

DS #: 4537

APN: 138-22-701-009

PROJECT: LAKE MEAD ROCK SPRINGS COMMERCIAL SUBD.

SUBMITTAL: 1ST

SCANNED BY/DATE: _____

CHECKED BY/DATE: _____



CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM

DATE:

August 30, 2011

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:
Lake Mead Rock Springs Commercial Subdivision

COPIES TO:
Slater Hanifan Group

Cross Streets: SWQ of Lake Mead Bl. & Rock Springs Dr.

Roohani Khusrow Family Trust

File Number: F:\Depot\DSMemos\DS4537A.doc

Bart Anderson, P.E., DevCo

Parcel Number: 138-22-701-009

Zoning Action: GPA-41883; ZON-41884; SUP-41885;
SDR-41886 & TMP-42978

FEMA Flood Zone YES NO X

Proposed Storm Drain YES NO X

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1 st Submittal	8/25/2011	8/30/2011	See Comments Below	\$400.00	259046: \$400
			TOTAL FEES (LDDRS):	\$400.00	----

REMARKS:

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

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

1. Provide a copy of the zoning/planning conditions associated with this site (**GPA-41883; ZON-41884; SUP-41885; SDR-41886 & TMP-42978**) with the next submittal to verify compliance with conditions. *Flood Control* will not issue conditional approval of the drainage study without the associated zoning/planning conditions (issued by the *City Council*). Any associated conditions of approval that revise the site drainage parameters will require that the drainage study be revised and resubmitted.
2. A Tentative Map has been proposed for the subject development. Provide a copy of the tentative map in the next submittal which must contain the following note:
ALL SUBDIVIDED PARCELS COMPRISING THIS COMMERCIAL SUBDIVISION SHALL PROVIDE PERPETUAL INTERSITE COMMON DRAINAGE RIGHTS ACROSS ALL EXISTING AND FUTURE PARCEL LIMITS.
3. The subject property accepts offsite flows in the existing and historical conditions which perpetuate the flows through the site and discharges to *Rock Springs Drive*. The proposed drainage to discharge flows to the *School District's* property is unacceptable. Review and revise accordingly.
4. At the southwest corner of the development where a proposed concrete valley gutter is to accept the offsite flow from the existing drainage easement from the adjacent *Lewis Homes*, provide a riprap pad for erosion control with sizing base on the discharge velocity of the Q_{100} in the existing drainage easement.

5. Revise the construction note for sidewalk underdrain per Uniform Standard Drawings Clark County Area (USDCCA) Number 236.
6. Construction Note 26 appears in the Phase I plans but to be found nowhere in the "Grading" notes column. Review and revise accordingly.
7. In the vicinity of the west end of the school private drive, there is a note tag for "Existing Drop Inlet", however, the existing facility is sidewalk underdrain instead. Revise in the next submittal in all pertinent plans.

In an effort to increase administrative efficiency, the City of Las Vegas Public Works Department requires all soil reports, drainage studies and traffic impact analysis submittals to be accompanied by an electronic copy of the submittal. Electronic documents must be submitted with one original hard copy of the study. Electronic documents should be on a universal computer-readable digital output replicating your submittal to be used for archival or display purposes. This may be more than one file if necessary. An Indexed Portable Document Format (PDF) or Print Ready CAD file formats with a minimum of 300dpi are the desired formats, but provided it is a high quality digitized replication of the submittal, other formats may be acceptable. If figures are in color, they must be scanned in color and saved as a separate file. The new submittal requirement is effective on **July 1, 2011**. If there are any questions regarding these new requirements, please contact Robert Welch in the Flood Section at (702) 229-2177 or Rick Schroder in Traffic Engineering at (702) 229-6327.

NOTE: Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the *Nevada Division of Environmental Protection* a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see <http://ndep.nv.gov/bwpc/storm01.htm> or call (775) 687-9429.

END OF REMARKS
ays

T/R/S: T20S/R60E/22
AREA L-22

TRANSACTION REPORT

P. 01

AUG-30-2011 TUE 03:34 PM

FOR: CITY OF LAS VEGAS

7023828551

SEND

DATE	START	RECEIVER	TX TIME	PAGES	TYPE	NOTE	M#	DP
AUG-30	03:34 PM	2845399	33"	2	FAX TX	OK	880	
TOTAL :						33S PAGES:	2	

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END OF REMARKS
ays

T/R/S: T20S/R60E/22
AREA L-22

TECHNICAL DRAINAGE STUDY

Lake Mead Rock Springs Commercial Subdivision

Clark County, Nevada

Job No.: RCI1105.000

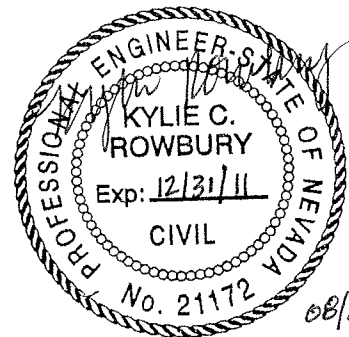
Date: August 2011

Prepared By:

Slater Hanifan Group, Inc.
5740 S. Arville Street, Suite 216
Las Vegas, Nevada 89118
Phone: 702-284-5300 • Fax: 702-284-5399

Prepared For:

Roohani Khusrow Family Trust
9315 W. Sunset Road #100
Las Vegas, NV 89148
Phone: 702-982-2100 • Fax: 702-982-2101



Kylie Rowbury, P.E.
NV Professional Engineer No. 21172

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: Lake Mead Rock Springs Commercial Subdivision Date: August 2011
 Location of Development: a) Descriptive (Cross Streets): North/South: Rock Springs Drive
East/West: Lake Mead Boulevard
 b) Section: 22 Township: 20 S Range: 60 E
 c) APN: 138-22-701-009

Name of Owner: Roohani Khusrow Family Trust
 Telephone No.: (702) 982-2100 Fax No.: (702) 982-2101 E-mail Address: gmarkowski@gdpdgroup.com
 Address: 9315 West Sunset Road #100, Las Vegas, NV 89148

Contact Person – Name: Kylie Rowbury, P.E. Telephone No.: (702) 284-5300
 *E-mail Address: krowbury@shg-inc.com Fax No.: (702) 284-5399
 Firm: Slater Hanifan Group
 Address: 5740 S. Arville St. #216, 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	Commercial Development

1. Total Owned Land Area: At Site: ± 4.4 acres Being Developed/Disturbed: ± 4.4 acres

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

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

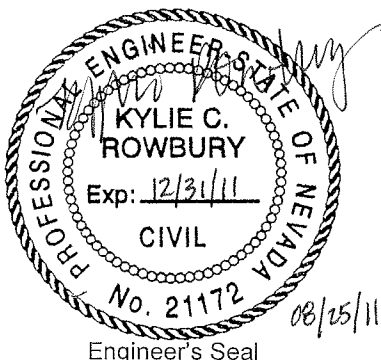
4. Proposed type of development (Residential, Commercial, Etc.): Commercial

5. Approximate upstream land area which drains to the subject site: ± 0.0 acres

6. Has the site drainage been evaluated in the past? ☒ Yes** ☐ No If yes, please identify documentation: Technical Drainage Study for Lake Mead Rock Springs Residential Development (DS4171)

7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Rock Springs Drive

8. Briefly describe your proposed schedule for the subject project: Phase 1 followed by Phase 2



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.

*Newly Required Field

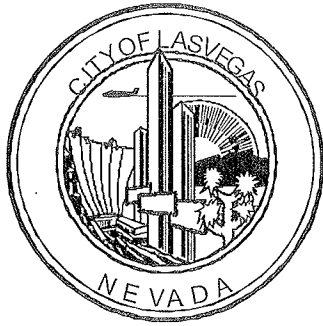
**Review and concurrence of the Clark County Regional Flood Control District is required

Local Entity File No.	Revision	Date

REFERENCE:

STANDARD FORM 1

Updated 05/01/2008



CITY OF LAS VEGAS

MINIMUM DRAINAGE STUDY CRITERIA STANDARD FORM 2 CHECKLIST SUPPLEMENT

(Revised 06/06/01)

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

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

I. GENERAL REQUIREMENT		
Yes	No	
	N/A	A notarized letter from the adjacent property owner(s) allowing off-site grading. (A copy of the letter must be received prior to final acceptance of the drainage study.)
	X	Copies of all conditions of approval for development related to this property. (e.g. zoning, use permit, tentative map, etc.) Verify compliance with conditions. <i>BEEN HEARD & APPROVED. WAITING FOR LETTERS.</i>

II. GRADING PLAN INFORMATION		
Yes	No	
X		(1) 24" X 36" copy of the Grading Plan, (including all Detail Sheets) sealed by the engineer.
X		Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street. Note: Proposed top of curb elevations must be provided for both sides of roadways even if only half street construction is required.
X		Label existing topography at a minimum 5 foot elevation interval including adjacent developments, finished floor elevations of existing buildings and top of existing curbs extending 100 feet* around the perimeter of the site. (*Measured from the centerline of the adjacent roadway.)
	N/A	Proposed on-site and off-site storm drains and other flood control facilities with plan and profile sheets for public storm drains showing the class of pipe, (Class III, IV, V, etc.), design hydraulic grade line, (HGL) and 100 year storm flow. A public drainage easement must be provided over on-site storm drains conveying off-site flows. An overflow path must be provided over all storm drains.
X		All existing and "to be constructed" walls with cross-sections showing wall type, (e.g. block wall, retaining wall, flood wall, etc.), with limits clearly defined, adjacent ground elevations. Wall heights must meet current ordinances and in no case exceed 14 feet above the adjacent property.
X		Street slopes for both interior and perimeter streets. Note: The minimum slope for a roadway is 0.4 percent, a minimum 18-inch storm drain must be provided where minimum slopes cannot be met.

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

II. GRADING PLAN INFORMATION		
Yes	No	
	N/A	Back of lot elevations and lot drainage pattern for all lots including common lots.
	N/A	Sites with a grade difference two feet above or below existing ground are required to have approval from City of Las Vegas Current Planning. Current Planning approval is required prior to final approval of the drainage study.
X		On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners. (The project must pass flows through the site every 600 feet where the project is blocking flow paths.)
	N/A	This project uses a solid grouted stem wall (or approved alternate) at the back of sidewalk to provide erosion protection for landscaped areas where the depth of flow in the roadway exceeds the back of walk elevation. A corresponding cross-section detail is included.
X		Commercial and Common Lot Landscape areas are not allowed to drain over the sidewalk. The grading plans show flow lines with grades and sidewalk under drains for all landscape areas draining to the public ROW.

III. Local Entity Criteria - City of Las Vegas – Manual Section 1600		
Yes	No	
X		Concrete valley gutters are required in parking lots with slopes less than 1 percent. Slopes through cul-de-sac must be at a 1 percent minimum where flow is drained through the cul-de-sac.
	N/A	Ten-foot wide public drainage easements to be privately maintained are allowed for flow less than 20 cfs. The depth of flow entering the easement must be checked using the submerged weir calculation.
	N/A	The limits of the flood zones and the base flood elevations (BFE) must be shown on all grading plans for all developments within a Special Flood Hazard Zone A, AO, AE, etc.
X		Minimum finish floor elevation is 6 inches above highest adjacent top of curb. Finish floor calculations must include allowances for super elevations on curves and velocity head for tee intersections. <i>TRUE FOR PERIMETER STREET ROCK SPRINGS DRIVE, LANDSCAPE BERM IN PRIVATE DRIVE, ONSITE SECTIONS FLOW DEPTH BELOW TC.</i>
	N/A	Finished floor elevations for buildings adjacent to public drainage easements must be a minimum of 18 inches above the Q100 weir of submerged weir elevation, whichever is greater.
	N/A	Lots with "B and C Type Drainage" shall be required to install an underground nuisance drainage system or a 2-foot valley gutter through the lot. 16" x 24" minimum block wall openings are required for both options.
	N/A	Bubblers are required across 80 foot and greater ROW streets. When flows exceed 10 cfs, bubblers larger than 18 inches will be required up to a maximum of 36". Inlets must be sized to match the pipe size provided.

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

- An appointment must be made to preview this checklist in conjunction with Clark County Regional Flood Control District Manual Standard Form 2 prior to the City accepting a new Drainage Study for review. The engineer may contact the Flood Control Section at 229-6541.
- Following the acceptance of the Drainage Study (meeting the minimum acceptable information above), there will be a charge of \$250 for each Drainage Study review submittal. These fees are payable at the time the Grading Permit is obtained.
- The Drainage Study must be accepted prior to submitting grading plans to the Land Development Section for review.

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

F:\Depot\DOCS\Memos\jbCHKLIST7.doc
6-Jun-01

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

Project Name: Lake Mead Rock Springs Commercial Subdivision		Map ID:
Firm Name: Slater Hanifan Group (SHG)		Kylie Rowbury, P.E.
Address: 5740 S. Arville St., Suite 216		
City: Las Vegas	State: Nevada	Zip: 89118
Phone Number: 702-284-5300	Fax Number: 702-284-5399	
Property Developer: Roohani Khusrow Family Trust (Firestone)		
Address: 9315 W. Sunset Road #100		
City: Las Vegas	State: NV	Zip: 89148
Reviewed By:	Date Received:	Date Accepted for Review:

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

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

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

I. GENERAL REQUIREMENT:

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

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

II. MAPS AND EXHIBITS

Yes	No	
☒	☐	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-25), for Flood Control Facilities and Environmental areas with the site delineated.
☒	☐	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.
☒	☐	Off-site drainage basin maps for existing, interim and future conditions showing the existing topography, basin boundaries, concentration points, and flows in cfs. REFERENCED

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.
☐	☐	n/a 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.
☒	☐	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.
☒	☐	Existing and proposed drainage easements and widths shown with sufficient detail. A cross sectional detail must be provided that shows appropriate lining and reinforcement.
☐	☐	n/a Location and detail of existing, proposed, and future block wall openings. Minimum size is 16"x48". Wrought iron gate is required for flows > 10 cfs.
☐	☐	n/a Location and detail of flood walls illustrating depth of flow, proposed grouting height, etc.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes

No

x

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.

n/a

Alignment of all existing, proposed, or future Regional Facilities adjacent to the site.

x

Limits of existing floodplain based on current FIRM or best available information; limits of proposed floodplains based on best available information.

x

For areas in Zone A, AE, AH, and AO, base flood elevations (BFEs) must be shown for each lot; BFEs may be listed on each lot, or in a table. Finish floor elevations must be a minimum of 18 inches above BFE.

x

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.

x

Street slopes for perimeter and interior streets. The minimum slope is 0.4 percent.

IV. HYDROLOGIC ANALYSIS

Yes

No

x

Appropriate soil information and Soils Map for existing and future conditions with subbasins and property delineated.

x

Input and output information for existing conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.

x

Input and output information for future conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.

x

Use of correct precipitation values in and around the McCarran Airport Rainfall Area.

x

A discussion in the text of the hydrologic analysis justifying subbasin boundaries and cutoffs, supporting assumptions, and calculations.

x

A summary table of storm water flows showing basin area, Q_{10} and Q_{100} for both individual basins and combined basin flows, where acceptable.

x

Copies of supporting technical information referenced from a previously approved study and a statement accepting these results.

x

On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners in accordance with current Nevada Drainage Law.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

V. HYDRAULIC ANALYSIS

Yes	No	
	n/a	Flow split calculations and supporting documentation or reference for the method of flow split calculations used.
x		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.
x		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.)
x		Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set finish floor elevations. Hydraulic calculations must include submerged weir, superelevation and tee intersection losses, where appropriate.
x		Provide necessary freeboard requirements to set the finished floor elevations of all proposed buildings, 2 x depth of flow or depth of flow plus 18 inches of freeboard, whichever is less. The minimum requirement is 6 inches above adjacent upstream top of curb. Buildings adjacent to drainage easements must always be provided with 18 inches of freeboard above the Q_{100} weir height or flow depth, which ever is greater.
x		A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones.
		• Field survey data. • Input and output information. • Plotted cross-sections based on survey with proper encroachments. • A map showing the location of the cross-sections. • Analysis of both sub- and super-critical flow segments. • A summary table and a discussion of the results in the text of the report.
	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.
x		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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- Exhibit B – FEMA FIRM Panel Map
- Exhibit C – CCRFCD MPU 2008 Figures F-25
- Exhibit D – Soils Map
- Exhibit E – Phase 1 Condition Onsite Drainage Map
- Exhibit F – Phase 2 Condition Onsite Drainage Map

Appendix B Flowmaster Hydraulic Computations

- Perimeter Street Sections
- Onsite Hydraulic Sections

Appendix C Reference Material

Technical Drainage Study for Lake Mead Rock Springs Retail Center
by AMTI Sunbelt LLP (CLV DS3725)

- Approval Letter
- Drainage Exhibits
- HEC-1 Analyses
 - o Proposed Condition
 - o Ultimate Condition
- Drop Inlet Calculations for Rock Springs at Lake Mead

Appendix D Reference Material

Technical Drainage Study for City Center West
by Kimley-Horn & Associates (CLV DS1923)

- Approval Letter
- Relevant Plan & Detail Sheets

Appendix E Reference Material

Technical Drainage Study for Lake Mead/Tenaya
by The Keith Companies (CLV DS1379)

- Approval Letter
- Drop Inlet Calculations

Appendix F CCRFCD 2008 MPU Figure H-25

Appendix G Plan, Profile and Detail Sheets

1 INTRODUCTION

1.1 Project Overview & Study Purpose

Roohani Khusrow Family Trust is proposing commercial development of a 4.4 +/- acre parcel located southwest of the intersection of Lake Mead Boulevard and Rock Springs Drive within the City of Las Vegas, Nevada. This study addresses commercial development of the site, including four (4) commercial buildings. The proposed project is identified as *Lake Mead Rock Springs Commercial Subdivision* (hereafter referred to as the project site).

The project site will be developed in two (2) phases as described below:

1. **Phase 1** – Commercial development the proposed Firestone Building, including parking and landscape improvements to the northeast portion of the site. Phase 1 also includes have street improvements to Rock Springs Drive as well as addition of A-curb along the northern boundary of the existing private drive adjacent to the project site to the south.
2. **Phase 2** – Commercial development of the remainder of the site, including three (3) additional commercial buildings and parking improvements.

The purpose of this study is to provide a detailed hydrologic and hydraulic analysis for the project site in order to protect the property from onsite and offsite runoff in accordance with local stormwater criteria. This study will also provide an inventory of existing stormwater facilities in the vicinity as well as provide recommendations for site specific facilities necessary to control runoff impacting the project site.

1.2 Site Description

The project site currently consists of undeveloped desert terrain with sparse desert brush and generally slopes to the east. The site is bordered by Rock Springs Drive to the east, existing Lake Mead Boulevard/Tenaya Way Commercial development to the west, existing Lake Mead Rock Springs Retail Center to the north, and existing McMillan Elementary School to the south. A vicinity map identified as Exhibit A is included in Appendix A for reference.

1.3 FEMA Flood Zone Designation

The project site is not located within a FEMA designated Special Flood Hazard Area (SFHA). The site has been identified on the current Flood Insurance Rate Map (FIRM) Panel 32003C2155E dated September 27, 2002 and revised to reflect LOMR effective December 31, 2003, designating that the site is located within a FEMA designated Zone X. A Zone X is described as an area determined to be outside the 0.2% annual chance flood. Exhibit B identifying the project site on the FIRM Panel has been included in Appendix A for reference.

1.4 CCRFCD Facility Information

The site has been identified on the current 2008 CCRFCD MPU Figure F-25, which is included as Exhibit C in Appendix A for reference. Per the 2008 CCRFCD MPU (Reference 1), the project site is not adjacent to any existing and/or proposed Regional Facilities; therefore, CCRFCD concurrence will not be required.

1.5 Reference Studies

Three (3) approved drainage studies and improvements plans have been utilized in preparation of this study. Note that all reference material herein has been reviewed and deemed acceptable for reference.

1. The study entitled, *Technical Drainage Study for Lake Mead Rock Springs Retail Center* (Retail Center Study, Reference 4), CLV DS3725, prepared by AMTI Sunbelt LLP analyzed the commercial development adjacent to the project site to the north. The Retail Center Study was utilized to establish the existing and proposed condition hydrology for the project site, as well as the offsite hydrology. Relevant reference material from the Retail Center Study is included in Appendix C.
2. The study entitled, *Technical Drainage Study for City Center West* (City Center West Study, Reference 5), CLV DS1923, prepared by Kimley-Horn & Associates, was utilized to show the existing drainage easement upstream of the proposed site which discharges flow into the adjacent private drive. Relevant reference material from the City Center West Study is included in Appendix D.
3. The study entitled, *Technical Drainage Study for Lake Mead/Tenaya* (Lake Mead/Tenaya Study, Reference 6), CLV DS1379, prepared by The Keith Companies, was utilized to establish the existing drop inlets at the Rock Springs Drive and Lake Mead Boulevard intersection to show that 10-year dry lane criteria is met at the intersection. Relevant reference material from the Lake Mead/Tenaya Study is included in Appendix E.

2 METHODOLOGY

2.1 Compliance

The methodologies utilized in the preparation of this study are in compliance with the Clark County Regional Flood Control District's Hydrologic and Drainage Design Manual (CCRFCD Manual, Reference 2).

2.2 Hydrologic Modeling

The hydrologic information for the proposed site, including precipitation, curve number and lag time data, has been referenced from the Retail Center Study. No additional hydrologic modeling has been performed as part of this study. The referenced HEC-1 analyses from the Retail Center Study, including Standard Form 4 for lag time computations, have been included in Appendix C. Note that the site lies within Soil Type 264 which is comprised of

Hydrologic Soil Group 'A'. See the Exhibit D located in Appendix A for reference to the soils map.

2.3 Hydraulic Modeling

Street Flow: Street flows have been analyzed utilizing the Flowmaster Version 7.0 software by Haestad Methods. In accordance with the CCRFCD Manual, the velocity times depth factor ($v \times d$) for street flow for the 10-year storm event must be less than or equal to 6, with a maximum depth of 1-ft. The velocity times depth factor ($v \times d$) for street flow for the 100-year storm event must be less than or equal to 8, with a maximum depth of 2-ft.

Drainage Flumes & Valley Gutters: Drainage flumes and valley gutters have been analyzed utilizing the Flowmaster Version 7.0 software by Haestad Methods.

Drainage Swales: Drainage swales have been analyzed utilizing the Flowmaster Version 7.0 software by Haestad Methods.

3 EXISTING DRAINAGE CONDITION

3.1 Definition of Existing Condition

The existing condition drainage patterns for the project site have been referenced from the Retail Center Study and have not been re-analyzed with this study. In the existing condition, the project site is undeveloped and surface drains east to Rock Springs Drive. Rock Springs Drive adjacent to the site to the east is paved without curb and gutter. The private drive adjacent to the site to the south is also paved without curb and gutter. Commercial development to the north and west is considered complete. The school site to the south is also developed. Please see referenced Figure 5 from the Retail Center Study located in Appendix C for reference to the existing condition drainage patterns for the project site.

3.2 Discussion of Existing Condition

Refer to referenced Figure 5 from the Retail Center Study located in Appendix C for a detailed illustration of the existing condition drainage patterns.

The existing project site is depicted as referenced Basin OFF1E from the Retail Center Study and drains east to Rock Springs Drive. Offsite flow from referenced Basin E1 is generated by commercial properties west of the project site and discharge thru an existing offsite drainage easement to the existing private drive to the south. See the referenced grading plans from the City Center West Study located in Appendix D for reference to the existing drainage easement. Flow discharging from the easement combines with flow generated by the school to the south at referenced Concentration Point CP-1 near the intersection of Rock Springs Drive. Flow from referenced Concentration Point CP-1 drains north in Rock Springs Drive and combines with flow from the site (Basin OFF1E) as well as flow generated by Rock Springs Drive and flow generated by the Retail Center to the north at Concentration Point CP-2 near the intersection of Lake Mead Drive.

3.3 Summary of Existing Condition Flows

A summary of existing condition flow rates, as referenced from the Retail Center Study's proposed condition, is presented below in Table 1. Refer to Appendix C for relevant reference material.

Table 1: Summary of Existing Condition Flows*			
Basin / Concentration Point	Area (ac)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)
E1	19.2	19	42
OFF1E (Project Site)	4.53	<1	2
CP-1	N/A	24	52
CP-2	N/A	28	65

*Referenced from the Retail Center Study's Proposed Condition Analysis

4 PROPOSED DRAINAGE CONDITION

4.1 Definition of Proposed Condition

The proposed drainage condition considers entire project site commercially developed. The site is proposed by this project to be constructed in two (2) phases. The following describes the onsite drainage condition of each of the two phases.

Phase 1 – Commercial development of the northeast portion of the site, including the Firestone building, is considered complete. The southwest portion of the site is considered undeveloped. Half street improvements to Rock Springs Drive and the addition of A-curb to the adjacent private drive to the south are considered complete with Phase 1.

Phase 2 – Commercial development of the remainder of the project site, including three (3) additional commercial buildings. The site is considered completely built out. See Exhibit F located in Appendix A for an illustration of the onsite Phase 2 drainage condition.

Offsite drainage patterns for the both Phase 1 and Phase 2 of the project site are the same as described in the existing condition and consider all offsite areas developed. Since the fully developed condition produces most conservative flows, a separate detailed hydrologic analysis has not been performed for Phase 1. Interim condition Phase 1 facilities have been designed based on the more conservative fully developed flows, and the referenced Retail Center Study's ultimate condition analysis has been referenced to represent the fully developed onsite condition (Phase 2).

4.2 Discussion of Proposed Phase 1 Condition

Refer to referenced Figure 6 included in Appendix C for a detailed illustration of the offsite proposed condition drainage patterns. Onsite drainage patterns for the Phase 1 condition are illustrated on Exhibit E included in Appendix A.

Offsite drainage patterns are similar to those presented in the existing condition. However, the offsite flow at the southwest corner of the project site has been routed onsite in a drainage swale prior to discharging to the private street to the south. This is due to a survey of the site showing that the existing grade at the outlet of the existing offsite drainage easement is lower than the existing edge of pavement for the adjacent private drive. Therefore, the proposed drainage swale perpetuates flow onsite until the flowline can tie back into the roadway. Once in the roadway, offsite drainage patterns mimic those presented in the existing condition.

