CITY OF SCOTTSDALE

Drainage Reports

PRELIMINARY DRAINAGE REPORT

MUSEUM SQUARE

2nd Steet and Marshall Way

Scottsdale, AZ

Prepared For:

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ARIZONA, U.S.A.
EXPIRES 12-31-18

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Table of Contents

1. INTRODUCTION 4
2. LOCATION AND PROJECT DESCRIPTION 4
2.1 LOCATION: 4
2.2 EXISTING AND PROPOSED DEVELOPMENTS SURROUNDING THE SITE: 4
2.3 EXISTING SITE DESCRIPTION: 4
2.4 PROPOSED SITE DEVELOPMENT: 5
2.5 FLOOD HAZARD ZONE: 5
3. EXISTING DRAINGE CONDITIONS 5
3.1 DRAINAGE PATTERNS 5
3.2 ON-SITE RETENTION 5
3.3 EXISTING STORM SEWER SYSTEMS 6
4. PROPOSED STORM WATER MANAGEMENT 6
4.1 DESIGN INTENT: 6
4.2 DESIGN STORM REQUIREMENTS: 7
4.3 LAND CHARACTERISTICS 7
4.4 STORMWATER RETENTION: 8
4.5 PIPE CAPACITY CALCULATIONS: 10
4.6 STORM DRAIN INLET CALCULATIONS 10
4.7 ADEQ WATER QUALITY REQUIREMENTS 10
5. FLOOD SAFETY FOR DWELLINGS 10
5.1 FINISHED FLOOR ELEVATIONS 10
6. CONCLUSIONS 10
6.1 OVERALL PROJECT: 10
6.2 PROJECT PHASING: 10
7. WARNING AND DISCLAIMER OF LIABILITY 10
8. REFERENCES 10

LIST OF FIGURES:

FIGURE 1 - Vicinity Map
FIGURE 2 - Aerial
FIGURE 3 - FIRM
FIGURE 4 - Parcel APN Exhibit
FIGURE 5 - Proposed Development Plan

APPENDIX:

APPENDIX I - Rainfall Data
APPENDIX II - Calculations
APPENDIX III - Preliminary Grading Plan
APPENDIX IV - Drainage Report for Marshall Way

1. INTRODUCTION

This Preliminary Drainage Report represents the storm water analysis for the Museum Square mixed-use project proposed in Scottsdale, Arizona. The purpose of this report is to provide the hydrologic and hydraulic analyses, required by the City of Scottsdale, to support the proposed site plan for said development. This report includes discussions and calculations defining the storm water management concepts for the collection and conveyance necessary to comply with the drainage requirements of the City of Scottsdale and Maricopa County. Preparation of this report has been done in accordance with the requirements of the City of Scottsdale Design Standards & Policies Manual (DS&PM) 2018 [1], and the Drainage Design Manuals for Maricopa County, Arizona, Volumes I[2] and Volume II

2. LOCATION AND PROJECT DESCRIPTION

2.1 LOCATION:

The subject property is generally located just south of Main Street's Gallery District, south of the Museum of the West (MOW) and the Scottsdale Artist's School.

- A portion of the Northeast quarter of Section 27, Township 2 North, Range 4 East of the Gila and Salt River Base and Meridian, Maricopa County, Scottsdale, Arizona.
- Parcel ID -The project generally affects the following parcels:
  Hotel: North of 2nd Street and west of Marshall Way. Part of APNs 130-13-106, -108, and -109A
  Apartment / Condos: North of 2nd Street east of Marshall Way. APNs 130-13 -164A, -165A, -166A, and -169B
  2nd Street ROW: APNs 130-13-111 and -112 (from Goldwater Blvd to Marshall Way). Plus 121A and 131A
  Marshall Way ROW: APNs 130-13-107 and -117 (from Goldwater Blvd to an alley south of E Main Street).
  Residential Buildings: Courtyard at Main Street Plaza Scottsdale Condominium (MCR 973-06 and Loloma Partial Replat (MCR 823-22), and APN 130-12-172 an access drive.

  Refer to **FIGURE 4** for additional parcel information.

Refer to **FIGURE 1** - **Vicinity Map** for the project's location with respect to major cross streets

2.2 EXISTING AND PROPOSED DEVELOPMENTS SURROUNDING THE SITE:

The site is bound as follows:

- West and South: N. Goldwater Boulevard
- North: Existing Residential (NW) and the Museum of the West (NE)
- East: Marshall Way
- Center: 2nd Street

2.3 EXISTING SITE DESCRIPTION:

The project area is fully developed as commercial.

- The proposed hotel parcel is approximately 1.09 acres.
- The proposed residential parcel is approximately 3.04 acres.

- The proposed apartment / condo parcel is approximately 0.91 acres (mcr)
- The project consists of additional areas yet to be described.

Refer to **FIGURE 2** attached for an aerial of the site.

2.4 PROPOSED SITE DEVELOPMENT:

Site development includes the demolition of the existing Loloma Station Transportation Center buildings and partial removal of the Stagebrush Theatre. New development includes the following:

- "The Arizonan" luxury hotel
- Apartment / Condo building
- Three residential buildings
- Underground parking
- Associated surface parking, landscaping, and amenities.
- Improvements to Marshall Way
- Improvements to 2nd Street

Refer to **FIGURE 5** for proposed development plan.

2.5 FLOOD HAZARD ZONE:

As defined by the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona, and Incorporated Areas, Community number 045012, Panel 2235 of 4425, as shown on Map Number 04013C2235L dated October 16, 2013, this site is designated as **Zone "X"**. As such, it is determined to be outside the 0.2% annual chance of floodplain. Refer to **FIGURE 3** for the FIRM map.

3. EXISTING DRAINAGE CONDITIONS

3.1 DRAINAGE PATTERNS:

The referenced drainage report for Marshall Way indicates the drainage for the "blocks" generally goes from the northwest to the southeast, into the adjacent roadways, and is collected in catch basins or is conveyed within the road systems. Flows travel southerly in Marshall Way with portions of the runoff splitting at each crossing street and traveling to the east in the respective streets.

Preliminary Flow2D modeling indicates some portions of the roadways do not have capacity within the curb lines for the 100-YR event but the high-water elevations remain below building finish floor elevations. Refer to the referenced report for additional information.

3.2 ON-SITE RETENTION:

Apartment/Condominium Parcel: No retention basins are existing on this site.

Hotel Parcel: No retention basins are existing on this site.

Residential Buildings Parcel: There are three stormwater storage facilities on the residential buildings site. Two basins discharge via dry-wells. Due to the proposed underground parking structure, these dry-wells will be removed. Existing retention volumes based on field topography compared to volumes stated in *Main Street Plaza Scottsdale*[5] report are summarized below:

EXISTING STORMWATER BASIN VOLUME SUMMARY		
BASIN ID	Volume from field topographic survey (c.f.)	*From Referenced Main Street Plaza Scottsdale Report (c.f.)
A	7,231	5,967
B	18,777	13,800
C	1,559	1,867
TOTAL	27,567	21,634

Refer to **Appendix II** for Existing Retention Exhibit and calculations.

Generally, runoff discharges to the Indian Bend Wash. The site drainage is described below. Runoff is calculated as follows:

$Q_{100}=C_{wt}IA$

Where: C_{wt} = The runoff coefficient relating runoff to rainfall

I = Average rainfall intensity in inches/hour, lasting for Tc (use 7.48 in/hr per NOAA)

Tc = The time of concentration (minutes) Use 5 minutes for developed area)

A = The contributing drainage area in acres

3.3 EXISTING STORM SEWER SYSTEMS:

There is no apparent public underground storm system within the immediate area of the property on North Marshall Way, East 1st Street or the alley way on the north side of the property.

- There is a 24" storm drain lateral in Goldwater Boulevard that connects two existing curb opening catchbasins with 17-foot wings located at the curb returns in Marshall Way. This drainage system outfalls into the Indian Bend Wash.
- There are two 3-foot catchbasins with 17-foot wings located at the curb returns on 2nd Street west of Marshall Way. There is also a catch basin on Marshall Way at the northwest curb return with an 18" lateral. These basins discharge into a 72-inch diameter storm drain in 2nd Street.
    - **Proposed upgrades to 2nd Street will require the relocation / reconstruction of these catch basins.**
- Existing scuppers located along the west curb line of Marshall Way allow a small amount of runoff to drain into a Low Impact Design linear basin and bio swales in the MOW property.

4. PROPOSED STORM WATER MANAGEMENT

4.1 DESIGN INTENT:

On-site drainage may be handled within paved areas, through curb openings, underground storm systems, or onsite channels where necessary. Retention will be provided as defined by Section 4.2 below.

Any designed retention will be provided as allowed by site configuration within open spaces and have total discharge of the storm water within thirty-six hours. The ultimate outfall(s) remain the historical outlets.

Refer to Section 5 below for a discussion on proposed finished floor elevations.

4.2 DESIGN STORM REQUIREMENTS:

The storm water system will be designed in accordance with City of Scottsdale Design Standards and Polices Manual. This is a re-development of existing commercial land; therefore, the City of Scottsdale allows that on-site retention shall be provided to store the difference between the existing vs. proposed development runoff from the 100-year 2-hour storm event while, as a minimum, maintaining existing storage or providing first flush storage, whichever is greater.

4.3 LAND CHARACTERSITICS:

For this preliminary investigation, the entire area being impacted by development, including Marshall Way and 2nd Street, is being considered to define overall changes. Refer to the Cwt Exhibits for study boundary delineation. Based on Figure 4.1-4 of the DS&PM, runoff coefficients for the 100-year storm event used are as follows:

- C=0.95 for paved streets, parking lots and roof areas
- C=0.45 for undisturbed natural desert or desert landscape
- C=0.30 for grassed areas

HYDROLOGIC ANALYSIS: The hydrologic analysis is determined using the procedures in the City of Scottsdale Design Standards & Policies Manual and the Drainage Design Manual for Maricopa County, Arizona, Volume I. The Rational Method was utilized to compute the on-site peak discharges. The Rational Method equation is used as shown below:

$Q=C_{wt}IA$

Where: C_{wt} = The runoff coefficient relating runoff to rainfall
I = Average rainfall intensity in inches/hour, lasting for Tc
Tc = The time of concentration (Using Five minutes for the developed areas)
A = The contributing drainage area in acres

C_{wt} CALCULATIONS:

❖ **RESIDENTIAL PARCEL (Three High-Rise buildings)**

➢ Pre-development (Existing Conditions) (Refer to EXHIBIT "A" in Appendix II)
- Landscape area (Desert): 1.23 ac @ C=0.45
- Impervious areas (Roof / Pavement): 2.52 ac @ C=0.95

(Total area to street centerline) C_{wt}: **3.75 ac @ C_{wt} = 0.79**

➢ Post-development (Proposed Conditions) (Refer to EXHIBIT "B" in Appendix II)
- Landscape area (Desert): 1.08 ac @ C=0.45
- Impervious Ares (Roof / Pavement): 2.67 ac @ C=0.95

(Total area to street centerline) C_{wt}: **3.75 ac @ C_{wt} = 0.81**

❖ **HOTEL PARCEL (NWC Marshall Way & 2nd Street)**

- Pre-development (Existing Conditions) (Refer to EXHIBIT "A" in Appendix II)
  - Landscape area (Desert): 0.64 ac @ C=0.45
  - Impervious areas (Roof / Pavement): 1.45 ac @ C=0.95
    (Total area to street centerline) C_{wt}: **2.09 ac @ C_{wt} = 0.80**

- Post-development (Proposed Conditions) (Refer to EXHIBIT "B" in Appendix II)
  - Landscape area (Desert): 0.37 ac @ C=0.45
  - Impervious Ares (Roof / Pavement): 1.72 ac @ C=0.95
    (Total area to street centerline) C_{wt}: **2.09 ac @ C_{wt} = 0.86**

❖ **APARTMENT/CONDO PARCEL (NEC Marshall Way & 2nd Street)**

- Pre-development (Existing Conditions) (Refer to EXHIBIT "A" in Appendix II)
  - Landscape area (Desert): 0.08 ac @ C=0.45
  - Impervious areas (Roof / Pavement): 1.21 ac @ C=0.95
    (Total area to street centerline) C_{wt}: **1.29 ac @ C_{wt} = 0.92**

- Post-development (Proposed Conditions) (Refer to EXHIBIT "B" in Appendix II)
  - Landscape area (Desert): 0.37 ac @ C=0.45
  - Impervious Ares (Roof / Pavement): 0.92 ac @ C=0.95
    (Total area to street centerline) C_{wt}: **1.29 ac @ C_{wt} = 0.81**

RUNOFF RATE COMPARISON:

Based on a Tc of 5 minutes, existing condition and proposed development rates for the 100-yr storm event are calculated as follows:

❖ **RESIDENTIAL PARCEL (Three High-Rise buildings)**

Q_{100} EXIST = 0.79 * 7.44 in/hr * 3.75 ac = **22.04 CFS**

Q_{100} PROP = 0.81 * 7.44 in/hr * 3.75 ac = **25.60 CFS** or a 16.2% increase.

❖ **HOTEL PARCEL (NWC Marshall Way & 2nd Street)**

Q_{100} EXIST = 0.80 * 7.44 in/hr * 2.09 ac = **12.44 CFS**

Q_{100} PROP = 0.86 * 7.44 in/hr * 2.09 ac = **13.37 CFS** or a 7.5% increase.

❖ **APARTMENT/CONDO PARCEL (NEC Marshall Way & 2nd Street)**

Q_{100} EXIST = 0.92 * 7.44 in/hr * 1.29 ac = **8.83 CFS**

Q_{100} PROP = 0.81 * 7.44 in/hr * 1.29 ac = **7.77 CFS** or a 12% decrease.

OVERALL COMPARISON: Existing = 22.04 + 12.44 + 8.83 = **43.31 cfs**
Proposed = 25.60 + 13.37 + 7.77 = **46.74 cfs** or a 7.9% increase.

4.4 STORMWATER RETENTION:

In accordance with COS requirements, existing retention volume plus volume required from Proposed vs Existing 100-yr, 2-hr event shall be stored or first flush, whichever is greater.

REQUIRED STORAGE Based on Existing vs Proposed conditions:
Stormwater storage for required First Flush treatment is calculated In accordance with the COS – DS&PM.
Required Retention (Acre-Feet) = (0.5"/12)*A*(C_{prop})

Stormwater storage for 100-yr, 2-hr event required is calculated In accordance with the COS – DS&PM.
Required Retention (Acre-Feet) = (P/12)*A*(C_{prop} – C_{exist})
Where: P = 100 Yr. 2 Hr. Precipitation in Inches (Ref: NOAA Atlas 14 in Appendix I)
A = Area (Acres)
C = Cpost – Cpre

- **RESIDENTIAL PARCEL (Three High-Rise buildings)**
  - **First Flush:** (0.5"/12)*3.75 ac *(0.81) = 0.127 ac-ft or 5,532 cf
  - **100-yr, 2- hr:** (2.16 in/12) * 3.75 ac * (0.81 – 0.79) = 0.014 ac-ft or 610 cf.
  - **Existing storage:** 27,567 cf per section 3.2 above
    - **Required Storage: 27,567 cf + 610 cf = <u>28,177 cf</u>**

- **HOTEL PARCEL (NWC Marshall Way & 2nd Street)**
  - **First Flush:** (0.5"/12)*2.09 ac *(0.86) = 0.075 ac-ft or 3,267 cf
  - **100-yr, 2- hr:** (2.16 in/12) * 2.09 ac * (0.91 – 0.80) = 0.042 ac-ft or 1,830 cf
  - **Existing storage:** None
    - **Required Storage: FF = <u>3,267 cf.</u>**

- **APARTMENT/CONDO PARCEL (NEC Marshall Way & 2nd Street)**
  - **First Flush:** (0.5"/12)*1.29*(0.81) = 0.044 ac-ft or 1,917 cf
  - **100-yr, 2- hr:** (2.16 in/12) * 1.29 ac * (0.81 – 0.92) = -0.026 ac-ft or -1,133 cf (no increase)
  - **Existing storage:** None
    - **Required Storage: FF = <u>1,917 cf.</u>**

STORAGE PROVIDED:

- **RESIDENTIAL PARCEL (Three High-Rise buildings)**
  8,425 cf provided (in four basins) < 28,177 cf required. Due to the lack of space available for retention, a waiver will be requested for the difference.
- **HOTEL PARCEL (NWC Marshall Way & 2nd Street)**
  3,637 cf provided > 3,267 cf required
- **APARTMENT/CONDO PARCEL (NEC Marshall Way & 2nd Street)**
  2,004 cf provided > 1,917 cf required

Refer to **Appendix II** for retention volume calculations.

STORMWATER DISCHARGE:
All six (6) basins proposed for the overall development will be a maximum one (1) foot depth and, therefore, will be drained by percolation.

4.5 PIPE CAPACITY CALCULATIONS:

These calculations will be provided in the Final Drainage Report

4.6 STORM DRAIN INLET CALCULATIONS

These calculations will be provided in the Final Drainage Report

4.7 ADEQ WATER QUALITY REQUIREMENTS

If the limit of disturbance exceeds one (1) acre, a NOI will be submitted to ADEQ and an approved NOI Certification from ADEQ with an AZCON number will be provided to the City during Improvement Plans submittal.

5. FLOOD SAFETY FOR DWELLINGS

5.1 FINISHED FLOOR ELEVATIONS

The building finished floor elevations (FFE) are protected from flooding as follows:

- The FFE will be set a minimum of 14 inches above emergency overflow points. The ultimate outflow(s) for this project will maintain historical outfall location.
- The FFE will be set a minimum of 12 inches above the 100-year high-water elevation of any adjacent streets, retention basins and drainage paths.

  This will ensure that each building will be well above the 100-year water level.

6. CONCLUSIONS

6.1 OVERALL PROJECT:

1. The buildings FFE is set at an elevation a minimum of 12" above the adjacent HWE and 14" above the ultimate outfall elevation.
2. Proposed retention basins will drain within 36-hours

6.2 PROJECT PHASING:

Phasing to be determined

7. WARNING AND DISCLAIMER OF LIABILITY

RE: following page.

8. REFERENCES

1. *Design Standards & Policies Manual, City of Scottsdale – 2018*
2. *Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology, Flood Control District of Maricopa County, Fourth Edition, August 15, 2013*
3. *Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics, Flood Control District of Maricopa County, August 15, 2013*
4. *Drainage Report – Marshall Way Goldwater Blvd to Indian School Road prepared by Dibble Engineering dated August 8, 2017 (Project No.: TD01/1015013.02)*
5. *Drainage Master Plan Update for Main Street Plaza Scottsdale and Conceptual Drainage Report for Main Street Plaza Scottsdale Phases II and III, prepared by Gannett Fleming, Inc., dated June 29, 2005*

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.

_____	_____	_____
Plan Check No.	Owner or Agent	Date

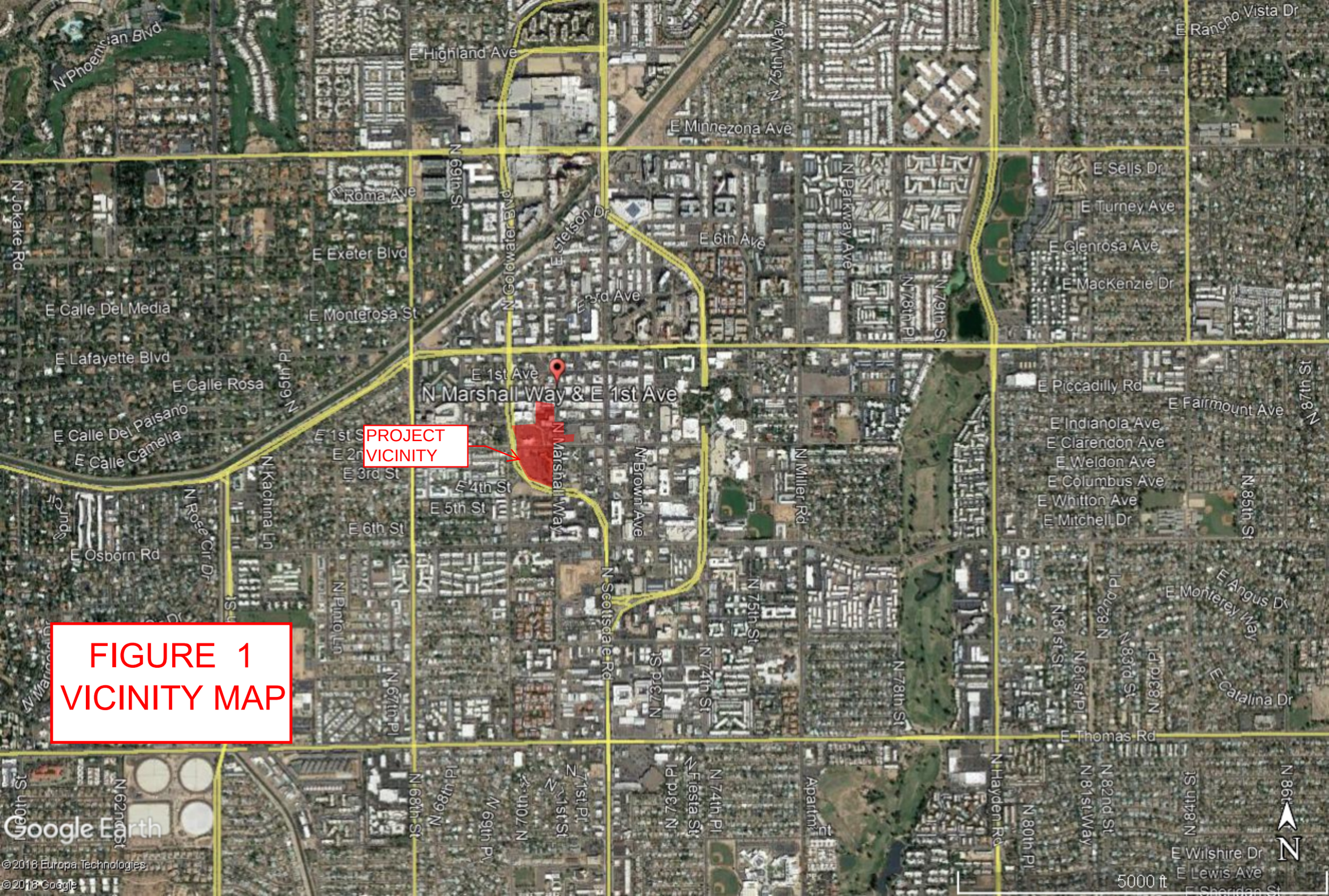


FIGURE 1
VICINITY MAP

FIGURE 2
AERIAL

NOTES TO USERS

This map is for use in administering the Nation Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Arizona State Plane Central zone (FIPSZONE 0202). The **horizontal datum** was NAD 83 HARN, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988 (NAVD 88). These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. Map users wishing to obtain flood elevations referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29) may use the following Maricopa County website application: http://www.fcd.maricopa.gov/Maps/gismaps/apps/gdacs/application/index.cfm

This web tool allows users to obtain point-specific datum conversion values by zooming in and hovering over a VERTCON checkbox on the layers menu on the left side of the screen. The VERTCON grid referenced in this web application was also used to convert existing flood elevations from NGVD 29 to NAVD 88.

To obtain current elevation, description, and/or location information for National Geodetic Survey bench marks shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at http://www.ngs.noaa.gov. To obtain information about Geodetic Densification and Cadastral Survey bench marks produced by the Maricopa County Department of Transportation, please visit the Flood Control District of Maricopa County website at:
http://www.fcd.maricopa.gov/Maps/gismaps/apps/gdacs/application/index.cfm.

Base map information shown on this FIRM was derived from multiple sources. Aerial imagery was provided in digital format by the Maricopa County Department of Public Works, Flood Control District. The imagery is dated October 2009 to November 2009. Additional National Agricultural Imagery Program (NAIP) imagery was provided by the Arizona State Land Department (ALRIS) and is dated 2007. The coordinate system used for the production of the digital FIRM is State Plane Arizona Central NAD83 HARN, International Feet.

The **profile baseline** depicted on this map represents the hydraulic modeling baselines that match flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

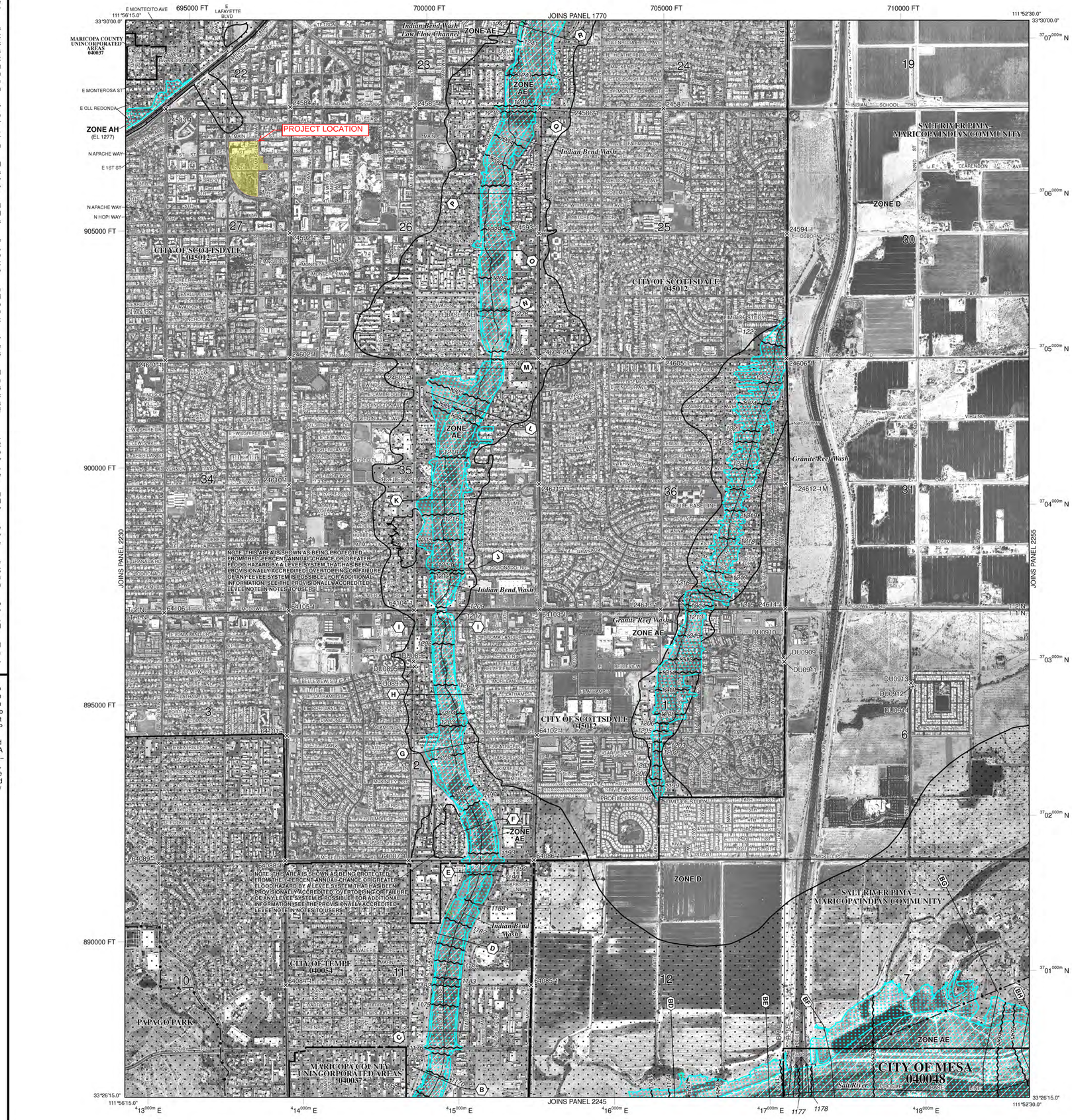
Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For Information on available products associated with this FIRM, visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/.

Provisionally Accredited Levee Notes to Users: Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1–percent–annual–chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To maintain accreditation, the levee owner or community is required to submit the data and documentation necessary to comply with Section 65.10 of the NFIP regulations by June 25, 2011. If the community or owner does not provide the necessary data and documentation or if the data and documentation provided indicate the levee system does not comply with Section 65.10 requirements, FEMA will revise the flood hazard and risk information for this area to reflect de–accreditation of the levee system. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at http://www.fema.gov/business/nfip/index.shtm.



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 12
6000000 M	5000-foot grid ticks: Arizona State Plane coordinate system, central zone (FIPSZONE 0202), Transverse Mercator
DX5510	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
April 15, 1988
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
July 19, 2001 September 30, 2005
October 16, 2013 –to advance suffix, to add floodway, to change base flood elevations, to change floodway, to update corporate limits, to add roads and road names, to incorporate previously issued letters of map revision, to add base flood elevation, and to add special flood hazard areas.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

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" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2235L

FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS

PANEL 2235 OF 4425
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	2235	L
MESA, CITY OF	040048	2235	L
SCOTTSDALE, CITY OF	045012	2235	L
TEMPE, CITY OF	040054	2235	L

FIGURE 3

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
04013C2235L

MAP REVISED
OCTOBER 16, 2013

Federal Emergency Management Agency

Map

FIGURE 4
Parcel ID Exhibit

5/17/2018 10:21:03 AM

FIGURE 4
Parcel ID Exhibit

	LALOMA PARCEL EXHIBIT					
	PARCEL No.	APN	SUB-APN	AREA (SF)	SUB AREA (SF)	OWNER
1	1	130-13-101		18,467		COS
2	2	130-13-100		15,552		COS
3	3	130-13-102		440		COS
4	4	130-13-106		73,082		COS
5	5	130-13-103		3,352		COS
6	6	130-13-108		7,585		COS
7	7	130-13-105A		3,365		COS
8	8	130-13-109A		85,511		COS
9	9	130-13-404	Tract CE	54,131		COS
10	9a		130-13-345		2,312	COS
11	9b		130-13-357		2,138	COS
12	9c		130-13-385		2,761	COS
13	9d		130-13-356		1,723	COS
14	9e		130-13-371		1,865	COS
15	9f		130-13-342		1,012	COS
16	9g		130-13-383		1,667	COS
17	9h		130-13-341		2,953	COS
18	9i		130-13-369		2,332	COS
19	9j		130-13-340		2,158	COS
20	9k		130-13-346		3,112	COS
21	9l		130-13-397		2,331	COS
22	9m		130-13-387		1,866	COS
23	9n		130-13-359		1,674	COS
24	9o		130-13-360		1,018	COS
25	9p		130-13-388		1,666	COS
26	9q		130-13-349		1,909	COS
27	9r		130-13-389		2,324	COS
28	9s		130-13-350		2,017	COS
29	9t		130-13-366		2,513	COS
30	9u		130-13-391		3,966	COS
31	9v		130-13-353		1,908	COS
32	9w		130-13-390		4,011	COS
33	9X		130-13-351		2,159	COS
34	9y		130-13-368		1,911	COS
35	10	130-13-171		1,543		COS
36	11	130-13-111		16,384		COS
37	12	130-13-167		73,489		COS
38	13	130-13-172		6,105		COS
39	14	130-13-168		38,428		COS
40	15	130-12-165A		6,750		ARC Scottsdale Holdings, LLP
41	16	130-12-164A		6,750		ARC Scottsdale Holdings, LLP
42	17	130-12-166A		12,136		ARC Scottsdale Holdings, LLP
43	18	130-12-169B		13,905		ARC Scottsdale Holdings, LLP
44	A	130-13-112		17,988		COS
45	B	130-13-111		16,384		COS
46	C	130-13-121A		69		COS
47	D	130-13-131A		1,437		COS
48	E	130-13-107		26,113		COS
49	F	130-13-117		38,638	TO S GW ROW	COS

MAP KEY

1. **RESIDENTIAL BUILDING #1**
   - 11 STORIES
   - 135 ' HEIGHT
2. **RESIDENTIAL BUILDING #2**
   - 13 STORIES
   - 150 ' HEIGHT
3. **RESIDENTIAL BUILDING #3**
   - 13 STORIES
   - 150 ' HEIGHT
4. **HOTEL - THE ARIZONAN**
   - 13 STORIES
   - 150 ' HEIGHT
   - 190 KEYS
5. **APARTMENT / CONDO BUILDING**
   - TBD
6. **SURFEACE PARKING LOT**
   - 120 SPACES
7. **ADDITIONAL ON-STREET PARKING**
   - UP TO 46 SPACES (W. of Marshall Way)
8. **RESIDENTIAL PARCEL PURCHASE**
   - 134,213 SQFT
9. **NORTH / SOUTH DISTRICT PROMENADE**
10. **CONDOMINIUM PARKING TRAY**
    - 376 SPACES
11. **GARAGE PARKING ACCESS**
12. **PLAZA / DRIVE COURT**
13. **MUSEUM "BRIDGE" EXPANSION**
14. **POOL & TERRACE**
15. **OPEN SPACE / GARDENS**
16. **MUSEUM EXPANSION**
    - 30,000 SQFT +/-
17. **ADDITIONAL ON-STREET PARKING**
    - UP TO 21 SPACES (north of 1st street)
18. **PROPOSED HOTEL (HILTON CANOPY)**
    - 66' HEIGHT
    - 185 KEYS
19. **MULTI-USE PUBLIC SPACE**
    - LAWN AREA, PATIOS, & TERRACES
    - PERFORMANCE SPACE
    - SPLASH PAD
    - SCULPTURE GARDEN
20. **RECONFIGURED HOTEL PARCEL PURCHASE**
    - (47,343 SQFT)
21. **ADDITIONAL ON STREET PARKING**
    - UP TO 28 SPACES (south of 1st street)
22. **PEDESTRIAN CONNECTION**
23. **ADDITIONAL ON-STREET PARKING**
    - UP TO 37 SPACES (East of Marshall Way)
24. **HOTEL PARKING TRAY**
    - UPPER LEVEL (84 SPACES)
    - LOWER LEVEL (84 SPACES)
25. **COVERED PROMENADE**
26. **RECONFIGURED ENTRY DRIVE (SHARED ACCESS / EGRESS)**
27. **ADDITIONAL ON-STREET PARKING**
    - UP TO 37 SPACES (South of 2nd Street)
28. **MAIN ART SCHOOL SHARED DRIVE ENTRY**
29. **HOTEL GARAGE PARKING ACCESS**
30. **THE GOLDWATER (CONDOMINIUMS)**
31. **NEW SIGNALIZED CROSSWALK**
32. **NEW SIGNALIZED MID-BLOCK CROSSWALK (HAWK)**

