



AGENDA
REGULAR MEETING OF THE
WINDSOR HEIGHTS
PLANNING AND ZONING COMMISSION
Wednesday, October 23, 2024 - 5:30 PM
WINDSOR HEIGHTS COUNCIL CHAMBERS - 1133 66th ST
ZOOM: <https://us02web.zoom.us/j/7832856334>
Meeting ID: 783 285 6334

1. **Call to Order**
2. **Approval of Agenda**
3. **Approval of the Minutes:**
 - A. Minutes 6.26.24
4. **Public Hearing to Review a New Building Site Plan at 6301 University Ave**
 - A. Staff Presentation
 - B. Site Plan & Supporting Documents
5. **Consideration of a New Building Site Plan at 6301 University Ave**
6. **Adjourn**

*It is possible that members, including a quorum of members of the City Council and other committees may be present. No City business will be discussed outside of this agenda.

City of Windsor Heights Planning and Zoning Commission Meeting Minutes
Wednesday, June 26, 2024 - 5:30 PM
WINDSOR HEIGHTS COUNCIL CHAMBERS - 1133 66th ST

1. Call to Order

Chair Geoff Wood called the meeting to order at 5:30 PM. Members present: Dave Ferree, Diane Foss, Bob Bishop, and Donna Mueller via Zoom. Members absent: Georgie Libbie, Tyler Holtorff.

2. Approval of Agenda

Motion by Dave Ferree to APPROVE. Seconded by Diane Foss. Motion Passed 5-0

3. Approval of the Minutes:

Motion by Bob Bishop to APPROVE. Seconded by Dave Ferree. Motion passed 5-0.

A. Minutes: 5.22.24

4. Public Hearing to Review a New Building Site Plan at 6900 School St

Trey Rouse presented the staff report. Geoff asked if the shed is a new structure or a replacement. Andy Larson responded and stated that it is a replacement and provided additional details. Motion by Dave Ferree to open the Public Hearing. Seconded by Diane Foss. Motion passed 5-0. No public comment. Motion by Bob Bishop to close the Public Hearing. Seconded by Dave Ferree. Motion passed 5-0.

A. Staff Presentation

B. Site Plan & Supporting Documents

5. Consideration of a New Building Site Plan at 6900 School St

Motion by Bob Bishop to APPROVE. Seconded by Diane Foss. Motion passed 5-0.

6. Public Hearing to Review an Updated Zoning Map

Trey Rouse presented. Geoff Wood asked for clarification on what was being changed. Trey advised that some zones were relabeled per the updated Zoning code, which were missed on the last re-do of the map. Bob Bishop asked about the comprehensive plan. Trey advised the next item on the agenda addresses this question.

Motion by Diane Foss to open the Public Hearing. Seconded by Bob Bishop. Motion passed 5-0. No public comment. Motion by Bob Bishop to close the public hearing. Seconded by Dave Ferree. Motion passed 5-0.

A. Staff Presentation

7. Consideration of an Updated Zoning Map

Motion by Diane Foss to APPROVE. Seconded by Donna Mueller. Motion passed 5-0.

8. Public Hearing to Review an Updated Future Land Use Map within the Comprehensive Plan

Trey Rouse presented the staff report. Bob Bishop asked about a full redo of the comprehensive plan. Adam Plagge advised that the current timeframe is likely FY27. Bob asked about the transitional residential district being removed. Trey advised that the updated map resolved discrepancies and advised that mixed use allows for residential, rather than transitional residential being an "overlay" rather than a true zone. The proposed mixed use district

reduces redundancy.

Motion by Dave Ferree to open the Public Hearing. Seconded by by Diane. Motion passed 5-0. No public comment. Motion by Diane Foss to close. Seconded by Bob Bishop. Motion passed 5-0.

A. Staff Presentation

9. **Consideration of an Updated Future Land Use Map within the Comprehensive Plan**

Motion by Diane Foss to APPROVE. Seconded by Dave Ferree. Motion passed 5-0.

10. **Adjourn**

Motion by Bob Bishop to adjourn at 6:11 PM. Seconded by Donna Mueller. Motion passed 5-0.

STAFF REPORT

Date: October 23rd, 2024
To: Windsor Heights Planning and Zoning Commission
From: Trey Rouse
Subject: Site Plan: 6301 University Avenue – Windsor Presbyterian Church

General Information

Applicant: Shane Devick
2400 86th Street, Suite 12
Urbandale, IA 50322
Property Owner: Windsor Presbyterian Church
Current Use: Civic Organization
Zoning: UC (Urban Center District)
Location: 6301 University Avenue

Summary

The applicant, Shane Devick representing Windsor Presbyterian Church, is requesting to expand the existing parking lot available to the Windsor Presbyterian Church to the north in the UC District (Urban Center District). The applicant has acquired the three homes and parcels directly north of the Windsor Presbyterian Church (1214, 1220, and 1228 University Avenue) and will utilize that area to be the expanded parking lot. The UC District (Urban Center District) allows for the Civic Organization use within the UC District by right. This development would be a part of the existing Civic Organization use on the property 6301 University Avenue and include ADA compliant parking spaces, ramps, landscaped/screened to the north and west sides of the parking lot with landscaped islands within the parking lot, and access onto 63rd Street approved by the Iowa Department of Transportation (DOT).

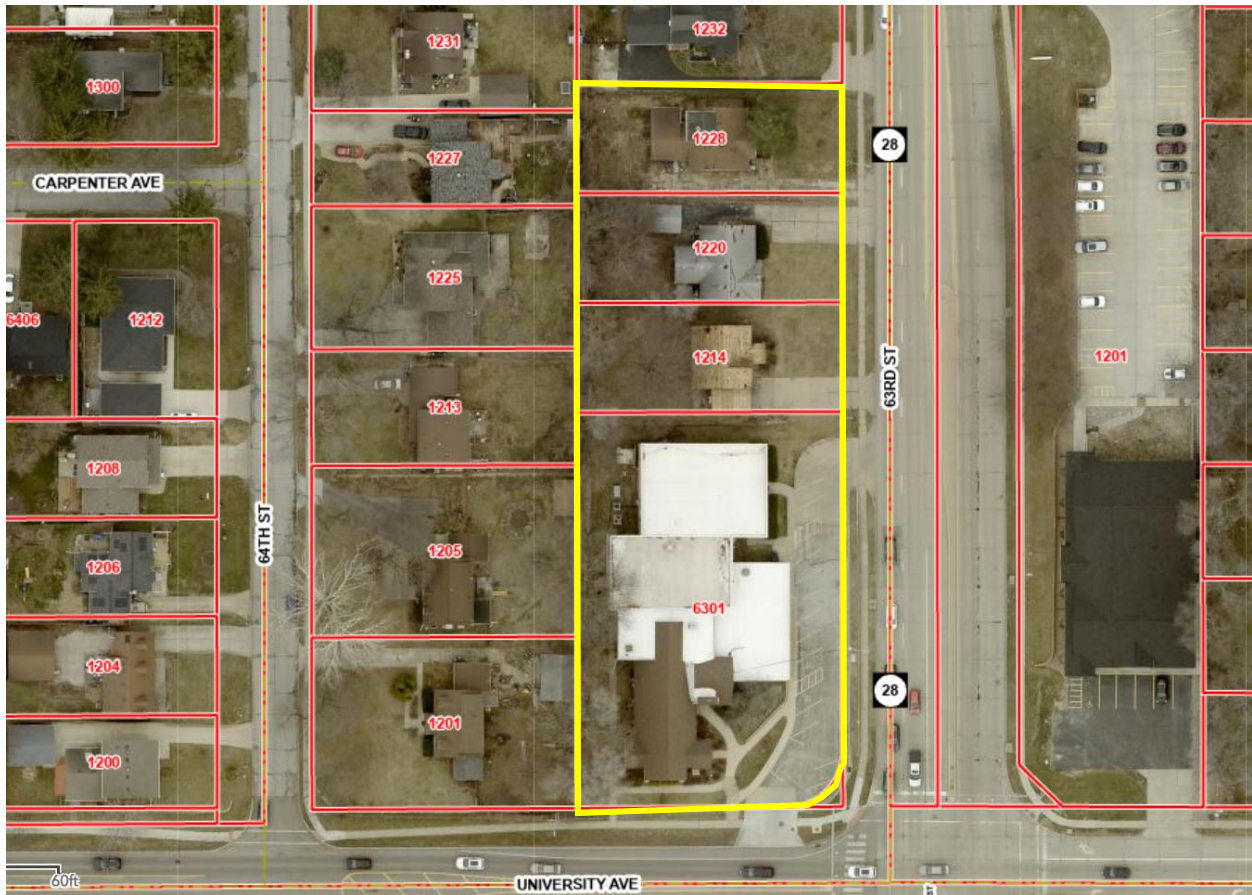
City Staff has completed a review of the documentation submitted by the applicant. The submitted application materials are attached to this report.

Existing Conditions

The existing conditions for each of the parcels in questions is as follows and labeled as such within the following aerial image of the properties.

1. 6301 University Avenue – Windsor Community Presbyterian Church
 - a. 0.66 Acre Lot
 - b. Currently a contiguous and connected building at the scale of 11,460 sq. ft.

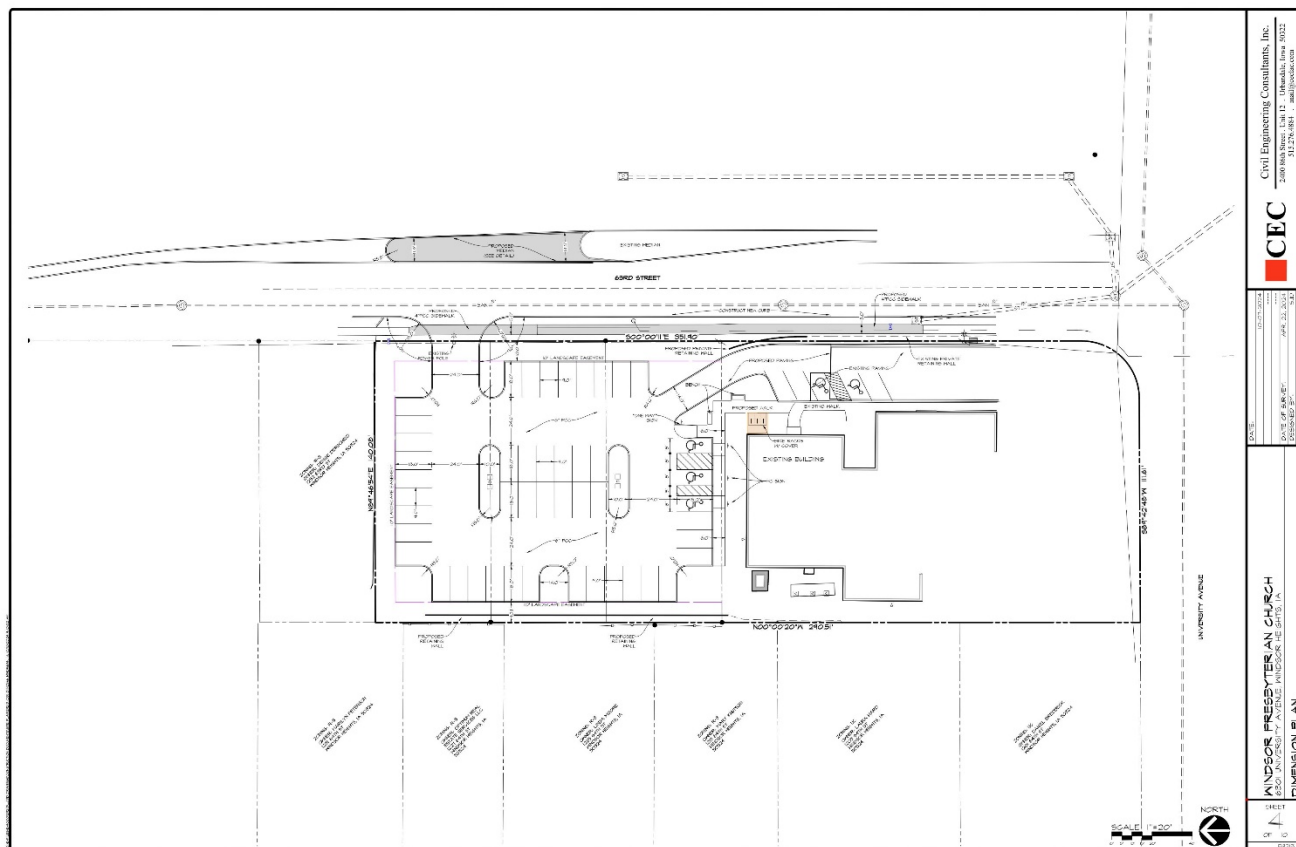
- c. Parking lot on the east side of the property with 11 angled-parking spaces (3 of them being handicap accessible) and 1 parallel parking space
 - d. Sidewalk access to all entrances to the existing building on the property
- 2. 1214 University Avenue
 - a. 0.185 Acre Lot
 - b. Formerly connected Single-Family Dwelling Unit and Garage at the scale of approximately 1,400 sq. ft.
 - c. Driveway with access to University Avenue
- 3. 1220 University Avenue
 - a. 0.185 Acre Lot
 - b. Formerly detached Single-Family Dwelling Unit at the scale of approximately 1,500 sq. ft.
 - c. Currently detached garage at the scale of approximately 400 sq. ft.
 - d. Driveway with access to University Avenue
- 4. 1228 University Avenue
 - a. 0.185 Acre Lot
 - b. Formerly connected Single-Family Dwelling Unit and Garage at the scale of approximately 1,600 sq. ft.
 - c. Driveway with access to University Avenue



Legal Description

LOT 8 & -EX BEG SE COR THN N 28.45F SWLY 44.72F E
 28.45F TO POB- LOT 9 & E 40F LOT 10 EVERGREEN
 HEIGHTS

Site Plan for Development



63rd Street is at the top and University Avenue is on the right side of the Site Plan plan sheet

Background of Parcel/Lot

Currently the parcels are going through the process of combining and/or creating a lot tie agreement to allow for development across the parcels. This will be necessary to have either one parcel or combined and connected parcels for development as off-street parking is not permitted use within the UC (Urban Center) Zoning district.

Adjacent Land Use

Direction	Zoning	Use
North	R-3 Multiple-Family Residential District	Residential, Single Family
South	Urban Center District (UC)	Residential, Multi-Family
East	N/A (Outside City Limits)	Commercial
West	Urban Center District (UC)	Residential, Single Family

Zoning Bulk Regulations

Category	UC
Lot Area	5,000 sq. ft.
Lot Width	25 ft
Front Yard Setback	0 ft
Side Yard Setback	0 ft
Rear Yard Setback	10 ft (When abutting Residential Zoning District, must have fully landscaped or visual buffer)

Traffic Information

There was no traffic study requested by the City for the development of this project. The number of access points to 63rd Street decreased, and the amount of traffic based upon the use would not change with the development of the proposed project.

The Iowa DOT signed off and released an Entrance Permit for the proposed access that can be seen within the Site Plan.

Parkland Dedication

This development does not require parkland dedication.

City staff took no further action on this review section.

Landscaping and Plantings

The applicant has provided a landscaping plan within the site plan (sheet 7 of 9) to illustrate the planting locations and types of plantings that will be on the development. The plantings provided and shown meet the requirements of the landscaping chapter of the Zoning Code by numbers and utilize plants on the approved Windsor Heights Tree/Plant list. The required number of trees and shrubs based upon the size of development are 7 trees (1/2000 sq. ft. of pervious area) and 35 shrubs (5/2000 sq. ft. of pervious area).

This requirement has been met as the applicant shows in the site plan to provide 34 trees in total (utilizing 7 existing trees) and 44 shrubs.

Building Façade

With the proposed development, there is no change to the building or façade of the building. The UC (Urban Center) Zoning District does have façade material requirements, but due to the scope of the project no requirements are needed for the project.

City staff took no further action within this review.

Stormwater/Drainage

The applicant has provided a Stormwater Plan to address the stormwater drainage on the proposed site and to address the stormwater requirements that are outlined within the City Code. The applicant has met these requirements through updating stormwater utilities and landscaping for permeable surfaces on the property. The updated stormwater utilities partially lie within the right-of-way, permission was granted by the City and Iowa DOT for these to be placed in their proposed locations.

The Stormwater Management Plan is attached.

Parking Requirements

Based upon the proposed site and development, minimum parking requirements have been established by the City of Windsor Heights.

Parking requirements for a Civic Organization use is parking space per 1,000 sq. ft. of building space. This would require 12 parking spaces based upon the size of the building/primary structure on the property. This includes a minimum of 1 of those ADA compliant and accessible parking spaces. The applicant meets this parking requirement as the property currently exists and will then exceed it with the proposed development. The proposed project will include 47 new parking spaces with 3 of those being ADA accessible spaces.

Bike parking is required at the proposed development as well. Short-term and Long-term bike parking are considered to be separate and are required in different capacities. 1 Short-term bike parking stall is required for every 4,000 sq. ft. of building space for Civic uses. 1 Long-term bike parking stall is required for every 10,000 sq. ft. of building space for Civic uses. This creates the requirements of 3 short-term bike parking stalls and 2 long-term bike parking stalls. The applicant meets this requirement by providing a combination of six (6) total bike parking stalls that meet the requirements of both short- and long-term bike parking stalls.

Screenings and Buffers

Screening and buffers are required to protect less intensive uses found in the R-1, R-2, and R-3 Districts from more intense uses that are commonly found in the UC, CC, and LI Districts. The Windsor Presbyterian Church Parking lot expansion project is located within the UC District and considered a more intensive district compared to surrounding Zoning Districts. This project abuts the R-3 District on its northern and western site boundary, so it is required to have a minimum of a 10 ft. fully opaque buffer according to Table 173.05-03-Screened Buffer Yard Requirements.

Table 173.05-03 – Screened Buffer Yard Requirements

		Less Intensive Adjacent District
		R-1*, R-2*, & R-3
More Intensive District	UC, CC	10 Feet
	LI	20 Feet
*Applies to residential uses only.		

The following requirements need to be met for the opaque buffer between the Zoning Districts:

2. Opaque Barrier. An opaque barrier shall be provided which visually screens the conditions listed in subsection 1 from less intensive uses by employing one or more of the following in any combination to obtain a solid barrier of at least 6' in height:

- a. A solid wood and/or masonry fence or wall at least six feet in height.
- b. A landscaped screen, using a minimum of 50% evergreen plant material, capable of providing a substantially opaque, hedge-like barrier and attaining a minimum height of six feet within three years of planting. (Note: All planting materials shall conform to the minimum caliper/size requirements set in Table 173-02)
- c. A landscaped earth berm with a maximum slope of three to one, rising no less than six feet above the existing grade of the lot line separating the zoning districts.
- d. Any combination of these methods that achieves a cumulative height of six feet.

The applicant is meeting this requirement with a fully landscaped buffer to create the required opaque residential buffer with approved planting materials as listed in Table 173-02. The inclusion of retaining walls, approved by the City and Iowa DOT (for the one located within the right-of-way on 63rd Street) assist in creating this buffer as well.

Comprehensive Plan Review

The Windsor Heights Comprehensive Plan has been reviewed by City Staff to make sure that this project aligns with the goals and ideals of the Comprehensive Plan. The proposed Windsor Apartment development project meets one of the goals identified and outlined within the Comprehensive Plan and addresses the following goal as determined by the City Staff. The Comprehensive Plan supports the proposed project as it is presented.

Economic Development:

1. Support strategic redevelopment along key corridors, including University Avenue, Hickman Road, 73rd Street, and 63rd Street.

- a. This project is supporting strategic redevelopment along both 63rd Street. With the updates to the area the UC (Urban Center) Zoning District is going through in expanding housing and commercial opportunities, developing close by parking opportunities that benefit from connectivity is essential to promising economic development.

