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CONCEPTUAL SEWER REPORT FOR THE PLATEAU DEVELOPMENT

Carson City, Nevada

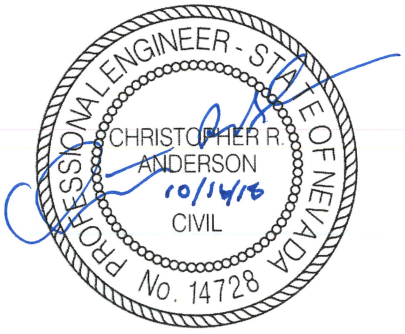
Prepared for:

TAHOE IV LLC (MR. KEITH SERPA)
P.O. BOX 1724
CARSON CITY, NEVADA 89702

Prepared by:

Manhard Consulting, Ltd.
241 Ridge Street, Suite 400, Reno, NV 89501

Job No. TIVCCNV01
October 16, 2018



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ABBREVIATIONS

ac	Acre
ac-ft	Acre-feet
bgs	Below ground surface
CCMC	Carson City Municipal Code 2005
cfs	Cubic feet per second
d/D	depth to diameter ratio
EDU	Equivalent dwelling unit
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
ft	Foot
ft^2	Square foot
ft^3	Cubic foot
fps	Feet per second
GIS	Geographical Information System
gpm	Gallons per minute
gpd	Gallons per day
Max.	Maximum
Min.	Minimum
NV	Nevada
Q_p	Peak flow
RCBC	Reinforced Concrete Box Culvert
ROW	Right of Way
vel.	Velocity

1 INTRODUCTION

1.1 PURPOSE OF STUDY

This report presents the data, methodology, and results of a conceptual sewer design report for the Plateau Development tentative map and zone change to remainder parcels. Adjacent remainder parcels that are being rezoned to multi-family and General Commercial are included in the analysis.

Future Final Maps and final designs will incorporate detailed sewer modeling and design.

This report documents the existing and proposed sewerage conditions of the proposed project:

- Existing and proposed sewershed
- Existing and proposed sewer generation rates
- Existing and proposed zoning
- Compliance with Carson City Municipal Code 2005 (CCMC) and/or other applicable ordinances

1.2 PROJECT LOCATION AND DESCRIPTION

The Plateau Development project site is in eastern Carson City, south of U.S. Highway 50 around Drako Way, located in Township 15 North, Range 20 East in portions of Sections 1 and 12.

Sanitary sewer infrastructure does not currently exist at the subject site. The nearest sanitary sewer is an 8-inch sewer main at the east end of the Morgan Mill Road that connects to the Morgan Mill sewer lift station.

Figure 1-1 shows the location of the project site. The site is not located in a FEMA flood zone. Relevant FEMA flood maps define the area as *outside the 0.2% annual chance flood.* Exhibit 1 shows the FEMA flood zone mapping adjacent to the Plateau Development.

Figure 1-1: Plateau Development Location Map

[Google Maps: https://www.google.com/maps/search/google+maps/@39.1897644,-119.7016629,4292m/data=!3m1!1e: accessed 10/10/2018]

2 METHODOLOGY AND ASSUMPTIONS

The existing zoning at the Plateau Development site is General Industrial. The proposed zone change and tentative map include the following land uses that constitute the sewershed for the Plateau Development and the remainder parcels:

- 269 Single Family Residential lots on 67.89 acres
- 18.53 acres Multi-Family
  - Estimated 250 EDUs
- 13.81 acres General Commercial

Existing and proposed conditions sewage loading is estimated based on the 2017 *Sewer System Sewer Master Plan Update* (ATKINS, 2017). Loading estimates are calculated using the unit rates in Table 2-1.

This conceptual sewer study for the Plateau Development adheres to the Carson City Municipal Code 2005 (CCMC) requirements for conceptual sanitary sewer preliminary design 12.06.360.

