TECHNICAL DRAINAGE STUDY
UPDATE No. 1
Skye Canyon Phase 3 Infrastructure

City of Las Vegas, Nevada

Job No.: OLY1602.000
Date: October 2017

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:
Ninety-Five Management, LLC
11411 Southern Highlands Parkway, Suite 300
Las Vegas, Nevada 89141
Phone: 702-220-6565 • Fax: 702-220-6566

PROFESSIONAL ENGINEER - STATE OF NEVADA
LANT K. LEAVITT
Exp: 12/31/17
CIVIL
No. 18287

10/18/17

Lant Leavitt, P.E.
NV Professional Engineer No. 18287

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Skye Canyon – Phase 3 Infrastructure Date: October 18, 2017

Location of Development: a) Descriptive (Cross Streets): North/South: Grand Canyon Drive
East/West: Skye Canyon Park Drive

b) Section: 7 Township: 19 South Range: 60 East

c) APN: 125-07-210-003

Name of Owner/Developer: M F Land, LLC / Ninety-Five Management, LLC

Telephone No.: 702-220-6565 Fax No.: 702-220-6566 E-mail Address: bwilliamson@olympiacompanies.com

Address: 11411 Southern Highlands Parkway, Suite 300; Las Vegas, NV 89141

Contact Person – Name: Lant Leavitt, P.E. Telephone No.: 702-284-5300

*E-mail Address: lleavitt@shg-inc.com Fax No.: 702-284-5399

Firm: Slater Hanifan Group

Address: 5740 S. Arville Street, Suite 216; Las Vegas, NV 89118

Type of Land Development/Land Disturbance Process:

☐	Rezoning	☐	Subdivison Map	☐	Clearing and grading Only
☐	Parcel Map	☐	Planned Unit Development	☒	Other (Please specify below)
☐	Large Parcel Map	☐	Building Permit	☐	Roadway & Storm Drain Infrastructure

1. Total Owned Land Area: At Site: 37.5 Acres Being Developed/Disturbed: 3.4 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.): Roadway

5. Approximate upstream land area which drains to the subject site: 1.6 sq. miles +/-

6. Has the site drainage been evaluated in the past? ☒ Yes** ☐ No If yes, please identify documentation:

Master Drainage Study for Skye Canyon (SHG, DS4420)

Technical Drainage Study for Skye Canyon Phase 3 Infrastructure (SHG DS4796)

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

East into ephemeral wash that crosses Grand Canyon approximately 700-ft north of Skye Canyon Park Drive

8. Briefly describe your proposed schedule for the subject project: ASAP. Phase 3 is divided into 2 phases:

Roadways – Infrastructure TDS; Commercial Subdivision – Onsites TDS. Infrastructure is constructed. Onsites are in progress.

PROFESSIONAL ENGINEER - STATE OF NEVADA
LANT K. LEAVITT
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Engineer's Seal

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

*Newly Required Field

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

Revision	Date

Local Entity File No.

REFERENCE: ***SHG Job No. OLY1602.000***

STANDARD FORM 1

Updated 05/01/2008

OLY1602.000

October 17, 2017

Albert Sung, P.E.
Flood Control Project Engineer
City of Las Vegas Department of Public Works
333 N. Rancho Drive
Las Vegas, Nevada 89106

Subject: Technical Drainage Study Update No. 1 for Skye Canyon Phase 3 Infrastructure (DS 4796)

Mr. Sung:

Submitted for your review is this *Technical Drainage Study Update for Skye Canyon Phase 3 Infrastructure* (hereinafter referred to as the Update Study). The original *Technical Drainage Study for Skye Canyon Phase 3 Infrastructure* (hereinafter referred to as the Original Study) was prepared by Slater Hanifan Group (SHG) and approved on September 22, 2016. The City of Las Vegas (CLV) approval letter has been provided in Appendix B.

Since the approval of the Original Study, the infrastructure improvements have been constructed and onsite commercial development grading (DS 4812) is being performed. The original Grand Canyon Drive culvert (see Original Study Hydraulic Summary Map, Appendix B) was constructed with an interim 14' x 7' RCB entrance to convey flow from the existing wash crossing the site. This interim culvert entrance is not needed now that onsite commercial improvements are being constructed, and the height of the culvert entrance interferes with the improvements proposed by the onsite developer.

Purpose: It is proposed to remove a portion of the interim culvert entrance at Grand Canyon Drive to facilitate onsite development. Revised improvement plans (Appendix D) show the extent of removal of the interim culvert entrance. To accomplish the removal, the connection of the existing 72" RCP storm drain lateral is also proposed to be revised. The 72" RCP will transition to a 6'x5' RCB and then discharge into the existing 14'x5' RCB. The purpose of this Update Study is to present the revised culvert configuration and provide updated hydraulic modeling of the crossing.

Hydraulic Analysis

The Grand Canyon Drive culvert crossing was modeled in the original study using WSPG (Appendix B). An updated model has been prepared to model the revised geometry of the culvert crossing (Appendix A.) No changes that would affect project hydrology have been made, and the revised model retains the original flow rates. Comparison of results of the updated WSPG model are shown in the following table:

WATER SURFACE COMPARISON TABLE

FACILITY / LOCATION	INVERT	ORIGINAL WSE (ft)	UPDATED WSE (ft)	UPDATED DEPTH (ft)	FG ELEV (ft)
72" RCP					
@ TRANS to 6'x5' RCB	2749.66	n/a	2753.31	3.65	2758.2
6'x5' RCB					
@ TRANS to 72" RCP	2749.60	n/a	2752.54	2.94	2757.9
@ ANGLE PT	2749.50	n/a	2752.49	2.99	2757.4
@ EXIT TO 14'X5' RCB	2749.34	n/a	2752.40	3.06	2757.5
14'x5' RCB					
WSPG STA 1059.43	2749.34	2750.64	2750.60	1.26	2757.5
WSPG STA 1033.50	2749.24	2750.59	2750.58	1.33	2757.9
WSPG STA 1017.00	2749.19	2751.24	2751.21	2.02	2757.5
30.5'x5' RCB					
WSPG STA 1007.00	2749.09	2753.93	2753.87	4.78	2757.5

As shown in the above table, water surface elevations in the proposed facilities are generally a few hundredths of a foot less than the original facility. No adverse impacts to culvert hydraulics are introduced by the proposed revisions.

Conclusion

Through evaluation of the proposed improvements and the supporting calculations and reference materials provided, it has been concluded that this Update Study and the proposed improvements are in conformance with the original *Technical Drainage Study for Skye Canyon Phase 3 Infrastructure.*

- This project is in compliance with all the applicable drainage laws as recognized by the state of Nevada as well as all the applicable design standards stipulated in the CCRFCD "*Hydrologic Criteria and Drainage Design Manual*".