Future Land Use Map

The future land use map should be used as guidance for areas throughout the City. The map identifies this location as Civic, which is defined on page 40 of the Windsor Heights 2017 Comprehensive Plan. “Civic Use. These areas include religious buildings, public facilities, schools and other public and semi-public uses.”

The proposed project conforms to the vision that has been laid out by the Comprehensive Plan Future Land Use Map.

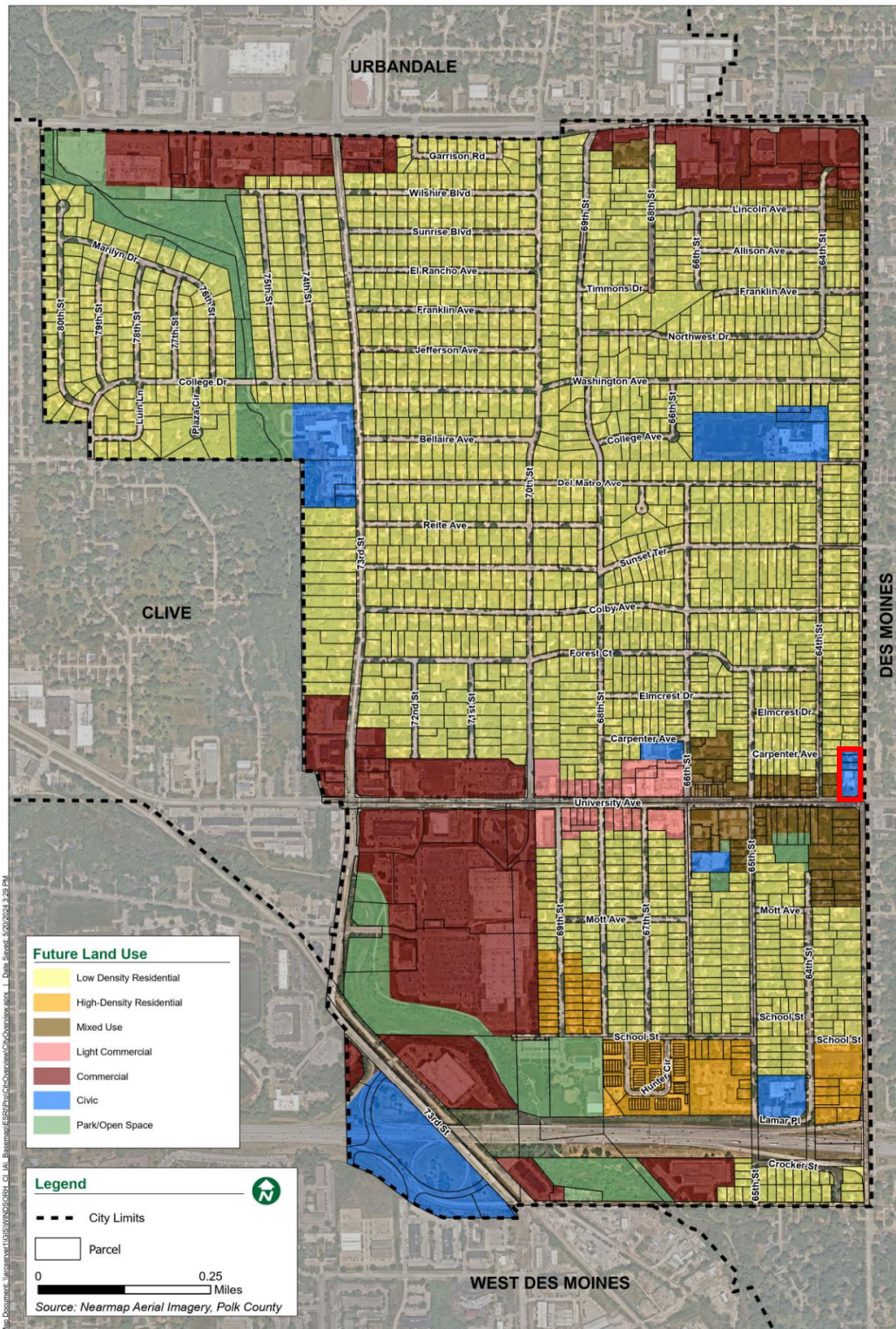


Figure 1: Current Future Land Use Map

Zoning Map

The parcels are currently zoned for Urban Center District which is defined in [Table 168-1 Purposes of Zoning Districts](#) as “This district recognizes the mixed-use character primarily along the University Avenue corridor, which is the principal route through central Windsor Heights. This district contains a combination of residential, commercial, and office uses and is known for its walkability and main street feel.”

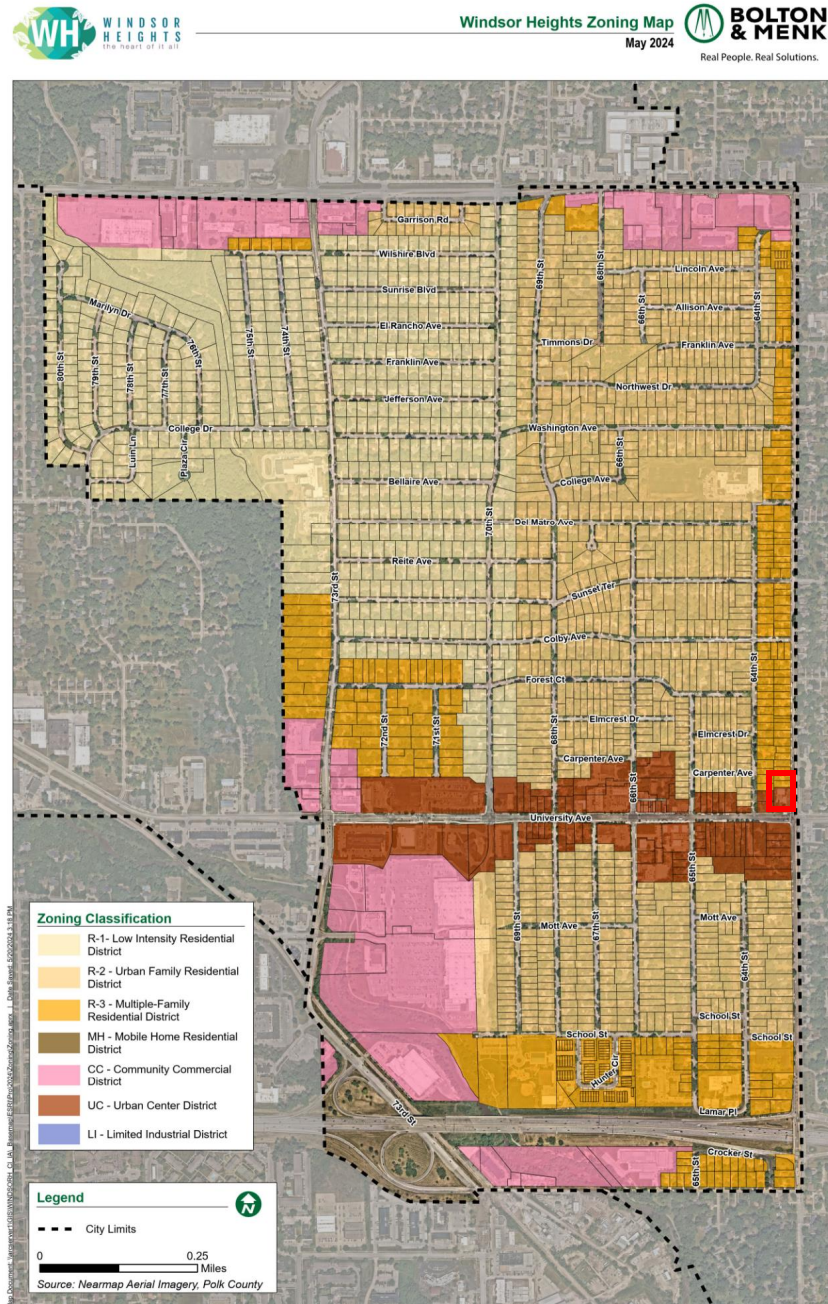


Figure 3: Current Zoning Map

Public Comments Received

The City of Windsor Heights City Staff, at the time of the creation of this Staff Report, has not received public comment on the proposed project of the Windsor Presbyterian Church Parking Lot expansion at this property.

Current Work Done at Site

The properties are currently vacant, the homes have been demolished. Sanitary laterals plugged and water lines disconnected at the main.

Conclusion and Recommendation

After reviewing all of the documentation submitted by the applicant by City Staff and all City Departments, Staff compared the project to the goals and vision of the Comprehensive Plan and other City plans. After review and comparison, Staff came to their recommendation.

The staff recommends to the Planning and Zoning Commission that they recommend approval of the site plan with the following conditions to the City Council.

Recommended Motion

Motion to recommend for approval of the 6301 University Avenue Site Plan (Windsor Presbyterian Church Parking Lot expansion) with the conditions of approval laid out by City Staff to the City Council.

Conditions:

All of the following conditions will be met, reviewed by the city department assigned, and deemed complete before approval of the site plan and before any development can take place.

General Comments

1. All permits related to the project will be held and released concurrently at the approval of the following:
 - a. Approval of signs and utility from Safe Building.
 - b. Revision of site plan application in accordance with the comment letter and all corresponding comments from each City Department.
 - c. Professional Signatures on Final Site Plan including Licensed Surveyor (Chapter 170.10)
 - d. City Council approval of site plan.

Engineering Comments

1. Obtain a Construction Site Erosion & Sediment Control Ordinance Permit or COSESCO Permit from City.
2. Provide performance security or bond per 161.11 of the City's Code.
3. Provide maintenance performance security or bond per 161.12 of the City's Code

4. Provide Maintenance and Repair Easement per 161.14 of the City's Code.
5. Complete Stormwater Maintenance Agreement and submit per instructions.

Planning Comments

1. Combine all lots to become one contiguous lot/parcel or develop and solidify a lot tie agreement that allows for development across the lots.

Attachments

1. Application Materials (as submitted)
2. Easement Submittal Documents
3. Entrance Permit from DOT
4. Stormwater Management Plan

August 30th, 2024

To: Clapsaddle-Garber Associates, Inc.

From: Justin Ernst, PE

Trey Rouse

Subject: Site Plan: Windsor Presbyterian Church Parking Lot Expansion (6301 University Avenue)

2nd Comment Letter

General Comments

All permits related to the project will be held and released concurrently at the approval of the following:

Approval of signs and utility from Safe Building.

Revision of site plan application in accordance with the comment letter and all corresponding comments from each City Department.

Professional Signatures on Final Site Plan including Licensed Surveyor (Chapter 170.10)

City Council approval of site plan.

Provide DOT approval and permit for proposed driveway.

Provide DOT ROW permit.

Storm Water Comments

1. Include recharge volume calculations.

RECHARGE VOLUME IS NOT FEASIBLE WITH UNDERGROUND STORAGE

2. Include calculations for storm sewer sizing.

ADDED TO SWMP

3. Provide Time of Concentration calculations to justify what is reported.

ADDED TO SWMP

4. Storm Water Report outlet pipe does not reflect what is in the plans.

PLANS UPDATED TO REFLECT SWMP

5. Include critical overflow path of underground detention for large storms.

CRITICAL OVERFLOW EXHIBIT ADDED TO DRAINAGE MAPS SECTION OF SWMP

6. Provided underground storage chambers stage-storage information from intended supplier.

SUPPLIER WILL BE CONTACTED AFTER THIS SUBMITTAL

7. An isolator row must be provided for the underground storage chamber to contribute to Water Quality Volume requirements. (See Attached)

FULL PLANS FROM SUPPLIER WILL INCLUDE ISOLATOR ROW

Storm Water Plan Set Comments

1. Include underground storage chamber specifications.

FULL PLANS FROM SUPPLIER WILL INCLUDE STORAGE CHAMBER SPECIFICATIONS

2. Include underground storage chamber subdrains.

FULL PLANS FROM SUPPLIER WILL INCLUDE STORAGE CHAMBER SUBDRAINS

3. Plans underground storage chamber outlet pipe does not reflect what is in the Storm Water report.

PLANS UPDATED TO REFLECT SWMP

Police Comments

1. No further comments.

Fire Comments

1. No further comments.

Des Moines Water Works Comments

1. Water services to the houses being removed will need to be cut at the main...Coordinate tap cut inspections with DMWW. **NOTED ON THE DEMO SHEET**
2. The stop box housing & rod are to be removed as part of the water service demo.... **NOTED ON THE DEMO SHEET**

Urbandale Windsor Heights Sanitary District Comments

1. No comments received.

Des Moines Metropolitan Wastewater Reclamation Authority Comments

1. No comments received.

Building Comments

1. No further comments.

Engineering Comments

1. Obtain a Construction Site Erosion & Sediment Control Ordinance Permit or COSESCO Permit from City.
2. Provide performance security or bond per 161.11 of the City's Code.
3. Provide maintenance performance security or bond per 161.12 of the City's Code
4. Provide Maintenance and Repair Easement per 161.14 of the City's Code.
5. Complete Stormwater Maintenance Agreement and submit per instructions.
6. Retaining wall along 63rd Street to be placed on private property. **CONNECTED TO EXISTING RETAIN WALL AND CURVED ALONG PROPOSED DRIVE INTO PRIVATE PROPERTY**
7. Private storm sewer located within ROW to be moved on private property.
8. Provide sheet index on title sheet. **ADDED**
9. Correct sheet number, total sheet number is incorrect. **CORRECTED**

Planning Comments

The following will be a condition of approval: A Lot Tie Agreement is done to simulate all lots being connected to allow for the development of the parking lot by the Zoning Code.

Landscaping Comments

1. Submit lighting plan and photometrics. This is a repeat comment from the previous set. (170.10)
2. Provide a sidewalk connection on the east end of the south bay of parking stalls for pedestrian connectivity to the rest of the parking lot. (170.17) **ADDED**
3. Show groups of plant material to be contain in a single mulched bed with type of edging specified. (173.05) **SHOWN**
4. Provide concrete pads for the benches. **ADDED**
5. Provide planting details. (173.03) **ADDED**
6. Traffic General Comments
7. The driveway location on 63rd Street has increased from 175-feet to 325-feet from University which has moved the driveway further from University and the intersection influence area of the 63rd/University signal which a good thing, however, this driveway will be full access now with close proximity to University Avenue and may not be supported by the Iowa DOT. **SUBMITTED TO THE DOT**
8. This section of 63rd Street is Highway 28, any change in access needs to be coordinated with the Iowa DOT. Moving the driveway to the north makes is a full access driveway and Iowa DOT may not be supportive of this change and may require median modifications on 63rd Street. **SUBMITTED TO THE DOT**

Public Works Comments

1. No further comments.

SITE PLAN
OF
WINDSOR PRESBYTERIAN CHURCH

6301 UNIVERSITY AVENUE, WINDSOR HEIGHTS, IA

SHEET LIST TABLE

SHEET #	SHEET TITLE
1	COVER
2	OVERALL PLAN
3	DEMOLITION PLAN
4	DIMENSION PLAN
5	GRADING PLAN
6	UTILITY PLAN
7	LANDSCAPE PLAN
8	PHOTOMETRIC PLAN

PROPERTY OWNER:
WINDSOR PRESBYTERIAN CHURCH
6301 UNIVERSITY AVENUE
WINDSOR HEIGHTS, IOWA 50324
515-277-8374

PROJECT MANAGER:
SHANE DEVICK
CIVIL ENGINEERING CONSULTANTS INC.
DES MOINES, IOWA 50322
515-276-4884
devick@cecinc.com

APPLICANT:
WINDSOR PRESBYTERIAN CHURCH
6301 UNIVERSITY AVENUE
WINDSOR HEIGHTS, IOWA 50324
515-277-8374

SETBACKS:
FRONT YARD = 35 FEET
STREET SIDE YARD = 35 FEET

LEGAL DESCRIPTION:
LOTS 5, 6 AND 7 EVERGREEN HEIGHTS, AN OFFICIAL PLAT, IN BOOK J, PAGE 168, CITY
OF WINDSOR HEIGHTS, POLK COUNTY, IOWA.

ZONING:
R-3 URBAN FAMILY RESIDENTIAL DISTRICT

AREAS:			
BUILDING	=	13,874 SF	26%
PAVING	=	22,985 SF	43%
OPEN SPACE	=	16,284 SF	31%
TOTAL	=	53,143 SF	100%

IMPERVIOUS: 39,691 SF (75%)
PERVIOUS: 13,452 SF (25%)

PARKING
BUILDING = 13,874 SF
1 SPACE / 200 SF

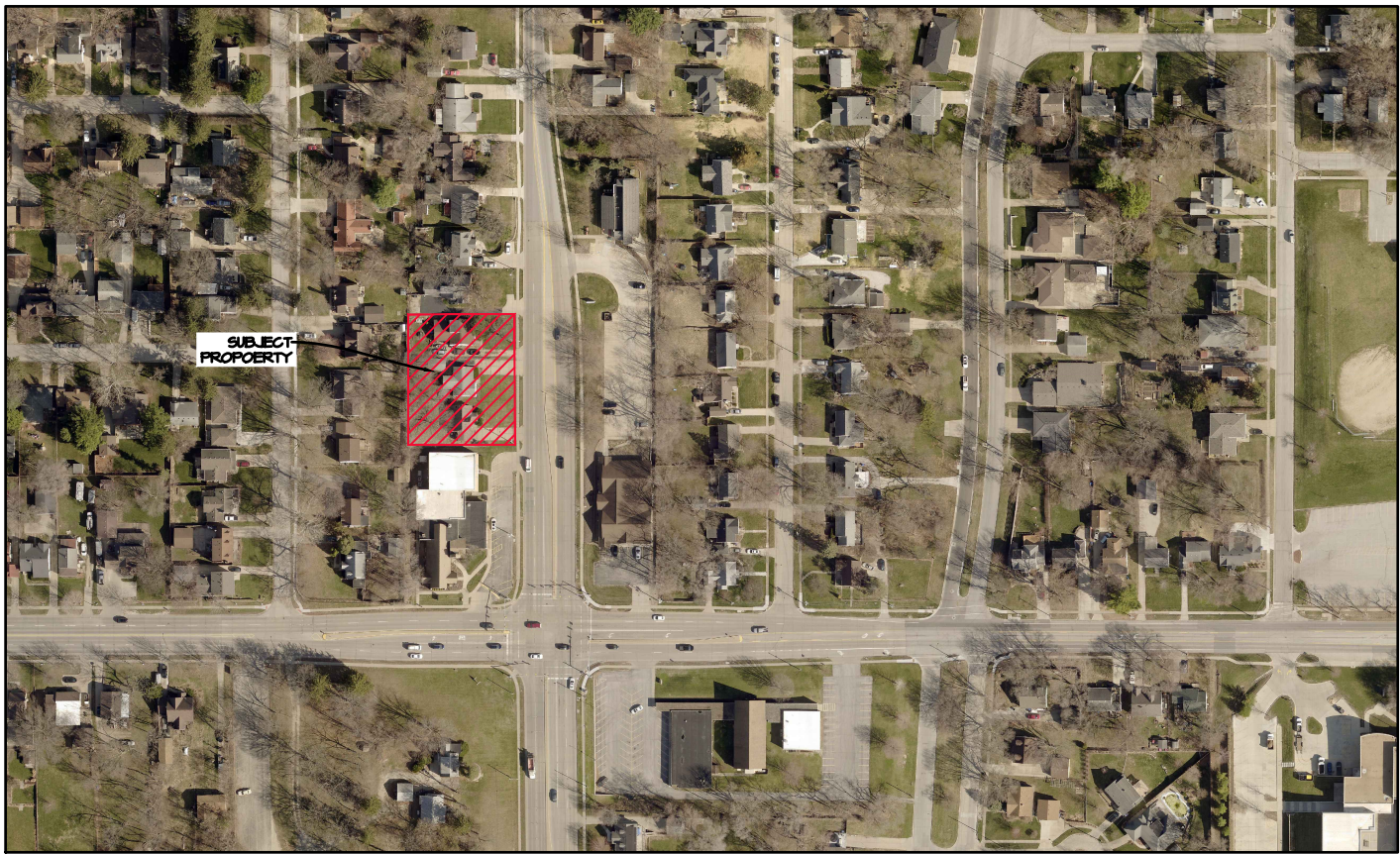
BUFFER REQUIREMENTS
1 TREE PER 50 LF

TOTAL SITE AREA
1.22 ACRES (53,143 SF)