Table 2-1: *Sewer System Master Plan Update* Wastewater Generation Rates

Land Use Category	*Average Dry Weather Flow*	*Units*
Single-Family Residential	148	(gpd/DU)
Multi-Family Residential	123	(gpd/DU)
Office	269	(gpd/acre)
Commercial	443	(gpd/acre)
Hotel/Resort/Casino Hotels/Motels	62	(gpd/room)
Industrial	189	(gpd/acre)
Institutional	1,127	(gpd/acre)
School	158	(gpd/acre)
Prison	366	(gpd/acre)
Hospital	2,333	(gpd/acre)

Sewage generation estimates do not include wet weather flows. This assumption is based on construction of new infrastructure, segregation of the sewer system from stormwater infrastructure, and groundwater at 100 feet bgs.

A peaking factor of 1.5 was used for average daily to average peak hourly flow (ATKINS, 2017).

2.1 PIPE SIZING CRITERIA

Pipe sizing will conform to the Carson City Municipal Code Division 15.3.2 for sewer design criteria.

- Sewer capacity when peak flow is at d/D = 0.75
- Min. diameter for sewer mains is 8-inches
- Min. design velocity is 2 fps
- Max. design velocity is 10 fps

Minimum slope for sewer main pipe shall be per Table 2-2.

.

Table 2-2: Minimum Sewer Main Pipe Slope

Diameter (in)	*Minimum Slope*
8	0.4%[1]
10	0.25%
12	0.19%
15	0.14%

[1]Minimum slope for 8" PVC SDR-35 flexible pipe

3 CONCEPTUAL SEWER DESIGN RESULTS

This section discusses the results of the proposed conditions sewage generation, onsite and offsite pipe capacity, and the Morgan Mill lift station capacity.

3.1 SEWAGE GENERATION

The estimates for the existing zoning and proposed Plateau Development flows are contained in Appendix A. The methodology and assumptions are included in the calculated estimates. Table 3-1 summarizes the existing zoning and proposed conditions sewage generation.

Table 3-1: Existing Zoning Sewage Generation

	Sewage Loading (gpd)	
Land Use Category	*Ave. Day*	*Peak Hourly*
General Industrial	21,298	31,948

Table 3-2 summarizes the proposed sewage generation values.

Table 3-2: Proposed Plateau Development and Zone Change Sewage Generation

	Sewage Loading (gpd)	
Land Use Category	*Ave. Day*	*Peak Hourly*
Single Family (SF6)	39,812	59,718
Multi-Family	30,750	46,125
General Commercial	6,029	9,044
Park/Open Space	0	0
Total	**76,591**	**114,887**

The proposed conditions will increase the average day sewage loading by 55,333 gpd.

3.2 PLATEAU DEVELOPMENT PIPE CAPACITY

Pipe capacity has been estimated for the single family residential for average daily flow and peak hourly flow. The results show that the average day and peak hourly flow are contained below the maximum 0.75 d/D ratio for 8-inch PVC pipe at the minimum slope of 0.4%. Flow capacity estimate results for 8-inch PVC pipe at 0.4% slope are summarized as follows:

- d/D=16.9% for SFR ADF=27.6 gpm
- d/D=20.6% for SFR PHF=41.5 gpm

Design velocity is less than 2 fps for both ADF and PHF at 1.6 fps and 1.8 fps, respectively. This indicates that pipe will need to be designed at slopes greater than the minimum specified in the CCMC.

The manning's normal depth calculations are included in Appendix B.

The 2017 *Sewer System Sewer Master Plan Update* includes a full buildout analysis for sewer mains and assesses the capacity for potential future deficiencies (ATKINS, 2017). This buildout condition pipeline deficiency reports the sewer mains, between the proposed Plateau Development and the Morgan Mill Lift Station, as less than d/D 0.50. This implies that the loading from the Plateau Development and associated remainder parcel zone changes would not pose a sewer main capacity issue.

3.3 MORGAN MILL LIFT STATION

The sewer loading from the Plateau Development and related zone change remainder parcels flow to the Morgan Mill Lift Station. The information presented in this section was taken from the 2017 *Sewer System Sewer Master Plan Update* (ATKINS, 2017).

The *Sewer System Sewer Master Plan Update* reports the following for the Morgan Mill Lift Station.

Table 3-3: Morgan Mill Lift Station Capacity

		Dry Weather (gpm)	
Lift Station	*Pump Capacity (gpm)*	*Existing Q_p*	*Buildout Q_p*
Morgan Mill	450	483	897

Carson City staff and the *Sewer System Sewer Master Plan Update* report that the lift station pump is currently undersized for the existing flows. This indicates that the pumps will have to be upgraded with, or without, additional loading from the Plateau Development.