MACDONALD DEVELOPMENT CORPORATION

MUSEUMSQUARE

SCOTTSDALE'S MUSEUMSQUARE

REZONING DEVELOPMENT APPLICATION

DRAFT

SWABACK pllc Architects + Planners

23F. SITE PLAN

6.12.18

APPENDIX I

Rainfall Data

NOAA Atlas 14, Volume 1, Version 5
Location name: Scottsdale, Arizona, USA*
Latitude: 33.4917°, Longitude: -111.929°
Elevation: 1256.91 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)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.183 (0.154-0.223)	0.240 (0.202-0.292)	0.326 (0.273-0.395)	0.392 (0.326-0.473)	0.481 (0.393-0.578)	0.550 (0.444-0.658)	0.620 (0.492-0.740)	0.693 (0.539-0.825)	0.789 (0.598-0.941)	0.862 (0.641-1.03)
10-min	0.279 (0.234-0.340)	0.365 (0.307-0.444)	0.496 (0.415-0.602)	0.596 (0.496-0.720)	0.733 (0.599-0.880)	0.838 (0.676-1.00)	0.944 (0.748-1.13)	1.05 (0.821-1.26)	1.20 (0.910-1.43)	1.31 (0.976-1.57)
15-min	0.345 (0.290-0.421)	0.452 (0.381-0.550)	0.614 (0.514-0.746)	0.739 (0.614-0.893)	0.908 (0.742-1.09)	1.04 (0.838-1.24)	1.17 (0.927-1.40)	1.31 (1.02-1.56)	1.49 (1.13-1.78)	1.63 (1.21-1.95)
30-min	0.465 (0.390-0.567)	0.609 (0.513-0.741)	0.827 (0.692-1.00)	0.995 (0.827-1.20)	1.22 (0.999-1.47)	1.40 (1.13-1.67)	1.58 (1.25-1.88)	1.76 (1.37-2.10)	2.00 (1.52-2.39)	2.19 (1.63-2.62)
60-min	0.576 (0.483-0.702)	0.754 (0.635-0.917)	1.02 (0.857-1.24)	1.23 (1.02-1.49)	1.51 (1.24-1.82)	1.73 (1.40-2.07)	1.95 (1.55-2.33)	2.18 (1.70-2.60)	2.48 (1.88-2.96)	2.71 (2.02-3.24)
2-hr	0.667 (0.569-0.796)	0.864 (0.736-1.03)	1.16 (0.983-1.38)	1.38 (1.16-1.64)	1.69 (1.40-1.99)	1.92 (1.57-2.26)	2.16 (1.74-2.54)	2.41 (1.91-2.83)	2.74 (2.12-3.22)	2.99 (2.26-3.54)
3-hr	0.726 (0.615-0.873)	0.931 (0.793-1.13)	1.22 (1.04-1.47)	1.46 (1.22-1.74)	1.78 (1.47-2.12)	2.04 (1.66-2.42)	2.31 (1.85-2.74)	2.59 (2.04-3.07)	2.98 (2.28-3.53)	3.30 (2.46-3.91)
6-hr	0.874 (0.757-1.03)	1.11 (0.963-1.30)	1.42 (1.23-1.67)	1.67 (1.43-1.95)	2.01 (1.70-2.33)	2.28 (1.90-2.63)	2.56 (2.10-2.95)	2.84 (2.28-3.29)	3.23 (2.53-3.75)	3.54 (2.71-4.11)
12-hr	0.977 (0.855-1.14)	1.24 (1.08-1.44)	1.57 (1.36-1.81)	1.83 (1.58-2.11)	2.17 (1.86-2.50)	2.44 (2.07-2.81)	2.72 (2.27-3.13)	3.00 (2.47-3.45)	3.38 (2.71-3.91)	3.67 (2.89-4.27)
24-hr	1.17 (1.04-1.32)	1.48 (1.32-1.67)	1.92 (1.71-2.17)	2.27 (2.02-2.55)	2.75 (2.42-3.09)	3.13 (2.74-3.51)	3.53 (3.07-3.96)	3.94 (3.40-4.42)	4.51 (3.85-5.06)	4.96 (4.19-5.58)
2-day	1.26 (1.13-1.42)	1.61 (1.44-1.82)	2.12 (1.89-2.38)	2.52 (2.24-2.83)	3.08 (2.72-3.46)	3.53 (3.10-3.96)	4.00 (3.49-4.50)	4.50 (3.89-5.06)	5.19 (4.44-5.85)	5.74 (4.86-6.49)
3-day	1.33 (1.19-1.50)	1.71 (1.52-1.92)	2.25 (2.00-2.53)	2.68 (2.37-3.01)	3.29 (2.90-3.69)	3.78 (3.31-4.24)	4.30 (3.74-4.83)	4.85 (4.18-5.45)	5.62 (4.79-6.32)	6.24 (5.26-7.04)
4-day	1.41 (1.25-1.59)	1.80 (1.60-2.03)	2.37 (2.11-2.67)	2.84 (2.51-3.19)	3.50 (3.08-3.92)	4.03 (3.52-4.51)	4.60 (3.99-5.15)	5.20 (4.47-5.84)	6.05 (5.14-6.79)	6.74 (5.67-7.58)
7-day	1.56 (1.39-1.76)	1.99 (1.78-2.25)	2.63 (2.34-2.97)	3.15 (2.79-3.55)	3.88 (3.42-4.36)	4.47 (3.91-5.02)	5.10 (4.43-5.73)	5.76 (4.96-6.48)	6.70 (5.70-7.54)	7.46 (6.28-8.41)
10-day	1.70 (1.51-1.91)	2.17 (1.93-2.44)	2.86 (2.54-3.22)	3.42 (3.03-3.84)	4.21 (3.70-4.71)	4.83 (4.23-5.40)	5.50 (4.78-6.15)	6.20 (5.35-6.94)	7.18 (6.12-8.05)	7.97 (6.72-8.94)
20-day	2.08 (1.86-2.33)	2.68 (2.39-3.00)	3.54 (3.16-3.95)	4.19 (3.73-4.67)	5.07 (4.48-5.65)	5.74 (5.06-6.40)	6.42 (5.64-7.17)	7.12 (6.22-7.95)	8.05 (6.97-9.02)	8.77 (7.53-9.84)
30-day	2.43 (2.17-2.73)	3.13 (2.79-3.50)	4.13 (3.67-4.61)	4.88 (4.34-5.44)	5.90 (5.21-6.57)	6.68 (5.88-7.43)	7.48 (6.55-8.32)	8.29 (7.23-9.23)	9.39 (8.12-10.5)	10.2 (8.78-11.4)
45-day	2.82 (2.52-3.15)	3.63 (3.25-4.06)	4.78 (4.28-5.34)	5.64 (5.03-6.29)	6.76 (6.01-7.54)	7.61 (6.74-8.49)	8.46 (7.47-9.45)	9.32 (8.18-10.4)	10.4 (9.11-11.7)	11.3 (9.79-12.7)
60-day	3.12 (2.80-3.48)	4.03 (3.62-4.49)	5.30 (4.75-5.90)	6.22 (5.56-6.92)	7.42 (6.62-8.26)	8.31 (7.39-9.25)	9.20 (8.15-10.2)	10.1 (8.89-11.2)	11.2 (9.84-12.5)	12.1 (10.5-13.5)

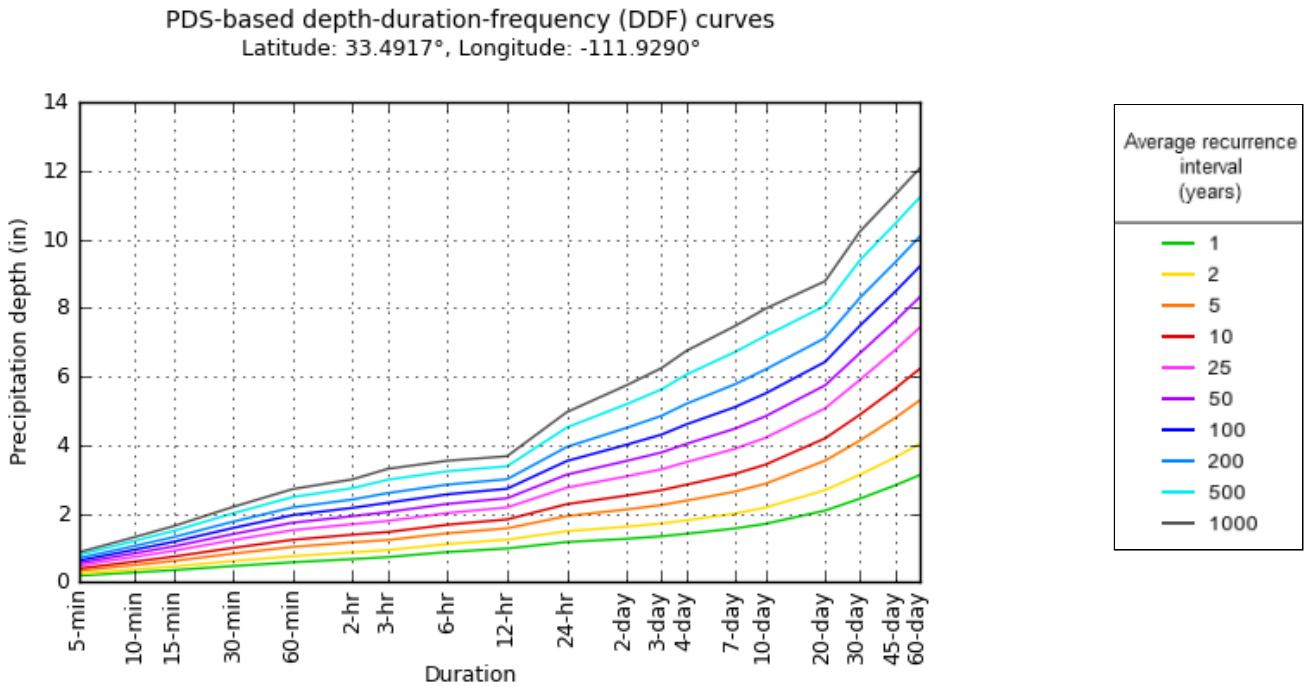
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

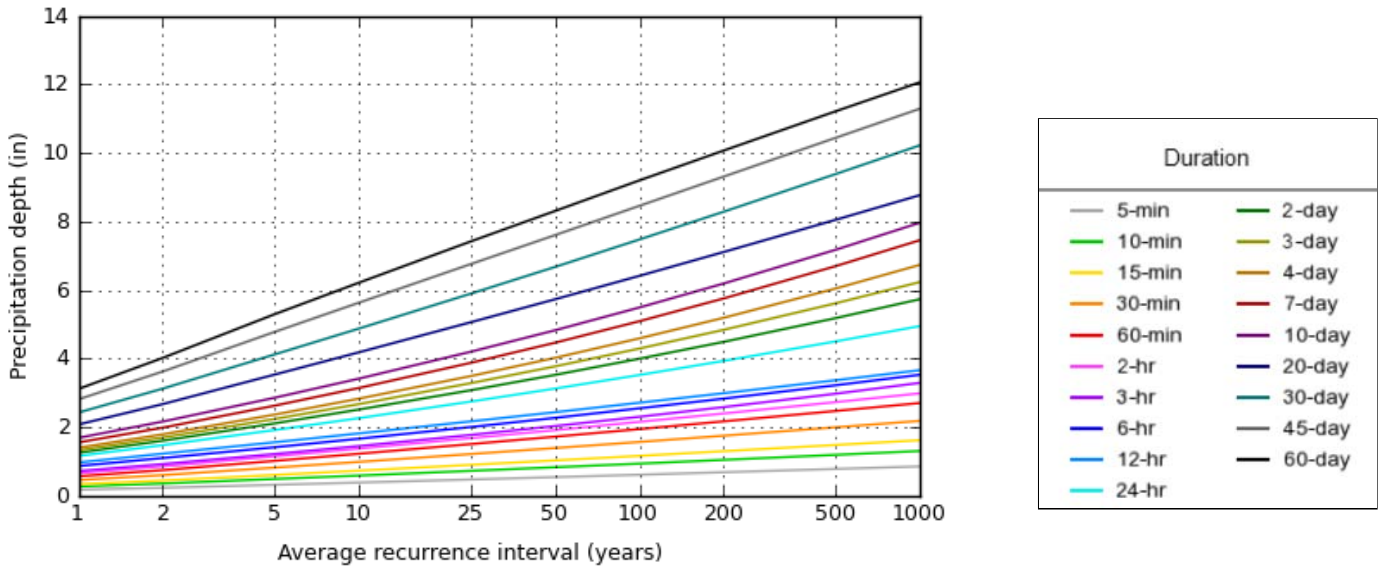
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper 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.

Back to Top

PF graphical





NOAA Atlas 14, Volume 1, Version 5

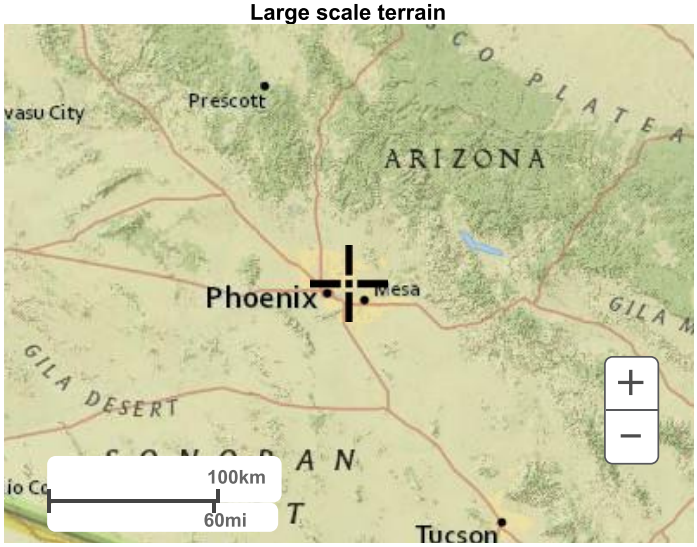
Created (GMT): Mon May 14 15:23:21 2018

Back to Top

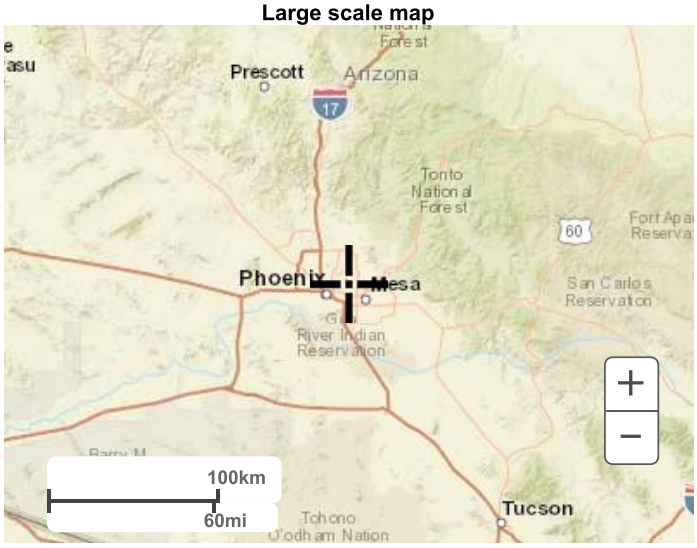
Maps & aerials

Small scale terrain

Large scale terrain



Large scale map



Large scale aerial

NOAA Atlas 14, Volume 1, Version 5
Location name: Scottsdale, Arizona, USA*
Latitude: 33.4917°, Longitude: -111.929°
Elevation: 1256.91 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	2.20 (1.85-2.68)	2.88 (2.42-3.50)	3.91 (3.28-4.74)	4.70 (3.91-5.68)	5.77 (4.72-6.94)	6.60 (5.33-7.90)	7.44 (5.90-8.88)	8.32 (6.47-9.90)	9.47 (7.18-11.3)	10.3 (7.69-12.4)
10-min	1.67 (1.40-2.04)	2.19 (1.84-2.66)	2.98 (2.49-3.61)	3.58 (2.98-4.32)	4.40 (3.59-5.28)	5.03 (4.06-6.01)	5.66 (4.49-6.76)	6.32 (4.93-7.54)	7.20 (5.46-8.59)	7.87 (5.86-9.41)
15-min	1.38 (1.16-1.68)	1.81 (1.52-2.20)	2.46 (2.06-2.98)	2.96 (2.46-3.57)	3.63 (2.97-4.36)	4.15 (3.35-4.97)	4.68 (3.71-5.59)	5.23 (4.07-6.23)	5.95 (4.52-7.10)	6.51 (4.84-7.78)
30-min	0.930 (0.780-1.13)	1.22 (1.03-1.48)	1.65 (1.38-2.01)	1.99 (1.65-2.40)	2.45 (2.00-2.94)	2.80 (2.26-3.34)	3.15 (2.50-3.76)	3.52 (2.74-4.19)	4.01 (3.04-4.78)	4.38 (3.26-5.24)
60-min	0.576 (0.483-0.702)	0.754 (0.635-0.917)	1.02 (0.857-1.24)	1.23 (1.02-1.49)	1.51 (1.24-1.82)	1.73 (1.40-2.07)	1.95 (1.55-2.33)	2.18 (1.70-2.60)	2.48 (1.88-2.96)	2.71 (2.02-3.24)
2-hr	0.334 (0.284-0.398)	0.432 (0.368-0.517)	0.578 (0.492-0.688)	0.690 (0.580-0.820)	0.843 (0.700-0.994)	0.960 (0.786-1.13)	1.08 (0.872-1.27)	1.20 (0.953-1.41)	1.37 (1.06-1.61)	1.50 (1.13-1.77)
3-hr	0.242 (0.205-0.291)	0.310 (0.264-0.375)	0.408 (0.345-0.490)	0.485 (0.407-0.580)	0.593 (0.491-0.705)	0.679 (0.554-0.805)	0.769 (0.616-0.911)	0.863 (0.680-1.02)	0.993 (0.759-1.18)	1.10 (0.818-1.30)
6-hr	0.146 (0.126-0.172)	0.185 (0.161-0.218)	0.237 (0.205-0.278)	0.279 (0.239-0.325)	0.336 (0.284-0.389)	0.380 (0.317-0.440)	0.427 (0.350-0.493)	0.474 (0.381-0.549)	0.539 (0.423-0.625)	0.591 (0.452-0.687)
12-hr	0.081 (0.071-0.094)	0.103 (0.090-0.119)	0.130 (0.113-0.150)	0.151 (0.131-0.175)	0.181 (0.154-0.208)	0.203 (0.171-0.233)	0.226 (0.188-0.260)	0.249 (0.205-0.287)	0.280 (0.225-0.324)	0.305 (0.240-0.355)
24-hr	0.049 (0.043-0.055)	0.062 (0.055-0.070)	0.080 (0.071-0.090)	0.095 (0.084-0.106)	0.115 (0.101-0.129)	0.131 (0.114-0.146)	0.147 (0.128-0.165)	0.164 (0.142-0.184)	0.188 (0.160-0.211)	0.206 (0.174-0.232)
2-day	0.026 (0.023-0.030)	0.034 (0.030-0.038)	0.044 (0.039-0.050)	0.053 (0.047-0.059)	0.064 (0.057-0.072)	0.074 (0.065-0.083)	0.083 (0.073-0.094)	0.094 (0.081-0.105)	0.108 (0.092-0.122)	0.120 (0.101-0.135)
3-day	0.019 (0.017-0.021)	0.024 (0.021-0.027)	0.031 (0.028-0.035)	0.037 (0.033-0.042)	0.046 (0.040-0.051)	0.052 (0.046-0.059)	0.060 (0.052-0.067)	0.067 (0.058-0.076)	0.078 (0.067-0.088)	0.087 (0.073-0.098)
4-day	0.015 (0.013-0.017)	0.019 (0.017-0.021)	0.025 (0.022-0.028)	0.030 (0.026-0.033)	0.036 (0.032-0.041)	0.042 (0.037-0.047)	0.048 (0.042-0.054)	0.054 (0.047-0.061)	0.063 (0.054-0.071)	0.070 (0.059-0.079)
7-day	0.009 (0.008-0.010)	0.012 (0.011-0.013)	0.016 (0.014-0.018)	0.019 (0.017-0.021)	0.023 (0.020-0.026)	0.027 (0.023-0.030)	0.030 (0.026-0.034)	0.034 (0.030-0.039)	0.040 (0.034-0.045)	0.044 (0.037-0.050)
10-day	0.007 (0.006-0.008)	0.009 (0.008-0.010)	0.012 (0.011-0.013)	0.014 (0.013-0.016)	0.018 (0.015-0.020)	0.020 (0.018-0.023)	0.023 (0.020-0.026)	0.026 (0.022-0.029)	0.030 (0.025-0.034)	0.033 (0.028-0.037)
20-day	0.004 (0.004-0.005)	0.006 (0.005-0.006)	0.007 (0.007-0.008)	0.009 (0.008-0.010)	0.011 (0.009-0.012)	0.012 (0.011-0.013)	0.013 (0.012-0.015)	0.015 (0.013-0.017)	0.017 (0.015-0.019)	0.018 (0.016-0.020)
30-day	0.003 (0.003-0.004)	0.004 (0.004-0.005)	0.006 (0.005-0.006)	0.007 (0.006-0.008)	0.008 (0.007-0.009)	0.009 (0.008-0.010)	0.010 (0.009-0.012)	0.012 (0.010-0.013)	0.013 (0.011-0.015)	0.014 (0.012-0.016)
45-day	0.003 (0.002-0.003)	0.003 (0.003-0.004)	0.004 (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 (0.008-0.011)	0.010 (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 (0.005-0.006)	0.006 (0.006-0.007)	0.007 (0.006-0.008)	0.008 (0.007-0.009)	0.008 (0.007-0.009)

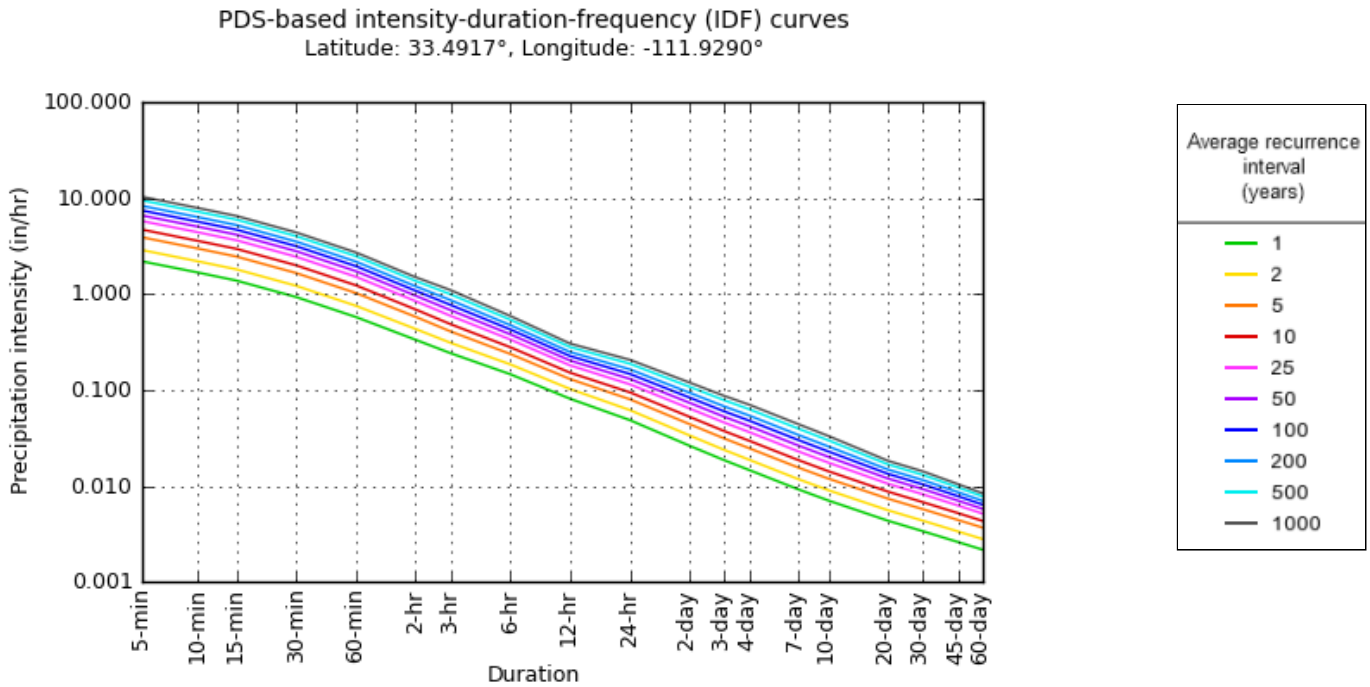
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

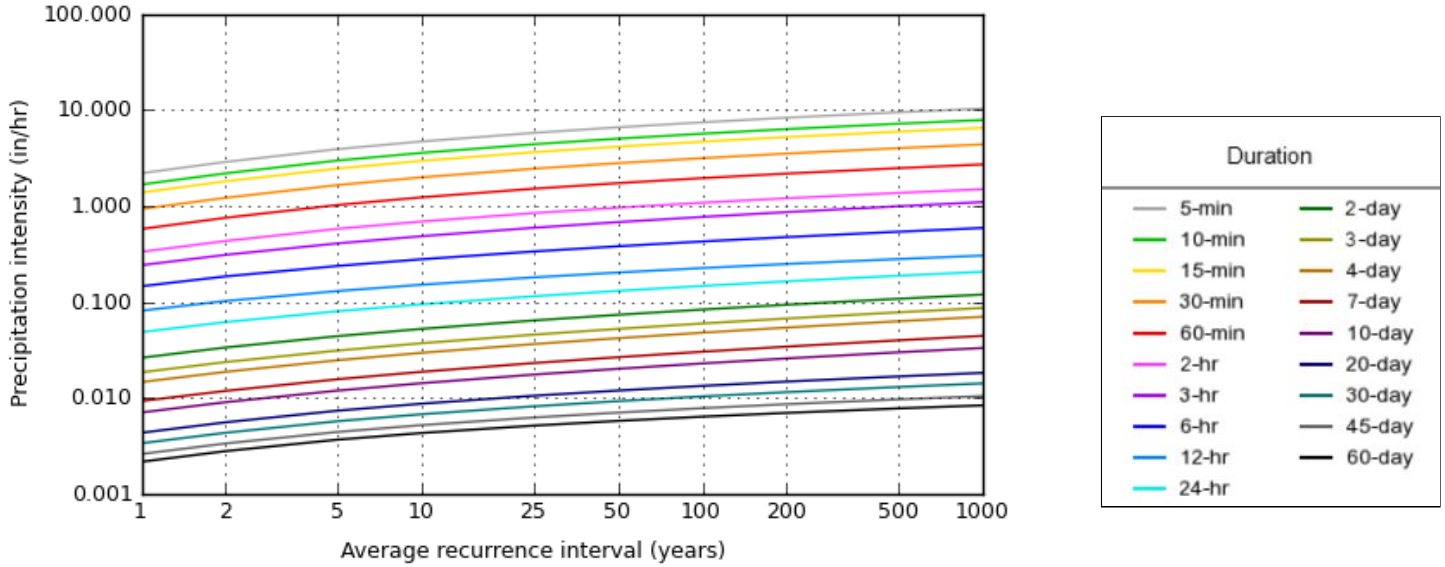
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper 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.

Back to Top

PF graphical





NOAA Atlas 14, Volume 1, Version 5

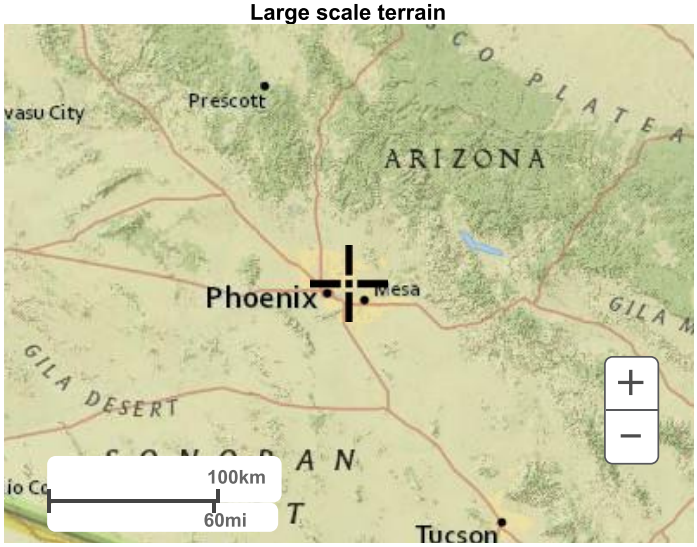
Created (GMT): Mon May 14 15:26:25 2018

Back to Top

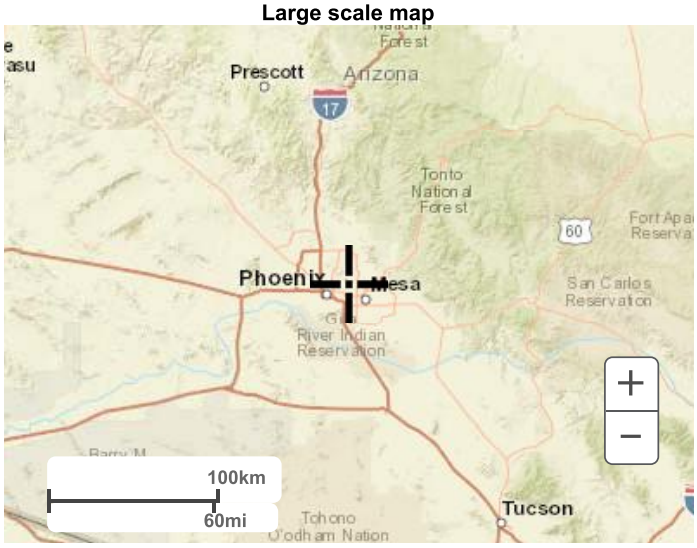
Maps & aerials

Small scale terrain

Large scale terrain



Large scale map

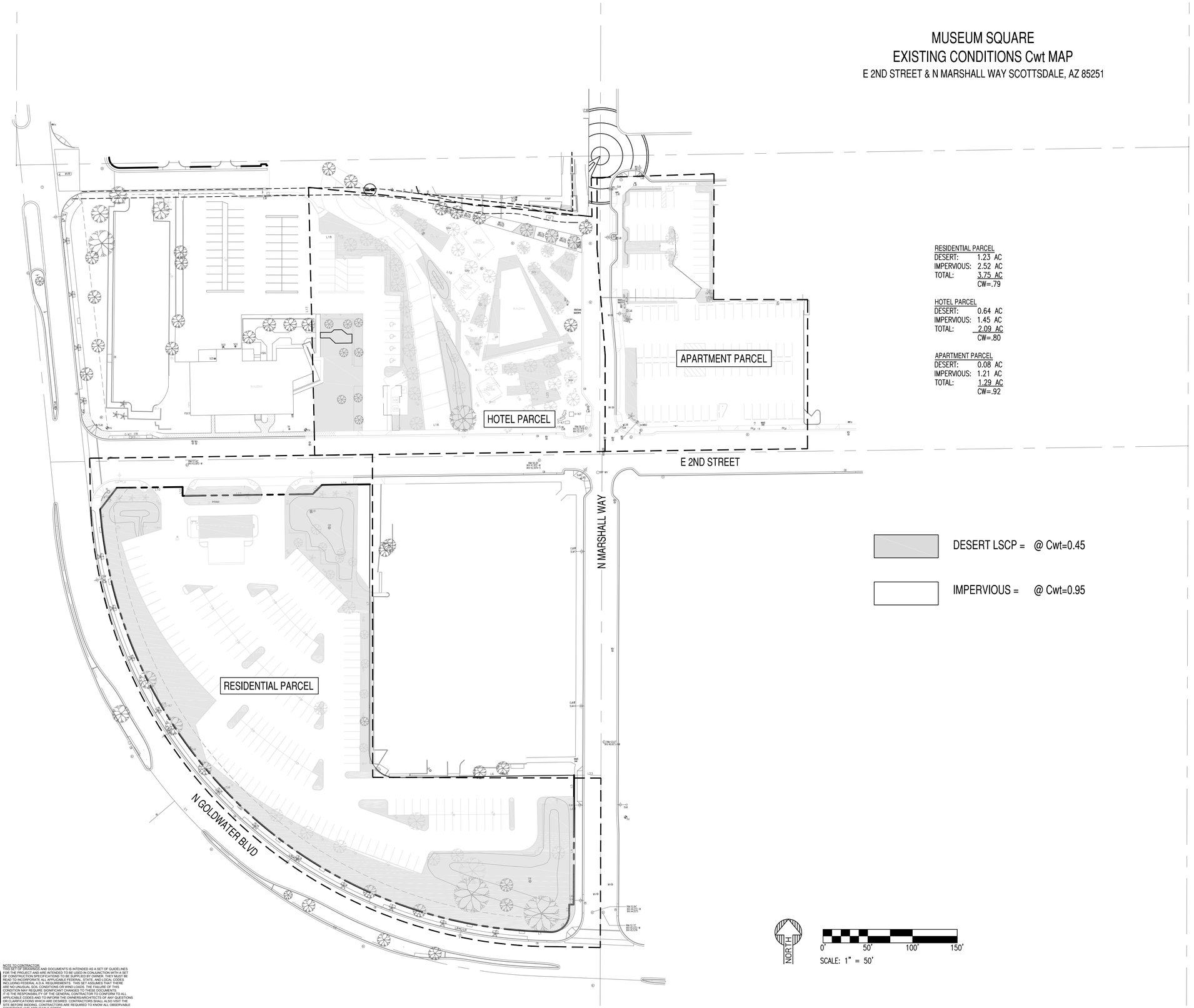


Large scale aerial

APPENDIX II

Calculations

MUSEUM SQUARE
EXISTING CONDITIONS Cwt MAP
E 2ND STREET & N MARSHALL WAY SCOTTSDALE, AZ 85251



RESIDENTIAL PARCEL
DESERT: 1.23 AC
IMPERVIOUS: 2.52 AC
TOTAL: 3.75 AC
CW=.79

HOTEL PARCEL
DESERT: 0.64 AC
IMPERVIOUS: 1.45 AC
TOTAL: 2.09 AC
CW=.80

APARTMENT PARCEL
DESERT: 0.08 AC
IMPERVIOUS: 1.21 AC
TOTAL: 1.29 AC
CW=.92

DESERT LSCP = @ Cwt=0.45

IMPERVIOUS = @ Cwt=0.95

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

NOTE TO CONTRACTORS:
THIS SET OF DRAWINGS AND DOCUMENTS IS INTENDED AS A SET OF GUIDELINES FOR THE PROJECT AND ARE INTENDED TO BE USED IN CONJUNCTION WITH A SET OF CONSTRUCTION SPECIFICATIONS TO BE SUPPLIED BY OWNER. THEY MUST BE READ TO INCORPORATE ALL APPLICABLE FEDERAL, STATE, AND LOCAL CODES INCLUDING FEDERAL A.D.A. REQUIREMENTS. THIS SET ASSUMES THAT THERE ARE NO UNUSUAL SOIL CONDITIONS OR WIND LOADS. THE FAILURE OF THIS CONDITION MAY REQUIRE SIGNIFICANT CHANGES TO THESE DOCUMENTS. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO CONFORM TO ALL APPLICABLE CODES AND TO INFORM THE OWNERS/ARCHITECTS OF ANY QUESTIONS OR CLARIFICATIONS WHICH ARE DESIRED. CONTRACTORS SHALL ALSO VISIT THE SITE BEFORE BIDDING. CONTRACTORS ARE REQUIRED TO KNOW ALL OBSERVABLE CONDITIONS AND APPLICABLE CODES.