PROPOSED SITE USE
CHURCH & PARKING LOT

PARKING
REQUIRED
1 SPACE PER 6 SEATS

PROPOSED
60 SPACES REQUIRED



VICINITY SKETCH

GENERAL LEGEND		EXISTING	
-----	PROPOSED PLAT BOUNDARY	---	LOT LINE
----	SECTION LINE	○	SANITARY/STORM MANHOLE
----	LOT LINE	⋈	WATER VALVE
----	CENTERLINE	⋈	FIRE HYDRANT
----	EASEMENT LINE	□	STORM SEWER SINGLE INTAKE
◁	FLARED END SECTION	⊞	STORM SEWER DOUBLE INTAKE
⊞	DRAIN BASIN OR SEDIMENT RISER	⊞	STORM SEWER ROUND INTAKE
⊞	DRAIN BASIN WITH SOLID GRATE	▷	FLARED END SECTION
⋈	WATER VALVE	⊞	DECIDUOUS TREE
⋈	FIRE HYDRANT ASSEMBLY	⊞	CONIFEROUS TREE
⋈	BLOW-OFF HYDRANT	○	SHRUB
⋈	SCOUR STOP MAT	⋈	POWER POLE
⋈	TURF REINFORCEMENT MAT	⋈	STREET LIGHT
ST 15"	STORM SEWER WITH SIZE	⋈	GUY ANCHOR
W 8"	WATER SEWER WITH SIZE	⋈	ELECTRIC TRANSFORMER
W	WATER SERVICE	⋈	GAS METER
926	PROPOSED CONTOUR	⋈	TELEPHONE RISER
X-X	SILT FENCE	⋈	SIGN
1234	ADDRESS	⋈	UNDERGROUND TELEVISION
⋈	RIPRAP	⋈	UNDERGROUND ELECTRIC
		⋈	UNDERGROUND GAS
		⋈	UNDERGROUND FIBER OPTIC
		⋈	UNDERGROUND TELEPHONE
		⋈	OVERHEAD ELECTRIC
		⋈	SANITARY SEWER WITH SIZE
		⋈	STORM SEWER WITH SIZE
		⋈	WATER MAIN WITH SIZE
		⋈	EXISTING CONTOUR
		⋈	TREELINE
		B.S.L.	BUILDING SETBACK LINE
		P.U.E.	PUBLIC UTILITY EASEMENT
		M.O.E.	MINIMUM OPENING ELEVATION

GRADING NOTES

- FINISHED GRADE ON ALL NON-PAVED AREAS SHALL BE WITHIN 0.20 FOOT OF PLAN GRADE. PAVED AREAS SHALL BE WITHIN 0.10 FOOT.
- THE CONTRACTOR SHALL VERIFY THE LOCATION AND PROTECT ALL EXISTING UTILITIES AND STRUCTURES. DAMAGE TO UTILITIES AND STRUCTURES SHALL BE REPAIRED BY THE CONTRACTOR AT THE CONTRACTOR'S EXPENSE, TO THE SATISFACTION OF THE UTILITY OWNER.
- TOPSOIL SHALL BE SPREAD TO A MINIMUM THICKNESS OF 6-INCHES ON ALL LANDSCAPED AREAS.
- BACKFILL TO THE TOP OF ALL CURBS.
- ALL ELEVATIONS ARE TO THE GUTTER GRADE UNLESS NOTED OTHERWISE.
- COVER AND/OR FILTER SOCK AROUND ALL INTAKES PRIOR TO PAVING TO PREVENT SEDIMENTATION FROM ENTERING THE STORM SEWER.
- ALL DEBRIS SPILLED ON CITY R.O.W. AND ADJOINING PROPERTY SHALL BE REMOVED BY CONTRACTOR IN A TIMELY FASHION.

UTILITY NOTES

- ALL UTILITIES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE SUDAS 2014 "URBAN STANDARD SPECIFICATIONS FOR PUBLIC IMPROVEMENTS".
- THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES OR STRUCTURES AT THE SITE. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE OWNERS OF UTILITIES OR STRUCTURES CONCERNED BEFORE STARTING WORK. THE CONTRACTOR SHALL NOTIFY THE PROPER UTILITY IMMEDIATELY UPON BREAKING OR DAMAGE TO ANY UTILITY LINE OR APPURTENANCE, OR THE INTERRUPTION OF THEIR SERVICE. IF EXISTING UTILITY LINES ARE ENCOUNTERED THAT CONFLICT IN LOCATION WITH NEW CONSTRUCTION, THE CONTRACTOR SHALL NOTIFY THE ENGINEER SO THAT THE CONFLICT MAY BE RESOLVED.
- ALL SERVICES SHALL BE CONSTRUCTED TO WITHIN 5 FEET OF THE OUTSIDE OF THE BUILDING WALLS.
- ALL EXISTING TILE LINES ENCOUNTERED SHALL BE RESTORED OR ROUTED TO A STORM SEWER WHETHER ACTIVE OR NOT.
- COORDINATE ALL UTILITY SERVICE LOCATIONS & SIZES WITH BUILDING MECHANICAL DRAWINGS.

PLANTING NOTES

- ALL SITE WORK, SODDING AND LANDSCAPING SHALL MEET THE REQUIREMENTS OF THE STATEWIDE URBAN DESIGN AND SPECIFICATIONS (SUDAS).
- ALL PLANT MATERIAL SHALL AT LEAST MEET MINIMUM REQUIREMENTS SHOWN IN THE "AMERICAN STANDARD FOR NURSERY STOCK" (ANSI Z60.1-2004).
- CONTRACTOR SHALL GUARANTEE ALL PLANT MATERIALS FOR A PERIOD OF ONE YEAR FROM DATE OF INSTALLATION.
- THE CONTRACTOR SHALL REMOVE THE TREE STAKES ONE YEAR AFTER INSTALLATION.
- NO PLANT MATERIAL SHALL BE SUBSTITUTED WITHOUT AUTHORIZATION OF THE LANDSCAPE ARCHITECT.
- ALL TREES, SHRUBS, BEDS & GROUND COVERS SHALL BE MULCHED WITH AT LEAST 3" SHREDDED BARK MULCH.
- THE CONTRACTOR SHALL VERIFY THE LOCATION AND PROTECT ALL UTILITIES AND STRUCTURES. DAMAGE TO UTILITIES AND STRUCTURES SHALL BE REPAIRED BY THE CONTRACTOR AT THE CONTRACTOR'S EXPENSE TO THE SATISFACTION OF THE OWNER OF THE UTILITY.
- ONE WEEK PRIOR TO INSTALLATION, THE CONTRACTOR SHALL NOTIFY THE LANDSCAPE ARCHITECT.
- NO STAKING OF STREET TREES IS ALLOWED IN THE R.O.W.
- REMOVE ALL WIRE, TWINE AND BURLAP FROM THE ROOTBALLS OF STREET TREES.
- TOPSOIL SHALL BE A LOAM, SANDY LOAM, CLAY LOAM, SILT LOAM, SANDY CLAY LOAM, LOAMY SAND. OTHER SOILS MAY BE USED IF RECOMMENDED BY AN AGRONOMIST OR SOIL SCIENTIST AND APPROVED BY DPH. REGARDLESS, TOPSOIL SHALL NOT BE A MIXTURE OF CONTRASTING TEXTURED SUBSOILS, AND SHALL CONTAIN LESS THAN 5% BY VOLUME OF CINDERS, STONES, SLAG, COARSE FRAGMENTS, GRAVEL, STICKS, ROOTS, TRASH, OR OTHER MATERIALS LARGER THAN 1 1/2" IN DIAMETER.
- ALL DISTURBED AREAS SHALL BE SEEDED OR SODDED.
- SHRUB SHALL CONTAIN 3 INCHES OF ORGANIC OR INORGANIC MULCH.

CERTIFICATION

I HEREBY CERTIFY THAT THIS ENGINEERING DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT PERSONAL SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF IOWA.	
PRELIMINARY	
SHANE J. DEVICK, IOWA LIC. NO. 16507	DATE
MY LICENSE RENEWAL DATE IS DECEMBER 31, 2024	
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WINDSOR PRESBYTERIAN CHURCH
6301 UNIVERSITY AVENUE, WINDSOR HEIGHTS, IA

COVER

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OF 9

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WINDSOR PRESBYTERIAN CHURCH
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OVERALL PLAN

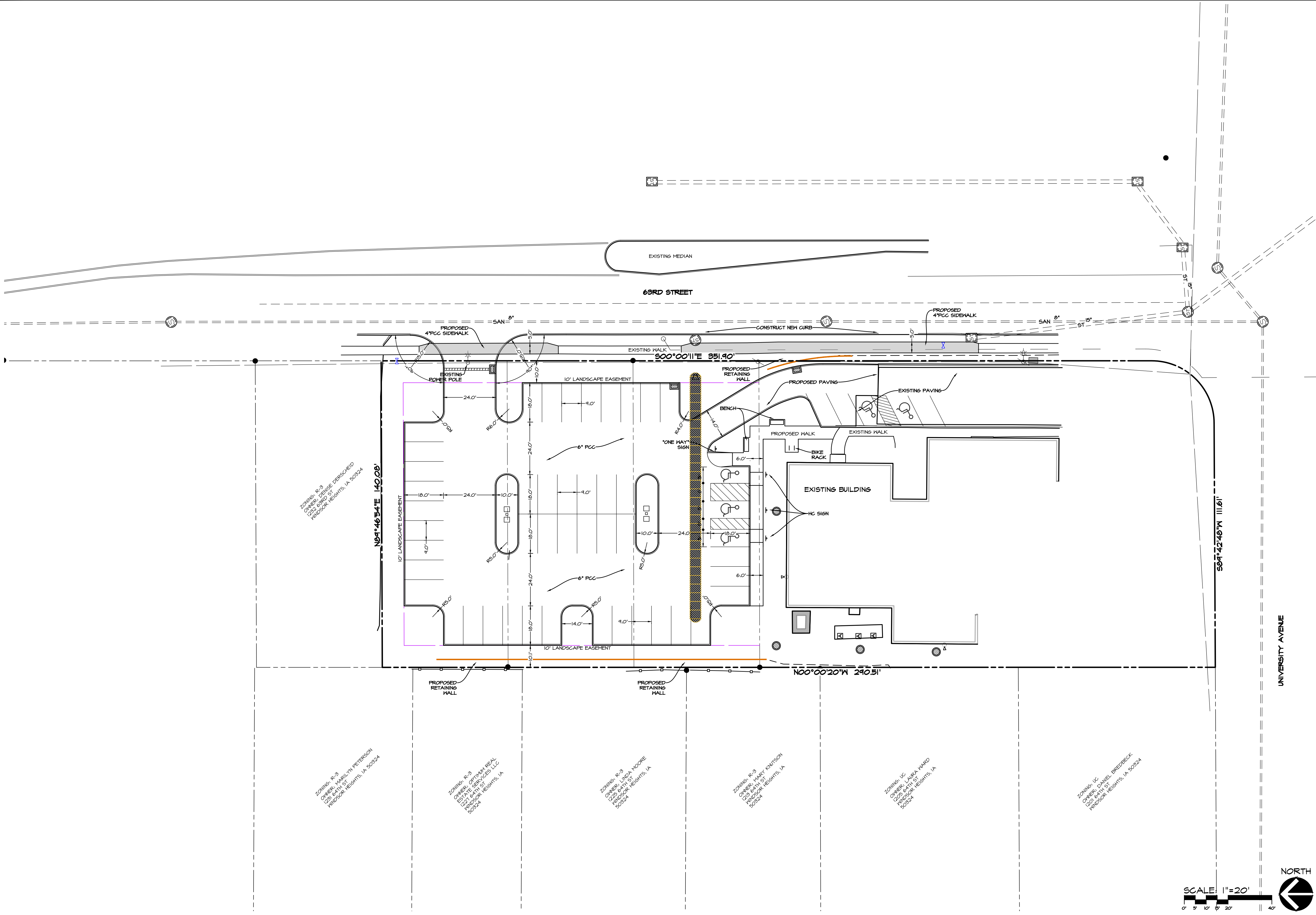
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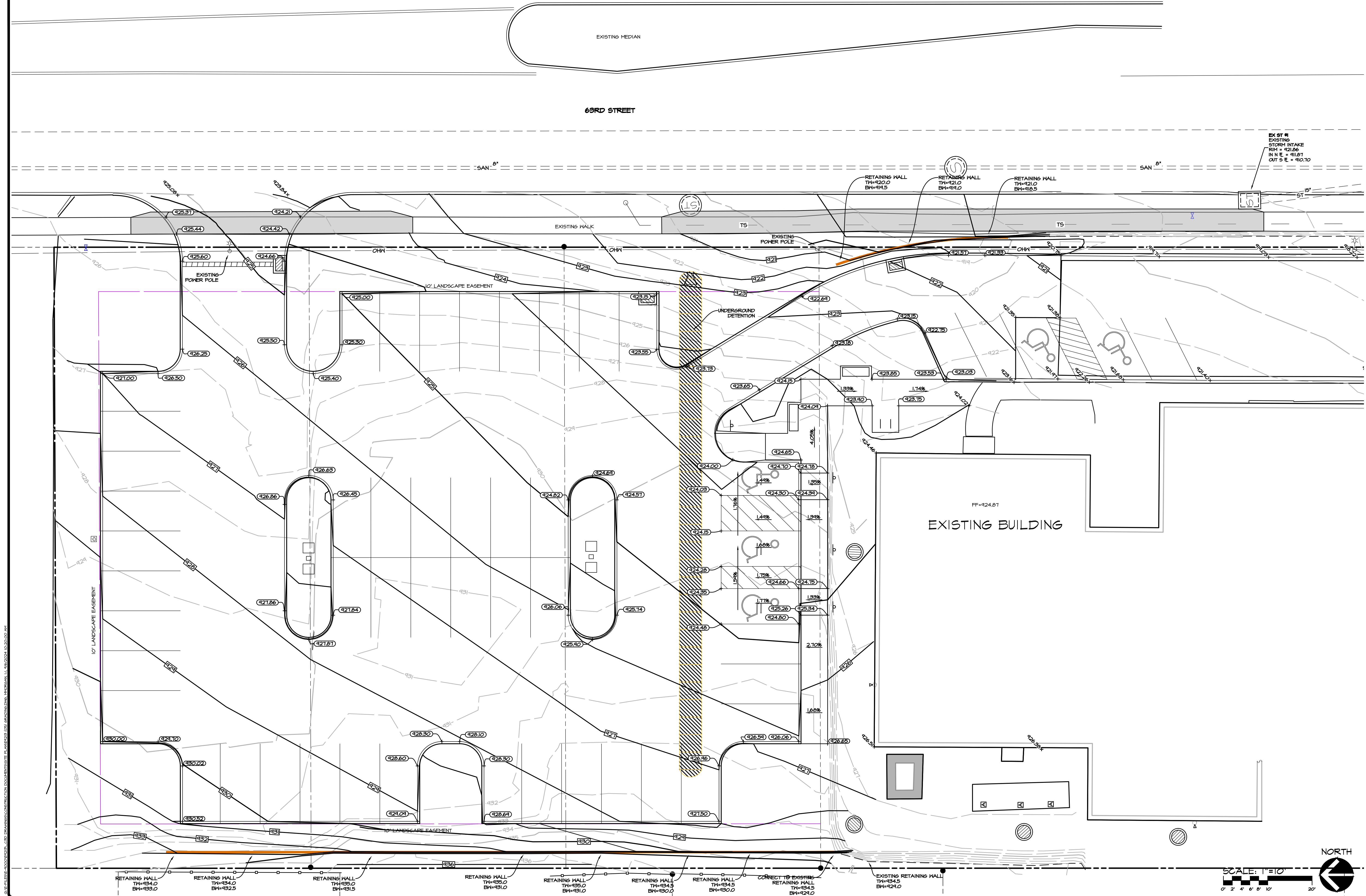


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WINDSOR PRESBYTERIAN CHURCH
6301 UNIVERSITY AVENUE, WINDSOR HEIGHTS, IA
DIMENSION PLAN

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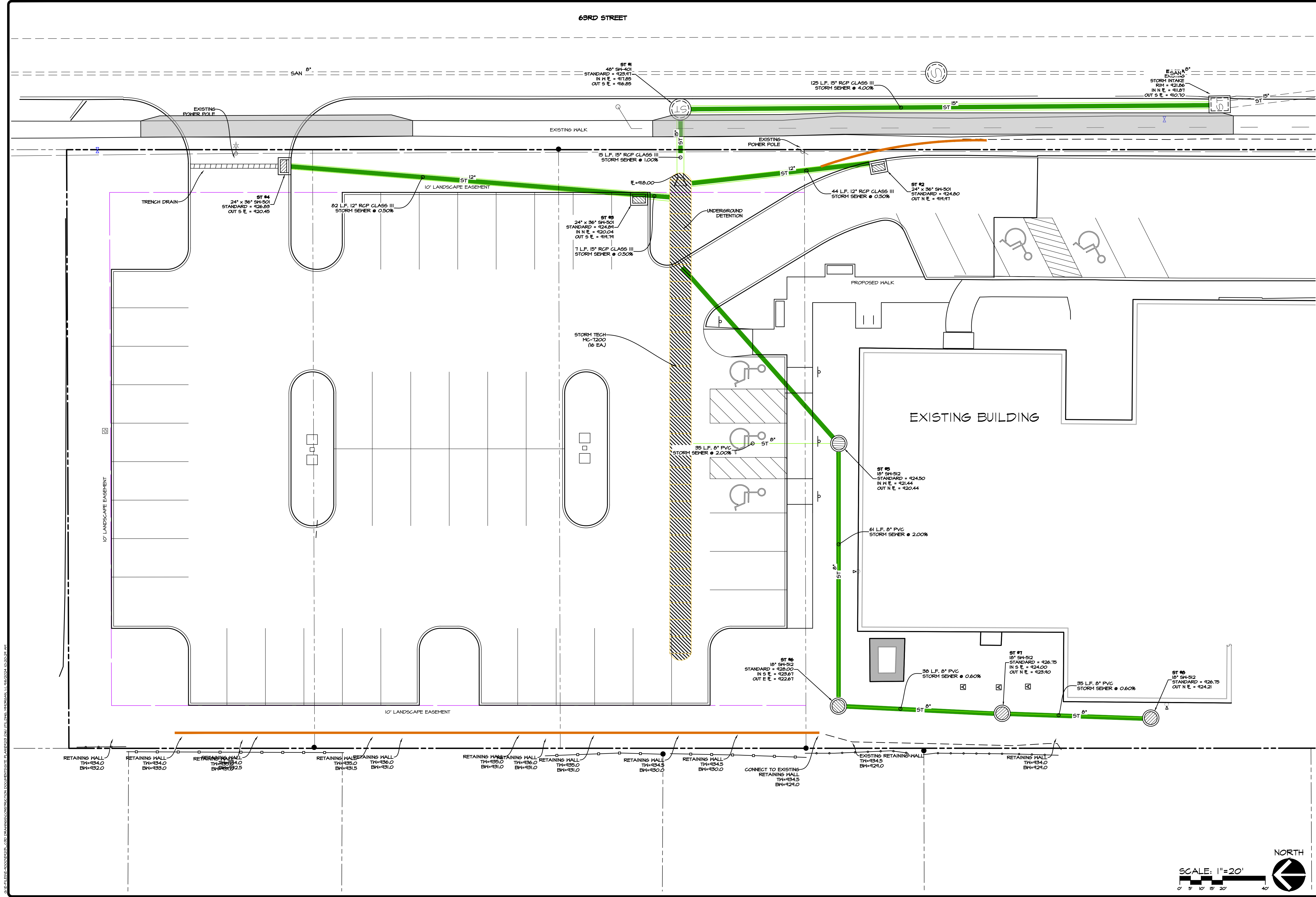
WINDSOR PRESBYTERIAN CHURCH
6301 UNIVERSITY AVENUE, WINDSOR HEIGHTS, IA
GRADING PLAN