The force main is also experiencing low velocity per the *Sewer System Sewer Master Plan Update*. The lift station wet well has sufficient volume for existing flows and reportedly has issues with the sewage going septic. Additional flows from the proposed Plateau Development would help increase the cycle times at the lift station.

Table 3-4: Lift Station Emergency Storage Capacity

			Dry Weather		
Lift Station	*Emergency Storage (gal)*	*Existing Q_p (gpm)*	*Existing Storage (hrs)*	*Buildout Q_p (gpm)*	*Existing Storage (hrs)*
Morgan Mill	9,800	483	0.34	897	0.18

Assuming that the 80 gpm peak hour sewage loading from the Plateau Development coincides with the master plan existing peak flow, then the emergency storage time decreases to 0.29 hours.

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 GENERAL CONSIDERATIONS

This study is intended to be a preliminary sewer analysis in support of the Plateau Development tentative map and remainder parcel zone changes. Further progress towards a final design of the Plateau Development site will include a master technical sewer report specific to the final site design.

This preliminary sewer design report shows that onsite and offsite sewer mains will have capacity.

The Morgan Mill Lift Station pumping capacity is less than the existing conditions peak flow. Loading from the Plateau Development would increase this discrepancy. However, the 2017 *Sewer System Sewer Master Plan Update* identifies that the lift station pumping capacity does not meet the existing peak flow.

4.2 REGULATIONS AND MASTER PLANS

The proposed improvements and the analyses presented herein are in accordance with Carson City Municipal Code 2005.

4.3 IMPACTS TO ADJACENT PROPERTIES

There are no impacts to adjacent properties regarding sanitary sewer.

4.4 STANDARDS OF PRACTICE

This study was prepared using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable professional engineers practicing in this and similar localities.

5 REFERENCES

Carson City Municipal Code. (2005). https://library.municode.com/nv/carson_city/codes/code_of_ordinances?nodeId=CANEMUCO2005

ATKINS. (2017). Sewer Master Plan Update Final Report. Job No. 100052963. Reno, NV: Brian Janes, P.E.

