CITY OF SCOTTSDALE

Drainage Reports

Abbreviated Water and Sewer Needs

Water Study

Wastewater Study

Stormwater Waiver Application

PRELIMINARY OVERALL GRADING AND DRAINAGE PLAN FOR
CAESARS REPUBLIC SCOTTSDALE
SCOTTSDALE, ARIZONA 85251

PROJECT DATA:

PROJECT ADDRESS:
SOUTHEAST CORNER OF GOLDWATER BOULEVARD AND HIGHLAND AVENUE SCOTTSDALE, ARIZONA 85251

BENCH MARK: A STONE IN HAND HOLE AT THE INTERSECTION OF CAMELBACK RD. & MILLER RD., CITY OF SCOTTSDALE BENCHMARK #4234.

ELEVATION= 1259.43' (PER C.O.S. NAVD '88 DATUM)

GROSS LOT AREA: 311,172 SF OR 7.14 ACRES

REDEVELOPED LOT AREA: 306,703 SF 7.04 ACRES

APN: PARCEL 173-37-010

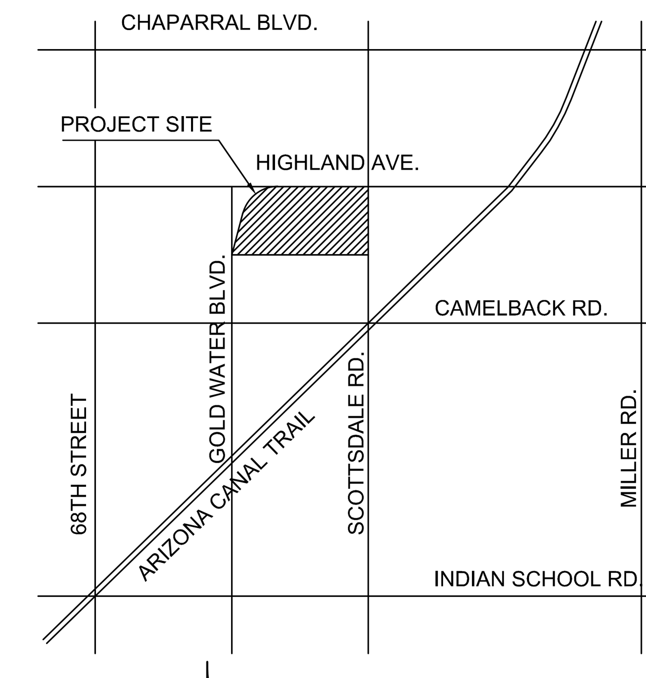
ZONING: D/DRU-2 PBD DO; 25-ZN2015 & 1-II-2016

SHEET INDEX

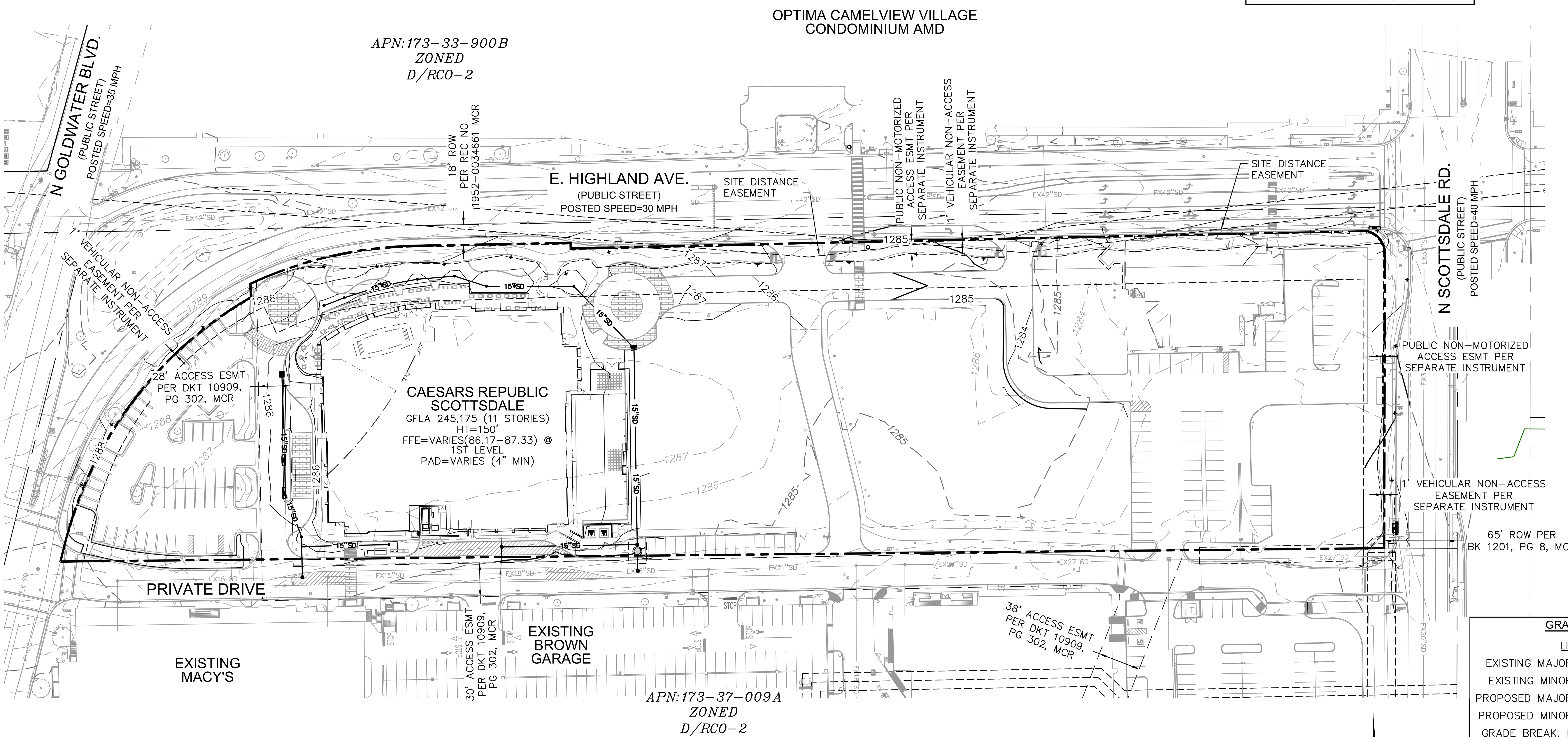
#	SHEET NAME	SHEET NO.
1	OVERALL GRADING PLAN	PC300
2	GRADING AND DRAINAGE PLAN	PC301
3	GRADING AND DRAINAGE PLAN	PC302
4	SITE CROSS SECTIONS	PC303
5	DETAILS	PC304

OWNER DEVELOPER
MACERICH
11411 NORTH TATUM BLVD
PHOENIX, AZ 85028
PHONE: (602)953-6539
FAX: (602)953-1964
ATTN: ANDY GREENWOOD

SITE ENGINEER/SURVEY/LAND ARCH
OLSSON
7250 N 16TH ST # 210
PHOENIX, AZ 85020
PHONE: (602)748-1000
FAX: (602)748-1001
CONTACT ENG: CARDELL ANDREWS
CONTACT SVY: MARK MACHEN
CONTACT LSC: AMY SCHWENNER



VICINITY MAP
NTS



GRADING LEGEND

LINES TYPES	
EXISTING MAJOR CONTOUR	1085
EXISTING MINOR CONTOUR	1086
PROPOSED MAJOR CONTOUR	1085
PROPOSED MINOR CONTOUR	1086
GRADE BREAK, RIDGE LINE, OR VALLEY/FLOW LINE	

N

0' 25' 50' 100'
SCALE IN FEET

ENGINEER PRELIMINARY GRADING NOTES:

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2. ELEVATIONS HAVE BEEN SHORTENED FOR CLARITY, REMOVING THE THOUSAND AND HUNDRED UNIT VALUES. SEE BENCHMARK ON COVER SHEET (PC001) FOR EXPANDED ELEVATION.
3. REFER TO RECOMMENDATIONS WITHIN THE GEOTECHNICAL EXPLORATION REPORT BY SPEEDIE AND ASSOCIATES, TITLED "CROMWELL HOTEL", DATED NOVEMBER 21, 2018 PROJECT NUMBER 181975SA.

DWG: F:\2018\3001-3500\018-3159\40-Design\AutoCAD\Preliminary Plans\Sheets\GNCV\1-PC300 Overall GRADING PLAN_83159.dwg USER: thutchinswoss
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www.olsson.com

Registered Professional Engineer
CERTIFICATE NO. 42633
ANDREA K. PAGE
Date Signed 5/9/19
ARIZONA, U.S.A.

Call at least two full working days before you begin excavation.
ARIZONA 811
Arizona Blue Stake, Inc.
Dial 8-1-1 or 1-800-STAKE-IT (782-5348)
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REVISIONS

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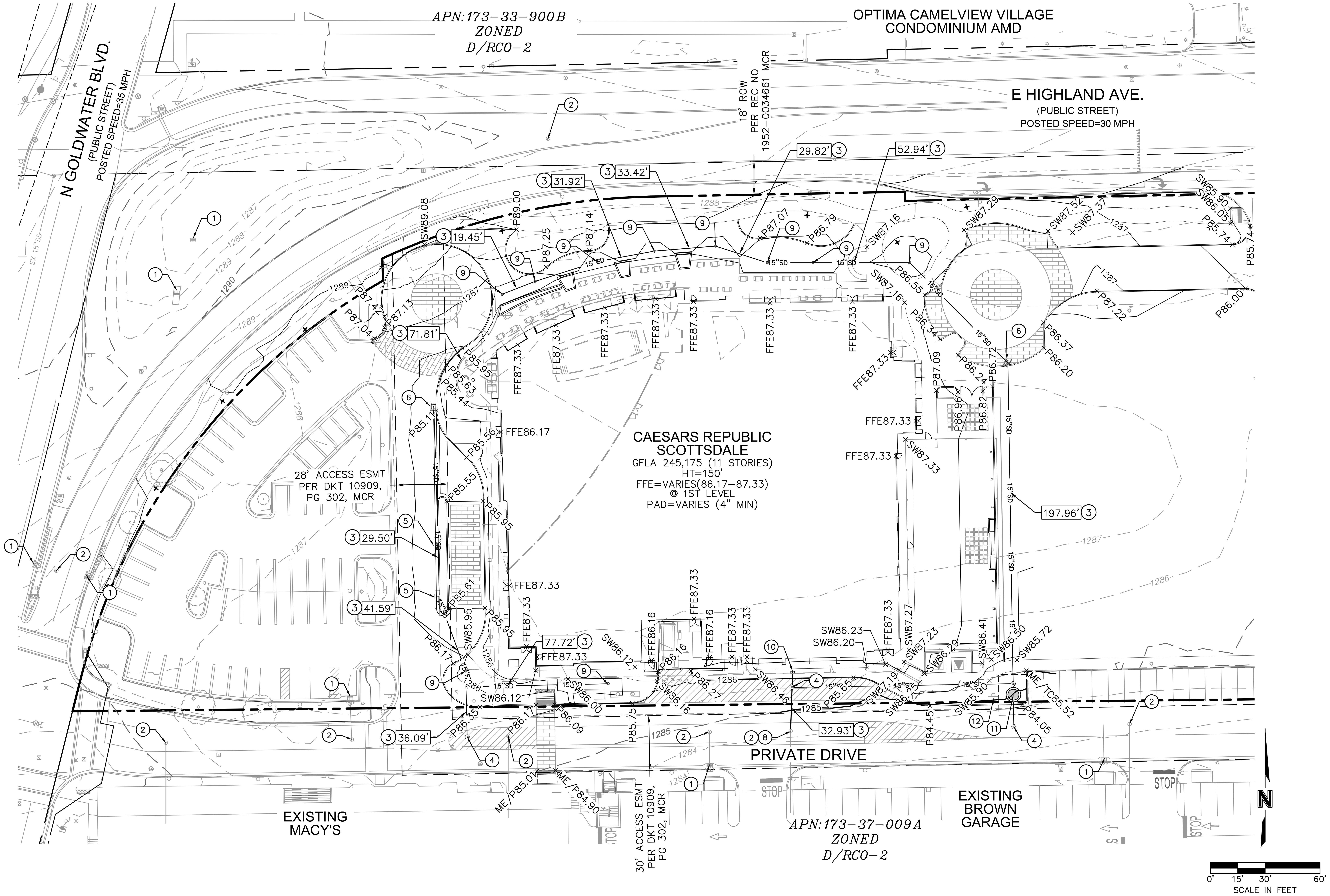
CAESARS REPUBLIC SCOTTSDALE
SCOTTSDALE, AZ 85251
2019

drawn by:	SS/THW
designed by:	SJV
checked by:	CAII
project no.:	018-3159
date:	05.09.2019

30-DR-2019
5/24/2019

PRELIMINARY GRADING AND DRAINAGE PLAN



DRAINAGE KEYNOTES

1. *EXISTING STORM DRAIN CATCH BASIN*
2. *EXISTING STORM DRAIN MANHOLE*
3. HDPE STORM PIPE ADS TYPE 'N12' OR EQUIVALENT.
4. 30" STORM DRAIN MANHOLE PER MAG STD DTL 520, MANHOLE TO READ "STORMWATER"
5. CURB INLET CATCH BASIN PER MAG STD DTL 534-1, TYPE 'E'
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12. VORTSENTRY HS SIGN, SEE DETAIL K, SHEET C304

GRADING ABBREVIATIONS

MATCH EXISTING GRADE	ME=XX.XX
FINISHED GRADE GROUND	FG=XX.XX
FLOW LINE	FL=XX.XX
HIGH POINT	HP=XX.XX
LOW POINT	LP=XX.XX
GRADE BREAK	GB=XX.XX
TOP OF CURB	TC=XX.XX
TOP OF PAVEMENT	P=XX.XX
RIM ELEVATION	RIM=XX.XX
GRATE ELEVATION	GR=XX.XX
SIDEWALK GRADE	SW=XX.XX
FINISHED FLOOR ELEVATION	FFE=XX.XX
TOP RETAINING WALL	TRW=XX.XX
BOTTOM RETAINING WALL	BRW=XX.XX
TOP SCREEN WALL	TSW=XX.XX
BOTTOM SCREEN WALL	BSW=XX.XX
TOP SLAB	TS=XX.XX

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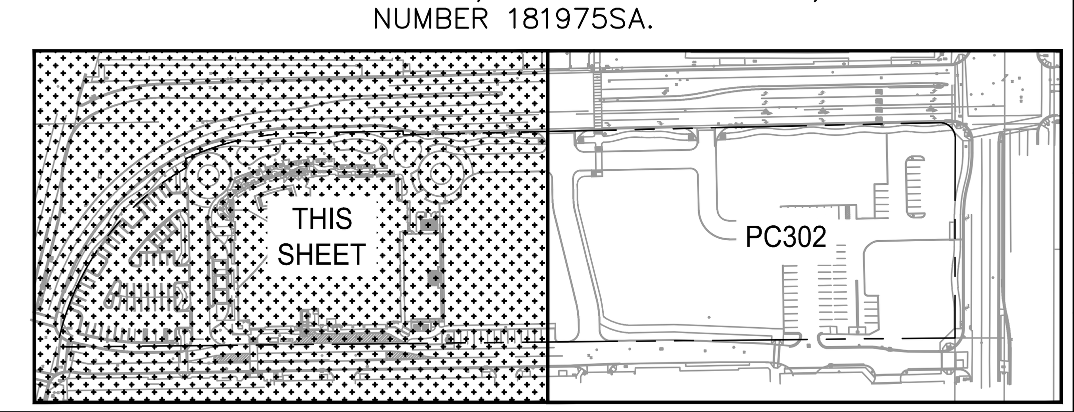

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Registered Professional Engineer, CERTIFICATE NO. 42633, ANDREA K. PAGE, (CIVIL), ARIZONA, U.S.A.

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checked by:	CAII
project no.:	018-3159
date:	05.09.2019

PC301

DWG: F:\2018\3001-3500\018-3159\40-Design\AutoCAD\Preliminary Plans\Sheets\GNCV\2-PC301 GRADING AND DRAINAGE PLAN_83159.dwg USER: thutchinswess
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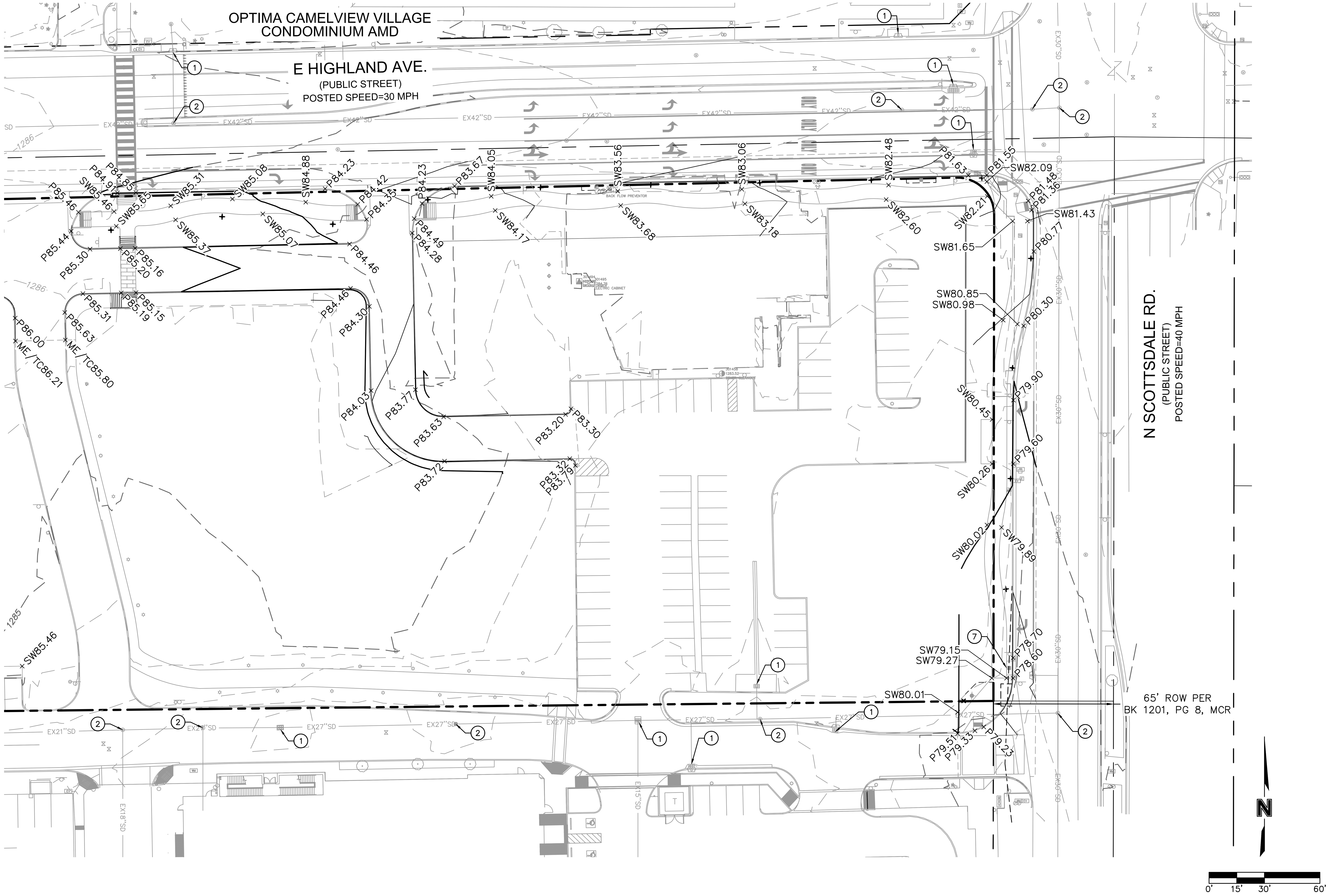
30-DR-2019
5/24/2019

PRELIMINARY GRADING AND DRAINAGE PLAN



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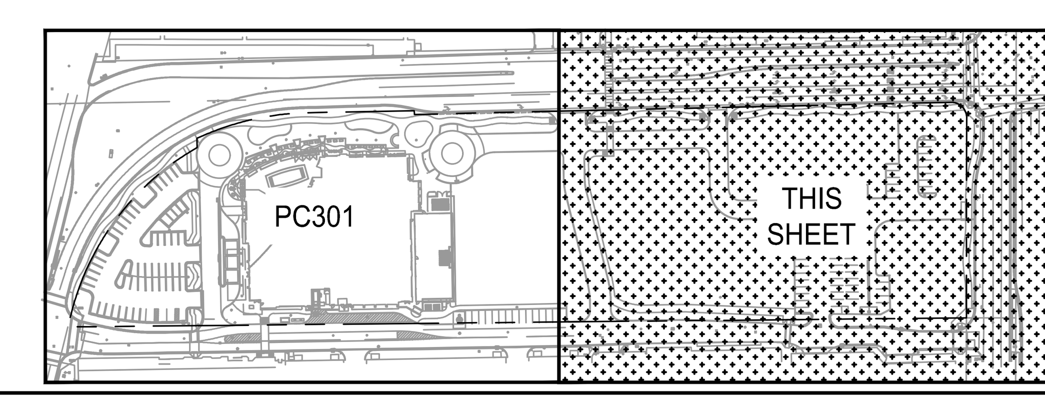

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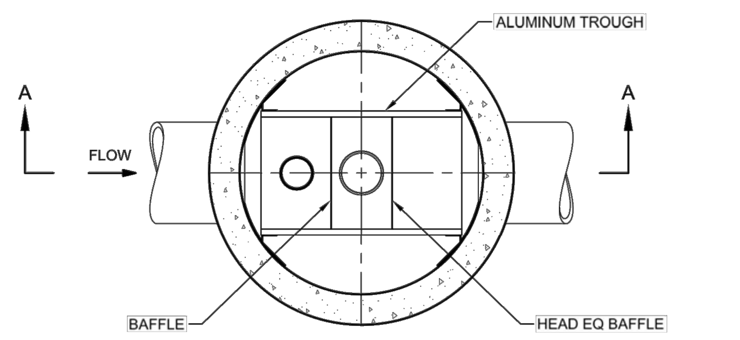
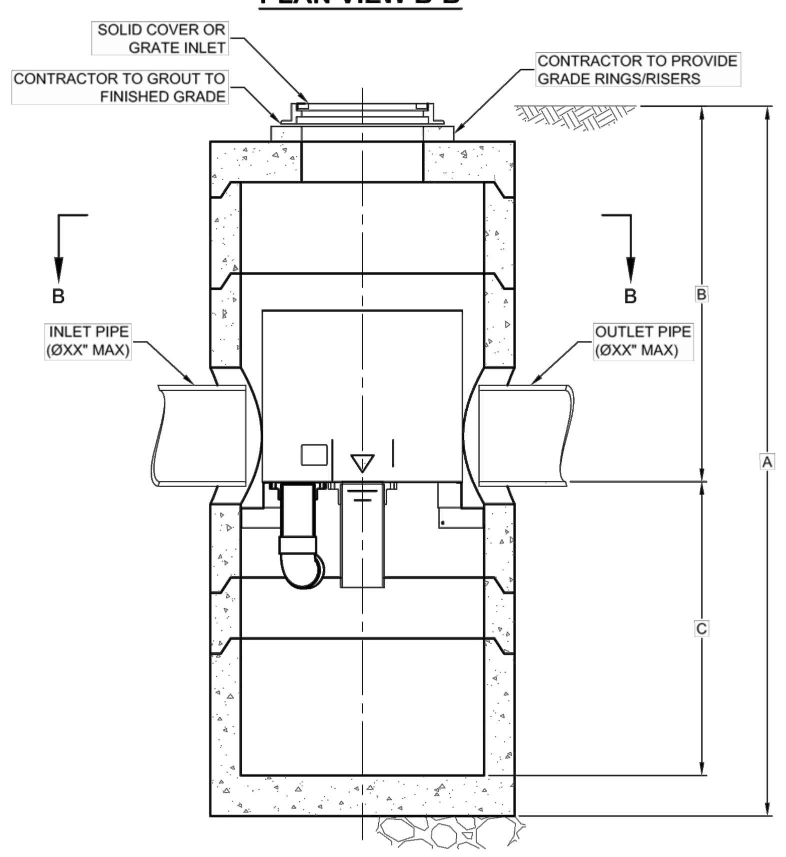
PRELIMINARY GRADING DETAILS



PLAN VIEW B-B



SECTION A-A

VortSentry

VORTSENTRY HS DESIGN NOTES

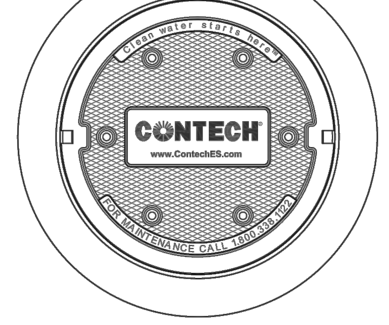
VSHS RATED TREATMENT CAPACITY IS SHOWN IN THE TABLE BELOW, OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY VARIES. CONTACT YOUR CONTECH REPRESENTATIVE FOR ADITIONAL INFORMATION.

THE STANDARD SOLID COVER CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW.

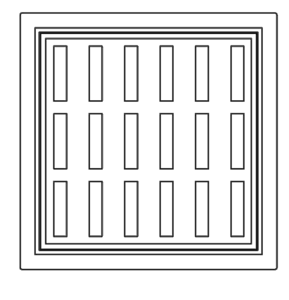
	CONFIGURATION OPTION DESCRIPTION
	GRATE INLET (NO INLET PIPE)
	GRATE INLET WITH INLET PIPE

VORTSENTRY HS GENERAL INFORMATION

Model	Manhole Diameter (ID)		Total Treatment Flow Rate		Typical Total Distance Rim to Outside Bottom A		Typical Distance Rim to Invert B		Typical Depth Below Invert (inside) C		Approximate Minimum Distance Rim to Invert		Maximum Pipe Diameter (ID)	
	FT	mm	CFS	L/S	FT	m	FT	m	FT	mm	FT	m	IN	mm
HS36	3	900	0.55	15.6	10.16	3.10	4.08	1.24	5.58	1702	3.00	0.91	18	450
HS48	4	1200	1.20	34.0	13.25	4.04	6.00	1.83	6.75	2057	4.00	1.22	24	600
HS60	5	1500	2.20	62.3	15.13	4.61	6.50	1.98	7.96	2426	4.82	1.47	30	750
HS72	6	1800	3.70	104.8	16.56	5.05	6.75	2.06	9.15	2788	5.59	1.70	36	900
HS84	7	2100	5.60	158.6	18.85	5.75	7.75	2.36	10.35	3156	5.00	1.52	42	1050
HS96	8	2400	8.10	229.4	20.87	6.36	8.50	2.59	11.54	3518	6.91	2.11	48	1200



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.



FRAME AND GRATE
(24" SQUARE)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS)	*		
PEAK FLOW RATE (CFS)	*		
RETURN PERIOD OF PEAK FLOW (YRS)	*		
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION	*		
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*
NOTES/SPECIAL REQUIREMENTS:			

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
4. VORTSENTRY HS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET AASHTO M306 LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.

INSTALLATION NOTES
1. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
2. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE VORTSENTRY HS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
3. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
4. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
5. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

VORTSENTRY HS
STANDARD DETAIL

J HYDRODYNAMIC SEPARATOR
NO SCALE

CONTECH VORTSENTRY HS

STORMWATER POLLUTANT REMOVAL DEVICE. INSPECT DEVICE TWO TIMES PER YEAR.

DEVICE LOCATED 11 FEET WEST OF THIS SIGN.

36" X 36"

SIGN TO HAVE BLACK LETTERING ON WHITE BACKGROUND

K VORTSENTRY HS SIGN
PER MUTCD NO SCALE

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Phoenix, AZ 85020-5282
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PC304

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DATE: May 09, 2019 9:36am XREFS: C_PTBLK_0183159 AMY_SCHWENNER_LA_AZ

Cardell Andrews

From: Dillon, Levi <LDillon@Scottsdaleaz.gov>
Sent: Wednesday, December 19, 2018 5:01 PM
To: Cardell Andrews
Cc: Hayes, Eliana; Cluff, Bryan
Subject: RE: Scottsdale Fashion Square- Old Days Inn Site

Thank you for the additional information Cardell. If possible, I will review this information prior to your BOD submittal. With regard to item 3: In lieu of using 100gpm and 50gpm respectively for peak combined pool/spa backwash wastewater flows, within the BOD you can include separately prepared MEP engineer sealed detailed calculations of the peak pool/spa backwash flow/frequency based on the equipment to be used (include details of equipment, filter type size, pump size, etc and complete calculation of backwash). Note that peak instantaneous backwash flow needs to be calculated, not averaged flow over the day.

Thank you, Levi

From: Cardell Andrews <candrews@olsson.com>
Sent: Monday, December 17, 2018 8:49 PM
To: Dillon, Levi <LDillon@Scottsdaleaz.gov>
Cc: Hayes, Eliana <EHayes@Scottsdaleaz.gov>; Cluff, Bryan <BCluff@Scottsdaleaz.gov>
Subject: RE: Scottsdale Fashion Square- Old Days Inn Site

Levi,

Thanks for the follow-up email. I provided a few responses in red text below.

From: Dillon, Levi <LDillon@Scottsdaleaz.gov>
Sent: Monday, December 17, 2018 2:34 PM
To: Cardell Andrews <candrews@olsson.com>
Cc: Hayes, Eliana <EHayes@Scottsdaleaz.gov>; Cluff, Bryan <BCluff@Scottsdaleaz.gov>
Subject: RE: Scottsdale Fashion Square- Old Days Inn Site

Hello Mr. Andrews,

I saw that a pre-app meeting is scheduled for today and I wanted to respond to your previous email and information provided (attached) and our previous discussion over the summer as part of the feedback for that pre-app meeting:

1. Both water and sewer basis of design reports (BODs) are required as part of the review case. Refer to DS&PM Chapters 6 and 7. Please submit electronically. **I will send these to your attention, via email, when prepared.**
2. Please update if any of the previously attached information has changed (attached here)
3. Your attached draft sewer loading calcs appear to be consistent with DS&PM; however please address the following:
    a. As discussed via phone please included 100gpm on top of peak gpm for rooms for pool backwash. Assume 50gpm for any hot tub/jacuzzi. Any resort hotel "Amenities" for this case are assumed to include the sewer loading from the restaurant(s), laundry services, and spa (except any pools/jacuzzis). **Per the Mechanical Engineer and the filter rep for the pool equipment, this pool looks to generate about 50-gpm (conservatively). Once you read through what the Mechanical Engineer provided below, please let me know if this will suffice in using for this size pool.**

30-DR-2019
5/24/2019

I caught up to a filter rep that I had been waiting on. This is a relatively small body of water…currently 1,750-cff. I assumed it may grow to 2,500-cf. It looks like we would be conservative in figuring that the backwash flow rate would be 50-gpm. Let me know if this causes any concerns. If it does, we could potentiallyo configure the system for lower backwash flow rate….but it would raise the cost of the system and complexity of maintenance.

Allen Davis P.E.
CJD Engineering | Principal
SGF 417.877.1700 | STL 314.282.2614

4. Our GIS system does not indicate that the sewer on Goldwater changes from 12" to 15" until south of the manhole located just south of the mall overpass. Field verification is necessary or very definitive as-built information. **Looks to be consistent with the information our survey crew obtained when dipping the manholes for invert elevations.**
5. Off-site analysis of sewer impacts will be required with potential necessity of off-site improvement if warranted. Perform sewer flow monitoring at the following points (or otherwise agreed upon with Water Resources:
    a. Goldwater-south: prior to entry into 15" pipe or north of Camelback
    b. Goldwater-north: north of Highland Ave
    c. Highland Ave prior to entry into Scottsdale Rd.
    d. As needed to define current flows

    The attached flow data is what we had Western Environmental Equipment prepare based on the attached manhole locations, as well as some of our initial discussions. This will be included in the BOD for sewer.
6. Be sure to perform current hydrant flow tests for use in water hydraulic modeling provided in the water BOD and to confirm max fire flow demand for each building (this is hydrant flow only and is per IFC and IBC building type). Confirm fire flow with COS fire department as needed. Note that high-rises (75ft or over) has special fire flow requirements. Refer to DS&PM Ch 6.

    Attached you will find the two flow test we will be utilizing in the BOD for the water report.

Thank you,

Levi C. Dillon, P.E. | *Sr. Water Resources Engineer*

SCOTTSDALE WATER

"Water Sustainability through Stewardship, Innovation and People"

Contact Info
Direct: (480) 312-5319
Main office: (480) 312-5685
Fax: (480) 312-5615
Mailing/Office Address
Water Resources Administration
9379 E. San Salvador Dr.
Scottsdale, AZ. 85258

Sending me an attachment over 5MB? Please use the link below:
https://securemail.scottsdaleaz.gov/dropbox/ldillon@scottsdaleaz.gov

---

From: Cardell Andrews <candrews@olssonassociates.com>
Sent: Monday, August 20, 2018 7:17 PM
To: Dillon, Levi <LDillon@Scottsdaleaz.gov>
Subject: Scottsdale Fashion Square- Old Days Inn Site

Levi,

I wanted to thank you again for taking my phone call regarding the future development at Scottsdale Fashion Square. Per our discussion, we wanted to get a better understanding of “Resort Hotel” and its inclusion of “amenities”, as it relates to the proposed Hotel Development at Scottsdale Fashion Square. For your use I attached the concept plan, which includes the floor plan for each floor. Please keep in mind the typical floor will be duplicated to get to the 260 rooms. Once you review, please let me know if you believe the 380 GPD would suffice for this use.

In addition, I also attached the QS map with the concept layout, showing how we envision sewer connections to work. I’ve included capacity calculations and demands to help you see why we made the connections the way they are shown.

Feel free to call me with any follow-up questions or concerns.

Thanks,

Cardell Andrews II | Arizona Civil Engineering Manager | Olsson Associates
7250 North 16th Street, Suite 210 | Phoenix, AZ 85020 | candrews@olssonassociates.com
TEL 602.748.1000 | DIR 480.333.4346 **PHX OFFICE** | DIR 480.333.4326 **MESA OFFICE** | CELL 520.390-9672
FAX 602.748.1001

Cardell Andrews

From: Cardell Andrews
Sent: Monday, December 17, 2018 8:49 PM
To: Dillon, Levi
Cc: Hayes, Eliana; Cluff, Bryan
Subject: RE: Scottsdale Fashion Square- Old Days Inn Site
Attachments: Highland Ave 8 inch Line Data Graph 051.pdf; Scottsdale Rd 10 inch Line Data Graph 050.pdf; Goldwater - Fashion Sq 12 inch Line Graph 054.pdf; Manhole #1 (1723).kmz; Manhole #2.kmz; Manhole #3.kmz; 18392 flow test results test 1.pdf; 18392 flow test results test 2.pdf

Levi,

Thanks for the follow-up email. I provided a few responses in red text below.

From: Dillon, Levi <LDillon@Scottsdaleaz.gov>
Sent: Monday, December 17, 2018 2:34 PM
To: Cardell Andrews <candrews@olsson.com>
Cc: Hayes, Eliana <EHayes@Scottsdaleaz.gov>; Cluff, Bryan <BCluff@Scottsdaleaz.gov>
Subject: RE: Scottsdale Fashion Square- Old Days Inn Site

Hello Mr. Andrews,

I saw that a pre-app meeting is scheduled for today and I wanted to respond to your previous email and information provided (attached) and our previous discussion over the summer as part of the feedback for that pre-app meeting:

1. Both water and sewer basis of design reports (BODs) are required as part of the review case. Refer to DS&PM Chapters 6 and 7. Please submit electronically. **I will send these to your attention, via email, when prepared.**
2. Please update if any of the previously attached information has changed (attached here)
3. Your attached draft sewer loading calcs appear to be consistent with DS&PM; however please address the following:
    a. As discussed via phone please included 100gpm on top of peak gpm for rooms for pool backwash. Assume 50gpm for any hot tub/jacuzzi. Any resort hotel "Amenities" for this case are assumed to include the sewer loading from the restaurant(s), laundry services, and spa (except any pools/jacuzzis). **Per the Mechanical Engineer and the filter rep for the pool equipment, this pool looks to generate about 50-gpm (conservatively). Once you read through what the Mechanical Engineer provided below, please let me know if this will suffice in using for this size pool.**

       I caught up to a filter rep that I had been waiting on. This is a relatively small body of water…currently 1,750-cff. I assumed it may grow to 2,500-cf. It looks like we would be conservative in figuring that the backwash flow rate would be 50-gpm. Let me know if this causes any concerns. If it does, we could potentiallyo configure the system for lower backwash flow rate….but it would raise the cost of the system and complexity of maintenance.

       Allen Davis P.E.
       CJD Engineering | Principal
       SGF 417.877.1700 | STL 314.282.2614
4. Our GIS system does not indicate that the sewer on Goldwater changes from 12" to 15" until south of the manhole located just south of the mall overpass. Field verification is necessary or very definitive as-built

information. **Looks to be consistent with the information our survey crew obtained when dipping the manholes for invert elevations.**

5. Off-site analysis of sewer impacts will be required with potential necessity of off-site improvement if warranted. Perform sewer flow monitoring at the following points (or otherwise agreed upon with Water Resources:
   a. Goldwater-south: prior to entry into 15" pipe or north of Camelback
   b. Goldwater-north: north of Highland Ave
   c. Highland Ave prior to entry into Scottsdale Rd.
   d. As needed to define current flows

   The attached flow data is what we had Western Environmental Equipment prepare based on the attached manhole locations, as well as some of our initial discussions. This will be included in the BOD for sewer.
6. Be sure to perform current hydrant flow tests for use in water hydraulic modeling provided in the water BOD and to confirm max fire flow demand for each building (this is hydrant flow only and is per IFC and IBC building type). Confirm fire flow with COS fire department as needed. Note that high-rises (75ft or over) has special fire flow requirements. Refer to DS&PM Ch 6.

   Attached you will find the two flow test we will be utilizing in the BOD for the water report.

Thank you,

Levi C. Dillon, P.E. | *Sr. Water Resources Engineer*

SCOTTSDALE WATER

"Water Sustainability through Stewardship, Innovation and People"

Contact Info
Direct: (480) 312-5319
Main office: (480) 312-5685
Fax: (480) 312-5615
Mailing/Office Address
Water Resources Administration
9379 E. San Salvador Dr.
Scottsdale, AZ. 85258

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FAX 602.748.1001

SCOTTSDALE FASHION SQUARE- LOT 2
FINAL SEWER BASIS OF DESIGN REPORT

COS CASE NO. 962-PA-2018

Prepared For:

Macerich
11411 N Tatum Boulevard
Phoenix, AZ 85253

May 2019

Olsson Project No. 018-3159

olsson

Table of Contents

I. INTRODUCTION

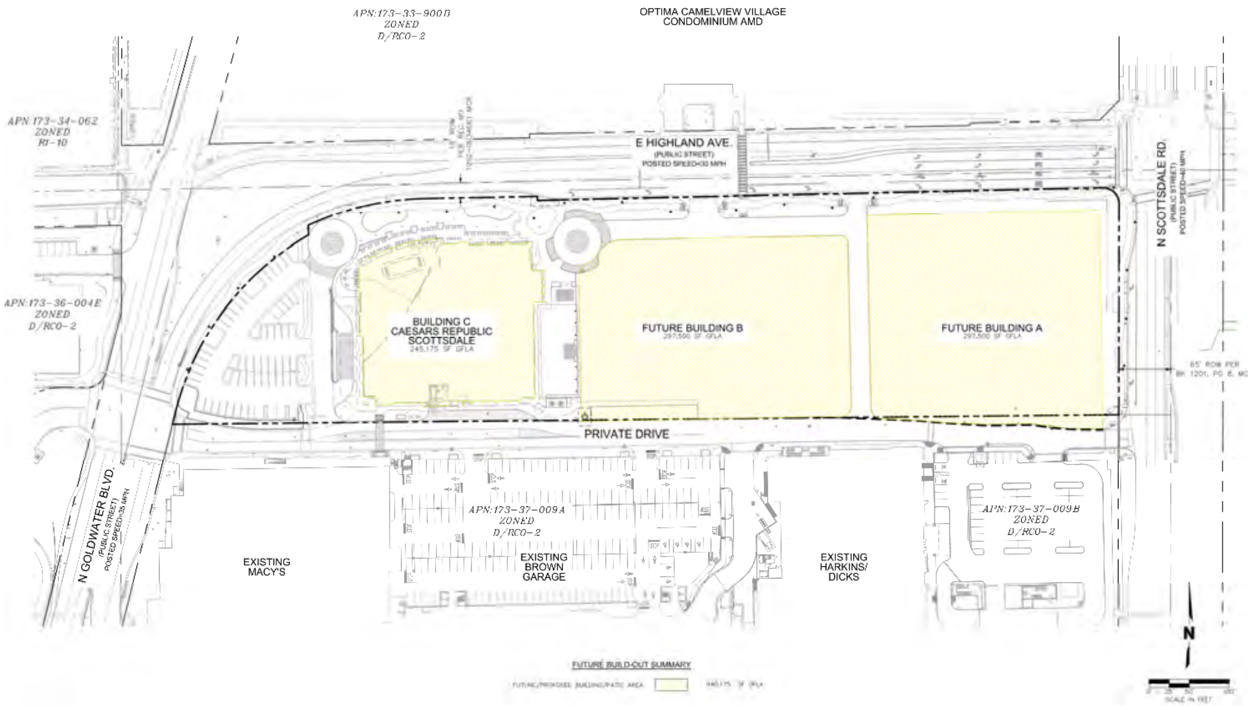
A. Purpose of Report

The purpose of this Final Sewer Basis of Design Report is to support the buildout of Scottsdale Fashion Square- Lot 2 (see Figure 1), which includes two (2) future buildings as well as the proposed Caesars Republic Scottsdale Hotel, hereinafter referred to as "The Project" (see Figure 2). The Project site is situated within the northeast quarter of Section 22, Township 2 North, Range 4 East of the Gila and Salt River Meridian, Maricopa County, Arizona, is zoned D/DRU-2 PBD DO; 25-ZN2015 & 1-II-2016, and covers approximately 7.04 acres after right-of-way dedications. More specifically The Project site is identified as Maricopa County assessor parcel number 173-37-010.

The Project will be developed in multiple Phases, including buildings, and site improvements, and when completely buildout will be a part of the greater Scottsdale Fashion Square mall. As mentioned above, this Final Sewer Basis of Design Report is to support the complete buildout of Scottsdale Fashion Square- Lot 2 (see Figure 2).

Scottsdale Fashion Square- Lot 2, Per BK 1201, PG 8

Figure 1 – Location/Parcel Map



Building A- Caesars Republic Scottsdale
Building B- Future Office and Retail
Building C- Future Office and Retail

Figure 2 – Final Buildout Exhibit

B. Contact Info

<u>Owner/Developer</u>
Macerich
11411 N Tatum Boulevard
Phoenix, AZ 85028
Phone: (602) 953-6548
Contact: Justin Long

<u>Developer</u>
HCW Hotels, LLC
2398 E Camelback Road, Suite 690
Phoenix, AZ 85016
Phone: (602) 469-1226
Contact: Rick Huffman

<u>Civil Engineer</u>
Olsson
7250 N. 16th Street, Suite210
Phoenix, AZ 85020
Phone: (602) 748-1000
Contact: Cardell Andrews

C. Existing Site Conditions

In the year 2013, the site improvements included a Days Inn Hotel, Desert Stages Theater, and Coco's Restaurant (see Figure 3). By the year 2014, all of the buildings onsite in 2013, with the exception of the Desert Stages Theater, were demolished, and remain in that state today (see Figure 4).

The Project site area is bounded to the north by Highland Avenue (public street), to the east by Scottsdale Boulevard (public street), to the south by a Private Drive (private access road), and to the west by Goldwater Boulevard (public street). All public streets are fully improved, and contain both water and sewer utilities. The City of Scottsdale Sewer Quarter Section Map, which includes The Project area, is in Appendix A.

Figure 3 – Existing Site Conditions (Year 2013)

Figure 4 – Existing Site Conditions (Year 2019)

D. Proposed Conditions

The Project will be developed in multiple Phases, including buildings, and onsite/offsite site improvements, and when completely buildout will total an additional 840,175 SF Gross Floor Lease Area, that will be a part of the greater Scottsdale Fashion Square mall (see Table 1).

Table 1— Final Buildout Breakout

Building	Use	Gross Floor Lease Area (SF)	Rooms
Future Building A1	Office	287,500	N/A
Future Building A2	Restaurant	10,000	N/A
Future Building A3	Restaurant	10,000	N/A
Future Building B	Office	287,500	N/A
Building C- Caesars Republic Scottsdale	Resort Hotel (w/ Amenities)	245,175	266
Total Buildout	**Varies**	**840,175**	**266**

The sewer system will be served by a combination of 6-inch, 8-inch, and 12-inch private gravity flow sewer lines. Manholes and cleanouts, per City of Scottsdale – 2018 Design Standards & Policies Manual have been placed at each grade and alignment change. Refer to Appendix B for the Proposed Master Sewer Layout, which outlines the proposed tie-ins, sewer sizes, flow directions, and sewer structures proposed for current and future phases.

II. General Calculations

A. Design Criteria

In accordance with City of Scottsdale—2018 Design Standards & Policies Manual all sanitary sewer lines 8-inches or smaller shall be designed and constructed to give mean velocities, when flowing full, of not less than 2.5 feet per second. This calculation is determined by using the Manning's equation, with a roughness coefficient, n, value of 0.013. In addition, the mean velocity in a pipe flowing full shall not exceed 10 feet per second.

Per City of Scottsdale—2018 Design Standards & Policies Manual, wastewater flows are calculated utilizing *Figure 7-1.2 Average Day Sewer Demand in Gallons Per Day & Peaking Factors By Land Use.* Wastewater flows for uses other than those listed in *Figure 7-1.2 Average Day Sewer Demand in Gallons Per Day & Peaking Factors By Land Use,* shall be based upon known regional or accepted engineering reference sources approved by the Water Resources Department.

Figure 7-1.2 Average Day Sewer Demand in Gallons Per Day & Peaking Factors By Land Use

Land Use	Demand (GPD)	Design Peaking Factor
Office	0.4/SF	3
Restaurant	1.2/SF	6
Resort Hotel (includes site amenities)	380/Room	4.5
****Hotel Pool Backwash**	106,500	-

**The pool backwash demand for the hotel was provided by the pool supply company, and is not a direct reflection of the City of Scottsdale—2018 Design Standards & Policies Manual, *Figure 7-1.2 Average Day Sewer Demand in Gallons Per Day & Peaking Factors By Land Use.* The breakdown for the pool backwash demand is outlined below.

Pool Backwash Demand Breakdown
15 FT x 40 FT = 600 SF Pool Area
600 x 4FT = 2,400 CF
*2,400 CF * 7.5 GAL/CF = 18,000 GAL*
18,000 GAL / 360 MINS (Industry Standard, exceeds MCESD minimum) = 50 GPM

A 50 GPM pool requires a 4.91 SF Sand Filter
50 GPM / 4.91 SF = 10.18 GPM/SF Pool Filtration Rate
4.91 SF x 15 GPM/SF = 73.65 GPM Backwash Rate

The 74 GPM Backwash Rate can be guaranteed with the use for a Variable Speed pump, which recommend for this project.

B. Design Flow

Goldwater Boulevard Sewer Connection

The proposed sewer connection at Goldwater Boulevard will been designed with a minimum slope of 1.10%, and a minimum pipe size of 12-inches. Utilizing this design criteria along with the associated use demand, the following flow capacity was calculated as follows:

Table 2. Proposed Wastewater Flow Demand

Building	Land Use	Gross Floor Lease Area (SF) Or Rooms	Demand (GPD)
Future Building B	Office	287,500 SF	287,500 SF x 0.4 GPD/SF= **115,000**
Building C- Caesars Republic Scottsdale	Resort Hotel (w/ Amenities	266 Rooms	266 Rooms x 380 GPD/Room= **101,080**
Building C- Caesars Republic Scottsdale	Resort Hotel Pool Backwash	18,000 Gallons	**106,500
Total	**-**	**-**	**322,580**

**See pool backwash demand breakdown in Figure 7-1.2 above.

Total Proposed Flow Demand= 322,580 GPD or 224.10 GPM

Table 3. Proposed Peak Wastewater Flow Demand

Building	Land Use	Demand (GPD)	Peak Demand (GPD)
Future Building B	Office	115,000	115,000 GPD x 3= **345,000**
Building C- Caesars Republic Scottsdale	Resort Hotel (w/ Amenities	101,080	101,080 GPD x 4.5= **454,860**
Building C- Caesars Republic Scottsdale	Resort Hotel Pool Backwash	**106,500	**106,500
Total	**-**	**-**	**906,360**

**Pool backwash demand shown is for peak demand. See breakdown in Figure 7-1.2 above.

Total Proposed Peak Flow Demand= 906,360 GPD or 629.50 GPM

Flow capacity per Manning's formula for uniform pipe flow:

$$Q = \frac{1.49}{n}(A)(R)^{\frac{2}{3}}(S)^{\frac{1}{2}}$$

Where:

Q = pipe capacity (cfs)
n = Manning's roughness coefficient
A = Cross sectional area (ft^2)
R = Hydraulic radius (ft.)
S = Minimum slope (ft/ft)

Capacity for a full flowing 12-inch Diameter pipe with a minimum slope of 0.011 ft/ft:

$$\frac{1.49}{0.013}\left(\frac{\pi}{4}.83^2\right)\left(\frac{.83}{4}\right)^{\frac{2}{3}}(.011)^{\frac{1}{2}} = 3.74\ cfs = 1{,}681\ gpm$$

1,681 gpm capacity > 629.50 gpm peak wastewater flow demand

Flow velocity per Manning's formula for uniform pipe flow:

$$V = \frac{1.49}{n}(R)^{\frac{2}{3}}(S)^{\frac{1}{2}}$$

Where:

V = pipe velocity (ft/s)
n = Manning's roughness coefficient
R = Hydraulic radius (ft.)
S = Minimum slope (ft/ft)

Velocity for a full flowing 12-inch diameter pipe with a minimum slope of 0.011 ft/ft:

$$\frac{1.49}{0.013}\left(\frac{.83}{4}\right)^{\frac{2}{3}}(.011)^{\frac{1}{2}} = 4.77\ ft/s$$

4.77 fps >2.5 fps, <10 fps ==> O.K. per City of Scottsdale—2018 Design Standards & Policies Manual

<u>Highland Avenue Sewer Connection</u>

The proposed sewer connection at Highland Avenue will been designed with a minimum slope of 1.10%, and a minimum pipe size of 8-inches. Utilizing this design criteria along with the associated use demand, the following flow capacity was calculated as follows:

Table 4. Proposed Wastewater Flow Demand

Building	Land Use	Gross Floor Lease Area (SF) Or Rooms	Demand (GPD)
Future Building A	Office	287,500 SF	287,500 SF x 0.4 GPD/SF= **115,000**
Future Building A	Restaurant	10,000 SF	10,000 SF x 1.2 GPD/SF= **12,000**
Total	**-**	**-**	**127,000**

Total Proposed Flow Demand= 127,000 GPD or 88.20 GPM

Table 5. Proposed Peak Wastewater Flow Demand

Building	Land Use	Demand (GPD)	Peak Demand (GPD)
Future Building A	Office	115,000	115,000 GPD x 3= **345,000**
Future Building A	Restaurant	12,000	12,000 GPD x 6= **72,000**
Total	**-**	**-**	**417,000**

Total Proposed Peak Flow Demand= 417,000 GPD or 289.60 GPM

Flow capacity per Manning's formula for uniform pipe flow:

$$Q = \frac{1.49}{n}(A)(R)^{\frac{2}{3}}(S)^{\frac{1}{2}}$$

Where:

Q = pipe capacity (cfs)
n = Manning's roughness coefficient
A = Cross sectional area (ft^2)
R = Hydraulic radius (ft.)
S = Minimum slope (ft/ft)

Capacity for a full flowing 8-inch Diameter pipe with a minimum slope of 0.011 ft/ft:

$$\frac{1.49}{0.013}\left(\frac{\pi}{4}.83^2\right)\left(\frac{.83}{4}\right)^{\frac{2}{3}}(.011)^{\frac{1}{2}} = 3.74\ cfs = 570\ gpm$$

570 gpm capacity > 289.60 gpm peak wastewater flow demand

Flow velocity per Manning's formula for uniform pipe flow:

$$V = \frac{1.49}{n}(R)^{\frac{2}{3}}(S)^{\frac{1}{2}}$$

Where:

V = pipe velocity (ft/s)
n = Manning's roughness coefficient
R = Hydraulic radius (ft.)
S = Minimum slope (ft/ft)

Velocity for a full flowing 8-inch diameter pipe with a minimum slope of 0.011 ft/ft:

$$\frac{1.49}{0.013}\left(\frac{.83}{4}\right)^{\frac{2}{3}}(.011)^{\frac{1}{2}} = 3.64\ ft/s$$

3.64 fps >2.5 fps, <10 fps ==> O.K. per City of Scottsdale—2018 Design Standards & Policies Manual

Scottsdale Road Sewer Connection

The proposed sewer connection at Scottsdale Road will been designed with a minimum slope of 1.10%, and a minimum pipe size of 6-inches. Utilizing this design criteria along with the associated use demand, the following flow capacity was calculated as follows:

Table 6. Proposed Wastewater Flow Demand

Building	Land Use	Gross Floor Lease Area (SF) Or Rooms	Demand (GPD)
Future Building A	Restaurant	10,000 SF	10,000 SF x 1.2 GPD/SF= **12,000**
Total	**-**	**-**	**12,000**

Total Proposed Flow Demand= 12,000 GPD or 8.3 GPM

Table 7. Proposed Peak Wastewater Flow Demand			
Building	**Land Use**	**Demand (GPD)**	**Peak Demand (GPD)**
Future Building A	Restaurant	12,000	12,000 GPD x 6= **72,000**
Total	**-**	**-**	**72,000**

Total Proposed Peak Flow Demand= 72,000 GPD or 50.00 GPM

Flow capacity per Manning's formula for uniform pipe flow:

$$Q = \frac{1.49}{n}(A)(R)^{\frac{2}{3}}(S)^{\frac{1}{2}}$$

Where:

Q = pipe capacity (cfs)
n = Manning's roughness coefficient
A = Cross sectional area (ft^2)
R = Hydraulic radius (ft.)
S = Minimum slope (ft/ft)

Capacity for a full flowing 6-inch Diameter pipe with a minimum slope of 0.011 ft/ft:

$$\frac{1.49}{0.013}\left(\frac{\pi}{4}.83^2\right)\left(\frac{.83}{4}\right)^{\frac{2}{3}}(.011)^{\frac{1}{2}} = 0.59\ cfs = 265\ gpm$$

265 gpm capacity > 50 gpm peak wastewater flow demand

Flow velocity per Manning's formula for uniform pipe flow:

$$V = \frac{1.49}{n}(R)^{\frac{2}{3}}(S)^{\frac{1}{2}}$$

Where:

V = pipe velocity (ft/s)
n = Manning's roughness coefficient
R = Hydraulic radius (ft.)
S = Minimum slope (ft/ft)

Velocity for a full flowing 6-inch diameter pipe with a minimum slope of 0.011 ft/ft:

$$\frac{1.49}{0.013}\left(\frac{.83}{4}\right)^{\frac{2}{3}}(.011)^{\frac{1}{2}} = 3.01\ ft/s$$

3.01 fps >2.5 fps, <10 fps ==> O.K. per City of Scottsdale—2018 Design Standards & Policies Manual

III. Conclusions

A. Summary

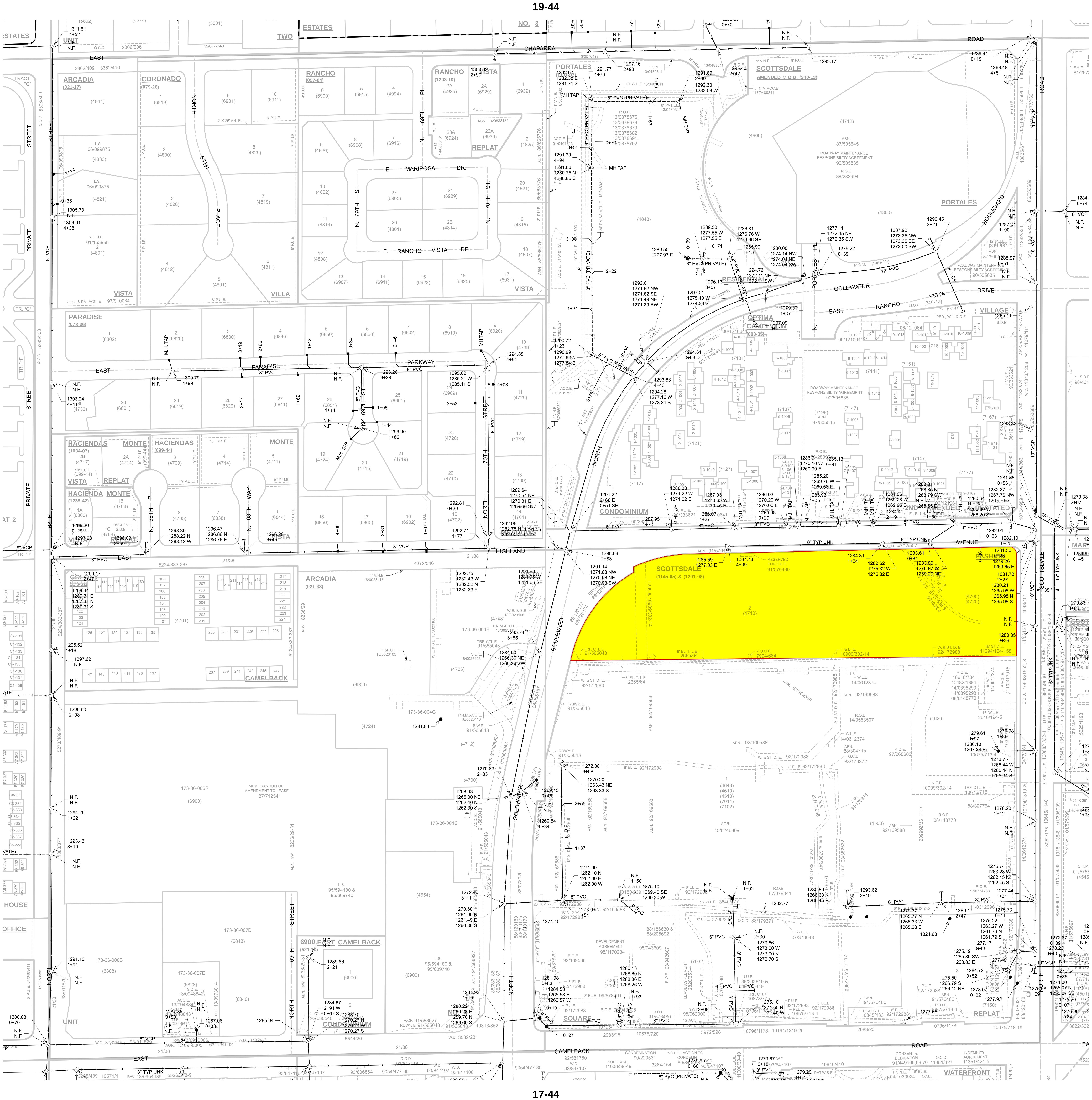
This Final Sewer Basis of Design Report was prepared in accordance with City of Scottsdale—2018 Design Standards & Policies Manual. For The Project, sewer design described within this Final Sewer Basis of Design Report was designed to collect and convey the projects wastewater under Average Day and Peak flow conditions, while the proposed sewer lines provided have sufficient capacity and acceptable velocities using Manning's equation for uniform pipe flow.

B. Effect of Development on Adjacent Properties

Based upon the Flow Data Results, taken over a 9-day period including 2 weekends (Appendix D), the additional demand creates no known capacity issues on the existing conditions downstream. In addition, the average required daily flows do not exceed the capacity of the minimum proposed pipe.

APPENDIX "A"

(City of Scottsdale Sewer Quarter Section Map (18-44))



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- THE SECTION LINE BEARING AND DISTANCES ARE BASED ON THE CITY OF SCOTTSDALE GPS SURVEY OF SEPTEMBER, 1991. BEARINGS ARE NAD 83 GRID AND DISTANCES ARE FLATTENED TO GROUND. WHERE NO CORNER WAS FOUND THE DIMENSIONS ARE GIVEN TO CALCULATED SECTION CORNERS AND ARE NOTED AS 'CALCULATED' ON THE MAP.

LEGEND:

- Cleanout
- Lift Station
- Manhole
- Non-GPS Point
- Plug
- Sewer Service Point
- Sewer Tap Point
- Sewer Valve
- Treatment Plant
- Sewer Main - Gravity
- Sewer Main - Force
- Sewer Main - Private

SEWER

QUARTER SECTION MAP

18-44

NE 1/4 SEC. 22 T2N R4E

SCOTTSDALE GEOGRAPHIC INFORMATION SYSTEMS
3629 North Drinkwater Boulevard
Scottsdale, Arizona 85251

N O T I C E

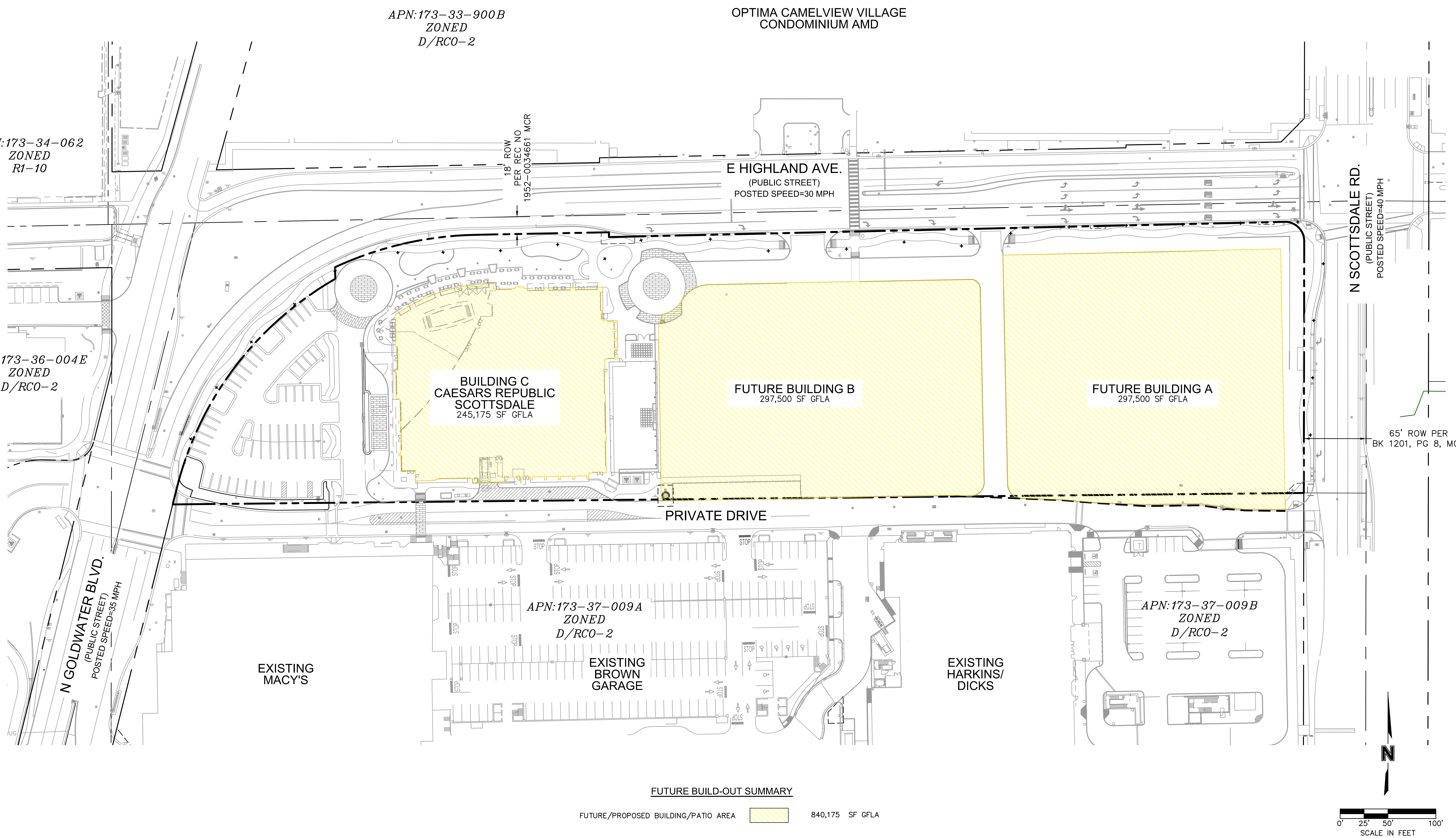
THIS DOCUMENT IS PROVIDED FOR GENERAL INFORMATION PURPOSES ONLY. THE CITY OF SCOTTSDALE DOES NOT WARRANT ITS ACCURACY, COMPLETENESS OR SUITABILITY FOR ANY PARTICULAR PURPOSE. IT SHOULD NOT BE RELIED UPON WITHOUT FIELD VERIFICATION.