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OF 9
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DATE OF SURVEY:	APR. 22, 2024
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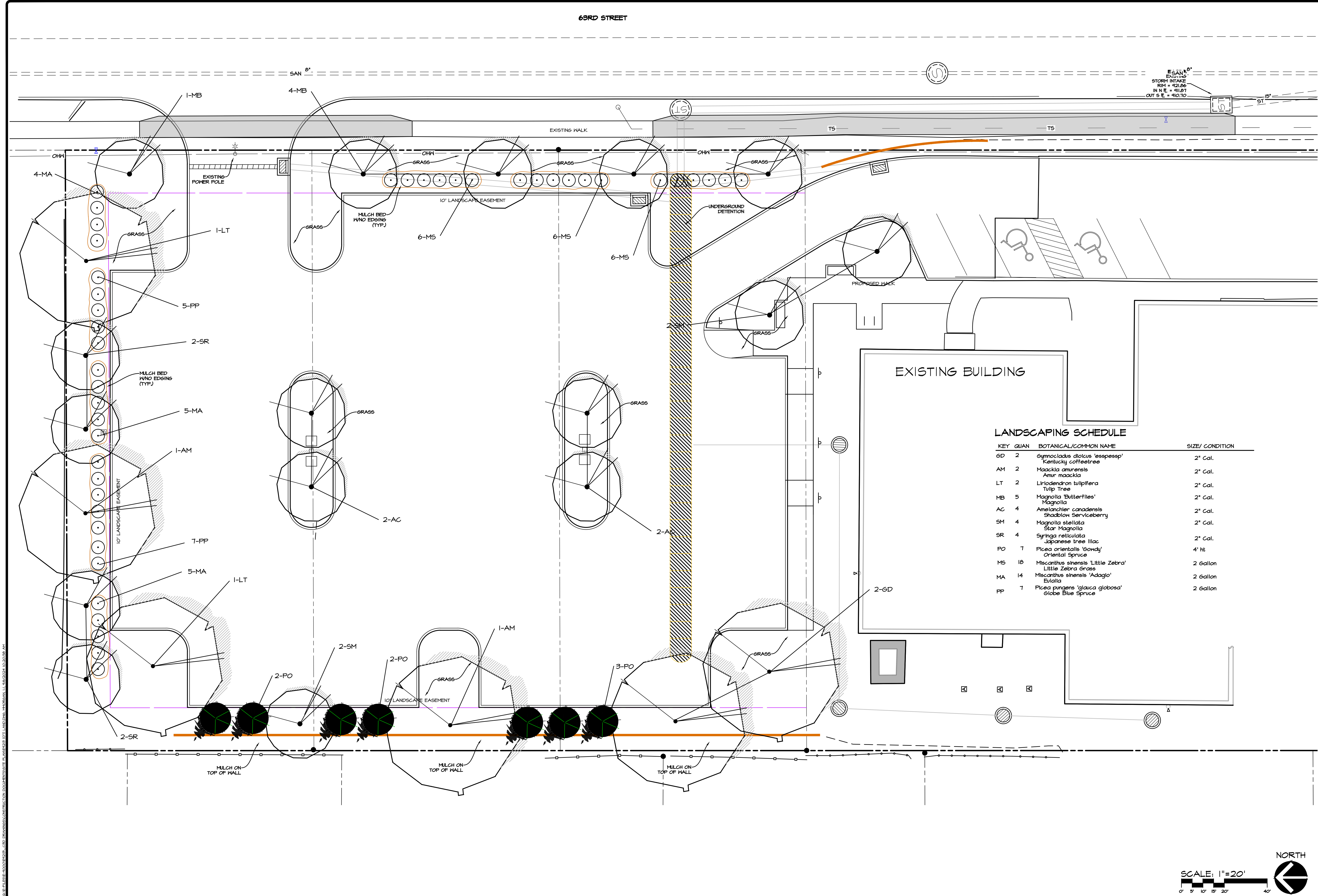
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6301 UNIVERSITY AVENUE, WINDSOR HEIGHTS, IA

UTILITY PLAN

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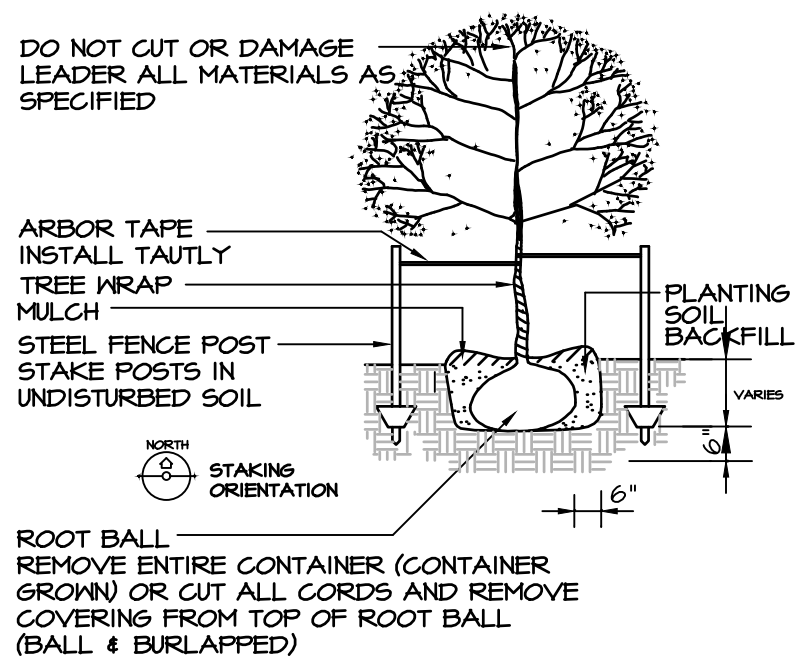
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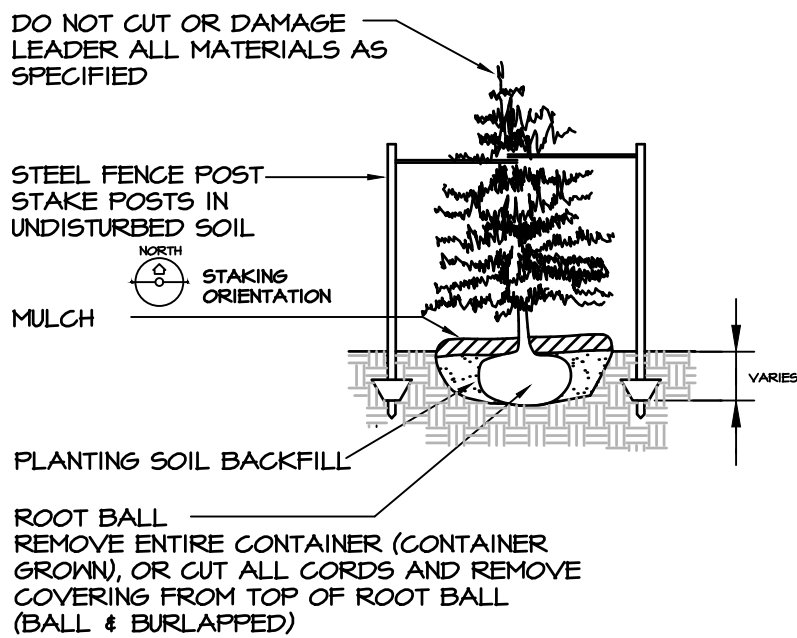
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DATE OF SURVEY: APR. 22, 2024
DESIGNED BY: SJD
DRAWN BY: MM

WINDSOR PRESBYTERIAN CHURCH
6301 UNIVERSITY AVENUE, WINDSOR HEIGHTS, IA
LANDSCAPE PLAN

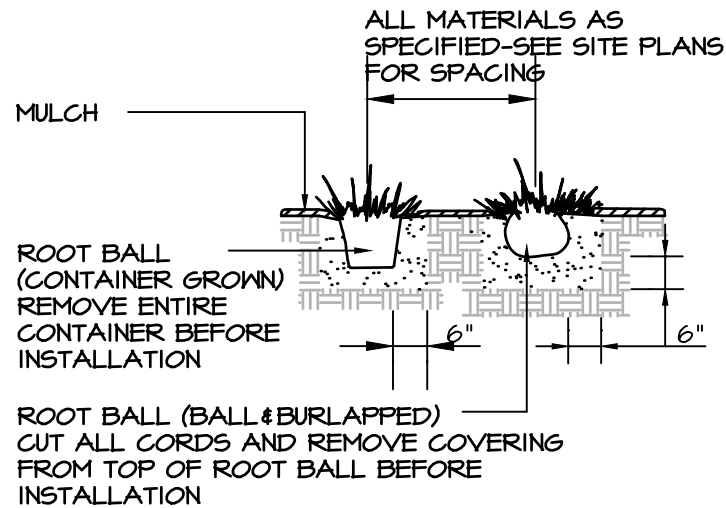
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OF 9
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**DECIDUOUS TREE
PLANTING AND STAKING DETAIL**
NO SCALE



**EVERGREEN TREE
PLANTING AND STAKING DETAIL**
NO SCALE



SHRUB PLANTING DETAIL
NO SCALE

PLANTING NOTES

1. ALL SITEWORK, SODDING AND LANDSCAPING SHALL BE IN ACCORDANCE WITH WINDSOR HEIGHTS STANDARD SPECIFICATIONS UNLESS SPECIFIED OTHERWISE.
2. ALL PLANT MATERIAL SHALL AT LEAST MEET MINIMUM REQUIREMENTS SHOWN IN THE "AMERICAN STANDARD FOR NURSERY STOCK" (ANSI Z60.1-1986).
3. CONTRACTOR SHALL GUARANTEE ALL PLANT MATERIALS FOR A PERIOD OF ONE YEAR FROM DATE OF INSTALLATION.
4. NO PLANT MATERIAL SHALL BE SUBSTITUTED WITHOUT AUTHORIZATION OF LANDSCAPE ARCHITECT AND THE CITY.
5. 2" TO 3" CALIFER DECIDUOUS TREES SHALL BE STAKED (2 STAKES) AND WRAPPED IMMEDIATELY AFTER PLANTING. ALL CONIFERS SHALL BE STAKED (2 STAKES).
6. ALL TREES, SHRUBS, BEDS & GROUND COVERS SHALL BE MULCHED WITH AT LEAST 3" SHREDDED BARK MULCH.
7. PLANT QUANTITIES ARE FOR CONTRACTORS CONVENIENCE, DRAWING SHALL PREVAIL WHERE CONFLICT OCCURS.
8. ONE WEEK PRIOR TO INSTALLATION. THE CONTRACTOR SHALL NOTIFY THE LANDSCAPE ARCHITECT AT CIVIL ENGINEERING CONSULTANTS, INC. (TELEPHONE 515/276- 4884).
9. ALL DECIDUOUS TREES SHALL BE PLANTED AT LEAST 5' FROM R.O.W. AND CONIFEROUS TREES AT LEAST 10' FROM R.O.W.
10. ALL DISTURBED AREAS SHALL BE SODDED.
11. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF IDENTIFICATION TAGS, CONTAINERS, AND BURLAP CORDS ON ALL PLANT MATERIAL PRIOR TO COMPLETION OF THE CONTRACT.

DATE:	Sep. 6, 2024
	09-06-2024
DATE OF SURVEY:	APR. 22, 2024
	5JD
DESIGNED BY:	MM
	MM

WINDSOR PRESBYTERIAN CHURCH
6801 UNIVERSITY AVENUE, WINDSOR HEIGHTS, IA

DETAILS

SHEET
OF 4

E9213

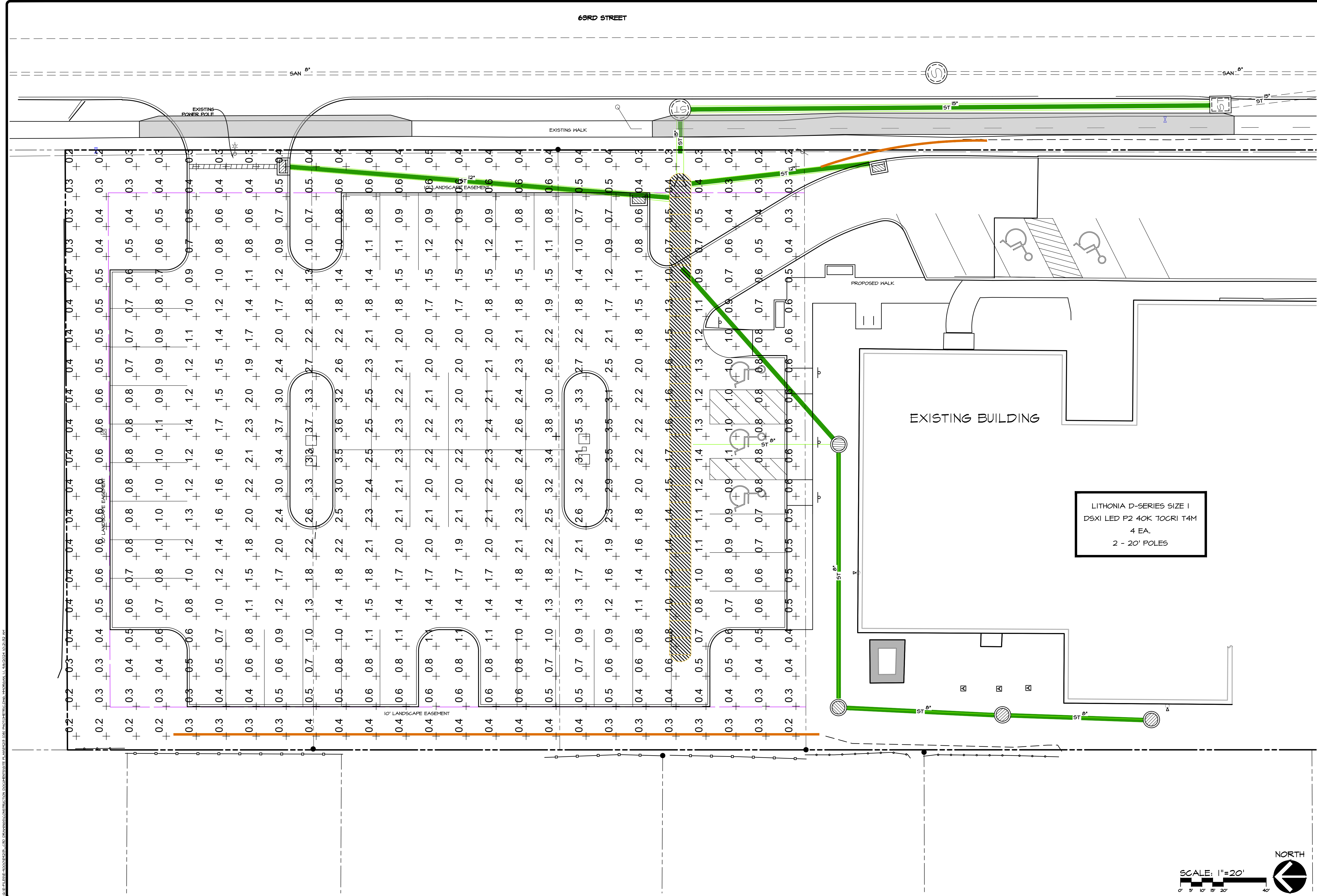
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WINDSOR PRESBYTERIAN CHURCH 6301 UNIVERSITY AVENUE, WINDSOR HEIGHTS, IA	DATE:	04-06-2024
	DATE OF SURVEY:	APR. 22, 2024
	DESIGNED BY:	SJD
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E9213		

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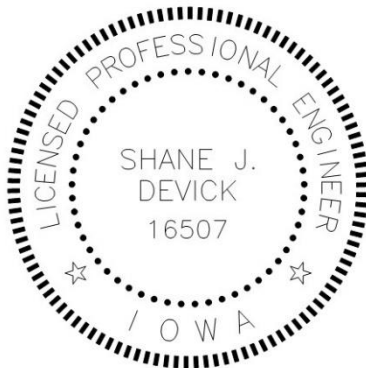
STORMWATER MANAGEMENT REPORT

Project: Windsor Presbyterian Church
6301 University Avenue, Windsor Heights IA
Prepared By: Shane Devick, P.E.
Austin Roemer, E.I.T.



Civil Engineering Consultants, Inc.

Date: September 6, 2024
Revised:
Project No: E9213



I HEREBY CERTIFY THAT THIS ENGINEERING DOCUMENT
WAS PREPARED BY ME OR UNDER MY DIRECT PERSONAL
SUPERVISION AND THAT I AM A DULY LICENSED
PROFESSIONAL ENGINEER UNDER THE LAWS OF THE
STATE OF IOWA.

SHANE J. DEVICK, IOWA LIC. NO. 16507 DATE _____
MY LICENSE RENEWAL DATE IS DECEMBER 31, 2024
PAGES OR SHEETS COVERED BY THIS SEAL:

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1. Site Characteristics

a. Pre-development Conditions

This site is located in the northwest quadrant of the intersection of University Avenue and 63rd St., City of Windsor Heights. The address is 6301 University Ave.

Currently the site has three existing residences.

The site is approximately 0.55 acres. The existing homes will be demolished.

The existing soils consist 100.0% of 4138C – Clarion-Urban land complex, Hydrologic Soil Group B. Hydrologic Soils Group B have a moderate infiltration rate when thoroughly wet and a moderate rate of water transmission. See Appendix for USDA Hydrologic Soils Report.

b. Post-development Conditions

The purpose of the proposed project is to construct a parking lot for the Church directly adjacent to the south.

Stormwater detention will be provided with underground storage chambers. The total allowed release rate during the developed 100-year rain event will be limited to the peak stormwater runoff rate of the 5-year rain event with existing conditions in addition to the peak stormwater runoff from offsite areas during the 100-year rain event. Additionally, water quality and channel protection shall be provided.

Stormwater Runoff Rate Summary								
Area Description	Area (Acres)	Runoff Rate, cfs						
		1-year	2-year	5-year	10-year	25-year	50-year	100-year
EXISTING DA	0.55	0.97	1.14	1.42	1.65	1.98	2.24	2.51
OFFSITE (PASS-THRU)	0.90	1.43	1.68	2.09	2.43	2.92	3.30	3.70
DEVELOPED DA	0.55	1.30	1.52	1.89	2.20	2.64	2.99	3.35
UNDERGROUND POND	0.55	0.00	0.00	0.00	0.06	0.31	0.51	0.72
UNDERGROUND POND + PASS-THRU	1.45	0.36	0.62	1.07	1.45	1.97	2.35	2.68

c. Contributing Off-site Drainage

There is 0.9 acres of offsite area draining to the site from the west. This offsite area will be treated as pass-thru.

d. Floodways, Floodplains and Wetlands

Please see Appendix for Wetlands map and FIRM Panel Number 19153C0327F.

