

DS #: 4563

APN: 138-15-612-012

PROJECT: Advanced Healthcare of Las Vegas II

SUBMITTAL: 1st

SCANNED BY/DATE: _____

CHECKED BY/DATE: _____



CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM

DATE:

August 9, 2012

TO:

Land Development Services
Department of Public Works

FROM:

Albert Sung, P.E.
Flood Control Project Engineer
Department of Public Works

SUBJECT:

Drainage Study for:

Advanced Healthcare of Las Vegas II

COPIES TO:

Zone Engineering

Cross Streets:

SEQ of Tenaya Way & Cheyenne Blvd.

The Boyer Company

File Number:

F:\Depot\DSMemos\DS4563A.doc

Bart Anderson, P.E., DevCo

Parcel Number:

138-15-612-012

NDOT

Zoning Action:

SDR-44908

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	7/26/2012	8/8/2012	See Comments Below	\$400.00	290925: \$400
TOTAL FEES (LDDRS):				\$400.00	----

REMARKS:

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

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

1. Provide a copy of the zoning/planning conditions associated with this site (**SDR-44908**) with the next submittal to verify compliance with conditions. *Flood Control* will not issue conditional approval of the drainage study without the associated zoning/planning conditions (**issued by the City Council**). Any associated conditions of approval that revise the site drainage parameters will require that the drainage study be revised and resubmitted.
2. Provide a copy of the Record of Survey for verification of the subject property being parceled out from the *City Parkway V Inc.* ownership.
3. The subject development proposes to discharge onsite drainage into adjacent properties at two locations: one at the northeast corner and the other at the southeast corner of the subject site. The northeast corner discharge is not ideal for it will burden the adjacent property to have a drainage easement in the middle of their land, ie, they cannot best utilize their land in the future. A more beneficial point of discharge is to shift the proposed point to the first angle point to the south.

Obtain a minimum 10'-wide public drainage easement (privately maintained) from the adjacent property owner prior to the final approval of the drainage study.

4. For the southeast discharge point, obtain a minimum 10'-wide public drainage easement (privately maintained) from the adjacent property owner prior to the final approval of the drainage study.

5. **Section C/4** shows that drainage behind the retaining wall discharge into the adjacent property to the east. Provide a swale to contain the drainage onsite. Show a flow line on the grading plan with elevations at regular interval to verify the detail as such.
6. **Section D/4** indicates that no flow is directed onto the adjacent property to the east. Provide a scarp along the east boundary with flow line elevations at regular interval on the grading plan to show as such.
7. Construction Note #19 (Construct Sidewalk Underdrain) cannot be located anywhere on the grading plan. Please clarify in the next submittal.
8. Label an existing storm drain in *Tenaya Way* with *City of Las Vegas* recorded drawing number.

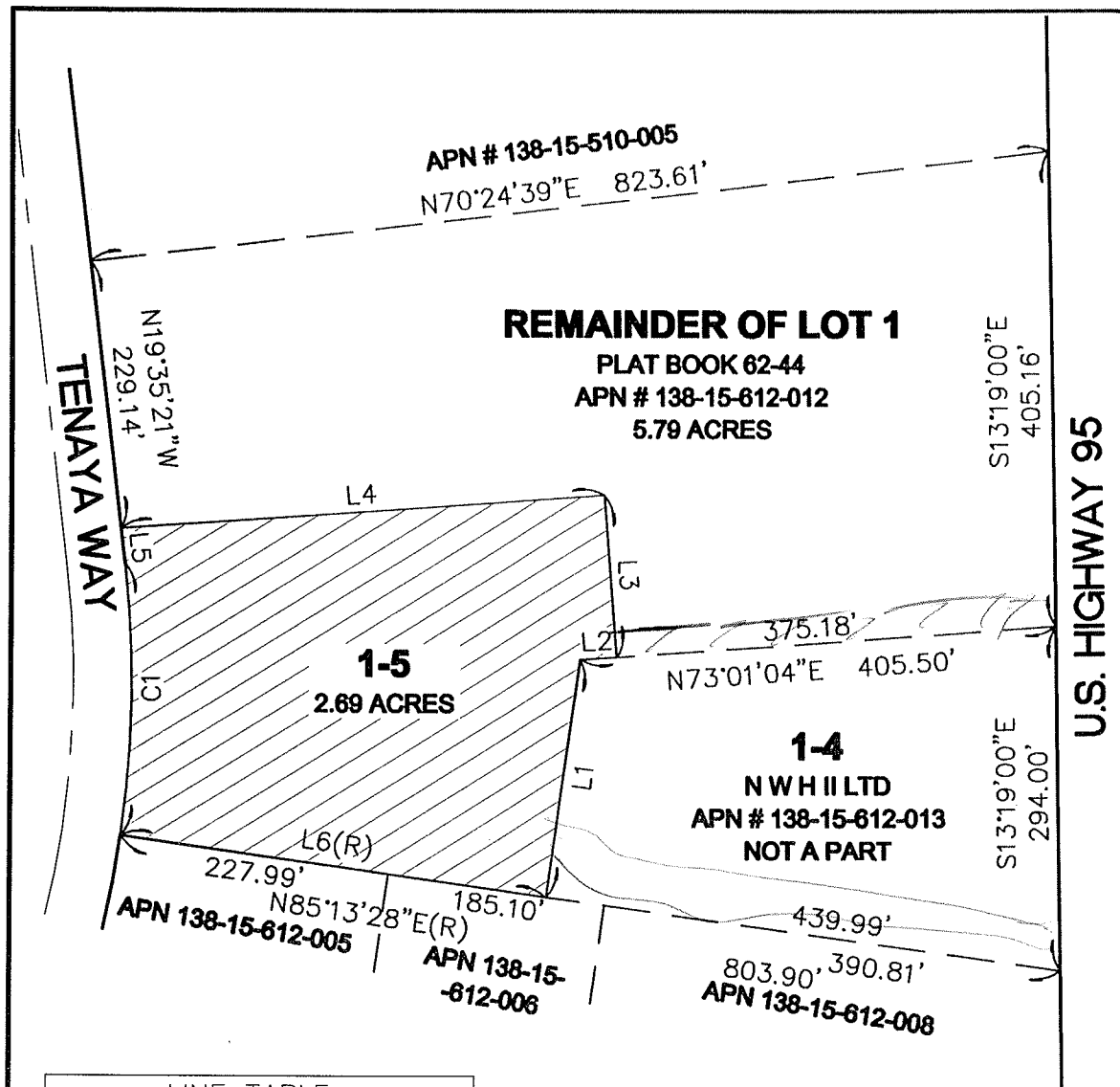
In an effort to increase administrative efficiency, the City of Las Vegas Public Works Department requires all soil reports, drainage studies and traffic impact analysis submittals to be accompanied by an electronic copy of the submittal. Electronic documents must be submitted with one original hard copy of the study. Electronic documents should be on a universal computer-readable digital output replicating your submittal to be used for archival or display purposes. This may be more than one file if necessary. An Indexed Portable Document Format (PDF) or Print Ready CAD file formats with a minimum of 300dpi are the desired formats, but provided it is a high quality digitized replication of the submittal, other formats may be acceptable. If figures are in color, they must be scanned in color and saved as a separate file. The new submittal requirement is effective on **July 1, 2011**. If there are any questions regarding these new requirements, please contact Albert Sung in the Flood Section at (702) 229-2001 or Rick Schroder in Traffic Engineering at (702) 229-6327.

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/R60E/15
AREA L-15



LINE TABLE		
LINE	BEARING	DISTANCE
L1	S04°46'32"E	205.00'
L2	S73°01'04"W	30.32'
L3	S17°03'33"E	138.53'
L4	N72°56'27"E	411.07'
L5	N19°35'21"W	29.84'
L6	N85°13'28"E	363.91'



SHEET 1 OF 1
NOT TO SCALE

CURVE TABLE				
CURVE	DELTA	RADIUS	LENGTH	TANG.
C1	14°48'49"	901.38'	233.05'	117.18'



EXHIBIT FOR AHC FACILITY

CITY OF LAS VEGAS — SURVEY
 333 N. RANCHO DRIVE, LAS VEGAS, NEVADA 89128 702 229-6217

DRAWING: AHC EXHIBIT
 DRAWN BY: HJB
 CHECKED BY: ARR
 DATE: 4/23/2012

Technical Drainage Study
For
ADVANCED HEALTH CARE OF LAS VEGAS II

CLV # _____

Prepared for:



The Boyer Company
90 South 400 West, Suite 200
Salt Lake City, UT 84101
Tel: (801) 521-4781
Fax: (801) 366-7103

Prepared by:

Zone Engineering
4550 W. Oakey Boulevard, Suite 102
Las Vegas, NV 89102
Tel: (702) 877-3005
Fax: (702) 877-3007



Project #12-1005

July 24, 2012

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: ADVANCED HEALTH CARE OF LAS VEGAS II Date: 7-23-12

Location of Development: a) Descriptive (Cross Streets) North/South: TENAYA WAY

East/West: CHEYENNE AVE.

b) Section: 15 Township: 20S Range: 60E

c) APN : A PORTION OF 138-15-612-012

Name of Owner: THE BOYER COMPANY

Telephone No.: 801-521-4781 Fax No.: 801-366-7103 E-Mail Address: _____

Address: 90 S. 400 WEST, SUITE 200, SALT LAKE CITY, UT 84101

Contact Person-Name: CHI-YING SETO, P.E. Telephone No.: 7028773005

* E-Mail Address: CSETO@ZONEENGINEERING.COM Fax No.: 7028773007

Firm: ZONE ENGINEERING

Address: 4550 W. OAKLEY BLVD., SUITE 102, LAS VEGAS, NV 89102

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	OFF-SITE CONSTRUCTION PERMIT	

1. Total Owned Land Area: At Site: 2.69 Being Developed/Disturbed: 2.69

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.): COMMERCIAL

5. Approximate upstream land area which drains to the subject site: 0 ACRES

6. Has the site drainage been evaluated in the past? ☒ YES ☐ NO If yes, please identify documentation: TECHNICAL DRAINAGE STUDY FOR HOLIDAY INN AT CASCADE & UNIVERSITY OF NV SCHOOL OF MEDICINE

7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: EAST PROPERTY LINE

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



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



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.)
✓		Copies of all conditions of approval for development related to this property. (e.g. zoning, use permit, tentative map, etc.) Verify compliance with conditions.
✓		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. CS 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	
✓		(1) 24" X 36" copy of the Grading Plan, (including all Detail Sheets) sealed by the engineer.
✓		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.
✓		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.
✓		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.
✓		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.
✓		Back of lot elevations and lot drainage pattern for all lots including common lots.
✓		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.
✓		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.)
✓		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.
✓		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	
✓		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.
N/A		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.



LAS VEGAS
CITY COUNCIL

CAROLYN G. GOODMAN
MAYOR

STAVROS S. ANTHONY
MAYOR PRO TEM

LOIS TARKANIAN
STEVEN D. ROSS
RICKI Y. BARLOW
BOB COFFIN
BOB BEERS

ELIZABETH N. FRETWELL
CITY MANAGER

May 9, 2012

Ms. Elizabeth Fretwell
City Parkway V, Inc.
495 South Main Street
Las Vegas, Nevada 89101

**RE: SDR-44908 - SITE DEVELOPMENT PLAN REVIEW
PLANNING COMMISSION MEETING OF MAY 8, 2012**

Dear Ms. Fretwell:

Your request for a Site Development Plan Review FOR A PROPOSED 38-BED, 33,515 SQUARE-FOOT CONVALESCENT CARE FACILITY/NURSING HOME AND A WAIVER TO ALLOW A ZERO LANDSCAPE BUFFER ALONG A PORTION OF THE EAST PERIMETER WHERE EIGHT FEET IS REQUIRED on a 2.7-acre portion of a 8.49-acre lot adjacent to the east side of Tenaya Way, approximately 370 feet north of Peak Drive (APN 138-15-612-012), C-PB (Planned Business Park) Zone, Ward 1 (Tarkanian), was considered by the Planning Commission on May 8, 2012.

The Planning Commission voted to recommend **APPROVAL** of your request.

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, landscape plan, and building elevations, date stamped 03/22/12, except as amended by conditions herein.
3. A Waiver from Title 19.08 is hereby approved, to allow a zero foot landscape buffer along a portion of the east perimeter where a minimum of eight feet is required.
4. An Exception from Title 19.08 is hereby approved, to allow seven trees along the east perimeter landscape buffer where 12 are required.
5. The applicant shall coordinate with the City Surveyor and other city staff to determine the most appropriate mapping action necessary to create a new legal lot. The mapping action shall be completed and recorded prior to the issuance of any building permits.

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



6. Any changes based upon right-of-way, traffic or drainage studies or street improvements required by the city or public utilities shall not reduce the widths of perimeter landscape buffers, height of walls or quantities of plant materials from that on submitted landscape plans date stamped 03/22/12. Any changes based upon subsequently submitted studies must be accommodated elsewhere on the site.
7. 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.
8. These Conditions of Approval shall be affixed to the cover sheet of any plan set submitted for building permit.
9. A technical landscape plan, signed and sealed by a Registered Architect, Landscape Architect, Residential Designer or Civil Engineer, must be submitted prior to or at the same time application is made for a building permit. A permanent underground sprinkler system is required, and shall be permanently maintained in a satisfactory manner; the landscape plan shall include irrigation specifications. Installed landscaping shall not impede visibility of any traffic control device. The technical landscape plan shall include the following changes from the conceptual landscape plan: to add an additional four 24-inch box trees and 16 five-gallon shrubs to the south perimeter landscape buffer.
10. A fully operational fire protection system, including fire apparatus roads, fire hydrants and water supply, shall be installed and shall be functioning prior to construction of any combustible structures.
11. Prior to or at the time of submittal for any building permit, the applicant shall provide written verification by the FAA and/or the Clark County Department of Aviation of the following:
 - Applicant is required to file a valid FAA Form 7460-1, "Notice of Proposed Construction or Alteration" with the FAA, in accordance with 14 CFR Part 77, or submit to the Clark County Director of Aviation a "Property Owner's Shielding Determination Statement" and request written concurrence from the Clark County Department of Aviation;
 - No Building Permit or other construction permit shall be issued for any structure greater than 35 feet above the surface of land that, based upon the FAA's 7460 airspace determination (the outcome of filing the FAA Form 7460-1) would (a) constitute a hazard to air navigation, (b) would result in an increase to minimum flight altitudes during any phase of flight (unless approved by the Department of Aviation), or (c) would otherwise be determined to pose a significant adverse impact on airport or aircraft operations.

Ms. Elizabeth Fretwell
City Parkway V, Inc.
SDR-44908 - Page Three
May 9, 2012

- Applicant is advised that FAA's airspace determinations are dependent on petitions by any interested party and the height that will not present a hazard as determined by the FAA may change based on these comments.
 - Applicant is advised that the FAA's airspace determinations include expiration dates and that the separate airspace determinations will be needed for construction cranes or other temporary equipment.
12. All City Code requirements and design standards of all City Departments must be satisfied, except as modified herein.

Public Works

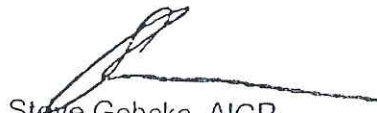
13. Construct all incomplete half-street improvements (sidewalk) on Tenaya Way adjacent to this site concurrent with development of this site. Additionally, construct a raised median island, as approved by the City Traffic Engineer, in Tenaya Way creating right in/out access at the proposed driveway accessing this site from Tenaya Way.
14. In accordance with code requirements of Title 13.16 and 13.56, remove all substandard improvements and replace with new improvements meeting current City Standards as directed by the City Engineer concurrent with development of this site. All existing paving damaged or removed by this development shall be restored at its original location and to its original width concurrent with development of this site.
15. Unless otherwise allowed by the City Engineer, construct sidewalk on at least one side of all access drives connecting this site to the adjacent public streets concurrent with development of this site. The connecting sidewalk shall extend from the sidewalk on the public street to the first intersection of the on-site roadway network and shall be terminated on-site with a handicap ramp.
16. All private improvements and landscaping installed with this project shall be situated and maintained so as to not create sight visibility obstructions for vehicular traffic at all development access drives and abutting street intersections.
17. Meet with the Fire Protection Engineering Section of the Department of Fire Services to discuss fire requirements for the proposed models.
18. No trees or vegetation over three feet tall shall be allowed within 20 feet of the east property line, which is an existing public sewer easement per Plat Book 38, Page 91.

Ms. Elizabeth Fretwell
City Parkway V, Inc.
SDR-44908 - Page Four
May 9, 2012

19. A Record of Survey Map and deed transfer is required to create the proposed parcel limits prior to the issuance of any permits for this site.
20. A Drainage Plan and Technical Drainage Study must be submitted to and approved by the Department of Public Works prior to the issuance of any building or grading permits or the submittal of any construction drawings, whichever may occur first. Provide and improve all drainageways recommended in the approved drainage plan/study. The developer of this site shall be responsible to construct such neighborhood or local drainage facility improvements as are recommended by the City of Las Vegas Neighborhood Drainage Studies and approved Drainage Plan/Study concurrent with development of this site.

This item will be considered by the City Council on June 6, 2012, at 1:00 P.M. in the Council Chambers of City Hall, 495 South Main Street, Las Vegas, Nevada. ***The Council requires that you or your representative be present at this meeting.*** If you or your representative chooses not to attend, the City Council may act in your absence without your input.

Sincerely,



Steve Gebeke, AICP
Planning Supervisor
Case Planning Division

SG:clb

cc: Mr. Nate Swain
The Boyer Company
90 South 400 West, Suite #200
Salt Lake City, Utah 84101



4550 W. Jones Boulevard, Suite 102
Las Vegas, Nevada 89102
Tel: (702) 877-3005
Fax: (702) 877-3007

July 24, 2012

Flood Control Engineer
City of Las Vegas
333 N. Rancho Dr.
Las Vegas, NV 89106

RE: Technical Drainage Study for ADVANCED HEALTH CARE OF LAS VEGAS II (APN 138-15-612-012).

Dear Sir or Madam,

Zone Engineering has enclosed one hard and one electronic copy of the Technical Drainage Study and grading plans for Advanced Health Care of Las Vegas II for your review. If you have any questions or concerns regarding this submittal, please contact us. Thank you.

Sincerely,



Chi-Ying Seto, P.E.
Project Manager

I. Project Information	1
A. Project Location and Description.....	1
B. FEMA Floodplain Information.....	1
C. CCRFCD Facilities.....	2
D. Soil Information.....	2
II. Rainfall and Runoff Methodology	2
A. Rainfall.....	2
B. Storm Distribution.....	3
C. Lag Time.....	3
III. Hydraulics and Hydrology	4
A. Model Description.....	4
B. Hydrological Analysis.....	4
C. Hydraulic Analysis.....	5
III. Conclusion	7
VI. Reference Studies	7
APPENDICES	
A. MAPS & FIGURES	
• Figure 1- Vicinity Map	
• Figure 2 - Assessor's Parcel Map	
• Figure 3 – Aerial Exhibit	
• Figure 4 –Zoning Exhibit	
• Figure 5 – FEMA FIRM Panel 2155	
• Figure 6 – Flood Control Master Plan Update Map – Figure F-25	
• Figure 7 - Flood Control Master Plan Update Facility Inventory – Figure F-25	
• Figure 8 - Flood Control Master Plan Update Soil Map – Figure H-25	
B. HYDROLOGIC PARAMETERS	
• Figure 513 of the Manual – McCarran Airport Rainfall Area	
• Table 505 of the Manual – Depth-Duration-Frequency Values for McCarran Airport Rainfall Area	
• Table 503 of the Manual – Six-Hour Storm Distributions	
• Table 602 (4 of 4) of the Manual – Runoff Curve Numbers (Semiarid Rangelands)	
• Table 602 (1 of 4) of the Manual – Runoff Curve Numbers (Urban Areas)	
C. HYDROLOGIC ANALYSIS	
<u>Existing Condition</u>	
• Drainage Map	
• Standard Form 4 w/Velocity Estimation	

- HEC-1 Output

Proposed/Developed Condition

- Drainage Map
- Standard Form 4 w/Velocity Estimation
- HEC-1 Output

D. NORMAL DEPTH CALCULATIONS/RIPRAP CALCULATION

- Section A – Tenaya Way - Q_{10}
- Section A – Tenaya Way - Q_{100}
- Section B – Onsite - Q_{10}
- Section B – Onsite - Q_{100}

E. REFERENCE MATERIALS

- Technical Drainage Study and Addendums for Holiday Inn at Cascade by The landesign Consultant (CLV DS #4273)

F. PROJECT GRADING PLANS

I. Project Information

This report serves as a technical drainage study for Advanced Health Care of Las Vegas II, a proposed skilled nursing facility. Enclosed are the findings of a detailed hydrology/hydraulic analysis of the site and tributary watershed. The following is general information about the site:

A. Project Location and Description

The project site is bound by undeveloped land to the east, existing commercial developments to the south, Tenaya Way to the west and an existing hospital to the north. The site is located in Section 15, Township 20 South, Range 60 East; and is presently legally defined by APN 138-15-612-012 (see *Figure 1, Vicinity Map, Figure 2, Assessor's Parcel Map & Figure 3, Aerial Exhibit* in *Appendix A*).

The subject site is currently undeveloped desert. The land generally slopes from west to east at approximately $\pm 1.68\%$. Per *Figure 4, Zoning Exhibit*, in *Appendix A*, the current zoning for the subject parcel is C-PB (Planned Business Park). The proposed development appears to satisfy the current zoning use.

B. FEMA Floodplain Information

Figure 5 is a reproduction of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Community Panel Number 2155, revised to reflect LOMR effective November 16, 2011. As shown, the proposed development is located in Zone X. Zone X is an area determined to be outside the 100-year flood zone.

C. CCRFCD Facilities

Figure 6 & 7, a reproduction of *Figure F-25* of the Clark County Regional Flood Control District (CCRFCD) "Flood Control Master Plan Update for the Las Vegas Valley" (CCRFCD 2008 Update). Figure 6 & 7 shows the site is not bordered or crossed by any existing or proposed CCRFCD facility.

D. Soil Information

The curve numbers for the hydraulic analysis were developed from **Figure 8**, a reproduction of **Figure H-25** of the CCRFCD 2008 Update and Tables 602 of the Manual. **Figure 8** indicates the on-site watersheds are assigned hydrological soil group B. For existing condition, a curve number of 77 is used to represent undeveloped land. For developed condition, a curve number of 92 is used to represent commercial and business development.

II. Rainfall & Runoff Methodology

A. Rainfall

The project site is located within the McCarran Airport Rainfall Area. The depth-duration-frequency values for the 6-hour, 10-year and 100-year storm events were obtained from Figure 513 and Table 505. The value for the 10-year storm event is 1.58 and the value for the 100-year storm event is 2.77.

B. Storm Distribution

Table 503 in the manual specifies that the 6-hour storm distribution, SDN 3 should be used for drainage area less than eight (8) square miles.

C. Lag Time

Standard Form 4 was completed to determine the time of concentration for each drainage basin. For all drainage basins, which comprise less than 1 square mile, the time of concentration was calculated as follows:

$$T_c = T_i + T_t$$

Where: T_c = Time of Concentration
 T_i = Initial, inlet or overland flow time
 T_t = Travel time in the ditch, gutter, etc

Initial flow time was calculated as follows:

$$T_i = 1.8(1.1 - K)L_o^{1/2}/S^{1/3}$$

Where: T_i = Initial overland flow time (minutes)

$$K = 0.0132 * CN - 0.39$$

CN = Curve Number

L_o = Length of overland flow (max. 500 feet)

S = average basin slope (percent)

The lag time was calculated as follows:

$$T_{lag} = 0.6T_c \text{ (hours)}$$

III. Hydraulics and Hydrology

A. Model Description

One (1) reference study had been reviewed prior to the preparation of this study: the Technical Drainage Study for Holiday Inn at Cascade (CLV DS #4273). This study was used to reference offsite flow impacting Tenaya Way.

The materials within the reference study had been reviewed; the hydrologic assumptions and parameters appear to be acceptable to be use in this study. The onsite watersheds within this study are modeled using the SCS Unit Hydrograph method within the Army Corps of Engineers HEC-1 Flood Hydrology Package.

B. Hydrologic Analysis

- Existing Condition

Under existing condition, one (1) onsite basin (ON1) is delineated to represent the subject development. Flow generated from basin ON1 will discharge east following existing topography. There are no offsite flows that will impact the subject site since Tenaya Way had already been fully improved with curb & gutter.

For existing condition drainage map, standard form 4 and HEC-1 output please refer to *Appendix C* of this study. Table 1 below summarizes the basin area and flows.

Table 1
Existing Condition Hydrologic Analysis Result

Basin	Area (ac)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)
ON1	2.69	1	3

- Developed Condition

Under developed condition, the offsite drainage remains the same as existing condition. Two onsite basins (ON1 & ON2) are delineated to represent the subject development. Both onsite basins will discharge east onto adjacent vacant parcel following historical drainage pattern.

The HEC-1 analysis, drainage map and standard form 4 for existing condition are included in *Appendix C*. Table 2 is a summary of the analysis result.

Table 2
Developed Conditions Hydrologic Analysis Result

Basin	Area (ac)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)
ON1	1.37	2	4
ON2	1.32	2	4

C. Hydraulic Analysis

Bentley FlowMaster Version 2008 was used to calculate depths of flow and velocities for Tenaya Way. As shown by normal depth Section A, the 10-year dry lane criterion is not met for Tenaya Way. However, Zone Engineering assumes no liability in this matter since the dry lane criterion under existing condition was already non-compliance to local agency standards. Furthermore, the subject development does not increase storm flow within Tenaya Way. The D*V criteria stated in the Manual <6 for 10-year storm and <8 for 100-year storm is met for Tenaya Way. The normal depth calculations used in the hydraulic analysis are

included in **Appendix D** for review. Summary of the normal depth calculations is included on the next page.

The minimum finished floor elevation for the subject development is set based on twice the depth of flow above an onsite section rather than in the street since the subject development is lower than Tenaya Way. However, flood protection for a 100 year storm event will be provided in accordance to the Manual by a combination of natural berms and “humped” driveways. The top of berm elevations will be set at 18 inches above the 100 year water surface elevation in Tenaya Way. The top of curb elevation for the “humped” driveway will be set at 6 inches above the 100 year water surface elevation in Tenaya Way. Please refer to Table 3 for Finished Floor Summary and Table 4 for driveway summary.

Table 3
Finished Floor Summary

Normal Depth Section Referenced	Flowline (ft.)	Depth of 100 Yr. Flow (DF) (ft.)	Min. Finished Floor (FF) @ 2 x DF	Proposed Finished Floor (FF)	Δ FF & WSE (ft.)
B	31.18	0.33	31.84	33.45	+1.61

Table 4
Driveway Summary

Driveway Location	Normal Depth Section Referenced	Flowline (ft.)	Depth of 100 Yr. Flow (DF) (ft.)	Min. Driveway Highpoint (TC/HP) FL + DF + 0.5' + 0.5'	Proposed HP (PHP)	Δ PHP & HP (ft.)
Tenaya Way (high side)	A	36.15	1.04	38.19	38.20	+0.01
Tenaya (low side)	A	36.03	1.04	38.07	38.08	+0.01

Normal Depth Calculation Summary Section A – Tenaya Way

10-year event			100-year event		
Flow Rate	69*	cfs	Flow Rate	121*	cfs
Depth of Flow	0.89	ft.	Depth of Flow	1.04	ft.
Velocity	2.87	fps	Velocity	3.36	fps
V * D	2.55 < 6 √ ok		V * D	3.49 < 8 √ ok	
Dry Lane	11' ≤ 38' [12' drive lane + 7' ½ turn lane] *dry lane not met, see Section B for explanation.	ft.			

*flow per reference study

Section B – Onsite

10-year event			100-year event		
Flow Rate	2	cfs	Flow Rate	4	cfs
Depth of Flow	0.27	ft.	Depth of Flow	0.33	ft.
Velocity	1.66	fps	Velocity	1.96	fps
V * D	0.45 < 6 √ ok		V * D	0.65 < 8 √ ok	
Dry Lane	N/A	ft.			

III. Conclusion

Based on the data and analysis presented in this study, we conclude that the proposed development should not have any adverse impact on surrounding properties. The subject site is not developed next to any existing or proposed Clark County Regional Flood Control District Master Plan Facilities and does not fall within a FEMA defined Special Flood Hazard Area. The existing street system and proposed on-site drainage facilities are capable of conveying the flow rates at depths and velocities that meet acceptable design standards. On-site curbs & gutters will allow nuisance flow to discharge into the existing drop inlet within the subject property.