SEG
8280 E GELDING DR #101, SCOTTSDALE, ARIZONA 85260
WWW. AZSEG.COM TEL. 480.588.7226

MACDONALD DEVELOPMENT CORPORATION

PROJECT
MUSEUM SQUARE

LOCATION
E. 2ND STREET & N. MARSHALL WAY
SCOTTSDALE, AZ 85251

DRAWN — SANTIAGO
DESIGNED — SANTIAGO
CHECKED — COUNSELL
PROJ. MGR. — FAKIH

DATE: 06/14/2018
ISSUED FOR:

REVISION NO.: DATE:
1
2
3
4

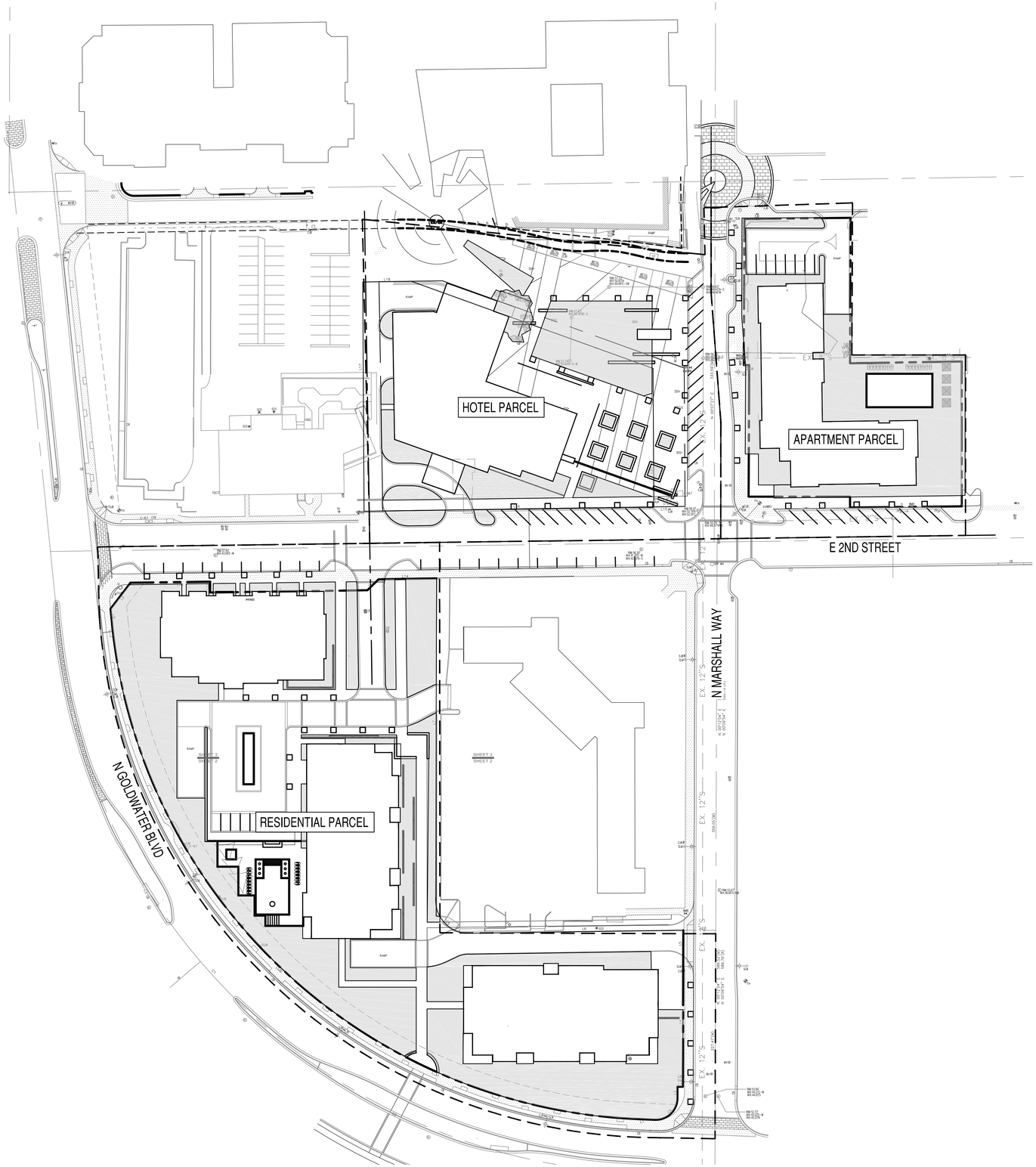
JOB NO.: 180109

SHEET TITLE:
EXISTING CONDITIONS
Cwt MAP

SHEET NO.:
EXHIBIT 'A'

THIS DRAWING IS AN INSTRUMENT OF SERVICE AND THE PROPERTY OF SUSTAINABILITY ENGINEERING GROUP, AND SHALL REMAIN THEIR PROPERTY. THE USE OF THIS DRAWING SHALL BE RESTRICTED TO THE ORIGINAL SITE FOR WHICH IT IS PREPARED AND PUBLICATION THEREOF IS EXPRESSLY LIMITED TO SUCH USE.

MUSEUM SQUARE
PROPOSED CONDITIONS Cwt MAP
E 2ND STREET & N MARSHALL WAY SCOTTSDALE, AZ 85251



RESIDENTIAL PARCEL
DESERT: 1.08 AC
IMPERVIOUS: 2.67 AC
TOTAL: 3.75 AC
CW=.81

HOTEL PARCEL
DESERT: 0.37 AC
IMPERVIOUS: 1.72 AC
TOTAL: 2.09 AC
CW=.86

APARTMENT PARCEL
DESERT: 0.37 AC
IMPERVIOUS: 0.92 AC
TOTAL: 1.29 AC
CW=.81

DESERT LSCP = @ Cwt=0.45

IMPERVIOUS = @ Cwt=0.95

NORTH

0' 50' 100' 150'
SCALE: 1" = 50'

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

NOTE TO CONTRACTOR:
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SEG
8280 E GELDING DR #101, SCOTTSDALE, ARIZONA 85260
WWW. AZSEG.COM TEL. 480.588.7226

MACDONALD DEVELOPMENT CORPORATION

PROJECT
MUSEUM SQUARE

LOCATION
E. 2ND STREET & N. MARSHALL WAY
SCOTTSDALE, AZ 85251

DRAWN — SANTIAGO
DESIGNED — SANTIAGO
CHECKED — COUNSELL
PROJ. MGR. — FAKIH

DATE: 06/14/2018
ISSUED FOR:

REVISION NO.:	DATE:
1	
2	
3	
4	

JOB NO.: 180109

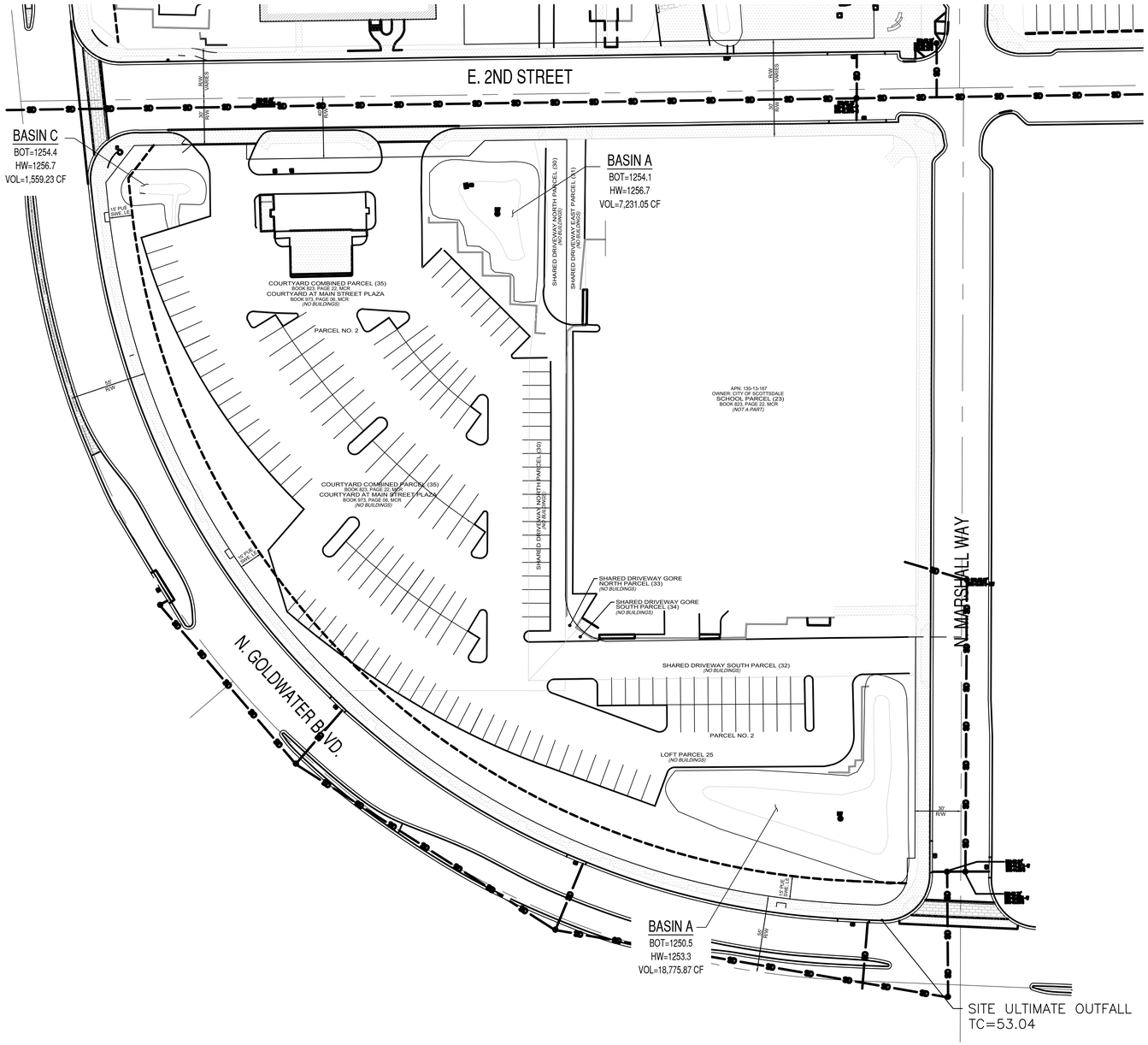
SHEET TITLE:
PROPOSED CONDITIONS
Cwt MAP

SHEET NO.:
EXHIBIT 'B'

THIS DRAWING IS AN INSTRUMENT OF SERVICE AND THE PROPERTY OF SUSTAINABILITY ENGINEERING GROUP, AND SHALL REMAIN THEIR PROPERTY. THE USE OF THIS DRAWING SHALL BE RESTRICTED TO THE ORIGINAL SITE FOR WHICH IT IS PREPARED AND PUBLICATION THEREOF IS EXPRESSLY LIMITED TO SUCH USE.

MUSEUM SQUARE
EXISTING RETENTION EXHIBIT

E 2ND STREET & N MARSHALL WAY SCOTTSDALE, AZ 85251



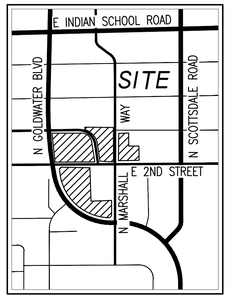
DEVELOPER
MACDONALD DEVELOPMENT
3225 N. CENTRAL AVENUE
PHOENIX, ARIZONA 85012
PHONE:
ATTN:

ENGINEER
SUSTAINABILITY ENGINEERING GROUP
8280 E. GELDING DR. SUITE #101
SCOTTSDALE, ARIZONA 85260
PHONE: 480-588-7226
ATTN: ALI FAKIH

ARCHITECT
SWABACK
7550 E. MCDONALD DRIVE
SCOTTSDALE, ARIZONA 85250
PHONE: 480-367-2100
ATTN: CHRIS MCKIBBEN

BENCHMARK
BENCHMARK IS

ELEVATION = NAVD 88



NORTH
VICINITY MAP
SCALE: NTS

BASIS OF BEARING
THE BASIS OF BEARING AND ALL MONUMENTATION SHOWN HEREON IS BASED ON THE EAST LINE OF THE NORTHEAST QUARTER OF SECTION 27, TOWNSHIP 2 NORTH, RANGE 4 EAST, USING A BEARING OF NORTH 00°09'25" WEST AS SHOWN ON THE MINOR LAND DIVISION PLAT RECORDED IN BOOK 1288, PAGE 43, MARICOPA COUNTY RECORDS.

LEGAL DESCRIPTION
A PORTION OF CENTER PARCEL 17, A PORTION OF WALKWAY SOUTH PARCEL 16, A PORTION OF TRANSIT PARCEL 14 AND COURTYARD PARCEL 35, SHARED DRIVEWAY NORTH PARCEL 30, LOFT PARCEL 25, SHARED DRIVEWAY SOUTH PARCEL 32, SHARED DRIVEWAY GORE NORTH PARCEL 33 AND SHARED DRIVEWAY GORE SOUTH PARCEL 34 AS SHOWN ON THE FINAL PLAT OF LOLOMA RECORDED IN BOOK 597, PAGE 6, MARICOPA COUNTY RECORDS AND THE RE-PLAT OF LOLOMA RECORDED IN BOOK 823, PAGE 22, MARICOPA COUNTY RECORDS, A PORTION OF THE NORTHEAST QUARTER OF SECTION 27, TOWNSHIP 2 NORTH, RANGE 4 EAST, OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA.

NORTH
0' 40' 80' 120'
SCALE: 1" = 40'

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

NOTE TO CONTRACTOR:
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SEG
8280 E GELDING DR #101, SCOTTSDALE, ARIZONA 85260
WWW. AZSEG.COM TEL. 480.588.7226

MACDONALD DEVELOPMENT CORPORATION

PROJECT
MUSEUM SQUARE

LOCATION
E. 2ND STREET & N. MARSHALL WAY
SCOTTSDALE, AZ 85251

DRAWN — SANTIAGO
DESIGNED — SANTIAGO
CHECKED — COUNSELL
PROJ. MGR. — FAKIH

DATE:
06/08/2018
ISSUED FOR:

REVISION NO.:	DATE:
1	
2	
3	
4	

JOB NO.: 180109

SHEET TITLE:
EXISTING RETENTION EXHIBIT

SHEET NO.:

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injection pipe with cement grout, remove the top six feet of the settling chamber and place a 2-foot thick cement plug four feet below the ground surface. In addition to the above referenced sections, ADEQ needs to be properly notified of the closure.

6. National Pollution Discharge Elimination System For Construction AZDEQ

The Developer will file a Notice of Intent (NOI) form with the ~~U.S. Environmental Protection Agency~~ and will copy the City within 72 hours of commencement of construction. The Developer will also provide to the City within the same time frame a copy of the Stormwater Pollution Prevention Plan (SWPPP).

Any Facilities - (Restaurants - Retail using SIC code materials, Paints, Oils etc) will need to file SWPPP with AZDEQ along with NOI

III. EXISTING CONDITIONS

A. ZONING AND LAND USE

The existing zoning is shown in Figure 1. The existing site has the following land uses: Parking, Retail Shops on Main Street, Stagebrush Theatre, Loloma Transit Station, and the Scottsdale Artists' School. (Refer to Exhibit A)

B. ONSITE DRAINAGE CHARACTERISTICS (EXISTING AND PHASE I)

The site is in an urbanized part of downtown Scottsdale. The maximum difference in elevation across the site is approximately eight (8) feet. The entire site is developed or under construction.

Exhibit A shows the delineation of onsite existing drainage boundaries and the pre-development 100-year flow rates estimated for these drainage areas.

There are three existing stormwater storage basins on site as shown in Exhibit A. A volume for each basin has been estimated based on a City topographic map and are listed in Table III.1.

Table III.1: Existing Stormwater Storage Basins

NO.	LOCATION	ESTIMATED VOLUME (CU.FT.)
1	South of Artists' School	13,800
2	SE Corner of Goldwater / 2nd Street	1,867
3	West of Artists' School	5,967
	Total	21,633

The following existing storm drains are located in the vicinity of the project:

1. 54-inch storm drain located in Goldwater Blvd., connecting to the storm drain in Second Street.

2. 72-inch storm drain in Second Street, connecting to a storm drain in Scottsdale Road.

EXISTING ON-SITE RETENTION BASIN VOLUMES

BASIN A					
ELEV.	AREA	DEPTH	AVG V	SUM V	COMMENT
(FT)	(SF)	(FT)	(CF)	(CF)	
1254.1	1,286			0.00	Basin Bottom
		2.58	7,231.05		
1256.7	4,320			**7,231.05**	Basin HWE

BASIN B					
ELEV.	AREA	DEPTH	AVG V	SUM V	COMMENT
(FT)	(SF)	(FT)	(CF)	(CF)	
1250.5	3,623			0.00	Basin Bottom
		2.80	18,775.87		
1253.3	9,789			**18,775.87**	Basin HWE

BASIN C					
ELEV.	AREA	DEPTH	AVG V	SUM V	COMMENT
(FT)	(SF)	(FT)	(CF)	(CF)	
1254.4	204			0.00	Basin Bottom
		2.25	1,559.23		
1256.7	1,182			**1,559.23**	Basin HWE

27,566.14 Total Volume (AC. FT.)

EXISTING STORMWATER BASIN VOLUME SUMMARY		
BASIN ID	Volume from field topographic survey (c.f.)	*From Referenced Main Street Plaza Scottsdale Report (c.f.)
A	7,231	5,967
B	18,777	13,800
C	1,559	1,867
TOTAL	27,567	21,634

BASIN 1					
ELEV.	AREA	DEPTH	AVG V	SUM V	COMMENT
(FT)	(SF)	(FT)	(CF)	(CF)	
1256.0	1,724			0.00	
		1.00	2,349.62		
1257.0	2,975			**2,349.62**	Basin HWE

BASIN 2					
ELEV.	AREA	DEPTH	AVG V	SUM V	COMMENT
(FT)	(SF)	(FT)	(CF)	(CF)	
1254.0	1,381			0.00	
		1.00	1,817.96		
1255.0	2,255			**1,817.96**	Basin HWE

BASIN 3					
ELEV.	AREA	DEPTH	AVG V	SUM V	COMMENT
(FT)	(SF)	(FT)	(CF)	(CF)	
1253.0	893			0.00	
		1.00	1,208.25		
1254.0	1,524			**1,208.25**	Basin HWE

BASIN 4					
ELEV.	AREA	DEPTH	AVG V	SUM V	COMMENT
(FT)	(SF)	(FT)	(CF)	(CF)	
1252.0	2,262			0.00	
		1.00	3,048.68		
1253.0	3,836			**3,048.68**	Basin HWE

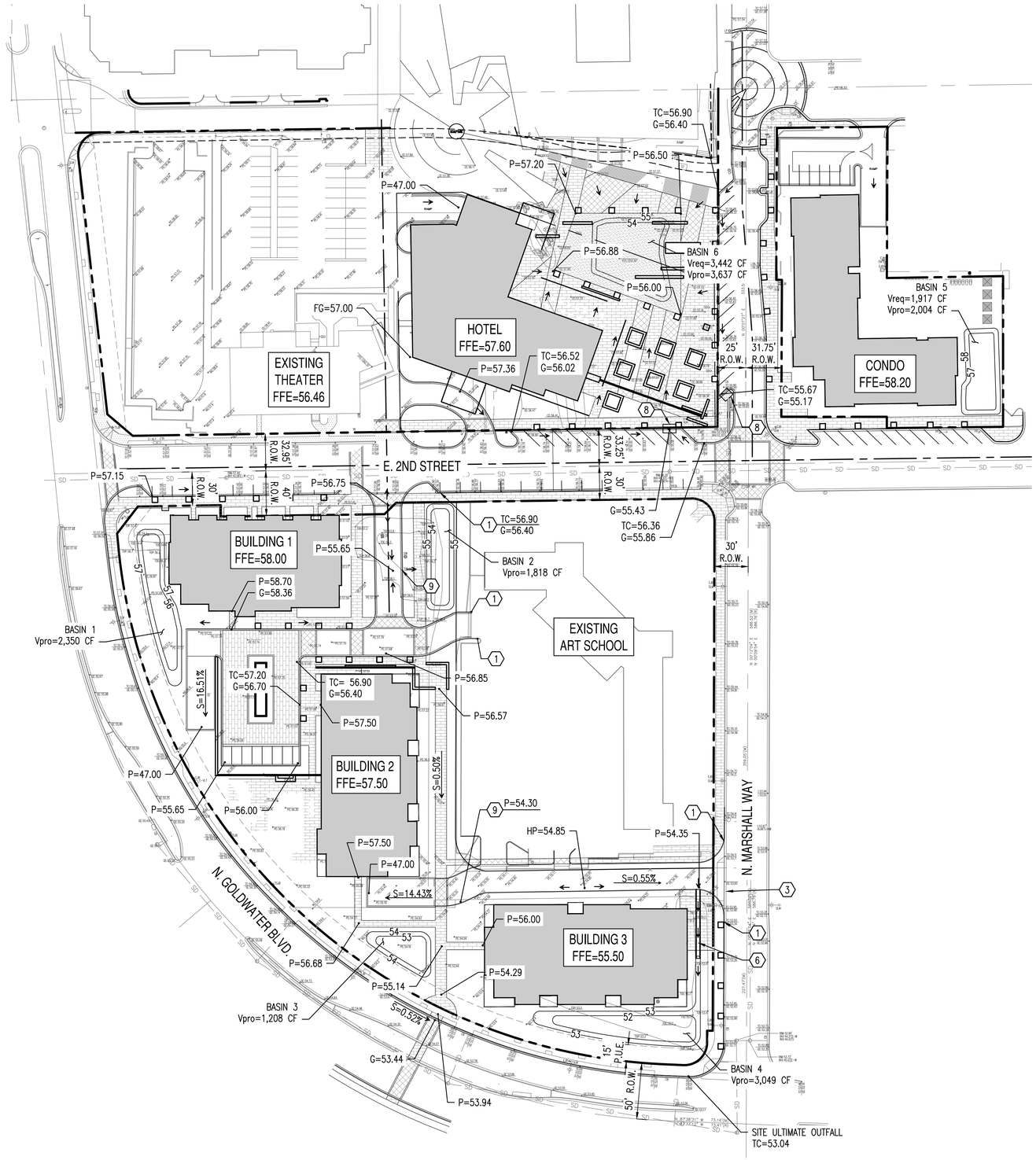
PROPOSED STORMWATER BASIN VOLUME	
BASIN ID	Proposed volume (c.f.)
1	2,349.62
2	1,817.96
3	1,208.25
4	3,048.68
TOTAL	8,424.51

BASIN 5					
ELEV.	AREA	DEPTH	AVG V	SUM V	COMMENT
(FT)	(SF)	(FT)	(CF)	(CF)	
1254.0	1,603			0.00	
		1.00	2,004.00		
1255.0	2,405			**2,004.00**	Basin HWE

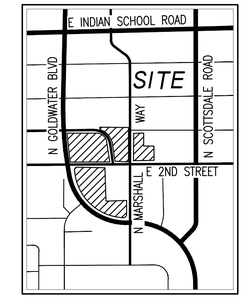
BASIN 6					
ELEV.	AREA	DEPTH	AVG V	SUM V	COMMENT
(FT)	(SF)	(FT)	(CF)	(CF)	
1257.0	3,148			0.00	
		1.00	3,636.50		
1258.0	4,125			**3,636.50**	Basin HWE

APPENDIX III

Preliminary Grading and Drainage Plan



MUSEUM SQUARE
PRELIMINARY GRADING AND DRAINAGE PLAN
E 2ND STREET & N MARSHALL WAY SCOTTSDALE, AZ 85251



NORTH
VICINITY MAP
SCALE: NTS

DEVELOPER
MACDONALD DEVELOPMENT
3225 N. CENTRAL AVENUE
PHOENIX, ARIZONA 85012
PHONE:
ATTN:

ARCHITECT
SWABACK
7550 E. MCDONALD DRIVE
SCOTTSDALE, ARIZONA 85250
PHONE: 480-367-2100
ATTN: CHRIS MCKIBBEN

ENGINEER
SUSTAINABILITY ENGINEERING GROUP
8280 E. GELDING DR. SUITE #101
SCOTTSDALE, ARIZONA 85260
PHONE: 480-588-7226
ATTN: ALI FAKIH

BENCHMARK
BENCHMARK IS A CITY OF SCOTTSDALE BRASS CAP IN HANDHOLE LOCATED AT THE INTERSECTION OF SCOTTSDALE ROAD AND INDIAN SCHOOL ROAD BEING THE NORTHEAST CORNER OR SECTION 27, TOWNSHIP 2 NORTH, RANGE 4 EAST.

ELEVATION = 1260.366' NAVD 88

BASIS OF BEARING
THE BASIS OF BEARING AND ALL MONUMENTATION SHOWN HEREON IS BASED ON THE EAST LINE OF THE NORTHEAST QUARTER OF SECTION 27, TOWNSHIP 2 NORTH, RANGE 4 EAST, USING A BEARING OF NORTH 00°09'25" WEST AS SHOWN ON THE MINOR LAND DIVISION PLAT RECORDED IN BOOK 1288, PAGE 43, MARICOPA COUNTY RECORDS.

LEGAL DESCRIPTION
A PORTION OF CENTER PARCEL 17, A PORTION OF WALKWAY SOUTH PARCEL 16, A PORTION OF TRANSIT PARCEL 14 AND COURTYARD PARCEL 35, SHARED DRIVEWAY NORTH PARCEL 30, LOFT PARCEL 25, SHARED DRIVEWAY SOUTH PARCEL 32, SHARED DRIVEWAY GORE NORTH PARCEL 33 AND SHARED DRIVEWAY GORE SOUTH PARCEL 34 AS SHOWN ON THE FINAL PLAT OF LOLOMA RECORDED IN BOOK 597, PAGE 6, MARICOPA COUNTY RECORDS AND THE RE-PLAT OF LOLOMA RECORDED IN BOOK 823, PAGE 22, MARICOPA COUNTY RECORDS, A PORTION OF THE NORTHEAST QUARTER OF SECTION 27, TOWNSHIP 2 NORTH, RANGE 4 EAST, OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA.

KEY NOTES
1. MATCH EXISTING GRADE
2. NEW 6" CURB AND GUTTER
3. REMOVE EXISTING CURB AND REPLACE 2' WIDE VALLEY GUTTER
4. NEW 5' WIDE SIDEWALK
5. REMOVE EXISTING SIDEWALK
6. CONSTRUCT SCUPPER
7. 24" DIA. HDPE STORM PIPE
8. REMOVE EXISTING CATCH BASIN AND CONSTRUCT NEW CATCH BASIN
9. CONSTRUCT CURB OPENING

PROPOSED LEGEND
TC	TOP OF CURB ELEVATION
G	GUTTER ELEVATION
	CURB & GUTTER
	PUBLIC UTILITY EASEMENT (P.U.E.)
	STORM PIPE
	STORMCEPTOR
	FLOW ARROWS
FG	FINISHED GRADE
FL	FLOW LINE
IE	INVERT ELEVATION

EXISTING LEGEND
×	SPOT ELEVATION
	FIRE HYDRANT
	CENTER LINE
	PROPERTY LINE

NORTH
0' 50' 100' 150'
SCALE: 1" = 50'

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

NOTE TO CONTRACTOR:
THIS SET OF DRAWINGS AND DOCUMENTS IS INTENDED AS A SET OF GUIDELINES ONLY. THE SET OF DRAWINGS AND INTENDED TO BE USED IN CONJUNCTION WITH A SET OF CONSTRUCTION SPECIFICATIONS TO BE SUPPLIED BY OWNER. THEY MUST BE READ TO INCORPORATE ALL APPLICABLE FEDERAL, STATE, AND LOCAL CODES INCLUDING FEDERAL A.D.A. REQUIREMENTS. THIS SET ASSUMES THAT THERE ARE NO UNUSUAL SOIL CONDITIONS OR WIND LOADS. THE FAILURE OF THIS CONDITION MAY REQUIRE SIGNIFICANT CHANGES TO THESE DOCUMENTS. THE CONTRACTOR SHALL ASSUME ALL RESPONSIBILITY FOR COMPLIANCE TO ALL APPLICABLE CODES AND TO INFORM THE OWNER/ARCHITECTS OF ANY QUESTIONS OR CLARIFICATIONS WHICH ARE DESIRED. CONTRACTORS SHALL ALSO VISIT THE SITE BEFORE BIDDING. CONTRACTORS ARE REQUIRED TO KNOW ALL OBSERVABLE CONDITIONS AND APPLICABLE CODES.

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WWW. AZSEG.COM TEL. 480.588.7226

MACDONALD
DEVELOPMENT CORPORATION

PROJECT
MUSEUM SQUARE

LOCATION
E. 2ND STREET & N. MARSHALL WAY
SCOTTSDALE, AZ 85251

DRAWN	SANTIAGO
DESIGNED	SANTIAGO
CHECKED	COUNSELL
PROJ. MGR.	FAKIH

DATE: 06/14/2018
ISSUED FOR:

REVISION NO.:	DATE:
1	
2	
3	
4	

JOB NO.: 180109

SHEET TITLE:
PRELIMINARY
GRADING AND DRAINAGE PLAN

SHEET NO.:
C3.00

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APPENDIX IV

Final Drainage Report for Marshall Way

Goldwater Blvd. to Indian School Road

Marshall Way
Goldwater Blvd to Indian School Road

Drainage Report

Project No.: TD01/1015013.02

August 8, 2017

Prepared For:

City of Scottsdale Capital Project Management

Plan # 2774-17
Case #
Q-S #
[X] Accepted
[ ] Corrections
N.Baronas 8-14-17
Reviewed By Date

Registered Professional Engineer (Civil)
CERTIFICATE NO.
25015
ANDREW JOHN
SPEAR
Date Signed 8/8/17
ARIZONA, U.S.A.
Expires 06/30/16

Dibble Engineering

7878 North 16th Street
Suite 300
Phoenix, Arizona 85020
P. 602.957.1155
F. 602.957.2838
www.dibblecorp.com

Table of Contents

I. INTRODUCTION 1

II. EXISTING CONDITIONS ANALYSIS 2

A. Goldwater Blvd to 2nd Street 2

B. 2nd Street to 1st Street 4

C. 1st Street to Main Street 4

D. Main Street to 1st Avenue 5

E. 1st Avenue to Indian School Road 5

III. ROADWAY DRAINAGE CRITERIA 5

IV. DRAINAGE RESULTS 6

A. Hydrology 6

B. Hydraulics 6

V. RESULTS 8

A. Goldwater to 2nd Street 8

B. 2nd Street to 1st Street 8

C. 1st street to Main Street 8

D. Main Street to 1st Avenue 9

E. 1st Avenue west of Marshall Way 9

List of Tables

Table 1 - Flow Splits 6

Table 2 - Q100 Street Drainage Results 7

List of Figures

Figure 1 - Vicinity Map 1

Figure 2 - Flow2D Preliminary Model Flows 3

Appendices

A – Drainage Area Map

B – DDMS Output

C – HydraFlow Cross Section Capacity Results

D – Cross –Sectional Flow Split Calculations

E –Catch Basin and Gutter Flow Calculations

I. INTRODUCTION

Marshall Way lies in the heart of Old Scottsdale, set in the art district just west of the Civic Center. Marshall is a minor collector connecting Goldwater Boulevard with Indian School Road and up to 5th Avenue. Main Street crosses Marshall Way just north of midway between Goldwater Blvd and Indian School Road and as is one of the main art gallery corridors in Downtown Scottsdale.

From halfway between 1st Street and Main St, this area is within the Main Street Design District, part of the Downtown Character Area. North of Indian School, Marshall Way continues north into the Marshall Way-Craftsman's Court and Fifth Avenue Districts.

Marshall Way is a vehicular, bike, and pedestrian link between the districts; however, the perception of the Marshall Way corridor south of Indian School Road is dark and not secure. Low levels and non-continuous roadway lighting have a significant role in these perceptions.

The area is known for ponding issues. The City and Flood Control District of Maricopa County are currently developing the Lower Indian Bend Wash Flood Study and a preliminary Flow2D model has been prepared.

This study has developed contributing watershed boundaries, runoff concentration points, intersection flow splits and cross-sections of key roadway locations on Marshall Way and 1st Avenue.

The hydraulic analysis only looked at the 100-year discharge and compared that value to the computer street capacity at 14 cross section locations.

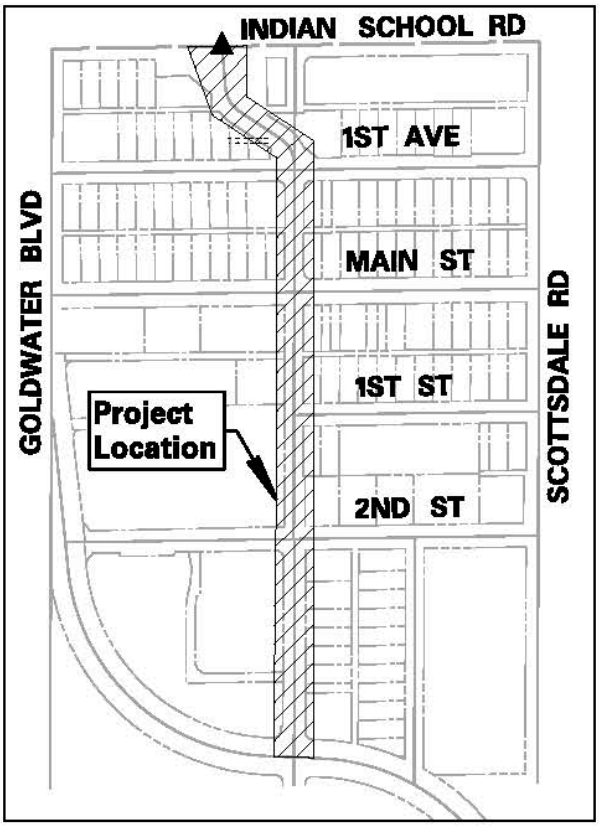


Figure 1- Vicinity Map

II. EXISTING CONDITIONS ANALYSIS

A. Goldwater Blvd to 2nd Street

Marshall Way is a 46 foot wide (back of curb (bc)-bc) paved roadway with two lanes and parallel parking on both sides. The right-of-way width is 60' with 65' at 2nd Street, but the ownership is listed in the County Assessor's as a City owned parcel as part of a plat, not as dedicated right-of-way. The right-of-way line on the west side is within the existing sidewalk. An 8-foot wide sidewalk is attached to the left curb and a 5-foot sidewalk is attached right. Goldwater Boulevard has a storm drain which outfalls into the Indian Bend Wash. At Marshall Way, the storm drainage has a 24-inch storm drain lateral which connects two existing catch basins located at each curb return on Marshall Way. The catch basins are City of Phoenix Standard curb opening type with 17-foot wings to the north. The west side of Marshall Way is vertical curb and the east side is primarily rolled curb.

The Flow2D model does not show significant issues with flow depth within this segment. The Flow2D model is shown in Figure 2.

An existing cross section, Cross Section 1, was prepared which showed the existing street has capacity for the 100-year discharge.

Figure 2 - Flow2D Preliminary Model Flows
Source: (FCDMC)

B. 2nd Street to 1st Street

Marshall Way in this segment is 32-foot wide except where southbound just north of 2nd Street. Parallel parking is allowed on the right. The right of way varies but starts out as 55-feet north of 2nd Street and reduces to 50 feet up to 1st Street. The east side sidewalk is 5-foot in width and attached. The west side sidewalk is variable in width and incorporated into the Museum of the West's pedestrian sidewalks. Two driveways are located on the east side. No driveways to the west. Roadway drainage is confined to the street drainage except near 2nd Street where a storm drain is located in 2nd street and flows easterly to Indian Bend Wash. Two catch basins are located at the west curb returns on 2nd Street. These are curb opening inlets with 17-foot wings to each side of a 3-foot wide basin. The 72-inch diameter storm drain was constructed as part of the Second Street Storm Drain, 69th Street to Wells Fargo Avenue, Project No. F-1704, as-built date 3/11/93.

An additional catch basin with an 18-inch diameter lateral is located on Marshall Way at the northwest curb return which drains the west curb and gutter to the 72-inch storm drain. The storm drain as-builts show a 30-inch diameter stub-out was designed to the north but not installed, suggesting the possibility that the storm drain was designed for additional flow at Marshall Way. The profile of the storm drain include a grade break at the west side Marshall Way at the catch basin laterals. The steeper grade to the east would have developed a higher capacity in the storm drain.

In addition, scuppers are located at the Low Impact Design linear basin and bio swales located on the Museum of the West property. These curb openings allow some of the runoff to exit the roadway and be used to irrigate the landscaped areas on the site. A recent rainstorm shows that flows can leave the roadway into the landscape areas but the capacity is small so that any additional rain will begin to pond along the west curb.

At the 2nd street intersection, the west curb line bulbs out into the road, creating a parking lane along the west curb north of this pint. The Scottsdale Trolley uses this parking lane for the bus stop location. The east curb has a recessed bus pullout just north of the 2nd Street intersection with a valley gutter to convey runoff to 2nd Street and then easterly.

The Flow2D shows depths of flow over the curb in this segment. The model shows that the incoming flow from the north splits at 1st Avenue with a significant percentage of the runoff flowing easterly in the 1st Avenue right-of-way.