2. Pre-development Runoff Analysis

1) Watershed Area

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Area (ac)	Runoff Coefficient (C)
Existing DA	Open Space (Good Cond.)	B	0.33	0.35
	Impervious	B	0.22	0.98
Total Area / Weighted Runoff Coefficient			0.55	0.60
			=====	===

2) Time of Concentration

TIME OF CONCENTRATION		
SUBAREA		
Existing DA		
SHEET FLOW	n (Manning's "n")	0.150
	L (length of flow)	100.0
	P2 (two year, 24 hr rainfall)	3.08
	S (slope in ft/ft)	6.86%
	T _{SF} (MINUTES)	6.10
SHALLOW CONCENTRATED FLOW	L (length of flow in feet)	42.6
	S (slope in ft/ft)	16.87%
	Ground Cover	SHORT-GRASS
	Velocity Coefficient (TABLE 2-B-3.02)	6.96
	V (ft/sec)	2.86
	T _{CF} (MINUTES)	0.25
CHANNEL FLOW	n (mannings "n")	N/A
	A (cross sectional area)	N/A
	P (wetted perimter)	N/A
	S (slope ft/ft)	N/A
	V (velocity ft/sec)	N/A
	L (Length of flow in feet)	N/A
	T _{CF} (MINUTES)	N/A
TIME OF CONCENTRATION (MINUTES)		6.35

The time of concentration is below the minimum of 15.0 minutes.
A time of concentration of 15.0 minutes will be used.

3) **Precipitation Model.** Rainfall Intensity Duration Frequency (IDF) Curve.

Rainfall Depth by Rainfall Return Period

1-Yr (in)	2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)
2.67	3.08	3.81	4.46	5.44	6.26	7.12

Storm Data Source: new NOAA-14 data

Rainfall Distribution Type: Type II

Dimensionless Unit Hydrograph: <standard>

4) **Runoff Model**

Hydraflow was used to predict existing runoff using Rational method.

5) **Summary of Pre-Development Stormwater Runoff**

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period						
	1-Yr	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
	(cfs) (hr)	(cfs) (hr)	(cfs) (hr)	(cfs) (hr)	(cfs) (hr)	(cfs) (hr)	(cfs) (hr)

SUBAREAS

Existing DA	0.97	1.14	1.42	1.65	1.98	2.24	2.51
--------------------	------	------	-------------	------	------	------	------

3. Offsite Runoff Analysis

1) Watershed Area

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Area (ac)	Runoff Coefficient (C)
Offsite	Open Space (Good Cond.)	B	0.63	0.35
(Pass-Thru)	Impervious	B	0.27	0.98
Total Area / Weighted Runoff Coefficient			0.90	0.54
			=====	===

2) Time of Concentration

		TIME OF CONCENTRATION
		SUBAREA
		Offsite
SHEET FLOW	n (Manning's "n")	0.150
	L (length of flow)	100.0
	P2 (two year, 24 hr rainfall)	3.08
	S (slope in ft/ft)	4.61%
	T _{SF} (MINUTES)	7.15
SHALLOW CONCENTRATED FLOW	L (length of flow in feet)	250.3
	S (slope in ft/ft)	6.14%
	Ground Cover	SHORT-GRASS
	Velocity Coefficient (TABLE 2-B-3.02)	6.96
	V (ft/sec)	1.72
	T _{CF} (MINUTES)	2.42
CHANNEL FLOW	n (mannings "n")	N/A
	A (cross sectional area)	N/A
	P (wetted perimter)	N/A
	S (slope ft/ft)	N/A
	V (velocity ft/sec)	N/A
	L (Length of flow in feet)	N/A
	T _{CF} (MINUTES)	N/A
TIME OF CONCENTRATION (MINUTES)		9.57

The time of concentration is below the minimum of 15.0 minutes.

A time of concentration of 15.0 minutes will be used.

3) **Precipitation Model.** Rainfall Intensity Duration Frequency (IDF) Curve.

Rainfall Depth by Rainfall Return Period						
1-Yr (in)	2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)
2.67	3.08	3.81	4.46	5.44	6.26	7.12

Storm Data Source: new NOAA-14 data

Rainfall Distribution Type: Type II

Dimensionless Unit Hydrograph: <standard>

4) **Runoff Model**

Hydraflow was used to predict predevelopment runoff using Rational method.

5) **Summary of Offsite Stormwater Runoff**

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period						
	1-Yr	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
	(cfs) (hr)	(cfs) (hr)	(cfs) (hr)	(cfs) (hr)	(cfs) (hr)	(cfs) (hr)	(cfs) (hr)

SUBAREAS							
Offsite	0.25 11.93	0.29 11.93	0.36 11.93	0.42 11.93	0.52 11.93	0.60 11.93	0.68 11.93

4. Post-development Runoff Analysis

1) Watershed Area

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Area (ac)	Runoff Coefficient (C)
Developed DA	Open Space (Good Cond.)	B	0.16	0.35
	Impervious	B	0.39	0.98
Total Area / Weighted Runoff Coefficient			0.55	0.80
			=====	===

2) Time of Concentration

		TIME OF CONCENTRATION
		SUBAREA
		Developed DA
SHEET FLOW	n (Manning's "n")	0.052
	L (length of flow)	100.0
	P2 (two year, 24 hr rainfall)	3.08
	S (slope in ft/ft)	6.85%
	T _{SF} (MINUTES)	2.60
SHALLOW CONCENTRATED FLOW	L (length of flow in feet)	106.6
	S (slope in ft/ft)	4.96%
	Ground Cover	PAVEMENT
	Velocity Coefficient (TABLE 2-B-3.02)	20.24
	V (ft/sec)	4.51
	T _{CF} (MINUTES)	0.39
CHANNEL FLOW	n (mannings "n")	N/A
	A (cross sectional area)	N/A
	P (wetted perimter)	N/A
	S (slope ft/ft)	N/A
	V (velocity ft/sec)	N/A
	L (Length of flow in feet)	N/A
	T _{CF} (MINUTES)	N/A
TIME OF CONCENTRATION (MINUTES)		3.00

The time of concentration is below the minimum of 15.0 minutes.
A time of concentration of 15.0 minutes will be used.

3) **Precipitation Model.** Rainfall Intensity Duration Frequency (IDF) Curve.

Rainfall Depth by Rainfall Return Period						
1-Yr (in)	2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)
2.67	3.08	3.81	4.46	5.44	6.26	7.12

Storm Data Source: new NOAA-14 data

Rainfall Distribution Type: Type II

Dimensionless Unit Hydrograph: <standard>

4) **Runoff Model**

Hydraflow was used to predict predevelopment runoff using Rational method.

5) **Summary of Post-Development Stormwater Runoff**

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period						
	1-Yr	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
	(cfs) (hr)	(cfs) (hr)	(cfs) (hr)	(cfs) (hr)	(cfs) (hr)	(cfs) (hr)	(cfs) (hr)
SUBAREAS							
DEV Central	1.30	1.52	1.89	2.20	2.64	2.99	3.35

5. Stormwater Conveyance Design

a. Design Information

The Rational Method was used to determine design flows. Manning’s Equation was used to determine pipe capacities.
Intakes were located to provide bypass flows below the maximum 50% bypass flow for the 5-YR event. (See Figure 5.1 Storm Sewer Intake Calculations)
Low point intakes were designed to intercept the 100-YR storm event. Pipes downstream from Low point intakes were designed to convey 100-YR flows.
Cleansing velocities within storm sewer pipes were calculated using ½ full pipes. All cleansing velocities were between 3 fps and 15 fps

b. Intake Calculations

Storm Sewer Calculations for Windsor Presbyterian Church																													
* LP or CG= intake is at a low point or continuous grade																													
n = 0.016 Broom Finish Concrete (typical for most streets)																													
INTAKE CHART																													
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	O	P	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI
DRAINAGE AREA IDENTIFIER	Area (ac)	Imperv. Area (ac)	I5 (in/hr)	I10 (in/hr)	I100 (in/hr)	c5	c10	c100	Q5 (cfs)	Q10 (cfs)	Q100 (cfs)	q5 + bypass	q10 + bypass	q100 + bypass	* CG LP	INT. Type SW-	Qi5 (cfs)	Qi10 (cfs)	Qi100 (cfs)	d5 ft	d10 ft	d100 (ft)	Qb5 (cfs)	Qb10 (cfs)	Qb100 (cfs)	%Capture 5Yr	%Capture 10Yr	%Capture 100Yr	Bypasses To Intake
Intakes																													
ST #8	0.01	0.00	4.12	4.82	7.44	0.15	0.20	0.35	0.01	0.01	0.03	0.01	0.01	0.03	0	TYPE 4A 18	0.01	0.01	0.03	0.01	0.01	0.02	0.00	0.00	0.00	100%	100%	100%	LP
ST #7	0.01	0.00	4.12	4.82	7.44	0.15	0.20	0.35	0.01	0.01	0.03	0.01	0.01	0.03	0	TYPE 4A 18	0.01	0.01	0.03	0.01	0.01	0.02	0.00	0.00	0.00	100%	100%	100%	LP
ST #6	0.01	0.00	4.12	4.82	7.44	0.15	0.20	0.35	0.01	0.01	0.03	0.01	0.01	0.03	0	TYPE 4A 18	0.01	0.01	0.03	0.01	0.01	0.02	0.00	0.00	0.00	100%	100%	100%	LP
ST #5	0.01	0.00	4.12	4.82	7.44	0.15	0.20	0.35	0.01	0.01	0.03	0.01	0.01	0.03	0	TYPE 4A 18	0.01	0.01	0.03	0.01	0.01	0.02	0.00	0.00	0.00	100%	100%	100%	LP
ST #4	0.67	0.23	4.12	4.82	7.44	0.42	0.46	0.57	1.17	1.48	2.82	1.17	1.48	2.82	1	501	0.95	1.20	2.07	0.12	0.12	0.12	0.22	0.28	0.76	81%	81%	73%	OFFSITE
ST #3	0.44	0.27	4.12	4.82	7.44	0.64	0.66	0.74	1.16	1.40	2.41	1.16	1.40	2.41	0	501	1.16	1.40	2.41	0.20	0.23	0.33	0.00	0.00	0.00	100%	100%	100%	LP
ST #2	0.30	0.16	4.12	4.82	7.44	0.58	0.60	0.69	0.71	0.87	1.53	0.71	0.87	1.53	1	501	0.60	0.71	1.12	0.11	0.12	0.12	0.12	0.16	0.41	84%	81%	73%	OFFSITE
Outlet Release																													
UG CHAMBER	1.45	0.66							1.07	1.45	2.68	1.07	1.45	2.68	3	MANHOLE	1.07	1.45	2.68	NA	NA	NA	0.00	0.00	0.00	100%	100%	100%	MANHOLE

c. Storm Sewer Calculations

PIPE CHART																
(All Minimum Pipe Slopes are based on using RCP)																
Structure	to	Structure	Cumm Q ₅ pipe cfs	Cumm Q ₁₀ pipe cfs	Cumm Q ₁₀₀ pipe cfs	DESIGN STORM	DESIGN	MINIMUM PIPE SIZE (INCHES) AND SLOPE (%)					PIPE DESIGN			
							FLOW (cfs)									
								24	18	15	12	8	PIPE SIZE (inches)	SLOPE (%)	PIPE CAPACITY (cfs)	1/2 FULL PIPE VELOCITY (FPS)
ST #8	to	ST #7	0.01	0.01	0.03	Q10pipe cfs	0.01	0.00%	0.00%	0.00%	0.00%	0.00%	8	0.60%	1.45	3.87
ST #7	to	ST #6	0.01	0.02	0.05	Q10pipe cfs	0.02	0.00%	0.00%	0.00%	0.00%	0.00%	8	0.60%	1.45	3.87
ST #6	to	ST #5	0.02	0.03	0.08	Q10pipe cfs	0.03	0.00%	0.00%	0.00%	0.00%	0.00%	8	2.00%	2.66	7.07
ST #5	to	UG CHAMBER	0.02	0.04	0.10	Q100pipe cfs	0.10	0.00%	0.00%	0.00%	0.00%	0.00%	8	2.00%	2.66	7.07
ST #4	to	ST #3	0.95	1.20	2.07	Q10pipe cfs	1.20	0.00%	0.01%	0.03%	0.11%	0.47%	12	0.50%	2.71	3.21
ST #3	to	UG CHAMBER	2.12	2.60	4.48	Q100pipe cfs	4.48	0.04%	0.18%	0.48%	1.57%	6.54%	15	0.50%	4.91	3.72
ST #2	to	UG CHAMBER	0.60	0.71	1.12	Q100pipe cfs	1.12	0.00%	0.01%	0.03%	0.10%	0.41%	12	0.50%	2.71	3.21
UG CHAMBER	to	ST #1	1.07	1.45	2.68	Q100pipe cfs	2.68	0.01%	0.06%	0.17%	0.56%	2.34%	15	1.00%	6.95	5.26
ST #1	to	EX ST #1	1.07	1.45	2.68	Q100pipe cfs	2.68	0.01%	0.06%	0.17%	0.56%	2.34%	15	4.00%	13.90	10.53

6. Stormwater Facilities Design

a. *Release Rate: Site Only*

The allowed release rate of the developed site during the 100-year rain event will be limited to the peak stormwater runoff rate of the 5-year rain event with existing conditions.

$$Q_{\text{ALLOWABLE RELEASE}} = Q_{\text{5-YR EX SITE}}$$

$$Q_{\text{ALLOWABLE RELEASE}} = 1.42 \text{ cfs}$$

$$Q_{\text{100 WETLANDS POND}} = 0.72 \text{ cfs (See Hydrograph 3)}$$

As shown in the Hydrograph reports in the Appendix, the proposed detention basin will meet the required release rate.

b. *Release Rate: Site + Pass-Thru*

The allowed release rate of the developed site with pass-thru during the 100-year rain event will be limited to the peak stormwater runoff rate of the 5-year rain event with existing conditions plus the 100-year release rate for the offsite area.

$$Q_{\text{ALLOWABLE RELEASE}} = Q_{\text{5-YR EX SITE}} + Q_{\text{100-YR PASS-THRU}}$$

$$Q_{\text{ALLOWABLE RELEASE}} = 1.42 \text{ cfs} + 3.70 \text{ cfs} = 5.12 \text{ cfs}$$

$$Q_{\text{100 DEVELOPED+PASS-THRU}} = 2.68 \text{ cfs (See Hydrograph 6)}$$

As shown in the Hydrograph reports in the Appendix, the proposed detention basin will meet the required release rate with pass-thru.

c. *Underground Storage Chambers*

1) Underground Storage Chambers Design & Performance

The developed drainage basin and offsite pass-thru area was routed through a typical dry-bottom pond in order to find the necessary storage volume for the underground detention that will be used onsite. The underground detention will consist of underground chambers under the parking lot of the site. The outlet structure for the Hydrograph pond consists of a 15-inch RCP, which will likely be a similar outlet to what will be used for the underground storage.

3.0 feet of depth was used for storage height, with the bottom of 'pond' elevation set at 918.00. The invert elevation of the outlet pipe was set at an elevation of 919.75, in order to provide the required Water Quality and Channel Protection storage for the site. The Water Quality and Channel Protection calculations can be found in the subsequent sections. Subdrains connecting to the outlet will be used in the bottom of the storage chamber to slowly release water quality and channel protection stormwater over the subsequent 24-hour period.

The top of 'pond' was set at an elevation of 921.00. The 100-year storm event required a storage volume of 4,530 cf. A minimum of storage of 4,600 cf will be used in design of the underground storage chambers.

The Hydroflow Hydrographs reports can be found in the Appendix.

2) Water Quality Design

WINDSOR PRESBYTERIAN CHURCH					
Water Quality Volume (WQv): Iowa Stormwater Manual 2B-1 Section C					
& 2C-6 Section B					
$WQv = \frac{P(in) \times Rv \times A(ac)}{12(in/ft)} \times 43,560 (ft^2/ac)$					
Modified CN = $\frac{1000}{[10+5P+10Q_n]-10[Q_n^2+1.25Q_nP]^{\frac{1}{2}}}$					
$P = 1.25" \text{ for Iowa}$		$P = 1.25 \text{ in}$			
$Rv = 0.05 + 0.009 \times (I)$		$Rv = 0.688$			
$I = \% \text{ impervious area}$		$I = 70.9\%$			
$A = \text{Area (acres)}$		$A = 0.55 \text{ acres}$			
		$A_{(impervious)} = 0.39 \text{ acres}$			
WQv=		1,717	cf		
WQv=		0.860	inches		
Modified CN		96			
$q_{allow} =$		0.040	cfs		

Water Quality Volume

E9213 Underground Chambers					
Storage Volume					
	ELEV	Height (ft)	Cont. Area (sf)	Inc. Storage (cf)	Total Storage (cf)
	918.00	0.00	20	-	-
	919.00	1.00	1,120	570.00	570
Invert Elev.	919.75	1.75	1,960	1,155.00	1,725
	920.00	2.00	2,240	525.00	2,250
	921.00	3.00	3,360	2,800.00	5,050

The Water Quality Hydrographs report can be seen below.