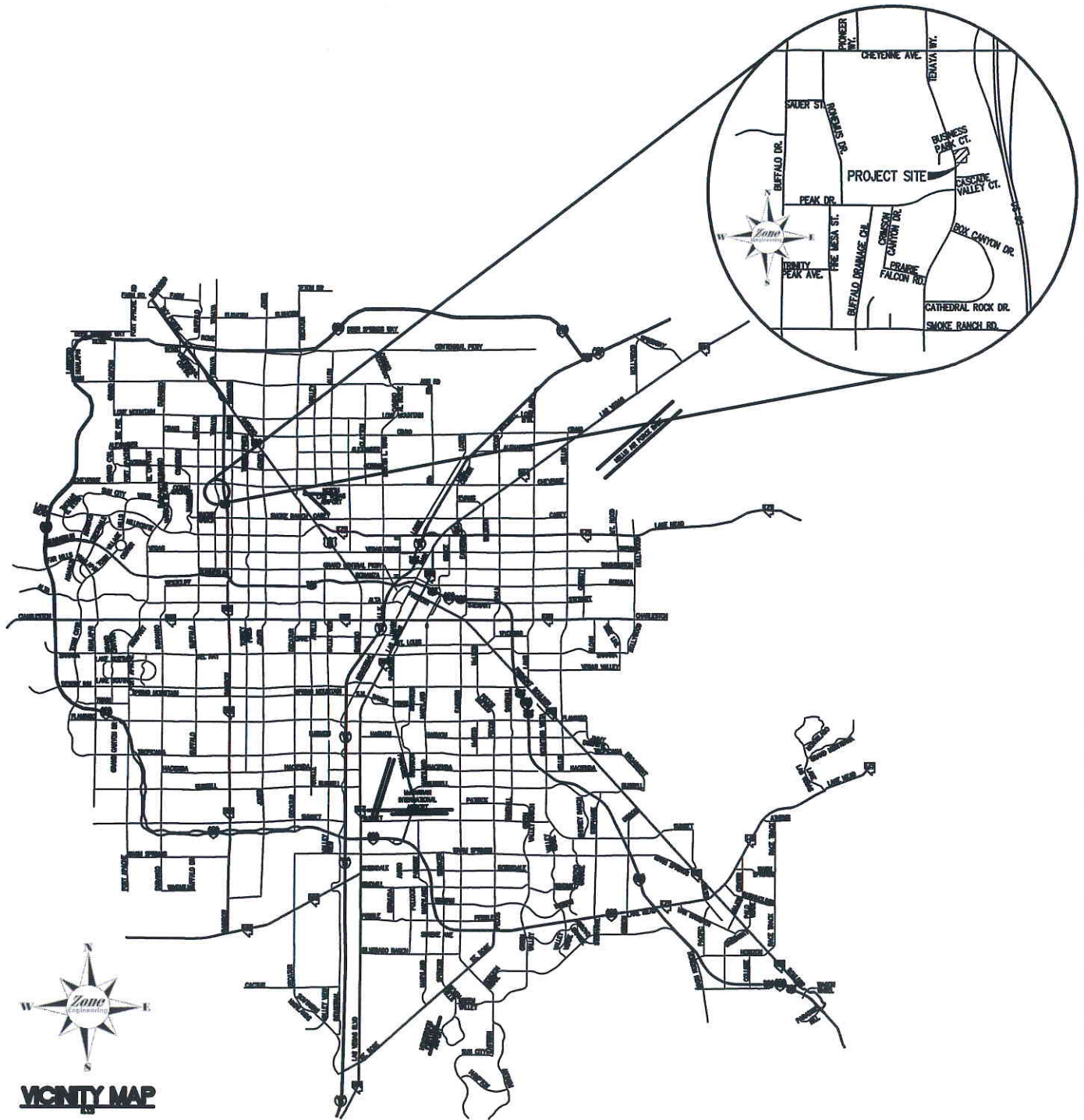
The project as designed will effectively control storm water runoff for the 10-year and 100-year floods as analyzed within this study. Changes made invalidating plan assumptions or conclusions reached will require a subsequent analysis and agency review and processing.

VI. Reference Studies

Technical Drainage Study for Holiday Inn at Cascade by The LanDesign Consultant. (2008). CLV DS #4273.

APPENDIX A – MAPS & FIGURES

- **FIGURE 1- VICINITY MAP**
- **FIGURE 2 - ASSESSOR'S PARCEL MAP**
- **FIGURE 3 – AERIAL EXHIBIT**
- **FIGURE 4 – ZONING EXHIBIT**
- **FIGURE 5 – FEMA FIRM PANEL 2155**
- **FIGURE 6 - FLOOD CONTROL MASTER PLAN UPDATE FACILITY INVENTORY – FIGURE F-25**
- **FIGURE 7 - FLOOD CONTROL MASTER PLAN UPDATE MAP – FIGURE H-25**
- **FIGURE 8 - FLOOD CONTROL MASTER PLAN UPDATE MAP – FIGURE F-25**



4550 W. Oakey Boulevard, Suite 102
 LAS VEGAS, NEVADA 89102
 PHONE: 702-877-3005
 FAX: 702-877-3007
www.zoneengineering.com

VICINITY MAP

FIGURE 1

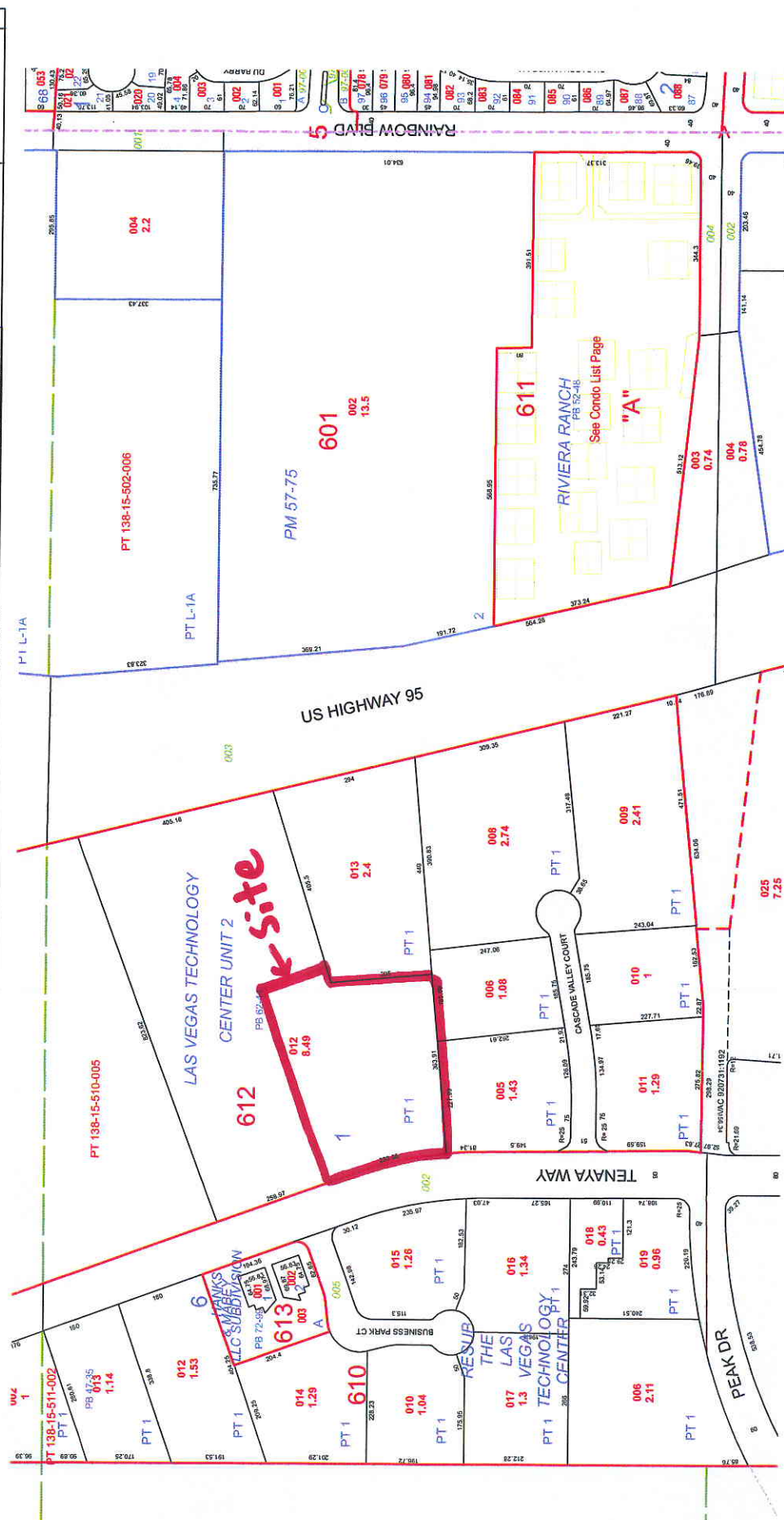
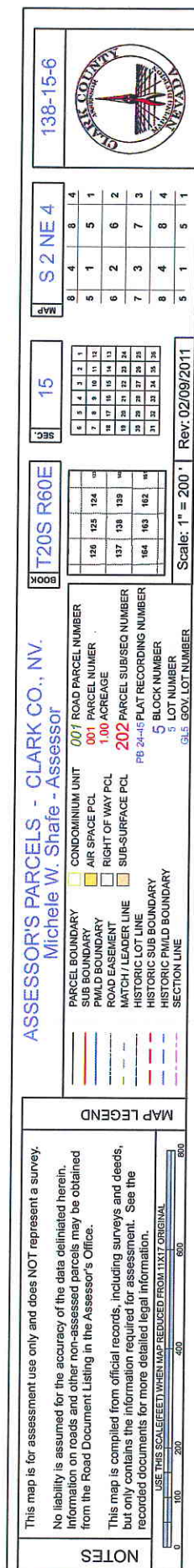


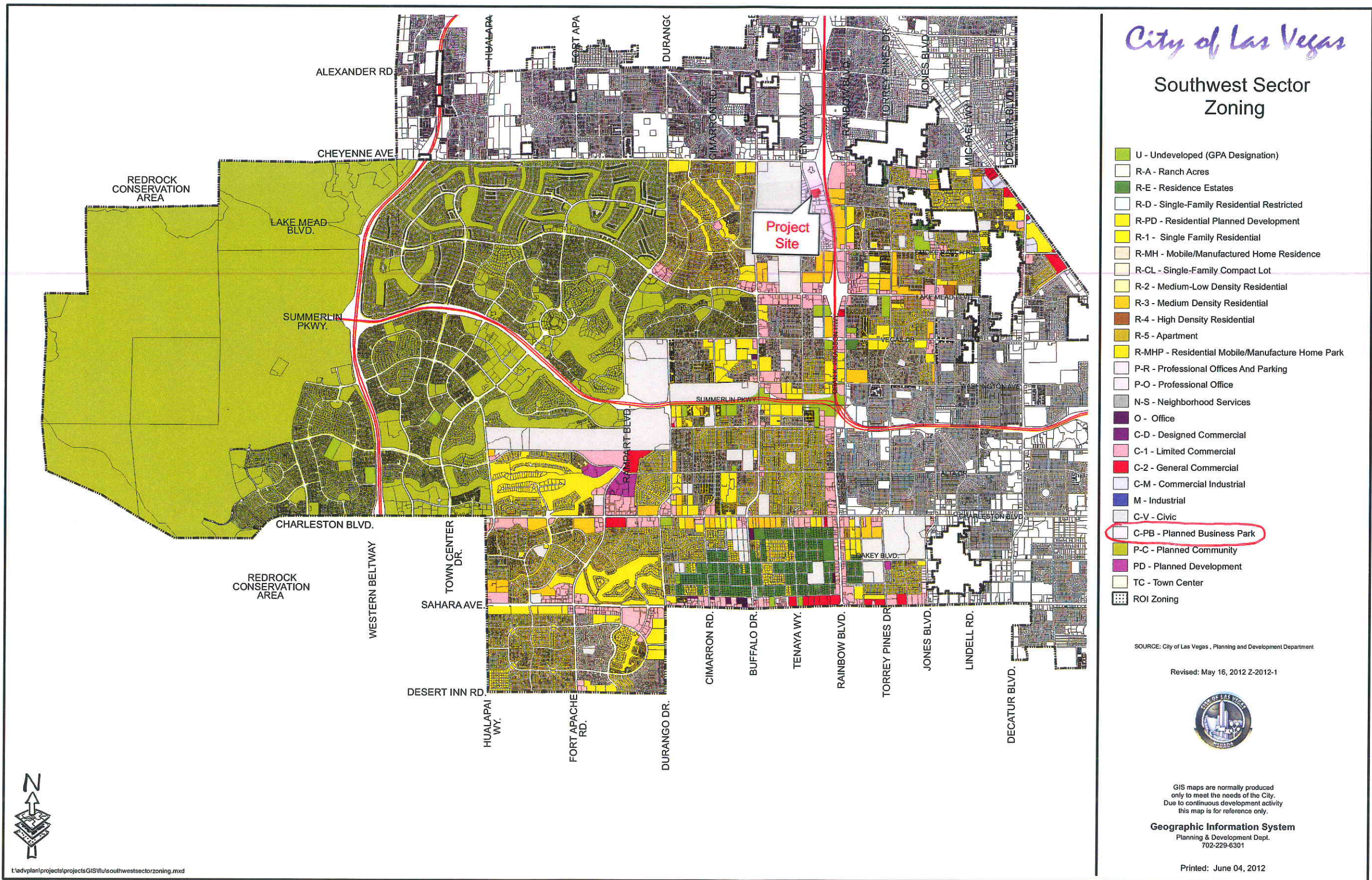
FIGURE 2

Date Created: 7/11/2012

Parcel:	138-15-612-012
Owner Name(s):	CITY PARKWAY V INC
Site Address:	0
Jurisdiction:	Las Vegas - 89128
Zoning Classification:	Planned Business Park District (C-PB)

Subdivision Name:	LAS VEGAS TECHNOLOGY CENTER		
Lot Block:	Lot:1 Block:1	Construction Year:	0
Sale Date:	00/0000	T-R-S:	20-60-15
Sale Price:	\$0	Census Tract:	3415
Recorded Doc Number:	2005060702022	Estimated Lot Size:	8.49
Flight Date:	10/12/2011		

Commission District:	C - LARRY BROWN	City Ward:	1 - LOIS TARKANIAN
US Senate:	DEAN HELLER, HARRY REID	US Congress:	04 - TO BE DECIDED NOV 2012
State Senate:	06-TO BE DECIDED IN NOV 2012	State Assembly:	37-TO BE DECIDED IN NOV 2012
School District:	E- TO BE DECIDED IN NOV 2012	University Regent:	07-TO BE DECIDED IN NOV 2012
Board of Education:	4-TO BE DECIDED IN NOV 2012	Minor Civil Division:	Las Vegas Township



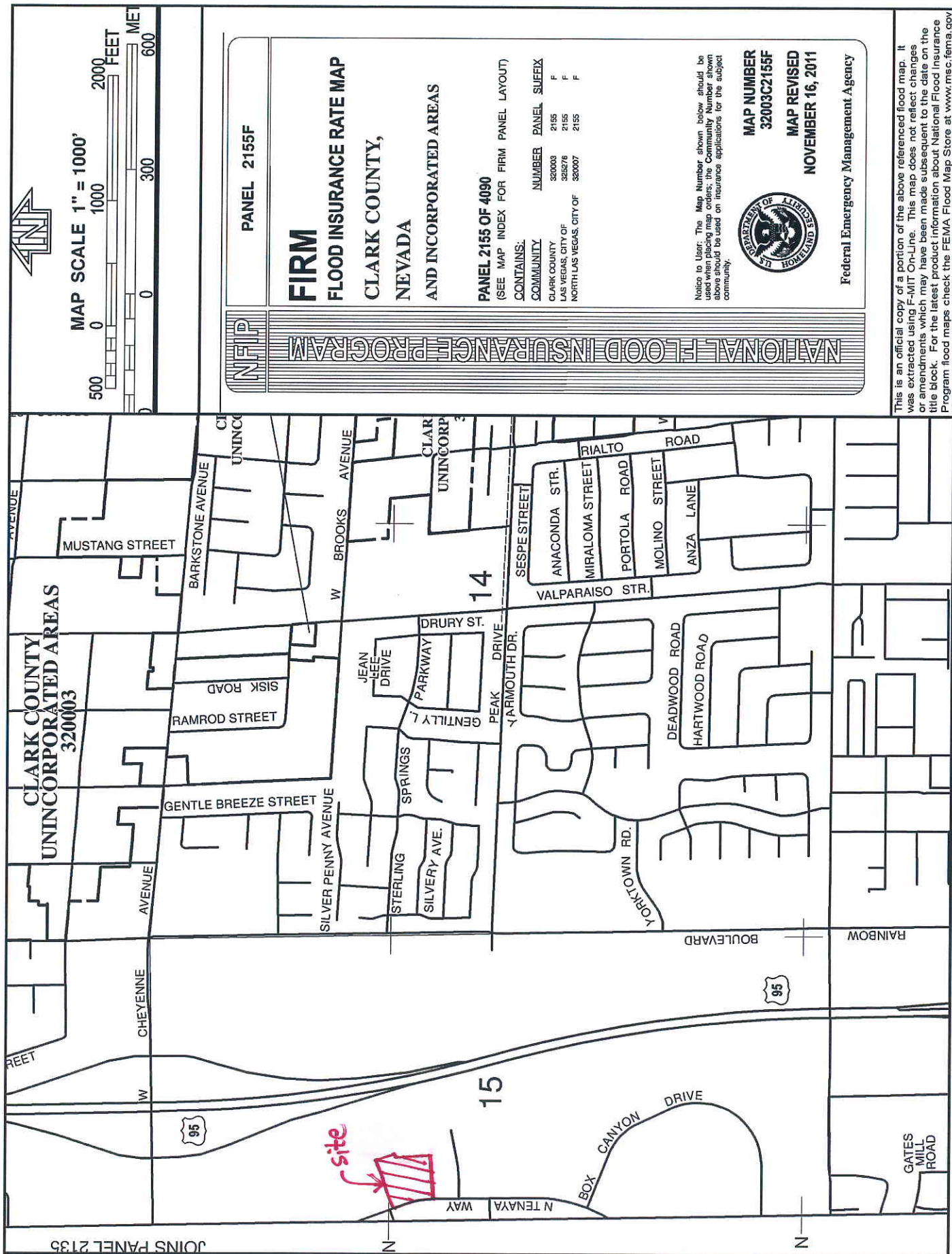


FIGURE 5

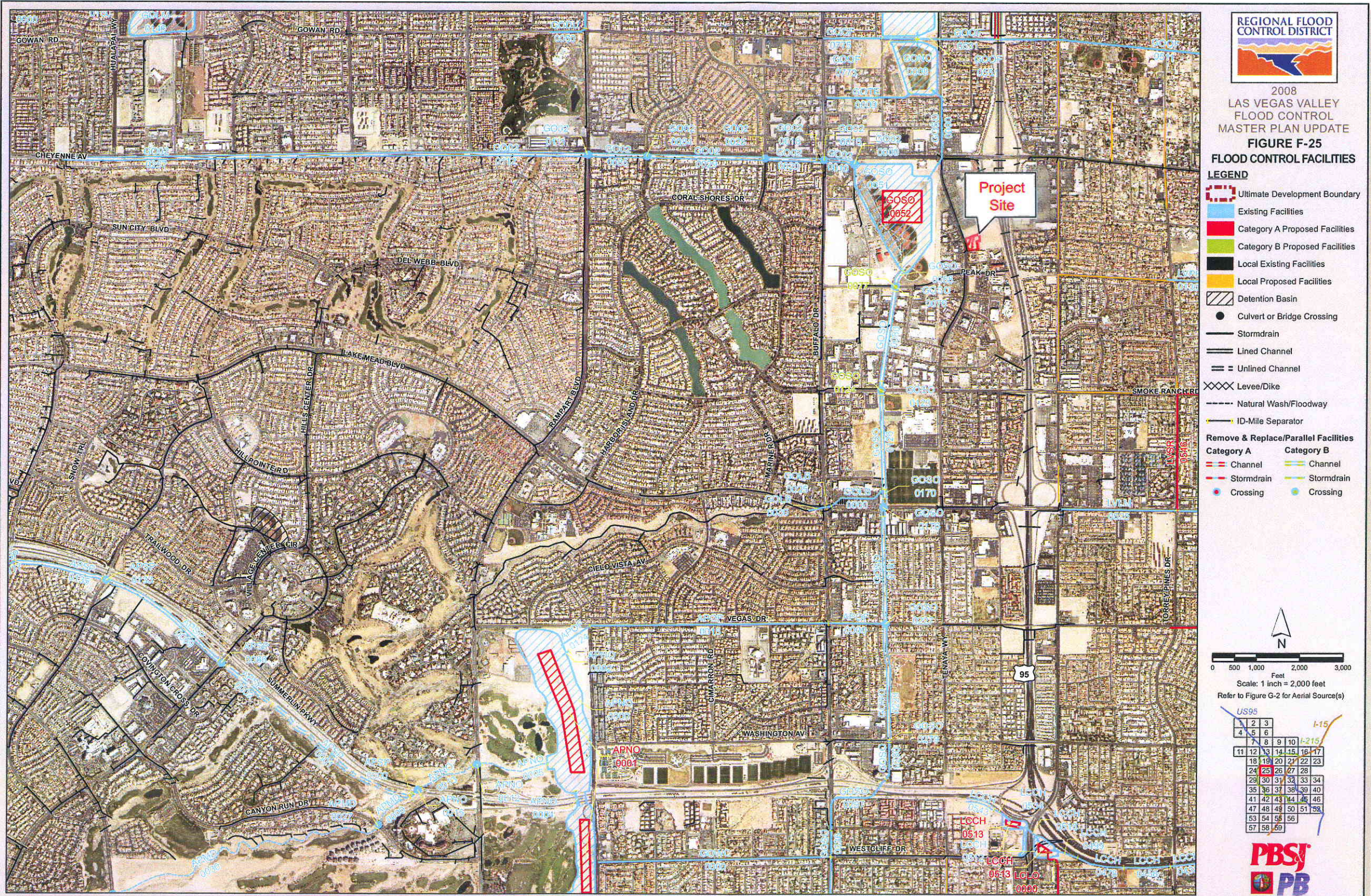


FIGURE 6

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						
0000	E	Natural Wash	940	6048	C11A-3*	ALLGOW4	11.31	2.90
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
APNO		ANGEL PARK NORTH						
0000	E	1,400 ac-ft Angel Park Detention Basin		9199	ANGLPKIN	ALLGOW5	21.99	
0001	P1	Upgrade to 1,512 ac-ft Angel Park Detention Basin		9199	ANGLPKIN	ALLGOW5	21.99	
0002	E	2: 33' & 1: 42' RCP Emergency Outlet	190	406	ANGLPKDB	ALLGOW5	21.99	
0004	E	14' X 12' RCB Connector Pipe under Summerlin Pkwy	380	9199	ANGLPKIN	ALLGOW5	21.99	1.00
0005	E	Natural Wash	1559	7988	CC3B-2B*	GW3SC	7.68	2.00
0012	E	3: 12' X 10' RCBC @ Rampart	232	7988	CC3B-2B*	GW3SC	7.68	1.00
0013	E	Natural Wash	1283	7988	CC3B-2B	GW3SC	7.68	1.40
0015	E	Two Span Bridge 28' W 14'D @ Summerlin Pkwy	236	7988	CC3B-2B	GW3SC	7.68	1.00
APOF		ANGEL PARK OUTFALL						
0000	E	66" RCP	1297	728	CGD34AC	GW3SC	0.65	1.90
0015	E	60" RCP	5472	454	CGD34AB	ALLGOW5	22.25	2.20
0124	E	54" RCP Outlet	810	406	ANGLPKDB	ALLGOW5	21.99	2.50
APSP		ANGEL PARK - SUMMERLIN PARKWAY						
0000	E	Concrete Chute Drop	103	7988	CC3B-2B	GW3SC	7.68	3.00
0001	E	Unlined Chnl with Gabion Drops 20'W Depth Varies 2:1 SS	3924	2746	C3B-2B	ALLGOW3	2.67	3.00
0002	E	Unlined Chnl with Gabion Drops 50'W 3:1 SS	1424	2746	C3B-2B	ALLGOW3	2.67	3.50
0066	E	5: 8' X 4' RCBC at Town Center Dr.	200	1697	C8B-2	ALLGOW3	1.56	2.40
0069	E	Conc Chnl 10'W 6'D 2:1 SS	3195	1697	C8B-2	ALLGOW3	1.56	2.40
0133	E	3: 8'X4' RCBC @ Crestdale	180	1173	C8B-1	ALLGOW3	1.14	2.33
0135	E	Conc Chnl 10'W 6'D 2:1 SS	2030	1173	C8B-1	ALLGOW3	1.14	2.40
GO02		GOWAN SOUTH FACILITIES (CHEYENNE CHANNEL)						
0000	E	Free Span Bridge 34'W 9.25'D @ Ronemus	100	4978	C16-C	ALLGOW3	7.09	0.50
0010	E	Conc Chnl 30'W 9'D 0:1 SS	600	4978	C16-C	ALLGOW3	7.09	0.50
0015	E	Free Span Bridge 31'W 7.25'D @ Buffalo	102	4978	C16-C	ALLGOW3	7.09	1.40
0018	E	Conc Chnl 30'W 9'D 0:1 SS	250	4978	C16-C	ALLGOW3	7.09	1.50
0020	E	Conc Chnl 10'W 7.25'D 1.5:1 SS	1000	4978	C16-C	ALLGOW3	7.09	1.50
0028	E	Free Span Bridge 35'W 7'D @ Soft Breezes	72	4800	CC7-C	ALLGOW3	6.78	2.20
0029	E	Conc Chnl 10'W 7.25'D 1.5:1 SS	2700	4800	CC7-C	ALLGOW3	6.78	1.50
0084	E	Free Span Bridge 35'W 7'D @ Soaring Gulls	95	4657	CCB-C	ALLGOW3	6.07	1.30
0085	E	Conc Chnl 10'W 7.25'D 1.5:1 SS	1240	4657	CCB-C	ALLGOW3	6.07	1.50
0111	E	Free Span Bridge 35'W 7'D @ Rampart	127	4657	CCB-C	ALLGOW3	6.07	2.90
0112	E	Conc Chnl 10'W 7'D 1.5:1 SS	7640	4225	CC-C	ALLGOW3	5.42	2.30
0257	E	Conc Chnl 10'W 6.75'D 1.5:1 SS	4293	2577	CCJ-C	ALLGOW3	2.97	4.10
GO95		GOWAN OUTFALL - U.S. 95 CHANNEL						
0000	P1	Conc Chnl 12'W 4'D 2:1 SS	2640	299	GD17BG-C	ALLGOW3	0.36	0.30
GO0U		GOWAN NORTH - DURANGO BRANCH						
0000	E	12' X 6' RCB	2629	1150	CLV14-C	ALLGOW3	1.40	0.91
0050	E	9' X 6' RCB	865	835	CLV20-C	ALLGOW3	0.97	1.50
GOLB		GOWAN LAKE MEAD-BUFFALO						
0000	E	12' X 6' RCB	1294	1071	CCVILL23	ALLGOW3	1.46	1.50
0025	E	10' X 7' RCB	145	1071	CCVILL23	ALLGOW3	1.46	0.50
0030	E	2: 8' X 4' RCB	408	1071	CCVILL23	ALLGOW3	1.46	0.85
GOLM		GOWAN LONE MOUNTAIN SYSTEM						
0146	E	888 ac-ft Lone Mountain Detention Basin		7252	LMTNIN	GW3SC	6.13	
GONO		GOWAN NORTH SYSTEM						
0000	E	8' X 8' RCB Outlet	184	558	GWNNDB	ALLGOW5	68.49	0.51
0001	E	8' X 8' RCB Outlet	156	558	GWNNDB	ALLGOW5	68.49	0.63
0006	E	30,780 cfs PMF Spillway		30780	GWNNDB	ALLGOW5	68.49	
0008	E	921 ac-ft Gowan North Detention Basin		4937	CCLV43-C*	GWASC	11.93	
GOOF		GOWAN OUTFALL FACILITIES						
0511	E	8' X 5' RCB	8390	699	CPT6B-C	GW3SC	1.08	0.50
0531	E	8' X 5' RCB	1300	558	GWNNDB	ALLGOW5	68.49	0.50
0551	E	72" RCP	524	558	GWNNDB	ALLGOW5	68.49	0.62
0773	E	60" RCP	803	286	LV30-C	ALLGOW3	0.42	1.40
0775	E	60" RCP	1300	286	LV30-C	ALLGOW3	0.42	1.00

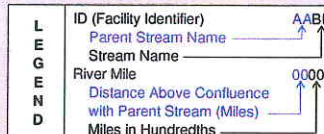
ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
GOSO		GOWAN SOUTH FACILITIES						
0000	E	72" RCP Outlet	2303	454	GWNSDB	GWSSC	12.13	0.53
0050	E	39,030 cfs PMF Spillway		39030	GWNSIN	GWSSC	12.13	
0051	E	524 ac-ft Gowan South Detention Basin		5625	GWNSIN	GWSSC	12.13	
0052	P1	Upgrade to 688 ac-ft Gowan South Detention Basin		5625	GWNSIN	GWSSC	12.13	
0068	E	Conc Chnl 15'W 7'D 2:1 SS	380	3796	CBUF01-C	GW3SC	4.88	0.40
0076	E	2: 10' X 7' RCBC @ Peak Dr	80	2119*	CBUF01-C*	GW3SC	4.88	0.56
0077	P0	Add 2: 14' X 7' RCBC @ Peak Dr	80	1677*	CBUF01-C*	GW3SC	4.88	0.56
0078	E	Conc Chnl 22'W 10'D 0:1 SS	60	3796	CBUF01-C	GW3SC	4.88	0.56
0080	E	Conc Chnl 12'W 7'D 2:1 SS	2078	3796	CBUF01-C	GW3SC	4.88	0.56
0119	E	Conc Chnl 22'W 10'D 0:1 SS	180	3587	CCCIL23	GW3SC	4.52	0.95
0123	E	2: 10' X 7' RCBC @ Smoke Ranch	100	2229*	CCCIL23*	GW3SC	4.52	0.62
0124	P0	Add 2: 10' X 7' RCBC @ Smoke Ranch	100	1358*	CCCIL23*	GW3SC	4.52	0.62
0125	E	Conc Chnl 22'W 9'D 0:1 SS	50	3587	CCCIL23	GW3SC	4.52	0.62
0126	E	Conc Chnl 12'W 7'D 2:1 SS	2155	3587	CCCIL23	GW3SC	4.52	0.62
0170	E	Conc Chnl 12'W 7'D 2:1 SS	220	2657	CCGD34AC	GW3SC	3.06	0.62
0173	E	Conc Chnl 22'W 7'D 0:1 SS	158	2657	CCGD34AC	GW3SC	3.06	0.62
0176	E	2: 10' X 7' RCBC @ Lake Mead	100	2657	CCGD34AC	GW3SC	3.06	0.62
0178	E	Conc Chnl 22'W 7'D 0:1 SS	150	2657	CCGD34AC	GW3SC	3.06	1.00
0181	E	Conc Chnl 12'W 7'D 2:1 SS	2429	2657	CCGD34AC	GW3SC	3.06	0.58
0227	E	2: 10' X 7' RCBC @ Vegas Drive	100	2065	CGD34AA	ALLGOW3	2.41	1.36
0229	E	Conc Chnl 12'W 7'D 1:1 SS	2649	2065	CGD34AA	ALLGOW3	2.41	1.36
0279	E	12' X 7' RCB	80	2065	CGD34AA	ALLGOW3	2.41	1.36
0280	E	12' X 8' RCB	875	2065	CGD34AA	ALLGOW3	2.41	0.34
0297	E	12' X 7' RCB	2124	1825	CW18B-C	ALLGOW3	2.14	1.60
0336	E	12' X 7' RCB	602	1593	C1-WESTC	ALLGOW3	1.84	3.40
0352	E	2: 8' X 5' RCB	2740	1374	C1-DUCHC	ALLGOW3	1.60	0.73
GOTE		GOWAN -TENAYA BRANCH						
0000	E	60" RCP	1954	272	LV29-C	ALLGOW3	0.28	1.30
GOWC		GOWAN SOUTH FACILITIES - WEST CLIFF						
0000	E	24" RCP	5400	257	1-WEST-C	ALLGOW3	0.24	1.67
LCCH		LAS VEGAS CREEK CHANNEL						
0438	E	60" RCP	1090	162	CLC01-C	SW3	1.20	1.60
0458	E	60" RCP	1060	162	CLC01-C	SW3	1.20	1.60
0478	E	60" RCP	1110	162	CLC01-C	SW3	1.20	0.55
0499	E	42" RCP Outlet	660	85	RAINBWD	SW3	1.11	1.88
0512	E	45 ac-ft Rainbow Detention Basin		970	RAINBWIN	SW3	1.11	
0513	P3	Upgrade to 102 ac-ft Rainbow Detention Basin		970	RAINBWIN	SW3	1.11	
0518	E	60" RCP Connector Pipe Under Rainbow Blvd	670	970	RAINBWIN	SW3	1.11	1.85
0534	E	60" RCP	460	279	AL00A-C	SW3	0.23	5.38
0543	E	Conc Chnl 10'W 4'D 0:1 SS	700	279	AL00A-C	SW3	0.23	1.88
LCLO		LAS VEGAS CREEK - LORENZI						
0000	P3	7' X 6' RCB	445	265	DAL00A	SW3	0.41	3.37
0008	P3	7' X 6' RCB	2415	265	DAL00A	SW3	0.41	0.40
LVLM		LAS VEGAS WASH - LAKE MEAD						
0475	E	48" RCP	2632	235	LM02-C	NW3	0.29	1.24
0525	E	48" RCP	2600	542	CLM01-C	NW3	0.64	1.24
LVOW		OWENS AVENUE SYSTEM						
0460	P1	7' X 6' RCB	2700	616	CVG03-C	NW3	0.95	1.48
LVPK		PEAK DRIVE SYSTEM						
0130	E	7' X 5' RCB	1435	400	CPD01-C	NW3	0.67	0.61
LVSF		LAS VEGAS WASH - SMOKE RANCH						
0496	P1	10' X 7' RCB	2855	1245	CSR02E	NW3	1.64	1.27
0546	P1	8' X 8' RCB	2640	758	CSR00A	NW3	1.01	0.57

* 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 from routing.
** As-built or design slopes were used when available. All other slopes are based on existing topography. The user should verify the facility slope listed prior to performing any facility specific analysis.
* For parallel facilities, the existing facility flow equals its normal depth capacity, and the proposed parallel facility flow equals the remaining flow (i.e., HEC-1 Node flow = existing facility normal depth capacity + proposed parallel facility flow).