To the west is identified watershed ON4 which is bounded by south of 1st Street to 2nd Street, Goldwater to Marshall. The Flow2D model shows that the majority of this watershed discharges into 2nd Street with only the east half of the Museum of the West building and Marshall right-of-way discharging into Marshall Way.

C. 1st Street to Main Street

Marshall Way in this segment is 32-foot wide except where southbound parallel parking is allowed in the northerly portion toward Main Street. Parallel parking is allowed on the right. The right of way varies but starts out as 55-feet north of 2nd Street and reduces to 50 feet up to Main Street. The east side sidewalk is 5-foot in width and attached. The west side sidewalk is variable in width and incorporated into the Museum of the West's pedestrian sidewalks. Three driveways are located on the east side. No driveways to the west. The curb and gutter is vertical to the west and on the east side from the alley north to Main Street, and rolled from 1st Street to the alley.

Runoff from the north enters this segment at Main Street. The Flow2D model shows a flow split at Main Street with a slightly larger amount heading south in Marshall Way than in Main Street. The Flow2D model also shows ponding issues.

The Arizona School of Real Estate and Business has the rolled curb in front. The finished floor (elevation 1258.78) of the building is 1.0 higher than the back of rolled curb. The existing rolled curb limits the capacity of the street section.

D. Main Street to 1st Avenue

The roadway width in this segment varies from 24-feet at the bump-outs to 50-feet where there is parallel parking to the east and 45° parking to the west. The portion from the alley to 1st Avenue is 40 feet wide and parallel parking is allowed on both sides. The right-of-way is 50 feet wide. The 45° parking has part of the parking space and curb outside of the right-of-way. The sidewalks are 5 feet wide and attached. Two driveways are located within this section at the alleyway halfway between Main Street and 1st Avenue.

North of Main Street, the west curb has a bump-out island with an 8.25-foot wide open scupper along the main curb line. The east curb also has a bump-out with a 2.5-foot wide covered scupper.

E. 1st Avenue to Indian School Road

The roadway is 40 feet wide and is signed for "No Parking". The right-of-way varies but it is generally 70 feet in width. The land is platted but the right-of-way is not shown as dedicated right-of-way. Marshall Way has a reverse curve to the west to match into the location of Marshall Way to the north of Indian School Road. The sidewalks are 8 feet wide and detached with a 5-foot landscape buffer. One driveway is located on each side of Marshall Way. Runoff comes from the south curb of Indian School Road at Goldwater Boulevard into the Marshall Way roadway. Part of the land bounded by 1st Avenue to Indian School Road and Goldwater Blvd. to Marshall Way flows onto the Marshall Way roadway and part into the 1st Avenue roadway. Runoff is conveyed through curb and gutter within the right of way. At the intersection of 1st Avenue and Marshall Way, the flow splits east and south. The majority is shown in the Flow2D model to flow south.

III. ROADWAY DRAINAGE CRITERIA

The City of Scottsdale (COS) is the owner on this project and will be responsible for the maintenance of the roadway and drainage system following construction completion. Per the design criteria, this report will look at the 100-year design discharge and compare to the street capacity. For the 100-year design discharge, the full right-of-way can be used with the test of the water surface elevation not being greater than the adjacent finish floor elevation. This was completed in two steps. First the existing roadway capacity was calculated with the software program HydraFlow. Cross-section were developed from the existing surface developed from survey data collected in January 2017. The Cross sections were edited using the survey data and field photo graphs to support any changes.

If the 100-year discharge exceeded the gutter capacity, than the right-of-way capacity was calculated. If the design discharge exceed the street capacity for both the existing and proposed condition, the results were note and the finished floor elevations were checked.

The proposed cross sections were developed from the plans. If the design plans required changes, the cross sections were revised until the criteria was met and the plans were revised accordingly.

Fourteen cross sections were developed at key locations as shown on the figure below.

IV. DRAINAGE RESULTS

A. Hydrology

The rational Method was incorporated in the hydrology by using the Drainage Design Management System (DDMS) software by the FCDMC. The City of Scottsdale criteria was used include a 5-munite minute minimum time of concentration.

Nine watersheds were delineated for the area. Four, labeled ON1 through ON4, cover the area comprised of urban buildings and roadways. Five, labeled ON5 through ON9, cover the open areas or eastern half street sections of Indian School Road and Marshall Way. Appendix A shows the watershed boundaries.

The Flow2D model shows runoff flows splitting at the roadway intersections in the 100-year design flow scenario. The Flow2D results were used to develop flow splits for the rational method routing. The Flow2D model shows flows splits at 1st Avenue, Main Street and 1st Street. At 2nd Street, the southerly flowing Marshall Way runoff turns and flows east in 2nd Street. Using the Flow2D GIS depth grid, each intersection flow split was determined and shown in **Table 1**. After review, the Flow Splits were also determined by using the cross-sectional area method using Hydraflow to determine the cross sectional area to determine the percentage of flow on the south leg versus the east leg of an intersection flow split. The results are shown in Appendix D.

Table 1 - Flow Splits

Intersection	Flow Split (% south/% east) By Flow2D	Flow Split (% south / % east) By Cross Section
Marshall Way / 1st Avenue	75% / 25%	69% / 31%
Marshall Way / Main Street	60% / 40%	46% / 54%
Marshall Way / 1st Street	20% / 80%	41% / 59%

Routing is based on adding the subareas. No attenuation is accounted for. A test case was performed at Concertation Point No. 2 located at Marshall Way and Main Street. The additive sub-basin routing was compared to the combined watershed area as one. The sub-basin routing was calculated to be 64.1 and the single watershed was calculated to be 61.9, a 3% difference. The sub-basin routing yields a more conservative analysis.

Appendix B shows the DDMS results.

B. Hydraulics

In the hydraulic design, HydraFlow software was used and incorporated FCDMC Manning's n-values were used as well as the City's composite street section n-value of 0.015. Any offsite decomposed granite or dirt areas used an n-value of 0.03.

Table 2 below show the results of the hydraulic analysis. Appendix B shows the existing and proposed sections with the street capacity calculations.

Table 2 - Q100 Street Drainage Results

Cross Section	Station	Existing Street Capacity (cfs)	Proposed Street Capacity (cfs)	Q100 (cfs)	Meets Existing	Meets Proposed	
1	10+75	57.76	56.66	13.1	Yes	Yes	
2	16+32	10.79	10.79	37.5	No	No	#1
3	17+00	60.34	74.1	34.7	Yes	Yes	
4	17+90	38.66	33.88	26.7	Yes	Yes	
5	18+85	104.48	104.48	26.7	Yes	Yes	
6	19+70	59.5	45.19	37.0	Yes	Yes	
7	20+94	24.81	37.59	36.1	No	Yes	
8	21+60	41.62	35.5	35.1	Yes	Yes	#2
9	23+15	31.59	31.59	28.2	Yes	Yes	#3
10	24+30	59.56	30.93	28.1	Yes	Yes	
11	25+50	57.13	39.05	26.2	Yes	Yes	
12	25+82/33' Lt	42.13	27.14	22.0	Yes	Yes	#4
13	25+82/93' Lt	38.17	38.17	22.0	Yes	Yes	
14	26+20	27.62	44.95	13.0	Yes	Yes	

Notes:

#1

Existing street section is under capacity. No changes in proposed conditions. Q100 flow will overtop curb and flow into parking area as sheet flow with low depth. Catch basin at northwest corner of 2nd St and Marshall has 5.2 cfs capacity at 8-inch depth (including depression).

#2

Revised island in Project Plans to a 3-foot scupper and reduced width 1' to obtain design criteria.

#3

Revised NW ramp on Marshall Way only, deleted proposed changes to island.

#4

Widened 1st Avenue SW bulb out 1 foot to south from plans to add street drainage capacity to meet design criteria.

V. RESULTS

A. Goldwater to 2nd Street

The project proposes to reduce the street capacity. The west curb will be moved into the road approximately 5 feet and the east side 1 foot. The west catch basin will be replaced with the same size as the existing catch basin, a City of Phoenix Standard P1569-1 with a 17-foot wing.

The existing catch basin is in sump condition at an approach slope of 0.58%. A similar on-grade catch basin is located on the northwest corner of Goldwater Boulevard and Marshall Way along the north curb of Goldwater Blvd. At the intersection, the street transverse cross sloe transitions to a valley gutter which flows to the east. North of the intersection, the cross slope is 2.0%. The DDMS reports shows a 10-year design discharge for street drainage is 6.1 cfs. The spread at the design flow is 15 feet. See the calculations in Appendix E. The spread will encroach 5 feet into the 10-foot wide. The 20-foot catch basin has a capacity of 5.4 cfs (with 25% clogging factor). The yields 0.7 cfs which will not be intercepted by the catch basin and flow to the next downstream catch basin located in Goldwater Blvd. This condition is consistent with the existing conditions. The calculations conducted herein are based on a larger area of the parking lot which may actually not reach the street but be directed to on-site retention.

B. 2nd Street to 1st Street

The cross sections were cut at the existing and proposed bottlenecks for the 100-year drainage flow. Cross Section 2 shows the existing cross section does not meet the design flow. The runoff will overtop the eastern curb into a parking lot and flow south easterly back into 2nd Street. The proposed project does not change this condition.

Cross section 3 has excess street drainage capacity. The new driveway and curb does not reduce the capacity. The loss of the bus pullout does not affect the capacity because of the downstream bottleneck at cross section 2.

An existing sump catch basin is located at the northwest corner of Marshall Way and 2nd Street. The capacity of the catch basin has been calculated to be 5.2 cfs. The calculations are in Appendix E.

Cross section 4 also has the runoff capacity in the proposed condition.

Cross section 5 also has runoff capacity. The east curb is proposed to be moved into the road approximately 5 feet.

C. 1st street to Main Street

Cross section 6 is located at a point where the bulb out could create a ponding which would impact the Building on the northeast corner of 1st Street and Marshall Way. Finished floor elevations were surveyed to be 1257.85. Cross section 6 capacity is 45.1 cfs at the finished floor in the proposed condition. The design discharge is 37.0 cfs.

Cross Section 7 is located at the driveway and alleyway at Station 20+94. The east side alley driveway will be extended into the street effectively reducing the street drainage capacity. The curb will be revised to a vertical which adds 2-inch of additional height to the water surface before the runoff spills into the alley. Anecdotal evidence suggests that this condition occurs in heavy storms in the current condition. The proposed changes will increase the capacity of the street by raising the back of sidewalk elevation.

Cross section 8 is located at a proposed parking island at Station 21+60. The island is required in order to place a street light at this location. The analysis showed that the original island design need to be revised to include a 3-foot wide scupper and the width of the island into the street reduced by 1 foot to provide the design capacity.

D. Main Street to 1st Avenue

Cross section 9 is located just north of the roundabout where existing curb bulb outs extend into Marshall Way. Originally, the plans proposed to extend the NW ramp into the Marshall Way street to match the exiting bulb out. This required reducing the west scupper width which bought the design capacity of the street below the design discharge. Options to mitigate the loss in capacity failed to alleviate the issue. This report recommends the design be revised to match the existing condition.

Cross Section 10 is located at the alleyway north of Main Street. Alleys are located both east and west of Marshall Way. The proposed condition is to extend the driveways into Marshall Way parking lane to create pocket for street lighting. The west side is an extension of the curb line to the north so the alley extension does not affect drainage. The east side does reduce the street drainage capacity but it still has a capacity greater than the design discharge.
Cross section 11 is located one the south leg of the 1st Avenue and Marshall Way intersection where two new curb bulb-outs are proposed. The street capacity will continue to be greater than the design discharge here.

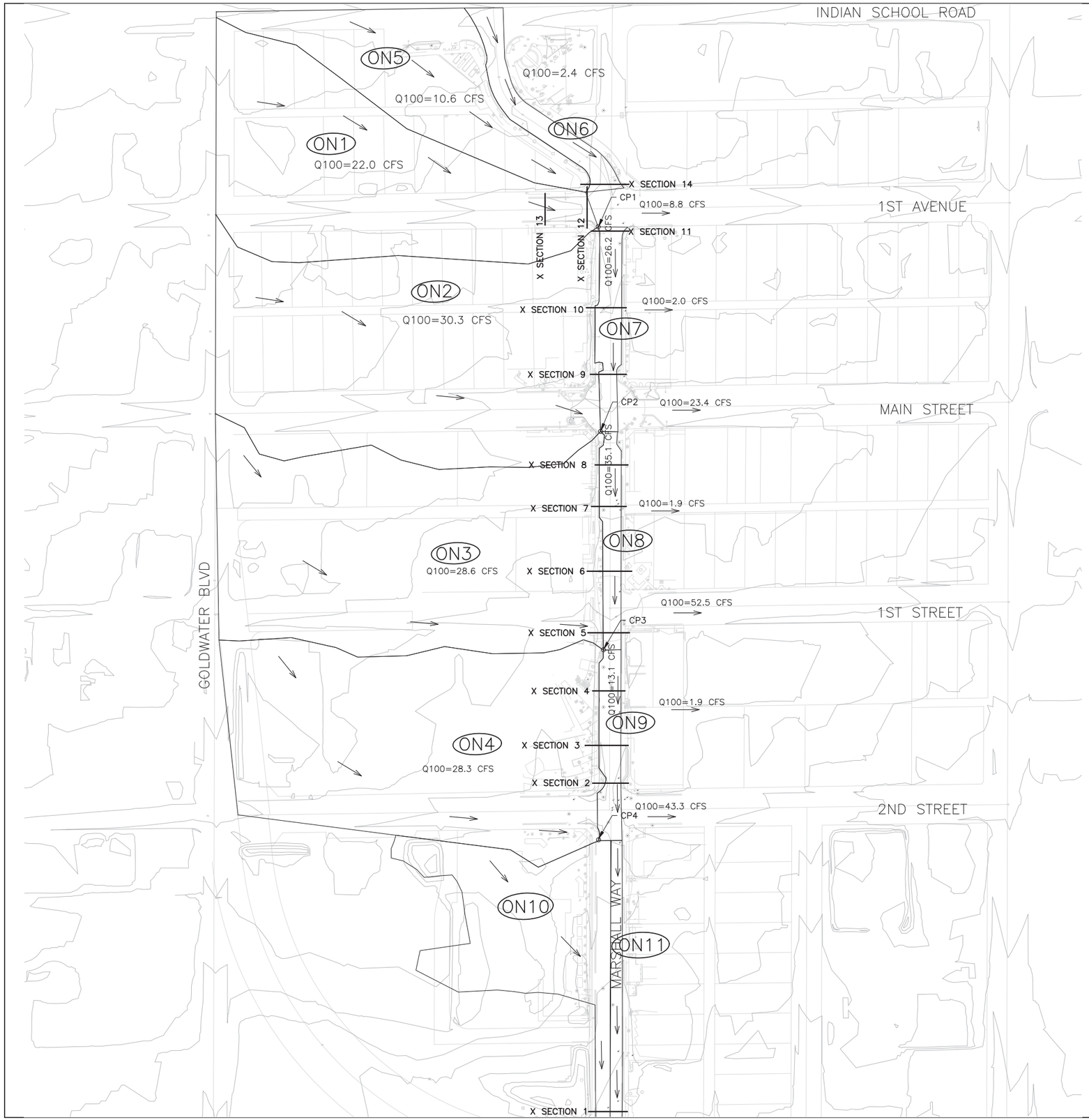
E. 1st Avenue west of Marshall Way

On 1st avenue west of Marshall Way, the building at the southwest corner has a finished floor lower than the street curb elevation. An existing swale made from bricks is located at the doorway on the north side of the building. The swale drains to the east around the building in a rock swale. The finished floor elevation is 1260.95 and the brick swale elevation is 0.20-0.40 feet lower.

Cross section 12 is located at the west curb returns of the intersection. The returns are proposed to be bulb-outs to define the parking lanes and reduce the pedestrian crossing distance. The top of sidewalk is capacity of the street section. A scupper is planned for the low flows in the 1st Avenue south gutter to be routed to the Marshall Way west curb. The design as shown in the 100% plans did not have the capacity to convey the runoff by a minor amount. In order to mitigate this, the south bulb-out curb will be moved to the south 1-foot to provide the required capacity in the 1st Avenue street section.

Cross section 13 is located adjacent to the building's doors to determine the existing roadway capacity. The design discharge was determined to be below the street capacity.

APPENDIX A
WATERSHED MAP



CONCENTRATION POINT	TOTAL Q100 (CFS)	TOTAL Q10 (CFS)
CP1	35.00	18.30
CP2	58.50	30.40
CP3	65.60	33.60
CP4	43.30	22.40

N

0' 40' 80' 160'

SCALE: 1"=80'

DRAINAGE EXHIBIT

MARSHALL WAY PEDESTRIAN IMPROVEMENTS STUDY

DIBBLE PROJECT - 1015013.02

Dibble Engineering
7878 North 16th Street
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www.dibblecorp.com

APPENDIX B
DDMS RESULTS

Flood Control District of Maricopa County
Drainage Design Management System
SUB BASINS
Project Reference: MARSHALL WAY

ID	Sub Basin Data							Sub Basin Hydrology Summary					
	Area (acres)	Length (ft)	USGE	DSGE	Slope (ft/mi)	Kb		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin ID: 01													
ON1	3.3	611	1,265.00	1,261.00	34.6	0.037	Q (cfs)	6.3	9.2	11.4	16.2	19.1	22.0
							C	0.85	0.85	0.85	0.94	0.95	0.95
							CA (ac)	2.84	2.84	2.84	3.14	3.17	3.17
							Volume (ac-ft)	0.1182	0.1489	0.1698	0.2204	0.2423	0.2670
							Tc (min)	10	9	8	7	7	7
							i (in/hr)	2.22	3.23	4.03	5.15	6.04	6.93
ON2	4.8	691	1,263.00	1,259.00	30.6	0.036	Q (cfs)	8.6	12.5	15.6	22.2	26.3	30.3
							C	0.85	0.85	0.85	0.94	0.95	0.95
							CA (ac)	4.07	4.07	4.07	4.50	4.55	4.55
							Volume (ac-ft)	0.1787	0.2253	0.2582	0.3347	0.3724	0.4067
							Tc (min)	11	10	9	8	8	7
							i (in/hr)	2.12	3.06	3.84	4.93	5.79	6.67
ON3	4.6	739	1,261.00	1,257.00	28.6	0.036	Q (cfs)	8.1	11.7	14.6	20.8	24.8	28.6
							C	0.85	0.85	0.85	0.94	0.95	0.95
							CA (ac)	3.94	3.94	3.94	4.36	4.41	4.41
							Volume (ac-ft)	0.1802	0.2259	0.2604	0.3366	0.3739	0.4102
							Tc (min)	12	11	10	9	8	8
							i (in/hr)	2.06	2.97	3.70	4.77	5.63	6.49
ON4	4.4	590	1,259.00	1,256.00	26.8	0.036	Q (cfs)	8.1	11.7	14.7	20.8	24.6	28.3
							C	0.85	0.85	0.85	0.94	0.95	0.95
							CA (ac)	3.74	3.74	3.74	4.14	4.18	4.18
							Volume (ac-ft)	0.1609	0.2022	0.2325	0.2983	0.3347	0.3643
							Tc (min)	11	9	9	8	7	7
							i (in/hr)	2.16	3.12	3.92	5.03	5.88	6.78
ON5	1.6	503	1,265.00	1,262.00	31.5	0.039	Q (cfs)	3.1	4.5	5.6	7.8	9.3	10.6
							C	0.85	0.85	0.85	0.94	0.95	0.95

* Non default value

Flood Control District of Maricopa County
Drainage Design Management System
SUB BASINS
Project Reference: MARSHALL WAY

ID	Sub Basin Data							Sub Basin Hydrology Summary					
	Area (acres)	Length (ft)	USGE	DSGE	Slope (ft/mi)	Kb		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin ID: 01													
							CA (ac)	1.35	1.35	1.35	1.49	1.51	1.51
							Volume (ac-ft)	0.0553	0.0695	0.0793	0.1004	0.1129	0.1228
							Tc (min)	10	8	8	7	7	6
							i (in/hr)	2.27	3.30	4.12	5.26	6.14	7.04
ON10	1.7	508	1,257.00	1,253.00	41.6	0.039	Q (cfs)	3.4	4.9	6.1	8.6	10.2	11.6
							C	0.85	0.85	0.85	0.94	0.95	0.95
							CA (ac)	1.43	1.43	1.43	1.58	1.60	1.60
							Volume (ac-ft)	0.0544	0.0685	0.0785	0.1012	0.1125	0.1216
							Tc (min)	9	8	7	6	6	6
							i (in/hr)	2.40	3.45	4.28	5.44	6.35	7.28
ON6	0.3	383	1,264.00	1,261.00	41.4	0.043	Q (cfs)	0.7	1.0	1.3	1.8	2.1	2.4
							C	0.85	0.85	0.85	0.94	0.95	0.95
							CA (ac)	0.29	0.29	0.29	0.32	0.32	0.32
							Volume (ac-ft)	0.0102	0.0127	0.0151	0.0192	0.0209	0.0229
							Tc (min)	8	7	6	6	5	5
							i (in/hr)	2.50	3.58	4.45	5.62	6.56	7.48
ON7	0.3	288	1,261.00	1,259.00	36.7	0.043	Q (cfs)	0.6	0.9	1.1	1.5	1.8	2.0
							C	0.85	0.85	0.85	0.94	0.95	0.95
							CA (ac)	0.24	0.24	0.24	0.26	0.27	0.27
							Volume (ac-ft)	0.0077	0.0101	0.0113	0.0141	0.0165	0.0184
							Tc (min)	7	6	6	5	5	5
							i (in/hr)	2.63	3.74	4.62	5.84	6.71	7.56
ON8	0.3	294	1,259.00	1,257.00	35.9	0.044	Q (cfs)	0.6	0.8	1.0	1.4	1.7	1.9
							C	0.85	0.85	0.85	0.94	0.95	0.95
							CA (ac)	0.22	0.22	0.22	0.24	0.25	0.25
							Volume (ac-ft)	0.0079	0.0091	0.0107	0.0136	0.0156	0.0175
							Tc (min)	7	6	6	5	5	5
							i (in/hr)	2.60	3.72	4.57	5.77	6.71	7.56

* Non default value

Flood Control District of Maricopa County
Drainage Design Management System
SUB BASINS
Project Reference: MARSHALL WAY

ID	Sub Basin Data							Sub Basin Hydrology Summary					
	Area (acres)	Length (ft)	USGE	DSGE	Slope (ft/mi)	Kb		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin ID: 01													
ON9	0.3	258	1,257.00	1,256.00	20.5	0.044	Q (cfs)	0.5	0.8	1.0	1.3	1.6	1.9
							C	0.85	0.85	0.85	0.94	0.95	0.95
							CA (ac)	0.22	0.22	0.22	0.24	0.25	0.25
							Volume (ac-ft)	0.0075	0.0104	0.0120	0.0143	0.0165	0.0185
							Tc (min)	8	7	7	6	6	5
							i (in/hr)	2.46	3.54	4.40	5.56	6.49	7.44
ON11	0.2	471	1,256.00	1,253.00	33.6	0.044	Q (cfs)	0.4	0.6	0.8	1.1	1.3	1.5
							C	0.85	0.85	0.85	0.94	0.95	0.95
							CA (ac)	0.19	0.19	0.19	0.21	0.21	0.21
							Volume (ac-ft)	0.0073	0.0094	0.0115	0.0144	0.0160	0.0177
							Tc (min)	10	9	8	7	7	6
							i (in/hr)	2.24	3.28	4.10	5.23	6.11	7.00

* Non default value

APPENDIX C
HYDRAFLOW RESULTS
EXISTING AND PROPOSED CROSS SECTIONS

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Jul 18 2017

Cross Section 1

User-defined

Invert Elev (ft)	= 1252.24
Slope (%)	= 0.63
N-Value	= Composite

Calculations

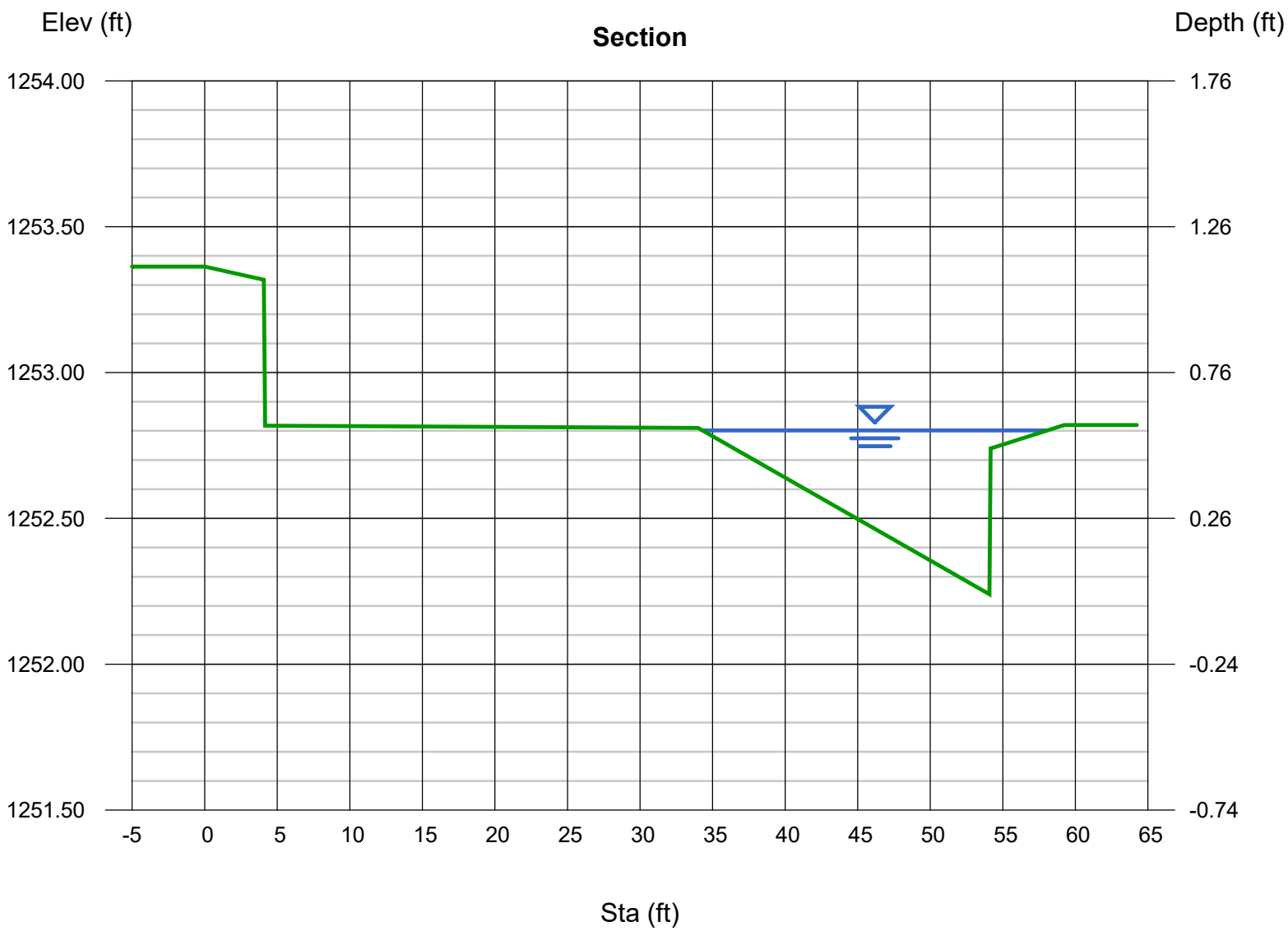
Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 0.56
Q (cfs)	= 19.75
Area (sqft)	= 5.70
Velocity (ft/s)	= 3.47
Wetted Perim (ft)	= 24.20
Crit Depth, Yc (ft)	= 0.63
Top Width (ft)	= 23.76
EGL (ft)	= 0.75

(Sta, El, n)-(Sta, El, n)...

(0.00, 1253.36)-(4.08, 1253.32, 0.013)-(4.16, 1252.82, 0.013)-(34.00, 1252.81, 0.013)-(54.08, 1252.24, 0.013)-(54.16, 1252.74, 0.013)-(59.23, 1252.82, 0.013)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jul 24 2017

Cross Section 2

User-defined

Invert Elev (ft)	= 1255.15
Slope (%)	= 0.37
N-Value	= Composite

Calculations

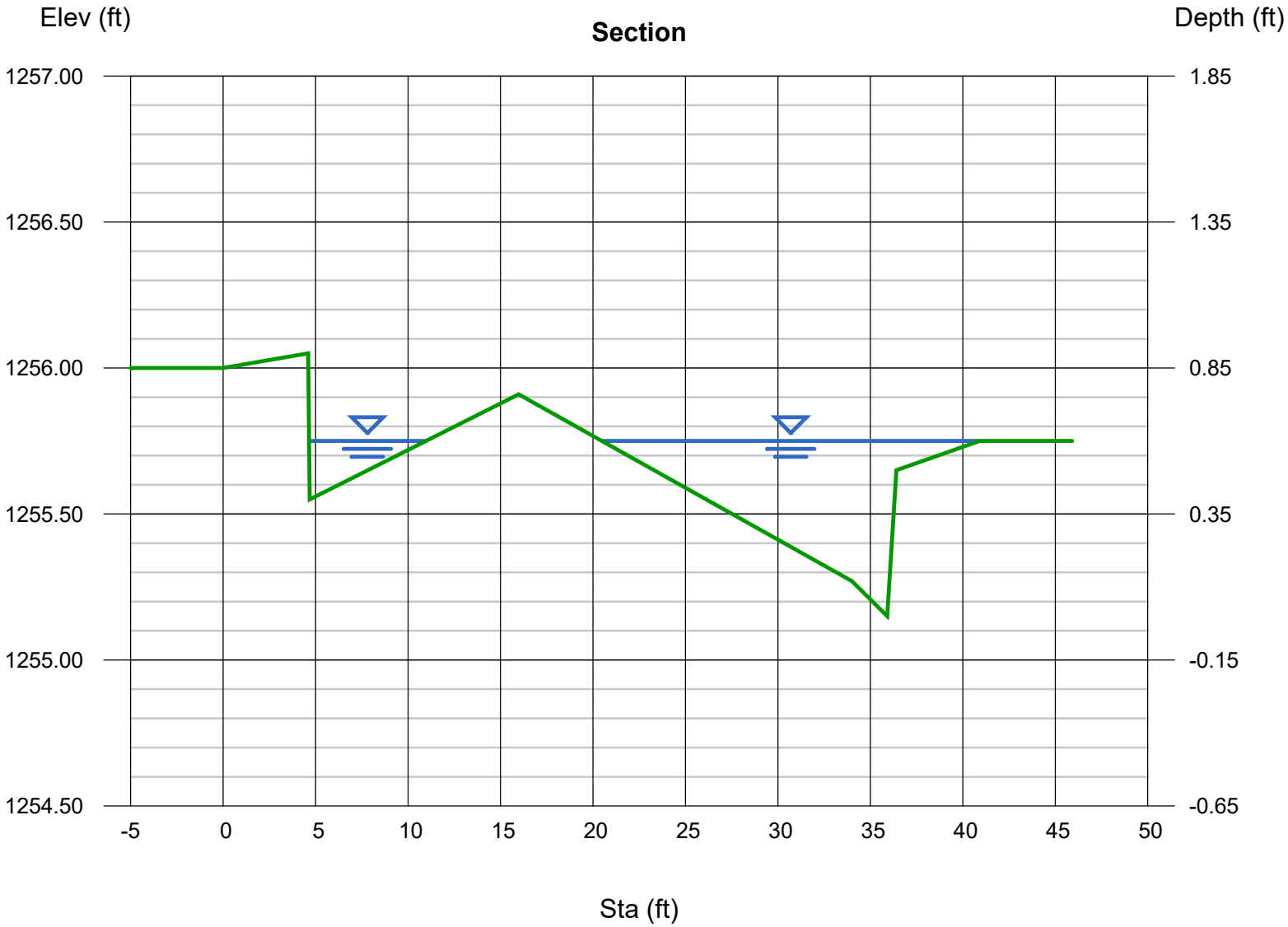
Compute by:	Q vs Depth
No. Increments	= 30

Highlighted

Depth (ft)	= 0.60
Q (cfs)	= 10.79
Area (sqft)	= 5.31
Velocity (ft/s)	= 2.03
Wetted Perim (ft)	= 27.13
Crit Depth, Yc (ft)	= 0.57
Top Width (ft)	= 26.74
EGL (ft)	= 0.66

(Sta, El, n)-(Sta, El, n)...

(0.00, 1256.00)-(4.60, 1256.05, 0.015)-(4.68, 1255.55, 0.015)-(6.57, 1255.61, 0.015)-(15.98, 1255.91, 0.015)-(34.00, 1255.27, 0.015)-(35.91, 1255.15, 0.015)-(36.41, 1255.65, 0.015)-(40.91, 1255.75, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jul 21 2017

Cross Section 3

User-defined

Invert Elev (ft)	= 1255.49
Slope (%)	= 0.37
N-Value	= Composite

Calculations

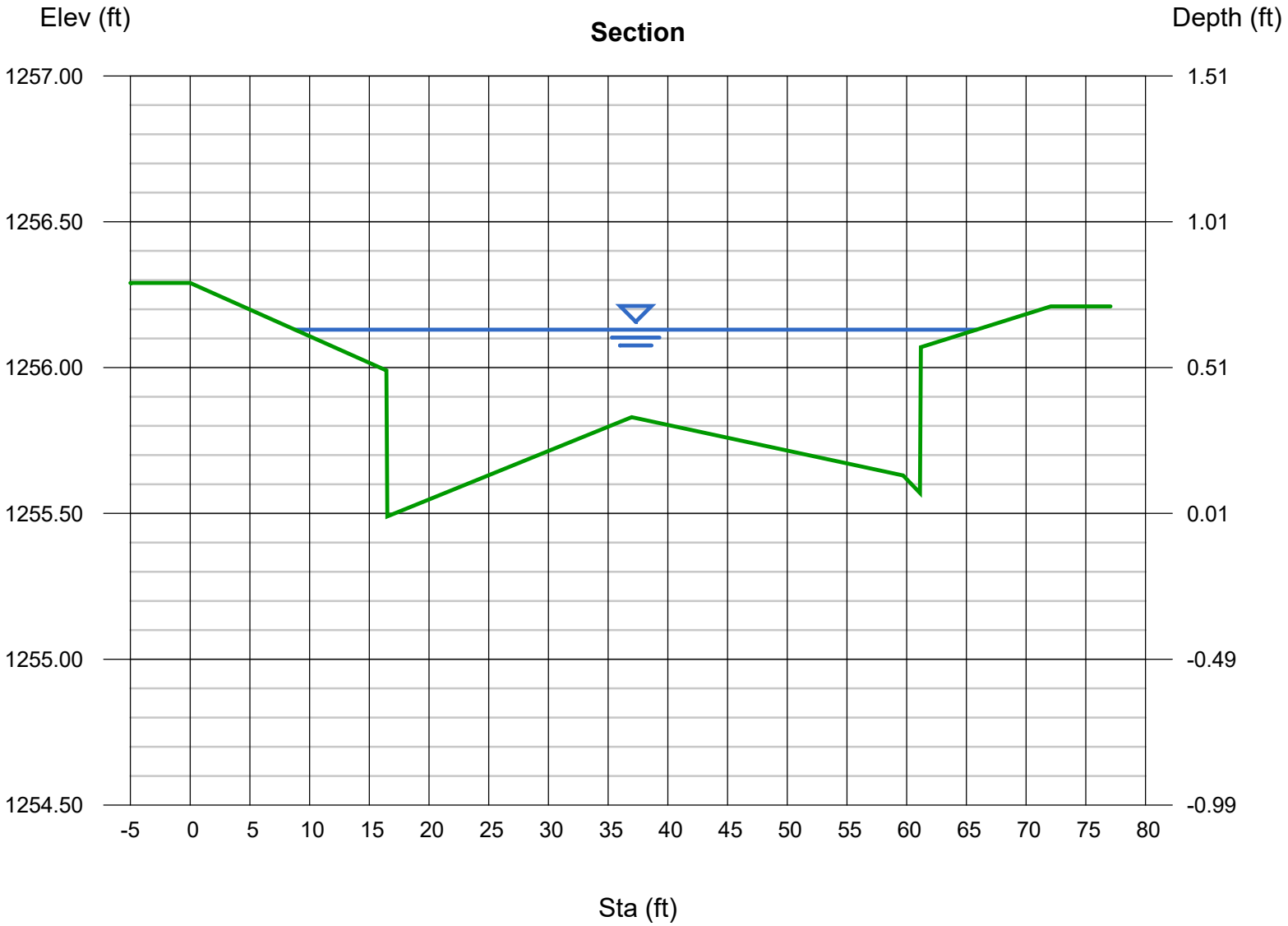
Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 0.64
Q (cfs)	= 60.34
Area (sqft)	= 20.19
Velocity (ft/s)	= 2.99
Wetted Perim (ft)	= 57.95
Crit Depth, Yc (ft)	= 0.61
Top Width (ft)	= 57.09
EGL (ft)	= 0.78

(Sta, El, n)-(Sta, El, n)...