THE CITY OF SCOTTSDALE

05-AUG-18

APPENDIX "B"

(Proposed Master Sewer Layout/Calculations)



FUTURE BUILD-OUT SUMMARY

FUTURE/PROPOSED BUILDING/PATIO AREA		840,175 SF GFLA

DWG: F:\2018\3001-3500\018-3159\40-Design\Exhibits\GROSS FLOOR LEASE AREA.dwg USER: thutchinswoss
DATE: May 29, 2019 5:27pm XREFS: c_xbase_0183159 c_xbase_overall improvements c_pre_pbase_0183159 C_ARCH_0183159 e_pltg_0183159

olsson
7250 North 16th Street, Suite 210
Phoenix, AZ 85020-5282
TEL 602.748.1000
FAX 602.748.1001
www.olsson.com

Call at least two full working days before you begin excavation.
ARIZONA 811
Arizona Blue Stake, Inc.
Dial 8-1-1 or 1-800-STAKE-IT (782-5348)
In Maricopa County: (602) 263-1100

REVISIONS

REV. NO.	DATE	REVISIONS DESCRIPTION

FINAL BUILD-OUT EXHIBIT
GROSS FLOOR LEASE AREA

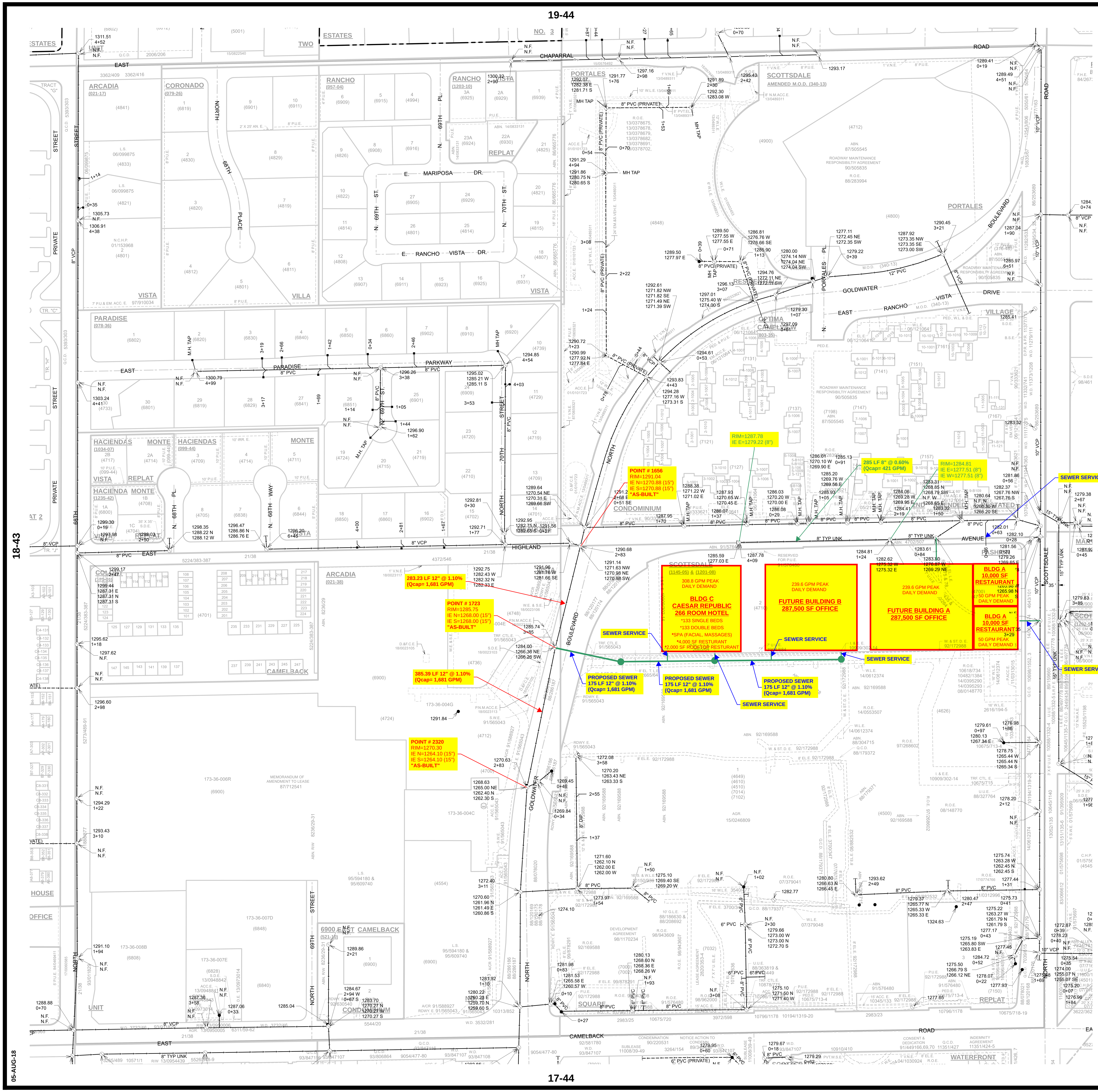
CAESARS REPUBLIC SCOTTSDALE

SCOTTSDALE, AZ 85251

2019

drawn by: SS/THW
designed by: SJV
checked by: CAII
project no.: 018-3159
date: 05.16.2019

C100
1 of 1



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LEGEND:

- Cleanout
- Lift Station (SLS)
- Manhole
- Non-GPS Point
- Plug
- Sewer Service Point
- Sewer Tap Point
- Sewer Valve
- Treatment Plant
- Sewer Main - Gravity
- Sewer Main - Force
- Sewer Main - Private

VICINITY MAP

N 1/4 COR. CHAPARRAL ROAD NE COR. 5000 N
68TH STREET
SCOTTSDALE ROAD
CENTER CAMELBACK ROAD 4500 N E 1/4 COR.
6800 E 7200 E

NORTH

SCALE: 1" = 100'

0 50 100 200

The map scale of 1" = 100' is based on a full size print of 30" x 36"

SEWER

QUARTER SECTION MAP

18-44

NE 1/4 SEC. 22 T2N R4E

SCOTTSDALE GEOGRAPHIC INFORMATION SYSTEMS

3629 North Drinkwater Boulevard
Scottsdale, Arizona 85251

N O T I C E

THE CITY OF SCOTTSDALE

05-AUG-18

SEWER DEMAND CALCULATIONS -AREA 1

References: Values from City of Scottsdale Design Standards & Policies Manual Fig 7-1.2

Lot ID	Area Description/ Land Use	Area	Rooms	Pools	Avg Daily Flow	Peaking Factor	Avg Daily Demand		Peak Daily Demand	
		(sf)	(RM)	(ea)	(gpsfd or gpud)	(People/Unit)	(gpd)	(gpm)	(gpd)	(gpm)
1	Resort Hotel (W/ Amentities)		266		380	4.5	101,080	70.2	454,860	315.9
2	Resort Hotel Pool Backwash						106,500	74.0	106,500	74.0
3	Office	287,500			0.4	3	115,000	79.9	345,000	239.6
4	Office	287,500			0.4	3	115,000	79.9	345,000	239.6
5	Restaurant	10,000			1.2	6	12,000	8.3	72,000	50.0
6	Restaurant	10,000			1.2	6	12,000	8.3	72,000	50.0
	TOTAL						461,580	320.5	1,395,360	969.0

RM= Rooms
gpsfd = Gallons per Square Foot per Day
gpud = Gallons per Unit per Day

GPD= Gallons per Day
GPM= Gallons per Minute
CFS= Cubic feet per Second

Let me know if the information below will address the city requirements or if you need anything further.

Thanks
David

David Hess, AIA I VP of Architecture & Design I HCW
D 417.332.3412 I C 417.848.5278 I F 417.332.3433

HCW L.L.C.

From: David Hess
Sent: Tuesday, January 8, 2019 2:53 PM
To: Jeffrey Iverson <jeff@hydrocon.com>
Cc: ageier@laytonconstruction.com; Curt Lonsdale <curt@hydrocon.com>; ben@brparc.com; adavis@cjd-eng.com
Subject: Re: The Republic - Backwash Flow Rates

Thanks-it was a pleasure meeting you as well and I appreciate all the assistance.

David

Sent from my iPhone

On Jan 8, 2019, at 11:47 AM, Jeffrey Iverson <jeff@hydrocon.com> wrote:

> Good afternoon Andrew & David,
>
> It was good to meet you this morning. Below I have outlined the process in determining the backwash rate for the pool we discussed.
>
> 15 FT x 40 FT = 600 SF Pool Area
> 600 x 4FT (Worst Case Depth) = 2,400 CF
> 2,400 CF * 7.5 GAL/CF = 18,000 GAL
> 18,000 GAL / 360 MINS (Industry Standard, exceeds MCESD minimum) = 50 GPM
>
> A 50 GPM pool requires a 4.91 SF Sand Filter
> 50 GPM / 4.91 SF = 10.18 GPM/SF Pool Filtration Rate
> 4.91 SF x 15 GPM/SF = 73.65 GPM Backwash Rate
>
> The 74 GPM Backwash Rate can be guaranteed with the use for a Variable Speed pump which is what I would recommend for this project.
>
> Hopefully this helps. If you have any further questions, please don't hesitate to reach out to us.
>
> Thanks!
>
> jeffrey iverson
> 602.510.3394 mobile
> 480.776.0155 office

APPENDIX "C"

(Preliminary Utility Plan- Phase I)

PRELIMINARY PHASING PLAN FOR
CAESARS REPUBLIC SCOTTSDALE
SCOTTSDALE, ARIZONA 85251

PROJECT DATA:

PROJECT ADDRESS:
SOUTHEAST CORNER OF GOLDWATER BOULEVARD AND HIGHLAND AVENUE SCOTTSDALE, ARIZONA 85251

BENCH MARK: A STONE IN HAND HOLE AT THE INTERSECTION OF CAMELBACK RD. & MILLER RD., CITY OF SCOTTSDALE BENCHMARK #4234.

ELEVATION= 1259.43' (PER C.O.S. NAVD '88 DATUM)

GROSS LOT AREA: 311,172 SF OR 7.14 ACRES

REDEVELOPED LOT AREA: 306,703 SF 7.04 ACRES

APN: PARCEL 173-37-010

ZONING: D/DRU-2 PBD DO; 25-ZN2015 & 1-II-2016

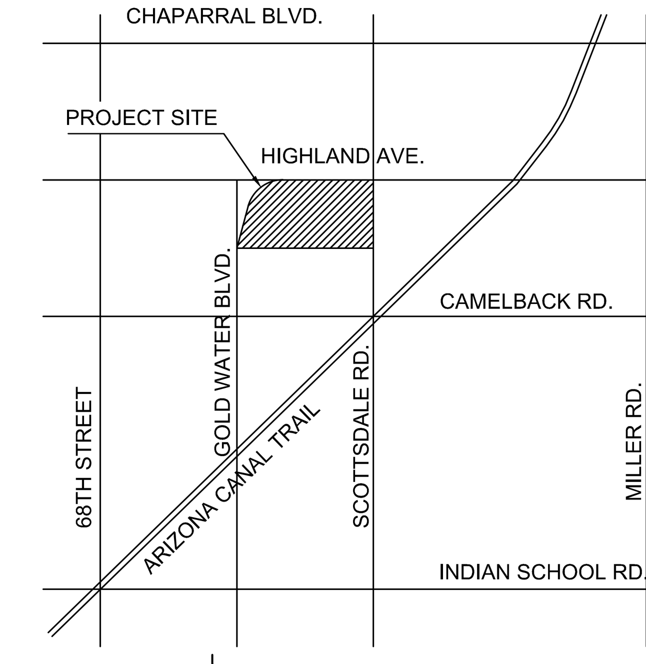
SHEET INDEX

#	SHEET NAME	SHEET NO.
1	PRELIMINARY PHASING PLAN	PC600

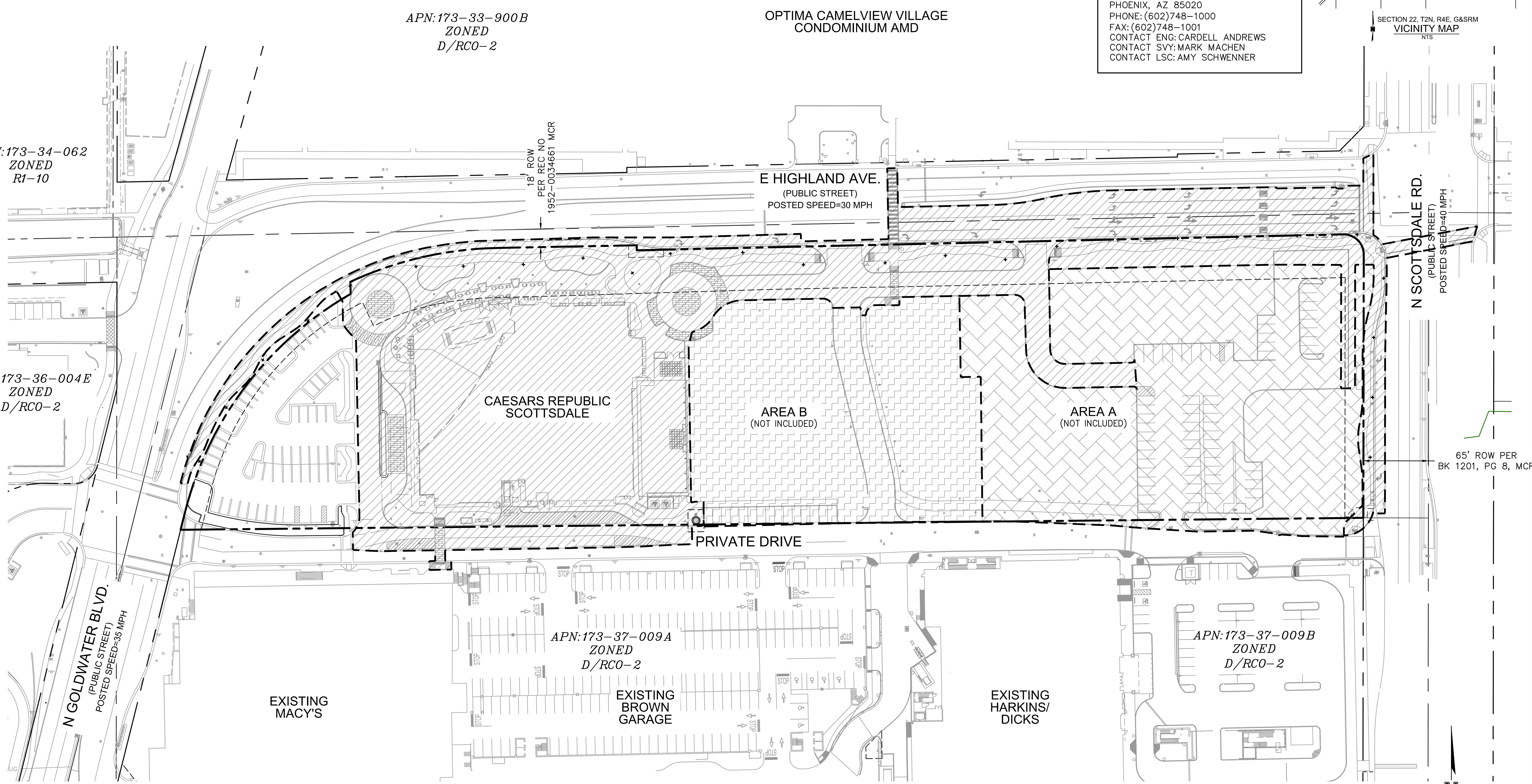
OWNER
MACERICH
11411 NORTH TATUM BLVD
PHOENIX, AZ 85028
PHONE: (602)953-6548
FAX: (602)953-1964
ATTN: JUSTIN LONG

DEVELOPER
HCW, LLC
2398 E CAMELBACK RD, SUITE 690
PHOENIX, AZ 85016
PHONE: (602)469-1226
FAX: (417)332-3434
ATTN: RICK HUFFMAN

SITE ENGINEER/SURVEY/LAND ARCH
OLSSON
7250 N 16TH SUITE 210
PHOENIX, AZ 85020
PHONE: (602)748-1000
FAX: (602)748-1001
CONTACT ENG: CARDELL ANDREWS
CONTACT SVY: MARK MACHEN
CONTACT LSC: AMY SCHWENNER



SECTION 22, T2N, R4E, G&SRM
VICINITY MAP
NTS



LEGEND:

- PHASE 1
- PHASE 2
- PHASE 3

olsson
7250 North 16th Street, Suite 210
Phoenix, AZ 85020-5282
TEL 602.748.1000
FAX 602.748.1001
www.olsson.com

Registered Professional Engineer (Civil) CERTIFICATE NO. 42633 ANDREA K. PAGE ARIZONA U.S.A.

Call at least two full working days before you begin excavation. ARIZONA 811 Arizona Blue Stake, Inc. Dial 8-1-1 or 1-800-STAKE-IT (782-5348) In Maricopa County: (602) 263-1100

REV. NO.	DATE	REVISIONS DESCRIPTION

REVISIONS

DESIGN REVIEW BOARD
PRELIMINARY PHASING PLAN
CAESARS REPUBLIC SCOTTSDALE
SCOTTSDALE, AZ 85251
2019

drawn by:	SS/THW
designed by:	SJV
checked by:	CAII
project no.:	018-3159
date:	05.09.2019

PC600
1 *of* 1

DWG: F:\2018\3001-3500\018-3159\40-Design\AutoCAD\Preliminary Plans\Sheets\GNCV\1-PC601 PHASING PLAN_83159.dwg
DATE: May 09, 2019 9:33am
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USER: thutchinswoss

PRELIMINARY UTILITY PLAN FOR
CAESARS REPUBLIC SCOTTSDALE
SCOTTSDALE, ARIZONA 85251

PROJECT DATA:

PROJECT ADDRESS:
SOUTHEAST CORNER OF GOLDWATER BOULEVARD AND HIGHLAND AVENUE SCOTTSDALE, ARIZONA 85251

BENCH MARK: A STONE IN HAND HOLE AT THE INTERSECTION OF CAMELBACK RD. & MILLER RD., CITY OF SCOTTSDALE BENCHMARK #4234.

ELEVATION= 1259.43' (PER C.O.S. NAVD '88 DATUM)

SITE AREA: 306,703 SF OR 7.04 ACRES

CONSTRUCTION LIMITS: 252,403 OR 5.79 ACRES

APN: PARCEL 173-37-010

ZONING: D/RCO-2 PBD DO

SHEET INDEX

#	SHEET NAME	SHEET NO.
1	PRELIMINARY UTILITY PLAN	PC401
2	PRELIMINARY UTILITY PLAN	PC402
3	PRELIMINARY DETAILS	PC403

OWNER
MACERICH
11411 NORTH TATUM BLVD
PHOENIX, AZ 85028
PHONE: (602)953-6548
FAX: (602)953-1964
ATTN: JUSTIN LONG

DEVELOPER
HCW, LLC
2398 E CAMELBACK RD, SUITE 690
PHOENIX, AZ 85016
PHONE: (602)469-1226
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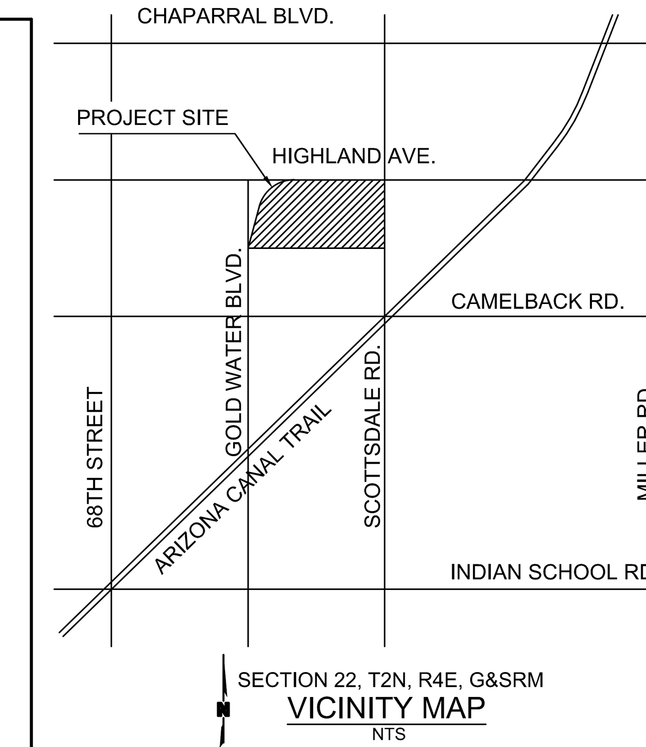
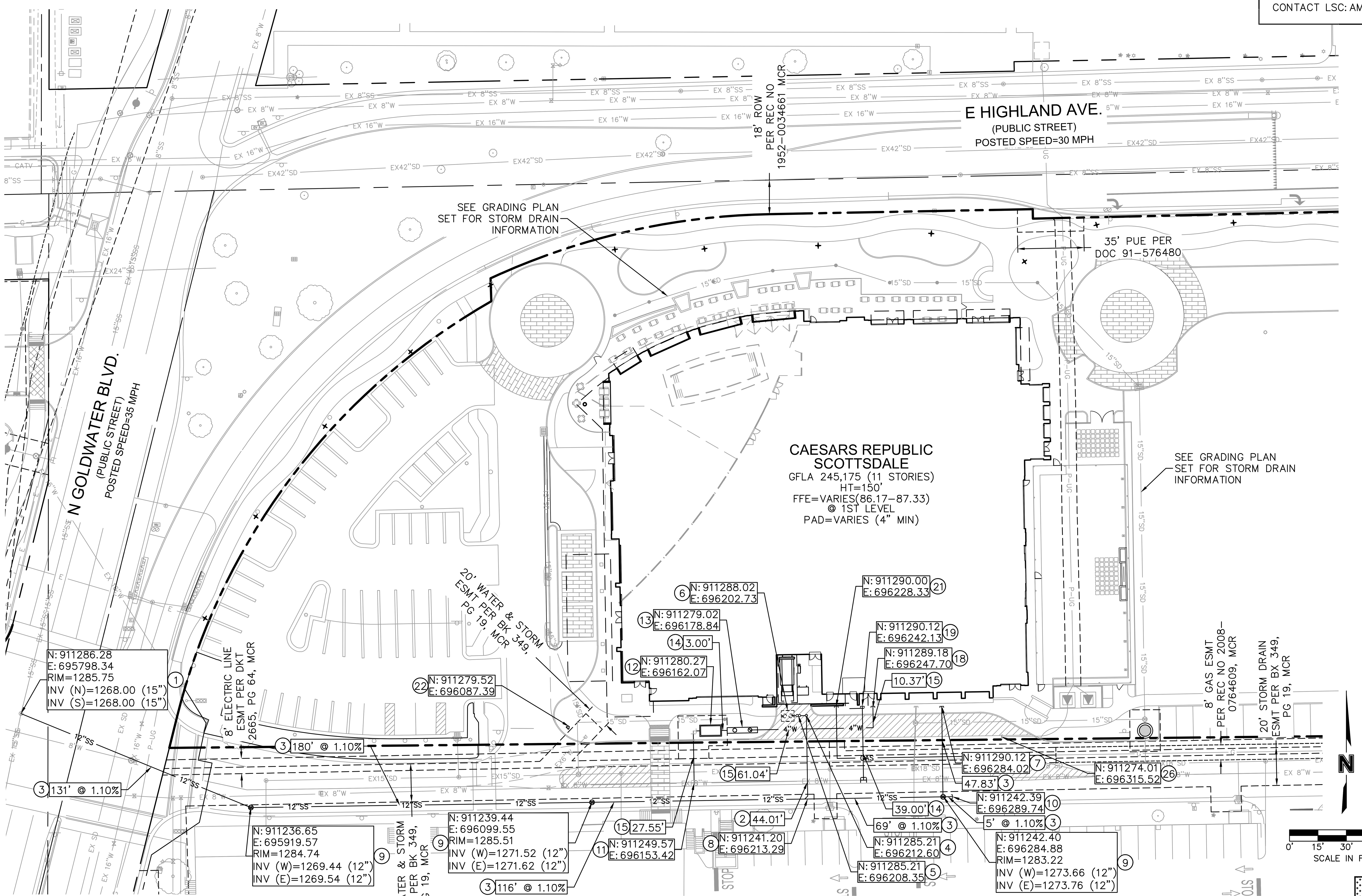
CONTACT ENG: CARDELL ANDREWS
CONTACT SVY: MARK MACHEN
CONTACT LSC: AMY SCHWENNER



SECTION 22, T2N, R4E, G&SRM
VICINITY MAP
NTS

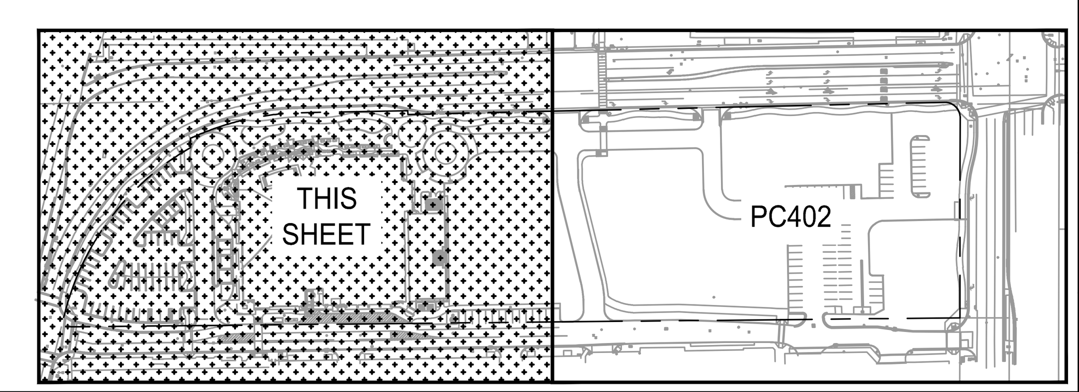


UTILITY PLAN KEYNOTES

1. CONTRACTOR TO CORE EXISTING SANITARY SEWER MANHOLE WALL AND INSTALL NEW 10" SERVICE CONNECTION INTO EXISTING STRUCTURE. CONTRACTOR TO FIELD VERIFY INVERT INFORMATION PRIOR TO THE START OF CONSTRUCTION AND NOTIFY ENGINEER IF ANY INFORMATION DIFFERS FROM PLAN
2. 6" PVC SDR35 SEWER SERVICE LINE PER MAG AND C.O.S. SPECIFICATIONS
3. 12" PVC SDR35 SEWER SERVICE LINE PER MAG AND C.O.S. SPECIFICATIONS
4. 6" SEWER CLEAN-OUT. SEE DETAIL H, SHEET PC403
5. 6" TWO WAY SEWER CLEAN-OUT. SEE DETAIL I, SHEET PC403
6. GGI-750 BIGFOOT GRAVITY GREASE INTERCEPTOR. SEE DETAIL G, ON SHEET PC403
7. SEWER SERVICE LINE TERMINATION, SEE MECHANICAL PLANS FOR CONTINUATION INTO BUILDING
8. 6" X 10" WYE CONNECTION
9. 48" MANHOLE PER MAG STD DETAIL 420-1 WITH MANHOLE FRAME AND COVER PER MAG STD DETAIL 423-1 MANHLE RIM SHALL READ "SANITARY SEWER"
10. 10" PVC SDR35 SEWER SERVICE LINE STUB FOR FUTURE CONNECTION
11. CONNECT TO EXISTING WATERLINE WITH A SERVICE SADDLE PER C.O.S. STD DETAIL 2330
12. 4" TURBINE WATER METER PER COS STD DETAIL 2345, PROVIDE 11.5' L X 6' W STANDARD WATER METER VAULT PER MAG STD DETAIL 321.
13. 4" BACKFLOW PREVENTION ASSEMBLY PER COS STD DETAIL 2353
14. 8" CLASS 350 POLY-WRAPPED DUCTILE IRON PIPE
15. 4" DOMESTIC WATER SERVICE
16. 1" DOMESTIC WATER SERVICE
17. 6" CLASS 350 POLY-WRAPPED DUCTILE IRON PIPE
18. TERMINATE AND CAP 4" DOMESTIC WATERLINE. SEE MECHANICAL PLANS FOR CONTINUATION INTO BUILDING
19. TERMINATE AND CAP 8" FIRE SEVICE LINE. SEE MECHANICAL PLANS FOR CONTINUATION INTO BUILDING
20. TERMINATE AND CAP 8" SECONDARY FIRE SEVICE LINE. SEE MECHANICAL PLANS FOR CONTINUATION INTO BUILDING
21. GASLINE TERMINATE AND CAP. SEE MECHANICAL PLANS FOR CONTINUATION INTO BUILDING
22. REMOTE FDC PER COS STD DTL 2367
23. RELOCATED WATER METER
24. RELOCATED CURB STOP WITH FLUSHING PIPE PER MAG STD DTL 390
25. RELOCATED FIRE HYDRANT
26. ELECTRIC LINE. SEE ELECTRICAL PLANS FOR CONTINUATION INTO BUILDING

UTILITY NOTES:

1. CONTRACTOR TO VERIFY LOCATIONS AND INVERTS OF ALL EXISTING UTILITIES 72 HOURS PRIOR TO THE CONSTRUCTION AND NOTIFY ENGINEER OF DISCREPANCIES FROM PLANS.
2. PIPE BEDDING FOR ALL UTILITY LINES TO BE PER CITY OF SCOTTSDALE SPECIFICATIONS. AND CITY OF SCOTTSDALE STANDARD DETAIL 2201.



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REV. NO.	DATE	REVISIONS DESCRIPTION

REVISIONS

DESIGN REVIEW BOARD
PRELIMINARY UTILITY PLAN
CAESARS REPUBLIC SCOTTSDALE
SCOTTSDALE, AZ 85251
2019

drawn by:	SS/THW
designed by:	SJV
checked by:	CAII
project no.:	018-3159
date:	05.16.2019

PC401

DWG: F:\2018\3001-3500\018-3159\40-Design\AutoCAD\Preliminary Plans\Sheets\GNCV\1-PC401 PRIVATE UTILITY PLAN_83159.dwg USER: thutchinswoss
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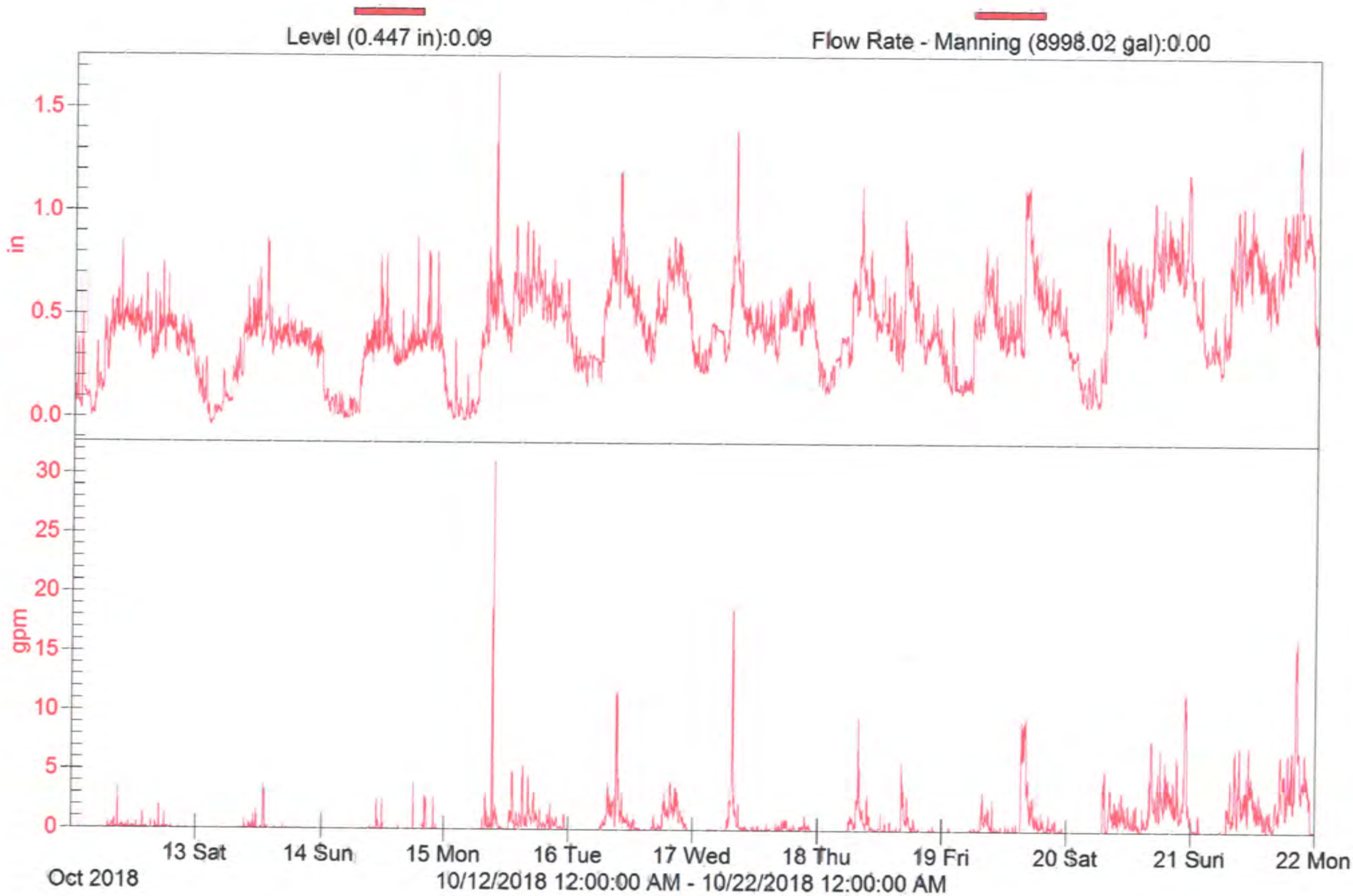
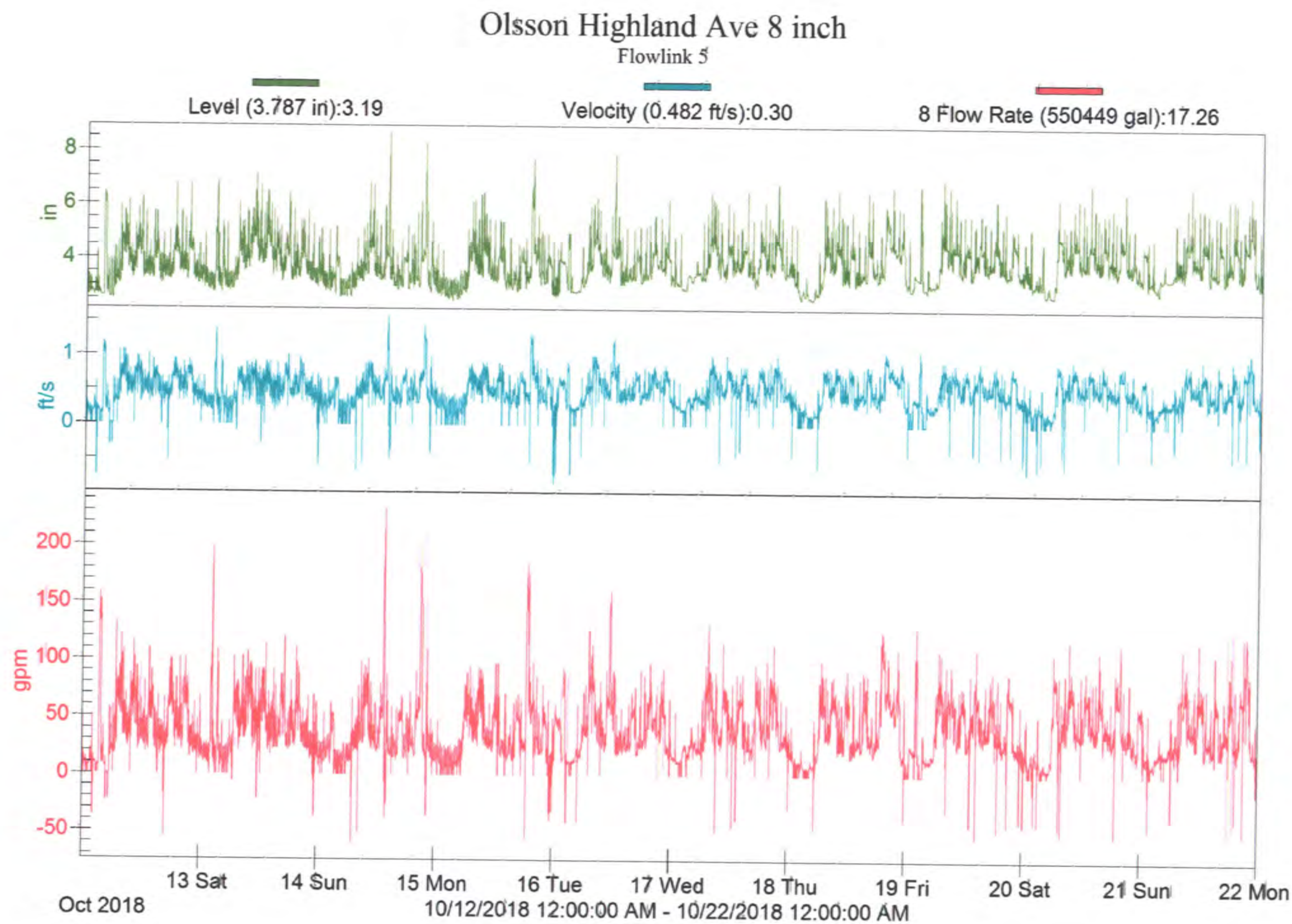
APPENDIX “D”

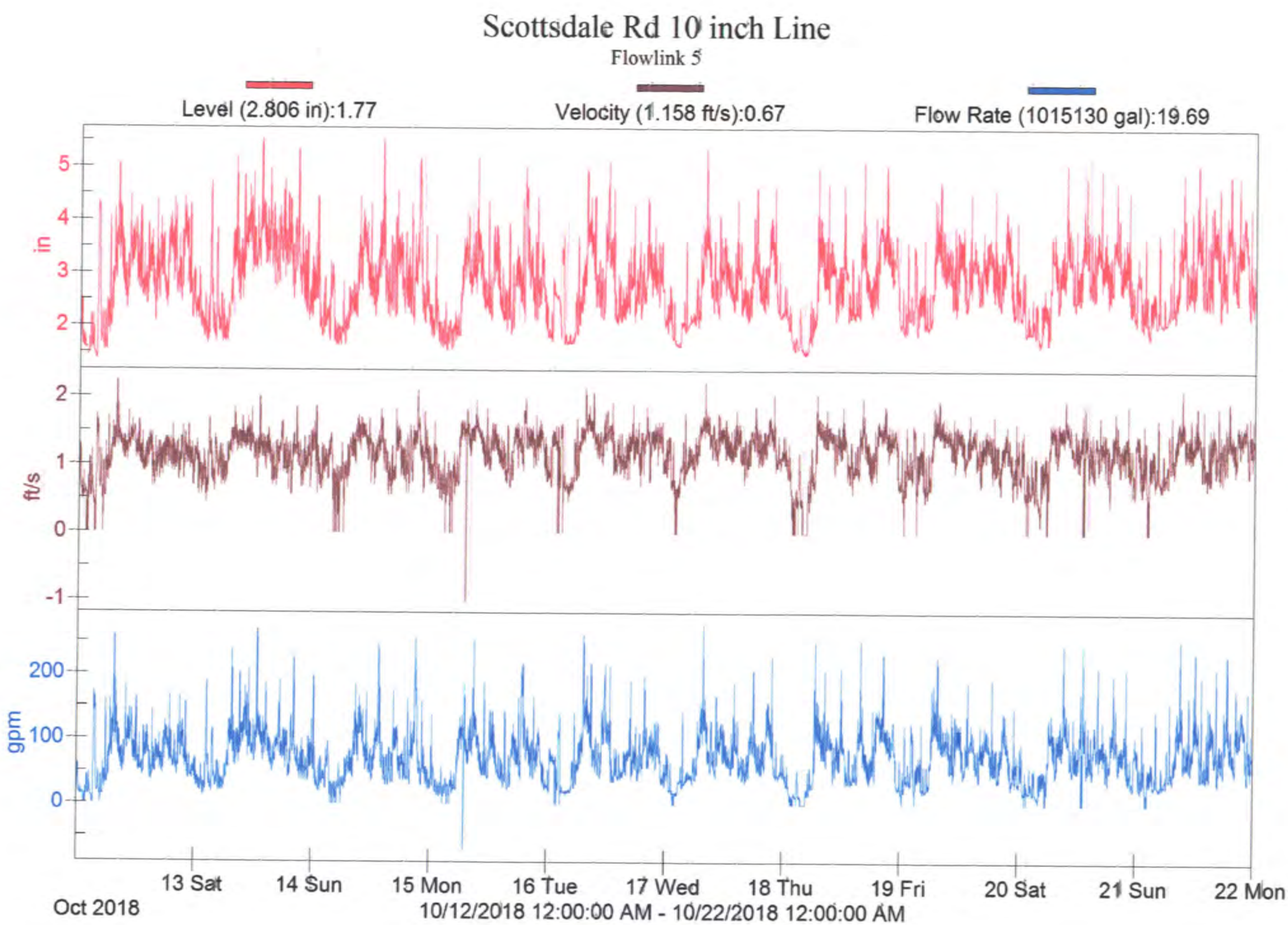
(Flow Data Results, Per Western Environmental Equipment Co.)

Goldwater - Fashion Square 12 inch Line

Flowlink 5




Olsson Highland Ave 8 inch
Flowlink 5
Level (3.787 in):3.19
Velocity (0.482 ft/s):0.30
8 Flow Rate (550449 gal):17.26
in
8
6
4
ft/s
1
0
gpm
200
150
100
50
0
-50
13 Sat
14 Sun
15 Mon
16 Tue
17 Wed
18 Thu
19 Fri
20 Sat
21 Sun
22 Mon
Oct 2018
10/12/2018 12:00:00 AM - 10/22/2018 12:00:00 AM



Scottsdale Rd 10 inch Line
Flowlink 5
Level (2.806 in):1.77
Velocity (1.158 ft/s):0.67
Flow Rate (1015130 gal):19.69
in
ft/s
gpm
13 Sat
14 Sun
15 Mon
16 Tue
17 Wed
18 Thu
19 Fri
20 Sat
21 Sun
22 Mon
Oct 2018
10/12/2018 12:00:00 AM - 10/22/2018 12:00:00 AM

SCOTTSDALE FASHION SQUARE- LOT 2
FINAL SEWER BASIS OF DESIGN REPORT

Scottsdale, AZ

May 2019

Olsson Project No. 018-3159

SCOTTSDALE FASHION SQUARE- LOT 2
FINAL WATER BASIS OF DESIGN REPORT

COS CASE NO. 962-PA-2018

Prepared For:

Macerich
11411 N Tatum Boulevard
Phoenix, AZ 85253

May 2019

Olsson Project No. 018-3159

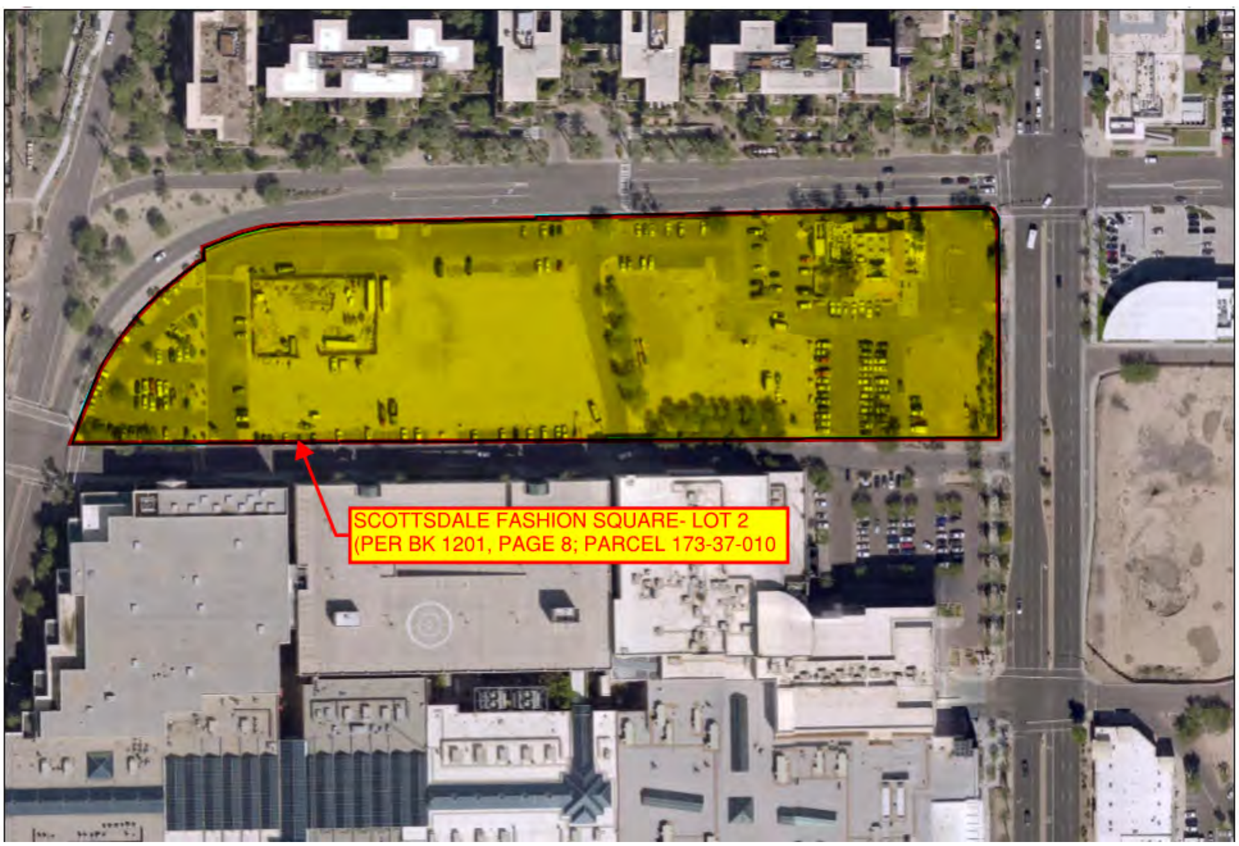
Table of Contents

I. INTRODUCTION

A. Project

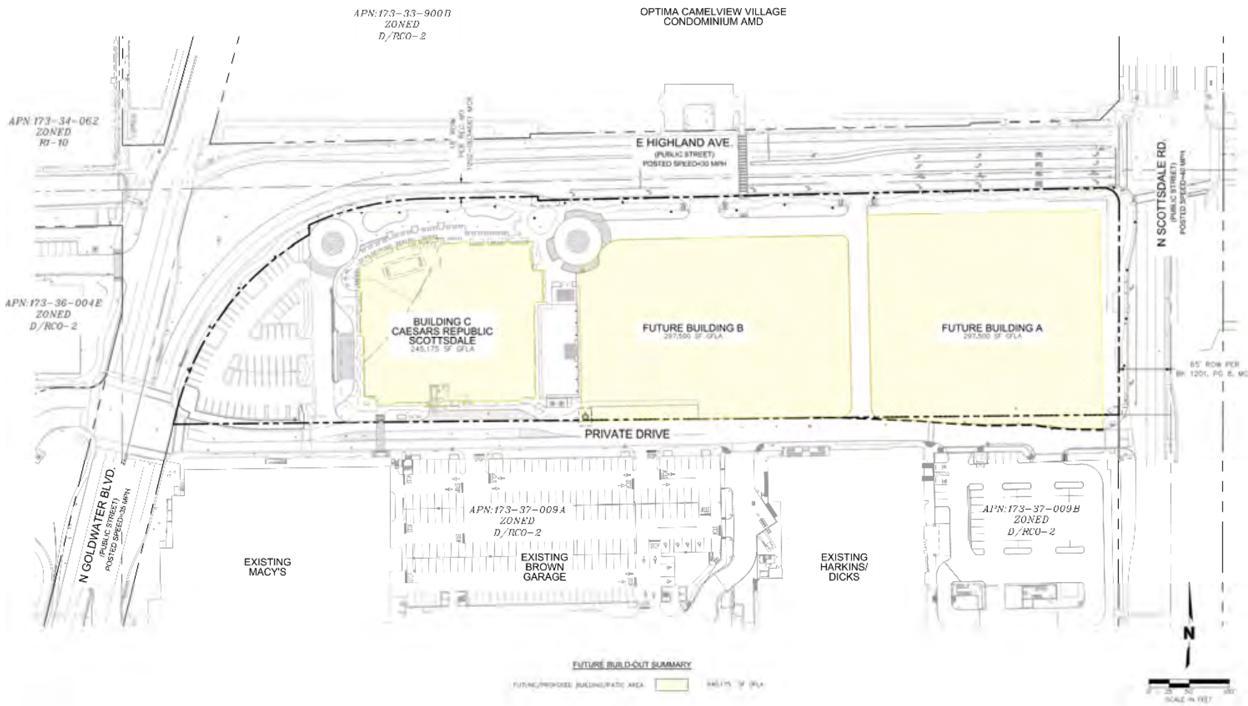
The purpose of this Final Water Basis of Design Report is to support the buildout of Scottsdale Fashion Square- Lot 2 (see Figure 1), which includes two (2) future buildings as well as the proposed Caesars Republic Scottsdale Hotel, hereinafter referred to as "The Project" (see Figure 2). The Project site is situated within the northeast quarter of Section 22, Township 2 North, Range 4 East of the Gila and Salt River Meridian, Maricopa County, Arizona, is zoned D/DRU-2 PBD DO; 25-ZN2015 & 1-II-2016, and covers approximately 7.04 acres after right-of-way dedications. More specifically The Project site is identified as Maricopa County assessor parcel number 173-37-010.

The Project will be developed in multiple Phases, including buildings, and site improvements, and when completely buildout will be a part of the greater Scottsdale Fashion Square mall. As mentioned above, this Final Sewer Basis of Design Report is to support the complete buildout of Scottsdale Fashion Square-Lot 2 (see Figure 2).



Scottsdale Fashion Square- Lot 2, Per BK 1201, PG 8

Figure 1 – Location/Parcel Map



Building A- Caesars Republic Scottsdale
Building B- Future Office and Retail
Building C- Future Office and Retail

Figure 2 – Final Buildout Exhibit

B. Contact Info

Owner/Developer
Macerich
11411 N Tatum Boulevard
Phoenix, AZ 85028
Phone: (602) 953-6548
Contact: Justin Long

Developer
HCW Hotels, LLC
2398 E Camelback Road, Suite 690
Phoenix, AZ 85016
Phone: (602) 469-1226
Contact: Rick Huffman

Civil Engineer
Olsson
7250 N. 16th Street, Suite210
Phoenix, AZ 85020
Phone: (602) 748-1000
Contact: Cardell Andrews

C. Existing Site Conditions

In the year 2013, the site improvements included a Days Inn Hotel, Desert Stages Theater, and Coco's Restaurant (see Figure 3). By the year 2014, all of the buildings onsite in 2013, with the exception of the Desert Stages Theater, were demolished, and remain in that state today (see Figure 4).

The Project site area is bounded to the north by Highland Avenue (public street), to the east by Scottsdale Boulevard (public street), to the south by a Private Drive (private access road), and to the west by Goldwater Boulevard (public street). All public streets are fully improved, and contain both water and sewer utilities. The City of Scottsdale Water Quarter Section Map, which includes The Project area, is in Appendix A. As much as possible, the existing services will be utilized.

Figure 3 – Existing Site Conditions (Year 2013)

Figure 4 – Existing Site Conditions (Year 2019)

D. Proposed Conditions

The Project will be developed in multiple Phases, including buildings, and onsite/offsite site improvements, and when completely buildout will total an additional 840,175 SF Gross Floor Lease Area, that will be a part of the greater Scottsdale Fashion Square mall (see Table 1).

Table 1— Final Buildout Breakout

Building	Use	Gross Floor Lease Area (SF)	Rooms
Future Building A1	Office	287,500	N/A
Future Building A2	Restaurant	10,000	N/A
Future Building A3	Restaurant	10,000	N/A
Future Building B	Office	287,500	N/A
Building C- Caesars Republic Scottsdale	Resort Hotel (w/ Amenities)	245,175	266
Total Buildout	**Varies**	**840,175**	**266**

The water system will be served by the existing 8-inch APC waterline onsite, as well as some existing water services along Highland Avenue and Scottsdale Road. The water design will be in accordance with City of Scottsdale – 2018 Design Standards & Policies Manual.

According to the jurisdictional standards and 2012 International Fire Code, a minimum system fire flow of

1,500 gpm is required for fully sprinkled commercial development. This fire flow must be available concurrent with maximum day demand conditions, while maintaining a minimum residual pressure of 20 psi at the source.

E. Fire Flow Tests

Two hydrant flow tests were performed by Arizona Flow Testing, LLC, on November 8, 2018 @ 7:30 a.m (Appendix B). The flow test map shows where the Fire Hydrant Flow Test was taken.

In summary, Fire Flow Test #1 (Private Drive) demonstrated the following:

Static Pressure =	72 psi
Residual Pressure =	58 psi with 1,954 gpm
Minimum Residual Pressure =	20 psi with 3,968 gpm

In addition, Fire Flow Test 2 (Highland Avenue) demonstrated the following:

Static Pressure =	72 psi
Residual Pressure =	56 psi with 1,917 gpm
Minimum Residual Pressure =	20 psi with 3,623 gpm

II. Demand Calculations

A. Design Criteria

Design criteria for the water system is based on City of Scottsdale—2018 Design Standards & Policies Manual. Utilizing these standards for the design criteria, the following design requirements will be followed:

- All new waterlines 6-inches through 12-inches shall be Class 350 ductile iron pipe.
- Fire line services 4 inches and larger shall be constructed of DIP, class 350. Fire line services 3 inches and smaller shall be constructed of type K, softcopper.
- Design flows shall be based on the Average Day Water Demands, Figure 6-1.2 Average Day Water Demands
- Maximum Day Demand scenario – 2 times the Average Day Demand
- Maximum Day Demand + Fire Flow
- Peak Hour Demand – 3.5 times the Average Day Demand.
- Minimum Fire flow of 2,500 gpm for high rise structures to account for potential firefighting activities
- Minimum Pressure: 20 psi @ max day + fire flow in accordance with uniform plumbing code.
- Pipeline calculations verifying that head loss per 1,000 feet of any pipe is no greater than 10 feet/feet. (The Hazen-Williams equation will be used to calculate head loss per 1,000 ft of pipe).

Figure 6-1.2 Average Day Water

Land Use	Demand (GPD)
Office	0.6
Restaurant	1.3
Resort Hotel (w/ Amenities)	446.3

B. Domestic Demand

Utilizing the above mentioned design criteria, the below demands were calculated:

Private Drive Connection- Phase I

The proposed water services off the existing 8-inch ACP water line in the Private Drive will include a 4-inch domestic water service and a 8-inch fire service line. Utilizing this design criteria along with the associated use demand, the following calculations were made:

Table 2. Proposed Average Day Water Demands

Building	Land Use	Gross Floor Lease Area (SF) Or Rooms	Demand (GPD)
Building C- Caesars Republic Scottsdale	Resort Hotel (w/ Amenities	266 Rooms	266 Rooms x 446.30 GPD/Room= **118,715.80**
Total	**-**	**-**	**118,715.80**

Average =118,715.80 gpd = 82.46 gpm
Max Day=118,715.80 gpd x 2 (peak factor) = 237,431.60 gpd = 164.92 gpm
Peak Hour=118,715.80 gpd x 3.5 (peak factor) = 415,505.30 gpd = 288.60 gpm
Maximum Day Demand + Fire Flow=164.92 gpm + 2,500 gpm= 2,664.92 gpm
2,664.92 gpm < 3,968 gpm ==> O.K.

The proposed system adequately provides peak hour demands and maximum day demand plus fire flow. Flow and pressures throughout the system during all design conditions meet or exceed minimum requirements. Adequate flow and pressure are available for the domestic water service and fire protection for The Project.

For the Hazen-Williams calculations for head loss per 1,000 ft of pipe, see Appendix D.

C. Fire Flow Demand

According to City of Goodyear Engineering Design Standards and Policies Manual, a minimum system fire flow of 2,500 gpm is required for high rise structures to account for potential firefighting activities. This fire flow must be available concurrent with maximum day demand conditions, while maintaining a minimum residual pressure of 20 psi at the source.

III. Conclusions

A. Compliance with Manual

This Final Water Basis of Design Report was prepared in accordance with City of Scottsdale—2018 Design Standards & Policies Manual. For The Project, water design described within this Final Water Basis of Design Report was designed to collect and convey the projects water under Average Day + Fire Flow. Flow and pressures throughout the system during all design conditions meet or exceed minimum pressure requirements.

B. Ability to Provide Emergency All Weather Access

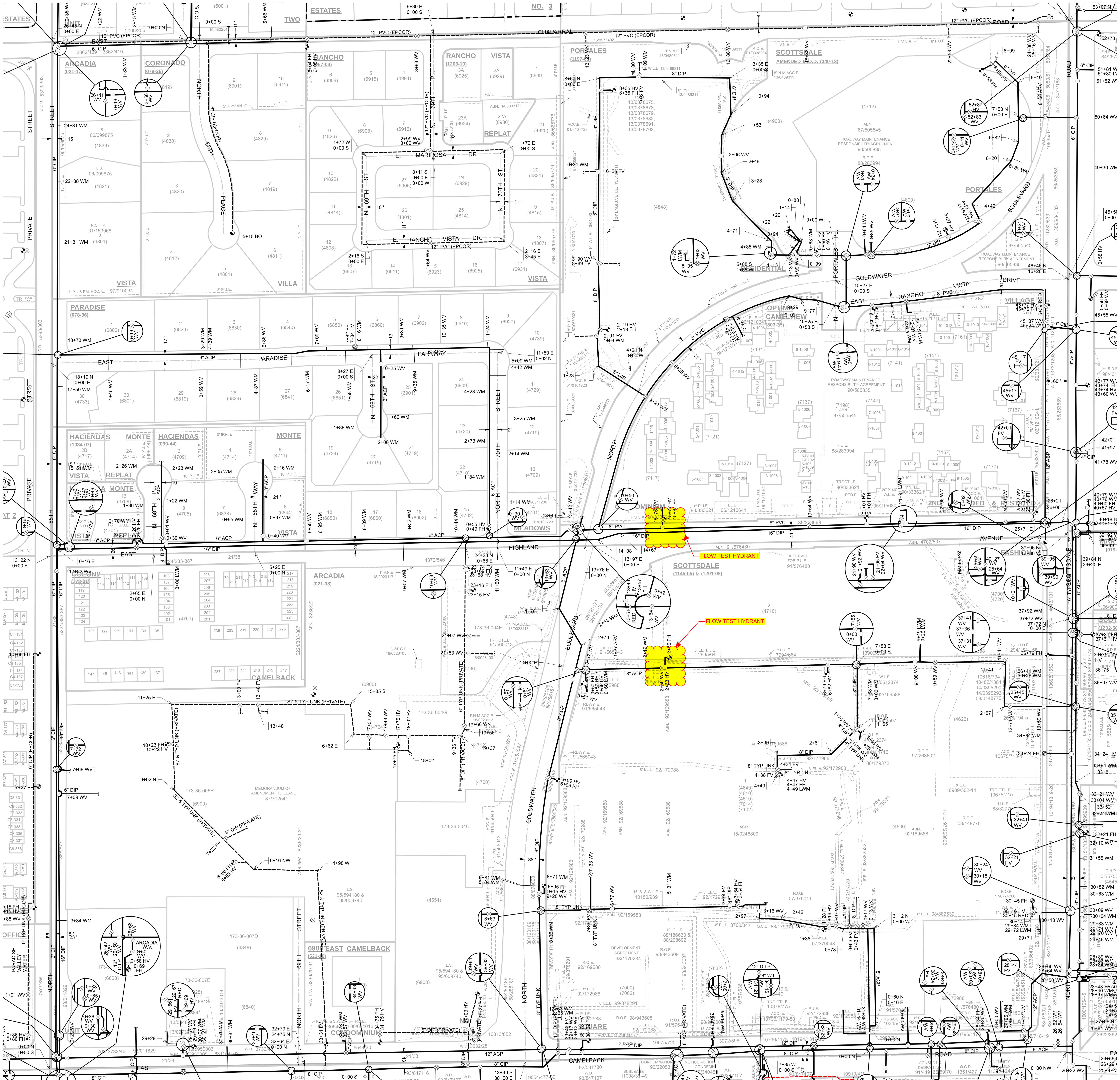
All projects sites when developed, will provide emergency all weather access in accordance with City of Scottsdale—2018 Design Standards & Policies Manual.

C. Effect of Development on Adjacent Properties

Modification to the existing infrastructure are not proposed or required, since adequate flow and pressure are available for the domestic water service and fire protection for The Project.

APPENDIX “A”

(City of Scottsdale Water Quarter Section Map (18-44))



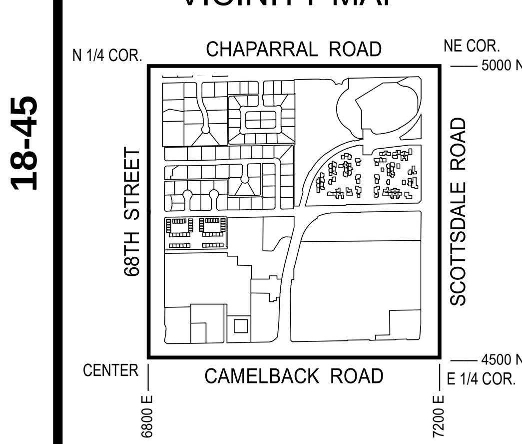
GENERAL NOTES:

- THIS IS A COMPUTER GENERATED DRAWING. FOR ANY REVISIONS PLEASE CONTACT THE CITY OF SCOTTSDALE GIS DEPARTMENT AT (480) 312-7792.
- THE SECTION LINE BEARING AND DISTANCES ARE BASED ON THE CITY OF SCOTTSDALE GPS SURVEY OF SEPTEMBER, 1991. BEARINGS ARE NAD 83 GRID AND DISTANCES ARE FLATTENED TO GROUND. WHERE NO CORNER WAS FOUND THE DIMENSIONS ARE GIVEN TO CALCULATED SECTION CORNERS AND ARE NOTED AS 'CALCULATED' ON THE MAP.

LEGEND:

Air Release Valve
Non-potable Air Release Valve
Blowoff
Cap
Cathodic Protection
Fill Drain
Fire Hydrant
Non-GPS Point
Pressure Reducing Valve
Pump
Reducer
Sample Station
Water Manhole
Non-Potable Manhole
Well
Valve
Non-potable Valve
Vault
Water Main
Non-Potable Main
Fire / Private Main
Non-Scottsdale Main

VICINITY MAP



NORTH

SCALE: 1" = 100'

0 50 100 200

The map scale of 1" = 100' is based on a full size print of 30" x 36"

WATER

QUARTER SECTION MAP

18-44

NE 1/4 SEC. 22 T2N R4E

SCOTTSDALE GEOGRAPHIC INFORMATION SYSTEMS

3629 North Drinkwater Boulevard
Scottsdale, Arizona 85251

05-AUG-18

APPENDIX "B"

(Fire Flow Test)

Arizona Flow Testing LLC

Hydrant Flow Test Report 1

Project Name:	Scottsdale Hotel
Project Address:	Highland and Goldwater, Scottsdale, Arizona, 85251
Client Project No.:	Not Provided
Arizona Flow Testing Project No.:	18392
Flow Test Permit No.:	C56653
Date and time flow test conducted:	November 8, 2018 at 7:30 AM
Data is current and reliable until:	May 8, 2019
Conducted by:	Floyd Vaughan – Arizona Flow Testing, LLC (480-250-8154)
Witnessed by:	B. Dick/R. Padilla –City of Scottsdale-Inspector (602-228-2187)

Raw Test Data

Static Pressure: **94.0 PSI**
(Measured in pounds per square inch)

Residual Pressure: **80.0 PSI**
(Measured in pounds per square inch)

Pitot Pressure: **27.0 PSI**
(Measured in pounds per square inch)

Diffuser Orifice Diameter: One 4-inch Hose Monster
(Measured in inches)

Coefficient of Diffuser: .7875

Flowing GPM: **1,954 GPM**
(Measured in gallons per minute)

GPM @ 20 PSI: **4,801 GPM**

Data with 22 PSI Safety Factor

Static Pressure: **72.0 PSI**
(Measured in pounds per square inch)

Scottsdale requires a maximum Static Pressure of 72 PSI for AFES Design.

Residual Pressure: **58.0 PSI**
(Measured in pounds per square inch)

Distance between hydrants: Approx. 450 Feet

Main size: Not Provided

Flowing GPM: **1,954 GPM**

GPM @ 20 PSI: **3,968 GPM**

Flow Test Location

North

East Highland Avenue

Project Site
Highland and Goldwater

Pressure Fire Hydrant

Flow Fire Hydrant

North Goldwater Blvd.

Arizona Flow Testing LLC

HYDRANT FLOW TEST REPORT 2

Project Name:	Scottsdale Hotel
Project Address:	Highland and Goldwater, Scottsdale, Arizona, 85251
Client Project No.:	Not Provided
Arizona Flow Testing Project No.:	18392
Flow Test Permit No.:	C56653
Date and time flow test conducted:	November 8, 2018 at 7:45 AM
Data is current and reliable until:	May 8, 2019
Conducted by:	Floyd Vaughan – Arizona Flow Testing, LLC (480-250-8154)
Witnessed by:	B. Dick/R. Padilla –City of Scottsdale-Inspector (602-228-2187)

Raw Test Data

Static Pressure: **92.0 PSI**
(Measured in pounds per square inch)

Residual Pressure: **76.0 PSI**
(Measured in pounds per square inch)

Pitot Pressure: **26.0 PSI**
(Measured in pounds per square inch)

Diffuser Orifice Diameter: One 4-inch Hose Monster
(Measured in inches)

Coefficient of Diffuser: .7875

Flowing GPM: **1,917 GPM**
(Measured in gallons per minute)

GPM @ 20 PSI: **4,319 GPM**

Data with 20 PSI Safety Factor

Static Pressure: **72.0 PSI**
(Measured in pounds per square inch)

Scottsdale requires a maximum Static Pressure of 72 PSI for AFES Design.

Residual Pressure: **56.0 PSI**
(Measured in pounds per square inch)

Distance between hydrants: Approx. 510 Feet

Main size: Not Provided

Flowing GPM: **1,917 GPM**

GPM @ 20 PSI: **3,623 GPM**

Flow Test Location **North**

Pressure Fire Hydrant

North Goldwater Blvd.

Flow Fire Hydrant

East Highland Avenue

Project Site
Highland and Goldwater

APPENDIX "C"

(Preliminary Utility Plan- Phase I)

PROJECT DATA:

PROJECT ADDRESS:
SOUTHEAST CORNER OF GOLDWATER BOULEVARD
AND HIGHLAND AVENUE SCOTTSDALE, ARIZONA 85251

BENCH MARK: A STONE IN HAND HOLE AT THE INTERSECTION OF CAMELBACK RD. & MILLER RD., CITY OF SCOTTSDALE BENCHMARK #4234.

ELEVATION= 1259.43' (PER C.O.S. NAVD '88 DATUM)

GROSS LOT AREA: 311,172 SF OR 7.14 ACRES

REDEVELOPED LOT AREA: 306,703 SF 7.04 ACRES

APN: PARCEL 173-37-010

ZONING: D/DRU-2 PBD DO; 25-ZN2015 & 1-II-2016

PRELIMINARY PHASING PLAN FOR
CAESARS REPUBLIC SCOTTSDALE
SCOTTSDALE, ARIZONA 85251

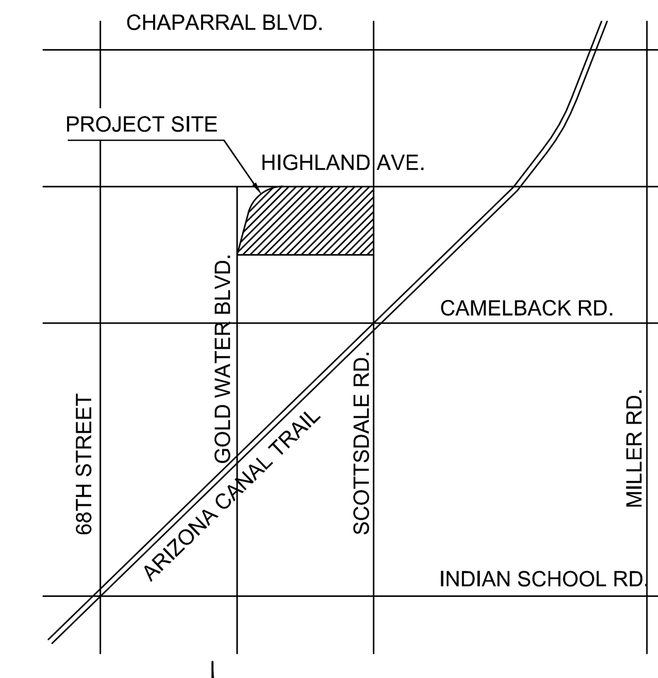
SHEET INDEX

#	SHEET NAME	SHEET NO.
1	PRELIMINARY PHASING PLAN	PC600

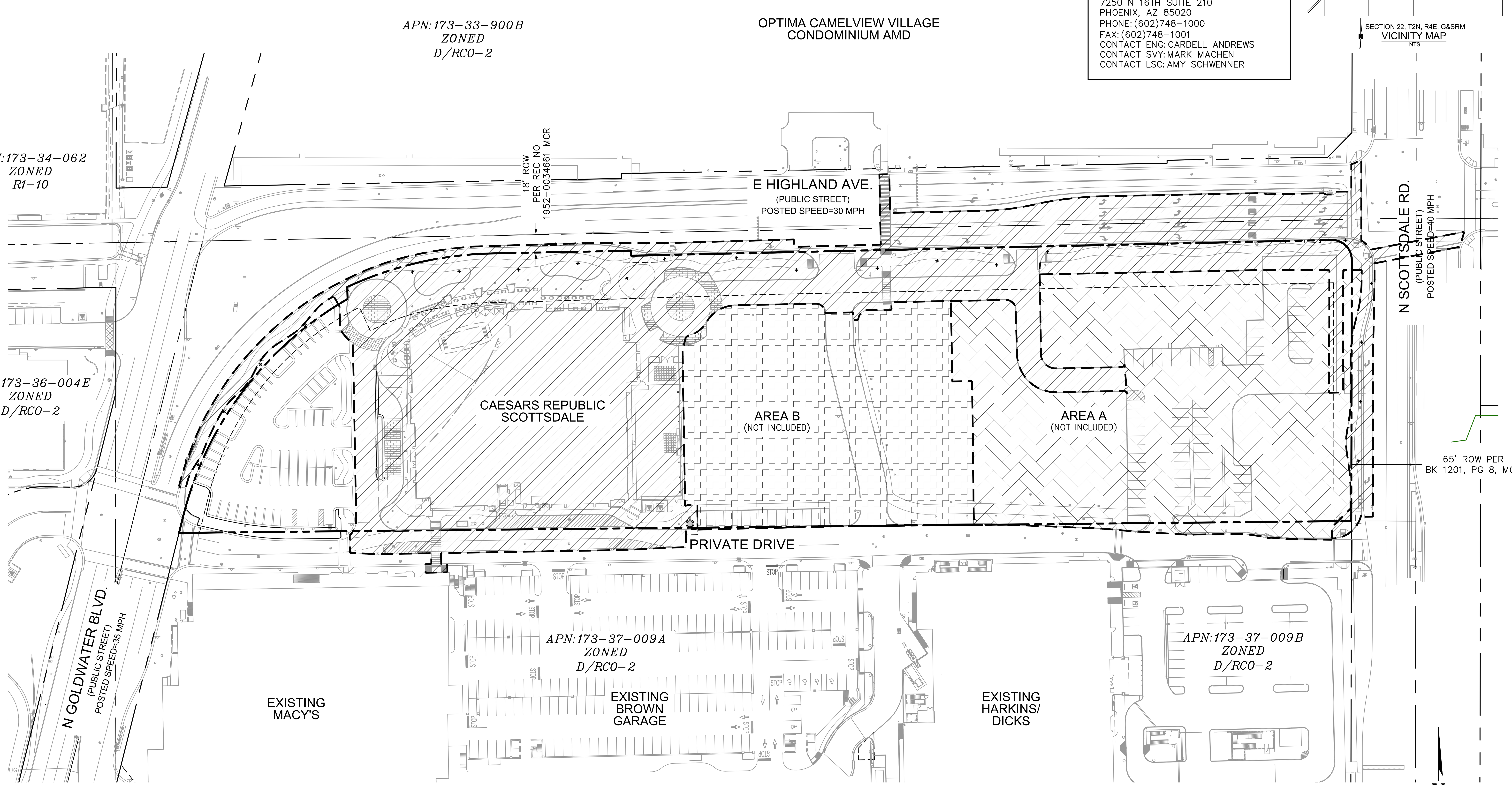
OWNER
MACERICH
11411 NORTH TATUM BLVD
PHOENIX, AZ 85028
PHONE: (602)953-6548
FAX: (602)953-1964
ATTN: JUSTIN LONG

DEVELOPER
HCW, LLC
2398 E CAMELBACK RD, SUITE 690
PHOENIX, AZ 85016
PHONE: (602)469-1226
FAX: (417)332-3434
ATTN: RICK HUFFMAN

SITE ENGINEER/SURVEY/LAND ARCH
OLSSON
7250 N 16TH SUITE 210
PHOENIX, AZ 85020
PHONE: (602)748-1000
FAX: (602)748-1001
CONTACT ENG: CARDELL ANDREWS
CONTACT SVY: MARK MACHEN
CONTACT LSC: AMY SCHWENNER



SECTION 22, T2N, R4E, G&SRM
VICINITY MAP
NTS



LEGEND:

- PHASE 1
- PHASE 2
- PHASE 3

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olsson®
7250 North 16th Street, Suite 210
Phoenix, AZ 85020-5282
TEL 602.748.1000
FAX 602.748.1001
www.olsson.com

Registered Professional Engineer (Civil)
CERTIFICATE NO. 42633
ANDREA K. PAGE
ARIZONA U.S.A.

