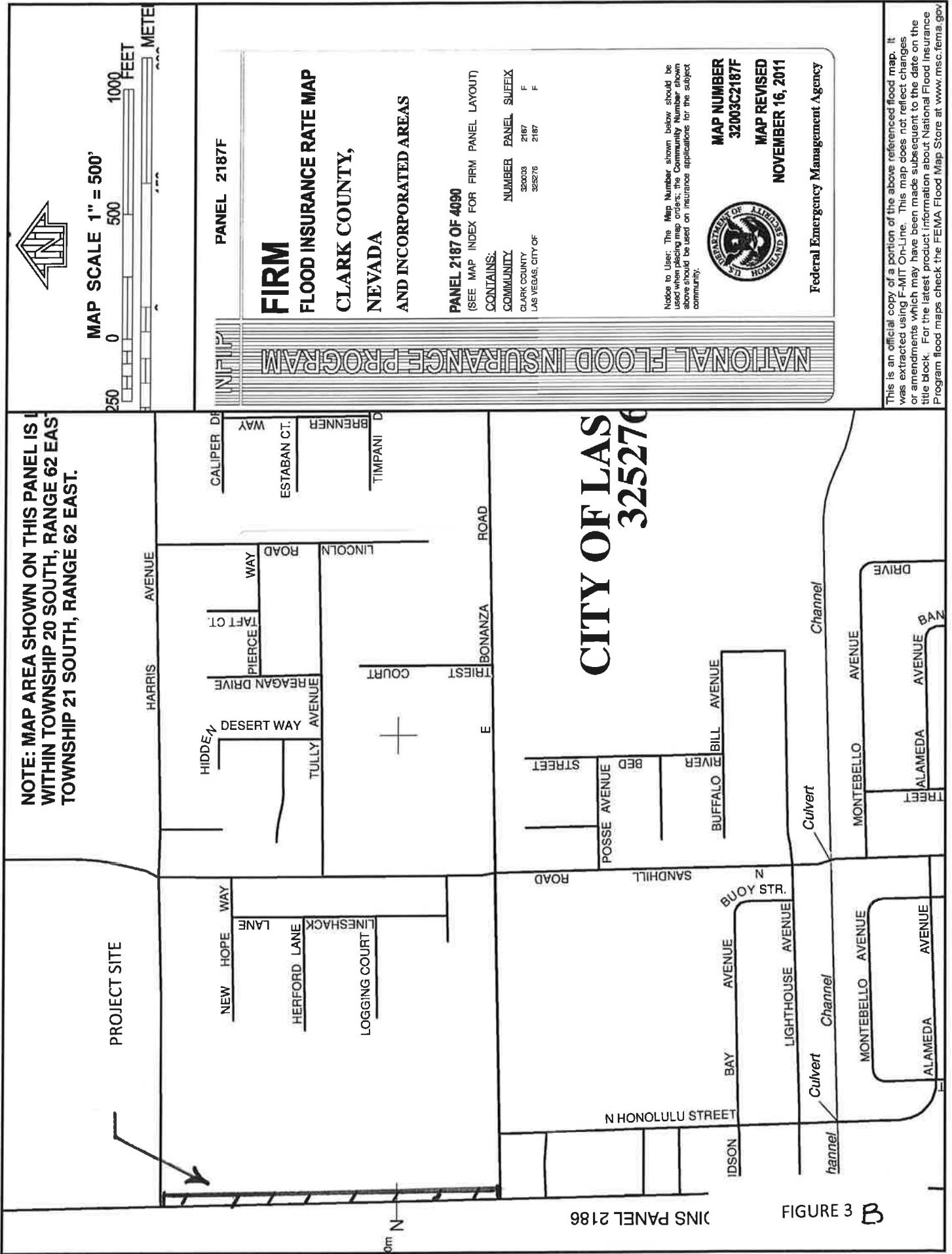


FIGURE 3 A

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov





2013
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE F- 27
FLOOD CONTROL FACILITIES
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 |

ID / River Mile	Status	Facility Description	Length (ft)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq. mi.)	Channel Slope (%)
LVBZ 0003	P1	2' 12" X 7' RCB	3400	1636	CBN15-C	SW3	2.40	0.40
0004	P1	2' 12" X 6' RCB	2630	1449	CBN12-C	SW3	2.12	0.40
0114	P1	2' 12" X 6' RCB	2740	1256	CBN10-C	SW3	1.79	0.40
0166	E	54" RCP (Replaces w/ LVBZ0167)	1095	1051	CBN09	SW3	1.54	0.45
0167	P0	10' X 9' RCB (Replaces LVBZ0166)	1095	1051	CBN09	SW3	1.54	0.45
0187	E	48" RCP (Replaces w/ LVBZ0188)	1235	1051	CBN09	SW3	1.54	0.71
0188	P0	9' X 9' RCB (Replaces LVBZ0187)	1235	1051	CBN09	SW3	1.54	0.71
0210	E	42" RCP (Replaces w/ LVBZ0211)	704	911	CBN08	SW3	1.30	1.37
0211	P0	8' X 7' RCB (Replaces LVBZ0210)	704	911	CBN08	SW3	1.30	1.37
0223	E	36" RCP (Replaces w/ LVBZ0224)	2275	722	CBN03	SW3	1.09	0.72
0224	P0	8' X 7' RCB (Replaces LVBZ0223)	2275	722	CBN03	SW3	1.09	0.72

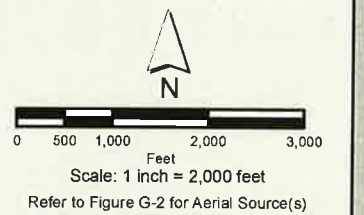


FIGURE 4



City of Las Vegas

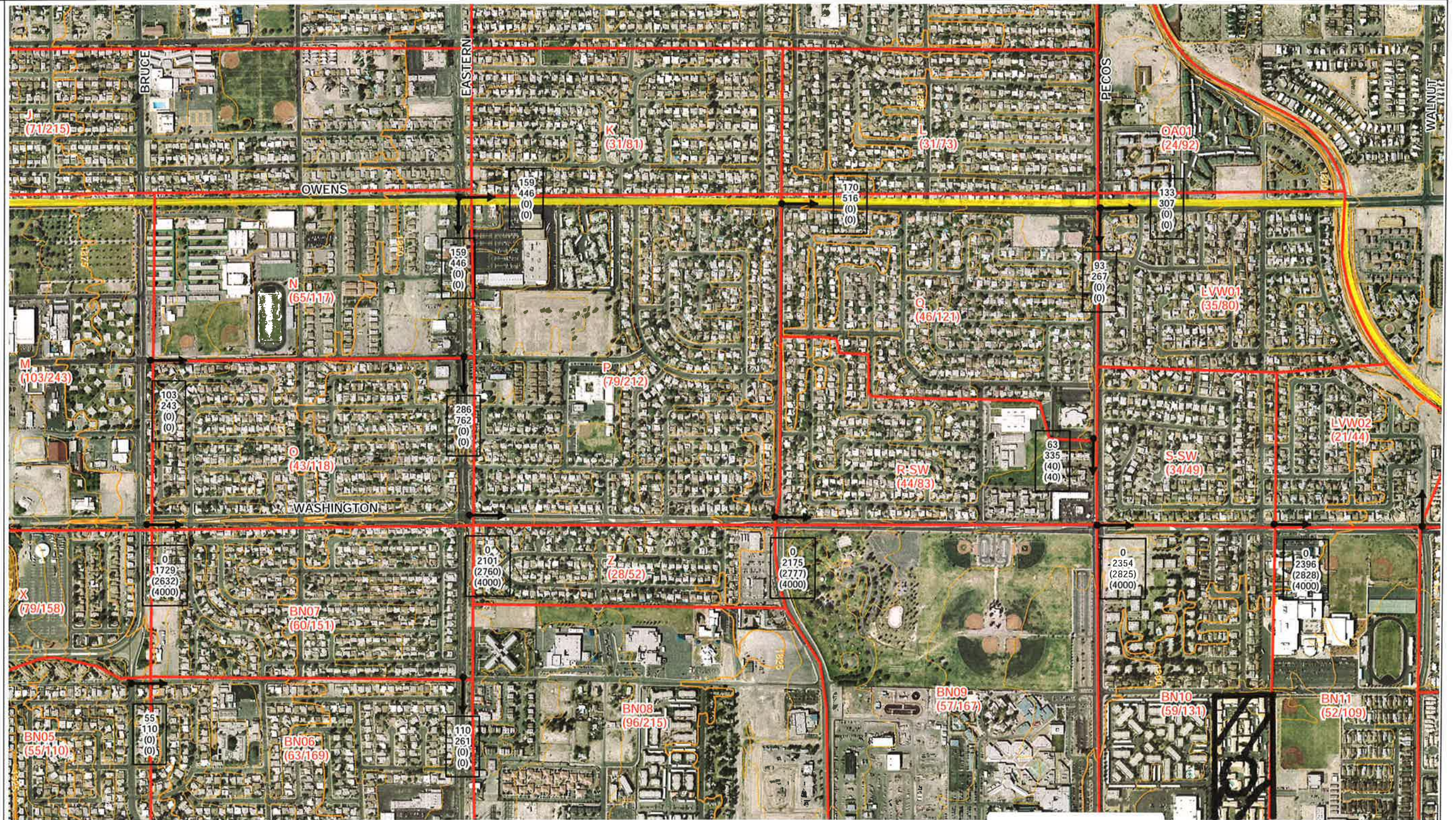
CENTRAL NEIGHBORHOOD FLOOD CONTROL MASTER PLAN

LEGEND

- Sub-basin Boundary
- Basin ID
- Contributing flow from the basin (cfs)
- Flow Arrow
- 10-Year Street Flow
100-Year Street Flow
10-Year Facility Flow
100-Year Facility Flow
(Flows in CFS)
- Study Area Limit

PHOTO DATE: SPRING 2004

FIGURE E-5



EXISTING DRAINAGE CONDITIONS



2270 Corporate Circle, Suite 100
Henderson, NV 89074
(702) 263-7275
Fax: (702) 263-7200

	Durango	Rainbow	Decatur	Tonopah	5th	Pecos	Nellis
Lake Mead				1	2		
Washington				3	4	5	6
Charleston	7	8	9	10	11	12	
Sahara	13	14	15	16	17		
Desert Inn		18	19				

PROJECT SITE

NOTE:
Existing conditions are based on future
Curve Number values with only existing local and
CCRCD facilities in place.