2008 LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FACILITY INVENTORY
FIGURE F - 25



Existing Facility..... E
Proposed or Modified Facility..... P
Contingency Level
Category B..... P0
Master Plan..... P1
Preliminary Design..... P2
Design..... P3
Bottom Width..... W
Depth..... D
Side Slope, H:V..... SS

Construction Features
Cast in Place Concrete Pipe..... CIPCP
Reinforced Concrete Arch Culvert..... RCAC
Corrugated Metal Arch Pipe Culvert..... CMAP
Reinforced Concrete Box Culvert..... RCB
Corrugated Metal Pipe Culvert..... CMPC
Reinforced Concrete Pipe..... RCP
High Density Polyethylene..... HDPE
Reinforced Concrete Pipe Culvert..... RCP
Horizontal Elliptical Reinforced Concrete Pipe..... HERCP
Reinforced Concrete Arch Pipe..... RCAP
Storm Sewer Pipe..... SSP



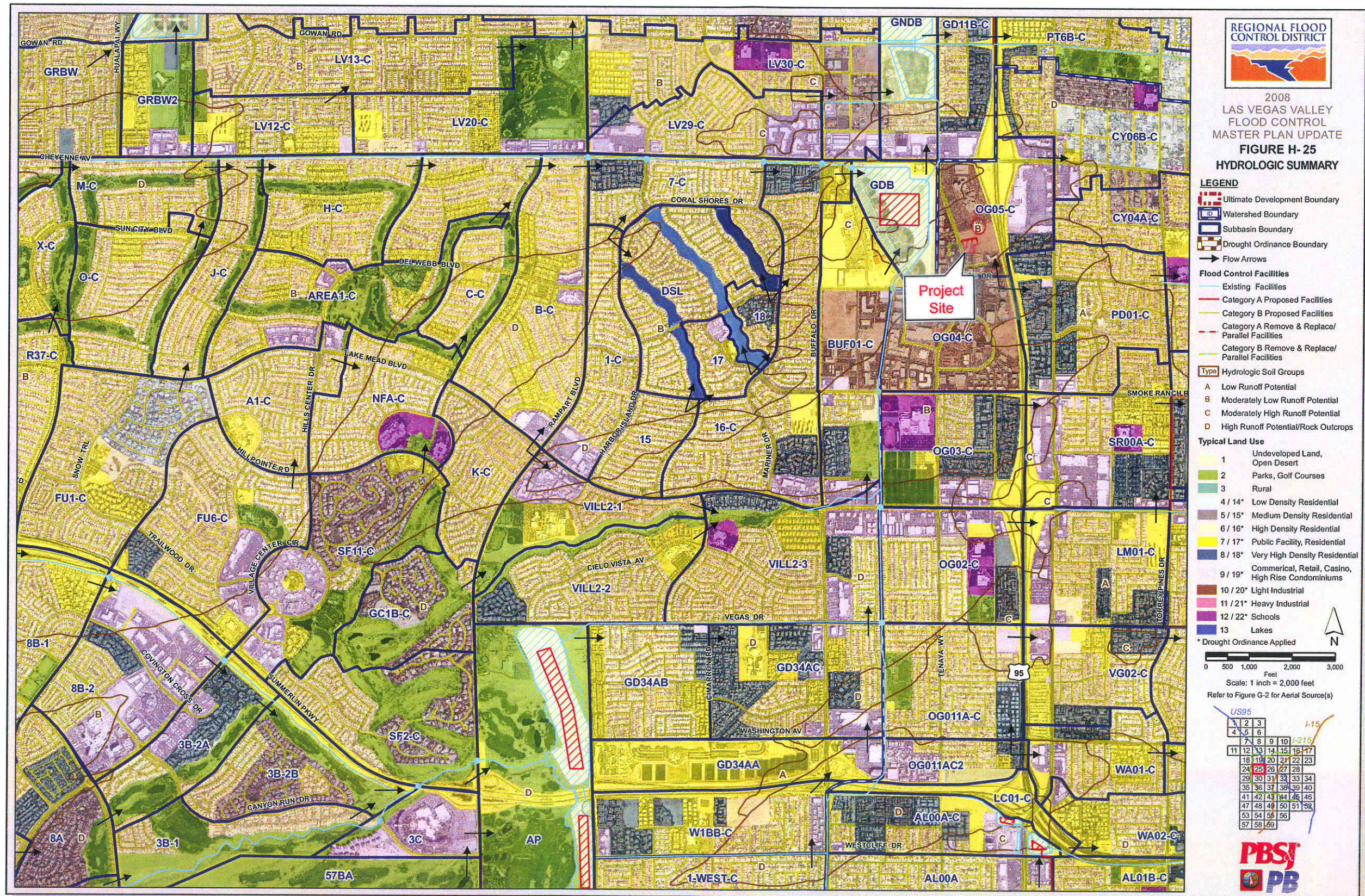


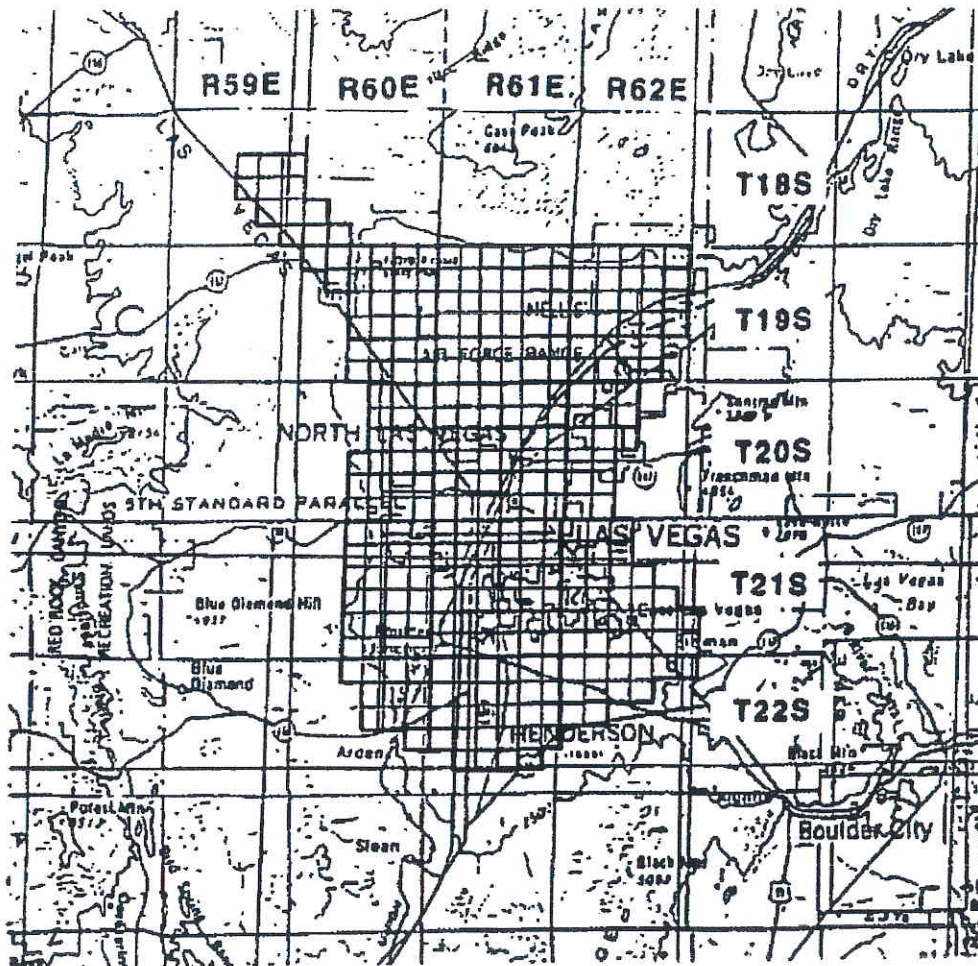
FIGURE 8

APPENDIX B – HYDROLOGIC PARAMETERS

- **FIGURE 513 OF THE MANUAL – McCARRAN AIRPORT RAINFALL AREA**
- **TABLE 505 OF THE MANUAL – DEPTH-DURATION-FREQUENCY VALUES FOR MCCARRAN AIRPORT RAINFALL AREA**
- **TABLE 503 OF THE MANUAL – SIX-HOUR STORM DISTRIBUTIONS**
- **TABLE 602 (4 of 4) OF THE MANUAL – RUNOFF CURVE NUMBERS (SEMIARID RANGELANDS)**
- **TABLE 602 (1 of 4) OF THE MANUAL – RUNOFF CURVE NUMBERS (URBAN AREAS)**

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

McCARRAN AIRPORT RAINFALL AREA



TOWNSHIP RANGE SECTIONS

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

TOWNSHIP RANGE SECTIONS

20 South 62 East 4-9, 16-20, 29-32
 21 South 60 East 1-4, 9-16, 21-28, 33-36
 21 South 61 East ALL SECTIONS
 21 South 62 East 4-9, 15-23, 25-36
 22 South 60 East 1-4, 10-15, 24
 22 South 61 East 1-24, 26-29
 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

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DEPTH-DURATION-FREQUENCY VALUES FOR McCARRAN AIRPORT RAINFALL AREA (IN INCHES)

TIME	RECURRENCE INTERVAL					
	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5 min.	0.15	0.27	0.35	0.46	0.54	0.63
10 min.	0.25	0.44	0.57	0.74	0.89	1.02
15 min.	0.33	0.57	0.74	0.97	1.15	1.32
30 min.	0.44	0.78	1.01	1.31	1.55	1.79
1 hour	0.52	0.89	1.15	1.50	1.78	2.06
2 hour	0.59	1.01	1.30	1.70	2.01	2.30
3 hour	0.64	1.08	1.39	1.82	2.15	2.48
6 hour	0.72	1.22	1.58	2.05	2.41	2.77
24 hour (TR-55)	1.20	1.60	1.80	2.40	2.70	2.96

- NOTE: 1. Refer to Figure 513 for a description and drawing of the area included in the McCarran Airport Rainfall Area.
2. The 24 hour values presented above are for use with TR-55 only.
3. Table 501 adjustments not required.

Revision	Date

WRC
ENGINEERING

REFERENCE:

USACE, Los Angeles District, 1988

TABLE 505

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

SIX-HOUR STORM DISTRIBUTIONS

Percent of Total Storm Depth				Percent of Total Storm Depth			
Storm Time (In Minutes)	SDN3	SDN4	SDN5	Storm Time (In Minutes)	SDN3	SDN4	SDN5
0	0.0	0.0	0.0	185	32.2	37.6	43.0
5	2.0	2.0	2.0	190	35.2	41.5	47.7
10	5.7	5.8	5.9	195	40.9	46.2	51.4
15	7.0	7.5	8.0	200	49.9	53.0	56.1
20	8.7	9.9	11.0	205	59.0	61.0	63.0
25	10.8	12.6	14.4	210	71.0	71.0	71.0
30	12.4	13.7	15.0	215	74.4	73.2	72.0
35	13.0	14.5	16.0	220	78.1	75.6	73.1
40	13.0	14.9	16.8	225	81.2	78.2	75.2
45	13.0	15.1	17.1	230	81.9	79.9	77.9
50	13.0	15.5	18.0	235	83.5	81.3	79.0
55	13.0	15.6	18.2	240	85.1	82.3	79.5
60	13.0	15.9	18.7	245	85.6	83.0	80.4
65	13.3	16.2	19.0	250	86.0	83.5	81.0
70	14.0	16.9	19.7	255	86.8	84.4	82.0
75	14.2	17.2	20.2	260	87.6	85.1	82.6
80	14.8	17.9	21.0	265	88.8	86.4	84.0
85	15.8	18.9	22.0	270	91.0	88.5	85.9
90	17.2	20.1	23.0	275	92.6	90.8	88.9
95	18.1	21.1	24.1	280	93.7	92.4	91.0
100	19.0	22.0	25.0	285	95.0	94.4	93.8
105	19.7	22.8	25.9	290	97.0	96.8	96.6
110	19.9	23.2	26.5	295	97.6	97.3	97.0
115	20.0	24.0	28.0	300	98.2	97.8	97.4
120	20.1	24.6	29.0	305	98.5	98.2	97.9
125	20.4	25.2	30.0	310	98.7	98.4	98.1
130	21.4	26.0	30.5	315	98.9	98.6	98.3
135	22.9	26.9	30.9	320	99.0	98.8	98.5
140	24.1	27.6	31.0	325	99.3	99.1	98.9
145	24.9	28.3	31.7	330	99.3	99.2	99.0
150	25.1	28.6	32.1	335	99.4	99.3	99.2
155	25.6	29.2	32.7	340	99.5	99.4	99.3
160	27.0	30.2	33.3	345	99.8	99.7	99.6
165	27.8	31.2	34.6	350	99.8	99.8	99.7
170	28.1	32.1	36.1	355	99.9	99.9	99.9
175	28.3	33.2	38.1	360	100.0	100.0	100.0
180	29.5	35.2	40.8				

- Notes: 1. For drainage areas less than 8 square miles in size, use SDN 3.
 2. For drainage areas greater than or equal to 8 square miles and less than 12 square miles in size, use SDN 4.
 3. For drainage areas greater than or equal to 12 square miles, use SDN 5.
 4. A graphical representation of these values is presented on Figure 515.

Revision	Date

REFERENCE:

TABLE 503

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS (SEMIARID RANGELANDS¹)

Cover description		Curve numbers for hydrologic soil group—			
Cover type	Hydrologic condition ²	A ³	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

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

²Poor: < 30% ground cover (litter, grass, and brush overstory).

Fair: 30 to 70% ground cover.

Good: > 70% ground cover.

³Curve numbers for group A have been developed only for desert shrub.

Revision	Date

WRC
ENGINEERING

REFERENCE:

SCS TR-55, USDA, June 1986.

TABLE 602
4 of 4

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS (URBAN AREAS¹)

Cover description		Curve numbers for hydrologic soil group—			
Cover type and hydrologic condition	Average percent impervious area ²	A	B	C	D
<i>Fully developed urban areas (vegetation established)</i>					
Open space (lawns, parks, golf courses, cemeteries, etc.):					
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) ³		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) ⁴	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

APPENDIX C – HYDROLOGIC ANALYSIS

EXISTING CONDITION

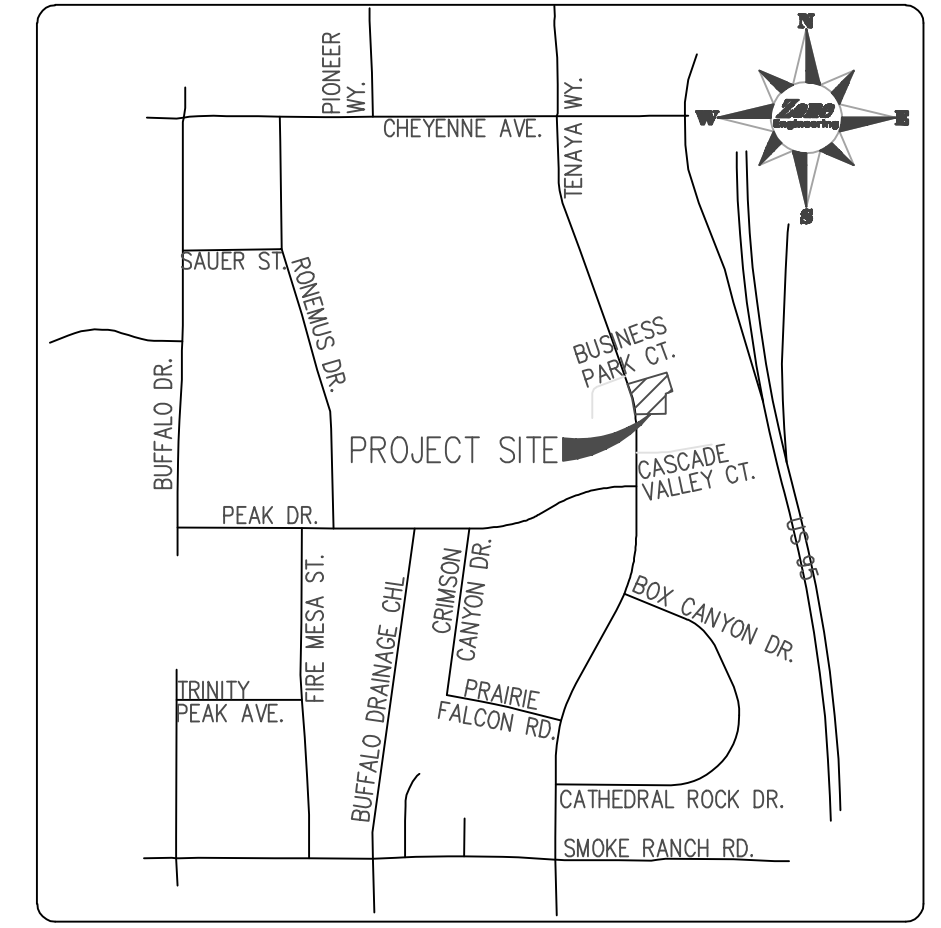
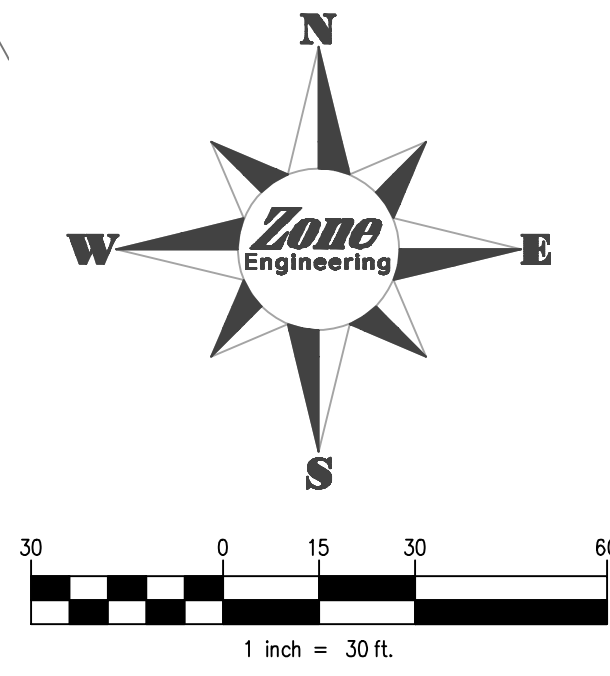
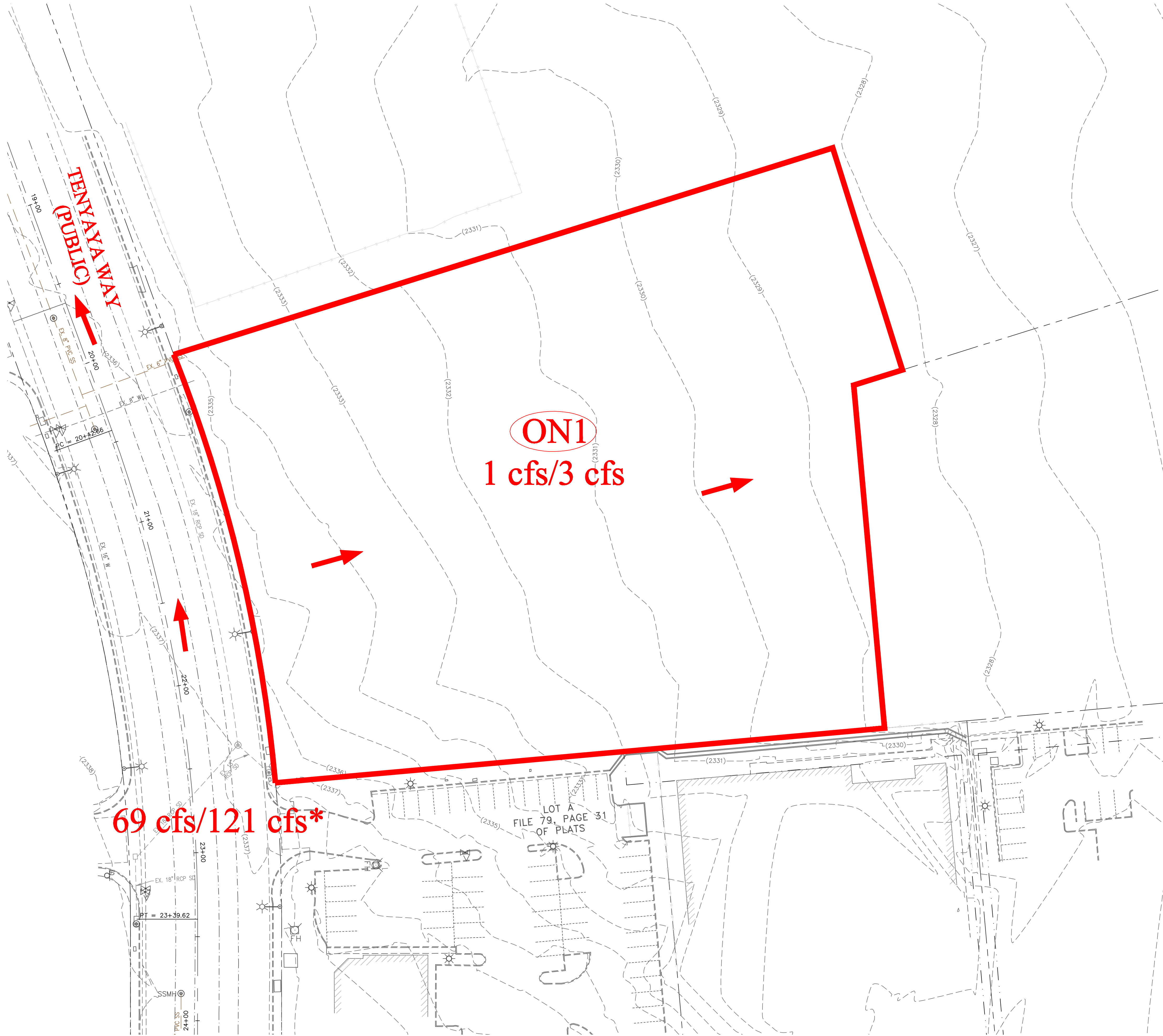
- **DRAINAGE MAP**
- **STANDARD FORM 4 w/VELOCITY ESTIMATION**
- **HEC-1 OUTPUT**

DEVELOPED CONDITION

- **DRAINAGE MAP**
- **STANDARD FORM 4 w/VELOCITY ESTIMATION**
- **HEC-1 OUTPUT**

EXISTING CONDITION

Z:\projects\2012\12-1005\Drainage\105\existing.dwg Zone Engineering Wed, 25 Jul 2012 - 3:55pm



LEGEND

- BASIN BOUNDARY
- FLOW ARROW
- BASIN ID
- COMBINATION POINT
- NORMAL DEPTH CROSS SECTIONS
- SOILS BOUNDARY
- SOILS TYPE
- 10 cfs/100 cfs
- Q10/Q100

NOTE:
FLOWS REFERENCED FROM THE TECHNICAL DRAINAGE
STUDY FOR HOLIDAY INN CASCADE (CLV DS#4273) ARE
DENOTED BY * ON THIS DRAINAGE MAP

4550 W. OAKLEY BLVD., SUITE 102
LAS VEGAS, NEVADA 89102
PHONE: 702.877.3005
FAX: 702.877.3007
WWW.ZONEENGINEERING.COM



EXISTING CONDITION DRAINAGE MAP

ADVANCED HEALTH CARE OF LAS VEGAS II
CITY OF LAS VEGAS, NV

DRAWN BY:	DATE:	SHEET
AK	7-18-12	
DESIGNED BY:	DATE:	
AK	7-18-12	
CHECKED BY:	DATE:	
CS	7-18-12	
PROJECT NO:		
12-1005		

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

EXISTING CONDITION

PROJECT NO. : 12-1005

DEVELOPMENT : ADVANCED HEALTH CARE OF LAS VEGAS II

FILE :

CALCULATED BY: CYS

DATE : 7/13/2012

Sub-Basin Data										Initial/Overland Time (Ti)				Travel Time (Tt)						Tc		Tc Check (Urbanized Basins)		Final Tc	Flag	Remarks
DESIG	CN	K	AREA (acres)	AREA (mi ²)	LENGTH (ft)	SLOPE (%)	Ti (min)	LENGTH (ft)	SLOPE (%)	V1 (fps)	V2 (fps)	Tt (min)	Tc=Ti+Tt (min)	TOTAL (ft)	Tc (min)	Tc (min)	Tc (min)	Flag (hrs)	Remarks							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)								
ON1	77	0.626	2.69	0.0042	170	1.0	11.1	400	1.68	1.92	N/A	3.5	14.6	N/A	N/A			0.146								
$Ti=(1.8(1.1-K)L^{1/2})/(S^{1/3})$ $Tc= Ti+Tt$ $K=0.0132(CN)-.39$ $Tlag = 0.6Tc$				For the travel time (Tt) calculations, V1 applies to the first 500 feet of travel distance; V2 applies to the remaining travel distance.										Travel Time Velocity Formulas						All basins over one square mile are calculated by the equation $Tlag=20Kn(L^{*}Lc/S^{0.5})^{0.33}$ and denoted by shaded gray (See Worksheet).						
														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:																		STANDARD FORM 4				* Used minimum lag time of 5 minutes.				