Onsite drainage patterns for the Phase 1 drainage condition are similar to the existing condition in that flow drains generally east to Rock Springs Drive. Flow from undeveloped Phase 2 will drain east to Phase 1. Flow generated by the northern portion of undeveloped Phase 2 (prorated basin PH2A) will drain north via a proposed interim earthen swale along the edge of pavement to a Phase 1 valley gutter and be perpetuated thru Phase 1 improvements to Rock Springs Drive. Flow generated by the southern portion of undeveloped Phase 2 (prorated basin PH2B) will drain east to the edge of Phase 1 landscape improvements and then be conveyed north via proposed earthen swale to the proposed driveway entrance and on to Rock Spring Drive.

As part of Phase 1, the existing curb and gutter at the northeast corner of the site will be removed to provide an additional drive aisle access to the site from the existing Retail Center to the north. Note that a negligible amount of flow from the site will drain north thru this access.

Curb and gutter and landscape improvements fronting Rock Springs Drive are proposed as part of Phase 1. Note that a drainage swale has been provided within the landscape area to prevent nuisance flow from draining over the sidewalk. NDOT approved sidewalk underdrains have been provided to convey flow from the landscape area to Rock Springs Drive. Furthermore, curb has been added along the north boundary of the existing private drive to the south as part of Phase 1 improvements.

4.3 Discussion of Proposed Phase 2 Condition

Refer to referenced Figure 6 included in Appendix C for a detailed illustration of the offsite proposed condition drainage patterns. Onsite drainage patterns for the Phase 2 condition are illustrated on Exhibit F included in Appendix A.

Offsite drainage patterns are the same as presented in the Phase 1 condition. However, in the Phase 2 condition, the entire project site is considered commercially developed. Flow generated by the site generally drains east and discharges thru the proposed driveway entrance to Rock Springs Drive.

4.4 Summary of Proposed Condition Flows

A summary of proposed condition flow rates, as determined by the referenced HEC-1 Analysis from the Retail Center Study's ultimate condition, is presented below in Table 2. Refer to Appendix C for the referenced HEC-1 Analysis.

Table 2: Summary of Proposed Condition Flows*			
Basin / Concentration Point	Area (ac)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)
E1	19.2	19	42
OFF1D (Project Site)	4.53	5	13
CP-1	N/A	24	52
CP-2	N/A	32	71

*Referenced from the Retail Center Study's Ultimate Condition Analysis

Flow generated by referenced Subbasin OFF1D was prorated for use in hydraulic analysis for Phase 1 interim facilities. Prorated basin boundaries are illustrated on Exhibit E located in Appendix A, and prorated flows are summarized in Table 3 below.

Table 3: Summary of Prorated Flows (Phase 1)			
Subbasin	Q ₁₀₀ (cfs)	Area (acres)	100-yr Unit Flow (cfs/ac)
OFF1D*	13	4.53	2.9
Prorated Subbasin	Q ₁₀₀ (cfs)	Area (acres)	100-yr Unit Flow (cfs/ac)
PH1	5.1	1.78	2.9
PH2A	2.4	0.82	2.9
PH2B	5.5	1.93	2.9
TOTAL	13.0	4.53	

*Referenced from Retail Center Study

Flow generated by referenced Subbasin OFF1D was also prorated to for used in hydraulic analysis for Phase 2 section calculations. Prorated basin boundaries are illustrated on Exhibit F located in Appendix A, and prorated flows are summarized in Table 4 below.

Table 4: Summary of Prorated Flows (Phase 2)			
Subbasin	Q ₁₀₀ (cfs)	Area (acres)	100-yr Unit Flow (cfs/ac)
OFF1D*	13	4.53	2.9
Prorated Subbasin	Q ₁₀₀ (cfs)	Area (acres)	100-yr Unit Flow (cfs/ac)
ONA	5.0	1.75	2.9
ONB	1.3	0.47	2.9
ONC	2.1	0.72	2.9
OND	4.6	1.59	2.9
TOTAL	13.0	4.53	

*Referenced from Retail Center Study

The proposed condition flows for the project site have been compared to the existing condition flows analyzed with this study. Table 5 below summarizes these comparisons.

Table 5: Flowrate Comparison			
Proposed Condition Flows vs. Existing Condition Flows			
Location	Proposed Condition Q_{10}/Q_{100} (cfs)	Location	Existing Condition Q_{10}/Q_{100} (cfs)
Private Drive (CP-1)	24/52	Private Drive (CP-1)	24/52
Proposed Project Site (OFFD1)	5/13	Existing Project Site (OFFE1)	<1/2
Rock Springs Drive (CP-2)	32/71	Rock Springs Drive (CP-2)	28/65

Upon review of Table 5 above, the proposed condition flows are larger than the existing condition flows for the site. The increase of flow onsite and in Rock Springs Drive can be attributed to the increased curve number for the project site based on the proposed commercial development. However, per the 2008 MPU, downstream Regional Facilities have been designed based on ultimate condition flows, assuming commercial development of the proposed site. See Figure H-25 from the 2008 MPU located in Appendix F. Therefore, the proposed development will produce similar developed condition flows as assumed in the 2008 MPU and will not negatively impact downstream facilities. Furthermore, the proposed condition flows have been referenced from the approved Retail Center Study and are, therefore, in conformance with that study and the design therein. Development of the proposed site does not create negative impacts downstream. In addition, as discussed in Section 4.5 of this report, developed condition flow rates in the perimeter streets meet street flow criteria as set forth in the CCRFCD Manual. Therefore, the proposed development is considered acceptable.

4.5 Summary of Proposed Condition Street Flows

The proposed condition flows in the adjacent perimeter streets, including the private drive to the south and Rock Springs Drive to the east, have been hydraulically analyzed with this study. See Appendix B for the Flowmaster computations. Hydraulic flow properties are summarized in Table 6 below.

Table 6: Perimeter Street Flow Summary							
Section	Slope (%)	Q_{100} (cfs)	Depth (ft)	Velocity (fps)	VxD	Q_{10} (cfs)	Dry Lane Width (ft)
SECTION A Private Drive ($Q = CP1^*$)	1.52	52.0	0.72	5.82	4.2	24.0	N/A
SECTION B Rock Springs Drive (60' ROW) ($Q = CP2^*$)	1.00	71.0	0.69	4.15	2.9	32.0	N/A
SECTION C Rock Springs Drive (80' ROW) ($Q = CP2^*$)	1.00	71.0	0.70	3.97	2.8	32.0	13.0

*Referenced from the Retail Center Study

The 100-year flows in the private drive and Rock Springs Drive adjacent to the project site meet VxD criteria as set forth in the CCRFCD Manual. Since 100-year flow meets 10-year criteria, VxD information for the 10-year event has not been reported. Note that Rock Springs Drive fronting the proposed site is in transition from a 60-foot ROW to an 80-foot ROW. Therefore, hydraulic sections have been provided for both street sections. Note that the 60-foot ROW is not subject to 10-year dry lane criteria; however, the 80-ft ROW is. Note that in the 10-year event, the 80-ft ROW street section produces a 13.0-ft-wide dry lane. The requirement per the CCRFCD Manual is 12.0-ft. However, an additional 7.5-ft is required to account for center median and turn lane. Note that the additional 7.5-ft is not provided in Rock Springs adjacent to the site. However, note that the street does not meet dry lane criteria in the current existing condition either. Furthermore, the Lake Mead/Tenaya Study provided drop inlets in Rock Springs at the intersection of Lake Mead Boulevard. Therefore, at the intersection of Lake Mead Boulevard, 10-year flows are collected and street flow criteria are met and the proposed design is considered acceptable. Please see the referenced drop inlet calculations included in Appendix E.

4.6 Summary of Proposed Condition Recommended Facilities

Interim Drainage Swales: Interim drainage swales are proposed as part of Phase 1 improvements to convey flow from undeveloped Phase 2 to the proposed site entrance and ultimately to Rock Springs Drive. The swales are generally 1-foot deep with 5:1 side slopes. Hydraulic sections depicting the drainage swales have been analyzed and results are summarized in Table 7 below. See Exhibit E located in Appendix A for section locations and Appendix B for Flowmaster calculations. Note that the velocity in the channel is less than 5 fps and is therefore considered non-erosive. Riprap pads have been provided where the earthen swales discharge onto Phase 1 improvements to minimize erosion potential.

Concrete Flume: A concrete flume within an onsite landscape area has been designed to allow flow generated by the southern portion of the site to access the discharge location. A Flowmaster calculation for the curb cut (Section 4) is included in Appendix B and results are summarized in Table 7 below. See Exhibit E located in Appendix A for section location. Note that this section has been analyzed utilizing the Phase 1 drainage condition flow since it is higher than the Phase 2 flow at that location. A riprap pad has been provided in this location during Phase 1 to minimize erosion potential.

Drainage Easement: A proposed drainage swale along the southwest boundary of the site will be utilized to convey offsite flow thru the site and to the existing private drive. The swale has been dedicated as a 20-foot-wide public drainage easement to be privately maintained. A 2-foot-wide valley gutter will run along the swale flowline and will daylight to the existing private drive edge of pavements. Note that the channel will not convey the entire flow, but the flow will be conveyed via a combination of the channel and the existing private drive. See the Flowmaster calculation for the swale (Section 5) included in Appendix B and results are summarized in Table 7 below. See Exhibit E located in Appendix A for section location. Note that the velocity in the channel is less than 5 fps and is therefore considered non-erosive.

Curb & Gutter/Valley Gutter: Flow generated onsite will be conveyed via proposed curb and gutter and proposed valley gutters to the discharge location along Rock Springs Drive. Onsite hydraulic Sections have been analyzed and results are summarized in Table 7

below. See Exhibit F located in Appendix A for section locations and Appendix B for Flowmaster calculations.

Table 7: Summary of Onsite Hydraulic Sections							
Section	Slope (%)	Q (cfs)	Flow Depth (ft)	Facility Depth (ft)	Top Width (ft)	Velocity (fps)	Section Description
Section 1 (Q = PH2A)	1.23	2.4	0.43	1.00	10	2.64	Earthen Swale (Triangular 5:1 SS)
Section 2 (Q = PH2B)	1.88	5.5	0.66	1.00	10	4.25	Earthen Swale (Triangular 5:1 SS)
Section 3 (Q = PH2B)	1.00	5.5	0.32	varies	varies	1.99	Earthen Swale (Triangular) 3:1 SS (right), 2% SS (left)
Section 4 (Q = PH2B)	13.60	5.5	0.21	0.50	2.00	13.11	Concrete Flume (Rectangular 2-ft Wide)
Section 5 (Q = E1*)	0.55	42	0.69	varies	varies	3.16	Drainage Swale (Trapezoidal)
	1.88	42	0.58	varies	varies	4.77	
Section 6 (Q = OND)	0.50	4.6	0.44	0.50	12.00	2.24	Drive Aisle
Section 7 (Q = ONA)	0.50	5	0.44	0.50	14.86	2.13	L-Curb
Section 8 (Q = ONA)	0.40	5	0.27	0.99	24.79	1.62	Valley Gutter
Section 9 (Q = ONB)	0.50	1.3	0.31	0.50	8.71	1.45	L-Curb
Section 10 (Q = OFF1D*)	3.70	13	0.4	0.50	19.30	5.13	Driveway Entrance

*Referenced from Retail Center Study

Driveway Humps: The proposed driveway entrance from Rock Springs Drive has been elevated a minimum of 6-inches above the depth of flow in Rock Springs Drive to prevent offsite flow from the roadway from entering the site.

Landscape Berm: The proposed site is generally lower in elevation than adjacent private drive to the south. Therefore, a landscape berm has been proposed within the landscape area along the southern boundary of the site to protect the proposed finished floors from flows within the roadway. The top of berm elevation has been set at a minimum elevation of twice the depth of flow above the flowline in the private drive.

4.7 Summary of Finished Floor Elevations

City of Las Vegas finished floor criteria requires proposed finished floors to be elevated 6-inches above the highest adjacent top of curb. However, due to handicap accessibility requirements, the above criteria cannot be met for this commercial site. Therefore, the depth of flow in all onsite sections has been checked and determined to be below curb height. The proposed finished floor elevations for the Firestone building and Pad 1 have been set a minimum of twice the depth of flow in Rock Springs Drive up to a maximum of 18 inches above the water surface elevation in the roadway. A landscape berm has been

added along the private drive to the south to a minimum elevation above the flowline of twice the depth of flow up to 18-inches to protect finished floors for Pads 1 thru 3 from flow in the private drive. In addition, the proposed driveway entrance has been humped a minimum of 6-inches above depth of flow in the adjacent roadway to prevent offsite flow from entering the site.

5 ULTIMATE DRAINAGE CONDITION

5.1 Definition of Ultimate Condition

The ultimate condition is considered identical to the proposed Phase 2 condition for the purposes of this study. All proposed condition analyses assumed worst-case developed condition flows. No additional analysis has been performed for the ultimate condition.

6 CONCLUSIONS & RECOMMENDATIONS

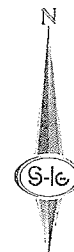
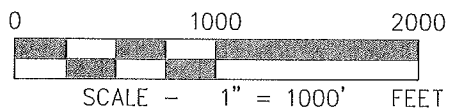
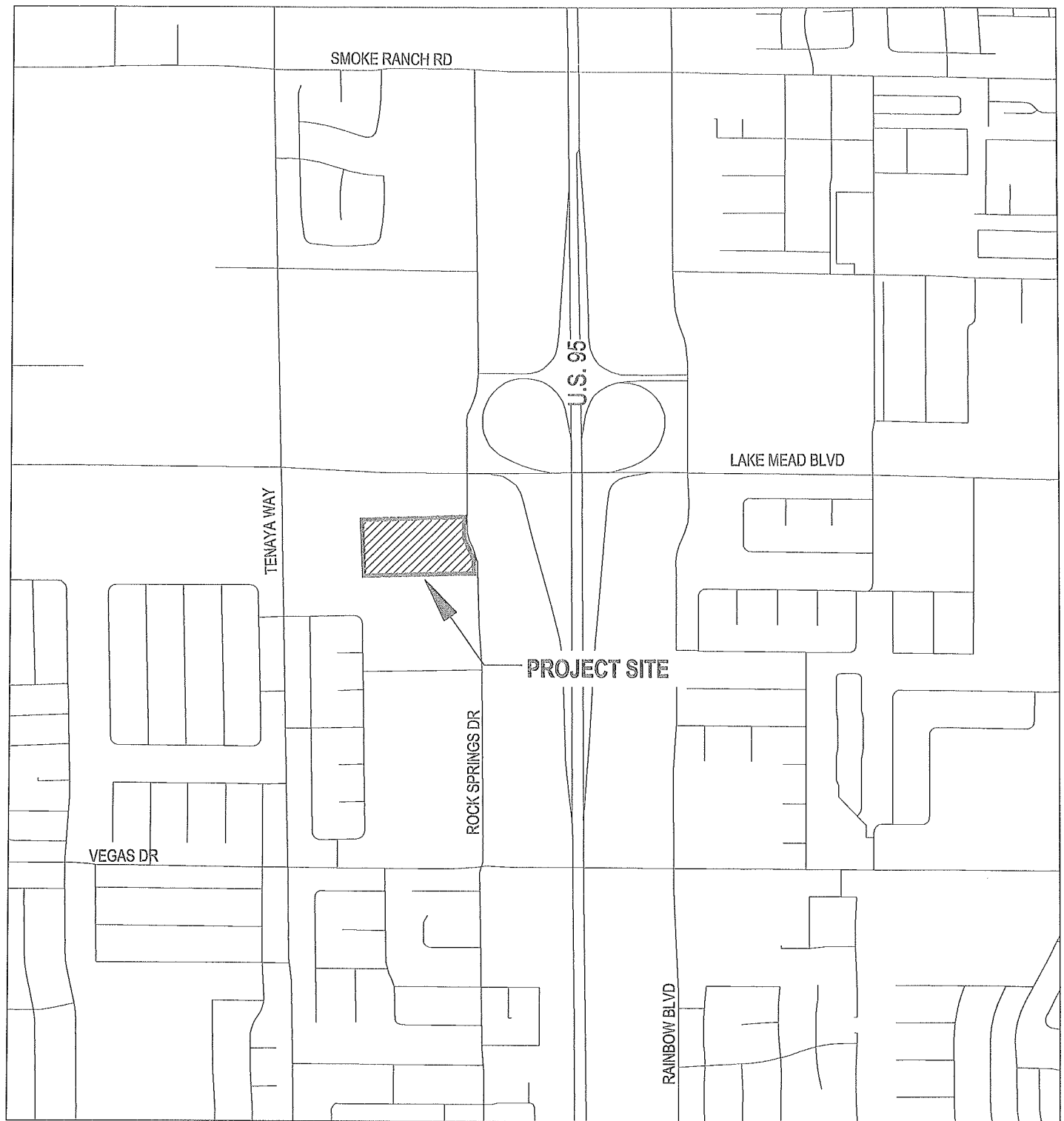
1. The project site is not located within a FEMA designated SFHA.
2. The project site is not adjacent to any existing and/or proposed CCRFCD Facilities; therefore, CCRFCD concurrence is not required.
3. Although proposed condition flows generated by the project site are greater than the existing condition flows, the proposed development is similar to the proposed land use anticipated with the 2008 MPU and downstream facilities have been designed for the more conservative developed condition flows. Furthermore, the proposed condition flow rates presented herein are the same as the design flows utilized by the downstream Retail Center development. Therefore, the development of the project site is considered acceptable and does not result in negative impacts downstream.
4. City of Las Vegas finished floor criteria requires proposed finished floors to be elevated 6-inches above the highest adjacent top of curb. However, due to handicap accessibility requirements, the above criteria cannot be met for this commercial site. Therefore, the depth of flow in all on-site sections has been checked and determined to be below curb height. The proposed finished floor elevations for the Firestone building and Pad 1 have been set a minimum of twice the depth of flow in Rock Springs Drive up to a maximum of 18 inches above the water surface elevation in the roadway. A landscape berm has been added along the private drive to the south to a minimum elevation above the flowline of twice the depth of flow up to 18-inches to protect finished floors for Pads 1 thru 3 from flow in the private drive. In addition, the proposed driveway entrance has been humped a minimum of 6-inches above depth of flow in the adjacent roadway to prevent offsite flow from entering the site.
5. The planning and zoning conditions for the site have been approved and issuance of the approval letters is pending. The approved conditions will be forwarded to CLV Public Works upon receipt.
6. Grading plan, profile and detail sheets included in Appendix G of this study support the drainage patterns and conclusions detailed in this study.

7 REFERENCES

1. *Las Vegas Valley Flood Control Master Plan Update*. PBS&J, Louis Berger Group and Parsons Brinckerhoff, October 2008.
2. *Hydrologic Criteria and Drainage Design Manual*. Clark County Regional Flood Control District, 1990.
3. *Soil Survey of Las Vegas Valley Area, Nevada*. U.S. Department of Agriculture, Soil Conservation Service, July 1985.
4. *Technical Drainage Study for Lake Mead Rock Spring Retail Center*, by AMTI Sunbelt LLP, February 2005.
5. *Technical Drainage Study for City Center West*, by Kimley-Horn & Associates, October 1996.
6. *Technical Drainage Study for Lake Mead/Tenaya*, by The Keith Companies, February 1995.

APPENDIX A

Drainage Exhibits



S-I-G **SLATER**
HANIFAN
GROUP
 CONSULTING ENGINEERS & PLANNERS
 5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
 PHONE (702) 284-5300 FAX (702) 284-5399

ROOHANI KHUSROW FAMILY TRUST (FIRSTSTONE)
LAKE MEAD ROCK SPRINGS COMMERCIAL SUBDIVISION
LOCATION MAP

DATE: AUG 2011
 DRAFTER: KC
 DESIGNER: KC
 CHECKED: KCR

PROJECT NO.
 RCI1105.000
EXHIBIT A
 SHEET 1 OF ----

APPENDIX B

Flowmaster Hydraulic Computations

Perimeter Street Sections

Section A (100-YR Ultimate) Worksheet for Irregular Channel

Project Description	
Worksheet	Section A (100-YR Ultimate)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	1.52 %
Discharge	52.00 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	0.72 ft
Elevation Range	0.00 to 1.09
Flow Area	8.9 ft²
Wetted Perimeter	25.88 ft
Top Width	25.00 ft
Actual Depth	0.72 ft
Critical Elevation	0.88 ft
Critical Slope	0.46 %
Velocity	5.82 ft/s
Velocity Head	0.53 ft
Specific Energy	1.25 ft
Froude Number	1.72
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.22049235 ft.

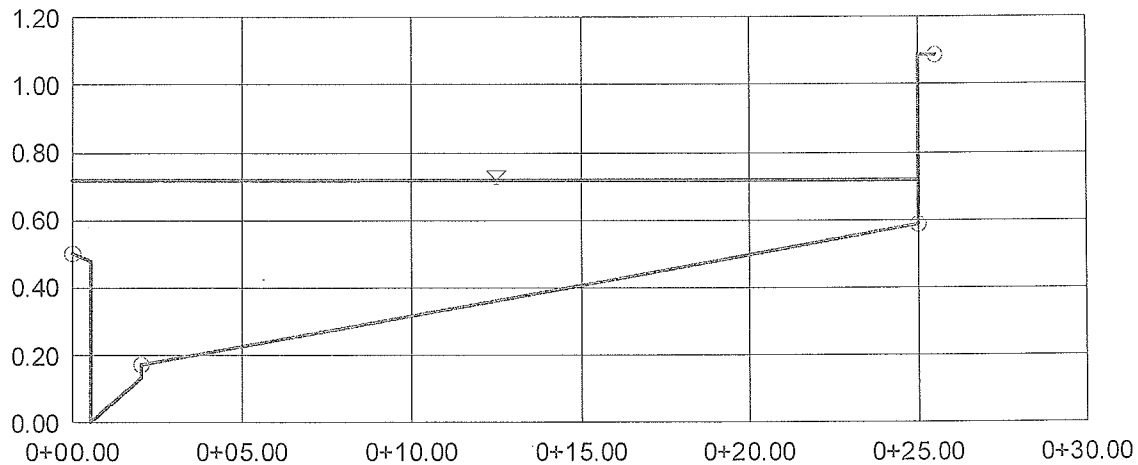
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+02.00	0.013
0+02.00	0+25.00	0.016
0+25.00	0+25.50	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.48
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+25.00	0.59
0+25.00	1.09
0+25.50	1.09

Section A (100-YR Ultimate) **Cross Section for Irregular Channel**

Project Description	
Worksheet	Section A (100-YR Ultimate)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.015
Channel Slope	1.52 %
Water Surface Elevation	0.72 ft
Elevation Range	0.00 to 1.09
Discharge	52.00 cfs



V:10.0
H:1
NTS

Section B (100-YR Ultimate) 60' ROW Worksheet for Irregular Channel

Project Description	
Worksheet	Section B (100-YR Ultimate)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	1.00 %
Discharge	71.00 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	0.69 ft
Elevation Range	0.00 to 0.63
Flow Area	17.1 ft ²
Wetted Perimeter	61.25 ft
Top Width	60.00 ft
Actual Depth	0.69 ft
Critical Elevation	0.76 ft
Critical Slope	0.50 %
Velocity	4.15 ft/s
Velocity Head	0.27 ft
Specific Energy	0.96 ft
Froude Number	1.37
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.94619849e-1 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+53.00	0.016
0+53.00	0+60.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.48
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+30.00	0.63
0+53.00	0.17

Section B (100-YR Ultimate) 60' ROW Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+53.00	0.13
0+54.50	0.00
0+54.50	0.48
0+55.00	0.50
0+60.00	0.60

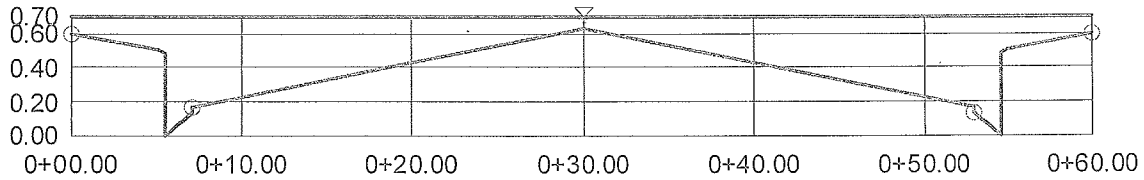
Section B (100-YR Ultimate) 60' ROW Cross Section for Irregular Channel

Project Description

Worksheet	Section B (100-YR Ultimate)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data

Mannings Coefficient	0.015
Channel Slope	1.00 %
Water Surface Elevation	0.69 ft
Elevation Range	0.00 to 0.63
Discharge	71.00 cfs



V:10.0
H:1
NTS

Section C (100-YR Ultimate) 80' ROW

Worksheet for Irregular Channel

Project Description	
Worksheet	Section C (100-YR Ultimate)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	1.00 %
Discharge	71.00 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 0.83
Flow Area	17.9 ft ²
Wetted Perimeter	68.64 ft
Top Width	67.37 ft
Actual Depth	0.70 ft
Critical Elevation	0.77 ft
Critical Slope	0.52 %
Velocity	3.97 ft/s
Velocity Head	0.24 ft
Specific Energy	0.95 ft
Froude Number	1.36
Flow Type	Supercritical

Calculation Messages:
Water elevation exceeds lowest end station by 0.10366414 ft.
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+73.00	0.016
0+73.00	0+80.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.48
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+40.00	0.83

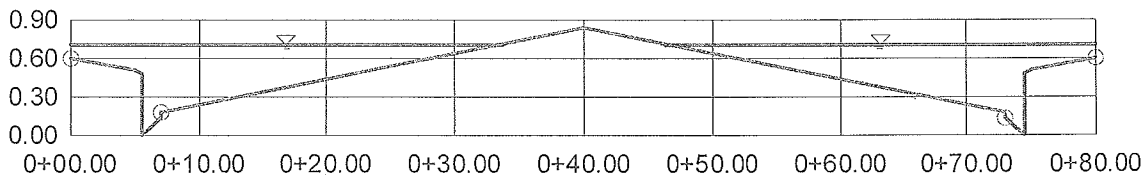
Section C (100-YR Ultimate) 80' ROW
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+73.00	0.17
0+73.00	0.13
0+74.50	0.00
0+74.50	0.48
0+75.00	0.50
0+80.00	0.60