(0.00, 1256.29)-(16.43, 1255.99, 0.015)-(16.51, 1255.49, 0.015)-(36.97, 1255.83, 0.015)-(59.70, 1255.63, 0.015)-(61.11, 1255.57, 0.015)-(61.19, 1256.07, 0.015)-(72.07, 1256.21, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jul 21 2017

Cross Section 4

User-defined

Invert Elev (ft)	= 1256.08
Slope (%)	= 0.37
N-Value	= Composite

Calculations

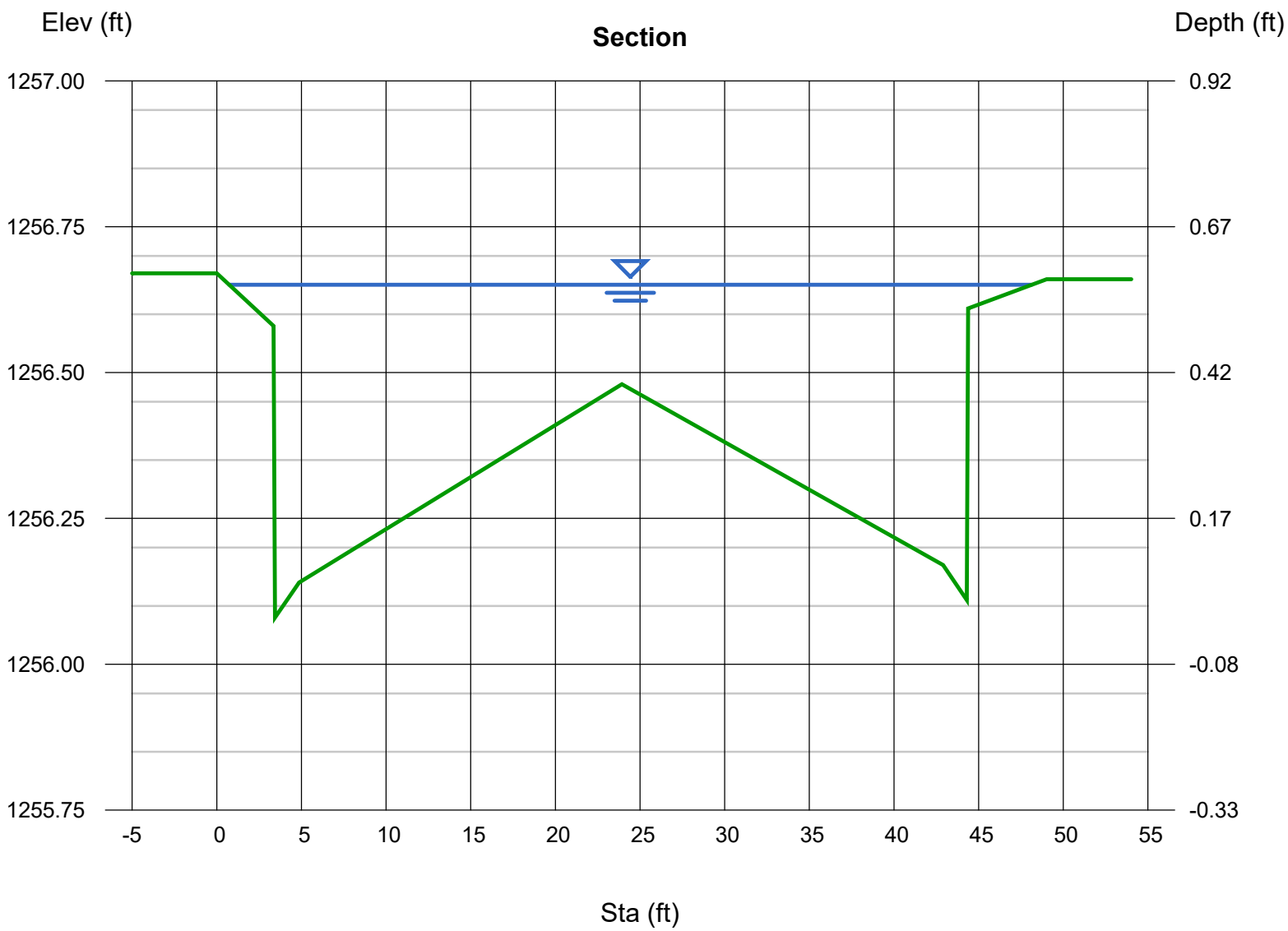
Compute by:	Q vs Depth
No. Increments	= 30

Highlighted

Depth (ft)	= 0.57
Q (cfs)	= 38.66
Area (sqft)	= 14.37
Velocity (ft/s)	= 2.69
Wetted Perim (ft)	= 48.25
Crit Depth, Yc (ft)	= 0.53
Top Width (ft)	= 47.40
EGL (ft)	= 0.68

(Sta, El, n)-(Sta, El, n)...

(0.00, 1256.67)-(3.35, 1256.58, 0.015)-(3.44, 1256.08, 0.015)-(4.86, 1256.14, 0.015)-(23.93, 1256.48, 0.015)-(42.90, 1256.17, 0.015)-(44.30, 1256.11, 0.015)-(44.38, 1256.61, 0.015)-(49.02, 1256.66, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Jul 25 2017

Cross Section 5

User-defined

Invert Elev (ft)	= 1256.45
Slope (%)	= 0.31
N-Value	= Composite

Calculations

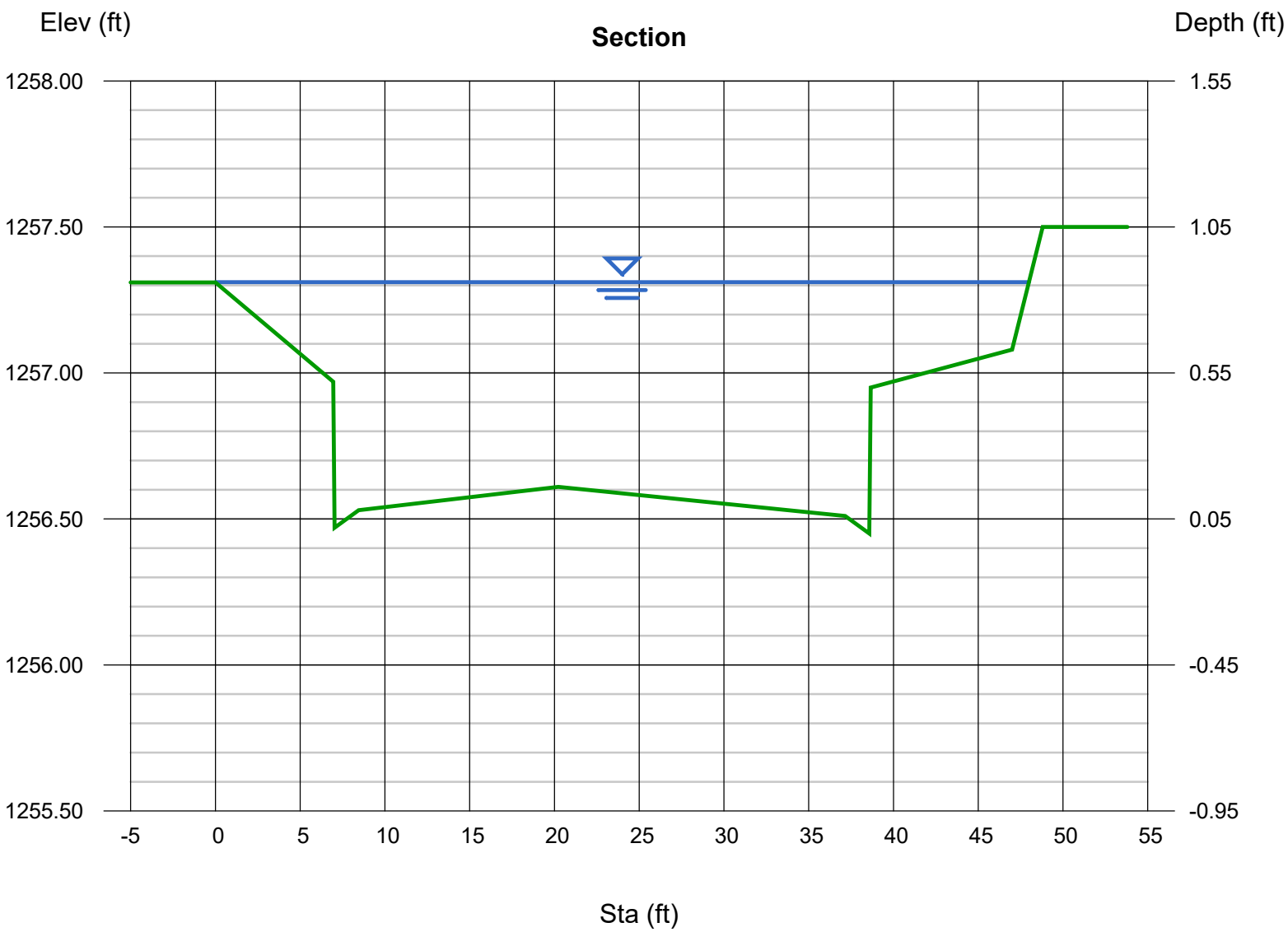
Compute by:	Q vs Depth
No. Increments	= 50

Highlighted

Depth (ft)	= 0.86
Q (cfs)	= 104.48
Area (sqft)	= 27.64
Velocity (ft/s)	= 3.78
Wetted Perim (ft)	= 48.87
Crit Depth, Yc (ft)	= 0.81
Top Width (ft)	= 47.99
EGL (ft)	= 1.08

(Sta, El, n)-(Sta, El, n)...

(0.00, 1257.31)-(6.95, 1256.97, 0.015)-(7.03, 1256.47, 0.015)-(8.45, 1256.53, 0.015)-(20.23, 1256.61, 0.015)-(37.15, 1256.51, 0.015)-(38.57, 1256.45, 0.015)-(38.66, 1256.95, 0.015)-(47.00, 1257.08, 0.015)-(48.80, 1257.50, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Jul 25 2017

Cross Section 6

User-defined

Invert Elev (ft)	= 1257.15
Slope (%)	= 0.31
N-Value	= Composite

Calculations

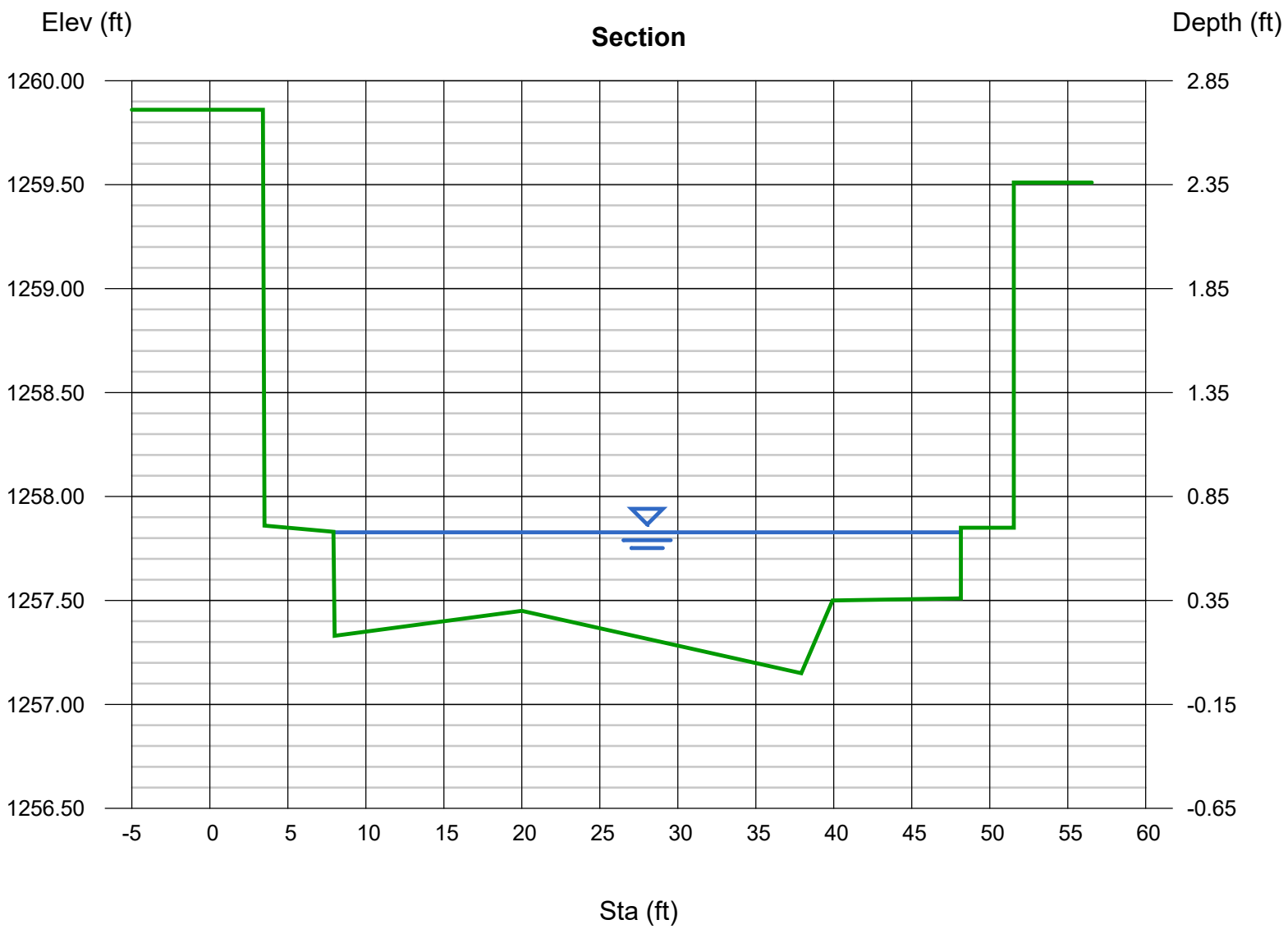
Compute by:	Q vs Depth
No. Increments	= 40

Highlighted

Depth (ft)	= 0.68
Q (cfs)	= 59.50
Area (sqft)	= 18.38
Velocity (ft/s)	= 3.24
Wetted Perim (ft)	= 41.00
Crit Depth, Yc (ft)	= 0.63
Top Width (ft)	= 40.23
EGL (ft)	= 0.84

(Sta, El, n)-(Sta, El, n)...

(0.00, 1259.86)-(3.40, 1259.86, 0.015)-(3.50, 1257.86, 0.015)-(7.92, 1257.83, 0.015)-(8.00, 1257.33, 0.015)-(20.00, 1257.45, 0.015)-(37.92, 1257.15, 0.015)-(39.92, 1257.50, 0.015)-(48.15, 1257.51, 0.015)-(48.15, 1257.85, 0.015)-(51.54, 1257.85, 0.015)-(51.54, 1259.51, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jul 21 2017

Cross Section 7

User-defined

Invert Elev (ft)	= 1258.02
Slope (%)	= 0.31
N-Value	= Composite

Calculations

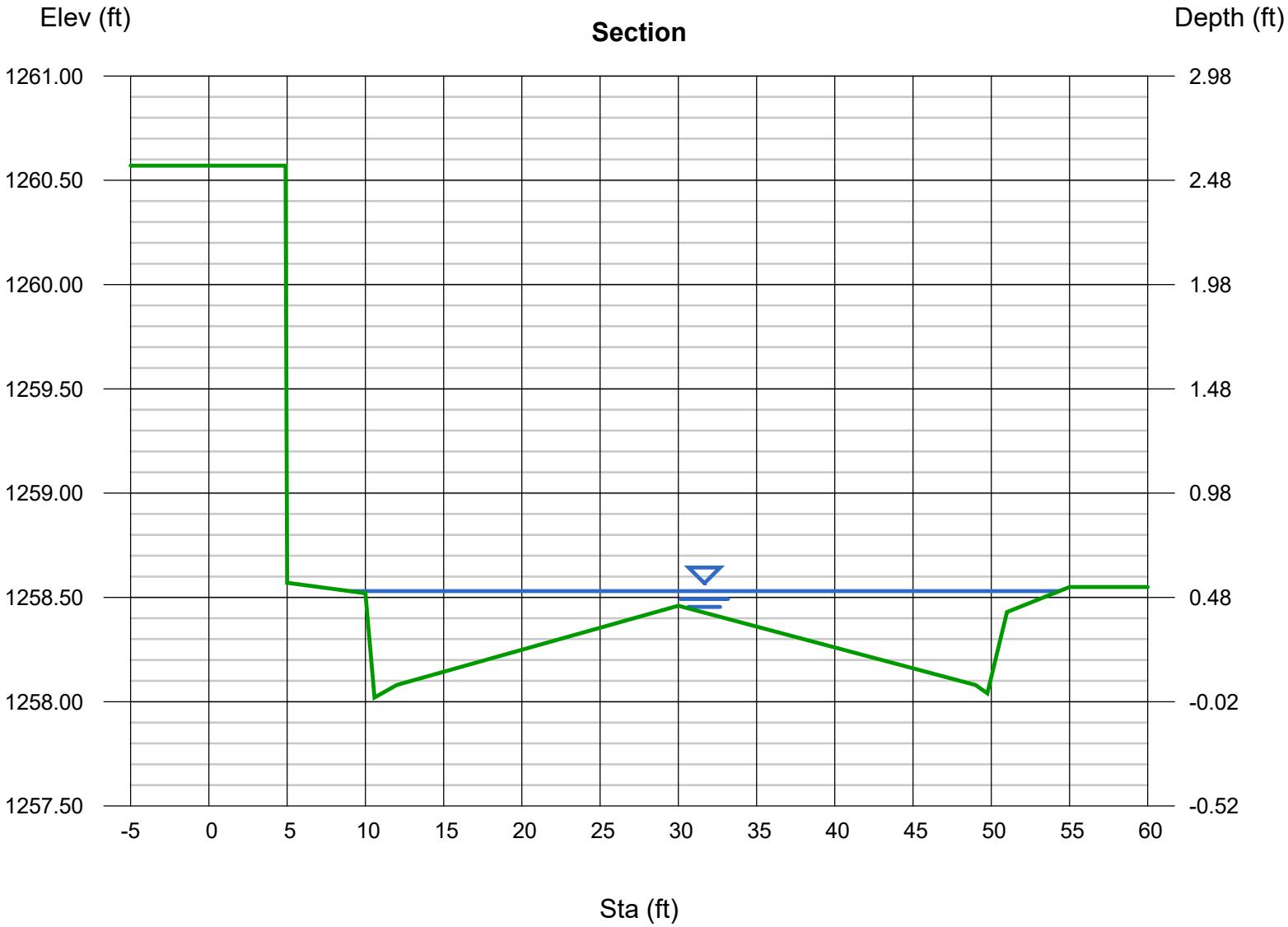
Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 0.51
Q (cfs)	= 24.81
Area (sqft)	= 11.35
Velocity (ft/s)	= 2.19
Wetted Perim (ft)	= 45.59
Crit Depth, Yc (ft)	= 0.47
Top Width (ft)	= 45.34
EGL (ft)	= 0.58

(Sta, El, n)-(Sta, El, n)...

(0.00, 1260.57)-(4.90, 1260.57, 0.015)-(5.00, 1258.57, 0.015)-(10.00, 1258.52, 0.015)-(10.58, 1258.02, 0.015)-(12.00, 1258.08, 0.015)-(30.00, 1258.46, 0.015)-(49.00, 1258.08, 0.015)-(49.75, 1258.04, 0.015)-(51.00, 1258.43, 0.015)-(55.00, 1258.55, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jul 24 2017

Cross Section 8

User-defined

Invert Elev (ft)	= 1258.13
Slope (%)	= 0.31
N-Value	= Composite

Calculations

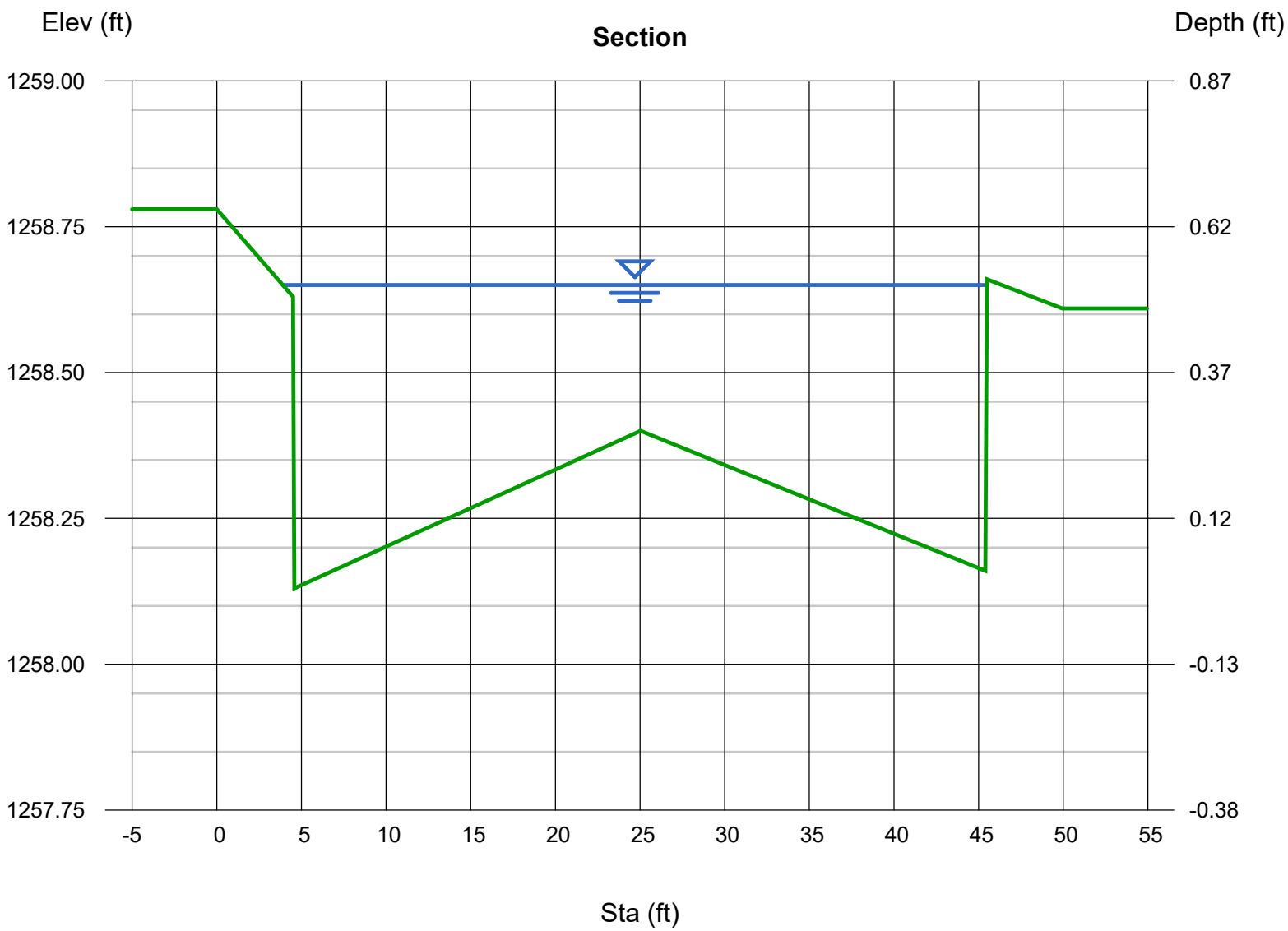
Compute by:	Q vs Depth
No. Increments	= 50

Highlighted

Depth (ft)	= 0.52
Q (cfs)	= 41.62
Area (sqft)	= 15.53
Velocity (ft/s)	= 2.68
Wetted Perim (ft)	= 45.99
Crit Depth, Yc (ft)	= 0.47
Top Width (ft)	= 45.15
EGL (ft)	= 0.63

(Sta, El, n)-(Sta, El, n)...

(0.00, 1258.78)-(4.50, 1258.63, 0.015)-(4.58, 1258.13, 0.015)-(25.03, 1258.40, 0.015)-(45.40, 1258.16, 0.015)-(45.49, 1258.66, 0.015)-(49.94, 1258.61, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Jul 25 2017

Cross Section 9

User-defined

Invert Elev (ft)	= 1258.92
Slope (%)	= 0.81
N-Value	= Composite

Calculations

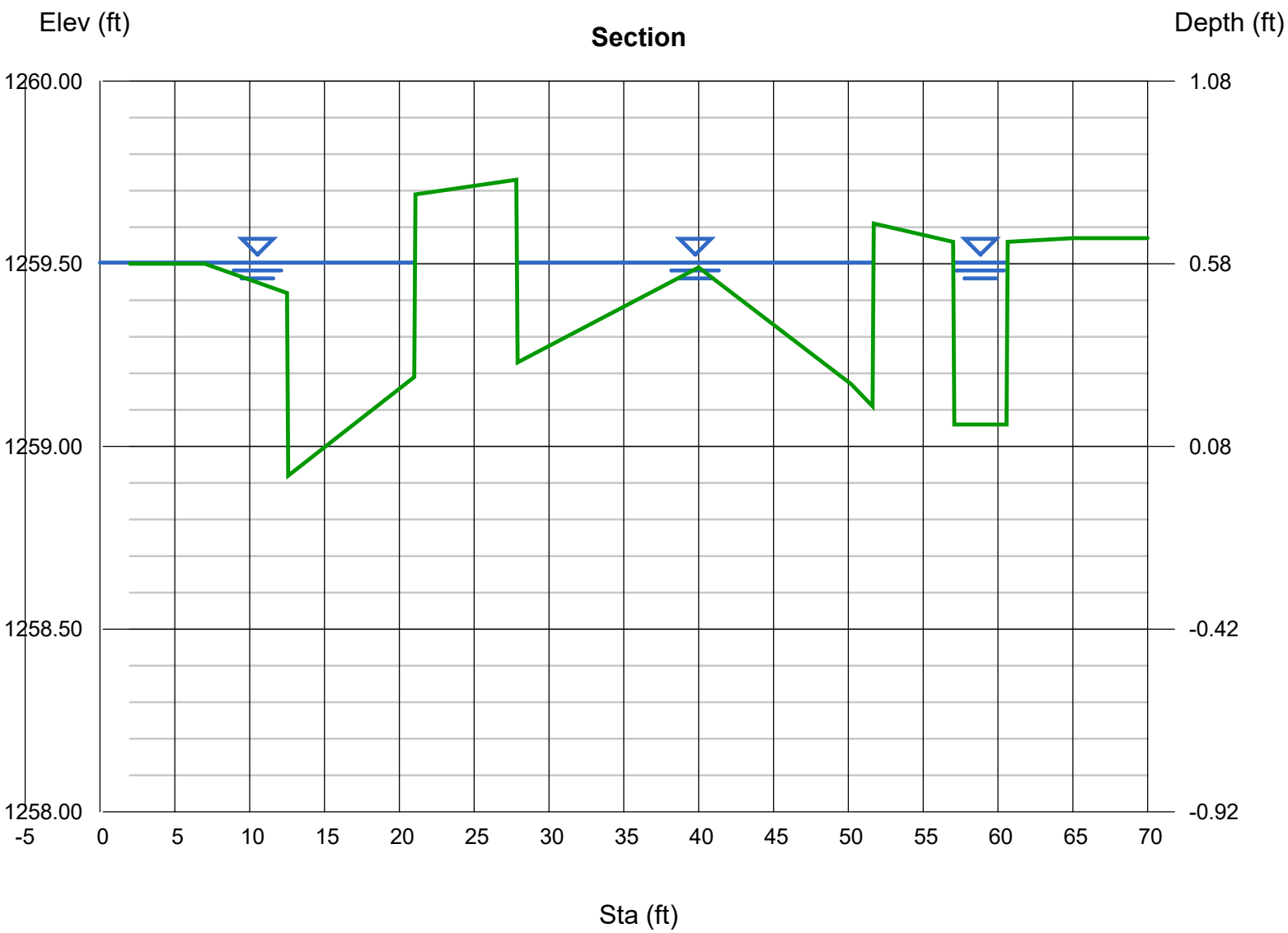
Compute by:	Q vs Depth
No. Increments	= 50

Highlighted

Depth (ft)	= 0.58
Q (cfs)	= 31.59
Area (sqft)	= 9.66
Velocity (ft/s)	= 3.27
Wetted Perim (ft)	= 43.54
Crit Depth, Yc (ft)	= 0.62
Top Width (ft)	= 41.51
EGL (ft)	= 0.75

(Sta, El, n)-(Sta, El, n)...

(7.00, 1259.50)-(12.50, 1259.42, 0.015)-(12.58, 1258.92, 0.015)-(21.00, 1259.19, 0.015)-(21.08, 1259.69, 0.015)-(27.82, 1259.73, 0.015)-(27.90, 1259.23, 0.015)
-(40.00, 1259.49, 0.015)-(50.20, 1259.17, 0.015)-(51.62, 1259.11, 0.015)-(51.70, 1259.61, 0.015)-(57.00, 1259.56, 0.015)-(57.08, 1259.06, 0.015)-(60.57, 1259.06, 0
-(60.65, 1259.56, 0.015)-(65.00, 1259.57, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jul 21 2017

Cross Section 10

User-defined

Invert Elev (ft)	= 1259.50
Slope (%)	= 0.81
N-Value	= Composite

Calculations

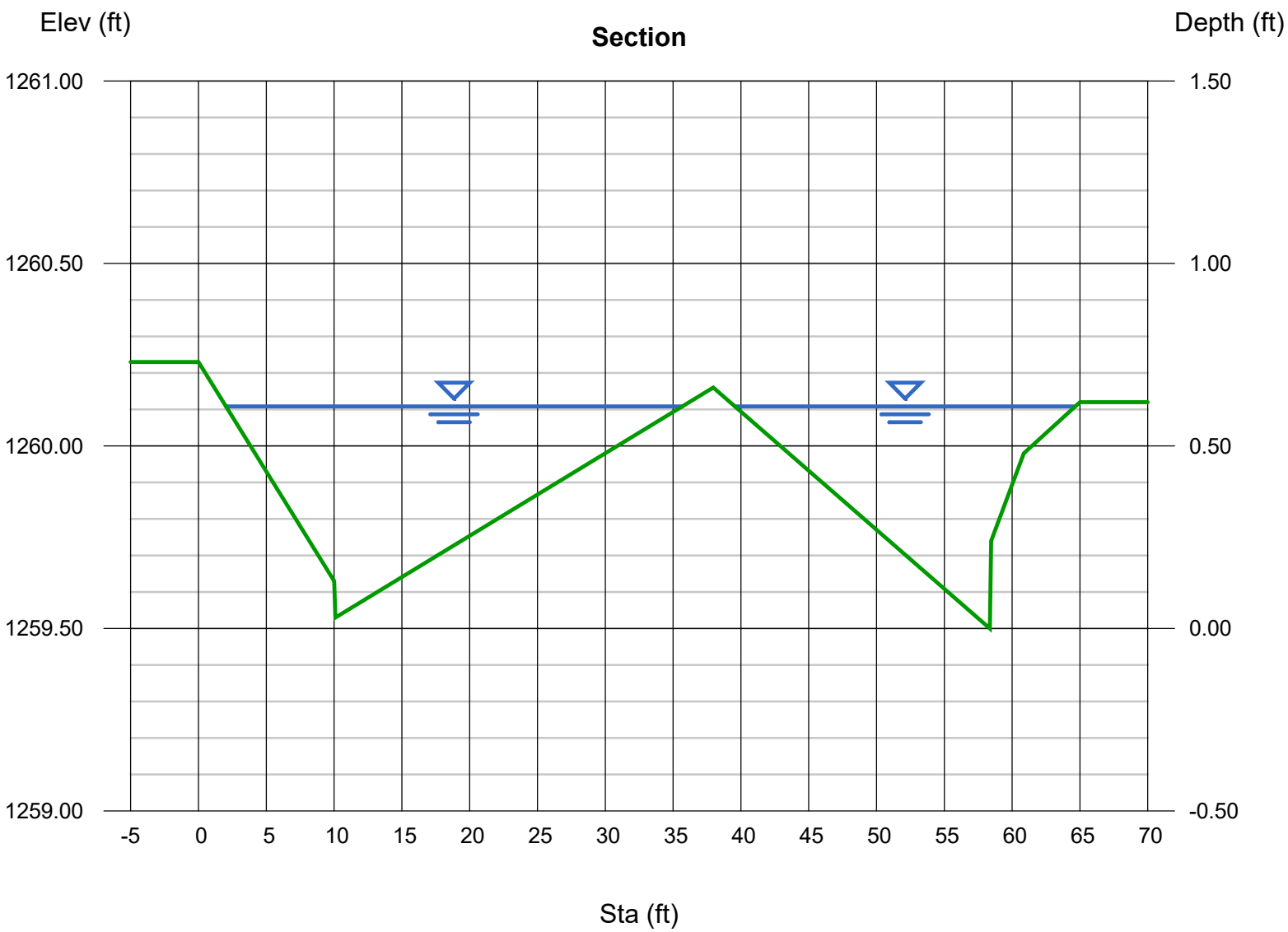
Compute by:	Q vs Depth
No. Increments	= 30

Highlighted

Depth (ft)	= 0.61
Q (cfs)	= 59.56
Area (sqft)	= 15.95
Velocity (ft/s)	= 3.73
Wetted Perim (ft)	= 58.99
Crit Depth, Yc (ft)	= 0.67
Top Width (ft)	= 58.73
EGL (ft)	= 0.83

(Sta, El, n)-(Sta, El, n)...