- This project is in compliance with the 2008/2013 CCRFCD "Master Plan Update," and is not directly bordered and/or traversed by any existing or future CCRFCD master planned facilities.

- The entire project site is located outside of the FEMA designated Special Flood Hazard Area (SFHA). The site and the proposed improvements are located within a FEMA flood Zone "X" (unshaded). Therefore, notification and/or coordination with FEMA will not be required for this project.

- The changes proposed in this update are in compliance with the previously approved Original Study. The proposed changes do not alter the previously established offsite flow rates.

The revised improvement plan set has been included in Appendix D to support the conclusions detailed in this study. If you have any questions or require additional information, please do not hesitate to contact us at (702) 284-5300.

Respectfully Submitted,

SLATER HANIFAN GROUP

Lant Leavitt, P.E.
Flood Control Division

pc: Mark Failla, P.E., CFM – SHG
Jerry Slater, P.E. – SHG
Jerrod Ratcliffe, P.E. – SHG

LIST OF APPENDICIES

Appendix A **Revised WSPG Model**

Appendix B **Reference Material**
- Previous Skye Canyon Phase 3 Approval Letter
- Previously Approved Skye Canyon Phase 3 Hydraulic Summary Map
- Previously Approved Skye Canyon Phase 3 Grand Canyon WSPG Model

Appendix C **Electronic Copy of Study (CD)**

Appendix D **Revised Storm Drain Plan and Profile**

APPENDIX A

Revised WSPG Model

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T1 SKYE CANYON PHASE 3 UPDATE OCT 2017                                        0
T2 STORM DRAIN SYSTEM AT GRAND CANYON LOW POINT (CULVERT CROSSING)
T3 14'W x 5'H RCB DISCHARGING TO NATURAL WASH (FUTURE CONDITION)
SO    998.0002748.980  1                          2751.970
R     999.0002748.980  1      .035                                .000
TS   1007.0002749.090  5      .042                                .000
JX   1017.0002749.190  5  2   .015   24.000         2749.240          .0         .000
WX   1017.0002749.190  3
R    1033.50 2749.24   3      .013
JX   1033.50 2749.24   3 66   .013  172.0           2749.23          45.0
R    1059.43 2749.34   3      .013
WX   1059.43 2749.34   2      .013
R    1079.43 2749.50   2      .013                                        11.0
R    1091.43 2749.60   2      .013                                        22.0
TS   1098.43 2749.66  72      .013                                        11.0
R    1112.55 2749.88  72      .013
SH   1112.55 2749.88  72                          2753.500
CD   1  1   0    .000   4.000   20.000 1.000 1.000   .00
CD   2  3   0    .000   5.000    6.000  .000  .000   .00
CD   3  3   0    .000   5.000   14.000  .000  .000   .00
CD   4  1   0    .000   5.000   20.000 3.000 3.000   .00
CD   5  1   0    .000   5.000   30.50010.00010.000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
CD  60  4   1    .000   5.000     .000  .000  .000   .00
CD  66  4   1    .000   5.500     .000  .000  .000   .00
CD  72  4   1    .000   6.000     .000  .000  .000   .00
Q           499.000   .0
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FILE: futr.WSW                          W S P G W  - EDIT LISTING - Version 14.06              Date:10- 9-2017  Time:10:36:30
                                   WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING                                PAGE    1
 CARD  SECT  CHN   NO OF  AVE PIER  HEIGHT 1  BASE    ZL    ZR   INV   Y(1)  Y(2)  Y(3)  Y(4)  Y(5)  Y(6)  Y(7)  Y(8)  Y(9)  Y(10)
 CODE   NO   TYPE PIER/PIP WIDTH    DIAMETER  WIDTH              DROP

 CD      1    1      0     .000    4.000   20.000   1.000  1.000    .00
 CD      2    3      0     .000    5.000    6.000    .000   .000    .00
 CD      3    3      0     .000    5.000   14.000    .000   .000    .00
 CD      4    1      0     .000    5.000   20.000   3.000  3.000    .00
 CD      5    1      0     .000    5.000   30.500  10.000 10.000    .00
 CD     54    4      1             4.500
 CD     60    4      1             5.000
 CD     66    4      1             5.500
 CD     72    4      1             6.000
                                                W S P G W                                                          PAGE NO   1
                          WATER SURFACE PROFILE - TITLE CARD LISTING
HEADING LINE NO 1 IS -
                            SKYE CANYON PHASE 3 UPDATE OCT 2017
HEADING LINE NO 2 IS -
                            STORM DRAIN SYSTEM AT GRAND CANYON LOW POINT (CULVERT CROSSING)
HEADING LINE NO 3 IS -
                            14'W x 5'H RCB DISCHARGING TO NATURAL WASH (FUTURE CONDITION)
                                                W S P G W                                                          PAGE NO   2
                          WATER SURFACE PROFILE - ELEMENT CARD LISTING
 ELEMENT NO   1 IS A SYSTEM OUTLET     *         *     *
                     U/S DATA   STATION    INVERT  SECT                                    W S ELEV
                                 998.000 2748.980    1                                     2751.970
 ELEMENT NO   2 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                                 999.000 2748.980    1              .035                           .000     .000      .000     0
 ELEMENT NO   3 IS A TRANSITION        *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                          RADIUS   ANGLE
                                1007.000 2749.090    5              .042                           .000     .000
 ELEMENT NO   4 IS A JUNCTION          *         *     *     *                 *                   *                 *
                     U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2  N      Q3        Q4     INVERT-3 INVERT-4  PHI 3  PHI 4
                                1017.000 2749.190    5     2     0  .015    24.000      .000  2749.240      .000    .000     .000
                                                                                                RADIUS    ANGLE
                                                                                                 .000     .000
 ELEMENT NO   5 IS A  WALL  EXIT                     *
                     U/S DATA   STATION    INVERT  SECT
                                1017.000 2749.190    3
 ELEMENT NO   6 IS A REACH             *         *     *
                     U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                                1033.500 2749.240    3              .013                           .000     .000      .000     0
 ELEMENT NO   7 IS A JUNCTION          *         *     *     *                 *                   *                 *
                     U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2  N      Q3        Q4     INVERT-3 INVERT-4  PHI 3  PHI 4
                                1033.500 2749.240    3    66     0  .013   172.000      .000  2749.230      .000  45.000     .000
                                                                                                RADIUS    ANGLE
                                                                                                 .000     .000
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THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
 ELEMENT NO   8 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               1059.430 2749.340    3              .013                          .000     .000      .000     0
 ELEMENT NO   9 IS A  WALL  EXIT                      *
                    U/S DATA   STATION    INVERT  SECT
                               1059.430 2749.340    2
                                                  W S P G W                                                          PAGE NO   3
                          WATER SURFACE PROFILE - ELEMENT CARD LISTING
 ELEMENT NO  10 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               1079.430 2749.500    2              .013                          .000     .000    11.000     0
 ELEMENT NO  11 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               1091.430 2749.600    2              .013                          .000     .000    22.000     0
 ELEMENT NO  12 IS A TRANSITION       *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS   ANGLE
                               1098.430 2749.660   72              .013                          .000     .000
 ELEMENT NO  13 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               1112.550 2749.880   72              .013                          .000     .000      .000     0
 ELEMENT NO  14 IS A SYSTEM HEADWORKS                 *                         *
                    U/S DATA   STATION    INVERT  SECT                                   W S ELEV
                               1112.550 2749.880   72                                   2753.500
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Program Package Serial Number: 1704