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
*   JUN 1998
*   VERSION 4.1
*
* RUN DATE 13JUL12 TIME 11:38:56
*
*****

```

```

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

```

```

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

```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW. THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE. THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY, DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1
PAGE 1

HEC-1 INPUT

```

LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1          *DIAGRAM
2          ID
3          ID
4          ID   ADVANCED HEALTH CARE OF LAS VEGAS II
5          ID   12-1005
6          ID   BY ZONE ENGINEERING
7          ID
8          ID   BASINS MODELED WITH 6-HOUR STORM DISTRIBUTION #3
9          ID   EXISTING CONDITION HEC1 MODEL
10         ID   10 & 100 YEAR RETURN PERIOD
11         ID
12         ID
13         IT      5      0      0      300
14         IO      5      0      0
15         IN      5      0      0
16         JR      PREC      0.57      1.00

17         KK      ON1
18         KM      ONSITE BASIN 1
19         BA      .0042
20         PB      2.77
21         PC      0.000  0.020  0.057  0.070  0.087  0.108  0.124  0.130  0.130  0.130
22         PC      0.130  0.130  0.130  0.133  0.140  0.142  0.148  0.158  0.172  0.181
23         PC      0.190  0.197  0.199  0.200  0.201  0.204  0.214  0.229  0.241  0.249
24         PC      0.251  0.256  0.270  0.278  0.281  0.283  0.295  0.322  0.352  0.409
25         PC      0.499  0.590  0.710  0.744  0.781  0.812  0.819  0.835  0.851  0.856
26         PC      0.860  0.868  0.876  0.888  0.910  0.926  0.937  0.950  0.970  0.976
27         PC      0.982  0.985  0.987  0.989  0.990  0.993  0.993  0.994  0.995  0.998
28         PC      0.998  0.999  1.000
29         LS      0      77
30         UD      0.146
31         *
31         ZZ

```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```

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

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

17      ON1

```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

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

```

```

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

```


*
 * RUN DATE 13JUL12 TIME 11:38:56 *
 *

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

ADVANCED HEALTH CARE OF LAS VEGAS II
 12-1005
 BY ZONE ENGINEERING

BASINS MODELED WITH 6-HOUR STORM DISTRIBUTION #3
 EXISTING CONDITION HEC1 MODEL
 10 & 100 YEAR RETURN PERIOD

14 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

1

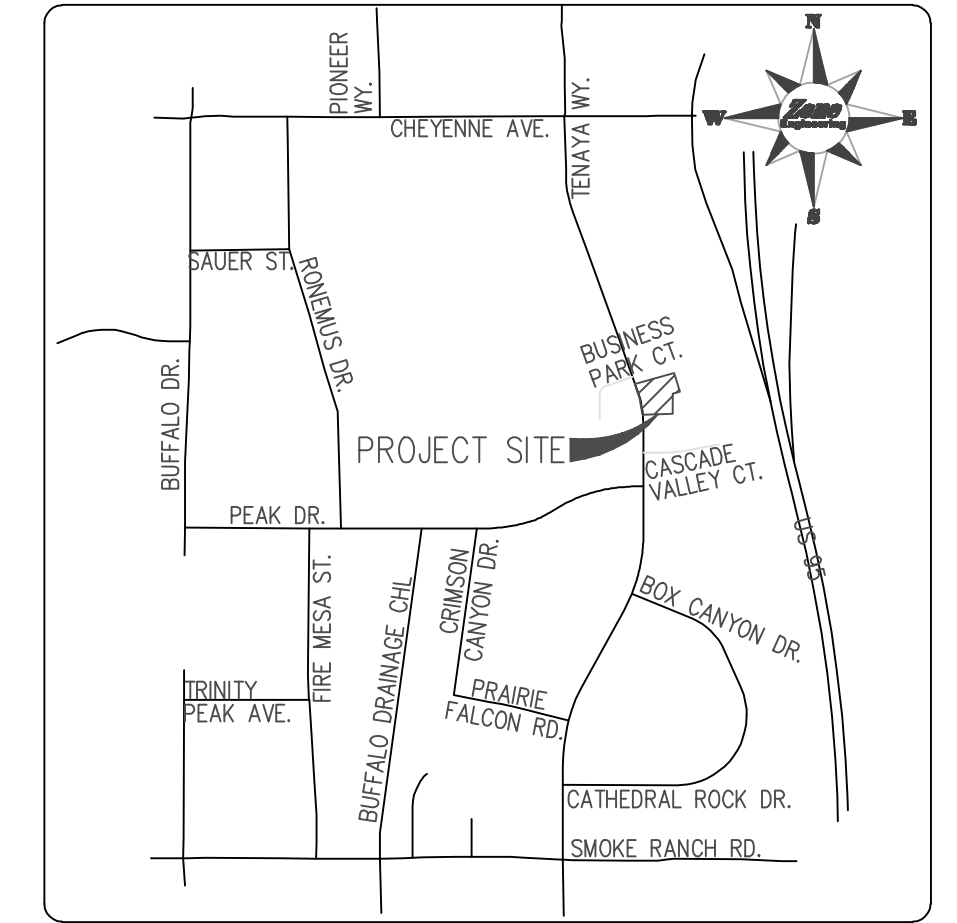
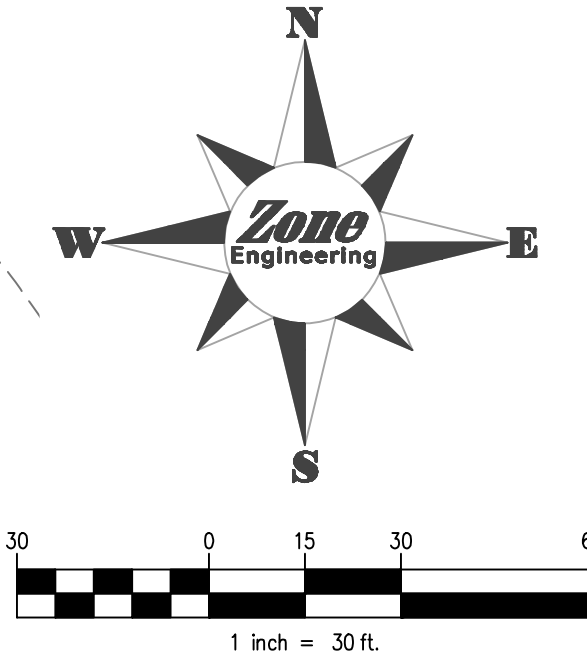
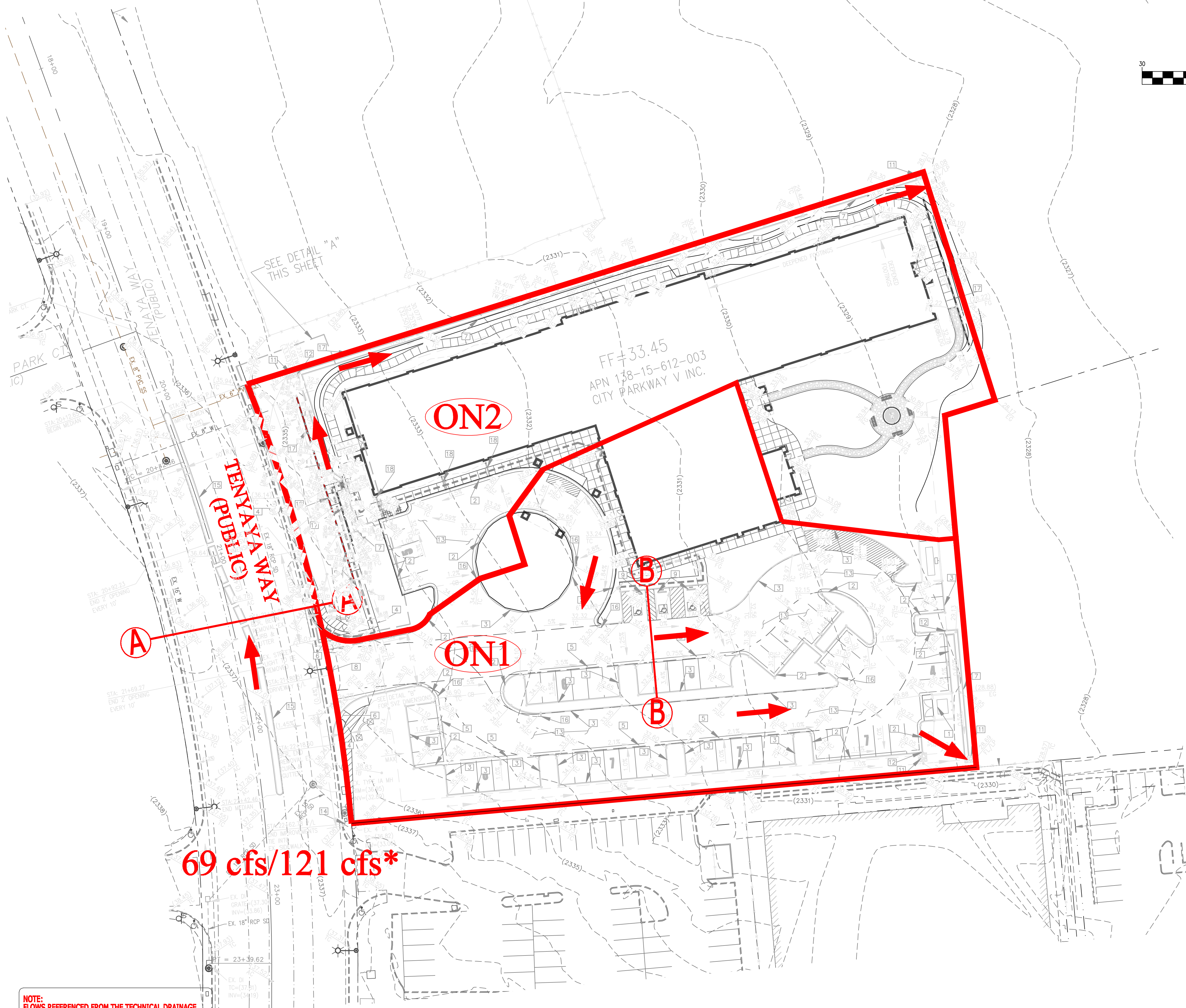
PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
 TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION	
				RATIO 1	RATIO 2
				.57	1.00
HYDROGRAPH AT					
+	ON1	.00	1	FLOW	1. 3.
				TIME	3.58 3.58

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

DEVELOPED CONDITION

Z:\projects\2012\12-1005\Drainage\TDS\Developed.dwg Zone Engineering Wed, 25 Jul 2012 - 4:03pm



LEGEND

- BASIN BOUNDARY
- FLOW ARROW
- BASIN ID
- COMBINATION POINT
- NORMAL DEPTH CROSS SECTIONS
- SOILS BOUNDARY
- SOILS TYPE
- 10 cfs/100 cfs
- Q₁₀/Q₁₀₀

BASIN FLOW SUMMARY

BASIN ID	AREA (acres)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)
ON1	1.45	2	4
ON2	2.25	2	4

STREET FLOW SUMMARY

SECT. ID	ST. NAME	Q ₁₀ (cfs)	D ₁₀ (ft)	V ₁₀ (fps)	D*V ₁₀	Q ₁₀₀ (cfs)	D ₁₀₀ (ft)	V ₁₀₀ (fps)	D*V ₁₀₀
A	TENAYA	69*	0.89	2.87	2.55	121*	1.04	3.36	3.49
B	ONSITE	2	0.22	1.40	0.31	4	0.33	1.96	0.65

DEVELOPED CONDITION DRAINAGE MAP

ADVANCED HEALTH CARE OF LAS VEGAS II
CITY OF LAS VEGAS, NV



4550 W. OAKLEY BLVD., SUITE 102
LAS VEGAS, NEVADA 89102
PHONE: 702.877.3005
FAX: 702.877.3007
WWW.ZONEENGINEERING.COM

DRAWN BY: AK
DESIGNED BY: AK
CHECKED BY: CS
PROJECT NO: 12-1005

SHEET No.
1 OF 1
CLV#

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

DEVELOPED CONDITION

PROJECT NO.: 12-1005 DEVELOPMENT : ADVANCED HEALTH CARE OF LAS VEGAS II
 FILE : CALCULATED BY: CYS DATE : 7/18/2012

Sub-Basin Data					Initial/Overland Time (Ti)				Travel Time (Tt)					Tc		Tc Check (Urbanized Basins)		Final Tc	Tlag	Remarks		
DESIG	CN	K	AREA (acres)	AREA (mi^2)	LENGTH (ft)	SLOPE (%)	TI (min)	LENGTH (ft)	SLOPE (%)	V1 (fps)	V2 (fps)	Tt (min)	Tc=Ti+Tt (min)	TOTAL (ft)	Tc (min)	Tc (min)	Tc (min)	Tlag (hrs)	Remarks			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)				
ON1	92.0	0.824	1.37	0.0021	24	1.0	2.4	375	2.00	2.86	N/A	2.2	4.6	399	12.2	4.6	0.046	*				
ON2	92.0	0.824	1.32	0.0021	45	2.0	2.6	580	0.50	1.43	2.16	6.5	9.1	625	13.5	9.1	0.091					
For the travel time (Tt) calculations, V1 applies to the first 500 feet of travel distance; V2 applies to the remaining travel distance. $Ti = (1.8(1.1-K)L^{1/2}) / (S^{1/3})$ $Tc = Ti + Tt$ $K = 0.0132(CN) - 39$ $Tlag = 0.6Tc$					Travel Time Velocity Formulas										All basins over one square mile are calculated by the equation $Tlag = 20Kn(L * Lc / S^{0.5})^{0.33}$ and denoted by shaded gray (See Worksheet)							
															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:

STANDARD FORM 4

* Used minimum lag time of 5 minutes.
 ** Used minimum lag time of 10 minutes.


```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
*   JUN 1998
*   VERSION 4.1
*
* RUN DATE 18JUL12 TIME 15:07:36
*
*****

```

```

*****
*
* 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   X
XXXXXXX   XXXX   X   XXXXX   X
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
 PAGE 1

HEC-1 INPUT

```

LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
          *DIAGRAM
1         ID
2         ID
3         ID   ADVANCED HEALTH CARE OF LAS VEGAS II
4         ID   12-1005
5         ID   BY ZONE ENGINEERING
6         ID
7         ID
8         ID   BASINS MODELED WITH 6-HOUR STORM DISTRIBUTION #3
9         ID   DEVELOPED CONDITION HEC1 MODEL
10        ID   10 & 100 YEAR RETURN PERIOD
11        ID
12        ID
13        IT      5      0      0      300
14        IO      5      0      0
15        IN      5      0      0
16        JR      PREC      0.57      1.00

17        KK      ON1
18        KM      ONSITE BASIN 1
19        BA      .0021
20        PB      2.77
21        PC      0.000      0.020      0.057      0.070      0.087      0.108      0.124      0.130      0.130      0.130
22        PC      0.130      0.130      0.130      0.133      0.140      0.142      0.148      0.158      0.172      0.181
23        PC      0.190      0.197      0.199      0.200      0.201      0.204      0.214      0.229      0.241      0.249
24        PC      0.251      0.256      0.270      0.278      0.281      0.283      0.295      0.322      0.352      0.409
25        PC      0.499      0.590      0.710      0.744      0.781      0.812      0.819      0.835      0.851      0.856
26        PC      0.860      0.868      0.876      0.888      0.910      0.926      0.937      0.950      0.970      0.976
27        PC      0.982      0.985      0.987      0.989      0.990      0.993      0.993      0.994      0.995      0.998
28        PC      0.998      0.999      1.000
29        LS      0      92
30        UD      0.050
          *

31        KK      ON2
32        KM      ONSITE BASIN 2
33        BA      .0021
34        LS      0      92
35        UD      0.091
          *
36        ZZ

```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```

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

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

17      ON1

```

31 ON2

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 18JUL12 TIME 15:07:36 *
*****
```

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

ADVANCED HEALTH CARE OF LAS VEGAS II
12-1005
BY ZONE ENGINEERING

BASINS MODELED WITH 6-HOUR STORM DISTRIBUTION #3
DEVELOPED CONDITION HEC1 MODEL
10 & 100 YEAR RETURN PERIOD

```
14 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
```

1

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION		
				RATIO 1	RATIO 2	
				.57	1.00	
HYDROGRAPH AT						
+	ON1	.00	1	FLOW	2.	4.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ON2	.00	1	FLOW	2.	4.
				TIME	3.50	3.50

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

APPENDIX D –NORMAL DEPTH CALCULATIONS

- **SECTION A – TENAYA WAY - Q10**
- **SECTION A – TENAYA WAY - Q100**
- **SECTION B – ONSITE - Q10**
- **SECTION B – ONSITE - Q100**

Worksheet for Section A - Tenaya Way Q10

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.40 %
Discharge 69.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	37.09
0+05.00	36.99
0+05.50	36.99
0+05.50	36.49
0+07.00	36.62
0+07.00	36.66
0+19.00	36.94
0+83.00	36.12
0+83.00	36.08
0+84.50	35.94
0+84.50	36.44
0+85.00	36.44
0+90.00	36.54

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 37.09)	(0+07.00, 36.62)	0.013
(0+07.00, 36.62)	(0+83.00, 36.08)	0.016
(0+83.00, 36.08)	(0+90.00, 36.54)	0.013

Options

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

Worksheet for Section A - Tenaya Way Q10

Results

Normal Depth		0.89	ft
Elevation Range	35.94 to 37.09	ft	
Flow Area		24.04	ft²
Wetted Perimeter		72.79	ft
Hydraulic Radius		0.33	ft
Top Width		71.56	ft
Normal Depth		0.89	ft
Critical Depth		0.86	ft
Critical Slope		0.00533	ft/ft
Velocity		2.87	ft/s
Velocity Head		0.13	ft
Specific Energy		1.02	ft
Froude Number		0.87	
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	0.89	ft
Critical Depth	0.86	ft
Channel Slope	0.40	%
Critical Slope	0.00533	ft/ft

Messages

Notes

*flow from reference study

Worksheet for Section A - Tenaya Way Q100

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.40 %
Discharge 121.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	37.09
0+05.00	36.99
0+05.50	36.99
0+05.50	36.49
0+07.00	36.62
0+07.00	36.66
0+19.00	36.94
0+83.00	36.12
0+83.00	36.08
0+84.50	35.94
0+84.50	36.44
0+85.00	36.44
0+90.00	36.54

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 37.09)	(0+07.00, 36.62)	0.013
(0+07.00, 36.62)	(0+83.00, 36.08)	0.016
(0+83.00, 36.08)	(0+90.00, 36.54)	0.013

Options

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

Worksheet for Section A - Tenaya Way Q100

Results

Normal Depth	1.04	ft
Elevation Range	35.94 to 37.09 ft	
Flow Area	36.05	ft²
Wetted Perimeter	86.04	ft
Hydraulic Radius	0.42	ft
Top Width	84.50	ft
Normal Depth	1.04	ft
Critical Depth	1.02	ft
Critical Slope	0.00498	ft/ft
Velocity	3.36	ft/s
Velocity Head	0.18	ft
Specific Energy	1.22	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	1.04	ft
Critical Depth	1.02	ft
Channel Slope	0.40	%
Critical Slope	0.00498	ft/ft

Messages

Notes

*flow from reference study

Cross Section for Section A - Tenaya Way Q100

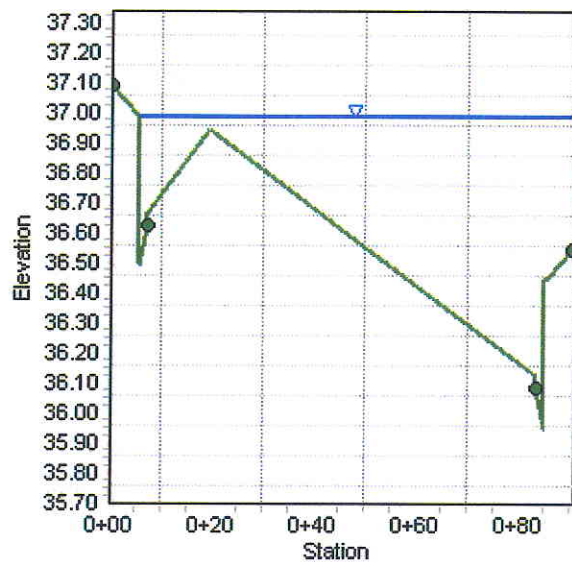
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.40 %
Normal Depth 1.04 ft
Discharge 121.00 ft³/s

Cross Section Image



$$\begin{aligned} & \underline{D \times V} \\ & 1.04' \times 3.36 \text{ ft/s} < 8 \\ & = 3.49 < 8 \checkmark \text{ ok} \end{aligned}$$

Project Description

Manning Formula

Normal Depth

2.00 ft³/s

The profile view graph shows the elevation of the road profile and existing ground level. The vertical axis represents Elevation (31.00 to 32.60) and the horizontal axis represents Station (0+00 to 0+60). The proposed road profile is shown as a solid line, and the existing ground level is shown as a dashed line. A horizontal line at elevation 31.45 indicates the existing ground level, and a vertical line at station 0+42 indicates the proposed road centerline.

Station	Elevation (Proposed Road)	Elevation (Existing Ground)
0+00	32.30	32.30
0+10	32.20	32.20
0+20	31.90	31.90
0+30	31.70	31.70
0+40	31.30	31.45
0+42	31.25	31.45
0+44	31.30	31.45
0+50	31.70	31.70
0+60	32.40	32.40

$$\frac{D \times V}{0.27' \times 1.66 \text{ ft/s} < 6}$$

$$= 0.45 < 6 \text{ ok}$$

Worksheet for Section B - Onsite Q10

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.50 %
Discharge 2.00 ft³/s

Section Definitions

Station (ft)	Elevation (ft)
-0+05.00	32.30
0+00.00	32.20
0+00.50	32.20
0+18.50	31.86
0+40.93	31.30
0+40.93	31.26
0+41.93	31.18
0+42.93	31.26
0+42.93	31.30
0+60.50	31.90
0+60.50	32.40
0+61.00	32.40

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+05.00, 32.30)	(0+00.50, 32.20)	0.016
(0+00.50, 32.20)	(0+40.93, 31.26)	0.013
(0+40.93, 31.26)	(0+42.93, 31.26)	0.016
(0+42.93, 31.26)	(0+60.50, 31.90)	0.013
(0+60.50, 31.90)	(0+61.00, 32.40)	0.016

Options

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

Worksheet for Section B - Onsite Q10

Options

Closed Channel Weighting Method Pavlovskii's Method

Results

Normal Depth		0.27	ft
Elevation Range	31.18 to 32.40 ft		
Flow Area		1.21	ft ²
Wetted Perimeter		12.31	ft
Hydraulic Radius		0.10	ft
Top Width		12.22	ft
Normal Depth		0.27	ft
Critical Depth		0.26	ft
Critical Slope		0.00588	ft/ft
Velocity		1.66	ft/s
Velocity Head		0.04	ft
Specific Energy		0.31	ft
Froude Number		0.93	
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	0.27	ft
Critical Depth	0.26	ft
Channel Slope	0.50	%
Critical Slope	0.00588	ft/ft

Messages

Notes

*flow from basin ON1

Project Description

Input Data

Station (ft)	Elevation (ft)
--------------	----------------

Roughness Segment Definitions

Options

7/18/2012 12:55:10 PM Bentley Systems, Inc. Haestad Methods Solution Center Bentley FlowMaster [08.11.00.03]
27 Siemens Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Page 1 of 2

Worksheet for Section B - Onsite Q100

Options

Closed Channel Weighting Method Pavlovskii's Method

Results

Normal Depth		0.33	ft
Elevation Range	31.18 to 32.40 ft		
Flow Area		2.04	ft ²
Wetted Perimeter		16.37	ft
Hydraulic Radius		0.12	ft
Top Width		16.28	ft
Normal Depth		0.33	ft
Critical Depth		0.32	ft
Critical Slope		0.00529	ft/ft
Velocity		1.96	ft/s
Velocity Head		0.06	ft
Specific Energy		0.39	ft
Froude Number		0.97	
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	0.33	ft
Critical Depth	0.32	ft
Channel Slope	0.50	%
Critical Slope	0.00529	ft/ft

Messages

Notes

*flow from basin ON1

Cross Section for Section B - Onsite Q100

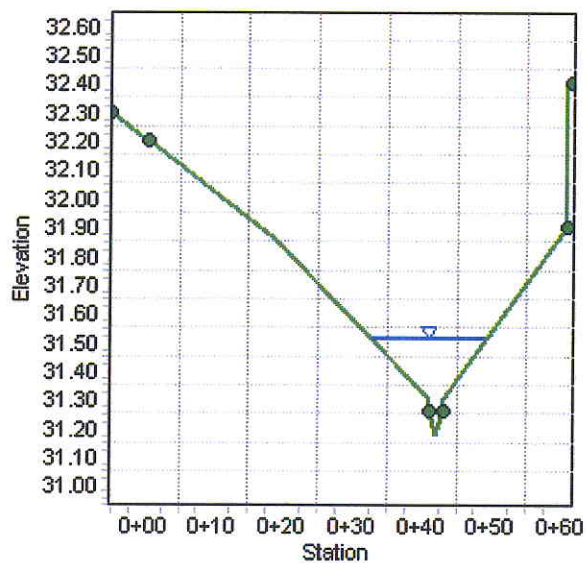
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.50 %
Normal Depth 0.33 ft
Discharge 4.00 ft³/s

Cross Section Image



$$\frac{D \times V}{0.33' \times 1.96 \text{ ft/s} < 8}$$
$$0.65 < 8 \checkmark \text{ ok}$$

APPENDIX E – REFERENCE MATERIALS

- **TECHNICAL DRAINAGE STUDY and ADDENDA FOR HOLIDAY INN AT CASCADE BY THE LANDESIGN CONSULTANT (CLV DS #4273)**

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM		DATE: June 4, 2008
TO: Land Development Services Department of Public Works		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT: Drainage Study for: Holiday Inn at Cascade		COPIES TO: The LanDesign Consultants
Cross Streets:	NEQ of Tenaya Way & Peak Drive	N.W.H. II Ltd.
File Number:	F:\Depot\DSMemos\DS4273B.doc	Bart Anderson, P.E., DevCo
Parcel Number:	138-15-612-013	NDOT
Zoning Action:	SDR-23105 & SUP-23106	
FEMA Flood Zone	YES	NO X
Proposed Storm Drain	YES	NO X

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Transaction #
1 st Submittal	1/23/2008	2/5/2008	Not Approved	\$400.00	86569: \$400
2 nd Submittal & Supplement	5/19/2008 & 6/4/2008	6/4/2008	See Comments Below	\$400.00	95278: \$400
TOTAL FEES (LDDRS):				\$800.00	----

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 NDOT concurrence.

- The project proposes to construct facilities and/or increase flows within *Nevada Department of Transportation* (NDOT) right-of-way (US 95). The engineer should contact NDOT for encroachment permit or acceptance of flows for the proposed project.

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 Amendment 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/R60E/15
AREA L-15

TECHNICAL DRAINAGE STUDY

for

Holiday Inn at Cascade

Rec'd : 1/22/08

Date Prepared:

January 11, 2008

Project No:

182.00

DS 4273

~~1802~~ L-15

\$400

NOOT

Prepared by

The **LanDesign Consultant**

I N C O R P O R A T E D
LAND DEVELOPMENT CIVIL ENGINEERS

Telephone

(702) 547-0047

Fax

(702) 547-0049

1050

Wigwam Pkwy

#110

Henderson, NV

89074

The
LanDesign
Consultant

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Holiday Inn at CascadeDate: January 11, 2008Location of Development: a) Descriptive (Cross Streets) Tenaya Way & Cascade Valley Courtb) Sect. X Twn. 20 S Rng. 60 EName of Owner: N.W.H. II Ltd.Assessors Parcel No: 138-15-612-003Telephone No: 702-521-3003Facsimile No: 702-261-0602Address: 3340 S Topaz #240Las Vegas, NV 89121Contact Person Name: Brian RidingerTelephone No: (702) 547-0047Firm: The LanDesign ConsultantAddress: 1050 Wigwam Pkwy #110, Henderson, NV 89074

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: 2.4 acres Being Developed/Disturbed: 2.4 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.)? Commercial
5. Approximate upstream land area which drains to the subject site? 8.6 acres
6. Has the site drainage been evaluated in the past? ☒ Yes ☐ NO If yes, please identify documentation:
Brook Hollow Park-phase IV Drainage Study; University of Nevada School of Medicine Drainage Study
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site:
The northeast and the southeast corners of the site
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.

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

Local Entity File No.

Revision

Date

REFERENCE:

STANDARD FORM 1

II. GENERAL LOCATION AND DEVELOPMENT DESCRIPTION

1. SCOPE

The scope of this study is to provide a hydrologic and hydraulic analysis for the Holiday Inn at Cascade project. The 10 and 100-year storm flows affecting the site are determined and recommendations for the drainage facilities necessary to convey these flows in accordance with the minimum standards as established by Clark County Regional Flood Control District (CCRFCD) and the City of Las Vegas are within.

2. LOCATION OF PROPERTY

(See Figure 1, Appendix A, *Vicinity Map*).

The site under investigation is located northeast of the end of the Cascade Valley Court cul-de-sac, that intersects with Tenaya Way, within the jurisdiction of the City of Las Vegas, Nevada. A legal description for the property is as follows: *a portion of lot 1 of Las Vegas Technology Center unit 2, lying within the East half (E ½) of Section 15, Township 20 South, Range 60 East, M.D.M., City of Las Vegas, Clark County, Nevada.* The subject properties can be further identified by Assessor's Parcel Number 138-15-612-003.

3. DESCRIPTION OF PROPERTY

(See Figures 2, Appendix A, *SOILS REFERENCE MAP*)

(Clark County Regional Flood Control, FLOOD CONTROL MASTER PLAN UPDATE LAS VEGAS VALLEY 2002, FIGURE H-8, Hydrologic Subareas, Land Use & Soils).

The, approximately 2.4 acre, project site is situated in an area underlain by gravelly fine sandy loam. Storm runoff traverses rough desert terrain with sparse desert rangeland vegetation. The natural soil composition place the site in a good to moderate hydrologic soil group. The site topography generally slopes west to east at a rate of approximately one and seven tenths percent (1.7%).

The project site is comprised of commercial business hotel development with the supporting infrastructure and parking lot.

III. HYDROLOGIC ANALYSIS

1. OFF-SITE DRAINAGE DESCRIPTION

a) EXISTING

(See Figure 3, Appendix A, EXISTING BASIN MAP)

Currently, the off-site basins impacting the study area are undeveloped. Figure 3 depicts the existing basins and is included within a pocket in this report. These basins are planned for future commercial development.

Basin EOFF1, a small minor basin located at the northwest corner of the proposed development, conveys a negligible amount of flow for the ten (10) and one hundred (100) year storm flows, respectively.