(0.00, 1260.23)-(10.01, 1259.63, 0.015)-(10.09, 1259.53, 0.015)-(37.96, 1260.16, 0.015)-(58.36, 1259.50, 0.015)-(58.45, 1259.74, 0.015)-(60.86, 1259.98, 0.015)-(65.00, 1260.12, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Jul 25 2017

Cross Section 11

User-defined

Invert Elev (ft)	= 1260.35
Slope (%)	= 0.81
N-Value	= Composite

Calculations

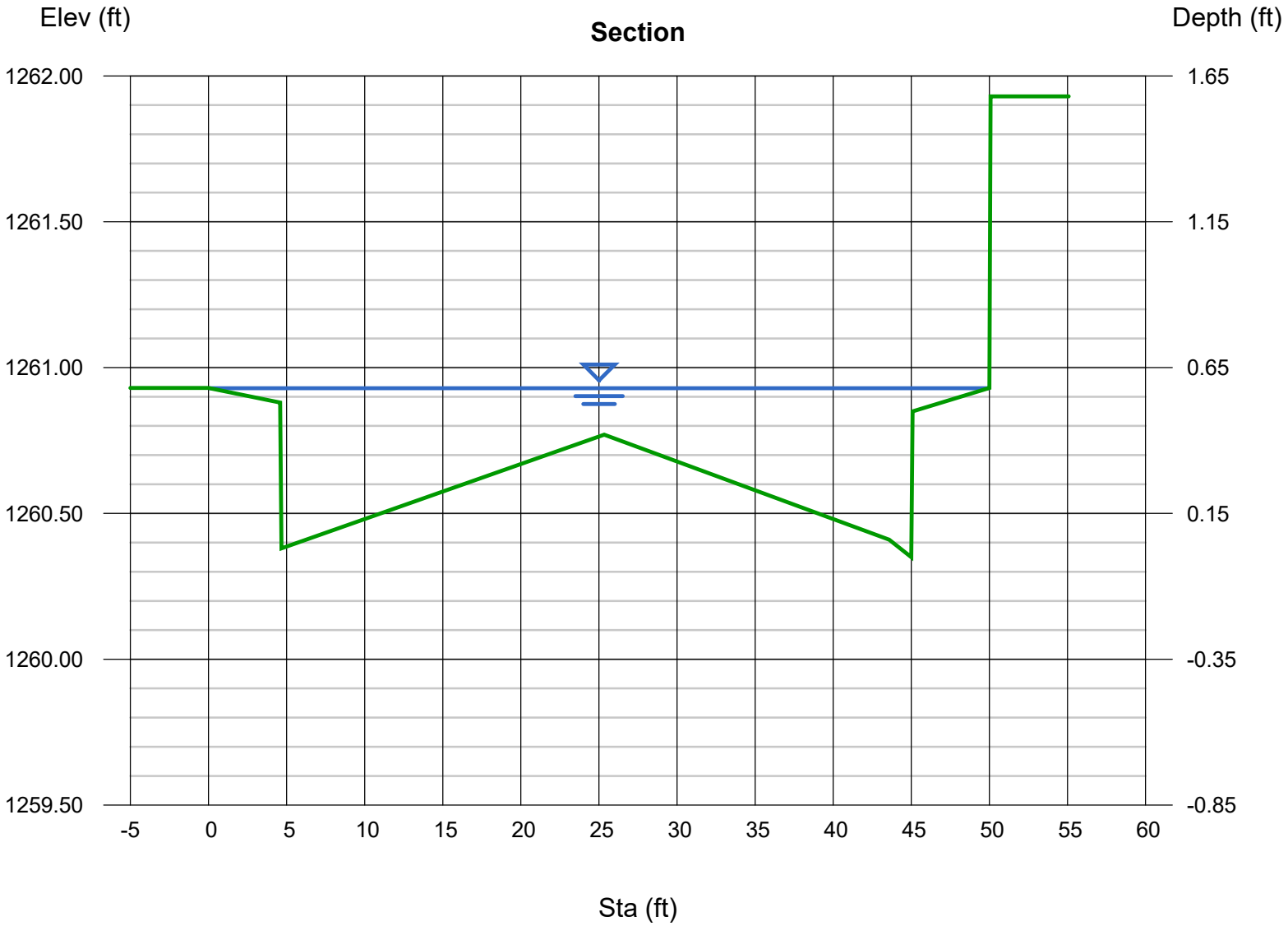
Compute by:	Q vs Depth
No. Increments	= 30

Highlighted

Depth (ft)	= 0.58
Q (cfs)	= 57.13
Area (sqft)	= 14.65
Velocity (ft/s)	= 3.90
Wetted Perim (ft)	= 50.75
Crit Depth, Yc (ft)	= 0.64
Top Width (ft)	= 49.89
EGL (ft)	= 0.82

(Sta, El, n)-(Sta, El, n)...

(0.00, 1260.93)-(4.59, 1260.88, 0.015)-(4.67, 1260.38, 0.015)-(25.34, 1260.77, 0.015)-(43.58, 1260.41, 0.015)-(45.00, 1260.35, 0.015)-(45.08, 1260.85, 0.015)-(50.00, 1260.93, 0.015)-(50.08, 1261.93, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jul 21 2017

Cross Section 12

User-defined

Invert Elev (ft)	= 1260.66
Slope (%)	= 0.23
N-Value	= Composite

Calculations

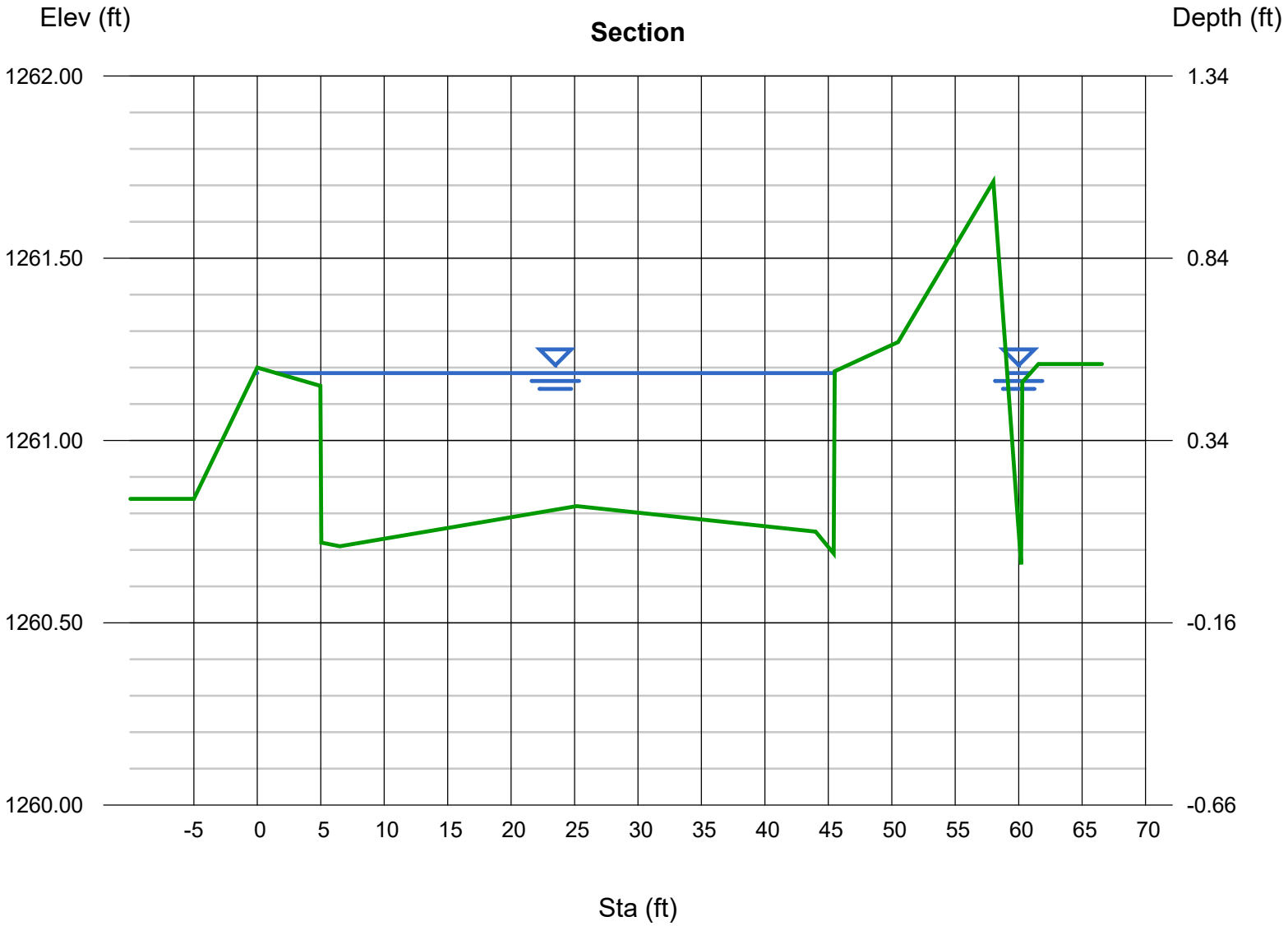
Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 0.52
Q (cfs)	= 42.13
Area (sqft)	= 17.97
Velocity (ft/s)	= 2.34
Wetted Perim (ft)	= 51.98
Crit Depth, Yc (ft)	= 0.43
Top Width (ft)	= 50.64
EGL (ft)	= 0.61

(Sta, El, n)-(Sta, El, n)...

(-5.00, 1260.84)-(4.97, 1261.15, 0.015)-(5.04, 1260.72, 0.015)-(6.50, 1260.71, 0.015)-(25.17, 1260.82, 0.015)-(44.00, 1260.75, 0.015)-(45.42, 1260.69, 0.015)-(45.50, 1261.19, 0.015)-(50.50, 1261.27, 0.015)-(58.00, 1261.71, 0.015)-(60.19, 1260.66, 0.015)-(60.28, 1261.16, 0.015)-(61.56, 1261.21, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jul 21 2017

Cross Section 13

User-defined

Invert Elev (ft)	= 1260.71
Slope (%)	= 0.23
N-Value	= Composite

Calculations

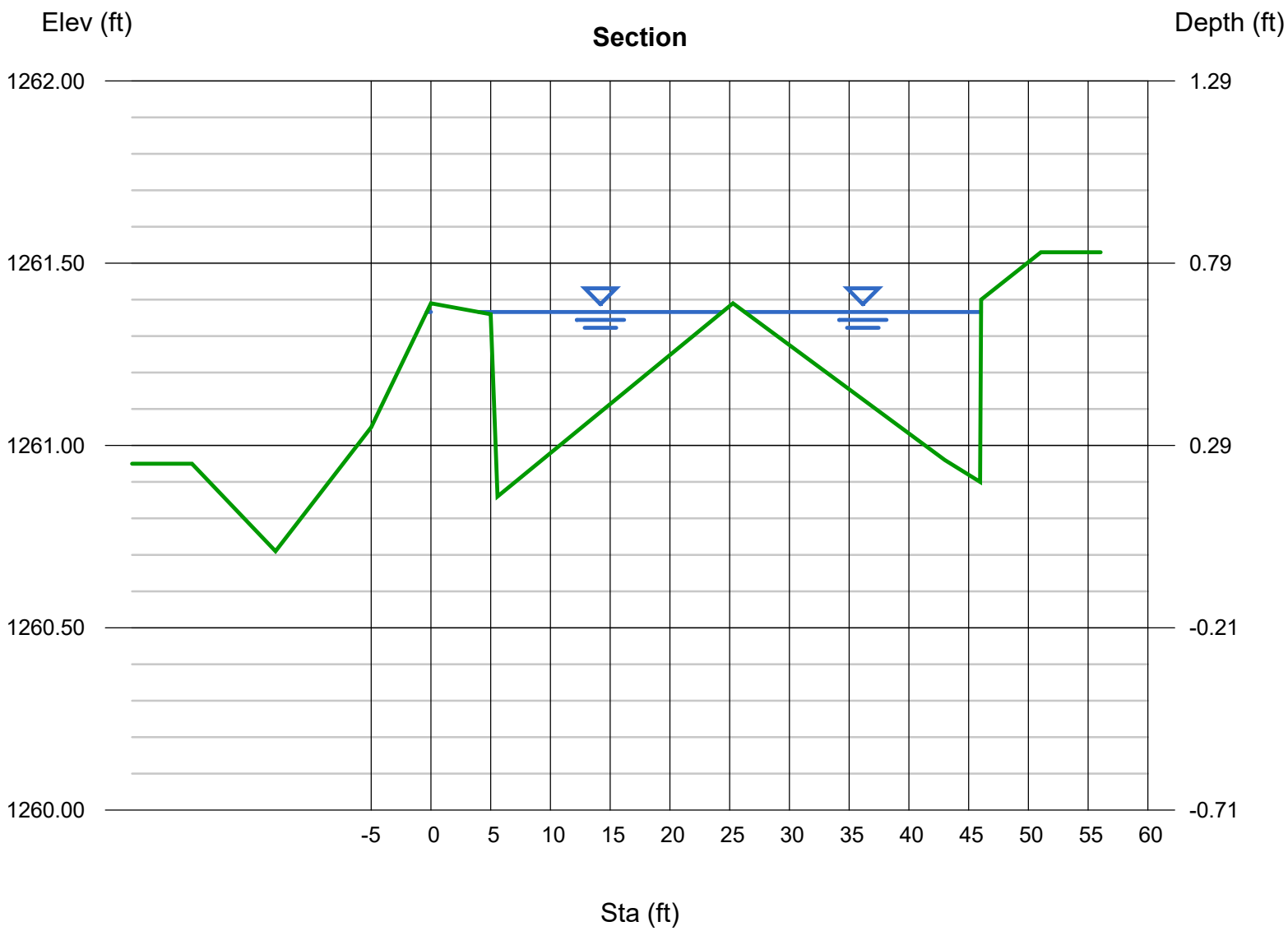
Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 0.66
Q (cfs)	= 38.17
Area (sqft)	= 17.99
Velocity (ft/s)	= 2.12
Wetted Perim (ft)	= 60.41
Crit Depth, Yc (ft)	= 0.57
Top Width (ft)	= 59.79
EGL (ft)	= 0.73

(Sta, El, n)-(Sta, El, n)...

(-20.00, 1260.95)-(5.00, 1261.36, 0.015)-(5.58, 1260.86, 0.015)-(25.27, 1261.39, 0.015)-(43.00, 1260.96, 0.015)-(45.96, 1260.90, 0.015)-(46.04, 1261.40, 0.015)-(51.04, 1261.53, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Jul 19 2017

Cross Section 14

User-defined

Invert Elev (ft)	= 1260.43
Slope (%)	= 0.81
N-Value	= Composite

Calculations

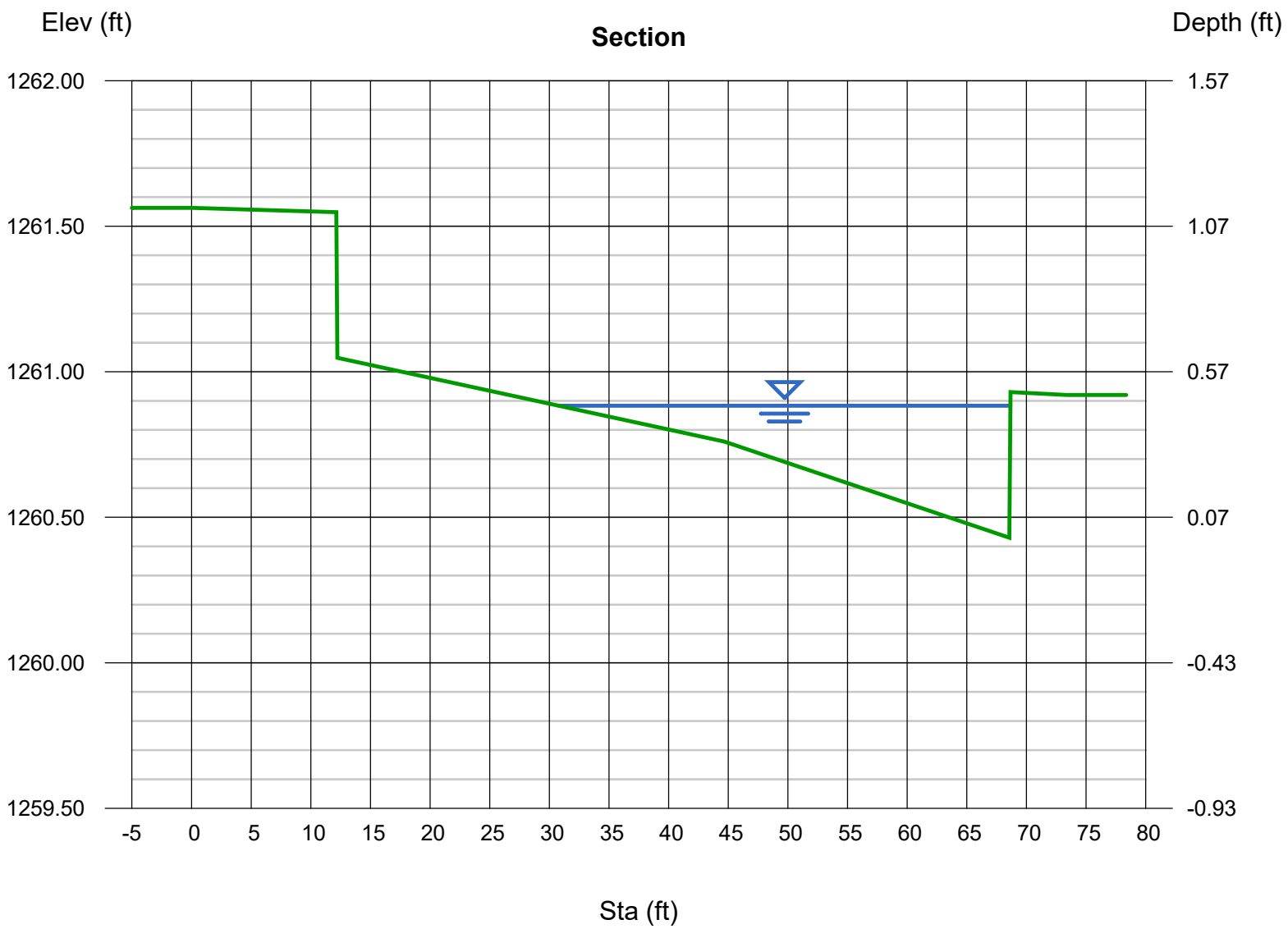
Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 0.45
Q (cfs)	= 27.62
Area (sqft)	= 7.76
Velocity (ft/s)	= 3.56
Wetted Perim (ft)	= 38.24
Crit Depth, Yc (ft)	= 0.52
Top Width (ft)	= 37.86
EGL (ft)	= 0.65

(Sta, El, n)-(Sta, El, n)...

(0.00, 1261.56)-(12.14, 1261.55, 0.013)-(12.23, 1261.05, 0.013)-(44.67, 1260.76, 0.013)-(68.57, 1260.43, 0.013)-(68.66, 1260.93, 0.013)-(73.36, 1260.92, 0.013)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Jul 26 2017

Cross Section 1 Proposed

User-defined

Invert Elev (ft)	= 1252.24
Slope (%)	= 0.63
N-Value	= Composite

Calculations

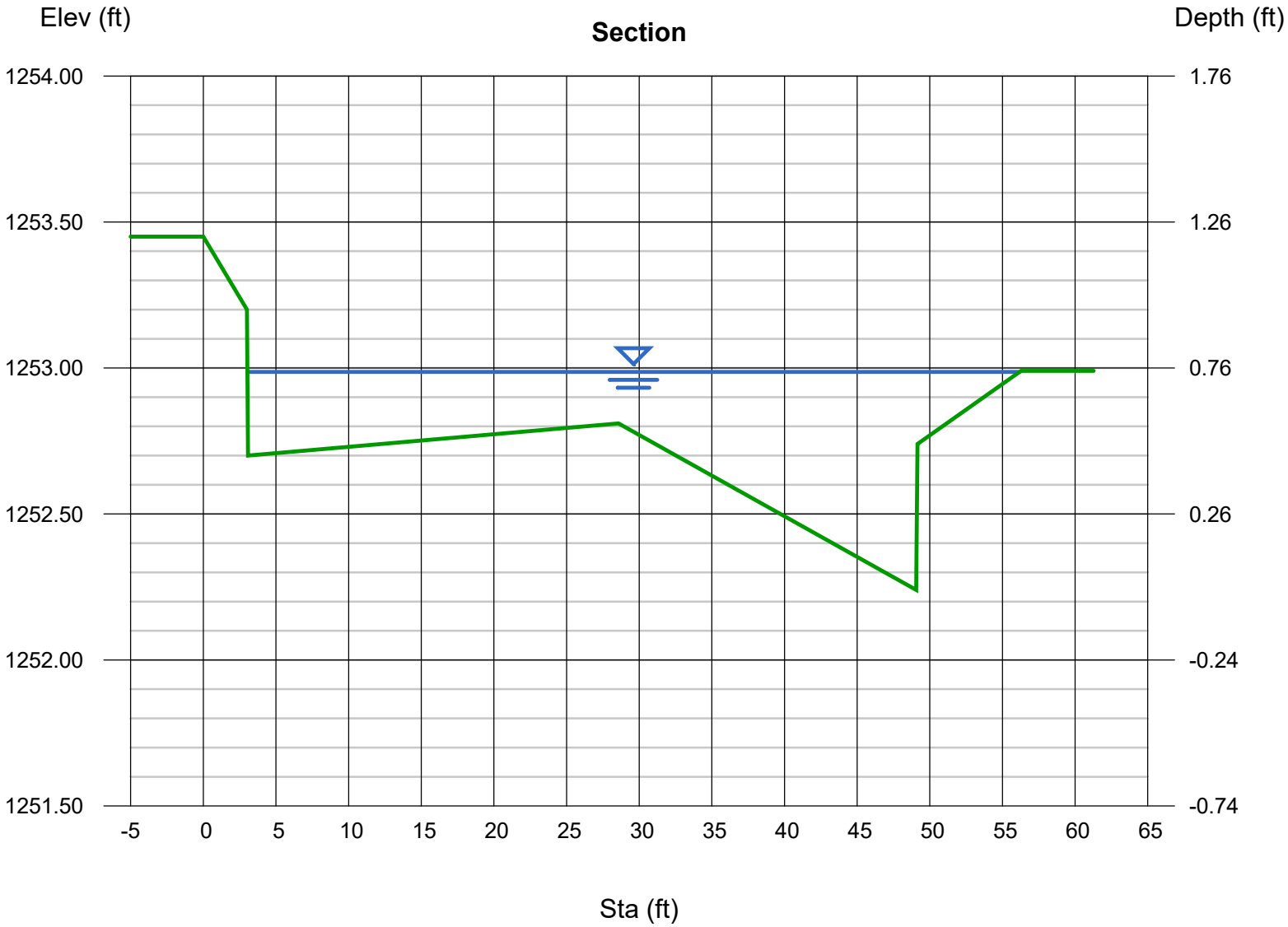
Compute by:	Q vs Depth
No. Increments	= 47

Highlighted

Depth (ft)	= 0.75
Q (cfs)	= 57.76
Area (sqft)	= 16.28
Velocity (ft/s)	= 3.55
Wetted Perim (ft)	= 53.82
Crit Depth, Yc (ft)	= 0.78
Top Width (ft)	= 53.15
EGL (ft)	= 0.94

(Sta, El, n)-(Sta, El, n)...

(0.00, 1253.45)-(3.00, 1253.20, 0.015)-(3.08, 1252.70, 0.015)-(28.58, 1252.81, 0.015)-(49.06, 1252.24, 0.015)-(49.15, 1252.74, 0.015)-(56.28, 1252.99, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jul 24 2017

Cross Section 2 Proposed

User-defined

Invert Elev (ft)	= 1255.15
Slope (%)	= 0.37
N-Value	= Composite

Calculations

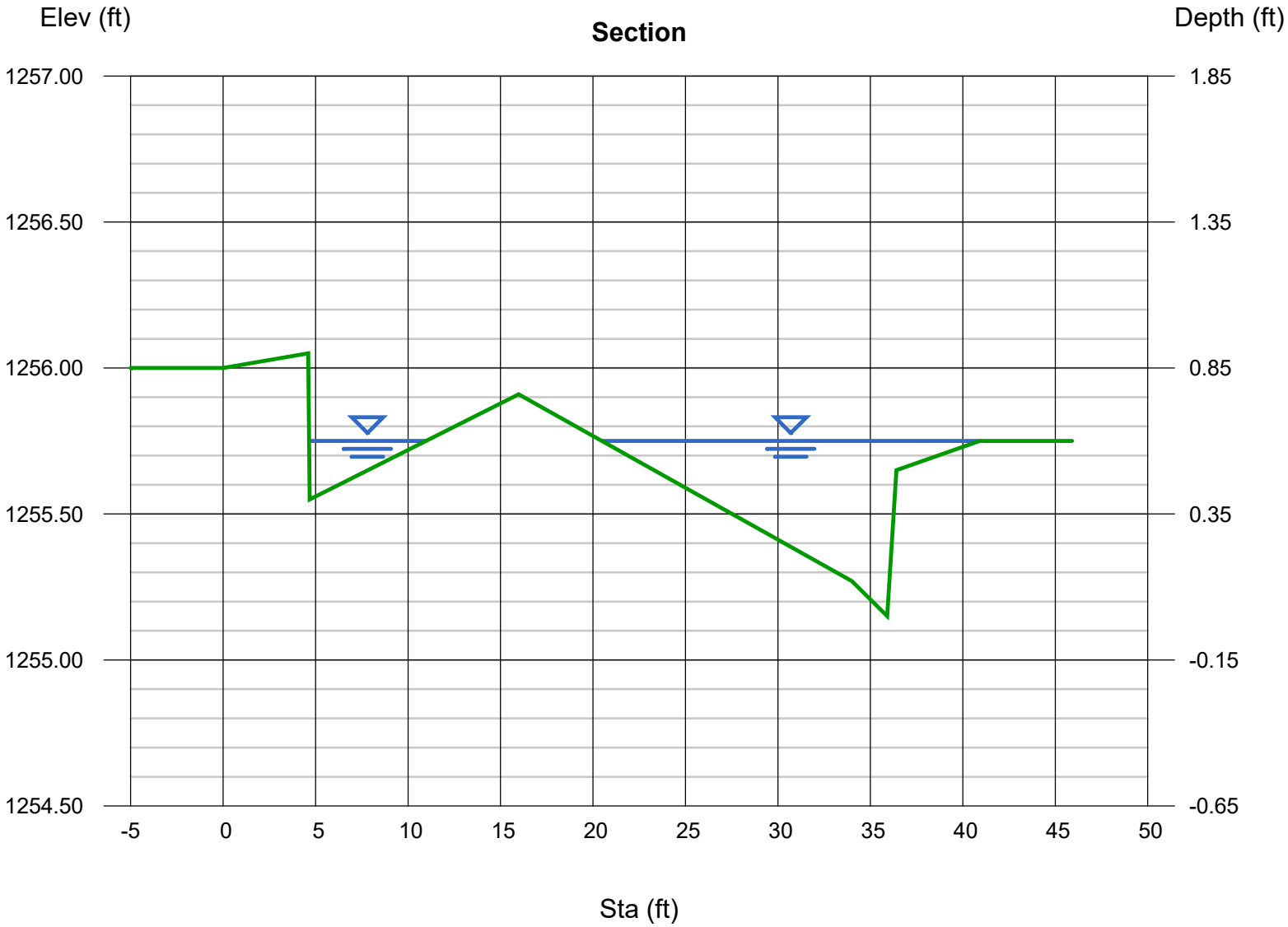
Compute by:	Q vs Depth
No. Increments	= 30

Highlighted

Depth (ft)	= 0.60
Q (cfs)	= 10.79
Area (sqft)	= 5.31
Velocity (ft/s)	= 2.03
Wetted Perim (ft)	= 27.13
Crit Depth, Yc (ft)	= 0.57
Top Width (ft)	= 26.74
EGL (ft)	= 0.66

(Sta, El, n)-(Sta, El, n)...

(0.00, 1256.00)-(4.60, 1256.05, 0.015)-(4.68, 1255.55, 0.015)-(6.57, 1255.61, 0.015)-(15.98, 1255.91, 0.015)-(34.00, 1255.27, 0.015)-(35.91, 1255.15, 0.015)-(36.41, 1255.65, 0.015)-(40.91, 1255.75, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Jul 25 2017

Cross Section 3 Proposed

User-defined

Invert Elev (ft)	= 1255.49
Slope (%)	= 0.37
N-Value	= Composite

Calculations

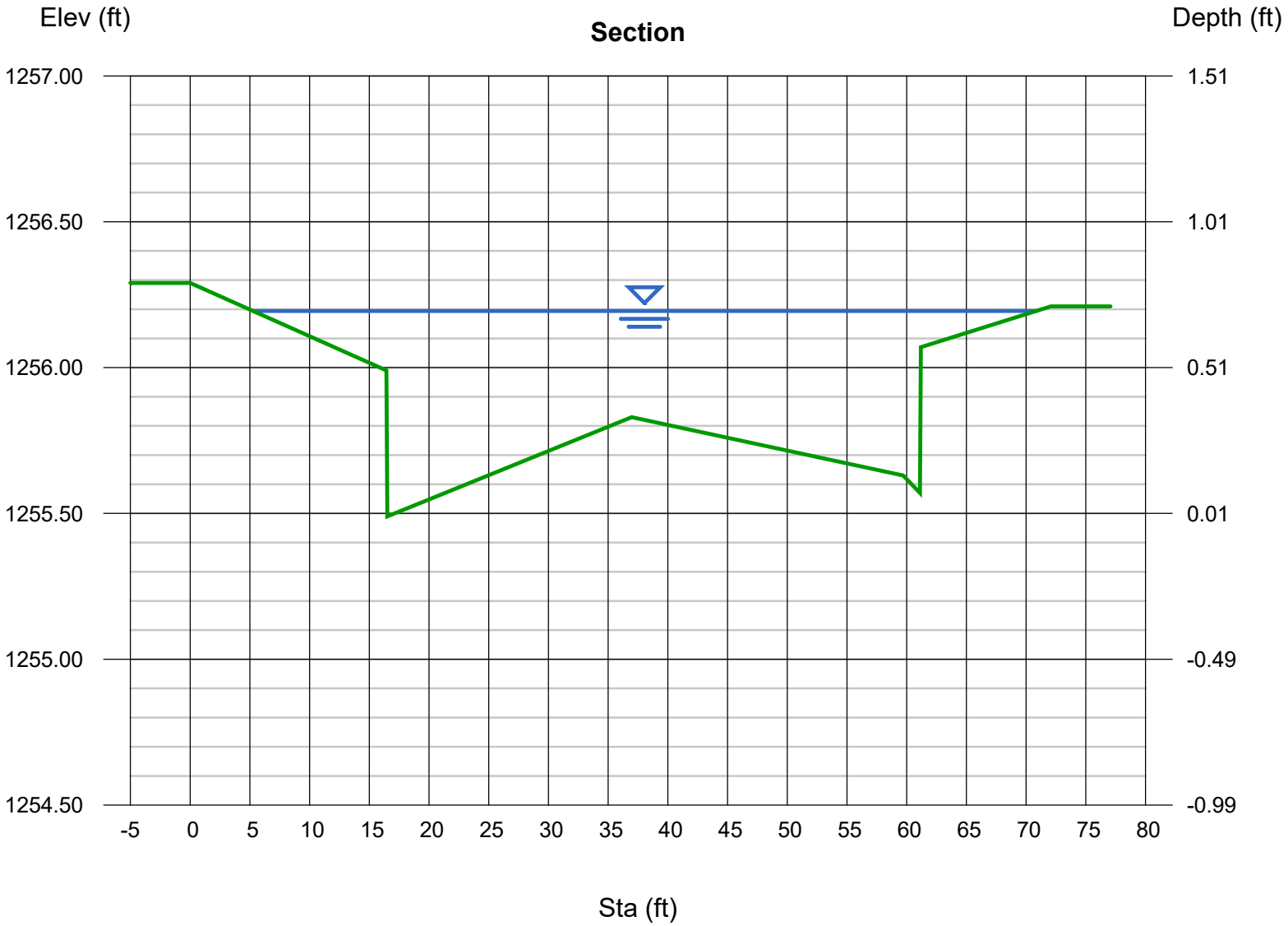
Compute by:	Q vs Depth
No. Increments	= 50

Highlighted

Depth (ft)	= 0.70
Q (cfs)	= 74.10
Area (sqft)	= 24.12
Velocity (ft/s)	= 3.07
Wetted Perim (ft)	= 66.44
Crit Depth, Yc (ft)	= 0.67
Top Width (ft)	= 65.58
EGL (ft)	= 0.85

(Sta, El, n)-(Sta, El, n)...

(0.00, 1256.29)-(16.43, 1255.99, 0.015)-(16.51, 1255.49, 0.015)-(36.97, 1255.83, 0.015)-(59.70, 1255.63, 0.015)-(61.11, 1255.57, 0.015)-(61.19, 1256.07, 0.015)-(72.07, 1256.21, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Jul 25 2017

Cross Section 4 Proposed

User-defined

Invert Elev (ft)	= 1256.08
Slope (%)	= 0.37
N-Value	= Composite

Calculations

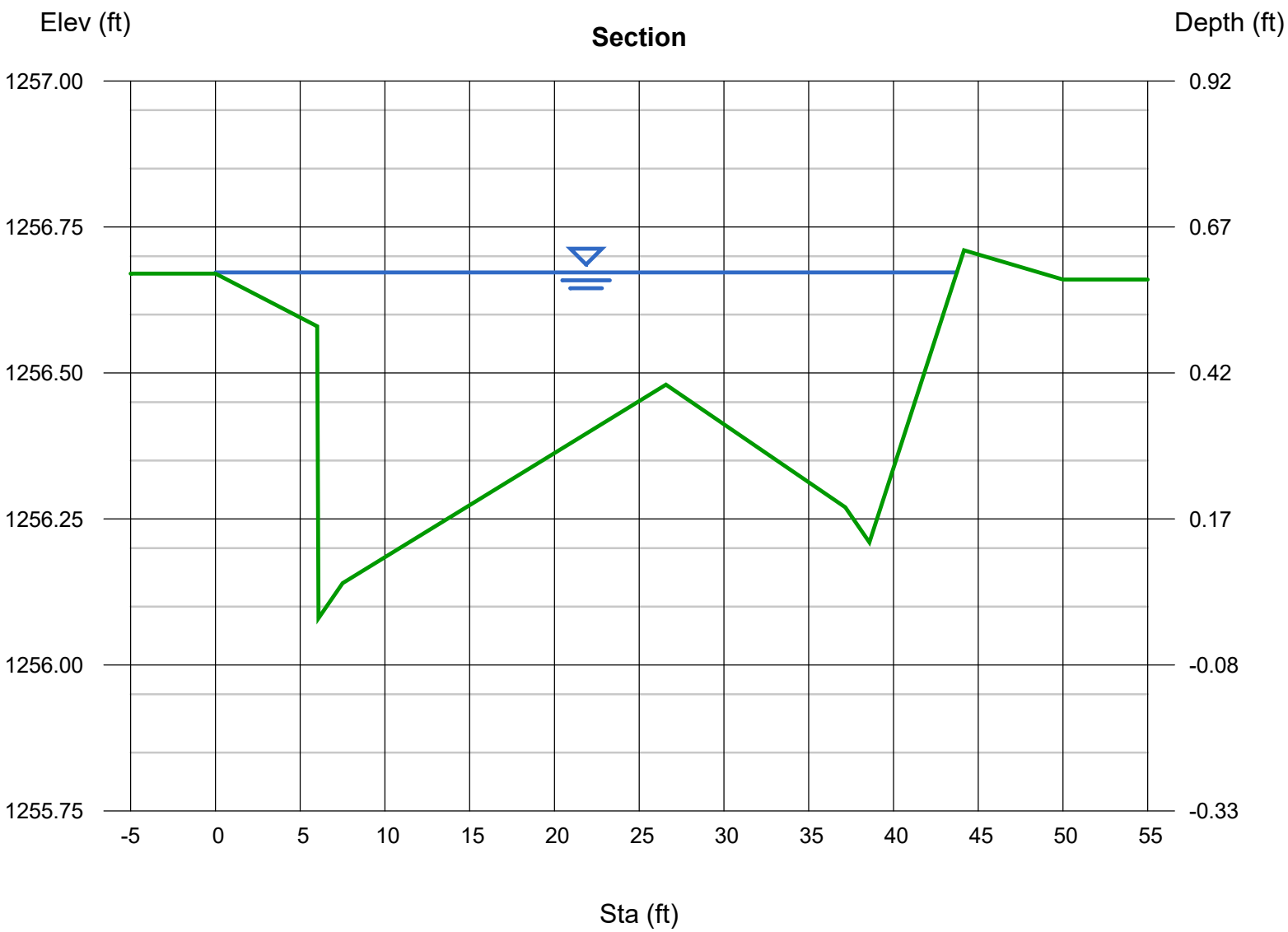
Compute by:	Q vs Depth
No. Increments	= 50

Highlighted

Depth (ft)	= 0.59
Q (cfs)	= 33.88
Area (sqft)	= 12.98
Velocity (ft/s)	= 2.61
Wetted Perim (ft)	= 45.61
Crit Depth, Yc (ft)	= 0.56
Top Width (ft)	= 45.15
EGL (ft)	= 0.70

(Sta, El, n)-(Sta, El, n)...