Section C (100-YR Ultimate) 80' ROW **Cross Section for Irregular Channel**

Project Description	
Worksheet	Section C (100-YR Ultimate)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.015
Channel Slope	1.00 %
Water Surface Elevation	0.70 ft
Elevation Range	0.00 to 0.83
Discharge	71.00 cfs



V:10.0
H:1
NTS

Section C (10-YR Ultimate) 80' ROW Worksheet for Irregular Channel

Project Description	
Worksheet	Section C (10-YR Ultimate)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	1.00 %
Discharge	32.00 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	0.57 ft
Elevation Range	0.00 to 0.83
Flow Area	10.0 ft²
Wetted Perimeter	52.66 ft
Top Width	51.60 ft
Actual Depth	0.57 ft
Critical Elevation	0.61 ft
Critical Slope	0.59 %
Velocity	3.20 ft/s
Velocity Head	0.16 ft
Specific Energy	0.73 ft
Froude Number	1.28
Flow Type	Supercritical

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+73.00	0.016
0+73.00	0+80.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.60
0+05.00	0.50
0+05.50	0.48
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+40.00	0.83
0+73.00	0.17

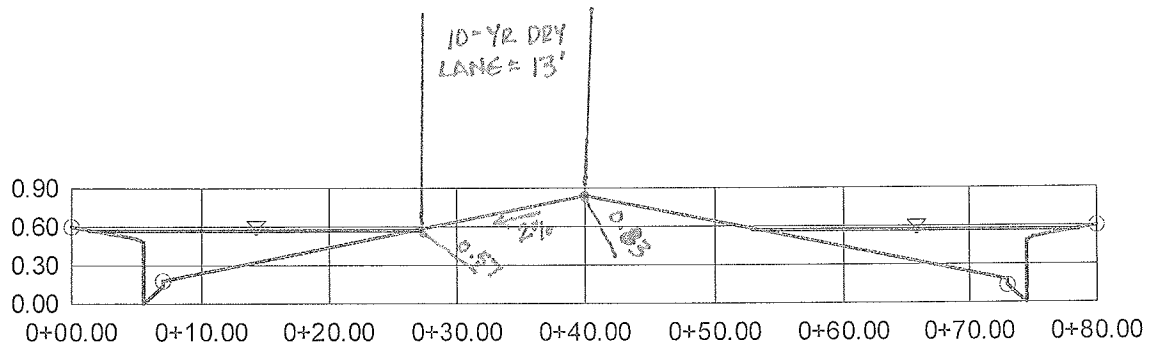
Section C (10-YR Ultimate) 80' ROW Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+73.00	0.13
0+74.50	0.00
0+74.50	0.48
0+75.00	0.50
0+80.00	0.60

Section C (10-YR Ultimate) 80' ROW Cross Section for Irregular Channel

Project Description	
Worksheet	Section C (10-YR Ultimate)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.015
Channel Slope	1.00 %
Water Surface Elevation	0.57 ft
Elevation Range	0.00 to 0.83
Discharge	32.00 cfs



V:10.0
H:1
NTS

$$S = \frac{Y}{X} \rightarrow 0.02 = \frac{(0.83 - 0.57)}{X} \rightarrow X = 13'$$

10-YR DRY LANE WIDTH = 13'

Onsite Hydraulic Sections

Section 1

Worksheet for Triangular Channel

Project Description

Worksheet	Section 1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.022
Channel Slope	1.23 %
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Discharge	2.40 cfs

Results

Depth	0.43 ft
Flow Area	0.9 ft ²
Wetted Perimeter	4.35 ft
Top Width	4.26 ft
Critical Depth	0.43 ft
Critical Slope	1.21 %
Velocity	2.64 ft/s
Velocity Head	0.11 ft
Specific Energy	0.53 ft
Froude Number	1.01
Flow Type	Supercritical

Section 1

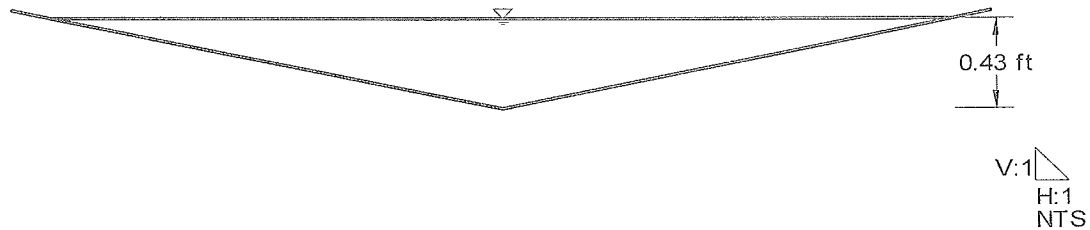
Cross Section for Triangular Channel

Project Description

Worksheet	Section 1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data

Mannings Coefficient	0.022
Channel Slope	1.23 %
Depth	0.43 ft
Left Side Slope	5.00 H : V
Right Side Slope	5.00 H : V
Discharge	2.40 cfs



Section 2

Worksheet for Triangular Channel

Project Description	
Worksheet	Section 2
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.022
Channel Slope	1.88 %
Left Side Slope	3.00 H : V
Right Side Slope	3.00 H : V
Discharge	5.50 cfs

Results	
Depth	0.66 ft
Flow Area	1.3 ft ²
Wetted Perimeter	4.15 ft
Top Width	3.94 ft
Critical Depth	0.73 ft
Critical Slope	1.06 %
Velocity	4.25 ft/s
Velocity Head	0.28 ft
Specific Energy	0.94 ft
Froude Number	1.31
Flow Type	Supercritical

Section 2

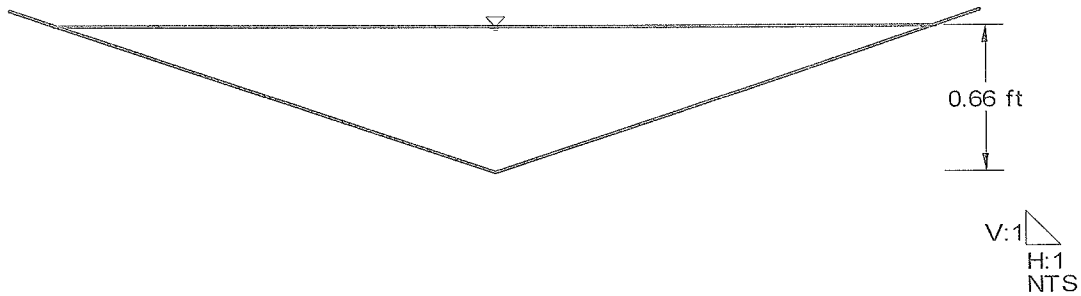
Cross Section for Triangular Channel

Project Description

Worksheet	Section 2
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data

Mannings Coefficient	0.022
Channel Slope	1.88 %
Depth	0.66 ft
Left Side Slope	3.00 H : V
Right Side Slope	3.00 H : V
Discharge	5.50 cfs



Section 3

Worksheet for Triangular Channel

Project Description

Worksheet	Section 3
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.022
Channel Slope	1.00 %
Left Side Slope	50.00 H : V
Right Side Slope	3.00 H : V
Discharge	5.50 cfs

Results

Depth	0.32 ft
Flow Area	2.8 ft ²
Wetted Perimeter	17.16 ft
Top Width	17.10 ft
Critical Depth	0.31 ft
Critical Slope	1.32 %
Velocity	1.99 ft/s
Velocity Head	0.06 ft
Specific Energy	0.38 ft
Froude Number	0.88
Flow Type	Subcritical

Section 3

Cross Section for Triangular Channel

Project Description	
Worksheet	Section 3
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.022
Channel Slope	1.00 %
Depth	0.32 ft
Left Side Slope	50.00 H : V
Right Side Slope	3.00 H : V
Discharge	5.50 cfs



Section 4

Worksheet for Rectangular Channel

Project Description

Worksheet	Section 4
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.013
Channel Slope	13.60 %
Bottom Width	2.00 ft
Discharge	5.50 cfs

Results

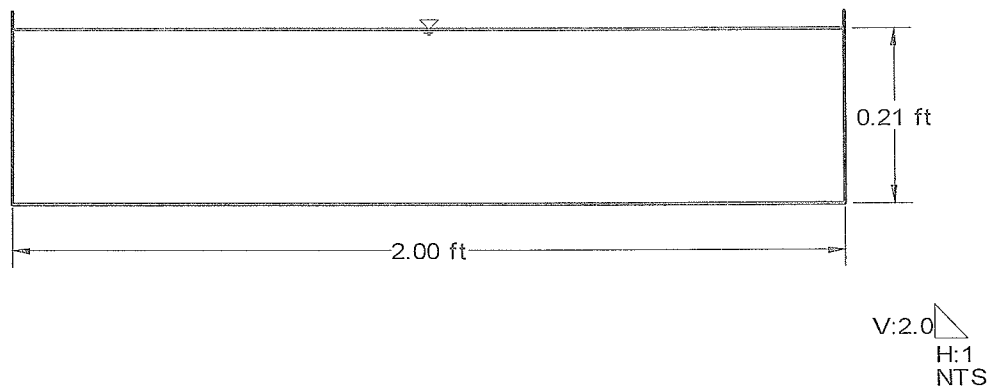
Depth	0.21 ft
Flow Area	0.4 ft ²
Wetted Perimeter	2.42 ft
Top Width	2.00 ft
Critical Depth	0.62 ft
Critical Slope	0.55 %
Velocity	13.11 ft/s
Velocity Head	2.67 ft
Specific Energy	2.88 ft
Froude Number	5.05
Flow Type	Supercritical

Section 4

Cross Section for Rectangular Channel

Project Description	
Worksheet	Section 4
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Channel Slope	13.60 %
Depth	0.21 ft
Bottom Width	2.00 ft
Discharge	5.50 cfs



Section 5 (S=0.55%) **Worksheet for Irregular Channel**

Project Description	
Worksheet	Section 5 (S=0.55%)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.55 %
Discharge	42.00 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	0.017
Water Surface Elevation	0.69 ft
Elevation Range	0.00 to 2.13
Flow Area	13.3 ft ²
Wetted Perimeter	40.50 ft
Top Width	39.68 ft
Actual Depth	0.69 ft
Critical Elevation	0.68 ft
Critical Slope	0.59 %
Velocity	3.16 ft/s
Velocity Head	0.16 ft
Specific Energy	0.84 ft
Froude Number	0.96
Flow Type	Subcritical

Calculation Messages:

Water elevation exceeds lowest end station by 0.18901674 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+02.00	0.013
0+02.00	0+25.00	0.016
0+25.00	0+25.50	0.013
0+25.50	0+36.00	0.025
0+36.00	0+38.00	0.013
0+38.00	0+48.50	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.48
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17

Section 5 (S=0.55%)
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+25.00	0.59
0+25.50	0.59
0+36.00	0.13
0+37.00	0.09
0+38.00	0.13
0+44.00	2.13
0+45.00	2.13
0+48.50	0.96

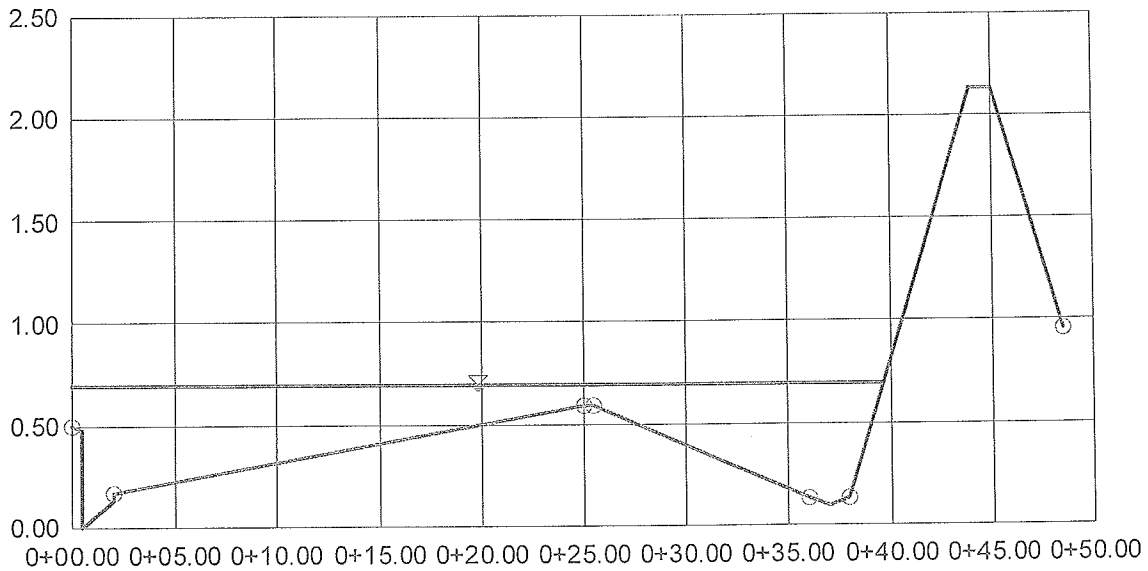
Section 5 (S=0.55%) **Cross Section for Irregular Channel**

Project Description

Worksheet	Section 5 (S=0.55%)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data

Mannings Coefficient	0.017
Channel Slope	0.55 %
Water Surface Elevation	0.69 ft
Elevation Range	0.00 to 2.13
Discharge	42.00 cfs



V:10.0
H:1
NTS

Section 5 (S=1.88%)

Worksheet for Irregular Channel

Project Description	
Worksheet	Section 5 (S=1.88%)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	1.88 %
Discharge	42.00 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	0.58 ft
Elevation Range	0.00 to 2.13
Flow Area	8.8 ft ²
Wetted Perimeter	38.40 ft
Top Width	37.71 ft
Actual Depth	0.58 ft
Critical Elevation	0.68 ft
Critical Slope	0.56 %
Velocity	4.77 ft/s
Velocity Head	0.35 ft
Specific Energy	0.93 ft
Froude Number	1.74
Flow Type	Supercritical

Calculation Messages:

Water elevation exceeds lowest end station by 0.7551602e-1 ft.
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+02.00	0.013
0+02.00	0+25.00	0.016
0+25.00	0+25.50	0.013
0+25.50	0+36.00	0.025
0+36.00	0+38.00	0.013
0+38.00	0+48.50	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.48
0+00.50	0.00
0+02.00	0.13

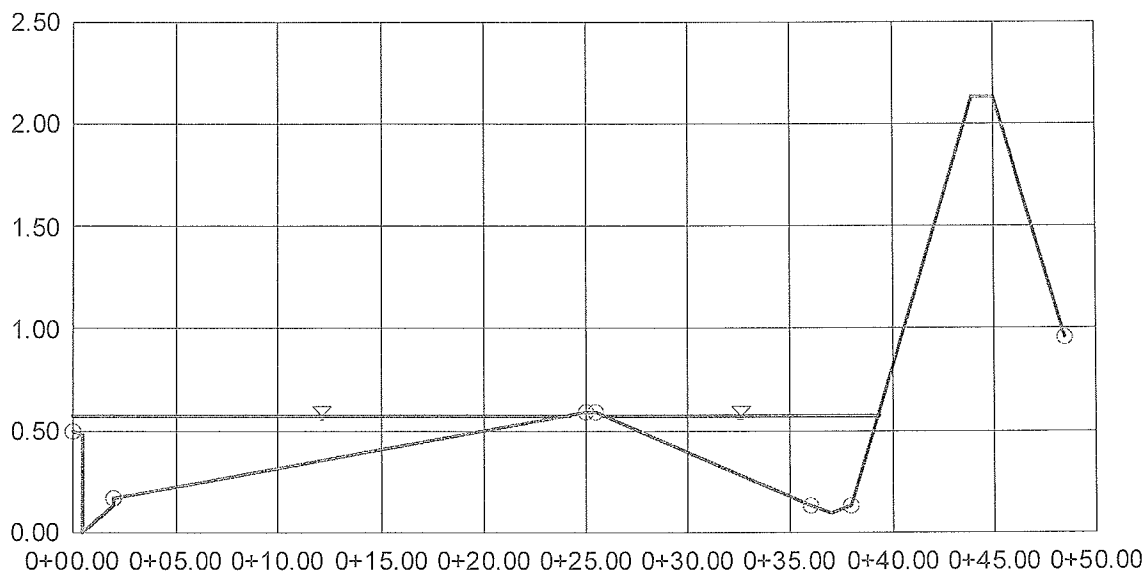
Section 5 (S=1.88%)
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+02.00	0.17
0+25.00	0.59
0+25.50	0.59
0+36.00	0.13
0+37.00	0.09
0+38.00	0.13
0+44.00	2.13
0+45.00	2.13
0+48.50	0.96

Section 5 (S=1.88%) **Cross Section for Irregular Channel**

Project Description	
Worksheet	Section 5 (S=1.88%)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.016
Channel Slope	1.88 %
Water Surface Elevation	0.58 ft
Elevation Range	0.00 to 2.13
Discharge	42.00 cfs



V:10.0
H:1
NTS

Section 6

Worksheet for Irregular Channel

Project Description	
Worksheet	Section 6
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.50 %
Discharge	4.60 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	0.014
Water Surface Elevation	0.44 ft
Elevation Range	0.00 to 0.92
Flow Area	2.0 ft ²
Wetted Perimeter	12.50 ft
Top Width	12.00 ft
Actual Depth	0.44 ft
Critical Elevation	0.43 ft
Critical Slope	0.55 %
Velocity	2.24 ft/s
Velocity Head	0.08 ft
Specific Energy	0.52 ft
Froude Number	0.96
Flow Type	Subcritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+02.00	0.013
0+02.00	0+12.50	0.016
0+12.50	0+13.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.48
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+12.50	0.42
0+12.50	0.92
0+13.00	0.92

Section 6

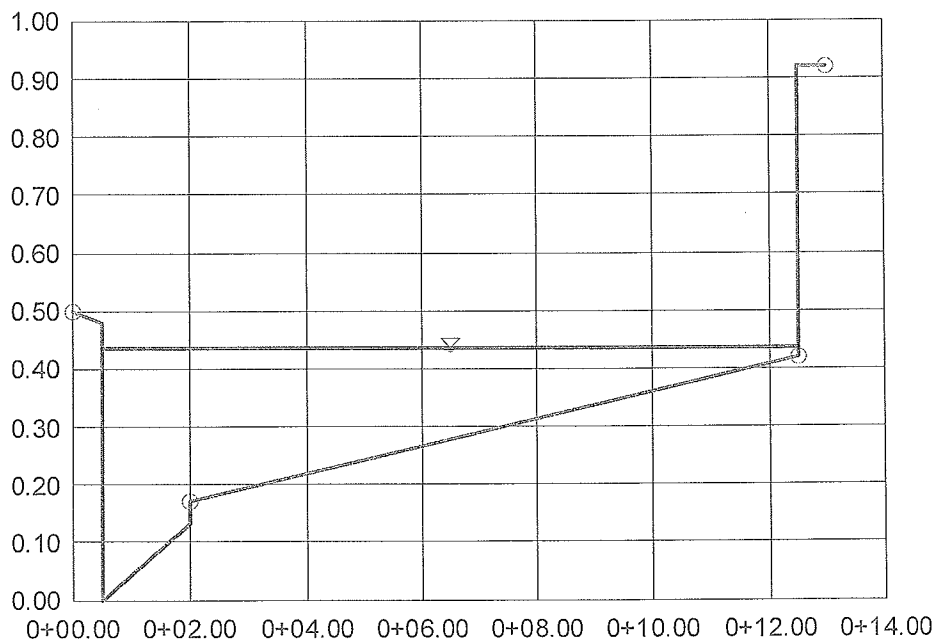
Cross Section for Irregular Channel

Project Description

Worksheet	Section 6
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data

Mannings Coefficient	0.014
Channel Slope	0.50 %
Water Surface Elevation	0.44 ft
Elevation Range	0.00 to 0.92
Discharge	4.60 cfs



V:10.0
H:1
NTS

Section 7

Worksheet for Irregular Channel

Project Description	
Worksheet	Section 7
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.50 %
Discharge	5.00 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	0.014
Water Surface Elevation	0.44 ft
Elevation Range	0.00 to 0.50
Flow Area	2.3 ft ²
Wetted Perimeter	15.34 ft
Top Width	14.86 ft
Actual Depth	0.44 ft
Critical Elevation	0.43 ft
Critical Slope	0.56 %
Velocity	2.13 ft/s
Velocity Head	0.07 ft
Specific Energy	0.51 ft
Froude Number	0.95
Flow Type	Subcritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+16.50	0.016
0+16.50	0+18.50	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.50
0+16.50	0.17
0+16.50	0.13
0+18.00	0.00
0+18.00	0.48
0+18.50	0.50

Section 7

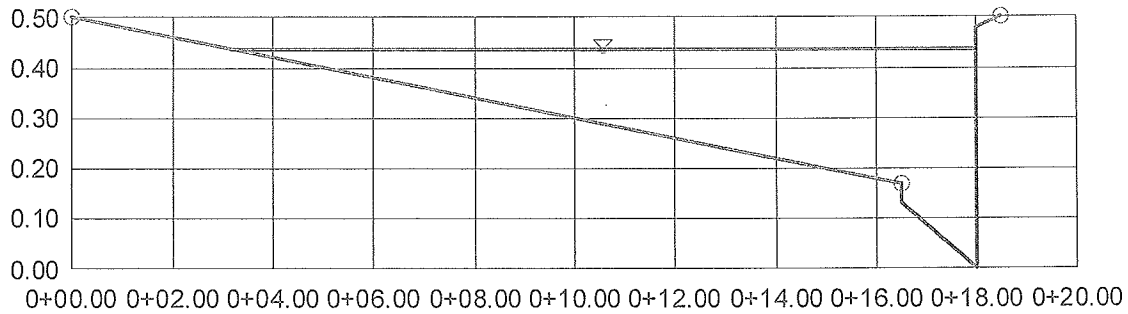
Cross Section for Irregular Channel

Project Description

Worksheet	Section 7
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data

Mannings Coefficient	0.014
Channel Slope	0.50 %
Water Surface Elevation	0.44 ft
Elevation Range	0.00 to 0.50
Discharge	5.00 cfs



V: 10.0
H: 1
NTS

Section 8

Worksheet for Irregular Channel

Project Description	
Worksheet	Section 8
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.40 %
Discharge	5.00 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	0.27 ft
Elevation Range	0.00 to 0.99
Flow Area	3.1 ft ²
Wetted Perimeter	24.80 ft
Top Width	24.79 ft
Actual Depth	0.27 ft
Critical Elevation	0.25 ft
Critical Slope	0.63 %
Velocity	1.62 ft/s
Velocity Head	0.04 ft
Specific Energy	0.31 ft
Froude Number	0.81
Flow Type	Subcritical

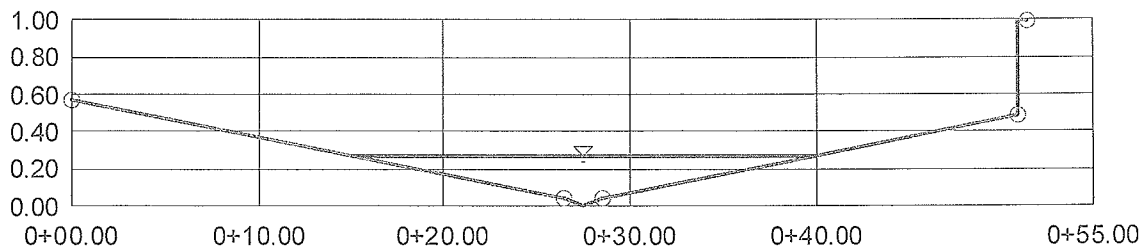
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+26.50	0.016
0+26.50	0+28.50	0.013
0+28.50	0+51.00	0.016
0+51.00	0+51.50	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.57
0+26.50	0.04
0+27.50	0.00
0+28.50	0.04
0+51.00	0.49
0+51.00	0.99
0+51.50	0.99

Section 8 Cross Section for Irregular Channel

Project Description	
Worksheet	Section 8
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.015
Channel Slope	0.40 %
Water Surface Elevation	0.27 ft
Elevation Range	0.00 to 0.99
Discharge	5.00 cfs



V:10.0
H:1
NTS

Section 9

Worksheet for Irregular Channel

Project Description	
Worksheet	Section 9
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.50 %
Discharge	1.30 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	0.31 ft
Elevation Range	0.00 to 0.50
Flow Area	0.9 ft ²
Wetted Perimeter	9.07 ft
Top Width	8.71 ft
Actual Depth	0.31 ft
Critical Elevation	0.30 ft
Critical Slope	0.80 %
Velocity	1.45 ft/s
Velocity Head	0.03 ft
Specific Energy	0.35 ft
Froude Number	0.80
Flow Type	Subcritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+16.50	0.016
0+16.50	0+18.50	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.50
0+16.50	0.17
0+16.50	0.13
0+18.00	0.00
0+18.00	0.48
0+18.50	0.50

Section 9

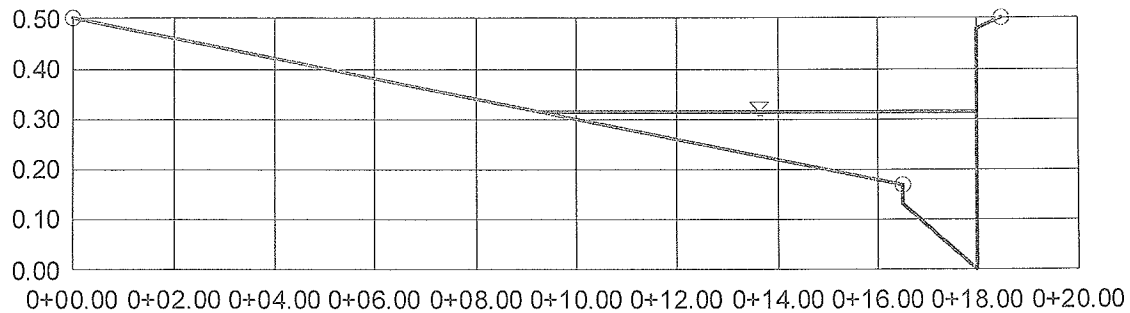
Cross Section for Irregular Channel

Project Description

Worksheet	Section 9
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data

Mannings Coefficient	0.015
Channel Slope	0.50 %
Water Surface Elevation	0.31 ft
Elevation Range	0.00 to 0.50
Discharge	1.30 cfs