100-Year flows at locations where a 100-Year
subbasin concentration point does not exist in the
hydrology model were based on an area-weighted
ratio of the 100-Year flows from concentration points
upstream and downstream of the location. See
Volume I for a more detailed explanation.



SCALE: 1 inch = 800 feet

FIGURE 5 A



City of Las Vegas

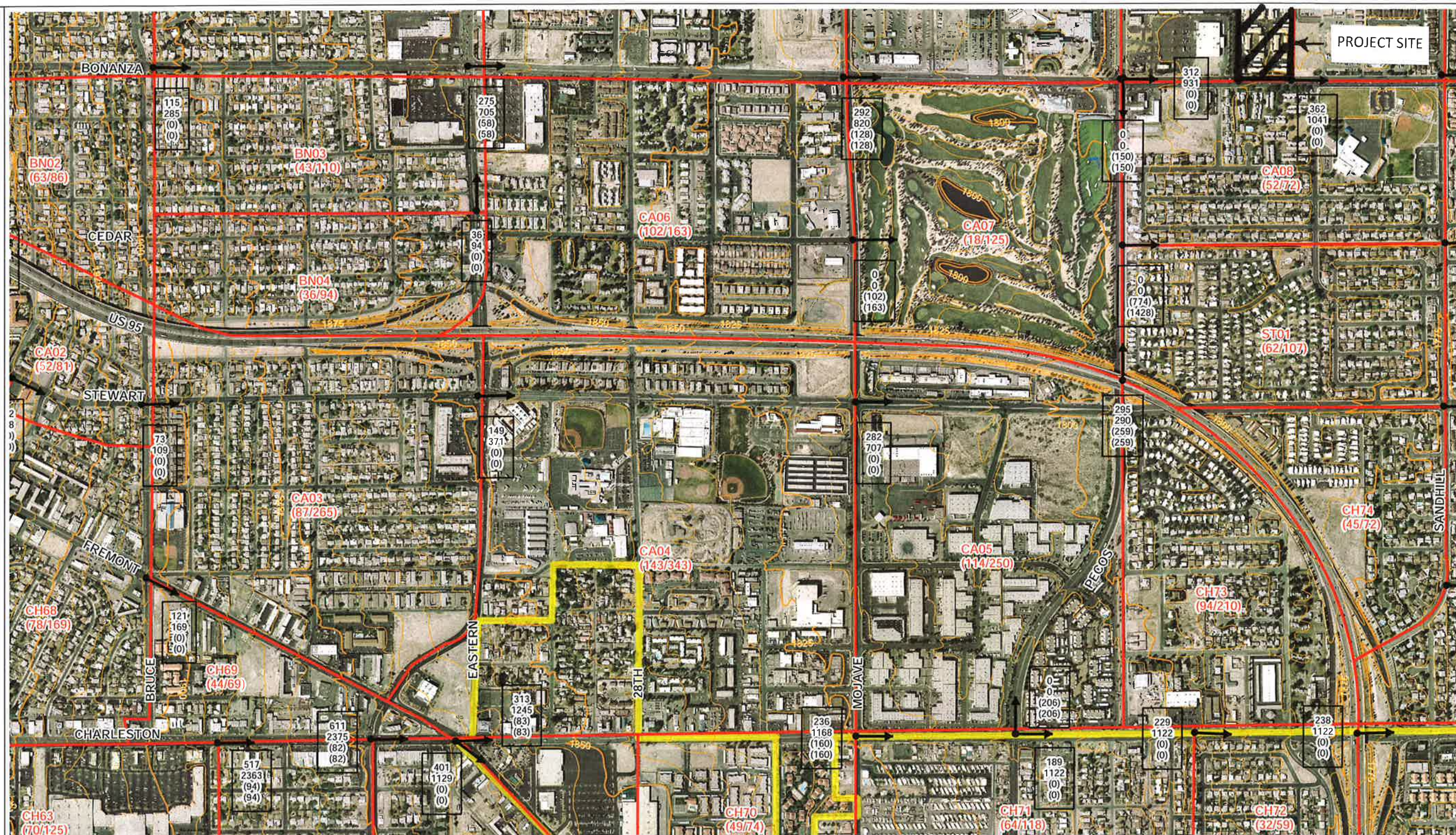
CENTRAL NEIGHBORHOOD FLOOD CONTROL MASTER PLAN

LEGEND

- Sub-basin Boundary
- Basin ID
- Contributing flow from the basin (cfs)
- Flow Arrow
- 10-Year Street Flow
100-Year Street Flow
10-Year Facility Flow
100-Year Facility Flow
(Flows in CFS)
- Study Area Limit

PHOTO DATE: SPRING 2004

FIGURE E- 11



EXISTING DRAINAGE CONDITIONS

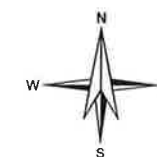


2270 Corporate Circle, Suite 100
Henderson, NV 89074
(702) 263-7275
Fax: (702) 263-7200

	Durango	Rainbow	Decatur	Tonopah	5th	Pecos	Nellis
Lake Mead				1	2		
Washington				3	4	5	6
Charleston	7	8	9	10	11		12
Sahara	13	14	15	16		17	
Desert Inn		18	19				

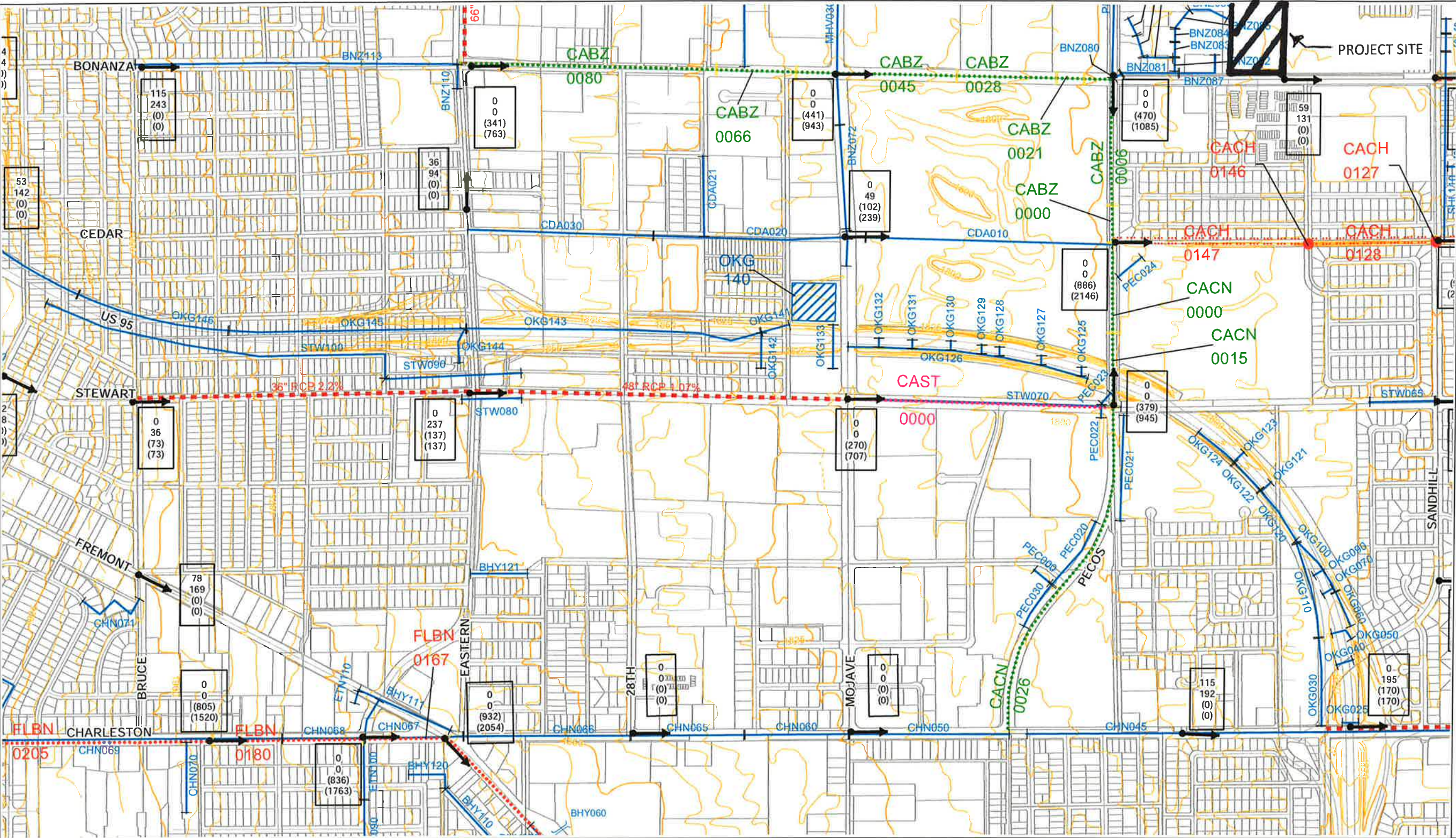
NOTE:
Existing conditions are based on future
Curve Number values with only existing local and
CCRCD facilities in place.

100-Year flows at locations where a 100-Year
subbasin concentration point does not exist in the
hydrology model were based on an area-weighted
ratio of the 100-Year flows from concentration points
upstream and downstream of the location. See
Volume I for a more detailed explanation.