**Note: In the hydrograph report, the '3-yr' storm is used to designate the 1.25" rainfall event.*

Hydrograph Report

1

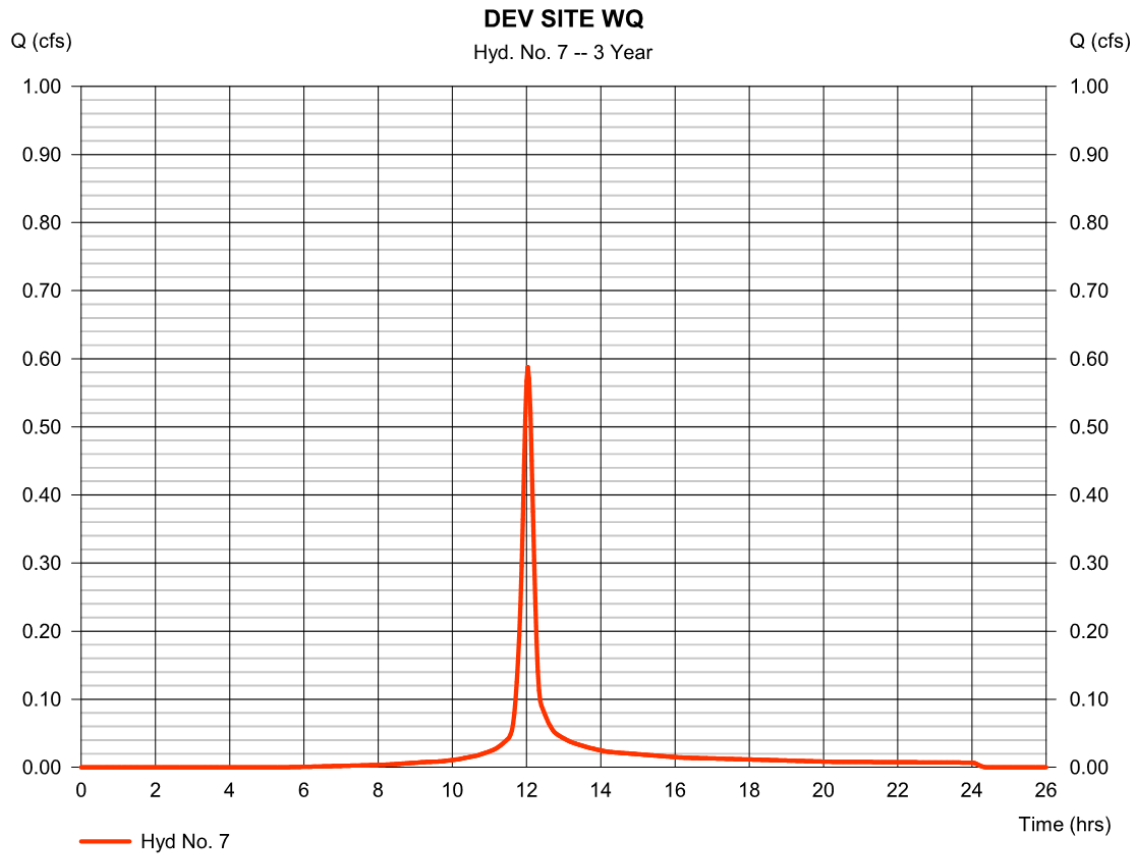
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Friday, 09 / 6 / 2024

Hyd. No. 7

DEV SITE WQ

Hydrograph type	= SCS Runoff	Peak discharge	= 0.588 cfs
Storm frequency	= 3 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 1,673 cuft
Drainage area	= 0.550 ac	Curve number	= 96
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 1.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

2

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

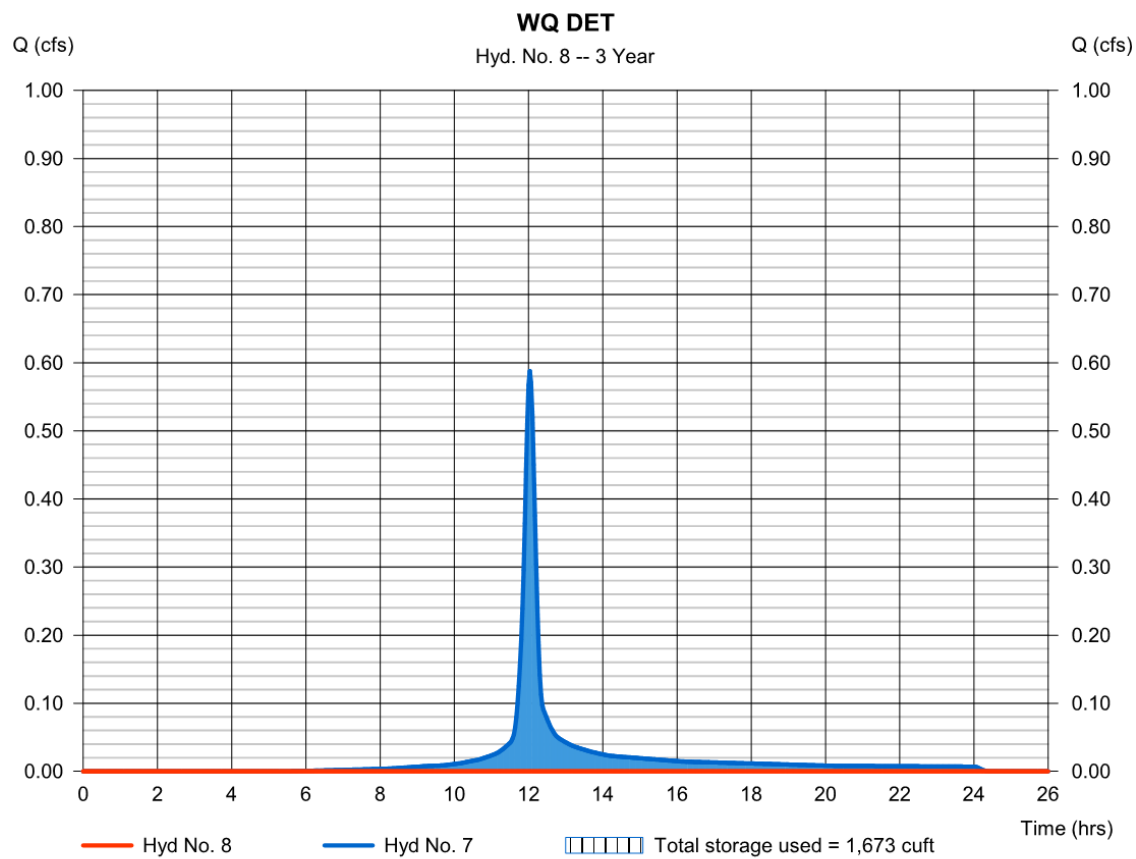
Friday, 09 / 6 / 2024

Hyd. No. 8

WQ DET

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 3 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 7 - DEV SITE WQ	Max. Elevation	= 919.72 ft
Reservoir name	= UNDERGROUND STORAGE	Max. Storage	= 1,673 cuft

Storage Indication method used.



Pond Report

3

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Friday, 09 / 6 / 2024

Pond No. 1 - UNDERGROUND STORAGE

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 918.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	918.00	20	0	0
1.00	919.00	1,120	570	570
1.75	919.75	1,960	1,155	1,725
2.00	920.00	2,240	525	2,250
3.00	921.00	3,360	2,800	5,050

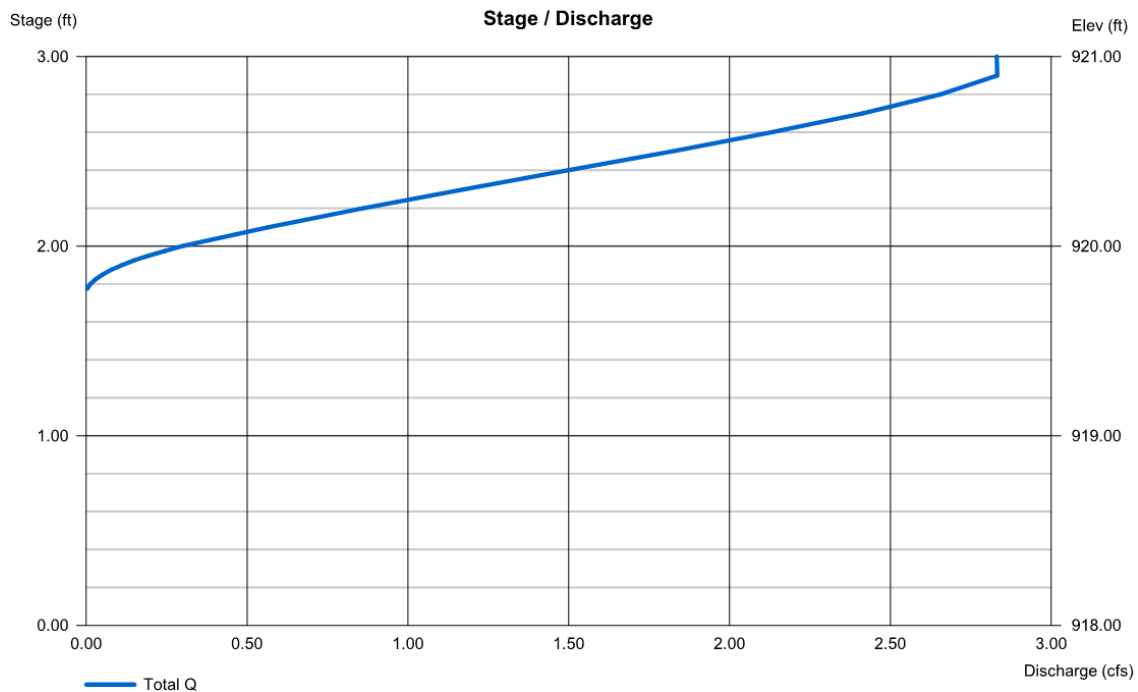
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	0.00	0.00	0.00
Span (in)	= 15.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 919.75	0.00	0.00	0.00
Length (ft)	= 40.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



3) Channel Protection Design

Channel Protection design for Developed DA.

Graphical Peak Discharge method

Given Input Data:

Rainfall distribution Type II

Frequency 1 years

Rainfall, P (24-hours) 2.67 in

Drainage area 0.55 ac

Runoff curve number, CN 87

Time of concentration, Tc 0.250 hrs

Win TR-55 Computed Results:

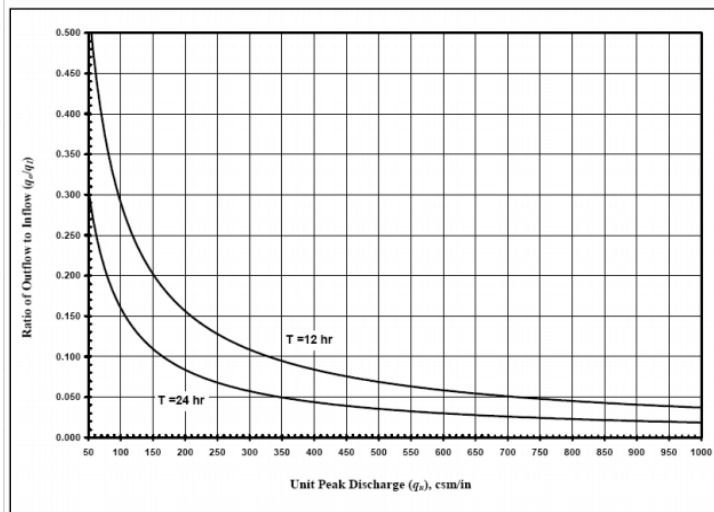
Unit peak discharge, q_u 433.32 csm/in

Runoff, Q 0.960 in

Peak discharge, q_p 0.99 cfs

Windsor Presbyterian Church			
Channel Protection Volume (Cp): Iowa Stormwater Manual 2C-6 Section C			
Cp is determined for the 1-yr, 24-hr storm			
Rainfall distribution: Type II		Tc = 0.250 hrs	
Drainage Area =		0.55 ac	Weighted CN = 87
$q_i = \frac{D_{1-yr}(in) \times A(ac)}{12(in/ft) \times 3,600(sec/hr)} \times 43,560(ft^2/ac)$			
I _{1-yr, 24-hr} =		2.67 in	
q _i =	0.99	cfs	From Win TR-55
Qa ₂ =	0.960	=Vr	watershed-in
q _u = unit peak discharge		q _u =	433.32 cfs/mi ² /in

Figure 1: Detention time vs. discharge ratios (q_o/q_i)



$$q_o/q_i = 0.042$$

$$q_o = 0.04$$

$$Vs/V_r = 0.683 - 1.43(q_o/q_i) + 1.64(q_o/q_i)^2 - 0.804(q_o/q_i)^3$$

$$Vs/V_r = 0.626$$

$$CP_v = 0.028 \text{ acre-ft} \quad 1,199 \text{ cf}$$

Hydrograph Report

1

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

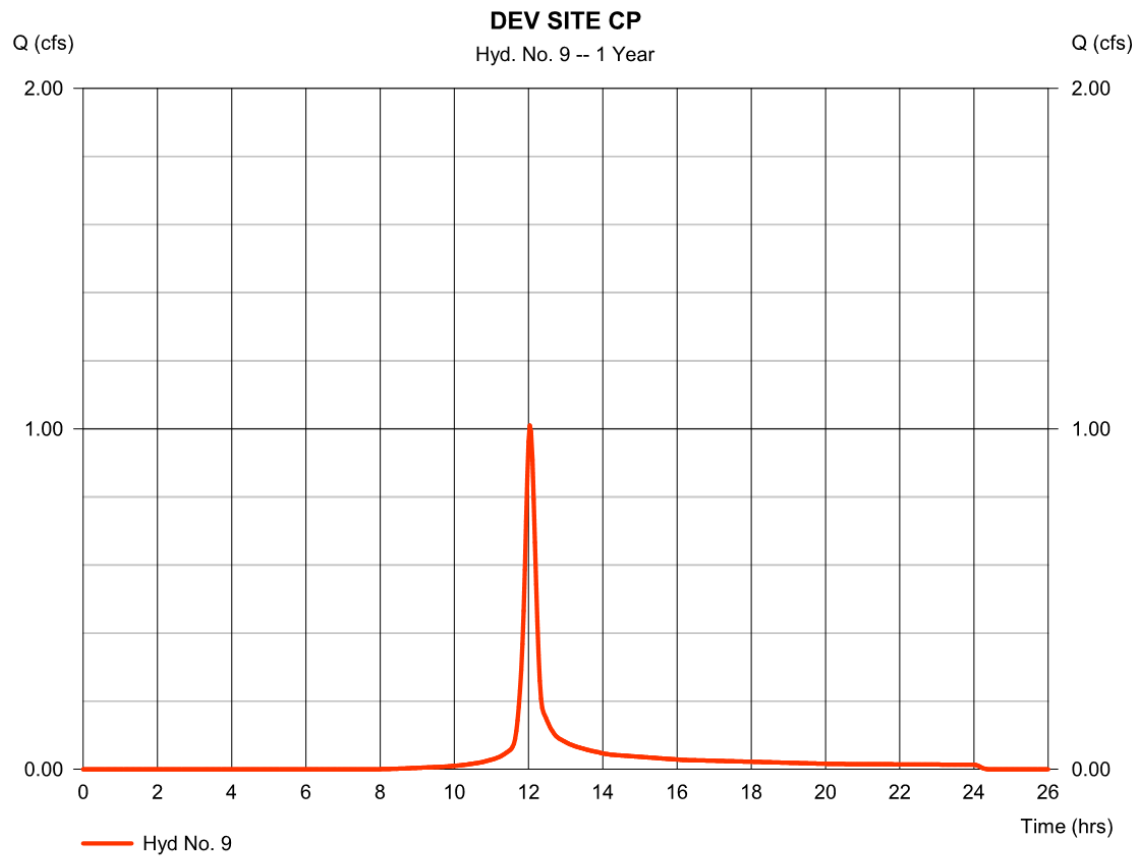
Friday, 09 / 6 / 2024

Hyd. No. 9

DEV SITE CP

Hydrograph type = SCS Runoff
Storm frequency = 1 yrs
Time interval = 2 min
Drainage area = 0.550 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 2.67 in
Storm duration = 24 hrs

Peak discharge = 1.010 cfs
Time to peak = 12.03 hrs
Hyd. volume = 2,831 cuft
Curve number = 87
Hydraulic length = 0 ft
Time of conc. (Tc) = 15.00 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

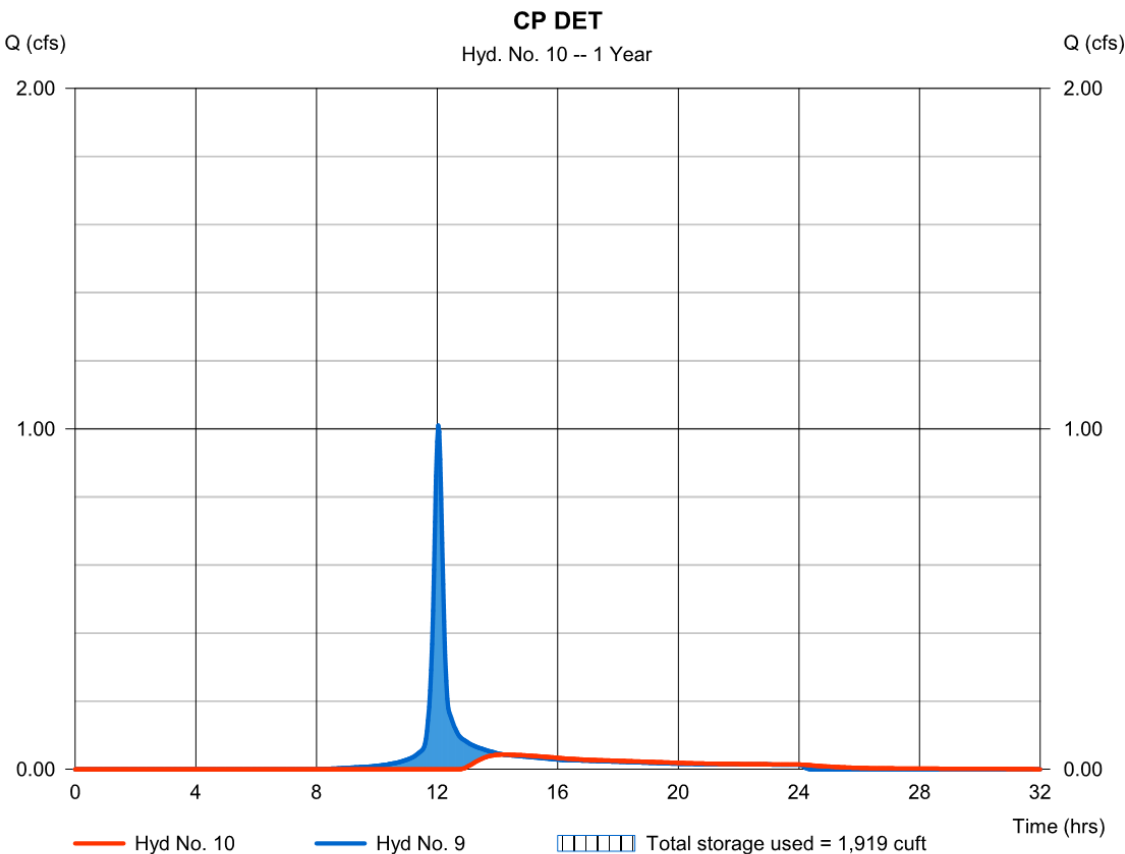
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Friday, 09 / 6 / 2024

Hyd. No. 10

CP DET

Hydrograph type	= Reservoir	Peak discharge	= 0.043 cfs
Storm frequency	= 1 yrs	Time to peak	= 14.20 hrs
Time interval	= 2 min	Hyd. volume	= 1,089 cuft
Inflow hyd. No.	= 9 - DEV SITE CP	Max. Elevation	= 919.84 ft
Reservoir name	= UNDERGROUND STORAGE	Max. Storage	= 1,919 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - UNDERGROUND STORAGE

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 918.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	918.00	20	0	0
1.00	919.00	1,120	570	570
1.75	919.75	1,960	1,155	1,725
2.00	920.00	2,240	525	2,250
3.00	921.00	3,360	2,800	5,050

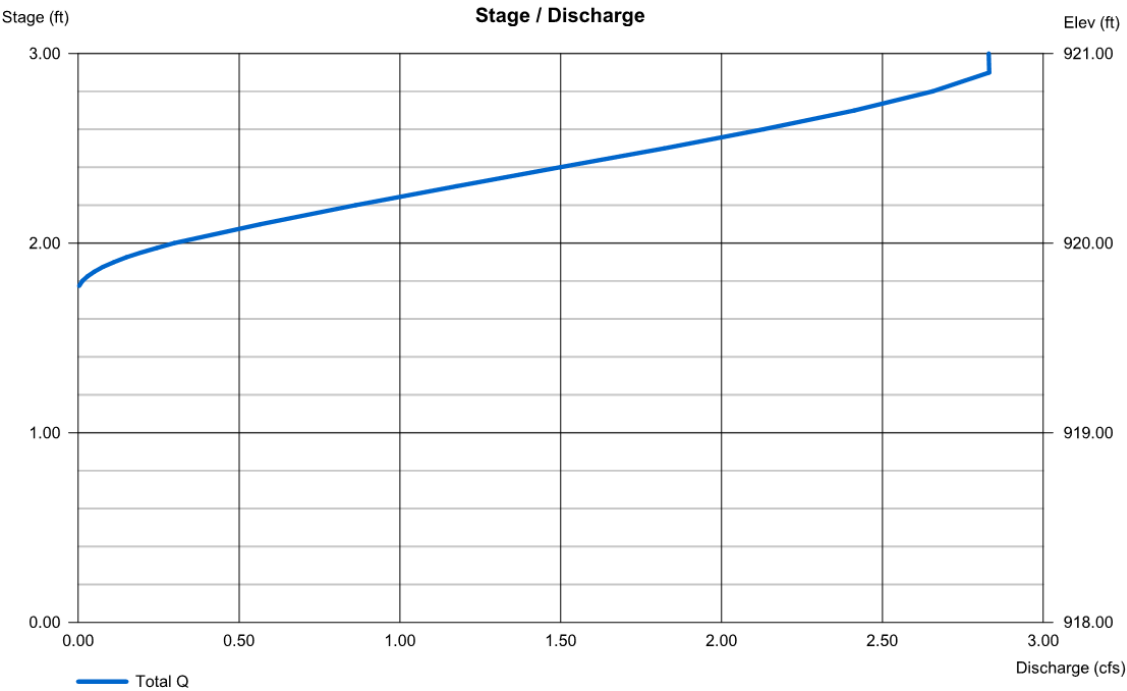
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	0.00	0.00	0.00
Span (in)	= 15.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 919.75	0.00	0.00	0.00
Length (ft)	= 40.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



7. Appendix

a. Drainage Maps

IMPERVIOUS:
9,470 SF
≈ 0.22 AC

EXISTING
DA
0.55 AC

EXISTING
DA
0.55 AC.