V:10.0
H:1
NTS

Section 10

Worksheet for Irregular Channel

Project Description	
Worksheet	Section 10
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	3.70 %
Discharge	13.00 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	0.014
Water Surface Elevation	0.40 ft
Elevation Range	0.00 to 1.10
Flow Area	2.5 ft ²
Wetted Perimeter	19.74 ft
Top Width	19.30 ft
Actual Depth	0.40 ft
Critical Elevation	0.52 ft
Critical Slope	0.53 %
Velocity	5.13 ft/s
Velocity Head	0.41 ft
Specific Energy	0.81 ft
Froude Number	2.50
Flow Type	Supercritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+02.00	0.013
0+02.00	0+35.50	0.016
0+35.50	0+36.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.48
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+35.50	0.60
0+35.50	1.10
0+36.00	1.10

Section 10

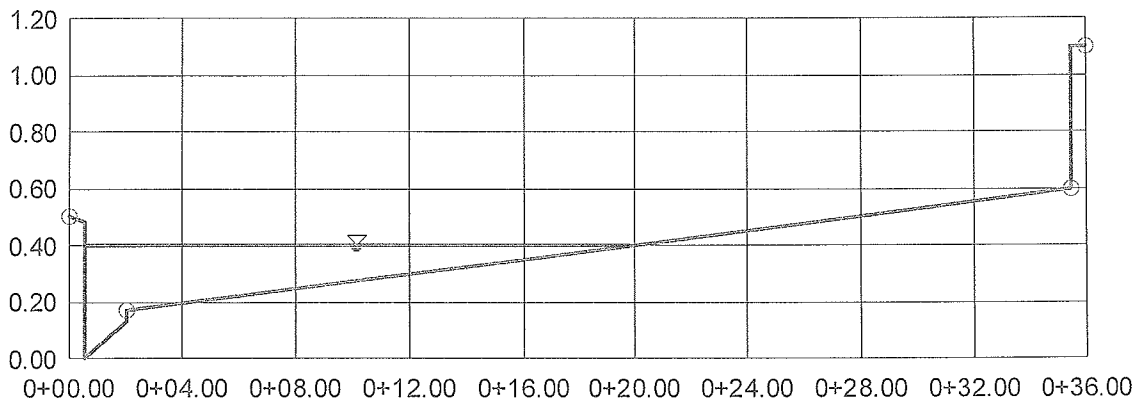
Cross Section for Irregular Channel

Project Description

Worksheet	Section 10
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data

Mannings Coefficient	0.014
Channel Slope	3.70 %
Water Surface Elevation	0.40 ft
Elevation Range	0.00 to 1.10
Discharge	13.00 cfs



V:10.0
H:1
NTS

APPENDIX C

Reference Material

Technical Drainage Study for Lake Mead Rock Springs Retail Center
by AMTI Sunbelt LLC, CLV DS3725

Approval Letter

CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		March 1, 2005
TO: Land Development Services Department of Public Works		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Technical Drainage Study for:	
	Retail Center	
Cross Streets:	SWC Rock Springs Dr. & Lake Mead Blvd.	COPIES TO:
File Number:	F:\Depot\DSMEMOS\DS3725B.doc	AMTI Sunbelt LLP
Parcel Number:	138-22-701-005	Sansone Development
Zoning Action:	ZON-5206	Bart Anderson, P.E., DevCo
FEMA Flood Zone	YES	NO X
Proposed Storm Drain	YES X	NO

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Trn. No.
1 st Submittal	1/5/2005	1/20/2005	Not Approved	\$400.00	14423: \$400
2 nd Submittal	2/8/2005 & 2/28/2005	3/1/2005	See Comments Below	\$400.00	15926: \$400
TOTAL FEES (LDDRS):				\$800.00	—

REMARKS:

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

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

1. Revise the I/C3 symbol in the Grading Plan to H/C3 as shown in the "Detail Sheet".

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
B&H/ays

T/R/S: T20S/R60E/22
AREA L-22

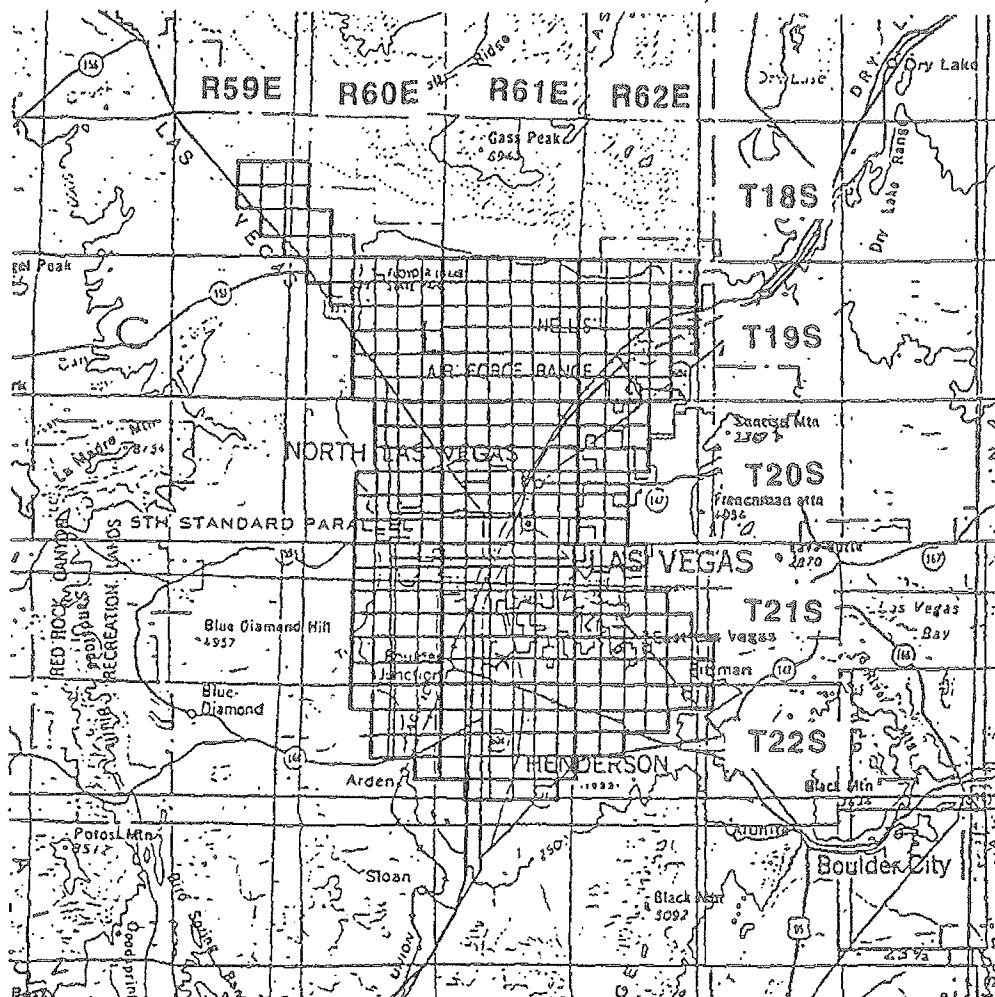
Referenced Drainage Exhibits

Referenced Precipitation, Curve Number & Lag Time Data

Precipitation Data

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

McCARRAN AIRPORT RAINFALL AREA



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

Notes:

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

Revision	Date

WRC
ENGINEERING

REFERENCE:

USACE, Los Angeles District, 1988

FIGURE 513

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

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

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

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

Revision	Date

WRC
ENGINEERING

REFERENCE:

USACE, Los Angeles District, 1988

TABLE 505

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Curve Number Data

EXISTING, PROPOSED AND ULTIMATE CONDITIONS CURVE NUMBER CALCULATIONS

Project: RETAIL CENTER

Designed by: RG

Checked by: DS

Date: 12/21/04

Job No.: SB04-100

File: CN-CALCS.XLS

Page: 1 of 1

SOIL TYPES FOR THE SITE ARE COMPOSED OF SOIL UNIT 264

SOIL TYPES FOR THE OFF-SITES ARE COMPOSED OF SOIL UNITS 152 AND 264

SOIL UNIT 152 BELONGS TO HYDROLOGIC SOIL GROUP (HSG) = D

SOIL UNIT 264 BELONGS TO HYDROLOGIC SOIL GROUP (HSG) = A

CURVE NUMBERS PER TABLE 602 OF THE MANUAL

Soil Unit Type	Natural/Desert Landscaping	Streets (100% Impervious)	Desert Shrub (Poor Condition)	Commercial & Business
152	88	98	88	95
264	63	98	63	89

Basin	Total Area (ac.)	Land Use	Land Use (ac.)	Soil Type	Soil Type (%)	CN	Partial CN	Composite CN
EXISTING CONDITIONS								
ON1E	3.56	DES	3.56	264	100.0	63	63.0	
OFF1E	4.53	DES	4.53	264	100.0	63	63.0	63
OFF2D	1.86	ST	0.59	152	31.7	98	31.1	
		ST	1.27	264	68.3	98	66.9	
								98
PROPOSED CONDITIONS								
ON1D	3.56	COM	3.56	264	100.0	89	89.0	
OFF1E	4.53	DES	4.53	264	100.0	63	63.0	
OFF2D	1.86	ST	0.59	152	31.7	98	31.1	
		ST	1.27	264	68.3	98	66.9	
								98
ULTIMATE CONDITIONS								
ON1D	3.56	COM	3.56	264	100.0	89	89.0	
OFF1D	4.53	COM	4.53	264	100.0	89	89.0	89
OFF2D	1.86	ST	0.59	152	31.7	98	31.1	
		ST	1.27	264	68.3	98	66.9	
								98

* SEE FIGURE 4, 5 AND 6

WHERE:

DES= Native Desert Shrub (Poor Condition)

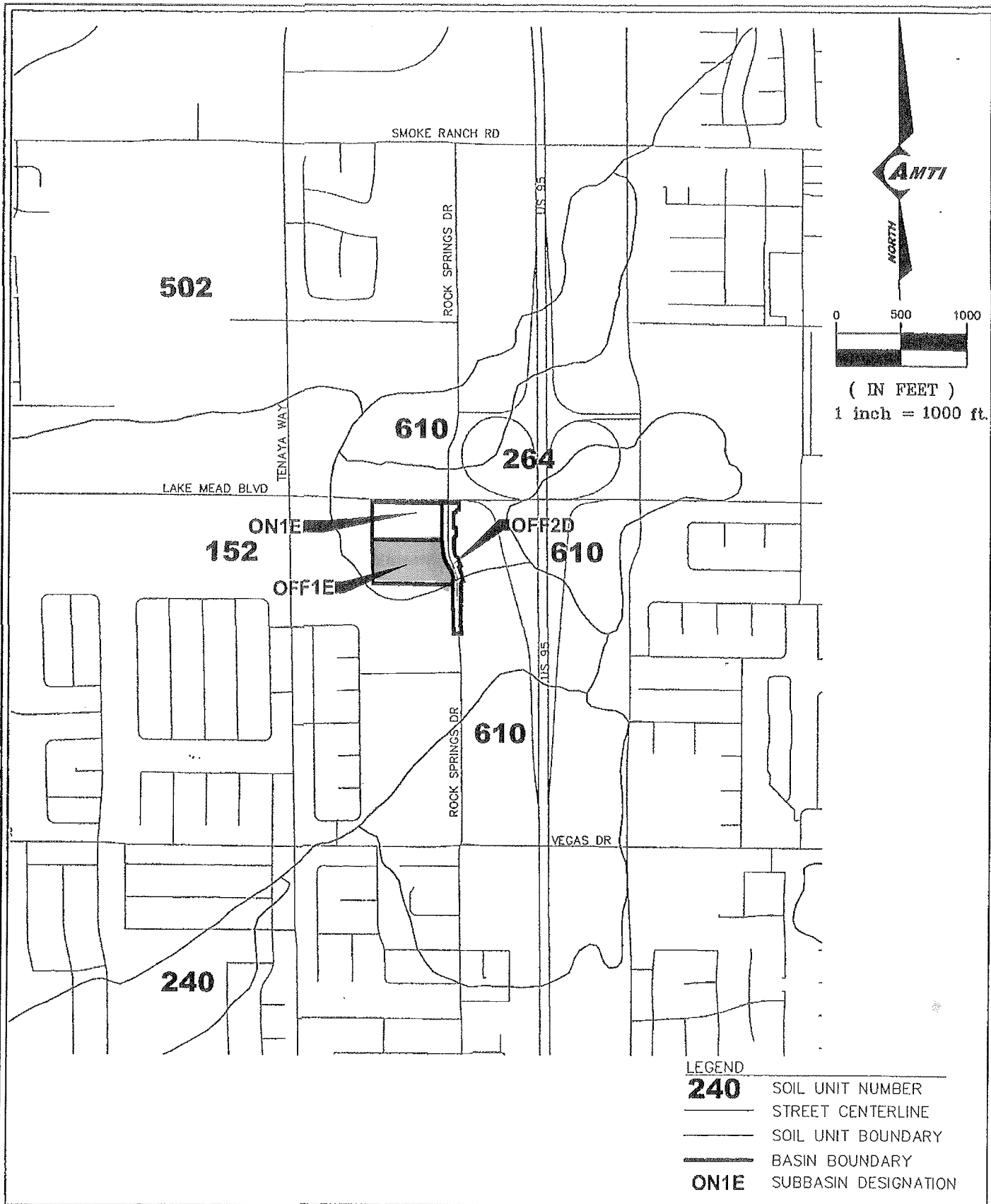
ST = Streets, roads, parking lots, roofs, etc. (Impervious areas)

NDL= Natural Desert Landscaping

COM= Commercial & Business

Partial CN= (Land Use Area * CN)/Total Area

Composite CN= Sum (Partial CN)



RETAIL CENTER
SOILS MAP
EXISTING/PROPOSED CONDITION

DATE 12/21/04

JOB NO. SB04-100

SCALE 1" = 1000'



AMTI • SUNBELT LLP
ENGINEERING • PLANNING • SURVEYING
720 SUSARNA WAY | PHONE (702) 242-9908
HENDERSON, NV. 89015 | FAX (702) 242-9915

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding		High water table		Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Months	Depth Fe	Months	Depth In	Thick-ness	Depth In	Hard-ness	Uncoated steel	Concrete
182*: Caliza-----	B	None-----	---	>6.0	---	>60	---	---	---	High-----	Low.
Pittman-----	C	None-----	---	>6.0	---	>60	---	20-30	Thick	High-----	Low.
Arizo-----	A	Occasional	Mar-Sep	>6.0	---	>60	---	---	---	High-----	Low.
183- Caliza	B	None-----	---	>6.0	---	>60	---	---	---	High-----	Low.
184- Caliza	B	Rare-----	---	>6.0	---	>60	---	---	---	High-----	Low.
187- Caliza	B	None-----	---	>6.0	---	>60	---	---	---	High-----	Low.
190- Dalian	B	None-----	---	>6.0	---	>60	---	---	---	High-----	Low.
191- Dalian	B	Rare-----	---	>6.0	---	>60	---	---	---	High-----	Low.
192*: Dalian-----	B	Rare-----	---	>6.0	---	>60	---	---	---	High-----	Low.
McCullough-----	B	Rare-----	---	>6.0	---	>60	---	---	---	High-----	Low.
200- Glencarb	B	Rare-----	---	>6.0	---	>60	---	---	---	High-----	Moderate.
206- Glencarb	C	Occasional	Jul-Sep	3.0-5.0	Jul-Jun	>60	---	---	---	High-----	High.
222- Glencarb	C	Rare-----	---	3.0-5.0	Jul-Jun	>60	---	---	---	High-----	High.
236- Glencarb	B	Rare-----	---	>6.0	---	>60	---	---	---	High-----	High.
237- Glencarb	B	Rare-----	---	>6.0	---	>60	---	40-60	Thick	High-----	Low.
240- Goodsprings	D	None-----	---	>6.0	---	>60	---	9-20	Thick	High-----	Low.
252, 255- Grapevine	B	Rare-----	---	>6.0	---	>60	---	---	---	High-----	High.
260- Jean	A	Rare-----	---	>6.0	---	>60	---	---	---	High-----	Low.
262*: Jean-----	A	Rare-----	---	>6.0	---	>60	---	---	---	High-----	Low.
Jean-----	A	Occasional	Jun-Sep	>6.0	---	>60	---	---	---	High-----	Low.
Goodsprings-----	D	Rare-----	---	>6.0	---	>60	---	9-20	Thick	High-----	Low.
263*: Jean-----	A	Rare-----	---	>6.0	---	>60	---	---	---	High-----	Low.
Jean-----	A	Occasional	Jun-Sep	>6.0	---	>60	---	---	---	High-----	Low.
264- Jean	A	Rare-----	---	>6.0	---	>60	---	---	---	High-----	Low.

See footnote at end of table.

fine sand, and the lower part to a depth of 60 inches or more is pink, stratified extremely gravelly fine sand to very gravelly loamy fine sand.

Permeability of this Jean soil is rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high if the surface is disturbed. This soil is subject to occasional periods of very brief, high-velocity flooding from June through September.

This unit is used mainly as habitat for desert wildlife and for recreation. It is also used for urban development.

The main limitation for construction of dwellings is the hazard of flooding. Flooding can be controlled only by use of major flood control structures. Excavating in areas of the Jean soils can expose material that is highly susceptible to soil blowing.

The main limitations for septic tank absorption fields are inadequate filtration of effluent and the hazard of flooding in areas of the Jean, flooded, soil. Because the substratum is highly permeable, special design may be needed to avoid polluting ground water and nearby water supplies. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage from onsite sewage disposal systems. Dikes and channels that have outlets for floodwater can be used to protect onsite sewage disposal systems from flooding.

The Jean, flooded, soil is limited for roads because of the hazard of flooding. Flooding can be controlled only by use of major flood control structures.

The main limitations for lawns and landscaping are the very low available water capacity and the desert pavement on the Jean, flooded, soil. Frequent irrigation of lawns, gardens, and most other plantings is needed because of the limited available water capacity of the soil. Removing the desert pavement is necessary for best results when landscaping, particularly in areas used for lawns.

This map unit is in capability subclasses IVw, irrigated, and VIIw, nonirrigated. It is in horticultural group 3.

264—Jean very gravelly loamy fine sand, 2 to 4 percent slopes. This very deep, excessively drained soil is on inset fans. It formed in alluvium derived from various kinds of rock.

Typically, about 60 percent of the surface is covered with a desert pavement of pebbles. The surface layer is pink very gravelly loamy fine sand about 1 inch thick. The upper 17 inches of the underlying material is light reddish brown loamy fine sand, and the lower part to a depth of 60 inches or more is pink, stratified extremely gravelly sand to very gravelly loamy fine sand.

Permeability of this Jean soil is rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high if the surface

is disturbed. This soil is subject to rare periods of flooding during prolonged, high-intensity storms. Channeling and deposition are common along streambanks.

This unit is used mainly as habitat for desert wildlife and for recreation. It is also used for urban development.

The main limitation for construction of dwellings is the hazard of flooding. Dikes and channels that have outlets for floodwater can be used to protect buildings from flooding. Excavating in areas of the Jean soil can expose material that is highly susceptible to soil blowing.

The main limitation for septic tank absorption fields is inadequate filtration of effluent. Because the substratum is highly permeable, special design may be needed to avoid polluting ground water and nearby water supplies. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage from onsite sewage disposal systems.

Channeling and deposition can be minimized and maintenance costs reduced by protecting roads from flooding. Unless an adequate wearing surface is maintained, stones and cobbles in the soil create road hazards and increase maintenance costs.

The main limitations for lawns and landscaping are the desert pavement and the very low available water capacity. Removing the desert pavement is necessary for best results when landscaping, particularly in areas used for lawns. Frequent irrigation of lawns, gardens, and most other plantings is needed because of the limited available water capacity of the soil.

This map unit is in capability subclasses IVs, irrigated, and VIIs, nonirrigated. It is in horticultural group 3.

270—Land silt loam, drained. This very deep, somewhat poorly drained soil is on recent alluvial flats. The drainage has been artificially altered. The soil formed in alluvium derived from various kinds of rock. Slope is 0 to 2 percent.

Typically, the surface layer is pink silt loam that is high in soluble salts and is about 6 inches thick. The underlying material to a depth of 60 inches or more is pink, stratified silty clay to silt loam and is high in soluble salts.

Included in this unit are about 5 percent Glencarb soils on recent alluvial flats and 5 percent McCarran soils on relict alluvial flats. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Land soil is moderately slow. Available water capacity is high. Effective rooting depth is limited by a seasonal high water table that is at a depth of 3.5 to 6.0 feet from March through September. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is subject to rare periods of flooding during prolonged, high-intensity storms. Channeling and deposition are

TIME OF CONCENTRATION

Technical Drainage Study

RETAIL CENTER

RETAIL CENTER

BY: RG

DATE: 12/28/04

SUB-BASIN DATA				INITIAL / OVERLAND TIME (Ti)				TRAVEL TIME (Tt)					Tc	Tag	REMARKS		
DESIG: (1)	DEV/JEX. (D or E)	CN	K	AREA Ac	AREA Mi^2	INITIAL LENGTH Feet (4)	SLOPE % (5)	Ti Min (6)	TRAVEL LENGTH Feet (7)	SLOPE % (8)	V1 VELOCITY FPS (9a)	V2 VELOCITY FPS (9b)	Tt Min (10)	Tc Calc. (13)	Tag Hours Per Tc Calc	REMARKS	
EXISTING CONDITION																	
ON1E	E	63	0.4416			29	3.45	4.2		2.28	2.2	4.4	4.0	8.2	0.082		2.77
OFF1E	E	63	0.4416	4.53	0.00708	15	6.67	2.4	824	1.58	1.9	3.7	5.9	8.4	0.084		2.77
OFF2D	D	98	0.9036	1.86	0.00291	23	2.00	1.3	1036	1.06	2.1	3.2	6.8	8.2	0.082		2.77
PROPOSED CONDITION																	
ON1D	D	89	0.7848	3.56	0.00556	180	0.87	8.0	515	2.57	3.2	4.9	2.6	10.8	0.106		2.77
OFF1E	E	63	0.4416	4.53	0.00708	15	6.67	2.4	824	1.58	1.9	3.7	5.9	8.4	0.084		2.77
OFF2D	D	98	0.9036	1.86	0.00291	23	2.00	1.3	1036	1.06	2.1	3.2	6.8	8.2	0.082		2.77
ULTIMATE CONDITION																	
ON1D	D	89	0.7848	3.56	0.00556	180	0.87	8.0	515	2.57	3.2	4.9	2.6	10.8	0.106		2.77
OFF1D	D	89	0.7848	4.53	0.00708	15	6.67	1.2	824	1.58	2.5	3.8	4.7	5.9	0.059		2.77
OFF2D	D	98	0.9036	1.86	0.00291	23	2.00	1.3	1036	1.06	2.1	3.2	6.8	8.2	0.082		2.77

Referenced HEC-1 Analyses

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Proposed Condition


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*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
* RUN DATE 27DEC04 TIME 01:02:03
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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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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

HEC-1 INPUT

PAGE 1

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

*DIAGRAM

*** FREE ***

```

1 ID PROPOSED CONDITIONS
2 ID PROJECT: RETAIL CENTER
3 ID INPUT FILE =RETAIL-CTR-PR.TXT
4 ID 12/26/2004
5 ID * DESIGN STORM = 10-YEAR, 25-YEAR & 100-YEAR 6-HOUR STORM*
6 ID STORM DISTRIBUTION = SDN3
7 ID *****
8 ID
9 ID NOTE: HEC-1 FROM IN-N-OUT BURGER REVISED TO REFLECT CURRENT DRAINAGE
10 ID CIRCULATION PATTERNS FOR THE AREA TRIBUTARY TO ROCK SPRINGS DRIVE.
11 ID
12 ID
13 IT 5 0 0 300
14 IO 5 0 0
15 IN 5 0 0
16 JR PREC 0.570 0.740 1.000
*
17 KK E1
18 KM PORTION OF TENAYA WAY EAST RESIDENTIAL SUBDIVISION THAT DISCHARGES THRU
19 KM DRAINAGE ESMT. TO PRIVATE DRIVE BETWEEN JAMES E. McMILLAN ELEMENTARY SCHOOL
20 KM REFERENCED FROM TDS FOR TENAYA EAST.
21 BA 0.03000
22 PB 2.77
23 PC 0.000 0.020 0.057 0.070 0.087 0.108 0.124 0.130 0.130 0.130
24 PC 0.130 0.130 0.130 0.133 0.140 0.142 0.148 0.158 0.172 0.181
25 PC 0.190 0.197 0.199 0.200 0.201 0.204 0.214 0.229 0.241 0.249
26 PC 0.251 0.256 0.270 0.278 0.281 0.283 0.295 0.322 0.352 0.409
27 PC 0.499 0.590 0.710 0.744 0.781 0.812 0.819 0.835 0.851 0.856
28 PC 0.860 0.868 0.876 0.888 0.910 0.926 0.937 0.950 0.970 0.976
29 PC 0.982 0.985 0.987 0.989 0.990 0.993 0.993 0.994 0.995 0.998
30 PC 0.998 0.999 1.000
31 LS 0 92.0
32 UD 0.200
*
33 KK RE1
34 KM ROUTE E1 (FORMERLY BASIN OS3) TO POINT CP-1
35 KM REFERENCED FROM TDS FOR ROCK SPRINGS COMMERCIAL DEVELOPMENT
36 RK 140 0.01 0.013 0 TRAP 10 0
37 RK 900 0.018 0.016 0 TRAP 50 0

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38 KK AREA-E
 39 KM BASIN AREA-E
 40 KM REFERENCED BASIN FROM HYDROLOGY STUDY FOR JAMES E. McMILLAN ELEMENTARY SCHOOL
 41 BA 0.00200
 42 LS 0 98.0
 43 UD 0.1295
 *

HEC-1 INPUT

PAGE 2

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
44	KK AREA-D
45	KM BASIN AREA-D
46	KM REFERENCED BASIN FROM HYDROLOGY STUDY FOR JAMES E. McMILLAN ELEMENTARY SCHOOL
47	BA 0.00350
48	LS 0 98.0
49	UD 0.1075
	*
50	KK AREA-C
51	KM BASIN AREA-C
52	KM REFERENCED BASIN FROM HYDROLOGY STUDY FOR JAMES E. McMILLAN ELEMENTARY SCHOOL
53	BA 0.00180
54	LS 0 82.0
55	UD 0.0715
	*
56	KK CP-1
57	KM "COMBINE BASINS E1, AREA-E, AREA-D AND AREA-C"
58	HC 4
	*
59	KK RCP-1
60	KM ROUTE RUNOFF FROM CP1 TO CP2 (ALONG ROCK SPRINGS DR)
61	KM REFERENCED FROM TDS FOR ROCK SPRINGS COMMERCIAL DEVELOPMENT
62	RK 750 0.01 0.016 0 TRAP 80 0
	*
63	KK OFF2D
64	KM BASIN OFF2D
65	BA 0.00291
66	LS 0 98.0
67	UD 0.082
	*
68	KK OFF1E
69	KM BASIN OFF1E
70	BA 0.00708
71	LS 0 63.0
72	UD 0.084
	*
73	KK ON1D
74	KM BASIN ON1D
75	BA 0.00556
76	LS 0 89.0
77	UD 0.106
	*
78	KK CP-2
79	KM "COMBINE BASINS ON1D, OFF1E, OFF2D, AND RCP-1"
80	HC 4
	*
81	ZZ

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
17	E1	
	V	
	V	
33	RE1	
	.	
38	.	AREA-E
	.	
44	.	AREA-D
	.	
50	.	AREA-C
	.	
56	CP-1	
	V	
	V	
59	RCP-1	
	.	
63	.	OFF2D
	.	
68	.	OFF1E
	.	
73	.	ON1D
	.	
78	CP-2	

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 27DEC04 TIME 01:02:03 *
*****

```

```

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

```

```

PROPOSED CONDITIONS
PROJECT: RETAIL CENTER
INPUT FILE =RETAIL-CTR-PR.TXT
12/26/2004
" DESIGN STORM = 10-YEAR, 25-YEAR & 100-YEAR 6-HOUR STORM"
STORM DISTRIBUTION = SDN3
*****

```

NOTE: HEC-1 FROM IN-N-OUT BURGER REVISED TO REFLECT CURRENT DRAINAGE
CIRCULATION PATTERNS FOR THE AREA TRIBUTARY TO ROCK SPRINGS DRIVE.