SCALE: 1 inch = 800 feet

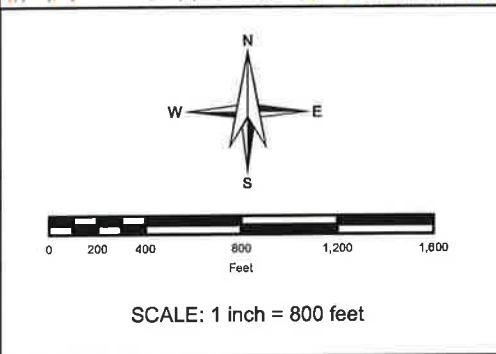
FIGURE 5 B



CENTRAL NEIGHBORHOOD FLOOD CONTROL MASTER PLAN

- ## LEGEND
- Existing Regional Facility
 - Category A Proposed Regional Facility (2002 MPU)
 - Category B Proposed Regional Facility (2002 MPU)
 - Category A Proposed Regional Facility (2004 CNFCMP)
 - Existing Local Facility
 - Proposed Local Facility
 - Regional Culvert
 - Regional Bridge
 - Regional Pipeline
 - Regional Channel
 - Regional Levee
 - Local Detention Basin
 - Local Storm Drain
 - Local Culvert
 - Proposed Local Storm Drain
 - Regional ID-Mile Separator
 - Local Facility Separator

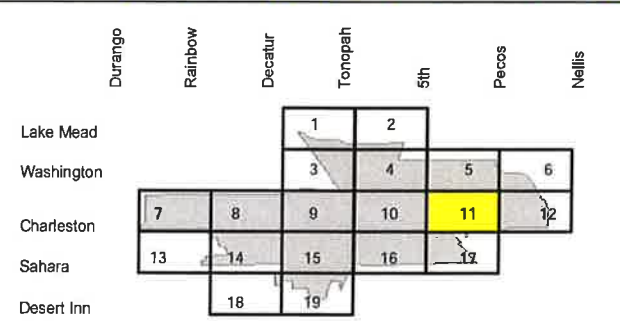
FIGURE F-11



- Flow Arrow
- 250
500
(300)
(800)
- 10-Year Street Flow
100-Year Street Flow
10-Year Facility Flow
100-Year Facility Flow
- (Flows in CFS)

NOTE:
Ultimate drainage conditions are based on future Curve Number values with all flood control facilities in place.

100-Year flows at locations where a 100-Year subbasin concentration point does not exist in the hydrology model were based on an area-weighted ratio of the 100-Year flows from concentration points upstream and downstream of the location. See Volume I for a more detailed explanation.

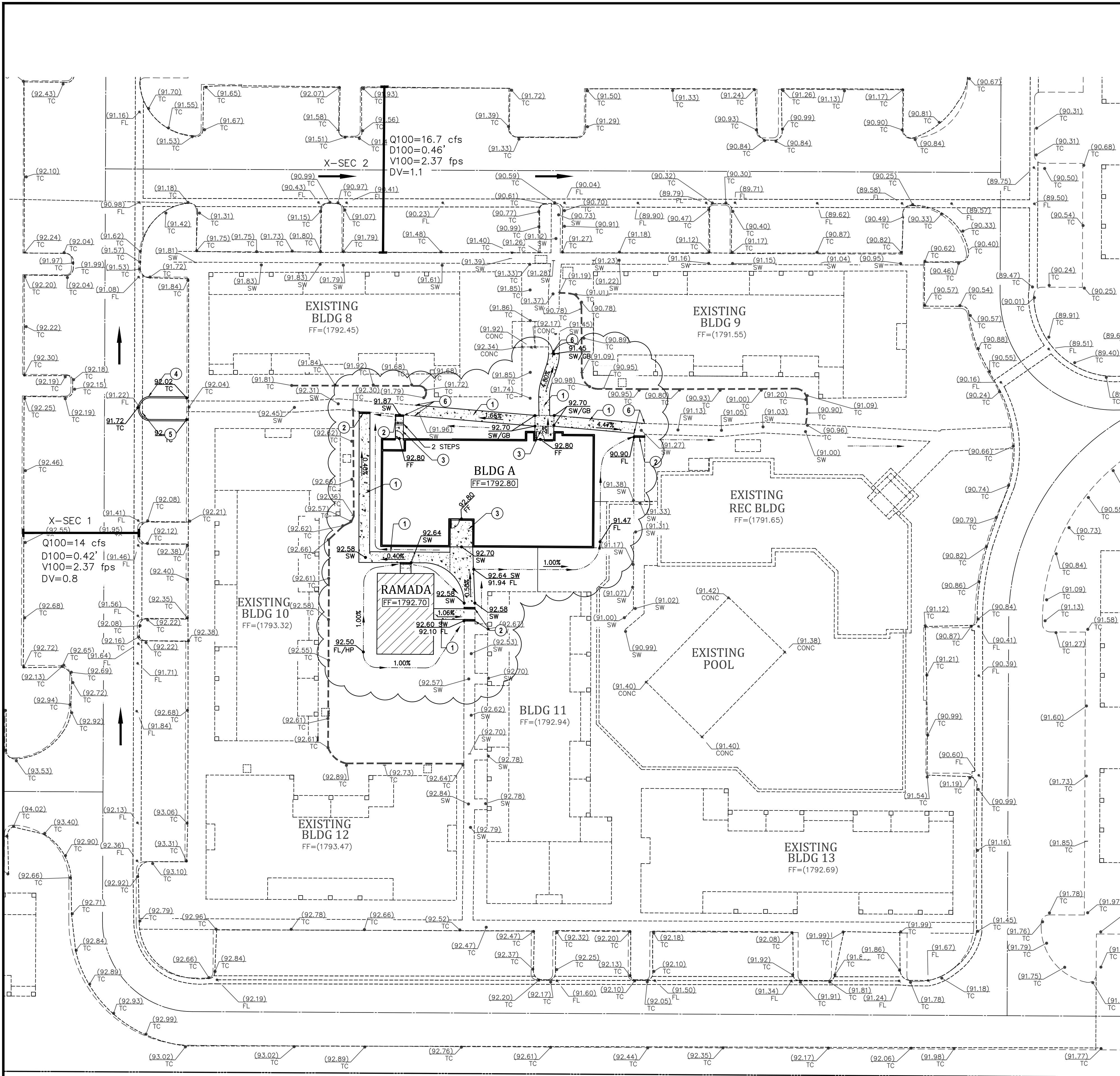


FUTURE DRAINAGE CONDITIONS

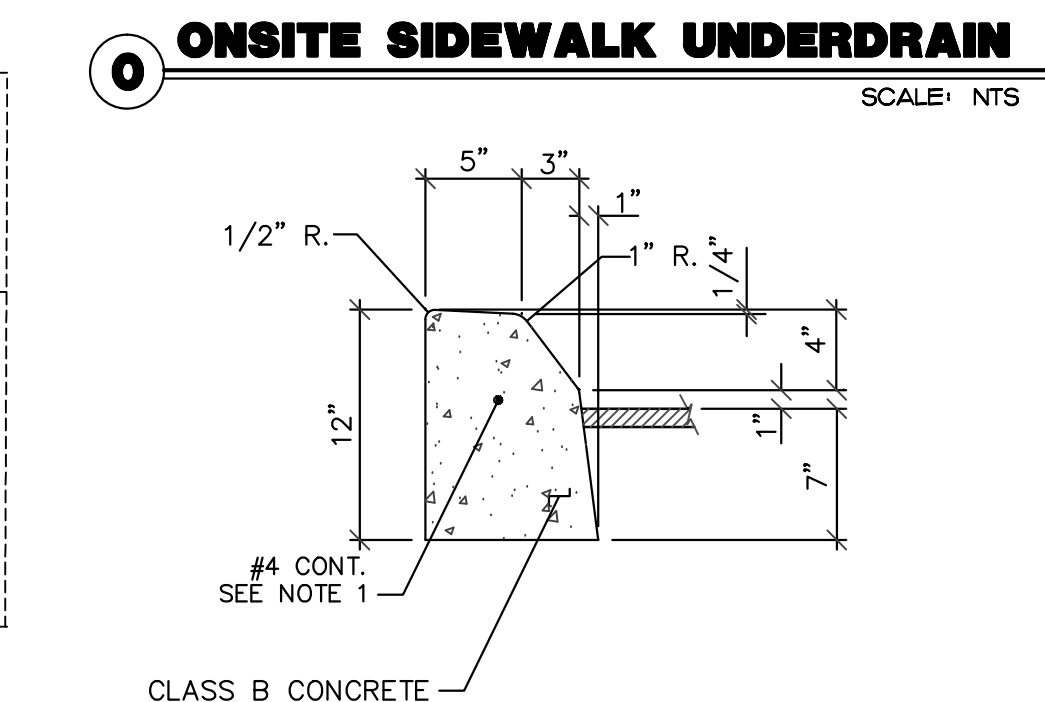
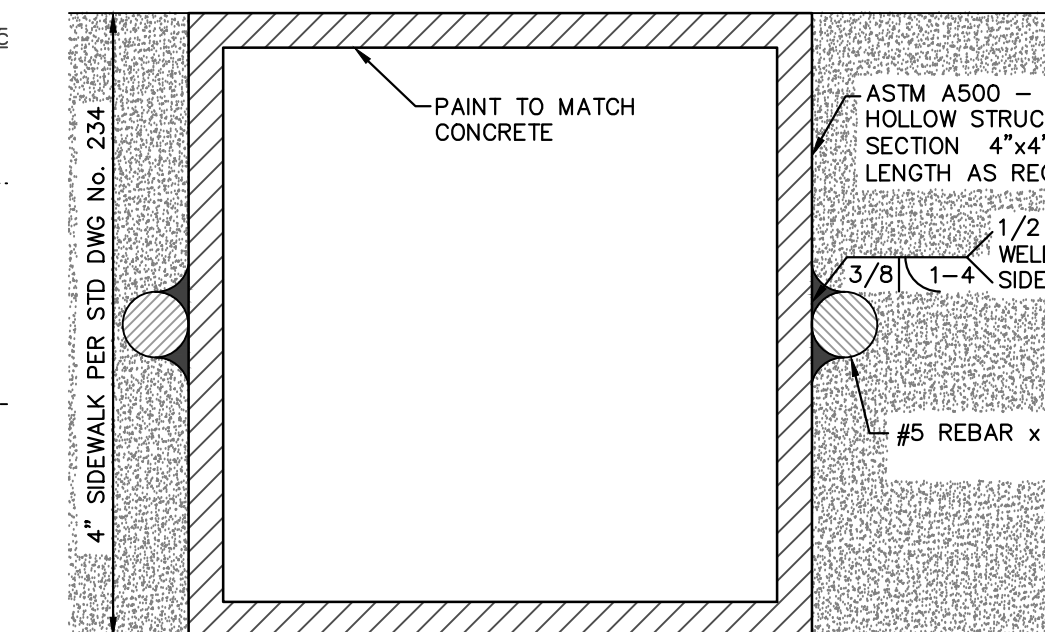
FIGURE 6 B