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Arizona Blue Stake, Inc.
Dial 8-1-1 or 1-800-STAKE-IT (782-5348)
In Maricopa County: (602) 263-1100

REV. NO.	DATE	REVISIONS DESCRIPTION

REVISIONS

DESIGN REVIEW BOARD
PRELIMINARY PHASING PLAN

CAESARS REPUBLIC SCOTTSDALE

SCOTTSDALE, AZ 85251

2019

drawn by:	SS/THW
designed by:	SJV
checked by:	CAII
project no.:	018-3159
date:	05.09.2019

PC600

PRELIMINARY UTILITY PLAN FOR
CAESARS REPUBLIC SCOTTSDALE
SCOTTSDALE, ARIZONA 85251

PROJECT DATA:
PROJECT ADDRESS:
SOUTHEAST CORNER OF GOLDWATER BOULEVARD AND HIGHLAND AVENUE SCOTTSDALE, ARIZONA 85251

BENCH MARK: A STONE IN HAND HOLE AT THE INTERSECTION OF CAMELBACK RD. & MILLER RD., CITY OF SCOTTSDALE BENCHMARK #4234.

ELEVATION= 1259.43' (PER C.O.S. NAVD '88 DATUM)

SITE AREA: 306,703 SF OR 7.04 ACRES

CONSTRUCTION LIMITS: 252,403 OR 5.79 ACRES

APN: PARCEL 173-37-010

ZONING: D/RCO-2 PBD DO

SHEET INDEX

#	SHEET NAME	SHEET NO.
1	PRELIMINARY UTILITY PLAN	PC401
2	PRELIMINARY UTILITY PLAN	PC402
3	PRELIMINARY DETAILS	PC403

OWNER
MACERICH
11411 NORTH TATUM BLVD
PHOENIX, AZ 85028
PHONE: (602)953-6548
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ATTN: JUSTIN LONG

DEVELOPER
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CONTACT ENG: CARDELL ANDREWS
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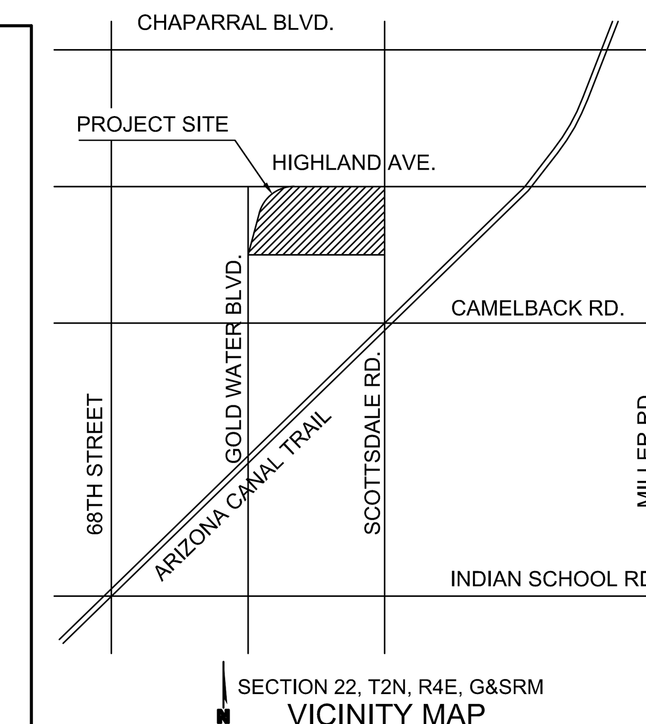
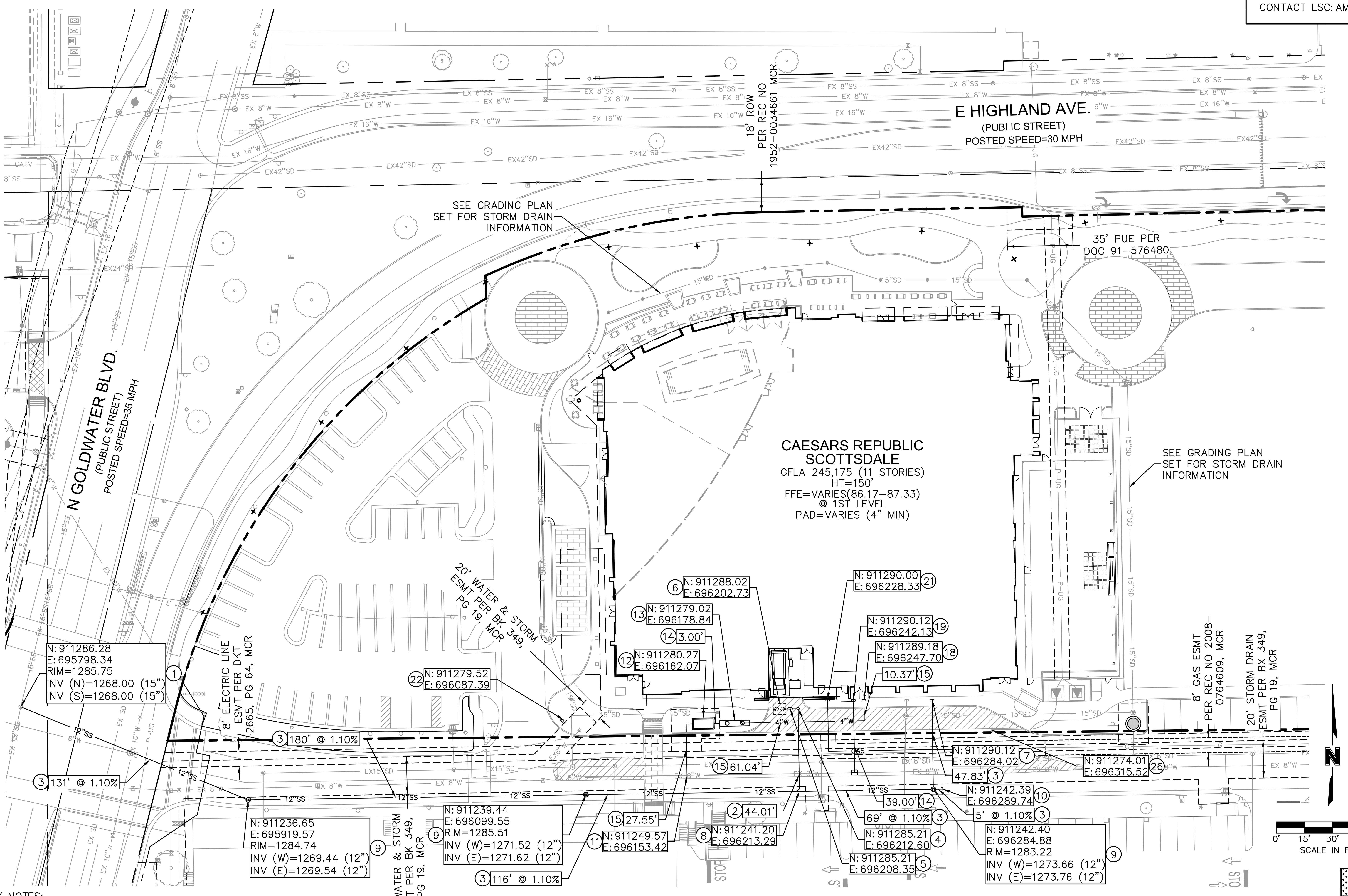
CONTACT LSC: AMY SCHWENNER



VICINITY MAP
NTS

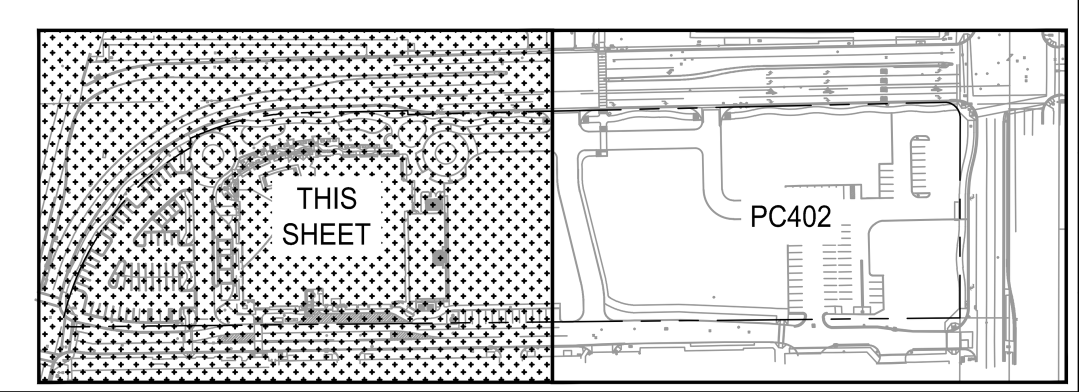
olsson
7250 North 16th Street, Suite 210
Phoenix, AZ 85020-5282
TEL 602.748.1000
FAX 602.748.1001
www.olsson.com



UTILITY PLAN KEYNOTES

1. CONTRACTOR TO CORE EXISTING SANITARY SEWER MANHOLE WALL AND INSTALL NEW 10" SERVICE CONNECTION INTO EXISTING STRUCTURE. CONTRACTOR TO FIELD VERIFY INVERT INFORMATION PRIOR TO THE START OF CONSTRUCTION AND NOTIFY ENGINEER IF ANY INFORMATION DIFFERS FROM PLAN
2. 6" PVC SDR35 SEWER SERVICE LINE PER MAG AND C.O.S. SPECIFICATIONS
3. 12" PVC SDR35 SEWER SERVICE LINE PER MAG AND C.O.S. SPECIFICATIONS
4. 6" SEWER CLEAN-OUT. SEE DETAIL H, SHEET PC403
5. 6" TWO WAY SEWER CLEAN-OUT. SEE DETAIL I, SHEET PC403
6. GGI-750 BIGFOOT GRAVITY GREASE INTERCEPTOR. SEE DETAIL G, ON SHEET PC403
7. SEWER SERVICE LINE TERMINATION, SEE MECHANICAL PLANS FOR CONTINUATION INTO BUILDING
8. 6" X 10" WYE CONNECTION
9. 48" MANHOLE PER MAG STD DETAIL 420-1 WITH MANHOLE FRAME AND COVER PER MAG STD DETAIL 423-1 MANHLE RIM SHALL READ "SANITARY SEWER"
10. 10" PVC SDR35 SEWER SERVICE LINE STUB FOR FUTURE CONNECTION
11. CONNECT TO EXISTING WATERLINE WITH A SERVICE SADDLE PER C.O.S. STD DETAIL 2330
12. 4" TURBINE WATER METER PER COS STD DETAIL 2345, PROVIDE 11.5' L X 6' W STANDARD WATER METER VAULT PER MAG STD DETAIL 321.
13. 4" BACKFLOW PREVENTION ASSEMBLY PER COS STD DETAIL 2353
14. 8" CLASS 350 POLY-WRAPPED DUCTILE IRON PIPE
15. 4" DOMESTIC WATER SERVICE
16. 1" DOMESTIC WATER SERVICE
17. 6" CLASS 350 POLY-WRAPPED DUCTILE IRON PIPE
18. TERMINATE AND CAP 4" DOMESTIC WATERLINE. SEE MECHANICAL PLANS FOR CONTINUATION INTO BUILDING
19. TERMINATE AND CAP 8" FIRE SEVICE LINE. SEE MECHANICAL PLANS FOR CONTINUATION INTO BUILDING
20. TERMINATE AND CAP 8" SECONDARY FIRE SEVICE LINE. SEE MECHANICAL PLANS FOR CONTINUATION INTO BUILDING
21. GASLINE TERMINATE AND CAP. SEE MECHANICAL PLANS FOR CONTINUATION INTO BUILDING
22. REMOTE FDC PER COS STD DTL 2367
23. RELOCATED WATER METER
24. RELOCATED CURB STOP WITH FLUSHING PIPE PER MAG STD DTL 390
25. RELOCATED FIRE HYDRANT
26. ELECTRIC LINE. SEE ELECTRICAL PLANS FOR CONTINUATION INTO BUILDING

UTILITY NOTES:
1. CONTRACTOR TO VERIFY LOCATIONS AND INVERTS OF ALL EXISTING UTILITIES 72 HOURS PRIOR TO THE CONSTRUCTION AND NOTIFY ENGINEER OF DISCREPANCIES FROM PLANS.
2. PIPE BEDDING FOR ALL UTILITY LINES TO BE PER CITY OF SCOTTSDALE SPECIFICATIONS. AND CITY OF SCOTTSDALE STANDARD DETAIL 2201.



REV. NO.	DATE	REVISIONS DESCRIPTION

REVISIONS

DESIGN REVIEW BOARD
PRELIMINARY UTILITY PLAN
CAESARS REPUBLIC SCOTTSDALE
SCOTTSDALE, AZ 85251
2019

drawn by:	SS/THW
designed by:	SJV
checked by:	CAII
project no.:	018-3159
date:	05.16.2019

DWG: F:\2018\3001-3500\018-3159\40-Design\AutoCAD\Preliminary Plans\Sheets\GNCV\1-PC401 PRIVATE UTILITY PLAN_83159.dwg USER: thutchinswoss
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APPENDIX "D"

(Hazen-Williams Calculations)

Hazen-Williams Equation for Pressure Loss in Pipes (Maximum Daily Flow)	
Specified Data	
l = length of pipe (ft)	1000
c = Hazen-Williams roughness constant	130
q = volume flow (gal/min) (Maximum Daily Flow)	165
dh = inside or hydraulic diameter (inches)	8
Calculated Pressure Loss	
f = friction head loss in feet of water per 100 feet of pipe (ft H20 per 100 ft pipe)	0.07
f = friction head loss in psi of water per 100 feet of pipe (psi per 100 ft pipe)	0.03
Head loss (ft H20)	0.66
Head loss (psi)	0.28
Calculated Flow Velocity	
v = flow velocity (ft/s)	1.05

Hazen-Williams Equation for Pressure Loss in Pipes (Peak Hourly Flow)	
Specified Data	
l = length of pipe (ft)	1000
c = Hazen-Williams roughness constant	130
q = volume flow (gal/min) (Peak Hourly Flow)	289
dh = inside or hydraulic diameter (inches)	8
Calculated Pressure Loss	
f = friction head loss in feet of water per 100 feet of pipe (ft H20 per 100 ft pipe)	0.19
f = friction head loss in psi of water per 100 feet of pipe (psi per 100 ft pipe)	0.08
Head loss (ft H20)	1.87
Head loss (psi)	0.80
Calculated Flow Velocity	
v = flow velocity (ft/s)	1.85

SCOTTSDALE FASHION SQUARE- LOT 2
FINAL SEWER BASIS OF DESIGN REPORT

Scottsdale, AZ

May 2019

Olsson Project No. 018-3159

CDC
CURTAINWALL DESIGN CONSULTING™

May 1, 2019

Final Report for

Solar Loads Impact Simulations for Caesars Republic Hotel

Prepared for

Mr. David Hess
HCW Hotels, LLC
153 South Payne Stewart Drive
Branson, MO 65616

Prepared by

Curtainwall Design and Consulting
8070 Park Lane, Suite 400
Dallas, Texas 75231

ABSTRACT

This final report documents CDC, Inc.'s solar loads impact analysis performed to determine the impact of reflections from the proposed Caesars Republic hotel structure on solar exposure in the surrounding area. The focus of the work was on identifying any reflections and solar load concentrations that could be detrimental to area traffic and uncomfortable for hotel patrons on the property.

30-DR-2019
5/24/2019

TABLE OF CONTENTS

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30-DR-2019
5/24/2019

INTRODUCTION AND EXECUTIVE SUMMARY

Curtain Wall Design and Consulting (CDC) provides consulting services for state-of-the-art building envelope systems. CDC has been providing consulting services for the design of Caesars Republic, an eleven-story, 266-room hotel in Scottsdale, Arizona, shown in Figure 1. HCW asked CDC to provide a computational solar loads impact analysis for the proposed structure. A CAD model of Caesars Republic was received from HCW and prepared for solar loads analysis. Necessary spatial discretization of the surface mesh was determined in a convergence study where the computational mesh was refined until the computed surface irradiation was sufficiently resolved. A validation effort was performed to ensure that the solar loads model and model geometries used adequately represented those present in the built environment being analyzed. This was accomplished by comparing satellite imagery of a nearby Scottsdale office building with computational model predictions of shadow locations to show qualitative agreement between predictions and reality. The solar irradiation of the built environment was calculated in thirty-minute increments spanning the daylight hours of one day a week over the course of a year to detect any problematic solar loading consequences due to the presence of the hotel. During times of increased solar loading, details of the solar load distributions were studied. Estimated temperature increases due to reflections off the specular surfaces of the hotel suggest that the impact to pedestrian areas of Caesars Republic will be minimal, and a reflective glare analysis performed using an after-image metric found that reflected visible light will pose little ocular hazard to pedestrians and passing traffic.

Figure 1: A rendering of the Caesars Republic

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5/24/2019

TECHNICAL APPROACH

The focus of the current work was to provide a solar loads analysis on Caesars Republic. The work involved the creation of a solar radiation model from a Revit model provided by HCW followed by a convergence study to determine the level of spatial refinement required for accurate solar loads calculations. A validation exercise was needed to ensure confidence in the solar loads model. The model was then used to assess the solar loads impacts of Caesars Republic on nearby roads and pedestrian areas and to identify any scenarios where large thermal or ocular impacts might exist.

Optics

When a radiation wave (visible or otherwise) travels in a medium and finds an obstacle such as a glass surface, part of the incident ray is reflected, part is absorbed, and the rest is transmitted to the other side of the obstacle. The reflectivity, ρ, absorptivity, α, and transmissivity, τ, sum to one such that the incident radiant energy, G, is distributed by one of those modes,

$$G = \rho G + \alpha G + \tau G. \qquad (1)$$

Energy is also emitted from the surface of the obstacle at a rate proportional to the fourth power of the surface temperature, $\epsilon\sigma T^4$, where ϵ and σ are the emissivity and Stefan-Boltzmann constant, respectively. The radiative energy balance is illustrated in Figure 2.

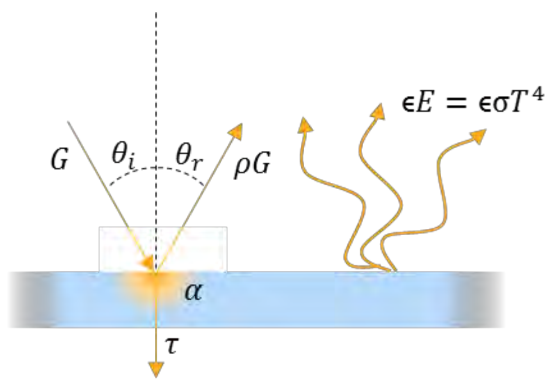

Figure 2. Radiative energy balance.

The reflection produced by surfaces that are idealized as perfectly smooth is called specular reflection, where the incident and reflected angle are equal. In reality, all surfaces have some roughness and produce diffuse reflection. Figure 2 shows an example of specular reflection.

This study focused only on the reflection from flat architectural glass, which is conservatively assumed to be completely specular. Since the details of the building interior are not modeled, transmissivity is neglected so that all incident radiant energy is either absorbed or reflected. A multiband radiative model is employed in which radiative properties are dependent on wavelength, and Kirchhoff's radiation law is respected, which states that spectral emissivity and absorptivity are equal, i.e., $\epsilon(\lambda) = \alpha(\lambda)$, where λ represents the wavelength.

Sun Tracking

The sun elevation, azimuthal angle, and solar intensity depend on the date, time, and geographical location, as shown in Figure 3.

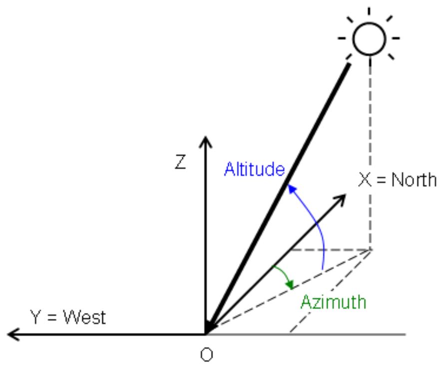

Figure 3: Altitude and azimuth of the sun.

The Solar Calculator built into the software was used to provide the time-varying solar loads incident on Atlanta according to the astronomical relationship between the sun, earth, and atmosphere developed by the National Renewable Energy Laboratory (NREL). The required inputs are the longitude and latitude, 33.8525° N, 84.3620° W for Atlanta, the date, and the time. An additional parameter, a sunshine factor by which the total solar flux is reduced to account for cloudy sky conditions, was set to zero to represent the worst-case scenario of a blue-sky day. All solar flux is assumed to be direct as opposed to diffuse.

Glass Selection

The architectural plans for Caesars Republic specified that all glass surfaces be assigned a frequency-invariant reflectivity of 0.06, and all nonreflective surfaces were assigned an emissivity of 1.0 (and a reflectivity of 0.0). The layout of the reflective and nonreflective surfaces is shown in Figure 0-4.

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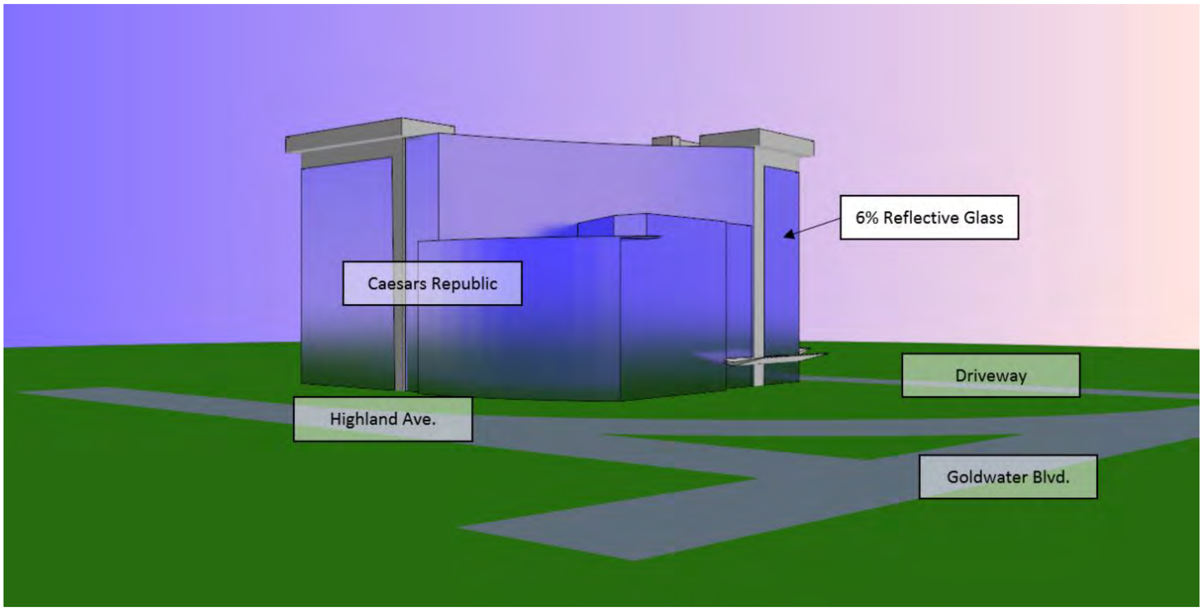


Figure 0-4. Surfaces modeled in the Caesars Republic solar loads model.

Model

The geometric model of Caesars Republic was imported and discretized for the solar load analysis, and a convergence study was performed to ensure that the spatial discretization was sufficient to produce accurate solar load predictions.

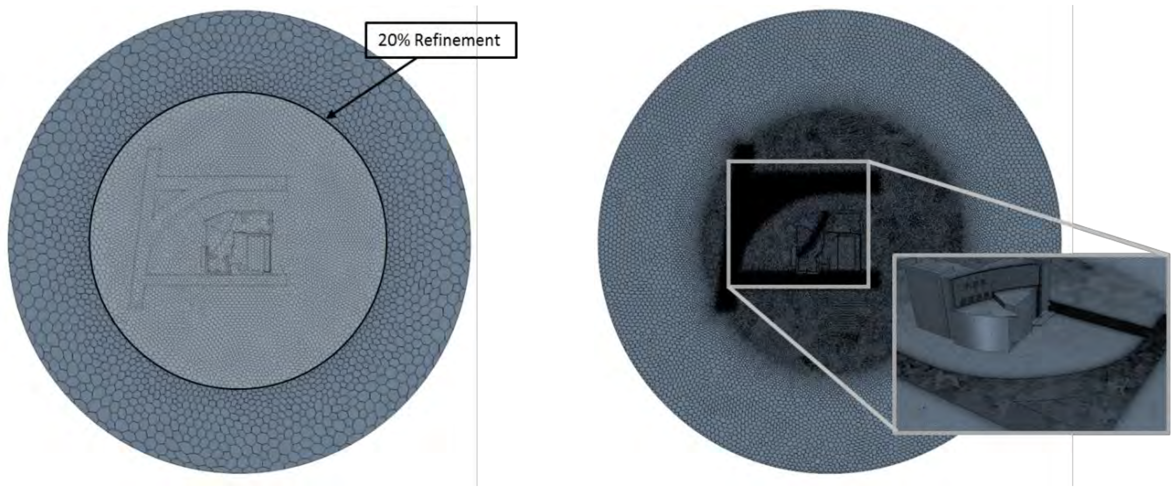
Computational Model and Geometry

The computational model represents Caesars Republic and the surrounding roadways including Goldwater Blvd., Highland Ave., and the driveway to the south, as shown in Figure 0-4. The reflective surfaces in the Caesars Republic model reflect visible and solar radiation specularly with the reflectivity of 0.06, as discussed in section 0. In the absence of surface finish details for the surrounding areas, all regions of Caesars Republic not associated with reflective surfaces were assigned zero reflectivity so that they only absorbed and emitted radiant energy.

Radiation was modeled using the *S2S (Surface-to-Surface) Radiation* model, in which radiative heat transfer can be modeled between spatially discretized surfaces separated by a nonparticipating medium. It is assumed that the space between the model surfaces does not absorb, emit, or scatter radiation, which offers the advantage that the air does not need to be modeled, reducing the computational cost significantly. All surfaces were assigned the *Environmental* boundary condition, which specifies that radiation emitted from a given surface that does not intersect another surface is then radiated to a virtual environmental surface that has been assigned a user-defined environmental temperature. For the analysis here, the environment was given a temperature of 80 °F.

Discretization

For the solar loads analysis, the model was discretized so that the surface was represented by a large number of radiation patches, as shown in Figure 2-4. The majority of the computational cost of a solar loads analysis is related to the calculation of the view-factor matrix, which quantifies the radiant energy transferred between all of the patches in the model. The view factors are calculated using a deterministic ray-tracing algorithm in which a user-defined number of rays are cast from a patch to determine the number of rays that intersect other patches, including the virtual environment patch. A numerical experiment determined that 512 rays per patch was sufficient for this work.



(a) (b)

Figure 2-4. Surface patch distribution of (a) coarse (Δx = 20 m with Δx =4 m local to hotel) and (b) semi-fine (Δx = 1 m Δx = 0.2 m local to hotel, .025 m on concave window and roads) discretizations used in the spatial convergence study.

For all practical purposes, the physical world exists on a continuum, and numerical simulations divide that continuum into a finite number of discrete cells, such as the patches discussed above, at which to perform calculations. The accuracy of numerical simulations depends on how well the spatial discretization represents the relevant scales of the geometry and physics being simulated. A finer discretization will result in a more accurate prediction of the physics but will lead to a more computationally demanding model. A convergence study was performed to determine the minimum refinement required to accurately predict the impact of the reflective surfaces of the Caesars Republic hotel on the solar loads in surrounding areas, most importantly the nearby roads. The mesh was characterized by a base size defining the cell dimensions on the perimeter of the computational domain. The base size was refined by 20% in a circle surrounding the hotel, shown in Figure 2-4 (a). Later grid iterations were further refined on the convex window and roads, as shown in Figure 2-4 (b). The refinement levels ranged from a base size of Δx = 20 m to a base size of Δx = 5 m with Δx = 0.0125 m on the convex window and roads, as shown in Figure 2-4, with resulting overall patch counts of around 36 thousand to 3 million patches, respectively. The time it took for twelve processors to calculate the view-factor matrix was 26 seconds for the coarse discretization to over 2 hours for the fine discretization.

The metric for convergence was the maximum solar irradiation (solar heat flux) in the Caesars Republic area over the course of June 21, 2019, shown in Figure 2-5 This date is the summer solstice and was chosen because that is when the sun is reaches its northernmost point in the sky.

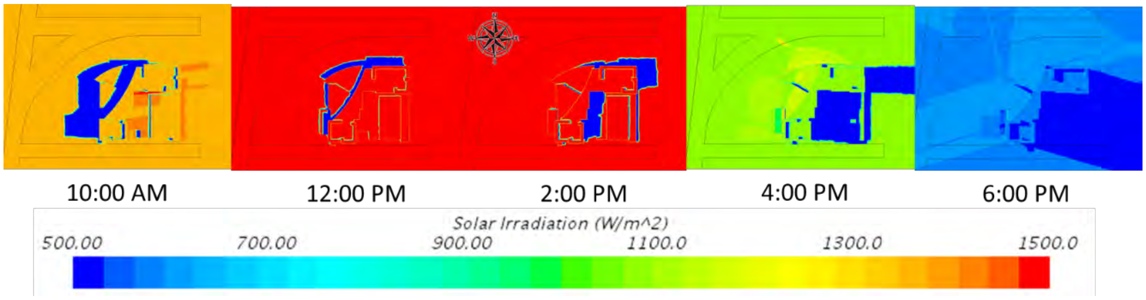


Figure 2-5. Solar irradiation of Caesars Republic on June 21, 2019.

Irradiation calculations were performed for every ten minutes from 5 a.m. to 8 p.m. The primary concern became a focused solar load from the concave window onto Highland Ave., the street north of Caesars Republic. The maximum instantaneous values of irradiation on the street over the course of the day for all discretizations are shown in Figure 2-6.

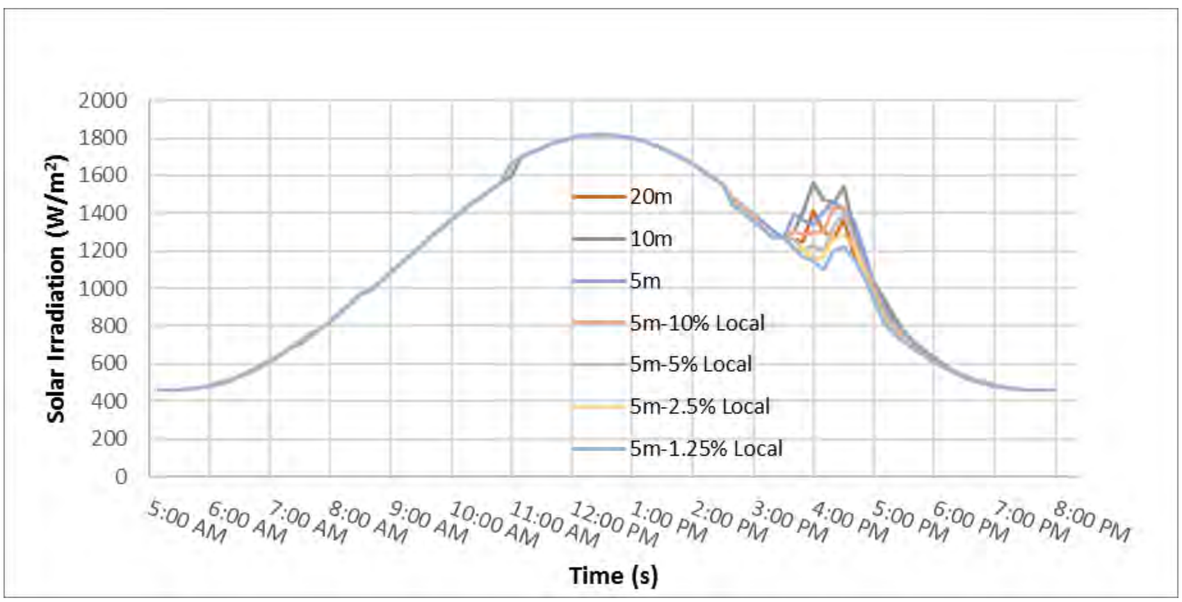


Figure 2-6. Maximum solar irradiation on the streets over the course of June 21, 2019.

It is seen that there is a spike in the solar load around 4:20 p.m. The spike is the result of the focused solar heat from the concave window. Figure 2-7 shows the evolution of the focused area with grid size. It is seen in Figure 2-6 and supported in Figure 2-7 that the spike in the heat load decreases in magnitude as the grid becomes more refined. The grid using a base size of Δx = 5 m was chosen for all further analysis to provide conservative solar loads calculations while keeping the computational cost low.

30-DR-2019
5/24/2019

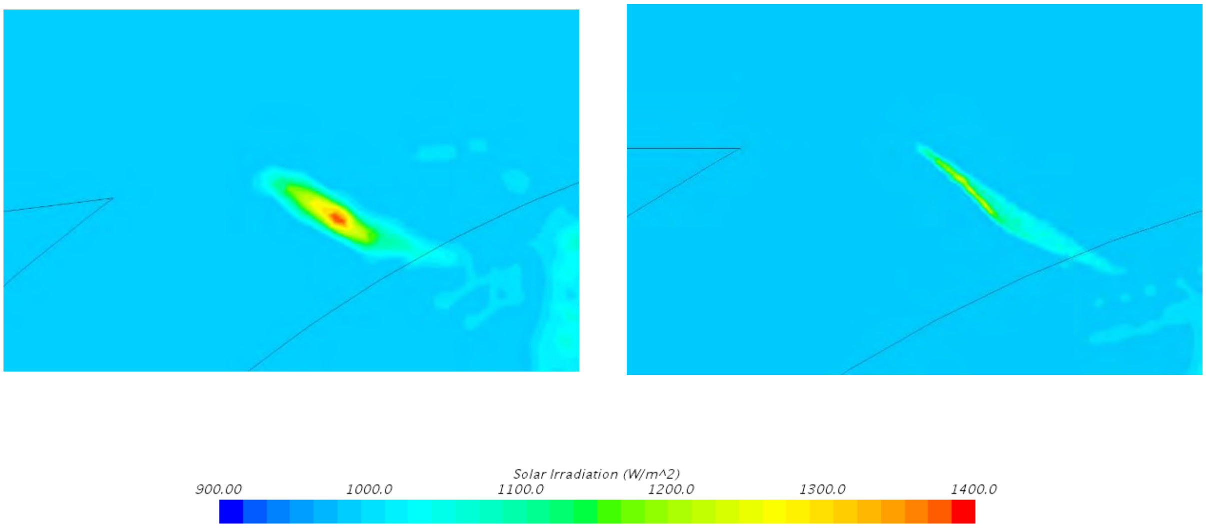


Figure 2-7. Solar irradiation focus at 4:20 p.m. on June 21, 2019, resolved on the (a) Δx = 5 m grid and (b) Δx = 5 m with Δx = 2.5 m on the concave window and streets.

RESULTS

Solar loads analyses were run over the course of one year to determine whether the presence of the Caesars Republic hotel would cause any unacceptable solar loads on nearby roadways. Additionally, the analysis considered the impact of reflective solar loads on patrons in different areas of the hotel premises. A validation exercise was performed to establish confidence in the solar loads predictions.

Solar Loads Model Validation

A validation effort was conducted to ensure that the solar loads model and model geometries used adequately represented those present in the built environment being analyzed. This was done by comparing solar data from a point in history with simulation predictions of a nearby Scottsdale office building. No existing features of the surrounding area were present in the HCW-provided Caesars Republic model, so a nearby building was used. The office building at 7150 E. Camelback Rd. was estimated with the Google Earth measurement tool to have an L-shape with side lengths of 68 m and 61 m on the south and east sides, respectively, a width of 27 m, and a height of 42.5 m. Satellite imagery obtained from Sanborn, through the United States Geological Society (USGS) Earth Explorer (4) qualitatively represented the solar loads in the Scottsdale area on some unspecified date and time in September 2012. By matching the predicted shadow patterns, the computational model determined that the image was taken within five minutes of 12:25 p.m. on September 1, 2012. The close match, shown in

30-DR-2019
5/24/2019

Figure 3-1, serves as a qualitative validation of the solar loads model.

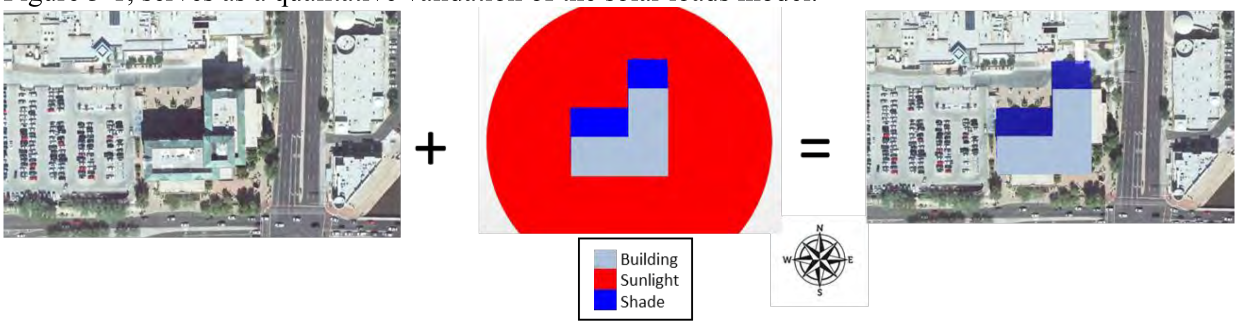


Figure 3-1. Qualitative comparison between satellite imagery and computational model predictions of the shadow cast by the office building at 7150 Camelback Rd. in Scottsdale.

Solar Loads Impact Around Caesars Republic

The solar loads impact of the reflective surfaces of the Caesars Republic hotel on pedestrian areas and surrounding roadways will vary throughout the year, and the times at which the most-severe impacts will be felt are not known a priori. Simulations were run to predict solar loads at thirty-minute intervals from 6 a.m. to 7 p.m. every Tuesday for 52 weeks over the course of the year 2019. The solar loads impact of the proposed building was quantified by comparison of solar loads predictions including the presence of the hotel with the flat surface solar irradiation:

$$Impact = \frac{G_R - G_0}{G_0} \quad (2)$$

where G_R and G_0 are the spatially averaged solar irradiation with the hotel and on a flat surface, respectively. Positive solar load impacts resulting from the hotel's reflective surfaces were considered on eight areas of in and around Caesars Republic (Figure 3-2). The impacts to nearby roadways were assessed for the driveway, Goldwater Blvd., Highland Ave., and the curve between Goldwater and Highland. Impacts to pedestrian comfort on the hotel premises were assessed in the west parking lot, the north parking lot, the park area to the east, and the rooftop patio. Tabulated solar loads impact results are given in Appendix A.

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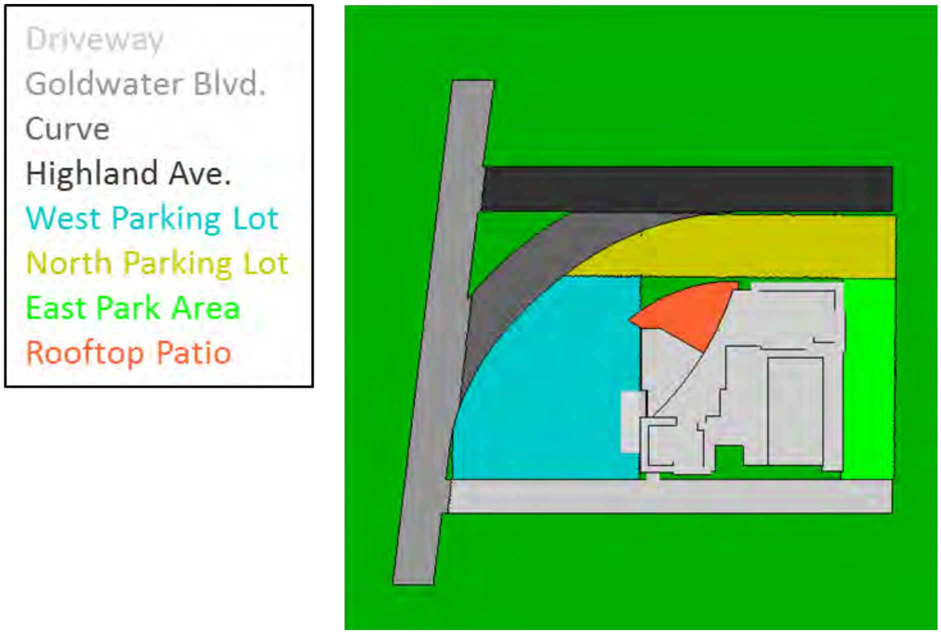


Figure 3-2. Caesars Republic areas in the solar loads impact analysis.

Instances of outlying positive solar load impacts were further investigated by plotting contours of solar load modification in terms of the normalized heat flux:

$$q_{nrm} = \frac{q - q_{flat}}{q_{flat}},$$

where q_{flat} represents the instantaneous solar heat load on a flat surface. Cases with a positive solar loads impact in the pedestrian areas of the park rooftop patio were further investigated by estimating the resulting surface temperatures under the augmented heat loads following the method presented in Appendix B. The temperature estimation procedure is approximate and is meant to provide familiar, relatable estimates of the solar load impacts; due to the many inherent assumptions in the method, the temperature values provide ballpark estimates and should not be taken literally. In isolated cases, the large concave reflective surface on the northwest side of the hotel causes solar focusing on the curve and Highland Ave. The after-image glare quantification metric, presented in Appendix C, is applied to assess the potential impact to motorist vision.

Solar Loads Impact on the Parking Lots

Over the course of the year, the north parking lot sees higher reflected solar loads increases compared to the west parking lot. As shown in Figure 3-3, the maximum reflected solar load augmentation on the north parking lot is 33%, whereas the west parking lot sees a maximum reflected load of 10%.

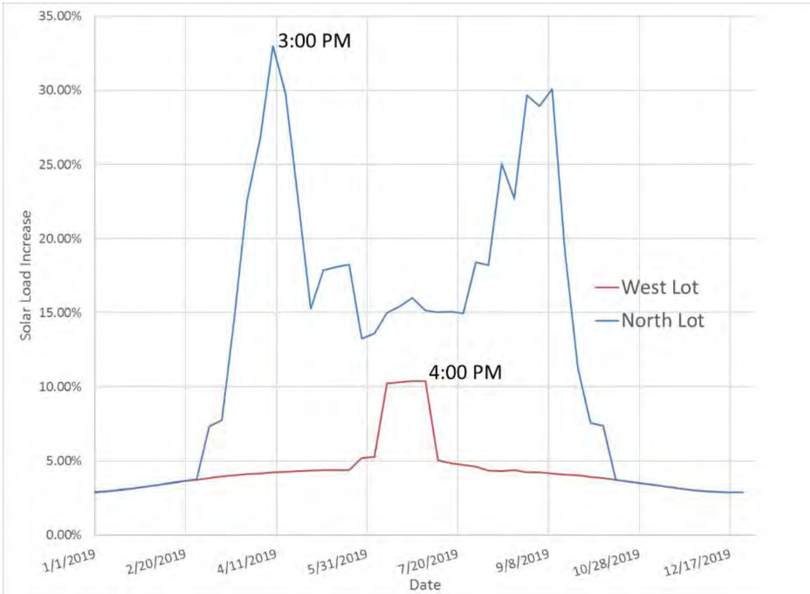
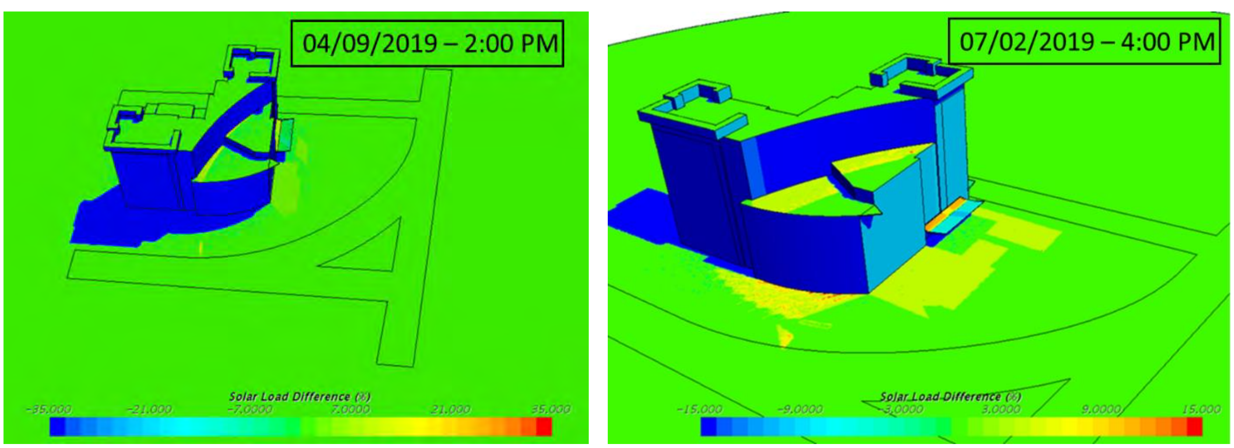


Figure 3-3. Solar load increases in on the north and west parking lots due to reflections from Caesars Republic.

Figure 3-4 shows solar load difference contours corresponding to the increases indicated in Figure 3-3. During the spring, summer, and fall months, the sun's latitude is sufficiently north to cause reflections from the northwest concave reflective surface to concentrate in localized areas in the north parking lot. An example of this is shown in Figure 3-4 (a), where a very localized region of the parking lot experiences an elevated heat load at 2:00 p.m. on April 9, 2019. The sun is never in a position where reflections from the concave surface impact the west parking lot. Therefore, maximum solar load increases are caused by reflections off the broad western windows, as shown in Figure 3-4 (b) at 4:00 p.m. on July 2, 2019.



(a) (b)

Figure 3-4. Solar load modification on (a) the north parking lot at 2:00 p.m. on April 9, 2019, and (b) the west parking lot at 4:00 p.m. on July 2, 2019.

It is noted that solar load increases in the west parking lot are only experienced in the middle of summer, when the sun is high enough in the sky to reflect onto the parking lot in the late afternoon hours.

Solar Loads Impact on Goldwater Blvd. and the Southern Driveway

The increase heat loads experienced by both Goldwater Blvd. and the driveway on the southern side of Caesars Republic are minimal, as shown in Figure 3-5. The proximity of the driveway to the hotel is the primary cause of the increased solar load magnitudes over those experienced on Goldwater Blvd.

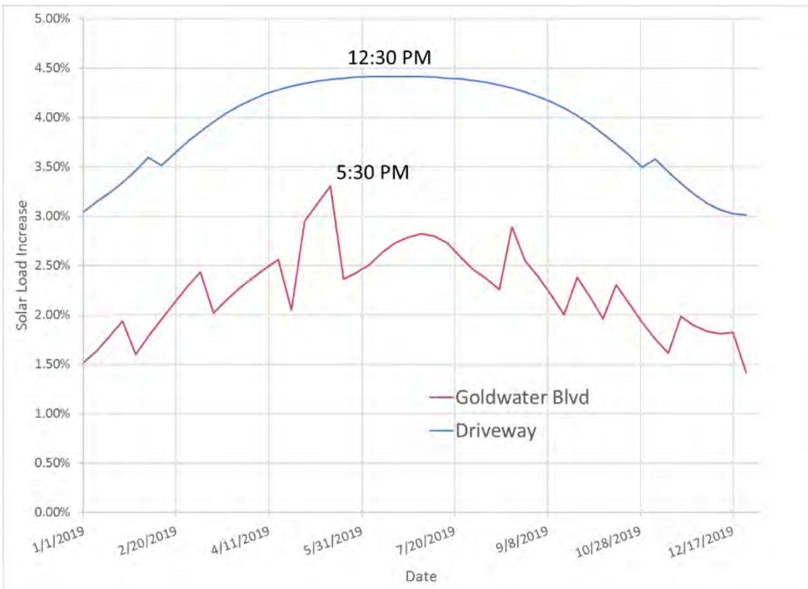


Figure 3-5. Solar load increases in on Goldwater Blvd. and the southern driveway due to reflections from Caesars Republic.

Figure 3-6 (a) shows the instance of the highest solar load increase on Goldwater Blvd. of 3.3% at 5:30 p.m. on May 14, 2019. The solar glares are minimal, especially considering they are only slightly higher than the low solar loads of the early evening sun. The highest glares pose little threat to passing motorists as they are perpendicular to the flow of traffic. As shown in Figure 3-6 (b), the highest solar loads on the driveway are 4.5% and occur at 12:30 p.m. on June 18, 2019. The solar load increases are confined to a region very close to the hotel as they are reflected vertically from the midday sun. The reflection angle poses little to no glare threat to automobiles.

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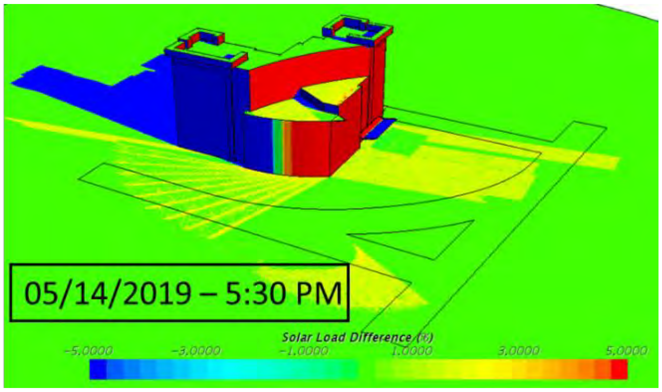

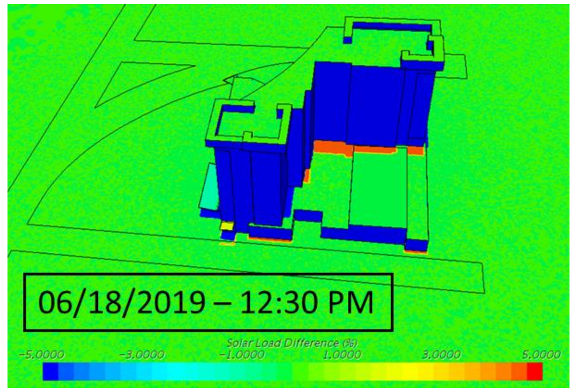

(a) (b)

Figure 3-6. Solar load modification on (a) Goldwater Blvd. at 5:30 p.m. on March 14, 2019, and (b) the south driveway at 12:30 p.m. on June 18, 2019.

Solar Loads Impact Park and Rooftop Patio Pedestrian Areas

Figure 3-7 shows that, of the two areas in which pedestrians may be spending extended periods of time, the patio and the park, the patio experiences the largest increased solar loads. This is due to the patio's proximity to the concave reflective surface on the northwest side of the hotel. The largest solar load increase on the patio is 40% on October 1, 2019, at 2:00 p.m., whereas the largest solar load increase in the park is only 7% and occurs at 9:00 a.m. on June 11, 2019.

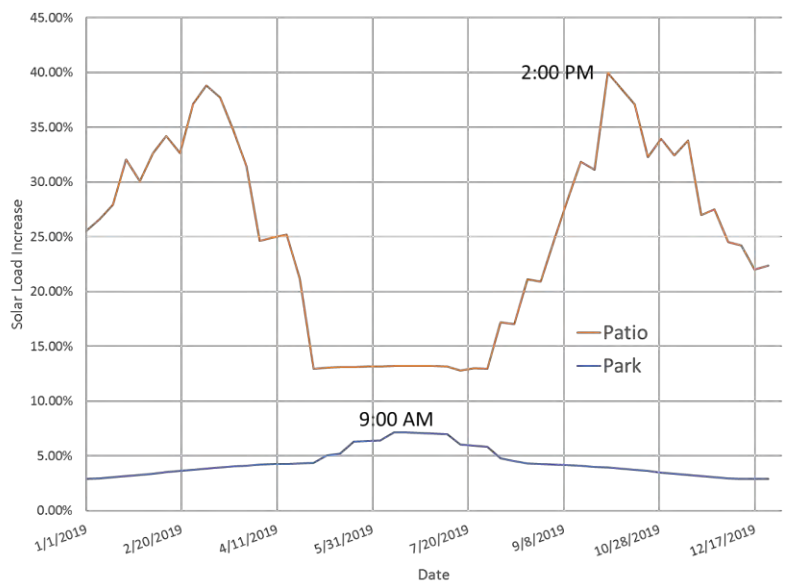

Figure 3-7. Solar load increases on the rooftop patio and park on the east side of Caesars Republic.

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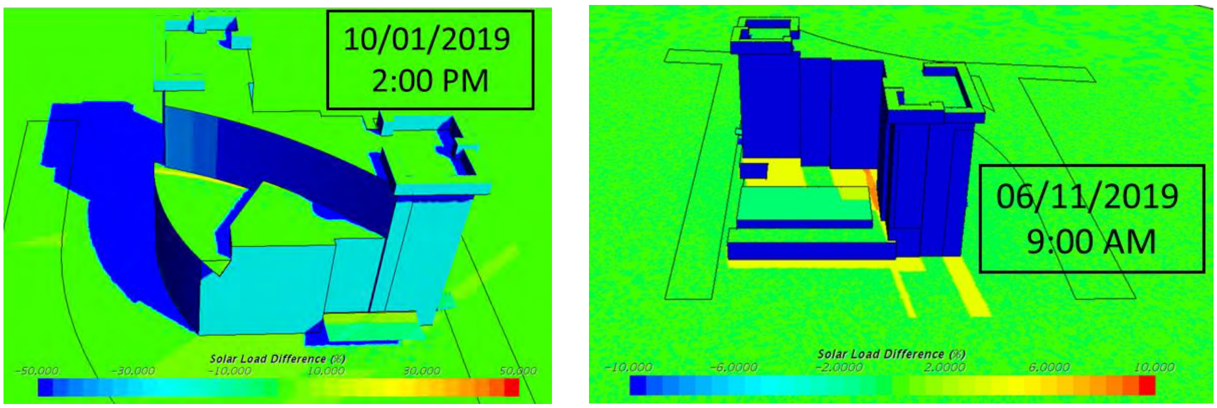
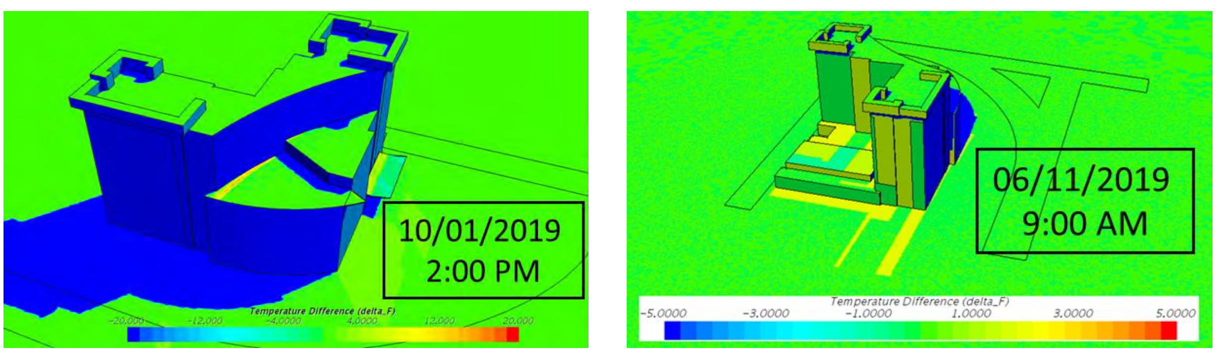
Figure 3-8 (a) shows that the largest solar load increases on the patio are confined to areas very close to the concave window while the majority of the patio surface is unaffected. The solar load increases in the park occur close to the hotel except in areas next to the tower, in which reflections stretch over across the width of the park area, as shown in Figure 3-8 (b).



(a) (b)

Figure 3-8. Solar load modification on (a) the rooftop patio at 2:00 p.m. on October 1, 2019, and (b) the east park at 9:00 a.m. on June 11, 2019.

To understand the solar loads impact on pedestrian comfort, the resulting temperatures are estimated in the park and patio areas following the procedure outlined in Appendix B. Figure 3-9 (a) shows that local heat flux augmentations seen at 2:00 p.m. on October 1 lead to an estimated 20 °F increase in patio surface temperatures in areas close to the concave window. Umbrellas or an awning may be used to ameliorate the temperature increases should it be a problem. The estimated park surface temperature increases in Figure 3-9 (b) are shown to be 2 °F and are unlikely to cause any discomfort.



(a) (b)

Figure 3-9. Equilibrium temperature predictions for (a) the rooftop patio on October 1, 2019, at 2:00 p.m. and (b) east park on June 11, 2019, at 9:00 a.m.

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Solar Loads Impact on Highland Ave. and Highland/Goldwater Curve

The maximum solar load increases on Highland Ave. and the Highland/Goldwater curve are shown in Figure 3-10. The solar load increases in these areas are relatively high, with a maximum of 59% on the curve on June 25, 2019, at 4:30 p.m. and maximum of 52% on July 16, 2019, at 4:30 p.m. Increases in both areas occur in the late afternoons during summer months, when the sun shines on the concave reflective surface on the northwest side of the hotel.

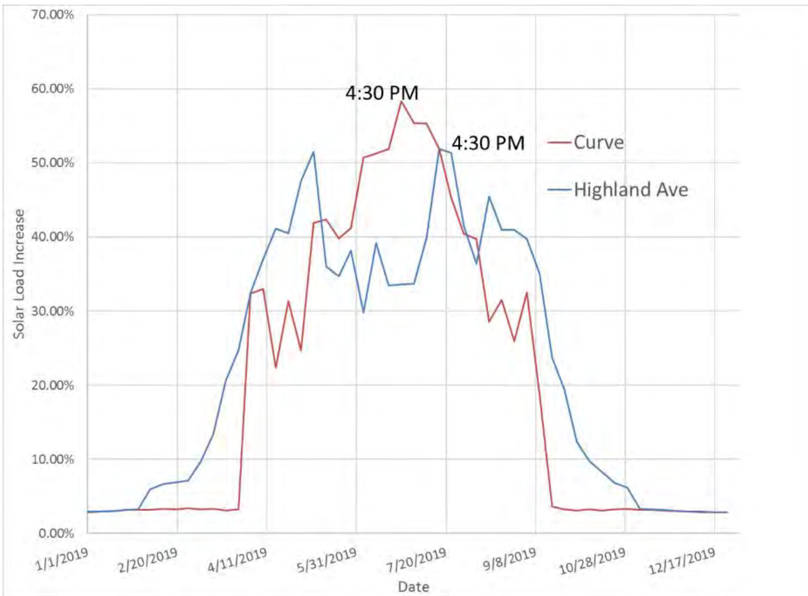
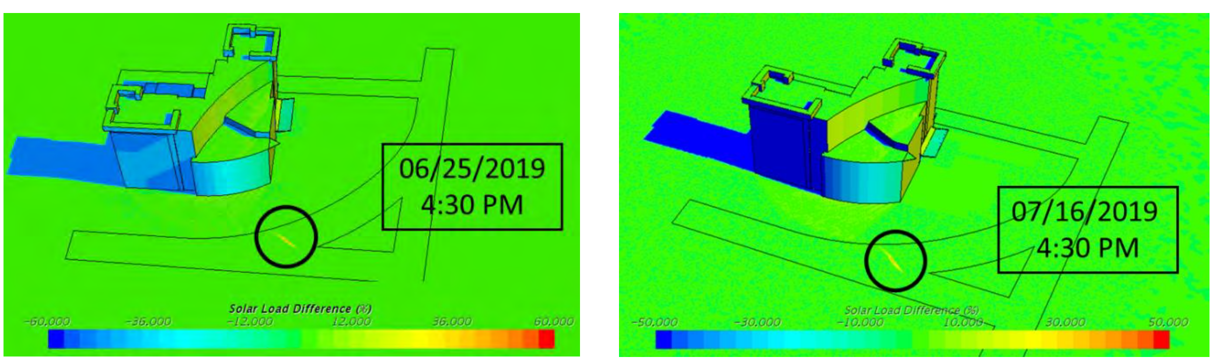


Figure 3-10. Solar load increases on Highland Ave. and the Highland/Goldwater curve.

Figure 3-11 shows that the maximum solar load increase is due to solar energy being focused by the concave surface onto the road. At times the very localized solar load focus falls on Highland Ave. (July 16, 2019, at 4:30 p.m., as shown in Figure 3-11 (a), while at other times it occurs on the Highland/Goldwater curve (June 25, 2019, at 4:30 p.m., as shown in Figure 3-11 (b).



(a) (b)

Figure 3-11. Solar load modification on (a) the Highland/Goldwater curve at 4:30 p.m. on June 25, 2019, and (b) Highland Ave. at 4:30 p.m. on July 16, 2019.

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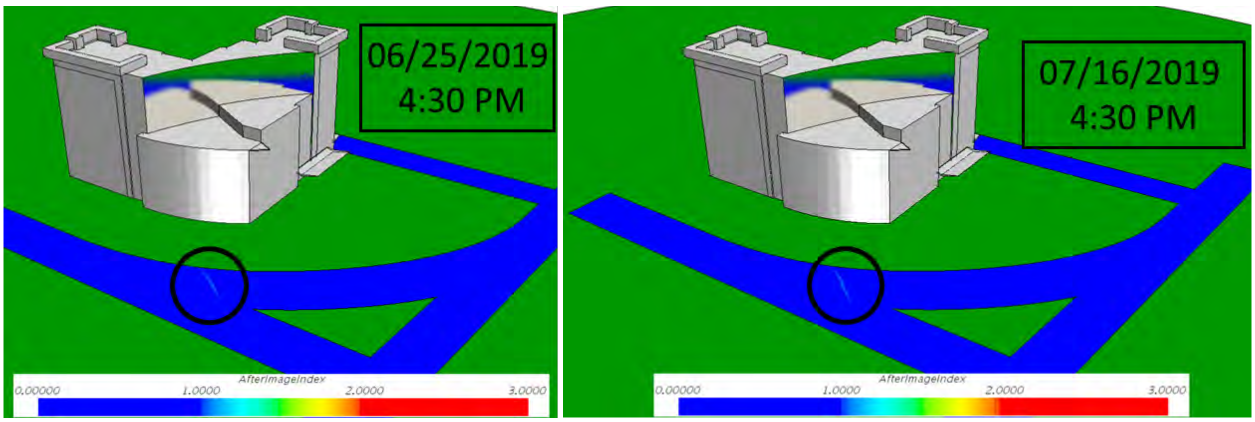
To quantify the reflective glare on the roadways, the after-image metric is computed as described in Appendix C. The after-image index contours, shown in Figure 3-12, show that the glare attains a maximum index of around 1.055 in both cases. This can be interpreted as an observer having a 5.5% chance of an after-image after looking at the concave window from the location indicated in Figure 3-12. This poses a minimal threat to traffic safety, as the angle of the solar reflection is perpendicular to the direction of travel and is therefore out of a driver's line of sight.



(a) (b)

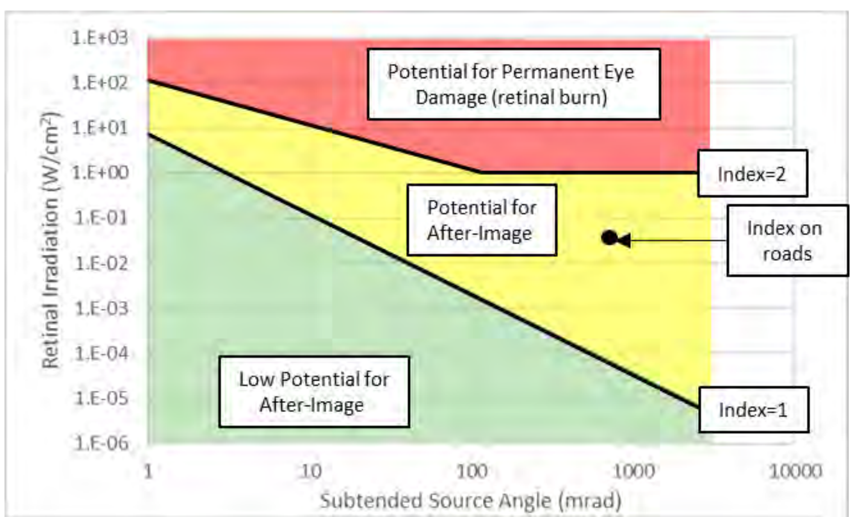


Figure 3-12. After-image index contours on (a) the Highland/Goldwater curve at 4:30 p.m. on June 25, 2019 and (b) Highland Ave. at 4:30 p.m. on July 16, 2019. (c) The index location on the empirical ocular hazard plot.

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CONCLUSION

A solar loads impact analysis was performed to assess the effect of the planned reflective Caesars Republic hotel on pedestrian areas and nearby roadways in Scottsdale, Arizona. A convergence study on the spatial discretization of the surface mesh was performed to ensure that the model of Caesars Republic was sufficiently resolved to produce accurate solar loads predictions, and a validation effort was performed in which shadows of a nearby office building from satellite imagery were compared with computational predictions to instill confidence in the computational model. Solar loads were calculated over the daylight hours of one day a week for 52 weeks to identify outlying increases in solar loads around Caesars Republic due to the presence of the reflective hotel surfaces. It was found that, depending on the time of year, different areas would experience temporary increases in thermal loads due to reflections on the hotel's reflective surfaces, especially the concave northwest window of Caesars Republic. Conservative temperature estimates predict modest local temperature increases in areas where pedestrians may spend extended lengths of time. A reflective glare analysis showed that on the nearby Highland Ave., there is a small potential for after-images, but the risk to traffic safety is minimal due to the angle of the reflected light being out of motorists' line of sight.

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Appendix A

Solar Loads Impact Over the 2019 Year

Table **Error! No text of specified style in document.**-1. Solar loads impact on the west parking lot, north parking lot, Goldwater Blvd, and the south driveway.

