

DS #: 4561.

APN: 140-28-110-003

Used. car Lot at 1578 N. Nellis

PROJECT: (Project in Clark county for CLV Concurrence)...

SUBMITTAL: 1st

SCANNED BY/DATE: _____

CHECKED BY/DATE: _____





CITY OF LAS VEGAS			DATE:	
INTER-OFFICE MEMORANDUM			July 24, 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: Used Car Lot at 1578 N. Nellis (Project in Clark County for CLV Concurrence)			COPIES TO: CivilWorks Inc.	
Cross Streets:	SEC of Owens Avenue & Nellis Boulevard		Bartsas, Mary 12 LLC	
File Number:	F:\Depot\DSMemos\DS4561A.doc		Bart Anderson, P.E., DevCo	
Parcel Number:	140-28-110-003		CCRFCD	
Zoning Action:	N/A		CCPW	
FEMA Flood Zone	YES	NO	X	
Proposed Storm Drain	YES	NO	X	
			NDOT	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1 st Submittal	7/16/2012	7/24/2012	See Comments Below	\$400.00	289640: \$400
TOTAL FEES (LDDRS):					----

REMARKS:

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

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

City of Las Vegas Flood Control staff has reviewed the Technical Drainage Study, including Addendum #1 and Supplement #1. City of Las Vegas concurs with the acceptance of the drainage study by Clark County Public Works Department. The review of this project was limited to issues of flood control significance to the City of Las Vegas.

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/R62E/28
AREA N-28

Rec'd: 7/16/12

TECHNICAL DRAINAGE STUDY
FOR
USED CAR LOT
AT
1578 N. NELLIS BLVD.

DS 4561

N-28

Project No. 104111014.01

DECEMBER 13, 2011

(Project in County
for CLV Conc.)

\$400-

Prepared for:

GGW ARCHITECTS
4945 W. PATRICK LANE
LAS VEGAS, NV 89118
702-534-7888

Prepared by:

CIVILWORKS, INC.
4945 W. PATRICK LANE
LAS VEGAS, NV 89118
702-534-7555

CivilWorks
Engineering with "sensible" solutions tailored to your "specific" needs.

4945 W. Patrick Lane Las Vegas, NV 89118
Office: (702) 534-7555 Fax: (702) 534-1825

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: USED CAR LOT Date: 12/13/2012
Location of Development: a) Descriptive (Cross Streets) North/South: NELLIS
East/West: OWENS
b) Section: 28 Township: 20 Range: 62
c) APN: 140-28-110-003

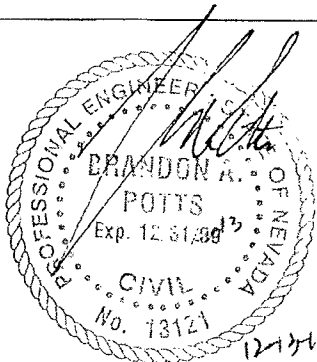
Name of Owner: BARTSAS, MARY 12 LLC
Telephone No.: _____ Fax No.: _____ E-Mail Address: _____
Address: 1578 N. NELLIS BLVD

Contact Person-Name: JENNIFER NUESCA Telephone No.: 534-1827
* E-Mail Address: JKN@CIVILWORKSONLINE.COM Fax No.: 534-1825
Firm: CIVILWORKS
Address: 4945 W. PATRICK LANE

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: 0.71 Being Developed/Disturbed: 0.71
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: _____
6. Has the site drainage been evaluated in the past? ☐ YES ☒ NO If yes, please identify documentation: _____
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: SOUTH WEST CORNER OF SITE INTO NELLIS.
8. Briefly describe your proposed schedule for the subject project: ASAP



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



Department of Public Works

Development Review Division • Drainage Study Team

500 S Grand Central Pky | Box 554000 | Las Vegas NV 89155-4000

(702) 455-4600 | Fax (702) 388-2550

www.ClarkCountyNV.gov/PubWorks

DRAINAGE STUDY MINIMUM CRITERIA CHECKLIST

Project Name: USED CAR LOT

Engineer: BRANDEN POTTS Company: CIVILWORKS

Address: 4945 W. PATRICK LANE

City: LAS VEGAS State: NV Zip: 89118

E-mail: BAP@CIVILWORKSONLINE.COM

Phone Number: 534-1816 Fax Number: 534-1825

Property Owner: PARTSAS, MARY 12 LLC

Address: 1578 N. NELLIS BLVD

City: LAS VEGAS State: NV Zip: _____

Phone Number: _____ Fax Number: _____

E-mail: _____

The following information is intended as a guide to the engineer for providing the minimum information required for a Technical Drainage Study submittal prior to the County performing a review. The engineer will remain responsible to ensure the Technical Drainage Study is prepared within the guidelines as set forth in the Clark County Regional Flood Control District (CCRFCD) *Hydrologic Criteria and Drainage Design Manual* (Design Manual).

This document is intended as an aid in preparing Technical Drainage Studies for Clark County. 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, and exhibits which may be necessary to properly evaluate the intended land use.

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

DRAINAGE STUDY MINIMUM CRITERIA CHECKLIST

I. GENERAL REQUIREMENT

Yes	No	
✓		Design Manual Standard Form 1 with the engineer's seal
✓		Design Manual Standard Form 4
✓		2 copies of the 24" x 36" drainage plan with the engineer's seal
✓		A notarized letter from adjacent property owner(s) allowing off-site grading or discharge

II. DRAINAGE PLAN INFORMATION

Yes	No	
✓		Sheet size: 24" x 36"
✓		Minimum Scale: 1" = 50'
✓		Project Name
✓		Vicinity Map
✓		Revision Box
✓		North Arrow and Bar Scale
✓		Professional Engineer's signature, seal, and date
✓		Engineer's/Consultant's address and phone number
✓		Elevation Datum and Benchmark
✓		Legend for symbols and abbreviations
✓		Cut/fill scarps, where applicable
✓		Street Names, Grades, and Widths
✓		Spot grades for top of curbs and street crowns at lot lines, grad breaks, and along curb returns
✓		Existing contours encompassing the site and 100 feet beyond with spot elevations for important, excess of 100 feet where appropriate
✓		Minimum finish floor elevations
✓		Typical street sections
✓		Proposed contours or spot elevations in sufficient detail to exhibit intended drainage patterns and slopes
✓		Property lines
✓		Right-of-way lines and widths, existing and proposed
✓		Existing improvements and their elevations
✓		Delineation of proposed onsite drainage basins indicating area and 10-year and 100- year storm peak flows at basin concentration points
✓		Drainage flow direction with Q100 and V100
✓		Cross-sectional detail for channels, including cutoff wall locations

Yes	No	
	N/A	Existing and proposed drainage easements and widths shown with sufficient detail
	N/A	Existing and proposed drainage easements and widths shown with sufficient detail
	N/A	Location and detail of existing, proposed, and future block wall openings
	N/A	Detail of flood walls illustrating depth of flow, proposed grouting height, etc.
	N/A	Retaining wall locations
	N/A	Building and/or lot numbers
✓		Alignment of all existing, proposed, or future Regional Facilities adjacent to the site
✓		Limits of existing floodplain based on current FIRM
	N/A	For areas in Zone A, AE, AH, and AO, base flood elevations (BFEs) must be shown for each lot; BFEs may be listed on each lot, or in a table

III. HYDROLOGIC ANALYSIS

Yes	No	
✓		Appropriate soil information
✓		Input and output information for computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models
✓		Use of correct precipitation values in and outside the McCarran Airport rainfalls area
✓		A discussion in the text of the hydrologic analysis justifying basin boundaries and cutoffs, supporting assumptions and calculations
✓		A summary table of stormwater flows showing basin area, Q10 and Q100 for both individual basins and combined basin flows where applicable
✓		Copies of supporting technical information referenced from a previously approved study and a comment accepting these flows
✓		On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners

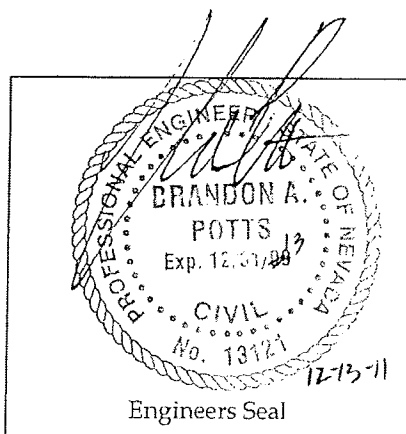
IV. HYDRAULIC ANALYSIS

Yes	No	
	N/A	Flow split calculations and supporting documentation for the method of flow split calculations used
✓		Normal depth street flow calculations and cross sections for all interior and perimeter streets (address dry lane criteria)
✓		Provide depth x velocity "D x V" products for flows in interior and exterior streets $Q_{10}(D \times V \leq 6)$ $Q_{100}(D \times V \leq 8)$
	N/A	Appropriate hydraulic calculations for block wall opening assuming a 50% vertical clogging factor (Assume the lower half of the opening is plugged)
	N/A	Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set first floor elevations. Hydraulic calculations must include submerged weir, superelevation and tee intersection losses where appropriate
✓		Provide necessary freeboard requirements to set the finished floor elevations
✓		On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners

Yes	No	
	N/A	A complete water surface profile analysis (HEC-2, WSPG, etc.) for channel flows and FEMA Zone A flood zones - Field survey data - Input and output information - Plotted cross-sections based on survey with proper encroachments - A map showing the location of the cross-sections - Analysis of both sub and supercritical flow segments - A summary table and a discussion of the results in the text of the report
	N/A	Provide a 50% clogging factor in the capacity calculation for drop inlets
	N/A	Hydraulic calculations for culverts and storm drains

V. MAPS AND EXHIBITS

Yes	No	
✓		A Flood Insurance Rate Map (FIRM) with the site delineated
✓		The CCRFCD Master Plan Update Figures (F&H) with the site delineated
✓		A soils map with the site and the upstream sub-basins delineated
✓		Off-site drainage basin map for existing, interim and future conditions showing the basin boundaries, concentration points, existing topo and flows in cfs
✓		On-site drainage basin map for existing and proposed conditions showing the basin boundaries, concentration points, existing topo and flows in cfs
✓		Vicinity Map with local and major cross streets identified



Submitted By: _____

Date: _____

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

Project Name: <u>USED CAR LOT</u>	Map ID:
Firm Name: <u>CIVILWORKS</u>	Engineer: <u>BRANDON POTTS</u>
Address: <u>4945 W. PATRICK LANE</u>	
City: <u>LAS VEGAS</u>	State: <u>NV</u> Zip: <u>89118</u>
Phone Number: <u>534-1827</u>	Fax Number: <u>534-1825</u>
Property Owner: <u>BARTAS, MARY</u>	
Address: <u>1578 N. NELLIS BLVD.</u>	
City: <u>LAS VEGAS</u>	State: <u>NV</u> Zip:
Reviewed By:	Date Received: Date Accepted for Review:

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

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

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

I. GENERAL REQUIREMENT

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

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

II. MAPS AND EXHIBITS

Yes No

- ☒ ☐ A copy of a current Flood Insurance Rate Map (FIRM) with the site delineated.
- ☒ ☐ A copy of the current CCRFCD Master Plan Update Figure, (F-x), for Flood Control Facilities and Environmental areas with the site delineated.
- ☒ ☐ Off-site drainage basin maps for existing, interim and future conditions showing the existing topography, basin boundaries, concentration points, and flows in cfs.
- ☒ ☐ On-site drainage basin maps for existing and proposed conditions showing the existing topography, basin boundaries, concentration points, and on-site and off-site flows in cfs.
- ☒ ☐ Vicinity Map with local and major cross streets identified and a north arrow.

III. DRAINAGE PLAN

Yes No

- ☒ ☐ Sheet size: 24" x 36" sealed by a registered engineer in the State of Nevada.
- ☒ ☐ Minimum scale: 1" = 60'.
- ☒ ☐ Project name.
- ☒ ☐ Vicinity Map with local and major cross streets.
- ☒ ☐ Revision box.
- ☒ ☐ North arrow and bar scale.
- ☒ ☐ Engineer's/consultant's address and phone number.
- ☒ ☐ Elevation datum and benchmark.
- ☒ ☐ Legend for symbols and abbreviations.
- ☒ ☐ Cut/fill scarps, where applicable.
- ☒ ☐ Street names, grades, widths.
- ☒ ☐ Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes No

- | | | |
|-------------------------------------|--------------------------|---|
| ☒ | ☐ | Existing contours encompassing the site and 100 feet beyond with spot elevations for important locations, where appropriate. |
| ☒ | ☐ | Minimum finish floor elevations with top-of-curb elevations at upstream end of lot. |
| ☒ | ☐ | Proposed typical street sections. |
| ☐ | <u>N/A</u> | Streets with off-set crowns. |
| ☒ | ☐ | Proposed contours or spot elevations in sufficient detail to exhibit intended drainage patterns and slopes. |
| ☒ | ☐ | Property lines. |
| ☒ | ☐ | Right-of-way lines and widths, existing and proposed. |
| ☒ | ☐ | Existing improvements and their elevations. |
| ☒ | ☐ | Delineation of proposed on-site drainage basins indicating area and 10-year and 100-year storm peak flows at basin concentration points. |
| ☒ | ☐ | Concentration points and drainage flow direction with Q_{100} and V_{100} and D_{100} in streets. |
| ☒ | ☐ | Cumulative flows, velocity, and direction of flow at upstream and downstream ends of site for the 10-year and 100-year flows. |
| ☒ | ☐ | Location and cross-section of street capacity calculations. |
| ☐ | <u>N/A</u> | Cross-sectional detail for channels, including cutoff wall locations. |
| ☒ | ☐ | Existing and proposed drainage facilities, appurtenances, and connections (i.e., sidewalk, ditches, swales, storm drain systems, unimproved and improved channels, and culverts, etc.) stating size, material, shape, and slope with plan and profile and HGL calculations. |
| ☐ | <u>N/A</u> | Existing and proposed drainage easements and widths shown with sufficient detail. A cross sectional detail must be provided that shows appropriate lining and reinforcement. |
| ☐ | <u>N/A</u> | Location and detail of existing, proposed, and future block wall openings. Minimum size is 16" x 48". Wrought iron gate is required for flows > 10 cfs. |
| ☐ | <u>N/A</u> | Location and detail of flood walls illustrating depth of flow, proposed grouting height, etc. |

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes No

- ☒ N/A Perimeter retaining wall locations. All existing and proposed walls (retaining screen and flood) must be shown with adjacent ground elevations. Flood walls with 8-inch concrete masonry unit.
- ☒ N/A Building and/or lot numbers.
- ☒ Alignment of all existing, proposed, or future Regional Facilities adjacent to the site.
- ☒ Limits of existing floodplain based on current FIRM or best available information; limits of proposed floodplains based on best available information.
- ☒ N/A For areas in Zone A, AE, AH, and AO, base flood elevations (BFEs) must be shown for each lot; BFEs may be listed on each lot, or in a table. Finish floor elevations must be a minimum of 18 inches above BFE.
- ☒ Appropriately elevated "humps" 6 inches above the 100 year water surface elevation at site accesses where the intent is to protect the site from the Q_{100} flows.
- ☒ Street slopes for perimeter and interior streets. The minimum slope is 0.4 percent.

IV. HYDROLOGIC ANALYSIS

Yes No

- ☒ Appropriate soil information and Soils Map for existing and future conditions with subbasins and property delineated.
- ☒ Input and output information for existing conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
- ☒ Input and output information for future conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
- ☒ Use of correct precipitation values in and around the McCarran Airport rainfall area.
- ☒ A discussion in the text of the hydrologic analysis justifying subbasin boundaries and cutoffs, supporting assumptions, and calculations.
- ☒ A summary table of stormwater flows showing basin area, Q_{10} and Q_{100} for both individual basins and combined basin flows, where applicable.
- ☒ Copies of supporting technical information referenced from a previously approved study and a statement accepting these results.
- ☒ On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners in accordance with current Nevada Drainage Law.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

V. HYDRAULIC ANALYSIS

Yes No

- ☒ N/A Flow split calculations and supporting documentation or reference for the method of flow split calculations used.
- ☒ ☐ Normal depth street flow calculations and cross section diagrams for all interior and perimeter streets. Provide "d x v" products for the Q_{100} and Q_{10} flows representing the worst case for interior and all perimeter streets. $Q_{100} d \times v \leq 8$. $Q_{10} d \times v \leq 6$ and 12 foot dry lane for rights-of-way ≥ 80 feet. Calculations must be labeled by street name as indicated on the Grading Plan.
- ☒ ☐ A summary table of interior and exterior street capacity calculations showing the street name, Q_{100} flow, slope, depth of flow, velocity and depth times velocity product and streets needing to meet 12 foot dry lane criteria.
- ☐ N/A Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.)
- ☐ N/A Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set finish floor elevations. Hydraulic calculations must include submerged weir, superelevation and tee intersection losses, where appropriate.
- ☒ ☐ Provide necessary freeboard requirements to set the finished floor elevations of all proposed buildings, 2 x depth of flow or depth of flow plus 18 inches of freeboard, whichever is less. The minimum requirement is 6 inches above adjacent upstream top of curb. Buildings adjacent to drainage easements must always be provided with 18 inches of freeboard above the Q_{100} weir height or flow depth, which ever is greater.
- ☐ N/A A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones.
- Field survey data.
 - Input and output information.
 - Plotted cross-sections based on survey with proper encroachments.
 - A map showing the location of the cross-sections.
 - Analysis of both sub and super-critical flow segments.
 - A summary table and a discussion of the results in the text of the report.
- ☐ N/A Provide a 50 percent clogging factor in the capacity calculation for drop inlets.
- ☐ N/A Hydraulic calculations for culverts and storm drains. D-Load calculations must be provided for storm drain pipes in public rights-of-way, including headwater pool inundation.
- ☒ ☐ The mitigation of nuisance water, both during construction and in the fully developed condition, must be addressed.

REFERENCE:

STANDARD FORM 2

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1.0 INTRODUCTION AND PURPOSE

1.1 Scope

This report has been prepared as the Technical Drainage Study for the Used Car Lot. The purpose of this report is to provide detailed hydrologic and hydraulic analysis for the proposed development. This report will address the existing and proposed conditions of the project site. The criterion set forth in the Clark County Regional Flood Control District's (CCRFCDD) Hydrologic Criteria and Drainage Design Manual (HCDDM) has been used as the technical basis for this study.

1.2 Location

The proposed commercial development is located within a portion of Section 28, Township 20 South, Range 62 East, M.D.M., Clark County, Nevada. The property is located on the southeast corner of Owens Avenue and Nellis Boulevard. Please refer to Figure 1: *Vicinity Map*, in Appendix. The Assessors Parcel Number for this site is 140-28-110-003. Please see Figure 2 in Appendix, for the Assessor's Parcel Map with the project site delineated.

1.3 Description of Project

The proposed development will encompass a +/- 0.71-acre area. The site is bounded by an existing commercial business to the north (APN 140-28-110-001 and -002), Nellis Boulevard to the west, an undeveloped parcel (APN 140-28-110-02) to east, and an existing commercial business to the south (APN 140-28-110-004). Nellis Boulevard is a fully developed 100' right of way with the eastern half in the Clark County jurisdiction and the western half within the City of Las Vegas jurisdiction.

1.4 Master Planning Information

The subject site falls within the Sunrise Township within Clark County. The Clark County Regional Flood Control District's 2008 Las Vegas Valley Flood Control Master Plan Update (2008 CCRFCDD MPU) will be used along with approved Technical Drainage Studies adjacent to the site to model storm flows upstream from the project site. See Figure 5 (H-28 from the Update) and Figures 6 & 6A (F-28 and its corresponding inventory sheet from the Update) located in Appendix. There is a proposed Regional drainage facility directly adjacent to the site within the Nellis Boulevard.

1.5 Floodplain Information

The subject site is located within Zone "X", as shown on F.I.R.M. Community-Panel Number 32003C2200E, revised to reflect LOMR effective September 27, 2002. Zone "X" is defined as "areas determined to be outside the 0.2% annual chance

floodplain". See Figure 3 in Appendix for the F.I.R.M Panel with the project site delineated.

1.6 Previous Drainage Studies

The following approved drainage studies were used to assist in analyzing the existing on-site and off-site conditions:

- Technical Drainage Study for Nellis and Owens Daycare Center HTE #07-24151; CLV DS 4097B, approved January 16, 2007 and concurred June 5, 2007. Located at the northwest corner of Nellis and Owens.

CivilWorks, Inc. concurs with the analyses presented in the above-mentioned studies. Relevant excerpts have been included in Appendix.

1.7 Compliance with Regulations and Adopted Plans

This study was prepared to conform with Clark County Flood Control policies, FEMA Regulations and Policies, Clark County Regional Flood Control District's 2002 Las Vegas Valley Flood control Master Plan Update and the CCRFCD Hydrologic Criteria and Drainage Design Manual, adopted August 12, 1999.

2.0 DRAINAGE BASIN DESCRIPTION

2.1 Existing On-site Drainage Description

The historical drainage pattern for the subject site is generally from northeast to southwest. The project site is bordered by existing walls that prohibit off-site flows from the north to enter and prevent on-site flows to enter the property to the south. The site has been delineated as a single basin (EON1) and analyzed to discharge into Nellis Blvd. through the southeastern corner of the site. Please see Figure 7: Existing Conditions Basin Map (Figure 7) in Appendix. The 10-year and 100-year onsite existing condition flows are shown in Table 1 below.

TABLE 1

EXISTING FLOW SUMMARY			
BASIN	AREA (ac)	Q10 (cfs)	Q100 (cfs)
EON1	0.71	1	1
EOFF1	0.03	0	0
STR1	0.13	0	0

2.2 Existing Off-site Drainage Description

Existing off-site flows have been analyzed to be conveyed west through the subject site. The existing street conditions in Nellis show that the flows are conveyed south. Since the subject site is bordered by walls on the north and south sides of the property, no off-site flows enter the subject site from the north and no on-site flow enter the property to the south.

2.3 Proposed On-site Drainage Description

During the proposed condition, the subject site will be fully developed and maintain the same flow pattern to the southeastern corner of the property. A wall will be constructed along the eastern property line that will prevent the off-site flows from entering the subject site. The flow patterns will remain as analyzed in the existing condition. The 10-year and 100-year proposed drainage condition flows are shown in Table 3 below. Please refer to Figure 8: Proposed Conditions Basin Map in Appendix.

TABLE 2

PROPOSED FLOW SUMMARY			
BASIN	AREA (ac)	Q10 (cfs)	Q100 (cfs)
PON1	0.71	2	3
EOFF1	0.03	0	0
STR1	0.13	0	0

2.4 Proposed Off-site Drainage Description

The off-site flow that entered the site through the eastern property line will be re-directed to flow back to the east. The existing berm on the adjacent property to the east will be re-graded to begin at the proposed wall and allow the off-site flow that originally discharged onto the subject site to follow the historical drainage pattern for the rest of the adjacent property.

3.0 EXISTING DRAINAGE FACILITIES

3.1 Existing On-site Drainage Facilities

There are no existing on-site drainage facilities.

3.2 Existing Off-site Drainage Facilities

There is an existing 84" RCP (CLV #107-V1789) within the eastern half of Nellis Boulevard.

4.0 PROPOSED DRAINAGE FACILITIES

4.1 Proposed On-site Drainage Facilities

There are no proposed on-site drainage facilities.

4.2 Proposed Off-site Drainage Facilities

Per the 2008 MPU, there is a proposed Regional Facility (P1) in the western half of Nellis Boulevard. It will be a 13' x 12' RCB.

5.0 HYDROLOGIC ANALYSIS

The U.S. Army Corps of Engineers HEC-1 flood hydrograph package was used to determine the peak runoff generated by the 100-year, 6-hour storm event. The HEC-1 computer model has the ability to simulate the surface runoff response of a given basin and smaller sub-basins to rainfall. The computed hydrographs from each sub-basin are then combined at the appropriate locations, from which a final discharge hydrograph is obtained.

5.1 Precipitation

The project site was determined to lie outside the McCarran Airport Rainfall Area. The rainfall depths for the 6-hour, 10-year and 100-year storm events were obtained per the CCRFCD Hydrologic Criteria and Drainage Design Manual (1999), Section 500. The adjusted rainfall values are 1.736-in. and 2.86-in. for the 10- and 100-year storm events, respectively. Since the site encompasses less than 8-square miles, a Storm Distribution Number Three (SDN #3) was used for the HEC-1 model. HEC-1 parameters are included in the Appendix.

5.2 Hydrologic Abstractions

The SCS curve number method was used to determine the infiltration rates for the drainage basins. The soil groups for the existing project site lie inside the SCS Soil Survey of the Las Vegas Valley. The soils are primarily within hydrologic group C. This information is based on information confirmed by the National Resources Conservation Service "Web soil Survey 2.0". Information referenced from NRCS has also been included in Appendix (see Figure 4). Runoff curve numbers have been highlighted on Table 606 (Pages 1-4) and Table 606A of the HCDDM (see Appendix B).

5.3 Basin Area

Basin areas for the on-site drainage basins were determined using AutoCad. Note that lag times have been adjusted to result in a minimum time of concentration of five minutes ($T_{lag}=0.050$), per Section 602 and 602.1 of the Drainage Design Manual. The HEC-1 parameter calculations are located in the Appendix of this study.

5.4 SCS Lag-Time with Time of Concentration

Lag-time, T_{lag} , is defined as the time measured from the centroid of effective rainfall to the peak of the outflow hydrograph. It is a measure of the watershed's response time and is related to basin length, slope, roughness characteristics, and land use. Lag-times for this study were estimated by calculating the drainage basin's time of concentration, T_C . The time of concentration consists of two component times; the initial overland flow time, t_i , and the gutter or channel flow time, t_f . The equation for the time of concentration is: $T_C = t_i + t_f$. The equation for lag-time is: $T_L = 0.6T_C$

6.0 HYDRAULIC ANALYSIS

6.1 Street and Facility Hydraulics

The existing hydraulic condition of Nellis Boulevard was taken from the previously approved study for the Nellis and Owens Daycare Center and has been summarized in Table 3 below. Please refer to the Appendix for the Reference Material.

TABLE 3

EXISTING CONDITIONS HYDRAULIC SUMMARY					
SECTION	Q_{10} (cfs)	D_{10} (ft)	V_{10} (fps)	$(D*V)_{10}$	DRY LANE?
NELLIS	58	0.70	2.78	1.95	NO

Table 4 below is a summarization of the proposed condition street and facility hydraulics. Please see Appendix for the hydraulic analyses.

TABLE 4

PROPOSED CONDITIONS HYDRAULIC SUMMARY					
SECTION	Q ₁₀ (cfs)	D ₁₀ (ft)	V ₁₀ (fps)	(D*V) ₁₀	DRY LANE?
NELLIS	60	0.83	3.66	3.03	NO

The finished floor elevation for the main building has been set to 1779.00' which is more than 18" above the centerline of Nellis Boulevard. Table 5 below is a summarization of the proposed condition water surface elevations within the adjacent street. Minimum finished floor calculations have been provided on the FlowMaster reports in Appendix.

TABLE 5

PROPOSED CONDITIONS FF CALCULATION SUMMARY					
STREET	DEPTH	FL	WSE	WSE + 2D	MEET FF?
NELLIS	1.11'	1776.49'	1777.60'	1778.71'	YES

Table 6 below is a summarization of the hydraulic calculations at the driveway entrance for both the proposed conditions. The hydraulic analyses for the driveway have been included in Appendix.

TABLE 6

DRIVEWAY HYDRAULIC SUMMARY					
CONDITION	DEPTH	FL	WSE	WSE + 6"	PROTECTED?
PROPOSED	1.11'	1776.49'	1777.60'	1778.10'	YES

There is a constant 1.00% slope out of the driveway that prevents flows from Nellis from entering the site. Therefore, the site is sufficiently flood-protected from the off-site flows within Nellis Boulevard. Hydraulic calculations have been provided in Appendix.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The project site is located at the northeast corner of Owens Avenue and Nellis Boulevard. It will consist of a parking lot and a pre-fabricated building with access from Oquendo Road on approximately ± 0.71 acres.

The project site is located within Flood Zone X. Zone X is defined by FEMA as "areas determined to be outside the 0.2% annual chance floodplain". Map number 32003C2200E, revised to reflect LOMR effective September 27, 2002.

The finished floor elevation for the main building has been set to 1779.00' which is more twice the depth of flow in the adjacent street. Minimum finished floor calculations have been provided on the FlowMaster reports in Appendix.

There is a constant 1.00% slope out of the driveway that prevents flows from Nellis from entering the site. Therefore, the site is sufficiently flood-protected from the off-site flows within Nellis Boulevard. Hydraulic calculations have been provided in Appendix.

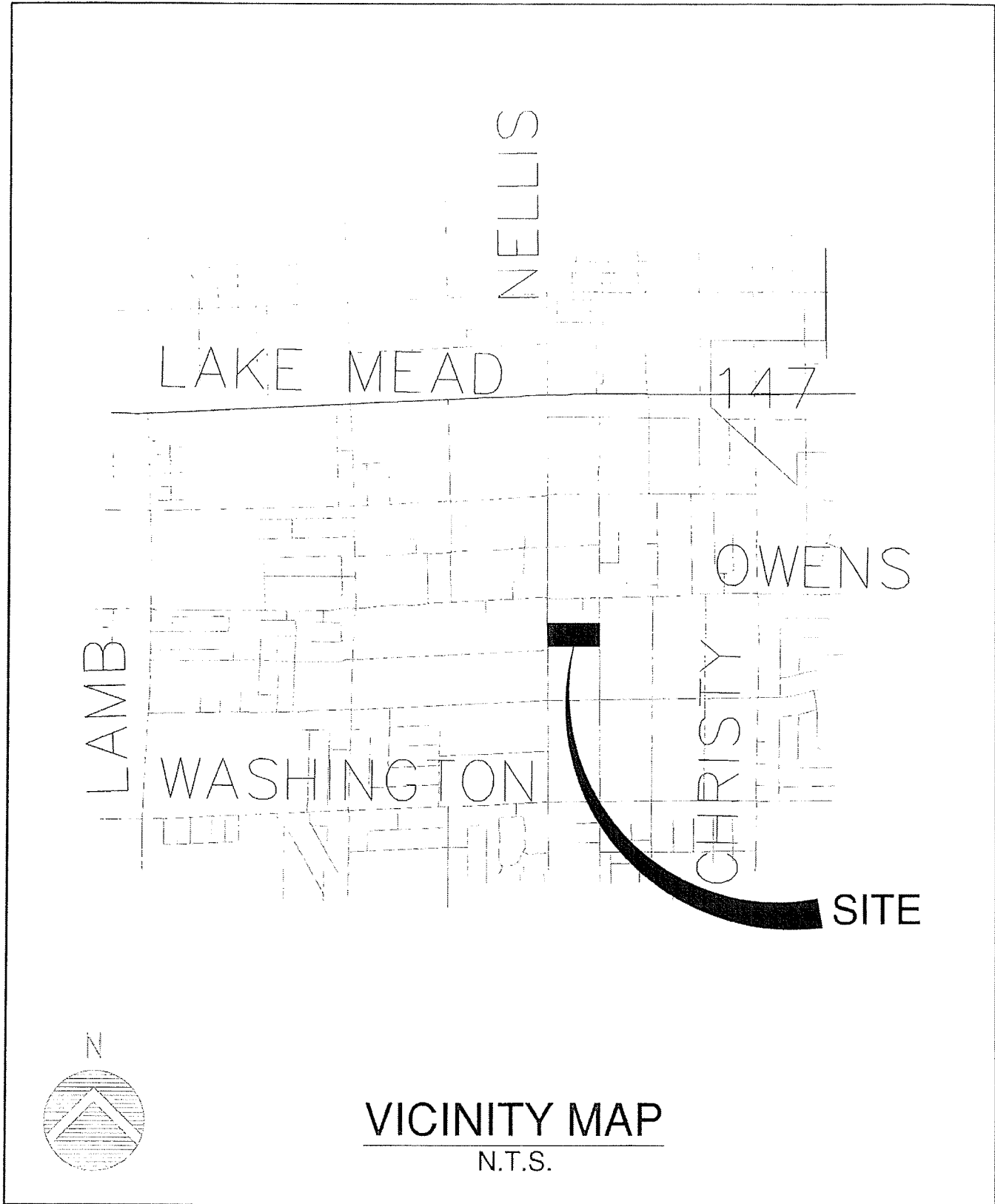
The development of this site is in compliance with the CCRFCD Flood Control Master Plan Update, and the drainage design criteria set forth in the Hydrologic Criteria & Drainage Design Manual.

8.0 REFERENCES

1. Clark County Regional Flood Control District, "Hydrologic Criteria & Drainage Design Manual", August 1999.
2. Federal Emergency Management Agency "Flood Insurance Rate Map Clark County, Nevada and Incorporated Areas Map Number 32003C2200E," dated September 27, 2002.
3. National Resources Conservation Service "Web soil Survey 2.0"
4. Technical Drainage Study for Nellis and Owens Daycare Center (HTE #07-24151 and CLV DS 4097B) approved January 16, 2007 and concurred June 5, 2007.. Located at the NWC of Owens and Nellis.

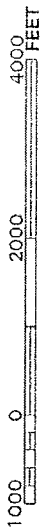
APPENDIX

FIGURES





MAP SCALE 1" = 2000'



PANEL 2200 E

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

PANEL 2200 OF 4090

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY NUMBER PANEL SHEET

CLARK COUNTY
UNINCORPORATED AREAS
LAS VEGAS CITY OF

100001 2200 F
355579 2200 E

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

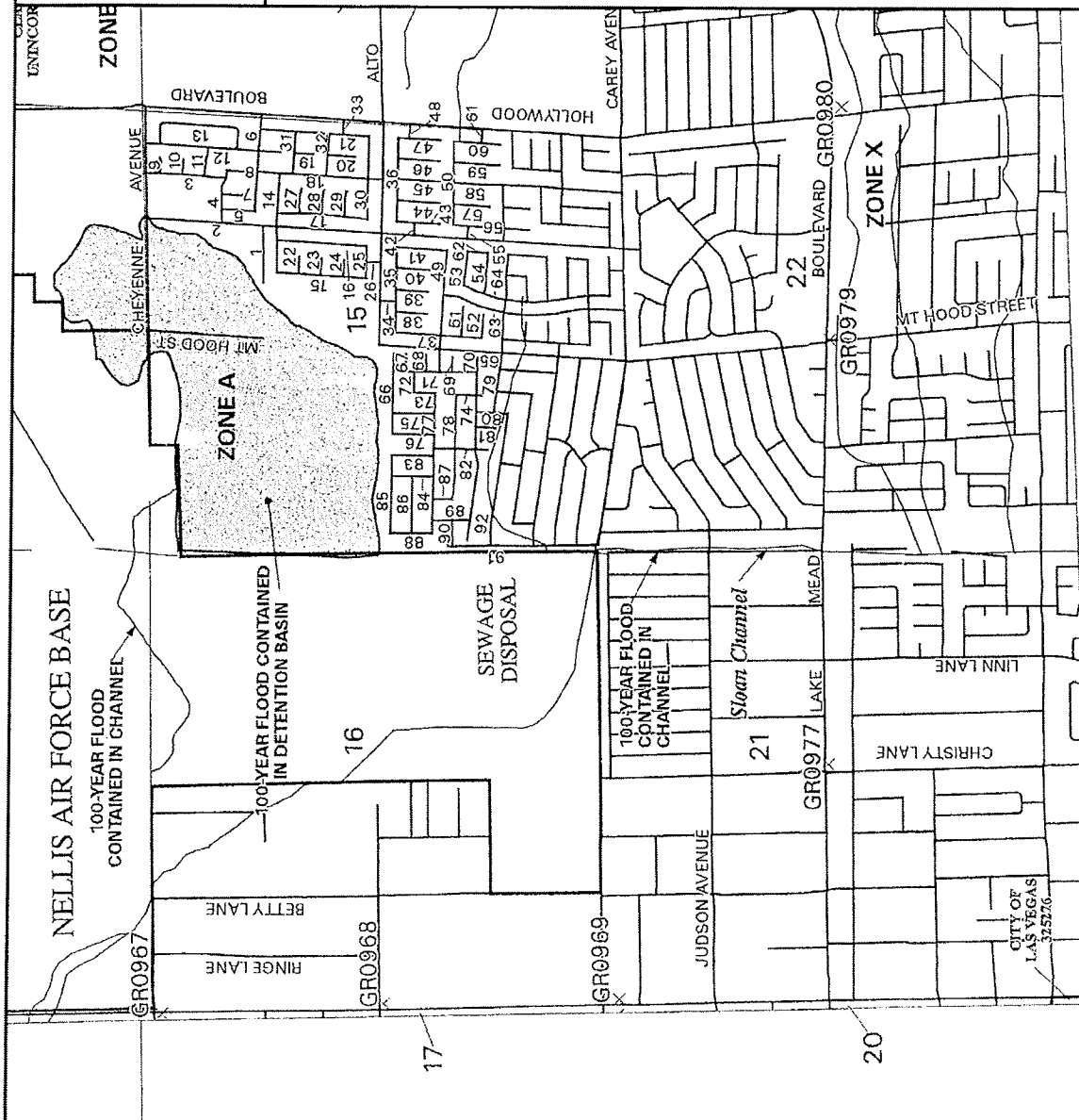
MAP NUMBER
32003C2200 E



MAP REVISED:
SEPTEMBER 27, 2002

Federal Emergency Management Agency

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





Map Scale 1:572 if printed on A size (8.5" x 11") sheet

A vertical scale bar labeled "Meters" with markings from 0 to 5. The bar is oriented vertically, with 0 at the bottom and 5 at the top. Major markings are at every integer, and minor markings are at every half-integer.

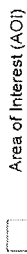
Age Group	Mean Number of Correct Responses
0-5	~10
5-10	~20
10-20	~40
20-30	~60
30-40	~170



Hydrologic Soil Group—Las Vegas Valley Area, Nevada, Part of Clark County (USED CAR LOT)

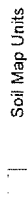
MAP LEGEND

Area of Interest (AOI)



Area of Interest (AOI)

Soils



Soil Map Units

Soil Ratings



A



A/D



B



B/D



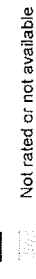
C



C/D



D



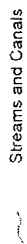
Not rated or not available

Political Features



Cities

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

MAP INFORMATION

Map Scale: 1:572 if printed on A size (8.5" x 11") sheet.

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

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

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

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

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>

Coordinate System: UTM Zone 11N NAD83

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

Soil Survey Area: Las Vegas Valley Area, Nevada, Part of Clark County

Survey Area Data: Version 7, Jul 18, 2011

Date(s) aerial images were photographed: 5/25/2006

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Las Vegas Valley Area, Nevada, Part of Clark County (NV788)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
200	Glencarb silt loam	C	0.8	100.0%
Totals for Area of Interest			0.8	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

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

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

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

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

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

HYDROLOGIC PARAMETERS

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

PROJECT # : 104111014.01
FILE : STDfrm4.XLS

DEVELOPMENT : USED CAR LOT
CALCULATED BY: JKN

DATE : 12/12/11

Sub-Basin Data				Initial/Overland Time (T _i)				Travel Time (T _t)					T _c	T _c Check (Urbanized Basins)		Final T _c	T _{lag}	Remarks
DESIG (1)	CN (2)	K (3)	AREA (acres) (4)	AREA (mi^2) (5)	LENGTH (ft) (6)	SLOPE (%) (7)	T _i (min) (8)	LENGTH (ft) (9)	SLOPE (%) (10)	V ₁ (fps) (11)	V ₂ (fps) (12)	T _t (min) (13)	T _c =T _i +T _t (min) (14)	TOTAL (ft) (15)	T _c (min) (16)	T _c (min) (17)	T _{lag} (hrs) (18)	Remarks (19)
EXISTING BASINS																		
EON1	85	0.732	0.7	0.0011	45	0.6	5.3	307	0.3	0.80	N/A	6.4	11.7	N/A	N/A	11.7	0.117	Existing
EOFF1	85	0.732	0.0	0.0000	10	30.0	0.7	46	6.5	3.77	N/A	0.2	0.9	N/A	N/A	0.9	0.100	Existing
STR1	98	0.904	0.1	0.0002	48	2.0	1.9	105	0.7	1.69	N/A	1.0	3.0	153.0	10.9	3.0	0.050	Developed
PROPOSED BASINS																		
PON1	98	0.904	0.7	0.0011	45	1.0	2.4	307	1.0	2.02	N/A	2.5	4.9	352.0	12.0	4.9	0.050	Developed

T _i =(1.8(1.1-K)L ^{0.5})/(S ^{0.5})	T _c =T _i +T _t	K=0.0132(CN) ^{-0.39}	T _{lag} = 0.6T _c	For the travel time (T _t) calculations, V ₁ applies to the first 500 feet of travel distance; V ₂ applies to the remaining travel distance.	Travel Time Velocity Formulas		All basins over one square mile are calculated by the equation T _{lag} =20Kn(L ^{0.5} /S ^{0.5}) ^{0.33} and denoted by shaded gray (See Worksheet).
					Existing V ₁ = 14.8*(S/100) ^{0.5} V ₂ = 29.4*(S/100) ^{0.5}	Developed V ₁ = 20.2*(S/100) ^{0.5} V ₂ = 30.6*(S/100) ^{0.5}	

REFERENCE:

STANDARD FORM 4

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.....
* FLOOD HYDROGRAPH PACKAGE [HEC 1]
*   JUN 1998
*   VERSION 4.1
*
* RUN DATE 13DEC11 TIME 10:51:23
*
.....