WATER SURFACE PROFILE LISTING Date:10- 9-2017 Time:10:36:37

SKYE CANYON PHASE 3 UPDATE OCT 2017
STORM DRAIN SYSTEM AT GRAND CANYON LOW POINT (CULVERT CROSSING)
14'W x 5'H RCB DISCHARGING TO NATURAL WASH (FUTURE CONDITION)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
998.000	2748.980	3.168	2752.148	695.00	9.47	1.39	2753.54	.00	3.17	26.34	4.000	20.000	1.00	0 .0
.887	.0000					.0133	.01	3.17	1.00	.00	.035	.00	1.00	TRAP
998.887	2748.980	3.326	2752.306	695.00	8.96	1.25	2753.55	.00	3.17	26.65	4.000	20.000	1.00	0 .0
.113	.0000					.0122	.00	3.33	.93	.00	.035	.00	1.00	TRAP
999.000	2748.980	3.335	2752.315	695.00	8.93	1.24	2753.55	.00	3.17	26.67	4.000	20.000	1.00	0 .0
TRANS STR	.0138					.0090	.07	3.34	.92		.042	.00	1.00	TRAP
1007.000	2749.090	4.779	2753.869	695.00	1.86	.05	2753.92	.00	2.01	126.07	5.000	30.500	****	0 .0
JUNCT STR	.0100					.0001	.00	4.78	.19		.015	.00	****	TRAP
1017.000	2749.190	4.682	2753.872	671.00	1.85	.05	2753.93	.00	1.98	124.13	5.000	30.500	****	0 .0
HYDRAULIC JUMP														
1017.000	2749.190	2.021	2751.211	671.00	23.72	8.74	2759.95	.00	4.15	14.00	5.000	14.000	.00	0 .0
16.500	.0030					.0245	.40	2.02	2.94	4.06	.013	.00	.00	BOX
1033.500	2749.240	1.976	2751.216	671.00	24.25	9.13	2760.35	.00	4.15	14.00	5.000	14.000	.00	0 .0
JUNCT STR	.0000					.0360	.00	1.98	3.04		.013	.00	.00	BOX
1033.500	2749.240	1.336	2750.576	499.00	26.67	11.05	2761.62	.00	3.40	14.00	5.000	14.000	.00	0 .0
3.759	.0039					.0473	.18	1.34	4.07	3.04	.013	.00	.00	BOX
1037.259	2749.254	1.326	2750.580	499.00	26.88	11.22	2761.80	.00	3.40	14.00	5.000	14.000	.00	0 .0
22.171	.0039					.0517	1.15	1.33	4.11	3.04	.013	.00	.00	BOX

Program Package Serial Number: 1704

WATER SURFACE PROFILE LISTING Date:10- 9-2017 Time:10:36:37

SKYE CANYON PHASE 3 UPDATE OCT 2017

STORM DRAIN SYSTEM AT GRAND CANYON LOW POINT (CULVERT CROSSING)

14'W x 5'H RCB DISCHARGING TO NATURAL WASH (FUTURE CONDITION)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1059.430	2749.340	1.264	2750.604	499.00	28.19	12.34	2762.95	.00	3.40	14.00	5.000	14.000	.00	0 .0
WALL EXIT														
1059.430	2749.340	3.061	2752.401	499.00	27.17	11.46	2763.86	.00	5.00	6.00	5.000	6.000	.00	0 .0
20.000	.0080					.0336	.67	3.06	2.74	5.00	.013	.00	.00	BOX
1079.430	2749.500	2.986	2752.486	499.00	27.85	12.05	2764.53	.00	5.00	6.00	5.000	6.000	.00	0 .0
12.000	.0083					.0354	.42	2.99	2.84	5.00	.013	.00	.00	BOX
1091.430	2749.600	2.941	2752.541	499.00	28.28	12.42	2764.96	.00	5.00	6.00	5.000	6.000	.00	0 .0
TRANS STR	.0085					.0328	.23	2.94	2.91		.013	.00	.00	BOX
1098.430	2749.660	3.650	2753.309	499.00	27.72	11.93	2765.24	.00	5.67	5.86	6.000	.000	.00	1 .0
14.120	.0156					.0299	.42	3.65	2.79	4.64	.013	.00	.00	PIPE
1112.550	2749.880	3.620	2753.500	499.00	27.98	12.16	2765.66	.00	5.67	5.87	6.000	.000	.00	1 .0

APPENDIX B

Reference Material

Previous Skye Canyon Phase 3 Approval Letter
Previously Approved Skye Canyon Phase 3 Hydraulic Summary Map
Previously Approved Skye Canyon Phase 3 Grand Canyon WSPG Model

TECHNICAL DRAINAGE STUDY
ADDENDUM No. 2

Skye Canyon
Phase 3 Infrastructure

City of Las Vegas, Nevada

Job No.: OLY1602.000
Date: August 2016

Prepared By:
Slater Hanifan Group, Inc.
5740 S. Arville Street, Suite 216
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Prepared For:
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11411 Southern Highlands Parkway, Suite 300
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PROFESSIONAL ENGINEER-STATE OF NEVADA
STEPHEN M. JONES
EXP. 6-30-17
CIVIL
No. 19638

8/29/2016

Steve Jones, P.E.
NV Professional Engineer No. 19638

Assisted by: Cameron Bencini, E.I.