Basins EOFF2 and EOFF3 convey flows northeasterly and eventually are discharged to the US 95 right of way. Basin EOFF2 generates flows in the magnitude of a negligible amount and two (2) cfs for the ten (10) and one hundred (100) year storm flows, respectively. Basin EOFF3 generates flows in the magnitude of two (2) and nine (9) cfs for the ten (10) and (100) year storm flows, respectively.

b) PROPOSED

For the purpose of this scope of analysis, we are anticipating the offsite basins upstream of the proposed development as existing and therefore our analysis is an interim analysis. The developed basins, as shown on the approved referenced material, do not directly affect the proposed development and therefore the interim analysis yields the analysis with the conservative design approach.

Existing offsite basin OFF1, west of the developed site, generates a negligible amount and two (2) cfs for the ten (10) and one hundred (100) year storm flows, respectively. Existing offsite basin OFF2, north of the proposed site, generates flows in the magnitude of two (2) and nine (9) cfs for the ten (10) and one hundred (100) year storm flows, respectively.

Basins OFF1 and OFF2 will be concentrated at CP1 and enter US-95 drainage facilities.

2. ON-SITE DRAINAGE DESCRIPTION

a) EXISTING

(See Figure 3, Appendix A, EXISTING BASIN MAP)

Existing conditions on-site are undeveloped and two principal basins appear. These basins were modeled to evaluate the historic runoff amounts and their patterns discharging through and out of the project site.

Existing basin EON1, a insignificant minor basin along the southwest end of the property conveys negligible amount of flow for the ten (10) and one hundred (100) year storm flows, respectively.

The runoff is conveyed southerly to the adjacent existing hotel site and continues easterly to the common east property corner of the existing and proposed development.

Basin EON2 located at the southeast corner of the proposed development generates a negligible amount and one (1) cfs for the ten (10) and one hundred (100) year storm flows, respectively. The flow is conveyed to the east to the US 95 right of way.

Basin EON3, a majority of the site, conveys flow to the northeast corner of the proposed development. Basin EON3 generates a negligible amount and two (2) cfs for the ten (10) and one hundred (100) year storm flows, respectively.

For the purpose of this study, Offsite Basins EOFF2 and EOFF3 are being combined with Basin EON2 Concentration Point ECP1 located at the northeast corner of the proposed development and yields flow in the magnitude of three (3) and fourteen (14) cfs for the ten (10) and one hundred (100) year storm flows, respectively.

b) PROPOSED

(See DRAINAGE PLAN, within a pocket of this report)

Proposed Basin ON1, located on the south half of the developed site, generates flows in the magnitude of two (2) and three (3) cfs for the ten (10) and one hundred (100) year storm flows, respectively. This basin is conveyed to the common property line with the existing Hotel development to the south and is conveyed easterly within the existing curb channel and drainage easement to the US-95 Right of Way.

Proposed Basin ON2, located on the north half of the developed site, generates flows in the magnitude of two (2) and four (4) cfs for the ten (10) and one hundred (100) year storm flows, respectively. This runoff is conveyed to the northeast corner of the proposed development and combines at CP1 with offsite basins OFF1 and OFF2. The concentrated flows entering the US 95 right of way are in the magnitude of two (2) and eleven (11) cfs for the ten (10) and one hundred (100) year storm flows, respectively.

c) EXISTING BASIN SUMMARY TABLE

EXISTING BASIN	10 YEAR (CFS)	100 YEAR (CFS)
EOFF1	0	0
EOFF2	0	2
EOFF3	2	9
EON1	0	0
EON2	0	1
EON3	0	2

d) PROPOSED BASIN SUMMARY TABLE

PROPOSED BASIN	10 YEAR (CFS)	100 YEAR (CFS)
OFF1	0	2
OFF2	2	9
ON1	2	3
ON2	2	4

We have tabulated within Table 3, Appendix B, Time of Concentration the existing and developed basin characteristics. Basin delineation is depicted on the DRAINAGE PLAN, within a pocket of this study. Basin characteristics were determined through field investigation, area technical manuals and area topography.

3. MASTER PLANNING INFORMATION

(See Figure 4, Appendix A, Regional Flood Control Facilities)

Review of Figure 4, Appendix A, Regional Flood Control Facilities, indicates the project site is not located adjacent to or impacted by an existing or proposed Clark County Regional Flood Control Master Plan Facility. Figure 4 is a reproduction of Figure F-8 from CCRFCD Master Plan Update 2002.

4. FLOODPLAIN INFORMATION

(See Figure 5, Appendix A, Flood Map)

The project is located within an area designated Flood Zone X. Review of Figure 5 will show the project site superimposed on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) panel number 2155 of 4090, map number 32003C2155 E, Clark County, Nevada and Incorporated Areas, effective December 312003. Flood Zone X is designated as "areas outside 500-year floodplain.

5. PREVIOUS DRAINAGE STUDIES

There has been a hydrology study in the project vicinity. Information from the following study was utilized in the preparation of this report:

1. *Technical Drainage Study, Brookhollow Business Park Phase IV, by Martin & Martin Civil Engineers, April 1995*
2. *Technical Drainage Study, University of Nevada School of Medicine, by Martin & Martin Civil Engineers, February 1997.*

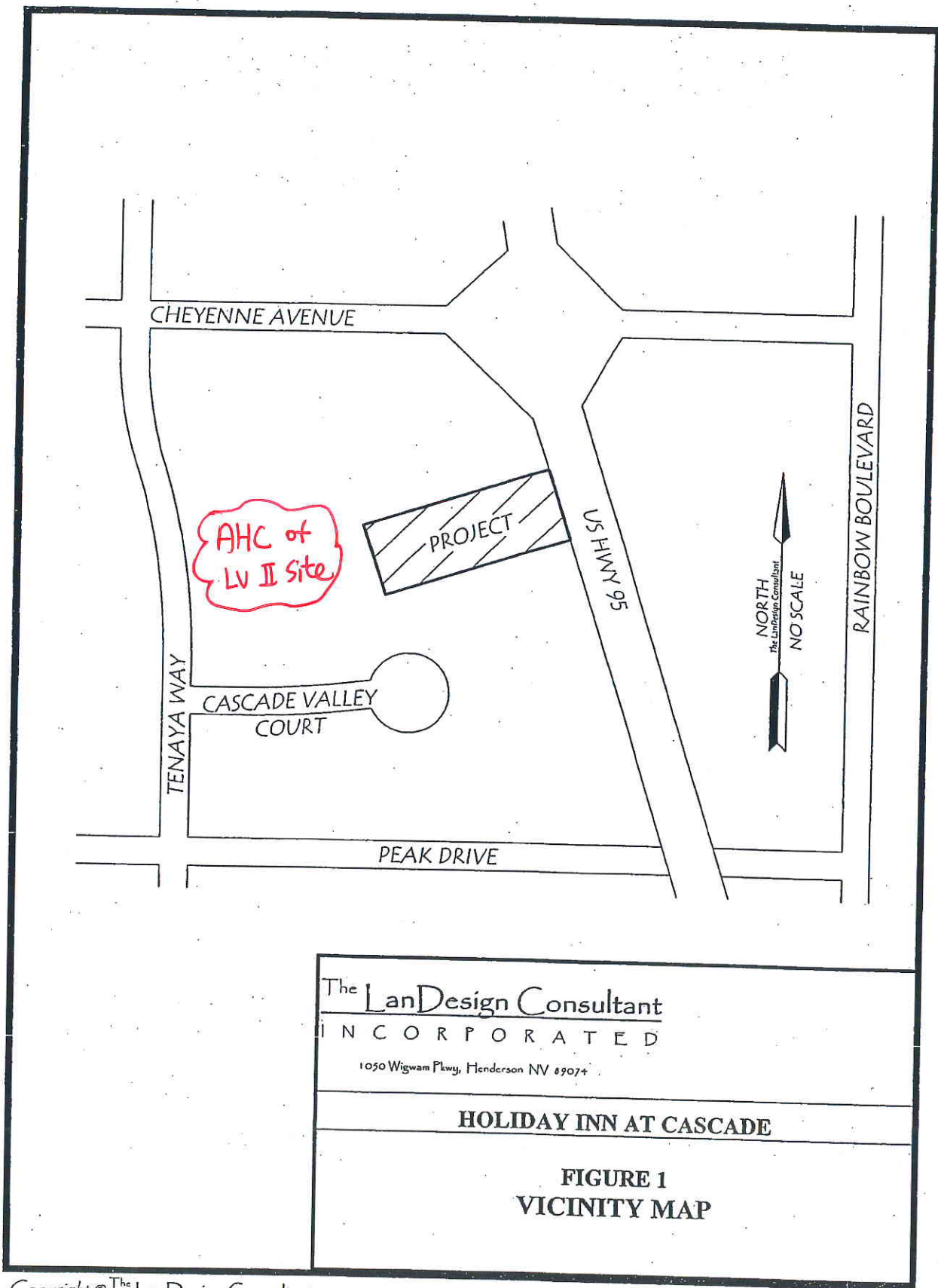
VI. REFERENCES

1. Technical Manuals and Software References

1. *Hydrologic Criteria and Drainage Design Manual*, Prepared by WRC Engineering, Inc., Updated by Montgomery Watson, for Clark County Regional Flood Control District, August 1999.
2. *Las Vegas Valley Flood Control Master Plan Update*, Prepare by PBS&J, for Clark County Regional Flood Control District, September 2002.
3. *Soil Survey of Las Vegas Valley Area*, Nevada, Part of Clark County, United States Department of Agriculture Soil Conservation Service, July 1985.
4. *Flood Insurance Rate Map*, Federal Emergency Management Agency, Clark County, Nevada and Incorporated Areas.
5. *HEC-1 Flood Hydrograph Package*, User's Manual, U.S. Army Corps of Engineers, September 1991.
6. *FLOWMASTER*, Pipe and Ditch Sizing Software, HAESTAD Methods Inc.

2. Technical Hydrology Study References

1. *Technical Drainage Study, Brookhollow Business Park Phase IV*, by Martin & Martin Civil Engineers, April 1995
2. *Technical Drainage Study, University of Nevada School of Medicine*, by Martin & Martin Civil Engineers, February 1997.



XI. APPENDIX E

1. **REFERENCE MATERIAL** *TDS, Brook Hollow Park-Phase IV*
2. **REFERENCE MATERIAL** *TDS, University of Nevada School of Medicine*

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM		DATE: May 9, 1997
TO: Barry Thompson, P.E. Land Development Services Department of Public Works		FROM: Dennis W. Stransky, P.E. Flood Control Project Manager Department of Public Works
SUBJECT: Drainage Study for: University of Nevada School of Medicine Tenaya and Smoke Ranch FILE NO. H:\DEPOT\DS\DS2020B.DOC		COPIES TO: Martin & Martin Civil Engineers Kaplan-McLaughlin-Diaz, Inc. John McNellis, P.E. NDOT
FEMA Flood Zone	YES No X	
Proposed Storm Drain	YES No X	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1st Submittal	02/27/97	03/07/97	Not Accepted	\$250.00
2nd Submittal	05/02/97	05/09/97	See 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 including the following:
	must have Clark County Regional Flood Control District concurrence

- Further development of the undeveloped portions of the site will require a technical update to this study prior to receiving a grading permit.
- The response to previous comment 8c states that the existing RCP under US 95 is shown on the Grading Plan. The pipe was not shown and must be included on the grading plan.

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 Amendment 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.

PLANS SENT TO LAND DEVELOPMENT YFS (initial)

END OF REMARKS
dws

T/R/S: 20S/60E/15
AREA L15

DRAINAGE STUDY
FOR
UNIVERSITY OF NEVADA
SCHOOL OF MEDICINE

February 20, 1997

Prepared For:

Kaplan-McLaughlin-Diaz, Inc.
1417 Fourth Avenue, Suite 200
Seattle, Washington 98101
(206) 467-1004

Prepared By:

Martin & Martin, Inc., Civil Engineers
1909 South Jones Boulevard
Suite B
Las Vegas, Nevada 89102
(702) 248-8000

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

2020
1-15
Rec'd
2/24/97

DRAINAGE STUDY INFORMATION FORM

Name of Development: University of Nevada - School of Medicine Date: February 20, 1997

Location of Development: a) Descriptive Tenaya Way between Cheyenne and Peak Avenue
b) Section 15 Township 20 South Range 60 East

Name of Owner: University of Nevada School of Medicine Assessors Parcel No.: 138-15-612-003

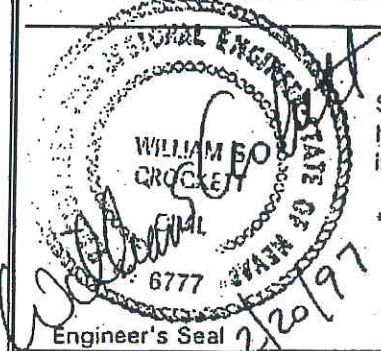
Contact Person-Name: William S. Crockett, P.E. Telephone No.: 702-248-8000

Firm: Martin & Martin, Inc., Civil Engineers
Address: 1909 South Jones Boulevard, Suite B, Las Vegas, Nevada 89102

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

- Total Owned Land Area: At Site: 10.9± Acres Being Developed / Disturbed: 5± Acres
- Is a portion or all of the subject property located in a designated F.E.M.A. 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.)? Ambulatory Care Building (Medical Office Building)
- Approximate upstream land area which drains to the subject site?
- Has the site drainage been evaluated in the past? ☒ YES NO If yes, please identify documentation: Templeton Office/Retail Complex, Martin & Martin, Inc. - 1995; Sunrise Mountain View Hospital and Office Building; By G. C. Wallace Engineering, 1994
- If known, please briefly identify the proposed discharge point(s) of runoff from the site: NE Corner of site (CP2 in Figure 8, Appendix A)
- Briefly describe your proposed schedule for the subject project: ASAP



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.

Revision / Date

Local Entity File No.

REFERENCE:

STANDARD FORM 1

2.0 HYDROLOGY

2.1 METHODOLOGY

The Kinematic Wave method within the U.S. Army Corps of Engineers HEC-1, Flood Hydrograph Package computer model (Ref. 1) was used to evaluate the existing and developed conditions. Peak discharges were computed for the 10- and 100-year, 6-hour storm duration events for each scenario. The Kinematic Wave Method in the HEC-1 Model and the 6-hour storm duration are consistent with the Methodology recommended by the "*Clark County Master Flood Control District Hydrologic Criteria and Drainage Design Manual*" (Ref. 5). A complete discussion of the Methodology used in the Hydrological Analysis can be found in the U.S. Army Corps of Engineers HEC-1 users Manual.

2.2 PRECIPITATION

The project site is located within the McCarran Airport Rainfall Area where the precipitation values have been pre-determined. The precipitation depths used to determine the 10- and 100-year, 6-hour event discharges were obtained from the *Clark County Regional Flood Control District Design Manual*, Figure 505. The depth-area-reduction factor was not utilized, since the total analyzed watershed area was 0.017 square miles. The 6-hour precipitation depth used for the HEC-1 analysis were 1.58 inches for the 10-year storm event and 2.77 inches for the 100-year storm event.

2.3 SOILS GROUP

Curve numbers for the on-site and off-site drainage basins have been estimated using procedures and data documented in the *Soil Conservation Services (SCS) Technical Release 55* (Ref. 4) and the *Clark County Regional Flood Control District Drainage Design Manual's* Table 602 (Ref. 5). The computed curve numbers were based on soil types, present and future land uses and the assumed antecedent soils moisture condition (AMC II) for this region. The SCS Curve Number Method is the abstraction method used in the HEC-1 Model.

Soil types for the on-site basins have been mapped to be within the Hydrologic Soils Group "B" (Refer to Figure H-10). The composite curve number determination shown on the following page, was developed to reflect the areas that will be landscaped (pervious) and areas covered by asphalt, concrete and building (impervious).

COMPOSITE CURVE NUMBER DETERMINATION							
BASIN	TOTAL AREA (ft ²)	IMP AREA (ft ²)	CN	%	PREV AREA (ft ²)	CN TYPE C	WEIGHTED CN
ON1	142326	0	98	0.0	142326	86	86.0
ON2	123120	0	98	0.0	123120	86	86.0
ON3	55800	28346	98	50.8	27454	77	87.7
ON4	115605	72947	98	63.1	42658	77	90.3
RD1	22950	22950	98	100.0			98.0
RF1	21690	21690	98	100.0			98.0

2.4 RESULTS

The HEC-1 computer model was used to compute the peak 10- and 100-year, 6-hour runoff rates for the existing and developed on-site conditions. A summary of the HEC-1 analysis for the existing conditions is shown in Table 1.

TABLE 1 Existing Conditions			
Basin ID	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)	Remarks
ONEX1	5	18	Flows off east side of site

The following Table 2, is a summary of the peak discharges determined for the developed condition. Complete HEC-1 output for the existing and developed on-site conditions are located in Appendix B.

TABLE 2 Proposed Conditions			
Basin ID	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)	Remarks
ON 2	1	5	
ON 1	1	5	
RD 1	1	2	
ON 4	2	6	
CP 2	5	17	Combined flow off NE corner of site from basins ON2, ON1, RD1 and ON4
RF 1	1	2	Flows through ON3 to CP1
ON 3	1	3	
CP 1	1	3	Combined flow off East side of site from ON3 & RF1

A comparison between the existing and developed conditions indicates there is a net increase of 2 cfs for the 10- and 100-year, 6-hour storm events.

Refer to the referenced study in Appendix C for off-site Hydrologic Analysis.

3.0 HYDRAULICS

3.1 Methodology

Mannings Equation was used to determine flow depths at four critical on-site locations, and one off-site location. The Cross Section locations are found in Figure 8 in Appendix A.

3.2 Results

The referenced studies determined that 121 cfs would be conveyed along Tenaya Way at Point 2 (see Appendix A, Figure 4). The depth of flow was calculated at Section C-C along Tenaya Way (see Figure 5, Appendix A). The results of these calculations were utilized in order to set the high point at the entrance of the site, allowing 6-inches of freeboard, and containing the Tenaya flows within the roadway. Table 3 summarizes these results.

TABLE 3 Tenaya Way - Section C-C					
Section	Q ₁₀₀ (cfs)	D (ft)	V (fps)	DV	WSE
C-C	121	1.07	3.44	3.68	35.9

The calculations for the depths of flow at on-site Section A-A and Section B-B are supplied in Figure 6 and Figure 7, Appendix A. At Section A-A, it was assumed that all flow from Basins ON1 and RD1 were conveyed through this location.

At Section B-B, a conservative assumption that all flows from Basin ON3 conveyed through this location was employed.

A 100-year flow of 3 cfs will be discharged from the south east side of the site at control point CP1 (see Figure 8, Appendix A) via a 2 foot U-gutter. A protective rock rip-rap pad will be constructed at the discharge location (see enclosed grading plans).

A 100-year flow of 17 cfs will be discharge from the northeast corner of the site a control point CP2 (see Figure 8, Appendix A). Low flows will be conveyed via a 2 foot U-gutter, while protection will be provided for the major storm event by the construction of a rock rip-rap pad as shown in the enclosed grading plans.

A depth of flow calculations for discharge points CP1 and CP2 are supplied in Figure 9 and Figure 10 in Appendix A.

Table 4 summarizes the results from these calculations.

Section ID	Q ₁₀₀ (cfs)	D (ft)	V (fps)	DV	WSE
A-A	11	.37	1.76	.65	25.47
B-B	4	.39	1.28	.50	25.65
CP1	3	.66	1.95	1.29	23.41
CP2	17	1.23	4.02	4.95	23.69

4.0 RECOMMENDATIONS

The following recommendations are provided to facilitate safety for both public and private.

1. The construction of the finished floor, as indicated on the grading plan.
2. Construction of the elevated entrance off of Tenaya Way.
3. Construction of Rock rip-rap pads as indicated on the grading plan.

5.0 CONCLUSIONS

This study quantified the 10- and 100-year existing and proposed on-site conditions. Off-site analysis from previously approved referenced studies were utilized for this analysis.

Based upon the analysis presented in this study, the development of the school of medicine does not adversely impact any proposed or existing Master Plan Facilities outlined in the *Clark County Regional Flood Control District 1991 Master Plan Update*.

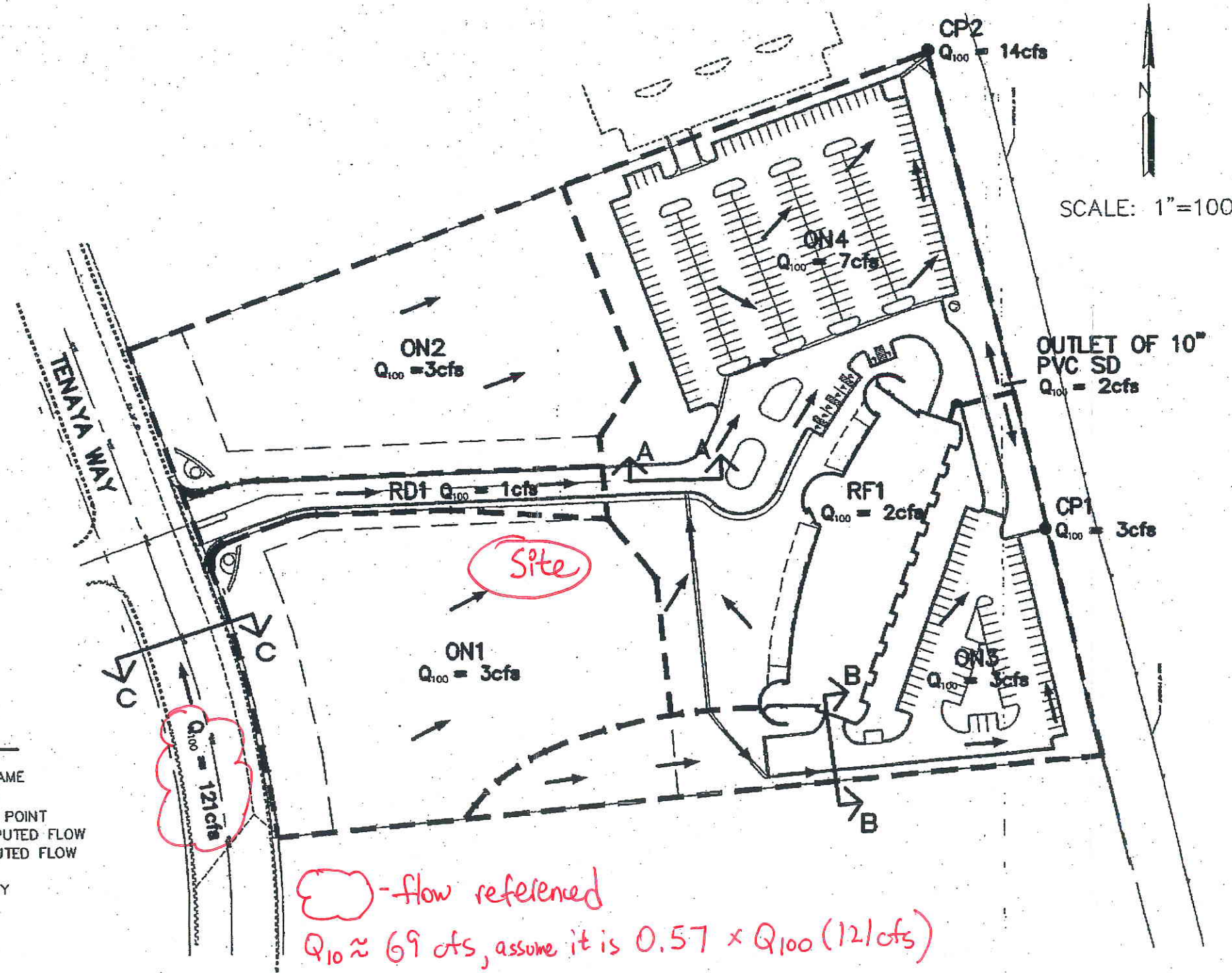
In conclusion, the results of this study indicate that if construction is in accordance with the recommendations of this study, the on-site development should be adequately protected from the computed 100-year flow, should not negatively impact surrounding and downstream properties, and should adequately contain Tenaya Way flows within the roadway.

6.0 REFERENCES

1. U.S. Army Corps of Engineers, HEC-1 Flood Hydrograph Package September, 1981, revised March, 1987.
2. James M. Montgomery, Consulting Engineers, Inc., Clark County Regional Flood Control District - Flood Control Master Plan, October, 1986.
3. U.S. Department of Commerce, NOAA, Atlas 2, "Precipitation - Frequency Atlas of the Western United States, Volume III, Nevada", 1973 (out of print).
4. U.S. Department of Agriculture, Soil Conservation Service, Technical Release 55, "Urban Hydrology for Small Watersheds", Washington, D.C., Second Edition, June, 1986.
5. Clark County Regional Flood Control District, "Hydrology Criteria & Drainage Design Manual", October, 1990.
6. Clark County Regional Flood Control District, "Master Plan Update of the Las Vegas Valley", August, 1991.
7. Martin & Martin, Inc. "Drainage Study for Templeton Office / Retail Complex", August, 1995.
8. Martin & Martin, Inc., "Brookhollow Business Park - Phase III", December 22, 1994.
9. G. C. Wallace, Inc., "Drainage Study for Sunrise Mountain View Hospital and Office Building", revised October, 1994.
10. Martin & Martin, Inc., "Drainage Study for Hampton Inn", June 1996.

f:\1574.00\drainage\report

- LEGEND**
- ON1 HEC-1 BASIN NAME
 - FLOW DIRECTION
 - CP1 CONCENTRATION POINT
 - Q₁₀₀ 100-YEAR COMPUTED FLOW
 - Q₁₀ 10-YEAR COMPUTED FLOW
 - HP 10-YEAR COMPUTED FLOW
 - BASIN BOUNDARY



SCALE: 1"=100'