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

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

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

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

1

HEC-1 INPUT

PAGE 1

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LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
          *DIAGRAM
1         ID      PREPARED BY CIVILWORKSINC
2         ID      USED CAR LOT - TDS - EXISTING CONDITIONS
3         ID      HEC-1 ANALYSIS TO DETERMINE 100-YEAR FLOWS
4         ID      12DEC11 BY JENNIFER K. NUESCA, E.I.
5         ID      FILE: 11014PR.DAT
          *
6         IT      5      0      0
7         IO      5      0      0
8         IN      5      0      0
9         JR      PREC   0.60   1.00

10        KK      EON1
11        KM      ON-SITE BASIN
12        BA      .0011
13        PC      .000   .020   .057   .070   .087   .108   .124   .130   .130   .130
14        PC      .130   .130   .130   .133   .140   .142   .148   .158   .172   .181
15        PC      .190   .197   .199   .200   .201   .204   .214   .229   .241   .249
16        PC      .251   .256   .270   .278   .281   .283   .295   .322   .352   .409
17        PC      .499   .590   .710   .744   .781   .812   .819   .835   .851   .856
18        PC      .860   .868   .878   .888   .910   .926   .937   .950   .970   .976
19        PC      .982   .985   .987   .989   .990   .993   .993   .994   .995   .998
20        PC      .998   .999   1.000
21        PB      2.86
22        LS      0      85
23        UD      .117

24        KK      EOFF1
25        KM      OFF-SITE BASIN
26        BA      .0001
27        LS      0      85
28        UD      .100

29        KK      STR1
30        KM      STREET BASIN
31        BA      .0002
32        LS      0      98
33        UD      .050
34        ZZ

```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```

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

10      EON1
.
.
24      EOFF1
.
.
29      STR1

```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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.....
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*

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* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 13DEC11 TIME 10:51:23 *
* *****

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

```

PREPARED BY CIVILWORKSINC
 USED CAR LOT - TDS - EXISTING CONDITIONS
 HEC-1 ANALYSIS TO DETERMINE 100-YEAR FLOWS
 12DEC11 BY JENNIFER K. NUESCA, E.I.
 FILE: 11014PR.DAT

7 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 101 NUMBER OF HYDROGRAPH ORDINATES
 NDDATE 1 0 ENDING DATE
 NDTIME 0820 ENDING TIME
 ICENT 19 CENTURY MARK

COMPUTATION INTERVAL .08 HOURS
 TOTAL TIME BASE 8.33 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
 .60 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
				.60	1.00
HYDROGRAPH AT					
+	EON1	.00	1 FLOW	1.	1.
			TIME	3.58	3.58
HYDROGRAPH AT					
+	EOFF1	.00	1 FLOW	0.	0.
			TIME	.00	.00
HYDROGRAPH AT					
+	STR1	.00	1 FLOW	0.	0.
			TIME	.00	.00

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

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.....
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1996 *
* VERSION 4.1 *
* RUN DATE 13DEC11 TIME 10:51:33 *
.....

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

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

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

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1

HEC-1 INPUT

PAGE 1

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LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
          *DIAGRAM
1         ID      PREPARED BY CIVILWORKSINC
2         ID      USED CAR LOT - TDS - PROPOSED CONDITIONS
3         ID      HEC-1 ANALYSIS TO DETERMINE 100-YEAR FLOWS
4         ID      12DEC11 BY JENNIFER K. NUESCA, E.I.
5         ID      FILE: 11014PR.DAT
          *
6         IT      5      0      0
7         IO      5      0      0
8         IN      5      0      0
9         JR      PREC   0.60   1.00

10        KK      PONI
11        KM      ON-SITE BASIN
12        BA      .0011
13        PC      .000   .020   .057   .070   .087   .108   .124   .130   .130   .130
14        PC      .130   .130   .130   .133   .140   .142   .148   .158   .172   .181
15        PC      .190   .197   .199   .200   .201   .204   .214   .229   .241   .249
16        PC      .251   .256   .270   .278   .281   .283   .295   .322   .352   .409
17        PC      .499   .590   .710   .744   .781   .812   .819   .835   .851   .856
18        PC      .860   .868   .878   .888   .910   .926   .937   .950   .970   .976
19        PC      .982   .985   .987   .989   .990   .993   .993   .994   .995   .998
20        PC      .998   .999   1.000
21        PB      2.86
22        LS      0      98
23        UD      .050

24        KK      EOFF1
25        KM      OFF-SITE BASIN
26        BA      .0001
27        LS      0      85
28        UD      .100

29        KK      STR1
30        KM      STREET BASIN
31        BA      .0002
32        LS      0      98
33        UD      .050
34        ZZ

```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```

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

10      PONI
.
.
24      EOFF1
.
.
29      STR1

```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1


```

* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
* RUN DATE 13DEC11 TIME 10:51:33
*
*****

```

```

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

```

PREPARED BY CIVILWORKS INC
 USED CAR LOT - TDS PROPOSED CONDITIONS
 HEC-1 ANALYSIS TO DETERMINE 100-YEAR FLOWS
 12DEC11 BY JENNIFER K. NUESCA, E.I.
 FILE: 11014PR.DAT

```

7 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        101 NUMBER OF HYDROGRAPH ORDINATES
          NDDATE    1 0 ENDING DATE
          NDTIME    0820 ENDING TIME
          ICENT     19 CENTURY MARK

```

COMPUTATION INTERVAL .09 HOURS
 TOTAL TIME BASE 8.33 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
          .60      1.00

```

1

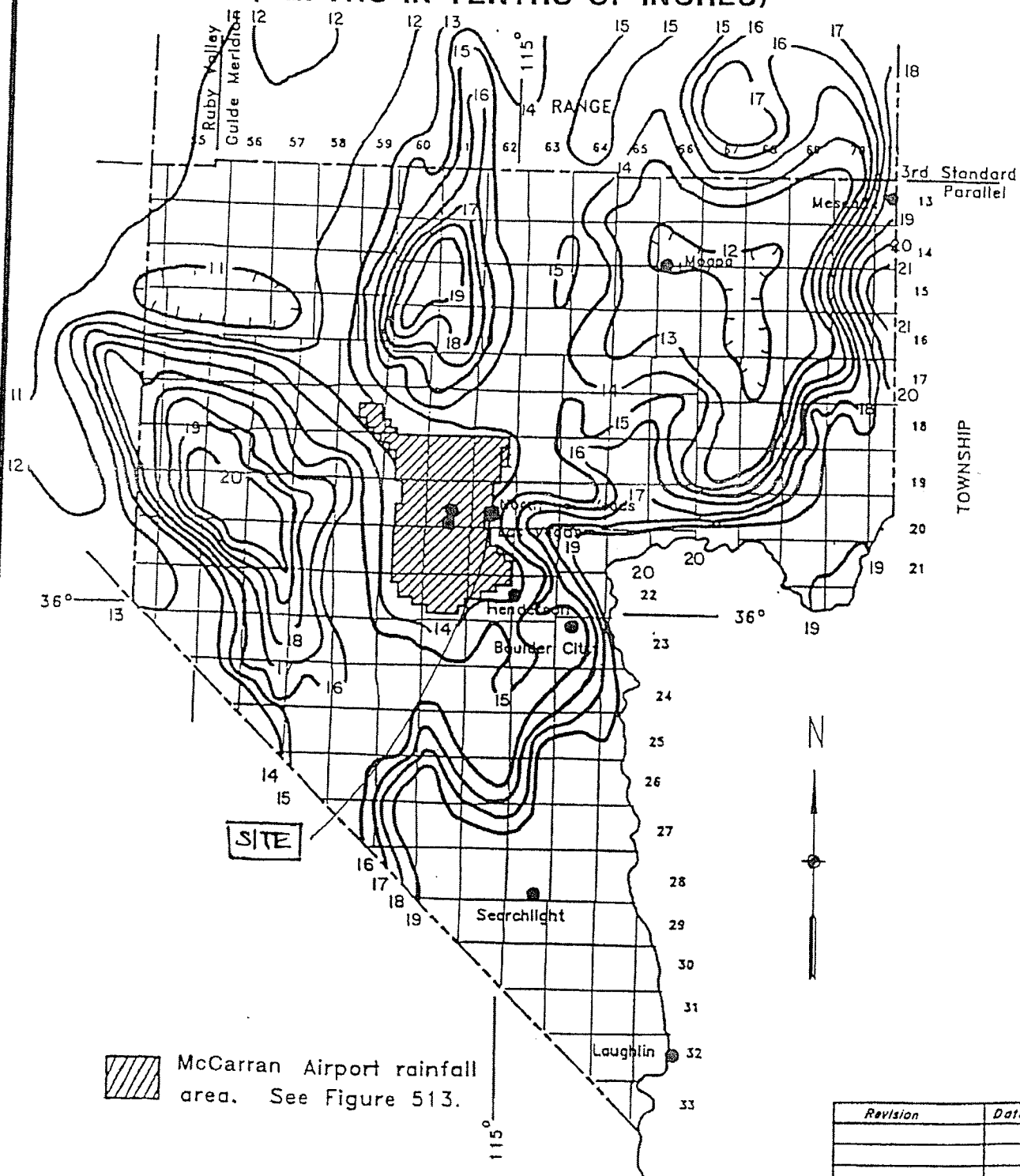
PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
 TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION	
				RATIO 1	RATIO 2
				.60	1.00
HYDROGRAPH AT					
+	PON1	.00	1 FLOW	2.	3.
			TIME	3.50	3.50
HYDROGRAPH AT					
+	EOFF1	.00	1 FLOW	0.	0.
			TIME	.00	.00
HYDROGRAPH AT					
+	STR1	.00	1 FLOW	0.	0.
			TIME	.00	.00

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

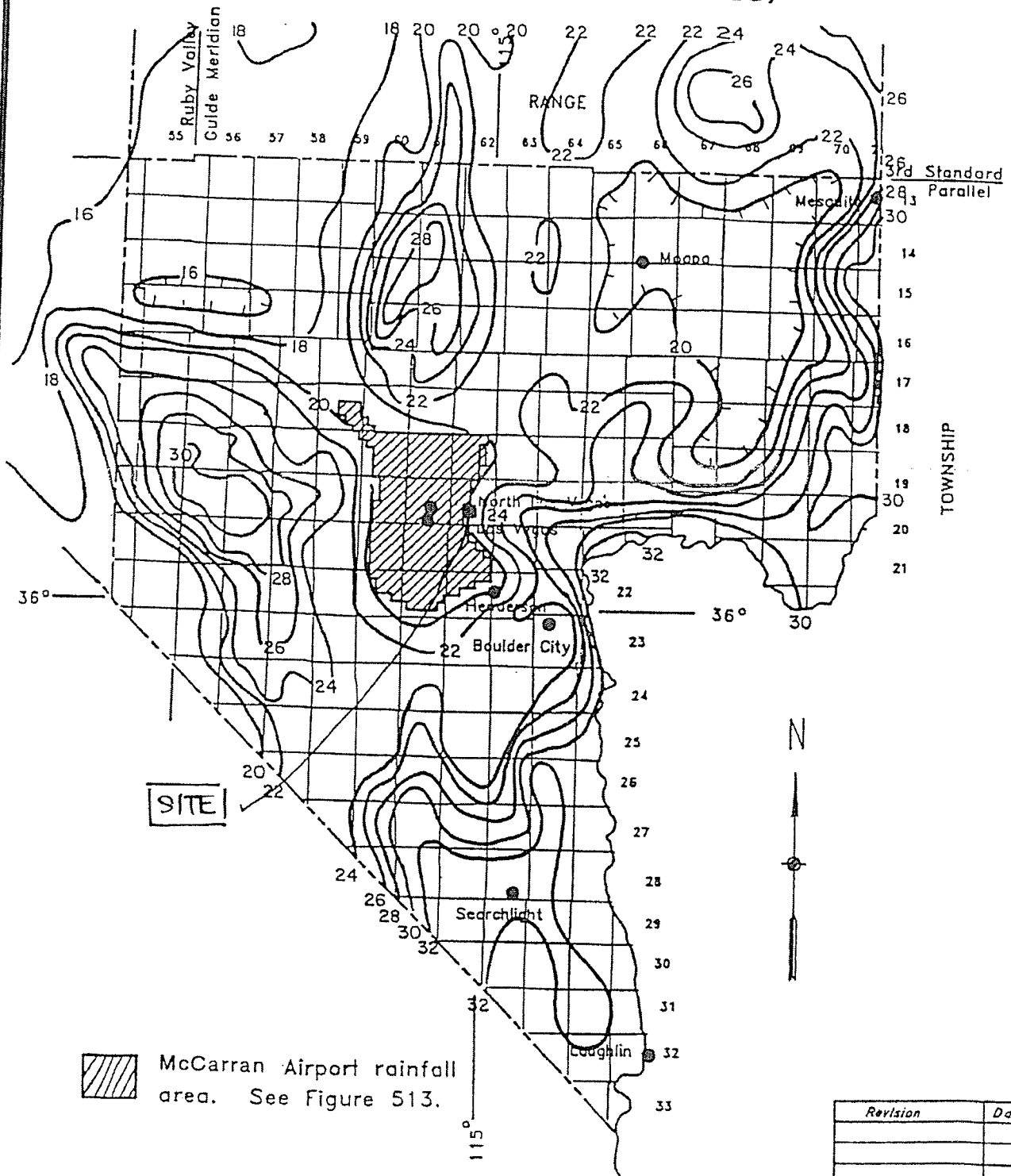
HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

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



HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

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



HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

PRECIPITATION ADJUSTMENT RATIOS

<u>Recurrence Interval</u>	<u>Ratio to NOAA Atlas 2</u>
2-year	1.00
5-year	1.16
10-year	<u>1.24</u>
25-year	1.33
50-year	1.39
100-year	<u>1.43</u>

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

<i>Revision</i>	<i>Date</i>

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

SIX-HOUR STORM DISTRIBUTIONS

Storm Time (In Minutes)	Percent of Total Storm Depth			Storm Time (In Minutes)	Percent of Total Storm Depth		
	SDN3	SDN4	SDN5		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 (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)*...		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 $I_p = 0.25$.
- 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

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

HYDRAULIC ANALYSES

NELLIS - 10YR
Worksheet for Irregular Channel

Project Description	
Project File	x:\2011 projects\104111014.01 phases 4-7 @ used car lot\08 - phase 2\tds\hydraulics\used
Worksheet	NELLIS - 10YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data				
Channel Slope	0.007000 ft/ft			
Elevation range: 0.00 ft to 1.90 ft.				
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	0.80	0.00	7.00	0.013
5.00	0.70	7.00	43.00	0.016
5.50	0.70	43.00	45.50	0.013
5.50	0.20	45.50	93.00	0.016
7.00	0.33	93.00	100.00	0.013
7.00	0.37			
43.00	1.40			
43.00	1.90			
45.50	1.90			
45.50	1.40			
93.00	0.17			
93.00	0.13			
94.50	0.00			
94.50	0.50			
95.00	0.50			
100.00	0.60			
Discharge	60.00	cfs		

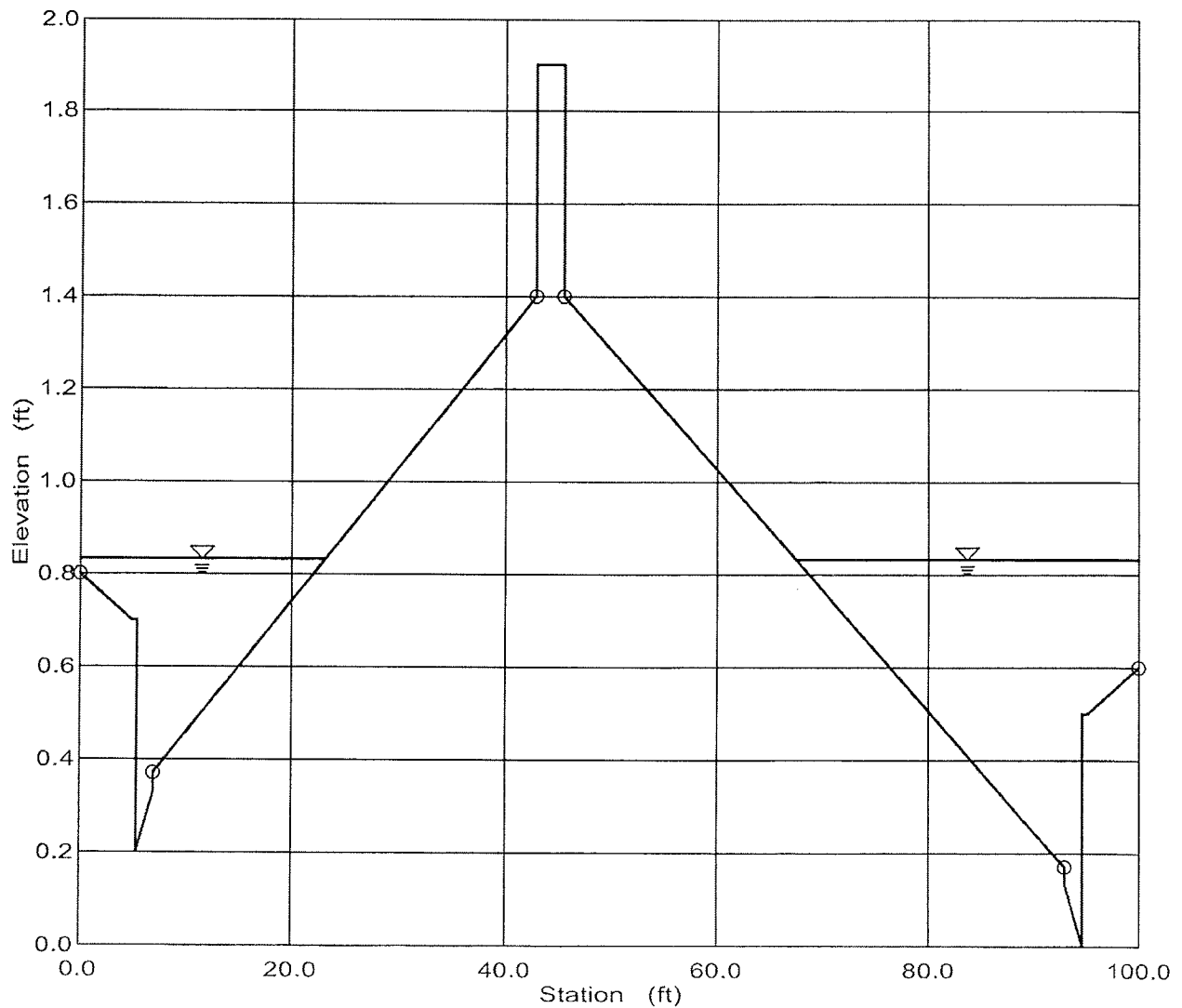
Results		
Wtd. Mannings Coefficient	0.015	
Water Surface Elevation	0.83	ft
Flow Area	16.39	ft ²
Wetted Perimeter	57.28	ft
Top Width	55.90	ft
Height	0.83	ft
Critical Depth	0.88	ft
Critical Slope	0.004835	ft/ft
Velocity	3.66	ft/s
Velocity Head	0.21	ft
Specific Energy	1.04	ft
Froude Number	1.19	
Flow is supercritical.		
Flow is divided.		
Water elevation exceeds lowest end station by 0.23 ft.		

NELLIS - 10YR
Worksheet for Irregular Channel

NELLIS - 10YR
Cross Section for Irregular Channel

Project Description	
Project File	x:\2011 projects\104111014.01 phases 4-7 @ used car lot\08 - phase 2\tds\hydraulics\used
Worksheet	NELLIS - 10YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data	
Wtd. Mannings Coefficient	0.015
Channel Slope	0.007000 ft/ft
Water Surface Elevation	0.83 ft
Discharge	60.00 cfs



NELLIS - 100YR
Worksheet for Irregular Channel

Project Description	
Project File	x:\2011 projects\104111014.01 phases 4-7 @ used car lot\08 - phase 2\tds\hydraulics\used
Worksheet	NELLIS - 100YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data				
Channel Slope		0.007000 ft/ft		
Elevation range: 0.00 ft to 1.90 ft.				
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	0.80	0.00	7.00	0.013
5.00	0.70	7.00	43.00	0.016
5.50	0.70	43.00	45.50	0.013
5.50	0.20	45.50	93.00	0.016
7.00	0.33	93.00	100.00	0.013
7.00	0.37			
43.00	1.40			
43.00	1.90			
45.50	1.90			
45.50	1.40			
93.00	0.17			
93.00	0.13			
94.50	0.00			
94.50	0.50			
95.00	0.50			
100.00	0.60			
Discharge	165.00	cfs		

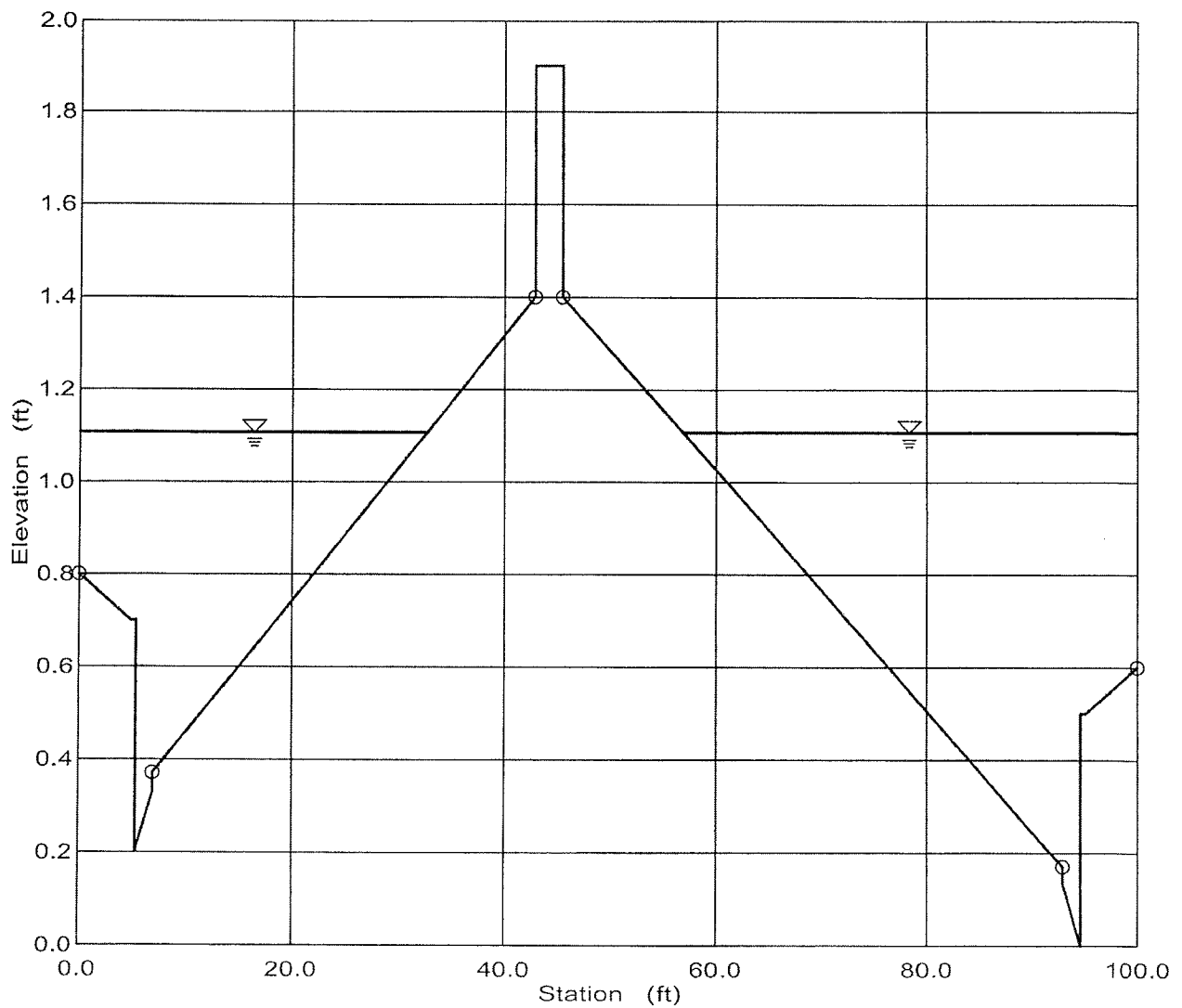
Results		
Wtd. Mannings Coefficient	0.015	
Water Surface Elevation	1.11	ft
Flow Area	34.28	ft ²
Wetted Perimeter	77.80	ft
Top Width	75.88	ft
Height	1.11	ft
Critical Depth	1.19	ft
Critical Slope	0.004263	ft/ft
Velocity	4.81	ft/s
Velocity Head	0.36	ft
Specific Energy	1.47	ft
Froude Number	1.26	
Flow is supercritical.		
Flow is divided.		
Water elevation exceeds lowest end station by 0.51 ft.		

NELLIS - 100YR
Worksheet for Irregular Channel

NELLIS - 100YR
Cross Section for Irregular Channel

Project Description	
Project File	x:\2011 projects\104111014.01 phases 4-7 @ used car lot\08 - phase 2\tds\hydraulics\used
Worksheet	NELLIS - 100YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data	
Wtd. Mannings Coefficient	0.015
Channel Slope	0.007000 ft/ft
Water Surface Elevation	1.11 ft
Discharge	165.00 cfs



REFERENCE MATERIALS



07-24/51
UPADD#1

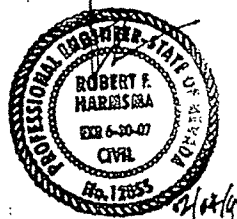
**UPDATE 1 Addendum 1
To the Technical Drainage Study
for the:**

NELLIS CROSSING

RENAMED TO:

**NELLIS AND OWENS
DAYCARE CENTER**

**Located at the SW corner of Nellis
Boulevard and Owens Avenue**



W.R.G. Project No. 3055114.00(GRU)

City of Las Vegas, Nevada

**A portion of the North (1/2) of the NE (1/4) of Section 29,
Township 20 South, Range 62 East, M.D.M.,
Clark County, Nevada**

Prepared for:

Grubb & Ellis
3800 Howard Hughes Pkwy, Suite 1220
Las Vegas, NV 89109



Department of Development Services Civil Engineering Division

500 S Grand Central Pky 1st Fl • Box 551799 • Las Vegas NV 89155-1799
(702) 455-4600 • Fax (702) 388-2550

Ronald L. Lynn, Building Official

June 5, 2007

WRG Inc.
3011 W. Horizon Ridge Parkway, Suite 100
Henderson, NV 89052

LTR
~~07-24151~~
07-24151

CLARK COUNTY Concurrence for Nellis/Owens Daycare
Study Updated: October 31, 2006
Update Addendum #1 Dated: December 4, 2006
Location: Southwest corner of Nellis Blvd and Owens Avenue
SEC29, T20S, R62E
H.T.E. # 07-24151 Concurrence with CLV# DS 4097B

The above-referenced project is located in the City of Las Vegas adjacent to Clark County south of Owens Avenue and west of Nellis Boulevard. The drainage study was submitted to the County for concurrence on May 17, 2007. The County has reviewed the Study and addenda. In addition, the County has received a copy of the acceptance letter from the City of Las Vegas, dated January 16, 2007. The County concurs with the acceptance of this drainage study by the City of Las Vegas. Please note that the County's review of this development is limited to drainage issues significant to Clark County unincorporated areas.

The County's review is solely based on the information submitted by the Engineer of Record. The County's review is strictly limited to compliance with minimum County Codes and Standards. The Engineer of Record is responsible for researching and addressing situations that may require designs above and beyond the minimum codes for issues of public safety and impacts to upstream, downstream and adjacent properties. The County assumes no liability for information data, designs or conclusions of the Engineer of Record.

DEPARTMENT OF DEVELOPMENT SERVICES

By

Glenn S. Hale, P. E.
Senior Civil Engineer
Civil Engineering Division

GSH/rmm

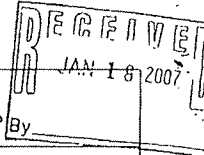
cc: Grubb & Ellis
Albert Sung P.E., City of Las Vegas Department of Public Works
Development File

BOARD OF COUNTY COMMISSIONERS
RORY REID, Chairman • CHIP MAXFIELD, Vice-Chairman
SUSAN BRAGER • TOM COLLINS • CHRIS GUINCHIGLIANI • LAWRENCE WEEKLY • BRUCE L. WOODBURY
VIRGINIA VALENTINE, P.E., County Manager

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM

DATE:

January 16, 2007



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:
Nellis and Owens Daycare Center

COPIES TO:
WRG Design Group

Cross Streets: SWC of Nellis Boulevard & Owens Avenue

Grubb & Ellis

File Number: F:\Depot\DSMemos\DS4097B.doc

Bart Anderson, P.E., DevCo

Parcel Number: 140-29-510-020 & -022

CCDDS

Zoning Action: ZON-9892; SDR-9893 & VAR-10104

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	11/1/2006	11/15/2006	Not Approved	\$400.00	56816: \$400
2 nd Submittal	12/4/2006 & 1/12/2007	1/16/2007	See Comments Below	\$400.00	58803: \$400
TOTAL FEES (LDDRS):				\$800.00	—

REMARKS:

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

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

1. The site is adjacent to the jurisdiction of the County of Clark to the north of Owens Avenue. The engineer must coordinate with Clark County Department of Development Services (CCDDS) and incorporate any concerns for boundary conditions along the northern border. CCDDS concurrence is required prior to final acceptance of the study.
2. **Second request:** Cross section C/C-5 shows spacing between an existing wall and a proposed wall. Maintenance of the 4.5'-strip of land may be a potential problem. City of Las Vegas Planning's approval must be obtained prior to the final approval of the drainage study.
3. Cross section E/C-5 shows a 1'-land between a fence and a new wall. Obtain City of Las Vegas Planning approval prior to the final approval of the drainage study.

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.ny.gov/bwpc/storm01.htm> or call (775) 687-9429.

END OF REMARKS
ays

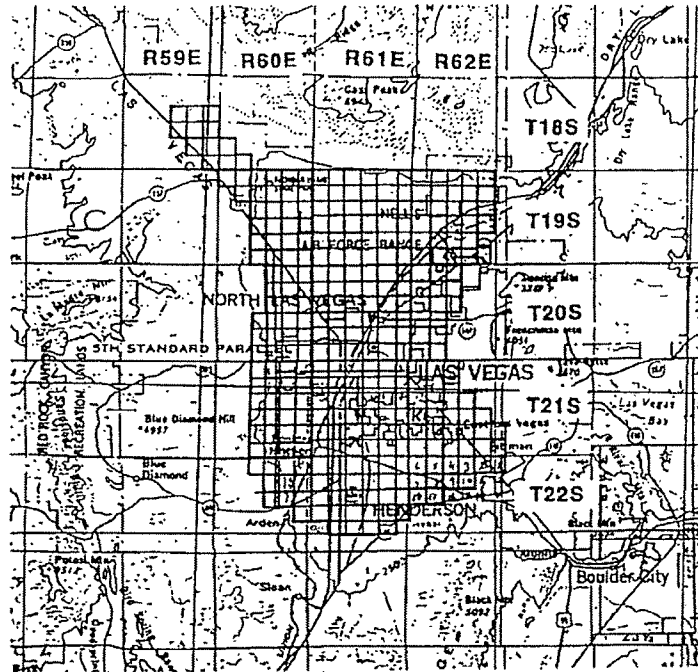
T/R/S: T20S/R62E/29
AREA N-29

APPENDIX B

HEC 1 INPUT PARAMETERS

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

WRG
ENGINEERING

REFERENCE:

USACE, Los Angeles District 1988

TABLE 505

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS (SEMIARID RANGELANDS¹)

Cover description	Hydrologic condition ²	Curve numbers for hydrologic soil group--			
		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 $I_a = 0.25$.

²/Poor: < 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 ¹	A	B	C	D
<i>Fully developed urban areas (vegetation established)</i>					
Open space (lawns, parks, golf courses, cemeteries, etc.): ²					
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)		63	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)⁵

77 86 91 94

- 1 Average runoff condition, and $I_p = 0.25$.
- 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 601.
- 3 CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space or wet type.
- 4 Composite CN's for natural desert landscaping should be computed using Figure 603 based on the impervious area percentage (CN #93) 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

WRC
ENGINEERING

REFERENCE:
SCS TR-55, USDA, June 1986.

TABLE 602
1 of 4

5114-Stdfrm4.XLS

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

WRG DESIGN, INC.
PROJECT NO. GRU 5114
FILE: STDfrm4.XLS

DEVELOPMENT: NELLIS AND OWENS RETAIL AND DAYCARE CENTER

CALCULATED BY: R. KELLER DATE: 1/19/2006

SUB-BASIN		INITIAL/OVERLAND TIME (t _i)			TRAVEL TIME (t _t)			CHECK (Urbanized Basins)	FINAL t _c	LAG TIME	Y			
Dist	CN	K	Area (ac)	Length (ft)	Slope (%)	t _i (min)	Length (ft)	Slope (%)	Velocity (ft/sec)	t _t (min)	Total Length (ft)	t _c (min)	t _c (min)	t _c (min)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
EXISTING														
EXIST	77.00	0.63	0.93	0.0015	70	0.50	8.99	130	0.55	2.18	1.0	200	9.98	0.100
DEVELOPED														
DEVELOP	97.00	0.82	0.43	0.0007	42	3.00	2.23	103	1.18	3.32	0.5	145	10.81	2.75
DEVELOP	97.00	0.82	0.49	0.0008	32	1.64	2.38	144	1.00	3.06	0.8	176	10.98	3.16
Note 1: Drainage Basin is greater than 1.0 square mile, so T _{LAG} = 20K _s [(L/L _c) ^{0.5}] ^{0.33} was used.														
$t_i = \frac{1.8(1.1-K)L}{S^{1/2}}$ $t_t = \frac{L}{60 \times V}$ $t_c = t_i + t_t$ $t_c = 0.6 \times t_c / 60$														
REFERENCE: STANDARD FORM 4														

WRG Design Inc.