Exhibit 1: FEMA FIRM

NOTES TO USERS

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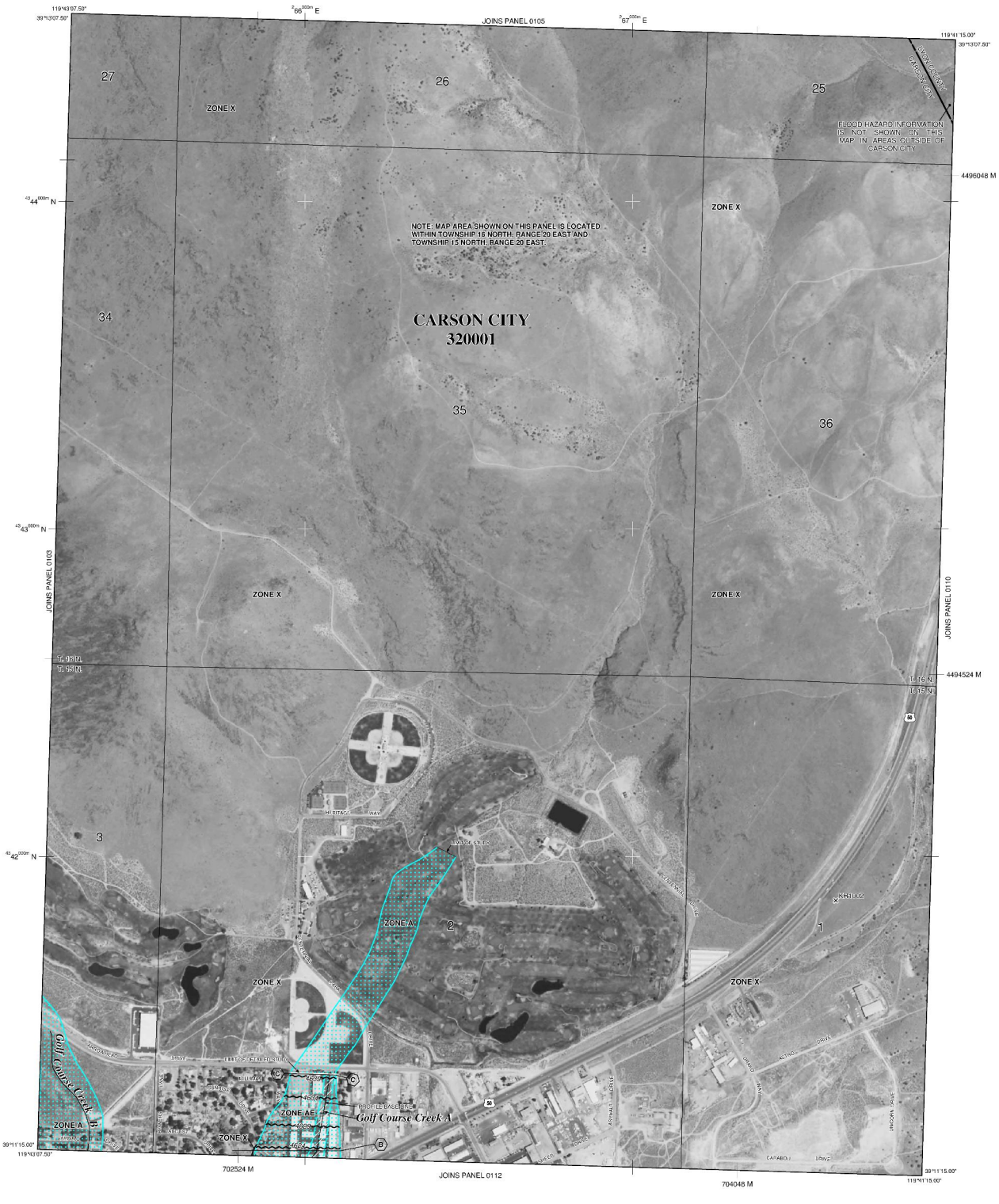

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

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.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A	Cross section line
23 — 23	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN	1000-meter Universal Transverse Mercator grid ticks, zone 11
6000000 M	5000-foot grid ticks: Nevada State Plane coordinate system, west zone (FIPSZONE 2703), Transverse Mercator
DX5510	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORY
Carson City Planning Dept, 2621 Northgate Lane, Suite 62, Carson City, Nevada 89706 (Maps available for reference only, not for distribution.)

INITIAL NFIP MAP DATE
May 24, 1974
FLOOD HAZARD BOUNDARY MAP REVISIONS
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To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0104E

FIRM
FLOOD INSURANCE RATE MAP

CARSON CITY, NEVADA
INDEPENDENT CITY

PANEL 104 OF 275
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CARSON, CITY	320001	0104	E