Date	West Parking Lot		North Parking Lot		Goldwater Blvd.		South Driveway	
	% Increase	Time	% Increase	Time	% Increase	Time	% Increase	Time
1/1/2019	3%	1:00 PM	3%	12:30 PM	2%	3:30 PM	3%	12:00 PM
1/8/2019	3%	1:00 PM	3%	12:30 PM	2%	3:30 PM	3%	12:30 PM
1/15/2019	3%	1:00 PM	3%	12:30 PM	2%	3:30 PM	3%	12:30 PM
1/22/2019	3%	1:00 PM	3%	12:30 PM	2%	3:30 PM	3%	12:30 PM
1/29/2019	3%	1:00 PM	3%	12:30 PM	2%	4:00 PM	3%	12:30 PM
2/5/2019	3%	1:00 PM	3%	12:30 PM	2%	4:00 PM	4%	12:30 PM
2/12/2019	4%	1:00 PM	4%	12:30 PM	2%	4:00 PM	4%	12:30 PM
2/19/2019	4%	1:00 PM	4%	12:30 PM	2%	4:00 PM	4%	12:30 PM
2/26/2019	4%	1:00 PM	4%	12:30 PM	2%	4:00 PM	4%	12:30 PM
3/5/2019	4%	1:00 PM	7%	2:00 PM	2%	4:00 PM	4%	12:30 PM
3/12/2019	4%	1:00 PM	8%	1:30 PM	2%	4:30 PM	4%	12:30 PM
3/19/2019	4%	1:00 PM	15%	2:30 PM	2%	4:30 PM	4%	12:30 PM
3/26/2019	4%	1:00 PM	23%	2:30 PM	2%	4:30 PM	4%	12:30 PM
4/2/2019	4%	1:00 PM	27%	2:30 PM	2%	4:30 PM	4%	12:30 PM
4/9/2019	4%	1:00 PM	33%	3:00 PM	2%	4:30 PM	4%	12:30 PM
4/16/2019	4%	12:30 PM	30%	3:00 PM	3%	4:30 PM	4%	12:30 PM
4/23/2019	4%	12:30 PM	23%	3:00 PM	2%	5:00 PM	4%	12:30 PM
4/30/2019	4%	12:30 PM	15%	3:00 PM	3%	5:30 PM	4%	12:30 PM
5/7/2019	4%	12:30 PM	18%	3:30 PM	3%	5:30 PM	4%	12:30 PM
5/14/2019	4%	12:30 PM	18%	3:30 PM	3%	5:30 PM	4%	12:30 PM
5/21/2019	4%	12:30 PM	18%	3:30 PM	2%	5:00 PM	4%	12:30 PM
5/28/2019	5%	8:00 AM	13%	4:00 PM	2%	5:00 PM	4%	12:30 PM
6/4/2019	5%	8:00 AM	14%	4:00 PM	3%	6:00 PM	4%	12:30 PM
6/11/2019	10%	4:00 PM	15%	3:30 PM	3%	6:00 PM	4%	12:30 PM
6/18/2019	10%	4:00 PM	15%	3:30 PM	3%	6:00 PM	4%	12:30 PM
6/25/2019	10%	4:00 PM	16%	3:00 PM	3%	6:00 PM	4%	12:30 PM
7/2/2019	10%	4:00 PM	15%	3:30 PM	3%	6:00 PM	4%	12:30 PM
7/9/2019	5%	8:00 AM	15%	3:30 PM	3%	6:00 PM	4%	12:30 PM
7/16/2019	5%	8:00 AM	15%	3:30 PM	3%	6:00 PM	4%	12:30 PM
7/23/2019	5%	8:00 AM	15%	3:30 PM	3%	6:00 PM	4%	12:30 PM
7/30/2019	5%	8:00 AM	18%	3:30 PM	2%	5:00 PM	4%	12:30 PM
8/6/2019	4%	1:00 PM	18%	3:30 PM	2%	5:00 PM	4%	12:30 PM
8/13/2019	4%	1:00 PM	25%	3:30 PM	2%	5:00 PM	4%	12:30 PM
8/20/2019	4%	2:00 PM	23%	3:00 PM	3%	5:30 PM	4%	12:30 PM
8/27/2019	4%	1:00 PM	30%	3:00 PM	3%	4:30 PM	4%	12:30 PM
9/3/2019	4%	12:30 PM	29%	3:00 PM	2%	4:30 PM	4%	12:30 PM
9/10/2019	4%	12:30 PM	30%	2:30 PM	2%	4:30 PM	4%	12:30 PM
9/17/2019	4%	12:30 PM	19%	2:00 PM	2%	4:30 PM	4%	12:30 PM
9/24/2019	4%	12:30 PM	11%	2:00 PM	2%	4:00 PM	4%	12:30 PM
10/1/2019	4%	12:30 PM	8%	1:30 PM	2%	4:00 PM	4%	12:30 PM
10/8/2019	4%	12:30 PM	7%	1:30 PM	2%	4:00 PM	4%	12:30 PM
10/15/2019	4%	12:30 PM	4%	12:00 PM	2%	3:30 PM	4%	12:00 PM
10/22/2019	4%	12:30 PM	4%	12:00 PM	2%	3:30 PM	4%	12:00 PM
10/29/2019	3%	12:30 PM	3%	12:00 PM	2%	3:30 PM	3%	12:00 PM
11/5/2019	3%	12:30 PM	3%	12:00 PM	2%	3:30 PM	4%	12:00 PM
11/12/2019	3%	12:30 PM	3%	12:00 PM	2%	3:30 PM	3%	12:00 PM
11/19/2019	3%	12:30 PM	3%	12:00 PM	2%	3:00 PM	3%	12:00 PM
11/26/2019	3%	12:30 PM	3%	12:00 PM	2%	3:00 PM	3%	12:00 PM
12/3/2019	3%	12:30 PM	3%	12:30 PM	2%	3:00 PM	3%	12:00 PM
12/10/2019	3%	12:30 PM	3%	12:30 PM	2%	3:00 PM	3%	12:00 PM
12/17/2019	3%	12:30 PM	3%	12:30 PM	2%	3:00 PM	3%	12:00 PM
12/24/2019	3%	12:30 PM	3%	12:30 PM	1%	3:30 PM	3%	12:00 PM

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Table A 2. Solar loads impact on the park, rooftop patio, Highland Ave., and the Highland/Goldwater curve.

Date	East Park		Rooftop Patio		Highland Ave.		Curve	
	% Increase	Time	% Increase	Time	% Increase	Time	% Increase	Time
1/1/2019	3%	12:30 PM	26%	2:30 PM	3%	12:30 PM	3%	1:00 PM
1/8/2019	3%	12:30 PM	27%	2:30 PM	3%	12:30 PM	3%	1:00 PM
1/15/2019	3%	12:30 PM	28%	2:30 PM	3%	12:30 PM	3%	1:00 PM
1/22/2019	3%	12:30 PM	32%	2:30 PM	3%	12:30 PM	3%	1:00 PM
1/29/2019	3%	12:30 PM	30%	3:00 PM	3%	12:30 PM	3%	1:30 PM
2/5/2019	3%	12:30 PM	33%	2:30 PM	6%	2:30 PM	3%	2:00 PM
2/12/2019	4%	12:30 PM	34%	2:30 PM	7%	2:00 PM	3%	2:00 PM
2/19/2019	4%	12:30 PM	33%	3:00 PM	7%	2:00 PM	3%	2:30 PM
2/26/2019	4%	12:30 PM	37%	2:30 PM	7%	2:00 PM	3%	2:30 PM
3/5/2019	4%	12:30 PM	39%	3:00 PM	10%	3:00 PM	3%	3:00 PM
3/12/2019	4%	12:30 PM	38%	2:00 PM	13%	3:00 PM	3%	3:00 PM
3/19/2019	4%	12:30 PM	35%	2:00 PM	21%	3:00 PM	3%	3:30 PM
3/26/2019	4%	12:30 PM	31%	2:00 PM	25%	3:00 PM	3%	3:30 PM
4/2/2019	4%	12:30 PM	25%	1:30 PM	32%	3:00 PM	32%	3:00 PM
4/9/2019	4%	12:30 PM	25%	1:30 PM	37%	3:30 PM	33%	3:00 PM
4/16/2019	4%	12:30 PM	25%	1:30 PM	41%	3:30 PM	22%	3:00 PM
4/23/2019	4%	12:30 PM	21%	1:30 PM	41%	4:00 PM	31%	3:30 PM
4/30/2019	4%	12:30 PM	13%	1:00 PM	48%	4:00 PM	25%	3:30 PM
5/7/2019	5%	8:00 AM	13%	1:00 PM	52%	4:00 PM	42%	4:00 PM
5/14/2019	5%	8:00 AM	13%	1:00 PM	36%	4:00 PM	42%	4:00 PM
5/21/2019	6%	8:30 AM	13%	1:00 PM	35%	4:30 PM	40%	4:00 PM
5/28/2019	6%	8:30 AM	13%	1:00 PM	38%	4:30 PM	41%	4:30 PM
6/4/2019	6%	8:30 AM	13%	1:00 PM	30%	4:30 PM	51%	4:30 PM
6/11/2019	7%	9:00 AM	13%	1:00 PM	39%	4:30 PM	51%	4:30 PM
6/18/2019	7%	9:00 AM	13%	1:00 PM	33%	4:30 PM	52%	4:30 PM
6/25/2019	7%	9:00 AM	13%	1:00 PM	34%	4:30 PM	58%	4:30 PM
7/2/2019	7%	9:00 AM	13%	1:00 PM	34%	4:30 PM	55%	4:30 PM
7/9/2019	7%	9:00 AM	13%	1:00 PM	40%	4:30 PM	55%	4:30 PM
7/16/2019	6%	8:30 AM	13%	2:00 PM	52%	4:30 PM	52%	4:30 PM
7/23/2019	6%	8:30 AM	13%	1:30 PM	51%	4:30 PM	45%	4:30 PM
7/30/2019	6%	8:30 AM	13%	1:30 PM	41%	4:30 PM	40%	4:00 PM
8/6/2019	5%	5:00 PM	17%	1:30 PM	36%	4:00 PM	40%	4:00 PM
8/13/2019	5%	5:00 PM	17%	1:30 PM	45%	4:00 PM	29%	3:30 PM
8/20/2019	4%	12:30 PM	21%	1:30 PM	41%	4:00 PM	32%	3:30 PM
8/27/2019	4%	12:30 PM	21%	1:30 PM	41%	3:30 PM	26%	3:00 PM
9/3/2019	4%	12:30 PM	25%	1:30 PM	40%	3:30 PM	33%	3:00 PM
9/10/2019	4%	12:30 PM	28%	1:30 PM	35%	3:00 PM	19%	2:30 PM
9/17/2019	4%	12:30 PM	32%	1:30 PM	24%	3:00 PM	4%	2:30 PM
9/24/2019	4%	12:30 PM	31%	1:30 PM	20%	3:00 PM	3%	3:00 PM
10/1/2019	4%	12:30 PM	40%	2:00 PM	12%	3:00 PM	3%	3:00 PM
10/8/2019	4%	12:30 PM	39%	2:00 PM	10%	2:30 PM	3%	2:30 PM
10/15/2019	4%	12:00 PM	37%	2:00 PM	8%	3:00 PM	3%	2:30 PM
10/22/2019	4%	12:00 PM	32%	2:00 PM	7%	1:30 PM	3%	2:00 PM
10/29/2019	3%	12:00 PM	34%	2:00 PM	6%	2:00 PM	3%	1:30 PM
11/5/2019	3%	12:00 PM	32%	2:00 PM	3%	11:30 AM	3%	1:30 PM
11/12/2019	3%	12:00 PM	34%	2:00 PM	3%	12:00 PM	3%	1:00 PM
11/19/2019	3%	12:00 PM	27%	2:00 PM	3%	12:00 PM	3%	1:00 PM
11/26/2019	3%	12:00 PM	28%	2:30 PM	3%	12:00 PM	3%	12:30 PM
12/3/2019	3%	12:30 PM	25%	2:30 PM	3%	12:00 PM	3%	12:30 PM
12/10/2019	3%	12:30 PM	24%	2:30 PM	3%	12:00 PM	3%	12:30 PM
12/17/2019	3%	12:30 PM	22%	2:30 PM	3%	12:00 PM	3%	12:30 PM
12/24/2019	3%	12:30 PM	22%	2:30 PM	3%	12:00 PM	3%	12:30 PM

Appendix B

Equilibrium Temperature Calculation Method

A method involving several approximations was used to estimate the surface temperature increases in the surrounding areas of Caesars Republic Hotel due to the presence of the hotel reflective surfaces. Conservative temperature estimates due to solar loads can be obtained by assuming that a given surface instantaneously reaches thermal equilibrium, i.e., the heat in balances with the heat out. The model, shown in Figure B-1 includes convection to ambient airflow over the surface and conduction into the underlying solid.

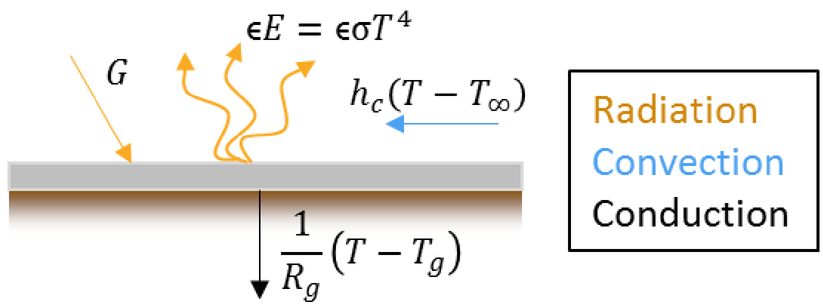


Figure B-1. Equilibrium temperature model.

Table B-1. Parameter values for equilibrium temperature model.

Parameter	Value
h_c	$27.37\left(\frac{W}{m^2K}\right)$
R_g	$1.94\left(\frac{m^2K}{W}\right)$
T_∞	300.0 K
T_g	288.7 K

The convection coefficient in Table B-1 is consistent with a 20 mph wind, and the ground resistance and temperature were taken from a derivation of the conduction through a grass surface provided in reference 8. The conduction parameters were applied to all surfaces in the computational model to provide an estimate of surface temperatures. The conduction coefficient that is accurate for grass provided a conservative approximation for the more conductive surfaces in the model. The surface temperature estimates were found by solving the energy balance for temperature.

$$\rho G + \epsilon\sigma T^4 + h_c(T - T_\infty) + \frac{1}{R_g}(T - T_g) = G \qquad (3)$$

The temperature was found by solving for the real positive root of Equation (3):

$$T = -\frac{1}{2}\sqrt{\frac{f_1}{f_2} + \frac{f_2}{f_3}} + \frac{1}{2}\left(\frac{2a}{\sqrt{\frac{f_1}{f_2} + \frac{f_2}{f_3}}} - \frac{f_1}{f_2} - \frac{f_2}{f_3}\right)^{\frac{1}{2}}$$

Where

$$a = \frac{h_c + \frac{1}{R_g}}{\epsilon\sigma}$$

$$b = -\frac{G(1-\rho) + h_c T_\infty + \frac{T_g}{R_g}}{\epsilon\sigma}$$

$$f_1 = 4b\left(\frac{2}{3}\right)^{\frac{1}{3}}$$

$$f_2 = \left(\sqrt{3}\sqrt{27a^4 - 256b^3} + 9a^2\right)^{\frac{1}{3}}$$

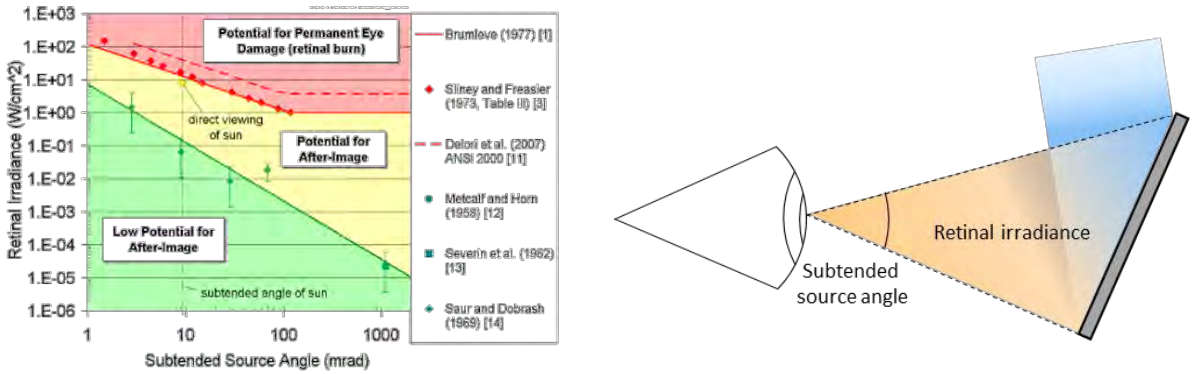
$$f_3 = 2^{\frac{1}{3}}3^{\frac{2}{3}}$$

30-DR-2019
5/24/2019

Appendix C

After-Image Reflective Glare Quantification

The effect on pedestrians from glare produced by reflections of visible light from the hotel was considered using the after-image metric defined by Ho et al. in 2011. The glare intensity is assessed by its potential to cause an after-image and is sorted into three empirically determined categories shown in the ocular hazard plot in Figure C-1 (a): “Low Potential for After-Image,” “Potential for After-Image,” and “Potential for Permanent Eye Damage.” These regions are parameterized by the retinal irradiance and subtended source angle as illustrated in Figure C-2 (b).



(a) (b)

Figure C-2. (a) Empirically defined ocular hazard plot and (b) an illustration of retinal irradiance and subtended source angle.

The after-image metric is used in the Sandia National Laboratory *Solar Glare Hazard Analysis Tool (SGHAT)* and was endorsed by the Federal Aviation Administration in 2013 to be used for assessing glare risk to pilots from solar arrays in proximity to airports.

The after-image metric was implemented through field functions in the software so that contours of the after-image index could be plotted to assess the risk of reflected glare on pedestrian surfaces. The after-image index was assigned a value of 1 on the boundary between “Low Potential for After-Image” and “Potential for After-Image” and 2 on the boundary between “Potential for After-Image” and “Potential for Permanent Eye Damage” in Figure C-1 (a). To isolate visible reflections from total solar irradiations, the direct visible solar irradiation measured from a flat surface was subtracted from the irradiance in the visible frequency band. A conservative approximation of the subtended source angle from the hotel was implemented, which resulted in higher than actual subtended angle values.

30-DR-2019
5/24/2019

SCOTTSDALE FASHION SQUARE- LOT 2

FINAL SEWER BASIS OF DESIGN REPORT

COS CASE NO. 962-PA-2018

Address comments below and herein and resubmit:

1) Little to no offsite sewer capacity analysis was completed despite flow monitoring completed. Address offsite issues highlighted herein. DS&PM 7-1.200
2) Sewer capacity is limited to d/D of 0.65 for 12" and smaller lines not d/D=1.0. The 2.5fps velocity requirement is for a line with d/D =1.0. DS&PM 7-1.404.
3) Install service line per MAG 440-3 with service line cleanout within ROW. DS&PM 7-1.409
4) Wall to wall horizontal clearance between sewer pipe and all other utilities and structures shall be 6feet. Utility plan indicates less. DS&PM 7-1.407, part A
5) Water/sewer crossings shown on utility plan should call out applicable details per MAG 404-2 and COS detail 2401. DS&PM 7-1.407, part A
6) Why is sewer service line 12"?
7) Note: 2 office buildings and 2 restaurants shown as future master planned structures. With the approval of this case BOD sewer capacity will be allocated for these building as shown for a period of 1 year. If subsequent case reviews for these are not submitted within 1 year their allocated sewer capacity may be reallocated. The same 1 year period applies for the hotel but with construction permits being the deadline...unless continuous progress towards construction phase can be demonstrated and accepted by the City and Water Resources.

Prepared For:

Macerich
11411 N Tatum Boulevard
Phoenix, AZ 85253

FINAL Basis of Design Report

☐ APPROVED
☐ APPROVED AS NOTED
☑ REVISE AND RESUBMIT

CITY OF SCOTTSDALE
SCOTTSDALE WATER
9379 E San Salvador Dr.
Scottsdale, AZ 85258

Disclaimer: If approved; the approval is granted under the condition that the final construction documents submitted for city review will match the information herein. Any subsequent changes in the water or sewer design that materially impact design criteria or standards will require re-analysis, re-submittal, and approval of a revised basis of design report prior to the plan review submission.; this approval is not a guarantee of construction document acceptance.
For questions or clarifications contact the Water Resources Planning and Engineering Department at 480-312-5685.

07/18/2019

BY ldillon DATE 7/18/2019

Registered Professional Engineer (Civil)
CERTIFICATE NO. 42633
ANDREA K. PAGE
Date Signed 5/10/19
ARIZONA, U.S.A.

May 2019

Olsson Project No. 018-3159

olsson

Dillon, Levi

From: Dillon, Levi
Sent: Wednesday, July 17, 2019 7:09 PM
To: Carr, Brad; Cluff, Bryan; Hayes, Eliana; Rahman, Rezaur; Mars, Scott; Cardell Andrews; Long, Justin; Goode, Cynthia; Nelson, Scott
Cc: Jeff Ford
Subject: RE: Discuss Goldwater sewer in relation to new hotel
Attachments: 30-DR-2019_V1_Final Basis of Design Report for Wastewater_offsiteanalysis.pdf

Cardell/All,

My apologies for the delay in BOD reviews. I'm over 50% complete and hope to complete both tomorrow. The sewer BOD has no (or very limited) offsite sewer capacity analysis. For the purposes of getting you this information as soon as possible I took the liberty of analyzing offsite hydraulics and including it in the attached.

There are 3 main issues highlighted:

1. Flat section on Goldwater 12", proposed flows cause surcharge condition (level over top of pipe and rising into manhole). **This needs to be verified with survey and resolved/mitigated.**
2. Reverse slope section on Highland Ave 8" near Scottsdale Rd. **This needs to be verified with survey and resolved**. A dip in sewer will cause solids accumulation, odors, and potential for blockage.
3. Large apparent d/D exceedance on southern extent of 10" Scottdale Rd (condition does not exist with proposed additional flows). **This needs to be survey verified and resolved/mitigated.**

Possible solutions to issues above:

1. Reduce flows to Goldwater to eliminate surcharge condition in the 12" flat line section. Office building B (west) would need to discharge to Scottsdale Rd line via a dedicated line to the east (this would be going downgrade, good) and connect to either the 10" or 15" in Scottsdale Rd. Additionally, either Office building A or B (but not both) would need to connect to the 15" line in Scottsdale Road due to the apparent capacity issues on the 10" Scottsdale Road line. Flow monitoring on the 15" would be required on Scottsdale Rd south of Highland at Coolidge to fully verify solution feasibility. 240gpm is only 15-20% of a 15" line capacity so it "should" be an acceptable strategy.
2. Reverse slope section: requires analysis/discussion
3. Large apparent d/D exceedance on southern extent of 10" Scottdale Rd line: line segment slopes need to be survey verified. If 0.4% is the minimum slope on the 10" then capacity is exceeded by 120gpm to about 200gpm with the proposed flows (the upper value depending on unknown southern fashion square discharges). The most logical solution would be to also route Office building A's flows out the south side of the building and to the east and connect to the 15" Scottsdale Rd line (again pending flow monitoring evaluation of 15" line).
    a. **Note** that this modifies solution 1 above where only one of the office building is proposed to be routed to the 15" on Scottsdale Rd and the other would remain on the 10". In this solution both office building would be connected to the 15" and 2 restaurants would stay on the 10".

Cardell/all, let me know if you have any feedback/thoughts on all this.

Thanks,

Levi C. Dillon, P.E. | *Sr. Water Resources Engineer*
SCOTTSDALE WATER

"Water Sustainability through
Stewardship, Innovation and People"

Contact Info
Direct: (480) 312-5319
Main office: (480) 312-5685
Fax: (480) 312-5615
Mailing/Office Address
Water Resources Administration
9379 E. San Salvador Dr.
Scottsdale, AZ. 85258

Sending me an attachment over 5MB? Please use the link below:
https://securemail.scottsdaleaz.gov/dropbox/ldillon@scottsdaleaz.gov

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From: Dillon, Levi
Sent: Tuesday, July 2, 2019 9:01 AM
To: Carr, Brad <bcarr@scottsdaleaz.gov>; Cluff, Bryan <BCluff@Scottsdaleaz.gov>; Hayes, Eliana <EHayes@Scottsdaleaz.gov>; Rahman, Rezaur <RRahman@Scottsdaleaz.gov>; Mars, Scott <SMars@Scottsdaleaz.gov>; Cardell Andrews <candrews@olsson.com>; Long, Justin <Justin.Long@macerich.com>; Goode, Cynthia <Cynthia.Goode@macerich.com>; Nelson, Scott <Scott.Nelson@macerich.com>
Cc: Jeff Ford <jford@olsson.com>
Subject: RE: Discuss Goldwater sewer in relation to new hotel

All, as a follow-up the Water Resources Executive Director decided that this project is first in line for sewer capacity so there will be no shared impact/development agreement regarding this project and Southbridge for discharging sewer onto Goldwater. This was also communicated to Southbridge in a meeting last week. That being said, I will be looking at the feasibility of sending some of the planned Cesar's Goldwater sewer flows to Scottsdale Rd and may make comments to such effect for the 30-DR-2019 case review that would need to be addressed. If not feasible/reasonable to do this then this will not be directed. I'm hoping to finish this BOD review this week.

Thank you,

Levi C. Dillon, P.E. | *Sr. Water Resources Engineer*
SCOTTSDALE WATER
"Water Sustainability through
Stewardship, Innovation and People"

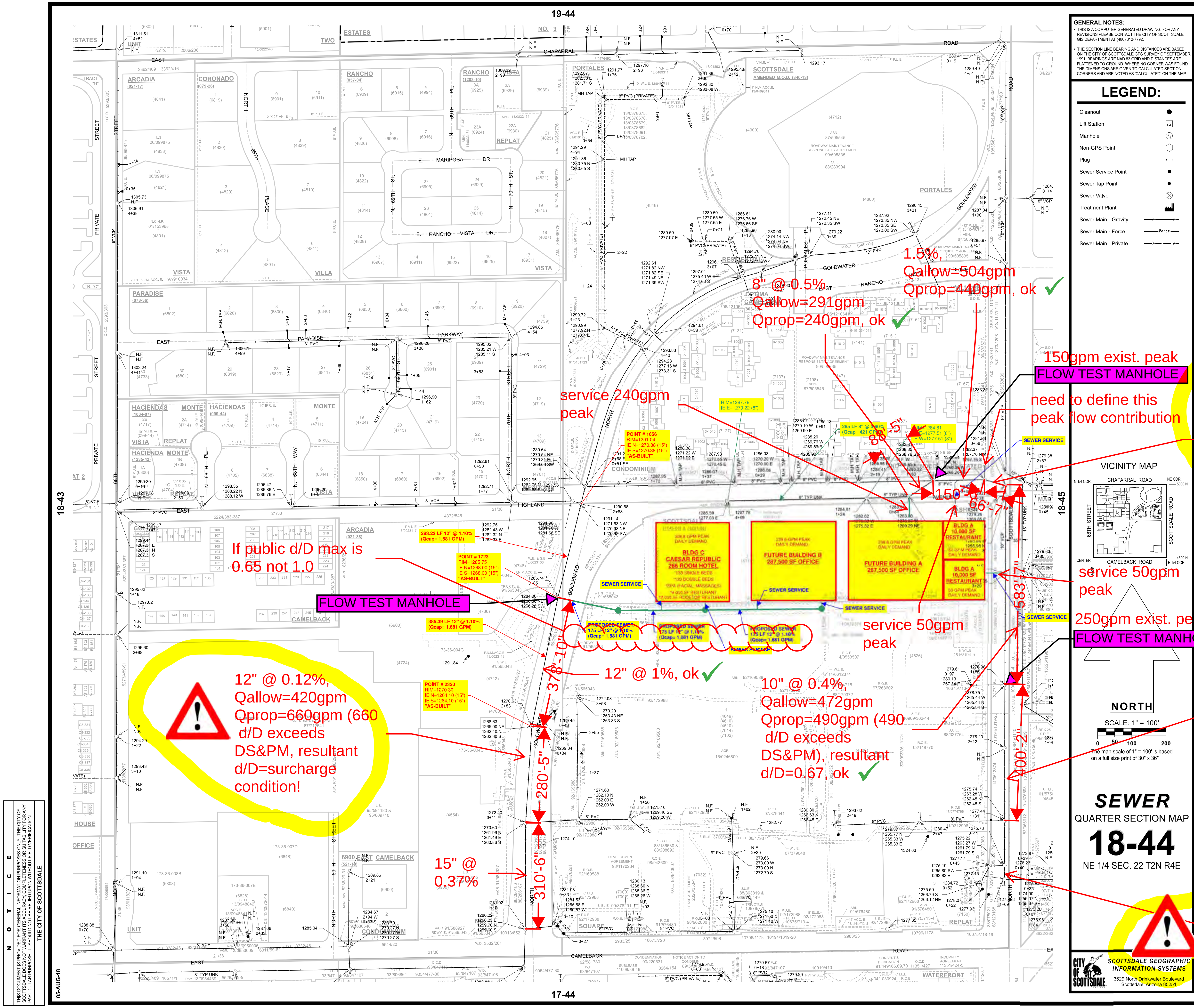
Contact Info
Direct: (480) 312-5319
Main office: (480) 312-5685
Fax: (480) 312-5615
Mailing/Office Address
Water Resources Administration
9379 E. San Salvador Dr.
Scottsdale, AZ. 85258

Sending me an attachment over 5MB? Please use the link below:
https://securemail.scottsdaleaz.gov/dropbox/ldillon@scottsdaleaz.gov

-----Original Appointment-----
From: Carr, Brad <bcarr@scottsdaleaz.gov>
Sent: Wednesday, June 19, 2019 4:46 PM

To: Carr, Brad; Cluff, Bryan; Hayes, Eliana; Dillon, Levi; Rahman, Rezaur; Mars, Scott; Cardell Andrews; Long, Justin; Goode, Cynthia; Nelson, Scott
Cc: Jeff Ford
Subject: Discuss Goldwater sewer in relation to new hotel
When: Monday, June 24, 2019 4:00 PM-5:00 PM (UTC-07:00) Arizona.
Where: Plan Review 1

Page added by LDillon. Flow monitoring location information received from Cardell Andrews of Olsson via email to LDillon on 6/132019.



10" @ -2.3% (Reverse slope! Is this real? Address)
Qallow=??gpm
Qprop=440gpm + flow to north= ????

10" @ 0.72%,
Qallow=633gpm
Qprop=590gpm, ok

Remainder to north side of canal (start of 24")
10" @ average slope of 0.44%, Qallow=495gpm
Qprop=590gpm+??, resultant d/D=0.80+?, need better resolution

Table of Contents

Figures

Tables

Appendices

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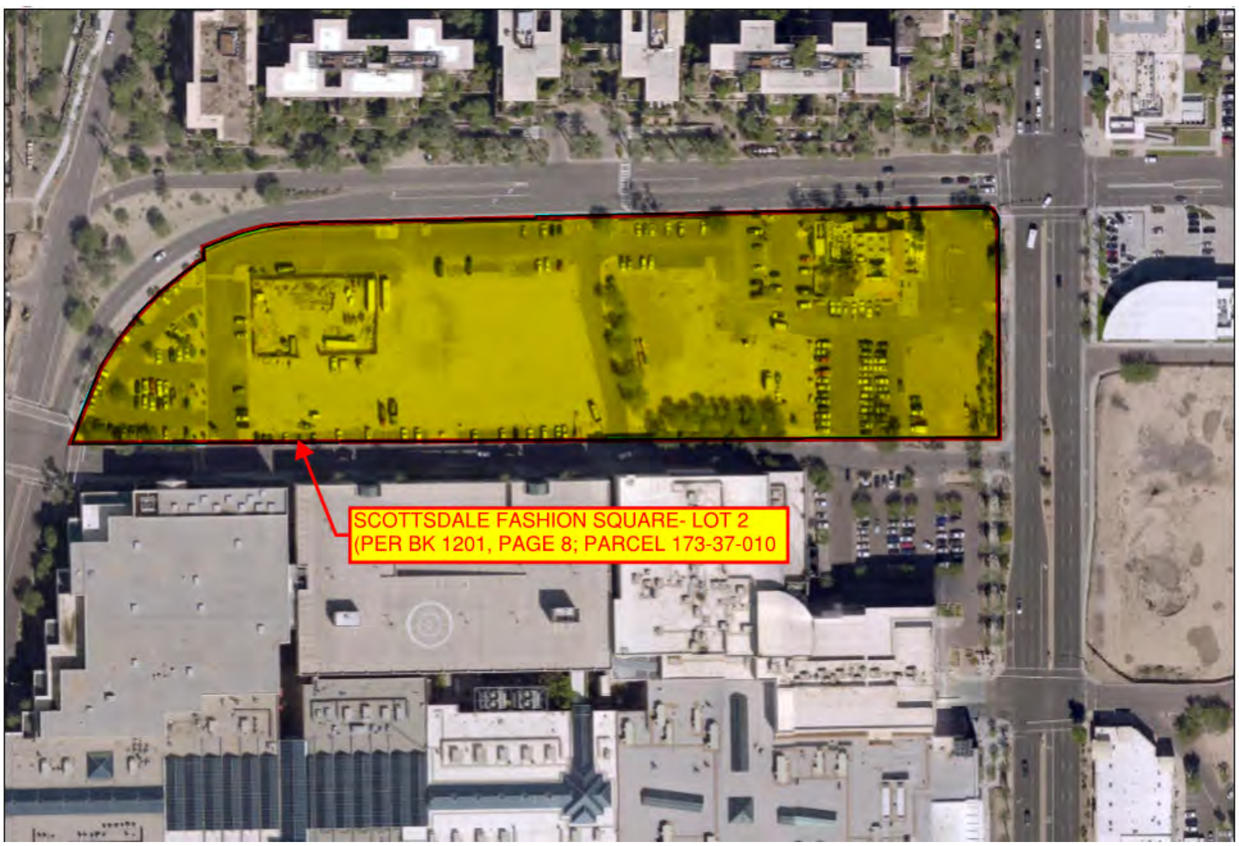
I. INTRODUCTION

A. Purpose of Report

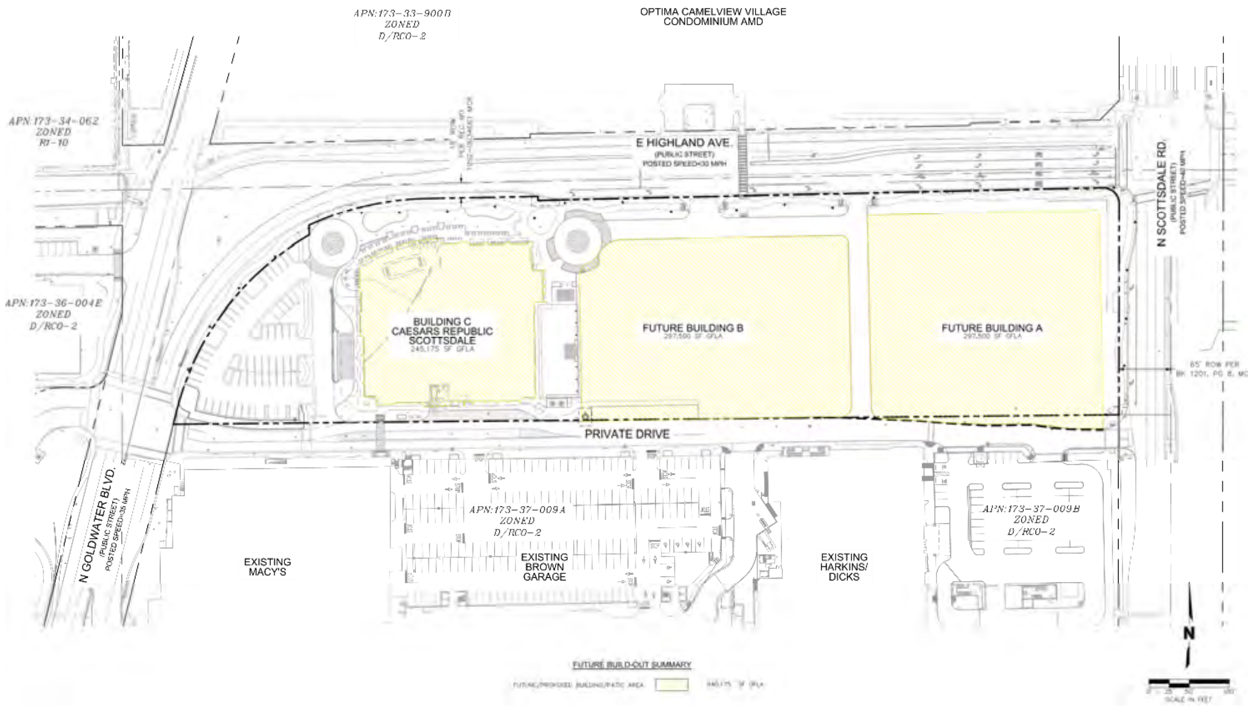
The purpose of this Final Sewer Basis of Design Report is to support the buildout of Scottsdale Fashion Square- Lot 2 (see Figure 1), which includes two (2) future buildings as well as the proposed Caesars Republic Scottsdale Hotel, hereinafter referred to as "The Project" (see Figure 2). The Project site is situated within the northeast quarter of Section 22, Township 2 North, Range 4 East of the Gila and Salt River Meridian, Maricopa County, Arizona, is zoned D/DRU-2 PBD DO; 25-ZN2015 & 1-II-2016, and covers approximately 7.04 acres after right-of-way dedications. More specifically The Project site is identified as Maricopa County assessor parcel number 173-37-010.

The Project will be developed in multiple Phases, including buildings, and site improvements, and when completely buildout will be a part of the greater Scottsdale Fashion Square mall. As mentioned above, this Final Sewer Basis of Design Report is to support the complete buildout of Scottsdale Fashion Square- Lot 2 (see Figure 2).



Scottsdale Fashion Square- Lot 2, Per BK 1201, PG 8

Figure 1 – Location/Parcel Map



Building A- Caesars Republic Scottsdale
Building B- Future Office and Retail
Building C- Future Office and Retail

Figure 2 – Final Buildout Exhibit

B. Contact Info

Owner/Developer
Macerich
11411 N Tatum Boulevard
Phoenix, AZ 85028
Phone: (602) 953-6548
Contact: Justin Long

Developer
HCW Hotels, LLC
2398 E Camelback Road, Suite 690
Phoenix, AZ 85016
Phone: (602) 469-1226
Contact: Rick Huffman

Civil Engineer
Olsson
7250 N. 16th Street, Suite210
Phoenix, AZ 85020
Phone: (602) 748-1000
Contact: Cardell Andrews

C. Existing Site Conditions

In the year 2013, the site improvements included a Days Inn Hotel, Desert Stages Theater, and Coco's Restaurant (see Figure 3). By the year 2014, all of the buildings onsite in 2013, with the exception of the Desert Stages Theater, were demolished, and remain in that state today (see Figure 4).

The Project site area is bounded to the north by Highland Avenue (public street), to the east by Scottsdale Boulevard (public street), to the south by a Private Drive (private access road), and to the west by Goldwater Boulevard (public street). All public streets are fully improved, and contain both water and sewer utilities. The City of Scottsdale Sewer Quarter Section Map, which includes The Project area, is in Appendix A.

Figure 3 – Existing Site Conditions (Year 2013)

Figure 4 – Existing Site Conditions (Year 2019)

D. Proposed Conditions

The Project will be developed in multiple Phases, including buildings, and onsite/offsite site improvements, and when completely buildout will total an additional 840,175 SF Gross Floor Lease Area, that will be a part of the greater Scottsdale Fashion Square mall (see Table 1).

Table 1— Final Buildout Breakout

Building	Use	Gross Floor Lease Area (SF)	Rooms
Future Building A1	Office	287,500	N/A
Future Building A2	Restaurant	10,000	N/A
Future Building A3	Restaurant	10,000	N/A
Future Building B	Office	287,500	N/A
Building C- Caesars Republic Scottsdale	Resort Hotel (w/ Amenities)	245,175	266
Total Buildout	**Varies**	**840,175**	**266**

The sewer system will be served by a combination of 6-inch, 8-inch, and 12-inch private gravity flow sewer lines. Manholes and cleanouts, per City of Scottsdale – 2018 Design Standards & Policies Manual have been placed at each grade and alignment change. Refer to Appendix B for the Proposed Master Sewer Layout, which outlines the proposed tie-ins, sewer sizes, flow directions, and sewer structures proposed for current and future phases.

II. General Calculations

A. Design Criteria

In accordance with City of Scottsdale—2018 Design Standards & Policies Manual all sanitary sewer lines 8-inches or smaller shall be designed and constructed to give mean velocities, when flowing full, of not less than 2.5 feet per second. This calculation is determined by using the Manning's equation, with a roughness coefficient, n, value of 0.013. In addition, the mean velocity in a pipe flowing full shall not exceed 10 feet per second.

Per City of Scottsdale—2018 Design Standards & Policies Manual, wastewater flows are calculated utilizing *Figure 7-1.2 Average Day Sewer Demand in Gallons Per Day & Peaking Factors By Land Use.* Wastewater flows for uses other than those listed in *Figure 7-1.2 Average Day Sewer Demand in Gallons Per Day & Peaking Factors By Land Use,* shall be based upon known regional or accepted engineering reference sources approved by the Water Resources Department.

Figure 7-1.2 Average Day Sewer Demand in Gallons Per Day & Peaking Factors By Land Use

Land Use	Demand (GPD)	Design Peaking Factor
Office	0.4/SF	3
Restaurant	1.2/SF	6
Resort Hotel (includes site amenities)	380/Room	4.5
****Hotel Pool Backwash**	106,500	-

**The pool backwash demand for the hotel was provided by the pool supply company, and is not a direct reflection of the City of Scottsdale—2018 Design Standards & Policies Manual, *Figure 7-1.2 Average Day Sewer Demand in Gallons Per Day & Peaking Factors By Land Use.* The breakdown for the pool backwash demand is outlined below.

74gpm, ok per calcs provided

Pool Backwash Demand Breakdown
15 FT x 40 FT = 600 SF Pool Area
600 x 4FT = 2,400 CF
*2,400 CF * 7.5 GAL/CF = 18,000 GAL*
18,000 GAL / 360 MINS (Industry Standard, exceeds MCESD minimum) = 50 GPM

6hr turnover, ok

A 50 GPM pool requires a 4.91 SF Sand Filter
50 GPM / 4.91 SF = 10.18 GPM/SF Pool Filtration Rate
4.91 SF x 15 GPM/SF = 73.65 GPM Backwash Rate

high rate sand, ok

The 74 GPM Backwash Rate can be guaranteed with the use for a Variable Speed pump, which recommend for this project.

B. Design Flow

Goldwater Boulevard Sewer Connection

The proposed sewer connection at Goldwater Boulevard will been designed with a minimum slope of 1.10%, and a minimum pipe size of 12-inches. Utilizing this design criteria along with the associated use demand, the following flow capacity was calculated as follows:

Table 2. Proposed Wastewater Flow Demand

Building	Land Use	Gross Floor Lease Area (SF) Or Rooms	Demand (GPD)
Future Building B	Office	287,500 SF	287,500 SF x 0.4 GPD/SF= **115,000**
Building C- Caesars Republic Scottsdale	Resort Hotel (w/ Amenities	266 Rooms	266 Rooms x 380 GPD/Room= **101,080**
Building C- Caesars Republic Scottsdale	Resort Hotel Pool Backwash	18,000 Gallons	****106,500**
Total	-	-	**322,580**

**See pool backwash demand breakdown in Figure 7-1.2 above.

Total Proposed Flow Demand= 322,580 GPD or 224.10 GPM

Table 3. Proposed Peak Wastewater Flow Demand

Building	Land Use	Demand (GPD)	Peak Demand (GPD)
Future Building B	Office	115,000	115,000 GPD x 3= **345,000**
Building C- Caesars Republic Scottsdale	Resort Hotel (w/ Amenities	101,080	101,080 GPD x 4.5= **454,860**
Building C- Caesars Republic Scottsdale	Resort Hotel Pool Backwash	**106,500	****106,500**
Total	-	-	**906,360**

**Pool backwash demand shown is for peak demand. See breakdown in Figure 7-1.2 above.

Total Proposed Peak Flow Demand= 906,360 GPD or 629.50 GPM

INPUT		
Slope, S	0.011	
Manning's roughness, n_{full}	0.013	
Manning's roughness is	Constant	
Diameter, D	12	in
Relative depth, d/D	0.650	

Flowrate =	1,272 gpm
Velocity =	5.24 ft/s

Flow capacity per Manning's formula for uniform pipe flow:

$$Q = \frac{1.49}{n}(A)(R)^{\frac{2}{3}}(S)^{\frac{1}{2}}$$

new on-site, what about existing off-site? Max 747gpm at min slope 0.3%. Max 1,272 at 1.1%.

Where:

Q = pipe capacity (cfs)
n = Manning's roughness coefficient
A = Cross sectional area (ft^2)
R = Hydraulic radius (ft.)
S = Minimum slope (ft/ft)

max 12" d/D is 0.65 per DS&PM

INPUT		
Slope, S	0.003	
Manning's roughness, n_{full}	0.013	
Manning's roughness is	Constant	
Diameter, D	12	in
Relative depth, d/D	0.650	

Flowrate =	664 gpm
Velocity =	2.74 ft/s

Capacity for a full flowing 12-inch Diameter pipe with a minimum slope of 0.011 ft/ft:

$$\frac{1.49}{0.013}\left(\frac{\pi}{4}.83^2\right)\left(\frac{.83}{4}\right)^{\frac{2}{3}}(.011)^{\frac{1}{2}} = 3.74\ cfs = 1{,}681\ gpm$$

1,681 gpm capacity > 629.50 gpm peak wastewater flow demand

see previous page comments

Flow velocity per Manning's formula for uniform pipe flow:

$$V = \frac{1.49}{n}(R)^{\frac{2}{3}}(S)^{\frac{1}{2}}$$

Where:

V = pipe velocity (ft/s)
n = Manning's roughness coefficient
R = Hydraulic radius (ft.)
S = Minimum slope (ft/ft)

Velocity for a full flowing 12-inch diameter pipe with a minimum slope of 0.011 ft/ft:

$$\frac{1.49}{0.013}\left(\frac{.83}{4}\right)^{\frac{2}{3}}(.011)^{\frac{1}{2}} = 4.77\ ft/s$$

need to also analyze existing 8" sewers, no offsite analysis provided

4.77 fps >2.5 fps, <10 fps ==> O.K. per City of Scottsdale—2018 Design Standards & Policies Manual

Highland Avenue Sewer Connection

The proposed sewer connection at Highland Avenue will been designed with a minimum slope of 1.10%, and a minimum pipe size of 8-inches. Utilizing this design criteria along with the associated use demand, the following flow capacity was calculated as follows:

Table 4. Proposed Wastewater Flow Demand

Building	Land Use	Gross Floor Lease Area (SF) Or Rooms	Demand (GPD)
Future Building A	Office	287,500 SF	287,500 SF x 0.4 GPD/SF= **115,000**
Future Building A	Restaurant	10,000 SF	10,000 SF x 1.2 GPD/SF= **12,000**
Total	**-**	**-**	**127,000**

Total Proposed Flow Demand= 127,000 GPD or 88.20 GPM

240gpm

Table 5. Proposed Peak Wastewater Flow Demand

Building	Land Use	Demand (GPD)	Peak Demand (GPD)
Future Building A	Office	115,000	115,000 GPD x 3= **345,000**
Future Building A	Restaurant	12,000	12,000 GPD x 6= **72,000**
Total	**-**	**-**	**417,000**

Total Proposed Peak Flow Demand= 417,000 GPD or 289.60 GPM

Flow capacity per Manning's formula for uniform pipe flow:

d/D=0.65 is max allowed, max capacity is 297gpm

INPUT	Slope, S	0.0052
	Manning's roughness, n_{full}	0.013
	Manning's roughness is	Constant
	Diameter, D	8 in
	Relative depth, d/D	0.650

Flowrate =	297 gpm
Velocity =	2.75 ft/s

$$Q = \frac{1.49}{n}(A)(R)^{\frac{2}{3}}(S)^{\frac{1}{2}}$$

Where:

Q = pipe capacity (cfs)
n = Manning's roughness coefficient
A = Cross sectional area (ft^2)
R = Hydraulic radius (ft.)
S = Minimum slope (ft/ft)

Capacity for a full flowing 8-inch Diameter pipe with a minimum slope of 0.011 ft/ft:

$$\frac{1.49}{0.013}\left(\frac{\pi}{4}.83^2\right)\left(\frac{.83}{4}\right)^{\frac{2}{3}}(.011)^{\frac{1}{2}} = 3.74\,cfs = 570\,gpm$$

570 gpm capacity > 289.60 gpm peak wastewater flow demand

Flow velocity per Manning's formula for uniform pipe flow:

$$V = \frac{1.49}{n}(R)^{\frac{2}{3}}(S)^{\frac{1}{2}}$$

Where:

V = pipe velocity (ft/s)
n = Manning's roughness coefficient
R = Hydraulic radius (ft.)
S = Minimum slope (ft/ft)

Velocity for a full flowing 8-inch diameter pipe with a minimum slope of 0.011 ft/ft:

$$\frac{1.49}{0.013}\left(\frac{.83}{4}\right)^{\frac{2}{3}}(.011)^{\frac{1}{2}} = 3.64\,ft/s$$

3.64 fps >2.5 fps, <10 fps ==> O.K. per City of Scottsdale—2018 Design Standards & Policies Manual

Scottsdale Road Sewer Connection

The proposed sewer connection at Scottsdale Road will been designed with a minimum slope of 1.10%, and a minimum pipe size of 6-inches. Utilizing this design criteria along with the associated use demand, the following flow capacity was calculated as follows:

Table 6. Proposed Wastewater Flow Demand

Building	Land Use	Gross Floor Lease Area (SF) Or Rooms	Demand (GPD)
Future Building A	Restaurant	10,000 SF	10,000 SF x 1.2 GPD/SF= **12,000**
Total	**-**	**-**	**12,000**

Total Proposed Flow Demand= 12,000 GPD or 8.3 GPM

Table 7. Proposed Peak Wastewater Flow Demand

Building	Land Use	Demand (GPD)	Peak Demand (GPD)
Future **Building A**	Restaurant	12,000	12,000 GPD x 6= **72,000**
Total	**-**	**-**	**72,000**

Total Proposed Peak Flow Demand= 72,000 GPD or 50.00 GPM

Flow capacity per Manning's formula for uniform pipe flow:

$$Q = \frac{1.49}{n}(A)(R)^{\frac{2}{3}}(S)^{\frac{1}{2}}$$

Where:

Q = pipe capacity (cfs)
n = Manning's roughness coefficient
A = Cross sectional area (ft^2)
R = Hydraulic radius (ft.)
S = Minimum slope (ft/ft)

Capacity for a full flowing 6-inch Diameter pipe with a minimum slope of 0.011 ft/ft:

$$\frac{1.49}{0.013}\left(\frac{\pi}{4}.83^2\right)\left(\frac{.83}{4}\right)^{\frac{2}{3}}(.011)^{\frac{1}{2}} = 0.59\ cfs = 265\ gpm$$

265 gpm capacity > 50 gpm peak wastewater flow demand

Flow velocity per Manning's formula for uniform pipe flow:

$$V = \frac{1.49}{n}(R)^{\frac{2}{3}}(S)^{\frac{1}{2}}$$

Where:

V = pipe velocity (ft/s)
n = Manning's roughness coefficient
R = Hydraulic radius (ft.)
S = Minimum slope (ft/ft)

Velocity for a full flowing 6-inch diameter pipe with a minimum slope of 0.011 ft/ft:

$$\frac{1.49}{0.013}\left(\frac{.83}{4}\right)^{\frac{2}{3}}(.011)^{\frac{1}{2}} = 3.01\ ft/s$$

3.01 fps >2.5 fps, <10 fps ==> O.K. per City of Scottsdale—2018 Design Standards & Policies Manual

III. Conclusions

A. Summary

This Final Sewer Basis of Design Report was prepared in accordance with City of Scottsdale—2018 Design Standards & Policies Manual. For The Project, sewer design described within this Final Sewer Basis of Design Report was designed to collect and convey the projects wastewater under Average Day and Peak flow conditions, while the proposed sewer lines provided have sufficient capacity and acceptable velocities using Manning's equation for uniform pipe flow.

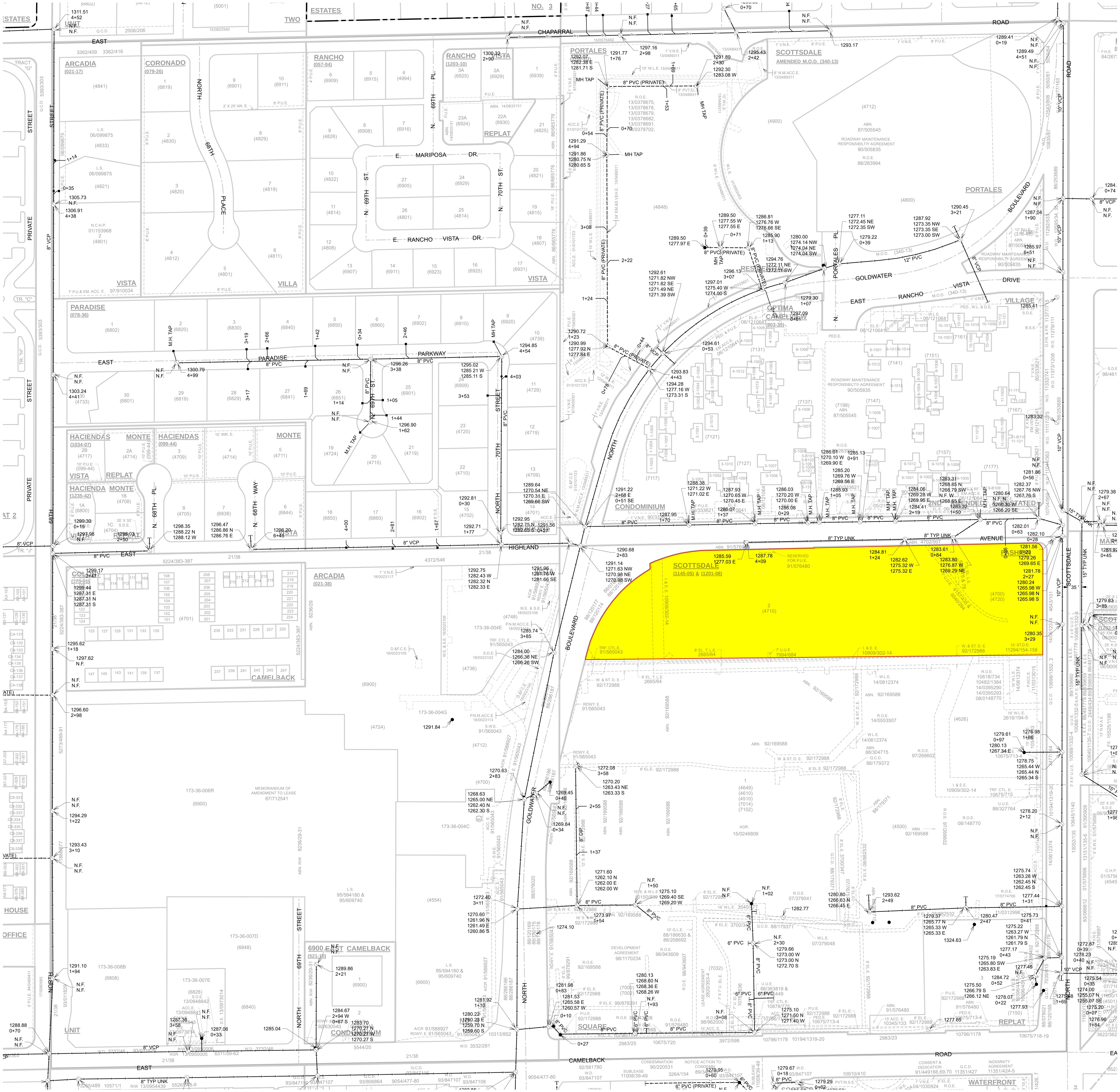
B. Effect of Development on Adjacent Properties

Based upon the Flow Data Results, taken over a 9-day period including 2 weekends (Appendix D), the additional demand creates no known capacity issues on the existing conditions downstream. In addition, the average required daily flows do not exceed the capacity of the minimum proposed pipe.

You did not evaluate offsite sewer hydraulic capacity, refer to comments on appended quarter section map. Average flows are not used for determining sewer adequecy.

APPENDIX “A”

(City of Scottsdale Sewer Quarter Section Map (18-44))



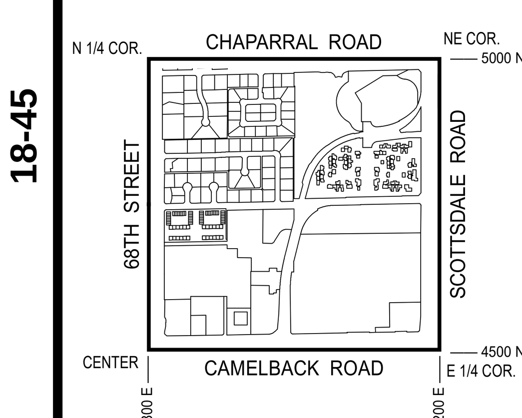
GENERAL NOTES:

- THIS IS A COMPUTER GENERATED DRAWING. FOR ANY REVISIONS PLEASE CONTACT THE CITY OF SCOTTSDALE GIS DEPARTMENT AT (480) 312-7792.
- THE SECTION LINE BEARING AND DISTANCES ARE BASED ON THE CITY OF SCOTTSDALE GPS SURVEY OF SEPTEMBER, 1991. BEARINGS ARE NAD 83 GRID AND DISTANCES ARE FLATTENED TO GROUND. WHERE NO CORNER WAS FOUND THE DIMENSIONS ARE GIVEN TO CALCULATED SECTION CORNERS AND ARE NOTED AS 'CALCULATED' ON THE MAP.

LEGEND:

- Cleanout
- Lift Station
- Manhole
- Non-GPS Point
- Plug
- Sewer Service Point
- Sewer Tap Point
- Sewer Valve
- Treatment Plant
- Sewer Main - Gravity
- Sewer Main - Force
- Sewer Main - Private

VICINITY MAP



NORTH

SCALE: 1" = 100'

0 50 100 200

The map scale of 1" = 100' is based on a full size print of 30" x 36"

SEWER

QUARTER SECTION MAP

18-44

NE 1/4 SEC. 22 T2N R4E

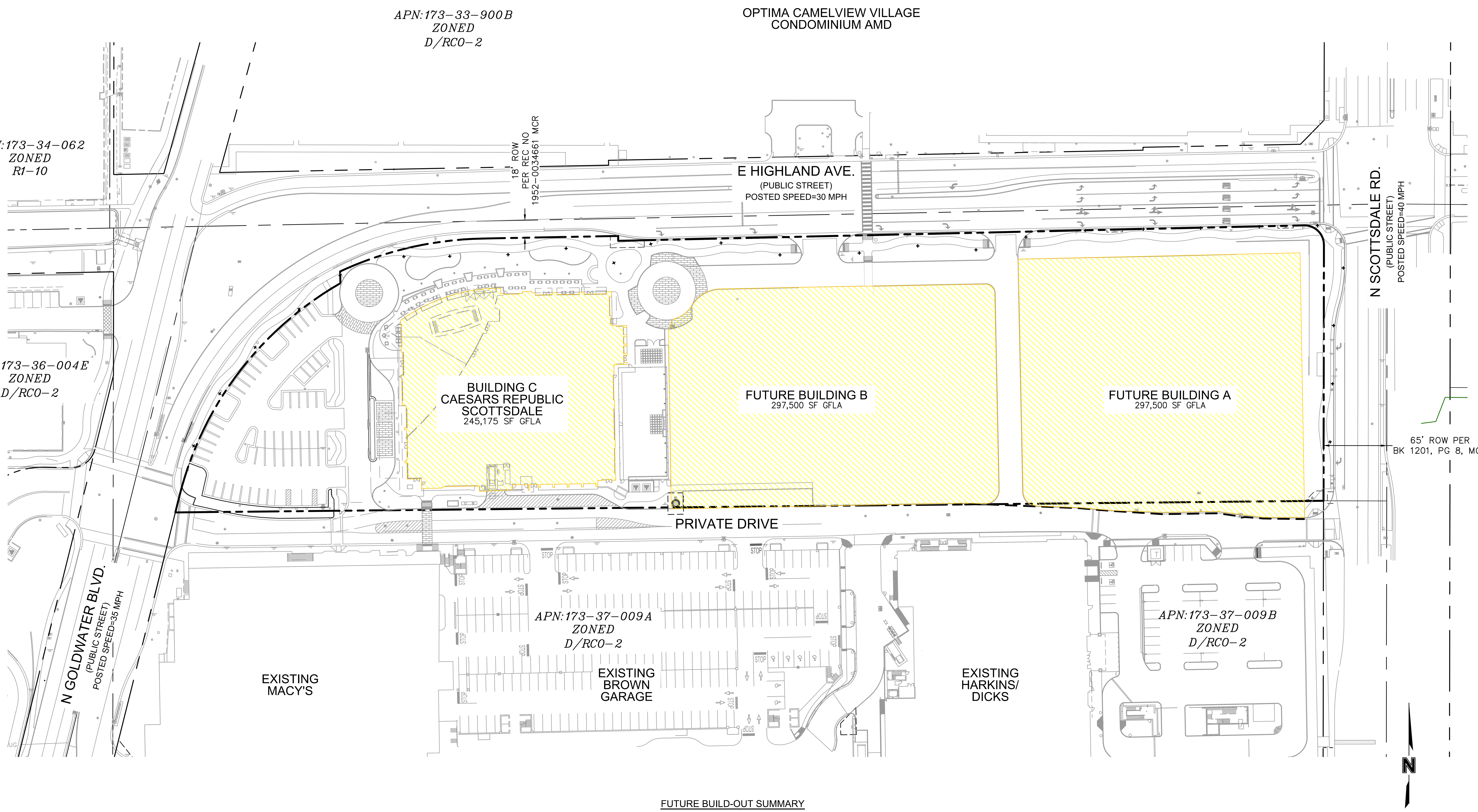
SCOTTSDALE GEOGRAPHIC INFORMATION SYSTEMS

3629 North Drinkwater Boulevard
Scottsdale, Arizona 85251

05-AUG-18

APPENDIX “B”

(Proposed Master Sewer Layout/Calculations)



FUTURE BUILD-OUT SUMMARY

FUTURE/PROPOSED BUILDING/PATIO AREA		840,175 SF GFLA

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Dial 8-1-1 or 1-800-STAKE-IT (782-5348)
In Maricopa County: (602) 263-1100

REV. NO.	DATE	REVISIONS DESCRIPTION

REVISIONS

FINAL BUILD-OUT EXHIBIT
GROSS FLOOR LEASE AREA

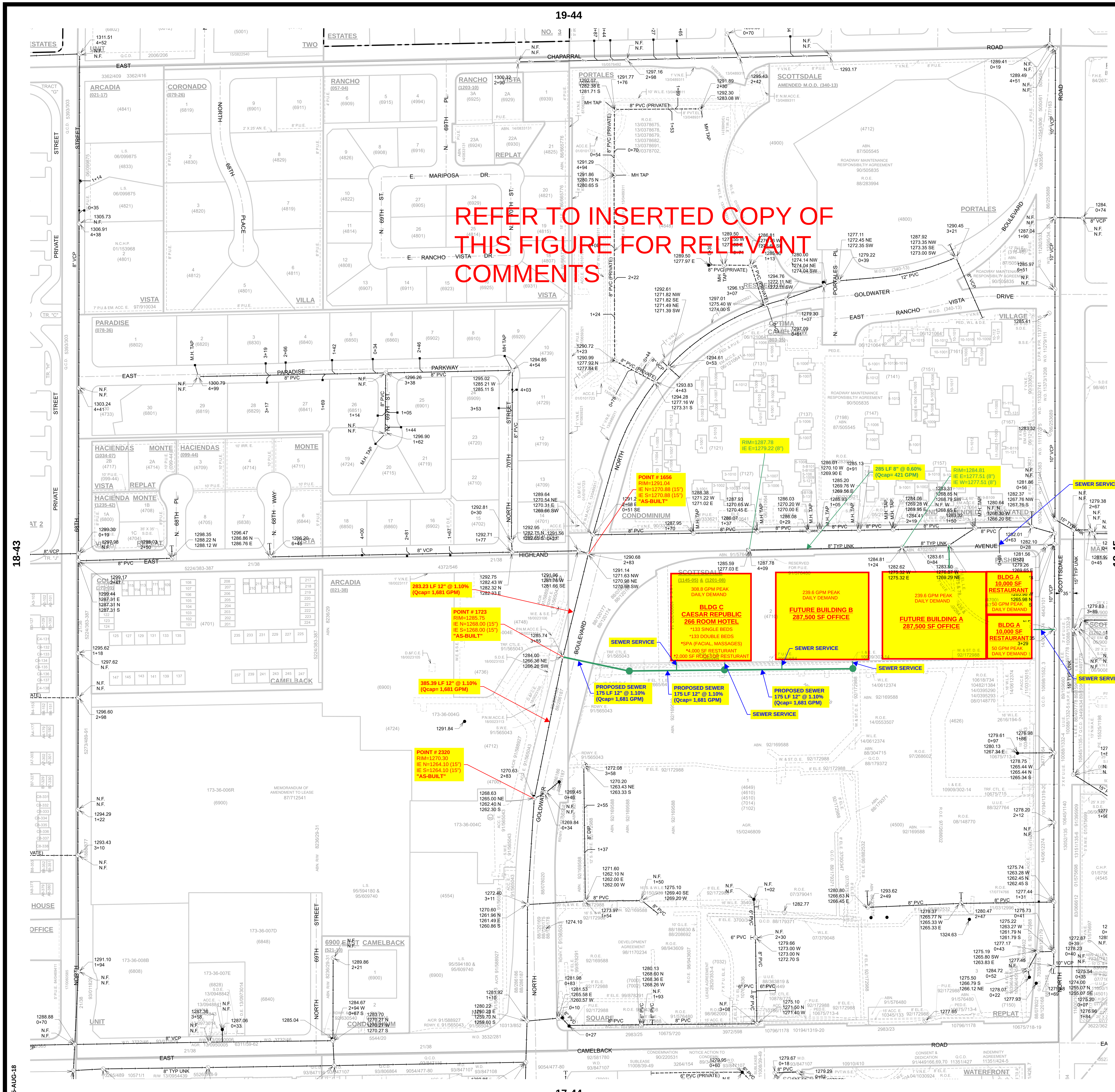
CAESARS REPUBLIC SCOTTSDALE

SCOTTSDALE, AZ 85251

2019

drawn by:	SS/THW
designed by:	SJV
checked by:	CAII
project no.:	018-3159
date:	05.16.2019

C100
1 of 1



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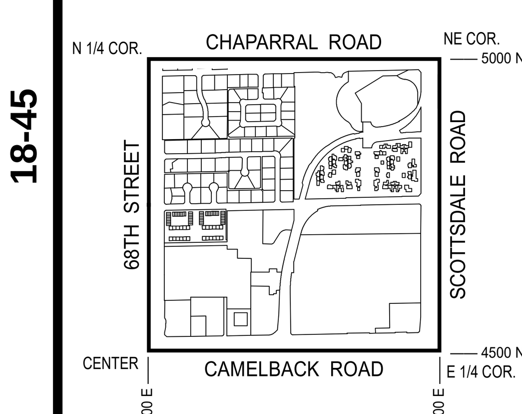
LEGEND:

Cleanout
Lift Station
Manhole
Non-GPS Point
Plug
Sewer Service Point
Sewer Tap Point
Sewer Valve
Treatment Plant
Sewer Main - Gravity
Sewer Main - Force
Sewer Main - Private

VICINITY MAP



NORTH

SCALE: 1" = 100'

0 50 100 200

The map scale of 1" = 100' is based on a full size print of 30" x 36"

SEWER

QUARTER SECTION MAP

18-44

NE 1/4 SEC. 22 T2N R4E

SCOTTSDALE GEOGRAPHIC INFORMATION SYSTEMS
3629 North Drinkwater Boulevard
Scottsdale, Arizona 85251

N O T I C E

THE CITY OF SCOTTSDALE

05-AUG-18

SEWER DEMAND CALCULATIONS -AREA 1

References: Values from City of Scottsdale Design Standards & Policies Manual Fig 7-1.2

Lot ID	Area Description/ Land Use	Area	Rooms	Pools	Avg Daily Flow	Peaking Factor	Avg Daily Demand		Peak Daily Demand	
		(sf)	(RM)	(ea)	(gpsfd or gpud)	(People/Unit)	(gpd)	(gpm)	(gpd)	(gpm)
1	Resort Hotel (W/ Amentities)		266		380	4.5	101,080	70.2	454,860	315.9
2	Resort Hotel Pool Backwash						106,500	74.0	106,500	74.0
3	Office	287,500			0.4	3	115,000	79.9	345,000	239.6
4	Office	287,500			0.4	3	115,000	79.9	345,000	239.6
5	Restaurant	10,000			1.2	6	12,000	8.3	72,000	50.0
6	Restaurant	10,000			1.2	6	12,000	8.3	72,000	50.0
	TOTAL						461,580	320.5	1,395,360	969.0

RM= Rooms
gpsfd = Gallons per Square Foot per Day
gpud = Gallons per Unit per Day
GPD= Gallons per Day
GPM= Gallons per Minute
CFS= Cubic feet per Second

Let me know if the information below will address the city requirements or if you need anything further.