14 IO

OUTPUT CONTROL VARIABLES

```

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

```

IT

HYDROGRAPH TIME DATA

```

NMNIN 5 MINUTES IN COMPUTATION INTERVAL
IDATE 1 0 STARTING DATE
ITIME 0000 STARTING TIME
NQ 300 NUMBER OF HYDROGRAPH ORDINATES
NDDATE 2 0 ENDING DATE
NDTIME 0055 ENDING TIME
ICENT 19 CENTURY MARK

```

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

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

JP MULTI-PLAN OPTION
NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
.57 .74 1.00

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

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION		
					RATIO 1	RATIO 2	RATIO 3
					.57	.74	1.00
HYDROGRAPH AT							
+	E1	.03	1	FLOW	19.	28.	42.
				TIME	3.58	3.58	3.58
ROUTED TO							
+	RE1	.03	1	FLOW	19.	28.	41.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	AREA-E	.00	1	FLOW	2.	3.	4.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	AREA-D	.00	1	FLOW	4.	5.	7.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	AREA-C	.00	1	FLOW	1.	1.	2.
				TIME	3.50	3.50	3.50
4 COMBINED AT							
+	CP-1	.04	1	FLOW	24.	35.	52.
				TIME	3.58	3.58	3.58
ROUTED TO							
+	RCP-1	.04	1	FLOW	24.	34.	50.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF2D	.00	1	FLOW	3.	4.	6.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	OFF1E	.01	1	FLOW	0.	0.	2.
				TIME	4.83	3.75	3.58
HYDROGRAPH AT							
+	QN1D	.01	1	FLOW	3.	5.	8.
				TIME	3.58	3.50	3.50
4 COMBINED AT							
+	CP-2	.05	1	FLOW	28.	42.	65.
				TIME	3.58	3.58	3.58

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

ISTAQ	ELEMENT	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	INTERPOLATED TO COMPUTATION INTERVAL			VOLUME (IN)
						DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	
FOR PLAN = 1	RATIO= .57								
RE1	MANE	1.00	19.41	217.53	.87	5.00	19.33	220.00	.87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1389E+01 EXCESS= .0000E+00 OUTFLOW= .1392E+01 BASIN STORAGE= .1014E-04 PERCENT ERROR= -.2

FOR PLAN = 1	RATIO= .74								
RE1	MANE	.95	28.29	217.34	1.28	5.00	28.00	220.00	1.28

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2051E+01 EXCESS= .0000E+00 OUTFLOW= .2055E+01 BASIN STORAGE= .1023E-04 PERCENT ERROR= -.2

FOR PLAN = 1	RATIO= 1.00								
RE1	MANE	.78	42.18	216.66	1.95	5.00	41.38	220.00	1.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3112E+01 EXCESS= .0000E+00 OUTFLOW= .3115E+01 BASIN STORAGE= .9571E-05 PERCENT ERROR= -.1

FOR PLAN = 1	RATIO= .57								
RCP-1	MANE	1.06	24.05	218.08	.92	5.00	23.93	220.00	.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1826E+01 EXCESS= .0000E+00 OUTFLOW= .1830E+01 BASIN STORAGE= .3498E-04 PERCENT ERROR= -.2

FOR PLAN = 1	RATIO= .74								
RCP-1	MANE	1.07	34.88	217.43	1.34	5.00	34.37	220.00	1.34

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2655E+01 EXCESS= .0000E+00 OUTFLOW= .2659E+01 BASIN STORAGE= .3208E-04 PERCENT ERROR= -.1

FOR PLAN = 1	RATIO= 1.00								
RCP-1	MANE	.85	51.75	216.57	2.00	5.00	50.48	220.00	2.00

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3978E+01 EXCESS= .0000E+00 OUTFLOW= .3983E+01 BASIN STORAGE= .3288E-04 PERCENT ERROR= -.1

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

Ultimate Condition

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
*   JUN 1998
*   VERSION 4.1
*
* RUN DATE 27DEC04 TIME 01:02:42
*
*****

```

```

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

```

```

X   X XXXXXXXX XXXXX      X
X   X X      X      X      XX
X   X X      X      X      X
XXXXXX XXXX   X      XXXXX  X
X   X X      X      X      X
X   X X      X      X      X
X   X XXXXXXXX XXXXX      XXX

```

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

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

HEC-1 INPUT

PAGE 1

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

*DIAGRAM

*** FREE ***

```

1 ID ULTIMATE CONDITIONS
2 ID PROJECT: RETAIL CENTER
3 ID INPUT FILE =RETAIL-CTR-UL.TXT
4 ID 12/26/2004
5 ID " DESIGN STORM = 10-YEAR, 25-YEAR & 100-YEAR 6-HOUR STORM"
6 ID STORM DISTRIBUTION = SDN3
7 ID *****
8 ID
9 ID NOTE: HEC-1 FROM IN-N-OUT BURGER REVISED TO REFLECT CURRENT DRAINAGE
10 ID CIRCULATION PATTERNS FOR THE AREA TRIBUTARY TO ROCK SPRINGS DRIVE.
11 ID
12 ID
13 IT 5 0 0 300
14 IO 5 0 0
15 IN 5 0 0
16 JR PREC 0.570 0.740 1.000
17
18 KK E1
19 KM PORTION OF TENAYA WAY EAST RESIDENTIAL SUBDIVISION THAT DISCHARGES THRU
20 KM DRAINAGE ESMT. TO PRIVATE DRIVE BETWEEN JAMES E. McMILLAN ELEMENTARY SCHOOL
21 KM REFERENCED FROM TDS FOR TENAYA EAST.
22 BA 0.03000
23 PB 2.77
24 PC 0.000 0.020 0.057 0.070 0.087 0.108 0.124 0.130 0.130 0.130
25 PC 0.130 0.130 0.130 0.133 0.140 0.142 0.148 0.158 0.172 0.181
26 PC 0.190 0.197 0.199 0.200 0.201 0.204 0.214 0.229 0.241 0.249
27 PC 0.251 0.256 0.270 0.278 0.281 0.283 0.295 0.322 0.352 0.409
28 PC 0.499 0.590 0.710 0.744 0.781 0.812 0.819 0.835 0.851 0.856
29 PC 0.860 0.868 0.876 0.888 0.910 0.926 0.937 0.950 0.970 0.976
30 PC 0.982 0.985 0.987 0.989 0.990 0.993 0.993 0.994 0.995 0.998
31 PC 0.998 0.999 1.000
32 LS 0 92.0
33 UD 0.200
34
35 KK RE1
36 RM ROUTE E1 (FORMERLY BASIN 053) TO POINT CP-1
37 RM REFERENCED FROM TDS FOR ROCK SPRINGS COMMERCIAL DEVELOPMENT
38 RK 140 0.01 0.013 0 TRAP 10 0
39 RK 900 0.018 0.016 0 TRAP 50 0

```

38 KK AREA-E
 39 KM BASIN AREA-E
 40 KM REFERENCED BASIN FROM HYDROLOGY STUDY FOR JAMES E. McMILLAN ELEMENTARY SCHOOL
 41 BA 0.00200
 42 LS 0 98.0
 43 UD 0.1295
 *

HEC-1 INPUT

PAGE 2

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
44	KK AREA-D
45	KM BASIN AREA-D
46	KM REFERENCED BASIN FROM HYDROLOGY STUDY FOR JAMES E. McMILLAN ELEMENTARY SCHOOL
47	BA 0.00350
48	LS 0 98.0
49	UD 0.1075
	*
50	KK AREA-C
51	KM BASIN AREA-C
52	KM REFERENCED BASIN FROM HYDROLOGY STUDY FOR JAMES E. McMILLAN ELEMENTARY SCHOOL
53	BA 0.00180
54	LS 0 82.0
55	UD 0.0715
	*
56	KK CP-1
57	KM *COMBINE BASINS E1, AREA-E, AREA-D AND AREA-C*
58	HC 4
	*
59	KK RCP-1
60	KM ROUTE RUNOFF FROM CP1 TO CP2 (ALONG ROCK SPRINGS DR)
61	KM REFERENCED FROM TDS FOR ROCK SPRINGS COMMERCIAL DEVELOPMENT
62	RK 750 0.01 0.016 0 TRAP 80 0
	*
63	KK OFF2D
64	KM BASIN OFF2D
65	BA 0.00291
66	LS 0 98.0
67	UD 0.082
	*
68	KK OFF1D
69	KM BASIN OFF1D
70	BA 0.00708
71	LS 0 89.0
72	UD 0.059
	*
73	KK ON1D
74	KM BASIN ON1D
75	BA 0.00556
76	LS 0 89.0
77	UD 0.106
	*
78	KK CP-2
79	KM *COMBINE BASINS ON1D, OFF1D, OFF2D, AND RCP-1*
80	HC 4
	*
81	ZZ

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

```

17      E1
      .V
      .V
33      RE1
      .
38      .      AREA-E
      .
44      .      .      AREA-D
      .
50      .      .      AREA-C
      .
56      CP-1.....
      .V
      .V
59      RCP-1
      .
63      .      OFF2D
      .
68      .      .      OFF1D
      .
73      .      .      ON1D
      .
78      CP-2.....
  
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

1*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1.
* RUN DATE 27DEC04 TIME 01:02:42
* *****
  
```

```

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

```

ULTIMATE CONDITIONS
PROJECT: RETAIL CENTER
INPUT FILE =RETAIL-CTR-UL.TXT
12/26/2004
* DESIGN STORM = 10-YEAR, 25-YEAR & 100-YEAR 6-HOUR STORM*
STORM DISTRIBUTION = SDN3
*****
  
```

NOTE: HEC-1 FROM IN-N-OUT BURGER REVISED TO REFLECT CURRENT DRAINAGE
 CIRCULATION PATTERNS FOR THE AREA TRIBUTARY TO ROCK SPRINGS DRIVE.