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM	DATE: September 22, 2016
TO: **Land Development Services** Department of Building & Safety	**FROM:** Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT: Drainage Study for: **Skye Canyon – Phase 3 Infrastructure**	**COPIES TO:** Slater Hanifan Group
Cross Streets: NWC of Grand Canyon & Skye Canyon Park	MF Land / Ninety Five Management
File Number: F:\Depot\DSMemos\DS4796C.doc	Bart Anderson, P.E., DevCo
Parcel Number: 125-07-201-003	
Zoning Action: MOD-62679; SUP-63594; SUP-63597; SDR-63598; VAR-63963 & GPA-64013	
FEMA Flood Zone YES NO **X**	
Proposed Storm Drain YES **X** NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	4/28/2016	5/24/2016 & 6/28/2016	Not Approved	$400.00	442241: $400
2nd Submittal & Supplement	7/21/2016 & 7/25/2016	8/18/2016	Not Approved	$400.00	452170: $400
3rd Submittal	8/31/2016 & 9/16/2016	9/22/2016	See Comments Below	$400.00	456806: $400
			TOTAL FEES (LDDRS):	**$1,200.00**	**----**

REMARKS: Infrastructure necessary for the 38 acre Commercial Development known as Phase 3.

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

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

1. The ***Phase 3 Infrastructure*** drainage study addresses the included street improvements of *Grand Canyon Drive*, *Skye Park Drive*, *Street "D"*, a local minor detention basin, culvert crossings and storm drain systems within the perimeter streets. A separate technical drainage study will be required for the future onsite commercial developments.

2. The proposed local detention basin near concentration point "CPN" is a minor and temporary facility which will be removed by the developer upon the construction of the ultimate upstream *Regional Flood Control* facilities. This detention basin is to be privately owned and privately maintained by the master developer. The developer shall provide maintenance access to the public storm drain outfall and shall provide a public drainage easement, to be privately maintained. The public drainage easement (privately maintained) must be dedicated and recorded prior to the final approval of the improvement plans.

3. The proposed debris/sediment basins at concentration points "CPN" and "CPS" shall be privately owned and privately maintained by the master developer. These facilities are considered to be temporary in nature and the City understands that the future development and the ultimate *Regional Flood Control* facilities will require that these facilities may be removed by the developer upon the City's approval of a Technical Drainage Study that addresses the impacts of those improvements.

4. The proposed culvert crossings at the concentration points "CPN", "CPS" and "WC9" are oversized interim facilities that are not required in the ultimate condition. All drainage facilities proposed in this ***Phase 3 Infrastructure Study*** are considered interim facilities and must be maintained by the Master Developer until the upstream ultimate facilities are completed and accepted by the *City of Las Vegas. The City of Las Vegas* will not maintain the culverts during all interim conditions. Interim facilities will require an Encroachment Agreement for those facilities within public right-of-way.

5. Future development of the site will require storm drain extensions from "CPN" and "CPS" and the corresponding public drainage easements (privately maintained) traversing the *Skye Canyon Village* site. Dedication shall be provided using the mapping process or by separate legal description and must be approved by *Flood Control* prior to recordation. The easements must be recorded prior to the final approval of the subject improvement plans.

6. The provided Phase 3 Infrastructure plans only show the proposed drainage facilities. The complete improvement plans will require additional review for impacts with other needed infrastructure; i.e. sanitary sewer, water, gas, etc. Any changes to the proposed storm drain system shall require a drainage study update.

7. Since the streets network and the associated storm drain facilities will eventually be accepted by the City, the engineer must coordinate with *City of Las Vegas Streets & Sanitation Department* for their review and approval prior to the final approval of the improvement plans.

8. Structural plans for the storm drain improvements must be submitted for review. Provide a soil report, structural calculations and specifications, wet stamped structural sets and a grading plan to the *City of Las Vegas Building Department* for processing (call *Building Department* to confirm their submittal requirements). The engineer must provide a copy of *Building Department* approval of the structures to *City Flood Control Section* prior to the final acceptance of the improvement plans.

9. The project proposes to build temporary drainage facilities including; detention basins, debris/sediment basins, drainage berms/swales over the *Phase 3* site. Prior to final plan approval the developer must complete a ***Maintenance and Liability Agreement*** for the interim drainage improvements and post a minimum maintenance bond of $50,000 or 50-percent of the construction cost for the improvements, whichever is greater. The engineer must submit an estimate of the quantities for construction the facility and an exhibit that adequately shows the location and limits of the drainage facility to *City Flood Control* for approval. Once the drainage study is conditionally approved, the engineer/developer should contact the *City's Land Development Section* (702-229-6371) to begin the agreement process.

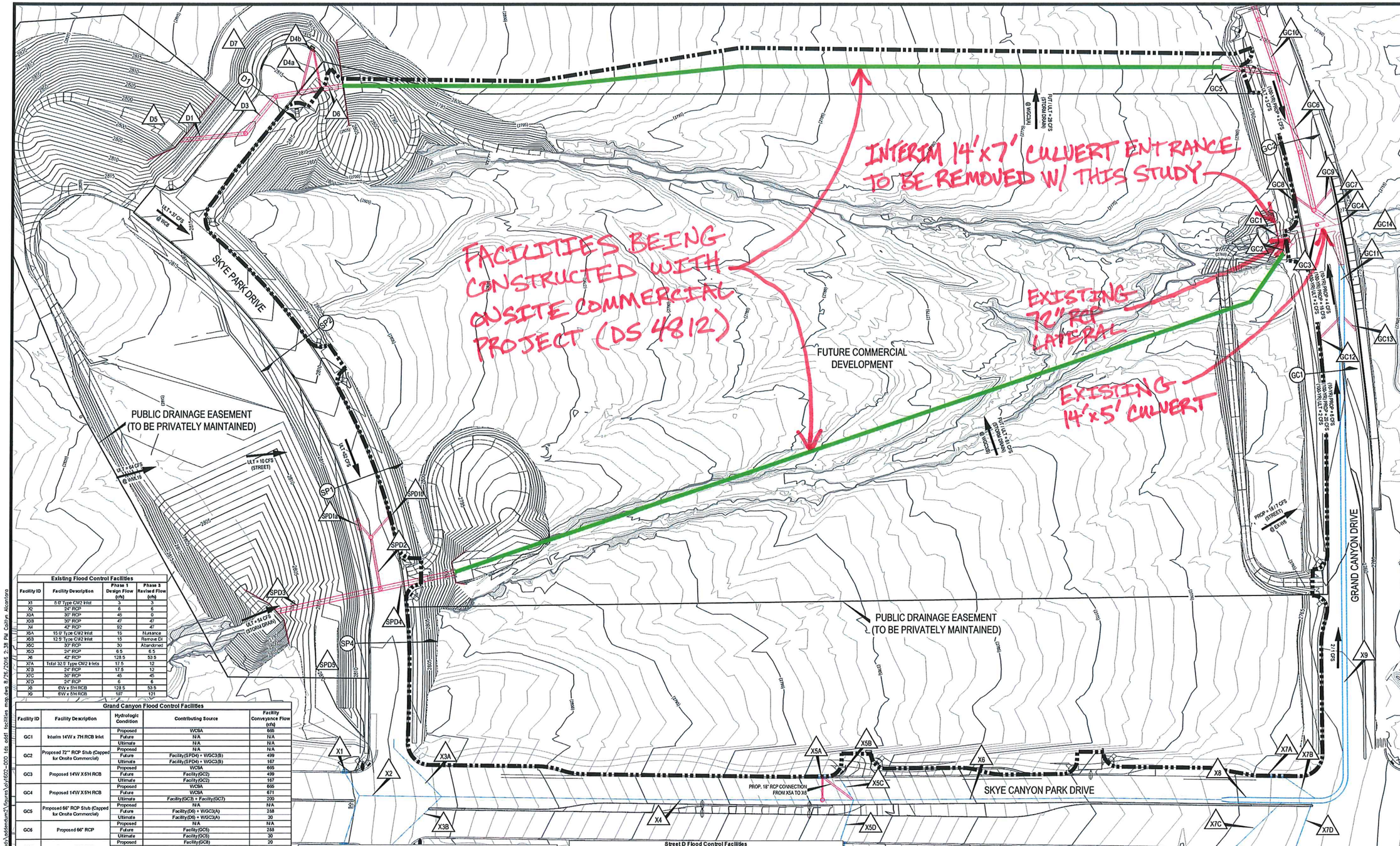
   In order for the maintenance bond to be released in the future, a drainage update/letter will be required to justify that the berms/swales are no longer necessary and can be removed.