Thanks
David

David Hess, AIA I VP of Architecture & Design I HCW
D 417.332.3412 I C 417.848.5278 I F 417.332.3433

HCW L.L.C.

From: David Hess
Sent: Tuesday, January 8, 2019 2:53 PM
To: Jeffrey Iverson <jeff@hydrocon.com>
Cc: ageier@laytonconstruction.com; Curt Lonsdale <curt@hydrocon.com>; ben@brparc.com; adavis@cjd-eng.com
Subject: Re: The Republic - Backwash Flow Rates

Thanks-it was a pleasure meeting you as well and I appreciate all the assistance.

David

Sent from my iPhone

On Jan 8, 2019, at 11:47 AM, Jeffrey Iverson <jeff@hydrocon.com> wrote:

> Good afternoon Andrew & David,
>
> It was good to meet you this morning. Below I have outlined the process in determining the backwash rate for the pool we discussed.
>
> 15 FT x 40 FT = 600 SF Pool Area
> 600 x 4FT (Worst Case Depth) = 2,400 CF
> 2,400 CF * 7.5 GAL/CF = 18,000 GAL
> 18,000 GAL / 360 MINS (Industry Standard, exceeds MCESD minimum) = 50 GPM
>
> A 50 GPM pool requires a 4.91 SF Sand Filter
> 50 GPM / 4.91 SF = 10.18 GPM/SF Pool Filtration Rate
> 4.91 SF x 15 GPM/SF = 73.65 GPM Backwash Rate
>
> The 74 GPM Backwash Rate can be guaranteed with the use for a Variable Speed pump which is what I would recommend for this project.
>
> Hopefully this helps. If you have any further questions, please don't hesitate to reach out to us.
>
> Thanks!
>
> jeffrey iverson
> 602.510.3394 mobile
> 480.776.0155 office

APPENDIX "C"

(Preliminary Utility Plan- Phase I)

PROJECT DATA:

PROJECT ADDRESS:
SOUTHEAST CORNER OF GOLDWATER BOULEVARD AND HIGHLAND AVENUE SCOTTSDALE, ARIZONA 85251

BENCH MARK: A STONE IN HAND HOLE AT THE INTERSECTION OF CAMELBACK RD. & MILLER RD., CITY OF SCOTTSDALE BENCHMARK #4234.

ELEVATION= 1259.43' (PER C.O.S. NAVD '88 DATUM)

GROSS LOT AREA: 311,172 SF OR 7.14 ACRES

REDEVELOPED LOT AREA: 306,703 SF 7.04 ACRES

APN: PARCEL 173-37-010

ZONING: D/DRU-2 PBD DO; 25-ZN2015 & 1-II-2016

PRELIMINARY PHASING PLAN FOR
CAESARS REPUBLIC SCOTTSDALE
SCOTTSDALE, ARIZONA 85251

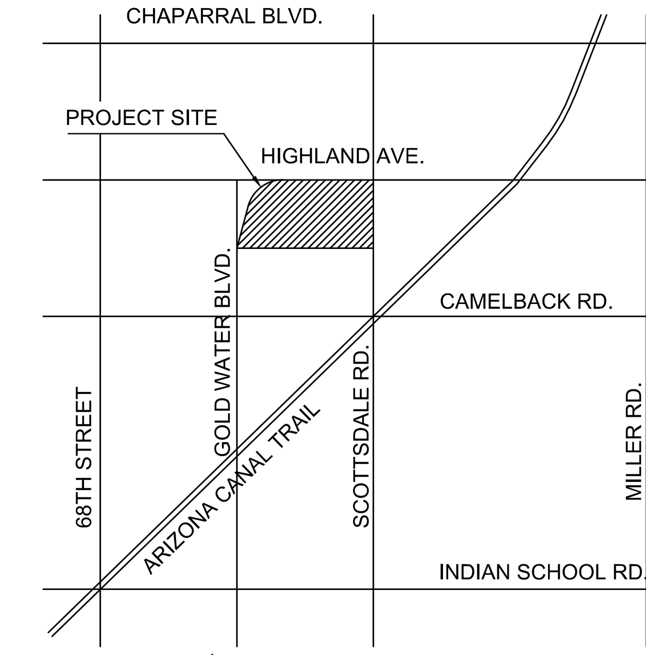
SHEET INDEX

#	SHEET NAME	SHEET NO.
1	PRELIMINARY PHASING PLAN	PC600

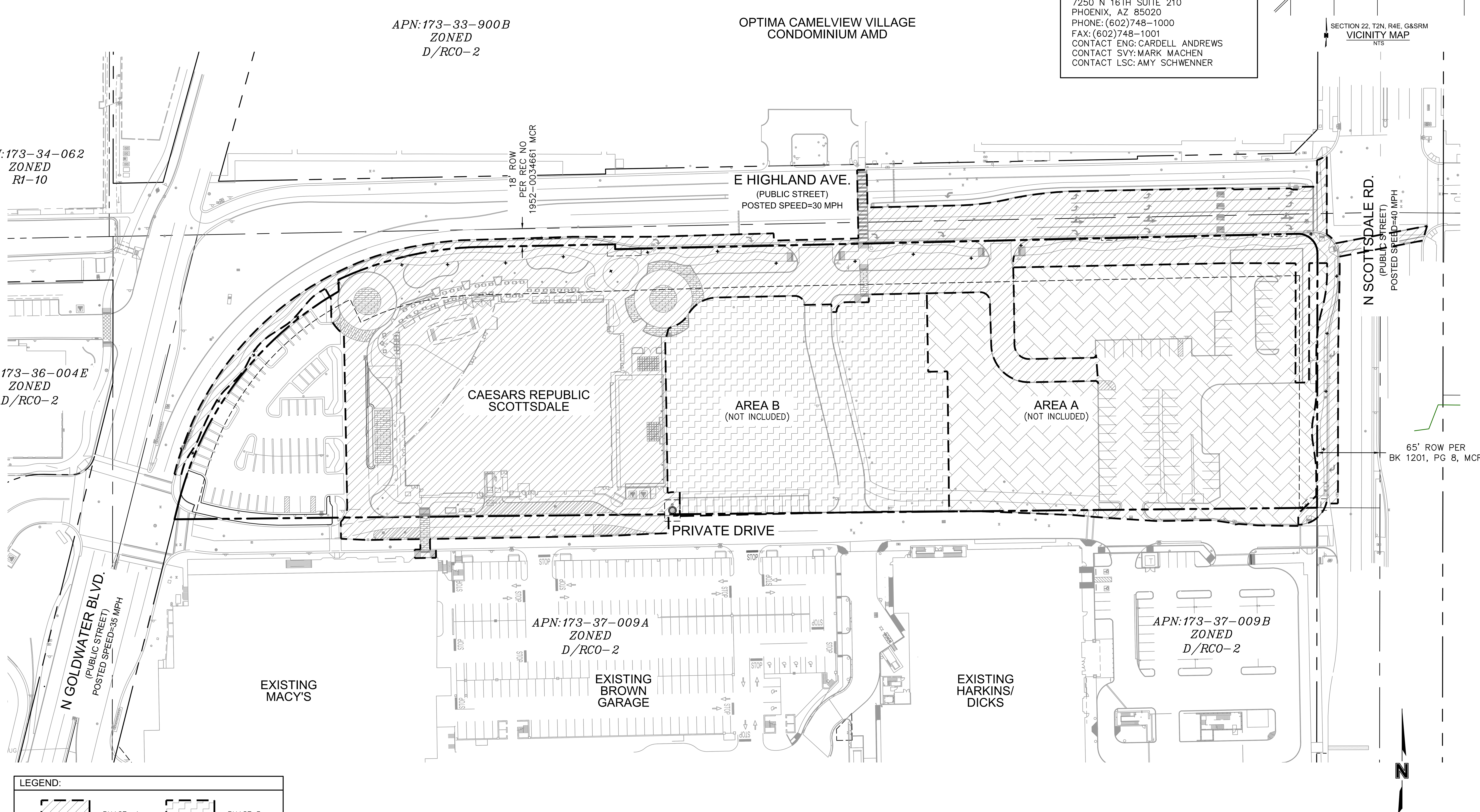
OWNER
MACERICH
11411 NORTH TATUM BLVD
PHOENIX, AZ 85028
PHONE: (602)953-6548
FAX: (602)953-1964
ATTN: JUSTIN LONG

DEVELOPER
HCW, LLC
2398 E CAMELBACK RD, SUITE 690
PHOENIX, AZ 85016
PHONE: (602)469-1226
FAX: (417)332-3434
ATTN: RICK HUFFMAN

SITE ENGINEER/SURVEY/LAND ARCH
OLSSON
7250 N 16TH SUITE 210
PHOENIX, AZ 85020
PHONE: (602)748-1000
FAX: (602)748-1001
CONTACT ENG: CARDELL ANDREWS
CONTACT SVY: MARK MACHEN
CONTACT LSC: AMY SCHWENNER



SECTION 22, T2N, R4E, G&SRM
VICINITY MAP
NTS



LEGEND:

PHASE 1
PHASE 3
PHASE 2

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7250 North 16th Street, Suite 210
Phoenix, AZ 85020-5282
TEL 602.748.1000
FAX 602.748.1001
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Registered Professional Engineer (Civil)
CERTIFICATE NO. 42633
ANDREA K. PAGE
ARIZONA U.S.A.

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REV. NO.	DATE	REVISIONS DESCRIPTION

REVISIONS

DESIGN REVIEW BOARD
PRELIMINARY PHASING PLAN
CAESARS REPUBLIC SCOTTSDALE
SCOTTSDALE, AZ 85251
2019

drawn by:	SS/THW
designed by:	SJV
checked by:	CAII
project no.:	018-3159
date:	05.09.2019

PC600
1 *of* 1

PROJECT DATA:

PROJECT ADDRESS:
SOUTHEAST CORNER OF GOLDWATER BOULEVARD AND HIGHLAND AVENUE SCOTTSDALE, ARIZONA 85251

BENCH MARK: A STONE IN HAND HOLE AT THE INTERSECTION OF CAMELBACK RD. & MILLER RD., CITY OF SCOTTSDALE BENCHMARK #4234.

ELEVATION= 1259.43' (PER C.O.S. NAVD '88 DATUM)

SITE AREA: 306,703 SF OR 7.04 ACRES

CONSTRUCTION LIMITS: 252,403 OR 5.79 ACRES

APN: PARCEL 173-37-010

ZONING: D/RCO-2 PBD DO

PRELIMINARY UTILITY PLAN FOR
CAESARS REPUBLIC SCOTTSDALE
SCOTTSDALE, ARIZONA 85251

SHEET INDEX

#	SHEET NAME	SHEET NO.
1	PRELIMINARY UTILITY PLAN	PC401
2	PRELIMINARY UTILITY PLAN	PC402
3	PRELIMINARY DETAILS	PC403

OWNER
MACERICH
11411 NORTH TATUM BLVD
PHOENIX, AZ 85028
PHONE: (602)953-6548
FAX: (602)953-1964
ATTN: JUSTIN LONG

DEVELOPER
HCW, LLC
2398 E CAMELBACK RD, SUITE 690
PHOENIX, AZ 85016
PHONE: (602)469-1226
FAX: (417)332-3434
ATTN: RICK HUFFMAN

SITE ENGINEER/SURVEY/LAND ARCH
OLSSON
7250 N 16TH SUITE 210
PHOENIX, AZ 85020
PHONE: (602)748-1000
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CONTACT ENG: CARDELL ANDREWS
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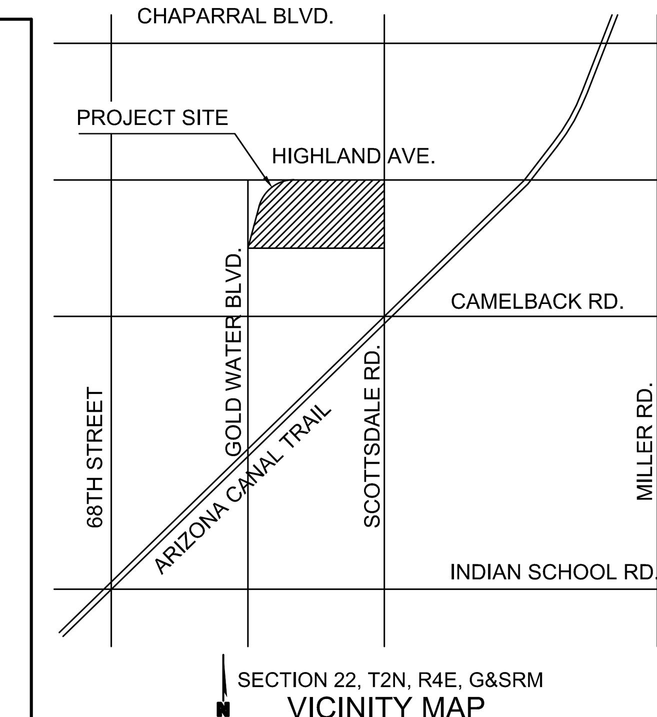
CONTACT LSC: AMY SCHWENNER



VICINITY MAP
NTS

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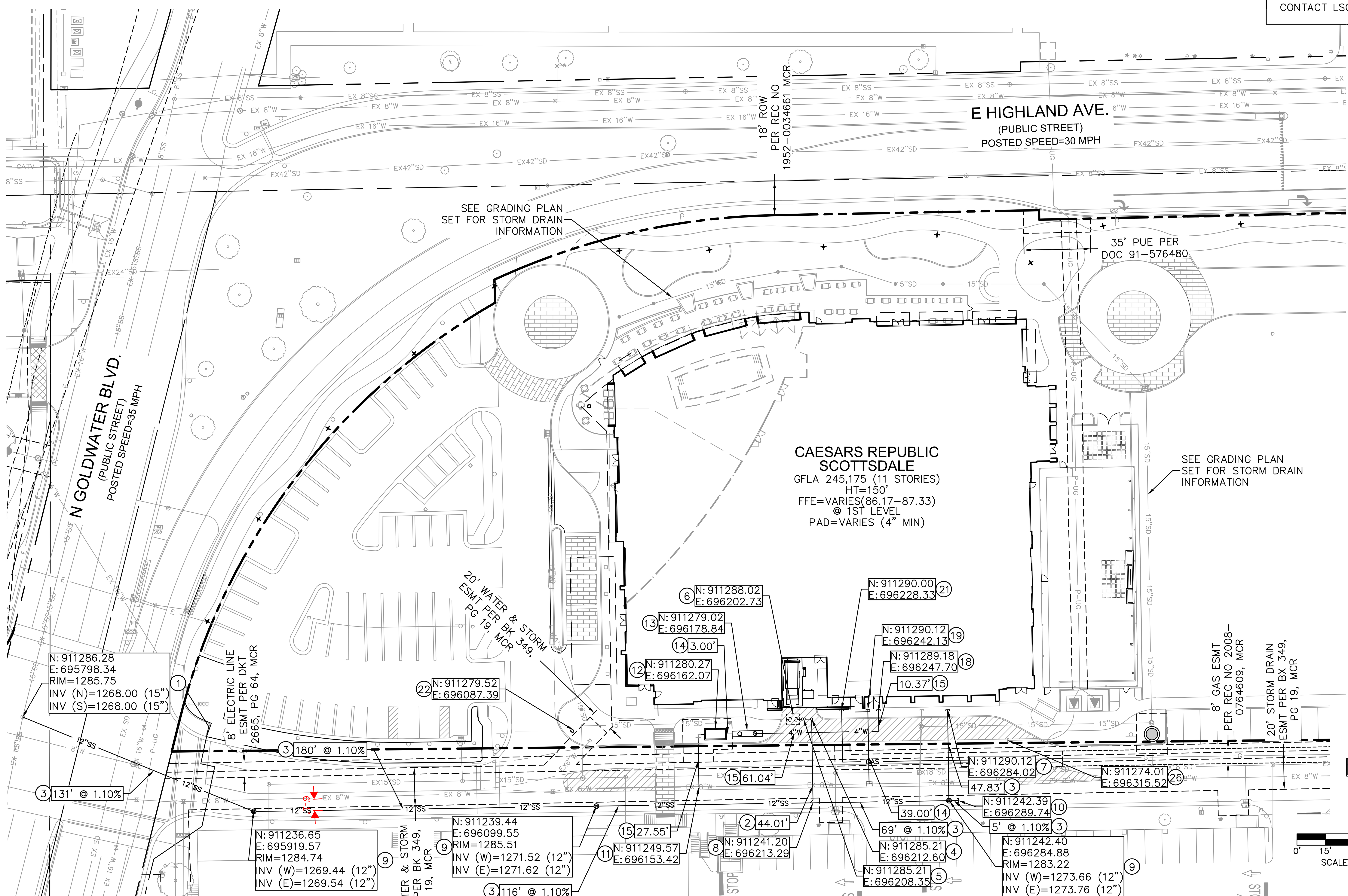
Phoenix, AZ 85020-5282
TEL 602.748.1000
FAX 602.748.1001
www.olsson.com



UTILITY NOTES:

1. CONTRACTOR TO VERIFY LOCATIONS AND INVERTS OF ALL EXISTING UTILITIES 72 HOURS PRIOR TO THE CONSTRUCTION AND NOTIFY ENGINEER OF DISCREPANCIES FROM PLANS.
2. PIPE BEDDING FOR ALL UTILITY LINES TO BE PER CITY OF SCOTTSDALE SPECIFICATIONS. AND CITY OF SCOTTSDALE STANDARD DETAIL 2201.

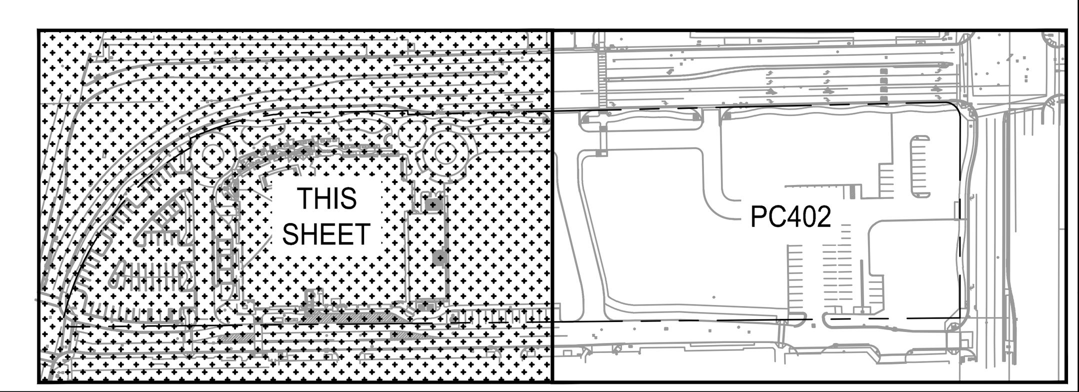
UTILITY PLAN KEYNOTES

1. CONTRACTOR TO CORE EXISTING SANITARY SEWER MANHOLE WALL AND INSTALL NEW 10" SERVICE CONNECTION INTO EXISTING STRUCTURE. CONTRACTOR TO FIELD VERIFY INVERT INFORMATION PRIOR TO THE START OF CONSTRUCTION AND NOTIFY ENGINEER IF ANY INFORMATION DIFFERS FROM PLAN
2. 6" PVC SDR35 SEWER SERVICE LINE PER MAG AND C.O.S. SPECIFICATIONS
3. 12" PVC SDR35 SEWER SERVICE LINE PER MAG AND C.O.S. SPECIFICATIONS
4. 6" SEWER CLEAN-OUT. SEE DETAIL H, SHEET PC403
5. 6" TWO WAY SEWER CLEAN-OUT. SEE DETAIL I, SHEET PC403
6. GGI-750 BIGFOOT GRAVITY GREASE INTERCEPTOR. SEE DETAIL G, ON SHEET PC403
7. SEWER SERVICE LINE TERMINATION, SEE MECHANICAL PLANS FOR CONTINUATION INTO BUILDING
8. 6" X 10" WYE CONNECTION
9. 48" MANHOLE PER MAG STD DETAIL 420-1 WITH MANHOLE FRAME AND COVER PER MAG STD DETAIL 423-1 MANHLE RIM SHALL READ "SANITARY SEWER"
10. 10" PVC SDR35 SEWER SERVICE LINE STUB FOR FUTURE CONNECTION
11. CONNECT TO EXISTING WATERLINE WITH A SERVICE SADDLE PER C.O.S. STD DETAIL 2330
12. 4" TURBINE WATER METER PER COS STD DETAIL 2345, PROVIDE 11.5' L X 6' W STANDARD WATER METER VAULT PER MAG STD DETAIL 321.
13. 4" BACKFLOW PREVENTION ASSEMBLY PER COS STD DETAIL 2353
14. 8" CLASS 350 POLY-WRAPPED DUCTILE IRON PIPE
15. 4" DOMESTIC WATER SERVICE
16. 1" DOMESTIC WATER SERVICE
17. 6" CLASS 350 POLY-WRAPPED DUCTILE IRON PIPE
18. TERMINATE AND CAP 4" DOMESTIC WATERLINE. SEE MECHANICAL PLANS FOR CONTINUATION INTO BUILDING
19. TERMINATE AND CAP 8" FIRE SEVICE LINE. SEE MECHANICAL PLANS FOR CONTINUATION INTO BUILDING
20. TERMINATE AND CAP 8" SECONDARY FIRE SEVICE LINE. SEE MECHANICAL PLANS FOR CONTINUATION INTO BUILDING
21. GASLINE TERMINATE AND CAP. SEE MECHANICAL PLANS FOR CONTINUATION INTO BUILDING
22. REMOTE FDC PER COS STD DTL 2367
23. RELOCATED WATER METER
24. RELOCATED CURB STOP WITH FLUSHING PIPE PER MAG STD DTL 390
25. RELOCATED FIRE HYDRANT
26. ELECTRIC LINE. SEE ELECTRICAL PLANS FOR CONTINUATION INTO BUILDING

REV. NO.	DATE	REVISIONS DESCRIPTION

REVISIONS

DESIGN REVIEW BOARD
PRELIMINARY UTILITY PLAN
CAESARS REPUBLIC SCOTTSDALE
SCOTTSDALE, AZ 85251
2019



drawn by:	SS/THW
designed by:	SJV
checked by:	CAII
project no.:	018-3159
date:	05.16.2019

PC401

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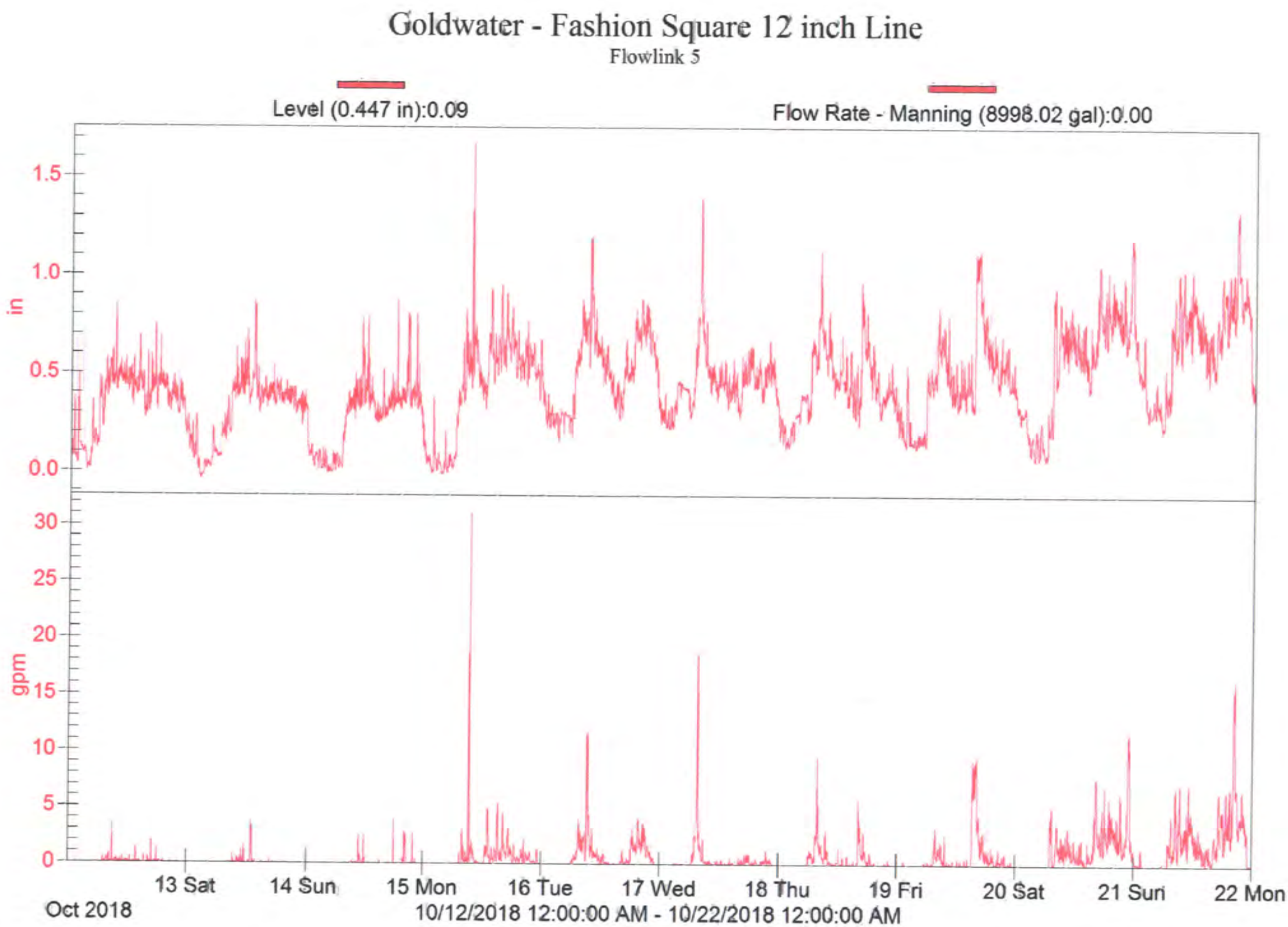
APPENDIX "D"

(Flow Data Results, Per Western Environmental Equipment Co.)


Goldwater - Fashion Square 12 inch Line
Flowlink 5
Level (0.447 in):0.09
Flow Rate - Manning (8998.02 gal):0.00
in
1.5
1.0
0.5
0.0
gpm
30
25
20
15
10
5
0
13 Sat
14 Sun
15 Mon
16 Tue
17 Wed
18 Thu
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21 Sun
22 Mon
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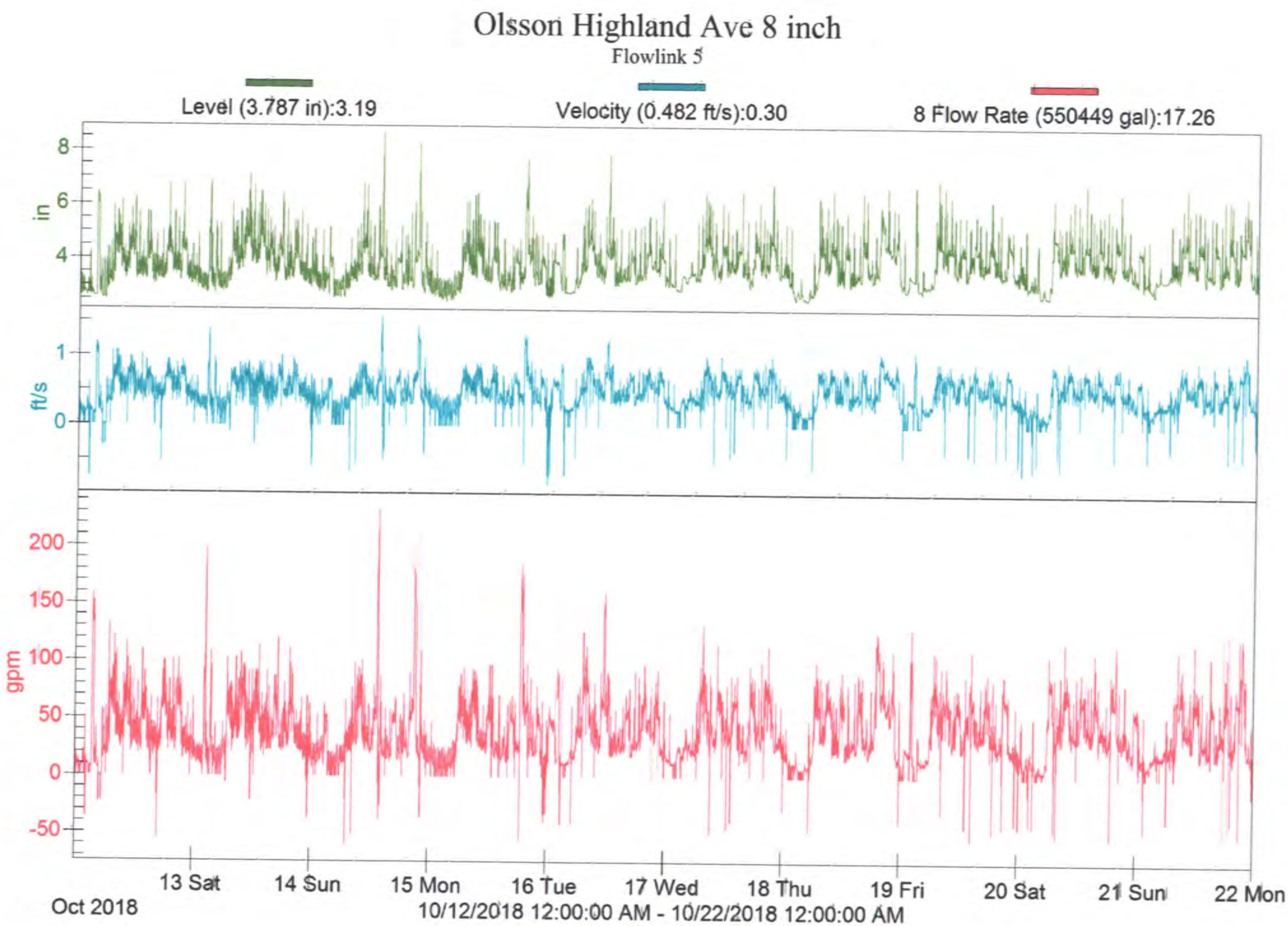
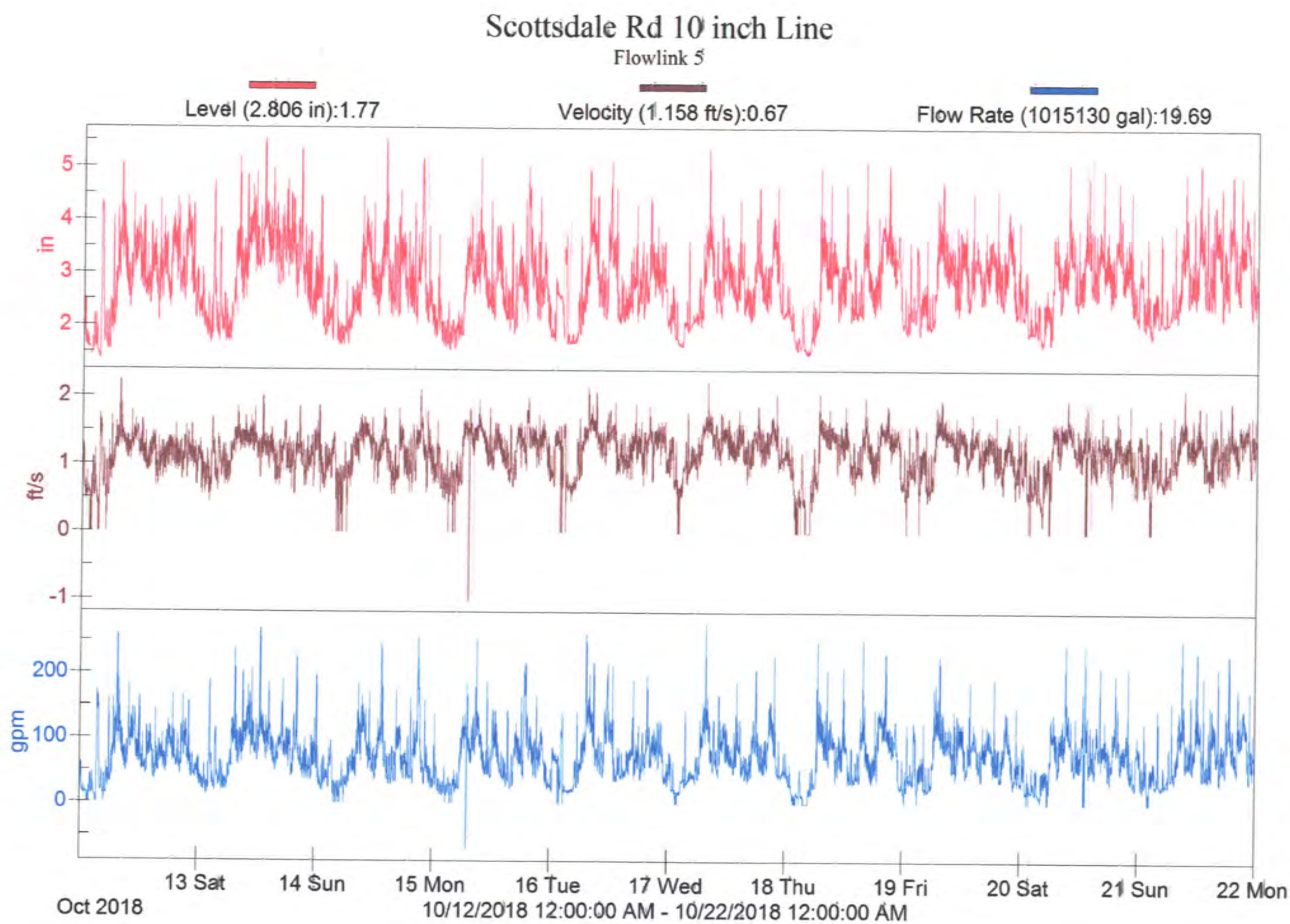

Olsson Highland Ave 8 inch
Flowlink 5
Level (3.787 in):3.19
Velocity (0.482 ft/s):0.30
8 Flow Rate (550449 gal):17.26
in
ft/s
gpm
13 Sat
14 Sun
15 Mon
16 Tue
17 Wed
18 Thu
19 Fri
20 Sat
21 Sun
22 Mon
Oct 2018
10/12/2018 12:00:00 AM - 10/22/2018 12:00:00 AM


Scottsdale Rd 10 inch Line
Flowlink 5
Level (2.806 in):1.77
Velocity (1.158 ft/s):0.67
Flow Rate (1015130 gal):19.69
in
5
4
3
2
ft/s
2
1
0
-1
gpm
200
100
0
13 Sat
14 Sun
15 Mon
16 Tue
17 Wed
18 Thu
19 Fri
20 Sat
21 Sun
22 Mon
Oct 2018
10/12/2018 12:00:00 AM - 10/22/2018 12:00:00 AM

SCOTTSDALE FASHION SQUARE- LOT 2
FINAL SEWER BASIS OF DESIGN REPORT

Scottsdale, AZ

May 2019

Olsson Project No. 018-3159

SCOTTSDALE FASHION SQUARE- LOT 2
FINAL WATER BASIS OF DESIGN REPORT

COS CASE NO. 962-PA-2018

FINAL Basis of Design Report

☐ APPROVED

☐ APPROVED AS NOTED

☑ REVISE AND RESUBMIT

CITY OF SCOTTSDALE

SCOTTSDALE WATER
9379 E San Salvador Dr.
Scottsdale, AZ 85258

Disclaimer: If approved; the approval is granted under the condition that the final construction documents submitted for city review will match the information herein. Any subsequent changes in the water or sewer design that materially impact design criteria or standards will require re-analysis, re-submittal, and approval of a revised basis of design report prior to the plan review submission.; this approval is not a guarantee of construction document acceptance.
For questions or clarifications contact the Water Resources Planning and Engineering Department at 480-312-5685.

07/18/2019

BY ldillon DATE 7/18/2019

Prepared For:

Macerich
11411 N Tatum Boulevard
Phoenix, AZ 85253

Address comments below and herein and resubmit:

1) Water master plan for all current and future proposed buildings must be presented with relevant demands and infrastructure analysis. DS&PM 6-1.200
2) Modeling of all proposed demands and required scenarios based on using just one of the hydrant flow tests as a supply curve (pump) should be completed with the relevant existing water pipe network included in the model. DS&PM 6-1.202
3) Provide utility plan showing currently proposed, and future developments, with existing and proposed water infrastructure. 6-1.202
4) Demands for hydraulic analysis should be determined per DS&PM gpm values not gpd. DS&PM 6-1.202 Figure 6-1.2
5) Minimum pressure during fire flow is 30psi, not 20 psi. DS&PM 6-1.406
6) Provide height of all buildings and fire flow determination for each. DS&PM 6-1.202
7) indicate hydrant spacing on utility plan DS&PM 6-1.502

Registered Professional Engineer (Civil)
CERTIFICATE NO. 42633
ANDREA K. PAGE
Date Signed 5/10/19
ARIZONA, U.S.A.
Andrea K. Page

May 2019

Olsson Project No. 018-3159

Table of Contents

Figures

Tables

Appendices

All analysis and necessary infrastructure serving all phases must be shown herein. Utility plan for all phases and hydraulic analysis must be provided.

I. INTRODUCTION

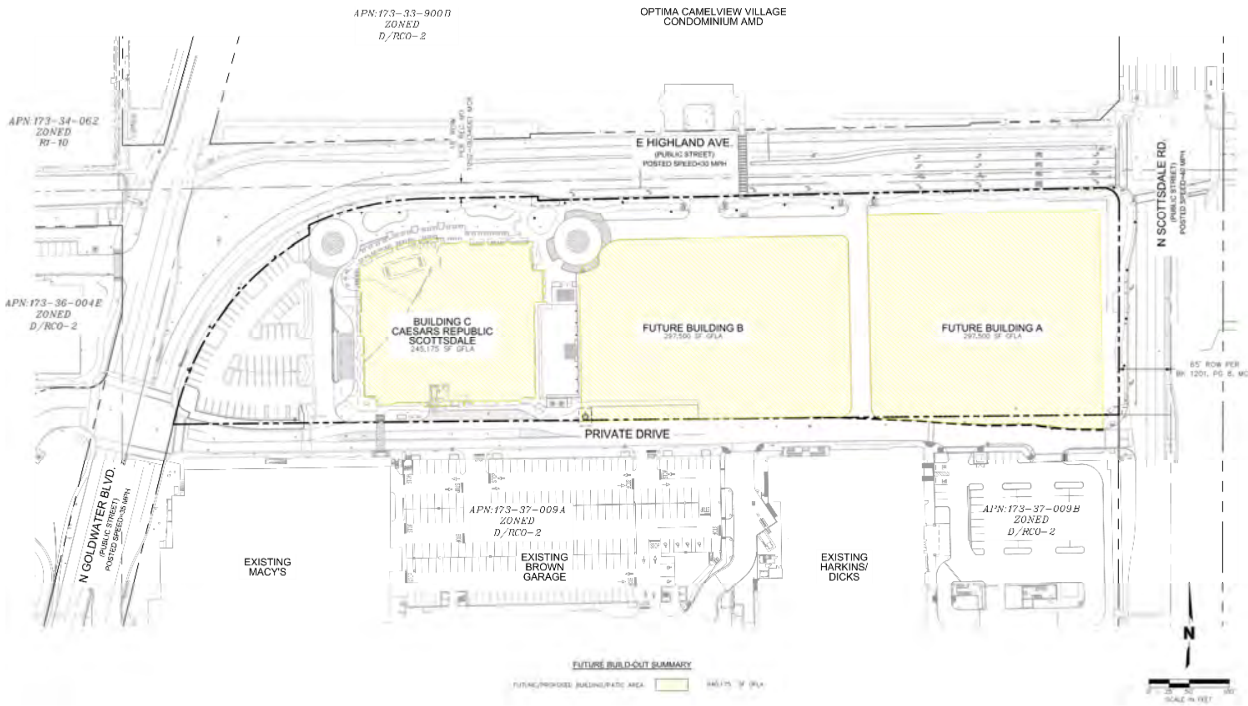
A. Project

The purpose of this Final Water Basis of Design Report is to support the buildout of Scottsdale Fashion Square- Lot 2 (see **Figure 1**), which includes two (2) future buildings as well as the proposed Caesars Republic Scottsdale Hotel, hereinafter referred to as "The Project" (see **Figure 2**). The Project site is situated within the northeast quarter of Section 22, Township 2 North, Range 4 East of the Gila and Salt River Meridian, Maricopa County, Arizona, is zoned D/DRU-2 PBD DO; 25-ZN2015 & 1-II-2016, and covers approximately 7.04 acres after right-of-way dedications. More specifically The Project site is identified as Maricopa County assessor parcel number 173-37-010.

The Project will be developed in multiple Phases, including buildings, and site improvements, and when completely buildout will be a part of the greater Scottsdale Fashion Square mall. As mentioned above, this Final Sewer Basis of Design Report is to support the complete buildout of Scottsdale Fashion Square-Lot 2 (see **Figure 2**).

Scottsdale Fashion Square- Lot 2, Per BK 1201, PG 8

Figure 1 – Location/Parcel Map



Building A- Caesars Republic Scottsdale
Building B- Future Office and Retail
Building C- Future Office and Retail

Figure 2 – Final Buildout Exhibit

B. Contact Info

<u>Owner/Developer</u>
Macerich
11411 N Tatum Boulevard
Phoenix, AZ 85028
Phone: (602) 953-6548
Contact: Justin Long

<u>Developer</u>
HCW Hotels, LLC
2398 E Camelback Road, Suite 690
Phoenix, AZ 85016
Phone: (602) 469-1226
Contact: Rick Huffman

<u>Civil Engineer</u>
Olsson
7250 N. 16th Street, Suite210
Phoenix, AZ 85020
Phone: (602) 748-1000
Contact: Cardell Andrews

C. Existing Site Conditions

In the year 2013, the site improvements included a Days Inn Hotel, Desert Stages Theater, and Coco's Restaurant (see Figure 3). By the year 2014, all of the buildings onsite in 2013, with the exception of the Desert Stages Theater, were demolished, and remain in that state today (see Figure 4).

The Project site area is bounded to the north by Highland Avenue (public street), to the east by Scottsdale Boulevard (public street), to the south by a Private Drive (private access road), and to the west by Goldwater Boulevard (public street). All public streets are fully improved, and contain both water and sewer utilities. The City of Scottsdale Water Quarter Section Map, which includes The Project area, is in Appendix A. As much as possible, the existing services will be utilized.

Figure 3 – Existing Site Conditions (Year 2013)

Figure 4 – Existing Site Conditions (Year 2019)

why aren't these shown in hydraulic analysis?

D. Proposed Conditions

The Project will be developed in multiple Phases, including buildings, and onsite/offsite site improvements, and when completely buildout will total an additional 840,175 SF Gross Floor Lease Area, that will be a part of the greater Scottsdale Fashion Square mall (see Table 1).

Table 1— Final Buildout Breakout

Building	Use	Gross Floor Lease Area (SF)	Rooms
Future Building A1	Office	287,500	N/A
Future Building A2	Restaurant	10,000	N/A
Future Building A3	Restaurant	10,000	N/A
Future Building B	Office	287,500	N/A
Building C- Caesars Republic Scottsdale	Resort Hotel (w/ Amenities)	245,175	266
Total Buildout	**Varies**	**840,175**	**266**

The water system will be served by the existing 8-inch APC waterline onsite, as well as some existing water services along Highland Avenue and Scottsdale Road. The water design will be in accordance with City of Scottsdale – 2018 Design Standards & Policies Manual.

According to the jurisdictional standards and 2012 International Fire Code, a minimum system fire flow of

1,500 gpm is required for fully sprinkled commercial development. This fire flow must be available concurrent with maximum day demand conditions, while maintaining a minimum residual pressure of 20 psi at the source.

At 11 stories and 150ft this building falls into the "high-rise" category i.e. over 75 feet. The minimum fire flow for high-rises per DS&PM 6-1.501 is 2,500gpm. Provide calc of fire flow per IFC Appendix B and IBC building type.

E. Fire Flow Tests

Two hydrant flow tests were performed by Arizona Flow Testing, LLC, on November 8, 2018 @ 7:30 a.m (Appendix B). The flow test map shows where the Fire Hydrant Flow Test was taken.

In summary, Fire Flow Test #1 (Private Drive) demonstrated the following:

Static Pressure =	72 psi
Residual Pressure =	58 psi with 1,954 gpm
Minimum Residual Pressure =	20 psi with 3,968 gpm

In addition, Fire Flow Test 2 (Highland Avenue) demonstrated the following:

Static Pressure =	72 psi
Residual Pressure =	56 psi with 1,917 gpm
Minimum Residual Pressure =	20 psi with 3,623 gpm

COS requires 30psi minimum, provide flows at 30psi

II. Demand Calculations

A. Design Criteria

Design criteria for the water system is based on City of Scottsdale—2018 Design Standards & Policies Manual. Utilizing these standards for the design criteria, the following design requirements will be followed:

- All new waterlines 6-inches through 12-inches shall be Class 350 ductile iron pipe.
- Fire line services 4 inches and larger shall be constructed of DIP, class 350. Fire line services 3 inches and smaller shall be constructed of type K, softcopper.
- Design flows shall be based on the Average Day Water Demands, Figure 6-1.2 Average Day Water Demands
- Maximum Day Demand scenario – 2 times the Average Day Demand
- Maximum Day Demand + Fire Flow
- Peak Hour Demand – 3.5 times the Average Day Demand.
- Minimum Fire flow of 2,500 gpm for high rise structures to account for potential firefighting activities
- Minimum Pressure: 20 psi @ max day + fire flow in accordance with uniform plumbing code.
- Pipeline calculations verifying that head loss per 1,000 feet of any pipe is no greater than 10 feet/feet. (The Hazen-Williams equation will be used to calculate head loss per 1,000 ft of pipe).

average day in gpm

30psi in COS

Figure 6-1.2 Average Day Water

Land Use	Demand (GPD)
Office	0.6
Restaurant	1.3
Resort Hotel (w/ Amenities)	446.3

you are using gpd values, the gpm values in DS&PM must be used for capacity analysis/modeling. Revise per Ch 6 page 471 table.

Add units of per ft2 and per room

B. Domestic Demand

Utilizing the above mentioned design criteria, the below demands were calculated:

vague, what/where does this apply?

different from previous section, 2,500gpm is a minimum

missing office buildings and restaurants. Provide design gpm demands.

Private Drive Connection- Phase I

The proposed water services off the existing 8-inch ACP water line in the Private Drive will include a 4-inch domestic water service and a 8-inch fire service line. Utilizing this design criteria along with the associated use demand, the following calculations were made:

Table 2. Proposed Average Day Water Demands

Building	Land Use	Gross Floor Lease Area (SF) Or Rooms	Demand (GPD)
Building C- Caesars Republic Scottsdale	Resort Hotel (w/ Amenities	266 Rooms	266 Rooms x 446.30 GPD/Room= **118,715.80**
Total	**-**	**-**	**118,715.80**

Average =118,715.80 gpd = 82.46 gpm

Max Day=118,715.80 gpd x 2 (peak factor) = 237,431.60 gpd = 164.92 gpm

Peak Hour=118,715.80 gpd x 3.5 (peak factor) = 415,505.30 gpd = 288.60 gpm

Maximum Day Demand + Fire Flow=164.92 gpm + 2,500 gpm= 2,664.92 gpm

2,664.92 gpm < 3,968 gpm ==> O.K.

Revise using gpm values from DS&PM Ch 6 page 471

The proposed system adequately provides peak hour demands and maximum day demand plus fire flow. Flow and pressures throughout the system during all design conditions meet or exceed minimum requirements. Adequate flow and pressure are available for the domestic water service and fire protection for The Project.

For the Hazen-Williams calculations for head loss per 1,000 ft of pipe, see Appendix D.

C. Fire Flow Demand

According to City of Goodyear Engineering Design Standards and Policies Manual, a minimum system fire flow of 2,500 gpm is required for high rise structures to account for potential firefighting activities. This fire flow must be available concurrent with maximum day demand conditions, while maintaining a minimum residual pressure of 20 psi at the source.

wrong City

COS requires 30psi minimum

III. Conclusions

A. Compliance with Manual

This Final Water Basis of Design Report was prepared in accordance with City of Scottsdale—2018 Design Standards & Policies Manual. For The Project, water design described within this Final Water Basis of Design Report was designed to collect and convey the projects water under Average Day + Fire Flow. Flow and pressures throughout the system during all design conditions meet or exceed minimum pressure requirements.

B. Ability to Provide Emergency All Weather Access

All projects sites when developed, will provide emergency all weather access in accordance with City of Scottsdale—2018 Design Standards & Policies Manual.

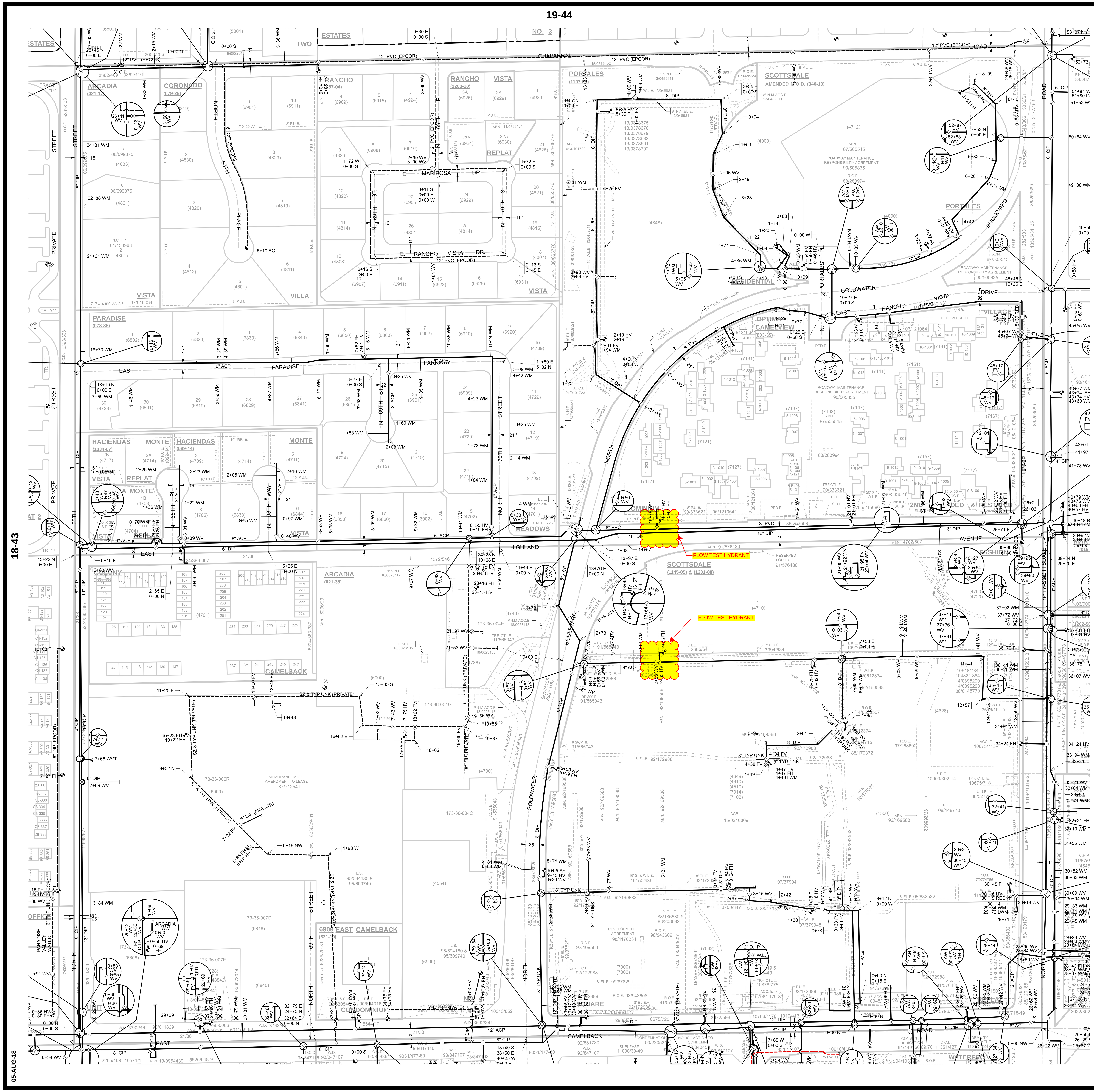
not applicable

C. Effect of Development on Adjacent Properties

Modification to the existing infrastructure are not proposed or required, since adequate flow and pressure are available for the domestic water service and fire protection for The Project.

APPENDIX "A"

(City of Scottsdale Water Quarter Section Map (18-44))



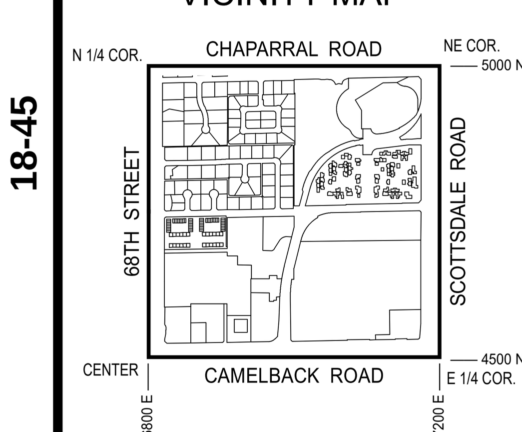
GENERAL NOTES:

- THIS IS A COMPUTER GENERATED DRAWING. FOR ANY REVISIONS PLEASE CONTACT THE CITY OF SCOTTSDALE GIS DEPARTMENT AT (480) 312-7792.
- THE SECTION LINE BEARING AND DISTANCES ARE BASED ON THE CITY OF SCOTTSDALE GPS SURVEY OF SEPTEMBER, 1991. BEARINGS ARE NAD 83 GRID AND DISTANCES ARE FLATTENED TO GROUND. WHERE NO CORNER WAS FOUND THE DIMENSIONS ARE GIVEN TO CALCULATED SECTION CORNERS AND ARE NOTED AS 'CALCULATED' ON THE MAP.

LEGEND:

- Air Release Valve
- Non-potable Air Release Valve
- Blowoff
- Cap
- Cathodic Protection
- Fill Drain
- Fire Hydrant
- Non-GPS Point
- Pressure Reducing Valve
- Pump
- Reducer
- Sample Station
- Water Manhole
- Non-Potable Manhole
- Well
- Valve
- Non-potable Valve
- Vault
- Water Main
- Non-Potable Main
- Fire / Private Main
- Non-Scottsdale Main

VICINITY MAP



NORTH

SCALE: 1" = 100'

0 50 100 200

The map scale of 1" = 100' is based on a full size print of 30" x 36"

WATER

QUARTER SECTION MAP

18-44

NE 1/4 SEC. 22 T2N R4E

SCOTTSDALE GEOGRAPHIC INFORMATION SYSTEMS
3629 North Drinkwater Boulevard
Scottsdale, Arizona 85251

N O T I C E

THIS DOCUMENT IS PROVIDED FOR GENERAL INFORMATION PURPOSES ONLY. THE CITY OF SCOTTSDALE DOES NOT WARRANT ITS ACCURACY, COMPLETENESS OR SUITABILITY FOR ANY PARTICULAR PURPOSE. IT SHOULD NOT BE RELIED UPON WITHOUT FIELD VERIFICATION.

THE CITY OF SCOTTSDALE

05-AUG-18

APPENDIX "B"

(Fire Flow Test)

Arizona Flow Testing LLC

HYDRANT FLOW TEST REPORT 1

Project Name:	Scottsdale Hotel
Project Address:	Highland and Goldwater, Scottsdale, Arizona, 85251
Client Project No.:	Not Provided
Arizona Flow Testing Project No.:	18392
Flow Test Permit No.:	C56653
Date and time flow test conducted:	November 8, 2018 at 7:30 AM
Data is current and reliable until:	May 8, 2019
Conducted by:	Floyd Vaughan – Arizona Flow Testing, LLC (480-250-8154)
Witnessed by:	B. Dick/R. Padilla –City of Scottsdale-Inspector (602-228-2187)

Raw Test Data

Static Pressure: **94.0 PSI**
(Measured in pounds per square inch)

Residual Pressure: **80.0 PSI**
(Measured in pounds per square inch)

Pitot Pressure: **27.0 PSI**
(Measured in pounds per square inch)

Diffuser Orifice Diameter: One 4-inch Hose Monster
(Measured in inches)

Coefficient of Diffuser: .7875

Flowing GPM: **1,954 GPM**
(Measured in gallons per minute)

GPM @ 20 PSI: **4,801 GPM**

Data with 22 PSI Safety Factor

Static Pressure: **72.0 PSI**
(Measured in pounds per square inch)

Scottsdale requires a maximum Static Pressure of 72 PSI for AFES Design.

Residual Pressure: **58.0 PSI**
(Measured in pounds per square inch)

Distance between hydrants: Approx. 450 Feet

Main size: Not Provided

Flowing GPM: **1,954 GPM**

GPM @ 20 PSI: **3,968 GPM**

Flow Test Location

North

Arizona Flow Testing LLC

HYDRANT FLOW TEST REPORT 2

Project Name:	Scottsdale Hotel
Project Address:	Highland and Goldwater, Scottsdale, Arizona, 85251
Client Project No.:	Not Provided
Arizona Flow Testing Project No.:	18392
Flow Test Permit No.:	C56653
Date and time flow test conducted:	November 8, 2018 at 7:45 AM
Data is current and reliable until:	May 8, 2019
Conducted by:	Floyd Vaughan – Arizona Flow Testing, LLC (480-250-8154)
Witnessed by:	B. Dick/R. Padilla –City of Scottsdale-Inspector (602-228-2187)

Raw Test Data

Static Pressure: **92.0 PSI**
(Measured in pounds per square inch)

Residual Pressure: **76.0 PSI**
(Measured in pounds per square inch)

Pitot Pressure: **26.0 PSI**
(Measured in pounds per square inch)

Diffuser Orifice Diameter: One 4-inch Hose Monster
(Measured in inches)

Coefficient of Diffuser: .7875

Flowing GPM: **1,917 GPM**
(Measured in gallons per minute)

GPM @ 20 PSI: **4,319 GPM**

Data with 20 PSI Safety Factor

Static Pressure: **72.0 PSI**
(Measured in pounds per square inch)

Scottsdale requires a maximum Static Pressure of 72 PSI for AFES Design.

Residual Pressure: **56.0 PSI**
(Measured in pounds per square inch)

Distance between hydrants: Approx. 510 Feet

Main size: Not Provided

Flowing GPM: **1,917 GPM**

GPM @ 20 PSI: **3,623 GPM**

Flow Test Location **North**

APPENDIX “C”

(Preliminary Utility Plan- Phase I)

PROJECT DATA:

PROJECT ADDRESS:
SOUTHEAST CORNER OF GOLDWATER BOULEVARD AND HIGHLAND AVENUE SCOTTSDALE, ARIZONA 85251

BENCH MARK: A STONE IN HAND HOLE AT THE INTERSECTION OF CAMELBACK RD. & MILLER RD., CITY OF SCOTTSDALE BENCHMARK #4234.

ELEVATION= 1259.43' (PER C.O.S. NAVD '88 DATUM)

GROSS LOT AREA: 311,172 SF OR 7.14 ACRES

REDEVELOPED LOT AREA: 306,703 SF 7.04 ACRES

APN: PARCEL 173-37-010

ZONING: D/DRU-2 PBD DO; 25-ZN2015 & 1-II-2016

PRELIMINARY PHASING PLAN FOR
CAESARS REPUBLIC SCOTTSDALE
SCOTTSDALE, ARIZONA 85251

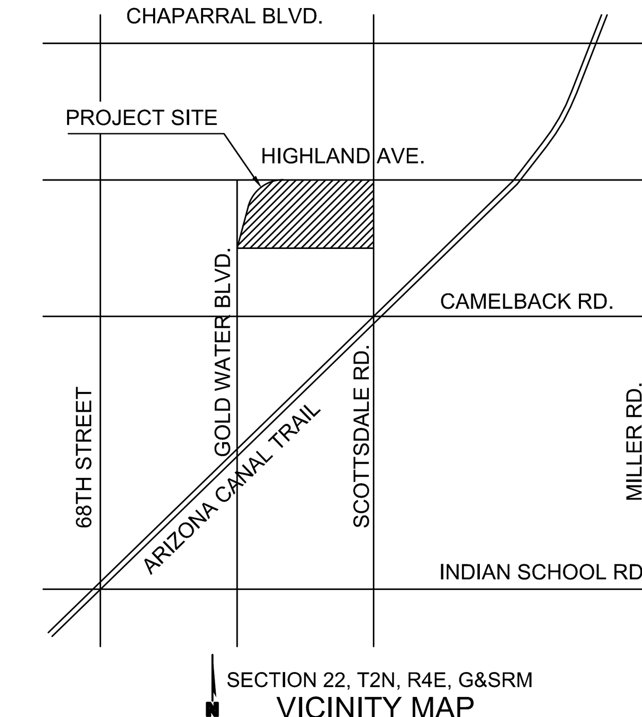
SHEET INDEX

#	SHEET NAME	SHEET NO.
1	PRELIMINARY PHASING PLAN	PC600

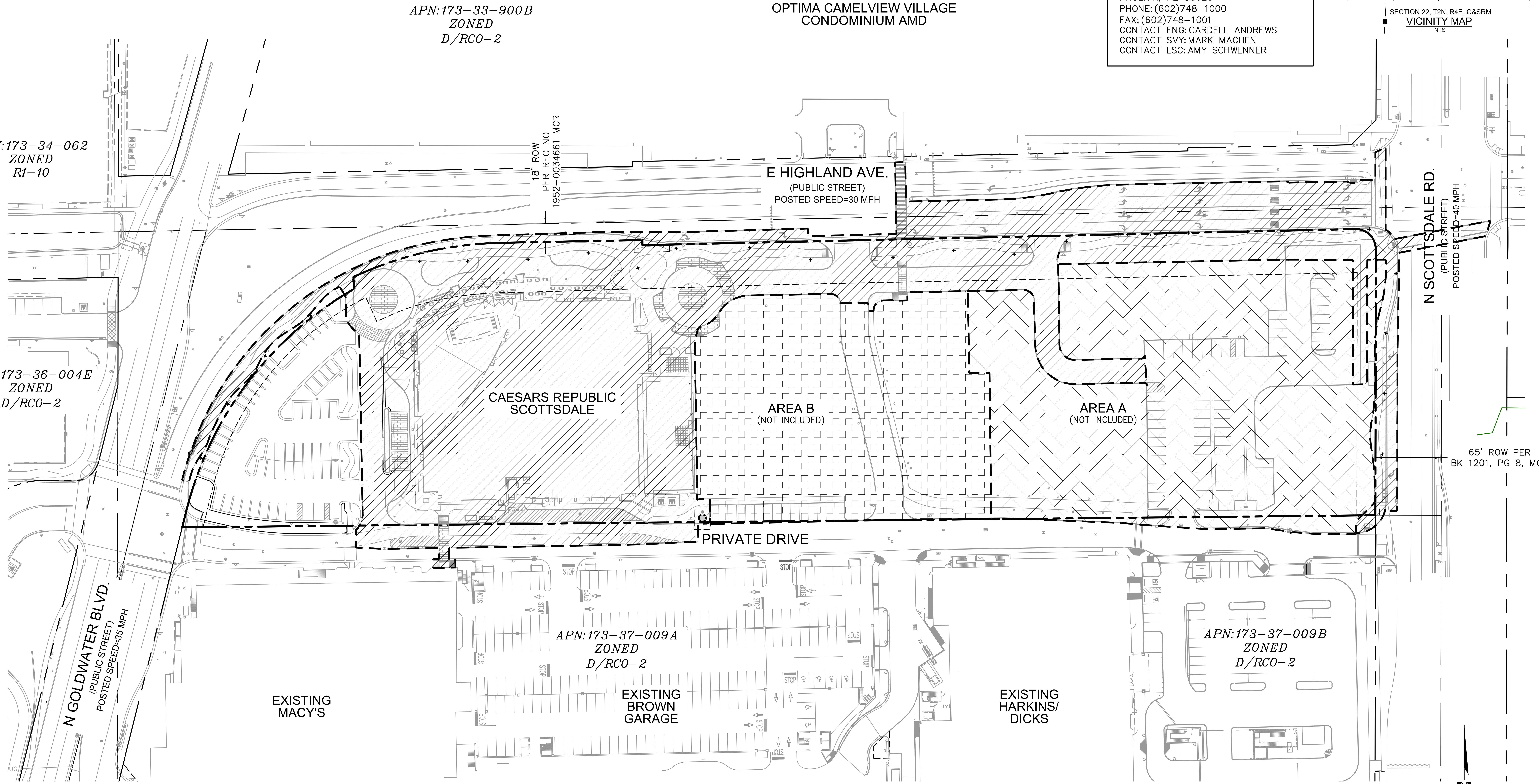
OWNER
MACERICH
11411 NORTH TATUM BLVD
PHOENIX, AZ 85028
PHONE: (602)953-6548
FAX: (602)953-1964
ATTN: JUSTIN LONG

DEVELOPER
HCW, LLC
2398 E CAMELBACK RD, SUITE 690
PHOENIX, AZ 85016
PHONE: (602)469-1226
FAX: (417)332-3434
ATTN: RICK HUFFMAN

SITE ENGINEER/SURVEY/LAND ARCH
OLSSON
7250 N 16TH SUITE 210
PHOENIX, AZ 85020
PHONE: (602)748-1000
FAX: (602)748-1001
CONTACT ENG: CARDELL ANDREWS
CONTACT SVY: MARK MACHEN
CONTACT LSC: AMY SCHWENNER



SECTION 22, T2N, R4E, G&SRM
VICINITY MAP
NTS



LEGEND:

PHASE 1

PHASE 3

PHASE 2

Call at least two full working days before you begin excavation.
ARIZONA 811
Arizona Blue Stake, Inc.
Dial 8-1-1 or 1-800-STAKE-IT (782-5348)
In Maricopa County: (602) 263-1100

Registered Professional Engineer (Civil)
CERTIFICATE NO. 42633
ANDREA K. PAGE
Date Signed 5/9/19
ARIZONA, U.S.A.

olsson
7250 North 16th Street, Suite 210
Phoenix, AZ 85020-5282
TEL 602.748.1000
FAX 602.748.1001
www.olsson.com

REVISIONS

REV. NO.	DATE	REVISIONS DESCRIPTION

DESIGN REVIEW BOARD
PRELIMINARY PHASING PLAN
CAESARS REPUBLIC SCOTTSDALE
SCOTTSDALE, AZ 85251
2019

drawn by:	SS/THW
designed by:	SJV
checked by:	CAII
project no.:	018-3159
date:	05.09.2019

PC600
1 *of* 1

DWG: F:\2018\3001-3500\018-3159\40-Design\AutoCAD\Preliminary Plans\Sheets\GNCV\1-PC601 PHASING PLAN_83159.dwg
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USER: thutchinswoss
XREFS: C_PTBLK_0183159 C_XBASE_0183159 C_XBASE_OVERALL IMPROVEMENTS C_PRE_PBASE_0183159 C_ARCH_0183159 AMY_SCHWENNER_LA_AZ E_PLTG_0183159

PRELIMINARY UTILITY PLAN FOR
CAESARS REPUBLIC SCOTTSDALE
SCOTTSDALE, ARIZONA 85251

PROJECT DATA:

PROJECT ADDRESS:
SOUTHEAST CORNER OF GOLDWATER BOULEVARD AND HIGHLAND AVENUE SCOTTSDALE, ARIZONA 85251

BENCH MARK: A STONE IN HAND HOLE AT THE INTERSECTION OF CAMELBACK RD. & MILLER RD., CITY OF SCOTTSDALE BENCHMARK #4234.