14 IO

OUTPUT CONTROL VARIABLES

```

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

IT

HYDROGRAPH TIME DATA

```

NMIN      5 MINUTES IN COMPUTATION INTERVAL
IDATE     1 0 STARTING DATE
ITIME     0000 STARTING TIME
NQ        300 NUMBER OF HYDROGRAPH ORDINATES
NDDATE    2 0 ENDING DATE
NDTIME    0055 ENDING TIME
ICENT     19 CENTURY MARK
  
```

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

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

JP MULTI-PLAN OPTION
NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
.57 .74 1.00

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

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION		
					RATIO 1 .57	RATIO 2 .74	RATIO 3 1.00
HYDROGRAPH AT							
+	E1	.03	1	FLOW	19.	28.	42.
				TIME	3.58	3.58	3.58
ROUTED TO							
+	RE1	.03	1	FLOW	19.	28.	41.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	AREA-E	.00	1	FLOW	2.	3.	4.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	AREA-D	.00	1	FLOW	4.	5.	7.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	AREA-C	.00	1	FLOW	1.	1.	2.
				TIME	3.50	3.50	3.50
4 COMBINED AT							
+	CP-1	.04	1	FLOW	24.	35.	52.
				TIME	3.58	3.58	3.58
ROUTED TO							
+	RCP-1	.04	1	FLOW	24.	34.	50.
				TIME	3.67	3.67	3.67
HYDROGRAPH AT							
+	OFF2D	.00	1	FLOW	3.	4.	6.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	OFF1D	.01	1	FLOW	5.	8.	13.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ON1D	.01	1	FLOW	3.	5.	8.
				TIME	3.58	3.50	3.50
4 COMBINED AT							
+	CP-2	.05	1	FLOW	32.	47.	71.
				TIME	3.58	3.58	3.58

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

ISTAQ	ELEMENT	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	DT (MIN)	INTERPOLATED TO COMPUTATION INTERVAL		VOLUME (IN)
							PEAK (CFS)	TIME TO PEAK (MIN)	
FOR PLAN = 1	RATIO= .57								
REL MANE	1.00		19.41	217.53	.87	5.00	19.33	220.00	.87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1389E+01 EXCESS= .0000E+00 OUTFLOW= .1392E+01 BASIN STORAGE= .1014E-04 PERCENT ERROR= -.2

FOR PLAN = 1	RATIO= .74								
REL MANE	.95		28.29	217.34	1.28	5.00	28.00	220.00	1.28

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2051E+01 EXCESS= .0000E+00 OUTFLOW= .2055E+01 BASIN STORAGE= .1023E-04 PERCENT ERROR= -.2

FOR PLAN = 1	RATIO= 1.00								
REL MANE	.78		42.18	216.66	1.95	5.00	41.38	220.00	1.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3112E+01 EXCESS= .0000E+00 OUTFLOW= .3115E+01 BASIN STORAGE= .9571E-05 PERCENT ERROR= -.1

FOR PLAN = 1	RATIO= .57								
RCP-1 MANE	1.06		24.05	218.08	.92	5.00	23.93	220.00	.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1826E+01 EXCESS= .0000E+00 OUTFLOW= .1830E+01 BASIN STORAGE= .3498E-04 PERCENT ERROR= -.2

FOR PLAN = 1	RATIO= .74								
RCP-1 MANE	1.07		34.88	217.43	1.34	5.00	34.37	220.00	1.34

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2655E+01 EXCESS= .0000E+00 OUTFLOW= .2659E+01 BASIN STORAGE= .3208E-04 PERCENT ERROR= -.1

FOR PLAN = 1	RATIO= 1.00								
RCP-1 MANE	.85		51.75	216.57	2.00	5.00	50.48	220.00	2.00

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3978E+01 EXCESS= .0000E+00 OUTFLOW= .3983E+01 BASIN STORAGE= .3288E-04 PERCENT ERROR= -.1

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

APPENDIX D

Reference Material

Technical Drainage Study for City Center West
by Kimley-Horn & Associates, CLV DS1923

Approval Letter

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM

DATE:

October 23, 1996

TO:

Barry Thompson
Land Development Services
Department of Public Works

FROM:

Dennis W. Slansky, P.E.
Project Manager, Flood Control
Department of Public Works

SUBJECT:

Drainage study for "City Center West"

COPIES TO:

Kimley-Horn
Lewis Homes
John McNellis

FILE NO. H:\DEPOT\DS\DS1923B.DOC

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1st Submittal	09/13/96	09/24/96	Not Acceptable	\$250.00
2nd Submittal	10/08/96	10/22/96	See Below Comments	\$250.00
TOTAL FEES:				\$500.00

REMARKS:

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

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

- Flow-line elevations and the flow line should be shown on the Grading Plan to coincide with Details 5/8 and 6/8. The flow-line elevations and drainage patterns of the swales along the south of Boston Market Site and around the two proposed buildings must be provided on the grading plan.

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

Plans sent to Land Development yes (initial).

END OF REMARKS

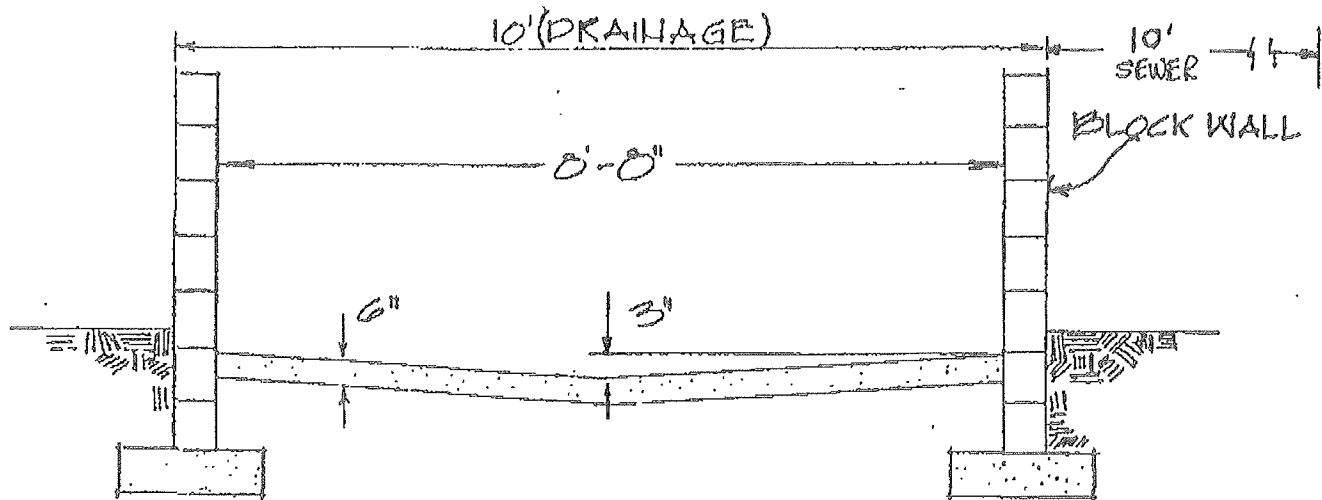
ssn

T/R/S 20S/60E/22

AREA L-22

Referenced Grading Plans

Showing Existing Drainage Easement at Southwest Corner of Proposed Site



CONCRETE DRAINAGE CHANNEL **TRAPEZOIDAL CHANNEL ANALYSIS** **NORMAL DEPTH COMPUTATION**

March 7, 1990
 PROPOSED 20" SEWER AND DRAINAGE EASEMENT
 AT THE NORTHEAST CORNER OF
 TENAYA EAST

PROGRAM INPUT DATA: DESCRIPTION

DESCRIPTION	VALUE
Flow Rate (cubic feet per second).....	41.8
Channel Bottom Slope (feet per foot).....	0.0100
Manning's Roughness Coefficient (n-value).....	0.0150
Channel Side Slope - Left Side (horizontal/vertical)....	0.00
Channel Side Slope - Right Side (horizontal/vertical)...	0.00
Channel Bottom Width (feet).....	8.7

PROGRAM RESULTS: DESCRIPTION

DESCRIPTION	VALUE
Normal Depth (feet).....	0.68
Flow Velocity (feet per second).....	6.96
Froude Number (Flow is Super-Critical).....	1.487
Velocity Head (feet).....	0.75
Energy Head (feet).....	1.43
Cross-Sectional Area of Flow (square feet).....	5.89
Top Width of Flow (feet).....	8.67

TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.3 (c) 1986
 Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77092
 (713) 895-8322. A manual with equations & flow chart is available.

APPENDIX E

Reference Material

Technical Drainage Study for Lake Mead/Tenaya
by The Keith Companies, CLV DS1379

Approval Letter

CITY OF LAS VEGAS

DATE:

INTER-OFFICE MEMORANDUM

February 28, 1995

TO:

Barry Thompson, E.I.T.
Land Development Services
Department of Public Works

FROM:

Randy Fultz, P.E. *RF*
Project Manager
Dept. of Public Works

SUBJECT:

Drainage Study for "Lake Mead/ Tenaya"

File No. DS1379E.ZNA

Date of Engineer's Stamp: 02/06/95

Date Received by City: 02/06/95

CCRFCDC Concurrence Letter: 2/21/95

COPIES TO:

The Keith Companies
CCRFCDC
John McNellis, PE

HISTORY:

1st Submittal	10/19/94 - Not Acceptable
2nd Submittal	01/13/95 - Not Acceptable
3rd Submittal	02/04/95 - Not Acceptable
4th Submittal	02/07/95 - Needs CCRFCDC
	Concurrence
CCRFCDC Concurrence	02/27/95 - (See Comments Below)

REMARKS:

The drainage study for the subject project has been reviewed and

 X is acceptable in concept subject to conformance to all
City standards.

 must have CCRFCDC Concurrence:

NOTE: This site is located in a FEMA Zone A. FEMA Elevation
Certificates, showing as-built finish floor elevations,
must be completed for each building and submitted to CLV
Flood Control prior to release of bonds, final inspection
or issuance of occupancy permits. The City recommends the
developer apply for a LOMR (using the drainage study, once
approved, as technical support) to remove the site or
individual structures from the Zone A.

C L A R K C O U N T Y
REGIONAL FLOOD CONTROL DISTRICT

1379
2/23/95

Accnt 2/27/95
L-222

Gale Wm. Fraser, II, P.E.
General Manager / Chief Engineer

BOARD OF DIRECTORS

Ira Blatsch
Chairman
City of Boulder City

Ken Brass
City of Las Vegas

Ken Carter
City of Mesquite

Wonna Atkinson Gates
Clark County

Theron Goynes
City of North Las Vegas

Jan Laverly Jones
City of Las Vegas

Larry Scheffler
City of Henderson

Bruce L. Woodbury
Clark County

February 21, 1995

Mr. Randy Fultz
City of Las Vegas
Department of Public Works
400 East Stewart Avenue
Las Vegas, NV 89101

DISTRICT CONCURRENCE: LAKE MEAD/TENAYA

Dear Mr. Fultz:

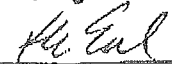
The District has reviewed the Technical Drainage Study dated September 15, 1994; Addendum No. 1 dated January 3, 1995; Addendum No. 2 dated January 25, 1995; and Addendum No. 3 dated February 6, 1995, for the above captioned project as submitted by The Keith Companies. In addition, the District is in receipt of the Conditional Letter of Acceptance from the City of Las Vegas Department of Public Works dated February 7, 1995.

The District concurs with the acceptance of this Technical Drainage Study by the City of Las Vegas Department of Public Works.

The District's review of this project was limited to issues of Regional Flood Control Significance as defined in the Uniform Regulations for the Control of Drainage. As noted in the study, the project resides in a Special Flood Hazard Area (SFHA) designated as "Zone A" per the effective Flood Insurance Rate Map (FIRM). Therefore, the consultant should be advised that this acceptance does not serve to amend the FIRM or remove the SFHA designation.

Please be aware that as additional information becomes available and/or restudies of Flood Insurance Studies are performed, the information submitted by The Keith Companies may be superseded. Compliance with the regulatory elements and design standards specified in the Uniform Regulations for the Control of Drainage does not imply a guarantee that properties will be free from flooding or flood damage. No liability is assumed by the District, its officials, or employees for the information, data or conclusions presented by the consulting engineer. We therefore make no warranties, either expressed or implied, in conducting this review.

GALE WM. FRASER II, P.E.
General Manager/Chief Engineer


BY: Kevin L. Eubanks, P.E.
Assistant General Manager

cc: The Keith Companies

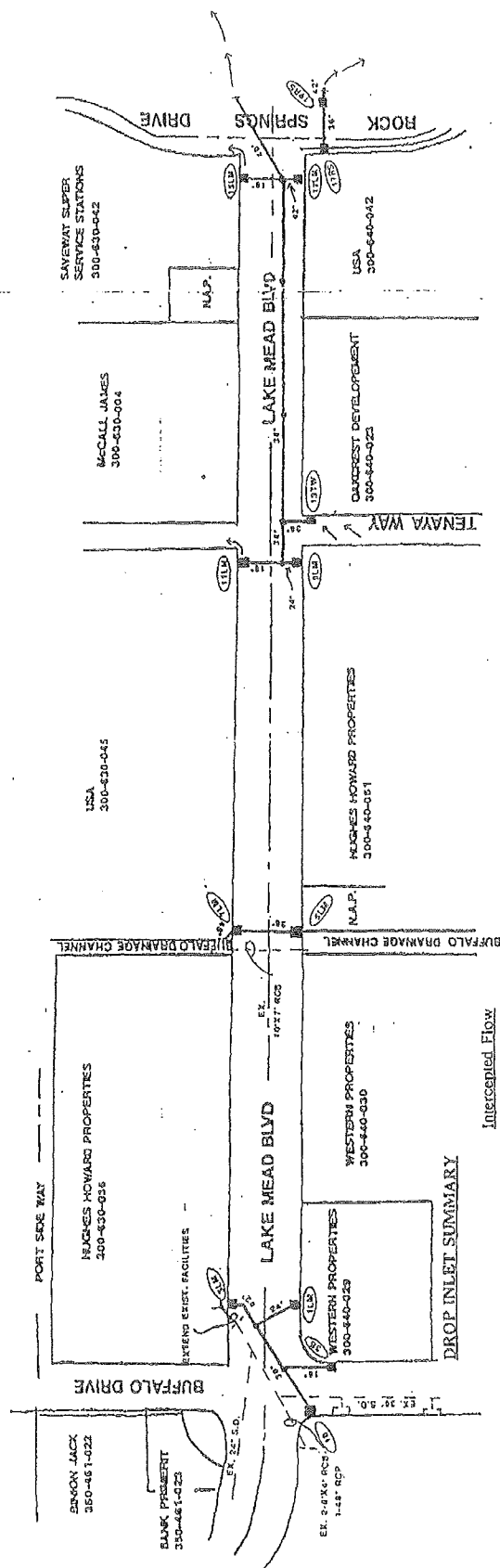
KLE:SEC:caj

FILE: 20-60-20.kal

301 E. Clark Avenue, Suite 301 • Las Vegas, Nevada 89101
(702) 455-3139 • FAX: (702) 455-3870

Referenced Drop Inlet Calculations

Existing Drop Inlets in Rock Springs Drive at Lake Mead Boulevard



Inlet No.	Size & Type	Q10 [cfs]	Q100 [cfs]
1B	40" Comb.	45	54
3B	10' Type A	2.2	2.9
1 LM	10' Type A	1.4	11
3 LM	10' Type A	0	11
5 LM	105' Comb.	24	96
7 LM	92' Comb.	5	76
9 LM	15' Comb.	22	35
11 LM	10' Type A	2.1	2.7
13 LM	40' Comb.	61	67 ²
15 LM	10' Type A	2.6	8
17 LM	40' Comb.	67	90 ²
19 RS	10' Comb.	40	49
21 RS	10' Comb.	8	41 ²

REFERENCED DROP INLETS

^a Inlet capacity limited by storm drain capacity

CITY OF LAS VEGAS
LAKE MEAD BLVD

**FIGURE 4
STORM DRAIN &
INLET SCHEMATIC**

PENTACORP

STORM DRAIN & INLET SUMMARY (10 YEAR ANALYSIS)

LAKE MEAD BOULEVARD - BUFFALO DRIVE TO ROCK SPRINGS DRIVE

INLET NUMBER	STATION	Q10 (cfs)	SLOPE (%)	DEPTH OF FLOW (ft)	INLET SIZE & TYPE	Qint (cfs)	Qfb (cfs)	1/2 STREET CAPACITY (cfs)	CONNECTOR PIPE			STORM DRAIN TRUNK		
									SIZE (in)	CAPACITY (cfs)		Q10 (cfs)	SIZE (in)	CAPACITY (cfs)
1B	BUFFALO (W)	45.0	SUMP	0.50	40' COMB.	45.0	0.0	-	36	67		45	36	67
3B	BUFFALO (E)	5.0	1.00	0.41	10' TYPE 'A'	2.2	2.8	10	18	7		47	36	67
1LM	22+00 (S)	2.8	1.33	0.34	10' TYPE 'A'	1.4	1.4	29	24	16		49	42	101
3LM	22+00 (N)	0.0	1.33	-	10' TYPE 'A'	-	-	29	42	71		49	42	101
5LM	33+50 (S)	24.0	1.25	0.62	105' COMB.	24.0	0.0	28	36	96		24	36	96
7LM	33+50 (N)	5.0	1.25	0.40	92' COMB.	5.0	0.0	28	48	203		29	48	203
9LM	46+00 (S)	35.0	2.00	0.65	15' COMB.	22.0	13.0	15	24	38		24	24	38
11LM	46+00 (N)	5.0	2.00	0.37	10' TYPE 'A'	2.1	2.9	15	18	11		26	24	38
13TW	TENAYA (E)	77.0	2.32	0.78	40' COMB.	61.0	16.0	16	36	67		87	36	105
15LM	58+00 (N)	7.0	1.40	0.43	10' TYPE 'A'	26.0	4.4	13	18	11		90	48	203
17LM	58+00 (S)	81.0	1.40	0.86	40' COMB.	67.0	14.0	13	42	101		157	48	203
17RS	ROCK SPR. (W)	40.0	SUMP	0.59	10' COMB.	40.0	0.0	-	36	67		40	36	67
19RS	ROCK SPR. (E)	8.0	SUMP	0.10	10' COMB.	8.0	0.0	-	42	101		48	42	101

STORM DRAIN & INLET SUMMARY (100 YEAR ANALYSIS)

LAKE MEAD BOULEVARD - BUFFALO DRIVE TO ROCK SPRINGS DRIVE

LAKE MEAD BOULEVARD - BUFFALO DRIVE TO ROCK SPRINGS DRIVE													
INLET NUMBER	STATION	Q100 (cfs)	SLOPE (%)	DEPTH OF FLOW (ft)	INLET SIZE & TYPE	Qint (cfs)	Q1b (cfs)	1/2 STREET CAPACITY (cfs)	CONNECTOR PIPE		STORM DRAIN TRUNK		
									SIZE (in)	CAPACITY (cfs)	Q100 (cfs)	SIZE (in)	CAPACITY (cfs)
1B	BUFFALO (W)	222.0	SUMP	0.60	40' COMB.	54.0	168.0		36	67	62	36	67
3B	BUFFALO (E)	8.0	1.00	0.47	10' TYPE 'A'	2.9	5.1	207	18	7	67	36	67
1LM	22+00 (S)	87.0	1.33	0.88	10' TYPE 'A'	11.0	76.0	195	24	16	80	42	101
3LM	22+00 (N)	87.0	1.33	0.88	10' TYPE 'A'	11.0	76.0	195	42	71	93	42	101
5LM	33+50 (S)	96.0	1.25	0.92	105' COMB.	96.0	0.0	198	36	96	96	36	96
7LM	33+50 (N)	76.0	1.25	0.85	92' COMB.	76.0	0.0	198	48	203	172	48	203
9LM	46+00 (S)	64.0	2.00	0.76	16' COMB.	35.0	29.0	177	24	38	35	24	38
11LM	46+00 (N)	8.0	2.00	0.42	10' TYPE 'A'	2.7	5.3	177	18	11	38	24	38
13TW	TENAYA (E)	153.0	2.32	0.95	40' COMB.	67*	86.0	169	36	67	105	36	105
15LM	58+00 (N)	77.0	1.40	0.84	10' TYPE 'A'	8.0	69.0	192	18	11	113	48	203
17LM	58+00 (S)	145.0	1.40	1.03	40' COMB.	90*	55.0	192	42	101	203	48	203
17RS	ROCK SPR. (W)	92.0	SUMP	0.83	10' COMB.	49.0	43.0	-	36	67	49	36	67
19RS	ROCK SPR. (E)	135.0	SUMP	0.60	10' COMB.	41.0	94.0	-	42	101	90	42	101

* INLET CAPACITY LIMITED BY STORM DRAIN CAPACITY

APPENDIX F

CCRFCD 2008 MPU Figure H-25

APPENDIX G

Plan, Profile and Detail Sheets

Phase 1

Phase 2

The United States of America

To all to whom these presents shall come, Greeting:

N-41565-08

WHEREAS

Clark County School District

is entitled to a land patent pursuant to the Act of June 14, 1926, as amended (43 U.S.C. 969 - 969-4), for the following described land:

300-640-022 pt Mount Diablo Meridian, Nevada

T. 20 S., R. 60 E.,
sec. 22, SE $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$.

containing 10.0 acres.

NOW KNOW YE, that there is, therefore, granted by the UNITED STATES, unto the Clark County School District the land described above; TO HAVE AND TO HOLD the said land with all the rights, privileges, immunities and appurtenances of whatsoever nature, thereunto belonging, unto the said Clark County School District, its successors and assigns, forever; and

EXCEPTING AND RESERVING TO THE UNITED STATES:

1. A right-of-way thereon for ditches or canals constructed by the authority of the United States. Act of August 30, 1890 (43 U.S.C. 945).
2. All mineral deposits in the lands so patented, and to it, or persons authorized by it, the right to prospect for, mine and remove such deposits from the same under applicable law and regulations to be established by the Secretary of the Interior.

Patent Number 27-91-0097

When recorded, please return to:
Dusty Dickens, Coordinator
Real Property Management
Clark County School District
4828 S. Pearl St.
Las Vegas, NV 89121

9 1 0 8 0 1 0 0 3 1 6

N-41565-08

SUBJECT TO:

1. An easement 30 feet in width along the east, west and north boundaries, and 15 foot radius corners on all four corners, in favor of The City of Las Vegas, for road, public utilities and flood control purposes to insure continued ingress and egress to adjacent lands.
2. Those rights for powerline purposes granted to Nevada Power Company, its successors or assigns, by right-of-way No. N-51899, pursuant to the Act of October 21, 1976 (43 U.S.C. 1761).

Provided that title shall revert to the United States upon a finding, after notice and opportunity for a hearing, that, without the approval of the Secretary of the Interior or his delegate, the patentee or its approved successor attempts to transfer title to or control over the lands to another, the lands have been devoted to a use other than that for which the lands were conveyed, the lands have not been used for the purpose for which the lands were conveyed for a 5-year period, or the patentee has failed to follow the approved development plan or management plan.

Provided further that the Secretary of the Interior may take action to revest title in the United States if the patentee directly or indirectly permits its agents, employees, contractors, or subcontractors (including without limitation lessees, sublessees, and permittees) to prohibit or restrict the use of any part of the patented lands or any of the facilities thereon by any person because of such person's race, creed, color, sex, or national origin.

PATENT NO. 27 - 91 - 0097

9 1 0 8 0 1 0 0 3 1 6

The grant of the herein described lands is subject to the following reservations, conditions, and limitations:

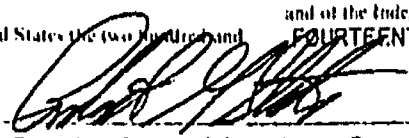