(0.00, 1256.67)-(6.00, 1256.58, 0.015)-(6.08, 1256.08, 0.015)-(7.50, 1256.14, 0.015)-(26.58, 1256.48, 0.015)-(37.16, 1256.27, 0.015)-(38.58, 1256.21, 0.015)-(44.16, 1256.71, 0.015)-(50.00, 1256.66, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Jul 25 2017

Cross Section 5

User-defined

Invert Elev (ft)	= 1256.45
Slope (%)	= 0.31
N-Value	= Composite

Calculations

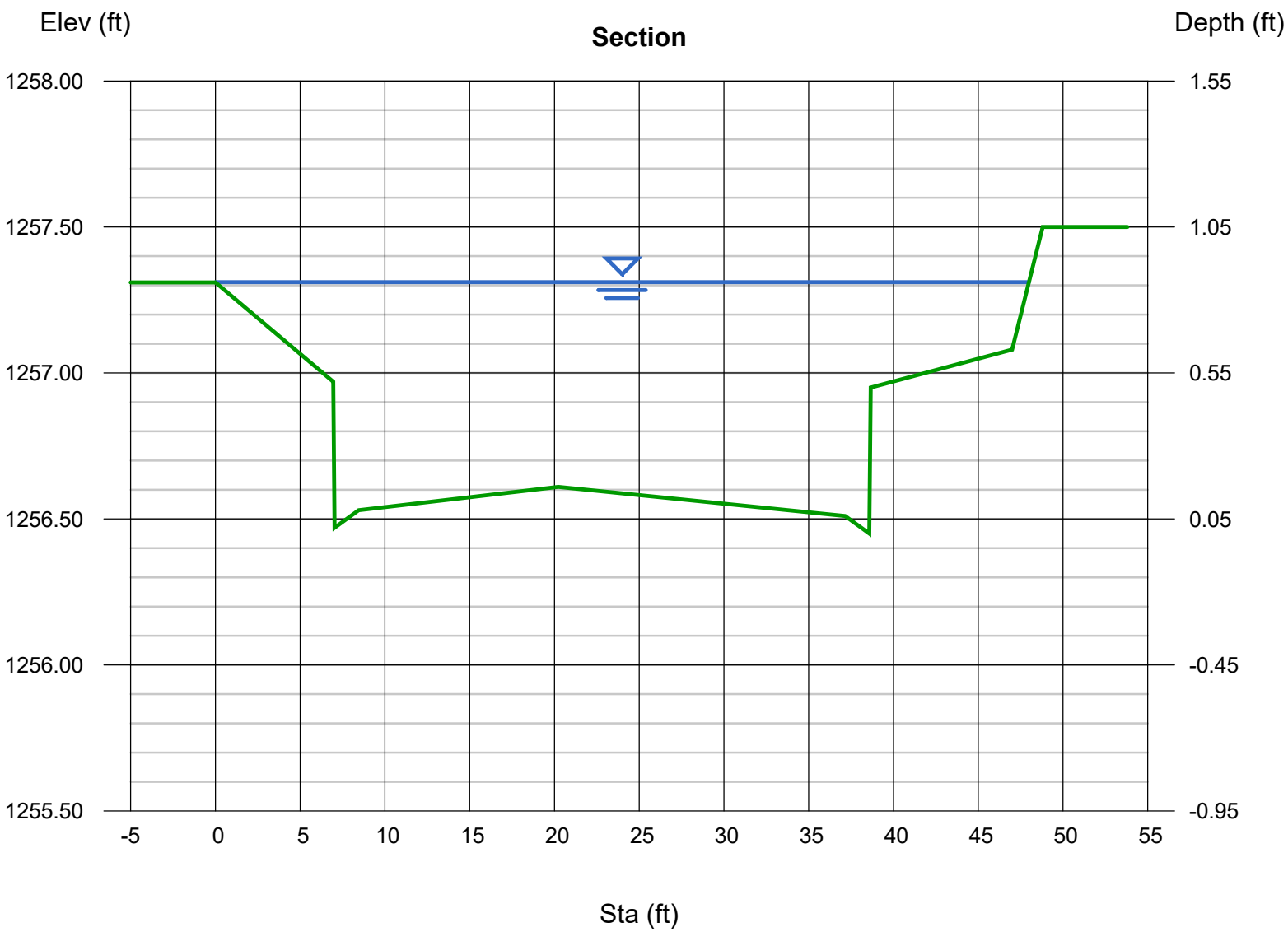
Compute by:	Q vs Depth
No. Increments	= 50

Highlighted

Depth (ft)	= 0.86
Q (cfs)	= 104.48
Area (sqft)	= 27.64
Velocity (ft/s)	= 3.78
Wetted Perim (ft)	= 48.87
Crit Depth, Yc (ft)	= 0.81
Top Width (ft)	= 47.99
EGL (ft)	= 1.08

(Sta, El, n)-(Sta, El, n)...

(0.00, 1257.31)-(6.95, 1256.97, 0.015)-(7.03, 1256.47, 0.015)-(8.45, 1256.53, 0.015)-(20.23, 1256.61, 0.015)-(37.15, 1256.51, 0.015)-(38.57, 1256.45, 0.015)-(38.66, 1256.95, 0.015)-(47.00, 1257.08, 0.015)-(48.80, 1257.50, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Jul 25 2017

Cross Section 6 Proposed

User-defined

Invert Elev (ft)	= 1257.15
Slope (%)	= 0.31
N-Value	= Composite

Calculations

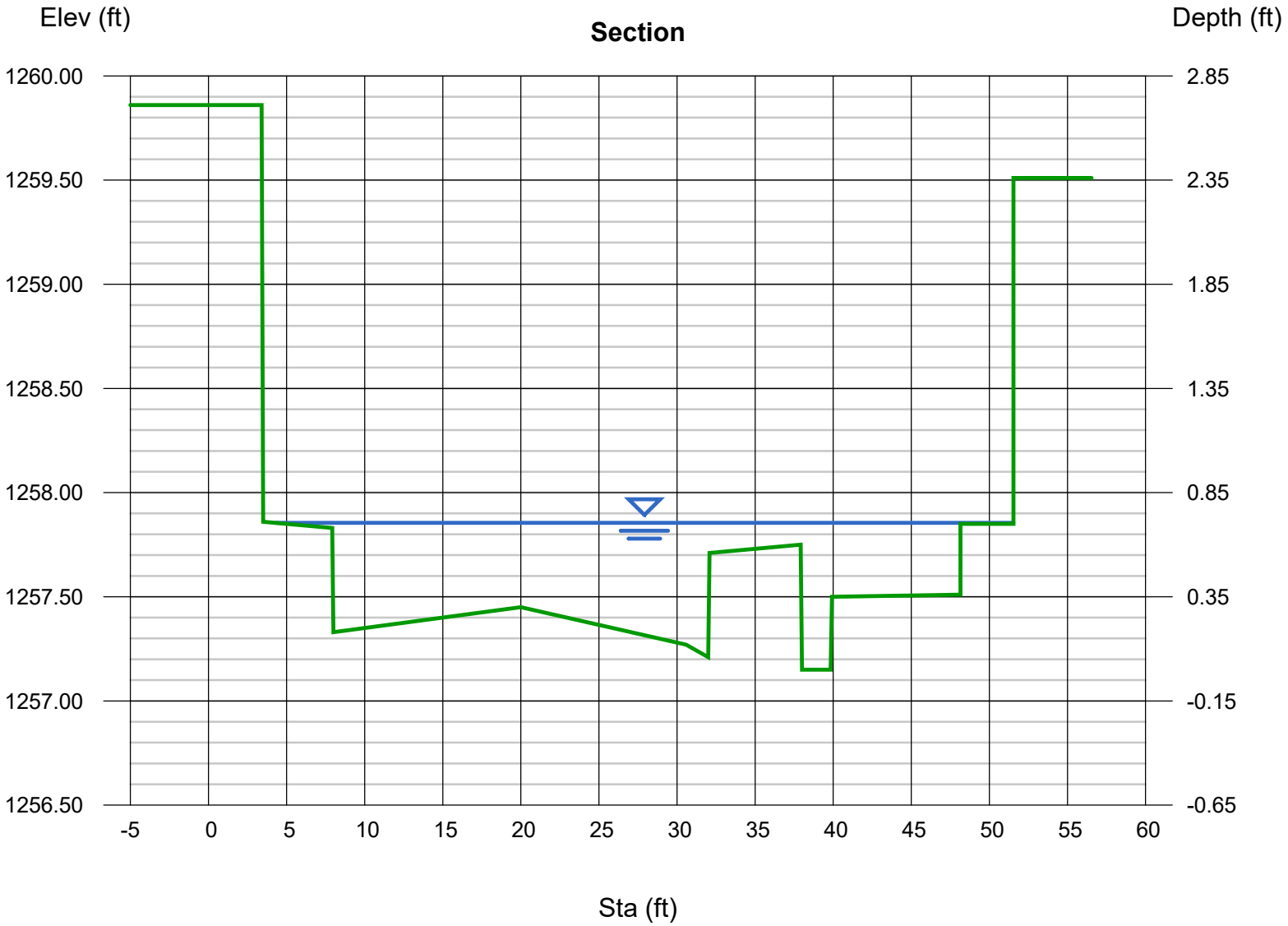
Compute by:	Q vs Depth
No. Increments	= 50

Highlighted

Depth (ft)	= 0.70
Q (cfs)	= 45.19
Area (sqft)	= 16.77
Velocity (ft/s)	= 2.69
Wetted Perim (ft)	= 49.25
Crit Depth, Yc (ft)	= 0.63
Top Width (ft)	= 47.25
EGL (ft)	= 0.82

(Sta, El, n)-(Sta, El, n)...

(0.00, 1259.86)-(3.40, 1259.86, 0.015)-(3.50, 1257.86, 0.015)-(7.92, 1257.83, 0.015)-(8.00, 1257.33, 0.015)-(20.00, 1257.45, 0.015)-(30.58, 1257.27, 0.015)
-(32.00, 1257.21, 0.015)-(32.08, 1257.71, 0.015)-(37.92, 1257.75, 0.015)-(38.00, 1257.15, 0.015)-(39.84, 1257.15, 0.015)-(39.92, 1257.50, 0.015)-(48.15, 1257.51, 0
-(48.15, 1257.85, 0.015)-(51.54, 1257.85, 0.015)-(51.54, 1259.51, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Jul 26 2017

Cross Section 7 Proposed

User-defined

Invert Elev (ft)	= 1258.02
Slope (%)	= 0.31
N-Value	= Composite

Calculations

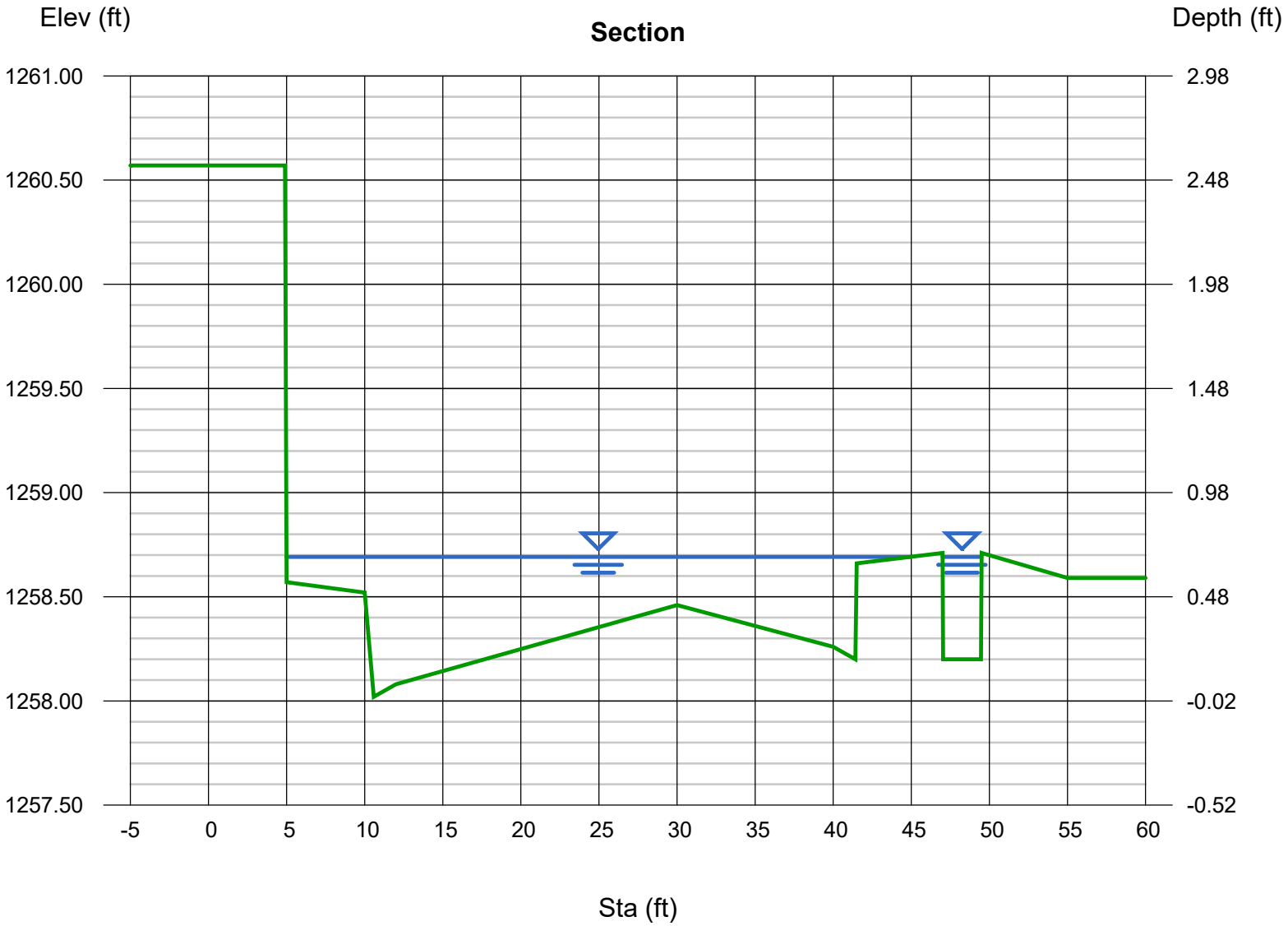
Compute by:	Q vs Depth
No. Increments	= 38

Highlighted

Depth (ft)	= 0.67
Q (cfs)	= 37.59
Area (sqft)	= 14.95
Velocity (ft/s)	= 2.52
Wetted Perim (ft)	= 48.66
Crit Depth, Yc (ft)	= 0.61
Top Width (ft)	= 47.05
EGL (ft)	= 0.77

(Sta, El, n)-(Sta, El, n)...

(0.00, 1260.57)-(4.90, 1260.57, 0.015)-(5.00, 1258.57, 0.015)-(10.00, 1258.52, 0.015)-(10.58, 1258.02, 0.015)-(12.00, 1258.08, 0.015)-(30.00, 1258.46, 0.015)
-(40.00, 1258.26, 0.015)-(41.42, 1258.20, 0.015)-(41.50, 1258.66, 0.015)-(47.00, 1258.71, 0.015)-(47.04, 1258.20, 0.015)-(49.46, 1258.20, 0.015)-(49.50, 1258.71, 0
-(55.00, 1258.59, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jul 24 2017

Cross Section 8 Proposed

User-defined

Invert Elev (ft)	= 1258.13
Slope (%)	= 0.31
N-Value	= 0.015

Calculations

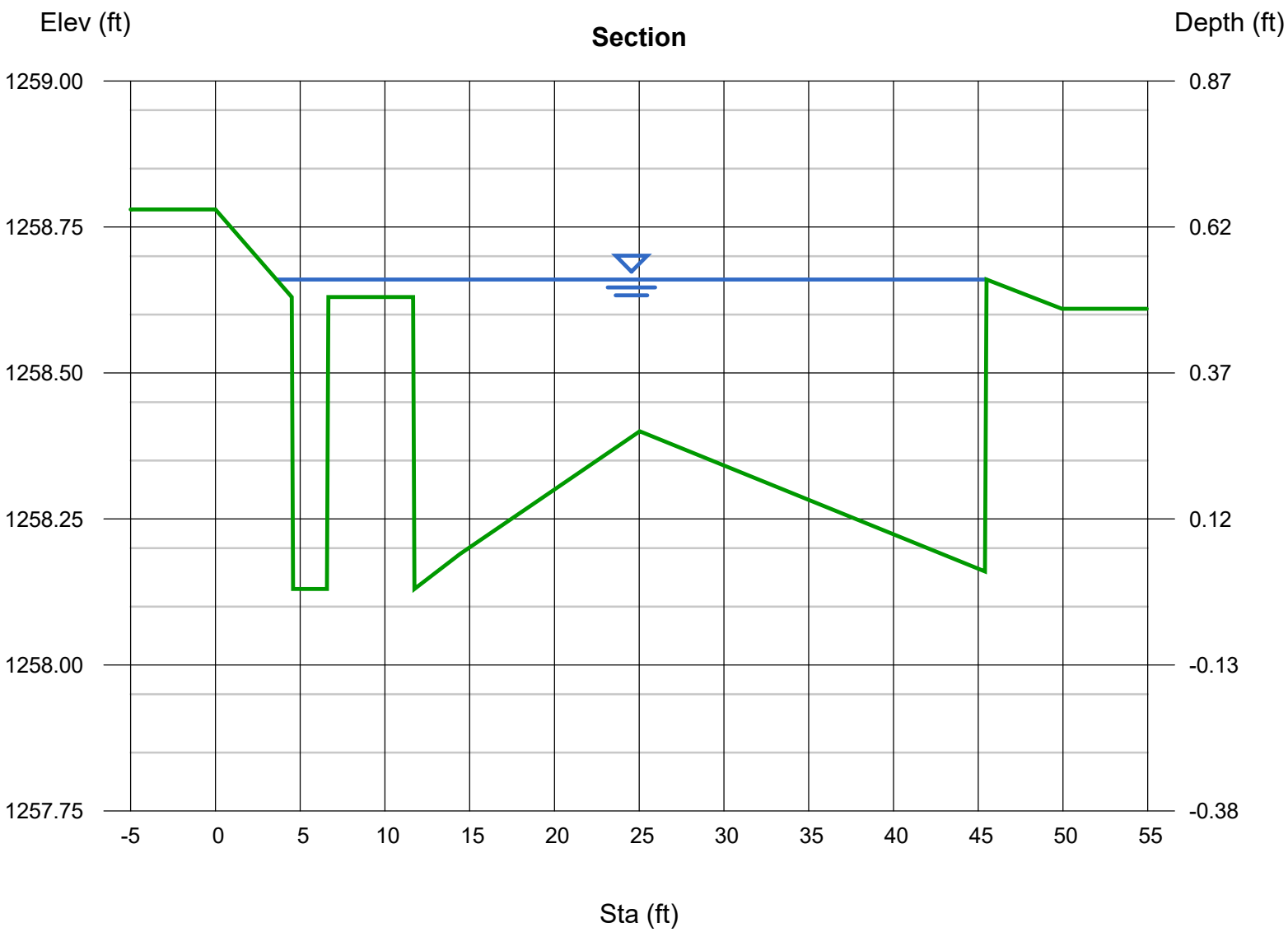
Compute by:	Known Q
Known Q (cfs)	= 35.50

Highlighted

Depth (ft)	= 0.53
Q (cfs)	= 35.50
Area (sqft)	= 14.38
Velocity (ft/s)	= 2.47
Wetted Perim (ft)	= 48.04
Crit Depth, Yc (ft)	= 0.45
Top Width (ft)	= 46.34
EGL (ft)	= 0.62

(Sta, El, n)-(Sta, El, n)...

(0.00, 1258.78)-(4.50, 1258.63, 0.015)-(4.58, 1258.13, 0.015)-(6.58, 1258.13, 0.015)-(6.66, 1258.63, 0.015)-(11.66, 1258.63, 0.015)-(11.74, 1258.13, 0.015)-(14.42, 1258.19, 0.015)-(25.03, 1258.40, 0.015)-(45.40, 1258.16, 0.015)-(45.49, 1258.66, 0.015)-(49.94, 1258.61, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Aug 2 2017

Cross Section 9 Proposed

User-defined

Invert Elev (ft)	= 1258.92
Slope (%)	= 0.81
N-Value	= 0.015

Calculations

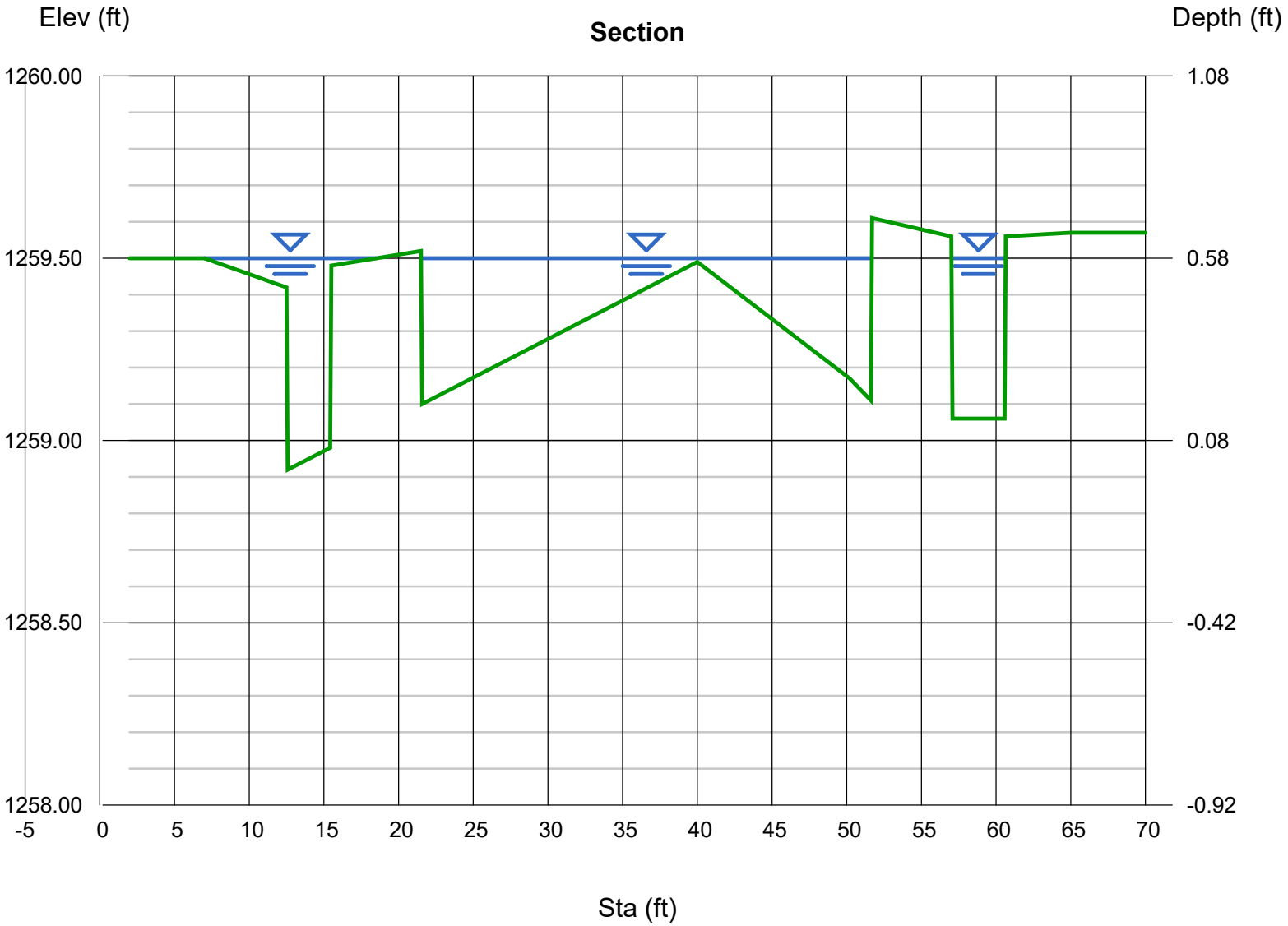
Compute by:	Known Q
Known Q (cfs)	= 28.70

Highlighted

Depth (ft)	= 0.58
Q (cfs)	= 28.70
Area (sqft)	= 9.48
Velocity (ft/s)	= 3.03
Wetted Perim (ft)	= 47.59
Crit Depth, Yc (ft)	= 0.61
Top Width (ft)	= 45.31
EGL (ft)	= 0.72

(Sta, El, n)-(Sta, El, n)...

(7.00, 1259.50)-(12.50, 1259.42, 0.015)-(12.58, 1258.92, 0.015)-(15.42, 1258.98, 0.015)-(15.50, 1259.48, 0.015)-(21.50, 1259.52, 0.015)-(21.58, 1259.10, 0.015)
-(40.00, 1259.49, 0.015)-(50.20, 1259.17, 0.015)-(51.62, 1259.11, 0.015)-(51.70, 1259.61, 0.015)-(57.00, 1259.56, 0.015)-(57.08, 1259.06, 0.015)-(60.57, 1259.06, 0
-(60.65, 1259.56, 0.015)-(65.00, 1259.57, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Jul 25 2017

Cross Section 10 Proposed

User-defined

Invert Elev (ft)	= 1259.55
Slope (%)	= 0.81
N-Value	= Composite

Calculations

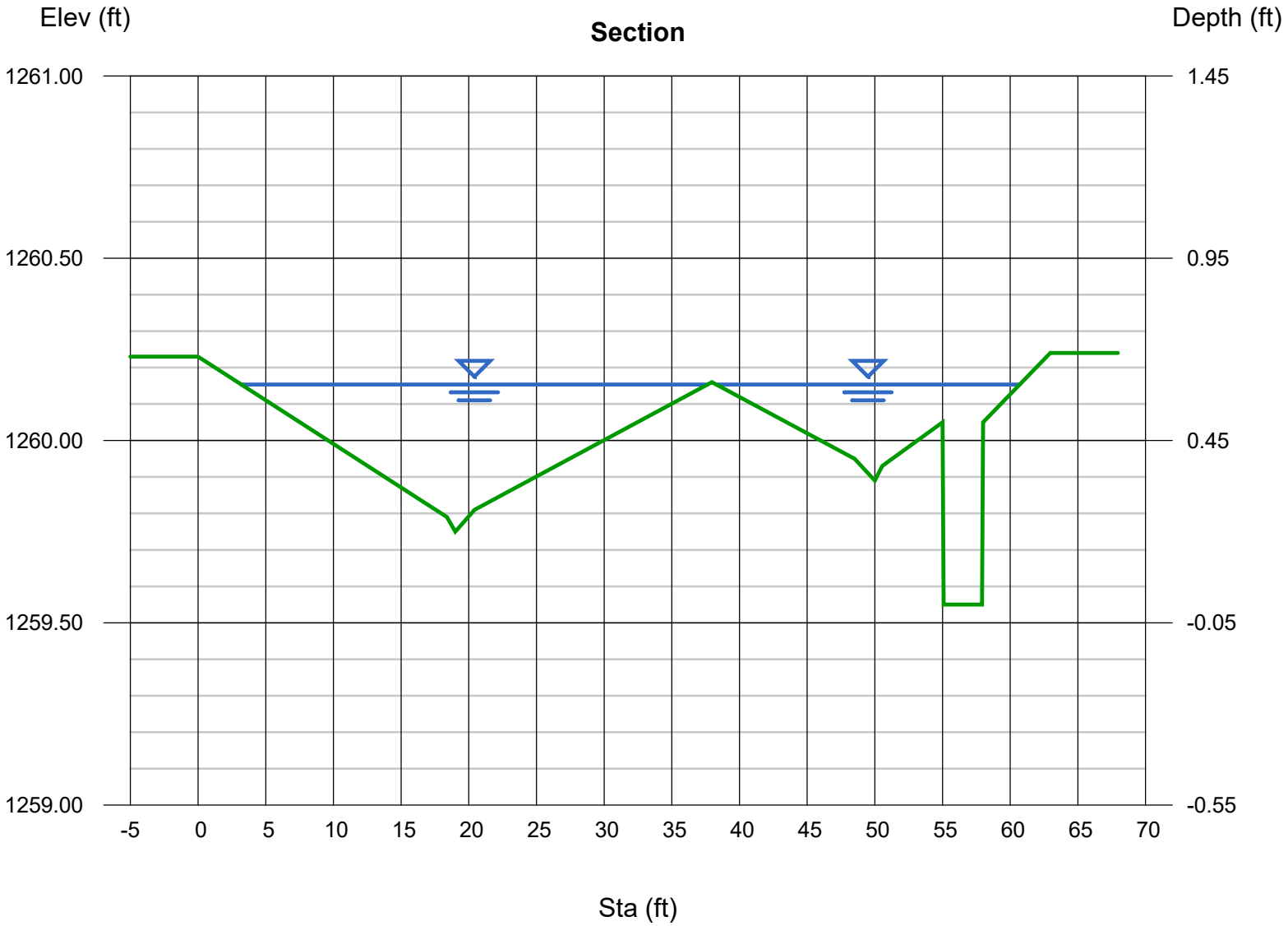
Compute by:	Q vs Depth
No. Increments	= 40

Highlighted

Depth (ft)	= 0.60
Q (cfs)	= 30.83
Area (sqft)	= 10.65
Velocity (ft/s)	= 2.89
Wetted Perim (ft)	= 57.75
Crit Depth, Yc (ft)	= 0.63
Top Width (ft)	= 56.88
EGL (ft)	= 0.73

(Sta, El, n)-(Sta, El, n)...

(0.00, 1260.23)-(18.38, 1259.79, 0.015)-(19.00, 1259.75, 0.015)-(20.42, 1259.81, 0.015)-(37.96, 1260.16, 0.015)-(48.50, 1259.95, 0.015)-(50.00, 1259.89, 0.015)-(50.54, 1259.93, 0.015)-(55.00, 1260.05, 0.015)-(55.08, 1259.55, 0.015)-(57.92, 1259.55, 0.015)-(58.00, 1260.05, 0.015)-(62.96, 1260.24, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Jul 25 2017

Cross Section 11 Proposed

User-defined

Invert Elev (ft)	= 1260.35
Slope (%)	= 0.81
N-Value	= 0.015

Calculations

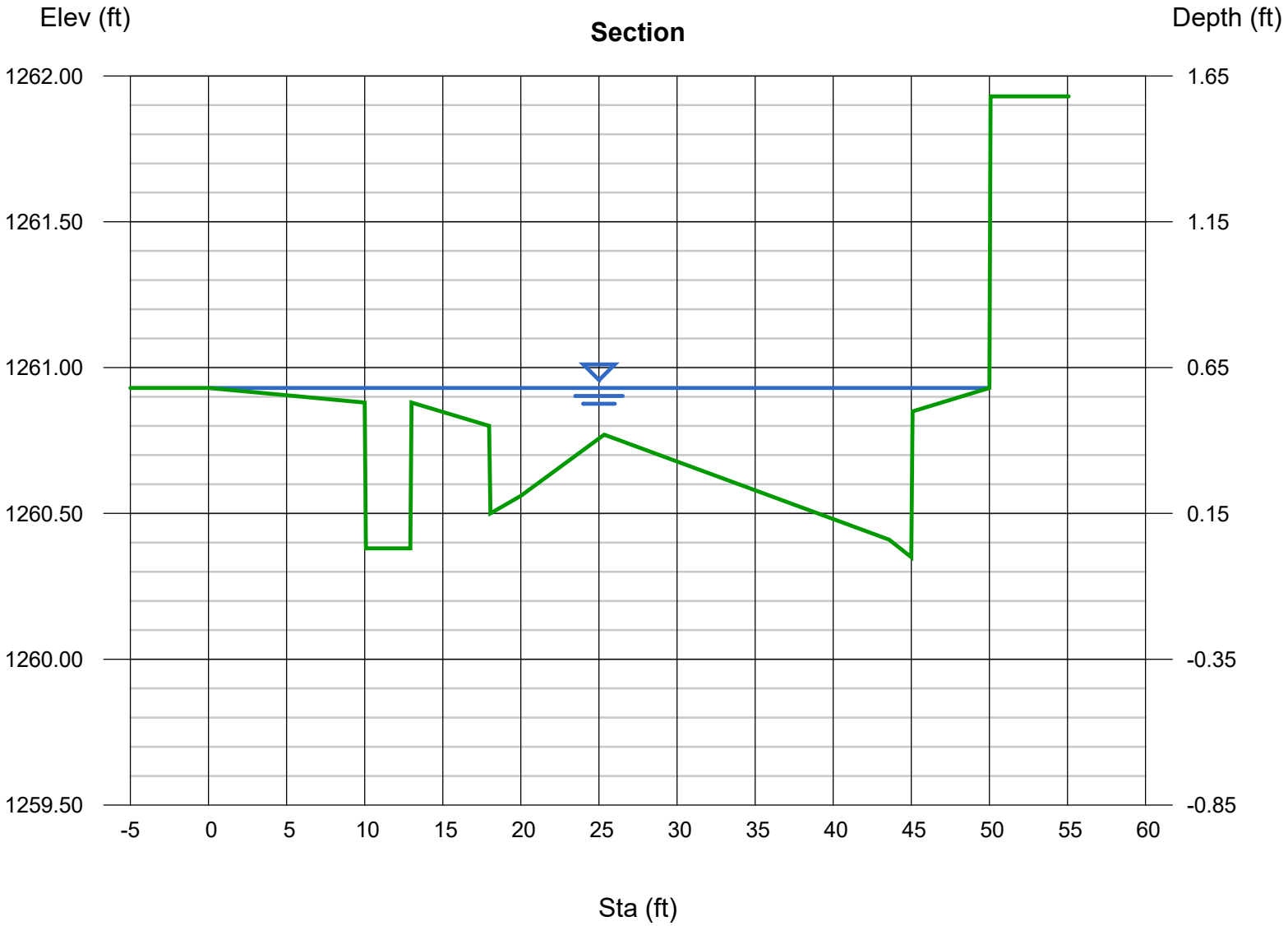
Compute by:	Known Q
Known Q (cfs)	= 39.05

Highlighted

Depth (ft)	= 0.58
Q (cfs)	= 39.05
Area (sqft)	= 11.73
Velocity (ft/s)	= 3.33
Wetted Perim (ft)	= 51.49
Crit Depth, Yc (ft)	= 0.62
Top Width (ft)	= 49.97
EGL (ft)	= 0.75

(Sta, El, n)-(Sta, El, n)...