ELEVATION= 1259.43' (PER C.O.S. NAVD '88 DATUM)

SITE AREA: 306,703 SF OR 7.04 ACRES

CONSTRUCTION LIMITS: 252,403 OR 5.79 ACRES

APN: PARCEL 173-37-010

ZONING: D/RCO-2 PBD DO

SHEET INDEX		
#	SHEET NAME	SHEET NO.
1	PRELIMINARY UTILITY PLAN	PC401
2	PRELIMINARY UTILITY PLAN	PC402
3	PRELIMINARY DETAILS	PC403

OWNER
MACERICH
11411 NORTH TATUM BLVD
PHOENIX, AZ 85028
PHONE: (602)953-6548
FAX: (602)953-1964
ATTN: JUSTIN LONG

DEVELOPER
HCW, LLC
2398 E CAMELBACK RD, SUITE 690
PHOENIX, AZ 85016
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SITE ENGINEER/SURVEY/LAND ARCH
OLSSON
7250 N 16TH SUITE 210
PHOENIX, AZ 85020
PHONE: (602)748-1000
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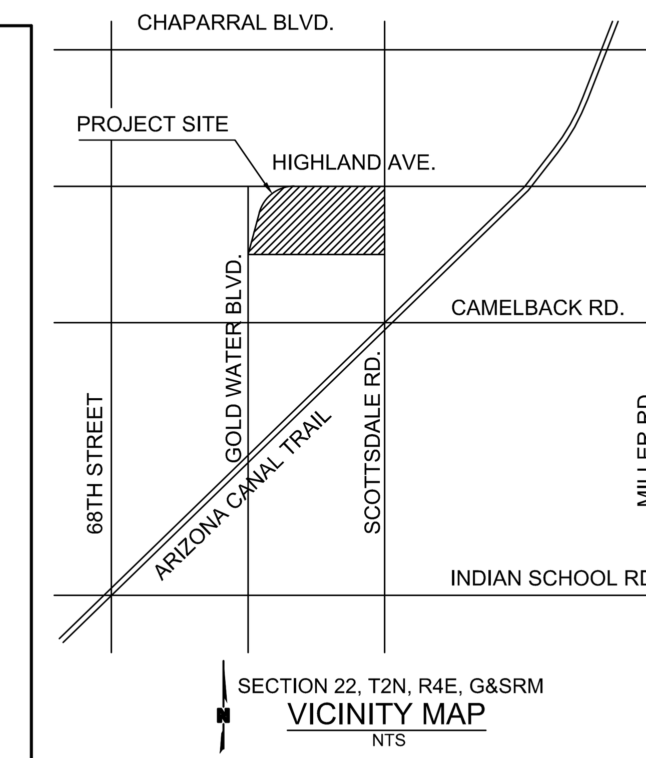
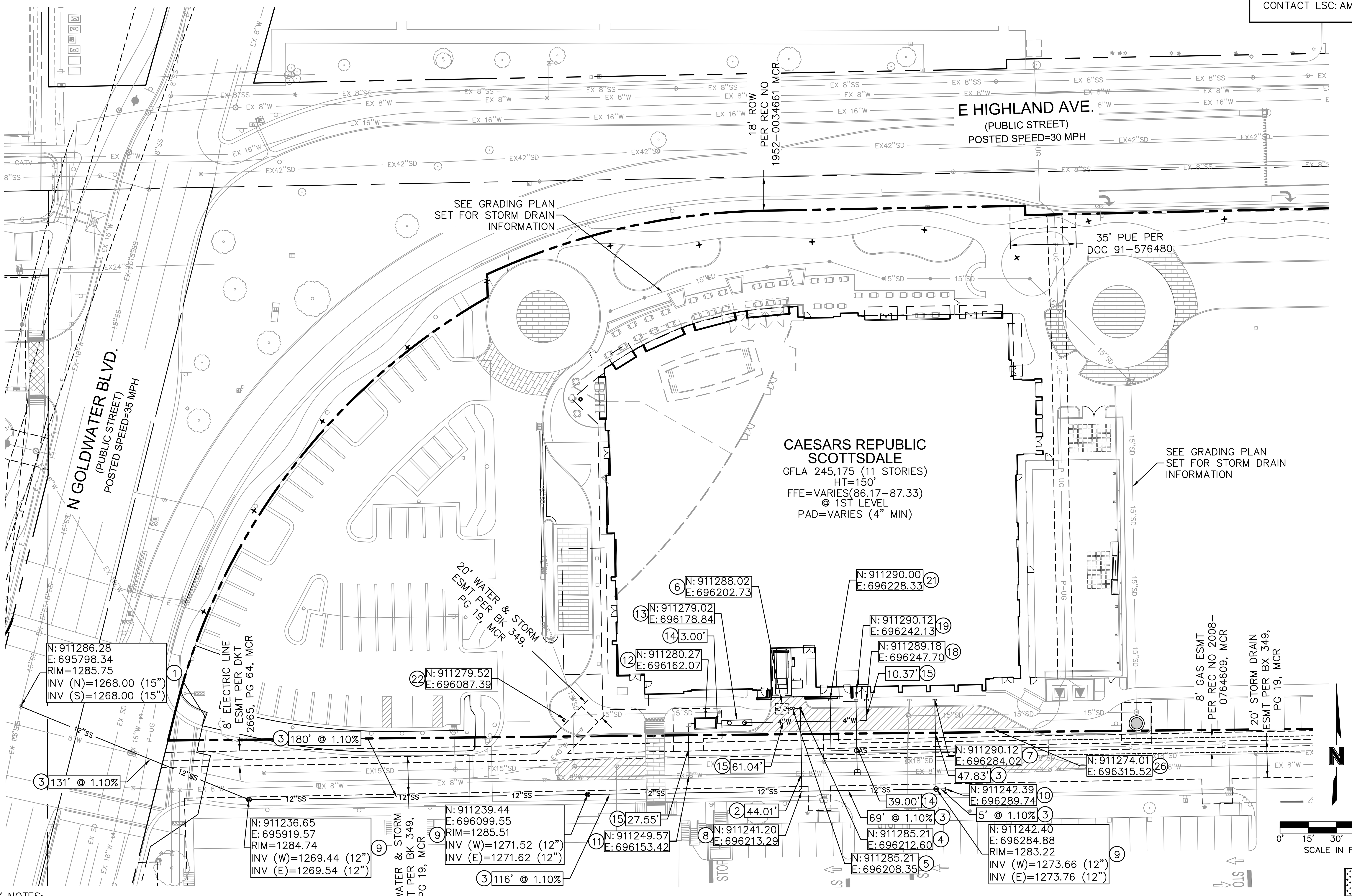


SECTION 22, T2N, R4E, G&SRM
VICINITY MAP
NTS

olsson
7250 North 16th Street, Suite 210
Phoenix, AZ 85020-5282
TEL 602.748.1000
FAX 602.748.1001
www.olsson.com

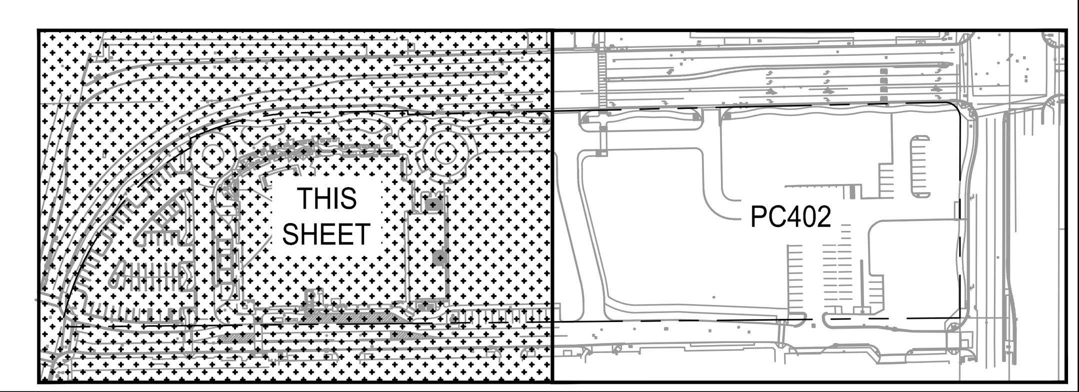


UTILITY NOTES:

1. CONTRACTOR TO VERIFY LOCATIONS AND INVERTS OF ALL EXISTING UTILITIES 72 HOURS PRIOR TO THE CONSTRUCTION AND NOTIFY ENGINEER OF DISCREPANCIES FROM PLANS.
2. PIPE BEDDING FOR ALL UTILITY LINES TO BE PER CITY OF SCOTTSDALE SPECIFICATIONS. AND CITY OF SCOTTSDALE STANDARD DETAIL 2201.

UTILITY PLAN KEYNOTES

1. CONTRACTOR TO CORE EXISTING SANITARY SEWER MANHOLE WALL AND INSTALL NEW 10" SERVICE CONNECTION INTO EXISTING STRUCTURE. CONTRACTOR TO FIELD VERIFY INVERT INFORMATION PRIOR TO THE START OF CONSTRUCTION AND NOTIFY ENGINEER IF ANY INFORMATION DIFFERS FROM PLAN
2. 6" PVC SDR35 SEWER SERVICE LINE PER MAG AND C.O.S. SPECIFICATIONS
3. 12" PVC SDR35 SEWER SERVICE LINE PER MAG AND C.O.S. SPECIFICATIONS
4. 6" SEWER CLEAN-OUT. SEE DETAIL H, SHEET PC403
5. 6" TWO WAY SEWER CLEAN-OUT. SEE DETAIL I, SHEET PC403
6. GGI-750 BIGFOOT GRAVITY GREASE INTERCEPTOR. SEE DETAIL G, ON SHEET PC403
7. SEWER SERVICE LINE TERMINATION, SEE MECHANICAL PLANS FOR CONTINUATION INTO BUILDING
8. 6" X 10" WYE CONNECTION
9. 48" MANHOLE PER MAG STD DETAIL 420-1 WITH MANHOLE FRAME AND COVER PER MAG STD DETAIL 423-1 MANHLE RIM SHALL READ "SANITARY SEWER"
10. 10" PVC SDR35 SEWER SERVICE LINE STUB FOR FUTURE CONNECTION
11. CONNECT TO EXISTING WATERLINE WITH A SERVICE SADDLE PER C.O.S. STD DETAIL 2330
12. 4" TURBINE WATER METER PER COS STD DETAIL 2345, PROVIDE 11.5' L X 6' W STANDARD WATER METER VAULT PER MAG STD DETAIL 321.
13. 4" BACKFLOW PREVENTION ASSEMBLY PER COS STD DETAIL 2353
14. 8" CLASS 350 POLY-WRAPPED DUCTILE IRON PIPE
15. 4" DOMESTIC WATER SERVICE
16. 1" DOMESTIC WATER SERVICE
17. 6" CLASS 350 POLY-WRAPPED DUCTILE IRON PIPE
18. TERMINATE AND CAP 4" DOMESTIC WATERLINE. SEE MECHANICAL PLANS FOR CONTINUATION INTO BUILDING
19. TERMINATE AND CAP 8" FIRE SEVICE LINE. SEE MECHANICAL PLANS FOR CONTINUATION INTO BUILDING
20. TERMINATE AND CAP 8" SECONDARY FIRE SEVICE LINE. SEE MECHANICAL PLANS FOR CONTINUATION INTO BUILDING
21. GASLINE TERMINATE AND CAP. SEE MECHANICAL PLANS FOR CONTINUATION INTO BUILDING
22. REMOTE FDC PER COS STD DTL 2367
23. RELOCATED WATER METER
24. RELOCATED CURB STOP WITH FLUSHING PIPE PER MAG STD DTL 390
25. RELOCATED FIRE HYDRANT
26. ELECTRIC LINE. SEE ELECTRICAL PLANS FOR CONTINUATION INTO BUILDING



REV. NO.	DATE	REVISIONS DESCRIPTION

REVISIONS

DESIGN REVIEW BOARD
PRELIMINARY UTILITY PLAN
CAESARS REPUBLIC SCOTTSDALE
SCOTTSDALE, AZ 85251
2019

drawn by:	SS/THW
designed by:	SJV
checked by:	CAII
project no.:	018-3159
date:	05.16.2019

PC401

DWG: F:\2018\3001-3500\018-3159\40-Design\AutoCAD\Preliminary Plans\Sheets\GNCV\1-PC401 PRIVATE UTILITY PLAN_83159.dwg USER: thutchinsweiss
DATE: May 30, 2019 9:40am XREFS: C_PTBLK_0183159 C_PRE_PBASE_0183159 C_XBASE_0183159 C_XBASE_OVERALL IMPROVEMENTS AMY_SCHWENNER_LA_AZ E_PLTG_0183159

APPENDIX "D"

(Hazen-Williams Calculations)

Revise per gpm demand values values in DS&PM

Hazen-Williams Equation for Pressure Loss in Pipes (Maximum Daily Flow)	
Specified Data	
l = length of pipe (ft)	1000
c = Hazen-Williams roughness constant	130
q = volume flow (gal/min) (Maximum Daily Flow)	165
dh = inside or hydraulic diameter (inches)	8
Calculated Pressure Loss	
f = friction head loss in feet of water per 100 feet of pipe (ft H20 per 100 ft pipe)	0.07
f = friction head loss in psi of water per 100 feet of pipe (psi per 100 ft pipe)	0.03
Head loss (ft H20)	0.66
Head loss (psi)	0.28
Calculated Flow Velocity	
v = flow velocity (ft/s)	1.05

Hazen-Williams Equation for Pressure Loss in Pipes (Peak Hourly Flow)	
Specified Data	
l = length of pipe (ft)	1000
c = Hazen-Williams roughness constant	130
q = volume flow (gal/min) (Peak Hourly Flow)	289
dh = inside or hydraulic diameter (inches)	8
Calculated Pressure Loss	
f = friction head loss in feet of water per 100 feet of pipe (ft H20 per 100 ft pipe)	0.19
f = friction head loss in psi of water per 100 feet of pipe (psi per 100 ft pipe)	0.08
Head loss (ft H20)	1.87
Head loss (psi)	0.80
Calculated Flow Velocity	
v = flow velocity (ft/s)	1.85

NOT SEWER

SCOTTSDALE FASHION SQUARE- LOT 2
FINAL SEWER BASIS OF DESIGN REPORT

Scottsdale, AZ

May 2019

Olsson Project No. 018-3159

PRELIMINARY OVERALL GRADING AND DRAINAGE PLAN FOR
CAESARS REPUBLIC SCOTTSDALE
SCOTTSDALE, ARIZONA 85251

PROJECT DATA:

PROJECT ADDRESS:
SOUTHEAST CORNER OF GOLDWATER BOULEVARD AND HIGHLAND AVENUE SCOTTSDALE, ARIZONA 85251

BENCH MARK: A STONE IN HAND HOLE AT THE INTERSECTION OF CAMELBACK RD. & MILLER RD., CITY OF SCOTTSDALE BENCHMARK #4234.

ELEVATION= 1259.43' (PER C.O.S. NAVD '88 DATUM)

GROSS LOT AREA: 311,172 SF OR 7.14 ACRES

REDEVELOPED LOT AREA: 306,703 SF 7.04 ACRES

APN: PARCEL 173-37-010

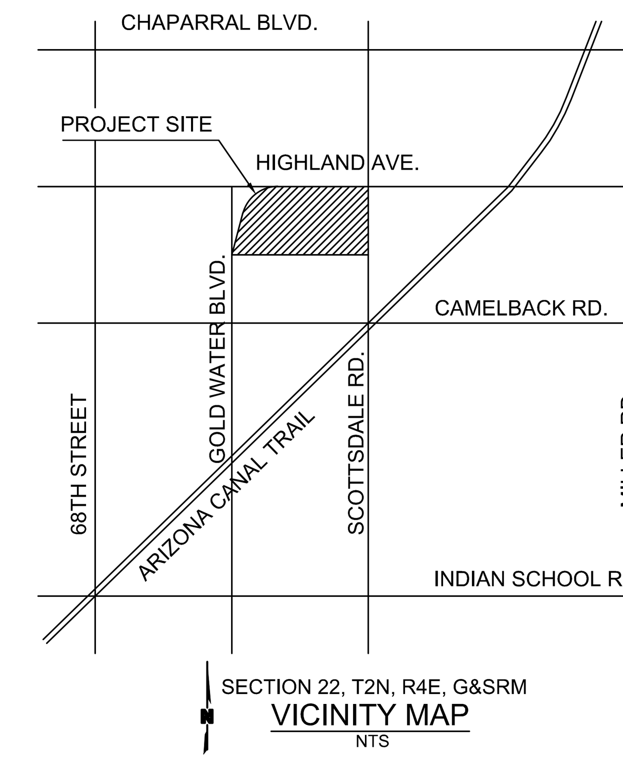
ZONING: D/DRU-2 PBD DO; 25-ZN2015 & 1-II-2016

SHEET INDEX

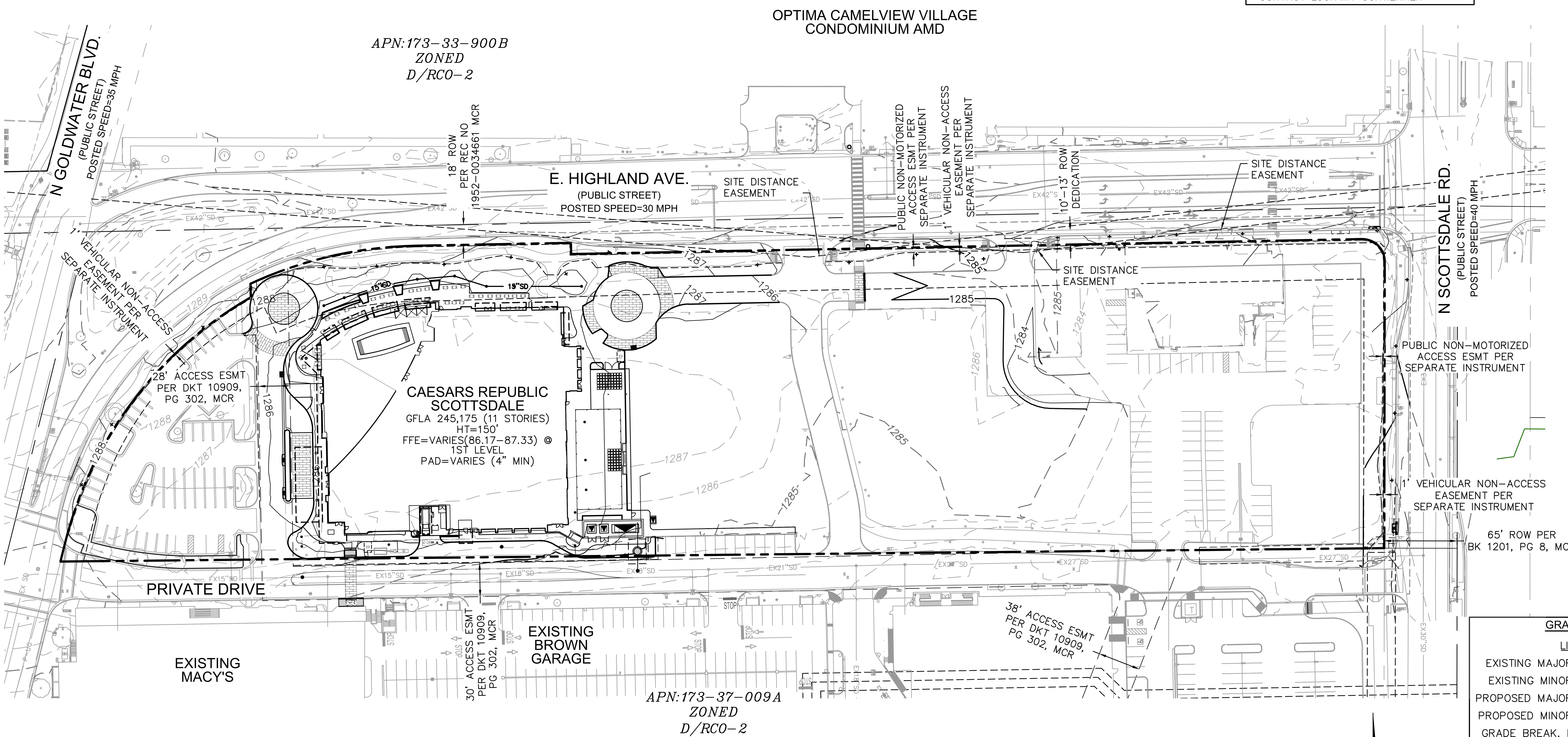
#	SHEET NAME	SHEET NO.
1	OVERALL GRADING PLAN	PC300
2	GRADING AND DRAINAGE PLAN	PC301
3	GRADING AND DRAINAGE PLAN	PC302
4	SITE CROSS SECTIONS	PC303
5	DETAILS	PC304

OWNER DEVELOPER
MACERICH
11411 NORTH TATUM BLVD
PHOENIX, AZ 85028
PHONE: (602)953-6539
FAX: (602)953-1964
ATTN: ANDY GREENWOOD

SITE ENGINEER/SURVEY/LAND ARCH
OLSSON
7250 N 16TH ST # 210
PHOENIX, AZ 85020
PHONE: (602)748-1000
FAX: (602)748-1001
CONTACT ENG: CARDELL ANDREWS
CONTACT SVY: GENE HARRISON
CONTACT LSC: AMY SCHWENNER



SECTION 22, T2N, R4E, G&SRM
VICINITY MAP
NTS



GRADING LEGEND

LINES TYPES

EXISTING MAJOR CONTOUR	1085
EXISTING MINOR CONTOUR	1086
PROPOSED MAJOR CONTOUR	1085
PROPOSED MINOR CONTOUR	1086
GRADE BREAK, RIDGE LINE, OR VALLEY/FLOW LINE	

ENGINEER PRELIMINARY GRADING NOTES:

1. ALL POINTS ARE TO FINISH PAVING GRADE ELEVATION UNLESS OTHERWISE NOTED. PAVING POINTS ON FACE OF CURB ARE AT GUTTER ELEVATION UNLESS NOTED OTHERWISE.
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3. REFER TO RECOMMENDATIONS WITHIN THE GEOTECHNICAL EXPLORATION REPORT BY SPEEDIE AND ASSOCIATES, TITLED "CROMWELL HOTEL", DATED NOVEMBER 21, 2018 PROJECT NUMBER 181975SA.

FLOOD INSURANCE RATE MAP (FIRM) INFORMATION:

COMMUNITY NUMBER	PANEL NUMBER	PANEL DATE	SUFFIX	DATE OF FIRM	FIRM ZONE	BASE FLOOD ELEVATION (IN AO ZONE, USE DEPTH)
04013C	1770	10/16/13	L	11/4/15	X	N/A

ZONE X AREAS OF 0.2% ANNUAL CHANCE FLOOD; AREAS OF 1% ANNUAL CHANCE FLOOD WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR WITH DRAINAGE AREAS LESS THAN 1 SQUARE MILE; AND AREAS PROTECTED BY LEVEES FROM 1% ANNUAL CHANCE FLOOD.

DWG: F:\2018\3001-3500\018-3159\40-Design\AutoCAD\Preliminary Plans\Sheets\GNCV\1-PC300 Overall GRADING PLAN_83159.dwg USER: thutchinswoss
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7250 North 16th Street, Suite 210
Phoenix, AZ 85020-5282
TEL 602.748.1000
FAX 602.748.1001
www.olsson.com

Registered Professional Engineer CERTIFICATE NO. 42633 ANDREA K. PAGE (Civil) ARIZONA U.S.A. Date Signed 8/22/19

ARIZONA 811 Arizona Blue Stake, Inc.
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Dial 8-1-1 or 1-800-STAKE-IT (782-5348)
In Maricopa County: (602) 263-1100

REV. NO.	DATE	REVISIONS DESCRIPTION

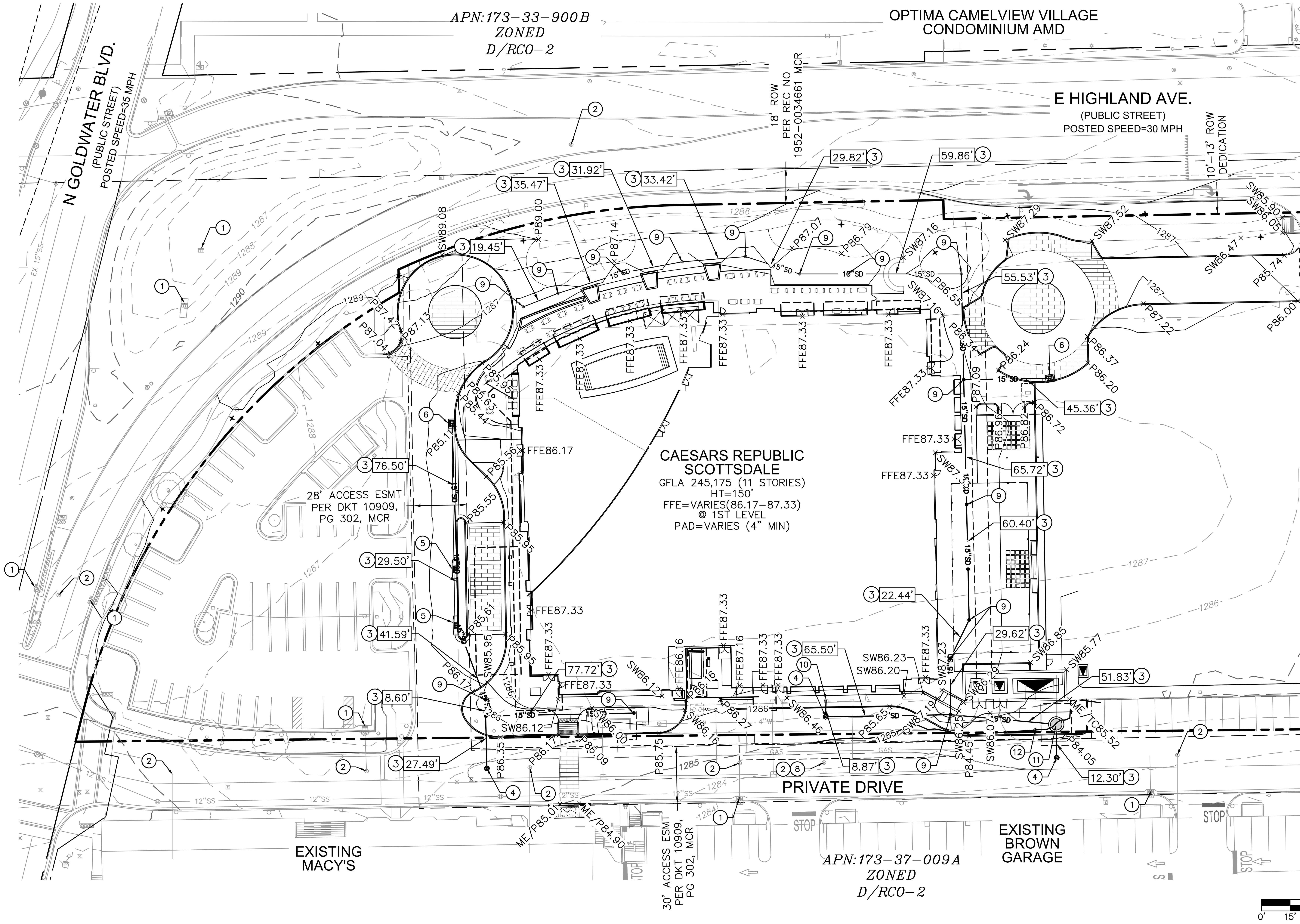
REVISIONS

DESIGN REVIEW BOARD
PRELIMINARY OVERALL GRADING AND DRAINAGE PLAN
CAESARS REPUBLIC SCOTTSDALE
SCOTTSDALE, AZ 85251
2019

drawn by: SS/THW
designed by: SJV
checked by: CAII
project no.: 018-3159
date: 08.20.2019

30-DR-2019
8/22/2019

PRELIMINARY GRADING AND DRAINAGE PLAN



DRAINAGE KEYNOTES

1. EXISTING STORM DRAIN CATCH BASIN
2. EXISTING STORM DRAIN MANHOLE
3. HDPE STORM PIPE ADS TYPE 'N12' OR EQUIVALENT.
4. 30" STORM DRAIN MANHOLE PER MAG STD DTL 520, MANHOLE TO READ "STORMWATER"
5. CURB INLET CATCH BASIN PER MAG STD DTL 534-1, TYPE 'E'
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8. CONNECT TO EXISTING STORM DRAIN MANHOLE
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10. CONTINUATION INTO BUILDING SEE MECHANICAL PLANS
11. CONTECH VORTSENTRY HS (OR EQUAL PRODUCT APPROVED BY DESIGN ENGINEER WITH CITY OF SCOTTSDALE'S CONCURRENCE), USED FOR HYDRODYNAMIC SEPARATION. CONTRACTOR TO COORDINATE WITH MANUFACTURER FOR FINAL SPECIFICATION, DETAIL(S) AND INSTALLATION PROCEDURES. SEE DETAIL J, SHEET PC304
12. VORTSENTRY HS SIGN, SEE DETAIL K, SHEET PC304

GRADING ABBREVIATIONS

MATCH EXISTING GRADE	ME=XX.XX
FINISHED GRADE GROUND	FG=XX.XX
FLOW LINE	FL=XX.XX
HIGH POINT	HP=XX.XX
LOW POINT	LP=XX.XX
GRADE BREAK	GB=XX.XX
TOP OF CURB	TC=XX.XX
TOP OF PAVEMENT	P=XX.XX
RIM ELEVATION	RIM=XX.XX
GRATE ELEVATION	GR=XX.XX
SIDEWALK GRADE	SW=XX.XX
FINISHED FLOOR ELEVATION	FFE=XX.XX
TOP RETAINING WALL	TRW=XX.XX
BOTTOM RETAINING WALL	BRW=XX.XX
TOP SCREEN WALL	TSW=XX.XX
BOTTOM SCREEN WALL	BSW=XX.XX
TOP SLAB	TS=XX.XX

GRADING LEGEND

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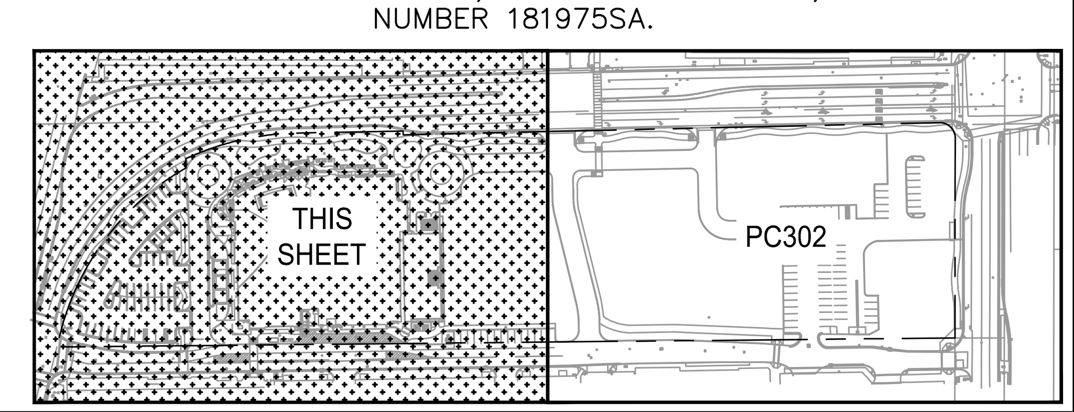

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TEL 602.748.1000
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www.olsson.com

Registered Professional Engineer, CERTIFICATE NO. 42633, ANDREA K. PAGE, ARIZONA, U.S.A., Date Signed 8/22/19

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PRELIMINARY GRADING AND DRAINAGE PLAN
CAESARS REPUBLIC SCOTTSDALE
SCOTTSDALE, AZ 85251
2019

drawn by:	SS/THW
designed by:	SJV
checked by:	CAII
project no.:	018-3159
date:	08.20.2019

PC301
2 of 5

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30-DR-2019
8/22/2019

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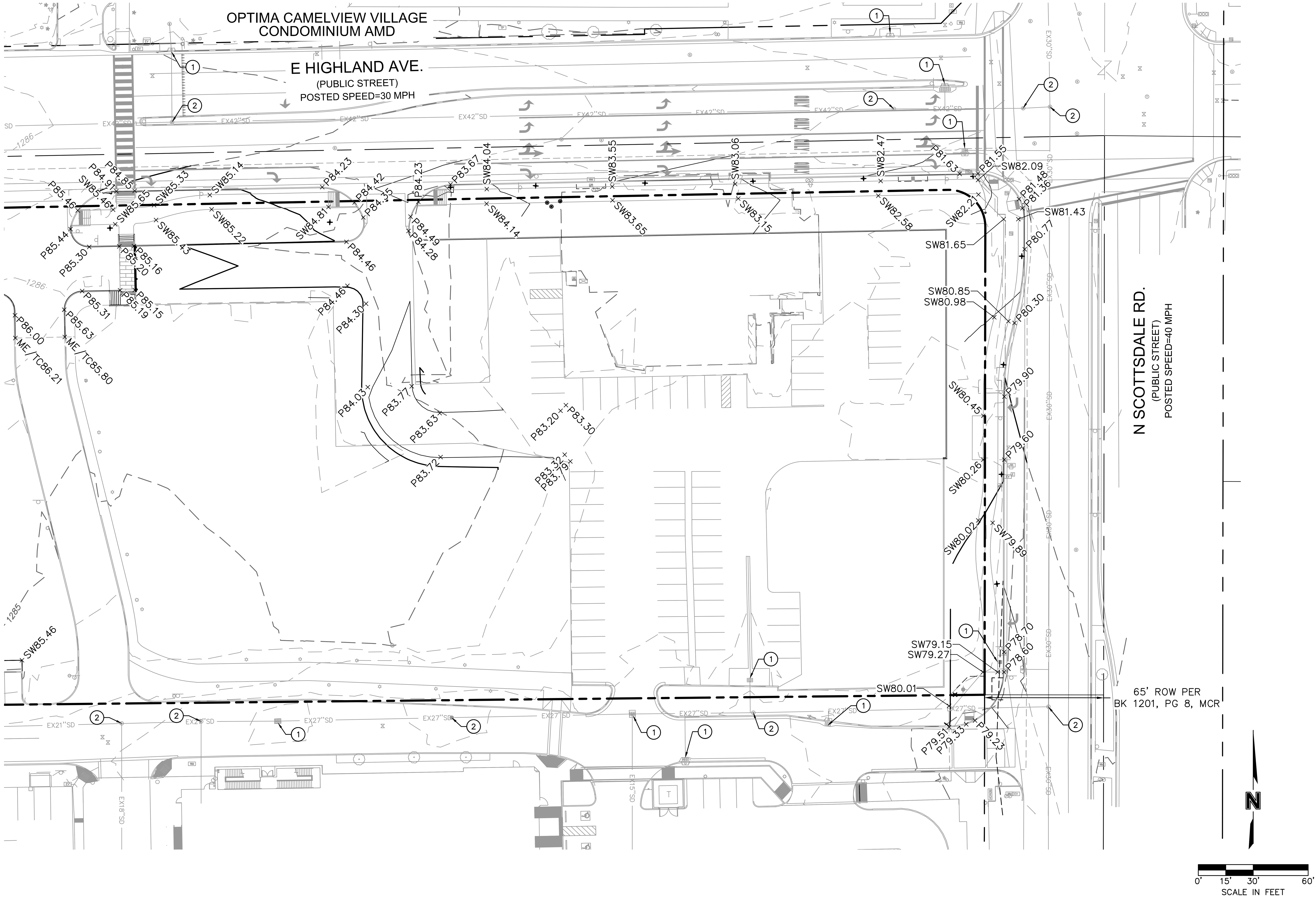

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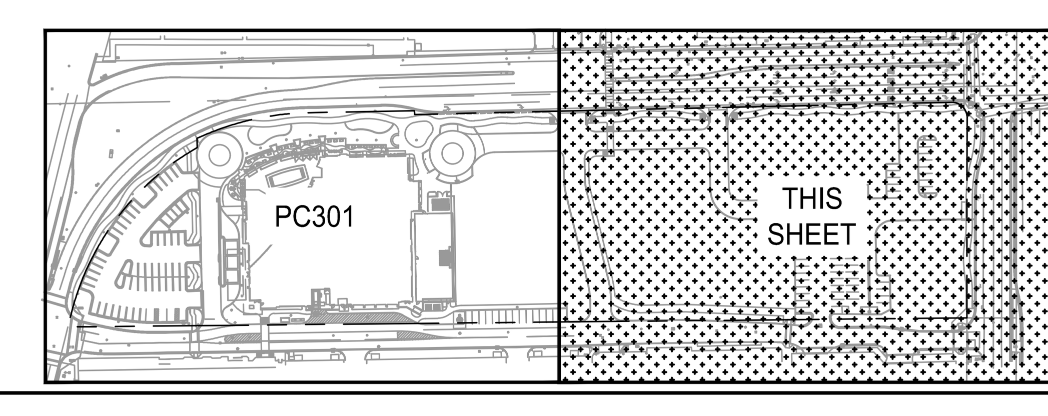

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Registered Professional Engineer (Civil) — CERTIFICATE NO. 42633 — ANDREA K. PAGE — ARIZONA, U.S.A.

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2019

drawn by:	SS/THW
designed by:	SJV
checked by:	CAII
project no.:	018-3159
date:	08.20.2019

PC302
3 of 5

30-DR-2019
8/22/2019

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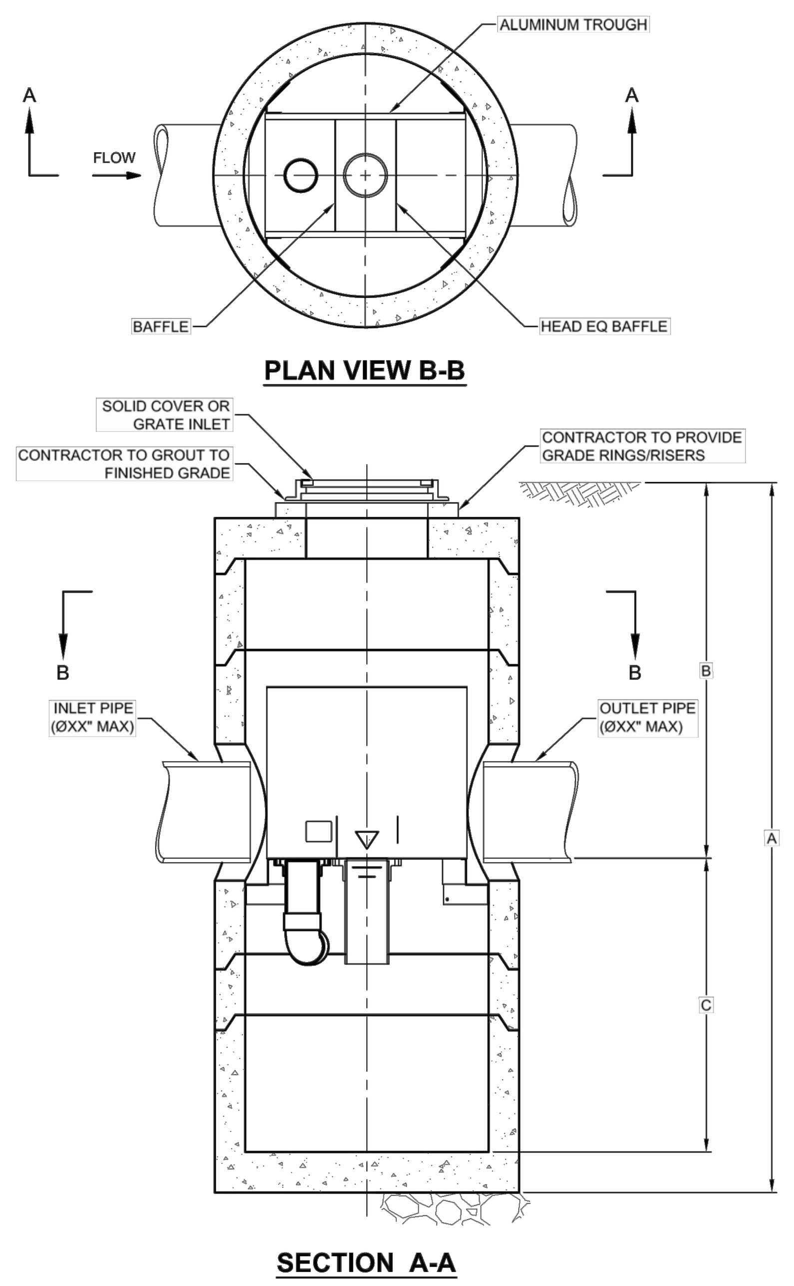


VortSentry

VORTSENTRY HS DESIGN NOTES

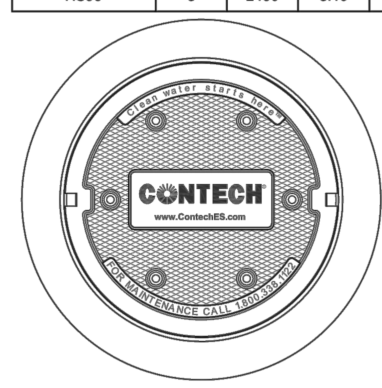
VSHS RATED TREATMENT CAPACITY IS SHOWN IN THE TABLE BELOW, OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY VARIES. CONTACT YOUR CONTECH REPRESENTATIVE FOR ADITIONAL INFORMATION.

THE STANDARD SOLID COVER CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW.

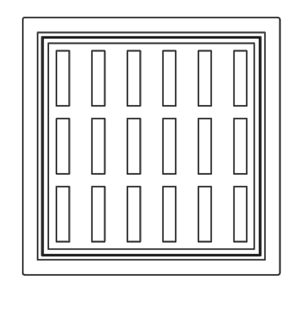
	CONFIGURATION OPTION DESCRIPTION
	GRATE INLET (NO INLET PIPE)
	GRATE INLET WITH INLET PIPE

VORTSENTRY HS GENERAL INFORMATION

Model	Manhole Diameter (ID)		Total Treatment Flow Rate		Typical Total Distance Rim to Outside Bottom A		Typical Distance Rim to Invert B		Typical Depth Below Invert (inside) C		Approximate Minimum Distance Rim to Invert		Maximum Pipe Diameter (ID)	
	FT	mm	CFS	L/S	FT	m	FT	m	FT	mm	FT	m	IN	mm
HS36	3	900	0.55	15.6	10.16	3.10	4.08	1.24	5.58	1702	3.00	0.91	18	450
HS48	4	1200	1.20	34.0	13.25	4.04	6.00	1.83	6.75	2057	4.00	1.22	24	600
HS60	5	1500	2.20	62.3	15.13	4.61	6.50	1.98	7.96	2426	4.82	1.47	30	750
HS72	6	1800	3.70	104.8	16.56	5.05	6.75	2.06	9.15	2788	5.59	1.70	36	900
HS84	7	2100	5.60	158.6	18.85	5.75	7.75	2.36	10.35	3156	5.00	1.52	42	1050
HS96	8	2400	8.10	229.4	20.87	6.36	8.50	2.59	11.54	3518	6.91	2.11	48	1200



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.



FRAME AND GRATE
(24" SQUARE)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS)			*
PEAK FLOW RATE (CFS)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*
NOTES/SPECIAL REQUIREMENTS:			

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
4. VORTSENTRY HS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET AASHTO M306 LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.

INSTALLATION NOTES
1. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
2. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE VORTSENTRY HS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
3. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
4. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
5. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

VORTSENTRY HS
STANDARD DETAIL

J HYDRODYNAMIC SEPARATOR
NO SCALE

CONTECH VORTSENTRY HS

STORMWATER POLLUTANT REMOVAL DEVICE. INSPECT DEVICE TWO TIMES PER YEAR.

DEVICE LOCATED 11 FEET WEST OF THIS SIGN.

36" X 36"

SIGN TO HAVE BLACK LETTERING
ON WHITE BACKGROUND

K VORTSENTRY HS SIGN
PER MUTCD NO SCALE

olsson
7250 North 16th Street, Suite 210
Phoenix, AZ 85020-5282
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DATE: Aug 21, 2019 3:29pm XREFS: C_PTBLK_0183159 AMY_SCHWENNER_LA_AZ

HCW CAESARS REPUBLIC
PRELIMINARY DRAINAGE REPORT

COS CASE NO. 962-PA-2018

Plan # 30-DR-2019
Case #
Q-S #
X Accepted
Corrections
A. Menez 09/09/2019
Reviewed By Date

Prepared For:

Macerich
Phoenix, Arizona

Registered Professional Engineer (Civil)
CERTIFICATE NO.
42633
ANDREA K.
PAGE
Date Signed 5/10/19
ARIZONA, U.S.A.
Andrea K. Page

May 2019

Olsson Project No. 018-3159

olsson

30-DR-2019
8/22/2019

TABLE OF CONTENTS

CITY OF SCOTTSDALE

Appendix 4-1C

WARNING & DISCLAIMER OF LIABILITY

The Drainage and Floodplain Regulations and Ordinances of the City of Scottsdale are intended to "minimize the occurrence of losses, hazards and conditions adversely affecting the public health, safety and general welfare which might result from flooding caused by the surface runoff of rainfall" (Scottsdale Revised Code §37-16).

As defined in S.R.C. §37-17, a flood plain or "*Special flood hazard* area means an area having flood and/or flood related erosion hazards as shown on a FHBM or FIRM as zone A, AO, A1-30, AE, A99, AH, or E, and those areas identified as such by the floodplain administrator, delineated in accordance with subsection 37-18(b) and adopted by the floodplain board." It is possible that a property could be inundated by greater frequency flood events or by a flood greater in magnitude than a 100-year flood. Additionally, much of the Scottsdale area is a dynamic flood area; that is, the floodplains may shift from one location to another, over time, due to natural processes.

WARNING AND DISCLAIMER OF LIABILITY PURSUANT TO S.R.C §37-22
"The degree of flood protection provided by the requirements in this article is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Floods larger than the base flood can and will occur on rare occasions. Floodwater heights may be increased by man-made or natural causes. This article (Chapter 37, Article II) shall not create liability on the part of the city, any officer or employee thereof, or the federal government for any flood damages that result from reliance on this article or any administrative decision lawfully made thereunder."

Compliance with Drainage and Floodplain Regulations and Ordinances does not insure complete protection from flooding. The Floodplain Regulations and Ordinances meet established local and federal standards for floodplain management, but neither this review nor the Regulations and Ordinances take into account such flood related problems as natural erosion, streambed meander or man-made obstructions and diversions, all of which may have an adverse affect in the event of a flood. You are advised to consult your own engineer or other expert regarding these considerations.

I have read and understand the above. If I am an agent for an owner I have made the owner aware of and explained this disclaimer.

26-DR-2017	[signature]	8/8/17	
Plan Check No.	Owner or Agent	Date	

30-DR-2019
8/22/2019

I. Introduction

A. Purpose of Report

The purpose of this preliminary drainage report is to provide hydrologic and hydraulic documentation for the proposed Scottsdale Fashion Square HCW Caesars Republic commercial site (Lot 2). More specifically, a design review of surface drainage, and offsite flows that impact the site. The project will be designed and developed in accordance with the City of Scottsdale and Maricopa County's current development standards and client requirements.

Per City of Scottsdale, Stormwater Management Division, Scottsdale Redevelopment Stormwater Storage Policy will apply to this site.

This Report and associated plans are on the NAVD 88 vertical datum and has a project benchmark as follows:

A stone in a hand hole at the intersection of Camelback Road & Miller Road, City of Scottsdale Benchmark #4234 NAVD 88 Elevation=1259.43'

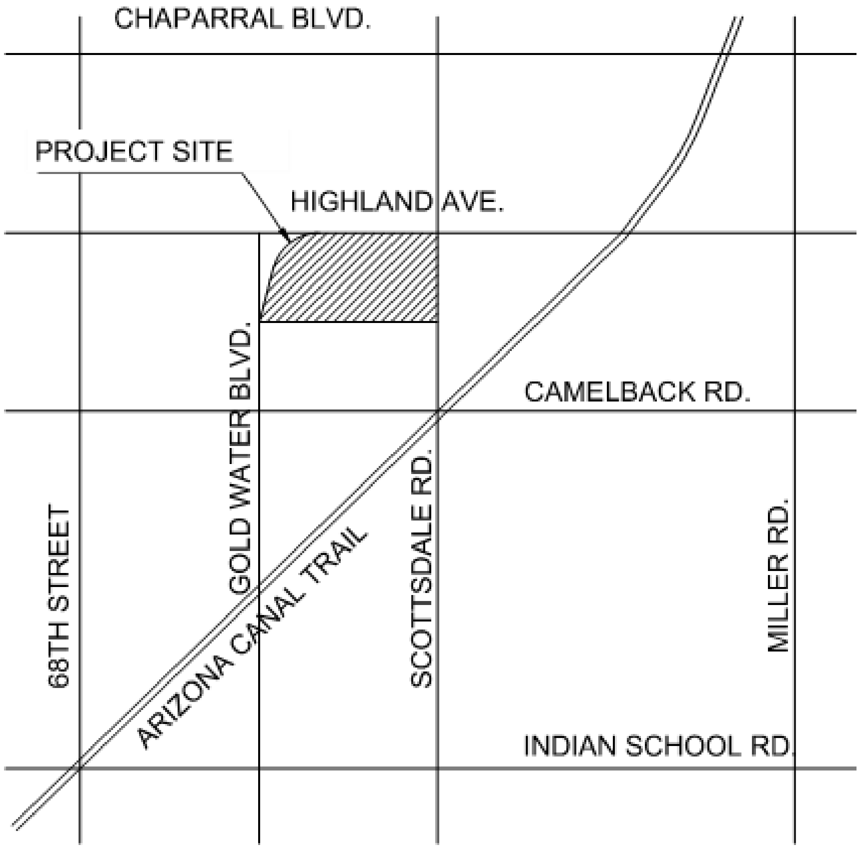

Figure 1. Location Map

B. Project Location and Description

The proposed Scottsdale Fashion Square Lot 2 Site (hereinafter referred to as the Project) consists of a commercial development with project zoning D/RCO-2 PBD DO covering approximately 7.04 acres. The Project is located within a portion of the Northeast Quarter of Section 22, Township 2 North, Range 4 East of the Gila and Salt River Meridian, Maricopa County, Arizona. More specifically, the project is located near the southeast corner of Highland Avenue and Goldwater Boulevard in Scottsdale Fashion Square (see Figure 1. Location Map above).

The project will consist of construction of a new resort style hotel along with on-site infrastructure improvements on the mall property and off-site improvements to Highland Avenue and Scottsdale Road. The off-site improvements will include adding a right-turn-lane to both Highland Avenue and Scottsdale Road as well as new meandering eight-foot-wide sidewalk. This Project is considered the first phase of improvements on Lot 2. Future construction phases on this lot will possibly include office and retail space, restaurants, parking structures and open space areas.

Table 1. Lot 2 Buildings Summary

Area ID	Use	Gross Building Floor Area (sf)	Building Cover (sf)
New Resort Hotel	Hotel	245,175	46,000

C. Existing Site Conditions

The existing ground slopes from the northwest to the southeast at a mild slope. **Figure 2** in **Appendix C** presents the existing topographic conditions for the Project. Highland Avenue and Scottsdale Road have been fully improved with catch basin inlets for stormwater runoff. The on-site portion of the project is a combination of empty undeveloped pads and surrounding private drive aisles serving the existing SFS mall buildings directly south of the project site.

D. FEMA Flood Insurance Rate Map

The project is entirely located within Zone "X" according to Flood Insurance Rate Map (FIRM) Panel 04013C1770L which is effective October 16, 2013 (REF 1). Zone X is defined as: "Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood." (Please refer to the Figure 1A, Flood Insurance Rate Map in Appendix A).

II. Offsite Drainage

A. References to all Drainage Planning Studies Associated with or near the Project

Major offsite watershed conditions have been detailed within the existing *Master Drainage Report* from Collar, Williams & White Engineering, and will not be modified by this project.

B. Existing Offsite Watershed

Highland Avenue borders the project on the west and north sides and Scottsdale Road runs along the east side. The public streets are fully improved with catch basin inlets, but this Project is proposing to add an additional right turn lane on a portion of Highland Avenue and along Scottsdale Road. Analysis of street capacity and inlet capacity will be presented in the final version of the drainage report. Runoff from the west portion of Highland Avenue is collected in existing inlets and connects to a storm system in Goldwater Boulevard, which then drains south via storm sewer to Camelback Road. The northern portion of Highland Avenue drains into inlets that connect into the Scottsdale Road storm drain system.

Based on the existing *Master Drainage Report* (REF 6) from Collar, Williams & White Engineering, date May 10, 1988 (**Appendix D**), the runoff collected from the site discharges into an existing 84-inch storm drain pipe in Camelback Road. This pipe connects to a 144-inch storm drain pipe which ultimately drains to Indian Bend Wash (See **Existing Conditions Drainage Map** in **Appendix B** for more details). The Project site has two outfalls in the southwest and southeast corners of the site onto Goldwater Boulevard and Camelback Road respectively and as it has been historically directed. The southwest outfall will not be affected by this project.

III. Onsite Drainage

A. Existing and Proposed Drainage Basin Boundaries

The existing site can be divided into two major drainage boundaries with distinct discharge locations. The first is denoted with a prefix of 'A' and contains a storm sewer system that collects runoff into a storm drain system that runs under the private road on the southern portion of the site flowing east. The storm sewer system discharges into the public storm system in Scottsdale Road (Location A) heading south. The rest of the site flows into Highland Avenue or Scottsdale Road, denoted with a prefix of 'B' and will ultimately end up in the storm system in Scottsdale Road (Location B1) or in the gutter at the southeast outfall (Location B2). **Table 2. Point Summary** shows the analysis of the existing and proposed areas heading to each location, as well as the difference to illustrate the effect of the project.

Table 2. Point Summary

Location ID	Point Description	Existing Q100(cfs)	Proposed Q100 (cfs)	Difference (cfs)
A	Onsite Connection to Storm Sewer	45.21	51.41	6.20+
B1	Offsite Connection to Storm Sewer	3.48	2.62	0.86-
B2	Southeast Site Outfall	3.48	2.62	0.86-

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B. Hydrology

Hydrology Analysis for this site included calculating runoff generation using the Rational Method for the existing and proposed conditions.

$Q = CiA$

The assumption made for calculated required retention are summarized below:

Q-Discharge (cubic ft per second)

C-Coefficient for Paved Streets, Parking Lots, Building Roof = 0.95
C-Coefficient for Lawns, Parks = 0.30
C-Coefficient for Desert Landscaping = 0.45

i-Intensity 10-yr (tc=5 min) (inches/hr) = 4.73 (inches)
i-Intensity 10-yr (tc=10 min) (inches/hr) = 3.59 (inches)
i-Intensity 10-yr (tc=15 min) (inches/hr) = 2.97 (inches)
i-Intensity 100-yr (tc=5 min) (inches/hr) = 7.48 (inches)
i-Intensity 100-yr (tc=10 min) (inches/hr) = 5.69 (inches)
i-Intensity 100-yr (tc=15 min) (inches/hr) = 4.70 (inches)

A-Drainage Area (acres)

Area breakdowns for the existing and proposed conditions are shown on the Drainage Maps in **Appendix C** and runoff calculations are shown in **Appendix B**. For this report a C coefficient of 0.95 was used for the entire existing and proposed site to calculated runoff.

As required by the City of Scottsdale this project will filter a substantial portion of the first flush runoff generated by the site per section 6.4 of Maricopa County Drainage Policies and Standards. This method for our site is shown in the section below. The runoff will pass through a pre-cast VortSentry HS or approved equivalent. A detail sheet and User Guide for the System can be found in **Appendix A**. The areas that will be treated are denoted on the drainage map as A06, A07 and A08 for a total of 1.54 acres.

<u>Maricopa County Rational Rainfall Method for "First Flush" Flowrate (Hydrodynamic Separator)</u>

$Q_{FF} = C\ I_{FF}\ A$ *(Assume ten-minute time of concentration for commercial site*
Where:

Q_{FF}*-First Flush Discharge rate (cubic ft per sec)*
C-Coefficient (See Above Assumptions)
I_{FF}*=First Flush Intensity*
Where: I_{FF}*=0.5 inches/Time of Concentration (in hours) or 0.5 in / 0.17 hours = 2.94 in/hr*
A-Drainage Area (acres)

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Q_{FF} = *0.95 * 2.94 in/hr * 1.54 acres =* ***4.30 cfs***

C. Stormwater Storage Requirements

This project will not provide additional stormwater storage. Instead the project will follow City of Scottsdale's Redevelopment Policies and treat the First Flush flowrate as shown in the previous section.

D. Hydraulics

Hydraulic design for this report included sizing the new onsite storm sewer system, sizing new inlets for onsite and offsite modifications, street capacity calculations for the modified public roads and sizing the stormwater treatment system. Calculations can be found in **Appendix B** and will only be provided in the final version of this report.

The on-site storm sewer systems and catch basins will be designed to capture the 10-year storm.

All offsite roads will be analyzed to verify that during the 10-year storm one 12-foot-wide drive lane will be dry each direction and the 100-year storm will not overtop an 8" depth.

E. Finished Floor Elevations

The proposed finish floor elevation for all phases of the project will be greater than 14" above the southeast site outfall. The southeast outfall for the site is at an elevation of 1278.55 located along Camelback Road in the southeast corner of the Project site. The minimum finished floor elevation for buildings on the lot will be set at 1279.72.

F. Project Phasing

The development of this entire lot will be completed in multiple phases. The first phase will include off-site improvements and the Hotel. The rest of the site will possibly be developed as retail and office space, restaurants, parking structures, and open landscaped areas. This report will act as an overall Preliminary Drainage Report for future phases as the project is built-out and addendums are added.

G. Storm System Maintenance

Ongoing maintenance of the designed drainage systems is required to preserve their design integrity. Poor maintenance can prevent the system from performing to its intended design purpose and can result in reduced performance. Maintenance is the responsibility of the property owner for facilities on private property. A regular maintenance program is required to ensure drainage systems perform to the level of protection or service as presented in this report and the project's plans and specifications

IV. Special Conditions

The Project will follow City of Scottsdale's Redevelopment Stormwater Storage Policy. There are no other special stipulations, 401 or 404 permits, or AZPDES applications expected with this project.

V. Conclusions

The following conclusions have been reached as a result of this drainage investigation, in support of the proposed Scottsdale Fashion HCW Caesars Republic Project:

- This drainage report was prepared in accordance with the recommendations and design parameters from the City of Scottsdale Design Standards & Policies Manual, Chapter 4 (REF 2), and MCFCD Drainage Design Manuals, Volume I and II (REF 4&5).

- The proposed Drainage plan maintains the existing drainage patterns and flows. The proposed drainage will continue to drain to the existing storm system as outlined in the Master Drainage Plan for Scottsdale Fashion Square approved August 18, 1986, revised May 10, 1988, by Collar, Williams & White Engineering (Appendix D).

- Per our discussion with the City of Scottsdale Stormwater Management Division, this project is required to meet City of Scottsdale Redevelopment Stormwater Storage Policy.

- The project is entirely located within Zone "X" according to FIRM Panel 04013C1770L. Zone X is defined as: "Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood." (Appendix A)

- A Storm Water General Permit has been obtained through ADEQ, and is listed as AZPDES Stormwater Construction General Permit (CGP) ID #: AZCN69125 (Appendix D).

- The manufacturers Operation, Design, Performance, and Maintenance Guidelines is provided in Appendix D.

VI. Warning and Disclaimer of Liability

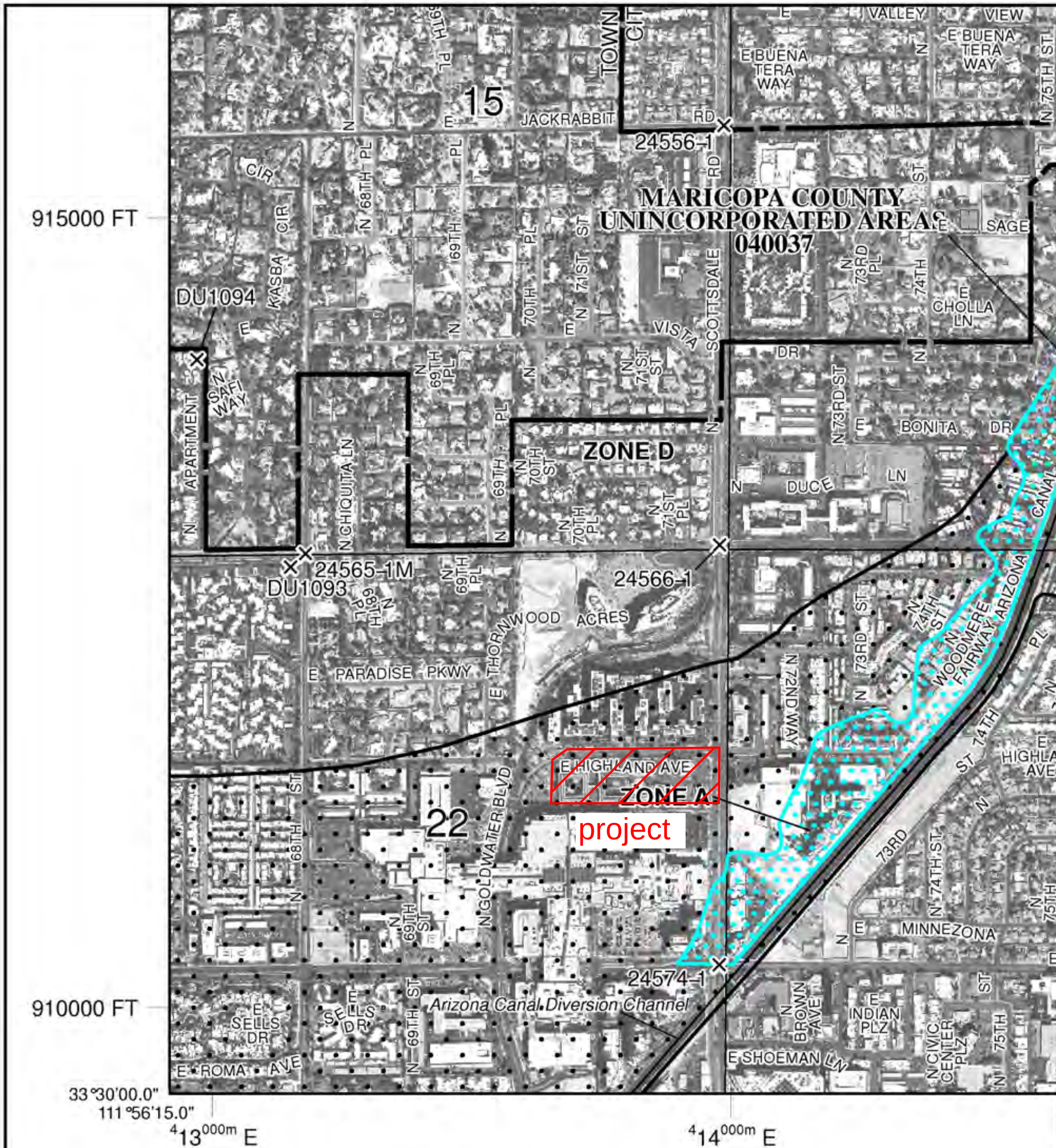
The Project will follow City of Scottsdale's Redevelopment Stormwater Storage Policy. There are no other special stipulations, 401 or 404 permits, or AZPDES applications expected with this project.

VII. References

1. Flood Insurance Rate Map, Maricopa County, Arizona, Map Number 04013C1770L, Federal Emergency Management Agency, Washington DC, October 16, 2013.
2. City of Scottsdale Design Standards & Policies Manual, Chapter 4, City of Scottsdale, AZ, January 2010.

3. MAG Uniform Standard Details for Public Works Construction, Maricopa Association of Governments, Phoenix, AZ, 2015 Revision.
4. Drainage Design Manual for Maricopa County, Arizona – Hydrology, 4th Edition, Flood Control District of Maricopa County, Phoenix, AZ, August 15, 2013.
5. Drainage Design Manual for Maricopa County, Arizona – Hydraulics, 3rd Edition, Flood Control District of Maricopa County, Phoenix, AZ, August 15, 2013.
6. Master Drainage Plan for Scottsdale Fashion Square, Collar, Williams & White Engineering, May 10, 1988.
7. Maricopa County (2016, June 1). Standard 6.4.1 First Flush. Drainage Policies and Standards for Maricopa County, Arizona

APPENDIX A - EXHIBITS



MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

METERS

NFIP

PANEL 1770L

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA

AND INCORPORATED AREAS

PANEL 1770 OF 4425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	1770	L
PARADISE VALLEY, TOWN OF	040049	1770	L
SCOTTSDALE, CITY OF	045012	1770	L

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
04013C1770L

MAP REVISED
OCTOBER 16, 2013

Federal Emergency Management Agency

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

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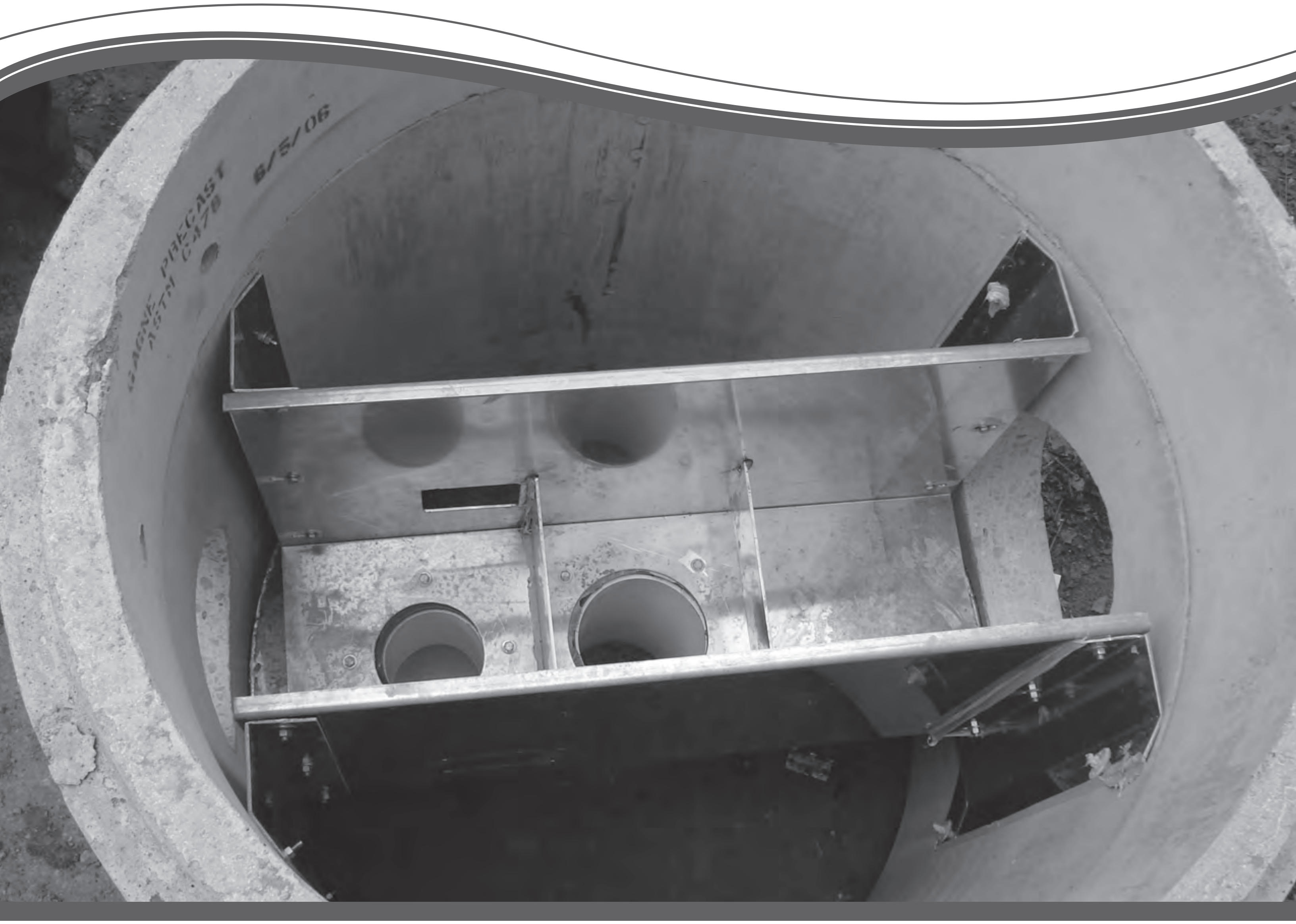
VortSentry® HS Guide
Operation, Design, Performance and Maintenance



CONTECH® ENGINEERED SOLUTIONS

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VortSentry® HS

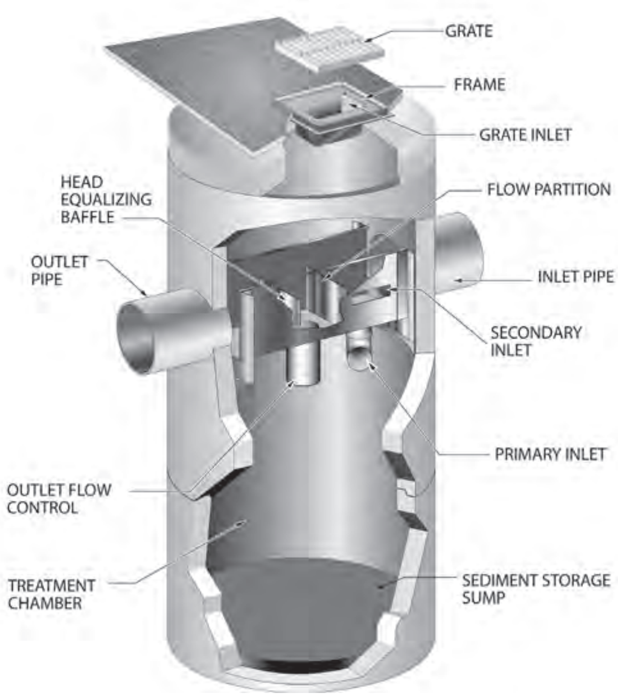
The VortSentry HS is a compact, below grade stormwater treatment system that employs helical flow technology to enhance gravitational separation of floating and settling pollutants from stormwater flows. With the ability to accept a wide range of pipe sizes, the VortSentry HS can treat and convey flows from small to large sites. A unique internal bypass design means higher flows can be diverted without the use of external bypass structures. The VortSentry HS is also available in a grate inlet configuration, which is ideal for retrofit installations.