- (1) The patentee or his (its) successor in interest shall comply with and shall not violate any of the terms or provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 241), and requirements of the regulations, as modified or amended, of the Secretary of the Interior issued pursuant thereto (43 CFR 17) for the period that the lands conveyed herein are used for the purpose for which the grant was made pursuant to the act cited above, or for another purpose involving the provision of similar services or benefits.
- (2) If the patentee or his (its) successor in interest does not comply with the terms or provisions of Title VI of the Civil Rights Act of 1964, and the requirements imposed by the Department of the Interior issued pursuant to that title, during the period during which the property described herein is used for the purpose for which the grant was made pursuant to the act cited above, or for another purpose involving the provision of similar services or benefits, the Secretary of the Interior or his delegate may declare the terms of this grant terminated in whole or in part.
- (3) The patentee, by acceptance of this patent, agrees for himself (itself) or his (its) successors in interest that a declaration of termination in whole or in part of this grant shall, at the option of the Secretary or his delegate, operate to re-vest in the United States full title to the lands involved in the declaration.
- (4) The United States shall have the right to seek judicial enforcement of the requirements of Title VI of the Civil Rights Act of 1964, and the terms and conditions of the regulations, as modified or amended, of the Secretary of the Interior issued pursuant to said Title VI, in the event of their violation by the patentee.
- (5) The patentee or his (its) successor in interest will, upon request of the Secretary of the Interior or his delegate, post and maintain on the property conveyed by this document signs and posters bearing a legend concerning the applicability of Title VI of the Civil Rights Act of 1964 to the area or facility conveyed.
- (6) The reservations, conditions, and limitations contained in paragraphs (1) through (5) shall constitute a covenant running with the land, binding on the patentee and his (its) successors in interest for the period for which the land described herein is used for the purpose for which this grant was made, or for another purpose involving the provision of similar services or benefits.
- (7) The assurances and covenant required by sections (1) - (6) above shall not apply to ultimate beneficiaries under the program for which this grant is made. "Ultimate beneficiaries" are identified in 43 CFR 17.12(b).

IN TESTIMONY WHEREOF, the undersigned, authorized officer of the Bureau of Land Management, in accordance with the provisions of the Act of June 17, 1948 (62 Stat. 476), has, in the name of the United States, caused these letters to be made Patent, and the Seal of the Bureau to be hereunto affixed.

[SEAL]

GIVEN under my hand and the
SIXTEENTH day of JULY
in the year of our Lord one thousand nine hundred and NINETY-ONE
and of the Independence of the
United States the two hundred and FOURTEENTH

By



Deputy State Director, Operations

Patent Number 27-91-0097

CLARK COUNTY, NEVADA
JOAN L. SWIFT, RECORDER
RECORDED AT REQUEST OF:
CLARK COUNTY SCHOOL DIST

00-01-91 09:22 18J
OFFICIAL RECORDS
BOOK: 910801 INST: 00316
FEE: 8.00 RPTD EXH002

940225:02075

Form 2912-1
(July 1984)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Serial Number

RECREATION OR PUBLIC PURPOSES LEASE

Act of June 14, 1926, as amended (43 U.S.C. 869 *et. seq.*)

N-51824

This lease entered into on this 5th day of February, 1991, by the United States of America, the lessor, through the authorized officer of the Bureau of Land Management, and the City of Las Vegas, 400 E. Stewart Avenue, Las Vegas, Nevada 89101

called the lessee, pursuant and subject to the terms and provisions of the Recreation and Public Purposes Act and to all reasonable regulations of the Secretary of the Interior now or hereafter in force when not inconsistent with any express and specific provisions herein, which are made a part hereof,

WITNESSETH:

Sec. 1. The lessor, in consideration of the rents to be paid and the conditions to be observed as hereinafter set forth, does hereby grant and lease to the lessee the right and privilege of using for the purposes hereinafter set forth in the following-described lands: together with an option to purchase during the term of the lease upon a showing of substantial compliance with the approved plan of development filed August 30, 1989, and amended December 11, 1989.

Mount Diablo Meridian, Nevada

T. 20 S., R. 60 E.,
sec. 22: E $\frac{1}{2}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$, E $\frac{1}{2}$ W $\frac{1}{2}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$.

containing 7.50 acres, together with the right to construct and maintain thereon all buildings or other improvements necessary for such use for a period of 5 years, the rental to be \$ 10.00 per annum. If, at the expiration date of the lease the authorized officer shall determine that the lease may be renewed, the lessee herein will be accorded the privilege of renewal upon such terms as may be fixed by the lessor. The lessee may use the premises for a metropolitan police station site.

Sec. 2. There are reserved to the United States all mineral deposits in said lands, together with the right to mine and remove the same under applicable laws and regulations to be established by the Secretary of the Interior.

Sec. 3. The lessor reserves the right of entry, or use, by

- (a) any authorized person, upon the leased area and into the buildings constructed thereon for the purpose of inspection;
- (b) Federal agents and game wardens upon the leased area on official business;
- (c) the United States, its permittees and licensees, to mine and remove the mineral deposits referred to in Sec. 2, above.

Sec. 4. In consideration of the foregoing, the lessee hereby agrees:

(a) To improve and manage the leased area in accordance with the plan of development and management ~~designations~~ filed August 30, 1989, and amended December 11, 1989.

and approved by an authorized officer on September 18, 1990 or any modification thereof hereinafter approved by an authorized officer, and to maintain all improvements, during the term of this lease in a reasonably good state of repair.

(b) To pay the lessor the annual rental above set forth in advance during the continuance of this lease.

1. Any cultural and/or paleontological resource (historic or prehistoric sites or object) discovered by the lessee, or any person working on his behalf, on public or Federal land shall be immediately reported to the authorized officer. The lessee shall suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the authorized officer. An evaluation of the discovery will be made by the authorized officer to determine appropriate actions to prevent the loss of significant cultural or scientific values. The lessee will be responsible for the cost of evaluation and any decision as to proper mitigation measures will be made by the authorized officer after consulting with the lessee.
2. Use of pesticides shall comply with the applicable Federal and State laws. Pesticides shall be used only in accordance with their registered uses and within limitations imposed by the Secretary of the Interior. Prior to the use of pesticides, the lessee shall obtain from the authorized officer written approval of a plan showing the type and quantity of material to be used, pest(s) to be controlled, method of application, location of storage and disposal of containers, and any other information deemed necessary by the authorized officer. Emergency use of pesticides shall be approved in writing by the authorized officer prior to such use.
3. A qualified tortoise biologist will re-survey the parcel immediately prior to any surface disturbing activity, if such activity is not initiated prior to May 15 of any year. If the entire site is not graded at one time, a tortoise survey shall be conducted immediately prior to the grading of each portion. The phase "immediately prior to" is defined as follows: From November 1 through February 28--two to three weeks; from March 1 through October 31--two to three days. If any tortoises or additional burrows are found at any time during the preconstruction tortoise surveys or during construction, all activities must cease and BLM must immediately reinitiate consultation with the Fish and Wildlife Service.
4. If a tortoise wanders onto the site during construction, all activity will cease until the tortoise has moved out of harms way of its own accord. It is illegal for an unauthorized person to pick up a wild tortoise.
5. All construction workers will be informed of the threatened status of the tortoise, the definition of "take" under the Endangered Species Act of 1973, as amended, and the fact that "take" is a prohibited action.
6. All construction equipment and building materials will be stored within the boundaries of the 7.5 acre parcel. Access to the site will be restricted to existing roads.
7. Garbage removed from the site will not be dumped on adjacent lands, but disposed of in the appropriate garbage or landfill site.
8. The lease is issued subject to all valid and existing rights, including right-of-way NEV-062275 granted to Nevada Department of Transportation for highway purposes.

940225:02075

9. The lease is issued subject to the following easements in favor of the City of Las Vegas for streets roads, and public utilities:

50' on the north side

30' on the south side

Alignment of Rock Springs Drive on the east side

Appendix A

The lease of the herein described land is also subject to the following conditions and limitations:

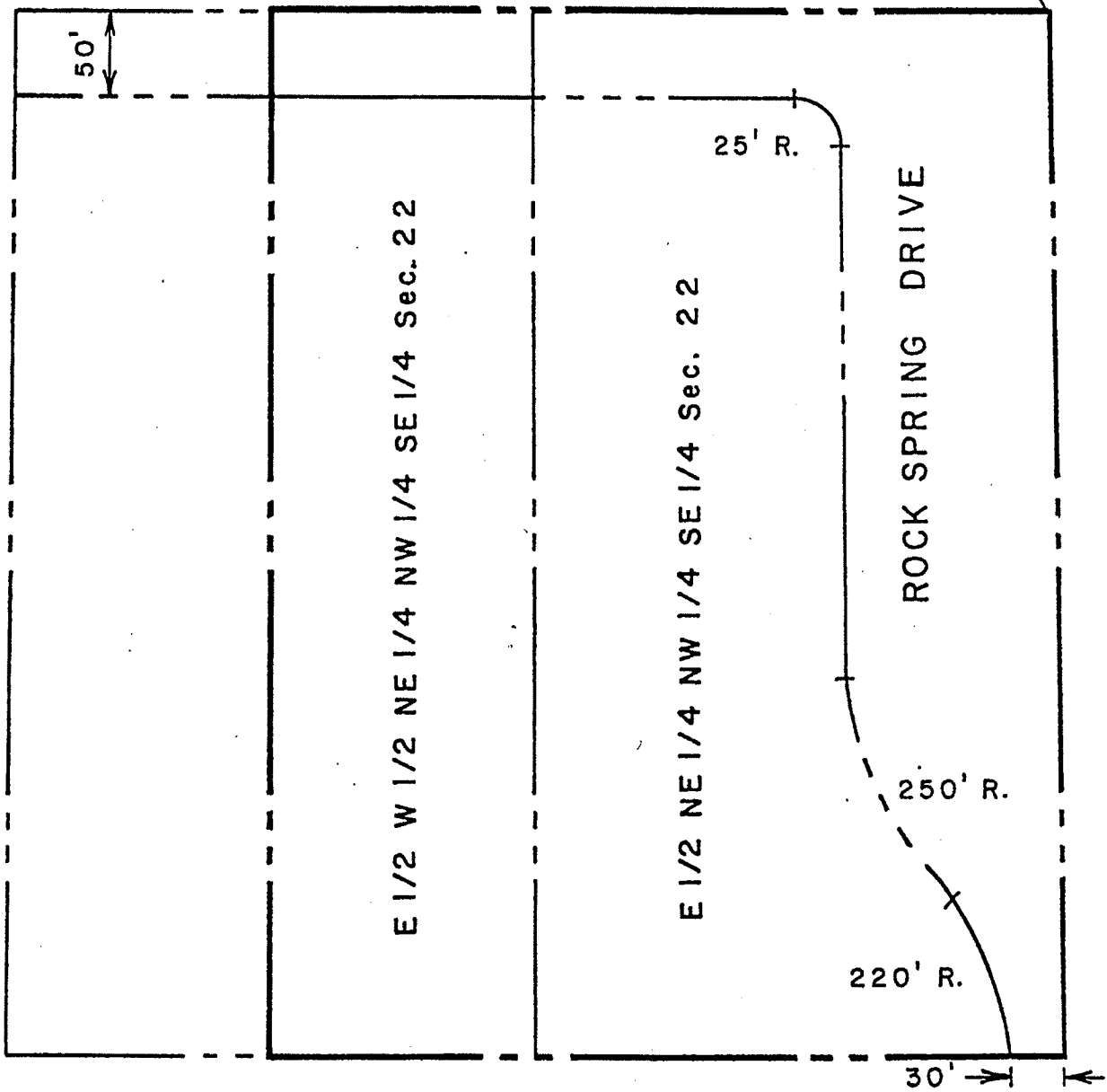
- (a) The lessee or its successor in interest shall comply with and shall not violate any of the terms or provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 241) and requirements of the regulations, as modified or amended, of the Secretary of the Interior issued pursuant thereto (43 CFR 17) for the period that the land leased herein is used for the purpose for which the lease was issued pursuant to the act cited or for another purpose involving the provision of similar services or benefits;
- (b) If the lessee or its successor in interest does not comply with the terms or provisions of Title VI of the Civil Rights Act of 1964 and the requirements imposed by the Secretary of the Interior issued pursuant to that title during the period which the land described herein is used for the purpose for which the lease was issued pursuant to the act cited or for another purpose involving the provision of similar services or benefits, said Secretary or his delegate may declare the terms of this grant terminated in whole or in part;
- (c) The lessee, by acceptance of this lease, agrees for itself and its successors in interest that a declaration of termination in whole or in part of this lease shall, at the option of the Secretary of the Interior or his delegate, operate to revert in the United States full title to the land involved in the declaration;
- (d) The United States shall have the right to seek judicial enforcement of the requirements of Title VI of the Civil Rights Act of 1964, and the terms and conditions of the regulations, as modified or amended, of the Secretary of the Interior issued pursuant to said Title VI, in the event of their violation by the lessee or its successor in interest;
- (e) The lessee or its successor in interest will, upon request of the Secretary of the Interior or his delegate, post and maintain on the property conveyed by this document, signs or posters bearing legend concerning the applicability of Title VI of the Civil Rights Act of 1964 to the property conveyed;
- (f) The conditions and limitations contained in paragraphs (a) through (e) shall constitute a covenant running with the land, binding on the lessee and its successors in interest for the period for which the land leased herein is used for the purpose for which this lease was issued or for another purpose involving the provision of similar services or benefits.

LAKE MEAD

BOULEVARD

940225:02075

E 1/16 C-C Sec. 22



NOT TO SCALE



PORTIONS OF THE NE 1/4 NW 1/4 SE 1/4,
SECTION 22, T. 20 S., R. 60 E., M. D. M.

940225:02075

No.89-12-05
(Revised 89-08-25)

CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS
RIGHT OF WAY DESIGN
LEGAL DESCRIPTION

Tax Parcel No.300-640-022

Document No.

Vesting: U.S.A.

Section: NE1/4, NW1/4, SE1/4, SEC. 22, T.20S., R.60E., M.D.M.
Street/Subdivision: BLM Application - Metropolitan Police Station

Requested eb	Written mwb	Checked bb	Proofread
	12-05-89	12-06-89	<u>6/4-25</u> 12-06-89

Those portions of the Northeast Quarter (NE 1/4) of the Northwest Quarter (NW 1/4) of the Southeast Quarter (SE 1/4) of Section 22, Township 20 South, Range 60 East, M.D.M., in the City of Las Vegas, County of Clark, State of Nevada, described as follows:

PARCEL 1

The East Half (E 1/2) of the Northeast Quarter (NE 1/4) of the Northwest Quarter (NW 1/4) of the Southeast Quarter (SE 1/4) of said Section 22.

PARCEL 2

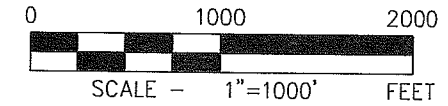
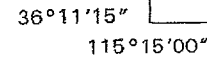
The East Half (E 1/2) of the West Half (W 1/2) of the Northeast Quarter (NE 1/4) of the Northwest Quarter (NW 1/4) of the Southeast Quarter (SE 1/4) of said Section 22.

CLARK COUNTY, NEVADA
JOAN L. SWIFT, RECORDER
RECORDED AT REQUEST OF:
CITY CLERK-CITY HALL

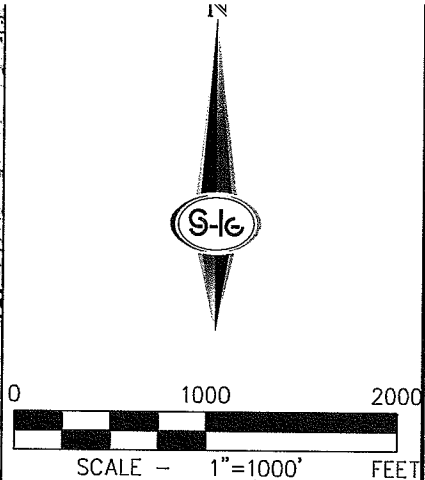
02-25-94 15:40 JMC 10
BOOK: 940225 INST: 02075

FEE: .00 RPTT: .00

DECISION
CONFORMED COPY HAS NOT BEEN COMPARED TO THE ORIGINAL



ROOHANI KHUSROW FAMILY TRUST (FIRSTSTONE) LAKE MEAD ROCK SPRINGS COMMERCIAL SUBDIVISION FEMA FIRM PANEL MAP		SLATER HANIFAL GROUP CONSULTING ENGINEERS & PLANNERS 5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89103 PHONE (702) 284-5300 FAX (702) 284-5300	
DATE:	AUG 2011	NO.	
DRAFTER:	KC	DESCRIPTION	
DESIGNER:	KC	DATE	
CHECKED:	KCR	BY	
PROJECT NO.	RCI1105.000	APP. DATE	
EXHIBIT B SHEET 1 OF ----			



LEGEND

 Ultimate Development Boundary

 Existing Facilities

 Category A Proposed Facilities

 Category B Proposed Facilities

 Local Existing Facilities

 Local Proposed Facilities

 Delention Basin

 Culvert or Bridge Crossing

 Stormdrain

 Lined Channel

 Unlined Channel

 Levee/Dike

 Natural Wash/Floodway

 ID-Mile Separator

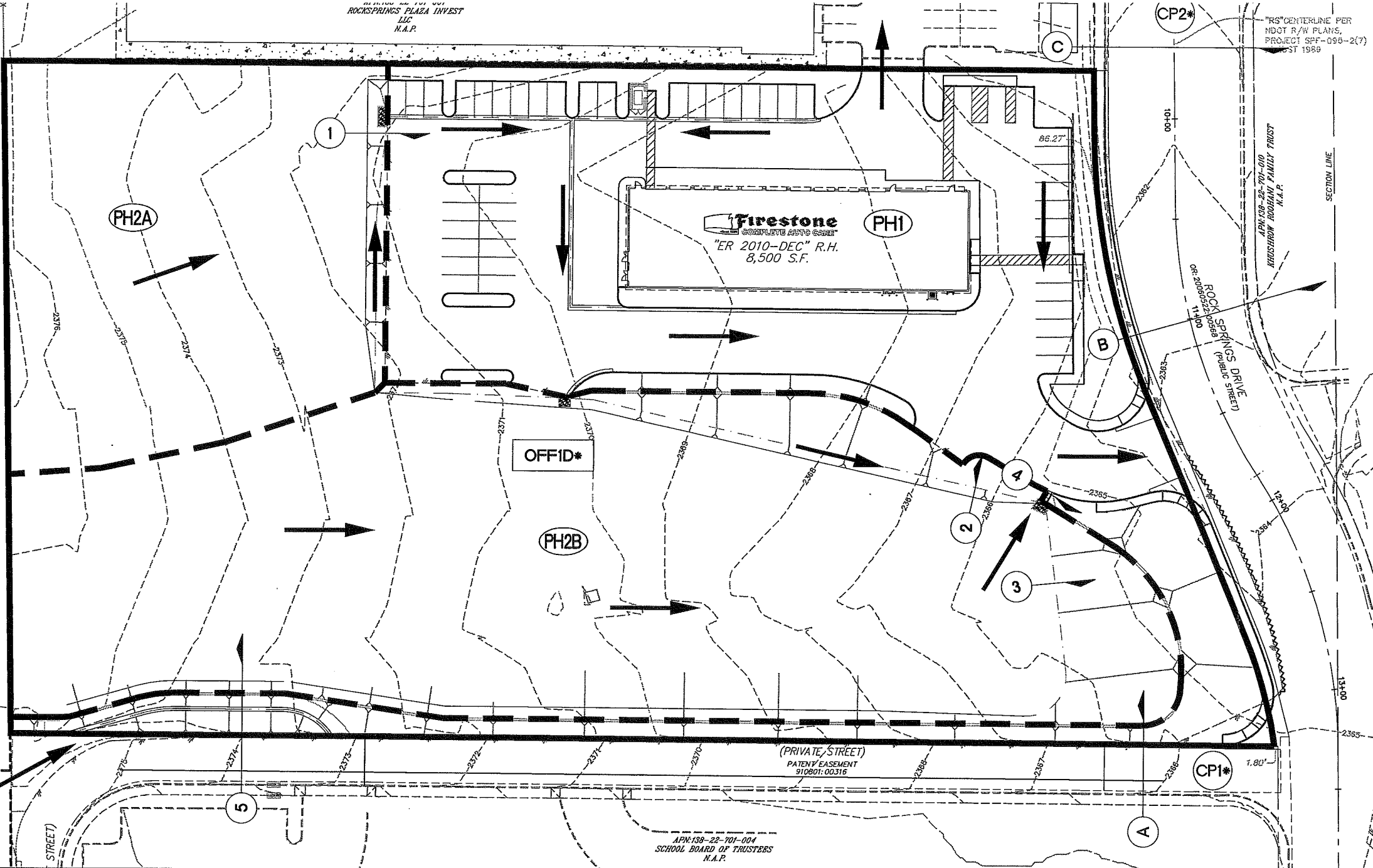
Remove & Replace/Parallel Facilities

Category A	Category B
 Channel	 Channel
 Stormdrain	 Stormdrain
 Crossing	 Crossing

ROOHANI KHUSROW FAMILY TRUST (FIRSTSTONE)		S-L	SLATEF HANIFAL GROUP
LAKE MEAD ROCK SPRINGS COMMERCIAL SUBDIVISION		CONSULTING ENGINEERS & PLANNERS	
CCRFCD 2008 MPU FACILITIES MAP		5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89 PHONE (702) 284-5300 FAX (702) 284-5300	
DATE:	AUG 2011	NO.	
DRAFTER:	KC	DESCRIPTION	
DESIGNER:	KC	DATE	
CHECKED:	KCR	BY	
PROJECT NO.	RCI1105.000	APP. DATE	
EXHIBIT C			
SHEET 1 OF ----			



DATE:	AUG 2011
DRAFTER:	KC
DESIGNER:	KC
CHECKED:	KCR
PROJECT NO.	RC11105.000
EXHIBIT D	
SHEET 1 OF ----	



Flow Summary Proposed Condition*			
Subbasin ID	Area (ac)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)
E1	19.2	19	42
OFF1D (Project Site)	4.53	5	13
CP-1	N/A	24	52
CP-2	N/A	32	71

*Referenced from the Retail Center Study's Ultimate Condition Analysis

Prorated Flow Computations (Phase 1)			
Subbasin	Q ₁₀₀ (cfs)	Area (acres)	100-yr Unit Flow (cfs/ac)
OFF1D*	13	4.53	2.9
Prorated Subbasin	Q ₁₀₀ (cfs)	Area (acres)	100-yr Unit Flow (cfs/ac)
PH1	5.1	1.78	2.9
PH2A	2.4	0.82	2.9
PH2B	5.5	1.93	2.9
TOTAL	13.0	4.53	

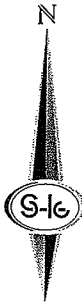
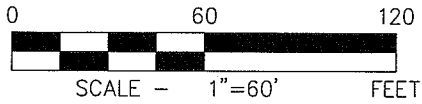
*Referenced from the Retail Center Study

Summary of Onsite Hydraulic Sections Phase 1 Drainage Condition							
Section	Slope (%)	Q (cfs)	Flow Depth (ft)	Facility Depth (ft)	Top Width (ft)	Velocity (fps)	Section Description
Section 1 (Q = PH2A)	1.23	2.4	0.43	1.00	10	2.64	Earthen Swale (Triangular 5:1 SS)
Section 2 (Q = PH2B)	1.88	5.5	0.66	1.00	10	4.25	Earthen Swale (Triangular 5:1 SS)