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INDEPENDENT CITY

PANEL 110 OF 275
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

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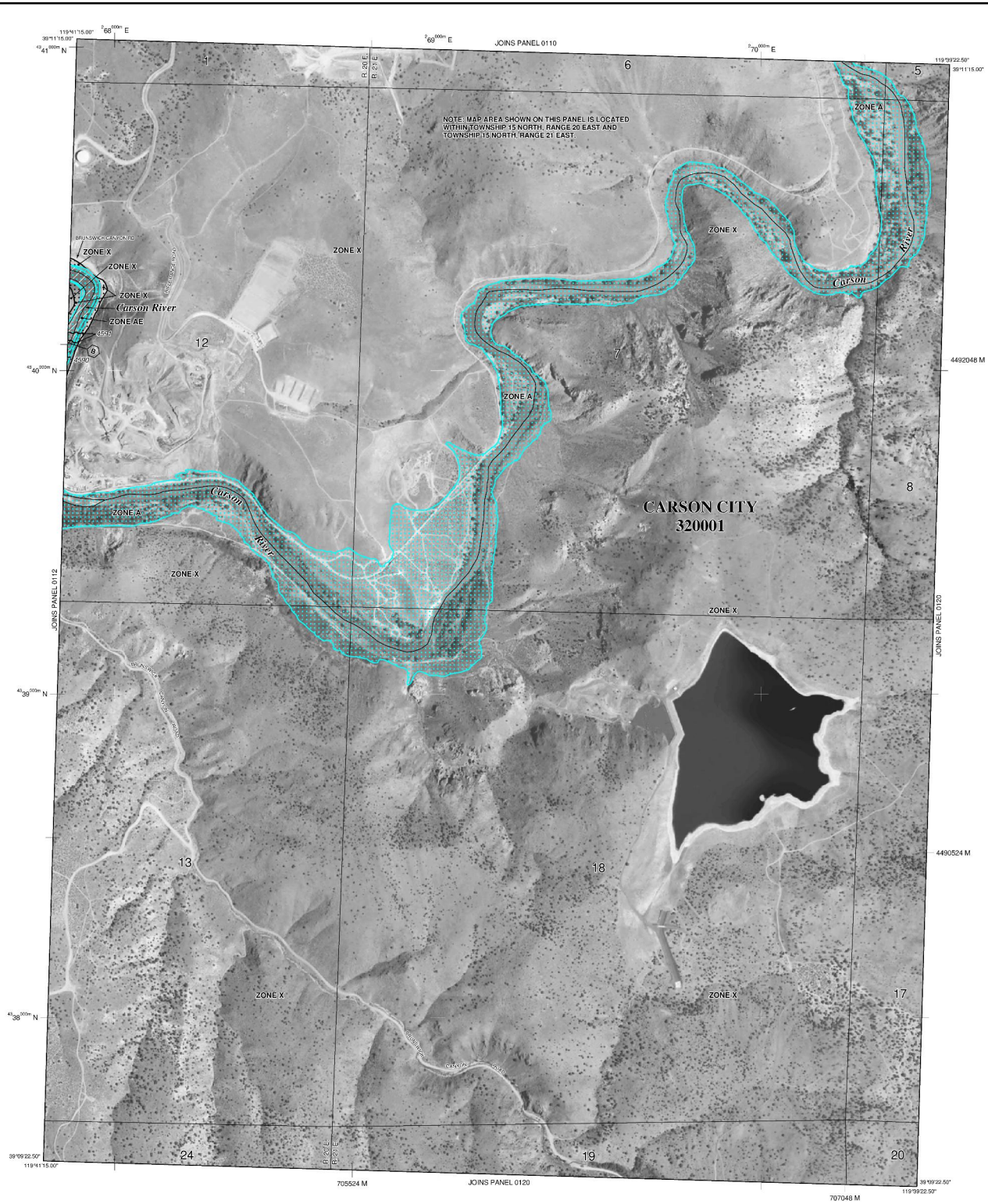

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

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.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A Cross section line
23 — 23 Transect line
97°07'30", 32°22'30" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN 1000-meter Universal Transverse Mercator grid ticks, zone 11
6000000 M 5000-foot grid ticks: Nevada State Plane coordinate system, west zone (FIPSZONE 2703), Transverse Mercator
DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 River Mile

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Carson City Planning Dept, 2621 Northgate Lane, Suite 62, Carson City, Nevada 89706 (Maps available for reference only, not for distribution.)

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MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0116E

FIRM
FLOOD INSURANCE RATE MAP

CARSON CITY, NEVADA
INDEPENDENT CITY

PANEL 116 OF 275
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CARSON, CITY	320001	0116	E

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
3200010116E

MAP REVISED
JANUARY 16, 2009

Federal Emergency Management Agency

NOTES TO USERS

use in administering the National Flood Insurance Program. It arily identify all areas subject to flooding, particularly from local s of small size. The **community map repository** should be ssible updated or additional flood hazard information.

e detailed information in areas where **Base Flood Elevations** oodways have been determined, users are encouraged to consult es and Floodway Data and/or Summary of Stillwater Elevations within the Flood Insurance Study (FIS) report that accompanies rs should be aware that BFEs shown on the FIRM represent flood elevations. These BFEs are intended for flood insurance only and should not be used as the sole source of flood ation. Accordingly, flood elevation data presented in the FIS be utilized in conjunction with the FIRM for purposes of or floodplain management.