PBS&

2270 Corporate Circle, Suite 100
Henderson, NV 89074
(702) 263-7275
Fax: (702) 263-7200



- CONSTRUCTION KEY NOTES**
1. CONSTRUCT CONCRETE SIDEWALK PER CAUSD NO. 234
 2. CONSTRUCT ON-SITE 4" SIDEWALK DRAIN FOR DETAIL "A" ON THIS SHEET
 3. MIN. 5' LANDINGS SHALL BE INSTALLED AT ALL DOORS PER ANSI/ICC A117.1 2009 404.2.3 (1/4-INCH MAX BELOW THRESHOLD) 2.0% MAX. SLOPE
 4. CONSTRUCT "A" TYPE CURB & GUTTER PER DETAIL "B" ON THIS SHEET
 5. REMOVE 7 LF OF EX 3" VALLEY GUTTER TO MATCH WITH PROPOSED "A" CURB
 6. MATCH EXISTING SIDEWALK



- "A" TYPE CURB**
- PER USD DWG. No. 219
- SCALE: NTS

DRAINAGE STUDY

I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE AT CITY OF LAS VEGAS (DS 1757)

JON HAYSLIP, PE #12584

DATE

BASIS OF BEARING

NORTH 89°46'11" WEST, BEING THE BEARING OF THE SOUTH LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 30, TOWNSHIP 20 SOUTH, RANGE 62 EAST, M.D.M., AS SHOWN ON A MAP ON FILE IN THE CLARK COUNTY, NEVADA RECORDER'S OFFICE AS FILE 51, PAGE 65 OF SURVEYS.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK NO. 2LV02-3055W6
RIVET AND PLATE IN TOP OF CURB, NORTHSIDE OF BONANZA ROAD AT STREETLIGHT POLE 1380 FEET ± WEST OF THE INTERSECTION OF SANDHILL ROAD AND BONANZA ROAD.
ELEVATION = 544.7961 METERS (1787.38 FEET) NAVD 1988 DATUM.

FEMA FLOOD PLAIN INFORMATION

ACCORDING TO THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD INSURANCE RATE MAP (FIRM) COMMUNITY-PANEL NUMBER 32003C 2186F AND 32003C 2187F, REVISED TO REFLECT LETTER OF MAP REVISION (LOMR) DATED MAY 17, 2012 FOR THE LATTER PANEL. THE SITE IS LOCATED WITHIN A ZONE "X". A ZONE "X" IS DESCRIBED BY FEMA AS AN AREA OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.

DISCLAIMER NOTE

UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND AND OVERHEAD UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

Call before you dig
Avoid cutting underground utility lines. It's costly.

811

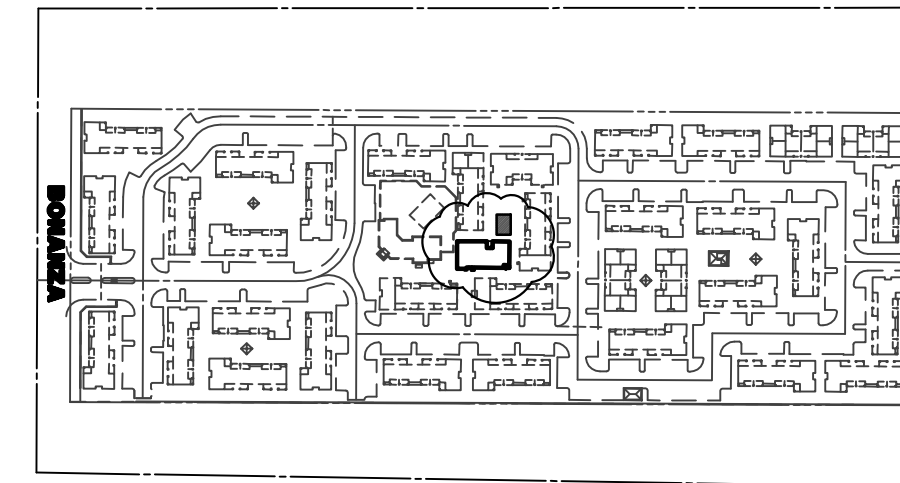
1-800-227-2600
CLARK COUNTY TRAFFIC OPERATIONS
1-702-455-7544

Avoid overhead power line contact
Call before you overheat

1-702-227-2929
NEVADA POWER ENVIRONMENT AND SAFETY SERVICES DEPARTMENT

Avoid hitting underground utility lines. It's costly.
Call before you dig

1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
1-702-455-5300
LAS VEGAS AREA COMPREHENSIVE TRAFFIC SYSTEM



ONSITE LOCATION MAP

LEGEND AND ABBREVIATIONS

- | | | |
|-------|---|---------------------|
| NG | = | NATURAL GROUND |
| SW | = | SIDEWALK |
| SD | = | STORM DRAIN |
| PAD | = | PAD ELEVATION |
| GF | = | FINISH GARAGE FLOOR |
| FF | = | FINISH FLOOR |
| SDM | = | STORM DRAIN MANHOLE |
| HP | = | HIGH POINT |
| FL | = | FLOW LINE |
| M | = | MECHANICAL |
| S | = | SANITARY |
| TF | = | TOP OF FOOTING |
| TC | = | TOP OF CURB |
| TW | = | TOP OF WALL |
| XX.XX | = | PROPOSED ELEVATION |
| XX | = | EXISTING ELEVATION |
| XX.X | = | PAD ELEVATION |
- 1.72%
XXXX
XXXX
- DIRECTION OF FLOW & SLOPE
- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- AREA OF EXISTING AC TO BE REMOVED IN EL DORADO LANE.
- DRAINAGE SWALE
- EXISTING CURB, GUTTER & SIDEWALK
- RIGHT-OF-WAY/PROPERTY LINE
- CENTERLINE

DRAINAGE LEGEND

- X-SEC 2 X-SECTION FLOW DEPTH NUMBER
- X-SECTION FLOW DEPTH LOCATION
- FLOW DIRECTION
- APPROX. AREA OF ONSITE REVISION

L. R. NELSON CONSULTING ENGINEERS, INC.

6765 West Russell Road, Suite 200
Las Vegas, Nevada 89118

• STRUCTURAL
• CIVIL
• PLANNING
• SURVEY

(702) 798-7978
(702) 451-2296 FAX



DRAINAGE PLAN

DESERT PINES APARTMENTS

FIGURE 7

LAS VEGAS NEVADA

SHEET NUMBER

1

OF 1 SHEETS

Appendix B: Hydrologic Analysis

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

L. R. Nelson Consulting Engineers, Inc.

File: STD_FORM_4

Project No.: 818-026-133

Project

Desert Pines

CALCULATED BY : STAFF

DATE: 4/9/14

SUB-BASIN DATA					INITIAL / OVERLAND TIME (Ti)				TRAVEL TIME (Tt)						Tc CHECK		Tc	Tag	REMARKS
DESIG:	DEV/EX. (D or E)	CN	K	AREA Ac	AREA Mi^2	INITIAL LENGTH Feet	SLOPE %	Ti Min	TRAVEL LENGTH Feet	SLOPE %	VELOCITY FPS	V1 FPS	VELOCITY FPS	Tt Min	TOTAL LENGTH Ft	Tc = (L/180)*10 Min	Min (13)	Tag=	RAINFALL Q100/Q10 Inches
(1)			(2)	(3)		(4)	(5)	(6)	(7)	(8)	(9a)	(9b)		(10)	(11)	(12)			
FUT-1	D	90.0	0.7980	5.00	0.00781	100.0	1.00	5.44	600	0.40	1.28	1.94	7.38	700	13.9	13.9	12.8	0.128	2.77 / 1.58
FUT-2	D	90.0	0.7980	5.80	0.00906	100.0	1.00	5.44	730	0.40	1.28	1.94	8.50	830	14.6	14.6	13.9	0.139	2.77 / 1.58
FUT-3	D	90.0	0.7980	2.00	0.00313	113.0	0.40	7.84	220	0.40	1.28	1.94	2.87	333	11.9	11.9	10.7	0.107	2.77 / 1.58
FUT-1	D	91.0	0.8112	5.00	0.00781	100.0	1.00	5.20	600	0.40	1.28	1.94	7.38	700	13.9	13.9	12.6	0.126	2.77 / 1.58
FUT-2	D	91.0	0.8112	5.80	0.00906	100.0	1.00	5.20	730	0.40	1.28	1.94	8.50	830	14.6	14.6	13.7	0.137	2.77 / 1.58
FUT-3	D	91.0	0.8112	2.00	0.00313	50.0	1.00	3.68	330	0.40	1.28	1.94	4.31	380	12.1	12.1	8.0	0.080	2.77 / 1.58
Tc = Ti + Tt																			
Tlag = 0.6 Tc																			
Ti = 1.8 (1.1 - K) L^1/2 / S^1/3																Developed		V1 = 20.2*(S/100)^1/2	
																§ 602.1			
K = 0.0132 (CN) - 0.39																Existing		V1 = 14.8*(S/100)^1/2	
																§ 602.1			
REFERENCE :																Existing		V2 = 29.4*(S/100)^1/2	
																Developed		V2 = 30.6*(S/100)^1/2	
																Developed			
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*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 09APR14 TIME 13:57:22 *
*****

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

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X X XXXXXX XXXX X
X X X X X XX
X X X X X X
XXXXXXX XXXX X XXXXX X
X X X X X X
X X X X X X
X X XXXXXX XXXXX XXX

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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 -AMSK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE, SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY, DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1