Operation Overview

Low, frequently occurring storm flows are directed into the treatment chamber through the primary inlet. The tangentially oriented downward pipe induces a swirling motion in the treatment chamber that increases capture and containment abilities. Moderate storm flows are directed into the treatment chamber through the secondary inlet, which allows for capture of floating trash and debris. The secondary inlet also provides for treatment of higher flows without significantly increasing the velocity or turbulence in the treatment chamber. This allows for a more quiescent separation environment. Settleable solids and floating pollutants are captured and contained in the treatment chamber.

Flow exits the treatment chamber through the outlet flow control, which manages the amount of flow that is treated and helps maintain the helical flow patterns developed within the treatment chamber.

Flows exceeding the system's rated treatment flow are diverted away from the treatment chamber by the flow partition. Internal diversion of high flows eliminates the need for external bypass structures. During bypass, the head equalizing baffle applies head on the outlet flow control to limit the flow through the treatment chamber. This helps prevent re-suspension of previously captured pollutants.



Design Basics

There are two primary methods of sizing a VortSentry HS system. The Water Quality Flow Rate Method determines which model size provides the desired removal efficiency at a given flow for a defined particle size. The summation process of the Rational Rainfall Method is used when a specific removal efficiency of the net annual sediment load is required.

Typically, VortSentry HS systems are designed to achieve an 80% annual solids load reduction based on lab generated performance curves for a particle gradation with an average particle size (d_{50}) of 240-microns (μm).

Water Quality Flow Rate Method

In many cases, regulations require that a specific flow rate, often referred to as the water quality design flow (WQQ), be treated. This WQQ represents the peak flow rate from either an event with a specific recurrence interval (i.e. the six-month storm) or a water quality depth (i.e. 1/2-inch of rainfall).

The VortSentry HS is designed to treat all flows up to the WQQ. Due to its internal bypass weir configuration, flow rates in the treatment chamber only increase minimally once the WQQ is surpassed. At influent rates higher than the WQQ, the flow partition will allow most flow exceeding the treatment flow rate to bypass the treatment chamber. This allows removal efficiency to remain relatively constant in the treatment chamber and reduces the risk of washout during bypass flows regardless of influent flow rates.

Treatment flow rates are defined as the rate at which the VortSentry HS will remove a specific gradation of sediment at a specific removal efficiency. Therefore they are variable based on the gradation and removal efficiency specified by the design engineer and the unit size is scaled according to the project goal.

Rational Rainfall Method™

Differences in local climate, topography and scale make every site hydraulically unique. The Rational Rainfall Method is a sizing program Contech uses to estimate a net annual sediment load reduction for a particular VortSentry HS model based on site size, site runoff coefficient, regional rainfall intensity distribution, and anticipated pollutant characteristics. For more information on the Rational Rainfall Method, see *Vortechs Technical Bulletin 4: Modeling Long Term Load Reduction: The Rational Rainfall Method*, available at **www.ContechES.com/stormwater**

Treatment Flow Rate

The outlet flow control is sized to allow the WQQ to pass entirely through the treatment chamber at a water surface elevation equal to the crest of the flow partition. The head equalizing baffle applies head on the outlet flow control to limit the flow through the treatment chamber when bypass occurs, thus helping to prevent re-suspension or re-entrainment of previously captured particles.

Hydraulic Capacity

The VortSentry HS is available in three standard configurations: inline (with inlet and outlet pipes at 180º to each other), grated inlet, and a combination of grate and pipe inlets. All three configurations are available in 36-inch (900-mm) through 96-inch (2400-mm) diameter manholes.

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The configuration of the system is determined by the suffix of the model name:

- A model name without a suffix denotes a standard pipe inlet (Example HS48).
- A "G" at the end of the model designation denotes a grate inlet (Example HS48G).
- A "GP" at the end of the model designation denotes a combination of grate and pipe inlets (Example HS48GP).

Performance

Full-Scale Laboratory Test Results

Laboratory testing of the VortSentry HS was conducted using F-55 Silica, a commercially available sand product with an average particle size of 240-μm (Table 1). This material was metered into a model HS48 VortSentry HS at an average concentration of between 250-mg/L and 300-mg/L at flow rates ranging from 0.50-cfs to 1.5-cfs (14-L/s to 56-L/s).

US Standard Sieve Size	Particle Size Micron (μm)	Cumulative Passing %
30	600	99.7%
40	425	95.7%
50	300	74.7%
70	212	33.7%
100	150	6.7%
140	106	0.7%

Table 1 : US Silica F-55 Particle Size Distribution

Removal efficiencies at each flow rate were calculated based on net sediment loads passing the influent and effluent sampling points. Results are illustrated in Figure 1.

Assuming that sediment in the inlet chamber is ideally mixed, removal rates through the system will decay according to the percentage of flow bypassed. This effect has been observed in the laboratory where the test system is designed to produce a

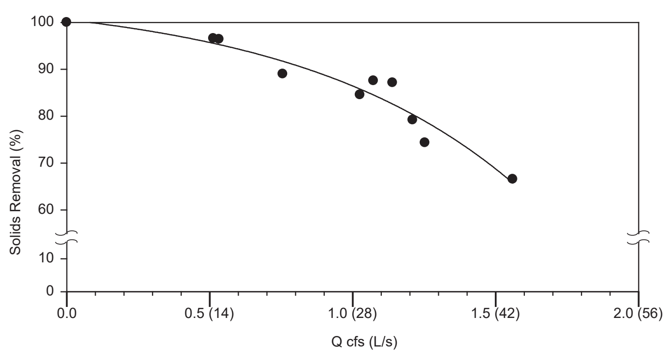

Figure 1: VortSentry HS Removal Efficiencies for 240-μm Particle Gradation

thoroughly mixed inlet stream. All VortSentry HS models have the same aspect ratio regardless of system diameter (i.e. an increase in diameter results in a corresponding increase in depth). Operating rates are expressed volumetrically.

Removal efficiency at each operating rate is calculated according to the average of volumetric and Froude scaling methods and is described by Equation 1.

$$\text{Equation 1:} \quad \left(\frac{\text{Diameter Prototype}}{\text{Diameter Model}}\right)^{2.75} = \left(\frac{\text{Flow Rate Prototype}}{\text{Flow Rate Model}}\right)$$

Equation 1 and actual laboratory test results were used to determine the flow rate which would be required for the various VortSentry HS models to remove 80% of solids.

View report at **www.ContechES.com/stormwater**

Maintenance

The VortSentry HS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit, i.e., unstable soils or heavy winter sanding will cause the treatment chamber to fill more quickly, but regular sweeping will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant deposition and transport may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (i.e. spring and fall) however more frequent inspections may be necessary in equipment washdown areas and in climates where winter sanding operations may lead to rapid accumulations of a large volume of sediment. It is useful and often required as part of a permit to keep a record of each inspection. A simple inspection and maintenance log form for doing so is available for download at **www.ContechES.com/stormwater**

The VortSentry HS should be cleaned when the sediment has accumulated to a depth of two feet in the treatment chamber. This determination can be made by taking two measurements with a stadia rod or similar measuring device; one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the distance given in Table 2, the VortSentry HS should be maintained to ensure effective treatment.

Cleaning

Cleaning of the VortSentry HS should be done during dry weather conditions when no flow is entering the system. Cleanout of the VortSentry HS with a vacuum truck is generally the most effective and convenient method of excavating pollutants from the system. Simply remove the manhole cover and insert the vacuum hose into the sump. All pollutants can be removed from this one access point from the surface with no requirements for Confined Space Entry.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use adsorbent pads, which solidify the oils. These are usually much easier to remove from the unit individually, and less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Floating trash can be netted out if you wish to separate it from the other pollutants.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure proper safety precautions. If anyone physically enters the unit, Confined Space Entry procedures need to be followed.

Disposal of all material removed from the VortSentry HS should be done is accordance with local regulations. In many locations, disposal of evacuated sediments may be handled in the same manner as disposal of sediments removed from catch basins or deep sump manholes. Check your local regulations for specific requirements on disposal.

VortSentry HS Model	Diameter		Distance Between Water Surface and Top of Storage Sump		Sediment Storage		Oil Spill Storage	
	in.	m	ft.	m	yd^3	m^3	gal.	liter
HS36	36	0.9	3.6	1.1	0.5	0.4	83	314
HS48	48	1.2	4.7	1.4	0.9	0.7	158	598
HS60	60	1.5	6.0	1.8	1.5	1.1	258	978
HS72	72	1.8	7.1	2.2	2.1	1.6	372	1409
HS84	84	2.1	8.4	2.6	2.9	2.2	649	2458
HS96	96	2.4	9.5	2.9	3.7	2.8	845	3199

Note: To avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile. Finer, silty particles at the top of the pile may be more difficult to feel with the measuring stick. These finer particles typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile.

Table 2: VortSentry HS Maintenance Indicators and Sediment Storage Capacities.

Logon to **www.ContechES.com/stormwater** to download the VortSentry HS Inspection and Maintenance Log.

For assistance with maintaining your VortSentry HS, contact us regarding the Contech Maintenance compliance certification program.

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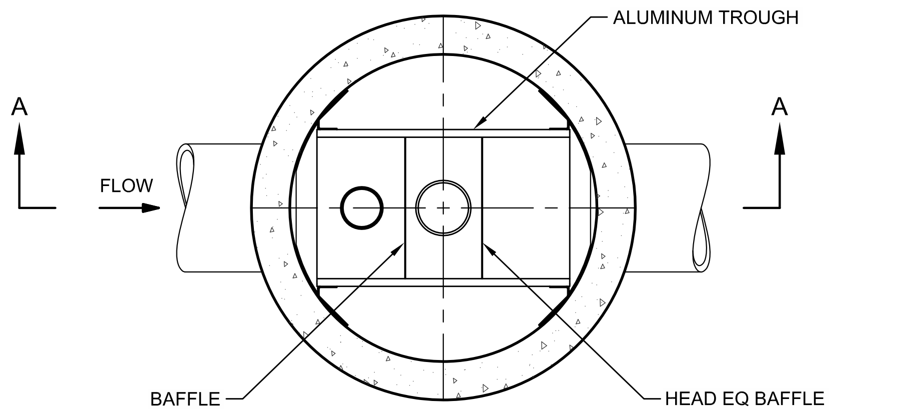
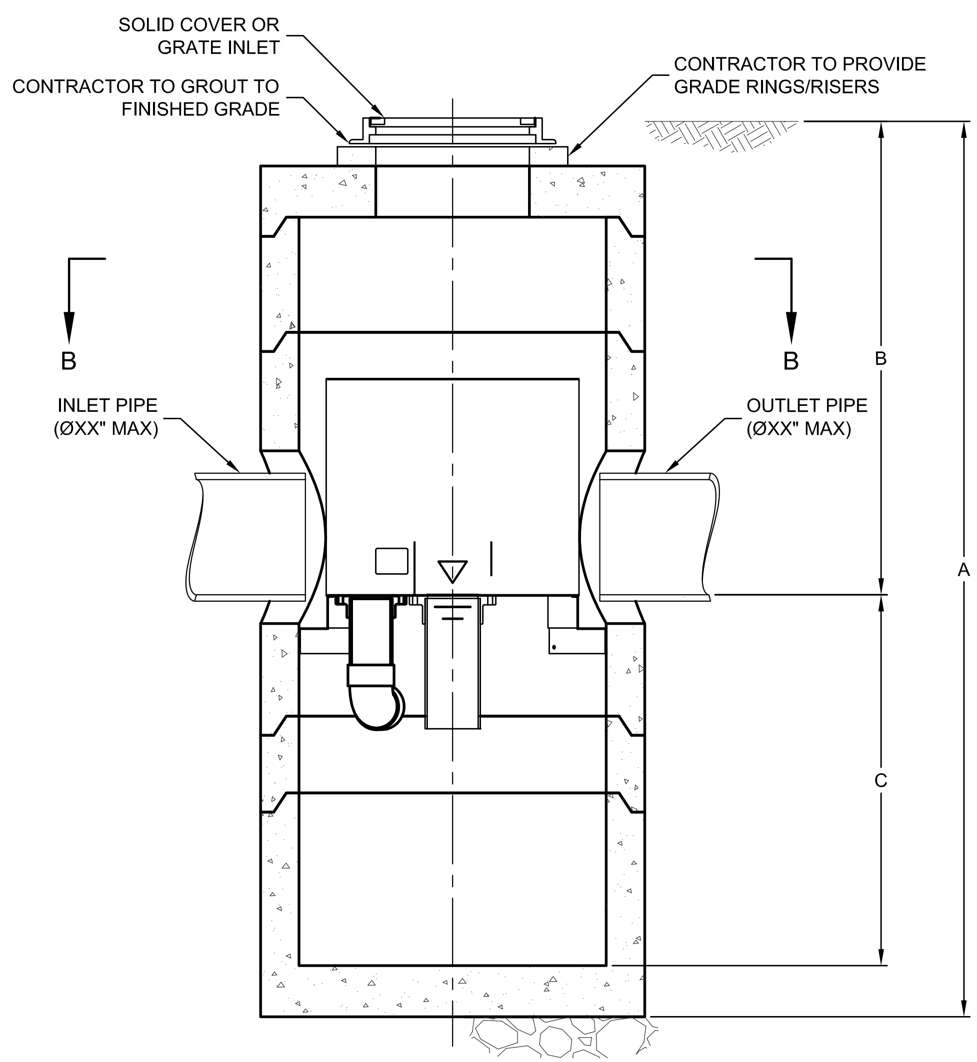
The product(s) described may be protected by one or more of the following US patents: 5,322,629; 5,624,576; 5,707,527; 5,759,415; 5,788,848; 5,985,157; 6,027,639; 6,350,374; 6,406,218; 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; 7,296,692; 7,297,266; related foreign patents or other patents pending.

Support

- Drawings and specifications are available at contechstormwater.com.
- Site-specific design support is available from our engineers.



PLAN VIEW B-B



SECTION A-A

VortSentry®

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 6,991,114; 7,296,692; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

VORTSENTRY HS DESIGN NOTES

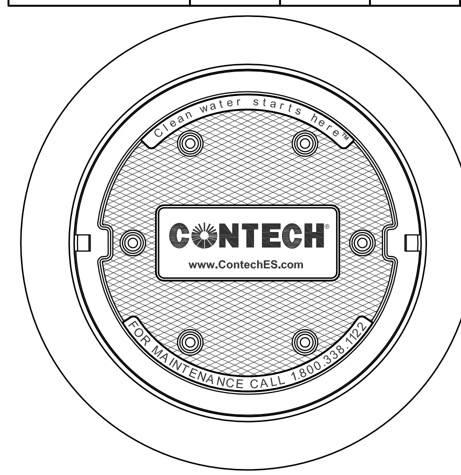
VSHS RATED TREATMENT CAPACITY IS SHOWN IN THE TABLE BELOW, OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY VARIES. CONTACT YOUR CONTECH REPRESENTATIVE FOR ADITIONAL INFORMATION.

THE STANDARD SOLID COVER CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW.

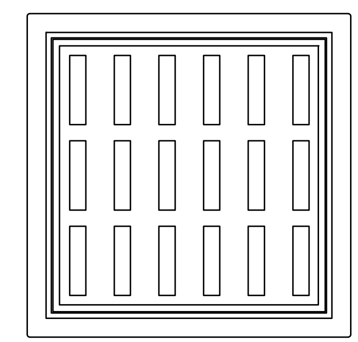
	CONFIGURATION OPTION DESCRIPTION
	GRATE INLET (NO INLET PIPE)
	GRATE INLET WITH INLET PIPE

VORTSENTRY HS GENERAL INFORMATION

Model	Manhole Diameter (ID)		Total Treatment Flow Rate		Typical Total Distance Rim to Outside Bottom A		Typical Distance Rim to Invert B		Typical Depth Below Invert (inside) C		Approximate Minimum Distance Rim to Invert		Maximum Pipe Diameter (ID)	
	FT	mm	CFS	L/S	FT	m	FT	m	FT	mm	FT	m	IN	mm
HS36	3	900	0.55	15.6	10.16	3.10	4.08	1.24	5.58	1702	3.00	0.91	18	450
HS48	4	1200	1.20	34.0	13.25	4.04	6.00	1.83	6.75	2057	4.00	1.22	24	600
HS60	5	1500	2.20	62.3	15.13	4.61	6.50	1.98	7.96	2426	4.82	1.47	30	750
HS72	6	1800	3.70	104.8	16.56	5.05	6.75	2.06	9.15	2788	5.59	1.70	36	900
HS84	7	2100	5.60	158.6	18.85	5.75	7.75	2.36	10.35	3156	5.00	1.52	42	1050
HS96	8	2400	8.10	229.4	20.87	6.36	8.50	2.59	11.54	3518	6.91	2.11	48	1200



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.



FRAME AND GRATE
(24" SQUARE)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS)	*		
PEAK FLOW RATE (CFS)	*		
RETURN PERIOD OF PEAK FLOW (YRS)	*		
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION	*		
ANTI-FLOTATION BALLAST	WIDTH	HEIGHT	
	*	*	

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
4. VORTSENTRY HS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET AASHTO M306 LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.

INSTALLATION NOTES

1. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
2. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE VORTSENTRY HS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
3. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
4. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
5. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

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9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
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VORTSENTRY HS
STANDARD DETAIL

30-DR-2019
8/22/2019

I:\STORMWATER\COMMOPS\26 VORTSENTRY HS\40 STANDARD DRAWINGS\DWG\VSHS-DTL.DWG 5/16/2014 4:31 PM

APPENDIX B – CALCULATIONS

SCOTTSDALE FASHION SQUARE- HCW CAESARS REPUBLIC

Existing Runoff To Q=ACi

Assume tc=5 min

Drainage Area ID	Area A (ac)	Weighted C	10-YR Intensity i (in/hr)	100-YR Intensity i (in/hr)	10-YR Runoff Q-10 (cfs)	100-YR Runoff Q-100 (cfs)	Capture Q-100 (cfs)	By-pass Q-100 (cfs)
A01	0.93	0.95	4.73	7.48	4.19	6.63		
EX CB-A1					4.19	6.63	5.00	1.63
A02	0.49	0.95	4.73	7.48	2.19	3.46		
A03	0.27	0.95	4.73	7.48	1.20	1.90		
EX CB-A2					3.39	5.36	5.00	0.36
A04	0.80	0.95	4.73	7.48	3.60	5.69		
A05	0.31	0.95	4.73	7.48	1.41	2.23		
EX CB-A3					5.01	7.93	5.00	2.93
A06	0.72	0.95	4.73	7.48	3.22	5.09		
A07	0.67	0.95	4.73	7.48	3.00	4.74		
A08	0.46	0.95	4.73	7.48	2.04	3.23		
EX CB-A4					8.26	13.06	5.00	8.06
A09	0.39	0.95	4.73	7.48	1.76	2.78		
A10	0.10	0.95	4.73	7.48	0.43	0.69		
EX CB-A5					2.19	3.47	5.00	-1.53
A11	0.72	0.95	4.73	7.48	3.23	5.11		
EX CB-A6					3.23	5.11	5.00	0.11
A12	0.06	0.95	4.73	7.48	0.25	0.40		
EX CB-A7					0.25	0.40	5.00	-4.60
A13	0.26	0.95	4.73	7.48	1.16	1.83		
A14	0.10	0.95	4.73	7.48	0.44	0.69		
EX CB-A8					1.60	2.52	5.00	-2.48
A15	0.10	0.95	4.73	7.48	0.46	0.72		
EX CB-A9					0.46	0.72	5.00	-4.28
TOTAL=	6.36				28.59	45.21		
B01	1.01	0.95	4.73	7.48	4.52	7.14		
B02	0.92	0.95	4.73	7.48	4.15	6.57		
EX CB-B1					8.67	13.71	5.00	8.71
B03	0.24	0.95	4.73	7.48	1.09	1.72		
B04	0.45	0.95	4.73	7.48	2.01	3.18		
B05	0.44	0.95	4.73	7.48	1.99	3.14		
B06	0.23	0.95	4.73	7.48	1.03	1.63		
B07	0.19	0.95	4.73	7.48	0.86	1.36		
EX CB-B2					6.97	11.03	5.00	6.03

SCOTTSDALE FASHION SQUARE- HCW CAESARS REPUBLIC

Proposed Runoff Tot Q=ACi

Assume tc=5 min

Drainage Area ID	Area A (ac)	Weighted C	10-YR Intensity i (in/hr)	100-YR Intensity i (in/hr)	10-YR Runoff Q-10 (cfs)	100-YR Runoff Q-100 (cfs)	Capture Q-100 (cfs)	By-pass Q-100 (cfs)
A01	0.44	0.95	4.73	7.48	1.99	3.14		
EX CB-A1					1.99	3.14	5.00	-1.86
A02	0.40	0.95	4.73	7.48	1.79	2.84		
CB-A1					1.79	2.84	5.00	-2.16
A03	0.14	0.95	4.73	7.48	0.61	0.97		
CB-A2					0.61	0.97	5.00	-4.03
A04	0.06	0.95	4.73	7.48	0.28	0.44		
DB-0X					0.28	0.44	5.00	-4.56
A05	0.24	0.95	4.73	7.48	1.09	1.72		
EX CB-A2					1.09	1.72	5.00	-3.28
A06	0.98	0.95	4.73	7.48	4.42	6.99		
ROOF DRAIN					4.42	6.99	5.00	1.99
A07	0.37	0.95	4.73	7.48	1.65	2.61		
DB-0X					1.65	2.61	5.00	-2.39
A08	0.19	0.95	4.73	7.48	0.84	1.34		
CB-A4					0.84	1.34	5.00	-3.66
A09	0.36	0.95	4.73	7.48	1.60	2.53		
EX CB-A3					1.60	2.53	5.00	-2.47
A10	0.90	0.95	4.73	7.48	4.03	6.37		
A11	0.75	0.95	4.73	7.48	3.38	5.35		
A12	0.44	0.95	4.73	7.48	1.99	3.15		
EX CB-A4					9.40	14.86	5.00	9.86
A13	0.36	0.95	4.73	7.48	1.62	2.57		
A14	0.10	0.95	4.73	7.48	0.43	0.69		
EX CB-A5					2.06	3.25	5.00	-1.75
A15	0.37	0.95	4.73	7.48	1.64	2.60		
A16	0.29	0.95	4.73	7.48	1.32	2.09		
A17	0.33	0.95	4.73	7.48	1.49	2.36		
EX CB-A6					4.46	7.06	5.00	2.06
A18	0.06	0.95	4.73	7.48	0.25	0.40		
EX CB-A7					0.25	0.40	5.00	-4.60
A19	0.26	0.95	4.73	7.48	1.16	1.83		
A20	0.10	0.95	4.73	7.48	0.44	0.69		
EX CB-A8					1.60	2.52	5.00	-2.48
A21	0.10	0.95	4.73	7.48	0.46	0.72		
EX CB-A9					0.46	0.72	5.00	-4.28
TOTAL=	7.23				32.51	51.41		
B01	1.15	0.95	4.73	7.48	5.18	8.19		
EX CB-B1					5.18	8.19	5.00	3.19
B02	0.58	0.95	4.73	7.48	2.62	4.15		
B03	0.46	0.95	4.73	7.48	2.07	3.27		
B04	0.23	0.95	4.73	7.48	1.03	1.63		
B05	0.19	0.95	4.73	7.48	0.86	1.35		

EX CB-B2					6.58	10.40	5.00	5.40
	2.62							

NOAA Atlas 14, Volume 1, Version 5
Location name: Scottsdale, Arizona, USA*
Latitude: 33.5043°, Longitude: -111.9314°
Elevation: 1290.29 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	2.21 (1.86–2.70)	2.89 (2.44–3.53)	3.94 (3.28–4.78)	4.73 (3.92–5.71)	5.81 (4.74–6.98)	6.64 (5.35–7.94)	7.48 (5.92–8.93)	8.35 (6.49–9.95)	9.50 (7.20–11.4)	10.4 (7.70–12.4)
10-min	1.69 (1.41–2.05)	2.20 (1.85–2.69)	2.99 (2.50–3.63)	3.59 (2.99–4.35)	4.42 (3.61–5.31)	5.05 (4.07–6.04)	5.69 (4.51–6.80)	6.35 (4.94–7.57)	7.23 (5.48–8.63)	7.90 (5.87–9.46)
15-min	1.39 (1.17–1.70)	1.82 (1.53–2.22)	2.47 (2.06–3.00)	2.97 (2.47–3.59)	3.65 (2.98–4.39)	4.17 (3.36–4.99)	4.70 (3.72–5.62)	5.25 (4.08–6.26)	5.98 (4.53–7.14)	6.53 (4.85–7.81)
30-min	0.936 (0.786–1.14)	1.22 (1.03–1.49)	1.66 (1.39–2.02)	2.00 (1.66–2.42)	2.46 (2.01–2.96)	2.81 (2.26–3.36)	3.17 (2.51–3.78)	3.53 (2.75–4.21)	4.02 (3.05–4.81)	4.40 (3.26–5.26)
60-min	0.579 (0.486–0.707)	0.757 (0.638–0.925)	1.03 (0.860–1.25)	1.24 (1.03–1.50)	1.52 (1.24–1.83)	1.74 (1.40–2.08)	1.96 (1.55–2.34)	2.19 (1.70–2.61)	2.49 (1.89–2.97)	2.72 (2.02–3.26)
2-hr	0.336 (0.286–0.402)	0.436 (0.370–0.522)	0.582 (0.494–0.694)	0.694 (0.582–0.826)	0.848 (0.704–1.00)	0.966 (0.790–1.14)	1.09 (0.876–1.28)	1.21 (0.957–1.42)	1.38 (1.06–1.62)	1.50 (1.14–1.78)
3-hr	0.244 (0.207–0.295)	0.313 (0.267–0.380)	0.412 (0.348–0.496)	0.490 (0.410–0.587)	0.599 (0.494–0.713)	0.685 (0.558–0.814)	0.776 (0.620–0.921)	0.871 (0.684–1.03)	1.00 (0.763–1.19)	1.11 (0.823–1.32)
6-hr	0.148 (0.128–0.174)	0.187 (0.162–0.220)	0.240 (0.207–0.281)	0.282 (0.241–0.329)	0.339 (0.286–0.394)	0.384 (0.319–0.445)	0.431 (0.352–0.498)	0.478 (0.384–0.555)	0.543 (0.425–0.631)	0.595 (0.455–0.693)
12-hr	0.082 (0.072–0.095)	0.104 (0.090–0.121)	0.131 (0.114–0.152)	0.153 (0.132–0.177)	0.182 (0.156–0.210)	0.205 (0.173–0.236)	0.228 (0.189–0.263)	0.251 (0.206–0.290)	0.283 (0.226–0.328)	0.307 (0.241–0.359)
24-hr	0.049 (0.044–0.056)	0.063 (0.055–0.071)	0.081 (0.072–0.092)	0.096 (0.084–0.109)	0.116 (0.102–0.131)	0.132 (0.115–0.149)	0.149 (0.129–0.168)	0.166 (0.142–0.188)	0.190 (0.161–0.215)	0.209 (0.175–0.237)
2-day	0.027 (0.024–0.030)	0.034 (0.030–0.039)	0.045 (0.040–0.050)	0.053 (0.047–0.060)	0.065 (0.057–0.073)	0.074 (0.065–0.084)	0.084 (0.073–0.095)	0.095 (0.082–0.107)	0.109 (0.093–0.124)	0.121 (0.102–0.138)
3-day	0.019 (0.017–0.021)	0.024 (0.021–0.027)	0.032 (0.028–0.036)	0.038 (0.033–0.043)	0.046 (0.041–0.052)	0.053 (0.046–0.060)	0.061 (0.052–0.068)	0.068 (0.059–0.077)	0.079 (0.067–0.090)	0.088 (0.074–0.100)
4-day	0.015 (0.013–0.017)	0.019 (0.017–0.022)	0.025 (0.022–0.028)	0.030 (0.026–0.034)	0.037 (0.032–0.042)	0.043 (0.037–0.048)	0.049 (0.042–0.055)	0.055 (0.047–0.062)	0.064 (0.054–0.072)	0.071 (0.060–0.081)
7-day	0.009 (0.008–0.011)	0.012 (0.011–0.014)	0.016 (0.014–0.018)	0.019 (0.017–0.022)	0.024 (0.021–0.027)	0.027 (0.024–0.031)	0.031 (0.027–0.035)	0.035 (0.030–0.040)	0.041 (0.034–0.046)	0.045 (0.038–0.052)
10-day	0.007 (0.006–0.008)	0.009 (0.008–0.010)	0.012 (0.011–0.014)	0.015 (0.013–0.016)	0.018 (0.016–0.020)	0.021 (0.018–0.023)	0.023 (0.020–0.026)	0.026 (0.023–0.030)	0.031 (0.026–0.034)	0.034 (0.028–0.038)
20-day	0.004 (0.004–0.005)	0.006 (0.005–0.006)	0.008 (0.007–0.008)	0.009 (0.008–0.010)	0.011 (0.009–0.012)	0.012 (0.011–0.014)	0.014 (0.012–0.015)	0.015 (0.013–0.017)	0.017 (0.015–0.019)	0.019 (0.016–0.021)
30-day	0.003 (0.003–0.004)	0.004 (0.004–0.005)	0.006 (0.005–0.007)	0.007 (0.006–0.008)	0.008 (0.007–0.009)	0.009 (0.008–0.011)	0.011 (0.009–0.012)	0.012 (0.010–0.013)	0.013 (0.011–0.015)	0.015 (0.012–0.016)
45-day	0.003 (0.002–0.003)	0.003 (0.003–0.004)	0.005 (0.004–0.005)	0.005 (0.005–0.006)	0.006 (0.006–0.007)	0.007 (0.006–0.008)	0.008 (0.007–0.009)	0.009 (0.008–0.010)	0.010 (0.009–0.011)	0.011 (0.009–0.012)
60-day	0.002 (0.002–0.002)	0.003 (0.003–0.003)	0.004 (0.003–0.004)	0.004 (0.004–0.005)	0.005 (0.005–0.006)	0.006 (0.005–0.007)	0.007 (0.006–0.007)	0.007 (0.006–0.008)	0.008 (0.007–0.009)	0.009 (0.007–0.010)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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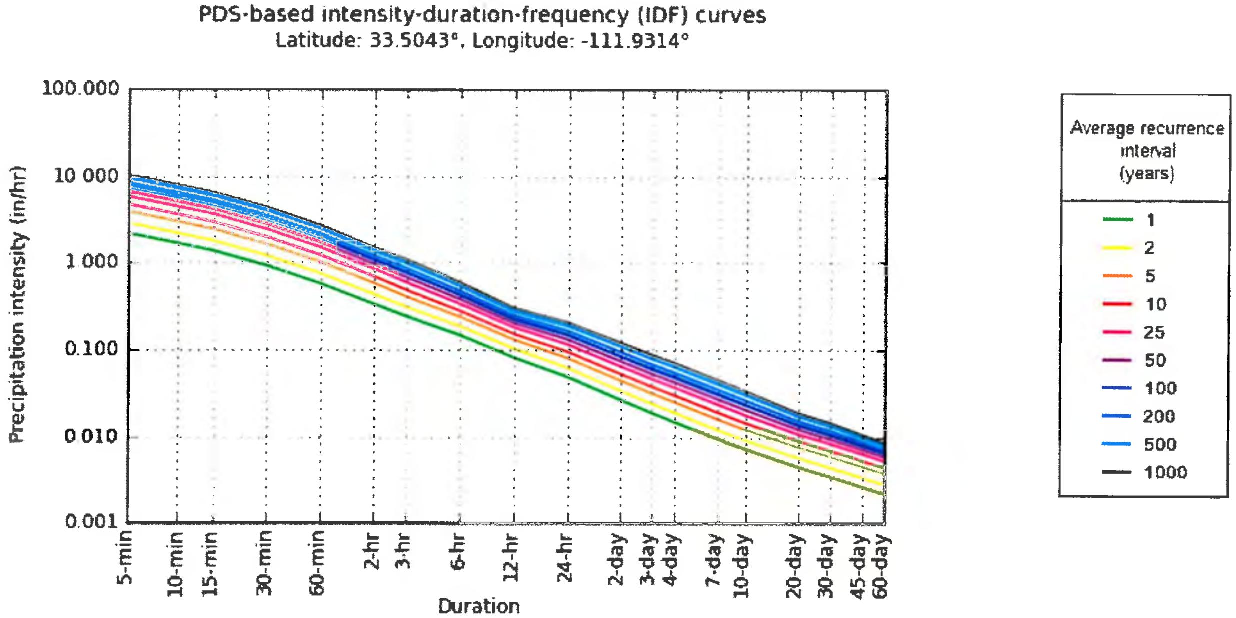
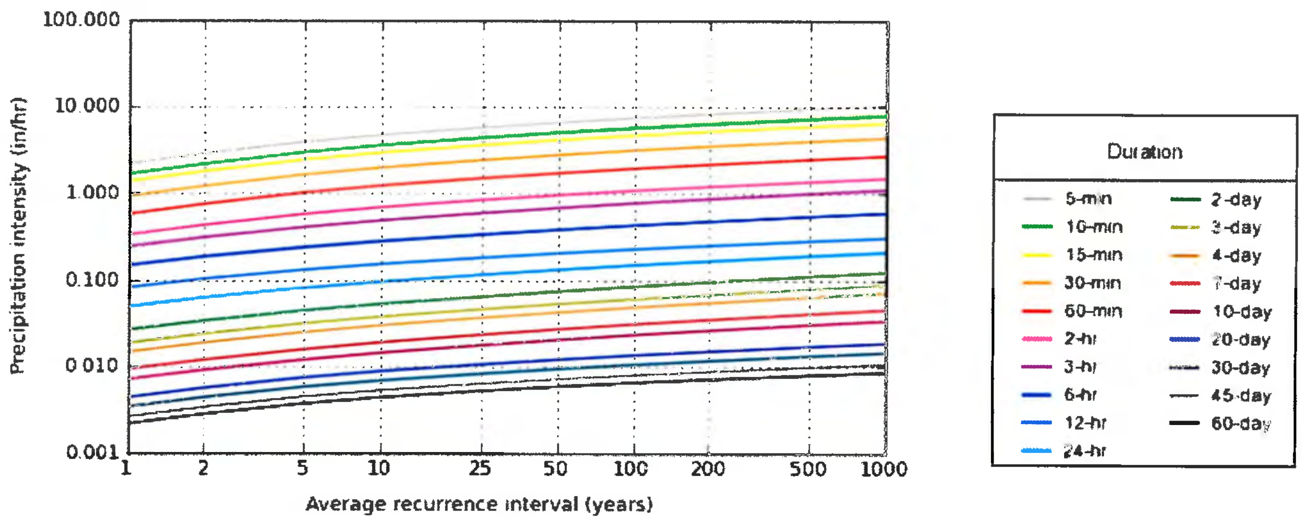
PF graphical





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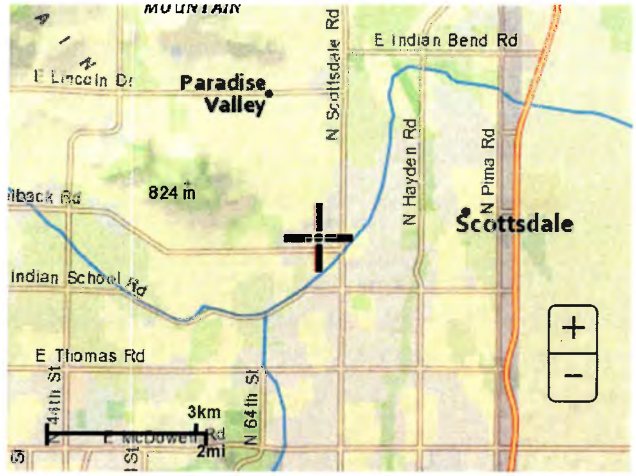
Maps & aerials

Small scale terrain

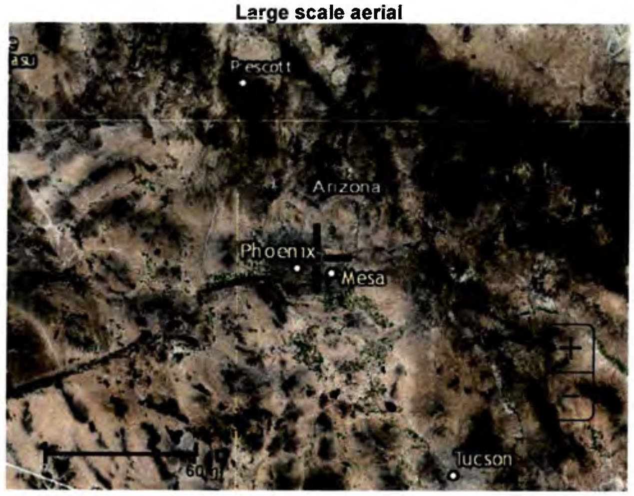


Large scale terrain

Large scale map

30-DR-2019
8/22/2019

Large scale aerial



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National Water Center
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Questions?: HDSC.Questions@noaa.gov

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30-DR-2019
8/22/2019

NOAA Atlas 14, Volume 1, Version 5
Location name: Scottsdale, Arizona, USA*
Latitude: 33.5043°, Longitude: -111.9314°
Elevation: 1290.29 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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NOAA, National Weather Service, Silver Spring, Maryland

PF tabular | PF graphical | Maps & aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.184 (0.155-0.225)	0.241 (0.203-0.294)	0.328 (0.273-0.398)	0.394 (0.327-0.476)	0.484 (0.395-0.582)	0.553 (0.446-0.662)	0.623 (0.493-0.744)	0.696 (0.541-0.829)	0.792 (0.600-0.946)	0.866 (0.642-1.04)
10-min	0.281 (0.235-0.342)	0.367 (0.309-0.448)	0.498 (0.416-0.605)	0.599 (0.498-0.725)	0.736 (0.601-0.885)	0.841 (0.678-1.01)	0.949 (0.751-1.13)	1.06 (0.823-1.26)	1.21 (0.913-1.44)	1.32 (0.978-1.58)
15-min	0.348 (0.292-0.424)	0.455 (0.383-0.555)	0.618 (0.516-0.751)	0.743 (0.617-0.898)	0.912 (0.745-1.10)	1.04 (0.841-1.25)	1.18 (0.930-1.40)	1.31 (1.02-1.57)	1.49 (1.13-1.78)	1.63 (1.21-1.95)
30-min	0.468 (0.393-0.572)	0.612 (0.516-0.747)	0.832 (0.695-1.01)	1.00 (0.831-1.21)	1.23 (1.00-1.48)	1.41 (1.13-1.68)	1.58 (1.25-1.89)	1.77 (1.37-2.11)	2.01 (1.52-2.40)	2.20 (1.63-2.63)
60-min	0.579 (0.486-0.707)	0.757 (0.638-0.925)	1.03 (0.860-1.25)	1.24 (1.03-1.50)	1.52 (1.24-1.83)	1.74 (1.40-2.08)	1.96 (1.55-2.34)	2.19 (1.70-2.61)	2.49 (1.89-2.97)	2.72 (2.02-3.26)
2-hr	0.673 (0.572-0.803)	0.871 (0.741-1.04)	1.17 (0.988-1.39)	1.39 (1.17-1.65)	1.70 (1.41-2.00)	1.93 (1.58-2.28)	2.18 (1.75-2.56)	2.42 (1.91-2.85)	2.75 (2.12-3.24)	3.01 (2.27-3.56)
3-hr	0.734 (0.622-0.885)	0.941 (0.801-1.14)	1.24 (1.05-1.49)	1.47 (1.23-1.76)	1.80 (1.48-2.14)	2.06 (1.68-2.44)	2.33 (1.86-2.77)	2.62 (2.06-3.10)	3.01 (2.29-3.57)	3.33 (2.47-3.95)
6-hr	0.884 (0.764-1.04)	1.12 (0.970-1.32)	1.44 (1.24-1.69)	1.69 (1.44-1.97)	2.03 (1.71-2.36)	2.30 (1.91-2.66)	2.58 (2.11-2.99)	2.86 (2.30-3.32)	3.25 (2.55-3.78)	3.56 (2.72-4.15)
12-hr	0.988 (0.863-1.15)	1.25 (1.09-1.45)	1.58 (1.37-1.83)	1.84 (1.59-2.13)	2.20 (1.87-2.53)	2.47 (2.08-2.84)	2.75 (2.28-3.16)	3.03 (2.48-3.49)	3.41 (2.73-3.95)	3.70 (2.91-4.32)
24-hr	1.18 (1.05-1.34)	1.50 (1.33-1.71)	1.94 (1.72-2.21)	2.30 (2.03-2.61)	2.78 (2.44-3.16)	3.17 (2.76-3.58)	3.57 (3.09-4.04)	3.99 (3.42-4.51)	4.56 (3.87-5.16)	5.02 (4.21-5.69)
2-day	1.28 (1.13-1.45)	1.63 (1.45-1.85)	2.14 (1.90-2.42)	2.55 (2.25-2.88)	3.12 (2.74-3.52)	3.57 (3.12-4.04)	4.05 (3.52-4.58)	4.55 (3.92-5.15)	5.25 (4.47-5.95)	5.81 (4.90-6.61)
3-day	1.35 (1.20-1.53)	1.73 (1.53-1.96)	2.28 (2.01-2.57)	2.72 (2.39-3.07)	3.34 (2.93-3.77)	3.83 (3.34-4.33)	4.36 (3.78-4.93)	4.92 (4.22-5.56)	5.70 (4.84-6.45)	6.34 (5.32-7.19)
4-day	1.43 (1.26-1.62)	1.83 (1.62-2.07)	2.41 (2.13-2.72)	2.88 (2.54-3.26)	3.55 (3.11-4.01)	4.09 (3.56-4.62)	4.67 (4.04-5.27)	5.29 (4.53-5.97)	6.16 (5.20-6.94)	6.86 (5.74-7.76)
7-day	1.59 (1.41-1.81)	2.03 (1.80-2.31)	2.69 (2.37-3.05)	3.22 (2.83-3.64)	3.97 (3.46-4.49)	4.57 (3.97-5.16)	5.21 (4.49-5.89)	5.90 (5.04-6.67)	6.86 (5.79-7.76)	7.64 (6.39-8.66)
10-day	1.72 (1.53-1.95)	2.21 (1.95-2.50)	2.91 (2.57-3.29)	3.49 (3.07-3.93)	4.28 (3.75-4.82)	4.93 (4.28-5.53)	5.61 (4.84-6.30)	6.32 (5.42-7.12)	7.33 (6.21-8.25)	8.14 (6.82-9.18)
20-day	2.12 (1.89-2.39)	2.73 (2.42-3.07)	3.61 (3.20-4.05)	4.27 (3.78-4.79)	5.16 (4.55-5.79)	5.85 (5.14-6.56)	6.55 (5.72-7.35)	7.26 (6.31-8.16)	8.22 (7.08-9.26)	8.96 (7.66-10.1)
30-day	2.48 (2.19-2.79)	3.19 (2.83-3.59)	4.21 (3.72-4.73)	4.98 (4.40-5.59)	6.02 (5.29-6.75)	6.82 (5.96-7.64)	7.64 (6.65-8.55)	8.47 (7.34-9.48)	9.59 (8.25-10.8)	10.5 (8.93-11.8)
45-day	2.87 (2.55-3.22)	3.69 (3.29-4.15)	4.87 (4.33-5.47)	5.74 (5.09-6.44)	6.89 (6.09-7.72)	7.75 (6.83-8.70)	8.63 (7.57-9.68)	9.50 (8.30-10.7)	10.7 (9.25-12.0)	11.5 (9.94-13.0)
60-day	3.17 (2.83-3.55)	4.09 (3.66-4.58)	5.39 (4.80-6.02)	6.33 (5.63-7.08)	7.55 (6.70-8.44)	8.46 (7.48-9.46)	9.37 (8.25-10.5)	10.3 (9.00-11.5)	11.4 (9.97-12.8)	12.3 (10.7-13.9)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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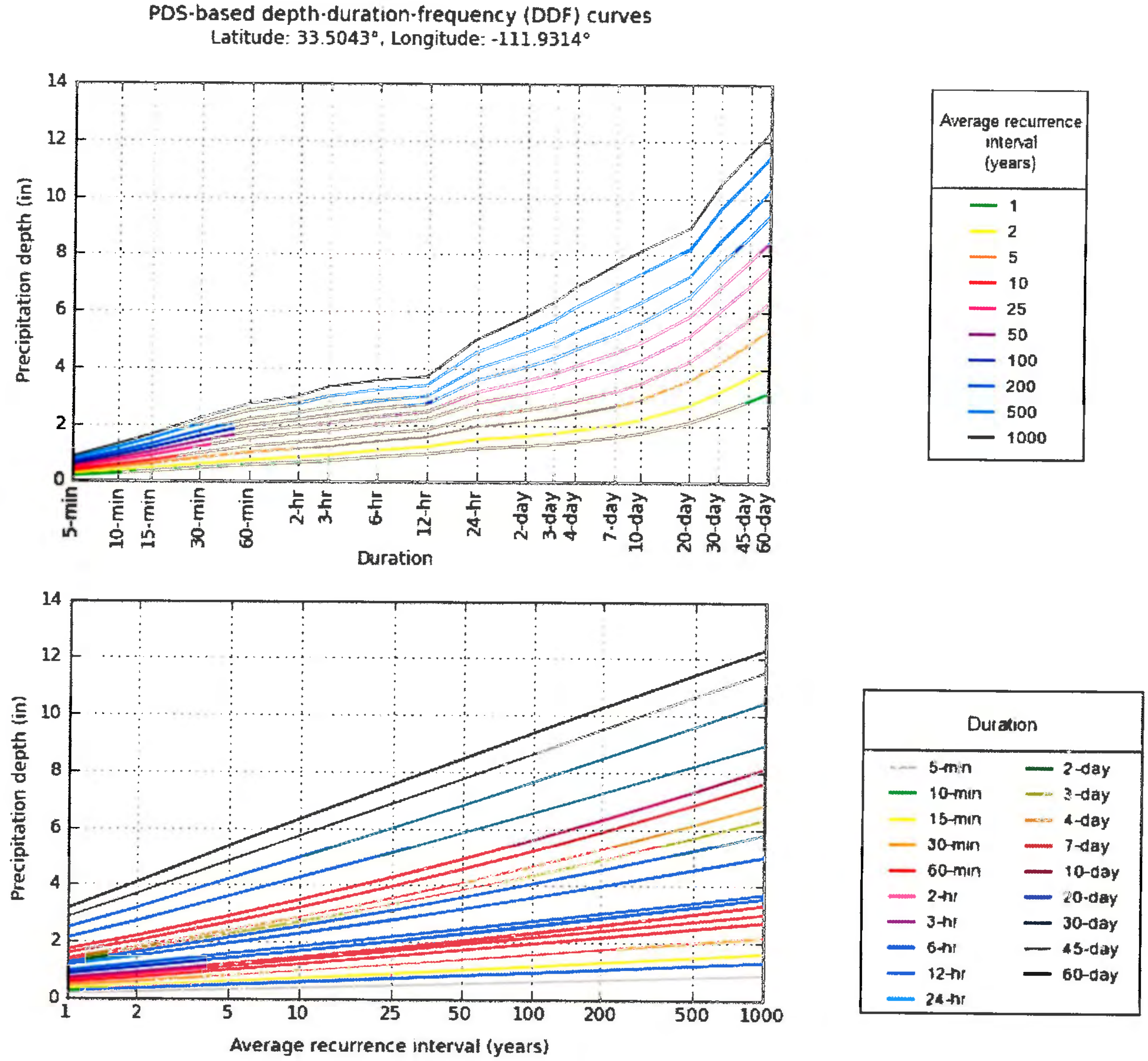
PF graphical



NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Mon Feb 13 21:16:50 2017

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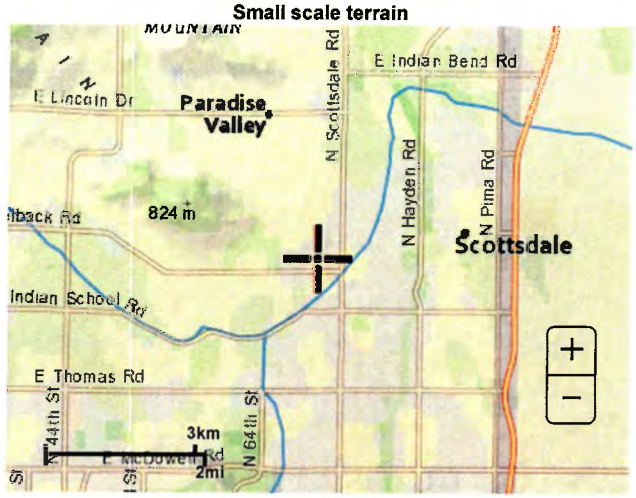
Maps & aerials

Small scale terrain



Large scale terrain

Large scale map

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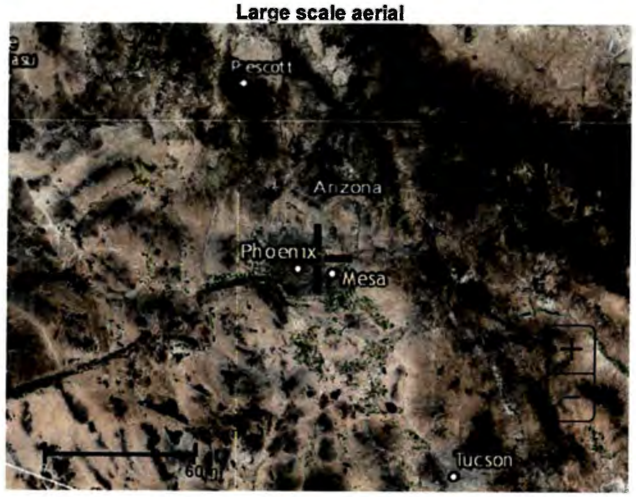
Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Table 6.7 Minimum Drainage Design Criteria

Drainage Feature	Flood Event Return Interval	
	2-year through 50-year	**100-year**
STORMWATER STORAGE BASINS		
Retention Basin	N/A	100-year 2-hour storm for determining stormwater storage volume.
Detention Basins are STRONGLY discouraged and may only be used if specified by an adopted ADMP/WCMP or with special approval by the County Drainage Review Board, the Community's City or Town Council, or Drainage Review Board.	2-, 10- and 50-year peak discharge: Q_{post} reduced to < Q_{pre} And First flush per policy 3.6.6	Q_{post} reduced to < Q_{pre} and First flush per policy 3.6.6

6.4 STORMWATER QUALITY

The following minimum standards will be utilized for protection of stormwater quality in Maricopa County.

Standard 6.4.1 **First Flush.** Discharges into a structure owned or operated by the District must comply with Policy 3.6.6 First Flush, and County-wide all discharges may be required to meet the First Flush requirements of Policy 3.6.6 by providing stormwater runoff control (Policy 3.11.1). The First Flush requirement can be addressed by retaining the required minimum First Flush volume, treating the first flush discharge, or utilizing a combination of both approaches.

The minimum First Flush volume is calculated as follows:

$$V_{FF} = C\frac{P}{12}A$$

where

VFF = minimum First Flush volume in ac-ft.,
C = runoff coefficient (set = 1),
P = first 0.5 inches of direct runoff, and
A = area of project site, in acres.

The minimum First Flush treatment discharge is calculated as follows, based on an unpublished paper by T.R. Adams titled *Designing Stormwater Quality Facilities to Comply with Volume-Based Treatment Requirements*:

$Q_{FF}=CI_{FF}A$

Where:

Q_{FF} = minimum First Flush discharge in cfs.
C = runoff coefficient (set =1).
I_{FF} = maximum first flush intensity in in/hr.

where: $I_{FF} = \frac{P_{FF}}{T_c}$

P_{FF} = 0.5 inches

T_c is the Time of Concentration of the upstream watershed in hours.

A = area of project site, in acres.

6.5 STREET DRAINAGE

The conveyance of stormwater in a roadway is influenced by the typical roadway cross-section, cross-slope, longitudinal slope and roadway material. The following are standards to be used in the evaluation of roadway conveyance:

Standard 6.5.1 Construction Plans. Construction plans for street drainage improvements are to meet the requirements of Section 6.16 and the MCDOT Roadway Design Manual.

Standard 6.5.2 Building Finished Floor Elevations. Refer to Table 6.7, Section 5.2 and Section 5.3.

Standard 6.5.3 Sizing Inlets and Laterals. Runoff calculations for the sizing of inlets and lateral connection pipes shall be based on acceptable hydrologic criteria.

Standard 6.5.4 Manning's n-value. A Manning's n-value of 0.015 shall be used for paved street flow unless special conditions exist.

Standard 6.5.5 Inverted Crowns. The use of inverted crown roadways is not permitted within the County's/Community's/District Right-of-Way.

Standard 6.5.6 Valley Gutters. Valley gutters will normally only be allowed between intersections on local streets. The minimum slope for valley gutters shall be as defined in the MCDOT Roadway Design Manual.

Standard 6.5.7 Curb Return Gutter Slope. Curb return gutters shall have a minimum slope of 0.0025 feet of fall for every 1.0 feet of gutter length.

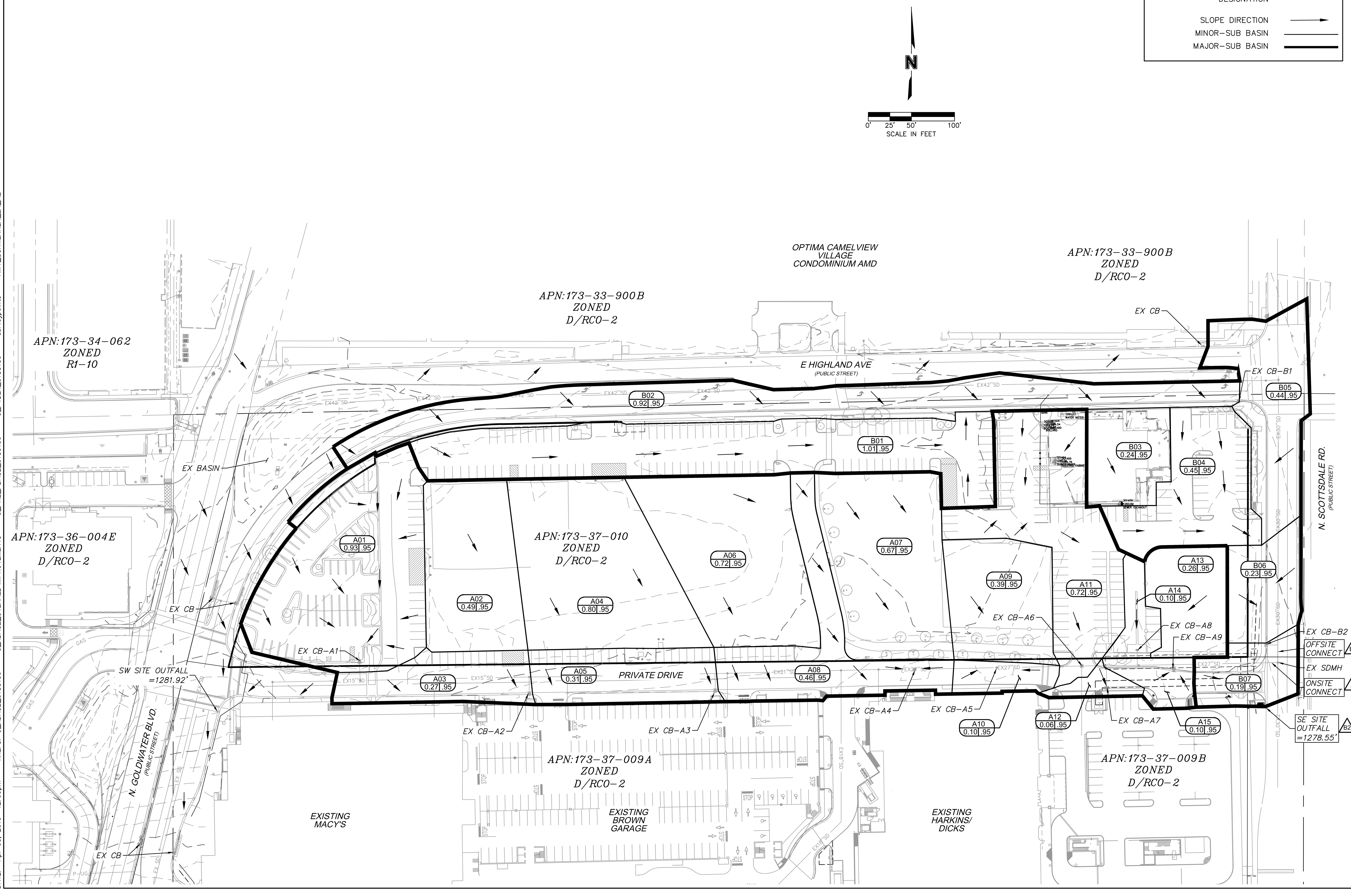
Standard 6.5.8 Maximum Flow Depth in Street Sections. Refer to Table 6.7.

Standard 6.5.9 Maximum Catch Basin Spacing. For arterial, collector streets and all-weather access streets, the maximum distance that drainage may be carried in the street is based

APPENDIX C – DRAINAGE PLAN

DRAINAGE MAP LEGEND

A= DRAINAGE AREA ID B=AREA IN ACRES C='C' RUNOFF COEFFICIENTS	A / B | C
DESIGN POINT DESIGNATION	D
SLOPE DIRECTION	→
MINOR-SUB BASIN	—
MAJOR-SUB BASIN	—



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DATE: Apr 03, 2019 12:09pm XREFS: C_XBASE_0183159 C_XBASE_OVERALL IMPROVEMENTS C_PRE_PBASE_0183159 C_PTBLK_0183159

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REV. NO.	DATE	REVISIONS DESCRIPTION

REVISIONS

2019

PRELIMINARY IMPROVEMENT PLANS
EXISTING CONDITIONS - DRAINAGE MAP

HCW CAESARS REPUBLIC

SCOTTSDALE, AZ 85251

drawn by:	SS/THW
designed by:	SJV
checked by:	CAII
project no.:	018-3159
date:	03.22.2019

EXHIBIT 3

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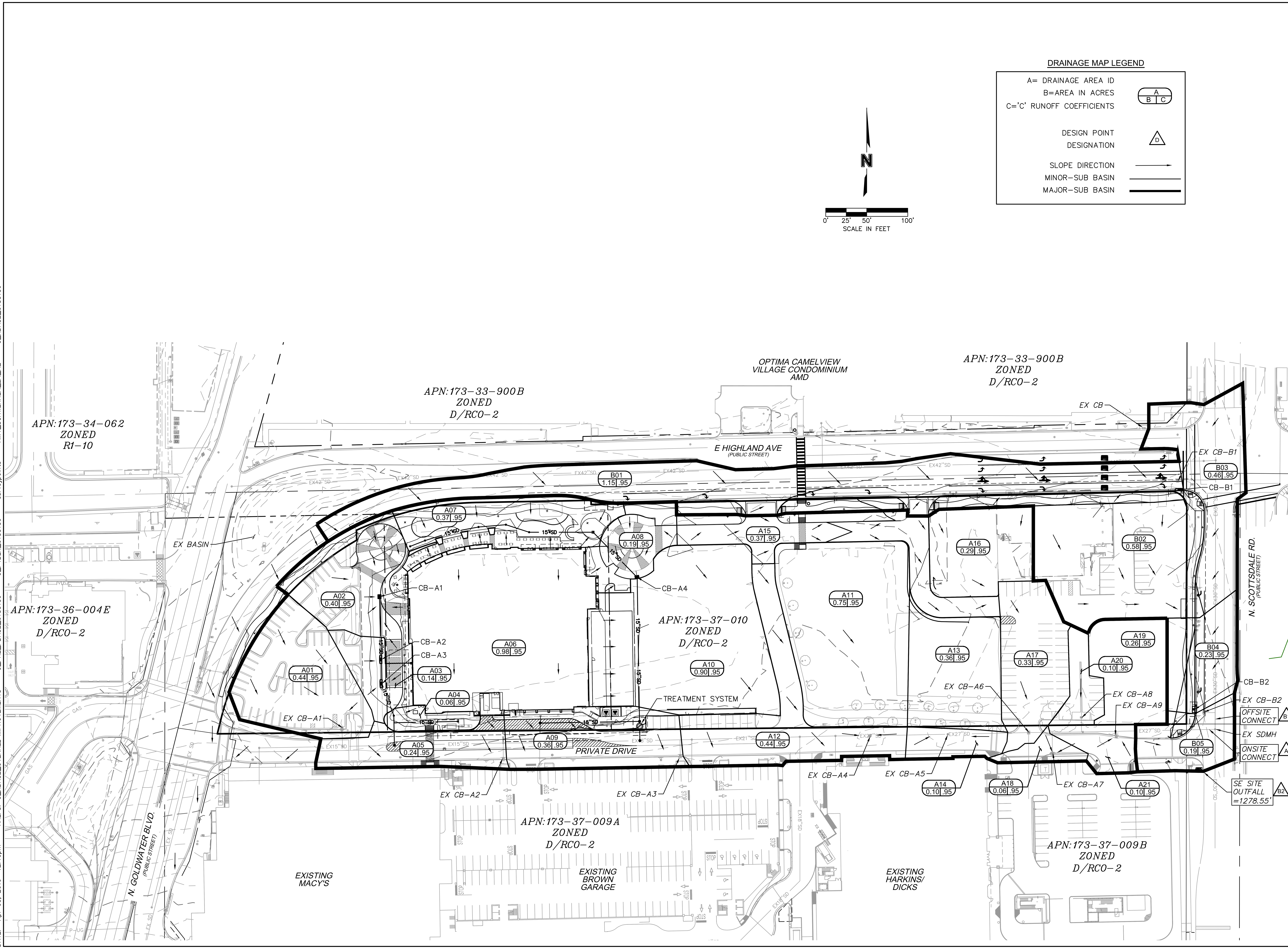
8/22/2019



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DATE: Apr 03, 2019 12:10pm XREFS: C_XBASE_OVERALL IMPROVEMENTS C_PRE_PBASE_0183159 C_PTBLK_0183159 survepoints AMY_SCHWENNER_LA_AZ C_XBASE_0183159

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REV. NO.	DATE	REVISIONS DESCRIPTION

REVISIONS

PRELIMINARY IMPROVEMENT PLANS
PROPOSED CONDITIONS DRAINAGE MAP

HCW CAESARS REPUBLIC

SCOTTSDALE, AZ 85251

2019

drawn by:	SS/THW
designed by:	SJV
checked by:	CAII
project no.:	018-3159
date:	03.22.2019

EXHIBIT 4

30-DR-2019
8/22/2019

APPENDIX D – REFERENCE DOCUMENTS

MASTER DRAINAGE PLAN
FOR
SCOTTSDALE FASHION SQUARE

C.W.W. No. 831114-21

Prepared for:
THE WESTCOR COMPANY II, LIMITED PARTNERSHIP
11411 North Tatum Boulevard
Phoenix, Arizona 85028

Prepared by:
COLLAR, WILLIAMS & WHITE ENGINEERING
2702 North 44th Street, Suite 205-B
Phoenix, Arizona 85008

April, 1986
Approved by City of Scottsdale, August 18, 1986
Revised May 10, 1988

COLLAR, WILLIAMS & WHITE ENGINEERING

Drainage System

Scottsdale Fashion Square is an existing 35.0 acre shopping center located at the northwest corner of Camelback Road and Scottsdale Road in the City of Scottsdale, Arizona.

New development will occur on this site in multiple phases. These phases will include the demolition of some existing buildings, renovations to existing buildings, new office and commercial building construction, construction of new underground and elevated parking levels, and construction of a new "retail bridge" to connect Scottsdale Fashion Square to Camelview Plaza to the west. In addition, the proposed "West Couplet Roadway" alignment will be along the westerly boundary of the project.

Existing on-site surface drainage flows are, in general, from the northwest towards the south and east. All existing drainage flows are intercepted by existing on-site catch basins and discharged into an existing 84 inch diameter storm drain in Camelback Road and an existing 42 inch diameter storm drain in Scottsdale Road. These two storm drains connect at the intersection of Camelback and Scottsdale Roads and empty into an existing 144 inch diameter storm drain which conveys the water under the Arizona Canal and to the East towards Indian Bend Wash.

Existing building roof drainage is presently routed via vertical roof drain leader lines to either existing on-site underground storm drainage systems or is discharged at existing grade and directed through existing curbing to the adjacent asphalt paved surfaces, where it sheet flows to existing storm drain inlets bordering the site.

As a part of the remodeling/renovating of existing buildings, additional floors will be added to the buildings. As additional floors are constructed, the existing vertical roof drain leader lines will be extended to the new roof levels. Future roof drainage from all new and renovated buildings will be connected to on-site underground storm drainage systems, and all ongrade discharges will be eliminated.

There are no existing on-site storm water retention/detention facilities presently provided, and the new site development and modifications will not necessitate new on-site storm water retention/detention facilities (See attached letter from the City of Scottsdale dated December 8, 1987). Since the site is essentially impervious at this time, and will remain so after the redevelopment, no additional drainage flows will be generated.

A field survey made by Collar, Williams & White Engineering, of the top of the existing west bank of the Arizona Canal, indicates the elevations along the top of the existing west bank presently vary from 1378.0 feet to 1375.4 feet between the canal crossing at Highland Avenue and 500 feet south of the intersection of Scottsdale and Camelback Roads. With one foot of freeboard required above the maximum top of existing canal bank elevations, all new first floor building elevations have been established at no less than 1379.0. All existing building elevations are above this elevation. Both Camelback Road and Scottsdale Road are lower than elevation 1379.0.

New site development and modifications have incorporated adequate design measures to assure that no overflow of the Arizona Canal from a 100 year flood event will inundate any existing or proposed on-site building.

In addition, the new development has made adequate provisions to prevent any storm water from a 100 year event, which would flood the intersection of Camelback Raod and Scottsdale Road from entering any underground basement or lower parking level.

This assurance has been achieved by denying direct driveway access from Scottsdale Road or Camelback Road to the new underground parking levels, and by construction of walls around the office building at the southeast corner of the site to prevent flooding of the basement area.

CITY OF SCOTTSDALE ARIZONA

December 8, 1987

Mr. William R. Kendall
Collar, Williams and White Engineering
2702 North 44th Street, Suite 100A
Phoenix, Arizona 85008

Dear Mr. Kendall:

This letter is to notify you that the City of Scottsdale will not require Scottsdale Fashion Square redevelopment (104-Z-85 and 59-Z-87) to provide any new onsite retention or detention facilities.

It is our understanding that the existing onsite catch basin and storm drain network which conveys stormwater runoff to the underground storm sewers in Camelback and Scottsdale Roads, will remain intact. These guidelines conform to the master drainage report for Scottsdale Fashion Square, approved by the City on August 18, 1986.

Sincerely,

John Faramelli

John Faramelli
Project Review Director

cc: John Smetana, Project Review Manager
Dick Crew, Planning and Zoning Manager
Randy Grant, Project Review Manager

JF:sw

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C.W.W. B.K.

3939 CIVIC CENTER PLAZA ■ SCOTTSDALE, ARIZONA 85251 ■ PHONE (602) 994-2600

LOWER BEND WASH
FLO-2D STUDY

HCW Caesars Republic

City of Scottsdale, AZ - 2019

May 2019

Olsson Project No. 018-3159

CDC
CURTAINWALL DESIGN CONSULTING™

May 1, 2019

Final Report for

Solar Loads Impact Simulations for Caesars Republic Hotel

Prepared for

Mr. David Hess
HCW Hotels, LLC
153 South Payne Stewart Drive
Branson, MO 65616

Prepared by

Curtainwall Design and Consulting
8070 Park Lane, Suite 400
Dallas, Texas 75231

ABSTRACT

This final report documents CDC, Inc.'s solar loads impact analysis performed to determine the impact of reflections from the proposed Caesars Republic hotel structure on solar exposure in the surrounding area. The focus of the work was on identifying any reflections and solar load concentrations that could be detrimental to area traffic and uncomfortable for hotel patrons on the property.