Flood Elevations shown on this map apply only landward American Vertical Datum of 1988 (NAVD 88). Users of this e aware that coastal flood elevations are also provided in the tillwater Elevations table in the Flood Insurance Study report on. Elevations shown in the Summary of Stillwater Elevations used for construction and/or floodplain management purposes igher than the elevations shown on this FIRM.

floodways were computed at cross sections and interpolated ections. The floodways were based on hydraulic considerations equirements of the National Flood Insurance Program. Floodway er pertinent floodway data are provided in the Flood Insurance this jurisdiction.

t in Special Flood Hazard Areas may be protected by **flood res.** Refer to Section 2.4 "Flood Protection Measures" of nce Study report for information on flood control structures on.

used in the preparation of this map was Universal Transverse zone 11. The **horizontal datum** was NAD83, GRS1980 nces in datum, spheroid, projection or UTM zones used in f FIRMs for adjacent jurisdictions may result in slight positional map features across jurisdiction boundaries. These differences e accuracy of this FIRM.

on this map are referenced to the North American Vertical . These flood elevations must be compared to structure and ns referenced to the same **vertical datum.** For information rsion between the National Geodetic Vertical Datum of 1929 American Vertical Datum of 1988, visit the National Geodetic at http://www.ngs.noaa.gov/ or contact the National Geodetic llowing address:

Services

Survey

Highway
20910-3282

elevation, description, and/or location information for **bench marks** map, please contact the Information Services Branch of the tic Survey at **(301) 713-3242,** or visit its website at aa.gov/.

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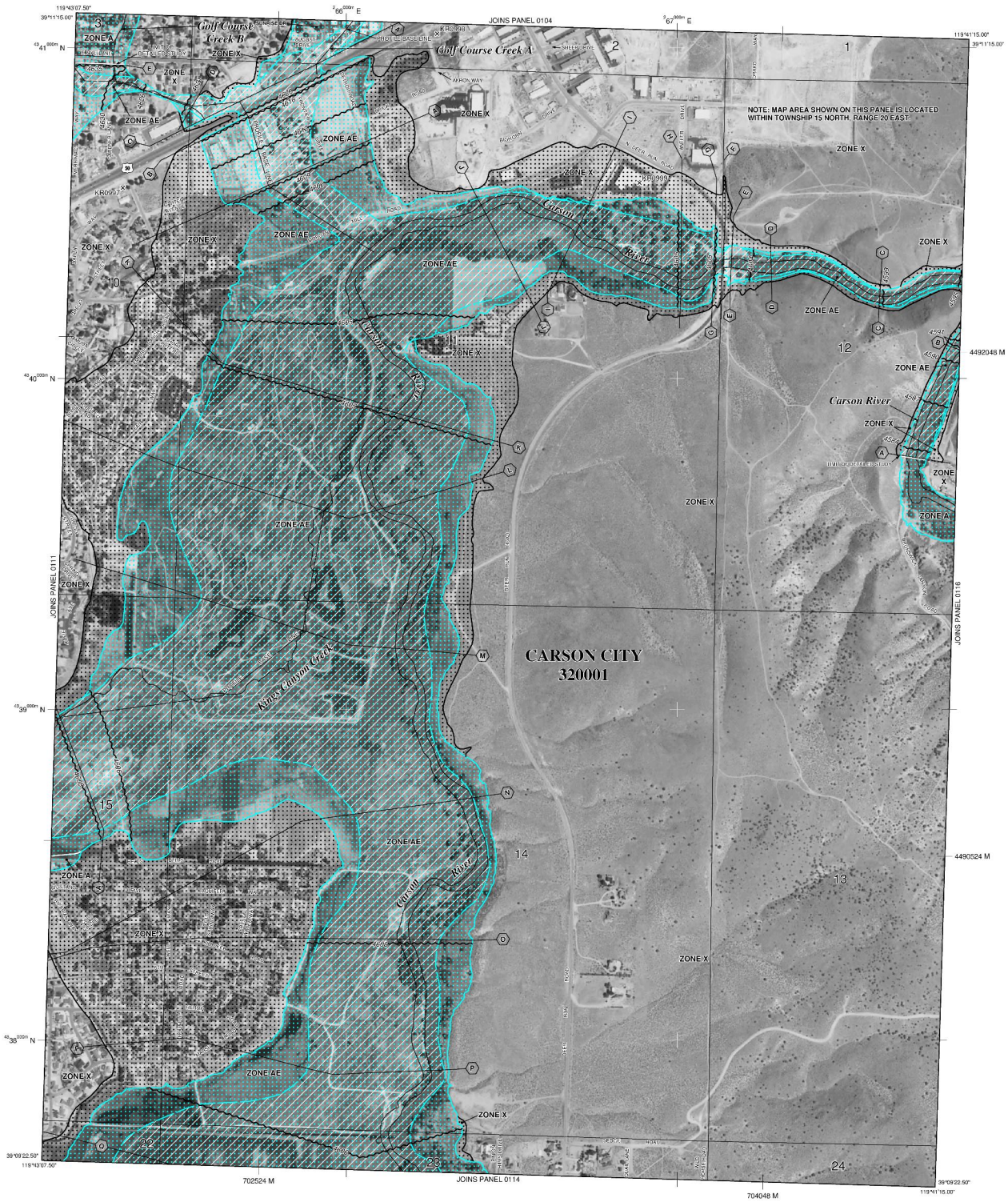