FINAL

Page 1

APPENDIX C

EXISTING CONDITION HEC-1 ANALYSIS

FILE: NELLIS & OWENS RETAIL AND DAYCARE CENTER
DESCRIPTION: EXISTING HEC-1

HEC1 S/M: 1343003909 HWVersion: 6.33 Data File: D:\Temp\--vsh2603.TMP

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*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*   MAY 1991                       *
*   VERSION 4.0.1C                 *
* RUN DATE 01/16/2006 TIME 17:11:16 *
*****
```

```
*****
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET            *
* DAVIS, CALIFORNIA 95616      *
* (916) 755-1104               *
*****
```

```

X X XXXXXX XXXX X
X X X X X XX
X X X X X X
XXXXXX XXXX X XXXX X
X X X X X X
X X X X X X
X X XXXXXX XXXX XXX

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!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!! Full Microcomputer Implementation !!!
!!! by !!!
!!! Haestad Methods, Inc. !!!
!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

```

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

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1G5, HEC1DB, AND HEC1AW.
 THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSKA- 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 AMP1 INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

FILE: NELLIS & OWENS RETAIL AND DAYCARE CENTER
DESCRIPTION: EXISTING HEC-1

HEC-1 INPUT

PAGE 1

LINE	10	20	30	40	50	60	70	80	90	100
1	ID	EXISTING CONDITION								
2	IT	5	300							
3	IO	5	0							
4	JR	PREC	0.57	1						
5	KX	EX	1							
6	KM	EXISTING BASIN SITE								
7	KO	22								
8	KA	.0015								
9	KB	2.77								
10	PC	0	.02	.057	.07	.087	.108	.124	.13	.13
11	PC	.13	.13	.13	.133	.14	.142	.148	.158	.172
12	PC	.19	.197	.199	.20	.201	.204	.214	.229	.241
13	PC	.251	.256	.27	.278	.281	.283	.295	.322	.352
14	PC	.499	.590	.71	.744	.781	.812	.819	.835	.851
15	PC	.86	.868	.878	.888	.91	.928	.937	.95	.97
16	PC	.982	.985	.987	.989	.99	.993	.993	.994	.995
17	PC	.998	.999	1.0						
18	LS	77								
19	UD	.100								
20	IZ									

1/16/2006

Page 2 of 4

FILE: NELLIS & OWENS RETAIL AND DAYCARE CENTER
DESCRIPTION: EXISTING HEC-1

HEC1 S/N: 1343001009 HWVersion: 6.53 Data File: D:\Temp\rbh2003.TMP

```
*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* MAT 1991 *
* VERSION 4.0.1E *
* RUN DATE 01/16/2006 TIME 17:11:16 *
*****
```

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

EXISTING CONDITION

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

17 HYDROGRAPH TIME DATA
   NMIN 5 MINUTES IN COMPUTATION INTERVAL
   IDATE 1 0 STARTING DATE
   ITIME 0000 STARTING TIME
   INO 300 NUMBER OF HYDROGRAPH ORDINATES
   MDATE 2 0 ENDING DATE
   MTIME 0055 ENDING TIME
   ICENT 19 CENTURY MARK

COMPUTATION INTERVAL 0.08 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
   MPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
   RATIOS OF PRECIPITATION
   0.57 1.00
```

```
*****
* EX 1 *
*****
```

```
7 KO OUTPUT CONTROL VARIABLES
   IPRNT 5 PRINT CONTROL
   IPLOT 0 PLOT CONTROL
   QSCAL 0. HYDROGRAPH PLOT SCALE
   IPNCH 0 PUNCH COMPUTED HYDROGRAPH
   IDUT 22 SAVE HYDROGRAPH ON THIS UNIT
   ISAY1 1 FIRST ORDINATE PUNCHED OR SAVED
   ISAY2 300 LAST ORDINATE PUNCHED OR SAVED
   TIMINT 0.083 TIME INTERVAL IN HOURS
```

1/16/2006

Page 3 of 4

FILE: NELLIS & OWENS RETAIL AND DAYCARE CENTER
DESCRIPTION: EXISTING HEC-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
				0.57	1.00
HYDROGRAPH AT	EX 1	0.00	1	0.	1.
				3.58	3.58

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

1/16/2006

Page 4 of 4

APPENDIX D

PROPOSED CONDITION HEC 1 ANALYSIS

**FILE: NELLIS & OWENS RETAIL AND DAYCARE CENTER
DESCRIPTION: DEVELOPED HEC-1**

HEC1 S/W: 1343001909 HWVersion: 6.33 Data File: D:\Temp\~vbi01A.TMP

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*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* MAY 1991 *
* VERSION 4.0.1E *
* RUN DATE 01/17/2006 TIME 09:12:32 *
*****
```

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

```

X I XXXXX XXXI X
X I X X X XI
X I X X X I
XXXXX XXX X XXXX X
X X X X X X
X X X X X X
X X XXXXX XXXI XXX

```

```

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

```

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

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1G, HEC1B, AND HEC1K.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -ANSKK- ON RX-CARD WAS CHANGED WITH REVISIONS DATED 20 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

FILE: NELLIS & OWENS RETAIL AND DAYCARE CENTER
DESCRIPTION: DEVELOPED HEC-1

HEC-1 INPUT

PAGE 1

LINE	ID	1	2	3	4	5	6	7	8	9	10	
1	ID	DEVELOPED CONDITION										
2	IT	5				300						
3	IO	5	0									
4	JR	PREC	0.57	1								
5	XX	DN 1										
6	KM	ON SITE BASIN ON 1										
7	KO						.22					
8	BA	.0007										
9	PB	2.77										
10	PC	0	.02	.057	.07	.087	.108	.124	.13	.13	.13	
11	PC	.13	.13	.13	.133	.14	.142	.148	.158	.172	.181	
12	PC	.19	.197	.199	.20	.201	.204	.214	.229	.241	.249	
13	PC	.251	.256	.27	.278	.281	.283	.295	.322	.352	.409	
14	PC	.499	.590	.71	.744	.781	.812	.819	.835	.851	.856	
15	PC	.86	.868	.876	.888	.91	.926	.937	.95	.97	.976	
16	PC	.982	.985	.987	.989	.99	.993	.993	.994	.995	.998	
17	PC	.998	.999	1.0								
18	LS		.05									
19	UD											
20	XX	DN 2										
21	KM	ON SITE BASIN ON 2										
22	KO						.22					
23	BA	.0008										
24	PB	2.77										
25	PC	0	.02	.057	.07	.087	.108	.124	.13	.13	.13	
26	PC	.13	.13	.13	.133	.14	.142	.148	.158	.172	.181	
27	PC	.19	.197	.199	.20	.201	.204	.214	.229	.241	.249	
28	PC	.251	.256	.27	.278	.281	.283	.295	.322	.352	.409	
29	PC	.499	.590	.71	.744	.781	.812	.819	.835	.851	.856	
30	PC	.86	.868	.876	.888	.91	.926	.937	.95	.97	.976	
31	PC	.982	.985	.987	.989	.99	.993	.993	.994	.995	.998	
32	PC	.998	.999	1.0								
33	LS		.05									
34	UD											
35	XX	C 1										
36	KM	DEVELOPED SITE RUNOFF										
37	KO						.22					
38	HC	2										
39	ZZ											

HEC1 5/N: 1343001909 HWVersion: 6.33 Data File: D:\Yexp\vbh101A.TMP

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

```

3 10      OUTPUT CONTROL VARIABLES
          IPKNT          5 PRINT CONTROL
          IPILOT        0 PLOT CONTROL
          QSCAL         0. HYDROGRAPH PLOT SCALE

IT        HYDROGRAPH TIME DATA
          MINH          5 MINUTES IN COMPUTATION INTERVAL
          IDATE         1 0 STARTING DATE
          ITIME         0000 STARTING TIME
          INQ           300 NUMBER OF HYDROGRAPH ORDINATES
          MDATE         2 0 ENDING DATE
          NDATE         0055 ENDING TIME
          ICENT         19 CENTURY MARK

          COMPUTATION INTERVAL 0.08 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
          MPLAN         1 NUMBER OF PLANS

JR        MULTI-RATIO OPTION
          RATIOS OF PRECIPITATION
          0.57         1.00

```

◆◆◆ 200 204 206 210 212 214 216 218 220 222 224 226 228 230 232 234 236 238 240 242 244 246 248 250 252 254 256 258 260 262 264 266 268 270 272 274 276 278 280 282 284 286 288 290 292 294 296 298 300 302 304 306 308 310 312 314 316 318 320 322 324 326 328 330 332 334 336 338 340 342 344 346 348 350 352 354 356 358 360 362 364 366 368 370 372 374 376 378 380 382 384 386 388 390 392 394 396 398 400 402 404 406 408 410 412 414 416 418 420 422 424 426 428 430 432 434 436 438 440 442 444 446 448 450 452 454 456 458 460 462 464 466 468 470 472 474 476 478 480 482 484 486 488 490 492 494 496 498 500 502 504 506 508 510 512 514 516 518 520 522 524 526 528 530 532 534 536 538 540 542 544 546 548 550 552 554 556 558 560 562 564 566 568 570 572 574 576 578 580 582 584 586 588 590 592 594 596 598 600 602 604 606 608 610 612 614 616 618 620 622 624 626 628 630 632 634 636 638 640 642 644 646 648 650 652 654 656 658 660 662 664 666 668 670 672 674 676 678 680 682 684 686 688 690 692 694 696 698 700 702 704 706 708 710 712 714 716 718 720 722 724 726 728 730 732 734 736 738 740 742 744 746 748 750 752 754 756 758 760 762 764 766 768 770 772 774 776 778 780 782 784 786 788 790 792 794 796 798 800 802 804 806 808 810 812 814 816 818 820 822 824 826 828 830 832 834 836 838 840 842 844 846 848 850 852 854 856 858 860 862 864 866 868 870 872 874 876 878 880 882 884 886 888 890 892 894 896 898 900 902 904 906 908 910 912 914 916 918 920 922 924 926 928 930 932 934 936 938 940 942 944 946 948 950 952 954 956 958 960 962 964 966 968 970 972 974 976 978 980 982 984 986 988 990 992 994 996 998 1000

7 KO		OUTPUT CONTROL VARIABLES	
IPRINT	5	PRINT CONTROL	
IPILOT	0	PLOT CONTROL	
QSCALE	0.	HYDROGRAPH PLOT SCALE	
IPUNCH	0	PUNCH COMPUTED HYDROGRAPH	
IOUT	22	SAYE HYDROGRAPH ON THIS UNIT	
ISAY1	1	FIRST ORDINATE PUNCHED OR SAYED	
ISAY2	300	LAST ORDINATE PUNCHED OR SAYED	
TIMEINT	0.083	TIME INTERVAL IN HOURS	

[illegible]

FILE: NELLIS & OWENS RETAIL AND DAYCARE CENTER
DESCRIPTION: DEVELOPED HEC-1

```
*****
*                               *
* 20 KK      ON 2              *
*                               *
*****
```

```
22 XD      OUTPUT CONTROL VARIABLES
          IPRINT      5  PRINT CONTROL
          IPLOT       0  PLOT CONTROL
          QSCAL       0. HYDROGRAPH PLOT SCALE
          IPWCH       0  PUNCH COMPUTED HYDROGRAPH
          IOUT        22  SAVE HYDROGRAPH ON THIS UNIT
          ISAV1       1  FIRST ORDINATE PUNCHED OR SAVED
          ISAV2      300  LAST ORDINATE PUNCHED OR SAVED
          TIMINT      0.083 TIME INTERVAL IN HOURS
```

*** END ***