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INTRODUCTION AND EXECUTIVE SUMMARY

Curtain Wall Design and Consulting (CDC) provides consulting services for state-of-the-art building envelope systems. CDC has been providing consulting services for the design of Caesars Republic, an eleven-story, 266-room hotel in Scottsdale, Arizona, shown in Figure 1. HCW asked CDC to provide a computational solar loads impact analysis for the proposed structure. A CAD model of Caesars Republic was received from HCW and prepared for solar loads analysis. Necessary spatial discretization of the surface mesh was determined in a convergence study where the computational mesh was refined until the computed surface irradiation was sufficiently resolved. A validation effort was performed to ensure that the solar loads model and model geometries used adequately represented those present in the built environment being analyzed. This was accomplished by comparing satellite imagery of a nearby Scottsdale office building with computational model predictions of shadow locations to show qualitative agreement between predictions and reality. The solar irradiation of the built environment was calculated in thirty-minute increments spanning the daylight hours of one day a week over the course of a year to detect any problematic solar loading consequences due to the presence of the hotel. During times of increased solar loading, details of the solar load distributions were studied. Estimated temperature increases due to reflections off the specular surfaces of the hotel suggest that the impact to pedestrian areas of Caesars Republic will be minimal, and a reflective glare analysis performed using an after-image metric found that reflected visible light will pose little ocular hazard to pedestrians and passing traffic.

Figure 1: A rendering of the Caesars Republic

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TECHNICAL APPROACH

The focus of the current work was to provide a solar loads analysis on Caesars Republic. The work involved the creation of a solar radiation model from a Revit model provided by HCW followed by a convergence study to determine the level of spatial refinement required for accurate solar loads calculations. A validation exercise was needed to ensure confidence in the solar loads model. The model was then used to assess the solar loads impacts of Caesars Republic on nearby roads and pedestrian areas and to identify any scenarios where large thermal or ocular impacts might exist.

Optics

When a radiation wave (visible or otherwise) travels in a medium and finds an obstacle such as a glass surface, part of the incident ray is reflected, part is absorbed, and the rest is transmitted to the other side of the obstacle. The reflectivity, ρ, absorptivity, α, and transmissivity, τ, sum to one such that the incident radiant energy, G, is distributed by one of those modes,

$$G = \rho G + \alpha G + \tau G. \qquad (1)$$

Energy is also emitted from the surface of the obstacle at a rate proportional to the fourth power of the surface temperature, $\epsilon\sigma T^4$, where ϵ and σ are the emissivity and Stefan-Boltzmann constant, respectively. The radiative energy balance is illustrated in Figure 2.

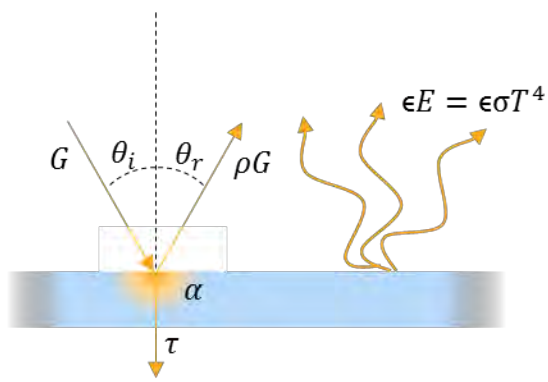

Figure 2. Radiative energy balance.

The reflection produced by surfaces that are idealized as perfectly smooth is called specular reflection, where the incident and reflected angle are equal. In reality, all surfaces have some roughness and produce diffuse reflection. Figure 2 shows an example of specular reflection.

This study focused only on the reflection from flat architectural glass, which is conservatively assumed to be completely specular. Since the details of the building interior are not modeled, transmissivity is neglected so that all incident radiant energy is either absorbed or reflected. A multiband radiative model is employed in which radiative properties are dependent on wavelength, and Kirchhoff's radiation law is respected, which states that spectral emissivity and absorptivity are equal, i.e., $\epsilon(\lambda) = \alpha(\lambda)$, where λ represents the wavelength.

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Sun Tracking

The sun elevation, azimuthal angle, and solar intensity depend on the date, time, and geographical location, as shown in Figure 3.

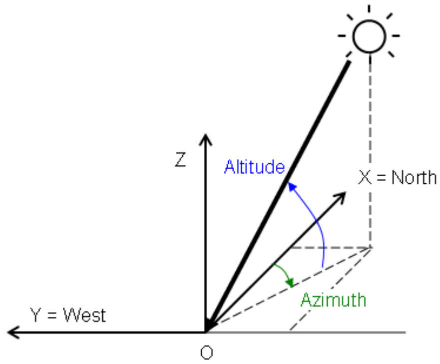

Figure 3: Altitude and azimuth of the sun.

The Solar Calculator built into the software was used to provide the time-varying solar loads incident on Atlanta according to the astronomical relationship between the sun, earth, and atmosphere developed by the National Renewable Energy Laboratory (NREL). The required inputs are the longitude and latitude, 33.8525° N, 84.3620° W for Atlanta, the date, and the time. An additional parameter, a sunshine factor by which the total solar flux is reduced to account for cloudy sky conditions, was set to zero to represent the worst-case scenario of a blue-sky day. All solar flux is assumed to be direct as opposed to diffuse.

Glass Selection

The architectural plans for Caesars Republic specified that all glass surfaces be assigned a frequency-invariant reflectivity of 0.06, and all nonreflective surfaces were assigned an emissivity of 1.0 (and a reflectivity of 0.0). The layout of the reflective and nonreflective surfaces is shown in Figure 0-4.

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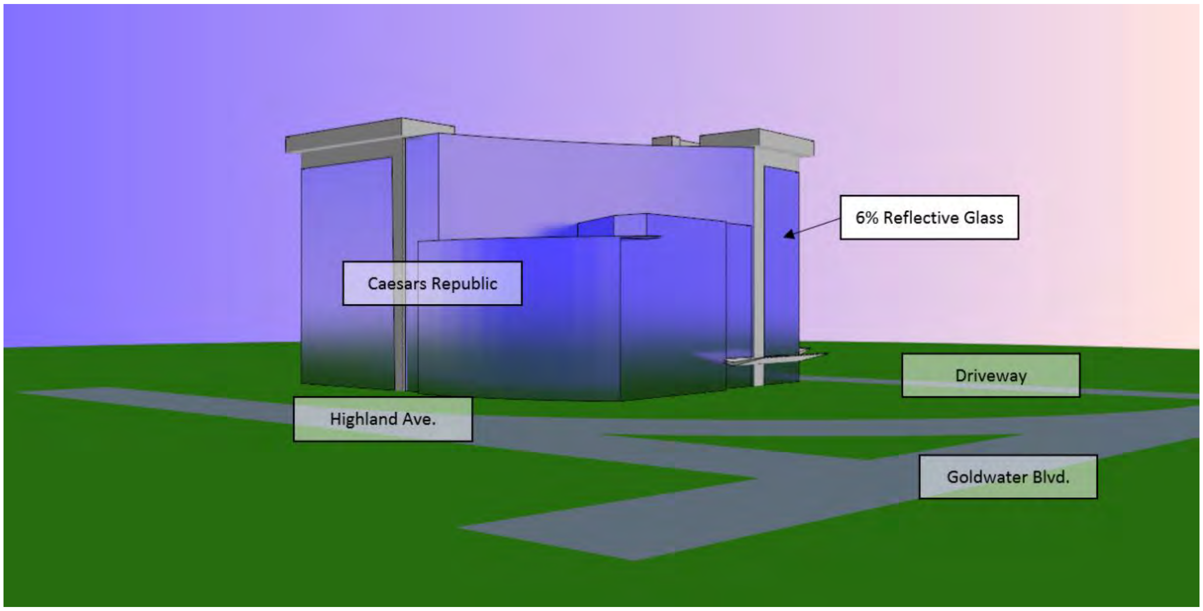


Figure 0-4. Surfaces modeled in the Caesars Republic solar loads model.

Model

The geometric model of Caesars Republic was imported and discretized for the solar load analysis, and a convergence study was performed to ensure that the spatial discretization was sufficient to produce accurate solar load predictions.

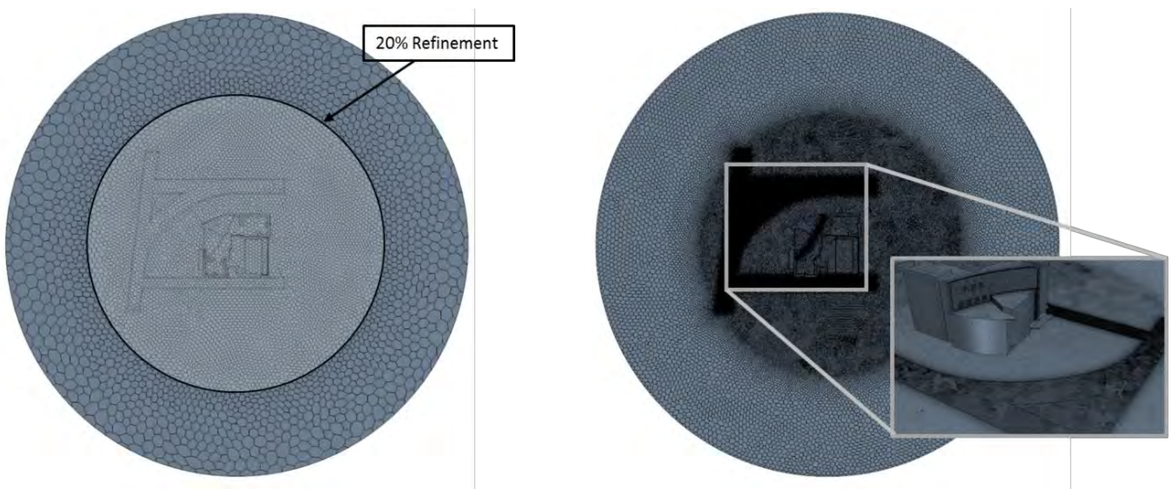
Computational Model and Geometry

The computational model represents Caesars Republic and the surrounding roadways including Goldwater Blvd., Highland Ave., and the driveway to the south, as shown in Figure 0-4. The reflective surfaces in the Caesars Republic model reflect visible and solar radiation specularly with the reflectivity of 0.06, as discussed in section 0. In the absence of surface finish details for the surrounding areas, all regions of Caesars Republic not associated with reflective surfaces were assigned zero reflectivity so that they only absorbed and emitted radiant energy.

Radiation was modeled using the *S2S (Surface-to-Surface) Radiation* model, in which radiative heat transfer can be modeled between spatially discretized surfaces separated by a nonparticipating medium. It is assumed that the space between the model surfaces does not absorb, emit, or scatter radiation, which offers the advantage that the air does not need to be modeled, reducing the computational cost significantly. All surfaces were assigned the *Environmental* boundary condition, which specifies that radiation emitted from a given surface that does not intersect another surface is then radiated to a virtual environmental surface that has been assigned a user-defined environmental temperature. For the analysis here, the environment was given a temperature of 80 °F.

Discretization

For the solar loads analysis, the model was discretized so that the surface was represented by a large number of radiation patches, as shown in Figure 2-4. The majority of the computational cost of a solar loads analysis is related to the calculation of the view-factor matrix, which quantifies the radiant energy transferred between all of the patches in the model. The view factors are calculated using a deterministic ray-tracing algorithm in which a user-defined number of rays are cast from a patch to determine the number of rays that intersect other patches, including the virtual environment patch. A numerical experiment determined that 512 rays per patch was sufficient for this work.



(a) (b)

Figure 2-4. Surface patch distribution of (a) coarse (Δx = 20 m with Δx =4 m local to hotel) and (b) semi-fine (Δx = 1 m Δx = 0.2 m local to hotel, .025 m on concave window and roads) discretizations used in the spatial convergence study.

For all practical purposes, the physical world exists on a continuum, and numerical simulations divide that continuum into a finite number of discrete cells, such as the patches discussed above, at which to perform calculations. The accuracy of numerical simulations depends on how well the spatial discretization represents the relevant scales of the geometry and physics being simulated. A finer discretization will result in a more accurate prediction of the physics but will lead to a more computationally demanding model. A convergence study was performed to determine the minimum refinement required to accurately predict the impact of the reflective surfaces of the Caesars Republic hotel on the solar loads in surrounding areas, most importantly the nearby roads. The mesh was characterized by a base size defining the cell dimensions on the perimeter of the computational domain. The base size was refined by 20% in a circle surrounding the hotel, shown in Figure 2-4 (a). Later grid iterations were further refined on the convex window and roads, as shown in Figure 2-4 (b). The refinement levels ranged from a base size of Δx = 20 m to a base size of Δx = 5 m with Δx = 0.0125 m on the convex window and roads, as shown in Figure 2-4, with resulting overall patch counts of around 36 thousand to 3 million patches, respectively. The time it took for twelve processors to calculate the view-factor matrix was 26 seconds for the coarse discretization to over 2 hours for the fine discretization.

The metric for convergence was the maximum solar irradiation (solar heat flux) in the Caesars Republic area over the course of June 21, 2019, shown in Figure 2-5 This date is the summer solstice and was chosen because that is when the sun is reaches its northernmost point in the sky.

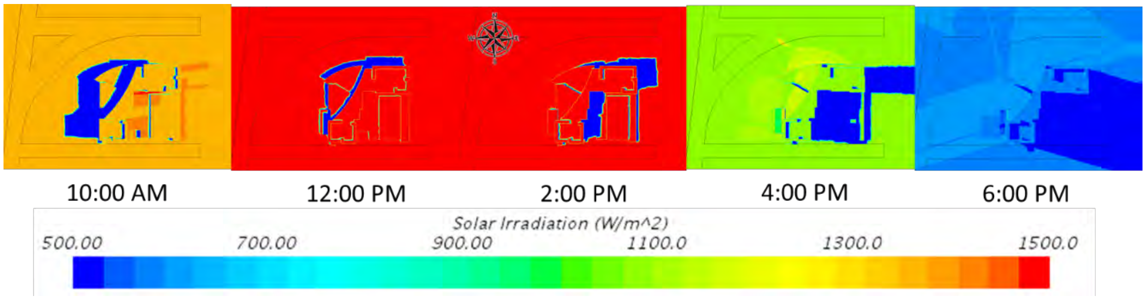


Figure 2-5. Solar irradiation of Caesars Republic on June 21, 2019.

Irradiation calculations were performed for every ten minutes from 5 a.m. to 8 p.m. The primary concern became a focused solar load from the concave window onto Highland Ave., the street north of Caesars Republic. The maximum instantaneous values of irradiation on the street over the course of the day for all discretizations are shown in Figure 2-6.

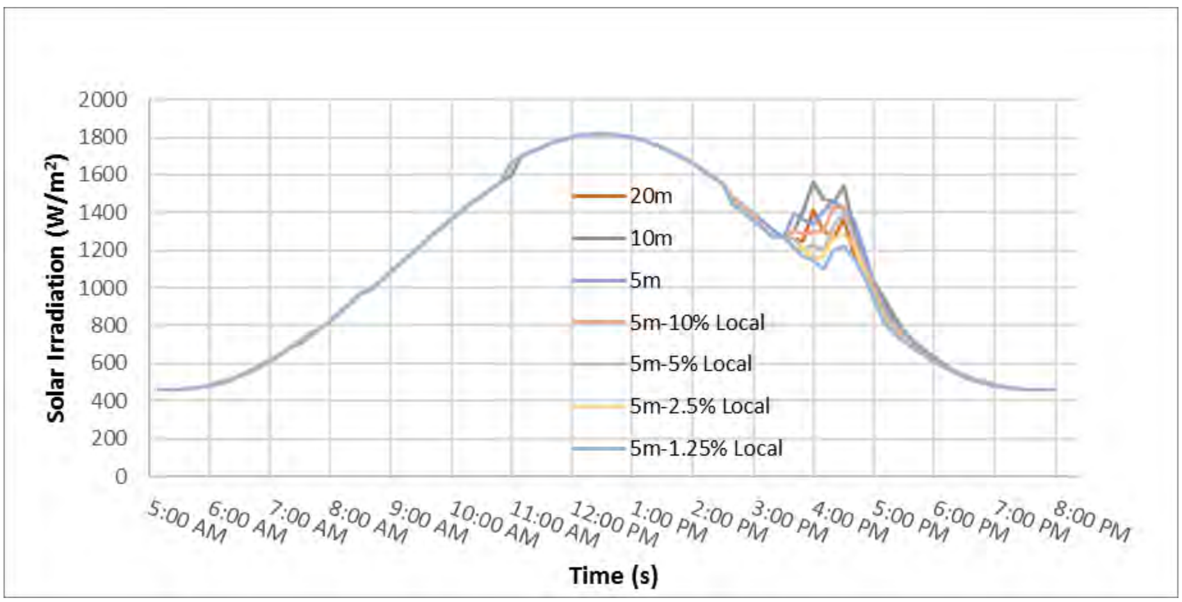


Figure 2-6. Maximum solar irradiation on the streets over the course of June 21, 2019.

It is seen that there is a spike in the solar load around 4:20 p.m. The spike is the result of the focused solar heat from the concave window. Figure 2-7 shows the evolution of the focused area with grid size. It is seen in Figure 2-6 and supported in Figure 2-7 that the spike in the heat load decreases in magnitude as the grid becomes more refined. The grid using a base size of $\Delta x = 5$ m was chosen for all further analysis to provide conservative solar loads calculations while keeping the computational cost low.

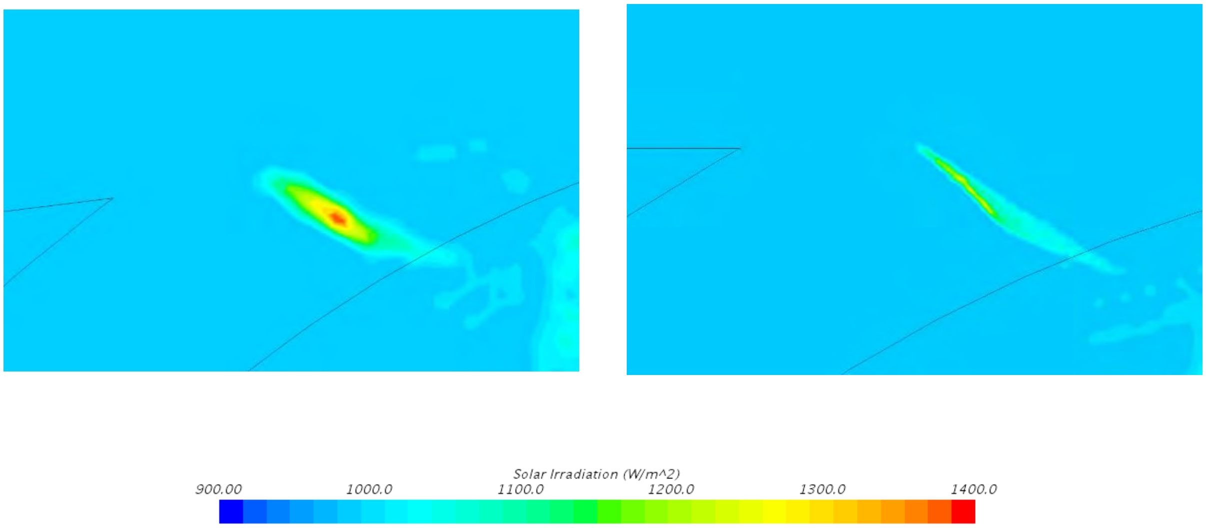


Figure 2-7. Solar irradiation focus at 4:20 p.m. on June 21, 2019, resolved on the (a) Δx = 5 m grid and (b) Δx = 5 m with Δx = 2.5 m on the concave window and streets.

RESULTS

Solar loads analyses were run over the course of one year to determine whether the presence of the Caesars Republic hotel would cause any unacceptable solar loads on nearby roadways. Additionally, the analysis considered the impact of reflective solar loads on patrons in different areas of the hotel premises. A validation exercise was performed to establish confidence in the solar loads predictions.

Solar Loads Model Validation

A validation effort was conducted to ensure that the solar loads model and model geometries used adequately represented those present in the built environment being analyzed. This was done by comparing solar data from a point in history with simulation predictions of a nearby Scottsdale office building. No existing features of the surrounding area were present in the HCW-provided Caesars Republic model, so a nearby building was used. The office building at 7150 E. Camelback Rd. was estimated with the Google Earth measurement tool to have an L-shape with side lengths of 68 m and 61 m on the south and east sides, respectively, a width of 27 m, and a height of 42.5 m. Satellite imagery obtained from Sanborn, through the United States Geological Society (USGS) Earth Explorer (4) qualitatively represented the solar loads in the Scottsdale area on some unspecified date and time in September 2012. By matching the predicted shadow patterns, the computational model determined that the image was taken within five minutes of 12:25 p.m. on September 1, 2012. The close match, shown in

Figure 3-1, serves as a qualitative validation of the solar loads model.

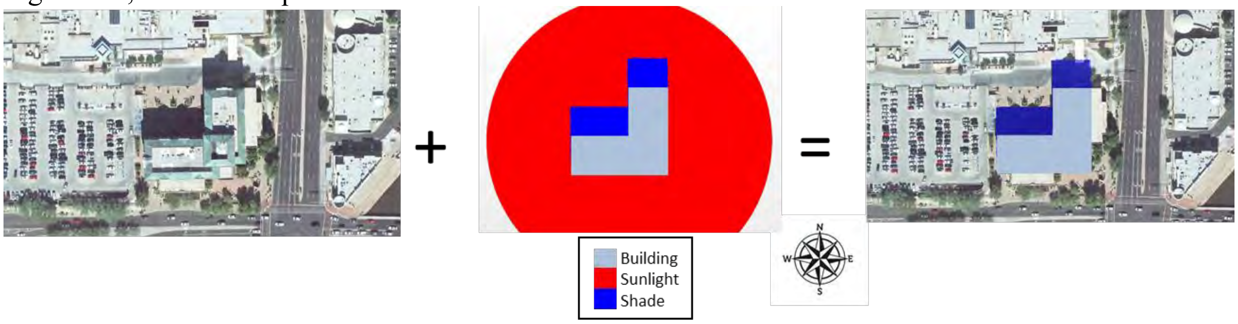


Figure 3-1. Qualitative comparison between satellite imagery and computational model predictions of the shadow cast by the office building at 7150 Camelback Rd. in Scottsdale.

Solar Loads Impact Around Caesars Republic

The solar loads impact of the reflective surfaces of the Caesars Republic hotel on pedestrian areas and surrounding roadways will vary throughout the year, and the times at which the most-severe impacts will be felt are not known a priori. Simulations were run to predict solar loads at thirty-minute intervals from 6 a.m. to 7 p.m. every Tuesday for 52 weeks over the course of the year 2019. The solar loads impact of the proposed building was quantified by comparison of solar loads predictions including the presence of the hotel with the flat surface solar irradiation:

$$Impact = \frac{G_R - G_0}{G_0} \qquad (2)$$

where G_R and G_0 are the spatially averaged solar irradiation with the hotel and on a flat surface, respectively. Positive solar load impacts resulting from the hotel's reflective surfaces were considered on eight areas of in and around Caesars Republic (Figure 3-2). The impacts to nearby roadways were assessed for the driveway, Goldwater Blvd., Highland Ave., and the curve between Goldwater and Highland. Impacts to pedestrian comfort on the hotel premises were assessed in the west parking lot, the north parking lot, the park area to the east, and the rooftop patio. Tabulated solar loads impact results are given in Appendix A.

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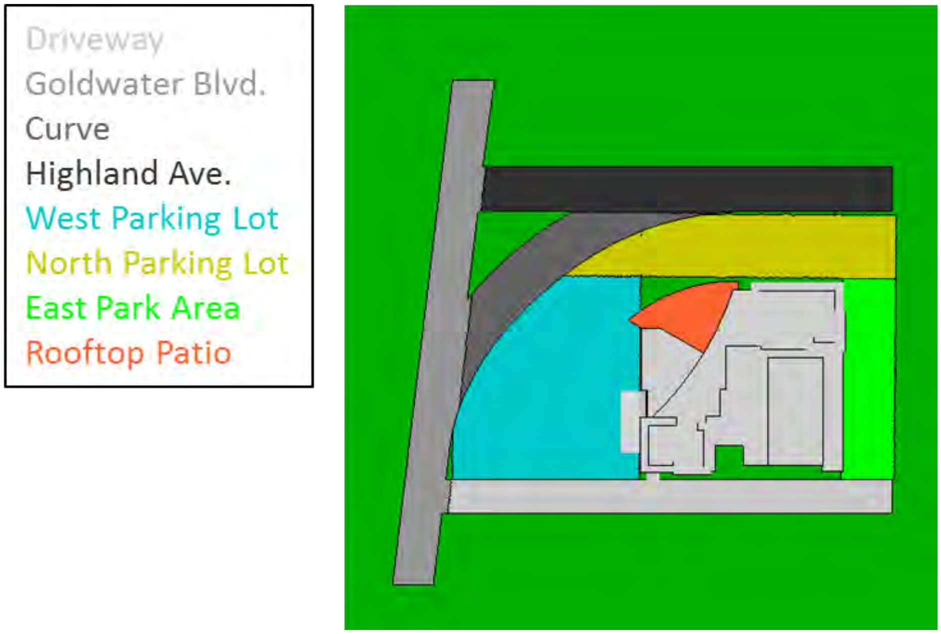


Figure 3-2. Caesars Republic areas in the solar loads impact analysis.

Instances of outlying positive solar load impacts were further investigated by plotting contours of solar load modification in terms of the normalized heat flux:

$$q_{nrm} = \frac{q - q_{flat}}{q_{flat}},$$

where q_{flat} represents the instantaneous solar heat load on a flat surface. Cases with a positive solar loads impact in the pedestrian areas of the park rooftop patio were further investigated by estimating the resulting surface temperatures under the augmented heat loads following the method presented in Appendix B. The temperature estimation procedure is approximate and is meant to provide familiar, relatable estimates of the solar load impacts; due to the many inherent assumptions in the method, the temperature values provide ballpark estimates and should not be taken literally. In isolated cases, the large concave reflective surface on the northwest side of the hotel causes solar focusing on the curve and Highland Ave. The after-image glare quantification metric, presented in Appendix C, is applied to assess the potential impact to motorist vision.

Solar Loads Impact on the Parking Lots

Over the course of the year, the north parking lot sees higher reflected solar loads increases compared to the west parking lot. As shown in Figure 3-3, the maximum reflected solar load augmentation on the north parking lot is 33%, whereas the west parking lot sees a maximum reflected load of 10%.

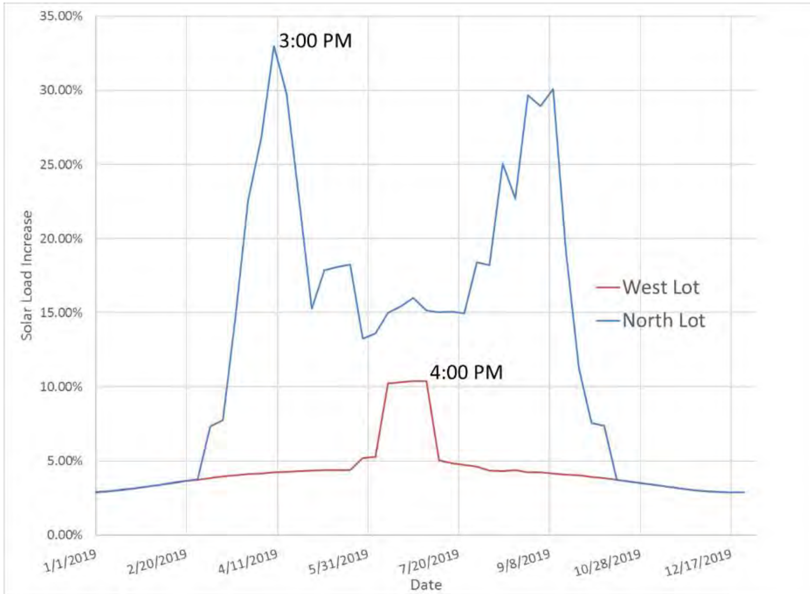
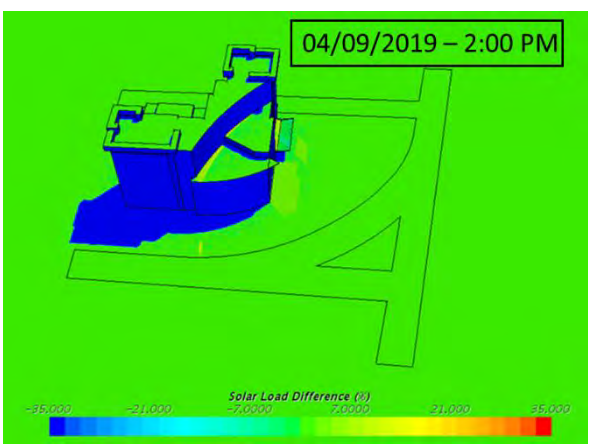
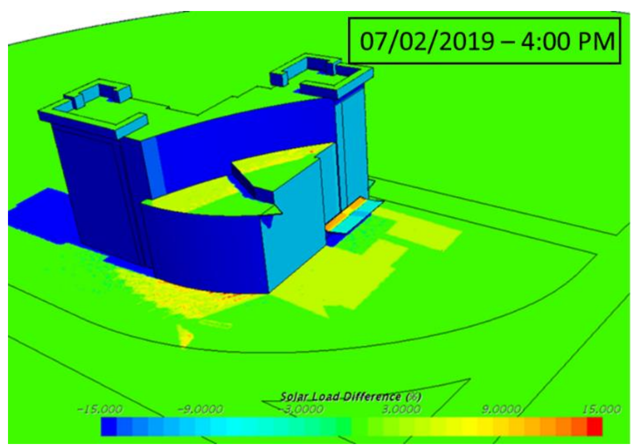


Figure 3-3. Solar load increases in on the north and west parking lots due to reflections from Caesars Republic.

Figure 3-4 shows solar load difference contours corresponding to the increases indicated in Figure 3-3. During the spring, summer, and fall months, the sun's latitude is sufficiently north to cause reflections from the northwest concave reflective surface to concentrate in localized areas in the north parking lot. An example of this is shown in Figure 3-4 (a), where a very localized region of the parking lot experiences an elevated heat load at 2:00 p.m. on April 9, 2019. The sun is never in a position where reflections from the concave surface impact the west parking lot. Therefore, maximum solar load increases are caused by reflections off the broad western windows, as shown in Figure 3-4 (b) at 4:00 p.m. on July 2, 2019.



(a)



(b)

Figure 3-4. Solar load modification on (a) the north parking lot at 2:00 p.m. on April 9, 2019, and (b) the west parking lot at 4:00 p.m. on July 2, 2019.

It is noted that solar load increases in the west parking lot are only experienced in the middle of summer, when the sun is high enough in the sky to reflect onto the parking lot in the late afternoon hours.

Solar Loads Impact on Goldwater Blvd. and the Southern Driveway

The increase heat loads experienced by both Goldwater Blvd. and the driveway on the southern side of Caesars Republic are minimal, as shown in Figure 3-5. The proximity of the driveway to the hotel is the primary cause of the increased solar load magnitudes over those experienced on Goldwater Blvd.

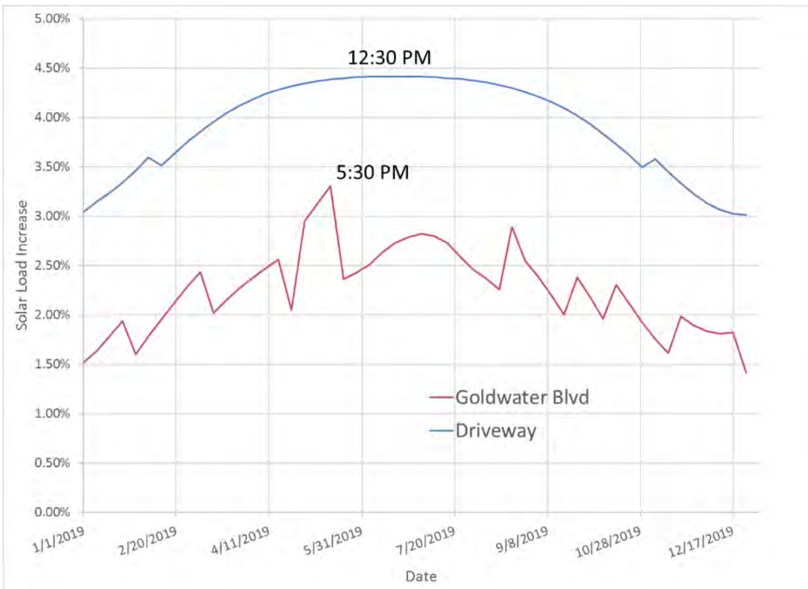
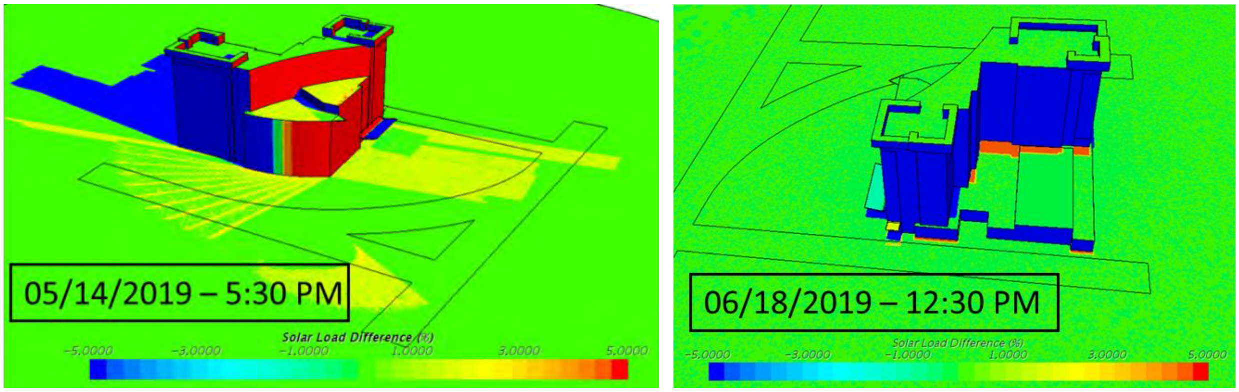


Figure 3-5. Solar load increases in on Goldwater Blvd. and the southern driveway due to reflections from Caesars Republic.

Figure 3-6 (a) shows the instance of the highest solar load increase on Goldwater Blvd. of 3.3% at 5:30 p.m. on May 14, 2019. The solar glares are minimal, especially considering they are only slightly higher than the low solar loads of the early evening sun. The highest glares pose little threat to passing motorists as they are perpendicular to the flow of traffic. As shown in Figure 3-6 (b), the highest solar loads on the driveway are 4.5% and occur at 12:30 p.m. on June 18, 2019. The solar load increases are confined to a region very close to the hotel as they are reflected vertically from the midday sun. The reflection angle poses little to no glare threat to automobiles.



(a) (b)

Figure 3-6. Solar load modification on (a) Goldwater Blvd. at 5:30 p.m. on March 14, 2019, and (b) the south driveway at 12:30 p.m. on June 18, 2019.

Solar Loads Impact Park and Rooftop Patio Pedestrian Areas

Figure 3-7 shows that, of the two areas in which pedestrians may be spending extended periods of time, the patio and the park, the patio experiences the largest increased solar loads. This is due to the patio's proximity to the concave reflective surface on the northwest side of the hotel. The largest solar load increase on the patio is 40% on October 1, 2019, at 2:00 p.m., whereas the largest solar load increase in the park is only 7% and occurs at 9:00 a.m. on June 11, 2019.

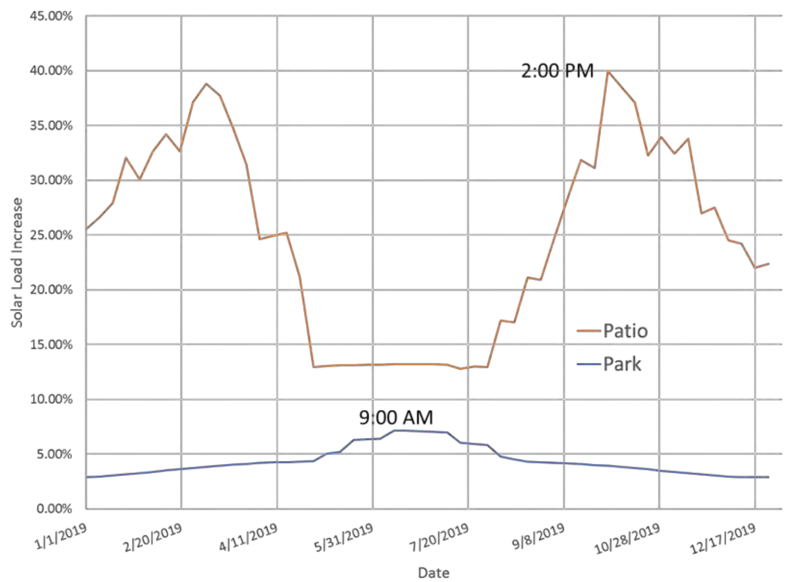
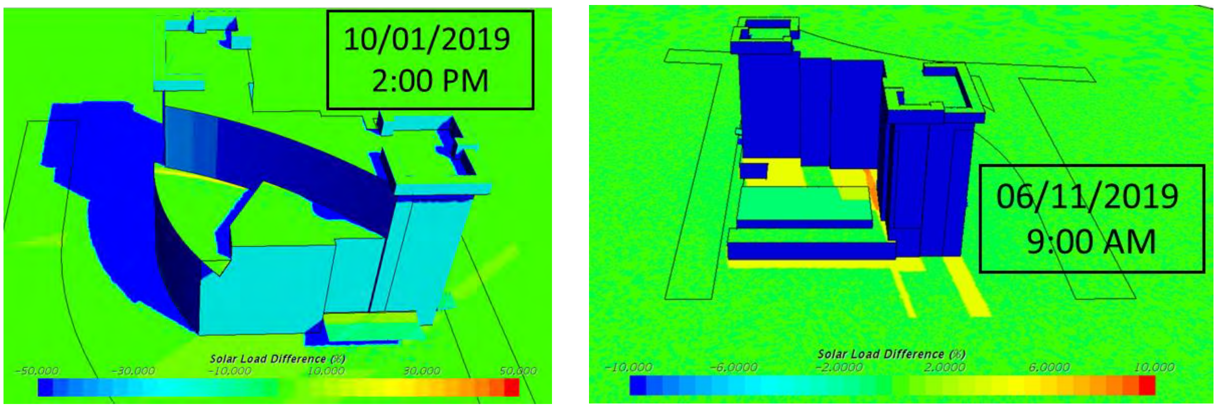


Figure 3-7. Solar load increases on the rooftop patio and park on the east side of Caesars Republic.

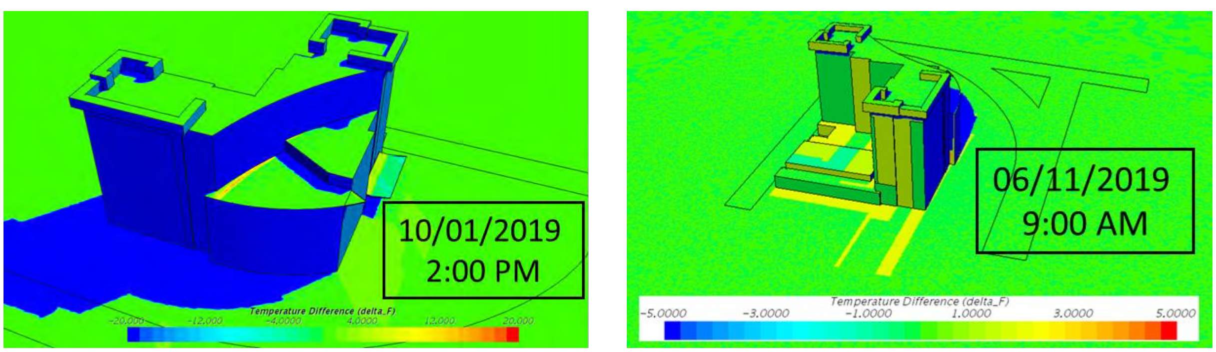
Figure 3-8 (a) shows that the largest solar load increases on the patio are confined to areas very close to the concave window while the majority of the patio surface is unaffected. The solar load increases in the park occur close to the hotel except in areas next to the tower, in which reflections stretch over across the width of the park area, as shown in Figure 3-8 (b).



(a) (b)

Figure 3-8. Solar load modification on (a) the rooftop patio at 2:00 p.m. on October 1, 2019, and (b) the east park at 9:00 a.m. on June 11, 2019.

To understand the solar loads impact on pedestrian comfort, the resulting temperatures are estimated in the park and patio areas following the procedure outlined in Appendix B. Figure 3-9 (a) shows that local heat flux augmentations seen at 2:00 p.m. on October 1 lead to an estimated 20 °F increase in patio surface temperatures in areas close to the concave window. Umbrellas or an awning may be used to ameliorate the temperature increases should it be a problem. The estimated park surface temperature increases in Figure 3-9 (b) are shown to be 2 °F and are unlikely to cause any discomfort.



(a) (b)

Figure 3-9. Equilibrium temperature predictions for (a) the rooftop patio on October 1, 2019, at 2:00 p.m. and (b) east park on June 11, 2019, at 9:00 a.m.

Solar Loads Impact on Highland Ave. and Highland/Goldwater Curve

The maximum solar load increases on Highland Ave. and the Highland/Goldwater curve are shown in Figure 3-10. The solar load increases in these areas are relatively high, with a maximum of 59% on the curve on June 25, 2019, at 4:30 p.m. and maximum of 52% on July 16, 2019, at 4:30 p.m. Increases in both areas occur in the late afternoons during summer months, when the sun shines on the concave reflective surface on the northwest side of the hotel.

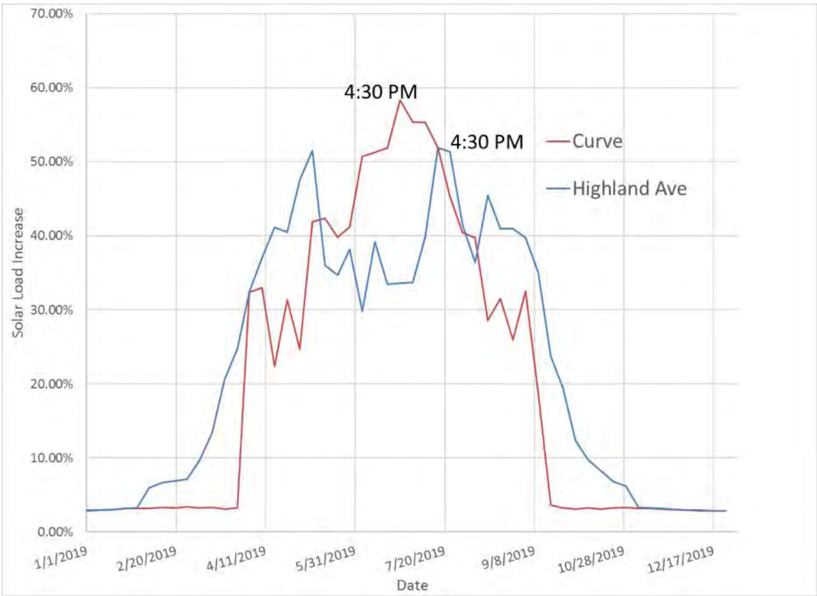
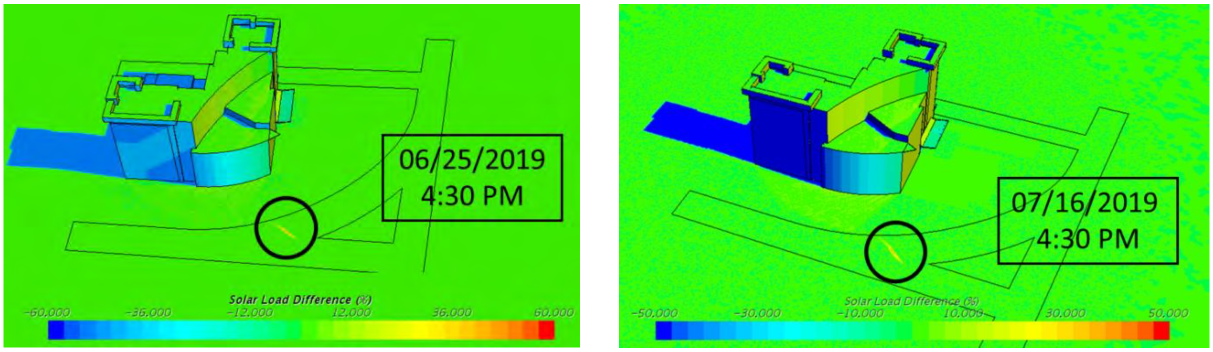


Figure 3-10. Solar load increases on Highland Ave. and the Highland/Goldwater curve.

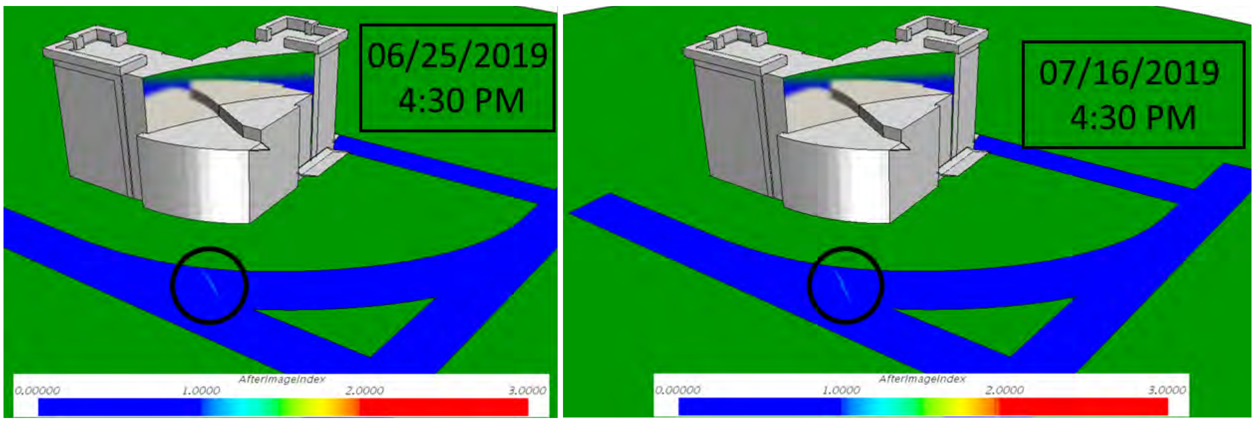
Figure 3-11 shows that the maximum solar load increase is due to solar energy being focused by the concave surface onto the road. At times the very localized solar load focus falls on Highland Ave. (July 16, 2019, at 4:30 p.m., as shown in Figure 3-11 (a), while at other times it occurs on the Highland/Goldwater curve (June 25, 2019, at 4:30 p.m., as shown in Figure 3-11 (b).



(a) (b)

Figure 3-11. Solar load modification on (a) the Highland/Goldwater curve at 4:30 p.m. on June 25, 2019, and (b) Highland Ave. at 4:30 p.m. on July 16, 2019.

To quantify the reflective glare on the roadways, the after-image metric is computed as described in Appendix C. The after-image index contours, shown in Figure 3-12, show that the glare attains a maximum index of around 1.055 in both cases. This can be interpreted as an observer having a 5.5% chance of an after-image after looking at the concave window from the location indicated in Figure 3-12. This poses a minimal threat to traffic safety, as the angle of the solar reflection is perpendicular to the direction of travel and is therefore out of a driver's line of sight.



(a) (b)

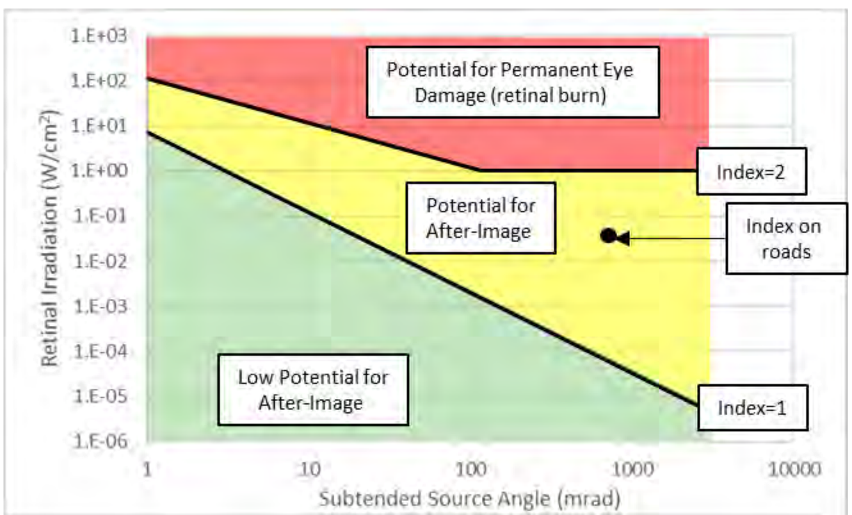


Figure 3-12. After-image index contours on (a) the Highland/Goldwater curve at 4:30 p.m. on June 25, 2019 and (b) Highland Ave. at 4:30 p.m. on July 16, 2019. (c) The index location on the empirical ocular hazard plot.

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CONCLUSION

A solar loads impact analysis was performed to assess the effect of the planned reflective Caesars Republic hotel on pedestrian areas and nearby roadways in Scottsdale, Arizona. A convergence study on the spatial discretization of the surface mesh was performed to ensure that the model of Caesars Republic was sufficiently resolved to produce accurate solar loads predictions, and a validation effort was performed in which shadows of a nearby office building from satellite imagery were compared with computational predictions to instill confidence in the computational model. Solar loads were calculated over the daylight hours of one day a week for 52 weeks to identify outlying increases in solar loads around Caesars Republic due to the presence of the reflective hotel surfaces. It was found that, depending on the time of year, different areas would experience temporary increases in thermal loads due to reflections on the hotel's reflective surfaces, especially the concave northwest window of Caesars Republic. Conservative temperature estimates predict modest local temperature increases in areas where pedestrians may spend extended lengths of time. A reflective glare analysis showed that on the nearby Highland Ave., there is a small potential for after-images, but the risk to traffic safety is minimal due to the angle of the reflected light being out of motorists' line of sight.

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Appendix A

Solar Loads Impact Over the 2019 Year

Table **Error! No text of specified style in document.**-1. Solar loads impact on the west parking lot, north parking lot, Goldwater Blvd, and the south driveway.

Date	West Parking Lot		North Parking Lot		Goldwater Blvd.		South Driveway	
	% Increase	Time	% Increase	Time	% Increase	Time	% Increase	Time
1/1/2019	3%	1:00 PM	3%	12:30 PM	2%	3:30 PM	3%	12:00 PM
1/8/2019	3%	1:00 PM	3%	12:30 PM	2%	3:30 PM	3%	12:30 PM
1/15/2019	3%	1:00 PM	3%	12:30 PM	2%	3:30 PM	3%	12:30 PM
1/22/2019	3%	1:00 PM	3%	12:30 PM	2%	3:30 PM	3%	12:30 PM
1/29/2019	3%	1:00 PM	3%	12:30 PM	2%	4:00 PM	3%	12:30 PM
2/5/2019	3%	1:00 PM	3%	12:30 PM	2%	4:00 PM	4%	12:30 PM
2/12/2019	4%	1:00 PM	4%	12:30 PM	2%	4:00 PM	4%	12:30 PM
2/19/2019	4%	1:00 PM	4%	12:30 PM	2%	4:00 PM	4%	12:30 PM
2/26/2019	4%	1:00 PM	4%	12:30 PM	2%	4:00 PM	4%	12:30 PM
3/5/2019	4%	1:00 PM	7%	2:00 PM	2%	4:00 PM	4%	12:30 PM
3/12/2019	4%	1:00 PM	8%	1:30 PM	2%	4:30 PM	4%	12:30 PM
3/19/2019	4%	1:00 PM	15%	2:30 PM	2%	4:30 PM	4%	12:30 PM
3/26/2019	4%	1:00 PM	23%	2:30 PM	2%	4:30 PM	4%	12:30 PM
4/2/2019	4%	1:00 PM	27%	2:30 PM	2%	4:30 PM	4%	12:30 PM
4/9/2019	4%	1:00 PM	33%	3:00 PM	2%	4:30 PM	4%	12:30 PM
4/16/2019	4%	12:30 PM	30%	3:00 PM	3%	4:30 PM	4%	12:30 PM
4/23/2019	4%	12:30 PM	23%	3:00 PM	2%	5:00 PM	4%	12:30 PM
4/30/2019	4%	12:30 PM	15%	3:00 PM	3%	5:30 PM	4%	12:30 PM
5/7/2019	4%	12:30 PM	18%	3:30 PM	3%	5:30 PM	4%	12:30 PM
5/14/2019	4%	12:30 PM	18%	3:30 PM	3%	5:30 PM	4%	12:30 PM
5/21/2019	4%	12:30 PM	18%	3:30 PM	2%	5:00 PM	4%	12:30 PM
5/28/2019	5%	8:00 AM	13%	4:00 PM	2%	5:00 PM	4%	12:30 PM
6/4/2019	5%	8:00 AM	14%	4:00 PM	3%	6:00 PM	4%	12:30 PM
6/11/2019	10%	4:00 PM	15%	3:30 PM	3%	6:00 PM	4%	12:30 PM
6/18/2019	10%	4:00 PM	15%	3:30 PM	3%	6:00 PM	4%	12:30 PM
6/25/2019	10%	4:00 PM	16%	3:00 PM	3%	6:00 PM	4%	12:30 PM
7/2/2019	10%	4:00 PM	15%	3:30 PM	3%	6:00 PM	4%	12:30 PM
7/9/2019	5%	8:00 AM	15%	3:30 PM	3%	6:00 PM	4%	12:30 PM
7/16/2019	5%	8:00 AM	15%	3:30 PM	3%	6:00 PM	4%	12:30 PM
7/23/2019	5%	8:00 AM	15%	3:30 PM	3%	6:00 PM	4%	12:30 PM
7/30/2019	5%	8:00 AM	18%	3:30 PM	2%	5:00 PM	4%	12:30 PM
8/6/2019	4%	1:00 PM	18%	3:30 PM	2%	5:00 PM	4%	12:30 PM
8/13/2019	4%	1:00 PM	25%	3:30 PM	2%	5:00 PM	4%	12:30 PM
8/20/2019	4%	2:00 PM	23%	3:00 PM	3%	5:30 PM	4%	12:30 PM
8/27/2019	4%	1:00 PM	30%	3:00 PM	3%	4:30 PM	4%	12:30 PM
9/3/2019	4%	12:30 PM	29%	3:00 PM	2%	4:30 PM	4%	12:30 PM
9/10/2019	4%	12:30 PM	30%	2:30 PM	2%	4:30 PM	4%	12:30 PM
9/17/2019	4%	12:30 PM	19%	2:00 PM	2%	4:30 PM	4%	12:30 PM
9/24/2019	4%	12:30 PM	11%	2:00 PM	2%	4:00 PM	4%	12:30 PM
10/1/2019	4%	12:30 PM	8%	1:30 PM	2%	4:00 PM	4%	12:30 PM
10/8/2019	4%	12:30 PM	7%	1:30 PM	2%	4:00 PM	4%	12:30 PM
10/15/2019	4%	12:30 PM	4%	12:00 PM	2%	3:30 PM	4%	12:00 PM
10/22/2019	4%	12:30 PM	4%	12:00 PM	2%	3:30 PM	4%	12:00 PM
10/29/2019	3%	12:30 PM	3%	12:00 PM	2%	3:30 PM	3%	12:00 PM
11/5/2019	3%	12:30 PM	3%	12:00 PM	2%	3:30 PM	4%	12:00 PM
11/12/2019	3%	12:30 PM	3%	12:00 PM	2%	3:30 PM	3%	12:00 PM
11/19/2019	3%	12:30 PM	3%	12:00 PM	2%	3:00 PM	3%	12:00 PM
11/26/2019	3%	12:30 PM	3%	12:00 PM	2%	3:00 PM	3%	12:00 PM
12/3/2019	3%	12:30 PM	3%	12:30 PM	2%	3:00 PM	3%	12:00 PM
12/10/2019	3%	12:30 PM	3%	12:30 PM	2%	3:00 PM	3%	12:00 PM
12/17/2019	3%	12:30 PM	3%	12:30 PM	2%	3:00 PM	3%	12:00 PM
12/24/2019	3%	12:30 PM	3%	12:30 PM	1%	3:30 PM	3%	12:00 PM

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Table A 2. Solar loads impact on the park, rooftop patio, Highland Ave., and the Highland/Goldwater curve.

Date	East Park		Rooftop Patio		Highland Ave.		Curve	
	% Increase	Time	% Increase	Time	% Increase	Time	% Increase	Time
1/1/2019	3%	12:30 PM	26%	2:30 PM	3%	12:30 PM	3%	1:00 PM
1/8/2019	3%	12:30 PM	27%	2:30 PM	3%	12:30 PM	3%	1:00 PM
1/15/2019	3%	12:30 PM	28%	2:30 PM	3%	12:30 PM	3%	1:00 PM
1/22/2019	3%	12:30 PM	32%	2:30 PM	3%	12:30 PM	3%	1:00 PM
1/29/2019	3%	12:30 PM	30%	3:00 PM	3%	12:30 PM	3%	1:30 PM
2/5/2019	3%	12:30 PM	33%	2:30 PM	6%	2:30 PM	3%	2:00 PM
2/12/2019	4%	12:30 PM	34%	2:30 PM	7%	2:00 PM	3%	2:00 PM
2/19/2019	4%	12:30 PM	33%	3:00 PM	7%	2:00 PM	3%	2:30 PM
2/26/2019	4%	12:30 PM	37%	2:30 PM	7%	2:00 PM	3%	2:30 PM
3/5/2019	4%	12:30 PM	39%	3:00 PM	10%	3:00 PM	3%	3:00 PM
3/12/2019	4%	12:30 PM	38%	2:00 PM	13%	3:00 PM	3%	3:00 PM
3/19/2019	4%	12:30 PM	35%	2:00 PM	21%	3:00 PM	3%	3:30 PM
3/26/2019	4%	12:30 PM	31%	2:00 PM	25%	3:00 PM	3%	3:30 PM
4/2/2019	4%	12:30 PM	25%	1:30 PM	32%	3:00 PM	32%	3:00 PM
4/9/2019	4%	12:30 PM	25%	1:30 PM	37%	3:30 PM	33%	3:00 PM
4/16/2019	4%	12:30 PM	25%	1:30 PM	41%	3:30 PM	22%	3:00 PM
4/23/2019	4%	12:30 PM	21%	1:30 PM	41%	4:00 PM	31%	3:30 PM
4/30/2019	4%	12:30 PM	13%	1:00 PM	48%	4:00 PM	25%	3:30 PM
5/7/2019	5%	8:00 AM	13%	1:00 PM	52%	4:00 PM	42%	4:00 PM
5/14/2019	5%	8:00 AM	13%	1:00 PM	36%	4:00 PM	42%	4:00 PM
5/21/2019	6%	8:30 AM	13%	1:00 PM	35%	4:30 PM	40%	4:00 PM
5/28/2019	6%	8:30 AM	13%	1:00 PM	38%	4:30 PM	41%	4:30 PM
6/4/2019	6%	8:30 AM	13%	1:00 PM	30%	4:30 PM	51%	4:30 PM
6/11/2019	7%	9:00 AM	13%	1:00 PM	39%	4:30 PM	51%	4:30 PM
6/18/2019	7%	9:00 AM	13%	1:00 PM	33%	4:30 PM	52%	4:30 PM
6/25/2019	7%	9:00 AM	13%	1:00 PM	34%	4:30 PM	58%	4:30 PM
7/2/2019	7%	9:00 AM	13%	1:00 PM	34%	4:30 PM	55%	4:30 PM
7/9/2019	7%	9:00 AM	13%	1:00 PM	40%	4:30 PM	55%	4:30 PM
7/16/2019	6%	8:30 AM	13%	2:00 PM	52%	4:30 PM	52%	4:30 PM
7/23/2019	6%	8:30 AM	13%	1:30 PM	51%	4:30 PM	45%	4:30 PM
7/30/2019	6%	8:30 AM	13%	1:30 PM	41%	4:30 PM	40%	4:00 PM
8/6/2019	5%	5:00 PM	17%	1:30 PM	36%	4:00 PM	40%	4:00 PM
8/13/2019	5%	5:00 PM	17%	1:30 PM	45%	4:00 PM	29%	3:30 PM
8/20/2019	4%	12:30 PM	21%	1:30 PM	41%	4:00 PM	32%	3:30 PM
8/27/2019	4%	12:30 PM	21%	1:30 PM	41%	3:30 PM	26%	3:00 PM
9/3/2019	4%	12:30 PM	25%	1:30 PM	40%	3:30 PM	33%	3:00 PM
9/10/2019	4%	12:30 PM	28%	1:30 PM	35%	3:00 PM	19%	2:30 PM
9/17/2019	4%	12:30 PM	32%	1:30 PM	24%	3:00 PM	4%	2:30 PM
9/24/2019	4%	12:30 PM	31%	1:30 PM	20%	3:00 PM	3%	3:00 PM
10/1/2019	4%	12:30 PM	40%	2:00 PM	12%	3:00 PM	3%	3:00 PM
10/8/2019	4%	12:30 PM	39%	2:00 PM	10%	2:30 PM	3%	2:30 PM
10/15/2019	4%	12:00 PM	37%	2:00 PM	8%	3:00 PM	3%	2:30 PM
10/22/2019	4%	12:00 PM	32%	2:00 PM	7%	1:30 PM	3%	2:00 PM
10/29/2019	3%	12:00 PM	34%	2:00 PM	6%	2:00 PM	3%	1:30 PM
11/5/2019	3%	12:00 PM	32%	2:00 PM	3%	11:30 AM	3%	1:30 PM
11/12/2019	3%	12:00 PM	34%	2:00 PM	3%	12:00 PM	3%	1:00 PM
11/19/2019	3%	12:00 PM	27%	2:00 PM	3%	12:00 PM	3%	1:00 PM
11/26/2019	3%	12:00 PM	28%	2:30 PM	3%	12:00 PM	3%	12:30 PM
12/3/2019	3%	12:30 PM	25%	2:30 PM	3%	12:00 PM	3%	12:30 PM
12/10/2019	3%	12:30 PM	24%	2:30 PM	3%	12:00 PM	3%	12:30 PM
12/17/2019	3%	12:30 PM	22%	2:30 PM	3%	12:00 PM	3%	12:30 PM
12/24/2019	3%	12:30 PM	22%	2:30 PM	3%	12:00 PM	3%	12:30 PM

Appendix B

Equilibrium Temperature Calculation Method

A method involving several approximations was used to estimate the surface temperature increases in the surrounding areas of Caesars Republic Hotel due to the presence of the hotel reflective surfaces. Conservative temperature estimates due to solar loads can be obtained by assuming that a given surface instantaneously reaches thermal equilibrium, i.e., the heat in balances with the heat out. The model, shown in Figure B-1 includes convection to ambient airflow over the surface and conduction into the underlying solid.

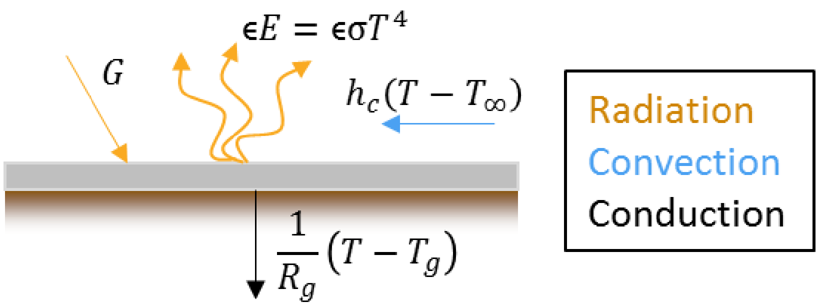

Figure B-1. Equilibrium temperature model.

Table B-1. Parameter values for equilibrium temperature model.

Parameter	Value
h_c	$27.37\left(\frac{W}{m^2K}\right)$
R_g	$1.94\left(\frac{m^2K}{W}\right)$
T_∞	300.0 K
T_g	288.7 K

The convection coefficient in Table B-1 is consistent with a 20 mph wind, and the ground resistance and temperature were taken from a derivation of the conduction through a grass surface provided in reference 8. The conduction parameters were applied to all surfaces in the computational model to provide an estimate of surface temperatures. The conduction coefficient that is accurate for grass provided a conservative approximation for the more conductive surfaces in the model. The surface temperature estimates were found by solving the energy balance for temperature.

$$\rho G + \epsilon\sigma T^4 + h_c(T - T_\infty) + \frac{1}{R_g}(T - T_g) = G \qquad (3)$$

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The temperature was found by solving for the real positive root of Equation (3):

$$T = -\frac{1}{2}\sqrt{\frac{f_1}{f_2} + \frac{f_2}{f_3}} + \frac{1}{2}\left(\frac{2a}{\sqrt{\frac{f_1}{f_2} + \frac{f_2}{f_3}}} - \frac{f_1}{f_2} - \frac{f_2}{f_3}\right)^{\frac{1}{2}}$$

Where

$$a = \frac{h_c + \frac{1}{R_g}}{\epsilon\sigma}$$

$$b = -\frac{G(1-\rho) + h_c T_\infty + \frac{T_g}{R_g}}{\epsilon\sigma}$$

$$f_1 = 4b\left(\frac{2}{3}\right)^{\frac{1}{3}}$$

$$f_2 = \left(\sqrt{3}\sqrt{27a^4 - 256b^3} + 9a^2\right)^{\frac{1}{3}}$$

$$f_3 = 2^{\frac{1}{3}}3^{\frac{2}{3}}$$

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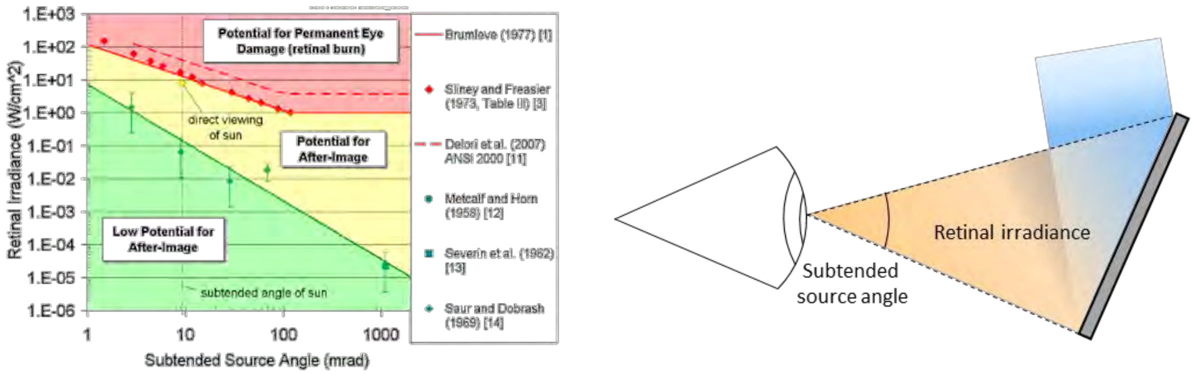
Appendix C

After-Image Reflective Glare Quantification

The effect on pedestrians from glare produced by reflections of visible light from the hotel was considered using the after-image metric defined by Ho et al. in 2011. The glare intensity is assessed by its potential to cause an after-image and is sorted into three empirically determined categories shown in the ocular hazard plot in Figure C-1 (a): “Low Potential for After-Image,” “Potential for After-Image,” and “Potential for Permanent Eye Damage.” These regions are parameterized by the retinal irradiance and subtended source angle as illustrated in Figure C-2 (b).



(a) (b)

Figure C-2. (a) Empirically defined ocular hazard plot and (b) an illustration of retinal irradiance and subtended source angle.

The after-image metric is used in the Sandia National Laboratory *Solar Glare Hazard Analysis Tool (SGHAT)* and was endorsed by the Federal Aviation Administration in 2013 to be used for assessing glare risk to pilots from solar arrays in proximity to airports.

The after-image metric was implemented through field functions in the software so that contours of the after-image index could be plotted to assess the risk of reflected glare on pedestrian surfaces. The after-image index was assigned a value of 1 on the boundary between “Low Potential for After-Image” and “Potential for After-Image” and 2 on the boundary between “Potential for After-Image” and “Potential for Permanent Eye Damage” in Figure C-1 (a). To isolate visible reflections from total solar irradiations, the direct visible solar irradiation measured from a flat surface was subtracted from the irradiance in the visible frequency band. A conservative approximation of the subtended source angle from the hotel was implemented, which resulted in higher than actual subtended angle values.

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