HEC-1 INPUT

PAGE 1

```

LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1          ID
2          ID      TECHNICAL DRAINAGE STUDY FOR DESERT PINES REC. BLDG
3          ID      FORMERLY KNOWN AS BONANZA SPRINGS BY LRN
4          ID      CLARK COUNTY, NEVADA
5          ID
6          ID      PREPARED BY:      L.R. NELSON CONSULTING ENGINEERS, INC.
7          ID      6765 W. RUSSELL ROAD, SUITE 200
8          ID      LAS VEGAS, NV 89118
9          ID
10         ID      FILENAME:BS1.DAT
11         ID      JOB# 818-026-133
12         ID      EXISTING CONDITION
13         ID      TECHNICAL DRAINAGE STUDY
14         ID
15         ID      *DIAGRAM
16         ID      IT      5      0      0      300
17         ID      IO      5
18         ID      IN      5
19         ID      JR      PREC      0.57      1.0
20         ID
21         ID      KK      FUT-1
22         ID      KM      DEVELOPED ONSITE BASIN - ORIGINAL MODEL
23         ID      BA      .00781
24         ID      PB      2.77
25         ID      PC      .000      .020      .057      .070      .087      .108      .124      .130      .130      .130
26         ID      PC      .130      .130      .130      .133      .140      .142      .148      .158      .172      .181
27         ID      PC      .190      .197      .199      .200      .201      .204      .214      .229      .241      .249
28         ID      PC      .251      .256      .270      .278      .281      .283      .295      .322      .352      .409
29         ID      PC      .499      .590      .710      .744      .781      .812      .819      .835      .851      .856
30         ID      PC      .860      .868      .876      .888      .910      .926      .937      .950      .970      .976
31         ID      PC      .982      .985      .987      .989      .990      .993      .993      .994      .995      .998
32         ID      PC      .998      .999      1.00
33         ID      LS      0
34         ID      UD      .1258
35         ID      *
36         ID      KK      FUT-2
37         ID      KM      DEVELOPED ONSITE BASIN - ORIGINAL MODEL
38         ID      BA      .00906
39         ID      LS      0      90
40         ID      UD      .1413
41         ID      *
42         ID      KK      FUT-3
43         ID      KM      DEVELOPED ONSITE BASIN - UPDATE #1 TO ORIGINAL MODEL IN MARCH 1996
44         ID      BA      .00313
45         ID      LS      0      90
46         ID      UD      .1046
47         ID      *

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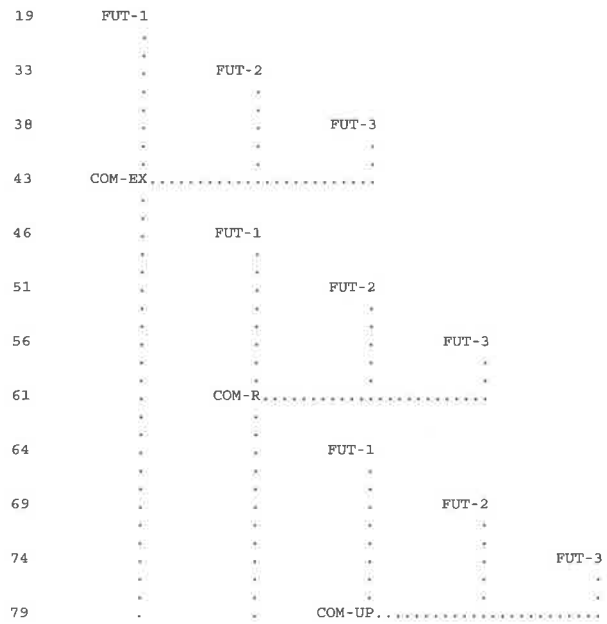

LINE	ID	1	2	3	4	5	6	7	8	9	10
43	KK	COM-EX									
44	KM	COMBINE FLOWS IN THE ORIGINAL HEC-1 REPRODUCED MODEL									
45	HC	3									
	*										
46	KK	FUT-1									
47	KM	DEVELOPED ONSITE BASIN - UPDATED SF4 CALCS W/REVISED TLAG VALUES									
48	BA	.00781									
49	LS	0	90								
50	UD	.128									
	*										
51	KK	FUT-2									
52	KM	DEVELOPED ONSITE BASIN - UPDATED SF4 CALCS W/REVISED TLAG VALUES									
53	BA	.00906									
54	LS	0	90								
55	UD	.139									
	*										
56	KK	FUT-3									
57	KM	DEVELOPED ONSITE BASIN - UPDATED SF4 CALCS W/REVISED TLAG VALUES									
58	BA	.00313									
59	LS	0	90								
60	UD	.1070									
	*										
61	KK	COM-R									
62	KM	COMBINED BASINS WITH REVISED SF4 COMPUTED TLAG VALUES									
63	HC	3									
	*										
64	KK	FUT-1									
65	KM	DEVELOPED ONSITE BASIN - UPDATED SF4 WITH CURRENT CN VALUES & REVISED TLAG									
66	BA	.00781									
67	LS	0	91								
68	UD	.126									
	*										
69	KK	FUT-2									
70	KM	DEVELOPED ONSITE BASIN - UPDATED SF4 WITH CURRENT CN VALUES & REVISED TLAG									
71	BA	.00906									
72	LS	0	91								
73	UD	.137									
	*										
74	KK	FUT-3									
75	KM	DEVELOPED ONSITE BASIN - UPDATED SF4 WITH CURRENT CN VALUES & REVISED TLAG									
76	BA	.00313									
77	LS	0	91								
78	UD	.075									
	*										

LINE	ID	1	2	3	4	5	6	7	8	9	10
79	KK	COM-UP									
80	KM	COMBINE BASINS WITH CURRENT CN VALUES & REVISED TLAG									
81	HC	3									
	*										
82	ZZ										

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT
 LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW
 NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION


```

1*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 09APR14 TIME 13:57:22 *
*****

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

```

TECHNICAL DRAINAGE STUDY FOR DESERT PINES REC. BLDG
FORMERLY KNOWN AS BONANZA SPRINGS BY LRN
CLARK COUNTY, NEVADA

PREPARED BY: L.R. NELSON CONSULTING ENGINEERS, INC.
6765 W. RUSSELL ROAD, SUITE 200
LAS VEGAS, NV 89118

FILENAME:BS1.DAT
JOB# 818-026-133
EXISTING CONDITION
TECHNICAL DRAINAGE STUDY

```

16 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        300 NUMBER OF HYDROGRAPH ORDINATES
          NDDATE     2  0  ENDING DATE
          NDTIME     0055 ENDING TIME
          ICENT      19 CENTURY MARK