WINDSOR PRESBYTERIAN CHURCH
6301 UNIVERSITY AVENUE, WINDSOR HEIGHTS, 1A

EXISTING IMPERVIOUS

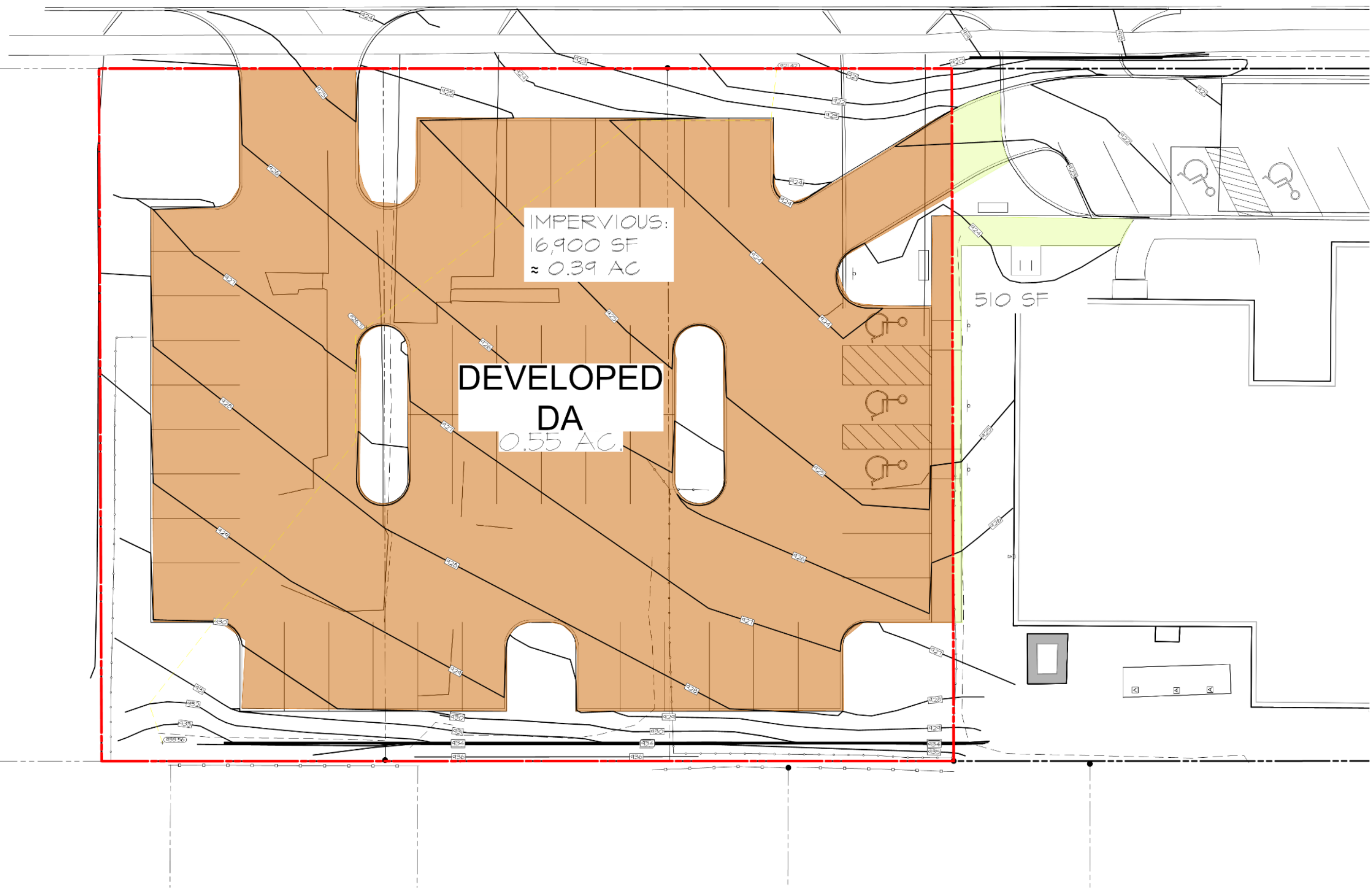
SHEET
OF 1
E9213

SCALE: 1"=10'

0' 2' 4' 6' 8' 10' 20'

NORTH

A circular north arrow with a white arrow pointing to the left, indicating that North is towards the left side of the map.



WINDSOR PRESBYTERIAN CHURCH
6301 UNIVERSITY AVENUE, WINDSOR HEIGHTS, IA

PROPOSED IMPERVIOUS

SHEET
OF

DATE:	Aug. 13, 2024
	3RD SUB.
	2ND SUB.
	1ST SUB.
DATE OF SURVEY:	AFR. 22, 2024
DESIGNED BY:	SJD
DRAWN BY:	MM

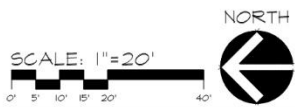
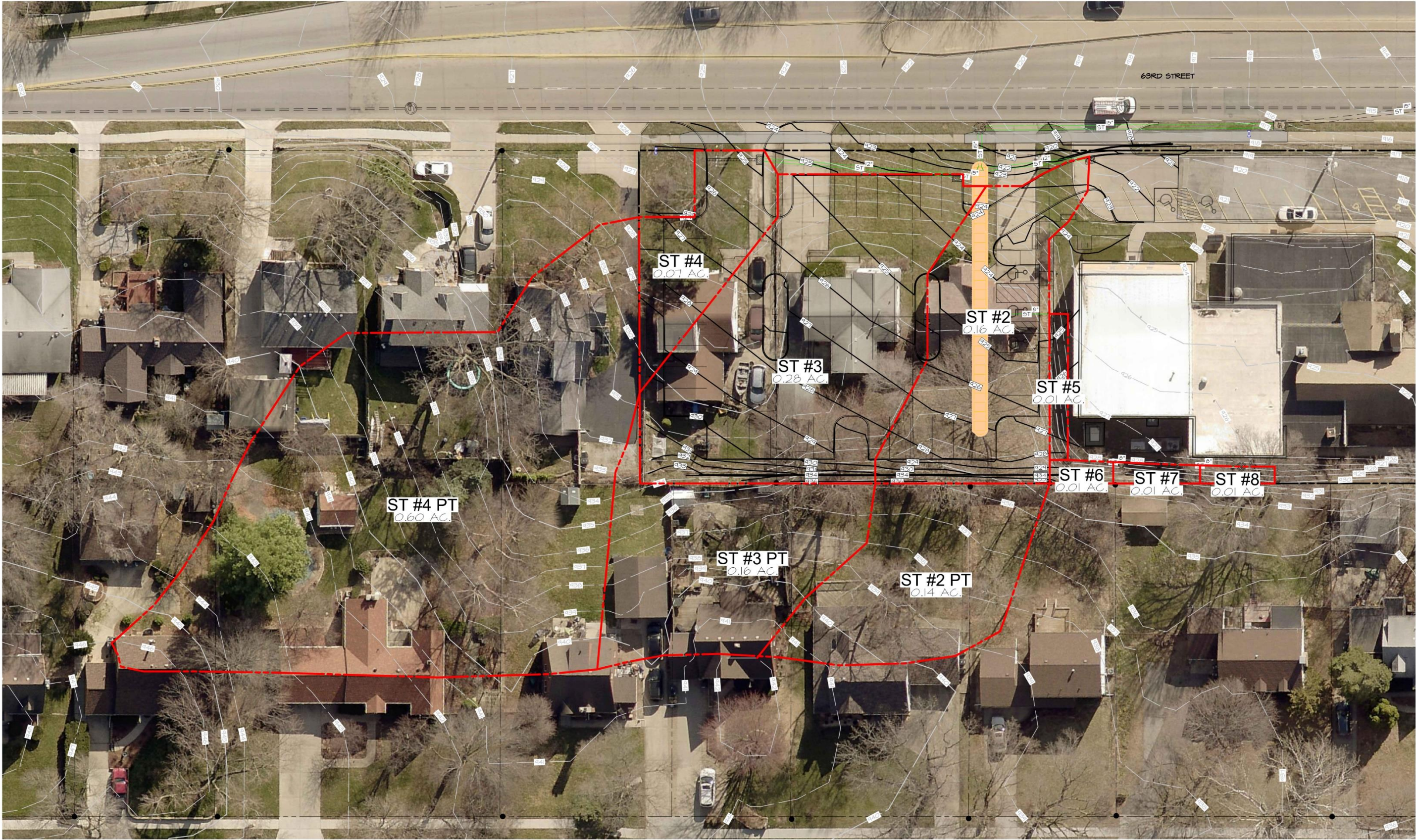
Civil Engineering Consultants, Inc.
22400 86th Street, Unit 12 • Urbandale, Iowa 50322
515.276.4884 • mail@ceclac.com

SCALE: 1"=10'

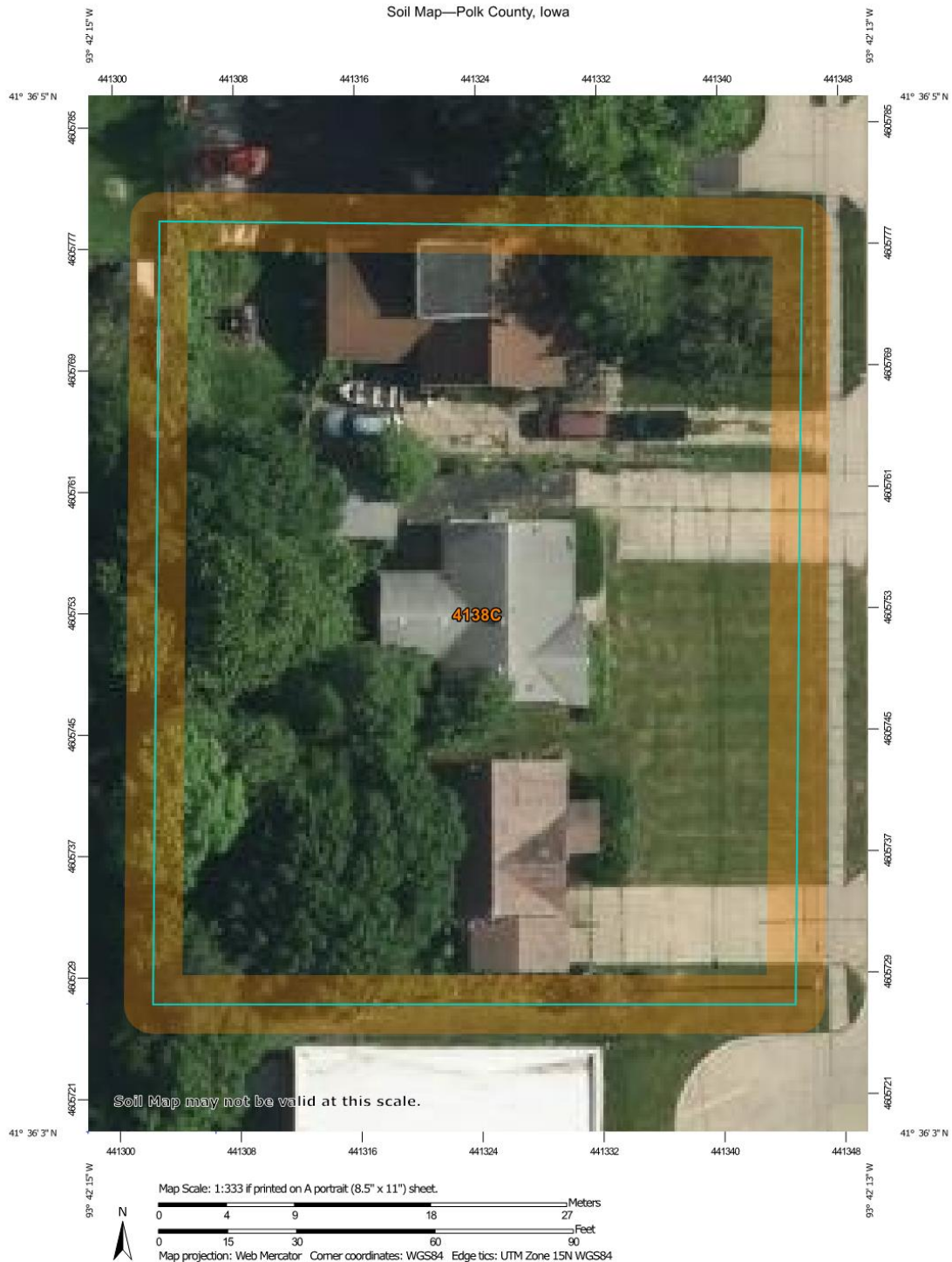
NORTH

A circular north arrow with a white arrow pointing to the left, indicating North is towards the left side of the map.





b. Hydrologic Soils Map



USDA
Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

4/24/2024
Page 1 of 3

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Polk County, Iowa
 Survey Area Data: Version 26, Sep 12, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 29, 2020—Jun 12, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
4138C	Clarion-Urban land complex, 5 to 9 percent slopes	0.5	100.0%
Totals for Area of Interest		0.5	100.0%

Hydric soil rating: No

Data Source Information

Soil Survey Area: Polk County, Iowa
Survey Area Data: Version 26, Sep 12, 2023



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

4/24/2024
Page 2 of 2

Polk County, Iowa

4138C—Clarion-Urban land complex, 5 to 9 percent slopes

Map Unit Setting

National map unit symbol: fvnn
Elevation: 950 to 1,500 feet
Mean annual precipitation: 23 to 35 inches
Mean annual air temperature: 43 to 50 degrees F
Frost-free period: 165 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Clarion and similar soils: 60 percent
Urban land: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clarion

Setting

Landform: Ground moraines
Landform position (two-dimensional): Shoulder, backslope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy supraglacial till

Typical profile

Ap - 0 to 7 inches: loam
A1,A2 - 7 to 18 inches: loam
Bw1,Bw2 - 18 to 36 inches: loam
C1,C2 - 36 to 60 inches: loam

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 1.42 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Available water supply, 0 to 60 inches: High (about 11.3 inches)

Interpretive groups

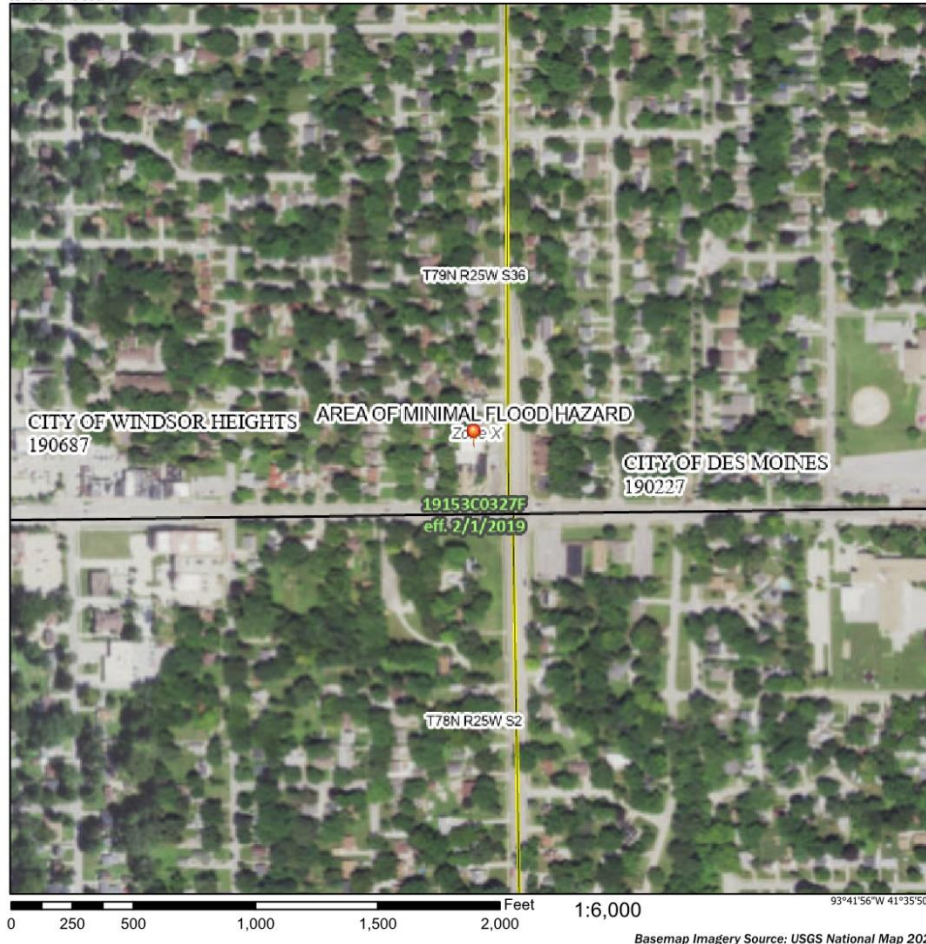
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R103XY004MN - Loamy Upland Prairies

c. **FEMA Map**

National Flood Hazard Layer FIRMette

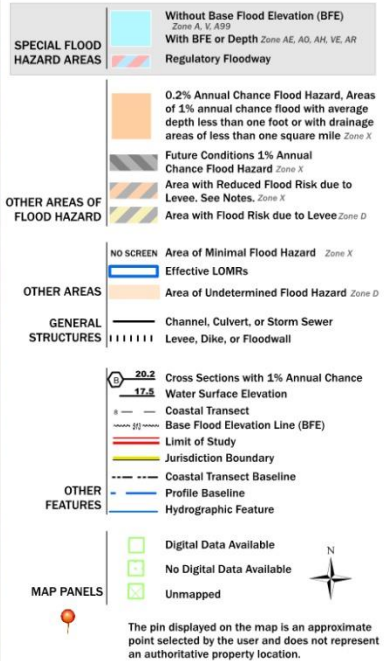


93°42'34"W 41°36'17"N



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT



This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards.