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: T19S/R60E/07
AREA G-07



Existing Flood Control Facilities			
Facility ID	Facility Description	Phase 1 Design Flow (cfs)	Phase 3 Revised Flow (cfs)
X1	5'0' Type CM2 Inlet	3	3
X2	24" RCP	6	6
X3A	30" RCP	45	0
X3B	30" RCP	47	47
X4	42" RCP	92	47
X5A	15'0' Type CM2 Inlet	15	Nuisance
X5B	12'0' Type CM2 Inlet	15	Remove DI
X5C	30" RCP	30	Abandoned
X5D	24" RCP	6.5	6.5
X6	42" RCP	128.5	53.5
X7A	Total 32.5' Type CM2 Inlets	17.5	12
X7B	24" RCP	17.5	12
X7C	30" RCP	45	45
X7D	24" RCP	6	6
X8	6'W x 5'H RCB	128.5	53.5
X9	6'W x 5'H RCB	197	121

Grand Canyon Flood Control Facilities				
Facility ID	Facility Description	Hydrologic Condition	Contributing Source	Facility Conveyance Flow (cfs)
GC1	Interim 14'W x 7'H RCB Inlet	Proposed	WC8A	665
		Future	N/A	N/A
		Ultimate	N/A	N/A
GC2	Proposed 72"* RCP Stub (Capped for Onsite Commercial)	Proposed	N/A	N/A
		Future	Facility(SPD4) + WGC3(B)	499
		Ultimate	Facility(SPD4) + WGC3(B)	167
GC3	Proposed 14'W X 5'H RCB	Proposed	WC8A	665
		Ultimate	Facility(GC2)	167
GC4	Proposed 14'W X 5'H RCB	Proposed	WC8A	665
		Future	WC8A	671
		Ultimate	Facility(GC3) + Facility(GC7)	200
GC5	Proposed 66" RCP Stub (Capped for Onsite Commercial)	Proposed	N/A	N/A
		Future	Facility(D6) + WGC3(A)	268
		Ultimate	Facility(D6) + WGC3(A)	30
GC6	Proposed 66" RCP	Proposed	N/A	N/A
		Future	Facility(GC5)	268
		Ultimate	Facility(GC5)	30
GC7	Proposed 66" RCP	Proposed	Facility(GC8)	20
		Future	Facility(GC6) + Facility(GC8)	292
		Ultimate	Facility(GC6) + Facility(GC8)	35
GC8	Proposed 10' Type CM2 SDDI & 24" RCP SD Lateral	Proposed	Bypass(Section GC-1)	18
		Future	WGRC1A	4
		Ultimate	WGRC1A + OFF1	5
GC9	Proposed 24" RCP Stub (Capped for Others)	Proposed	N/A	N/A
		Future	N/A	N/A
		Ultimate	WGRC1A + OFF1	5
GC10	Proposed 66" RCP Stub (Capped for Others)	Proposed	N/A	N/A
		Future	N/A	N/A
		Ultimate	N/A	N/A
GC11	6'W x 5'H RCB	Proposed	Facility(GC12) + Facility(D9)	125
		Future	Facility(D9)	121
		Ultimate	Facility(D9)	121
GC12	Proposed 7.5' Type CM2 SDDI & 24" RCP SD Lateral	Proposed	10-Yr (EX/W8 + (0.5)WGRC1A)	4
		Future	N/A	Nuisance
		Ultimate	N/A	Nuisance
GC13	Proposed 24" RCP Stub	Proposed	N/A	N/A
		Future	N/A	Nuisance
		Ultimate	N/A	Nuisance
GC14	Existing Wash	Proposed	WC9	694
		Future	WC9	695
		Ultimate	WC9	317

All Contributing Sources are based on 100-yr flowrates unless noted

Skye Park Drive Flood Control Facilities				
Facility ID	Facility Description	Hydrologic Condition	Contributing Source	Facility Conveyance Flow (cfs)
SPD1a	Proposed 12' Type CM2 Inlet & 24" RCP Lateral	Proposed	(0.5)WSPD3	2.5
		Future	(0.5)WSPD3	2.5
		Ultimate	(0.5)Section(SP2) + (0.5)WSPD3) + (0.5)WMLI6[10cfs]	26
SPD1b	Proposed 12' Type CM2 Inlet & 24" RCP Lateral	Proposed	(0.5)WSPD3	2.5
		Future	(0.5)WSPD3	2.5
		Ultimate	(0.5)Section(SP2) + (0.5)WSPD3) + (0.5)WMLI6[10cfs]	26
SPD2	Proposed 30" RCP	Proposed	WSPD3	5
		Future	WSPD3	5
		Ultimate	SPD1a + SPD1b	52
SPD3	Proposed 72" RCP	Proposed	CP8	433
		Future	CP8	433
		Ultimate	WMLI6[54cfs]	54
SPD4	Proposed 72" RCP	Proposed	SPD2 + SPD3	438
		Future	SPD2 + SPD3	438
		Ultimate	SPD2 + SPD3	105
SPD5	Emergency Overflow 30' Wide Channel w/ 3' High Berm	Proposed	CP8	433
		Future	CP8	433
		Ultimate	SPD2	105