          COMPUTATION INTERVAL .08 HOURS
          TOTAL TIME BASE 24.92 HOURS

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

JP         MULTI-PLAN OPTION
          NPLAN      1  NUMBER OF PLANS

JR         MULTI-RATIO OPTION
          RATIOS OF PRECIPITATION
          .57        1.00

```

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION	
				RATIO 1 .57	RATIO 2 1.00
HYDROGRAPH AT +	FUT-1	.01	1 FLOW TIME	5. 3.58	12. 3.58
HYDROGRAPH AT +	FUT-2	.01	1 FLOW TIME	6. 3.58	13. 3.58
HYDROGRAPH AT +	FUT-3	.00	1 FLOW TIME	2. 3.50	5. 3.50
3 COMBINED AT +	COM-EX	.02	1 FLOW TIME	13. 3.58	30. 3.58
HYDROGRAPH AT +	FUT-1	.01	1 FLOW TIME	5. 3.58	12. 3.58
HYDROGRAPH AT +	FUT-2	.01	1 FLOW TIME	6. 3.58	13. 3.58
HYDROGRAPH AT +	FUT-3	.00	1 FLOW TIME	2. 3.58	5. 3.50
3 COMBINED AT +	COM-R	.02	1 FLOW TIME	13. 3.58	30. 3.58
HYDROGRAPH AT +	FUT-1	.01	1 FLOW TIME	6. 3.58	12. 3.58
HYDROGRAPH AT +	FUT-2	.01	1 FLOW TIME	6. 3.58	14. 3.58
HYDROGRAPH AT +	FUT-3	.00	1 FLOW TIME	3. 3.50	6. 3.50
3 COMBINED AT +	COM-UP	.02	1 FLOW TIME	14. 3.58	31. 3.58

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

Appendix C: Hydraulic Analysis

Project Description

Input Data

Cross Section Image



Project Description

Input Data

Station (ft)

Elevation (ft)

0+00.00	92.54
0+00.00	92.04
0+41.00	91.48
0+42.50	91.45
0+42.50	91.95

Start Station

Ending Station

Roughness Coefficient

(0+00.00, 92.54)	(0+00.00, 92.04)	0.013
(0+00.00, 92.04)	(0+42.50, 91.45)	0.016
(0+42.50, 91.45)	(0+42.50, 91.95)	0.013

Current Roughness weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Normal Depth		0.42	ft
Elevation Range	91.45 to 92.54 ft		
Flow Area		6.15	ft²
Wetted Perimeter		30.42	ft
Hydraulic Radius		0.20	ft
Top Width		30.00	ft

Worksheet for Section 1 - Q100

Results

Normal Depth	0.42	ft
Critical Depth	0.38	ft
Critical Slope	0.00666	ft/ft
Velocity	1.95	ft/s
Velocity Head	0.06	ft
Specific Energy	0.48	ft
Froude Number	0.76	
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
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.42	ft
Critical Depth	0.38	ft
Channel Slope	0.00370	ft/ft
Critical Slope	0.00666	ft/ft

Worksheet for Section 2 - Q100

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.00500 ft/ft
Discharge 14.70 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	91.90
0+00.00	91.40
0+41.00	90.48
0+42.50	90.40
0+44.00	90.48
0+61.00	91.16
0+61.00	91.66

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 91.90)	(0+00.00, 91.40)	0.013
(0+00.00, 91.40)	(0+41.00, 90.48)	0.016
(0+41.00, 90.48)	(0+44.00, 90.48)	0.013
(0+44.00, 90.48)	(0+61.00, 91.16)	0.016
(0+61.00, 91.16)	(0+61.00, 91.66)	0.013

Options

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

Results

Normal Depth 0.46 ft
Elevation Range 90.40 to 91.90 ft

Worksheet for Section 2 - Q100

Results

Flow Area	6.19	ft ²
Wetted Perimeter	29.23	ft
Hydraulic Radius	0.21	ft
Top Width	29.22	ft
Normal Depth	0.46	ft
Critical Depth	0.44	ft
Critical Slope	0.00612	ft/ft
Velocity	2.37	ft/s
Velocity Head	0.09	ft
Specific Energy	0.54	ft
Froude Number	0.91	
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
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.46	ft
Critical Depth	0.44	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00612	ft/ft

Messages

Notes

$Q100 = \text{FUT-1} + 1/3 \text{ FUT-2} = 12 + 1/3(14) = 14.7 \text{ cfs}$

Appendix D: Referenced Information

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM		DATE: March 8, 1996
TO: Dan Bender Land Development Services Department of Public Works		FROM: Dennis W. Stransky, P.E. Project Manager, Flood Control Department of Public Works
SUBJECT: "BONANZA SPRINGS" Drainage Study		COPIES TO: L. R. Nelson (Jonathan Char) American Pacific Properties, Inc. John McNellis, P.E.
FILE NO.	DS1757B.DOC	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1st Submittal	01/23/96	02/05/96	Not Accepted	\$250.00
2nd Submittal	02/22/96	03/08/96	See Comments Below	\$250.00
TOTAL FEES				\$500.00

REMARKS:

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

X	is acceptable in concept subject to conformance to all City standards and the following conditions.
	must be resubmitted or supplemented:
	must have Clark County Regional Flood Control District concurrence

1. The minimum acceptable top of hump at all entrances to the site is 6 inches over the Q-100 flow depth in the adjacent street to prevent off-site flows from entering the site. Hump elevation at the main entrance, not met above criteria, must be revised. The depth of flow calculated in Bonanza Road is 1.14 feet with a flow rate of 330.59 cfs. The expected flow rate is approximately 650 cfs resulting in a depth of approximately 1.30 feet. The top of curb at the high point of the main entrance must be a minimum of 89.75 to prevent flows in Bonanza from entering the site.

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

END OF REMARKS

ssn

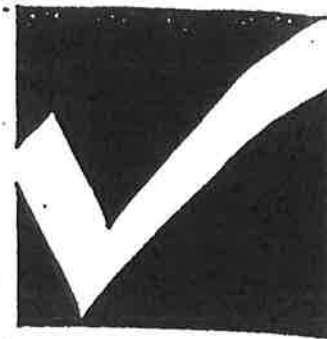
T/R/S: 20/62/30

AREA N-30

PLAN SENT TO LAND DEVELOPMENT yes (initial)



140-30-401-002
3750 E BONANZA ROAD



DS# 1757

DS INDEX

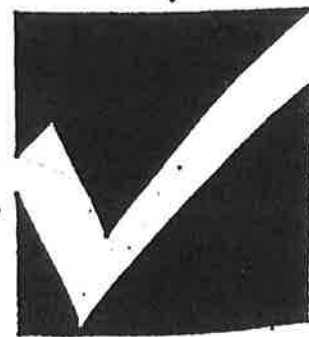
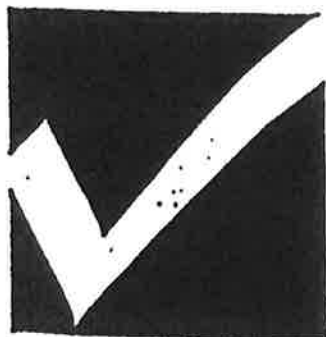
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APN 140-30-401-002

PROJECT "BONANZA SPRINGS" DRAINAGE STUDY

SUBMITTAL

1ST SUBMITTAL



PROJECT NUMBER: 756-001-953
DATE: January 12, 1996

HYDROLOGY STUDY
FOR
BONANZA SPRINGS
CITY OF LAS VEGAS,
NEVADA APN'S 140-30-401-002

Prepared For: American Pacific Properties, Inc.
825 E. Multnomah Street
Portland, OR 97232
(503) 797-7200, 797-7246

Prepared By:


Jonathan R. Char, E.I.T.

Reviewed By:


Larry R. Nelson, P.E.
L.R. Nelson Consulting Engineers
3035 E. Patrick Lane, Suite 9
Las Vegas, Nevada 89120
(702) 798-7978

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: BONANZA SPRINGS Date: 01-19-96

Location of Development: a) Descriptive North side of Bonanza 950 feet East of Pecos
 b) Sect. 30 Twn. 20S Rng. 62E

Name of Owner: American Pacific Properties Assessors Parcel No: 140-30-401-002

Contact Person-Name: Jon Char Telephone No: (702) 798-7978

Firm: L.R. Nelson Consulting Engineers, Inc.

Address: 3035 E. Patrick Lane #9
Las Vegas, NV 89120

Type of Land Development/Land Disturbance Process:

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

- Total Owned Land Area: At Site: 12.8 Being Developed/Disturbed: 12.8
- Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? YES* NO
- Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? YES* NO
- Proposed type of development (Residential, Commercial, Etc.)? Residential
- Approximate upstream land area which drains to the subject site? 227.7 Acres
- Has the site drainage been evaluated in the past? YES NO If yes, please identify documentation: _____
- If known, please briefly identify the proposed discharge point(s) of runoff from the site: Easterly on Bonanza Road
- Briefly describe your proposed schedule for the subject project: Build in one phase to include all building structures and parking facilities



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.

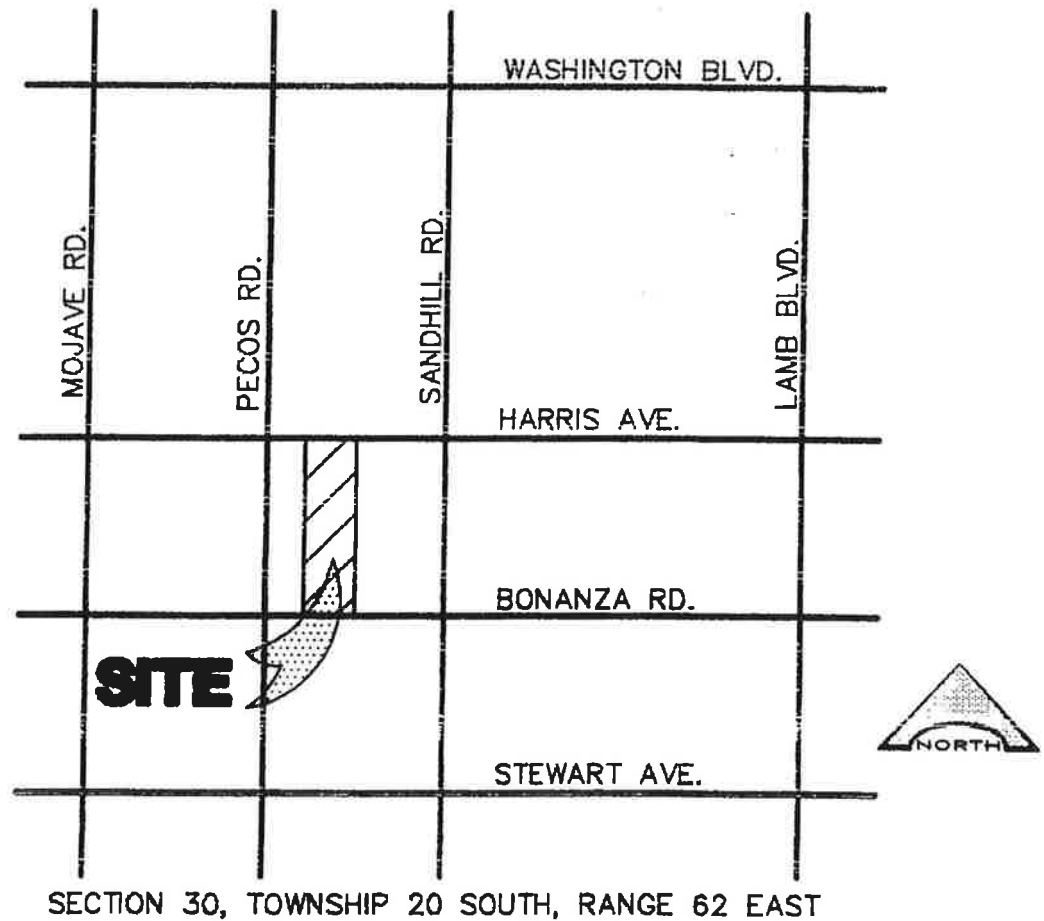
* Review and concurrence of the Clark County Regional Flood Control District is required.

Local Entity File No. _____

Revision	Date

REFERENCE:

STANDARD FORM 1



VICINITY MAP

NO SCALE

site.

II. HYDROLOGIC CRITERIA AND ANALYSIS

Computer

A WYSE 486 (AT compatible) computer was used for this analysis.

Rainfall\Runoff Simulation

The HEC-1 Flood Hydrograph Package developed by the United States Corps of Engineers, dated February 1, 1985 was used to determine the flows for this study.

Soils

The soil survey diagram (Figure C-1, Appendix A) in the appendix shows soil types for the project as shown on figure H-11 of the Clark County Regional Flood Control Districts (CCRFCD's) Master Plan. The on-site basins consist of hydrologic group C soils, where infiltration is low and water transmissions are high. SCS curve numbers were determined by using Table 602 (Tables 1 of 4 and 4 of 4) of the CCRFCD's Hydrologic Criteria and Drainage Design Manual. Existing curve numbers for basin EX was obtained by assuming desert shrub in poor condition (see Figure A-1, Appendix A). An SCS Curve Number table has been constructed which indicates curve numbers for both existing and developed conditions, and has been provided in Appendix B (Table I).

Precipitation

Precipitation analysis was based on a 6 hour duration with estimates for the 100 and 10 year events. Precipitation values were obtained from the NOAA Atlas 2, Precipitation Frequency Atlas of the Western United States, Volume VIII, Nevada and modified as per the Clark County Regional Flood Control District Master Plan. The project site is within the McCarran Airport rainfall area. The precipitation values for the major (100 yr.) and minor (10 yr.) events for this study area are 2.77" and 1.58", respectively (see Table II, Appendix B).

Flows

All concerning flows are summarized in Table V of Appendix B and are discussed within the Conclusions portion of this report.

Hydraulic Analysis

Street and channel capacities were determined using the Manning equation and corresponding "n" values as found in Open-Channel

III. DRAINAGE BASINS

A. Off-Site Basins

The off-site basins affecting this project along Bonanza Road were previously delineated by the Kunin Parcel Map Hydrology Study by L.R. Nelson 1994 (see figure C-III, Appendix A)

RESULTS OF THE KUNIN PARCEL MAP HYDROLOGY STUDY

BASIN	10-YEAR STORM (CFS)	100-YR STORM (CFS)
OFB-1	15	50
OFB-2	85	198

Two additional basins have been delineated that affect the amount of flows being conveyed to Bonanza, they consist of the Smith's shopping center (OFB-3) at the corner of Pecos and Bonanza and the Island Club Apartments (OFB-4) adjacent to the western boundary of the site. The offsite basin that will influence the flows along Harris Ave. has been delineated as basin OFB-5 (See figure C-IIIa, Appendix A). The offsite basins generate 100-year flow rates as follows; OFB-3 25 cfs, OFB-4 35 cfs, and OFB-5 69 cfs.

B. On-Site Basins

The onsite basins consist of one basin EX-1 in the existing conditions and three basins FUT-1, FUT-2 and FUT-3 for the proposed future conditions (See figure C-II, D-I Appendix A). The onsite basins generate 100-year flow rates as follows; EX-1 19 cfs, FUT-1 13 cfs, FUT-2 13 cfs, and FUT-3 6 cfs.

IV. PROPOSED CONVEYANCE

Onsite Basins

The future onsite basins consist of three basins FUT-1, FUT-2 and FUT-3. Basins FUT-1, FUT-2 and FUT-3 shall combine with offsite basin flows being conveyed along Bonanza Ave.

Offsite Basins

The offsite basins OFB-1, OFB-2, OFB-3, and OFB-4 shall combine together (308 cfs) to flow easterly along Bonanza Road at a flow depth of 1.14 ft (See calculation sheet #2, Appendix C). The offsite basin flows from OFB-5 (69 cfs) shall be conveyed easterly on Harris Ave. at a flow depth of 0.79 ft (See calculation sheet #3, Appendix C).

APPENDIX D

HEC-1 PRINTOUT

TIME OF CONCENTRATION

SUB-BASIN DATA			INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)				t_c CHECK (URBANIZED BASINS)		FINAL t_c	REMARKS
DESIG.	K	AREA A_c (3)	LENGTH F_i (4)	SLOPE % (5)	t_i Min (6)	LENGTH F_i (7)	SLOPE % (8)	VEL. FPS (9)	t_t Min (10)	TOTAL LENGTH F_i (11)	$t_c = (F_i/180) + 10$ Min (12)	Min (13)	
OFB-3	0.851	8.97	100	1.0	4.48	1200	1.0	2.0	10.0	1300	17.22	14.48	$t_{LAG} (HR)$ 0.1449
OFB-4	0.798	16.67	100	1.0	5.44	2030	0.4	1.4	24.17	2130	21.83	21.83	0.2183
OFB-5	0.798	32.8	75	0.5	5.93	2000	0.5	1.4	23.81	2075	21.53	21.53	0.2153
FX-1	0.732	12.8	120	0.6	7.82	950	0.6	0.8	19.79	-	-	27.61	0.2761
FUT-1	0.798	5.0	100	1.0	5.44	600	0.4	1.4	7.14	700	13.89	12.58	0.1258
FUT-2	0.798	5.8	100	1.0	5.44	730	0.4	1.4	8.69	830	14.61	14.13	0.1413
FUT-3	0.851	2.0	50	1.0	3.17	330	0.5	1.4	3.93	380	12.11	5.0	0.0833

LAG TIME = (8) x THE TIME OF CONCENTRATION - FROM SECTION 606.3 OF THE CORFOO'S HYDROLOGIC DESIGN AND CRITERIA MANUAL

DEVELOPMENT	BONANZA / AWALON APTS	
CALCULATED BY	J. CHAR	DATE 1-11-96

L.R. TABLE III

NELSON
CONSULTING ENGINEERS
STANDARD FORM FOUR

HEC1 S/N: 1346000189 HWVersion: 6.33 Data File: 756001.HC1

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*      MAY 1991                    *
*      VERSION 4.0.1E              *
*
* RUN DATE 01/10/1996 TIME 15:47:46 *
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*****
*
* U.S. ARMY CORPS OF ENGINEERS    *
* HYDROLOGIC ENGINEERING CENTER   *
* 609 SECOND STREET               *
* DAVIS, CALIFORNIA 95616        *
* (916) 756-1104                 *
*
*****
```

```

X   X XXXXXXX XXXX      X
X   X X      X   X      XX
X   X X      X          X
XXXXXX XXXX   X      XXXX X
X   X X      X          X
X   X X      X   X      X
X   X XXXXXXX XXXX      XXX
```

```

*****
*****
:::                                     :::
::: Full Microcomputer Implementation :::
:::                               by    :::
::: Haestad Methods, Inc.         :::
:::                                     :::
*****
*****
```