MARTIN & MARTIN
CIVIL ENGINEERS
1000 S. JONES BLVD.
SUITE 100
LAS VEGAS, NEVADA 89102
PHONE (702) 388-9000

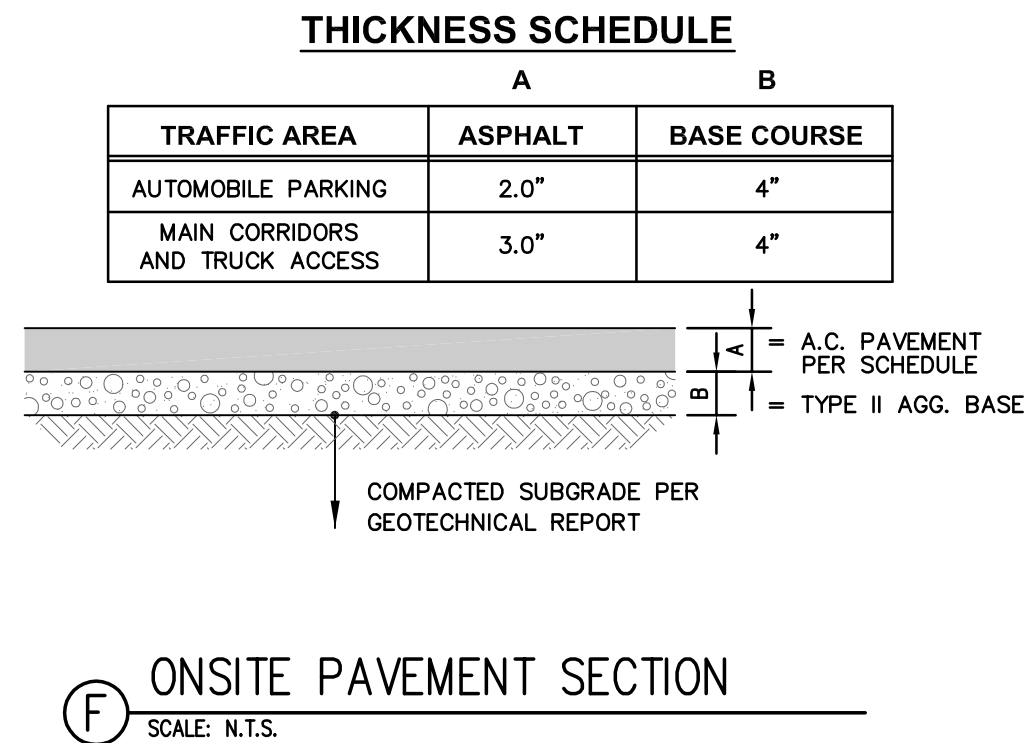
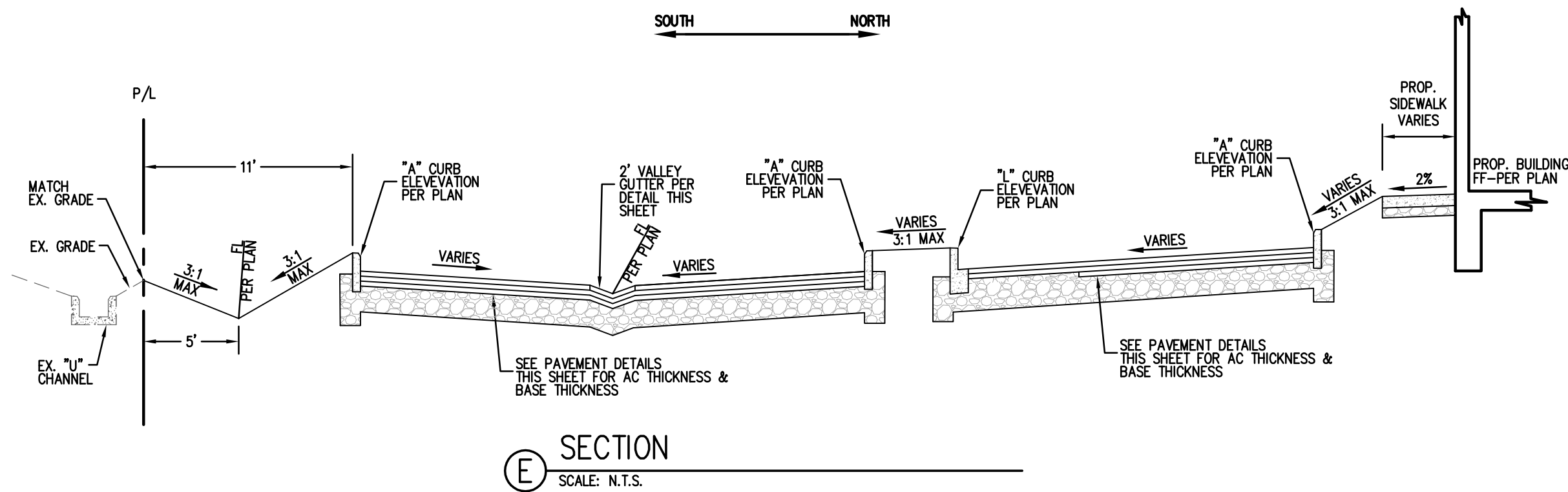
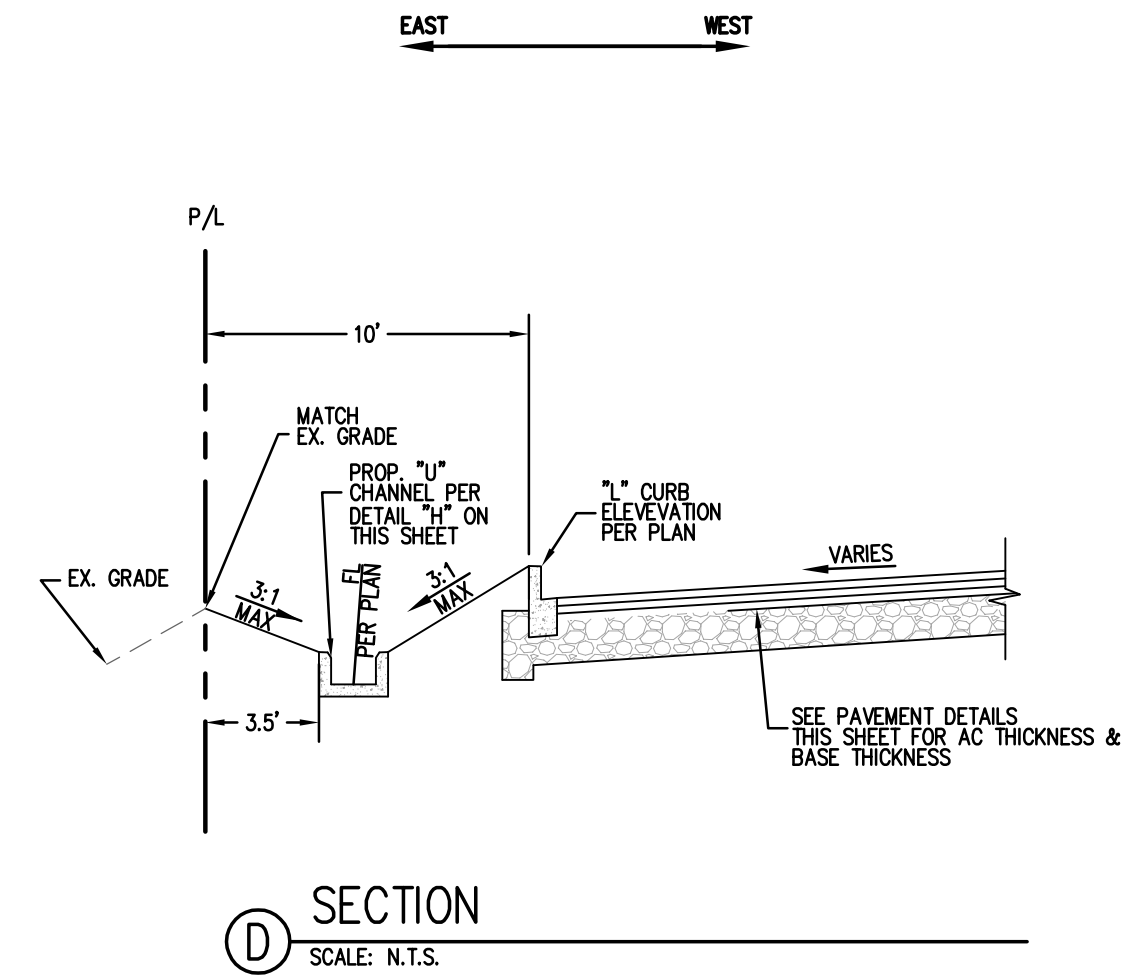
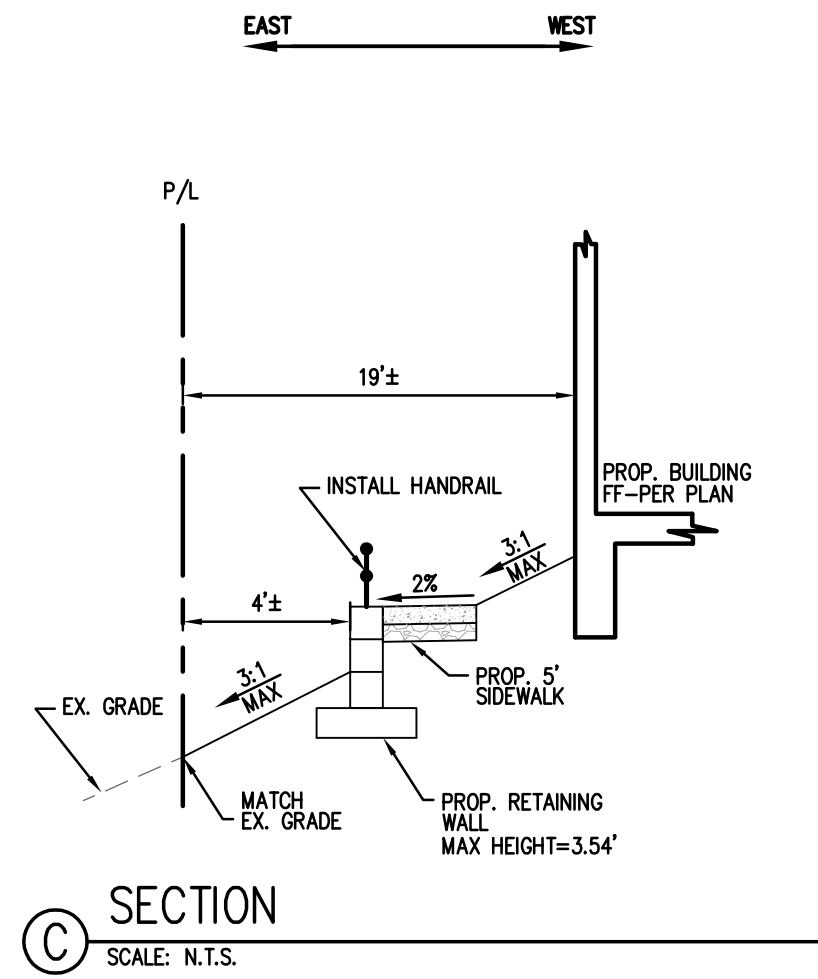
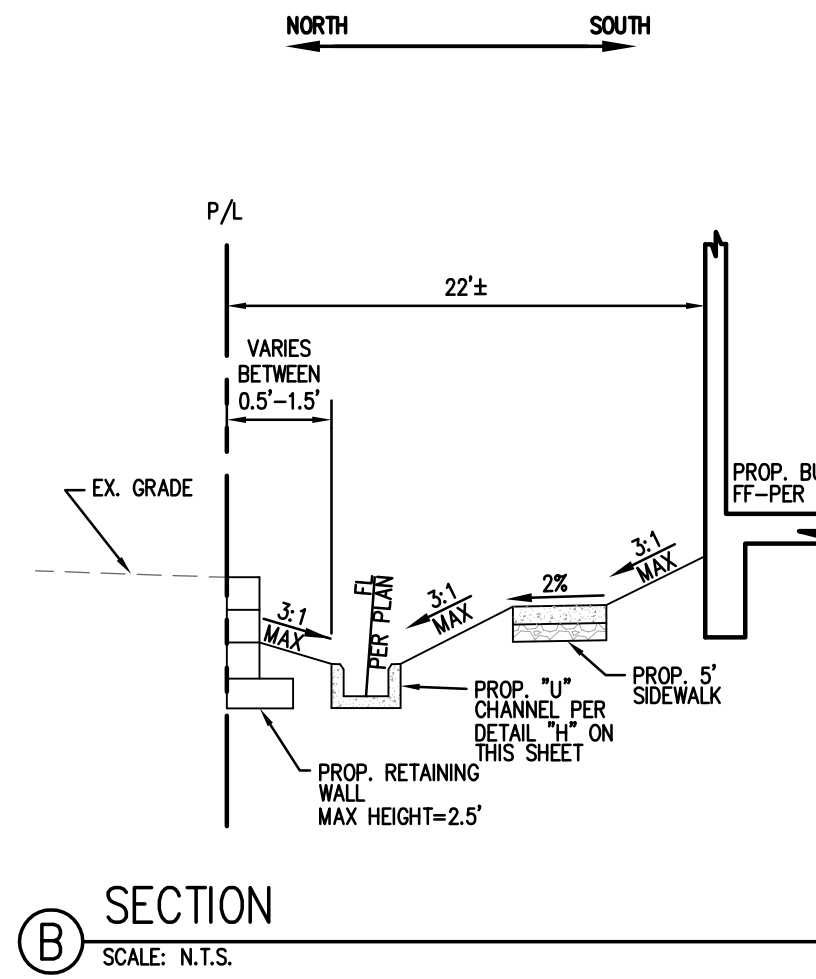
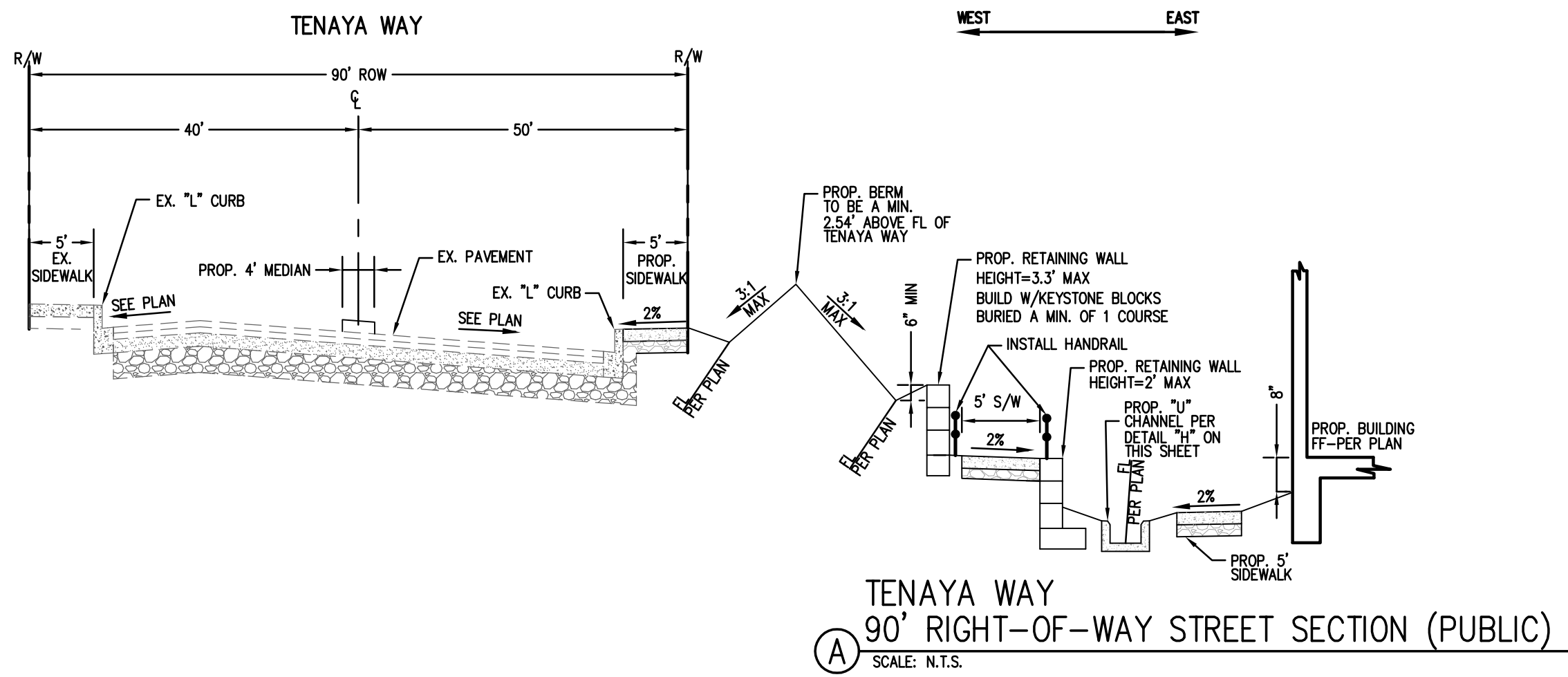


REVISED
DRAINAGE MAP
FIGURE 8

UNIVERSITY OF NEVADA
SCHOOL OF MEDICINE

APPENDIX F – PROJECT GRADING PLANS

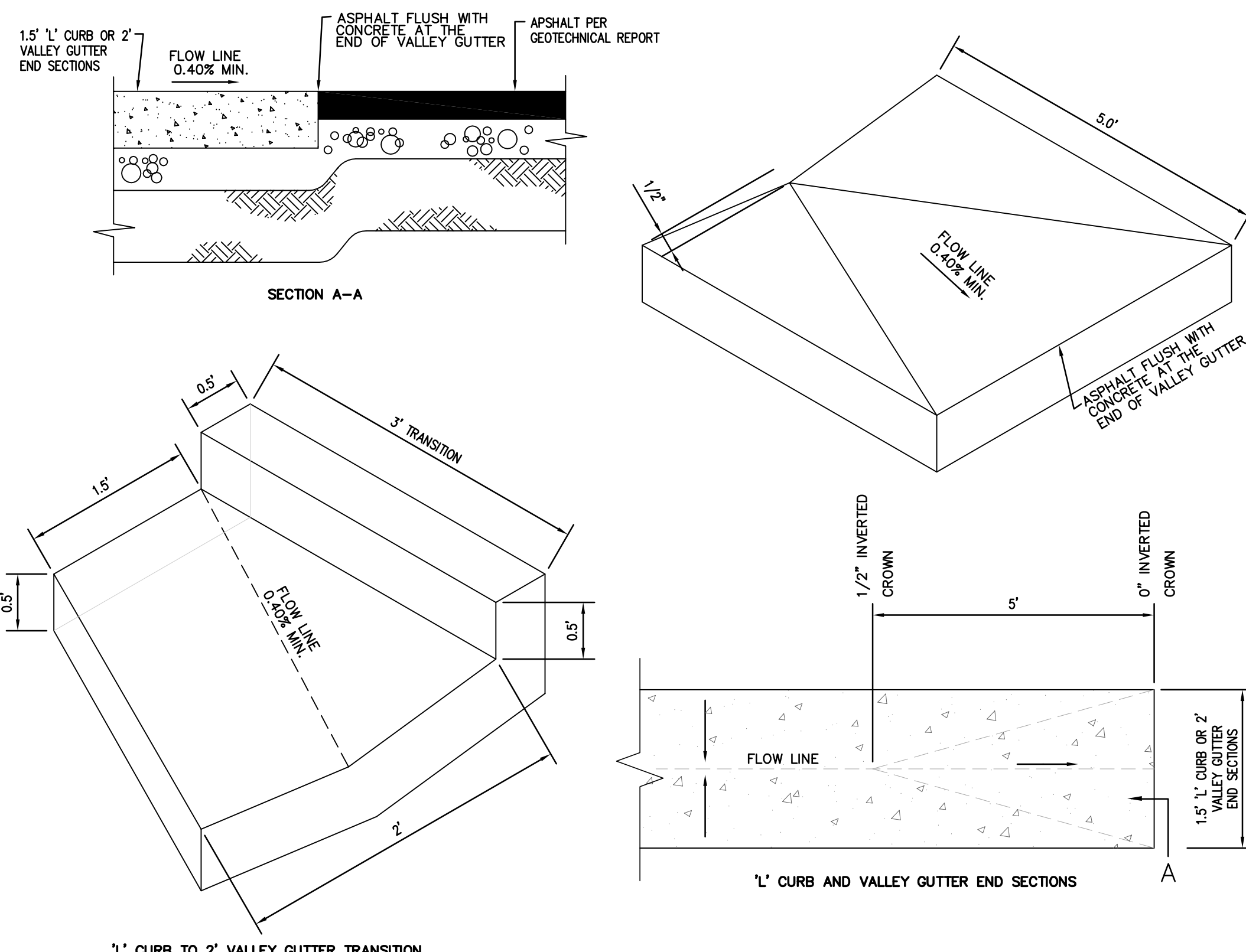
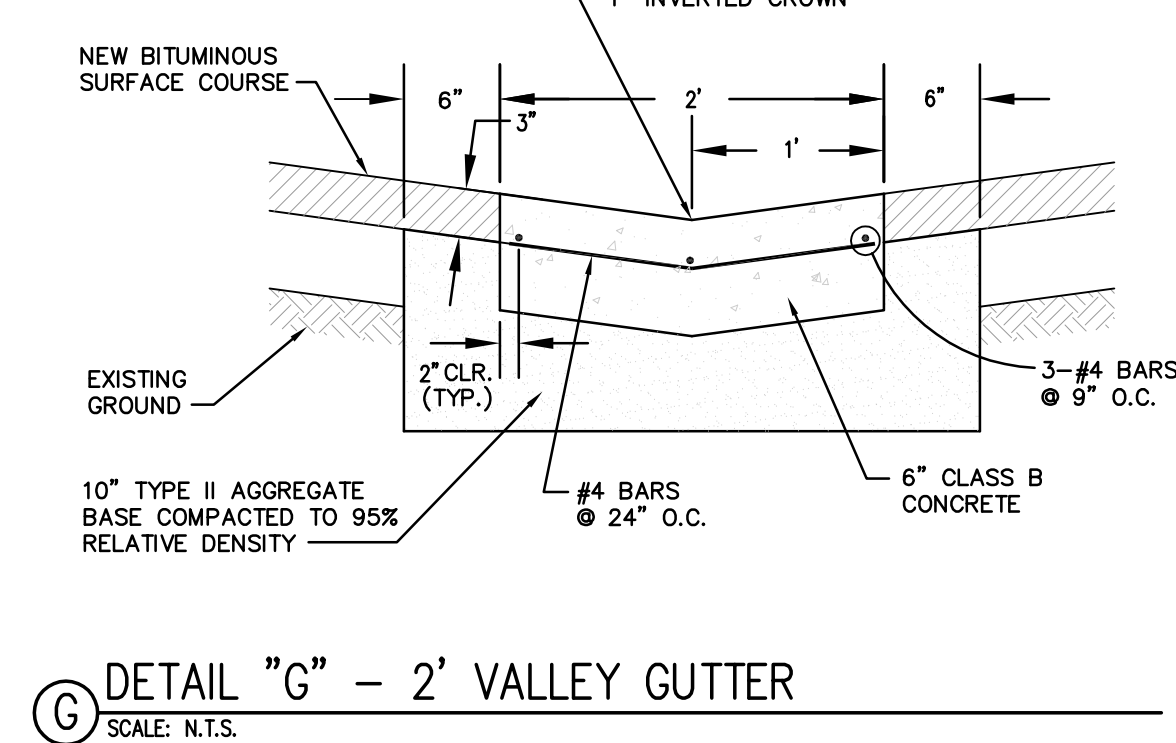
Z:\projects\2012\12-1005\dwg\12-1005-ds.dwg ZONE ENGINEERING W51 Wed, 25 Jul 2012 - 3:22pm



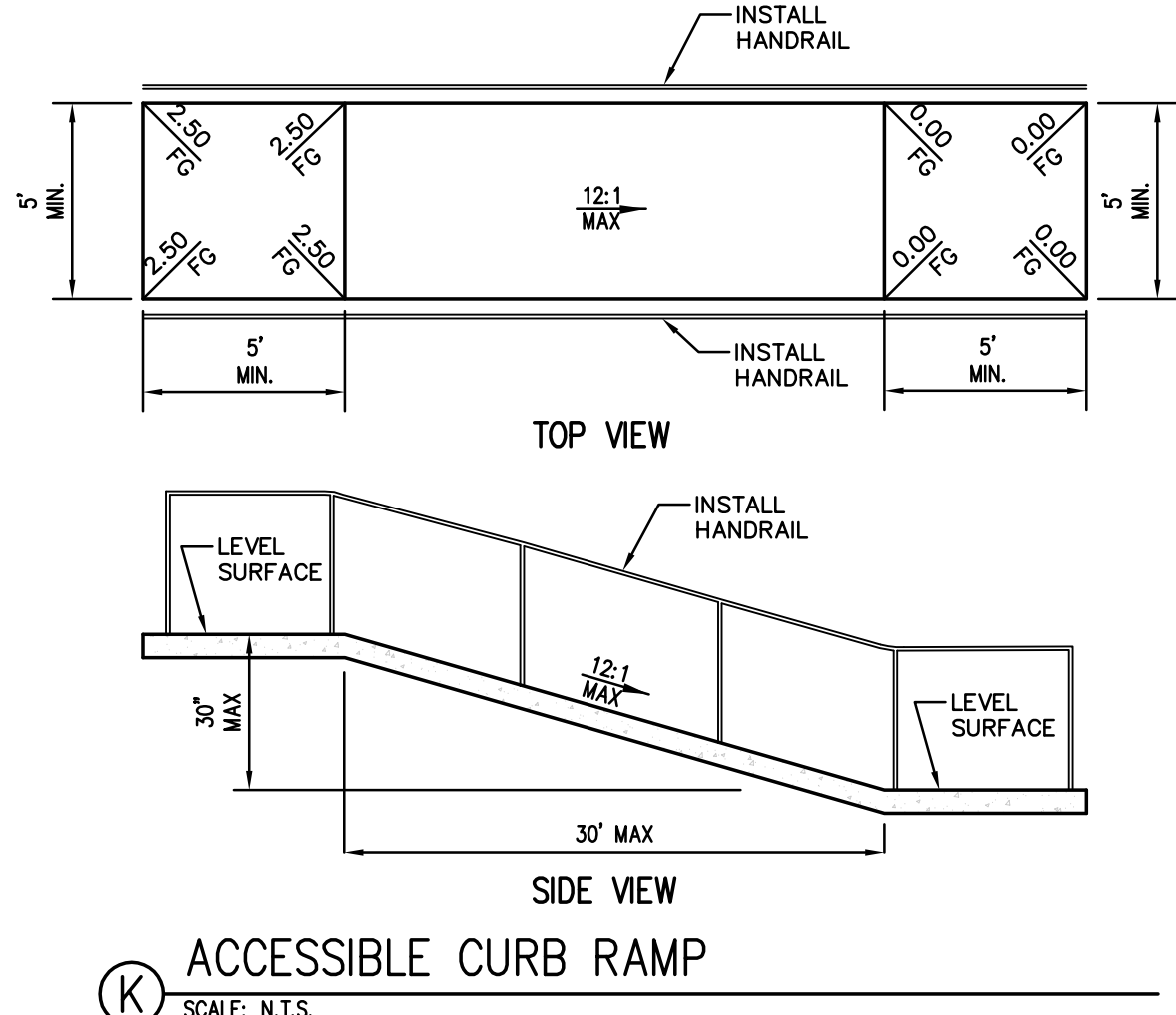
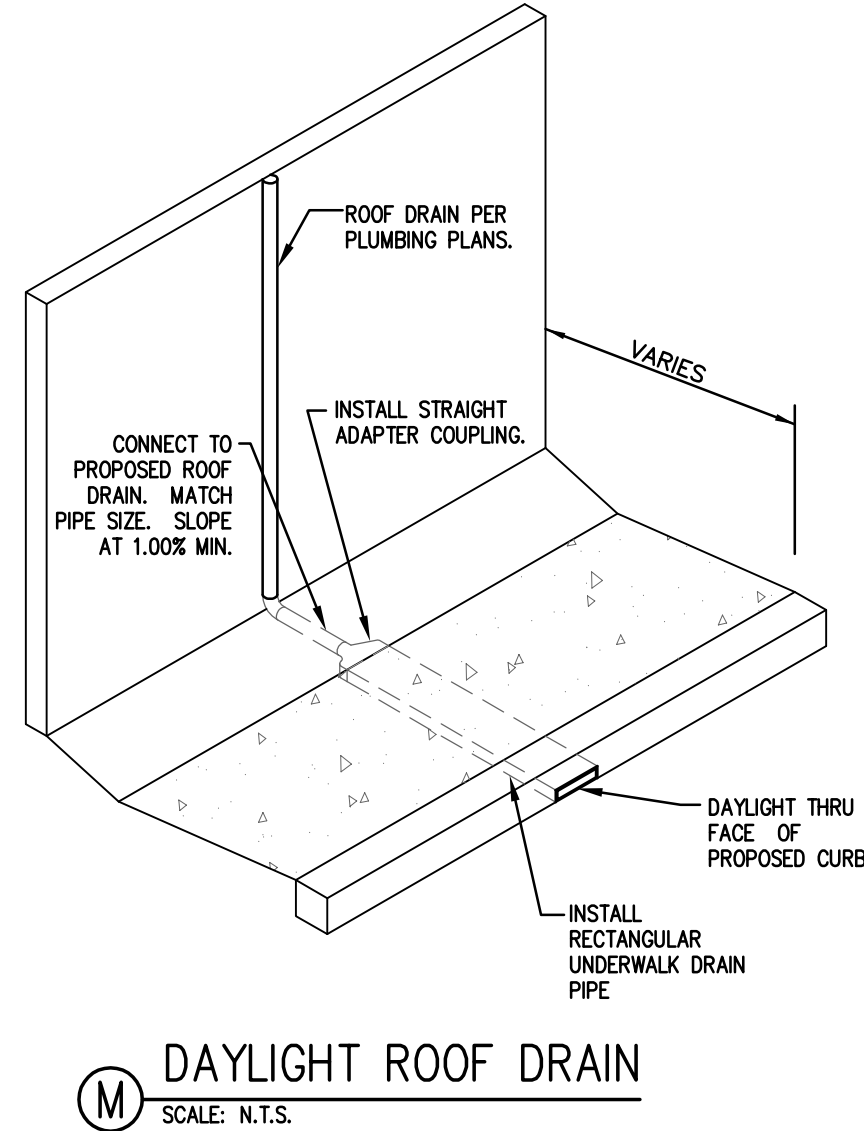
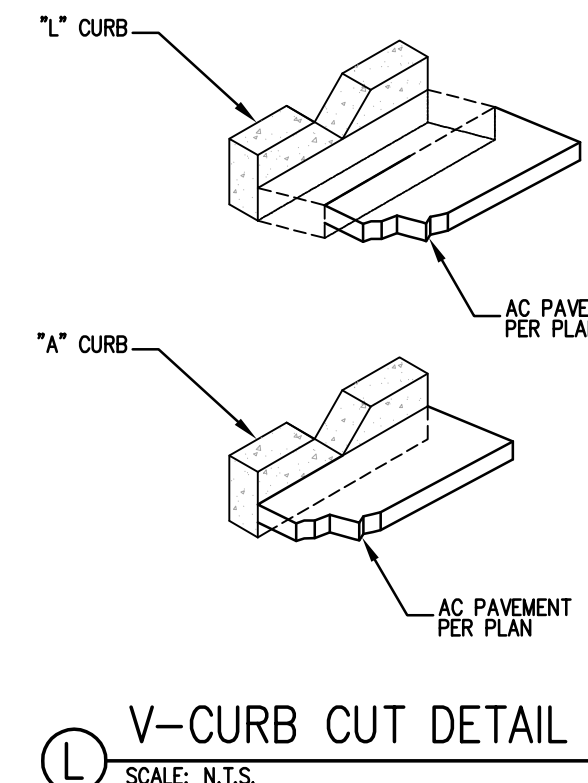
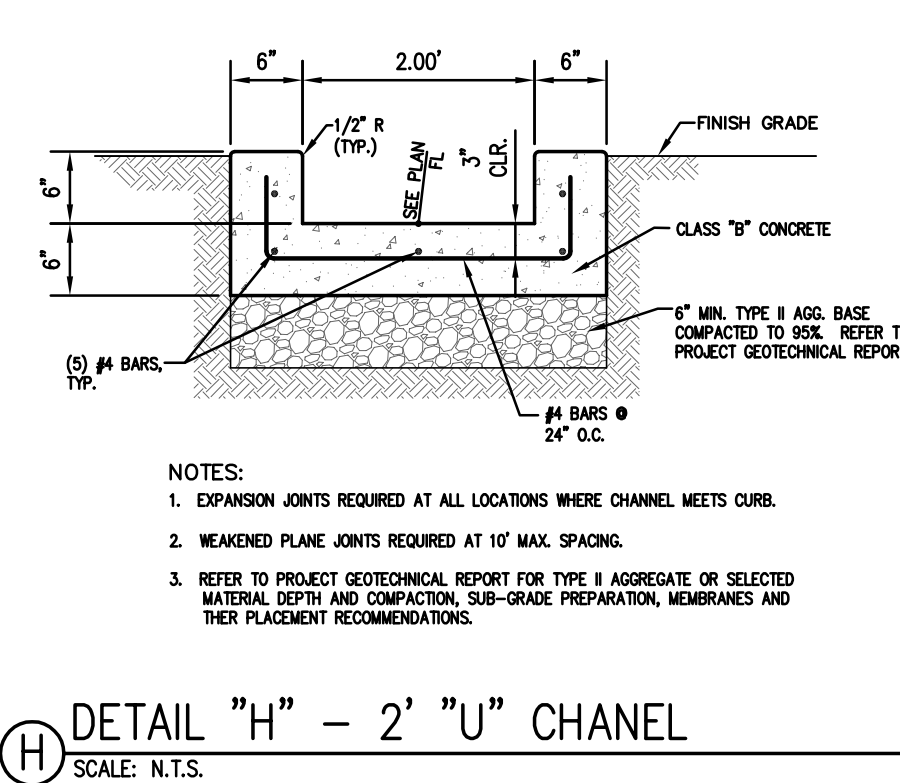
SOILS REPORT NOTE

ALL WORK SHALL CONFORM TO THE GEOTECHNICAL REPORT PREPARED BY:
NOVA ENGINEERING & INSPECTION SERVICES
4480 West Hacienda Ave
Suite 104
Las Vegas, NV 89118
OFFICE: 702.873.3478

PROJECT No. E-12-039
DATED: MAY 11, 2012



J 1.5' CURB AND 2' VALLEY GUTTER TRANSITION
SCALE: N.T.S.