(0.00, 1260.93)-(10.00, 1260.88, 0.015)-(10.08, 1260.38, 0.015)-(12.92, 1260.38, 0.015)-(13.00, 1260.88, 0.015)-(17.97, 1260.80, 0.015)-(18.05, 1260.50, 0.015)
-(20.00, 1260.56, 0.015)-(25.34, 1260.77, 0.015)-(43.58, 1260.41, 0.015)-(45.00, 1260.35, 0.015)-(45.08, 1260.85, 0.015)-(50.00, 1260.93, 0.015)-(50.08, 1261.93, 0



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Jul 25 2017

Cross Section 12 Proposed

User-defined

Invert Elev (ft)	= 1260.65
Slope (%)	= 0.23
N-Value	= Composite

Calculations

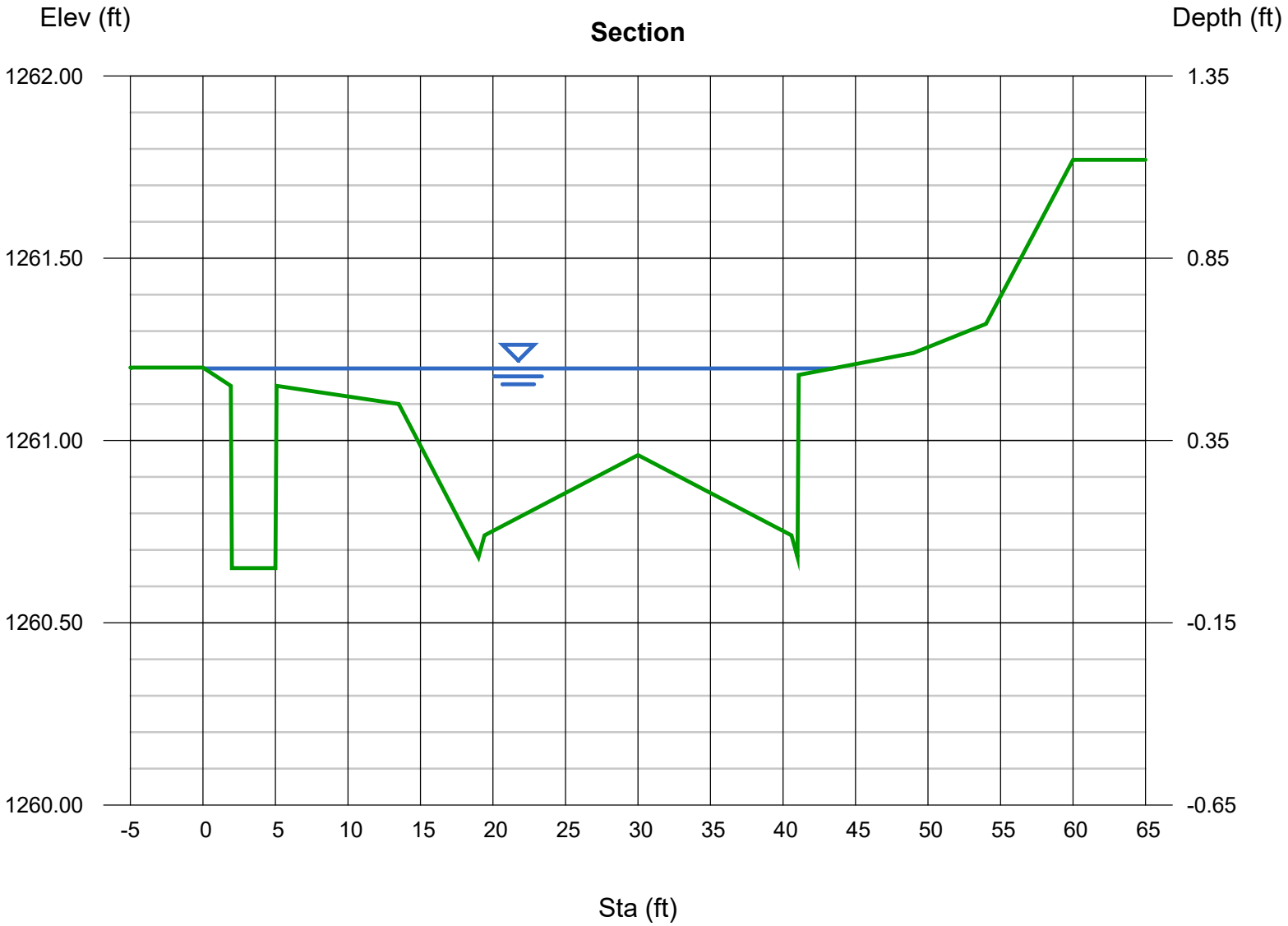
Compute by:	Q vs Depth
No. Increments	= 45

Highlighted

Depth (ft)	= 0.55
Q (cfs)	= 21.91
Area (sqft)	= 11.85
Velocity (ft/s)	= 1.85
Wetted Perim (ft)	= 44.62
Crit Depth, Yc (ft)	= 0.44
Top Width (ft)	= 43.31
EGL (ft)	= 0.60

(Sta, El, n)-(Sta, El, n)...

(0.00, 1261.20)-(1.92, 1261.15, 0.015)-(2.00, 1260.65, 0.015)-(5.00, 1260.65, 0.015)-(5.08, 1261.15, 0.015)-(13.50, 1261.10, 0.015)-(19.00, 1260.68, 0.015)
-(19.42, 1260.74, 0.015)-(30.00, 1260.96, 0.015)-(40.58, 1260.74, 0.015)-(41.00, 1260.68, 0.015)-(41.08, 1261.18, 0.015)-(49.00, 1261.24, 0.030)-(54.00, 1261.32, 0
-(60.00, 1261.77, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jul 21 2017

Cross Section 13 (Proposed same as Existing)

User-defined

Invert Elev (ft)	= 1260.71
Slope (%)	= 0.23
N-Value	= Composite

Calculations

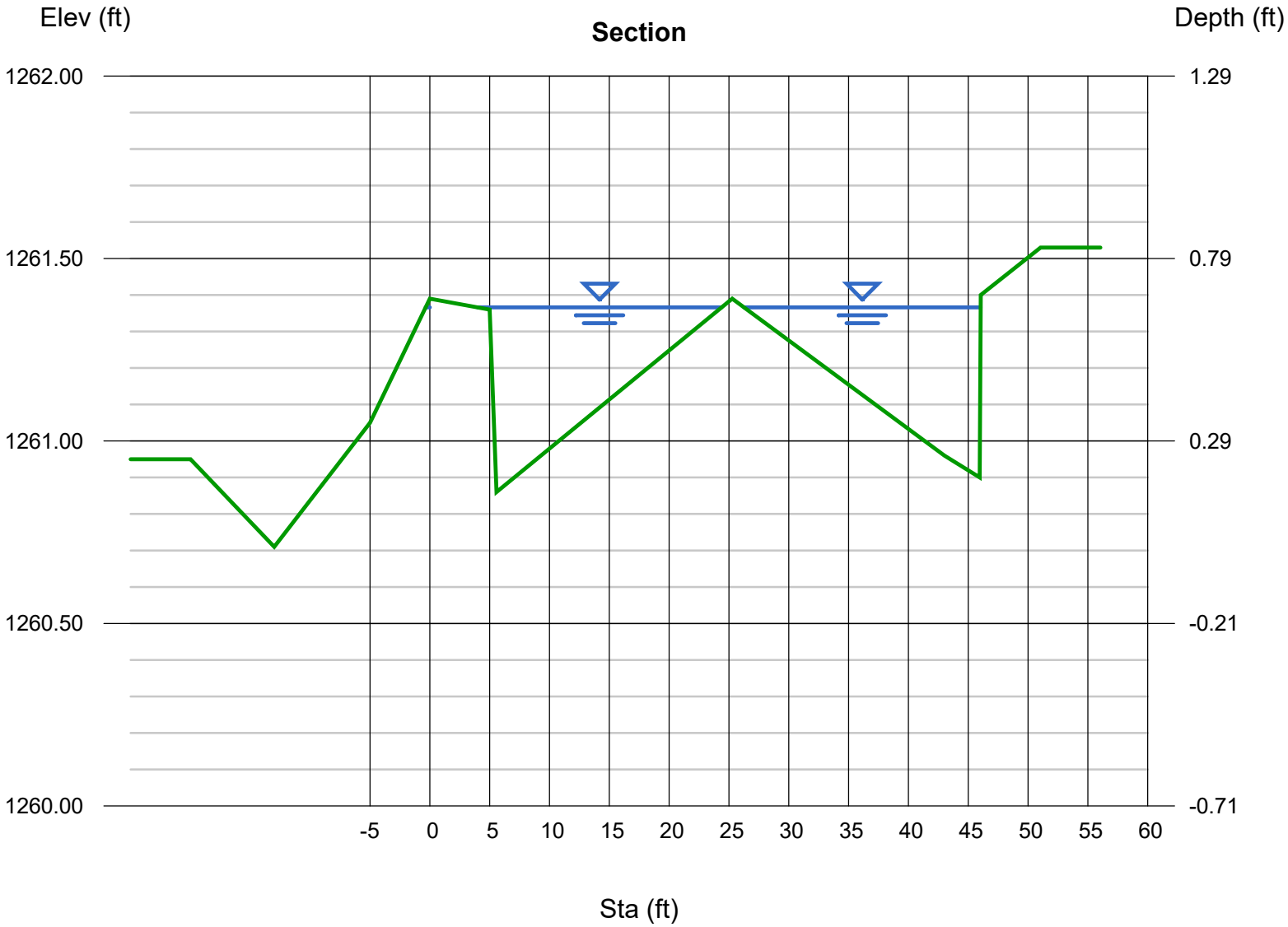
Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 0.66
Q (cfs)	= 38.17
Area (sqft)	= 17.99
Velocity (ft/s)	= 2.12
Wetted Perim (ft)	= 60.41
Crit Depth, Yc (ft)	= 0.57
Top Width (ft)	= 59.79
EGL (ft)	= 0.73

(Sta, El, n)-(Sta, El, n)...

(-20.00, 1260.95)-(5.00, 1261.36, 0.015)-(5.58, 1260.86, 0.015)-(25.27, 1261.39, 0.015)-(43.00, 1260.96, 0.015)-(45.96, 1260.90, 0.015)-(46.04, 1261.40, 0.015)-(51.04, 1261.53, 0.015)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Jul 25 2017

Cross Section 14 Proposed

User-defined

Invert Elev (ft)	= 1260.38
Slope (%)	= 0.81
N-Value	= Composite

Calculations

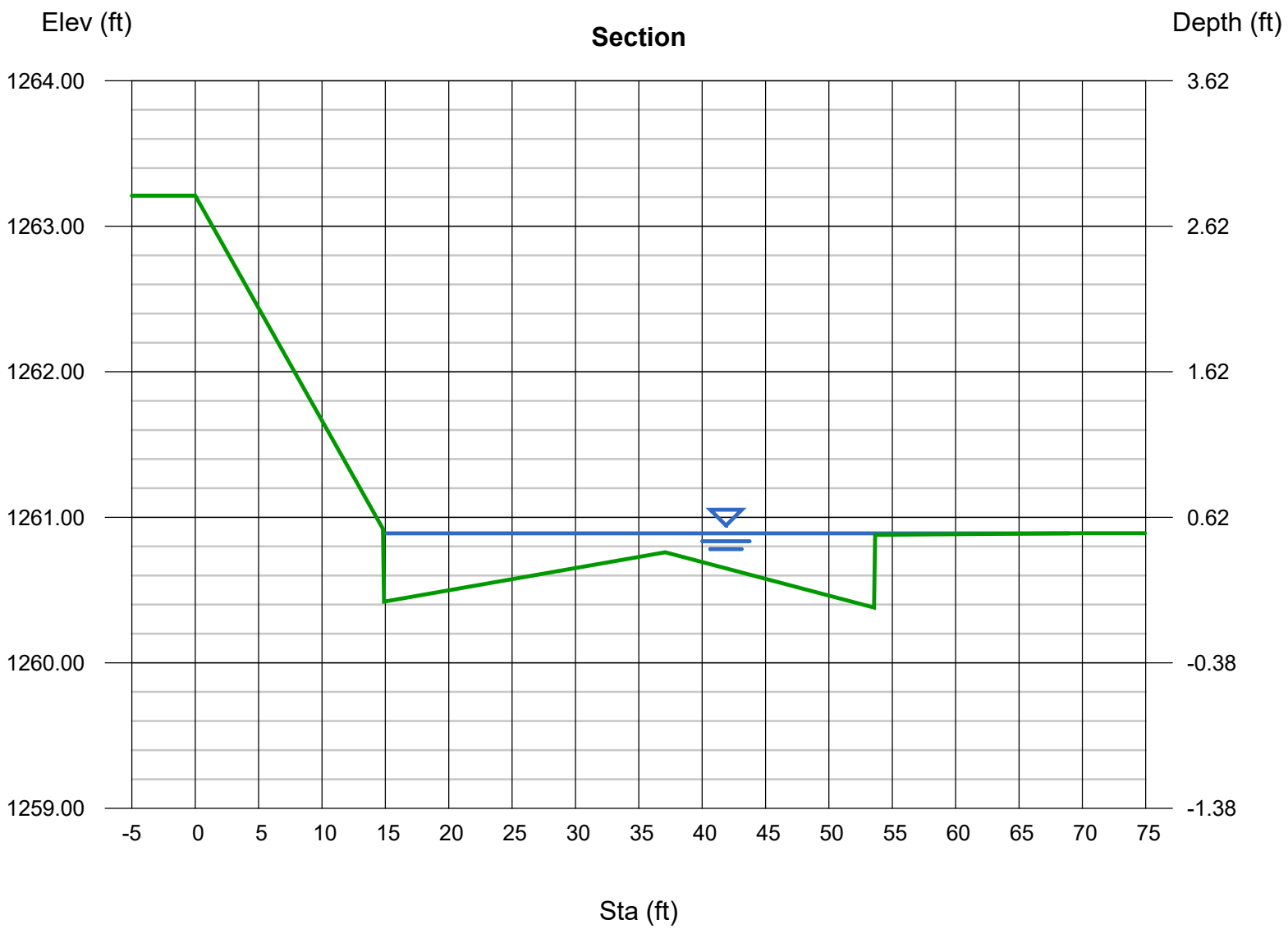
Compute by:	Q vs Depth
No. Increments	= 50

Highlighted

Depth (ft)	= 0.51
Q (cfs)	= 44.95
Area (sqft)	= 12.02
Velocity (ft/s)	= 3.74
Wetted Perim (ft)	= 54.96
Crit Depth, Yc (ft)	= 0.57
Top Width (ft)	= 54.14
EGL (ft)	= 0.73

(Sta, El, n)-(Sta, El, n)...

(0.00, 1263.21)-(14.81, 1260.92, 0.013)-(14.90, 1260.42, 0.013)-(37.09, 1260.76, 0.013)-(53.56, 1260.38, 0.013)-(53.65, 1260.88, 0.013)-(69.95, 1260.89, 0.013)



APPENDIX D
CROSS-SECTIONAL FLOW SPLIT CALCULATIONS

Channel Report

Marshall and 1st Ave

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jul 31 2017

<Name>

User-defined

Invert Elev (ft)	= 60.35
Slope (%)	= 0.50
N-Value	= 0.015

Calculations

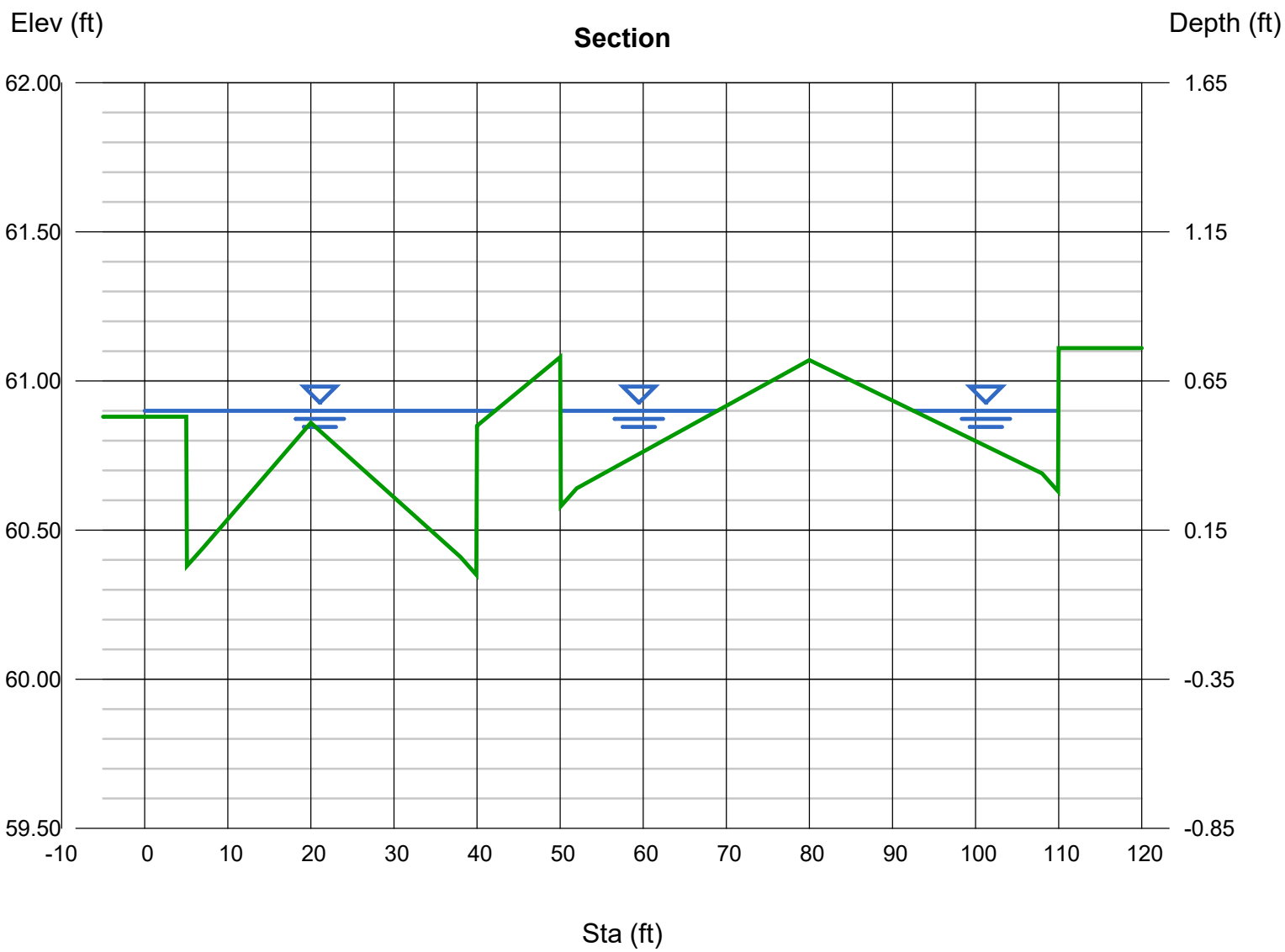
Compute by:	Known Q
Known Q (cfs)	= 35.00

Highlighted

Depth (ft)	= 0.55
Q (cfs)	= 35.00
Area (sqft)	= 14.92
Velocity (ft/s)	= 2.35
Wetted Perim (ft)	= 74.89
Crit Depth, Yc (ft)	= 0.54
Top Width (ft)	= 73.51
EGL (ft)	= 0.64

(Sta, El, n)-(Sta, El, n)...

(5.00, 60.88)-(5.08, 60.38, 0.015)-(7.00, 60.44, 0.015)-(20.00, 60.86, 0.015)-(38.00, 60.41, 0.015)-(39.92, 60.35, 0.015)-(40.00, 60.85, 0.015)
-(50.00, 61.08, 0.015)-(50.08, 60.58, 0.015)-(52.00, 60.64, 0.015)-(80.00, 61.07, 0.015)-(108.00, 60.69, 0.015)-(109.92, 60.63, 0.015)-(110.00, 61.11, 0.015)



Channel Report

Marshall and Main Street

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Aug 1 2017

<Name>

User-defined

Invert Elev (ft)	= 58.34
Slope (%)	= 0.31
N-Value	= 0.015

Calculations

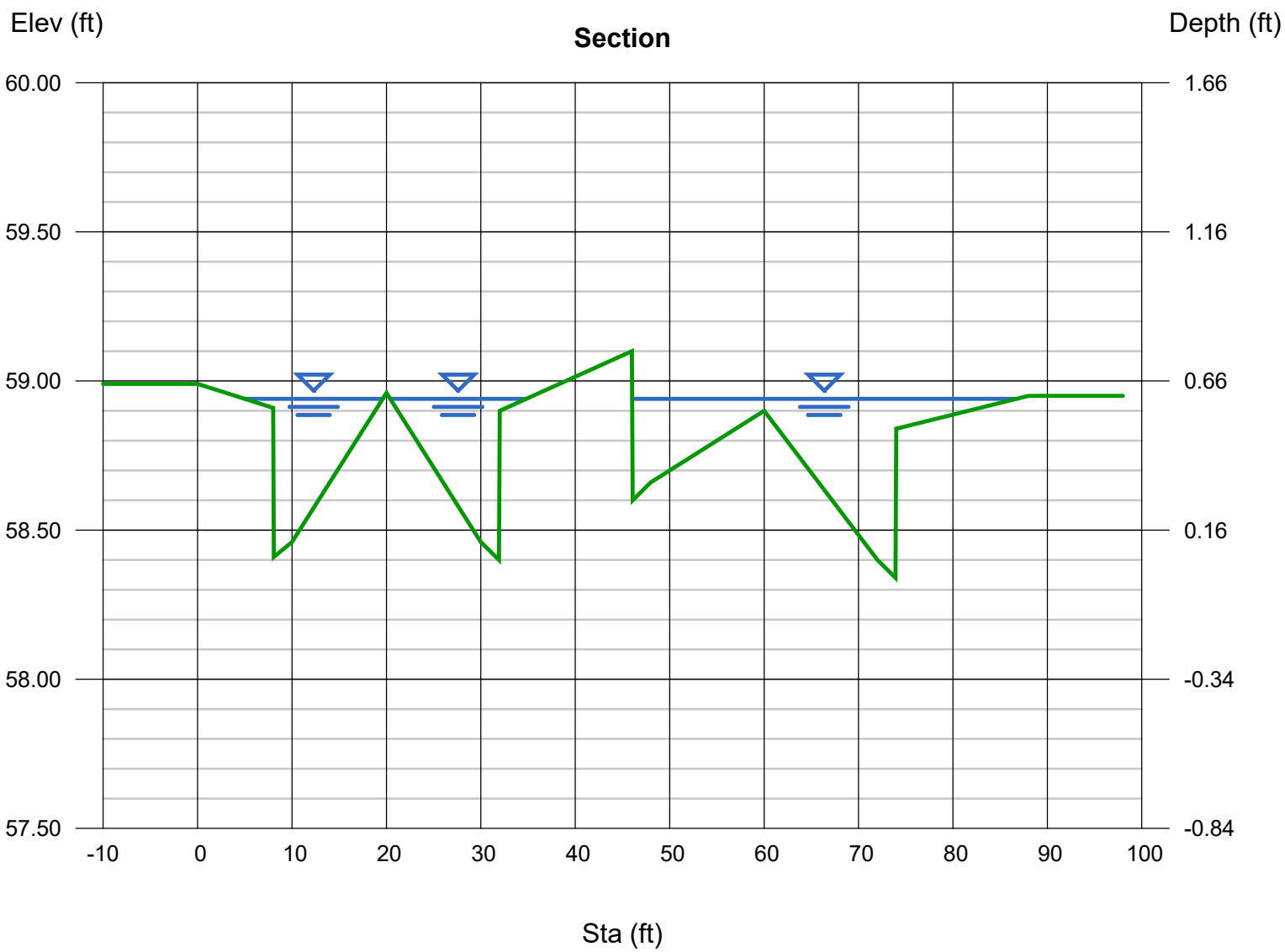
Compute by:	Known Q
Known Q (cfs)	= 27.00

Highlighted

Depth (ft)	= 0.60
Q (cfs)	= 27.00
Area (sqft)	= 14.47
Velocity (ft/s)	= 1.87
Wetted Perim (ft)	= 71.31
Crit Depth, Yc (ft)	= 0.54
Top Width (ft)	= 69.70
EGL (ft)	= 0.65

(Sta, El, n)-(Sta, El, n)...

(0.00, 58.99)-(8.00, 58.91, 0.015)-(8.08, 58.41, 0.015)-(10.00, 58.46, 0.015)-(20.00, 58.96, 0.015)-(30.00, 58.46, 0.015)-(31.92, 58.40, 0.015)
-(32.00, 58.90, 0.015)-(46.00, 59.10, 0.015)-(46.08, 58.60, 0.015)-(48.00, 58.66, 0.015)-(60.00, 58.90, 0.015)-(72.00, 58.40, 0.015)-(73.92, 58.34, 0.015)
-(74.00, 58.84, 0.015)-(88.00, 58.95, 0.015)



Channel Report

Marshall and 1st St

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Aug 1 2017

<Name>

User-defined

Invert Elev (ft)	= 56.38
Slope (%)	= 0.31
N-Value	= 0.015

Calculations

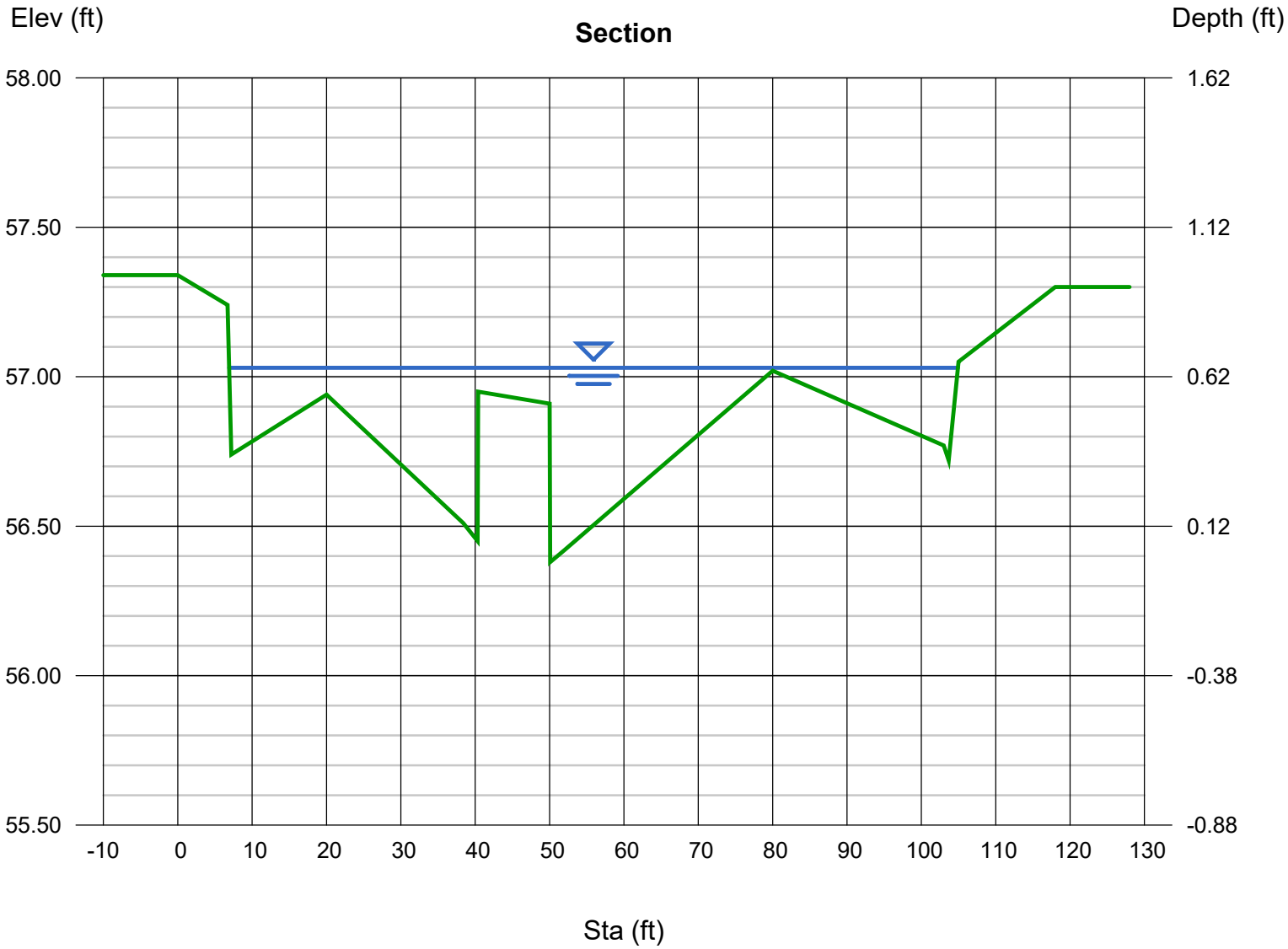
Compute by:	Known Depth
Known Depth (ft)	= 0.65

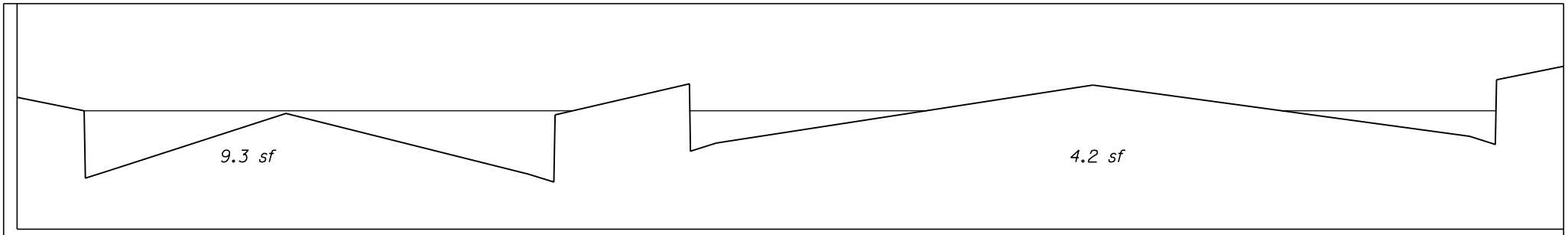
Highlighted

Depth (ft)	= 0.65
Q (cfs)	= 49.89
Area (sqft)	= 23.54
Velocity (ft/s)	= 2.12
Wetted Perim (ft)	= 99.07
Crit Depth, Yc (ft)	= 0.61
Top Width (ft)	= 98.01
EGL (ft)	= 0.72

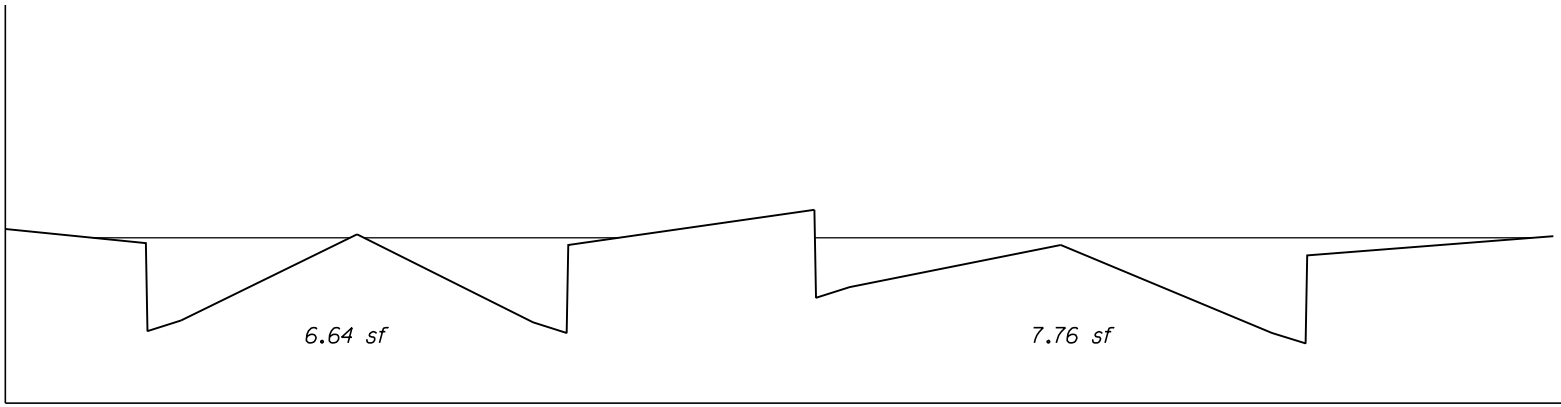
(Sta, El, n)-(Sta, El, n)...

(0.00, 57.34)-(6.70, 57.24, 0.015)-(7.20, 56.74, 0.015)-(20.00, 56.94, 0.015)-(38.40, 56.51, 0.015)-(40.32, 56.45, 0.015)-(40.40, 56.95, 0.015) -(50.00, 56.91, 0.015)-(50.08, 56.38, 0.015)-(52.00, 56.42, 0.015)-(80.00, 57.02, 0.015)-(103.00, 56.77, 0.015)-(103.67, 56.72, 0.015)-(105.00, 57.05, 0.015) -(118.00, 57.30, 0.015)

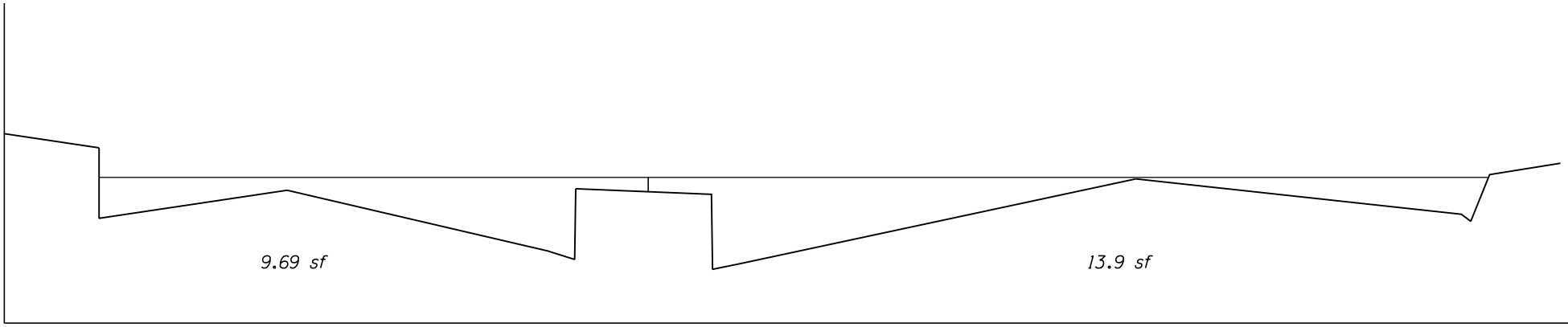




Marshall and 1st Avenue



Marshall and Main Street



Marshall and 1st Street

Note: Looking North and West

APPENDIX E
CATCH BASIN AND GUTTER FLOW CALCULATIONS

Dibble Engineering

CALC _____ DATE 7/23/17 JOB 101513.02

CHKD _____ DATE _____ SHT 1 OF 1

TITLE Scottsdale · Marshall Way
Existing Catch Basin Capacity Calc

Maricopa County Drainage Manual

Eqn 3.11

$$Q_i = C_w(L + 1.8W)d^{1.5}$$

$C_w = 2.3$
$W = 1.5$ ft

$d = 0.5 + .16 = 0.66'$
$L = 3'$

$$Q_i = 2.3(3 + 1.8(1.5))(.66)^{1.5}$$

$Q_i = 7.03$ cfs

w/ 25% clogging factor

$Q_i = 5.2$ cfs

Curb Opening Catch Basin on Grade Calculation
Marshall Way, Goldwater Blvd to Indian School Road

STATION 10+75

EQN 3.3 Qs = 0.56/n*Sx^1.67*S^0.5*T^2.67
EQN 3.4 Eo=1/(1+(Sw/Sx)/((Sw/Sx)/(T/W-1)+1)^2.67-1)+1

T	15.0		
n	0.015		
Sw	0.161385		
Sx	0.02		
S	0.0058		
W	1.5		
Eo	0.28873		
Qs	4.310444		
Q	6.060205	<===	Design Q10= 6.1 cfs
Qw=	1.749761		

Roadway Width = 20'
Lane Width =10'
Spread max = Roadway - Lane/2 = 15'

EQN 3.10

Lt = 0.6*Q^.42*S^.3*(1/n*Se)^.6

Q	6.1
S	0.0058
n	0.015

EQN 3.9 Se = Sx+S'w*Eo

Sx	0.02
S'w	0.141385
Eo	0.28873
Se	0.060822
Lt	18.23589

L with 25% cloggoing factor

22.79486

L = 20