Section 3 (Q = PH2B)	1.00	5.5	0.32	varies	varies	1.99	Earthen Swale (Triangular) 3:1 SS (right), 2% SS (left)
Section 4 (Q = PH2B)	13.60	5.5	0.21	0.50	2.00	13.11	Concrete Flume (Rectangular 2-ft Wide)
Section 5 (Q = E1*)	0.55	42	0.69	varies	varies	3.16	Drainage Swale (Trapezoidal)
	1.88	42	0.58	varies	varies	4.77	

*Referenced from Retail Center Study

Perimeter Street Flow Summary Proposed Condition								
Section	Slope (%)	Q ₁₀₀ (cfs)	Depth (ft)	Velocity (fps)	VxD	Q ₁₀ (cfs)	Dry Lane Width (ft)	
SECTION A Private Drive (Q = CP1*)	1.52	52.0	0.72	5.82	4.2	24.0	N/A	
SECTION B Rock Springs Drive (60' ROW) (Q = CP2*)	1.00	71.0	0.69	4.15	2.9	32.0	N/A	
SECTION C Rock Springs Drive (80' ROW) (Q = CP2*)	1.00	71.0	0.70	3.97	2.8	32.0	13.0	

*Referenced from the Retail Center Study



LEGEND	
	BASIN BOUNDARY
	ON-DI
	BASIN ID
	PRORATED BASIN BOUNDARY
	PRORATED BASIN ID
	FLOW DIRECTION
	CONCENTRATION POINT
	FLOWMASTER SECTION

SLATEF
HANIFAI
GROUP

CONSULTING ENGINEERS & PLANNER

5740 S. ARVILLE STREET #216, LAS VEGAS, NV 891
PHONE (702) 284-5300 FAX (702) 284-5300

ROOHANI KHUSROW FAMILY TRUST (FIRESTONE)

LAKE MEAD ROCK SPRINGS COMMERCIAL SUBDIVISION

PHASE I CONDITION ONSITE DRAINAGE MAP

DATE: 08/22/11

DRAFTER: KCR

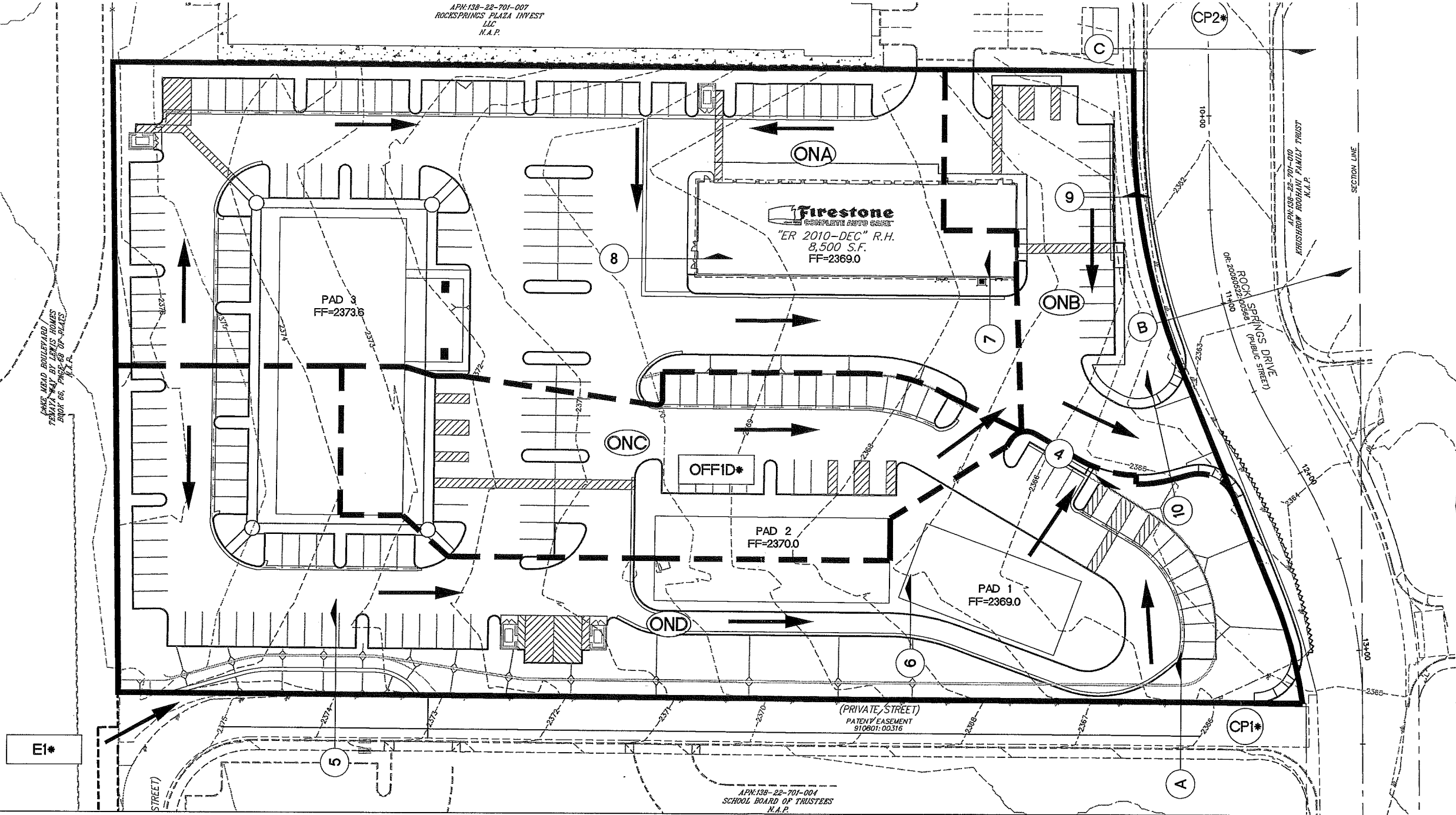
DESIGNER: KCR

CHECKED: MJF

PROJECT NO.
RCI1105.000

EXHIBIT E

SHEET 1 OF 1



Flow Summary Proposed Condition*			
Subbasin ID	Area (ac)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)
E1	19.2	19	42
OFF1D (Project Site)	4.53	5	13
CP-1	N/A	24	52
CP-2	N/A	32	71

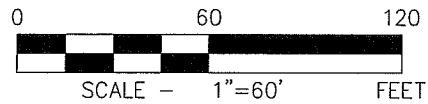
*Referenced from the Retail Center Study's Ultimate Condition Analysis

Prorated Flow Computations (Phase 2)			
Subbasin	Q ₁₀₀ (cfs)	Area (acres)	100-yr Unit Flow (cfs/ac)
OFF1D*	13	4.53	2.9
Prorated Subbasin	Q ₁₀₀ (cfs)	Area (acres)	100-yr Unit Flow (cfs/ac)
ONA	5.0	1.75	2.9
ONB	1.3	0.47	2.9
ONC	2.1	0.72	2.9
OND	4.6	1.59	2.9
TOTAL	13.0	4.53	

*Referenced from the Retail Center Study

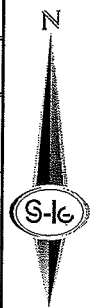
Summary of Onsite Hydraulic Sections Phase 2 Drainage Condition							
Section	Slope (%)	Q (cfs)	Flow Depth (ft)	Facility Depth (ft)	Top Width (ft)	Velocity (fps)	Section Description
Section 5 (Q = E1*)	0.55 1.88	42 42	0.69 0.58	varies varies	varies varies	3.16 4.77	Drainage Swale (Trapezoidal)
Section 6 (Q = OND)	0.50	4.6	0.44	0.50	12.00	2.24	Drive Aisle
Section 7 (Q = ONA)	0.50	5	0.44	0.50	14.86	2.13	L-Curb
Section 8 (Q = ONA)	0.40	5	0.27	0.99	24.79	1.62	Valley Gutter
Section 9 (Q = ONB)	0.50	1.3	0.31	0.50	8.71	1.45	L-Curb
Section 10 (Q = OFF1D*)	3.70	13	0.4	0.50	19.30	5.13	Driveway Entrance

*Referenced from Retail Center Study

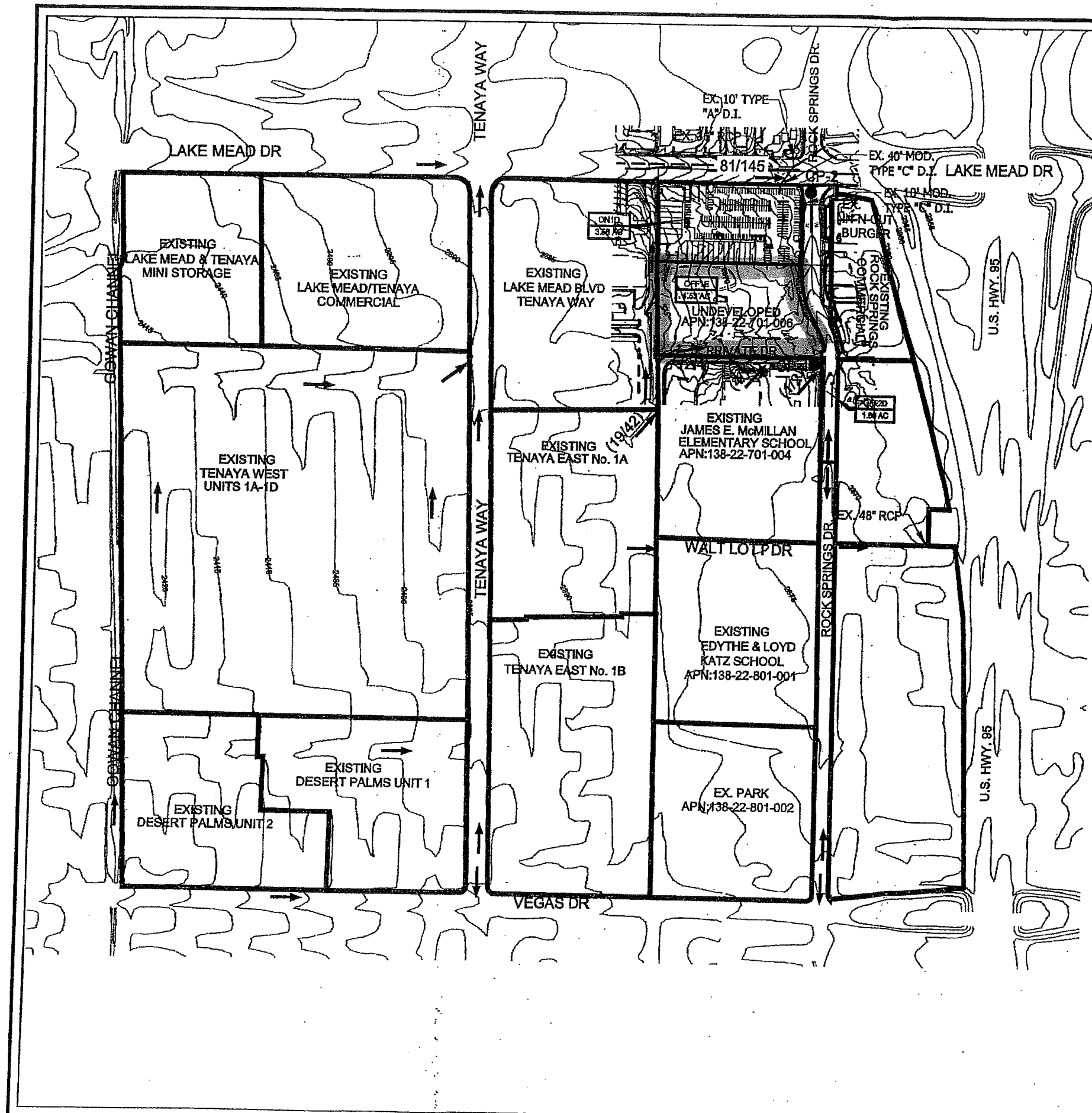


Perimeter Street Flow Summary Proposed Condition							
Section	Slope (%)	Q ₁₀₀ (cfs)	Depth (ft)	Velocity (fps)	VxD	Q ₁₀ (cfs)	Dry Lane Width (ft)
SECTION A Private Drive (Q = CP1*)	1.52	52.0	0.72	5.82	4.2	24.0	N/A
SECTION B Rock Springs Drive (60' ROW) (Q = CP2*)	1.00	71.0	0.69	4.15	2.9	32.0	N/A
SECTION C Rock Springs Drive (80' ROW) (Q = CP2*)	1.00	71.0	0.70	3.97	2.8	32.0	13.0

*Referenced from the Retail Center Study



LEGEND	
	BASIN BOUNDARY
	BASIN ID
	PRORATED BASIN BOUNDARY
	PRORATED BASIN ID
	FLOW DIRECTION
	CONCENTRATION POINT
	FLOWMASTER SECTION



SUMMARY OF HEC-1 MODEL

BASIN OR LOCATION	Q10 (CFS)	Q25 (CFS)	Q100 (CFS)
CP-1	24	35	52
CP-2	28	42	65
*AREA-C	1	1	2
*AREA-D	4	5	7
*AREA-E	2	3	4
**E1	19	28	42
OFF1E	<1	<1	2
OFF2D	3	4	6
ON1D	3	5	8

*BASINS REFERENCED DIRECTLY FROM THE APPROVED TECHNICAL DRAINAGE STUDY FOR JAMES E. McMILLAN ELEMENTARY SCHOOL
 **BASIN REFERENCED DIRECTLY FROM THE APPROVED TECHNICAL DRAINAGE STUDY TENAYA WAY EAST.

LEGEND

- ON1D SUBBASIN DESIGNATION
- 8.66 AC SUBBASIN AREA
- FLOW DIRECTION
- SUBBASIN BOUNDARY
- CP-2 CONCENTRATION POINT
- 81/145 10 YEAR/100 YEAR REFERENCED STORM FLOW FROM APPROVED TECHNICAL DRAINAGE STUDY FOR LAKE MEAD/TENAYA BY THE KEITH COMPANIES
- PARCEL BOUNDARY
- (2/4) 10/100 YEAR REFERENCED STORM FLOW FROM THE APPROVED DRAINAGE STUDIES FOR TENAYA EAST AND THE JAMES E. McMILLAN SCHOOL

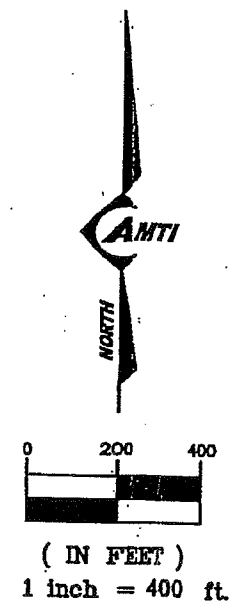


FIGURE 5

PROPOSED CONDITIONS DRAINAGE MAP

RETAIL CENTER

LAS VEGAS CLARK COUNTY NEVADA

AMTI • SUNBELT LLP

ENGINEERING • PLANNING • SURVEYING

5900 EMERALD AVENUE, SUITE A 7776 WEST SAHARA AVENUE
 LAS VEGAS, NV. 89122 LAS VEGAS, NV. 89117
 PHONE (702) 938-0650 PHONE (702) 242-9908
 FAX (702) 938-0649 FAX (702) 242-9915

SHEET

C1

1 OF 1 SHEETS



SUMMARY STREET CHARACTERISTICS

CROSS SECTION	Q100 (CFS)	V100 (FPS)	D100 (FT)	VxD
*A	36	3.9	0.71	2.8
*B	73	5.3	0.83	4.4

*REPRESENTS HALF-STREET FLOW



SUMMARY OF HEC-1 MODEL

BASIN OR LOCATION	Q10 (CFS)	Q25 (CFS)	Q100 (CFS)
CP-1	24	35	52
CP-2	32	47	71
*AREA-C	1	1	2
*AREA-D	4	5	7
*AREA-E	2	3	4
**E1	19	28	42
OFF1D	5	8	13
OFF2D	3	4	6
ON1D	3	5	8

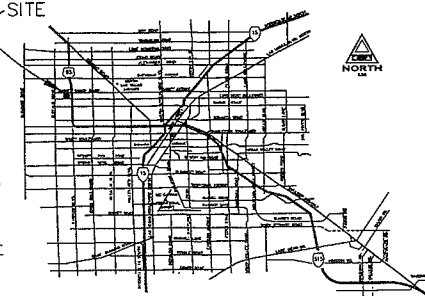
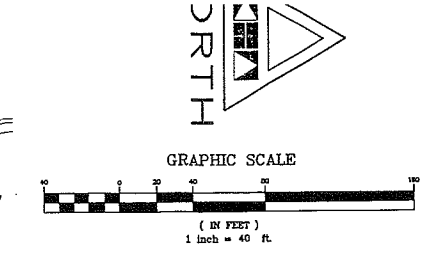
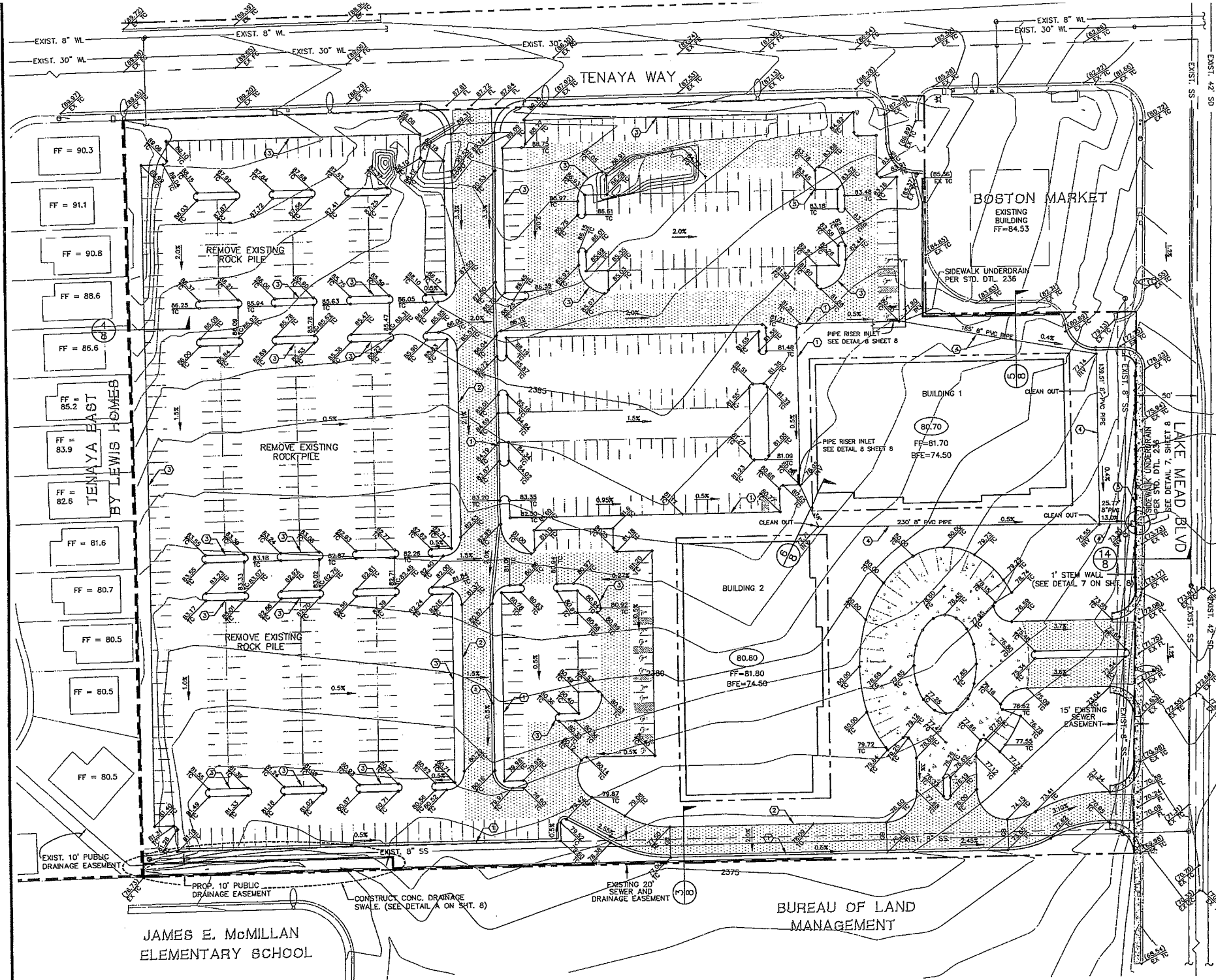
*BASINS REFERENCED DIRECTLY FROM THE APPROVED TECHNICAL DRAINAGE STUDY FOR JAMES E. McMILLAN ELEMENTARY SCHOOL

**BASIN REFERENCED DIRECTLY FROM THE APPROVED TECHNICAL DRAINAGE STUDY TENAYA WAY EAST.

- LEGEND
- ON1D SUBBASIN DESIGNATION
 - 8.65 AC SUBBASIN AREA
 - FLOW DIRECTION
 - SUBBASIN BOUNDARY
 - CP-2 CONCENTRATION POINT
 - 81/145 10 YEAR/100 YEAR REFERENCED STORM FLOW FROM APPROVED TECHNICAL DRAINAGE STUDY FOR LAKE MEAD/TENAYA BY THE KEITH COMPANIES
 - PARCEL BOUNDARY
 - ⊙ CROSS SECTION LOCATION
 - (2/4) 10/100 YEAR REFERENCED STORM FLOW FROM APPROVED DRAINAGE STUDIES FOR TENAYA EAST AND THE JAMES E. McMILLAN SCHOOL.

FIGURE 6
 ULTIMATE CONDITIONS DRAINAGE MAP
 RETAIL CENTER
 LAS VEGAS CLARK COUNTY NEVADA

AMTI • SUNBELT LLP
 ENGINEERING • PLANNING • SURVEYING
 5900 EMERALD AVENUE, SUITE A 1775 WEST SAHARA AVENUE
 LAS VEGAS, NV. 89122 LAS VEGAS, NV. 89117
 PHONE (702) 938-0850 PHONE (702) 242-8908
 FAX (702) 938-0849 FAX (702) 242-8915



LEGEND

DESCRIPTION	EXISTING	PROPOSED
INDEX CONT	---	---
INTERMEDIATE CONT	---	---
BLOCK / RET WALL	---	---
SANITARY SEWER	---	---
WATER LINE	---	---
STORM DRAIN	---	---
GRADE ELEVATION	---	---
PAD ELEVATION	---	---
GRADE SLOPE	---	---
CLEAN OUT	---	---
MANHOLE	---	---
INDOT PIPE RISOR	---	---
INLET (TYPE 3)	---	---
FIRE HYDRANT	---	---
STREET LIGHT	---	---
3" AC ON 3" TYPE II	---	---
CONCRETE	---	---
SEE ARCHITECT PLANS	---	---

CONSTRUCTION NOTES

1. CONSTRUCT L-TYPE CURB & GUTTER PER STD DWG NO. 216
2. CONSTRUCT MODIFIED L-TYPE CURB & GUTTER PER DETAIL 1.3 ON SHEET 8
3. CONSTRUCT A-TYPE CURB & GUTTER PER STD DWG NO. 216
4. INSTALL 8" PVC PIPE STORM DRAIN

NOTES

1. ADD 2300 TO ALL ELEVATIONS SHOWN ON THIS PLAN.
2. ESTIMATED EARTHWORKS QUANTITIES
CY CUT
CY FILL
• EARTHWORK QUANTITIES DO NOT REFLECT SHRINKAGE AND SUBSIDANCE
3. ALL GRADING SHALL COMPLY WITH THE GEOTECHNICAL REPORT PREPARED BY TERRACON CONSULTANTS WESTERN NO. 64965269 DATE: AUGUST 8, 1996
4. UNLESS OTHERWISE NOTED, ALL ASPHALT SHOULD BE 2" THICK ON TOP OF 3" TYPE II - SEE DETAIL 10 SHEET 8.
5. THE SITE HAS BEEN REVISED TO A ZONE "X" FLOOD PLAIN PER LOMR DATED 9/30/96.

BENCHMARK
BEING A RIVET AND PLATE IN TOP OF CURB ON LAKE MEAD BLVD. 400' WEST OF ROCK SPRINGS DRIVE, NORTH CURB LINE. CITY OF LAS VEGAS BM. # 01V00/2265
DATUM = 2368.48 FEET OR 721.914 METERS NAVD 1988

BASIS OF BEARING
NORTH 69°27'48" WEST, BEING THE NORTH LINE OF THE SOUTHEAST QUARTER (SE 1/4) OF SECTION 22, TOWNSHIP 20 SOUTH, RANGE 60 EAST, M.D. 8 & 4 M. AND ALSO BEING THE CENTERLINE OF LAKE MEAD BOULEVARD AS SHOWN BY MAP IN FILE 79, PAGE 5 OF SURVEYS FILED IN THE RECORDER'S OFFICE OF CLARK COUNTY, NEVADA.

THIS GRADING PLAN IS CERTIFIED TO CONFORM TO THE REQUIREMENTS OF THE APPROVED DRAINAGE STUDY.
Daniel J. Wonders 10/8/96
DANIEL J. WONDERS P.E. NO. 6950 DATE

SAFETY ALERT
Call Before You Overhead
1-702-593-6111

Call before you Dig
1-800-227-2600



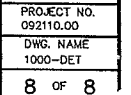
Kimley-Horn and Associates, Inc.
1050 East Flamingo Road, Suite S-210
Las Vegas, Nevada 89119 (702) 734-5666

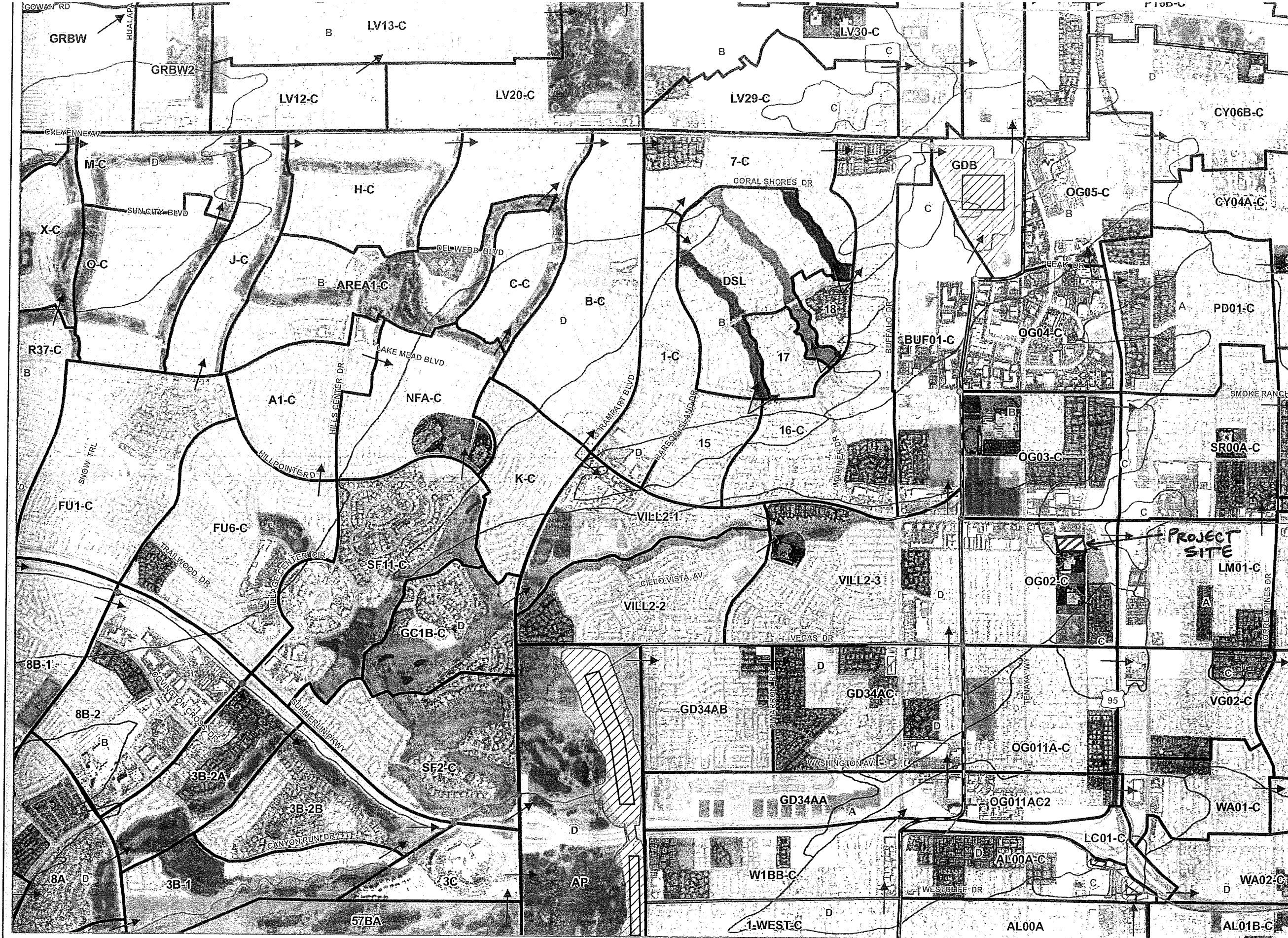
Engineer-in-Charge, Planning, and Environmental Consultants

DATE: 9-12-96

CITY CENTER WEST
GRADING PLAN

PROJECT NO. 092110.00
DWS. NAME 1000-GP
4 OF 8







2008
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

**FIGURE H-25
HYDROLOGIC SUMMARY**

LEGEND

- Ultimate Development Boundary
- Watershed Boundary
- Subbasin Boundary
- Drought Ordinance Boundary
- Flow Arrows

Flood Control Facilities

- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Category A Remove & Replace/Parallel Facilities
- Category B Remove & Replace/Parallel Facilities

Type Hydrologic Soil Groups

- A Low Runoff Potential
- B Moderately Low Runoff Potential
- C Moderately High Runoff Potential
- D High Runoff Potential/Rock Outcrops

Typical Land Use

- 1 Undeveloped Land, Open Desert
- 2 Parks, Golf Courses
- 3 Rural
- 4 / 14* Low Density Residential
- 5 / 15* Medium Density Residential
- 6 / 16* High Density Residential
- 7 / 17* Public Facility, Residential
- 8 / 18* Very High Density Residential
- 9 / 19* Commercial, Retail, Casino, High Rise Condominiums
- 10 / 20* Light Industrial
- 11 / 21* Heavy Industrial
- 12 / 22* Schools
- 13 Lakes
- * Drought Ordinance Applied

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

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	60

PBSJ
1 PB

SPRINGS

Existing Office
Service Commercial
C-1 Zoning

Existing Shopping Center
Service Commercial
C-1 Zoning

Existing Shopping Center
Service Commercial
C-1 Zoning

Undeveloped
(U(M))
8.1 to 12 du/a

Medium - up to 25.41 du/ac

Existing School
Public Facility

1 Site Plan

scale: 1" = 40'-0"

#	description
1	6'-0" HIGH CONCRETE BLOCK TRASH ENCLOSURE WITH PAIR OF WROUGHT IRON GATES WITH STAMPED METAL BACKING AND LIFT PIN LOCKLATCH W/ DECORATIVE ROOF PER CITY OF LAS VEGAS
2	2" A.C. PAVING
3	LANDSCAPED AREA
4	CONCRETE SIDEWALK, CURB & GUTTER AS PER CITY OF LAS VEGAS
5	4" CONCRETE SIDEWALK W/ROCKSALT FINISH
6	HANDICAP ACCESSIBLE AISLE
7	HANDICAP ACCESSIBLE RAMP
8	HANDICAP ACCESSIBLE ROUTE
9	15'X25' LOADING ZONE

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John David Burke, Architect

revisions	date	description
1	10/1/11	Initial Design
2	10/1/11	Final Design

John David Burke
architect

John David Burke, Architect, 3471 West Ogden Road, #201, Las Vegas, NV 89119 (702) 735-4652, jdb@jdbarchitect.com

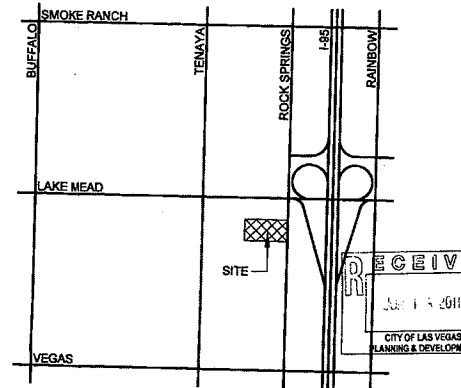
project data

EXISTING ZONING:	U(M)
REQUIRED ZONING:	C-1(SERVICE COMMERCIAL)
EXISTING USE:	UNDEVELOPED
PROPOSED USE:	SHOPPING CENTER

AREA SUMMARY/PARKING ANALYSIS (OVERALL SITE)

USE	AREA	FACTOR	PARKING REQUIRED	PARKING PROVIDED
OFFICE	20,000 S.F.			
FIRESTONE	8,500 S.F.			
FARMER BOYS	3,368 S.F.			
RESTAURANT 1	2,000 S.F.			
RESTAURANT 2	3,375 S.F.			
TOTAL:	37,243 S.F.	1/250	149	194
PROPERTY SIZE:	192,970 S.F., 4.43 AC NET			
F.A.R. (FLOOR AREA RATIO):	19.3%			
APN#:	138-22-701-009			

vicinity map

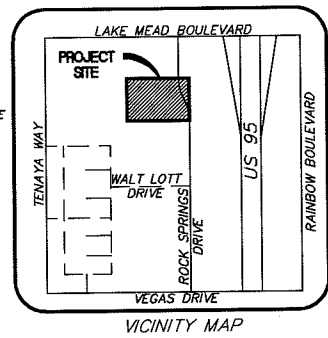
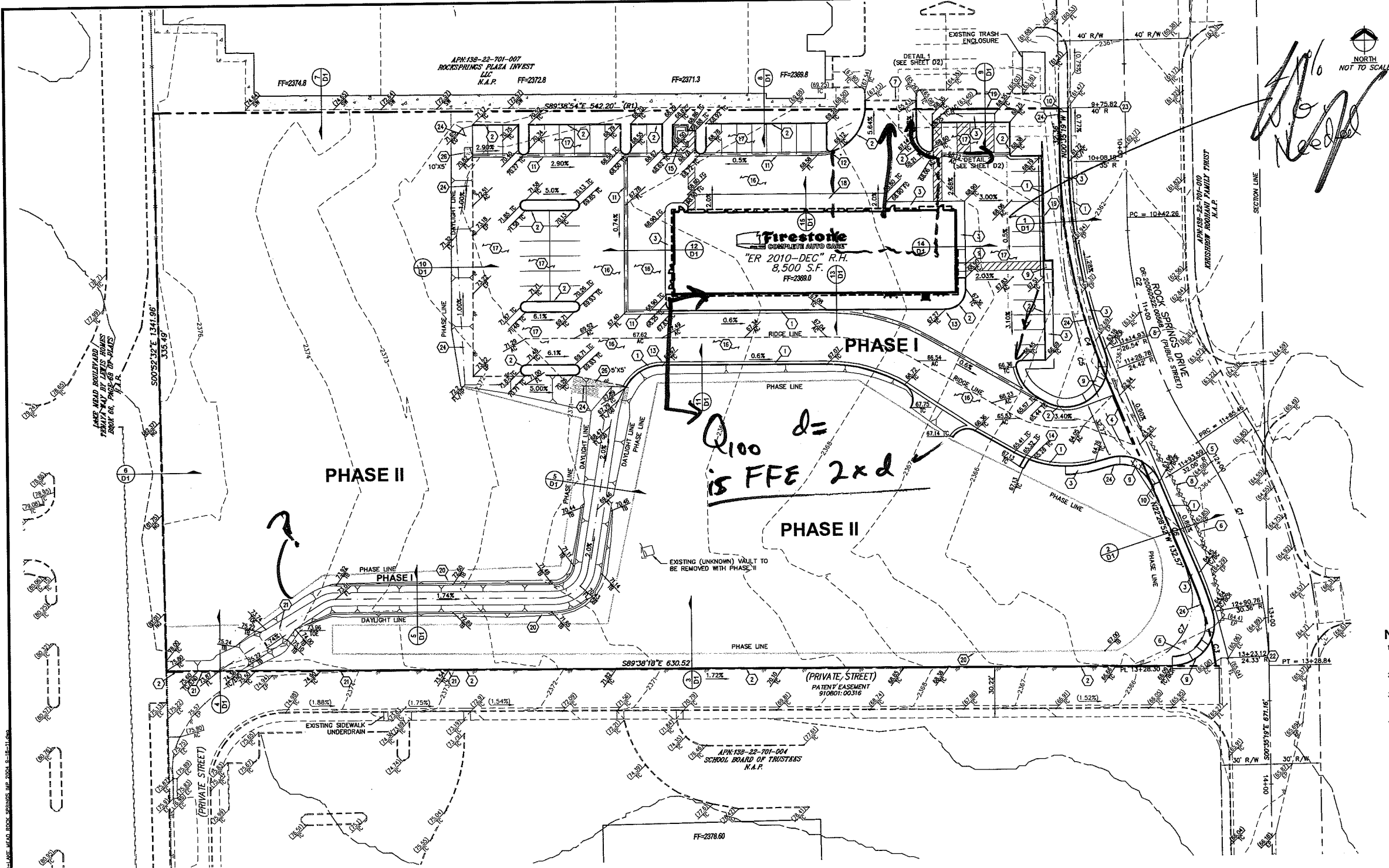


GPA-41883 ZON-41884
SUP-41885 SDR-41886

SHOPPING CENTER
Rock Springs Dr. south of Lake Mead Blvd.
for: DesertWorks
City of Las Vegas Nevada

date	proj. no.	drwn. by	chkd. by
6/13/11	2011516		

sheet no.
ST1



LEGEND

---	INDEX CONTOUR (5' INTERVAL)
---	INTERMEDIATE CONTOUR (1' INTERVAL)
---	CENTERLINE
---	RIGHT-OF-WAY
---	BOUNDARY LINE
---	ROOT RIGHT-OF-WAY
---	PROPOSED EDGE OF PAVEMENT
---	EXISTING EDGE OF PAVEMENT
---	PROPOSED FLOW LINE
---	PROPOSED CURB WALL
---	EXISTING CURB WALL
---	EXISTING CHAIN LINK FENCE
---	EXISTING LOT LINE
---	PROPOSED CURB AND GUTTER
---	EXISTING CURB AND GUTTER
---	SAWTOOTH LINE

PROPOSED		EXISTING	
00.00	TOP BACK CURB	00.00	TOP BACK CURB
00.00	FINISH GRADE	00.00	FINISH GRADE
00.00	EDGE OF PAVEMENT	00.00	EDGE OF PAVEMENT
00.00	FLOW LINE	00.00	FLOW LINE
00.00	ASPHALT CONCRETE	00.00	ASPHALT CONCRETE
00.00	TOP OF BURM	N/A	N/A
N/A	N/A	00.00	EDGE OF CONCRETE
N/A	N/A	00.00	NATURAL GRADE
N/A	N/A	00.00	SIDEWALK
00.00	HIGH POINT	N/A	N/A

- NOTES**
- CONTRACTOR TO VERIFY LOCATION AND ELEVATION OF EXISTING STRUCTURES AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.
 - IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY LOCATION AND ELEVATION OF EXISTING UTILITIES PRIOR TO CONSTRUCTION.
 - OWNER RESPONSIBLE TO PROVIDE SURVEY MONUMENTATION AS SHOWN AND TO REPLACE ALL SURVEY MONUMENTATION DAMAGED, DISTURBED, DESTROYED OR OBLISCURED DURING CONSTRUCTION.
 - ALL WALLS ARE SHOWN FOR REFERENCE ONLY. ALL WALLS SHALL BE PERMITTED BY A SEPARATE WALL PERMIT THROUGH THE CITY OF LAS VEGAS BUILDING DEPARTMENT.

CENTER LINE CURVE TABLE

CURVE	LENGTH	RADIUS	DELTA
C1	143.38'	250.00'	32°51'34"
C2	143.37'	250.00'	32°51'29"

RIGHT-OF-WAY CURVE TABLE

CURVE	LENGTH	RADIUS	DELTA
C3	55.89'	220.00'	14°33'23"
C4	130.87'	342.51'	21°53'33"

NDOT RIGHT-OF-WAY CURVE TABLE

CURVE	LENGTH	RADIUS	DELTA
C5	166.31'	280.00'	32°51'29"
C6	78.01'	210.00'	21°17'05"
C7	73.35'	40.00'	105°03'37"

BASIS OF BEARING
S 89°22'45" W - THE SOUTH LINE OF THE S.E. 1/4 OF SECTION 19, TOWNSHIP 22 SOUTH, RANGE 63 EAST, N.M.S. AS SHOWN ON PARCEL MAP RECORDED ON PAGE 81, FILE 7, IN THE OFFICE OF THE CLARK COUNTY RECORDER, NEVADA.

BENCHMARK
BENCHMARK STATION: 7C20 25MS 1997
CITY OF LAS VEGAS BENCHMARK # 00000226A
RIVET & PLATE IN TOP OF CURB @ NW CORNER OF LAKE MEAD & ROCK SPRINGS.
ELEVATION = 2362.22 FEET
N.A.V.D. 88 DATUM

FLOOD ZONE
THIS SITE IS LOCATED IN ZONE "X", AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD PLAIN, PER THE FLOOD INSURANCE RATE MAP COMMUNITY PANEL 3000022615 E. CLARK COUNTY, NEVADA DATED SEPTEMBER 27, 2002.

DISCLAIMER NOTE:
EXISTING UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL 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 IN THEIR PROPER LOCATION.

Call before you Dig
1-800-227-2600
1-702-455-7511
1-702-455-7544

DRAINAGE QUANTITIES

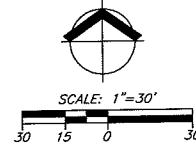
QUANTITY	ITEM
6 LF	2" FLUME
472 LF	2" VALLEY GUTTER
674 SF	RP-RAP D ₅₀ =6", 12" DEEP

- GRADING**
- CONSTRUCT "L" CURB AND GUTTER PER CCAUSD #216
 - CONSTRUCT "A" CURB AND GUTTER PER CCAUSD #219
 - CONSTRUCT 4" SIDEWALK PER CCAUSD #234
 - CONSTRUCT 6" CROSS GUTTER PER CCAUSD #229 AND #228
 - CONSTRUCT COMMERCIAL DRIVEWAY PER CCAUSD #222A AND #228
 - SAWTOOTH (CLEAN) 1' FROM EDGE OF PAVEMENT, REMOVE EXISTING ASPHALT PAVEMENT
 - SAWTOOTH (CLEAN), REMOVE CURB
 - ASPHALT PAVING FOR ROCK SPRINGS PER CCAUSD #300A AND RETEIGNED GEOTECHNICAL REPORT 3" AC OVER 4" TYPE II
 - CONSTRUCT HANDICAP RAMPS PER CCAUSD #235 CASE II A AND B - 8" UNLESS OTHERWISE NOTED
 - CONSTRUCT 3" SIDEWALK UNDER DRAIN PER DETAIL 16 SHEET D2
 - INSTALL 2" VALLEY GUTTER PER DETAIL 17 SHEET D1
 - TURN OUT VALLEY GUTTER TO ENSURE POSITIVE DRAINAGE
 - TURN OUT "L" CURB TO ENSURE POSITIVE DRAINAGE
 - INSTALL 2" "U" CHANNEL PER DETAIL 16 SHEET D1
 - TRASH ENCLOSURE (SEE ARCHITECTURAL PLANS SHEET)
 - MAIN CORRIDOR (TRUCK ACCESS) INSTALL 3" AC OVER 5" TYPE II AGGREGATE BASE PER GEOTECH REPORT PREPARED BY TERRACON JANUARY 13, 2011
 - AUTOMOBILE ROUTE / PARKING, INSTALL 2" AC OVER 4" TYPE II AGGREGATE BASE PER GEOTECH REPORT PREPARED BY TERRACON JANUARY 13, 2011
 - CONCRETE APRON, INSTALL 5" CONCRETE OVER 4" TYPE II AGGREGATE BASE PER GEOTECH REPORT PREPARED BY TERRACON JANUARY 13, 2011
 - CONSTRUCT CAR RETAINING WALL, HEIGHT PER PLAN
 - CONSTRUCT EARTH BERM AND COMPACT TO 95%
 - CONSTRUCT 6" CURB
 - BEGIN CONSTRUCTION, MEET AND MATCH EXISTING CROSS GUTTER AND ASPHALT
 - END CONSTRUCTION, MEET AND MATCH EXISTING CURB, GUTTER, AND SIDEWALK
 - CONSTRUCT EARTH SWALE TO ENSURE POSITIVE DRAINAGE
 - INSTALL RP-RAP PAD D₅₀=6", 12" DEEP (PAD SIZE PER PLAN)

APR # 138-22-701-009
4.43 ACRES

DATUM
ADD 2300.00 TO PLAN GRADES, EXCEPT FOR CONTOURS.
CONTOUR INTERVAL = 1'

GEOTECHNICAL REPORT
PROJECT No. 64105048
DATE: JANUARY 13, 2011
AS PREPARED BY: TERRACON



I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY DLY # XXXXX FOR THIS SITE ON FILE AT CITY OF LAS VEGAS FOR THIS PROJECT.

ERIC J. RIETZ, P.E. No. 16350 DATE

Firestone
COMPLETE AUTO CARE

RIETZ CONSULTING INC.
5740 SOUTH ARVILLE STREET, #206
LAS VEGAS, NEVADA 89118
PH: 702.521.3355 FX: 702.212.3963

PHASE I GRADING PLAN

ROHANI KHANROW FAMILY TRUST
9865 W. SUNSET RD # 100
LAS VEGAS, NV 89148

DATE: 8/24/2011
DRAFTER: RES
CHECKED: EJR
SCALE: NTS

PROFESSIONAL ENGINEER - STATE OF NEVADA
ERIC J. RIETZ
Exp. 12/31/11
No. 16350

SHEET C3
SHEET 3 of X SHEETS