37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1G3, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMEKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE PORTRAM77 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

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1	ID
2	ID
3	ID
4	ID
5	ID
6	ID
7	ID
8	ID
9	ID
10	ID
11	ID
12	ID
13	ID
14	ID
15	ID
16	ID
	*DIAGRAM
17	IT 2 0 0 300
18	IO 5
19	IN 5
20	JR PREC 1 .57
21	KK OFB-3
22	KM RUNOFF FROM OFF-SITE BASIN OFB-3 (EXISTING CONDITIONS)
23	BA .01402
24	PB 2.77
25	PC .000 .020 .057 .070 .087 .108 .124 .130 .130 .130
26	PC .130 .130 .130 .133 .140 .142 .148 .148 .172 .181
27	PC .190 .197 .199 .200 .201 .204 .214 .229 .241 .249
28	PC .251 .256 .270 .278 .281 .283 .295 .322 .352 .409
29	PC .499 .590 .710 .744 .781 .812 .819 .835 .851 .856
30	PC .860 .868 .876 .888 .910 .926 .937 .950 .970 .976
31	PC .982 .985 .987 .989 .990 .993 .993 .994 .995 .998
32	PC .998 .999 1.00
33	LS 0 94
34	UD .1449
35	KK OFB-4
36	KM RUNOFF FROM OFF-SITE BASIN OFB-4 (EXISTING CONDITIONS)
37	BA .02605
38	LS 0 90
39	UD .2183
40	KK OFB-5
41	KM RUNOFF FROM OFF-SITE BASIN OFB-5 (EXISTING CONDITION)
42	BA .0513
43	LS 0 90
44	UD .2153
45	KK EX-1
46	KM RUNOFF FROM ON-SITE BASIN EX-1 (EXISTING CONDITIONS)
47	BA .02
48	LS 0 85
49	UD 0.2761

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

50 KK FUT-1
51 KM RUNOFF FROM ON-SITE BASIN FUT-1 (FUTURE CONDITIONS)
52 BA .00781
53 LS 0 90
54 UD .1258

55 KK FUT-2
56 KM RUNOFF FROM ON-SITE BASIN FUT-2 (FUTURE CONDITIONS)
57 BA .00867
58 LS 0 90
59 UD .1413

60 KK FUT-3
61 KM RUNOFF FROM ON-SITE BASIN FUT-3 (FUTURE CONDITIONS)
62 BA .00313
63 LS 0 94
64 UD .0833
65 ZZ

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

PREPARED BY L.R. NELSON CONSULTING ENGINEERS, INC.
3035 E. PATRICK LANE, SUITE 9
LAS VEGAS, NV 89120

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

JR MULTI-RATIO OPTION
 RATIOS OF PRECIPITATION
 1.00 0.57

1027E (V) ~~SCHEMATIC~~ HYDROLOGIC DIAGRAM ~~OF~~ ~~STATION~~ ~~NO~~ ~~VEHICLE~~ ~~FOR~~ ~~PUMPED~~ ~~FLOW~~

21	OFB-3	.					
	.	.					
35		OFB-4	.				
	.	.	.				
40	.	.	OFB-5	.			
	.	.	.	.			
45	.	.	.	EX-1	.		
	.	.	.	.	.		
50	.	.	.	.	FUT-1	.	
	.	.	.	.	.	.	
55	.	.	.	.	.	FUT-2	.
	.	.	.	.	.	.	.
60	.	.	.	.	.	.	FUT-3

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

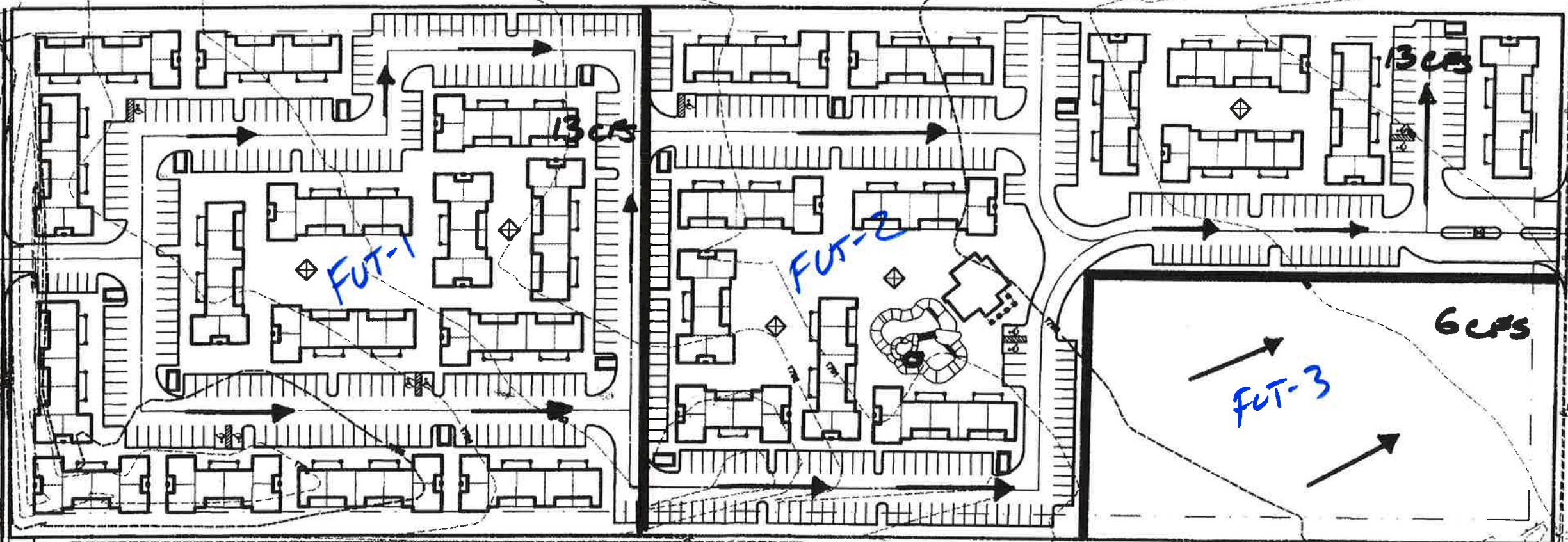
PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
 TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED		
				RATIO 1 1.00	RATIO 2 0.57	
HYDROGRAPH AT	OFB-3	0.01	1	FLOW TIME	25. 3.57	12. 3.57
HYDROGRAPH AT	OFB-4	0.03	1	FLOW TIME	35. 3.63	15. 3.63
HYDROGRAPH AT	OFB-5	0.05	1	FLOW TIME	69. 3.63	30. 3.63
HYDROGRAPH AT	EX-1	0.02	1	FLOW TIME	19. 3.70	7. 3.73
HYDROGRAPH AT	FUT-1	0.01	1	FLOW TIME	13. 3.57	6. 3.57
HYDROGRAPH AT	FUT-2	0.01	1	FLOW TIME	13. 3.57	6. 3.57
HYDROGRAPH AT	FUT-3	0.00	1	FLOW TIME	6. 3.53	3. 3.53

REFERENCED
 ORIGINAL
 ON-SITE
 FLOW RATES

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

ONLY FUT-1 & FUT-2
 USED IN THIS UPDATE



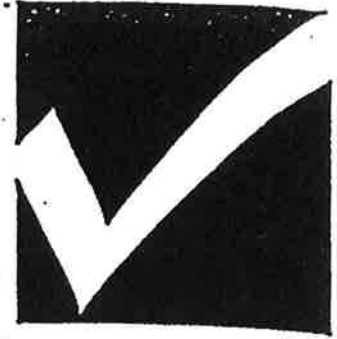
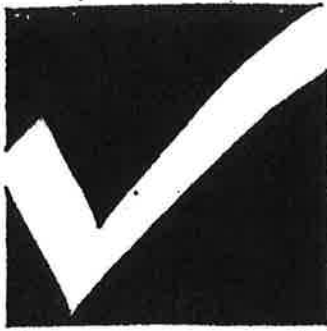
GRAPHIC SCALE



(IN FEET)
1 inch = 100 ft.