```
*****
*                               *
* 35 KK      C 1              *
*                               *
*****
```

```
37 XD      OUTPUT CONTROL VARIABLES
          IPRINT      5  PRINT CONTROL
          IPLOT       0  PLOT CONTROL
          QSCAL       0. HYDROGRAPH PLOT SCALE
          IPWCH       0  PUNCH COMPUTED HYDROGRAPH
          IOUT        22  SAVE HYDROGRAPH ON THIS UNIT
          ISAV1       1  FIRST ORDINATE PUNCHED OR SAVED
          ISAV2      300  LAST ORDINATE PUNCHED OR SAVED
          TIMINT      0.083 TIME INTERVAL IN HOURS
```

FILE: NELLIS & OWENS RETAIL AND DAYCARE CENTER
DESCRIPTION: DEVELOPED HEC-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 0.57	RATIO 2 1.00
HYDROGRAPH AT	DN 1	0.00	1 FLOW TIME	1. 3.50	1. 3.50
HYDROGRAPH AT	DN 2	0.00	1 FLOW TIME	1. 3.50	2. 3.50
2 COMBINED AT	C 1	0.00	1 FLOW TIME	1. 3.50	3. 3.50

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



APPENDIX E

STREET FLOW CALCULATIONS

SECTION 1 - OWENS AVE. - 10-YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION 1 - OWENS - FULL ST - 10-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.500 %
Discharge	15.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Manning's Coefficient	0.014
Water Surface Elevation	0.49 ft
Elevation Range	0.00 to 1.48
Flow Area	6.5 ft ²
Wetted Perimeter	38.37 ft
Top Width	35.29 ft
Actual Depth	0.49 ft
Critical Elevation	0.48 ft
Critical Slope	0.561 %
Velocity	2.31 ft/s
Velocity Head	0.08 ft
Specific Energy	0.57 ft
Froude Number	0.95
Flow Type	Subcritical

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Manning's Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+93.00	0.018
0+93.00	1+00.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.60
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+40.00	0.83
0+40.00	1.25

Title: 3055114
J:\data\gru5114\drain\flowmaster\proposed.fm2
01/18/06 03:37:39 PM © Haestad Methods, Inc

WRG Design Inc
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1886

Project Engineer: R. KELLER
FlowMaster v6.1 [814c]
Page 1 of 2

SECTION 1 - OWENS AVE. - 10-YEAR
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+45.00	1.48
0+45.00	1.13
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.80

Title: 3055114
j:\data\gru5114\drain\flowmaster\proposed.fm2
01/19/08 03:37:39 PM

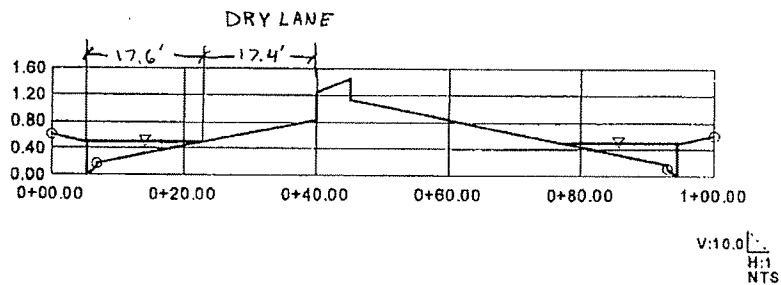
WRG Design Inc
© Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 USA (203) 755-1888

Project Engineer: R. KELLER
FlowMaster v6.1 [6140]
Page 2 of 2

SECTION 1 - OWENS AVE Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION 1 - OWENS - FULL ST - 10-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.014
Slope	0.500 %
Water Surface Elevation	0.40 ft
Elevation Range	0.00 to 1.46
Discharge	15.00 cfs



SECTION 1 - OWENS AVE. - 100-YR Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION 1 - OWENS - FULL ST - 100-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.500 %
Discharge	100.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.015
Water Surface Elevation	0.85 ft
Elevation Range	0.00 to 1.48
Flow Area	29.2 ft ²
Wetted Perimeter	82.79 ft
Top Width	81.15 ft
Actual Depth	0.85 ft
Critical Elevation	0.85 ft
Critical Slope	0.491 %
Velocity	3.43 ft/s
Velocity Head	0.18 ft
Specific Energy	1.03 ft
Froude Number	1.01
Flow Type	Supercritical

Calculation Messages:
Flow is divided.
Water elevation exceeds lowest end station by 0.2521032 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+83.00	0.018
0+83.00	1+00.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+40.00	0.83

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Project Engineer: R. KELLER
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Page 1 of 2

SECTION 1 - OWENS AVE. - 100-YR
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+40.00	1.25
0+45.00	1.48
0+45.00	1.13
0+83.00	0.17
0+83.00	0.13
0+84.50	0.00
0+84.50	0.50
0+85.00	0.50
1+00.00	0.80

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Project Engineer: R. KELLER

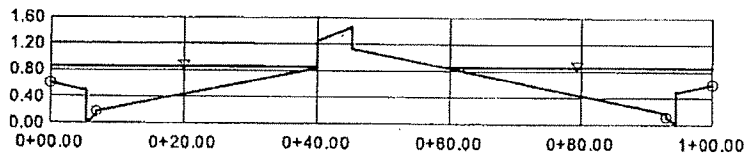
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Page 2 of 2

SECTION 1 OWENS AVE Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION 1 - OWENS - FULL ST - 100-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.015
Slope	0.500 %
Water Surface Elevation	0.85 ft
Elevation Range	0.00 to 1.40
Discharge	100.00 cfs



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Page 1 of 1

SECTION 2 - NELLIS BLVD - 10-YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION 2 - NELLIS - FULL ST - 10-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.500 %
Discharge	68.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Manning's Coefficient	0.016
Water Surface Elevation	0.70 ft
Elevation Range	0.00 to 1.25
Flow Area	20.9 ft²
Wetted Perimeter	80.37 ft
Top Width	79.07 ft
Actual Depth	0.70 ft
Critical Elevation	0.69 ft
Critical Slope	0.555 %
Velocity	2.78 ft/s
Velocity Head	0.12 ft
Specific Energy	0.82 ft
Froude Number	0.95
Flow Type	Subcritical

Calculation Messages:
Flow is divided.
Water elevation exceeds lowest end station by 0.88590039e-1 ft.

Roughness Segments		
Start Station	End Station	Manning's Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+93.00	0.016
0+93.00	1+00.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.50
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+40.00	0.83

**SECTION 2 - NELLIS BLVD - 10-YEAR
Worksheet for Irregular Channel**

Natural Channel Points	
Station (ft)	Elevation (ft)
0+40.00	1.25
0+45.00	1.25
0+45.00	0.83
0+83.00	0.17
0+83.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.80

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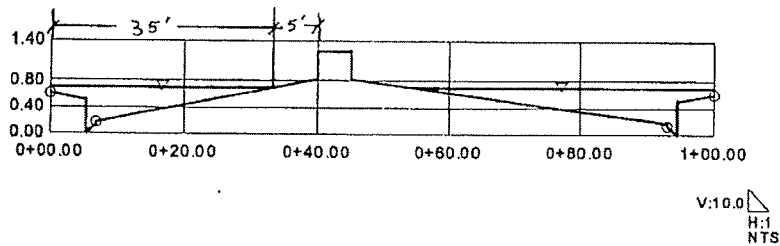
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Page 2 of 2

SECTION 2 - NELLIS BLVD Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION 2 - NELLIS - FULL ST - 10-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.015
Slope	0.500 %
Water Surface Elevation	0.70 ft
Elevation Range	0.00 to 1.25
Discharge	58.00 cfs



SECTION 2 - NELLIS BLVD - 100-YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION 2 - NELLIS - FULL ST - 100-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.500 %
Discharge	184.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.015
Water Surface Elevation	0.93 ft
Elevation Range	0.00 to 1.25
Flow Area	42.0 ft ²
Wetted Perimeter	98.98 ft
Top Width	95.00 ft
Actual Depth	0.93 ft
Critical Elevation	0.94 ft
Critical Slope	0.484 %
Velocity	3.80 ft/s
Velocity Head	0.24 ft
Specific Energy	1.17 ft
Froude Number	1.03
Flow Type	Supercritical

Calculation Messages:
Flow is divided.
Water elevation exceeds lowest end station by 0.33198421 ft.

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

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.80
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+40.00	0.83

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Page 1 of 2

**SECTION 2 - NELLIS BLVD - 100-YEAR
Worksheet for Irregular Channel**

Natural Channel Points	
Station (ft)	Elevation (ft)
0+40.00	1.25
0+45.00	1.25
0+45.00	0.83
0+83.00	0.17
0+83.00	0.13
0+84.50	0.00
0+84.50	0.50
0+85.00	0.50
1+00.00	0.60

Title: 3055114

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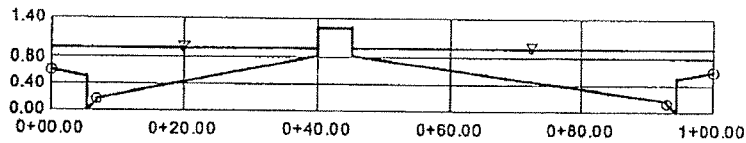
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Page 2 of 2

SECTION 2 - NELLIS BLVD Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION 2 - NELLIS - FULL ST - 100-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.015
Slope	0.500 %
Water Surface Elevation	0.93 ft
Elevation Range	0.00 to 1.25
Discharge	184.00 cfs



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SECTION 3 - ONSITE - 10-YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION 3 - 10-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	1.150 %
Discharge	1.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.016
Water Surface Elevation	0.10 ft
Elevation Range	0.00 to 1.22
Flow Area	0.7 ft ²
Wetted Perimeter	13.80 ft
Top Width	13.80 ft
Actual Depth	0.10 ft
Critical Elevation	0.11 ft
Critical Slope	0.890 %
Velocity	1.40 ft/s
Velocity Head	0.03 ft
Specific Energy	0.13 ft
Froude Number	1.09
Flow Type	Supercritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+42.50	0.016

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	1.22
0+00.00	0.72
0+24.00	0.00
0+42.00	0.18
0+42.00	0.68
0+42.50	0.68

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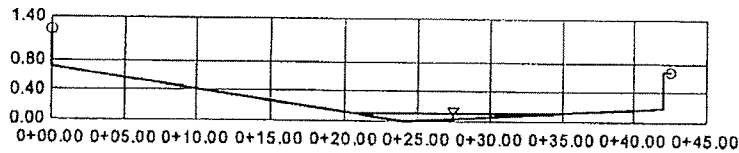
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 Page 1 of 1

SECTION 3 - ONSITE Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION 3 - 10-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Manning's Coefficient	0.016
Slope	1.180 %
Water Surface Elevation	0.10 ft
Elevation Range	0.00 to 1.22
Discharge	1.00 cfs



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SECTION 3 - ONSITE - 100-YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION 3 - 100-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	1.180 %
Discharge	1.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.016
Water Surface Elevation	0.10 ft
Elevation Range	0.00 to 1.22
Flow Area	0.7 ft ²
Wetted Perimeter	13.80 ft
Top Width	13.80 ft
Actual Depth	0.10 ft
Critical Elevation	0.11 ft
Critical Slope	0.990 %
Velocity	1.40 ft/s
Velocity Head	0.03 ft
Specific Energy	0.13 ft
Froude Number	1.09
Flow Type	Supercritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+42.50	0.016

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	1.22
0+00.00	0.72
0+24.00	0.00
0+42.00	0.18
0+42.00	0.68
0+42.50	0.88

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Project Engineer: R. KELLER

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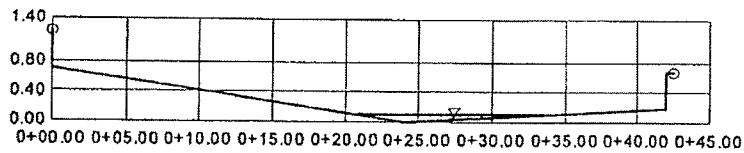
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Page 1 of 1

SECTION 3 - ONSITE Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION 3 - 100-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.016
Slope	1.180 %
Water Surface Elevation	0.10 ft
Elevation Range	0.00 to 1.22
Discharge	1.00 cfs



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SECTION 4 - ONSITE - 10-YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION 4 - 10-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	1.000 %
Discharge	1.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.016
Water Surface Elevation	0.37 ft
Elevation Range	0.25 to 1.22
Flow Area	0.7 ft ²
Wetted Perimeter	11.71 ft
Top Width	11.70 ft
Actual Depth	0.12 ft
Critical Elevation	0.37 ft
Critical Slope	0.850 %
Velocity	1.42 ft/s
Velocity Head	0.03 ft
Specific Energy	0.40 ft
Froude Number	1.02
Flow Type	Supercritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+45.50	0.016

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	1.22
0+00.00	0.72
0+33.00	0.25
0+45.00	0.69
0+45.00	1.19
0+45.50	1.19

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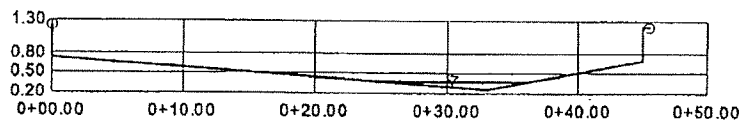
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Page 1 of 1

SECTION 4 - ONSITE Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION 4 - 10-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.018
Slope	1.000 %
Water Surface Elevation	0.37 ft
Elevation Range	0.25 to 1.22
Discharge	1.00 cfs



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SECTION 4 - ONSITE - 100 YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION 4 - 100-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	1.000 %
Discharge	2.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.016
Water Surface Elevation	0.41 ft
Elevation Range	0.25 to 1.22
Flow Area	1.2 ft ²
Wetted Perimeter	15.18 ft
Top Width	15.18 ft
Actual Depth	0.16 ft
Critical Elevation	0.41 ft
Critical Slope	0.886 %
Velocity	1.69 ft/s
Velocity Head	0.04 ft
Specific Energy	0.45 ft
Froude Number	1.07
Flow Type	Supercritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+45.50	0.016

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	1.22
0+00.00	0.72
0+33.00	0.25
0+45.00	0.69
0+45.00	1.19
0+45.50	1.19

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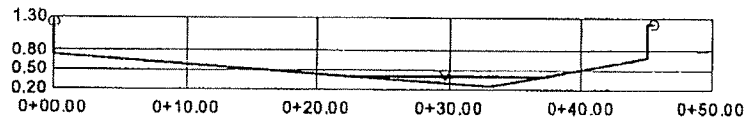
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Page 1 of 1

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SECTION 4 - ONSITE Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION 4 - 100-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.018
Slope	1.000 %
Water Surface Elevation	0.41 ft
Elevation Range	0.25 to 1.22
Discharge	2.00 cfs



V:5.0
H:1
NTS



Department of Public Works

500 S Grand Central Pky • Box 554000 • Las Vegas NV 89155-4000
(702) 455-6000 • Fax (702) 455-6040

Denis Cederburg, P.E., Director • E-Mail: dlc@ClarkCountyNV.gov

Drainage Study Approval Letter

Date: June 6, 2012
Firm: CivilWorks, Inc.
Engineer: Brandon A. Potts, P.E.
Address: 4945 W. Patrick Lane, Las Vegas, NV 89118
Phone: (702) 534-7555
Fax: (702) 534-1825
E-mail: jkn@civilworksonline.com

Subject: Technical Drainage Study for Used Car Lot
Location: SE of Nellis Boulevard and Owens Avenue
APN: 140-28-110-003
Sec, Township, Range: S28, T20S, R62E
Flood Zone & Panel: Zone X, 2185F, Revised November 16, 2011
Application Tracking #: 11-44701



Submittals	Date Received	Date Returned	Reviewer	Miscellaneous
Technical	12/13/2011	12/22/2011	WG	
Addendum #1	03/07/2012	03/19/2012	WG	
Supplement #1	05/21/2012	06/06/2012	WG	

Concurrence Required: (Must be obtained prior to permit issuance)		Reason Concurrence is required
	City of Henderson	Adjacent to or Impacts Henderson
X	City of Las Vegas	Adjacent to or Impacts Las Vegas
	City of North Las Vegas	Adjacent to or Impacts North Las Vegas
X	Nevada Department of Transportation	Adjacent to or Impacts NDOT Facility
	Union Pacific Rail Road	Adjacent to or Impacts a UPRR Facility
	US Army Corp of Engineers	Impacts a USACE Facility
X	Clark County Regional Flood Control District	Regional Significance, Adjacent to or Impacts CCRFCD MPU Facility or in a SFHA

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DONALD G. BURNETTE, County Manager

The referenced **Technical Drainage Study** has been reviewed and is accepted as complying with minimum improvement standards. As set forth in the subject drainage study, the following measures will be taken to mitigate flood hazards.

The site shall be graded with respect to drainage as shown on "Used Car Lot", grading plan sheets C5, C7, signed and sealed by Brandon A. Potts, P.E., on May 14, 2012.

Check appropriate conditions

	Retaining/screen wall combination may be in excess of current Clark County Unified Development Code, Chapter 30.64.050.
	A FEMA Elevation Certificate, completed by a licensed surveyor, must be submitted to and approved by CCPW Development Review Plan Check prior to the issuance of Certificates of Occupancy for those structures.
X	Mylars of the grading plan must be submitted to the CCPW Development Review Plan Check for approval signatures prior to map recordation (residential) or permit issuance (commercial).
	An administrative variance to allow the finished floor elevation(s) to be set below the current Clark County criteria must be approved. The finished floor variance must be submitted to CCPW Development Review front counter after drainage study approval and prior to offsite final review.
X	The grading plan will be reviewed by the Building Office Operations Division to ensure compliance with the ADA access requirements. Revisions to the grading plan may be required if the site accessibility design does not comply with the requirements set forth in the Accessibility Chapter of the Clark County Building Code.
X	The plans show work is proposed outside of the project boundary. Notarized written permission must be obtained prior to grading plan approval.
X	Right-of-way dedication must be verified.
	Any previously approved drainage easements that are not being used must be vacated.
	<i>Per Regional Flood Control District policies and Procedures manual, Section VIII. D. 13. Uniform Regulations for the Control of Drainage</i> , the Engineer of Record shall provide As-Built plans or record drawings to the District after completion and final inspection of such privately installed flood control facilities that have regional flood control significance.
	Structural calculations are required. The structural calculations, plans, and details must be approved prior to "Offsite" submittal and prior to CCRFCD submittal, if applicable.
X	Plan revisions can be found on the red-lined plans and must be addressed.
	Prepare drainage easement documents as shown on the grading plans.

The County's review is solely based on the information submitted by the Engineer of Record. The County's review is strictly limited to compliance with minimum County Codes and Standards. The Engineer of Record is responsible for researching and addressing situations that may require designs above and beyond the minimum codes for issues of public safety and impacts to upstream, downstream and adjacent properties. The County assumes no liability for information data, designs or conclusions of the Engineer of Record.

By


W. Layne Weber, P.E., CFM
Principal Engineer
Clark County Public Works
Development Review

cc: Bartsas

TRANSMITTAL 09:

Project Name: USED CAR LOT

Project #: 10036.00

Date: 11JULY11

Time: 2:38 PM

By: JKN

Page: 1 of 1

Company: CITY OF LAS VEGAS

Attention: ALBERT SUNG

Address: 333 N. RANCHO DRIVE

Phone: _____

Las Vegas, NV 89106

Regarding: _____

Please note the following is/are:

☐ Attached	☐ Print	☐ Shop Drawings
☒ Plans	☐ Samples	☐ Specifications
☐ Copy of Letter	☐ Change Order	☐ Other:

Copies:	Date:	#:	Description:
1			Concurrence Package for Used Car Lot (TDS, Addendum #1, Supplement #1, Approved Grading and Approval Letter)

- | | | |
|--|---|--|
| ☐ For your approval | ☐ Reviewed as submitted | ☐ Resubmit ____ copies for approval |
| ☐ For your use | ☐ Reviewed as noted | ☐ Submit ____ copies for distribution |
| ☐ As requested | ☐ Returned for correction | ☐ Return ____ corrected prints |
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| ☐ Other: _____ | | |

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Signed by:

Name: Jennifer Nuesca

Title: Civil EIT

Last printed: 11-Jul-12 2:38 PM

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☒ No Reply Necessary Unless Exception Taken

☒ Project Files

☐ Account Files

☐ H.R.M. Files

☐ Other:

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4945 W. Patrick Lane Las Vegas, NV 89118
Office: (702) 534-7555 Fax: (702) 534-1825

GRADING PLANS

**ADDENDUM #1 TO THE
TECHNICAL DRAINAGE STUDY
FOR
USED CAR LOT
AT
1578 N. NELLIS BLVD.**

**Project No. 104111014.01
MARCH 6, 2012**

Prepared for:

**GGW ARCHITECTS
4945 W. PATRICK LANE
LAS VEGAS, NV 89118
702-534-7888**

Prepared by:

**CIVILWORKS, INC.
4945 W. PATRICK LANE
LAS VEGAS, NV 89118
702-534-7555**

CivilWorksInc
Engineering with "sensible" solutions tailored to your "specific" needs.

4945 W. Patrick Lane Las Vegas, NV 89118
Office: (702) 534-7555 Fax: (702) 534-1825

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: USED CAR LOT - ADD# 1 Date: MARCH 4, 2012
 Location of Development: a) Descriptive (Cross Streets) North/South: NELLIS
 East/West: OWENS
 b) Section: 28 Township: 20 Range: 62
 c) APN: 140-28-110-003

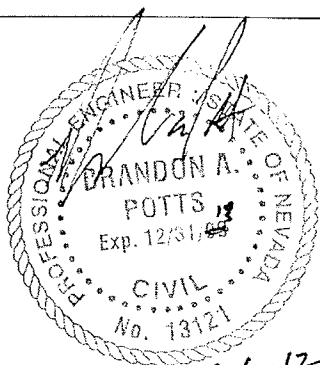
Name of Owner: PARTSAS, MARY 12 LLC
 Telephone No.: _____ Fax No.: _____ E-Mail Address: _____
 Address: 1570 N. NELLIS BLVD.

Contact Person-Name: JENNIFER NUESCA Telephone No.: 534-1827
 * E-Mail Address: JKN@CIVILWORKSONLINE.COM Fax No.: 534-1825
 Firm: CIVILWORKS, INC.
 Address: 4945 W. PATRICK LANE LAS VEGAS, NV 89118

Type of Land Development/Land Disturbance Process:

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

- Total Owned Land Area: At Site: 0.71 Being Developed/Disturbed: 0.71
- Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☐ Yes** ☒ No
- Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☒ Yes** ☐ No
- Proposed type of development (Residential, Commercial, Etc.): COMMERCIAL
- 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: _____
- If known, please briefly identify the proposed discharge point(s) of runoff from the site: SOUTHWEST CORNER OF SITE INTO NELLIS
- Briefly describe your proposed schedule for the subject project: ASAP



Engineer's Seal

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

*New Required Field

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

Revision	Date

Local Entity File No. _____

REFERENCE:

STANDARD FORM 1

March 6, 2012

Layne Weber
Clark County Public Works – Development Review
500 S. Grand Central Parkway
Las Vegas, NV 89155

Re: Addendum #1 to the Technical Drainage Study for USED CAR LOT at Nellis and Owens (HTE #11-44701)

Dear Mr. Weber,

This letter is in response to the drainage study review comments for the Technical Drainage Study for Used Car Lot dated December 22, 2011. The comments have been reiterated below along with the corresponding responses.

Comment 1: Section 2.2 and 2.4 of the report should discuss offsite basins contributing to flows in Nellis adjacent to the site.

Response 1: An excerpt of Section 2.2 and 2.4 of the report has been revised to discuss offsite basins contributing to flow in Nellis adjacent to the site and has been included in the Appendix.

Comment 2: Revise Figure 3 to delineate the site.

Response 2: Figure 3 has been revised to show the delineated site.

Comment 3: Provide additional topo for property to the east to verify historic flows convey east and not west through the subject site.

Response 3: The topo provided extends 100' past the property boundaries. As you can see from the spot grades as well as the contours, the offsite flows do indeed travel east.

Comment 4: Table 3 and Table 4 of the report appear to show 10-year flow values. It is not clear where 100-year flow analysis is for Nellis.

Response 4: The 100-year flow analysis for Nellis has been provided in the Appendix.

Civil Works Inc
Engineering with "sensible" solutions tailored to your "specific" needs.

4945 W. Patrick Lane Las Vegas, NV 89118
Office: (702) 534-7555 Fax: (702) 534-1825

Comment 5: Provide Clark County approval letter for referenced study 07-24151.

Response 5: The Clark County approval letter for referenced study 07-24151 has been provided.

Comment 6: Provide offsite drainage basin map either referenced or analyzed that quantifies Nellis Boulevard flow.

Response 6: The referenced offsite drainage basin map has been provided.

Comment 7: It is noted the reference material used in the report, 07-24151, also referenced offsite flow in Nellis from 05-53718. This approved study shows approximately 1642 cfs in Nellis at 2.6-ft. deep. Note the proposed FF elevation does not meet criteria based on the worst case flow for Nellis. Note if reference material is not adequate, the engineer should delineate and analyze offsite basins contributing flow to Nellis.

Response 7: After reviewing the referenced report 07-24151, it was concluded that offsite flow in Nellis from 05-53718 was not referenced in report 07-24151. The study references the report for Nellis Crossing. The approved drainage maps as well as Grading Plan from report 07-24151 have been included in the Appendix and has been used as the basis for analysis and design.

Comment 8: A bondable quantities list of proposed drainage/flood control facilities must be provided on the plans.

Response 8: A quantities list of proposed drainage/flood control facilities has been provided on the plans.

Comment 9: Per County policy, please provide the Stormwater Management Notes on the grading plan set from Section 3.5.1 of The Las Vegas Valley Construction Site BMP Guidance Manual. A pdf of the document can be accessed at (<http://www.lvstormwater.com>). Please insert "Clark County" and reference "Title 24.40" where indicated.

Response 9: The Stormwater Management Notes have been added to the grading plan.

Comment 10: Label plans with HTE#, L-Drawing or Project of who constructed existing offsite improvements.

Response 10: The existing improvements have been labeled with the appropriate reference document numbers.

Comment 11: Grading proposed outside of the project boundary and on private property will require notarized, written permission from the offsite owner and must be included with the next submittal. Note private property owner's including Clark County Aviation, School District, Parks and Recreation, Public Works, BLM, Water District, etc. may not grant permission and this should be resolved without delay as the site design may change.

Response 11: A notarized letter for Permission to Grade has been obtained.

Comment 12: Per Building Code criteria 1803.3 (site grading), the finished floor elevations of the commercial buildings must be a minimum of 6-inches above the adjacent flowline high point.

Response 12: Additional spot elevations have been provided to show the finished floor elevation meets the Building Code requirement as well as the freeboard criteria.

Comment 13: The engineer may want to consider a solid grouted stemwall to keep flow off site.

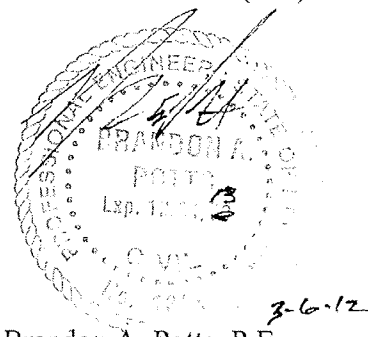
Response 13: A 2' high landscape berm is proposed in the landscape area fronting the subject site. Hydraulic sections have been modeled to show the flows within Nellis Blvd. do not encroach onto the site.

If you have any questions or concerns, please do not hesitate to contact me at (702) 534-1827

Sincerely,



Jennifer K. Nuesca, E.I.
Civil EIT



Brandon A. Potts, P.E.
Principal Engineer

Civil Works Inc
Engineering with "sensible" solutions tailored to your "specific" needs.

4945 W. Patrick Lane Las Vegas, NV 89118
Office: (702) 534-7555 Fax: (702) 534-1825



Department of Public Works

500 S Grand Central Pky • Box 554000 • Las Vegas NV 89155-4000
(702) 455-6000 • Fax (702) 455-6040

Denis Cederburg, P.E., Director • E-Mail: dlc@ClarkCountyNV.gov

Drainage Study Comment Letter

Date: December 22, 2011
Firm: CivilWorks, Inc.
Engineer: Brandon A. Potts, P.E.
Address: 4945 W. Patrick Lane, Las Vegas, NV 89118
Phone: (702) 534-7555
Fax: (702) 534-1825
E-mail: jkn@civilworksonline.com

Subject: Technical Drainage Study for Used Car Lot
Location: SE of Nellis Boulevard and Owens Avenue
APN: 140-28-110-003
Sec, Township, Range: S28, T20S, R62E
Flood Zone & Panel: Zone X, 2200E, Revised September 27, 2002
Application Tracking #: 11-44701



Submittals	Date Received	Date Returned	Reviewer	Miscellaneous
Technical	12/13/2011	12/22/2011	WG	

Concurrence Required: (Must be obtained prior to permit issuance)		Reason Concurrence is required
	City of Henderson	Adjacent to or Impacts Henderson
X	City of Las Vegas	Adjacent to or Impacts Las Vegas
	City of North Las Vegas	Adjacent to or Impacts North Las Vegas
X	Nevada Department of Transportation	Adjacent to or Impacts NDOT Facility
	Union Pacific Rail Road	Adjacent to or Impacts a UPRR Facility
	US Army Corp of Engineers	Impacts a USACE Facility
X	Clark County Regional Flood Control District	Regional Significance, Adjacent to or Impacts CCRFCD MPU Facility or in a SFHA

The following comments must be fully addressed and response provided with the next submittal. Incomplete responses may result in further review and time delays to the drainage study approval. Any revisions/modifications to the original site design must have supporting hydrologic and/or hydraulic calculations. CCPW Development Review will not be held responsible for project delays due to incomplete responses.

CCPW – Development Review Comments:

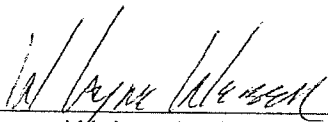
1. Section 2.2 and 2.4 of the report should discuss offsite basins contributing to flows in Nellis adjacent to the site.
2. Revise Figure 3 to delineate the site.
3. Provide additional topo for property to the east to verify historic flows convey east and not west through the subject site.
4. Table 3 and Table 4 of the report appear to show 10-year flow values. It is not clear where 100-year flow analysis is for Nellis.
5. Provide Clark County approval letter for referenced study 07-24151.
6. Provide offsite drainage basin map either referenced or analyzed that quantifies Nellis Boulevard flow.
7. It is noted the reference material used in the report, 07-24151, also referenced offsite flow in Nellis from 05-53718. This approved study shows approximately 1642 cfs in Nellis at 2.6-ft deep. Note the proposed FF elevation does not meet criteria based on the worst case flow for Nellis. Note if reference material is not adequate, the engineer should delineate and analyze offsite basins contributing flow to Nellis.
8. A bondable quantities list of proposed drainage/flood control facilities must be provided on the plans.
9. Per County policy, please provide the **Stormwater Management Notes** on the grading plan set from Section 3.5.1 of *The Las Vegas Valley Construction Site BMP Guidance Manual*. A pdf of the document can be accessed at (<http://www.lvstormwater.com>). Please insert "Clark County" and reference "Title 24.40" where indicated.
10. Label plans with HTE#, L-Drawing or Project of who constructed existing offsite improvements.

11. Grading proposed outside of the project boundary and on private property will require notarized, written permission from the offsite owner and must be **included with the next submittal**. Note private property owner's including Clark County Aviation, School District, Parks and Recreation, Public Works, BLM, Water District, etc. may not grant permission and this should be resolved without delay as the site design may change.
12. Per Building Code criteria 1803.3 (site grading), the finished floor elevations of the commercial buildings must be a minimum of 6-inches above the adjacent flowline high point.
13. The engineer may want to consider a solid grouted stemwall to keep flow off site.

The drainage/grading plans have been red-lined and require modifications prior to the next submittal. Failure to resubmit the red-lined grading plan will require an additional \$400 re-review fee.

The County's review is solely based on the information submitted by the Engineer of Record. The County's review is strictly limited to compliance with minimum County Codes and Standards. The Engineer of Record is responsible for researching and addressing situations that may require designs above and beyond the minimum codes for issues of public safety and impacts to upstream, downstream and adjacent properties. The County assumes no liability for information data, designs or conclusions of the Engineer of Record.

By


W. Layne Weber, P.E., CFM
Principal Engineer
Clark County Public Works
Development Review

cc: Bartsas

APPENDIX

FIGURES

Revised Figure 3

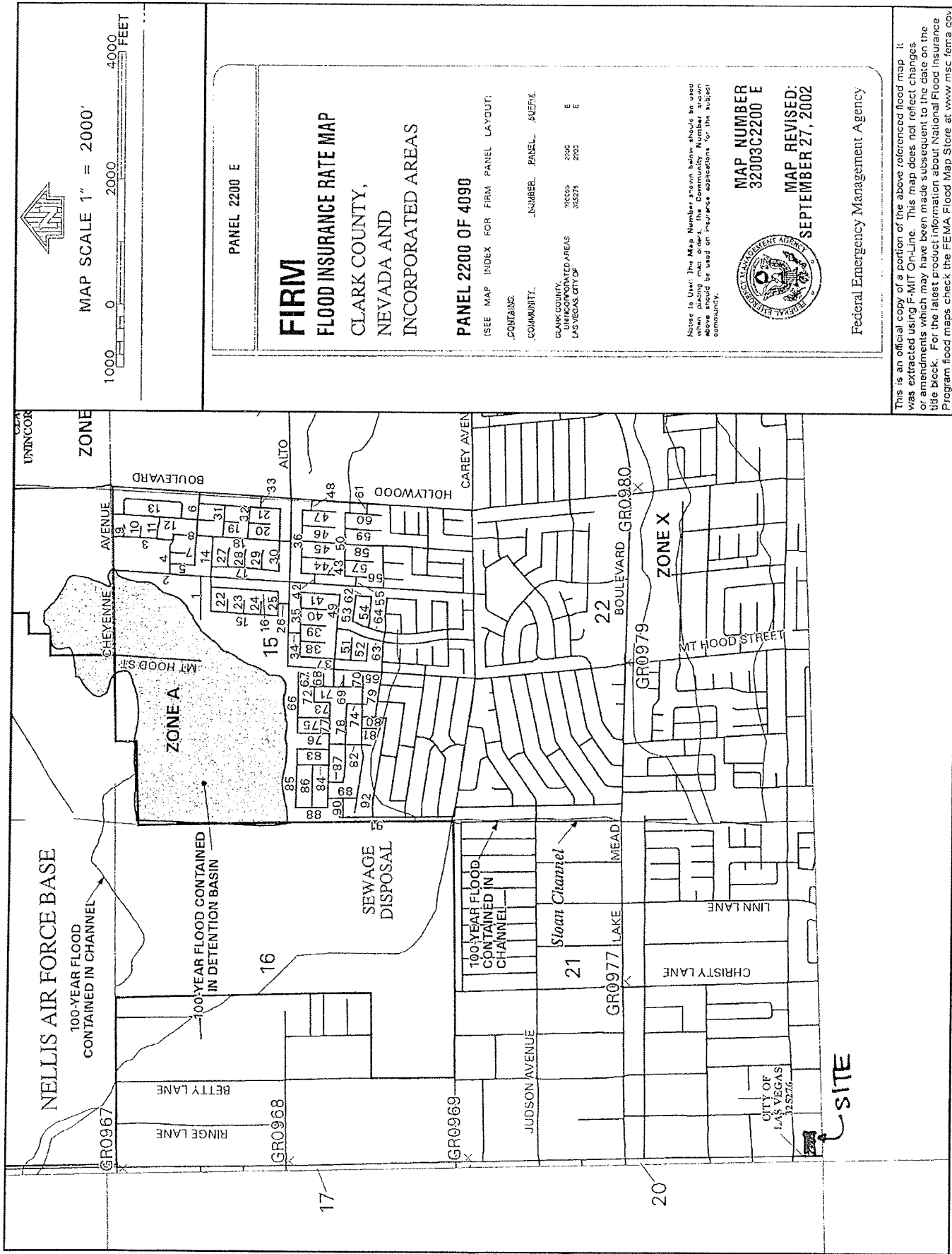


FIGURE 3

ADDENDUM MATERIALS

DISCUSSION OF OFFSITE BASINS

REVISED TABLES 3 AND 4

PERMISSION TO GRADE LETTER

2.0 DRAINAGE BASIN DESCRIPTION

2.2 Existing Off-site Drainage Description

The existing street conditions in Nellis show that the flows are conveyed south. Per the approved report 07-24151, the existing flow in Nellis is 58-cfs and 164-cfs, for the 10-year and 100-year storm events, respectively. Since the subject site is bordered by walls on the north and south sides of the property, no off-site flows enter the subject site from the north and no on-site flow enter the property to the south. In addition, there is an existing berm adjacent to the subject site along the eastern property line. There is an area between the existing berm and subject property line that generates runoff that impacts the subject site. This area does not generate enough flow to quantify.

2.4 Proposed Off-site Drainage Description

The off-site flow generated by the area between the existing off-site berm and the subject site will be re-directed to flow back to the east and follow the historical drainage pattern. The existing berm on the adjacent property to the east will be re-graded to begin at the proposed wall and allow the off-site flow that originally discharged (which in this case is so little that I could not be quantified) onto the subject site to follow the historical drainage pattern for the rest of the adjacent property. The flow pattern in Nellis Blvd. will remain the same. The on-site flow that will discharge into Nellis will increase the 10-year and 100-year flows to 60-cfs and 167-cfs, respectively. This increase does not show a significant change from the existing flow conditions of Nellis.

6.0 HYDRAULIC ANALYSIS**6.1 Street and Facility Hydraulics**

The existing hydraulic condition of Nellis Boulevard was taken from the previously approved study for the Nellis and Owens Daycare Center (07-24151) and has been summarized in Table 3 below. Please refer to the Appendix for the Reference Material.

TABLE 3

*EXISTING CONDITIONS HYDRAULIC SUMMARY					
SECTION	Q (cfs)	D (ft)	V (fps)	(D*V)	DRY LANE?
NELLIS (10yr)	58	0.70	2.78	1.95	NO
NELLIS (100yr)	164	0.93	3.90	3.65	N/A

*Flow values were referenced from HTE 07-24151.

Table 4 below is a summarization of the proposed condition street hydraulics. Please see Appendix for the hydraulic analyses.

TABLE 4

PROPOSED CONDITIONS HYDRAULIC SUMMARY					
SECTION	Q (cfs)	D (ft)	V (fps)	(D*V)	DRY LANE?
NELLIS (10yr)	60	0.83	3.66	3.03	NO
NELLIS (100yr)	167	1.10	4.76	5.23	N/A

The finished floor elevation for the main building has been set to 1779.00' which is more than 18" above the centerline of Nellis Boulevard and meets the freeboard requirement of twice the depth of flow during the 100-year storm event. Table 5 below is a summarization of the proposed condition water surface elevations within the adjacent street.

TABLE 5

PROPOSED CONDITIONS FF CALCULATION SUMMARY					
STREET	DEPTH	FL	WSE	WSE + D	MEET FF?
NELLIS	1.10'	1776.80'	1777.90'	1779.00'	YES

Clark County Public Works
500 S. Grand Central Parkway, 2nd Floor
Las Vegas, NV89155

PERMISSION TO GRADE AUTHORIZATION

I, Doloresa Renkiewicz, as landowner of APN: 140-28-110-002 located on the west side of Ringe Lane south of Owens Avenue, grant permission to grade on a portion of my property, from the west property boundary approximately 5' 6" to the east, for the purpose of leveling the top of an existing berm.

Doloresa Renkiewicz
Signed

March 5, 2012
Date

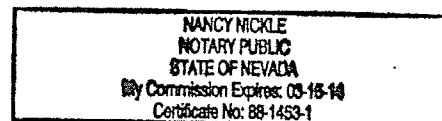
State of Nevada

County of Clark

This document was executed before me by Doloresa Renkiewicz on March 5, 2012.

Nancy Nickle
Signature of Notary

03-05-2012
Date



HYDRAULIC ANALYSES

Revised FlowMaster Models

NELLIS - 10YR
Worksheet for Irregular Channel

Project Description	
Project File	x:\2011 projects\104111014.01 phases 4-7 @ used car lot\08 - phase 2\add1\hydraulics\used
Worksheet	NELLIS - 10YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data					
Channel Slope		0.007000 ft/ft			
Elevation range: 0.00 ft to 1.90 ft.					
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness	
0.00	0.80	0.00	7.00	0.013	
5.00	0.70	7.00	43.00	0.016	
5.50	0.70	43.00	45.50	0.013	
5.50	0.20	45.50	93.00	0.016	
7.00	0.33	93.00	100.00	0.013	
7.00	0.37	100.00	109.00	0.025	
43.00	1.40				
43.00	1.90				
45.50	1.90				
45.50	1.40				
93.00	0.17				
93.00	0.13				
94.50	0.00				
94.50	0.50				
95.00	0.50				
100.00	0.60				
102.00	0.70				
108.00	1.70				
109.00	1.70				
Discharge	60.00	cfs			

Results			
Wtd. Mannings Coefficient	0.015		
Water Surface Elevation	0.83	ft	
Flow Area	16.63	ft ²	
Wetted Perimeter	59.62	ft	
Top Width	58.47	ft	
Height	0.83	ft	
Critical Depth	0.87	ft	
Critical Slope	0.004850	ft/ft	
Velocity	3.61	ft/s	
Velocity Head	0.20	ft	
Specific Energy	1.03	ft	
Froude Number	1.19		
Flow is supercritical.			
Flow is divided.			

NELLIS - 10YR

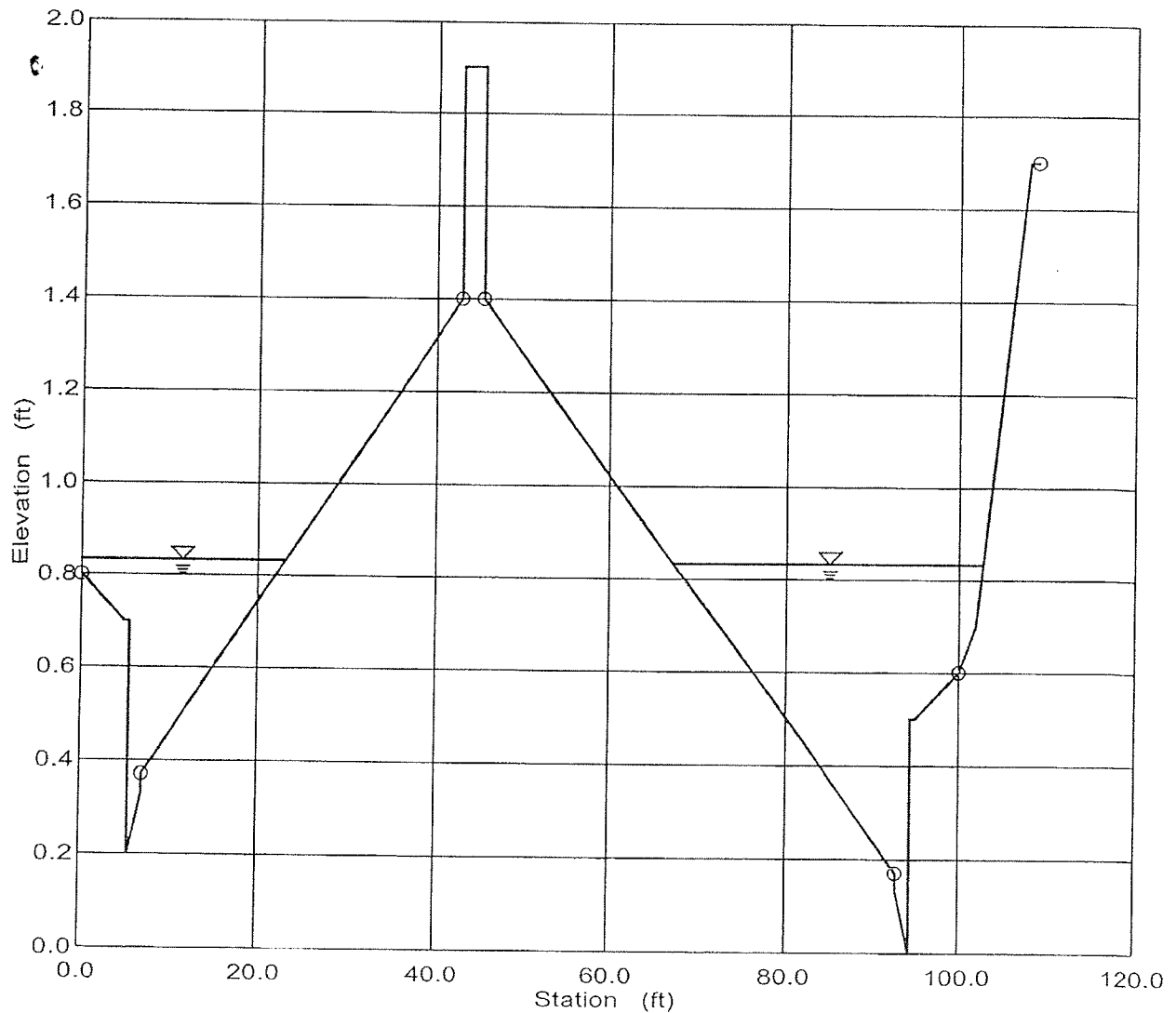
Worksheet for Irregular Channel

Water elevation exceeds lowest end station by 0.03 ft.

NELLIS - 10YR
Cross Section for Irregular Channel

Project Description	
Project File	x:\2011 projects\104111014.01 phases 4-7 @ used car lot\08 - phase 2\add1\hydraulics\used
Worksheet	NELLIS - 10YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data	
Wtd. Mannings Coefficient	0.015
Channel Slope	0.007000 ft/ft
Water Surface Elevation	0.83 ft
Discharge	60.00 cfs



NELLIS - 100YR
Worksheet for Irregular Channel

Project Description	
Project File	x:\2011 projects\104111014.01 phases 4-7 @ used car lot\08 - phase 2\add1\hydraulics\used
Worksheet	NELLIS - 100YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data					
Channel Slope		0.007000 ft/ft			
Elevation range: 0.00 ft to 2.70 ft.					
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness	
0.00	0.80	0.00	7.00	0.013	
5.00	0.70	7.00	43.00	0.016	
5.50	0.70	43.00	45.50	0.013	
5.50	0.20	45.50	93.00	0.016	
7.00	0.33	93.00	100.00	0.013	
7.00	0.37	100.00	109.00	0.025	
43.00	1.40				
43.00	1.90				
45.50	1.90				
45.50	1.40				
93.00	0.17				
93.00	0.13				
94.50	0.00				
94.50	0.50				
95.00	0.50				
100.00	0.60				
102.00	0.70				
108.00	2.70				
109.00	2.70				
Discharge	167.00	cfs			

Results		
Wtd. Mannings Coefficient	0.015	
Water Surface Elevation	1.10	ft
Flow Area	35.09	ft ²
Wetted Perimeter	80.25	ft
Top Width	78.76	ft
Height	1.10	ft
Critical Depth	1.19	ft
Critical Slope	0.004305	ft/ft
Velocity	4.76	ft/s
Velocity Head	0.35	ft
Specific Energy	1.45	ft
Froude Number	1.26	
Flow is supercritical.		
Flow is divided.		

NELLIS - 100YR

Worksheet for Irregular Channel

Water elevation exceeds lowest end station by 0.30 ft.

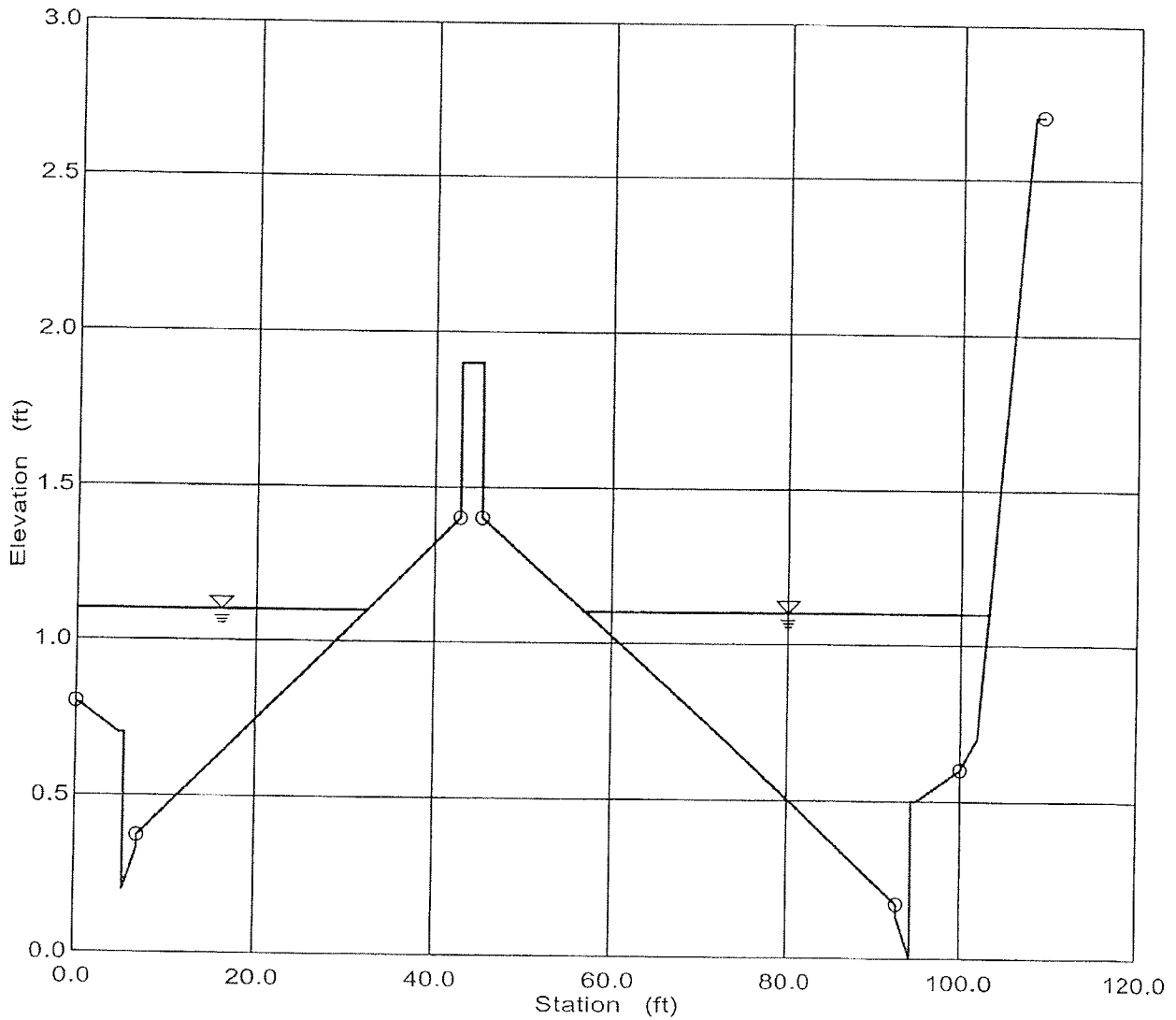
NELLIS - 100YR
Cross Section for Irregular Channel

Project Description

Project File	x:\2011 projects\104111014.01 phases 4-7 @ used car lot\08 - phase 2\add1\hydraulics\used
Worksheet	NELLIS - 100YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data

Wtd. Mannings Coefficient	0.015
Channel Slope	0.007000 ft/ft
Water Surface Elevation	1.10 ft
Discharge	167.00 cfs



REFERENCE MATERIALS

Approval Letter 07-24151
Additional Reference Material



Department of Development Services Civil Engineering Division

500 S Grand Central Pky 1st Fl • Box 551799 • Las Vegas NV 89155-1799
(702) 455-4600 • Fax (702) 388-2550

Ronald L. Lynn, Building Official

June 5, 2007

WRG Inc.
3011 W. Horizon Ridge Parkway, Suite 100
Henderson, NV 89052

LTR
~~07-24151~~
07-24151

CLARK COUNTY Concurrence for Nellis/Owens Daycare
Study Updated: October 31, 2006
Update Addendum #1 Dated: December 4, 2006
Location: Southwest corner of Nellis Blvd and Owens Avenue
SEC29, T20S, R62E
H.T.E. # 07-24151 Concurrence with CLV# DS 4097B

The above-referenced project is located in the City of Las Vegas adjacent to Clark County south of Owens Avenue and west of Nellis Boulevard. The drainage study was submitted to the County for concurrence on May 17, 2007. The County has reviewed the Study and addenda. In addition, the County has received a copy of the acceptance letter from the City of Las Vegas, dated January 16, 2007. The County concurs with the acceptance of this drainage study by the City of Las Vegas. Please note that the County's review of this development is limited to drainage issues significant to Clark County unincorporated areas.