LEGEND

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DX5510	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

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150 0 150 300 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0112E

FIRM
FLOOD INSURANCE RATE MAP

CARSON CITY, NEVADA
INDEPENDENT CITY

PANEL 112 OF 275
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CARSON CITY	320001	0112	E

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MAP NUMBER
3200010112E

MAP REVISED
JANUARY 16, 2009

Federal Emergency Management Agency

Appendix A: Sewage Generation Estimates

Manhard CONSULTING LTD
241 Ridge Street, Suite 400, Reno, Nevada 89501
(775)746-3500

Project: Plateau Development TM
Subject: Sewer Loading Estimate
Client: Tahoe IV LLC
Job Code: TIV.CCNV01.00
Date: 10/10/2018
By: CAnderson
Checked: RWenziger

PLATEAU TENTATIVE MAP

Goal:

Estimates of proposed sewage generation for Plateau based on the tentative map and adjacent zone changes.
Estimates of existing sewage generation for site based on the existing zoning.

Assumptions:

- Based on Table 5-4 Carson City Sewer Master Plan Update July 2017
- Assume no groundwater infiltration
- Assume no raw acreage offset
- Peaking Factor per Table 5-1 Carson City Sewer Master Plan Update July 2017

Peaking Factor= 1.5 Average Day to Peak Hourly

	Average Loading	
Single Family Residential=	148	gpd /EDU
Duplex=	148	gpd /EDU
Apartments/Multi-Family (MF)=	123	gpd /EDU
Office=	269	gpd /ac
Commercial=	443	gpd /ac

	Average Loading	
Hotel/Resort/Casino Hotels/Motels=	62	gpd /room
Industrial=	189	gpd /ac
Institutional=	1127	gpd/ac
School=	158	gpd/ac
Prison=	366	gpd/ac
Hospital=	366	gpd/ac

					Average Day		Peak Hourly	
Existing Zoning	Acres	Lots (EDUs)	Description	Zoning	EDUs	GPD	GPM	GPD	GPM
General Industrial	112.69				0	21,298	15	31,948	22
						21,298	**15**	**31,948**	**22**

					Average Day		Peak Hourly	
Plateau TM and Zoning Change Estimate	Acres	Lots or EDUs	Description	Zoning	EDUs	GPD	GPM	GPD	GPM
Park/Common Open Space	23.4		Desert landscaping		0	0	0.0	0	0.0
Single Family Residential	67.89	269		SF6	269	39,812	27.6	59,718	41.5
Multi-Family (MF)	18.53	250		MF	250	30,750	21.4	46,125	32.0
General Commercial	13.61			GC		6,029	4.2	9,044	6.3
						76,591	**53**	**114,887**	**80**

Calculations

SFR or MF Loading: Ave. GPD=EDU*gpd/EDU
Commercial, Industrial, Office, Institutional, School, Prison, or Hospital Loading: Ave. GPD=Acres*gpd/Acre

Table 5-4 summarizes the average calibrated wastewater unit generation rates categorized by land use and the recommended values for us in future planning and forecasting on wastewater flows. The unit wastewater generation rates for each land use type were primarily determined from using water usage data for the month of February 2016 and assuming a 100% return-to-sewer ratio. Winter water usage is assumed to only include indoor water use, therefore water rates, in theory, are typically considered to equal wastewater flows. These values were further refined with the flow metering data. In addition to the flow from sewer sources, significant groundwater infiltration was observed throughout the City. As discussed in **Section 5.3.2**, it is estimated that approximately 243 gallons/acre of developed land, on average, infiltrated into the sewer system.