4550 W. OAKY BLVD., SUITE 102
LAS VEGAS, NEVADA 89102
PHONE: 702.877.3005
FAX: 702.877.3007
WWW.ZONEENGINEERING.COM

Zone ENGINEERING
CIVIL ENGINEERING & LAND PLANNING

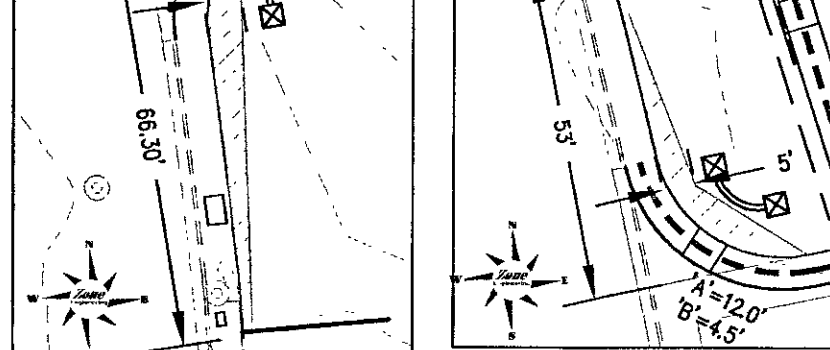
DETAIL SHEET

ADVANCED HEALTH CARE OF LAS VEGAS II
CITY OF LAS VEGAS, NV

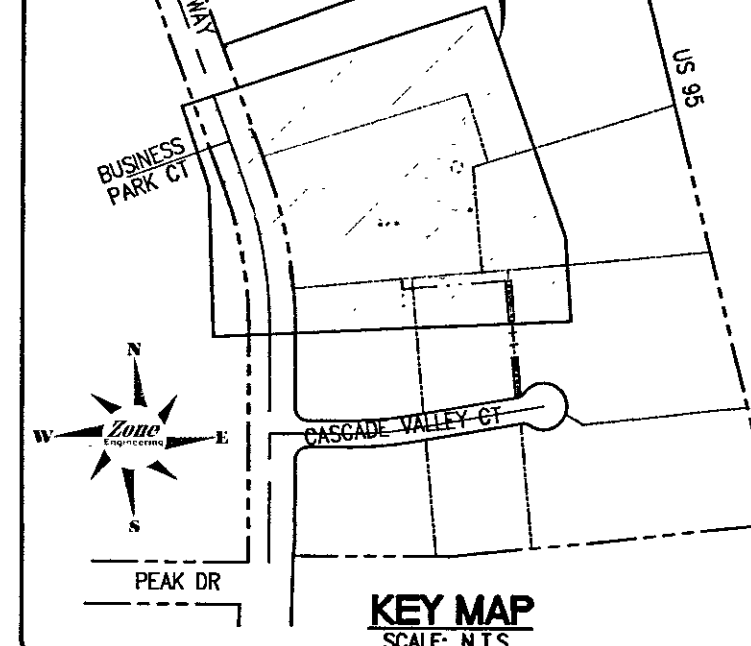
SHEET
DATE: 7-25-12
DESIGNED BY: AK
CHECKED BY: CS
PROJECT NO: 12-1005

TITLE
DATE: 7-25-12
PROJECT NO: 12-1005

SHEET No.
4 of **8**



DETAIL 'B'
SCALE 1"=30'



CONSTRUCTION NOTES

1. CONSTRUCT TRASH ENCLOSURE PER ARCHITECTURAL PLANS
2. CONSTRUCT TYPE "L" CURB PER C.C.A.U.S.D. #216
3. CONSTRUCT TYPE "A" CURB PER C.C.A.U.S.D. #219
4. CONSTRUCT SIDEWALK PER C.C.A.U.S.D. #234
5. CONSTRUCT 2" VALLEY GUTTER PER DETAIL "G" ON SHEET 4
6. CONSTRUCT HANDICAP RAMP PER C.C.A.U.S.D. #235 CASE 1
7. CONSTRUCT "U" CHANNEL PER DETAIL H ON SHEET 4
8. CONSTRUCT DRIVEWAY PER C.C.A.U.S.D. #226.2
9. INSTALL PRECAST VEHICLE BUMPER BLOCK PER C.C.A.U.S.D. #238
10. CONSTRUCT HANDICAP RAMP PER DETAIL "K" ON SHEET 4
11. INSTALL RIPRAP D50=6", THICKNESS=12"
12. CONSTRUCT CURB OPENING PER DETAIL "L" ON SHEET 4
13. CONSTRUCT PAVEMENT PER DETAIL F ON 4
14. TIE INTO EXISTING IMPROVEMENTS
15. CONSTRUCT TACK ON CURB PER C.C.A.U.S.D. #220
16. CONSTRUCT END SECTION/TRANSITION PER DETAIL J ON SHEET 4
17. CONSTRUCT RETAINING WALL
18. DAYLIGHT ROOF DRAIN PER DETAIL "M" ON SHEET 4
19. CONSTRUCT SIDEWALK UNDERDRAIN
20. INSTALL BIKE RACK, REFER TO ARCH. PLANS

LEGEND

CENTER LINE & STATION	10+00	FINISHED GRADE	FG
RIGHT-OF-WAY		GRADE BREAK	GB
PARCEL LINE		FLOW LINE	FL
EXISTING WATER MAIN	EX 8" W	HIGH POINT	HP
EXISTING GAS MAIN	EX GAS	TOP OF CURB	TC
EXISTING SEWER MAIN	EX 8" SS	TOP OF ROLL CURB	TRC
EXISTING STORM DRAIN	EX 36" SD	TOP OF RETAINING WALL	TRW
BACK OF CURB		TOP OF BERM	TB
FACE OF CURB		ADA ACCESS ROUTE	
LIP OF GUTTER		PROPOSED PAD ELEVATION	(21.1)
SIDEWALK		DRAINAGE EASEMENT	
DRAINAGE SWALE & DIRECTION		RETAINING WALL	
SCARP W/DIRECTION		SCREEN WALL	
EXISTING CONTOURS & ELEVATION		GRADE BREAK/A.C. FLOW LINE	
PROPOSED CONTOURS & ELEVATION		SAWCUT LINE	
SIGHT VISIBILITY ZONE		NEW AC PAVEMENT	
NO OBJECT ABOVE 24" IN SVZ		PROPOSED CONCRETE	

This grading plan is a
part of drainage study
#4563 which was received
on 7/26/12 and approved
8/9/12. Page 1

ADA ACCESS NOTE

ADA ACCESSIBLE ENTRANCE/EXIT

FLOODPLAIN INFORMATION

THE SUBJECT SITE IS LOCATED WITHIN FEMA ZONE X AS SHOWN ON THE FLOOD INSURANCE RATE MAP COMMUNITY PANEL NUMBER 2155, EFFECTIVE NOV. 16, 2011. ZONE X IS DEFINED BY FEMA AS BEING OUTSIDE THE 100 YEAR FLOODPLAIN.

NOTE

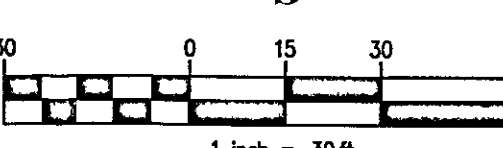
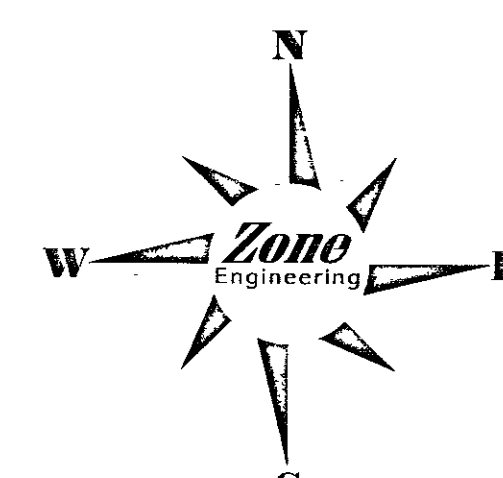
OWNER RESPONSIBLE TO PROVIDE SURVEY MONUMENTATION AS SHOWN AND TO REPLACE ALL SURVEY MONUMENTATION DAMAGED, DISTURBED, DESTROYED, OR OBLISCURED DURING CONSTRUCTION.

NOTE

ZONE ENGINEERING INC. ASSUMES NO RESPONSIBILITY FOR EXISTING UTILITY LOCATIONS & ELEVATIONS. THE UTILITIES SHOWN ON THIS DRAWING HAVE BEEN PLOTTED FROM THE BEST AVAILABLE INFORMATION. IT IS, HOWEVER, THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE LOCATION AND ELEVATION OF ALL UTILITIES PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION. CONTRACTOR TO FIELD VERIFY ALL EXISTING SITE CONDITIONS PRIOR TO CONSTRUCTION. IF A CONFLICT EXISTS BETWEEN WHAT IS SHOWN ON THESE DRAWINGS AND WHAT EXIST IN THE FIELD, THE CONTRACTOR IS TO NOTIFY THE ARCHITECT, OWNER'S REPRESENTATIVE, OR ENGINEER IMMEDIATELY.

I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY ON FILE WITH THE CITY OF LAS VEGAS.

CHI-YING SETO, P.E. DATE



SOILS REPORT NOTE

ALL WORK SHALL CONFORM TO THE GEOTECHNICAL REPORT PREPARED BY:
PROJECT No.: E-12-039
FIRM NAME: NOVA GEOTECHNICAL & INSPECTION SERVICES
DATED: MAY 11, 2012

TO CHEYENNE AVE

BUSINESS PARK CT (PUBLIC) 5700334' W

STA: 19+42.04
END 2' OPENING EVERY 10'

STA: 20+92.23
END 2' OPENING EVERY 10'

STA: 21+62.27
END 2' OPENING EVERY 10'

STA: 22+18.50
END 2' OPENING EVERY 10'

STA: 22+42.46
END 2' OPENING EVERY 10'

STA: 23+39.62
END 2' OPENING EVERY 10'

BASIS OF BEARING

SOUTH 19°56'26" EAST, BEING THE BEARING OF THE CENTERLINE OF TENAYA WAY AS SHOWN BY MAP THEREOF ON FILE IN BOOK 62, PAGE 44 OF PLATS IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

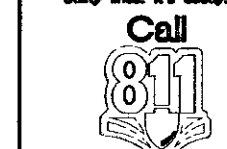
BENCHMARK

MONUMENT ID: 7LV001FC4
RIVET AND PLATE TOP CURB EAST SIDE TENAYA WAY 130 FEET NORTH OF PEAK DRIVE.

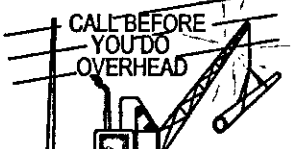
SECTION 15, TOWNSHIP 20 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA

NAVD 88 ELEVATION = 2338.63 METERS = 7728.1439

Call before you Dig



1-800-227-2600
1-702-655-7544



1-702-593-6111

TO PEAK DR

FF=33.45
APN 138-15-612-003
CITY PARKWAY V INC.

EX. BUILDING
7150 CASCADE VALLEY COURT
APN: 138-15-612-006
FIRE MESA PROPERTIES LLC

10.00' WIDE PRIVATE DRAINAGE EASEMENT
PER FILE 79, PAGE 31 OF SURVEYS
7100 CASCADE VALLEY COURT
APN: 138-15-612-008
N W H LTD

4550 W. OAKLEY BLVD., SUITE 102
LAS VEGAS, NEVADA 89102
PHONE: 702.877.3005
FAX: 702.877.3007

ZONE

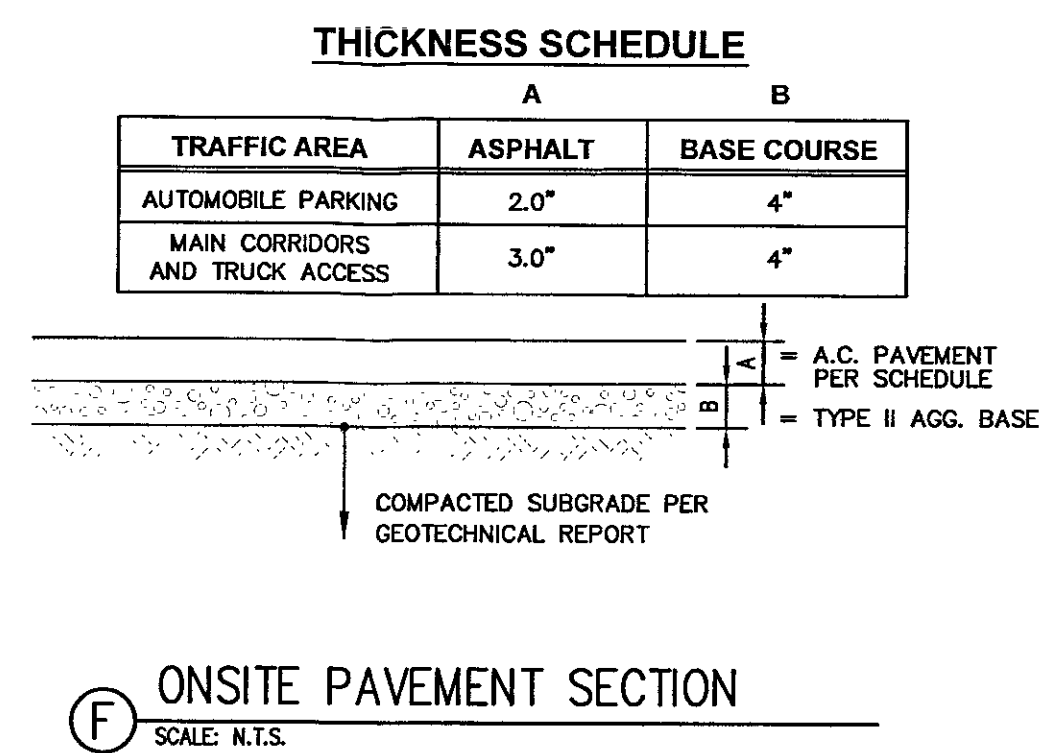
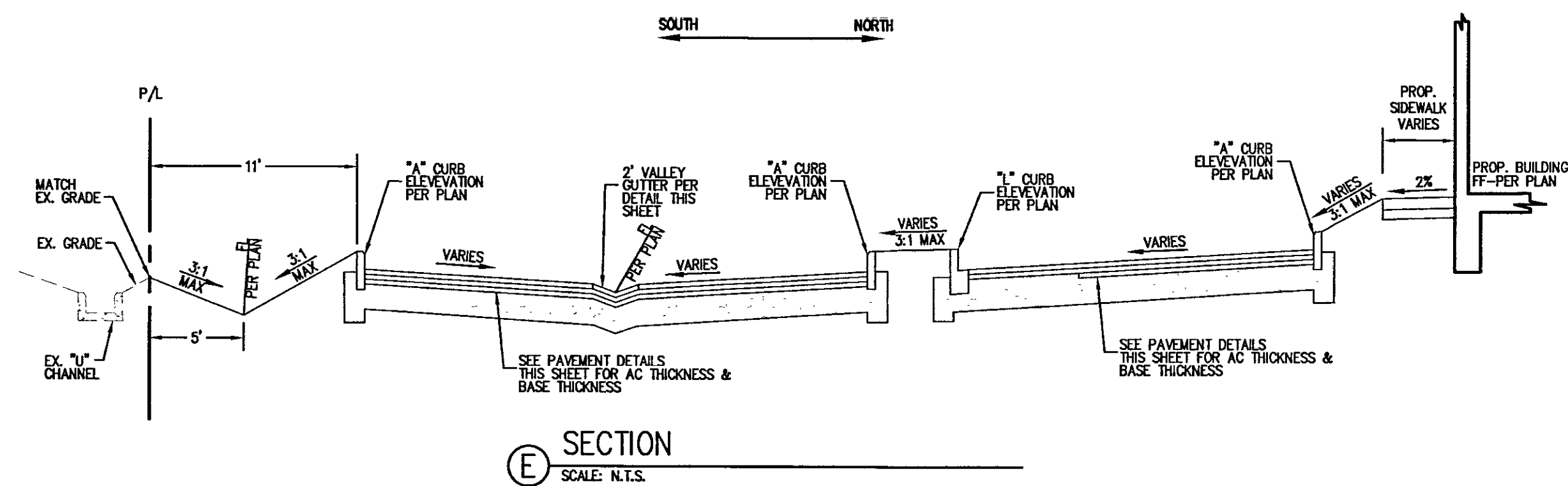
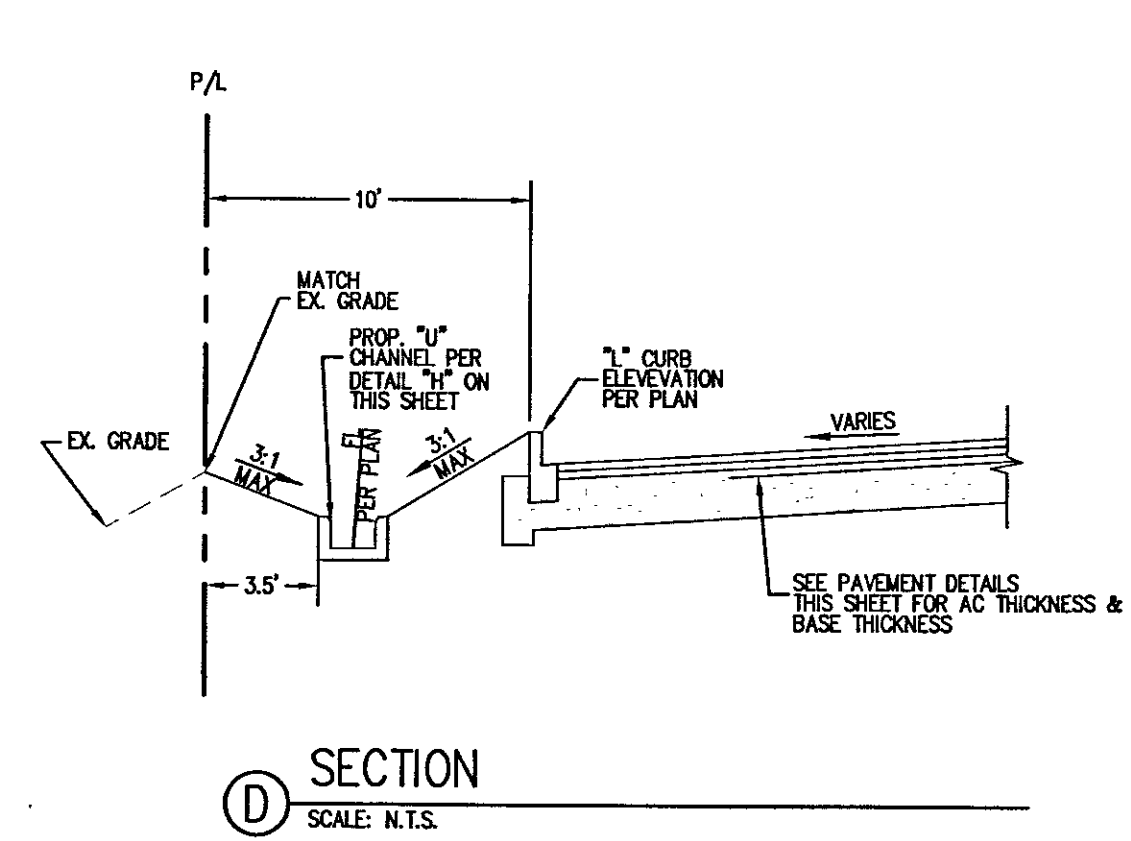
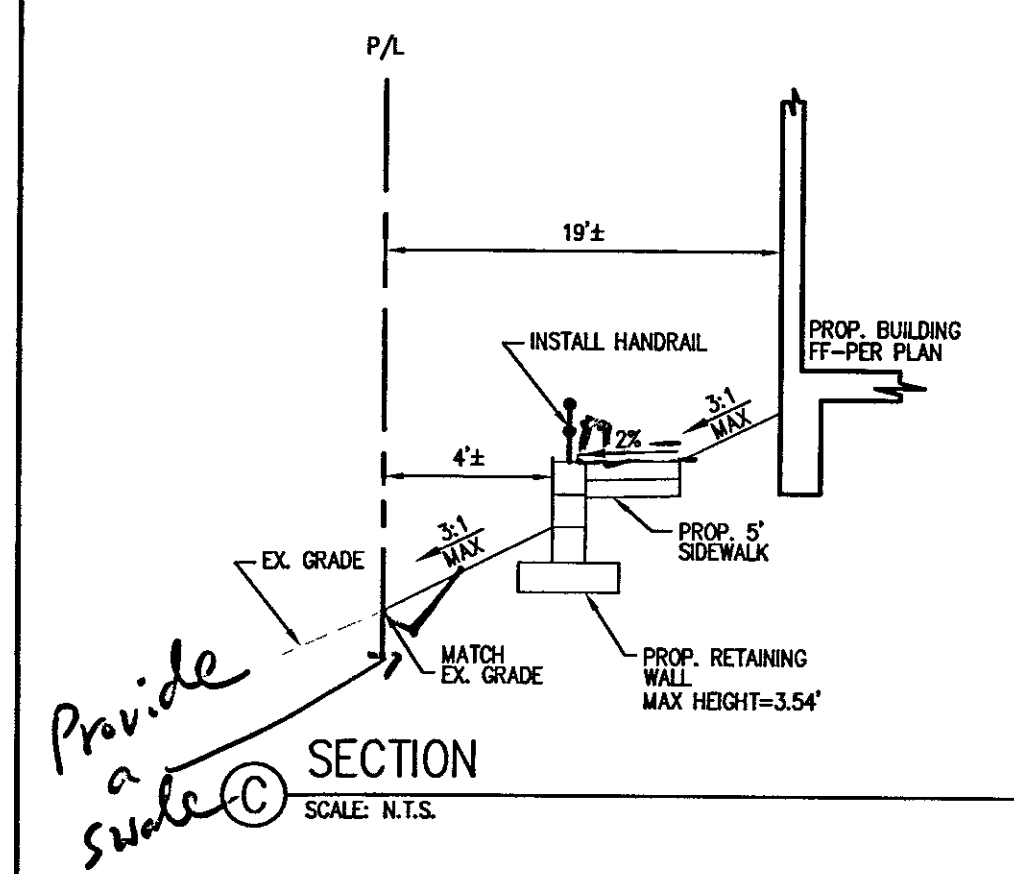
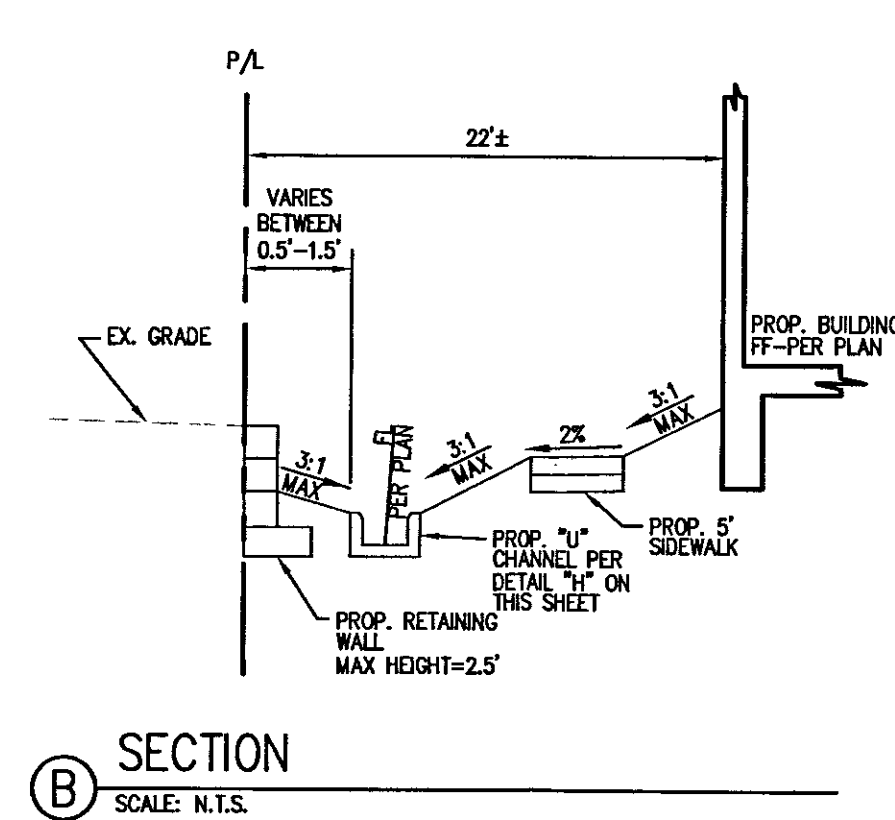
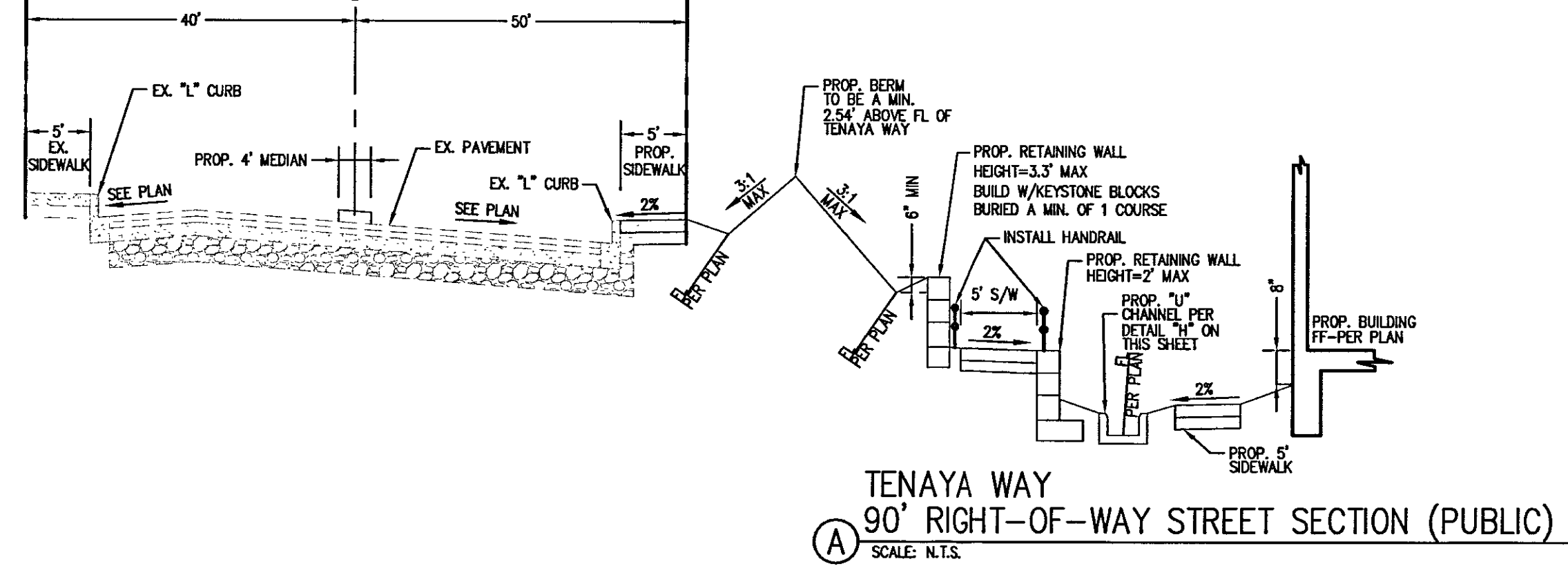
GRADING PLAN