Street D Flood Control Facilities				
Facility ID	Facility Description	Hydrologic Condition	Contributing Source	Facility Conveyance Flow (cfs)
D1	Proposed 54" RCP	Proposed	DBN	258
		Future	DBN	258
		Ultimate	N/A	N/A
D3	Proposed 60" RCP	Proposed	DBN	258
		Future	DBN	258
		Ultimate	N/A	N/A
D4a	Proposed 18" RCP	Proposed	WSPD0	2
		Future	WSPD0	2
		Ultimate	WSPD0	2
D4b	Proposed 5' Type CM2 Inlet	Proposed	WSPD0	2
		Future	WSPD0	2
		Ultimate	WSPD0	2
D5	5-acre-ft Detention Basin with a 54" Outlet (Facility D1)	Proposed	CP4	361
		Future	CP4	361
		Ultimate	N/A	N/A
D6	Proposed 60" RCP	Proposed	DBN + WSPD0	260
		Future	DBN + WSPD0	260
		Ultimate	WSPD0	2
D7	Emergency Overflow 25' Wide Channel w/ 3' High Berm	Proposed	CP4	361
		Future	CP4	361
		Ultimate	N/A	N/A

Hydraulic Analyses Flow Summary						
Cross Section	Section Type	Q (cfs)	Slope (%)	Depth (ft)	Velocity (fps)	DxV
D1 Q = WSPD0	Full Street	2	3.50	0.23	3.0	0.7
SP1 Q = SP2 + WSPD3 + BASIN WMLI6[10CFS]	Full Street	52	1.90	0.59	4.9	2.9
SP2 Q = WC8	Full Street	37	1.90	0.54	4.4	2.4
SP4 Q = 0.5 (WSPD0)	Full Street	2.5	0.60	0.36	1.8	0.6
GC1 (10-Year) Q = 0.5(WGRC1A) + WGC3a[10cfs]	Half Street	4	0.50	0.41	2.1	0.8
GC1 (100-Year) Q = 0.5(WGRC1A) + WGC3a[18cfs]	Half Street	16	0.50	0.62	2.7	1.7
GC2 (10-Year) Q = 0.5(WGRC1A) + DS-1	Half Street	2	2.36	0.26	3.0	0.8
GC2 (100-Year) Q = 0.5(WGRC1A) + DS-1	Half Street	4	2.36	0.34	3.4	1.2

Max. Capacity for Grand Canyon 10-Yr Dry Lane Criteria is 5-cfs.

LEGEND

- FUTURE COMMERCIAL SITE BOUNDARY
- EXISTING DRAINAGE FACILITY
- PROPOSED DRAINAGE FACILITY
- ESTIMATED FUTURE DRAINAGE FACILITY
- FLOW DIRECTION
- ID — FLOWMASTER SECTION
- ID — FACILITY ID

N

SCALE – 1"=60' (0, 60, 120 FEET)

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

NO.	DESCRIPTION	DATE	BY	APP. DATE	APP.

NINETY-FIVE MANAGEMENT, LLC

SKYE CANYON PHASE 3 INFRASTRUCTURE DRAINAGE FACILITIES & HYDRAULIC SUMMARY MAP

DATE: JULY 2016
DRAFTER: CWB
DESIGNER: CWB
CHECKED: SMJ
PROJECT NO. OLY1602.000

EXHIBIT I
SHEET 1 OF 1

j:\oly1602-000 skye canyon phase 3\drainage\technical study\addendum2\figures\oly1602-000 fds addt facilities map.dwg 9/26/2016 2:38 PM Caitlyn Alcantara

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T1 SKYE CANYON PHASE 3
T2 STORM DRAIN SYSTEM AT GRAND CANYON LOW POINT (CULVERT CROSSING)
T3 14'W x 5'H RCB DISCHARGING TO NATURAL WASH (FUTURE CONDITION)
SO     998.0002748.980  1                          2751.970
R      999.0002749.000  1      .035                                  .000    .000 0
TS    1007.0002749.090  5      .042                                  .000
JX    1017.0002749.190  5  2   .015   24.000         2749.240          .0         .000
WX    1017.00 2749.19   3
R     1033.50 2749.24   3      .013
JX    1033.50 2749.24   3 66   .013  172.0           2749.23          45.0
R     1081.00 2749.46   3      .013
TS    1094.00 2749.50  72      .013
R     1120.00 2749.89  72      .013                                     -45.0
R     1189.00 2752.05  72      .013                                     -37.0
R     2365.00 2787.32  72      .013                                       0.0
SH    2365.00 2787.32  72
CD    1  1   0    .000   4.000   20.000 1.000 1.000   .00
CD    2  3   0    .000   5.000    6.000  .000  .000   .00
CD    3  3   0    .000   5.000   14.000  .000  .000   .00
CD    4  1   0    .000   5.000   20.000 3.000 3.000   .00
CD    5  1   0    .000   5.000   30.50010.00010.000   .00
CD   54  4   1    .000   4.500     .000  .000  .000   .00
CD   60  4   1    .000   5.000     .000  .000  .000   .00
CD   66  4   1    .000   5.500     .000  .000  .000   .00
CD   72  4   1    .000   6.000     .000  .000  .000   .00
Q           499.000   .0
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FILE: FUT.WSW W S P G W - EDIT LISTING - Version 14.06 Date: 8-29-2016 Time: 8:11:51

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	1	0	.000	4.000	20.000	1.000	1.000	.00										
CD	2	3	0	.000	5.000	6.000	.000	.000	.00										
CD	3	3	0	.000	5.000	14.000	.000	.000	.00										
CD	4	1	0	.000	5.000	20.000	3.000	3.000	.00										
CD	5	1	0	.000	5.000	30.500	10.000	10.000	.00										
CD	54	4	1		4.500														
CD	60	4	1		5.000														
CD	66	4	1		5.500														
CD	72	4	1		6.000														

W S P G W PAGE NO 1

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

SKYE CANYON PHASE 3

HEADING LINE NO 2 IS -

STORM DRAIN SYSTEM AT GRAND CANYON LOW POINT (CULVERT CROSSING)

HEADING LINE NO 3 IS -

14'W x 5'H RCB DISCHARGING TO NATURAL WASH (FUTURE CONDITION)