The County's review is solely based on the information submitted by the Engineer of Record. The County's review is strictly limited to compliance with minimum County Codes and Standards. The Engineer of Record is responsible for researching and addressing situations that may require designs above and beyond the minimum codes for issues of public safety and impacts to upstream, downstream and adjacent properties. The County assumes no liability for information data, designs or conclusions of the Engineer of Record.

DEPARTMENT OF DEVELOPMENT SERVICES

By

Glenn S. Hale, P. E.
Senior Civil Engineer
Civil Engineering Division

GSH/rmm

cc: Grubb & Ellis
Albert Sung P.E., City of Las Vegas Department of Public Works
Development File

BOARD OF COUNTY COMMISSIONERS
RORY REID, Chairman • CHIP MAXFIELD, Vice-Chairman
SUSAN BRAGER • TOM COLLINS • CHRIS GIUNCHIGLIANI • LAWRENCE WEEKLY • BRUCE L. WOODBURY
VIRGINIA VALENTINE, P.E., County Manager

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM

DATE:

January 16, 2007

By

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;
Nellis and Owens Daycare Center

COPIES TO:
WRG Design Group

Cross Streets: SWC of Nellis Boulevard & Owens Avenue

Grubb & Ellis

File Number: F:\Depot\DSMemos\DS4097B.doc

Bart Anderson, P.E., DevCo

Parcel Number: 140-29-510-020 & -022

CCDDS

Zoning Action: ZON-9892; SDR-9893 & VAR-10104

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	11/1/2006	11/15/2006	Not Approved	\$400.00	56816: \$400
2 nd Submittal	12/4/2006 & 1/12/2007	1/16/2007	See Comments Below	\$400.00	58803: \$400
TOTAL FEES (LDDRS):				\$800.00	---

REMARKS:

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

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

1. The site is adjacent to the jurisdiction of the County of Clark to the north of Owens Avenue. The engineer must coordinate with Clark County Department of Development Services (CCDDS) and incorporate any concerns for boundary conditions along the northern border. CCDDS concurrence is required prior to final acceptance of the study.
2. **Second request:** Cross section C/C-5 shows spacing between an existing wall and a proposed wall. Maintenance of the 4.5'-strip of land may be a potential problem. City of Las Vegas Planning's approval must be obtained prior to the final approval of the drainage study.
3. Cross section E/C-5 shows a 1'-land between a fence and a new wall. Obtain City of Las Vegas Planning approval prior to the final approval of the drainage study.

NOTE: Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the Nevada Division of Environmental Protection a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all

stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see <http://ndep.nv.gov/bwpc/storm01.htm> or call (775) 687-9429.

END OF REMARKS
ays

T/R/S: T20S/R62E/29
AREA N-29



APPENDIX E

STREET FLOW CALCULATIONS

SECTION 2 - NELLIS BLVD - 10-YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION 2 - NELLIS - FULL ST - 10-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.500 %
Discharge	58.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.015
Water Surface Elevation	0.70 ft
Elevation Range	0.00 to 1.25
Flow Area	20.8 ft ²
Wetted Perimeter	80.37 ft
Top Width	79.07 ft
Actual Depth	0.70 ft
Critical Elevation	0.69 ft
Critical Slope	0.555 %
Velocity	2.78 ft/s
Velocity Head	0.12 ft
Specific Energy	0.82 ft
Froude Number	0.95
Flow Type	Subcritical

Calculation Messages:
Flow is divided.
Water elevation exceeds lowest end station by 0.98590039e-1 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+83.00	0.016
0+83.00	1+00.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+40.00	0.83

SECTION 2 - NELLIS BLVD - 10-YEAR
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+40.00	1.25
0+45.00	1.25
0+45.00	0.63
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

Title: 3055114

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WRG Design Inc

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Project Engineer: R. KELLER

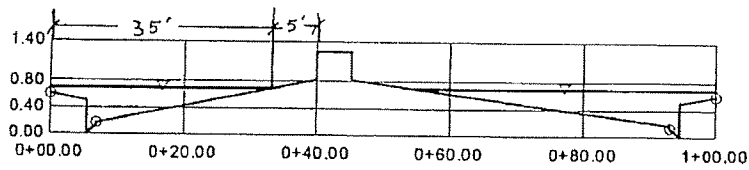
FlowMaster v6.1 (614c)

Page 2 of 2

SECTION 2 - NELLIS BLVD Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION 2 - NELLIS - FULL ST - 10-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.015
Slope	0.500 %
Water Surface Elevation	0.70 ft
Elevation Range	0.00 to 1.25
Discharge	58.00 cfs



V:10.0
H:1
NTS

SECTION 2 - NELLIS BLVD - 100-YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION 2 - NELLIS - FULL ST - 100-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.500 %
Discharge	164.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.015
Water Surface Elevation	0.93 ft
Elevation Range	0.00 to 1.25
Flow Area	42.0 ft ²
Wetted Perimeter	96.88 ft
Top Width	95.00 ft
Actual Depth	0.93 ft
Critical Elevation	0.94 ft
Critical Slope	0.464 %
Velocity	3.80 ft/s
Velocity Head	0.24 ft
Specific Energy	1.17 ft
Froude Number	1.03
Flow Type	Supercritical

Calculation Messages:
Flow is divided.
Water elevation exceeds lowest end station by 0.33198421 ft.

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

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+40.00	0.83

Title: 3055114
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WRG Design Inc
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1888

Project Engineer: R. KELLER
FlowMaster v6.1 [614c]
Page 1 of 2

SECTION 2 - NELLIS BLVD - 100-YEAR
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+40.00	1.25
0+45.00	1.25
0+45.00	0.83
0+83.00	0.17
0+83.00	0.13
0+84.50	0.00
0+84.50	0.50
0+85.00	0.50
1+00.00	0.60

Title: 3055114

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WRG Design Inc

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Project Engineer: R. KELLER

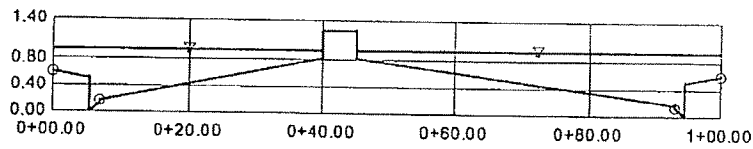
FlowMaster v6.1 [6140]

Page 2 of 2

SECTION 2 - NELLIS BLVD Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION 2 - NELLIS - FULL ST - 100-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.015
Slope	0.500 %
Water Surface Elevation	0.93 ft
Elevation Range	0.00 to 1.25
Discharge	184.00 cfs



V:10.0
H:1
NTS

**SUPPLEMENT #1 TO THE
TECHNICAL DRAINAGE STUDY
FOR
USED CAR LOT
AT
1578 N. NELLIS BLVD.**

Project No. 104111014.01

MAY 14, 2012

Prepared for:

GGW ARCHITECTS
4945 W. PATRICK LANE
LAS VEGAS, NV 89118
702-534-7888

Prepared by:

CIVILWORKS, INC.
4945 W. PATRICK LANE
LAS VEGAS, NV 89118
702-534-7555

Civil Works
Engineering with "sensible" solutions tailored to your "specific" needs.

4945 W. Patrick Lane Las Vegas, NV 89118
Office: (702) 534-7555 Fax: (702) 534-1825

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: USED CAR LOT - SUPPLEMENT #1 Date: MAY 14, 2012
Location of Development: a) Descriptive (Cross Streets) North/South: NELLIS
East/West: OWENS
b) Section: 28 Township: 20 Range: 02
c) APN: 140-28-110-003

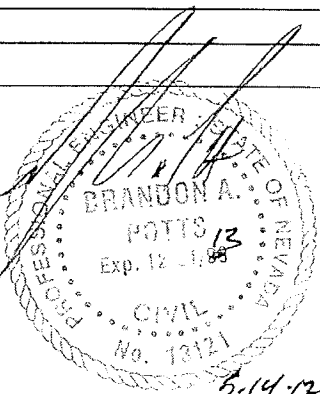
Name of Owner: BARTSAS, MARY 12 LLC
Telephone No.: _____ Fax No.: _____ E-Mail Address: _____
Address: 1578 N. NELLIS BLVD

Contact Person-Name: JENNIFER NUESCA Telephone No.: 534-1827
* E-Mail Address: JKNC@CIVILWORKSONLINE.COM Fax No.: 534-1825
Firm: CIVILWORKS
Address: 4945 W. PATRICK LANE

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: 0.71 Being Developed/Disturbed: 0.75
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: _____
6. Has the site drainage been evaluated in the past? ☐ YES ☒ NO If yes, please identify documentation: _____
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: SOUTHWEST CORNER OF SITE INTO NELLIS
8. Briefly describe your proposed schedule for the subject project: ASAP



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

May 14, 2012

Layne Weber
Clark County Public Works – Development Review
500 S. Grand Central Parkway
Las Vegas, NV 89155

Re: Supplement #1 to the Technical Drainage Study for USED CAR LOT at Nellis and Owens (HTE #11-44701)

Dear Mr. Weber,

This letter is in response to the drainage study review comments for the Technical Drainage Study for Used Car Lot dated March 19, 2012. The comments have been reiterated below along with the corresponding responses.

Comment 1: It does not appear that the site entrances are adequate to prevent flow from entering the site. Provide calculations to show that all site entrances are elevated at least 6" above the 100-year WSE in the adjacent streets per Section 903.6 of the CCRFCD Manual.

Response 1: In order to adequately elevate the site driveway entrances to 6" above the 100-year WSE, the driveway slope will need to be 8%. This grade change is not allowed per the Fire Department and therefore cannot meet criteria in the proposed condition (as well as the existing condition).

Comment 2: Per Section 905 of the CCRFCD Manual the street hydraulic calculations must limit the flow to the ROW (Nellis 100-ft). The calculation provided show 3% and 2.7% cross slopes on each side of Nellis. This is not typical and as-built plans should be provided to verify cross slopes. Provide a corrected 10-yr street calculation for Nellis under proposed conditions.

Response 2: The calculation provided in the previous submittal was based on surveyed data. A copy an approved Grading Plan showing grades in Nellis has been provided in the Appendix and shows cross slopes of approximately 2.02% and 2.50%. The hydraulic models have been revised to reflect the use of these values.

Comment 3: The reference material for Nellis shows that there is approximately 6.5-ft of available drylane out of the required 19-ft. Under existing conditions criteria are not met, therefore the site development is not allowed to make the situation worse. The site increases flow by 2-cfs and increases the flow depth. Please address mitigation of 2-cfs under the 10-year storm event.

Response 3: The reference material from HTE 07-24151 shows a dry lane value of 5' (based on Q10 = 58 cfs). The proposed condition only adds 1-cfs to the existing condition during the 10-year event. The time of concentration for the 2-cfs generated onsite during the proposed conditions is 12 mins. The hydraulic model for Nellis has been revised to reflect the model used in the WRG report (HTE 07-24151). During the 10-year storm event, the depth of flow is not affected by the 1-cfs increase.

Comment 4: Provide offsite drainage basin map that shows the basin delineation to support the Nellis Boulevard flow.

Response 4: An offsite drainage basin map has been provided from approved study HTE 07-24151.

Comment 5: The response to previous Comment #7 does not address the required flood protection of the site based on worst case analysis (1642-cfs). Please address.

Response 5: The finished floor elevation has been adjusted to be 18" above the worst case scenario of 1642-cfs (depth of 2.6-ft). See calculations in the Appendix as well as the updated Grading Plan.

Comment 6: The response to previous Comment #12 states grades were added. However, the revised plans compared to the previous redlined plans do not show additional grades. Please address.

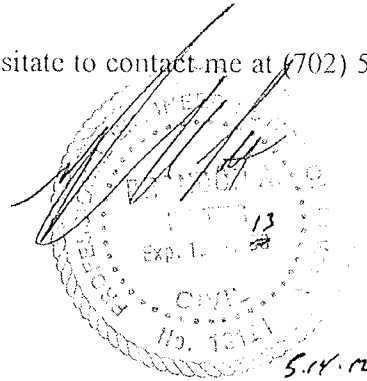
Response 6: A 2' berm is proposed on the adjacent property to the east in order to mitigate an existing ponding issue. Design grades and existing tie-in shots have been added to the Grading Plan to demonstrate positive drainage.

If you have any questions or concerns, please do not hesitate to contact me at (702) 534-1827

Sincerely,



Jennifer K. Nuesca, E.I.
Civil EIT



Brandon A. Potts, P.E.
Principal Engineer

Civil Works

Engineering with "sensible" solutions tailored to your "specific" needs.

4945 W. Patrick Lane Las Vegas, NV 89118
Office: (702) 534-7555 Fax: (702) 534-1825

Drainage Study Comment Letter

Date: March 19, 2012
Firm: CivilWorks, Inc.
Engineer: Brandon A. Potts, P.E.
Address: 4945 W. Patrick Lane, Las Vegas, NV 89118
Phone: (702) 534-7555
Fax: (702) 534-1825
E-mail: jkn@civilworksonline.com

Subject: Technical Drainage Study for Used Car Lot
Location: SE of Nellis Boulevard and Owens Avenue
APN: 140-28-110-003
Sec, Township, Range: S28, T20S, R62E
Flood Zone & Panel: Zone X, 2200E, Revised September 27, 2002
Application Tracking #: 11-44701

HTE11-44701

Submittals	Date Received	Date Returned	Reviewer	Miscellaneous
Technical	12/13/2011	12/22/2011	WG	
Addendum #1	03/07/2012	03/19/2012	WG	

Concurrence Required: (Must be obtained prior to permit issuance)		Reason Concurrence is required
	City of Henderson	Adjacent to or Impacts Henderson
X	City of Las Vegas	Adjacent to or Impacts Las Vegas
	City of North Las Vegas	Adjacent to or Impacts North Las Vegas
X	Nevada Department of Transportation	Adjacent to or Impacts NDOT Facility
	Union Pacific Rail Road	Adjacent to or Impacts a UPRR Facility
	US Army Corp of Engineers	Impacts a USACE Facility
X	Clark County Regional Flood Control District	Regional Significance, Adjacent to or Impacts CCRFCD MPU Facility or in a SFHA

The following comments must be fully addressed and response provided with the next submittal. Incomplete responses may result in further review and time delays to the

drainage study approval. Any revisions/modifications to the original site design must have supporting hydrologic and/or hydraulic calculations. CCPW Development Review will not be held responsible for project delays due to incomplete responses.

CCPW – Development Review Comments:

1. It does not appear that the site entrances are adequate to prevent flow from entering the site. Provide calculations to show that all site entrances are elevated at least 6-inches above the 100-year WSE in the adjacent streets per Section 903.6 of the *CCRFCD Manual*.
2. Per Section 905 of the *CCRFCD Manual* the street hydraulic calculations must limit the flow to the ROW (Nellis 100-ft). The calculation provided show 3% and 2.7% cross slopes on each side of Nellis. This is not typical and as-built plans should be provided to verify cross slopes. Provide a corrected 10-yr street calculation for Nellis under proposed conditions.
3. The reference material for Nellis shows that there is approximately 6.5-ft of available drylane out of the required 19-ft. Under existing conditions criteria are not met, therefore the site development is not allowed to make the situation worse. The site increases flow by 2 cfs and increases the flow depth. Please address mitigation of 2 cfs under the 10-year storm event.
4. Provide offsite drainage basin map that shows the basin delineation to support the Nellis Boulevard flow.
5. The response to previous Comment #7 does not address the required flood protection of the site based on worst case analysis (1642 cfs). Please address.
6. The response to previous Comment #12 states grades were added. However the revised plans compared to the previous redlined plans do not show additional grades. Please address.

The drainage/grading plans have been red-lined and require modifications prior to the next submittal. Failure to resubmit the red-lined grading plan will require an additional \$400 re-

Used Car Lot
March 19, 2012
Page 3 of 3

11-44701

review fee.

The County's review is solely based on the information submitted by the Engineer of Record. The County's review is strictly limited to compliance with minimum County Codes and Standards. The Engineer of Record is responsible for researching and addressing situations that may require designs above and beyond the minimum codes for issues of public safety and impacts to upstream, downstream and adjacent properties. The County assumes no liability for information data, designs or conclusions of the Engineer of Record.

By

W. Layne Weber, P.E., CFM
Principal Engineer
Clark County Public Works
Development Review

cc: Bartsas

APPENDIX

HYDRAULIC ANALYSES

Revised FlowMaster Models

NELLIS - 10YR (WRG)
Worksheet for Irregular Channel

Project Description	
Project File	x:\2011 projects\104111014.01 phases 4-7 @ used car lot\08 - phase
Worksheet	NELLIS - 10YR (WRG)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data				
Channel Slope	0.005000 ft/ft			
Elevation range: 0.00 ft to 1.25 ft.				
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	0.60	0.00	7.00	0.013
5.00	0.50	7.00	93.00	0.016
5.50	0.50	93.00	100.00	0.013
5.50	0.00			
7.00	0.13			
7.00	0.17			
40.00	0.83			
40.00	1.25			
45.00	1.25			
45.00	0.83			
93.00	0.17			
93.00	0.13			
94.50	0.00			
94.50	0.50			
95.00	0.50			
100.00	0.60			
Discharge	59.00	cfs		

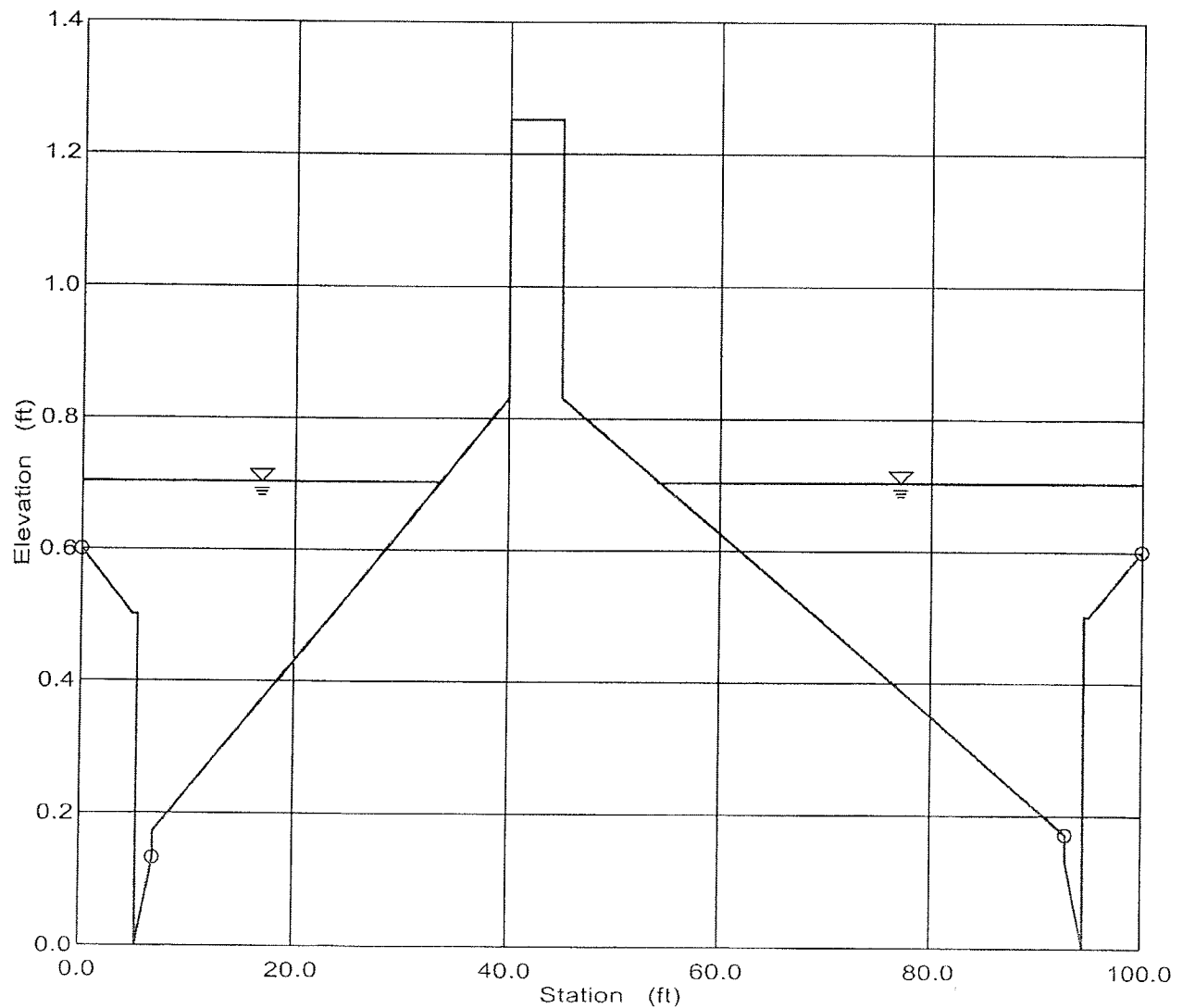
Results		
Wtd. Mannings Coefficient	0.015	
Water Surface Elevation	0.70	ft
Flow Area	21.15	ft ²
Wetted Perimeter	80.83	ft
Top Width	79.52	ft
Height	0.70	ft
Critical Depth	0.69	ft
Critical Slope	0.005537	ft/ft
Velocity	2.79	ft/s
Velocity Head	0.12	ft
Specific Energy	0.82	ft
Froude Number	0.95	
Flow is subcritical.		
Flow is divided.		
Water elevation exceeds lowest end station by 0.10 ft.		

NELLIS - 10YR (WRG)
Worksheet for Irregular Channel

NELLIS - 10YR (WRG)
Cross Section for Irregular Channel

Project Description	
Project File	x:\2011 projects\104111014.01 phases 4-7 @ used car lot\08 - phase
Worksheet	NELLIS - 10YR (WRG)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data	
Wtd. Mannings Coefficient	0.015
Channel Slope	0.005000 ft/ft
Water Surface Elevation	0.70 ft
Discharge	59.00 cfs



NELLIS - 100YR (WRG)
Worksheet for Irregular Channel

Project Description	
Project File	x:\2011 projects\104111014.01 phases 4-7 @ used car lot\08 - phase
Worksheet	NELLIS - 100YR (WRG)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data				
Channel Slope		0.005000 ft/ft		
Elevation range: 0.00 ft to 1.25 ft.				
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	0.60	0.00	7.00	0.013
5.00	0.50	7.00	93.00	0.016
5.50	0.50	93.00	100.00	0.013
5.50	0.00			
7.00	0.13			
7.00	0.17			
40.00	0.83			
40.00	1.25			
45.00	1.25			
45.00	0.83			
93.00	0.17			
93.00	0.13			
94.50	0.00			
94.50	0.50			
95.00	0.50			
100.00	0.60			
Discharge	166.00	cfs		

Results		
Wtd. Mannings Coefficient	0.015	
Water Surface Elevation	0.94	ft
Flow Area	42.33	ft ²
Wetted Perimeter	96.99	ft
Top Width	95.00	ft
Height	0.94	ft
Critical Depth	0.95	ft
Critical Slope	0.004628	ft/ft
Velocity	3.92	ft/s
Velocity Head	0.24	ft
Specific Energy	1.18	ft
Froude Number	1.04	
Flow is supercritical.		
Flow is divided.		
Water elevation exceeds lowest end station by 0.34 ft.		

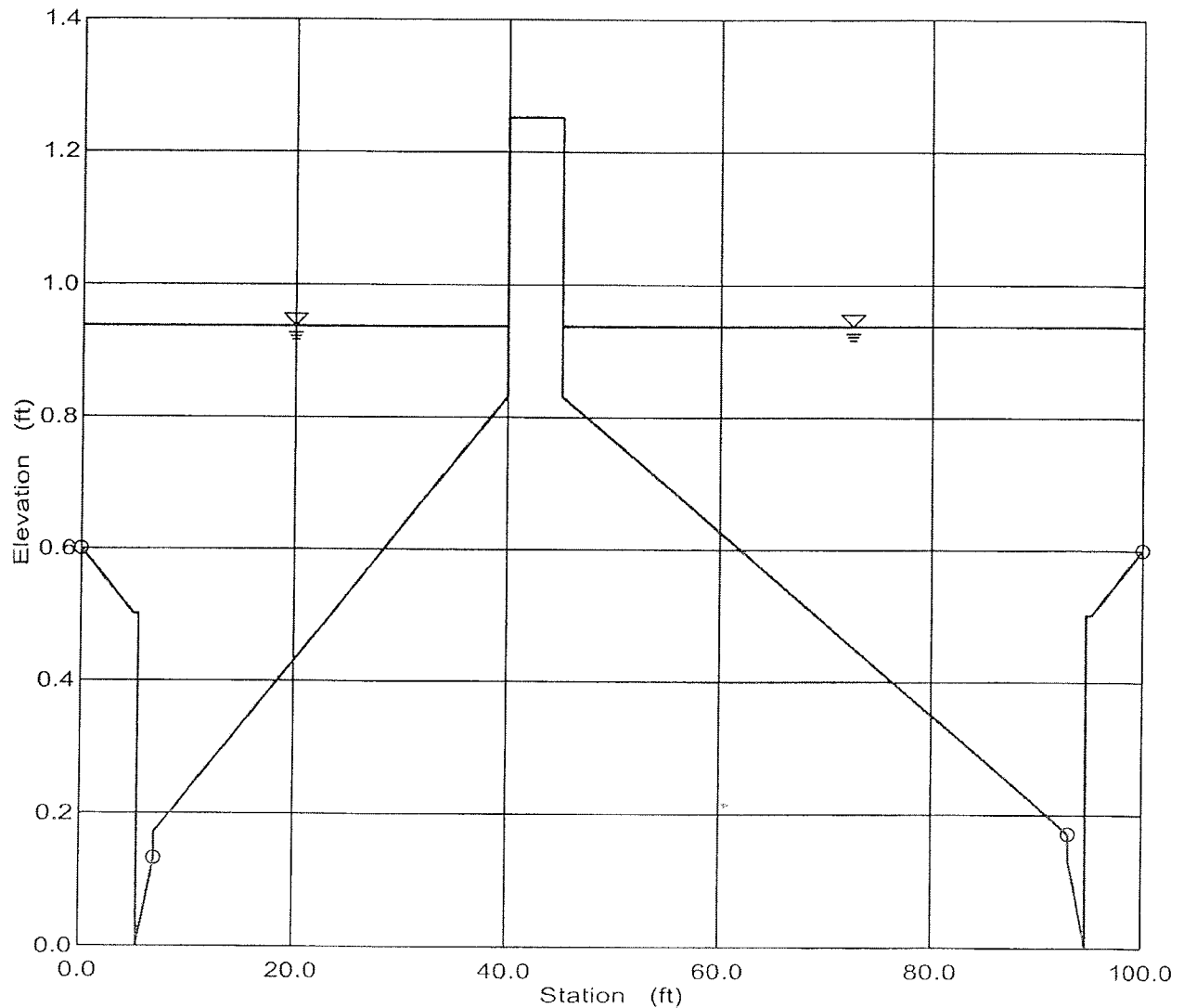
NELLIS - 100YR (WRG)
Worksheet for Irregular Channel

NELLIS - 100YR (WRG)

Cross Section for Irregular Channel

Project Description	
Project File	x:\2011 projects\104111014.01 phases 4-7 @ used car lot\08 - phase
Worksheet	NELLIS - 100YR (WRG)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data	
Wtd. Mannings Coefficient	0.015
Channel Slope	0.005000 ft/ft
Water Surface Elevation	0.94 ft
Discharge	166.00 cfs



REFERENCE MATERIALS

Additional Reference Material

W R G

07-24|51
UPADD#1

UPDATE 1 Addendum 1
To the Technical Drainage Study
for the:

NELLIS CROSSING
RENAMED TO:

NELLIS AND OWENS
DAYCARE CENTER

Located at the SW corner of Nellis
Boulevard and Owens Avenue



W.R.G. Project No. 3055114.00(GRU)

City of Las Vegas, Nevada
A portion of the North (1/2) of the NE (1/4) of Section 29,
Township 20 South, Range 62 East, M.D.M.,
Clark County, Nevada

Prepared for:
Grubb & Ellis
3800 Howard Hughes Pkwy, Suite 1220
Las Vegas, NV 89109

V. HYDRAULIC ANALYSES

A. Street Flows

Normal depth calculations were performed for the drive isles and street along the project site. Although minimum velocity times depth criteria do not apply to parking lots, the depths, velocities and their products are quite low. The finished floor elevation of the project site is a minimum of twice the depth of the 100-year peak flow. The 100-year offsite flow on Nellis Boulevard is 164 cfs would overtop the existing curb along the east side of the project. Therefore, the driveway hump and landscape area will be sloped to protect the site from offsite flows. The slope will have sufficient freeboard along its length. The 10-year dry lane criterion is met in Owens Avenue. However, the 10-year dry lane criterion is not met in Nellis Boulevard. The dry lane criterion is a pre-existing condition. The project site is not adversely impacting Nellis Blvd. The calculations can be found in Appendix E.