**L.R.
NELSON**
CONSULTING
ENGINEERS

FIGURE D-1
**FUTURE
ON-SITE DRAINAGE BASIN**



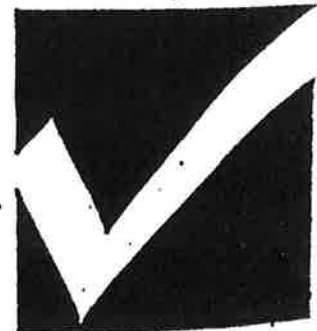
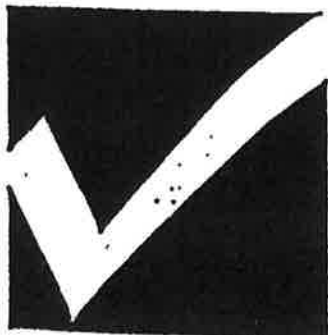
DS# 1757

DS INDEX 4085

APN 140-30-401-002

PROJECT "BONANZA SPRINGS"

SUBMITTAL 3RD SUBMITTAL (ADDENDUM 2)



CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM		DATE: April 30, 1996
TO: Dan Bender Land Development Services Department of Public Works		FROM: Dennis W. Stransky, P.E. Project Manager, Flood Control Department of Public Works
SUBJECT: "BONANZA SPRINGS" Drainage Study		COPIES TO: • L. R. Nelson (Jonathan Char) • American Pacific Properties, Inc. • John McNellis, P.E.
FILE NO.	DS1757C.DOC	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1st Submittal	01/23/96	02/05/96	Not Accepted	\$250.00
2nd Submittal	02/22/96	03/08/96	Conditional Acceptance	\$250.00
3rd Submittal	04/24/96	04/30/96	See below comments	\$100.00
TOTAL FEES				\$600.00

REMARKS:

3rd Submittal (Update & revised G. P.)

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

X	is acceptable in concept subject to conformance to all City standards and the following conditions:
	must be resubmitted or supplemented:
	must have Clark County Regional Flood Control District concurrence

- The expected flow rate for Bonanza Road is approximately 650 cfs at 1.3 feet deep. The minimum acceptable top of curb elevations at the main entrance high point must be at **89.78** ($87.48+1.3+1.0$) on the westside and **89.54** ($87.24+1.3+1.0$) on the eastside respectively.

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

END OF REMARKS
ssn

T/R/S: 20/62/30
AREA N-30

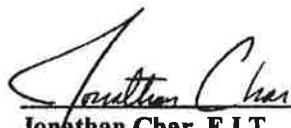
PLAN SENT TO LAND DEVELOPMENT yes (initial)

PROJECT NUMBER: 756-001-952

DATE: March 21, 1996

**BONANZA SPRINGS
UPDATE #1**

Prepared By:


Jonathan Char, E.I.T.

Reviewed By:


Larry R. Nelson, P.E.
L.R. Nelson Consulting Engineers, Inc.
3035 East Flamingo Avenue, Suite 100
Las Vegas, Nevada 89119
(702) 798-7978
(702) 451-2296 (Fax)



4/23/96

LARRY R. NELSON, P.E.
President

March 21, 1996
Project Number: 756-001-952

City of Las Vegas
400 E. Stewart
Las Vegas, NV 89101

ATTENTION: Mr. Dennis Stransky, P.E.

REFERENCE: BONANZA SPRINGS

Dear Mr. Stransky:

The enclosed update to the City of Las Vegas is being provided as an addition to the Bonanza Springs Hydrology Study.

• STRUCTURAL

• CIVIL

• SURVEY

According to the Bonanza Springs Hydrology Study, future on-site basin FUT-3 was expected to be a commercial site. The anticipated basin was calculated as a commercial site with Curve Number 94, that generates 6 cfs. The proposed development for this area delineated as FUT-3, is a continuation of the residential community Bonanza Springs. The lag time value for this basin will be about the same, the only thing that will change is the Curve Number, which will decrease from 94 to 90. The change in Curve Number will in fact decrease the amount of surface water generated in this basin to 5 cfs, as calculated in the HEC-1 analysis (see enclosures). Therefore the development of this basin should have no adverse effects to properties down stream because the anticipated surface waters generated from this basin have been accounted for in the original Bonanza Springs Hydrology Study. Please see grading plan for proposed development of on-site basin FUT-3.

If you have any other questions or require additional information regarding this matter please contact me at this office at 798-7978.

Sincerely,
L.R. NELSON CONSULTING ENGINEERS, INC.

3035 East Patrick Lane

Suite 9

Las Vegas, NV 89120

Phone

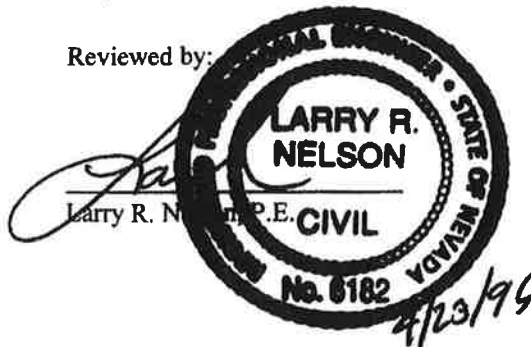
702 / 798-7978

FAX

702 / 451-2296


Jonathan Char, E.I.T.

Reviewed by:



[illegible]

DEVELOPMENT		
CALCULATED BY		DATE

L.R. NELSON CONSULTING ENGINEERS	TABLE III
STANDARD FORM FOUR	

HEC1 S/N: 1346000189 HWVersion: 6.33 Data File: 756001UP.HC1

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*   MAY 1991
*   VERSION 4.0.1E
*
* RUN DATE 03/21/1996 TIME 14:32:49
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*****
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*****
*
* U.S. ARMY CORPS OF ENGINEERS
* HYDROLOGIC ENGINEERING CENTER
*   609 SECOND STREET
*   DAVIS, CALIFORNIA 95616
*   (916) 756-1104
*
*****
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X   X XXXXXX XXXX      X
X   X X      X   X     XX
X   X X      X         X
XXXXXX XXXX  X      XXXX X
X   X X      X         X
X   X X      X   X     X
X   X XXXXXX XXXX      XX

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*****
*****
:::                                     :::
::: Full Microcomputer Implementation :::
:::                               by      :::
::: Haestad Methods, Inc.         :::
:::                                     :::
*****
*****
```

37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1G3, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -ANSKK- 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 ANPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1	ID
2	ID
3	ID
4	ID
5	ID
6	ID
7	ID
8	ID
9	ID
10	ID
11	ID
12	ID
13	ID
14	ID
15	ID
16	ID
	*DIAGRAM
17	IT 2 0 0 300
18	IO 5
19	IN 5
20	JR PREC 1 .57
21	KX FUT-3
22	KM RUNOFF FROM ON-SITE BASIN FUT-3 (PROPOSED CONDITIONS)
23	BA .00313
24	PB 2.77
25	PC .000 .020 .057 .070 .087 .108 .124 .130 .130 .130
26	PC .130 .130 .130 .133 .140 .142 .148 .148 .172 .181
27	PC .190 .197 .199 .200 .201 .204 .214 .229 .241 .249
28	PC .251 .256 .270 .278 .281 .283 .295 .322 .352 .409
29	PC .499 .590 .710 .744 .781 .812 .819 .835 .851 .856
30	PC .860 .868 .876 .888 .910 .926 .937 .950 .970 .976
31	PC .982 .985 .987 .989 .990 .993 .993 .994 .995 .998
32	PC .998 .999 1.00
33	LS 0 90
34	UD .1046
35	ZZ

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT

LINE (V) ROUTING (—>) DIVERSION OR PUMP FLOW

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

21 FUT-3

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

HEC1 S/N: 1346000189 HWVersion: 6.33 Data File: 756001UP.HC1

*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* MAY 1991 *
* VERSION 4.0.1E *
*
* RUN DATE 03/21/1996 TIME 14:32:49 *
*

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

TECHNICAL DRAINAGE STUDY FOR THE BONANAZA/AVALON APARTMENTS
CITY OF LAS VEGAS, NEVADA

PREPARED FOR THE CITY OF LAS VEGAS PUBLIC WORKS

PREPARED BY L.R. NELSON CONSULTING ENGINEERS, INC.
3035 E. PATRICK LANE, SUITE 9
LAS VEGAS, NV 89120

18 IO OUTPUT CONTROL VARIABLES

IPRNT 5 PRINT CONTROL
IPLOT 0 PLOT CONTROL
QSCAL 0. HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

NNIN 2 MINUTES IN COMPUTATION INTERVAL
IDATE 1 0 STARTING DATE
ITIME 0000 STARTING TIME
NQ 300 NUMBER OF HYDROGRAPH ORDINATES
NDATE 1 0 ENDING DATE
NDTIME 0958 ENDING TIME
ICENT 19 CENTURY MARK

COMPUTATION INTERVAL 0.03 HOURS
TOTAL TIME BASE 9.97 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

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION	
				RATIO 1	RATIO 2
				1.00	0.57
HYDROGRAPH AT	FUT-3	0.00	1	5.	2.
			FLOW TIME	3.53	3.53

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