ADVANCED HEALTH CARE OF LAS VEGAS II

DRAWN BY: DATE: 7-25-12
DESIGNED BY: DATE: 7-25-12
CHECKED BY: DATE: 7-25-12

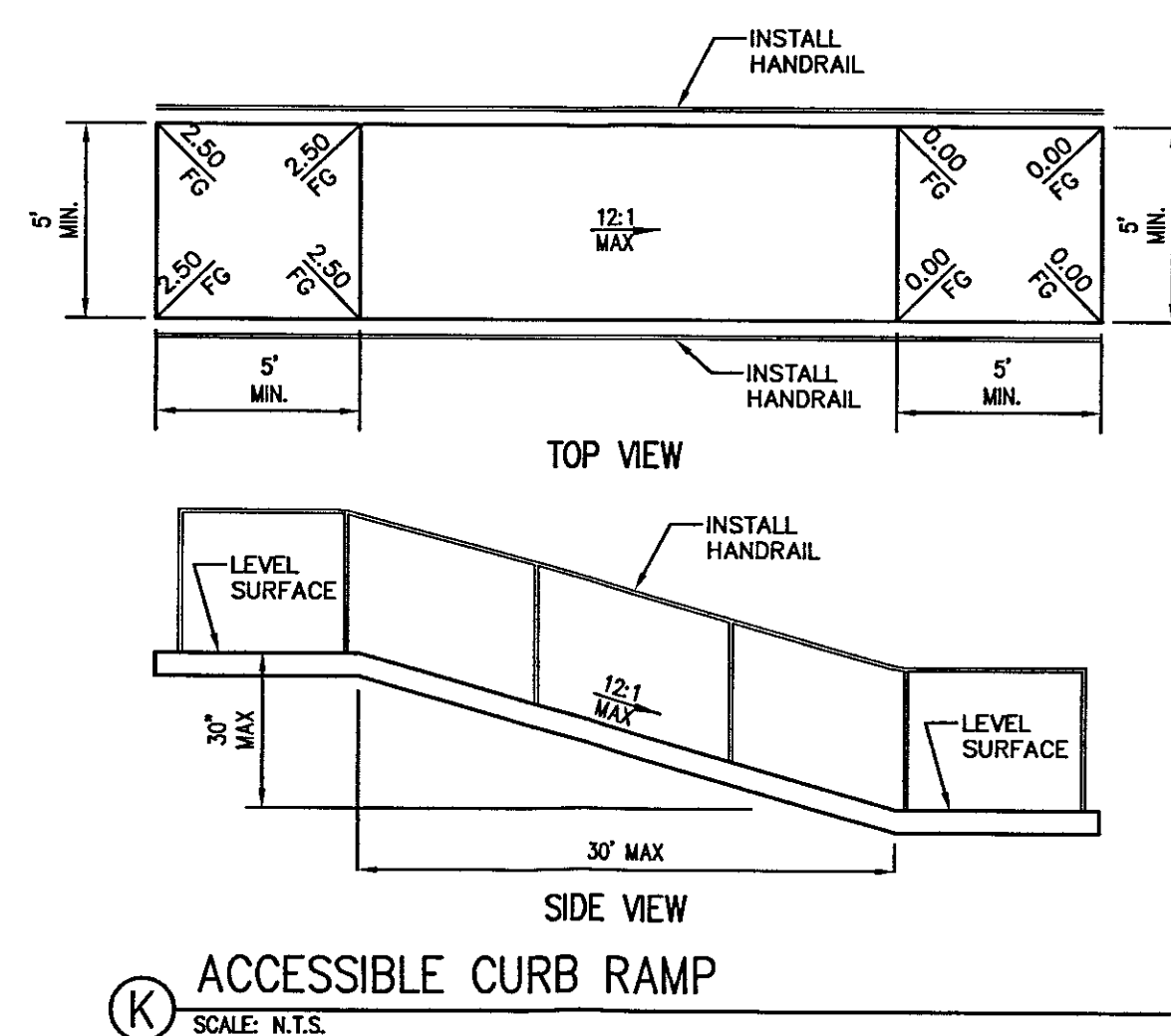
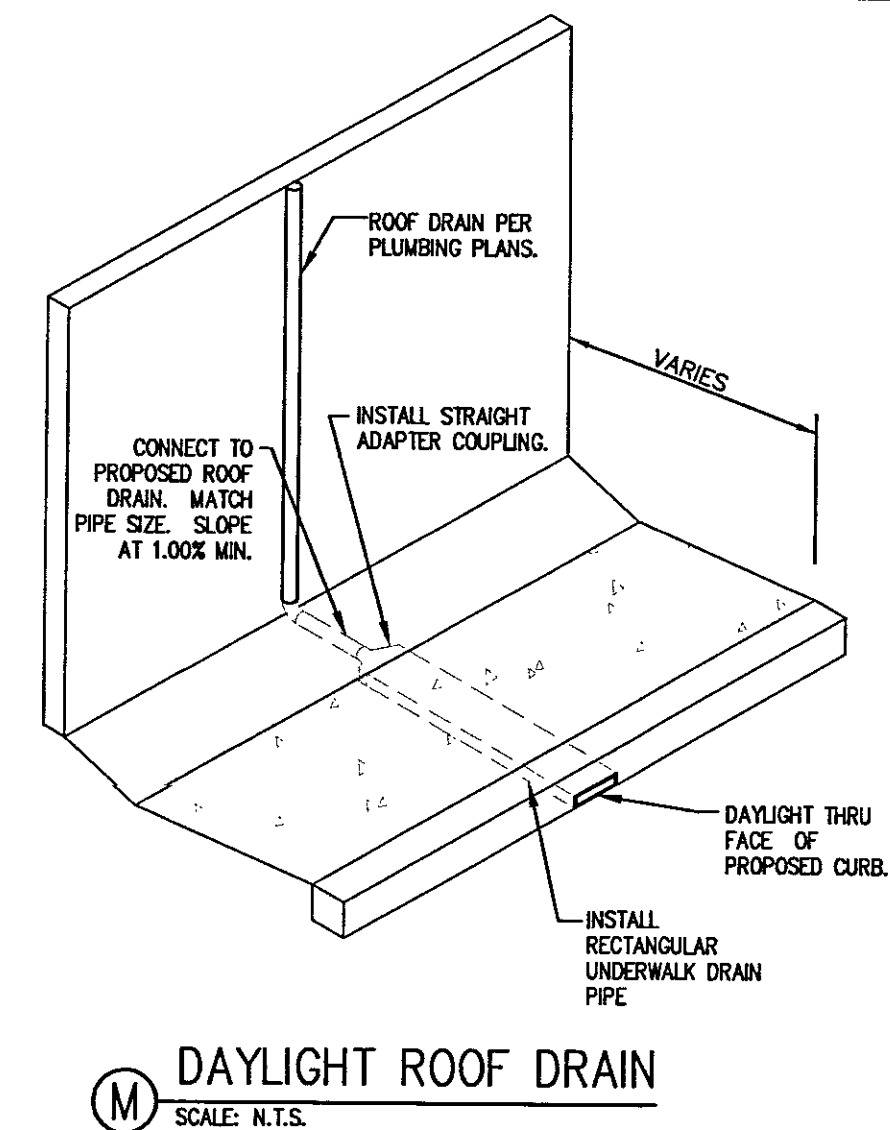
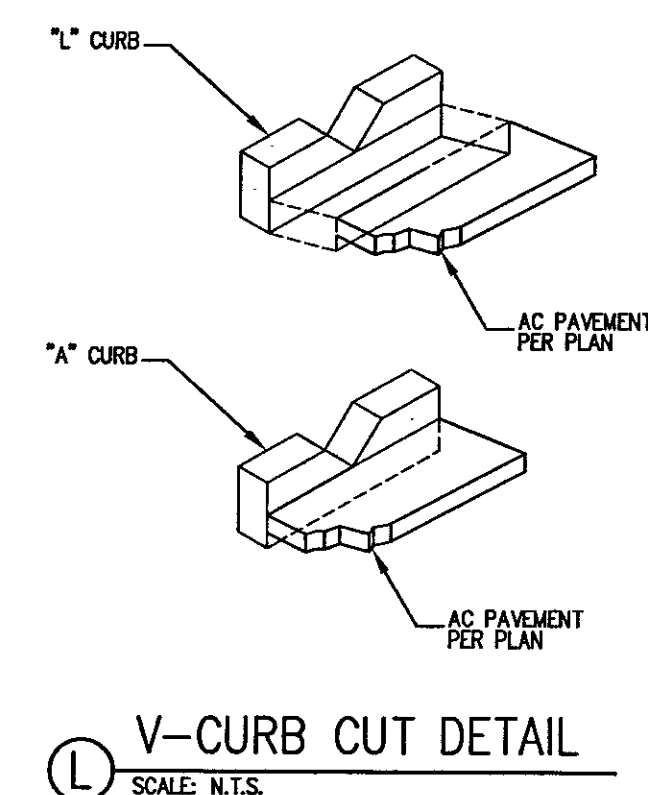
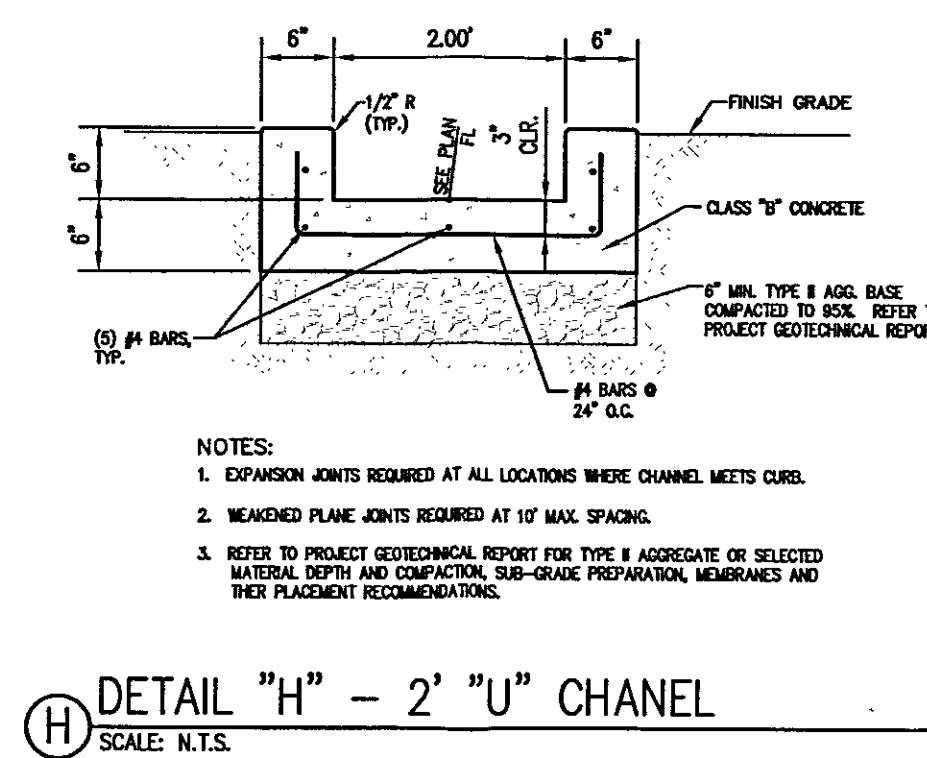
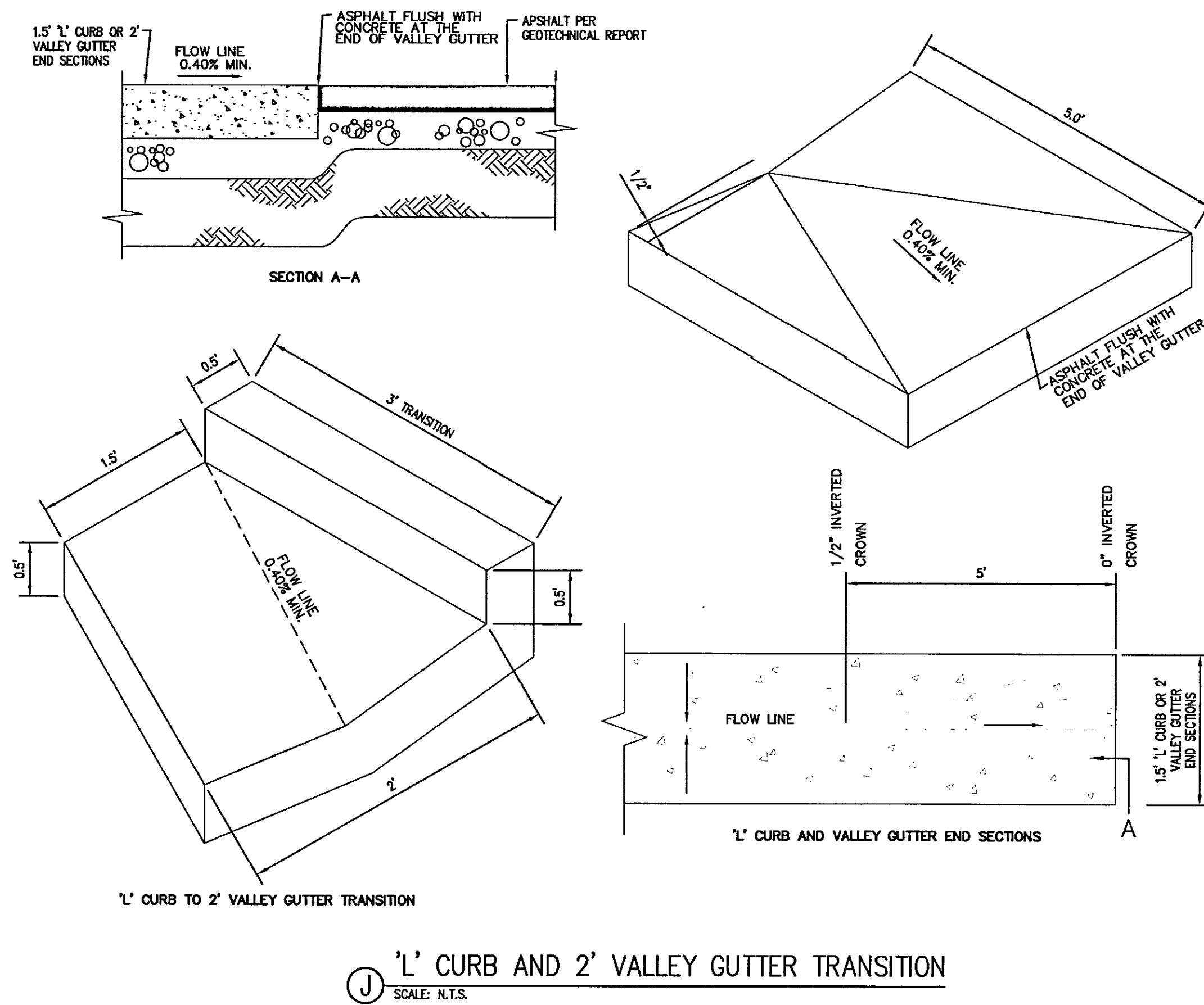
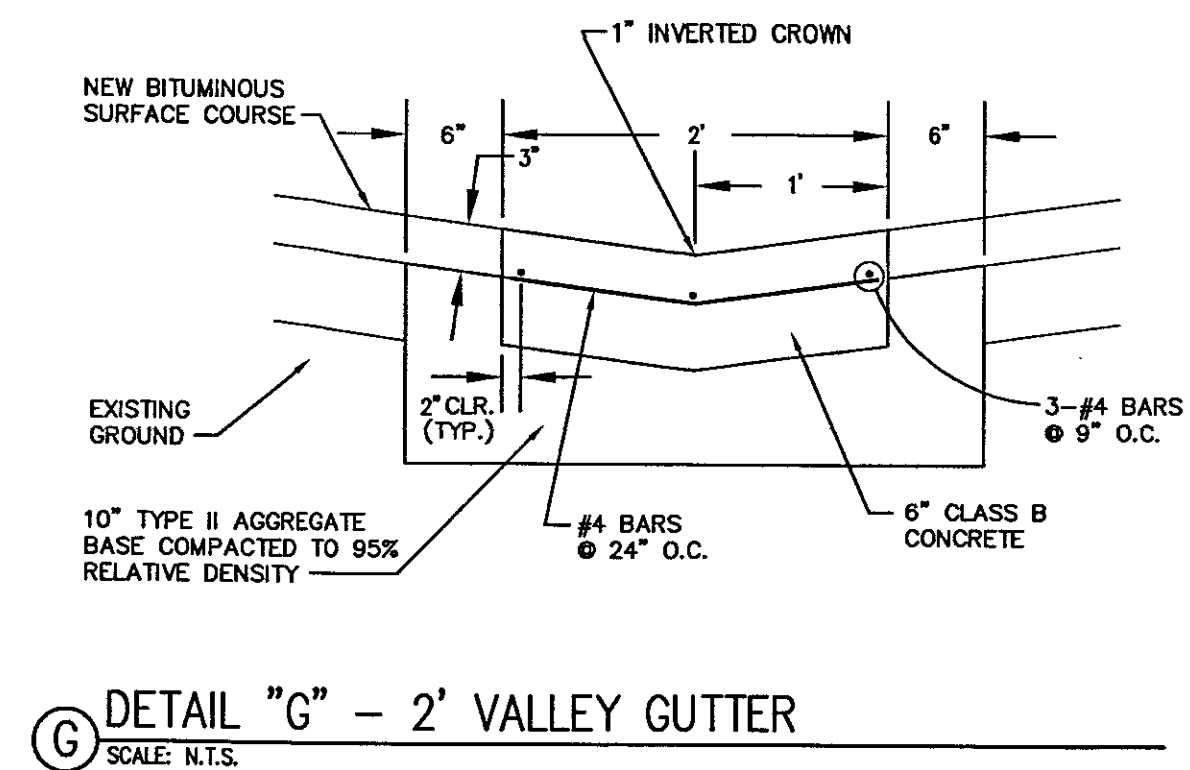
CHI-YING SETO
Exp: 6/30/14
CIVIL
No. 21422

SHEET No. 3 OF 8

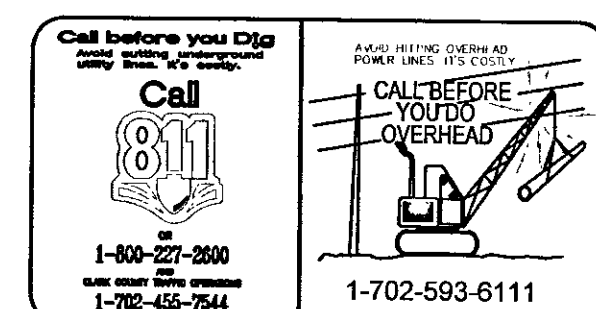


SOILS REPORT NOTE

ALL WORK SHALL CONFORM TO THE GEOTECHNICAL REPORT PREPARED BY:
NOVA ENGINEERING & INSPECTION SERVICES
4400 West Hacienda Ave
Suite 104
Las Vegas, NV 89118
OFFICE: 702.877.3478
PROJECT No. E-12-039
DATED: MAY 11, 2012



This grading plan is a part of drainage study #4563 which was received on 7/26/12 and Rejection on 8/9/12. Page 2 of 4.



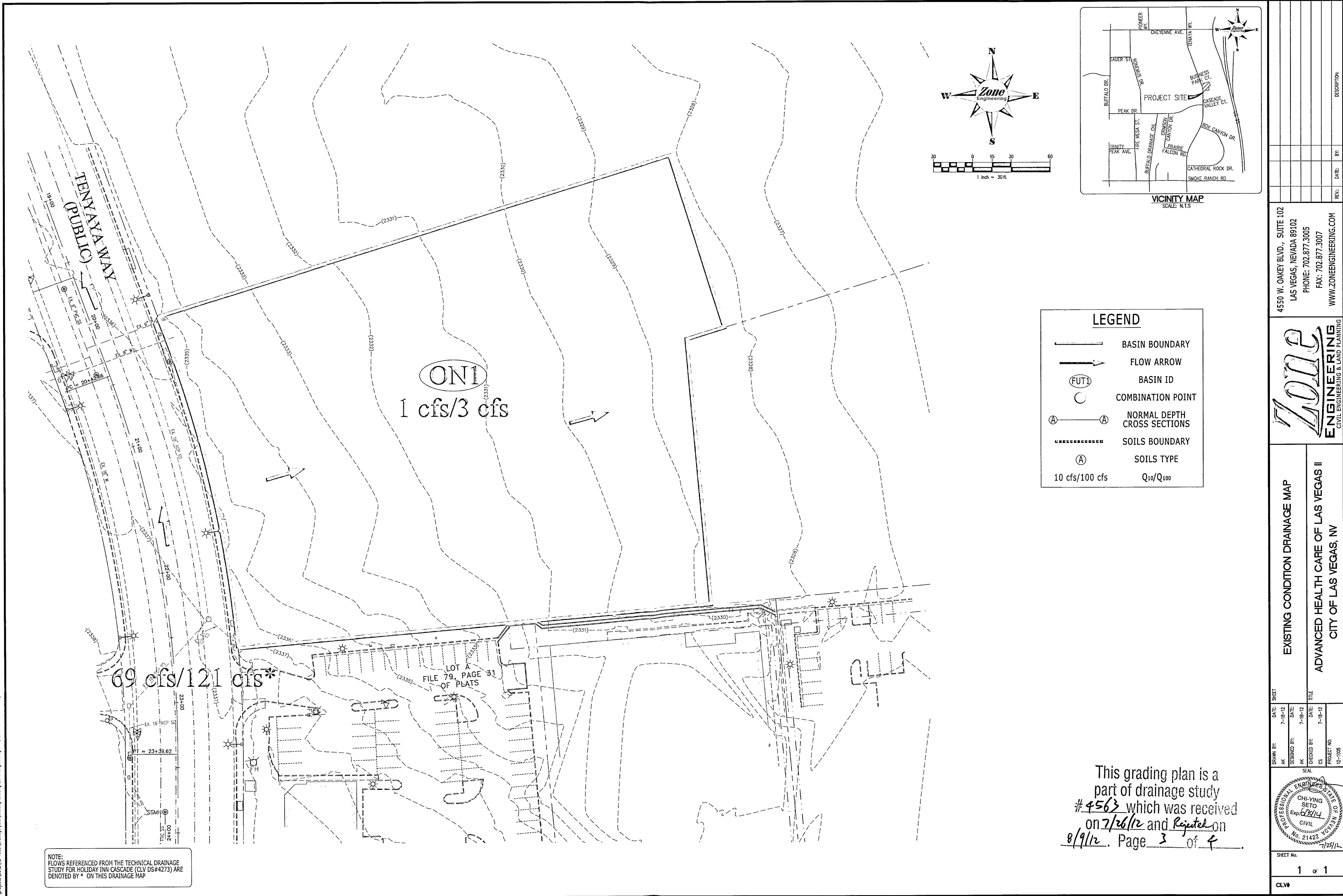
4550 W. OAKLEY BLVD., SUITE 102
LAS VEGAS, NEVADA 89102
PHONE: 702.877.3005
FAX: 702.877.3007

NOVA ENGINEERING & INSPECTION SERVICES

DETAIL SHEET
ADVANCED HEALTH CARE OF LAS VEGAS II

SHEET
DATE: 7-25-12
DESIGNED BY: AK
CHECKED BY: CS
TITLE
No. 21422
CIVIL
SHEET No. 4 of 8

Z:\projects\2012\12-1005\1005.dwg Zone Engineering, Inc. 25 Jul 2012 - 3:55pm



NOTE:
FLOWS REFERENCED FROM THE TECHNICAL DRAINAGE
STUDY FOR HOLIDAY INN CASCADE (CLV DS#4273) ARE
DENOTED BY * ON THIS DRAINAGE MAP

This grading plan is a
part of drainage study
#4563 which was received
on 7/26/12 and rejected on
8/9/12. Page 3 of 4

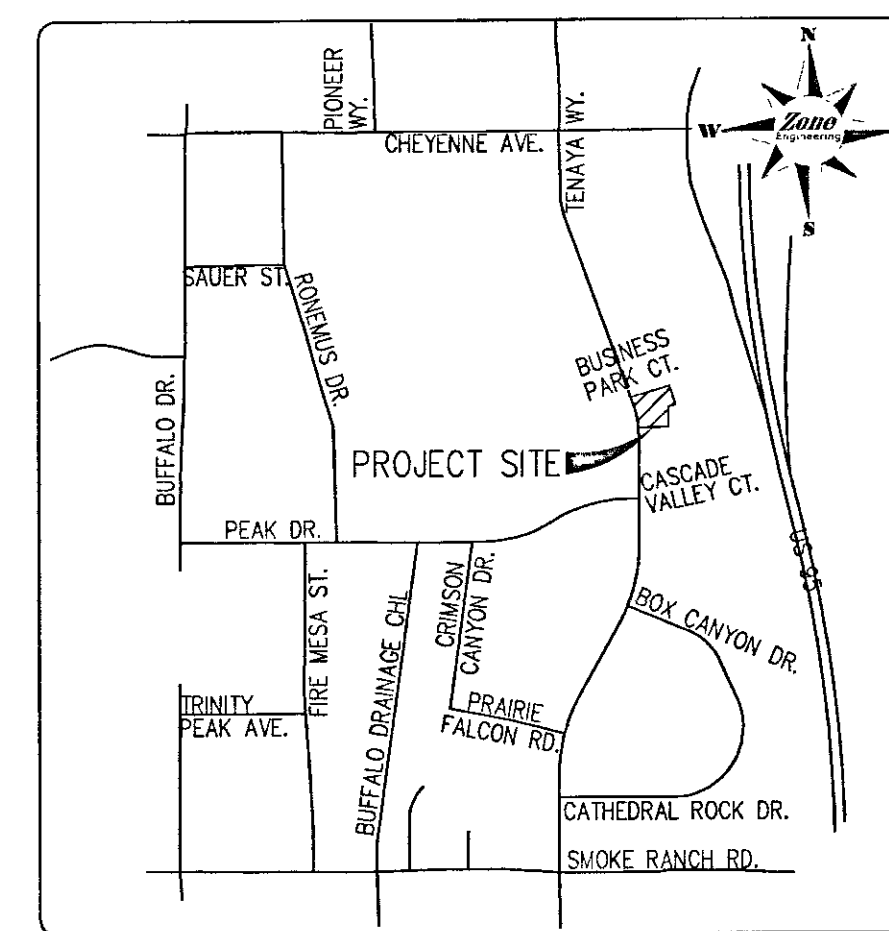
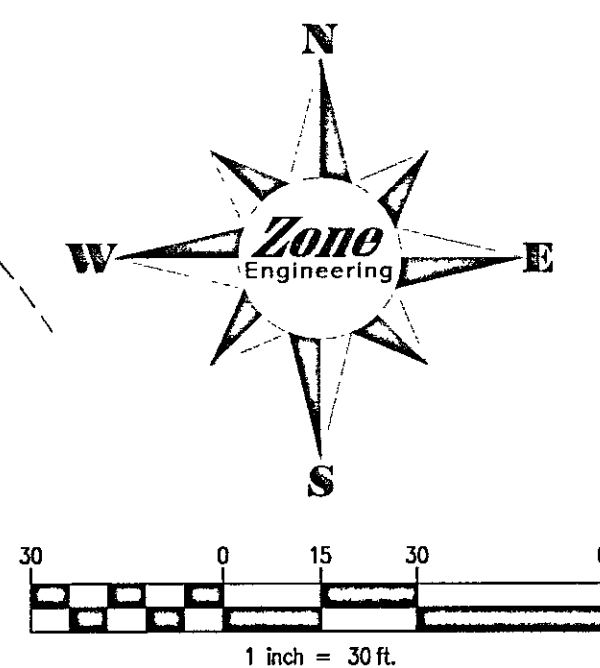
DATE: 7-18-12	DATE: 7-18-12	DATE: 7-18-12	DATE: 7-18-12
DRAWN BY: AK	DESIGNED BY: AK	CHECKED BY: CS	PROJECT NO: 12-1005
SHEET No. 1 of 1			
CLV#			
EXISTING CONDITION DRAINAGE MAP			
ADVANCED HEALTH CARE OF LAS VEGAS II			
CITY OF LAS VEGAS, NV			
4550 W. OAKLEY BLVD., SUITE 102 LAS VEGAS, NEVADA 89102 PHONE: 702.877.3005 FAX: 702.877.3007 WWW.ZONEENGINEERING.COM			
Zone ENGINEERING CIVIL ENGINEERING & LAND PLANNING			
REVISIONS			
REV:	DATE:	BY:	DESCRIPTION:

Z:\projects\2012\12-1005\drainage\TDS\developed.dwg Zone Engineering, Inc. 25 Jul 2012 - 4:54pm

NOTE:
FLOWS REFERENCED FROM THE TECHNICAL DRAINAGE
STUDY FOR HOLIDAY INN CASCADE (CLV DS#4273) ARE
DENOTED BY * ON THIS DRAINAGE MAP

69 cfs/121 cfs*

FF=33.45
APN 138-15-612-003
CITY PARKWAY V INC.



VICINITY MAP
SCALE: N.T.S.

LEGEND

- BASIN BOUNDARY
- FLOW ARROW
- BASIN ID
- COMBINATION POINT
- NORMAL DEPTH CROSS SECTIONS
- SOILS BOUNDARY
- SOILS TYPE
- 10 cfs/100 cfs Q_{10}/Q_{100}

BASIN FLOW SUMMARY				
BASIN ID	AREA (acres)	Q_{10} (cfs)	Q_{100} (cfs)	
ON1	1.45	2	4	
ON2	2.25	2	4	

STREET FLOW SUMMARY								
SECT. ID	ST. NAME	Q_{10} (cfs)	D_{10} (ft)	V_{10} (fps)	D^*V_{10}	Q_{100} (cfs)	D_{100} (ft)	V_{100} (fps)
A	TENAYA	69*	0.89	2.87	2.55	121*	1.04	3.36
B	ONSITE	2	0.22	1.40	0.31	4	0.33	1.96

This grading plan is a
part of drainage study
#4563 which was received
on 7/26/12 and Rejected on
8/9/12. Page 4 of 4.

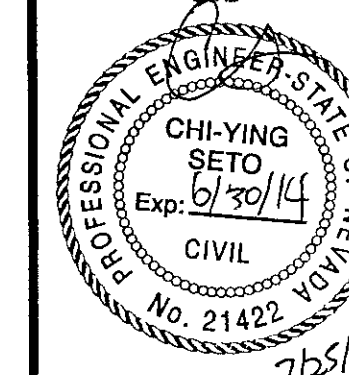
4550 W. OAKLEY BLVD., SUITE 102
LAS VEGAS, NEVADA 89102
PHONE: 702.877.3005
FAX: 702.877.3007
WWW.ZONEENGINEERING.COM

Zone
ENGINEERING
CIVIL ENGINEERING & LAND PLANNING

DEVELOPED CONDITION DRAINAGE MAP

ADVANCED HEALTH CARE OF LAS VEGAS II
CITY OF LAS VEGAS, NV

DRAWN BY: AK
DESIGNED BY: AK
CHECKED BY: CS
DATE: 7-8-12
DATE: 7-8-12
DATE: 7-8-12
PROJECT NO: 12-1005



SHEET No. 1 OF 1
CLV#