The drive isles calculations are summarized in the following table.

STREET SECTION	Q_{10}/Q_{100} (CFS)	D_{10}/D_{100} (ft)	V_{10}/V_{100} (ft/s)	$V \times D$ (ft ² /s)	10-Yr Dry Lane
SECTION 1 Owens Ave	15/100	0.49/0.85	2.31/3.43	1.13/2.92	17.4'
SECTION 2 Nellis Blvd	58/164	0.70/0.93	2.78/3.90	1.95/3.63	5'
SECTION 3 Onsite	1/1	0.10/0.10	1.40/1.40	0.14/0.14	N/A
SECTION 4 Onsite	1/2	0.12/0.16	1.42/1.69	0.17/0.27	N/A

SECTION 2 - NELLIS BLVD - 10-YEAR Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION 2 - NELLIS - FULL ST - 10-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.500 %
Discharge	58.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.015
Water Surface Elevation	0.70 ft
Elevation Range	0.00 to 1.25
Flow Area	20.9 ft ²
Wetted Perimeter	80.37 ft
Top Width	79.07 ft
Actual Depth	0.70 ft
Critical Elevation	0.69 ft
Critical Slope	0.555 %
Velocity	2.78 ft/s
Velocity Head	0.12 ft
Specific Energy	0.82 ft
Froude Number	0.95
Flow Type	Subcritical

Calculation Messages:
Flow is divided.
Water elevation exceeds lowest end station by 0.08500039e-1 ft.

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

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+40.00	0.83

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WRG Design Inc.
Heeslaid Methods, Inc. 37 Brookside Road Waterbury, CT 06708 USA (203) 755-1886

Project Engineer: R. KELLER
FlowMaster v6.1 [814a]
Page 1 of 2

SECTION 2 - NELLIS BLVD - 10-YEAR
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+40.00	1.25
0+45.00	1.25
0+45.00	0.83
0+93.00	0.17
0+93.00	0.13
0+94.50	0.00
0+94.50	0.50
0+95.00	0.50
1+00.00	0.60

Title: 3055114

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WRG Design, Inc.

Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06706 USA (203) 755-1886

Project Engineer: R. KELLER

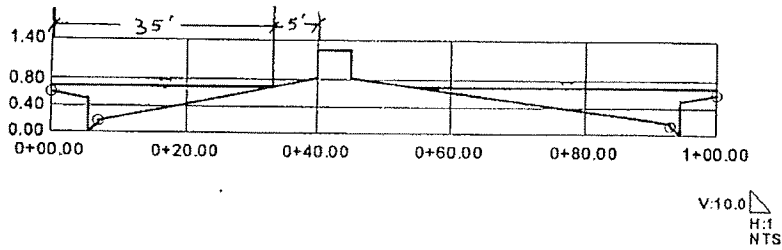
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Page 2 of 2

SECTION 2 - NELLIS BLVD
Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION 2 - NELLIS - FULL ST - 10-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.015
Slope	0.500 %
Water Surface Elevation	0.70 ft
Elevation Range	0.00 to 1.25
Discharge	58.00 cfs



**SECTION 2 - NELLIS BLVD - 100-YEAR
Worksheet for Irregular Channel**

Project Description	
Worksheet	SECTION 2 - NELLIS - FULL ST - 100-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.500 %
Discharge	164.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.015
Water Surface Elevation	0.93 ft
Elevation Range	0.00 to 1.25
Flow Area	42.0 ft ²
Wetted Perimeter	96.98 ft
Top Width	95.00 ft
Actual Depth	0.93 ft
Critical Elevation	0.94 ft
Critical Slope	0.464 %
Velocity	3.90 ft/s
Velocity Head	0.24 ft
Specific Energy	1.17 ft
Froude Number	1.03
Flow Type	Supercritical

Calculation Messages:
Flow is divided.
Water elevation exceeds lowest end station by 0.33198421 ft.

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

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.60
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+40.00	0.83

Title: 3055114
J:\data\gru5114\drain\flowmaster\proposed.fm2
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WRG Design Inc
© Heated Methods, Inc. 37 Brookside Road Waterbury, CT 06706 USA (203) 755-1666

Project Engineer: R. KELLER
FlowMaster v8.1 [8140]
Page 1 of 2

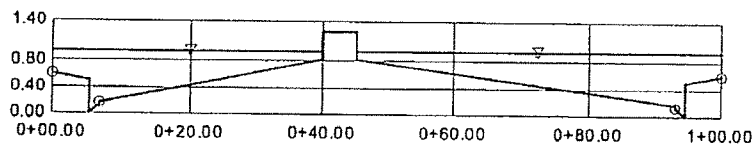
SECTION 2 - NELLIS BLVD - 100-YEAR
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+40.00	1.25
0+45.00	1.25
0+45.00	0.83
0+83.00	0.17
0+83.00	0.13
0+84.50	0.00
0+84.50	0.50
0+85.00	0.50
1+00.00	0.60

SECTION 2 - NELLIS BLVD Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION 2 - NELLIS - FULL ST - 100-YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.015
Slope	0.500 %
Water Surface Elevation	0.93 ft
Elevation Range	0.00 to 1.25
Discharge	164.00 cfs



V:10.0
H:1
NTS

GRADING PLANS

NOTES

This map is for assessment use only and does NOT represent a survey.

No liability is assumed for the accuracy of the data delineated herein. Information on roads and other non-assessed parcels may be obtained from the Road Document Listing in the Assessor's Office.

This map is compiled from official records, including surveys and deeds, but only contains the information required for assessment. See the recorded documents for more detailed legal information.

USE THIS SCALE (FEET) WHEN MAP REDUCED FROM 11X17 ORIGINAL

ASSESSOR'S PARCELS - CLARK CO., NV.
Michele W. Shafe - Assessor

MAP LEGEND

PARCEL BOUNDARY

SUB BOUNDARY

PM/LD BOUNDARY

ROAD EASEMENT

MATCH / LEADER LINE

HISTORIC LOT LINE

HISTORIC SUB BOUNDARY

HISTORIC PM/LD BOUNDARY

SECTION LINE

CONDOMINIUM UNIT

AIR SPACE PCL

RIGHT OF WAY PCL

SUB-SURFACE PCL

001 ROAD PARCEL NUMBER

001 PARCEL NUMBER

1.00 ACREAGE

202 PARCEL SUB/SEQ NUMBER

PB 24-45 PLAT RECORDING NUMBER

5 BLOCK NUMBER

5 LOT NUMBER

GL5 GOV. LOT NUMBER

BOOK

T20S R62E

SEC

28

MAP

N 2 NW 4

140-28-1

CLARK COUNTY

ASSESSOR

NEVADA

124 123 122

139 140 141

162 161 160

177 176 175

174 173 172

171 170 169

168 167 166

165 164 163

162 161 160

159 158 157

156 155 154

153 152 151

150 149 148

147 146 145

144 143 142

141 140 139

138 137 136

135 134 133

132 131 130

129 128 127

126 125 124

123 122 121

120 119 118

117 116 115

114 113 112

111 110 109

108 107 106

105 104 103

102 101 100

99 98 97

96 95 94

93 92 91

90 89 88

87 86 85

84 83 82

81 80 79

78 77 76

75 74 73

72 71 70

69 68 67

66 65 64

63 62 61

60 59 58

57 56 55

54 53 52

51 50 49

48 47 46

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30 29 28

27 26 25

24 23 22

21 20 19

18 17 16

15 14 13

12 11 10

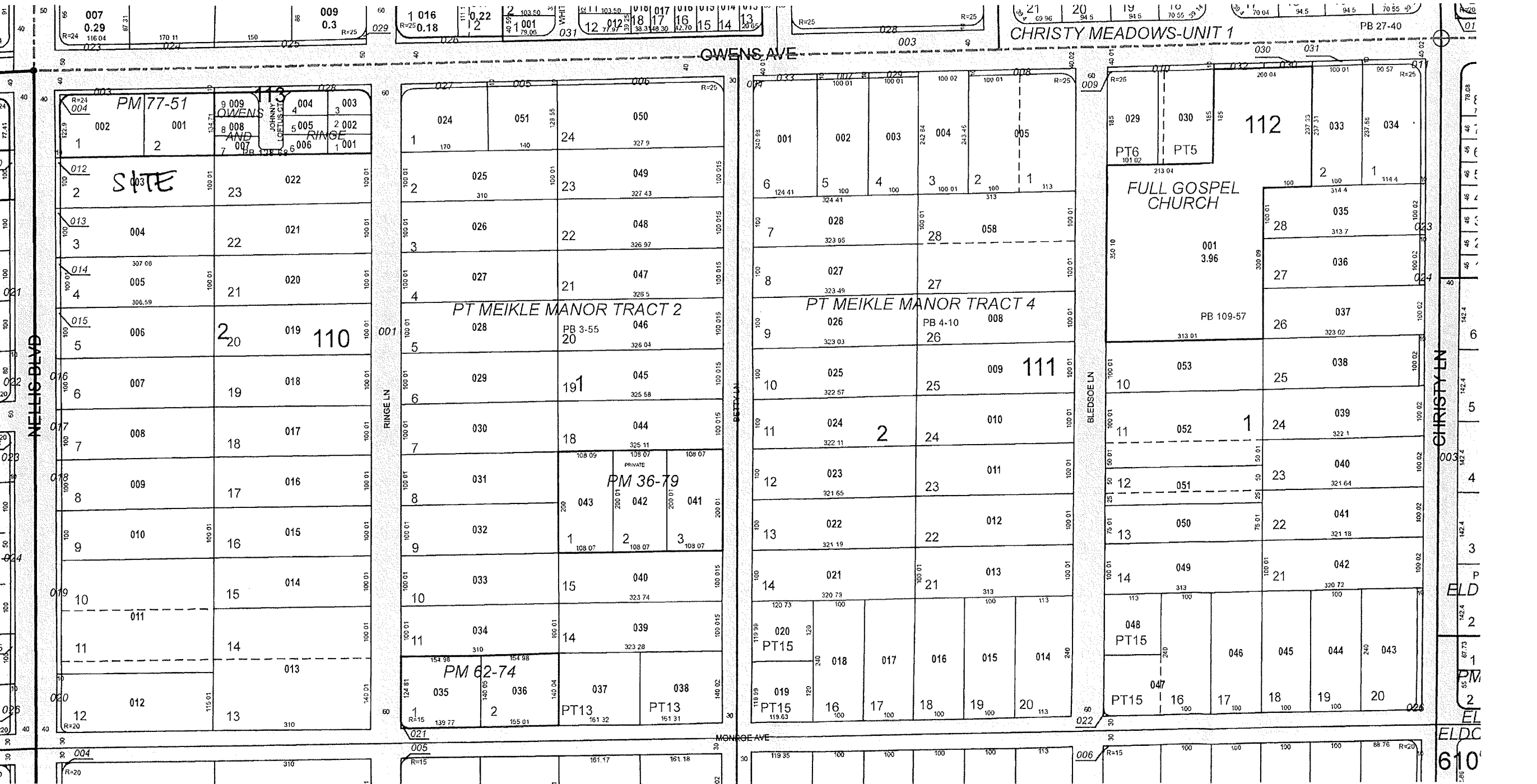
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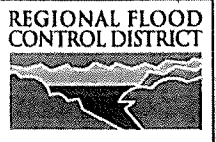
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Scale: 1" = 200'

Rev: 02/09/2011



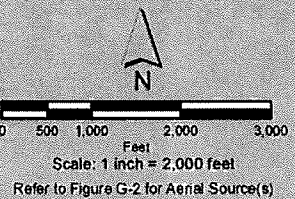


2008
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE
FIGURE F-28
FLOOD CONTROL FACILITIES

LEGEND

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

- Remove & Replace/Parallel Facilities**
- | Category A | Category B |
|------------|------------|
| Channel | Channel |
| Stormdrain | Stormdrain |
| Crossing | Crossing |



US95

2	3		
4	5	6	
7	8	9	10
11	12	13	14
15	16	17	18
19	20	21	22
23	24	25	26
27	28	29	30
31	32	33	34
35	36	37	38
39	40	41	42
43	44	45	46
47	48	49	50
51	52	53	54
55	56	57	58
59			

I-15



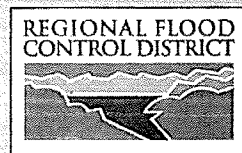
ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%)**
LVCH 0114	P1	RANGE WASH - CHRISTY LATERAL 10' X 7' RCB	2600	849	C324-5	RW3	1.60	0.58
LVNE 0009	P1	LAS VEGAS WASH - NELLIS 2' 13' X 10' RCB	4675	2303	CNEL02-C	WEST3	3.39	0.20
0089	P1	13' X 12' RCB	2700	2187	CNEL01-C	WEST3	3.11	0.37
0140	P1	13' X 12' RCB	2700	2094	COA03-C	WEST3	2.83	0.37
0191	P1	12' X 11' RCB	2700	1745	CLV53-2	WEST3	2.27	0.40
0242	P1	12' X 9' RCB	2700	1367	C321A-3	WEST3	1.72	0.56
RWAL 0009	P1	ALTO CONVEYANCE Conc Chnl 12'W 7'D 2:1 SS	3600	2770	C318D2	RW3	3.38	1.81
0068	P1	Conc Chnl 12'W 6.5'D 2:1 SS	2700	2770	C318D2	RW3	3.38	2.78
0117	P1	Conc Chnl 12'W 7.5'D 2:1 SS	2500	2674	C318C	RW3	3.11	1.00
0170	P1	Conc Chnl 12'W 5'D 2:1 SS	2340	1445	318B	RW3	1.59	2.92
RWEA 0000	P0	RANGE WASH - EAST TRIBUTARY Conc Chnl 25'W 7'D 2:1 SS	1925	4033	C318A2	RW3SC	3.91	0.95
0043	P0	4' 10' X 8' RCBC @ Hollywood	80	4033	C318A2	RW3SC	3.91	0.95
0044	P0	Conc Chnl 25'W 6.5'D 2:1 SS	1930	3230	CC317-3	RW3SC	2.66	0.95
0070	P0	Conc Chnl 25'W 7'D 2:1 SS	3565	2473	C317-4	RW3SC	2.07	0.38
RWLM 0000	P1	LAKE MEAD CONVEYANCE TO ALTO SYSTEM Conc Chnl 12'W 5'D 2:1 SS	2900	1303	318E	RW3	0.93	4.67
0047	P1	12' X 6' RCBC @ Lake Mead	100	1303	318E	RW3	0.93	4.67
0049	P1	Conc Chnl 12'W 5'D 2:1 SS	620	1303	318E	RW3	0.93	4.67
RWSL 0189	E	RANGE WASH - SLOAN Conc Chnl 60'W 6'D 2:1 SS	2590	3710	C324-1	SLOAN3	6.14	0.32
0238	E	5' 10' X 5' RCBC @ Bonanza	100	3221	C324-2	SLOAN3	5.36	0.58
0239	E	Conc Chnl 60'W 6'D 2:1 SS	2600	3221	C324-2	SLOAN3	5.36	0.19
0288	E	3 Span Bridge 54'W 7'D @ Washington Ave	100	2687	C324-3	CONFDB	24.22	0.19
0289	E	Conc Chnl 60'W 6'D 2:1 SS	2700	2687	C324-3	CONFDB	24.22	0.19
0339	E	3' 9' X 5' RCBC @ Owens	75	2555	C324-4	CONFDB	23.70	0.60
0340	E	Conc Chnl 48'W 6'D 2:1 SS	1350	2555	C324-4	CONFDB	23.70	0.60
0365	E	Conc Chnl 48'W 7'D 3:1 SS	1300	2555	C324-4	CONFDB	23.70	0.60
0369	E	5' 12' X 5' RCBC @ Lake Mead	100	2311	C48A1	CONFDB	22.22	0.36
0390	E	Conc Chnl 38'W 6'D 3:1 SS	1290	2311	C48A1	CONFDB	22.22	0.36
0414	E	4' 12' X 5' RCBC @ Judson Ave	60	2311	C48A1	CONFDB	22.22	0.45
0415	E	Conc Chnl 39'W 6'D 3:1 SS	1290	2311	C48A1	CONFDB	22.22	0.36
0446	E	Conc Chnl 20'W 6'D 2:1 SS	2650	1073	C318D1	CONFDB	20.75	0.38
0447	E	Earth Chnl 25'W 9'D 2:1 SS (Replace w/ RWSL0448)	4050	1831	C321-1	RW4SC	11.83	0.42
0448	P0	Riprap Chnl 25'W 8.5'D 2:1 SS (Replaces RWSL0447)	4050	1831	C321-1	RW4SC	11.83	0.42
0489	E	Earth Chnl 12'W 9'D 2:1 SS (Replace w/ RWSL0490)	3460	1668	SLOAN	RW4SC	10.94	0.42
0490	P0	Riprap Chnl 12'W 10'D 2:1 SS (Replaces RWSL0489)	3460	1668	SLOAN	RW4SC	10.94	0.42
0499	E	72,000 cfs PMF Spillway	72000		CCONDB	RW5SC	20.23	
0500	E	2' 8' X 7' RCB Outlet	126	1038	CONFDB	RW5SC	20.23	
0501	E	1,025 ac-ft Confluence Detention Basin		6081	CCONDB	RW5SC	20.23	
0502	E	Grass Chnl 60'W 6'D 3:1 SS	1100	4377	D2C47B3*	RW4SC	10.94	0.37
0524	E	Grass Chnl 60'W 6'D 3:1 SS	2400	4377	D2C47B3	RW4SC	10.94	0.37
0560	E	Earth Chnl 50'W 6'D 3:1 SS (Replace w/ RWSL0561)	580	4377	D2C47B3	RW4SC	10.94	0.37
0561	P1	Conc Chnl 55'W 6.5'D 2:1 SS (Replaces RWSL0560)	580	4377	D2C47B3	RW4SC	10.94	0.37
0574	E	2 Span Bridge 24'W	50	4377	D2C47B3	RW4SC	10.94	0.38
0575	E	Diversion Structure	280	4377	D2C47B3	RW4SC	10.94	
0576	E	Earth Chnl 16'W 9'D 2:1 SS (Replace w/ RWSL0577)	3000	5187	CCSLNL	RW4SC	8.62	0.38
0577	P1	Conc Chnl 40'W 8'D 2:1 SS (Replaces RWSL0576)	3000	5187	CCSLNL	RW4SC	8.62	0.38
0609	P1	Conc Chnl 30'W 9'D 2:1 SS	1440	5187	CCSLNL	RW4SC	8.62	0.38
0663	E	3' 10' X 8' RCBC @ Tyndall Street	60	3080^	CCSLNL^	RW4SC	8.62	0.38
0664	P1	Add 4' 10' X 7' RCBC @ Tyndall Street	60	2107^	CCSLNL^	RW4SC	8.62	0.38
0685	E	Conc Chnl 16'W 9'D 1.5:1 SS	435	5187	CCSLNL	RW4SC	8.62	0.56
0670	E	3' 10' X 7' RCBC @ Nellis	100	3178^	CCSLNL^	RW4SC	8.62	0.56
0671	P1	Add 3' 12' X 7' RCBC @ Nellis	100	2009^	CCSLNL^	RW4SC	8.62	0.56
0672	E	Conc Chnl 14'W 8'D 1.5:1 SS	1130	2924	CC47C-4	RW3SC	3.94	0.56
SLBN 0009	E	BONANZA ROAD CONVEYANCE 72' RCP	5400	615	C50B1	RW3	0.56	1.85

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%)**
SLER 0000	E	EASTRIDGE CONVEYANCE TO WASHINGTON SYSTEM 8' X 4.5' RCAP	2740	901	C49E5	RW3	0.64	1.78
0056	E	60" RCP	1500	901	C49E5	RW3	0.64	2.61
0086	E	78" CMP	1350	623	49D	RW3	0.35	3.73
SLLM 0000	E	LAKE MEAD CONVEYANCE 48" RCP	5100	601	48B	RW3	0.39	2.60
SLNL 0000	P1	NELLIS STORMDRAIN 2' 12' X 11' RCB	3400	3471	CSLNL	RW3	4.68	0.44
SLOW 0000	P1	OWENS CONVEYANCE TO WASHINGTON SYSTEM 8' X 6' RCB	270	317	COW2	RW3	0.23	3.80
0005	P1	6' X 6' RCB	830	317	COW2	RW3	0.23	1.70
0021	P0	Conc Chnl 12'W 3.5'D 2:1 SS	860	317	COW2	RW3	0.23	7.50
SLST 0104	P1	STEWART AVENUE CONVEYANCE 6' X 6' RCB	1700	408	20R-2	RW3	0.41	1.00
SLWA 0000	E	WASHINGTON AVENUE CONVEYANCE / DETENTION 11' X 8.1' RCAP	3750	1195	C49E1	RW3	1.92	0.60
0066	E	10' X 6' RCAP	1300	168	C49E3	RW3	1.03	4.10
0091	E	Conc Chnl 10'W 5'D 2:1 SS	1950	168	C49E3	RW3	1.03	0.40
0130	P1	48" RCP	1050	60	OWENSOT	RW3	0.87	4.10
0150	P1	36" RCP	1270	60	OWENSOT	RW3	0.87	4.10
0151	P1	13,610 cfs PMF Spillway		13610	OWENSIN	RW3	0.87	
0152	P1	24" RCP Outlet	150	60	OWENSOT	RW3	0.87	
0153	P1	88 ac-ft Owens Detention Basin		1288	OWENSIN	RW3	0.87	
0175	P1	Conc Chnl 12'W 3.5' D 2:1 SS	1500	779	OW4	RW3	0.52	7.50

* 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 - 28

LEGEND	ID (Facility Identifier)	AABB
	Parent Stream Name	
	Stream Name	
	River Mile	0000
	Distance Above Confluence with Parent Stream (Miles)	
	Miles in Hundredths	

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

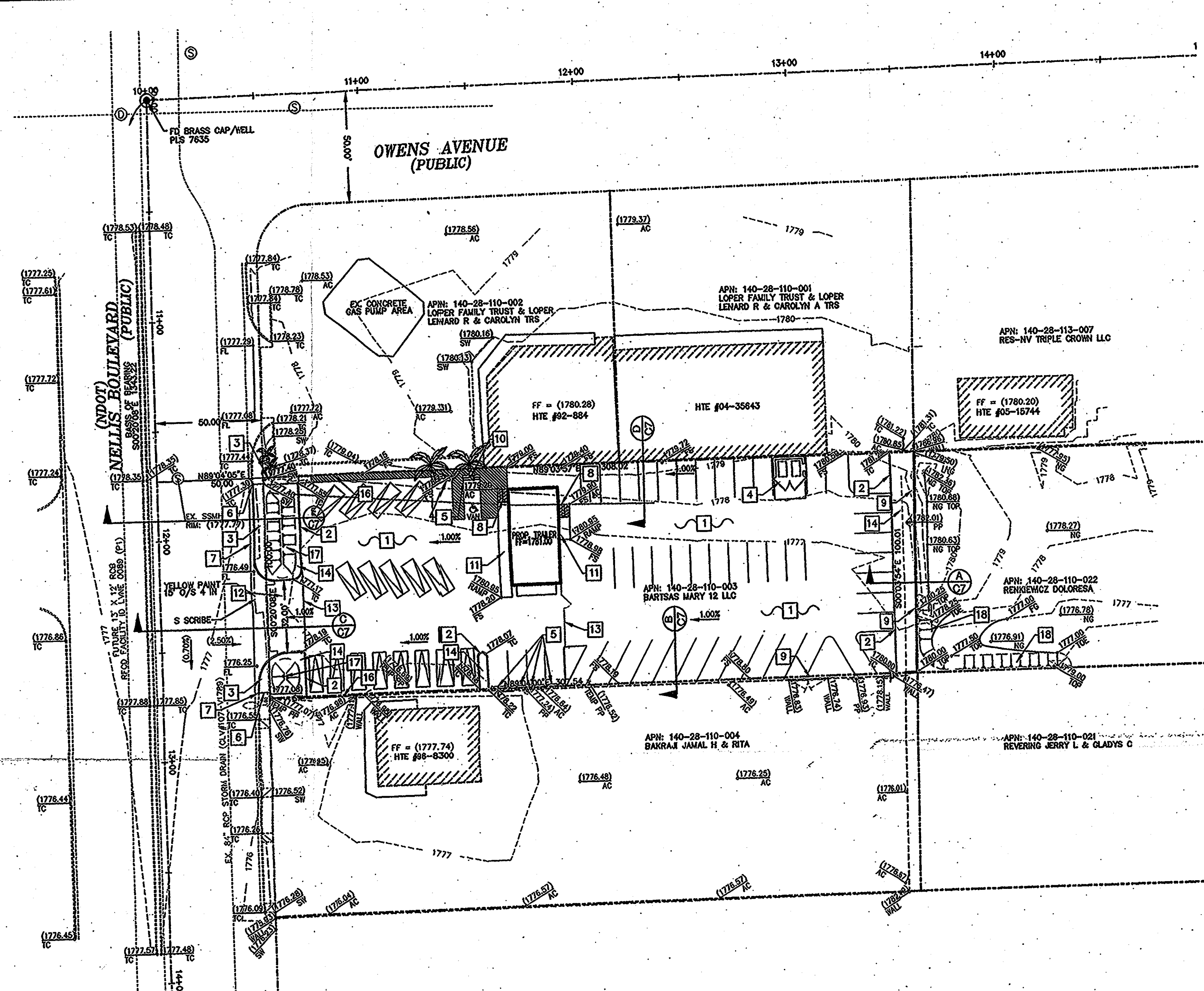
Construction Features

Cast in Place Concrete Pipe	CIPCP	Reinforced Concrete Arch Culvert	RCAC
Corrugated Metal Arch Pipe Culvert	CMAF	Reinforced Concrete Box	RCB
Corrugated Metal Pipe Culvert	CMPC	Reinforced Concrete Box Culvert	RCBC
High Density Polyethylene	HDPE	Reinforced Concrete Pipe	RCP
Horizontal Elliptical Reinforced Concrete Pipe	HERCP	Reinforced Concrete Pipe Culvert	RCPC
Reinforced Concrete Arch Pipe	RCAP	Storm Sewer Pipe	SSP



- ABBREVIATIONS
(SEE CIV. SHT. FOR COMPLETE LIST)
- AC ASPHALTIC CONCRETE
 - ADJ ADJUST
 - AGG AGGREGATE
 - BC BEGINNING OF CURB RETURN
 - BEG BEGIN
 - BSW BACK OF SIDEWALK
 - BVC BEGINNING OF VERTICAL CURVE
 - CATV CABLE TV
 - CCAU CLARK COUNTY AREA
 - CCF CLARK COUNTY FLOOD CONTROL DISTRICT
 - CL CENTERLINE
 - CLV CITY OF LAS VEGAS
 - CMU CONCRETE MASONRY UNIT
 - CO CLEAN OUT
 - COMM COMMUNICATIONS
 - CONC CONCRETE
 - COND CONDUIT
 - CULV CULVERT
 - DC DEEPENED CURB
 - DIP DROP INLET
 - DIP DUCTILE IRON PIPE
 - DMA DOMESTIC
 - ELEC ELECTRIC
 - EAC END OF AC
 - EC END OF CURVE
 - ECR END OF CURB RETURN
 - ELEV ELEVATION
 - EP EDGE OF PAVEMENT
 - EV END OF VERTICAL CURVE
 - EX EXISTING
 - FF FINISH FLOOR
 - FG FINISH GRADE
 - FI FIRE HYDRANT
 - FL FLOW LINE
 - FO FIBER OPTICS
 - FS FINISHED SURFACE
 - GB GRADE BREAK
 - HDPE HIGH DENSITY POLYETHYLENE
 - HDL HEADWALL
 - HGL HYDRAULIC GRADE LINE
 - HP HIGH POINT
 - INV INVERT
 - IRR IRRIGATION
 - LAT LATERAL
 - LF LINEAL FEET
 - LS LANDSCAPE
 - LT LEFT
 - LVWD LAS VEGAS VALLEY WATER DISTRICT
 - MAX MAXIMUM
 - MH MANHOLE
 - MIN MINIMUM
 - MTR METER
 - NDOT NEVADA DEPARTMENT OF TRANSPORTATION
 - PB PULL BOX
 - PL PROPERTY LINE
 - PP POWER POLE
 - PROP PROPOSED
 - PVC POLY VINYL CHLORIDE PIPE
 - PVMT PAVEMENT
 - RT RIGHT
 - ROW RIGHT-OF-WAY
 - SS SANITARY SEWER
 - SD STORM DRAIN
 - SHWA SOUTHERN NEVADA WATER AUTHORITY
 - STA STATION
 - STLT STREET LIGHT
 - SVZ SIGHT VISIBILITY ZONE
 - SW SIDEWALK
 - TEL TELEPHONE
 - TC TOP OF CURB
 - TF TOP OF FOOTING
 - TP TOP OF WALL
 - TYP TYPICAL
 - UDACS UNIFORM DESIGN AND CONSTRUCTION STANDARDS
 - VG VALLEY CUTTER
 - WL WATER LINE

LEGEND		
DESCRIPTION	EXISTING	PROPOSED
UTILITIES		
B.O. VALVE	↑	↑
ARE HYDRANTS	○	○
CLEAN OUT	○	○
GATE VALVE	○	○
METER	△	△
RECOVER	△	△
GAP	↑	↑
11.25' E.B.W.	↑	↑
22.5' E.B.W.	↑	↑
45' E.B.W.	↑	↑
90' E.B.W.	↑	↑
CROSS	↑	↑
T.C.	↑	↑
MANHOLES		
ELECTRICAL	⊙	⊙
SANITARY SEWER	⊙	⊙
STORM DRAIN	⊙	⊙
TELEPHONE	⊙	⊙
STREET LIGHTS		
100W HPS STL	○	○
150W HPS STL	○	○
200W HPS STL	○	○
250W HPS STL	○	○
400W HPS STL	○	○
GRADING		
SPOT ELEV.	(12.33)	12.34
SLOPE	(1.23%)	1.23%
5' CONT.	(2005)	(2005)
1' CONT.	(2007)	(2007)
SITE		
SDH	—	—
1" CURB	—	—
2" CURB	—	—
EDGE OF PAVT.	—	—
WALL	—	—
LINE TYPES		
CL OR SECTION LINE	—	—
RIGHT OF WAY LINE	—	—
1" EASEMENT LINE	—	—
SAWTOOTH LINE	—	—
FLOW	—	—
SHADES		
HEAVY AC PAVEMENT	—	—



DRAINAGE FACILITIES QUANTITIES

DESCRIPTION	PUBLIC QUANTITY	PRIVATE QUANTITY
CROSS CUTTER	35 LF	1 LF
1" CURB	64 LF	6 LF

STORMWATER MANAGEMENT NOTES:

1. THE OWNER, SITE DEVELOPER, CONTRACTOR, AND/OR THEIR AUTHORIZED AGENTS SHALL EACH DAY REMOVE ALL SEDIMENT, MUD, CONSTRUCTION DEBRIS OR OTHER POTENTIAL POLLUTANTS THAT MAY HAVE BEEN DISCHARGED TO, OR ACCUMULATED IN, THE PUBLIC RIGHTS OF WAY OF THE CLARK COUNTY AS A RESULT OF CONSTRUCTION ACTIVITIES ASSOCIATED WITH THIS SITE DEVELOPMENT OR CONSTRUCTION PROJECT. SUCH MATERIALS SHALL BE PREVENTED FROM ENTERING THE STORM SEWER SYSTEM.
2. ADDITIONAL CONSTRUCTION-SITE DISCHARGE BEST MANAGEMENT PRACTICES MAY BE REQUIRED OF THE OWNER AND HIS OR HER AGENTS DUE TO UNFORESEEN EROSION PROBLEMS OR IF THE SUBMITTED PLAN DOES NOT MEET THE PERFORMANCE STANDARDS SPECIFIED IN THE CLARK COUNTY BUILDING ADMINISTRATIVE CODE 24.40 AND THE LAS VEGAS VALLEY CONSTRUCTION SITE BMP GUIDANCE MANUAL.
3. TEMPORARY OR PERMANENT STABILIZATION PRACTICES WILL BE INSTALLED ON DISTURBED AREAS AS SOON AS PRACTICABLE AND NO LATER THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS TEMPORARILY OR PERMANENTLY CEASED. SOME EXCEPTIONS MAY APPLY, REFER TO THE NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.5.
4. AT A MINIMUM, THE CONTRACTOR OR HIS AGENT SHALL INSPECT ALL DISTURBED AREAS, AREAS USED FOR STORAGE OF MATERIALS AND EQUIPMENT THAT ARE EXPOSED TO PRECIPITATION, VEHICLE ENTRANCE AND EXIT LOCATIONS, AND ALL BMPs WEEKLY, AND WITHIN 24 HOURS AFTER ANY RAIN EVENT OF 0.5 INCHES OR MORE. THE CONTRACTOR SHALL HAVE AGENT SHALL UPDATE OR MODIFY THE STORMWATER POLLUTION PREVENTION PLAN AS NECESSARY. SOME EXCEPTIONS TO WEEKLY INSPECTIONS MAY APPLY, SUCH AS SUSPENSION OF LAND DISTURBANCE ACTIVITIES. REFER TO THE NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.12.
5. ACCUMULATED SEDIMENT IN BMPs SHALL BE REMOVED WITHIN SEVEN DAYS AFTER STORMWATER RUNOFF EVENT OR PRIOR TO THE NEXT ANTICIPATED STORM EVENT, WHICHEVER IS EARLIER. SEDIMENT MUST BE REMOVED WHEN BMP DESIGN CAPACITY HAS BEEN REDUCED BY 50 PERCENT OR MORE.

GRADING PLAN CERTIFICATION

NAME: BRANDON POTTS PE #13121 DATE: 7/16/12
CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH APPROVED DRAINAGE STUDY HTE #11-44701 FOR THIS SITE ON FILE AT CLARK COUNTY FOR THIS PROJECT.

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS

ACCEPTANCE OF PLANS FOR FILING:
BY: _____ DATE: _____
ACCEPTANCE OF THESE PLANS FOR FILING SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS AND/OR SPECIFICATIONS. CLARK COUNTY SHALL BE HELD FREE FROM DAMAGES WHICH MAY RESULT FROM THE CONSTRUCTION OF THE IMPROVEMENTS FROM THE ENGINEERING DESIGN DEPICTED HEREIN. NOTE: POWER POLES AND/OR OTHER EXISTING FACILITIES NOT IN PROPER LOCATION, BASED ON PROPOSED IMPROVEMENTS SHOWN HEREON WILL BE RELOCATED AT NO EXPENSE TO CLARK COUNTY.

CONSTRUCTION NOTES:

- 1. ALL CONSTRUCTION TO BE DONE IN ACCORDANCE WITH "CLARK COUNTY AREA UNIFORM STANDARD DRAWINGS (C.C.A.U.S.D.)" LATEST EDITION AND/OR REGULATING ENTITY HAVING JURISDICTION.
- 2. NOT ALL NOTES USED ON THIS SHEET -
- 1. CONSTRUCT AC PAVEMENT PER DETAIL ON SHEET C7.
- 2. CONSTRUCT "A" TYPE CURB PER C.C.A.U.S.D. No. 219.
- 3. CONSTRUCT CONCRETE SIDEWALK PER C.C.A.U.S.D. No. 234 (MIN 2.0% CROSS SLOPE).
- 4. CONSTRUCT TRASH ENCLOSURE. SEE ARCHITECTURAL PLANS.
- 5. INSTALL BUMPER BLOCK PER C.C.A.U.S.D. No. 238.
- 6. MATCH EXISTING CURB.
- 7. REPLACE "L" TYPE CURB PER C.C.A.U.S.D. No. 219.
- 8. INSTALL RAMP PER ADA STANDARDS.
- 9. INSTALL CHU WALL PER DETAIL ON SHEET C7.
- 10. INSTALL RESERVED PARKING SIGN PER DETAIL ON SHEET C7.
- 11. INSTALL TRAILER DECK WITH HANDRAILS. SEE ARCHITECTURAL PLANS.
- 12. INSTALL DRIVEWAY PER C.C.A.U.S.D. No. 222, 228.
- 13. INSTALL SLIDING GATE. SEE ARCHITECTURAL PLANS.
- 14. LANDSCAPE AREA. SEE ARCHITECTURAL PLANS.
- 15. INSTALL SIGN. SEE ARCHITECTURAL PLANS.
- 16. INSTALL WROUGHT IRON FENCE. SEE ARCHITECTURAL PLANS.
- 17. INSTALL 2' BERM (MAX 3:1 SLOPE). SEE DETAIL ON SHEET C7.
- 18. INSTALL OFF-SITE 2' BERM (MAX 3:1 SLOPE).

GRADING NOTES:

1. SLOPES 4:1 OR STEEPER AND FINE-GRAINED MATERIALS THAT HAVE BEEN DISTURBED (SANDY AND SILTY MATERIALS) SHOULD BE PROTECTED WITH BURLAP OR OTHER EROSION CONTROL FABRIC/MATERIAL, UNLESS OTHERWISE SPECIFIED BY LANDSCAPE DRAWINGS AND SPECIFICATIONS OR THE SOILS REPORT.
2. CONTRACTOR SHALL DETERMINE HIS OWN FOOTING OR BASEMENT EXCAVATION QUANTITIES, EVEN THOUGH SHOWN ON ROUGH GRADING PLANS. ADDITIONALLY, STRUCTURE BACKFILL COSTS SHOULD BE INCLUDED IN THE COST OF THE STRUCTURE, UNLESS OTHERWISE SPECIFIED IN THE CONTRACT DOCUMENTS.