W S P G W PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

```
 ELEMENT NO   1 IS A SYSTEM OUTLET     *         *     *
                    U/S DATA   STATION    INVERT  SECT                                  W S ELEV
                                998.000 2748.980    1                                    2751.970
 ELEMENT NO   2 IS A REACH             *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                        RADIUS    ANGLE     ANG PT  MAN H
                                999.000 2749.000    1              .035                         .000     .000      .000     0
 ELEMENT NO   3 IS A TRANSITION        *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                        RADIUS   ANGLE
                               1007.000 2749.090    5              .042                         .000     .000
 ELEMENT NO   4 IS A JUNCTION          *         *     *     *              *                    *                *
                    U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3        Q4     INVERT-3 INVERT-4  PHI 3  PHI 4
                               1017.000 2749.190    5     2     0   .015    24.000      .000  2749.240      .000    .000     .000
                                                                                                          RADIUS    ANGLE
                                                                                                            .000     .000
 ELEMENT NO   5 IS A  WALL  EXIT                      *
                    U/S DATA   STATION    INVERT  SECT
                               1017.000 2749.190    3
 ELEMENT NO   6 IS A REACH             *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                        RADIUS    ANGLE     ANG PT  MAN H
                               1033.500 2749.240    3              .013                         .000     .000      .000     0
 ELEMENT NO   7 IS A JUNCTION          *         *     *     *              *                    *                *
                    U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3        Q4     INVERT-3 INVERT-4  PHI 3  PHI 4
                               1033.500 2749.240    3    66     0   .013   172.000      .000  2749.230      .000  45.000     .000
                                                                                                          RADIUS    ANGLE
                                                                                                            .000     .000
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
 ELEMENT NO   8 IS A REACH             *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                        RADIUS    ANGLE     ANG PT  MAN H
                               1081.000 2749.460    3              .013                         .000     .000      .000     0
 ELEMENT NO   9 IS A TRANSITION        *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                        RADIUS   ANGLE
                               1094.000 2749.500   72              .013                         .000     .000
```

WATER SURFACE PROFILE - ELEMENT CARD LISTING

```
ELEMENT NO  10 IS A REACH                *         *     *
               U/S DATA   STATION    INVERT  SECT              N                    RADIUS    ANGLE     ANG PT  MAN H
                          1120.000 2749.890   72              .013                     .000     .000   -45.000     0
ELEMENT NO  11 IS A REACH                *         *     *
               U/S DATA   STATION    INVERT  SECT              N                    RADIUS    ANGLE     ANG PT  MAN H
                          1189.000 2752.050   72              .013                     .000     .000   -37.000     0
ELEMENT NO  12 IS A REACH                *         *     *
               U/S DATA   STATION    INVERT  SECT              N                    RADIUS    ANGLE     ANG PT  MAN H
                          2365.000 2787.320   72              .013                     .000     .000      .000     0
ELEMENT NO  13 IS A SYSTEM HEADWORKS                   *                   *
               U/S DATA   STATION    INVERT  SECT                                W S ELEV
                          2365.000 2787.320   72                                   .000
```

SKYE CANYON PHASE 3
STORM DRAIN SYSTEM AT GRAND CANYON LOW POINT (CULVERT CROSSING)
14'W x 5'H RCB DISCHARGING TO NATURAL WASH (FUTURE CONDITION)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
998.000	2748.980	3.071	2752.051	695.00	9.81	1.49	2753.55	.00	3.17	26.14	4.000	20.000	1.00	0 .0
1.000	.0200					.0152	.02	3.07	1.05	2.87	.035	.00	1.00	TRAP
999.000	2749.000	3.168	2752.168	695.00	9.47	1.39	2753.56	.00	3.17	26.34	4.000	20.000	1.00	0 .0
TRANS STR	.0113					.0107	.09	3.17	1.00		.042	.00	1.00	TRAP
1007.000	2749.090	4.840	2753.930	695.00	1.82	.05	2753.98	.00	2.01	127.29	5.000	30.500	****	0 .0
JUNCT STR	.0100					.0001	.00	4.84	.19		.015	.00	****	TRAP
1017.000	2749.190	4.743	2753.933	671.00	1.82	.05	2753.98	.00	1.98	125.35	5.000	30.500	****	0 .0
HYDRAULIC JUMP														
1017.000	2749.190	2.048	2751.238	671.00	23.40	8.50	2759.74	.00	4.15	14.00	5.000	14.000	.00	0 .0
16.500	.0030					.0235	.39	2.05	2.88	4.06	.013	.00	.00	BOX
1033.500	2749.240	2.004	2751.244	671.00	23.92	8.88	2760.13	.00	4.15	14.00	5.000	14.000	.00	0 .0
JUNCT STR	.0000					.0347	.00	2.00	2.98		.013	.00	.00	BOX
1033.500	2749.240	1.352	2750.592	499.00	26.37	10.80	2761.39	.00	3.40	14.00	5.000	14.000	.00	0 .0
3.015	.0046					.0455	.14	1.35	4.00	2.86	.013	.00	.00	BOX
1036.515	2749.254	1.343	2750.597	499.00	26.53	10.93	2761.53	.00	3.40	14.00	5.000	14.000	.00	0 .0
22.907	.0046					.0496	1.14	1.34	4.03	2.86	.013	.00	.00	BOX
1059.423	2749.360	1.281	2750.641	499.00	27.83	12.02	2762.67	.00	3.40	14.00	5.000	14.000	.00	0 .0
21.577	.0046					.0576	1.24	1.28	4.33	2.86	.013	.00	.00	BOX

SKYE CANYON PHASE 3
STORM DRAIN SYSTEM AT GRAND CANYON LOW POINT (CULVERT CROSSING)
14'W x 5'H RCB DISCHARGING TO NATURAL WASH (FUTURE CONDITION)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch

1081.000	2749.460	1.221	2750.681	499.00	29.19	13.23	2763.91	.00	3.40	14.00	5.000	14.000	.00	0	.0
TRANS STR	.0031					.0453	.59	1.22	4.65		.013	.00	.00	BOX	
1094.000	2749.500	3.679	2753.179	499.00	27.46	11.71	2764.88	.00	5.67	5.84	6.000	.000	.00	1	.0
26.000	.0150					.0295	.77	3.68	2.74	4.73	.013	.00	.00	PIPE	
1120.000	2749.890	3.623	2753.513	499.00	27.96	12.14	2765.65	.00	5.67	5.87	6.000	.000	.00	1	.0
69.000	.0313					.0300	2.07	3.62	2.83	3.58	.013	.00	.00	PIPE	
1189.000	2752.050	3.635	2755.685	499.00	27.85	12.04	2767.73	.00	5.67	5.86	6.000	.000	.00	1	.0
331.528	.0300					.0297	9.83	3.64	2.81	3.63	.013	.00	.00	PIPE	
1520.528	2761.993	3.651	2765.644	499.00	27.70	11.91	2777.56	.00	5.67	5.86	6.000	.000	.00	1	.0
421.307	.0300					.0278	11.70	3.65	2.78	3.63	.013	.00	.00	PIPE	
1941.835	2774.628	3.802	2778.430	499.00	26.41	10.83	2789.26	.00	5.67	5.78	6.000	.000	.00	1	.0
153.967	.0300					.0246	3.79	3.80	2.57	3.63	.013	.00	.00	PIPE	
2095.802	2779.246	3.963	2783.209	499.00	25.18	9.85	2793.06	.00	5.67	5.68	6.000	.000	.00	1	.0
89.426	.0300					.0219	1.96	3.96	2.38	3.63	.013	.00	.00	PIPE	
2185.228	2781.928	4.135	2786.063	499.00	24.01	8.95	2795.01	.00	5.67	5.55	6.000	.000	.00	1	.0
60.059	.0300					.0195	1.17	4.14	2.19	3.63	.013	.00	.00	PIPE	
2245.287	2783.729	4.320	2788.050	499.00	22.89	8.14	2796.19	.00	5.67	5.39	6.000	.000	.00	1	.0
42.914	.0300					.0175	.75	4.32	2.01	3.63	.013	.00	.00	PIPE	

Program Package Serial Number: 1704

WATER SURFACE PROFILE LISTING Date: 8-29-2016 Time: 8:11:54

SKYE CANYON PHASE 3
STORM DRAIN SYSTEM AT GRAND CANYON LOW POINT (CULVERT CROSSING)
14'W x 5'H RCB DISCHARGING TO NATURAL WASH (FUTURE CONDITION)

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
2288.201	2785.017	4.522	2789.539	499.00	21.83	7.40	2796.94	.00	5.67	5.17	6.000	.000	.00	1 .0
31.502	.0300					.0157	.49	4.52	1.83	3.63	.013	.00	.00	PIPE
2319.703	2785.961	4.744	2790.706	499.00	20.81	6.73	2797.43	.00	5.67	4.88	6.000	.000	.00	1 .0
22.942	.0300					.0142	.33	4.74	1.65	3.63	.013	.00	.00	PIPE
2342.645	2786.649	4.993	2791.643	499.00	19.84	6.11	2797.76	.00	5.67	4.48	6.000	.000	.00	1 .0
15.521	.0300					.0130	.20	4.99	1.48	3.63	.013	.00	.00	PIPE
2358.166	2787.115	5.285	2792.400	499.00	18.92	5.56	2797.96	.00	5.67	3.89	6.000	.000	.00	1 .0

```
     -|-       -|-       -|-       -|-       -|-      -|-      -|-       -|-      -|-       -|-       -|-      -|-      -|-      |-
   6.834    .0300                                    .0122      .08     5.29     1.28     3.63     .013      .00     .00  PIPE
      |        |         |         |         |         |         |        |        |        |        |        |        |        |
2365.000 2787.320    5.670 2792.990    499.00    18.04     5.05  2798.04      .00     5.67     2.74    6.000     .000     .00    1    .0
     -|-       -|-       -|-       -|-       -|-      -|-      -|-       -|-      -|-       -|-       -|-      -|-      -|-      |-
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SKYE CANYON PHASE 3

STORM DRAIN SYSTEM AT GRAND CANYON LOW POINT (CULVERT CROSSING)

14'W x 5'H RCB DISCHARGING TO NATURAL WASH (FUTURE CONDITION)

```
 998.00   .I     W HE                                                                  .   R
1025.90   .I     W HE                                                                  .   TX
1053.80   .I   C     H                                                                 .   JX
1081.69   .IYYYCYYYYYH                                                                 .   WX
1109.59   .I   W   C H          E                                                      .   R
1137.49   .I   W   C H           E                                                     .   JX
1165.39   .I  W   C  H             E                                                   .   R
1193.29   .I  W   C  H             E                                                   .   R
1221.18   .I  W   C  H               E                                                 .   R
1249.08   .I  W   C   H                 E                                              .   TX
1276.98   . I      W   CH                 E                                            .   R
1304.88   . I       W   CH                 E                                           .   R
1332.78   .      I      W   CH                   E                                    .   R
1360.67   .                                                                            .
```

```
1388.57    .                                                                  .
1416.47    .                                                                  .
1444.37    .                                                                  .
1472.27    .                                                                  .
1500.16    .                                                                  .
1528.06    .                    I     W    H                E                .    R
1555.96    .                                                                  .
1583.86    .                                                                  .
1611.76    .                                                                  .
1639.65    .                                                                  .
1667.55    .                                                                  .
1695.45    .                                                                  .
1723.35    .                                                                  .
1751.24    .                                                                  .
1779.14    .                                                                  .
1807.04    .                                                                  .
1834.94    .                                                                  .
1862.84    .                                                                  .
1890.73    .                                                                  .
1918.63    .                                                                  .
```

```
                                                                FUT.OUT
1946.53   .                                                        I       W  CH                 E                  .    R

1974.43   .                                                                                                           .

2002.33   .                                                                                                           .

2030.22   .                                                                                                           .

2058.12   .                                                                                                           .

2086.02   .                                                                                                           .

2113.92   .                                                                I       W   H               E           .    R

2141.82   .                                                                                                           .

2169.71   .                                                                                                           .

2197.61   .                                                                        I       W  CH             E       .    R

2225.51   .                                                                                                           .

2253.41   .                                                                            I        W  CH            E    .    R

2281.31   .                                                                                                           .

2309.20   .                                                                               I        W  H           E   .    R

2337.10   .                                                                                 I         WCH          E  .    R

2365.00   .                                                                                  I         W CH         E .    R

          2748.980  2753.886  2758.792  2763.699  2768.605  2773.511  2778.417  2783.324  2788.230  2793.136  2798.042
```

N O T E S
1. GLOSSARY
   I = INVERT ELEVATION
   C = CRITICAL DEPTH
   W = WATER SURFACE ELEVATION
   S = SUPER-ELEVATION
   H = HEIGHT OF CHANNEL
   E = ENERGY GRADE LINE

X = CURVES CROSSING OVER
B = BRIDGE ENTRANCE OR EXIT
Y = WALL ENTRANCE OR EXIT

2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

APPENDIX C

Electronic Copy of Study (CD)

APPENDIX D

Revised Storm Drain Plan & Profile