Table 5-4 Calibrated and Recommended Future Wastewater Unit Generation Rates

Land Use Category (Land Use Unit)	Unit	Average Flow from Sewer Sources (Q_S)	Total Flow, Q_T ($Q_S + Q_{GWI}$)
Single-Family Residential	(gpd/DU)	148	219
Multi-Family Residential	(gpd/DU)	123	140
Office	(gpd/acre)	269	467
Commercial	(gpd/acre)	443	708
Hotel/Resort/Casino Hotels/Motels	(gpd/room)	62	68
Industrial	(gpd/acre)	189	564
Institutional	(gpd/acre)	1,127	1,452
School	(gpd/acre)	158	392
Prison	(gpd/acre)	366	463
Hospital	(gpd/acre)	2,333	2,686

Table 5-1 Temporary and Permanent Flow Metering Summary

Meter Name	Meter Type	Average Daily Flow (mgd)	Average Hourly Peak Flow (mgd)	Sewer Peaking Factor
Meter 01	Temporary	0.740	1.036	1.4
Meter 02	Temporary	2.016	2.744	1.4
Meter 03	Temporary	2.212	2.877	1.3
Meter 04	Temporary	1.169	1.367	1.2
Meter 05	Temporary	0.076	0.112	1.5
North Lift Station Meter	Permanent	4.129	5.671	1.5
Headworks Meter	Permanent	6.557	8.012	1.2

Notes:

- Permanent and temporary meter data was collected during February 16 to March 9, 2017.
- The data excludes metered data collected during February 20- 22 and March 5 due to the influence of wet weather flows. Refer to **Section 5.3.3** for a general discussion on wet weather flow analysis.

Appendix B: FlowMaster Pipe Capacity Calculations

TIVCCNV01 Plateau Development Average Daily Flow Capacity

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.40	%
Diameter	8.00	in
Discharge	27.60	gal/min

Results

Normal Depth	1.35	in
Flow Area	0.04	ft²
Wetted Perimeter	0.56	ft
Hydraulic Radius	0.83	in
Top Width	0.50	ft
Critical Depth	0.11	ft
Percent Full	16.9	%
Critical Slope	0.00400	ft/ft
Velocity	1.58	ft/s
Velocity Head	0.04	ft
Specific Energy	0.15	ft
Froude Number	1.00	
Maximum Discharge	1.07	ft³/s
Discharge Full	0.99	ft³/s
Slope Full	0.00002	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	16.86	%
Downstream Velocity	Infinity	ft/s

TIVCCNV01 Plateau Development Average Daily Flow Capacity

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.35	in
Critical Depth	0.11	ft
Channel Slope	0.40	%
Critical Slope	0.00400	ft/ft

TIVCCNV01 Plateau Development Peak Hourly Flow Capacity

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.40	%
Diameter	8.00	in
Discharge	41.50	gal/min

Results

Normal Depth	1.65	in
Flow Area	0.05	ft²
Wetted Perimeter	0.63	ft
Hydraulic Radius	0.99	in
Top Width	0.54	ft
Critical Depth	0.14	ft
Percent Full	20.6	%
Critical Slope	0.00392	ft/ft
Velocity	1.78	ft/s
Velocity Head	0.05	ft
Specific Energy	0.19	ft
Froude Number	1.01	
Maximum Discharge	1.07	ft³/s
Discharge Full	0.99	ft³/s
Slope Full	0.00003	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	20.61	%
Downstream Velocity	Infinity	ft/s

TIVCCNV01 Plateau Development Peak Hourly Flow Capacity

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.65	in
Critical Depth	0.14	ft
Channel Slope	0.40	%
Critical Slope	0.00392	ft/ft