3. CONTRACTOR SHALL NOTIFY CIVILWORKS INC WITHIN 24 HOURS OF OMISSIONS AND ERRORS DISCOVERED ON PLANS. CIVILWORKS INC WILL NOT BE RESPONSIBLE FOR ANY "CORRECTIVE" WORK DONE BY OTHERS.

GEOTECHNICAL NOTE:

A GEOLOGIST OR GEOTECHNICAL ENGINEER SHALL BE ON SITE DURING EXCAVATION AND MASS GRADING OPERATIONS TO EXAMINE THE SOIL CHARACTERISTICS AND GEOLOGICAL CONDITIONS ENCOUNTERED, AND TO PROVIDE PROFESSIONAL ADVICE TO THE OWNER IN THE EVENT THAT UNANTICIPATED SOIL PROBLEMS ARISE AND/OR SUBSURFACE SITE CONDITIONS ARE FOUND TO BE SIGNIFICANTLY DIFFERENT THAN DEFINED BY PRE-DESIGN EXPLORATION AND TESTING.

FLOOD ZONE NOTE:

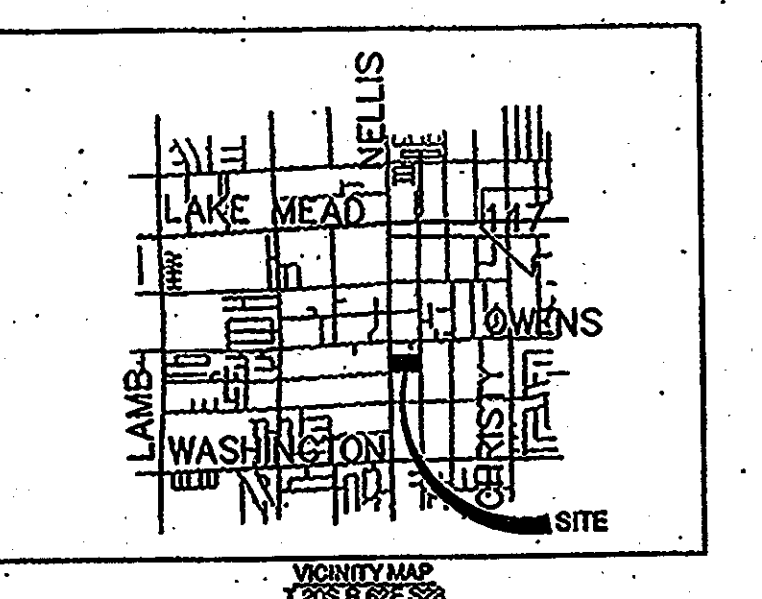
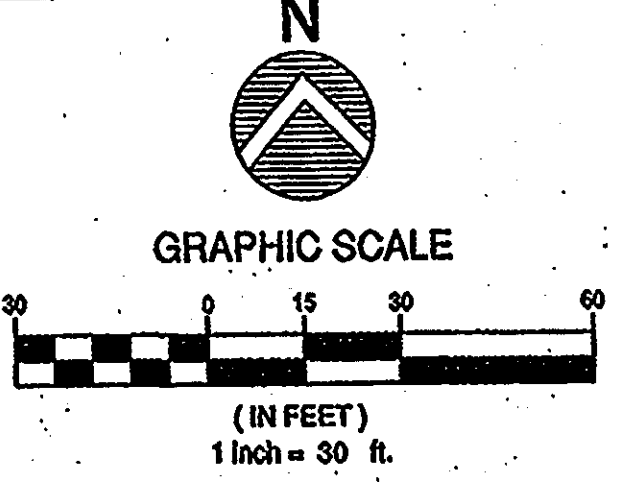
A REVIEW OF THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD INSURANCE RATE MAP (FIRM) COMMUNITY-PANEL NUMBER 32003C022606-DATED SEPTEMBER-27, 2002 INDICATES THE SITE IS LOCATED WITHIN A FEMA ZONE "X". A ZONE "X" IS DESCRIBED AS FEMA AREAS OUTSIDE OF THE 0.2% ANNUAL CHANCE FLOODPLAIN.

BENCHMARK

CLARK COUNTY BENCHMARK: 6C02 28NWN6 (NAVD83)
RIVET AND SQUARE ALUMINUM PLATE IN TOP OF NORTHWEST CORNER OF NELLIS BLVD. AND MONROE AVE. NEAR THE PC OF NELLIS BLVD. #4561
ELEV. = 540.396 (METRIC)
1772.95 (US SURVEY FEET)
BASIS OF BEARING
NORTH 00°20'08" WEST BEING THE WEST LINE OF NORTHWEST QUARTER (NW 1/4) OF SECTION 28, TOWNSHIP 20 SOUTH, RANGE 62 EAST, M.D.M., CLARK COUNTY, STATE OF NEVADA, AS SHOWN BY MAP THEREOF ON FILE IN FILE 77, PAGE 51 OF SURVEYS, IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

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Office: (702) 334-7555 Fax: (702) 334-1825

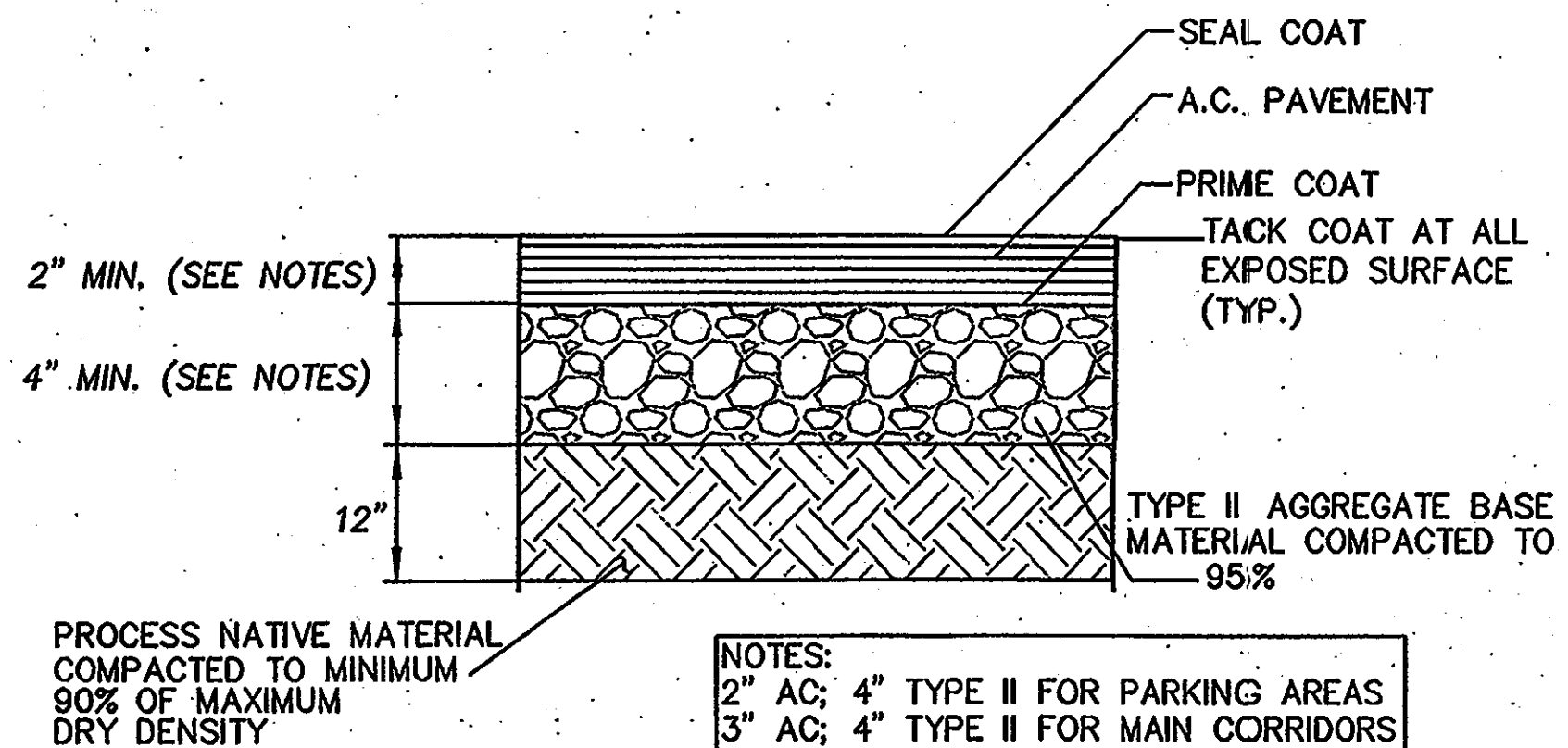
CONSULTANT LIST:
Civilworks Inc
4945 W. Patrick Lane
Las Vegas, NV 89118
Phone: 702-334-7555
Fax: 702-334-1825

USED CAR LOT
AT 1578 NELLIS BLVD.
DEVELOPER: GGM ARCHITECTS
4945 W. PATRICK LANE
LAS VEGAS, NV 89118
PHONE: 702-334-7888
CONTACT: MARK MARTINO

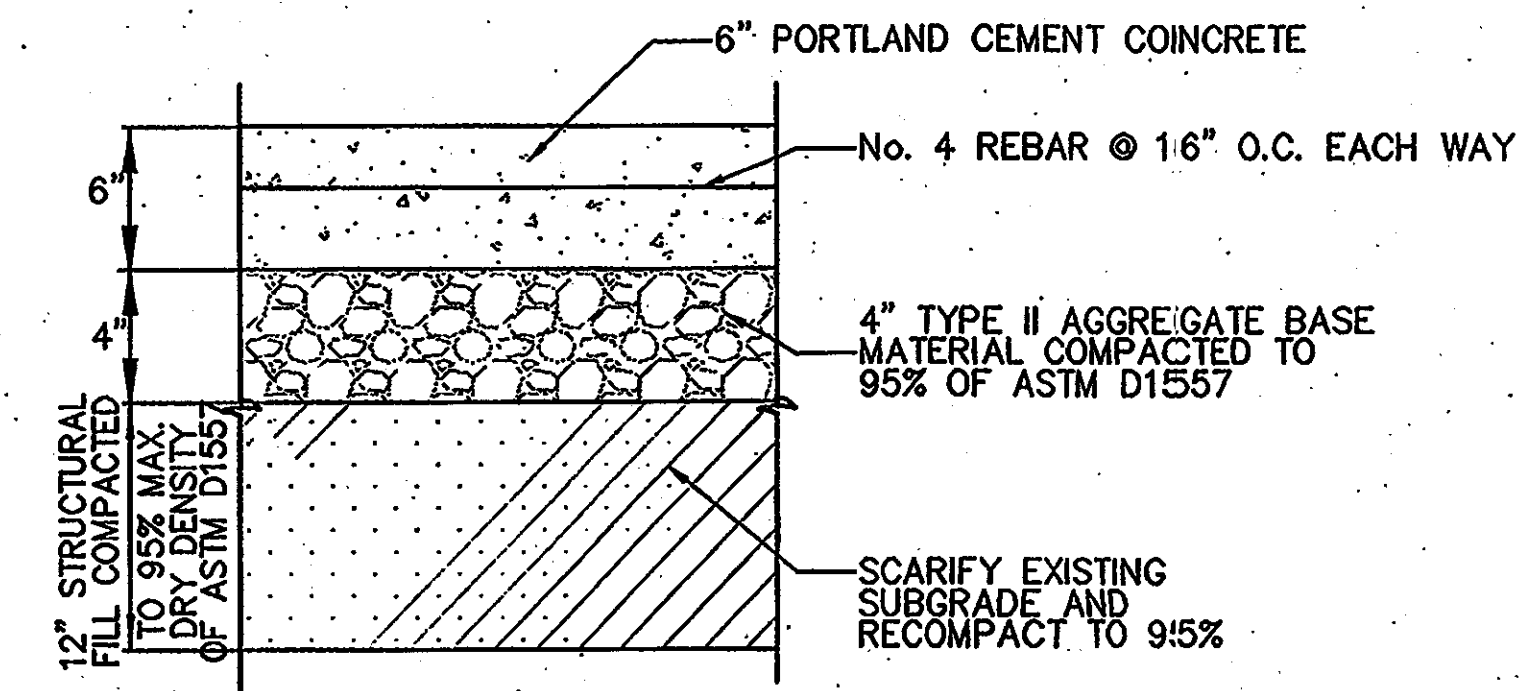
GRADING PLAN
SHEET # C5
DATE: 7/16/12
BY: BRANDON POTTS
PE #13121
CIVIL
RETURN DRAINAGE STUDY
REDLINES WITH ALL FUTURE
SUBMITTALS FOR THIS PROJECT
APPLAN

- ABBREVIATIONS
(SEE C.V.R. SHT. FOR COMPLETE LIST)
AC ASPHALTIC CONCRETE
ADJ ADJUST
AGG AGGREGATE
BC BACK OF CURB
BCR BEGINNING OF CURB RETURN
BEG BEGIN
BSW BACK OF SIDEWALK
BVC BEGINNING OF VERTICAL CURVE
CATV CABLE TV
CCAUSSD CLARK COUNTY AREA UNIFORM STANDARD DRAWING
CCRFCD CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
CL CENTERLINE
CLV CITY OF LAS VEGAS
CMU CONCRETE MASONRY UNIT
CO CLEAN OUT
COMM COMMUNICATIONS
COND CONDUIT
CULV CULVERT
DC DEEPENED CURB
DIP DROP INLET
DIP DUCTILE IRON PIPE
DOM DOMESTIC
ELEC ELECTRIC
EAC EDGE OF AC
EC END OF CURVE
ECR END OF CURB RETURN
ELEV ELEVATION
EP EDGE OF PAVEMENT
EV END OF VERTICAL CURVE
EX EXISTING
FAST FREEWAY & ARTERIAL SYSTEM OF TRANSPORTATION
FF FINISH FLOOR
FG FINISH GRADE
FH FIRE HYDRANT
FL FLOW LINE
FO FIBER OPTICS
FS FINISHED SURFACE
GB GRADE BREAK
HDPE HIGH DENSITY POLYETHYLENE
HDLH HEADWALL
HGL HYDRAULIC GRADE LINE
HP HIGH POINT
INV INVERT
IRR IRRIGATION
LAT LATERAL
LF LINEAL FEET
LS LANDSCAPE
LVND LEFT LAS VEGAS VALLEY WATER DISTRICT
MAX MAXIMUM
MH MANHOLE
MIN MINIMUM
MTR METER
NDOT NEVADA DEPARTMENT OF TRANSPORTATION
PB PULL BOX
PL PROPERTY LINE
PP POWER POLE
PROP PROPOSED
PVC POLY VINYL CHLORIDE PIPE
PVM PAVEMENT
RT RIGHT
ROW RIGHT-OF-WAY
SS SANITARY SEWER
SD STORM DRAIN
SNWA SOUTHERN NEVADA WATER AUTHORITY
STA STATION
STLT STREET LIGHT
SVZ SIGHT VISIBILITY ZONE
SW SIDEWALK
TEL TELEPHONE
TC TOP OF CURB
TF TOP OF FOOTING
TV TOP OF WALL
TYP TYPICAL
UDACS UNIFORM DESIGN AND CONSTRUCTION STANDARDS
VG VALLEY GUTTER
VL WATER LINE

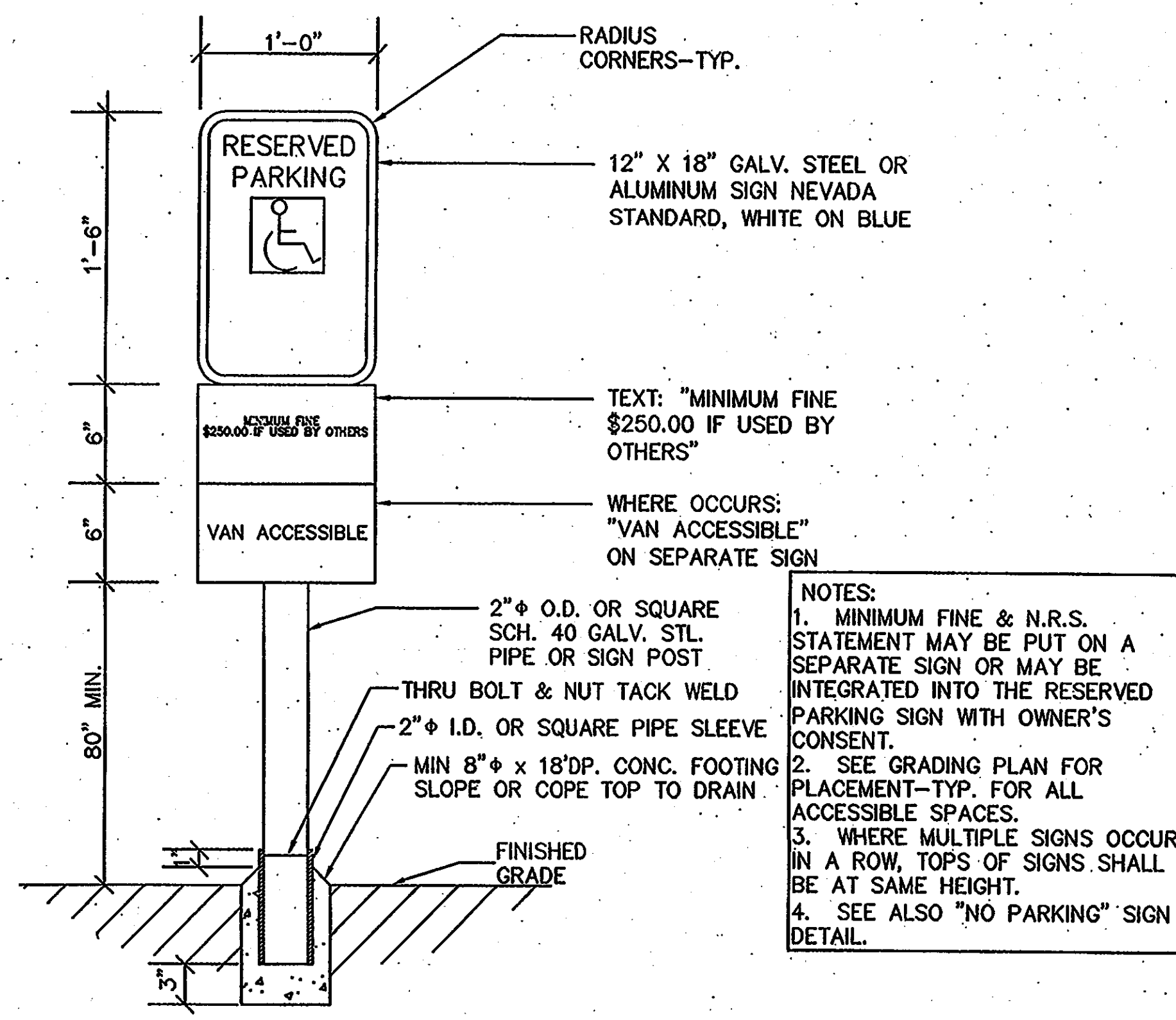
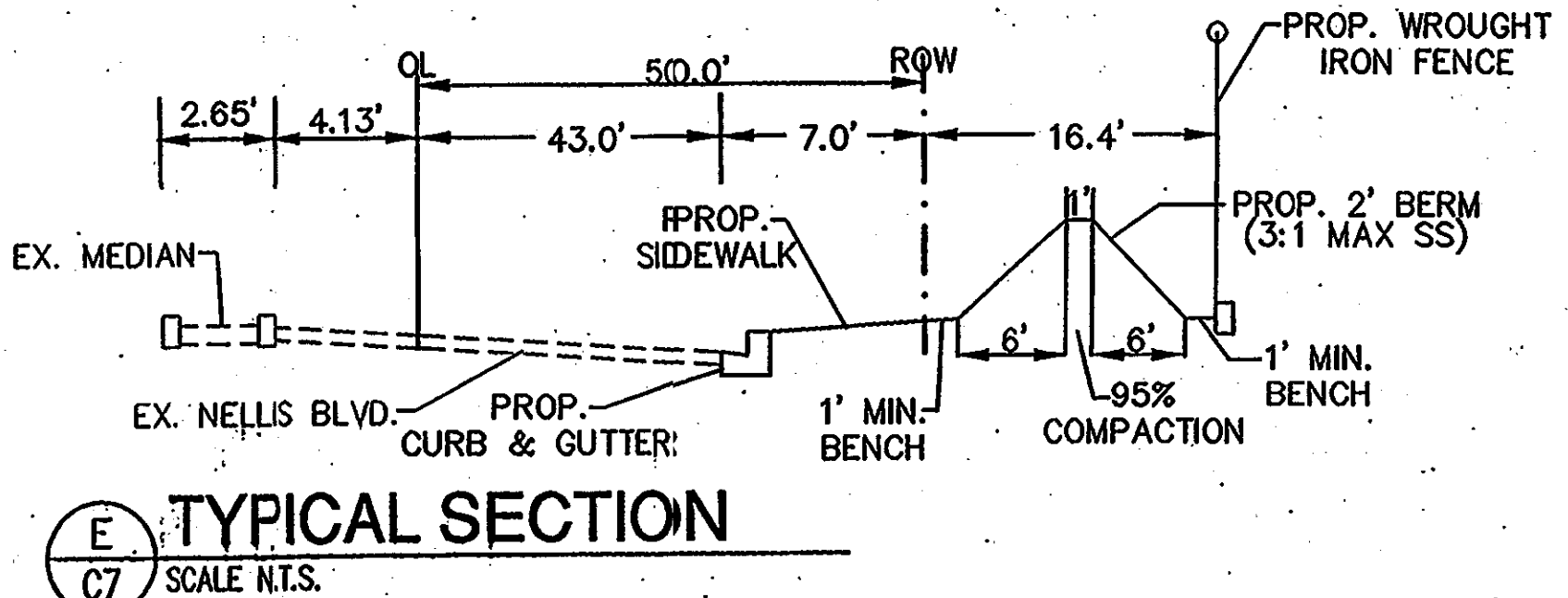
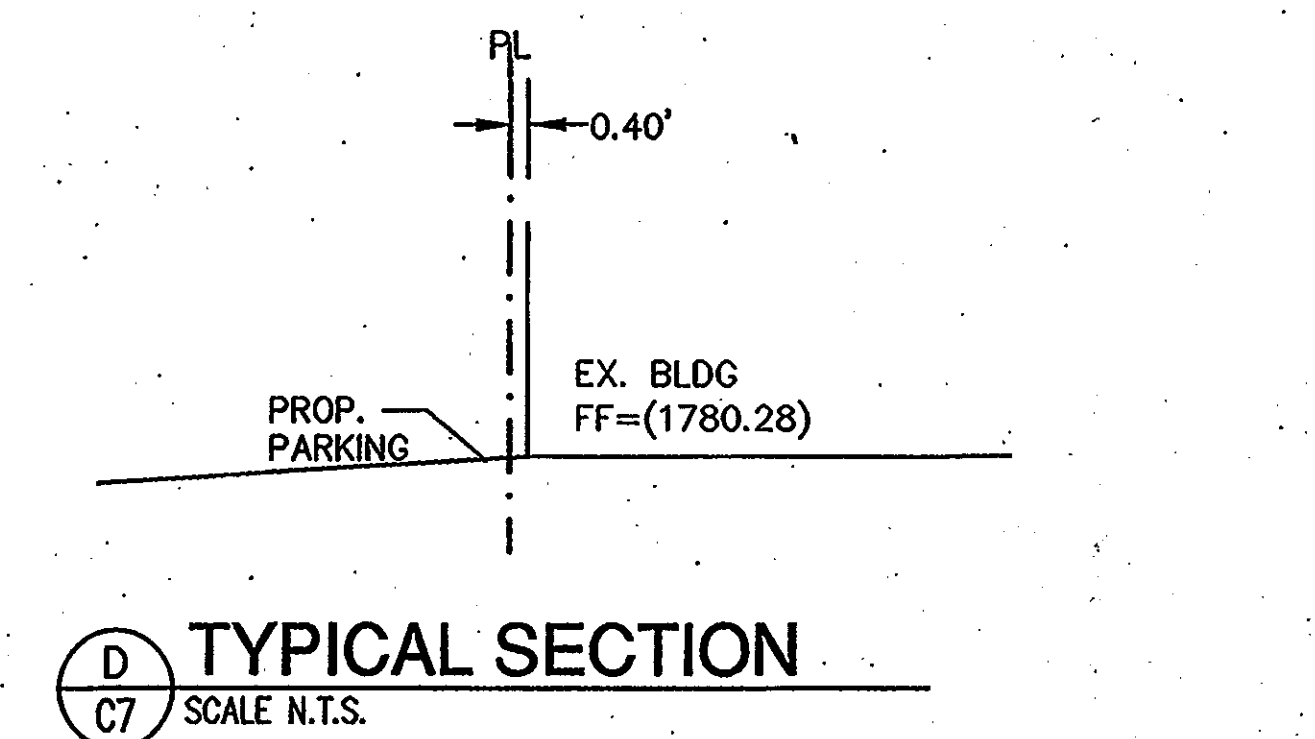
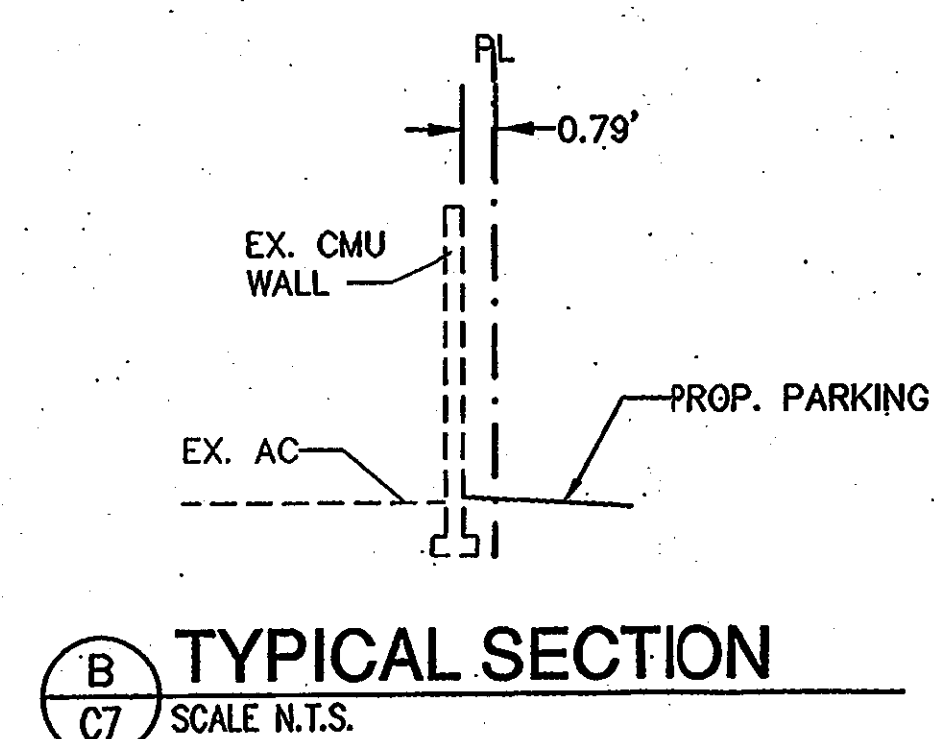
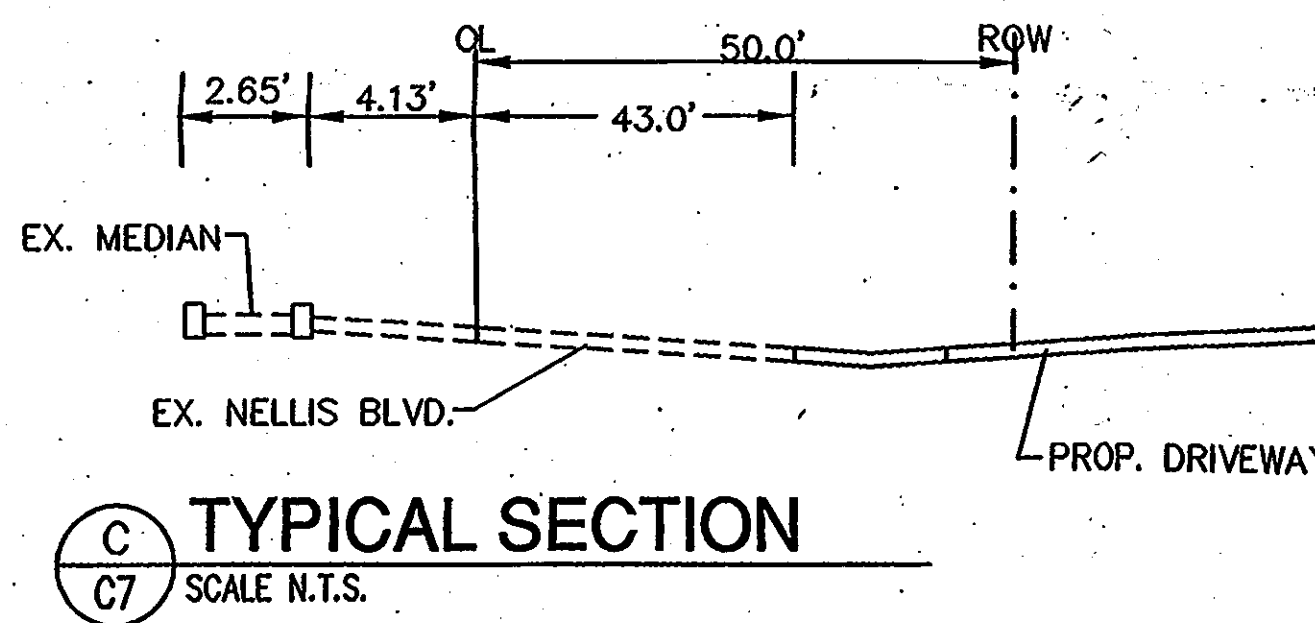
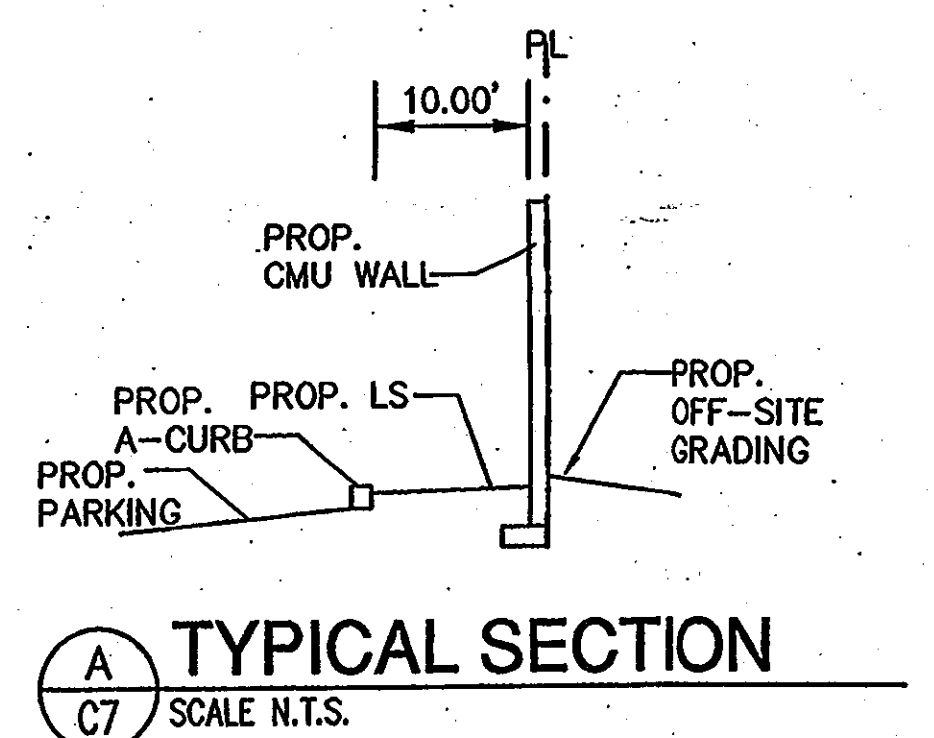
LEGEND		
DESCRIPTION	EXISTING	PROPOSED
UTILITIES		
B.O. VALVE	↑	↑
FIRE HYDRANTS	○	○
CLEAN OUT	○	○
GATE VALVE	⊗	⊗
METER	⊗	⊗
REDUCER	△	△
CAP	⊕	⊕
11.25° ELBOW	⋈	⋈
22.5° ELBOW	⋈	⋈
45° ELBOW	⋈	⋈
90° ELBOW	⋈	⋈
CROSS	⋈	⋈
TEE	⋈	⋈
MANHOLES		
ELECTRICAL	⊗	⊗
SANITARY SEWER	⊗	⊗
STORM DRAIN	⊗	⊗
TELEPHONE	⊗	⊗
STREET LIGHTS		
100W HPS STL.	⊗	⊗
150W HPS STL.	⊗	⊗
200W HPS STL.	⊗	⊗
250W HPS STL.	⊗	⊗
400W HPS STL.	⊗	⊗
GRADING		
SPOT ELEV.	12.34	12.34
SLOPE	1:23%	1:23%
5' CONT.	(2005)	(2005)
1' CONT.	(2007)	(2007)
SITE		
IGN	---	---
"L" CURB	---	---
"A" CURB	---	---
EDGE OF PAVT.	---	---
WALL	---	---
LINE TYPES		
CL OR SECTION LINE	---	---
PROPERTY LINE	---	---
RIGHT OF WAY LINE	---	---
EASEMENT LINE	---	---
SAWTOOTH LINE	---	---
FLOW LINE	---	---
SHADES		
HEAVY AC PAVEMENT	---	---
LIGHT AC PAVEMENT	---	---
CONCRETE PAVEMENT	---	---



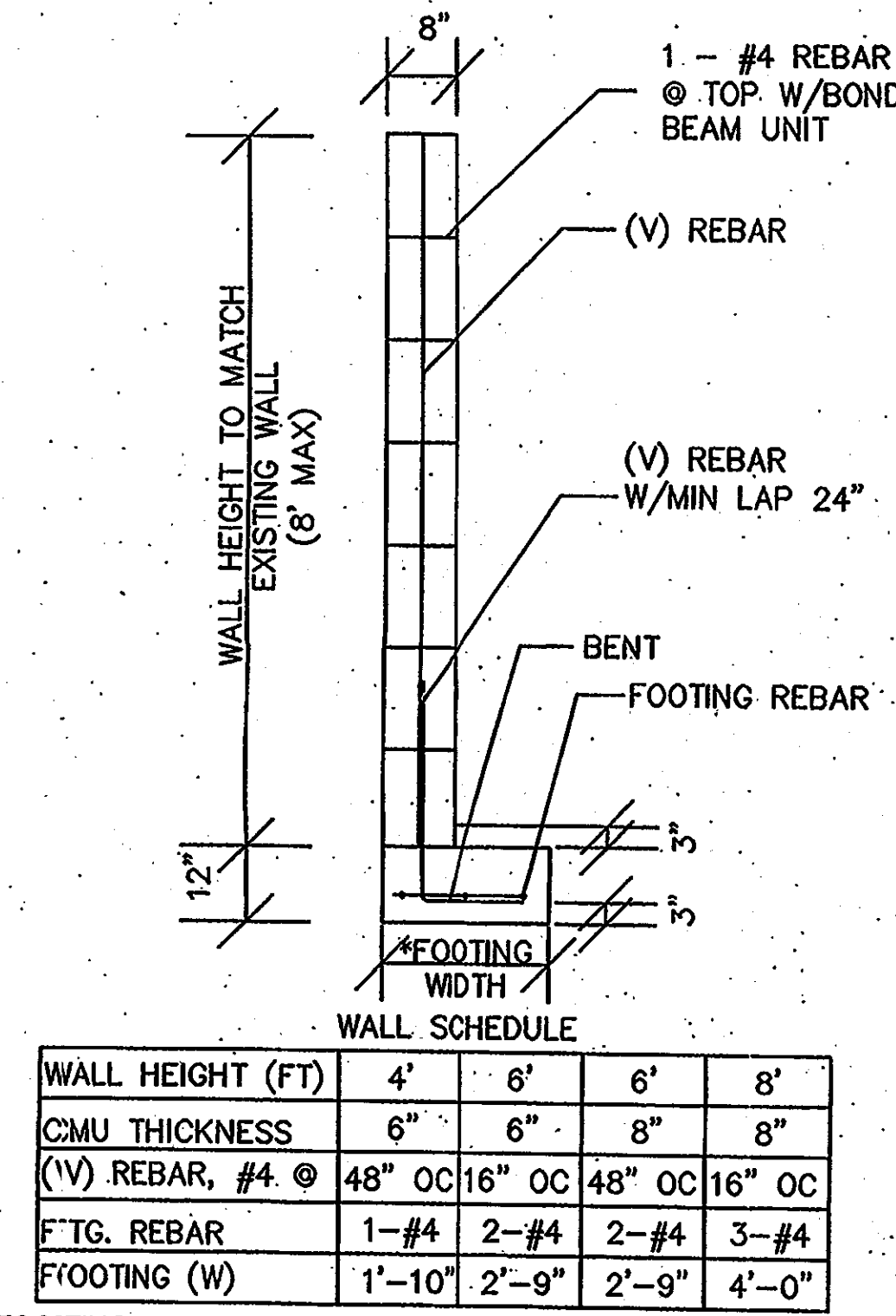
ONSITE AC PAVEMENT DETAIL
SCALE N.T.S.



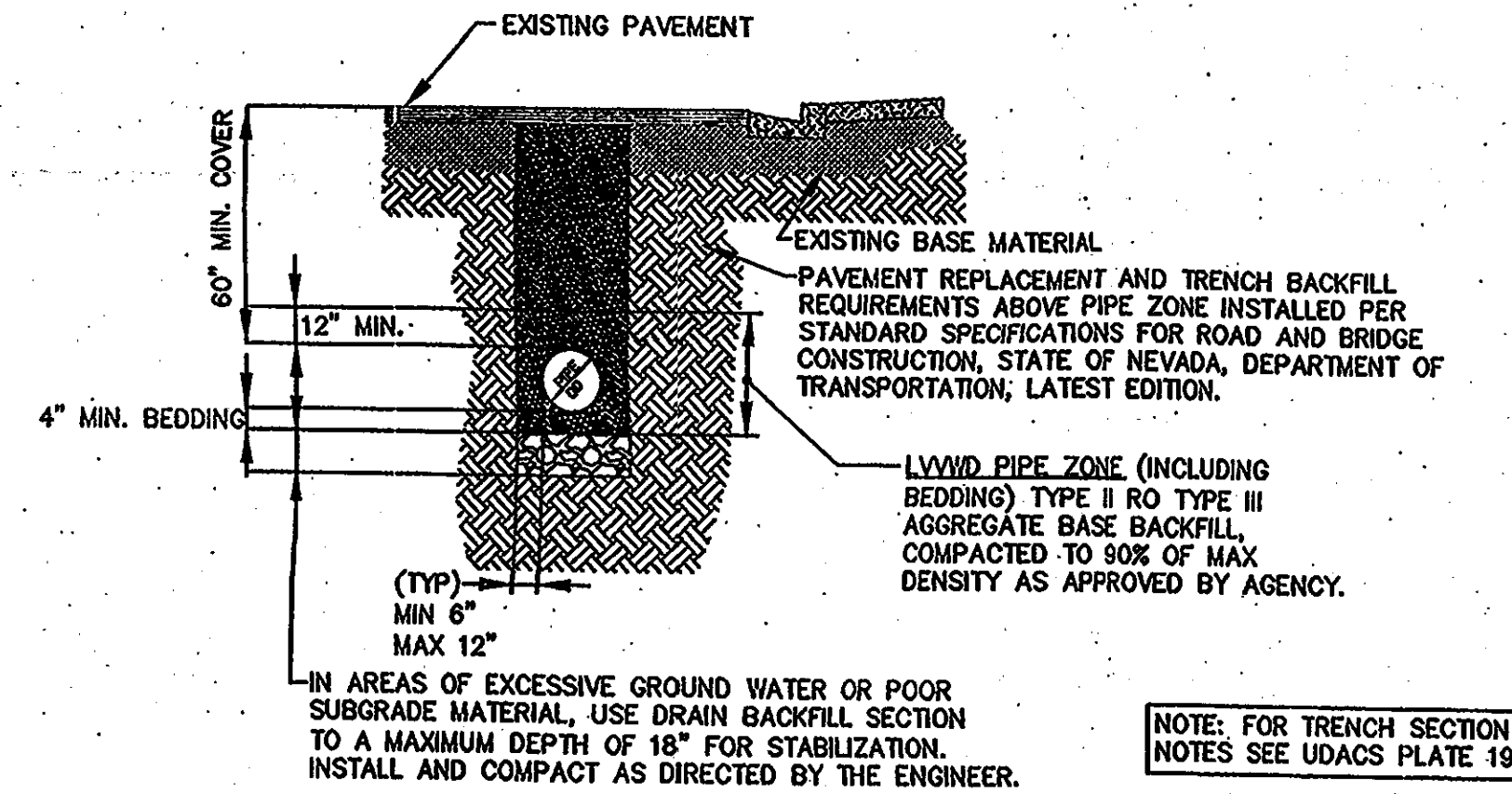
TRASH ENCLOSURE PAVEMENT DETAIL
SCALE N.T.S.



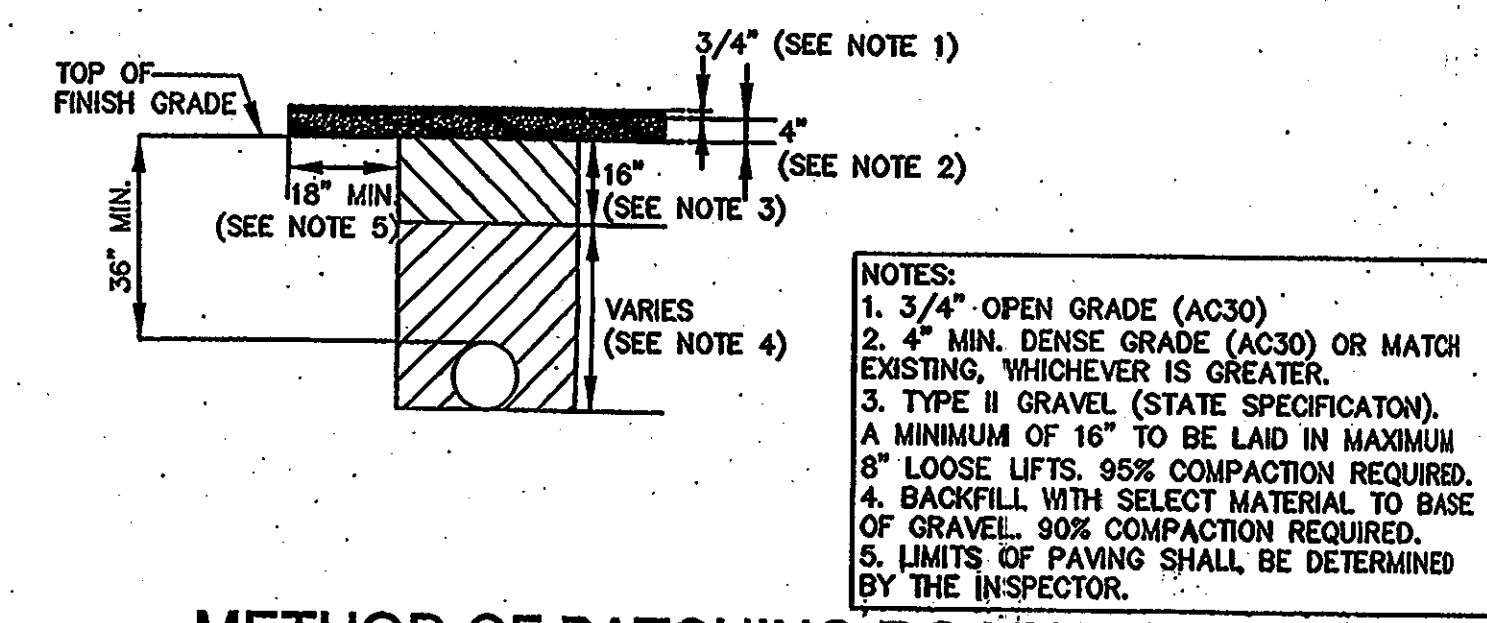
RESERVED PARKING SIGN
SCALE N.T.S.



CMU WALL DETAIL
SCALE N.T.S.



TRENCH SECTION BACKFILL SPECIFICATIONS
(FOR L.V.W.D. WATER FACILITIES)
IMPROVED AND UNIMPROVED AREAS
(NDOT STREET R/W)



METHOD OF PATCHING ROADWAY WHERE
TRENCHING IS NECESSARY FOR UTILITY
OR OTHER INSTALLATIONS
NTS (NDOT STREET R/W)

BENCHMARK
CLARK COUNTY BENCHMARK: 6C02.28NW6
RIVET AND SQUARE ALUMINUM PLATE IN TOP CORNER OF NORTHWEST QUARTER OF SECTION 28, TOWNSHIP 20 SOUTH, RANGE 62 EAST, M.D.M., CLARK COUNTY, STATE OF NEVADA, AS SHOWN BY MAP THEREOF ON FILE IN FILE 77, PAGE 51 OF SURVEYS, IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

This grading plan is a part of drainage study #4561 which was received on 7/16/12 and approved by the Clark County Engineer on 7/17/12.

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CLARK COUNTY ENGINEER
BRANDON A. POTTS
Exp: 12/31/13
CIVIL
No. 13121

DETAIL SHEET
C7
7 OF 7

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LAS VEGAS, NV 89102
PHONE: (702) 250-2000
FAX: (702) 250-2001

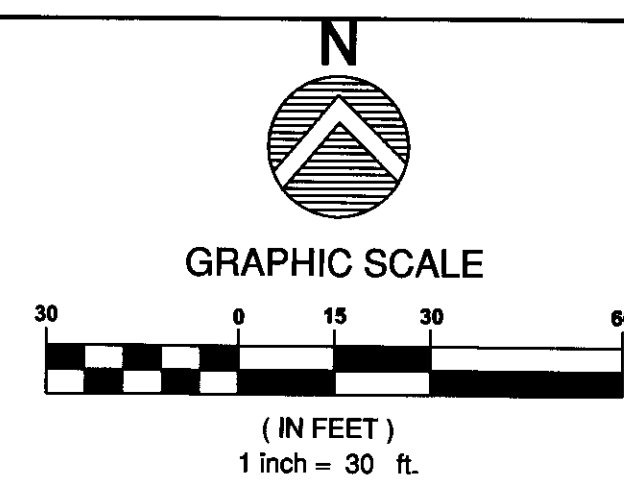
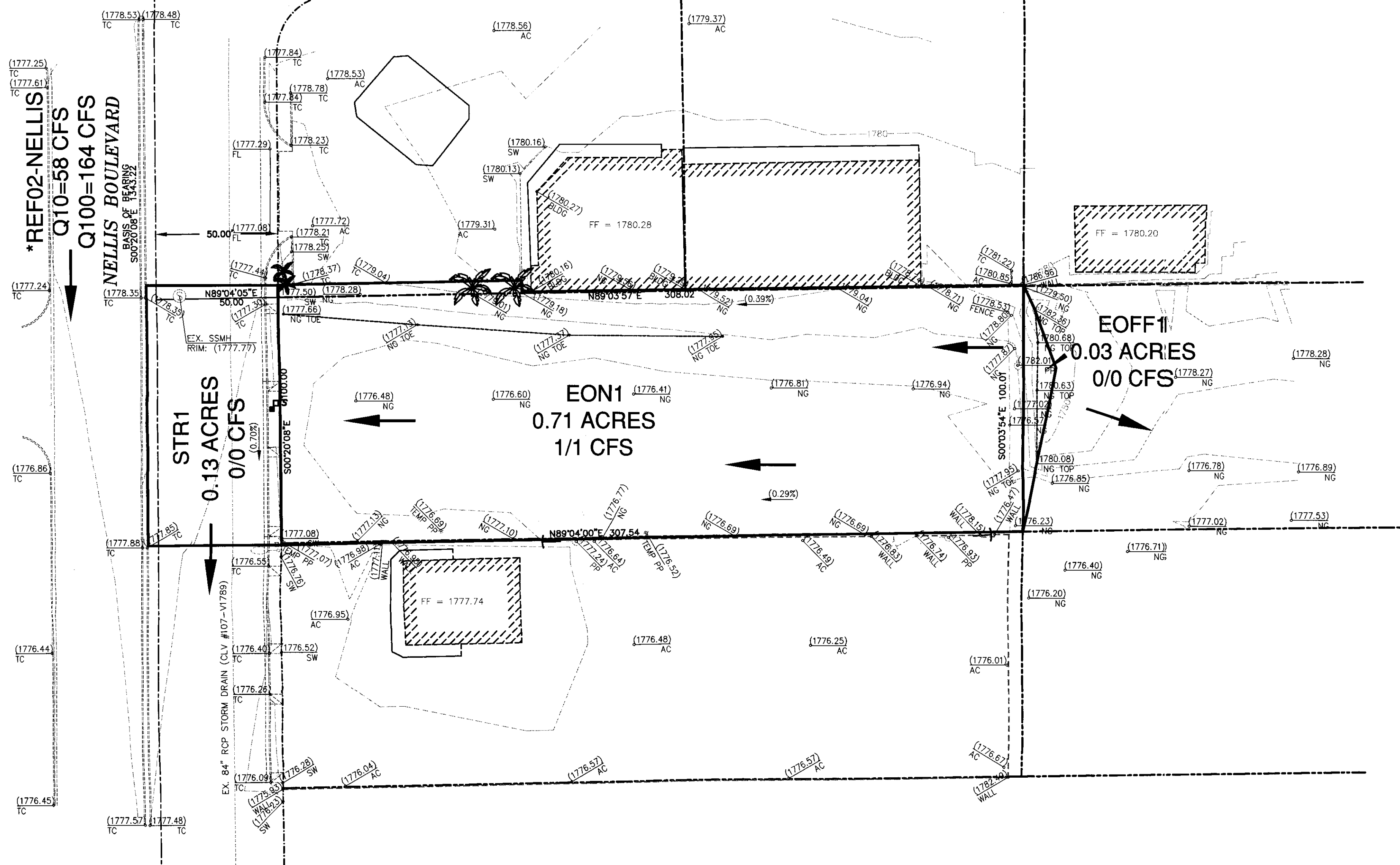
USED CAR LOT
AT 1578 NELLIS BLVD.

DEVELOPER:
GCM ARCHITECTS
4945 W. PATRICK LANE
LAS VEGAS, NV 89118
PHONE: 702-534-7888
CONTACT: MARK MARTINO

ABBREVIATIONS (SEE CIV. SH. FOR COMPLETE LIST)		
AC	ADJUST	ADJUST
ADJ	ADJUST	ADJUST
AGG	AGGREGATE	AGGREGATE
BCR	BACK OF CURB	BACK OF CURB
BEG	BEGINNING OF CURB RETURN	BEGINNING OF CURB RETURN
BEG	BEGIN	BEGIN
BSW	BACK OF SIDEWALK	BACK OF SIDEWALK
BVC	BEGINNING OF VERTICAL CURVE	BEGINNING OF VERTICAL CURVE
CATV	CABLE TV	CABLE TV
CCAUUSD	CLARK COUNTY AREA	CLARK COUNTY AREA
CCRFCD	CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT	CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
CL	CENTERLINE	CENTERLINE
CLV	CITY OF LAS VEGAS	CITY OF LAS VEGAS
CMU	CONCRETE MASONRY UNIT	CONCRETE MASONRY UNIT
CO	CLEAN OUT	CLEAN OUT
COMM	COMMUNICATIONS	COMMUNICATIONS
CONC	CONCRETE	CONCRETE
COND	CONDUIT	CONDUIT
CULV	CULVERT	CULVERT
DC	DEPRESSED CURB	DEPRESSED CURB
DI	DROP INLET	DROP INLET
DIP	DUCTILE IRON PIPE	DUCTILE IRON PIPE
DOM	DOMESTIC	DOMESTIC
ELEC	ELECTRIC	ELECTRIC
EAC	EDGE OF AC	EDGE OF AC
EC	END OF CURVE	END OF CURVE
ECR	END OF CURB RETURN	END OF CURB RETURN
ELEV	ELEVATION	ELEVATION
EP	EDGE OF PAVEMENT	EDGE OF PAVEMENT
EVC	END OF VERTICAL CURVE	END OF VERTICAL CURVE
EX	EXISTING	EXISTING
FAST	FREEWAY & ARTERIAL SYSTEM OF TRANSPORTATION	FREEWAY & ARTERIAL SYSTEM OF TRANSPORTATION
FF	FINISH FLOOR	FINISH FLOOR
FG	FINISH GRADE	FINISH GRADE
FH	FIRE HYDRANT	FIRE HYDRANT
FL	FLOW LINE	FLOW LINE
FO	FIBER OPTICS	FIBER OPTICS
FS	FINISHED SURFACE	FINISHED SURFACE
GB	GRADE BREAK	GRADE BREAK
HDPE	HIGH DENSITY POLYETHYLENE	HIGH DENSITY POLYETHYLENE
HDWL	HEADWALL	HEADWALL
HGL	HYDRAULIC GRADE LINE	HYDRAULIC GRADE LINE
HP	HIGH POINT	HIGH POINT
INV	INVERT	INVERT
IRR	IRRIGATION	IRRIGATION
LAT	LATERAL	LATERAL
LF	LINEAL FEET	LINEAL FEET
LS	LANDSCAPE	LANDSCAPE
LT	LEFT	LEFT
LVWD	LAS VEGAS VALLEY WATER DISTRICT	LAS VEGAS VALLEY WATER DISTRICT
MAX	MAXIMUM	MAXIMUM
MH	MANHOLE	MANHOLE
MIN	MINIMUM	MINIMUM
MTR	METER	METER
NDOT	NEVADA DEPARTMENT OF TRANSPORTATION	NEVADA DEPARTMENT OF TRANSPORTATION
PB	PULL BOX	PULL BOX
PL	PROPERTY LINE	PROPERTY LINE
PP	POWER POLE	POWER POLE
PROP	PROPOSED	PROPOSED
PVC	POLY VINYL CHLORIDE PIPE	POLY VINYL CHLORIDE PIPE
PVMT	PAVEMENT	PAVEMENT
RT	RIGHT	RIGHT
ROW	RIGHT-OF-WAY	RIGHT-OF-WAY
SS	SANITARY SEWER	SANITARY SEWER
SD	STORM DRAIN	STORM DRAIN
SNWA	SOUTHERN NEVADA WATER AUTHORITY	SOUTHERN NEVADA WATER AUTHORITY
STA	STATION	STATION
STLT	STREET LIGHT	STREET LIGHT
SVZ	SIGHT VISIBILITY ZONE	SIGHT VISIBILITY ZONE
SW	SIDEWALK	SIDEWALK
TEL	TELEPHONE	TELEPHONE
TC	TOP OF CURB	TOP OF CURB
TF	TOP OF FOOTING	TOP OF FOOTING
TW	TOP OF WALL	TOP OF WALL
TYP	TYPICAL	TYPICAL
UDACS	UNIFORM DESIGN AND CONSTRUCTION STANDARDS	UNIFORM DESIGN AND CONSTRUCTION STANDARDS
VG	VALLEY GUTTER	VALLEY GUTTER
WL	WATER LINE	WATER LINE

LEGEND		
DESCRIPTION	EXISTING	PROPOSED
UTILITIES		
B.O. VALVE		
FIRE HYDRANTS		
CLEAN OUT		
GATE VALVE		
METER		
REDUCER		
CAP		
11.25' ELBOW		
22.5' ELBOW		
45' ELBOW		
90' ELBOW		
CROSS		
TEE		
MANHOLES		
ELECTRICAL		
SANITARY SEWER		
STORM DRAIN		
TELEPHONE		
STREET LIGHTS		
100W HPS STLT.		
150W HPS STLT.		
200W HPS STLT.		
250W HPS STLT.		
400W HPS STLT.		
GRADING		
SPOT ELEV.		
SLOPE		
5' CONT.		
1' CONT.		
SITE		
SIGN		
1" CURB		
4" CURB		
EDGE OF PAVT.		
WALL		
LINE TYPES		
CL OR SECTION LINE		
PROPERT LINE		
RIGHT OF WAY LINE		
EASEMENT LINE		
SAWTOOTH LINE		
FLOW LINE		
SHADES		
HEAVY AC PAVEMENT		
LIGHT AC PAVEMENT		
CONCRETE PAVEMENT		

*REF01-OWENS
Q10=15 CFS
Q100=100 CFS



BENCHMARK

CLARK COUNTY BENCHMARK: 6C02 28NWW6
RIVET AND SQUARE ALUMINUM PLATE IN TOP OF NORTHWEST QUARTER (NW 1/4) OF SECTION 28, TOWNSHIP 20 SOUTH, RANGE 62 EAST, M.D.M., CLARK COUNTY, STATE OF NEVADA, AS SHOWN BY MAP THEREOF ON FILE IN FILE 77, PAGE 51 OF SURVEYS, IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

ELEV. = 540.396 (METRIC)
1772.95 (US SURVEY FEET)

BASIS OF BEARING

NORTH 00°20'08" WEST BEING THE WEST LINE OF NORTHWEST QUARTER (NW 1/4) OF SECTION 28, TOWNSHIP 20 SOUTH, RANGE 62 EAST, M.D.M., CLARK COUNTY, STATE OF NEVADA, AS SHOWN BY MAP THEREOF ON FILE IN FILE 77, PAGE 51 OF SURVEYS, IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

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4945 W. Patrick Lane
Las Vegas, NV 89118
Office#: (702)534-7555

CONSULTANT LIST:

HHNSurveying Inc.
1985 US HIGHWAY 95, SUITE 101
LAS VEGAS, NV 89118
OFFICE # 702.593.6111
FACSIMILE # 702.593.6112

USED CAR LOT

AT 1578 NELLIS BLVD.

DEVELOPER:

GGW ARCHITECTS
4945 W. PATRICK LANE
LAS VEGAS, NV 89118
PHONE: 702.534.7888
CONTACT: MARK MARTINO

DATE: 7/24/12

BY: [Signature]

CHECKED: [Signature]

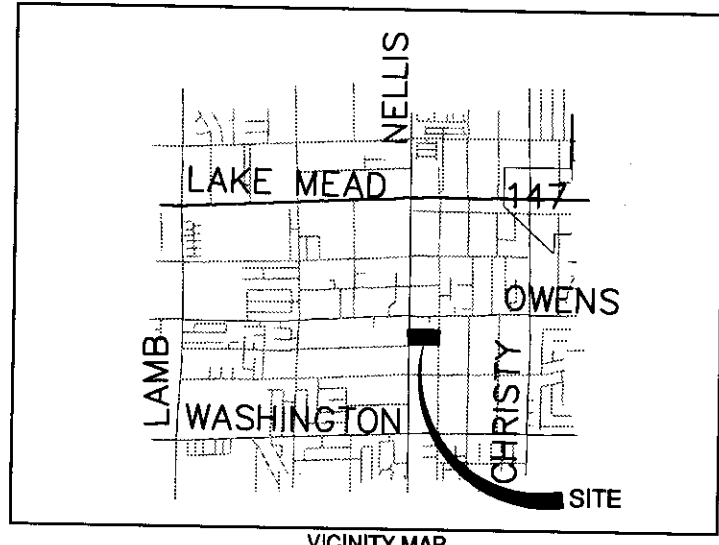
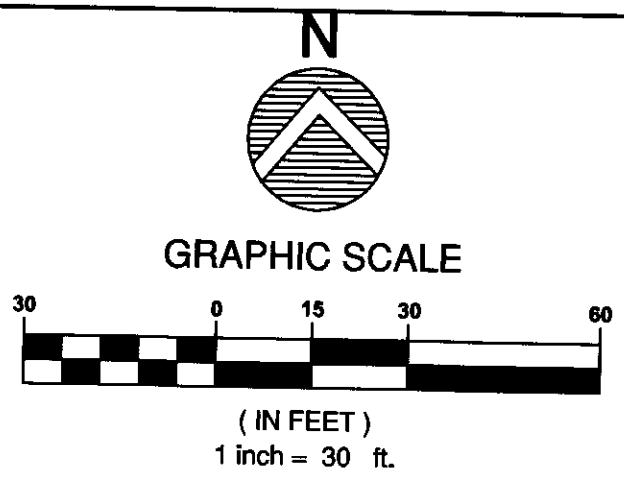
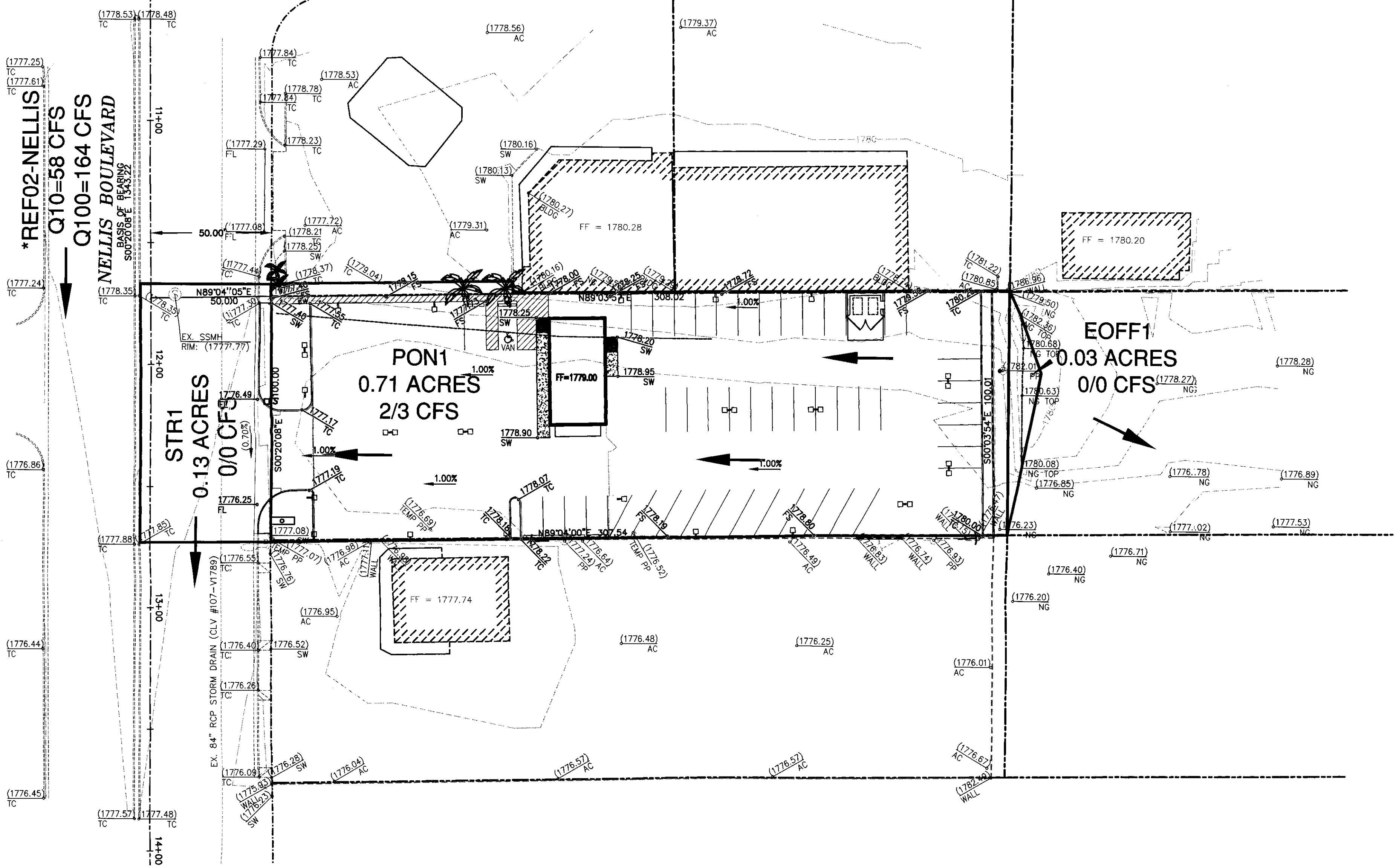
APPROVED: [Signature]

1-702-593-6111

ABBREVIATIONS	
(SEE C.V.R. SHT. FOR COMPLETE LIST)	
AC	ASPHALTIC CONCRETE
ADJ	ADJUST
AGG	AGGREGATE
BC	BACK OF CURB
BCR	BEGINNING OF CURB RETURN
BEG	BEGIN
BSW	BACK OF SIDEWALK
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CON	CONDUIT
CULV	CULVERT
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DIP	DUCTILE IRON PIPE
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HDPE	HIGH DENSITY POLYETHYLENE
HDWL	HEADWALL
HGL	HYDRAULIC GRADE LINE
HP	HIGH POINT
INV	INVERT
IRR	IRRIGATION
LAT	LATERAL
LF	LINEAL FEET
LS	LANDSCAPE
LT	LEFT
LVVWD	LAS VEGAS VALLEY WATER DISTRICT
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
MTR	METER
NDOT	NEVADA DEPARTMENT OF TRANSPORTATION
PB	PULL BOX
PL	PROPERTY LINE
PP	POWER POLE
PROP	PROPOSED
PVC	POLY VINYL CHLORIDE PIPE
PVMT	PAVEMENT
RT	RIGHT
ROW	RIGHT-OF-WAY
SS	SANITARY SEWER
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SNWA	SOUTHERN NEVADA WATER AUTHORITY
STA	STATION
SILT	STREET LIGHT
SVZ	SIGHT VISIBILITY ZONE
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VG	VALLEY GUTTER
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LEGEND		
DESCRIPTION	EXISTING	PROPOSED
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B.O. VALVE		
FIRE HYDRANTS		
CLEAN OUT		
GATE VALVE		
METER		
REDUCER		
CAP		
11.25' ELBOW		
22.5' ELBOW		
45' ELBOW		
90' ELBOW		
CROSS		
TEE		
MANHOLES		
ELECTRICAL		
SANITARY SEWER		
STORM DRAIN		
TELEPHONE		
STREET LIGHTS		
100W HPS STL.		
150W HPS STL.		
200W HPS STL.		
250W HPS STL.		
400W HPS STL.		
GRADING		
SPOT ELEV.	(12.32)	12.34
SLOPE	(1.2%)	1.23%
5' CONT.		
1' CONT.		
SITE		
SIGN		
"L" CURB		
"A" CURB		
EDGE OF PAVT.		
WALL		
LINE TYPES		
CL OR SECTION LINE		
PROPERTY LINE		
RIGHT OF WAY LINE		
EASEMENT LINE		
SAWTOOTH LINE		
FLOW LINE		
SHADES		
HEAVY AC PAVEMENT		
LIGHT AC PAVEMENT		
CONCRETE PAVEMENT		

*REF01-OWENS
Q10=15 CFS
Q100=100 CFS



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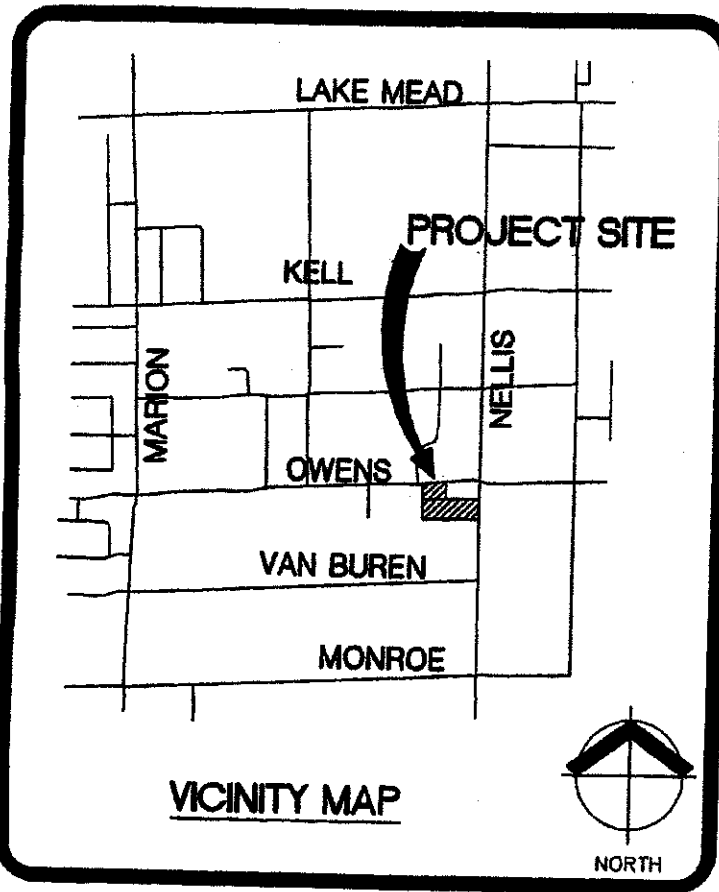
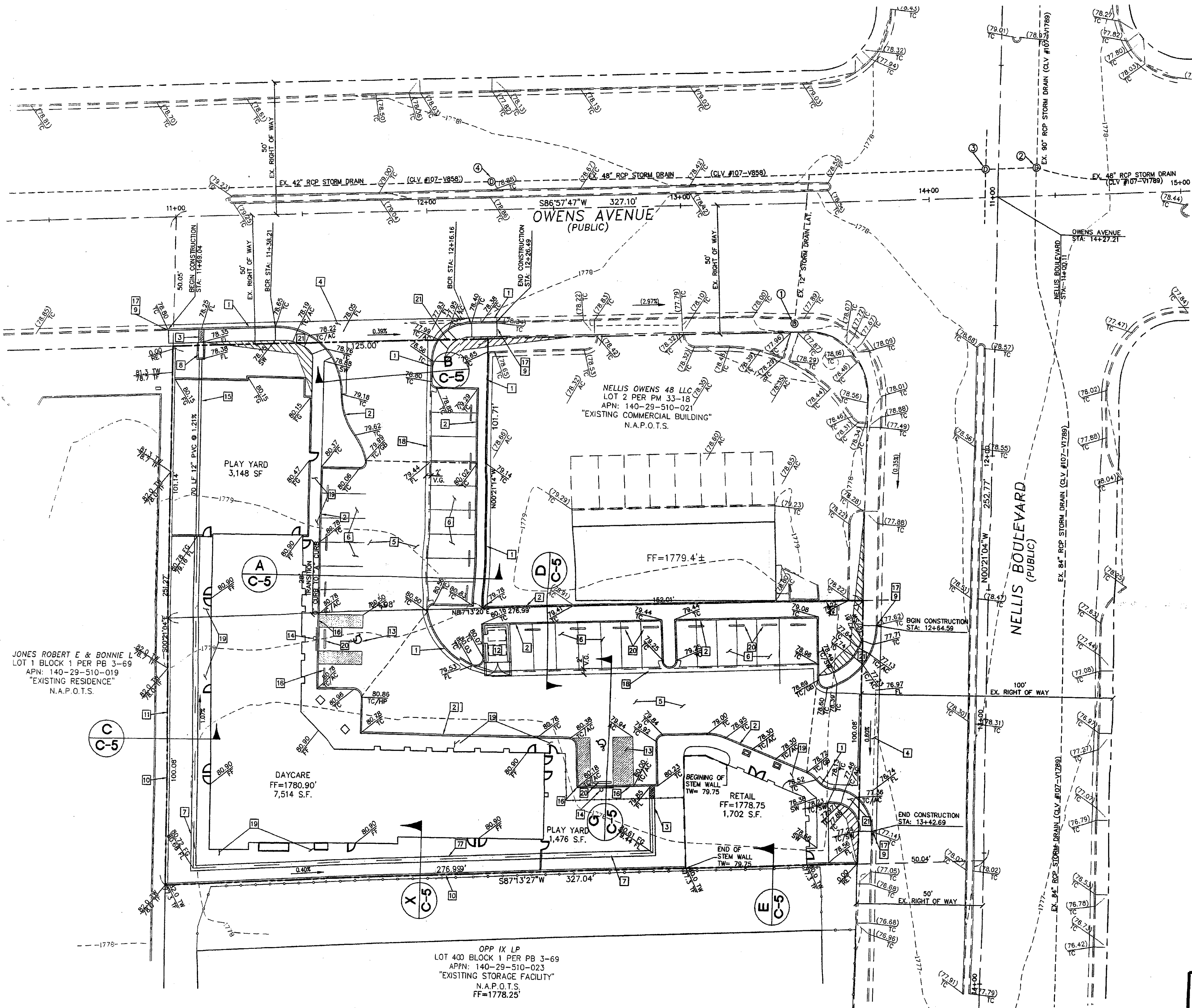
USED CAR LOT
AT 1578 NELLIS BLVD.
DEVELOPER:
GGW ARCHITECTS
4945 W. PATRICK LANE
LAS VEGAS, NV 89118
PHONE: 702-534-7888
CONTACT: MARK MARTINO

BENCHMARK
CLARK COUNTY BENCHMARK: 6C02 28NWNW6
RIVET AND SQUARE ALUMINUM PLATE IN TOP OF NORTHWEST CORNER OF NELLIS BLVD. AND MONROE AVE. NEAR THE PC OF NELLIS BLVD.
ELEV. = 540.396 (METRIC)
1772.95 (US SURVEY FEET)
BASIS OF BEARING
NORTH 00°20'08" WEST BEING THE WEST LINE OF NORTHWEST QUARTER (NW 1/4) OF SECTION 28, TOWNSHIP 20 SOUTH, RANGE 62 EAST, M.D.M., CLARK COUNTY, STATE OF NEVADA, AS SHOWN BY MAP THEREOF ON FILE IN FILE 77, PAGE 51 OF SURVEYS, IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

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LAS VEGAS AREA COMPIUTERIZED TRAFFIC SYSTEM

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LAS VEGAS AREA COMPIUTERIZED TRAFFIC SYSTEM

CONDITIONS
This plan is a part of a drainage study which was recorded on 7/16/15 and App'd on 7/16/15. Page 4 of 4
BASIN MAP - PROPOSED IMPROVEMENTS



CONSTRUCTION NOTES:

1. INSTALL "L" CURB PER USD #216
2. INSTALL "A" CURB PER USD #219
3. INSTALL 2' SIDEWALK UNDER DRAIN PER USD #236
4. INSTALL 8" CROSS GUTTER PER USD #228
5. 3' AC ON 4" TYPE II, IN HEAVY PAVEMENT AREA PER DETAIL J-C5 (DRIVE ISLES)
6. 2' AC ON 4" TYPE II, IN LIGHT PAVEMENT AREA PER DETAIL H-C5 (PARKING)
7. INSTALL 2' TRENCH DRAIN OR EQUAL WITH APPROVED GRATE PER DETAIL U-C5
8. CONSTRUCT 2' CONCRETE HEADWALL AND FLUME PER DETAIL P-C5
9. REPLACE SIDEWALK TO NEAREST SCORE LINE. REFER TO DEMOLITION PLAN FOR REMOVAL EXTENTS
10. CONSTRUCT RETAINING WALL PER PER C.C. STANDARDS OR EQUAL
11. CONSTRUCT 6" CMU SCREEN WALL PER C.C. STANDARDS OR EQUAL
12. TRASH ENCLOSURE, SEE ARCHITECTURAL DRAWINGS (TYP.)
13. INSTALL HANDICAP STRIPING PER DETAIL M-C5
14. INSTALL HANDICAP SIGNAGE PER DETAIL K-C5
15. INSTALL 12" PVC DRAIN PIPE FOR "U" CHANNEL OUTLET
16. INSTALL DEPRESSED CURB SEE DETAIL F-C5
17. CONSTRUCT PROPOSED CURB TO MATCH EXISTING
18. CONSTRUCT 2 VALLEY GUTTER PER DETAIL V-C5
19. CONSTRUCT SIDEWALK PER PLANS
20. INSTALL BUMPER BLOCKS PER USD #238 (TYP.)
21. CONSTRUCT SIDEWALK RAMPS USING ARMOR TILE TRUNCATED EDGES OR EQUIVALENT PER USD #235 CASE 1

LEGEND

—	RIGHT-OF-WAY	(ELEV.)	FUTURE ELEVATION
---	PROPERTY LINE	(ELEV.)	PROPOSED ELEVATION
- - -	EXISTING CURB AND GUTTER	(ELEV.)	EXISTING ELEVATION
---	WROUGHT IRON FENCE	TC	TOP OF CURB
---	RETAINING WALL	FG	FINISHED GRADE
		FS	FINISHED SURFACE
		FL	FLOW LINE
		HP	HIGH POINT
		GB	GRADE BREAK
		①	BLOCK NUMBER
		A-D	SECTION OR DETAIL IDENTIFIER
			SHEET ON WHICH SECTION OR DETAIL IS SHOWN

STORM DRAIN NOTES:

1. RIM EL.=1777.92'
2. NOT DIPPED
3. RIM EL.=1775.56'
4. INV. IN (S)=1757.37' (84" RCP)
5. INV. OUT (N)=1756.87' (90" RCP)
6. RIM EL.=1776.21'
7. INV. IN (W)=1759.21' (48" RCP)
8. INV. OUT (E)=1758.92' (48" RCP)
9. RIM EL.=1778.25'
10. INV. IN (W)=1762.10' (42" RCP)
11. INV. OUT (E)=1762.28' (48" RCP)

NOTE:

REFER TO DEMOLITION PLAN FOR LOCATIONS OF EXISTING AC CURB AND SIDEWALK TO BE REMOVED.

PUBLIC QUANTITIES

CURB & GUTTER (TYPE "A" & "L")	116 LF
COMMERCIAL DRIVEWAY	1172 SF
5' SIDEWALK	476 SF
HANDICAP RAMP	4 EA
SIDEWALK UNDERDRAIN	1 EA
TYPE II GRAVEL BASE	70 CY

PRIVATE QUANTITIES

CURB & GUTTER (TYPE "A" & "L")	1062 LF
SIDEWALK UNDERDRAIN	1 EA
TYPE II GRAVEL BASE	495 CY
2" ASPHALT CONCRETE PAVEMENT	527 SY
3" ASPHALT CONCRETE PAVEMENT	960 SY

BENCH MARK

CITY OF NORTH LAS VEGAS STATION "602215WS"
BRASS CAP REFERENCE MONUMENT, IN TOP OF CURB AT THE NORTHEAST CORNER OF NELLIS BLVD. AND OWENS AVE.

ELEVATION:
FEET = 1778.32' (NAVD88)
METERS = 542.032 M (NAVD88)

BASIS OF BEARING

NORTH 002°10'4" WEST, BEING THE EAST LINE OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 29, TOWNSHIP 20 SOUTH, RANGE 62 EAST, M.D.M., AND THE CENTERLINE OF A PORTION OF "NELLIS BOULEVARD" AS SHOWN BY MAP THEREOF ON FILE IN FILE 98 OF PARCEL MAPS, PAGE 77, OFFICIAL RECORDS, CLARK COUNTY, NEVADA.

GRADING NOTES:

1. WRG DESIGN, INC. SHALL BE NOTIFIED IMMEDIATELY OF ANY DISCREPANCY IN THE PLANS OR CONDITIONS IN THE FIELD.
2. ALL WORK TO BE PERFORMED OUTSIDE OF THE PROJECT BOUNDARY AND ON PRIVATE PROPERTY SHALL NOT BE PERFORMED UNTIL WRITTEN PERMISSION HAS BEEN OBTAINED FROM THE OFFSITE OWNER AND GIVEN TO CLARK COUNTY.
3. ADD 1700' TO ALL PROPOSED ELEVATIONS SHOWN HEREON.
4. ALL STATIONING SHOWN, UNLESS OTHERWISE NOTED, IS CENTERLINE STATIONING.

DISCLAIMER NOTE

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UNDERGROUND SERVICE (USA)

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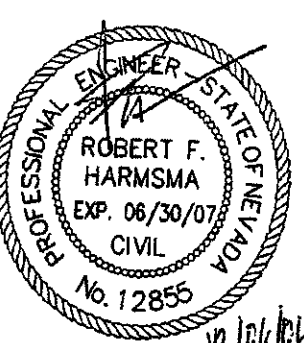
UNDERGROUND SERVICE (USA)

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

W R G
D E S I G N
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GRADING PLAN NELLIS/OWENS DAYCARE GRUBB AND ELLIS CITY OF LAS VEGAS, NEVADA

DATE	DESCRIPTION



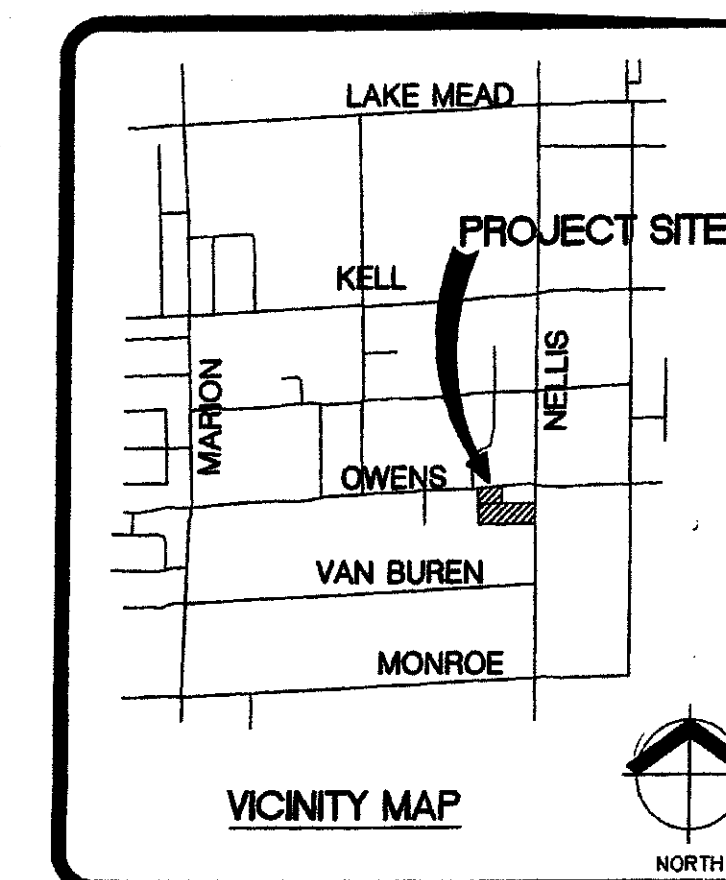
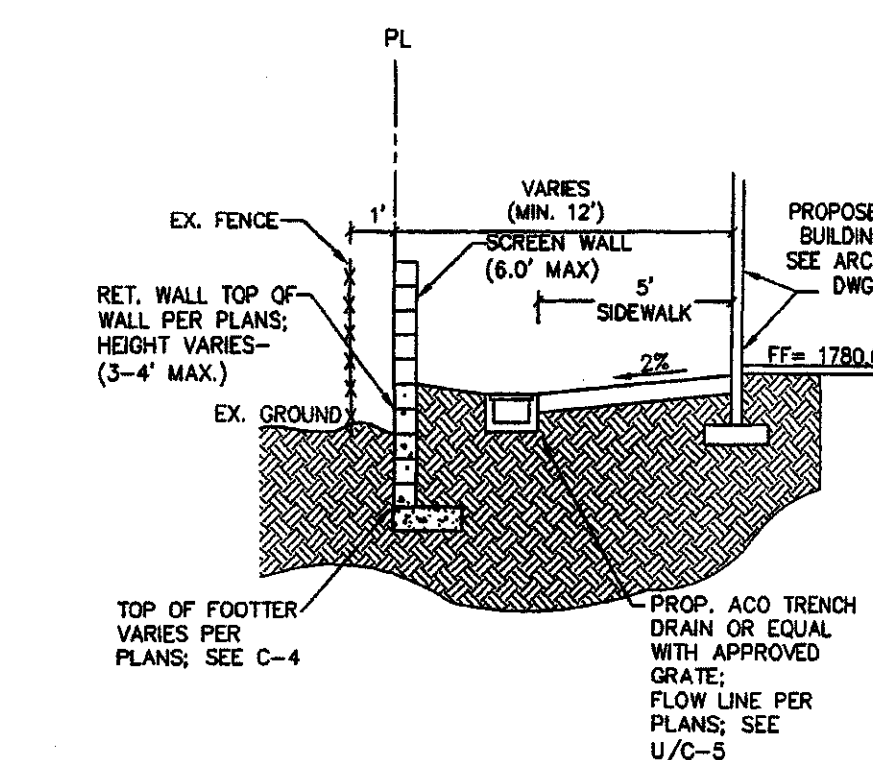
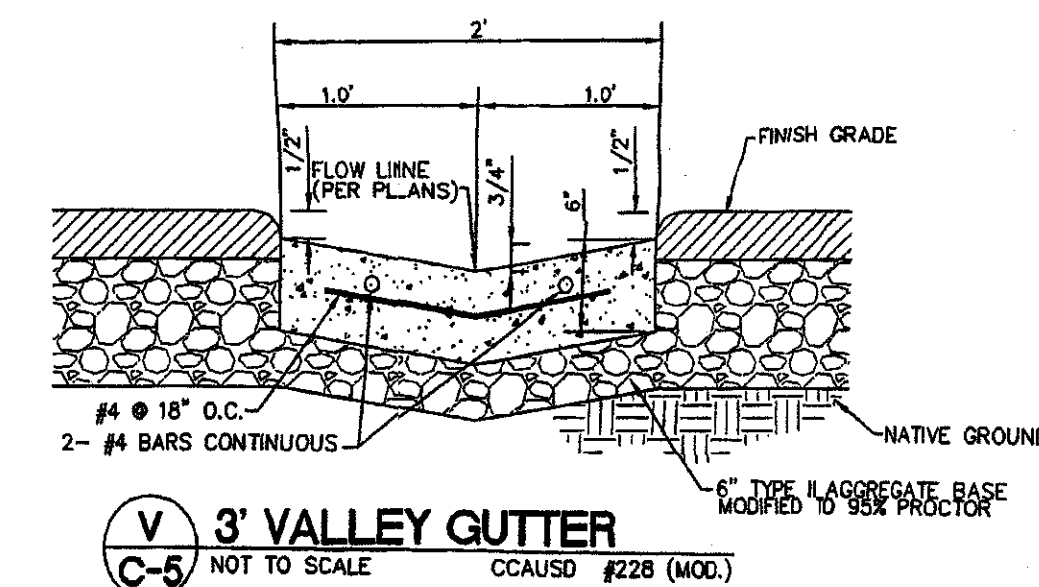
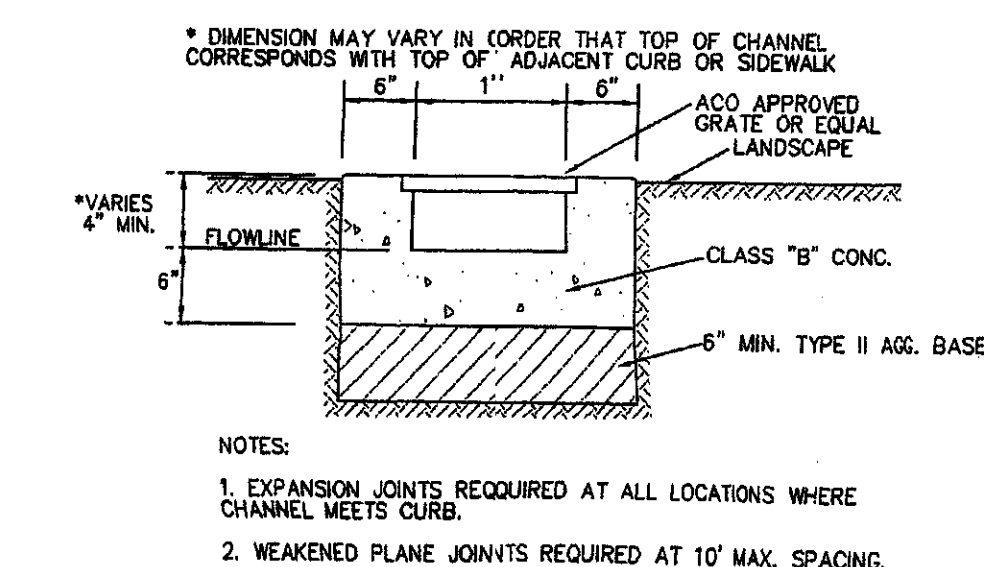
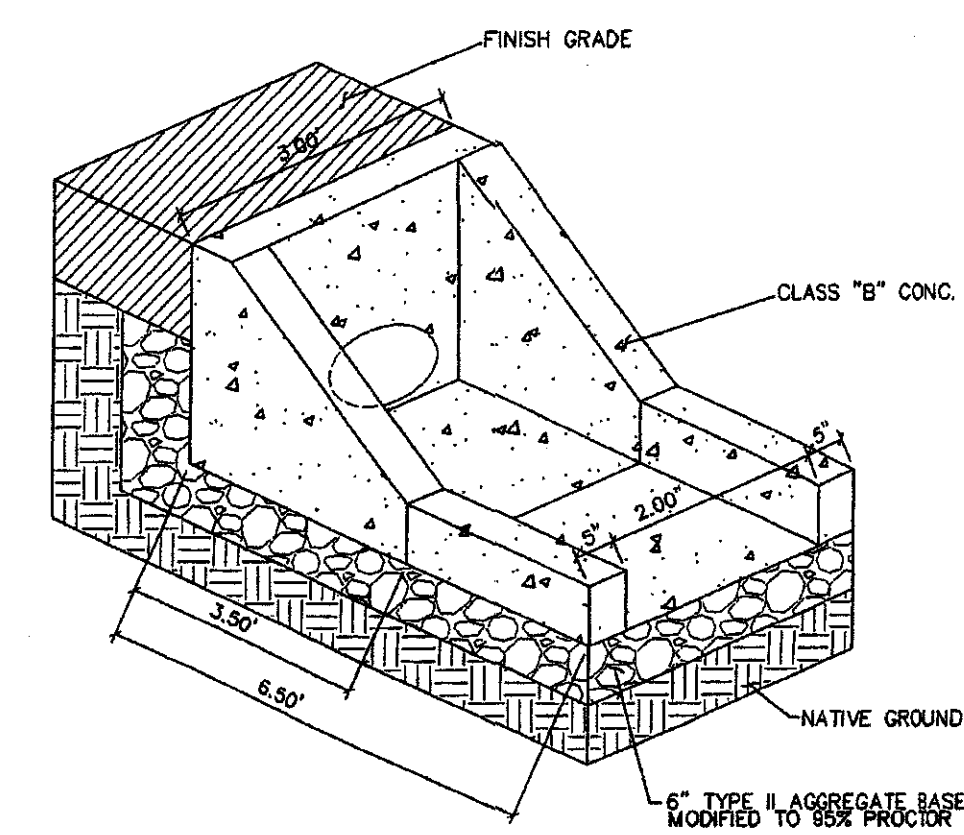
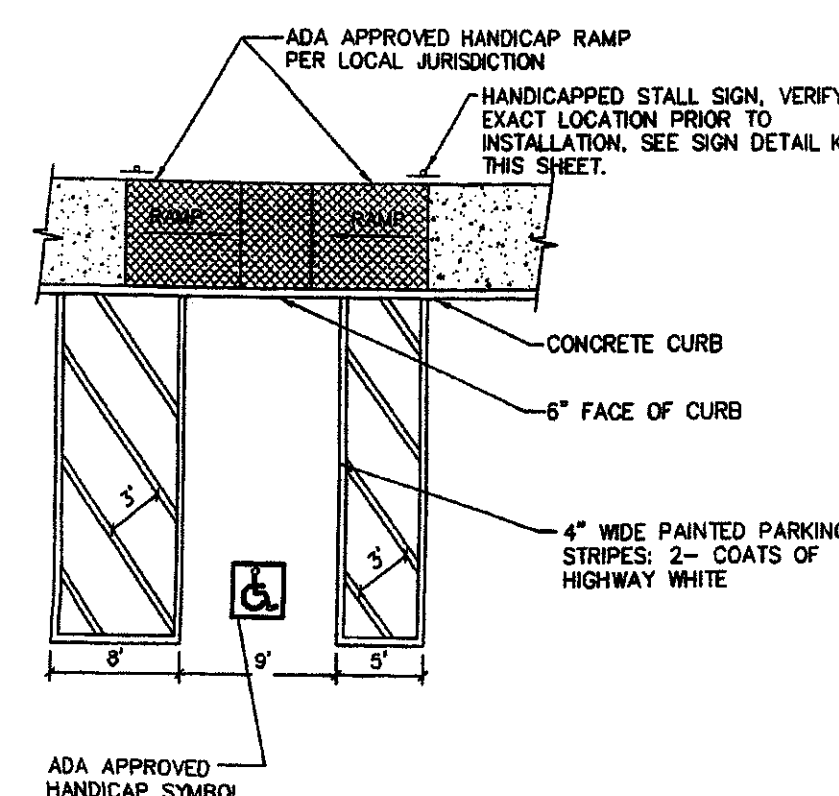
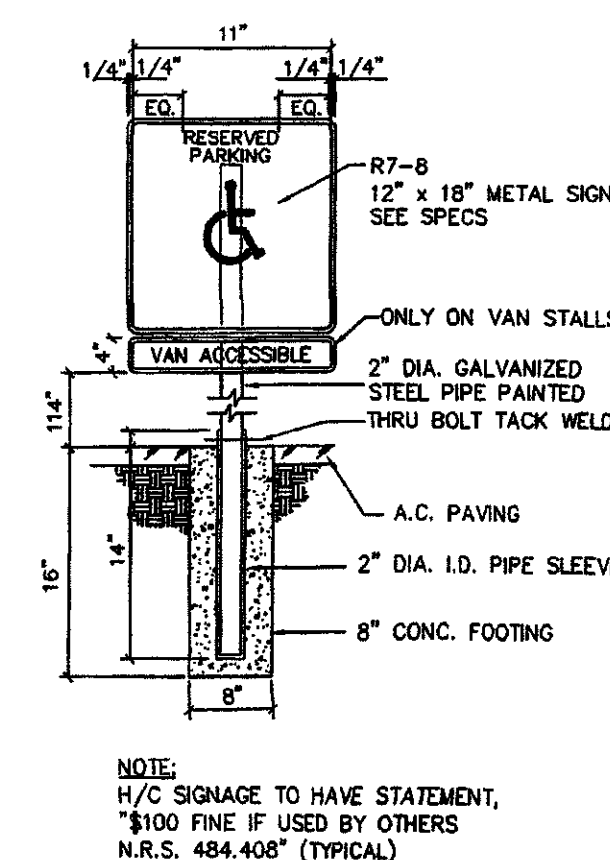
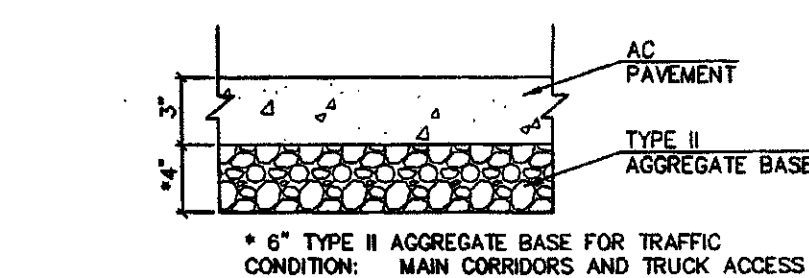
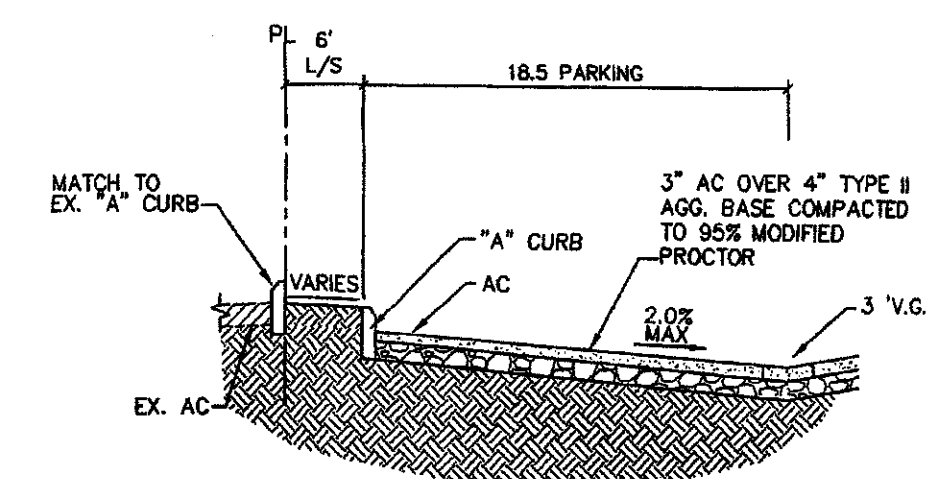
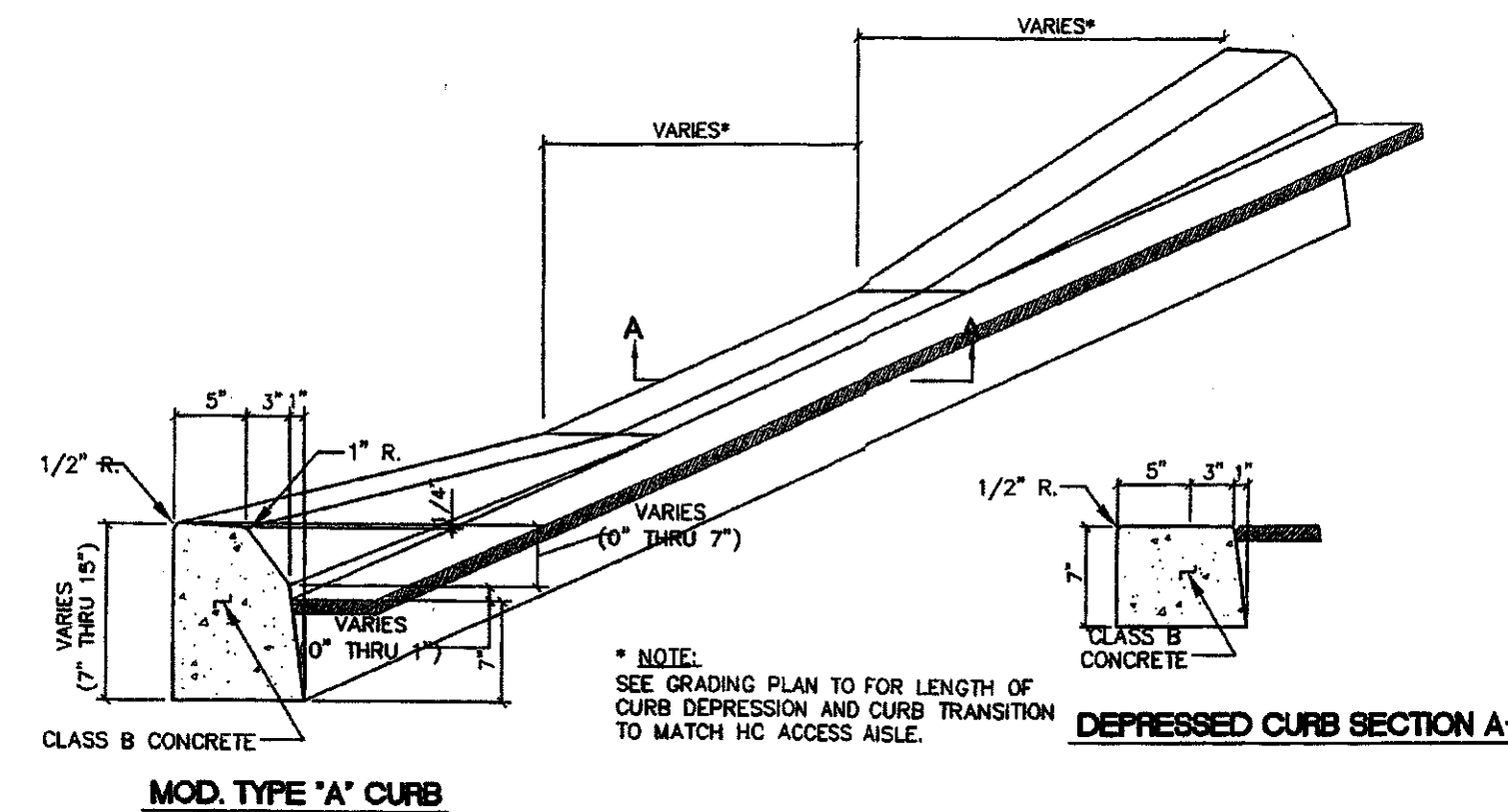
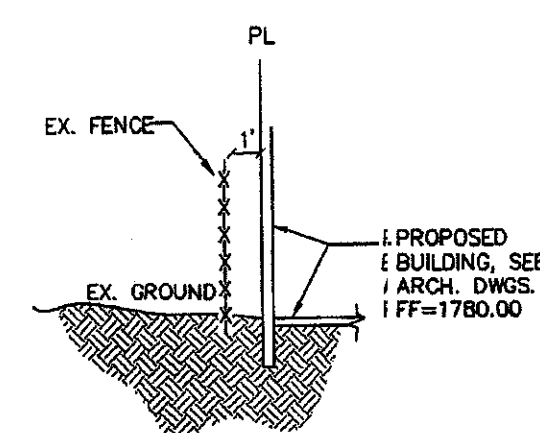
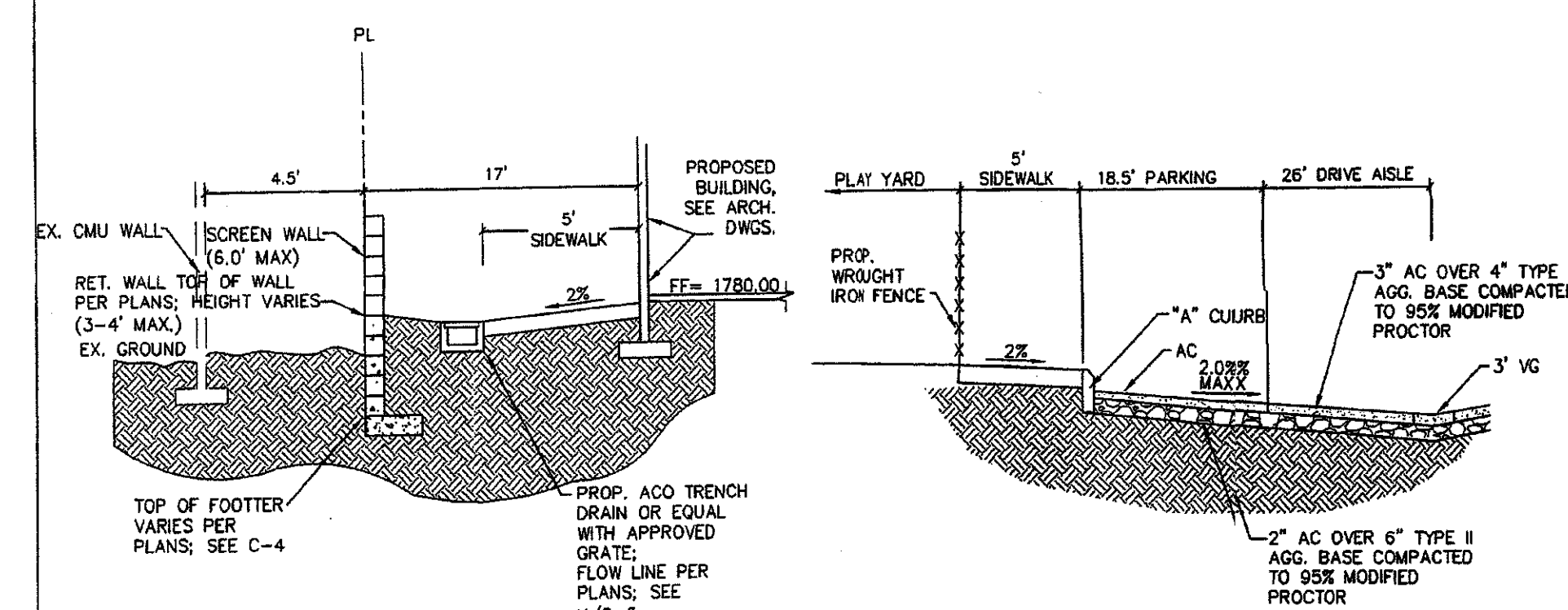
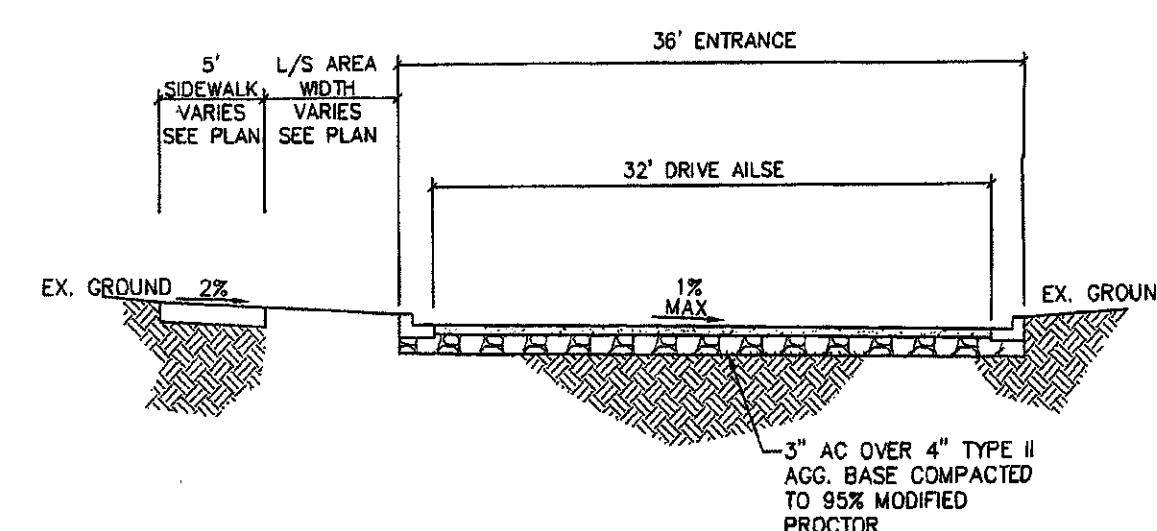
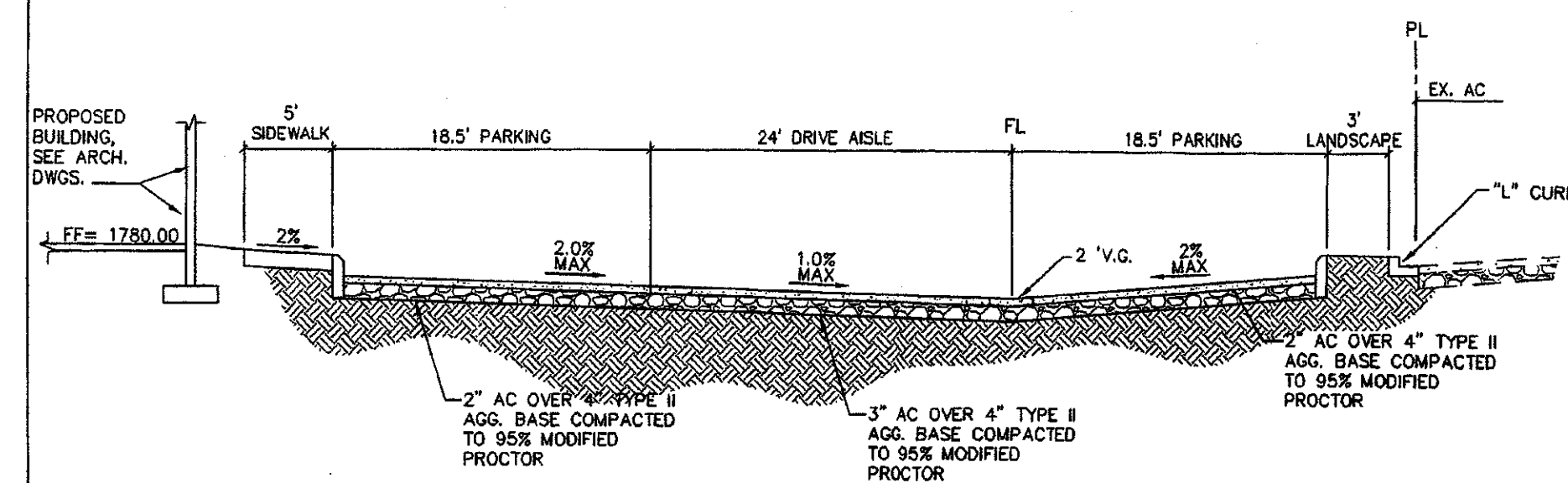
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DESIGNED: EDS
CHECKED: RFH
PROJECT #: 1305514.00

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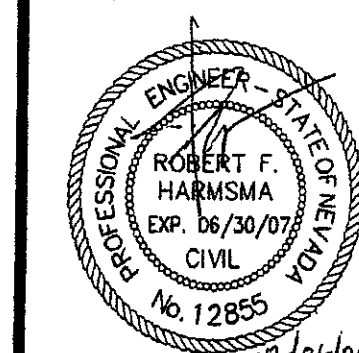
C4
4 OF 9 SHEETS

ROBERT F. HARMSMA, P.E. #12855
DATE

ADD UP APP. 07-24/05



DETAILS
NELLIS/OWENS DAYCARE
GRUBB AND ELLIS
CITY OF LAS VEGAS, NEVADA

[illegible]

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DESIGNED	EDS
CHECKED	RFH
PROJECT #	3055114.00

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DETAIL SHEET

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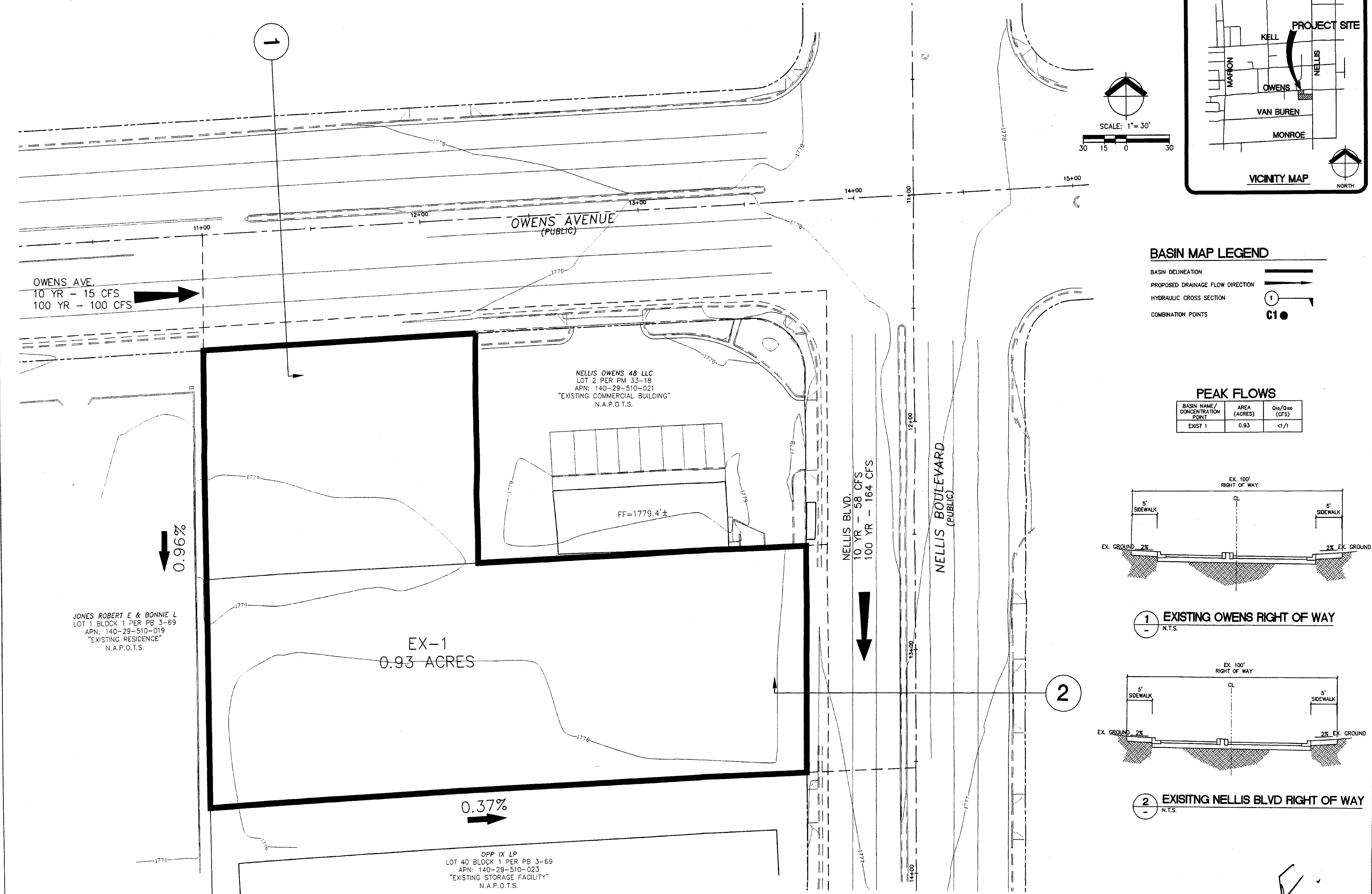
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5 OF 9 SHEET

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GIBBBS AND ELLIS
CITY OF LAS VEGAS, NEVADA

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REF

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EXISTING BASIN MAP

NELLIS/OWENS DAYCARE

GRUBB AND ELLIS

LAS VEGAS, NEVADA

BY	DATE	DESCRIPTION

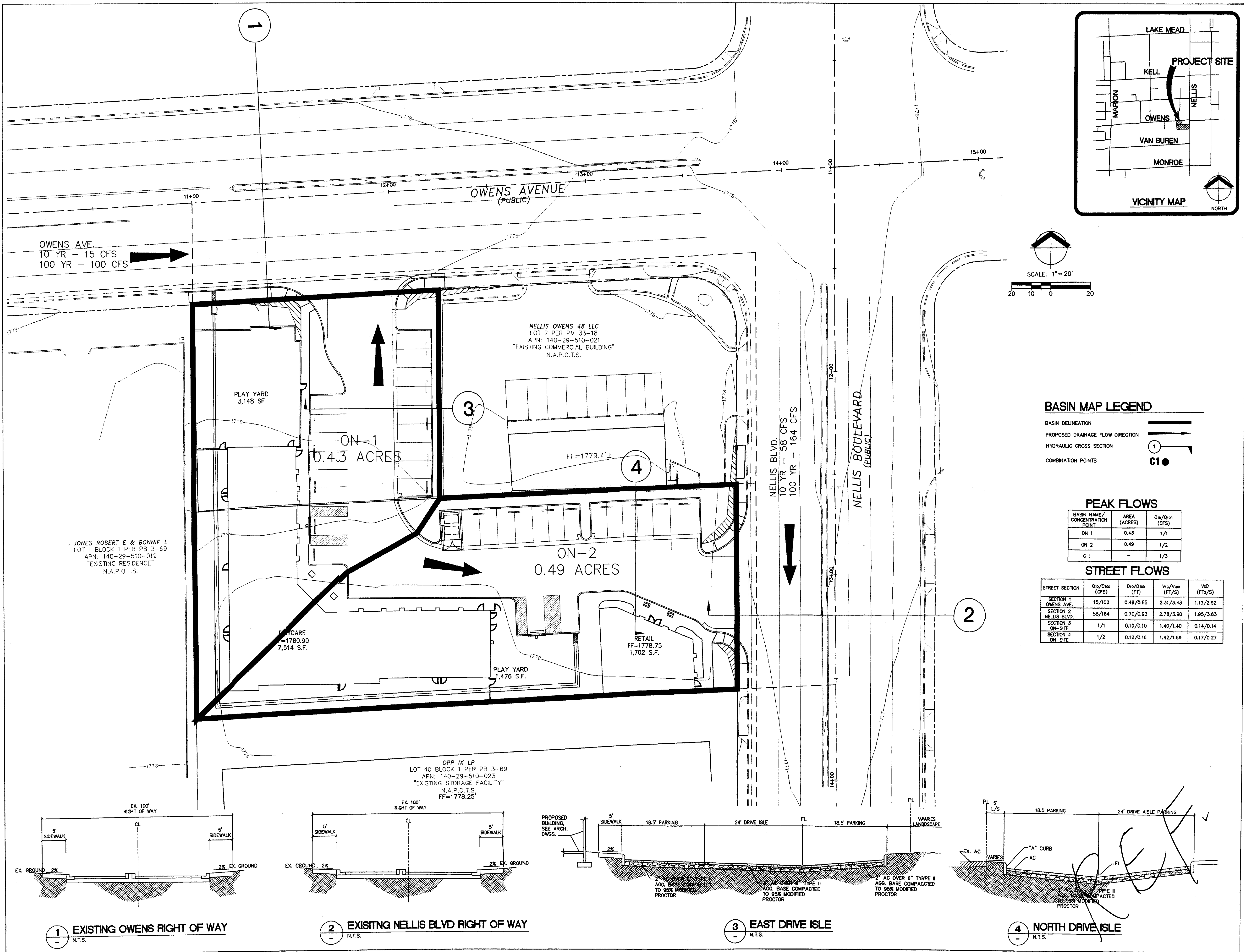
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SHEET TITLE
EX. BASIN MAP
SHEET NUMBER

FIG. 7
OF 1 SHEETS

ADD UPDATE MAP

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DEVELOPED BASIN MAP

NELLIS/OWENS DAYCARE

GRUBB AND ELLIS

LAS VEGAS, NEVADA

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PROP. BASIN MAP
SHEET NUMBER
FIG. 8
OF 1 SHEETS