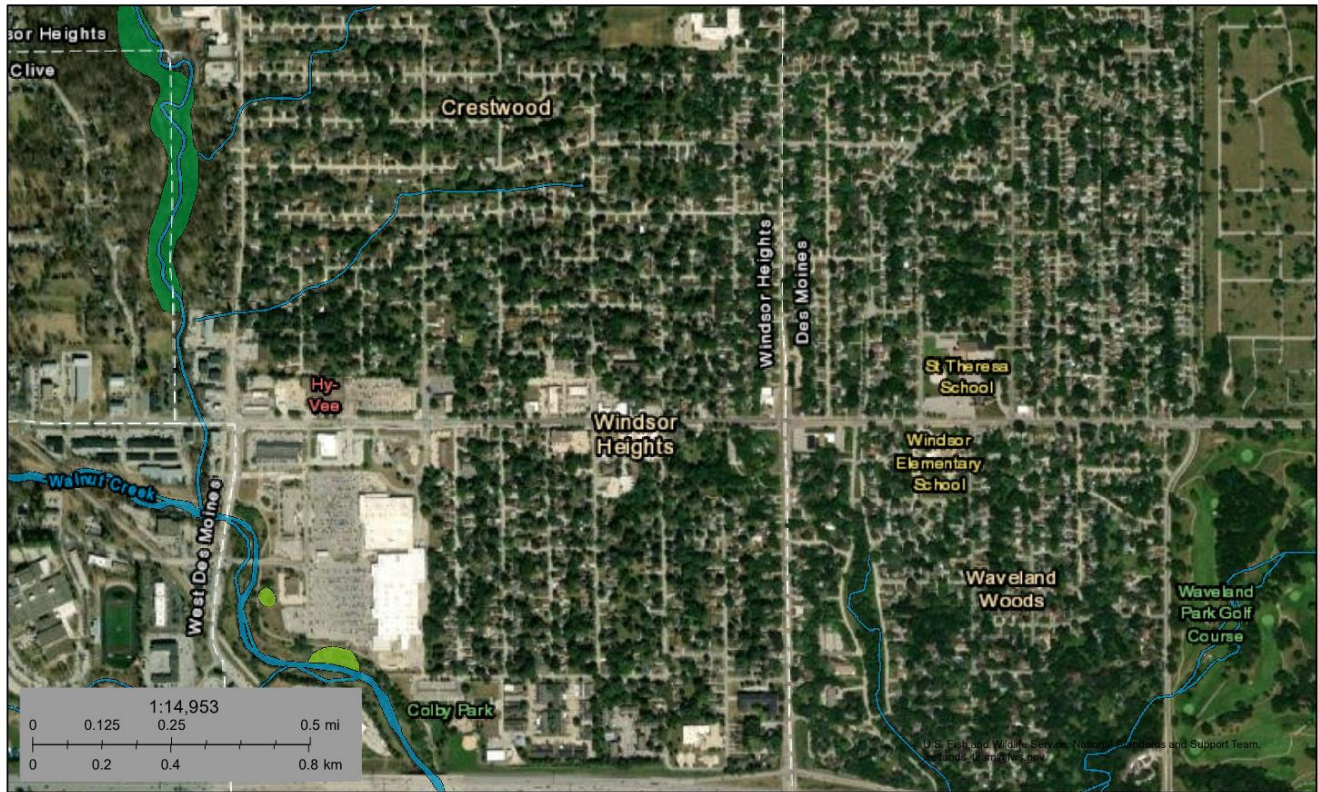
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/24/2024 at 5:00 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

d. Wetlands Map



Wetlands



April 24, 2024

Wetlands

Estuarine and Marine Deepwater	Freshwater Emergent Wetland	Lake
Estuarine and Marine Wetland	Freshwater Forested/Shrub Wetland	Other
	Freshwater Pond	Riverine

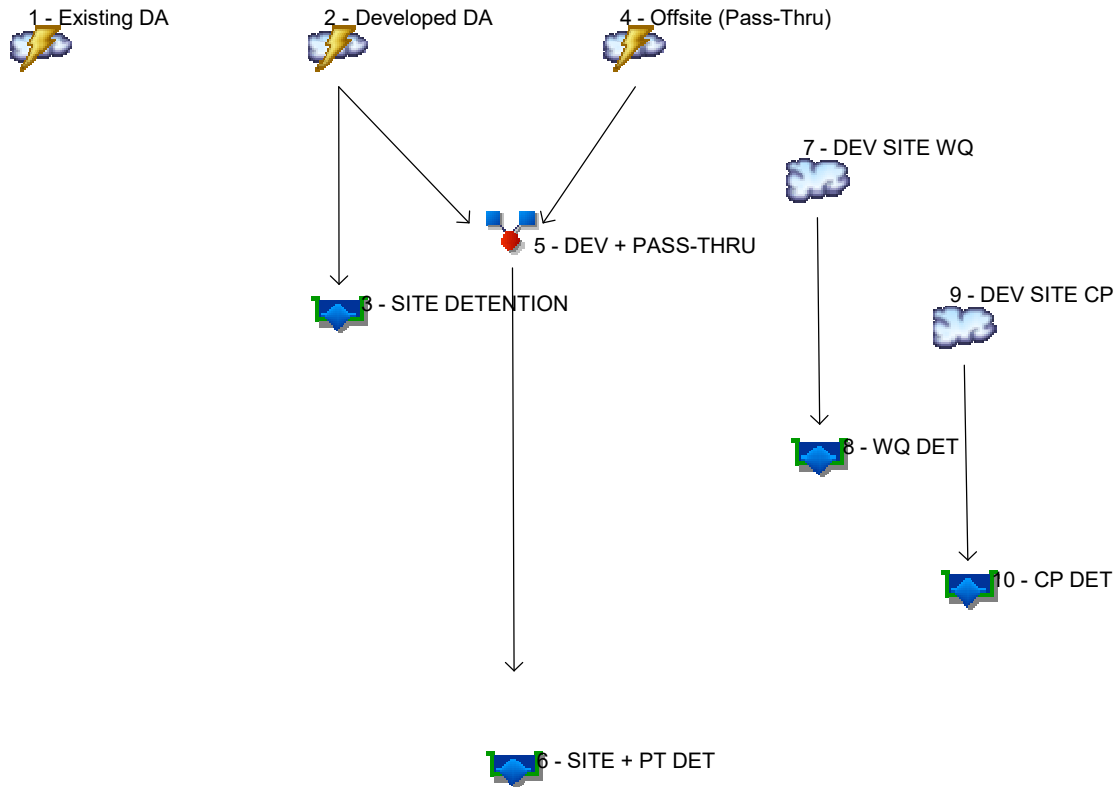
This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

e. Hydrographs Report

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022



Legend

Hyd.	Origin	Description
1	Rational	Existing DA
2	Rational	Developed DA
3	Reservoir	SITE DETENTION
4	Rational	Offsite (Pass-Thru)
5	Combine	DEV + PASS-THRU
6	Reservoir	SITE + PT DET
7	SCS Runoff	DEV SITE WQ
8	Reservoir	WQ DET
9	SCS Runoff	DEV SITE CP
10	Reservoir	CP DET

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.971	1	15	874	-----	-----	-----	Existing DA
2	Rational	1.295	1	15	1,165	-----	-----	-----	Developed DA
3	Reservoir	0.000	1	n/a	0	2	919.39	1,165	SITE DETENTION
4	Rational	1.430	1	15	1,287	-----	-----	-----	Offsite (Pass-Thru)
5	Combine	2.725	1	15	2,453	2, 4	-----	-----	DEV + PASS-THRU
6	Reservoir	0.360	1	28	710	5	920.02	2,314	SITE + PT DET
7	SCS Runoff	1.453	2	722	4,337	-----	-----	-----	DEV SITE WQ
8	Reservoir	0.464	2	736	2,595	7	920.06	2,423	WQ DET
9	SCS Runoff	1.010	2	722	2,831	-----	-----	-----	DEV SITE CP
10	Reservoir	0.043	2	852	1,089	9	919.84	1,919	CP DET
base.gpw					Return Period: 1 Year			Friday, 09 / 6 / 2024	

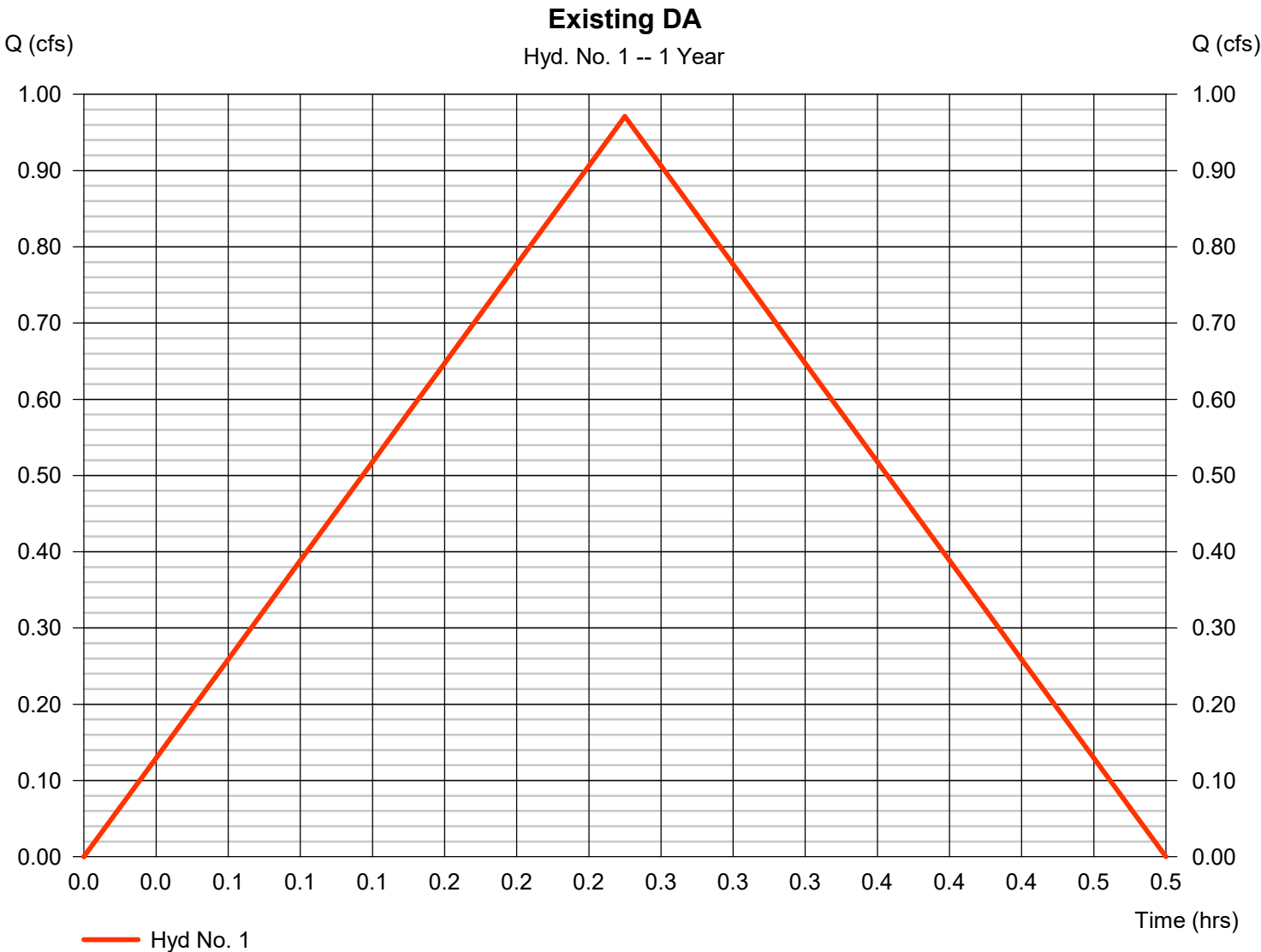
Hydrograph Report

Hyd. No. 1

Existing DA

Hydrograph type	= Rational	Peak discharge	= 0.971 cfs
Storm frequency	= 1 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 874 cuft
Drainage area	= 0.550 ac	Runoff coeff.	= 0.6*
Intensity	= 2.943 in/hr	Tc by User	= 15.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.330 x 0.35) + (0.220 x 0.98)] / 0.550



Hydrograph Report

Hyd. No. 2

Developed DA

Hydrograph type	= Rational	Peak discharge	= 1.295 cfs
Storm frequency	= 1 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 1,165 cuft
Drainage area	= 0.550 ac	Runoff coeff.	= 0.8*
Intensity	= 2.943 in/hr	Tc by User	= 15.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.160 x 0.35) + (0.390 x 0.98)] / 0.550



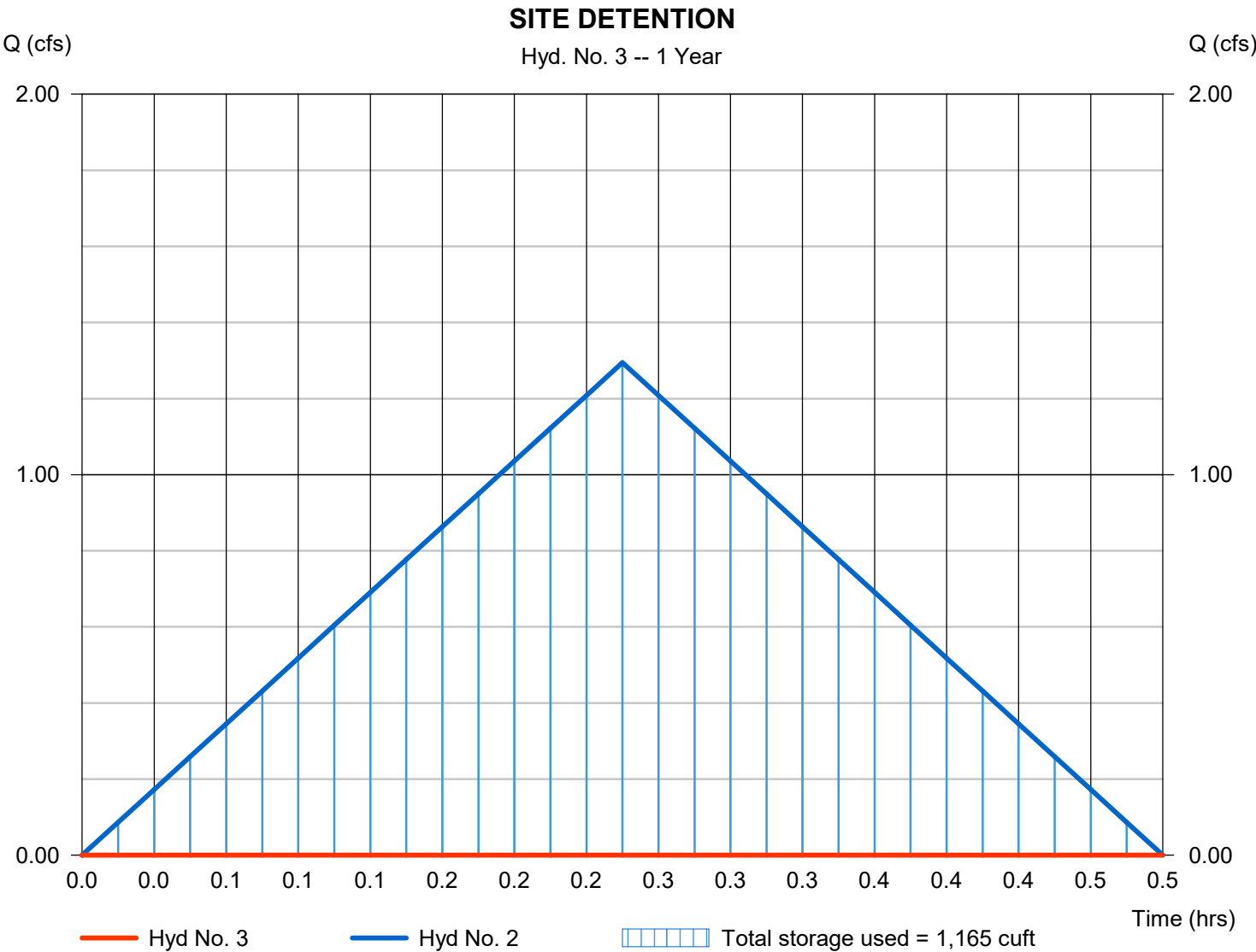
Hydrograph Report

Hyd. No. 3

SITE DETENTION

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Developed DA	Max. Elevation	= 919.39 ft
Reservoir name	= UNDERGROUND STORAGE	Max. Storage	= 1,165 cuft

Storage Indication method used.



Pond No. 1 - UNDERGROUND STORAGE

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 918.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	918.00	20	0	0
1.00	919.00	1,120	570	570
1.75	919.75	1,960	1,155	1,725
2.00	920.00	2,240	525	2,250
3.00	921.00	3,360	2,800	5,050

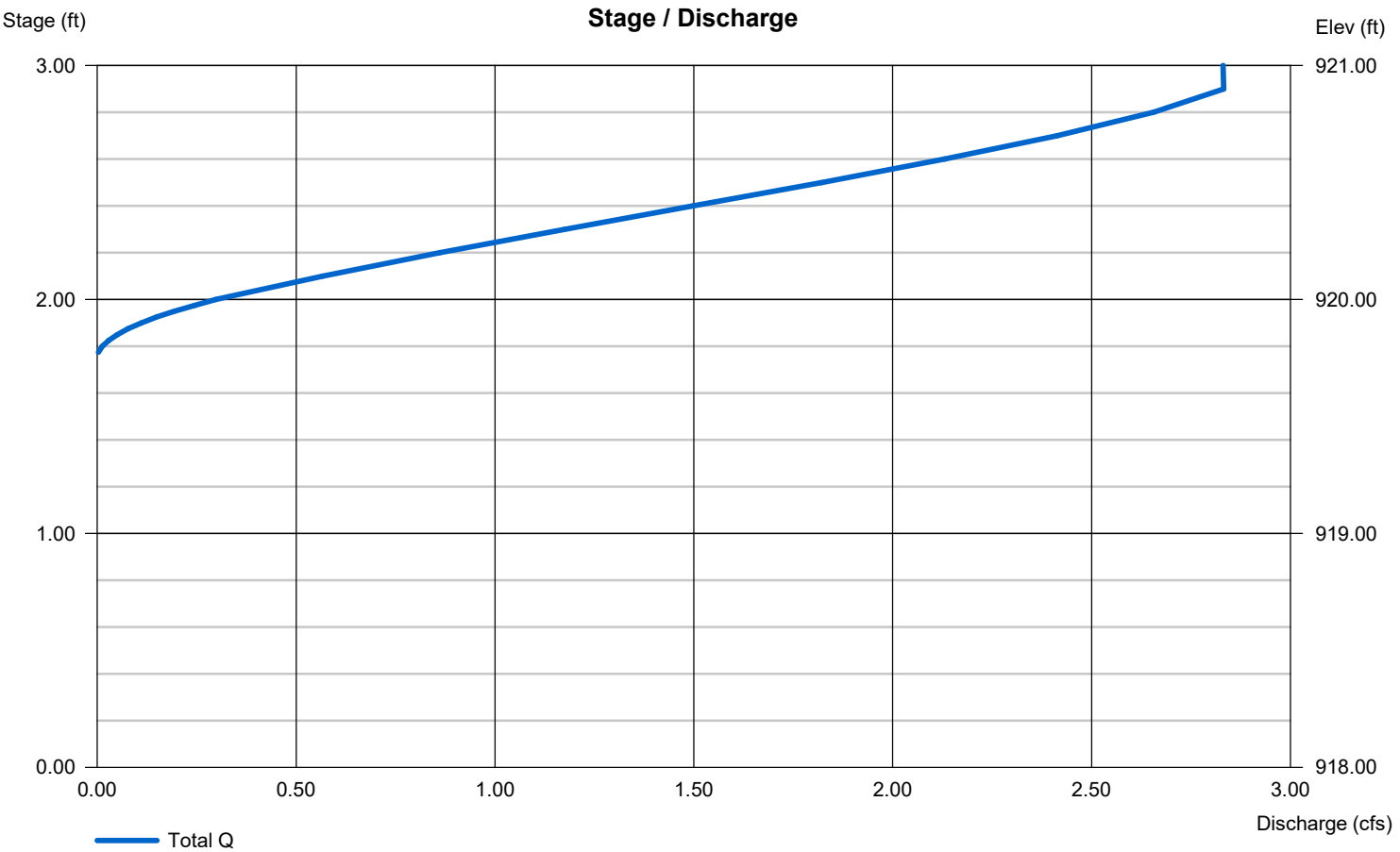
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	0.00	0.00	0.00
Span (in)	= 15.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 919.75	0.00	0.00	0.00
Length (ft)	= 40.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Report

Hyd. No. 4

Offsite (Pass-Thru)

Hydrograph type	= Rational	Peak discharge	= 1.430 cfs
Storm frequency	= 1 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 1,287 cuft
Drainage area	= 0.900 ac	Runoff coeff.	= 0.54*
Intensity	= 2.943 in/hr	Tc by User	= 15.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.630 x 0.35) + (0.270 x 0.98)] / 0.900

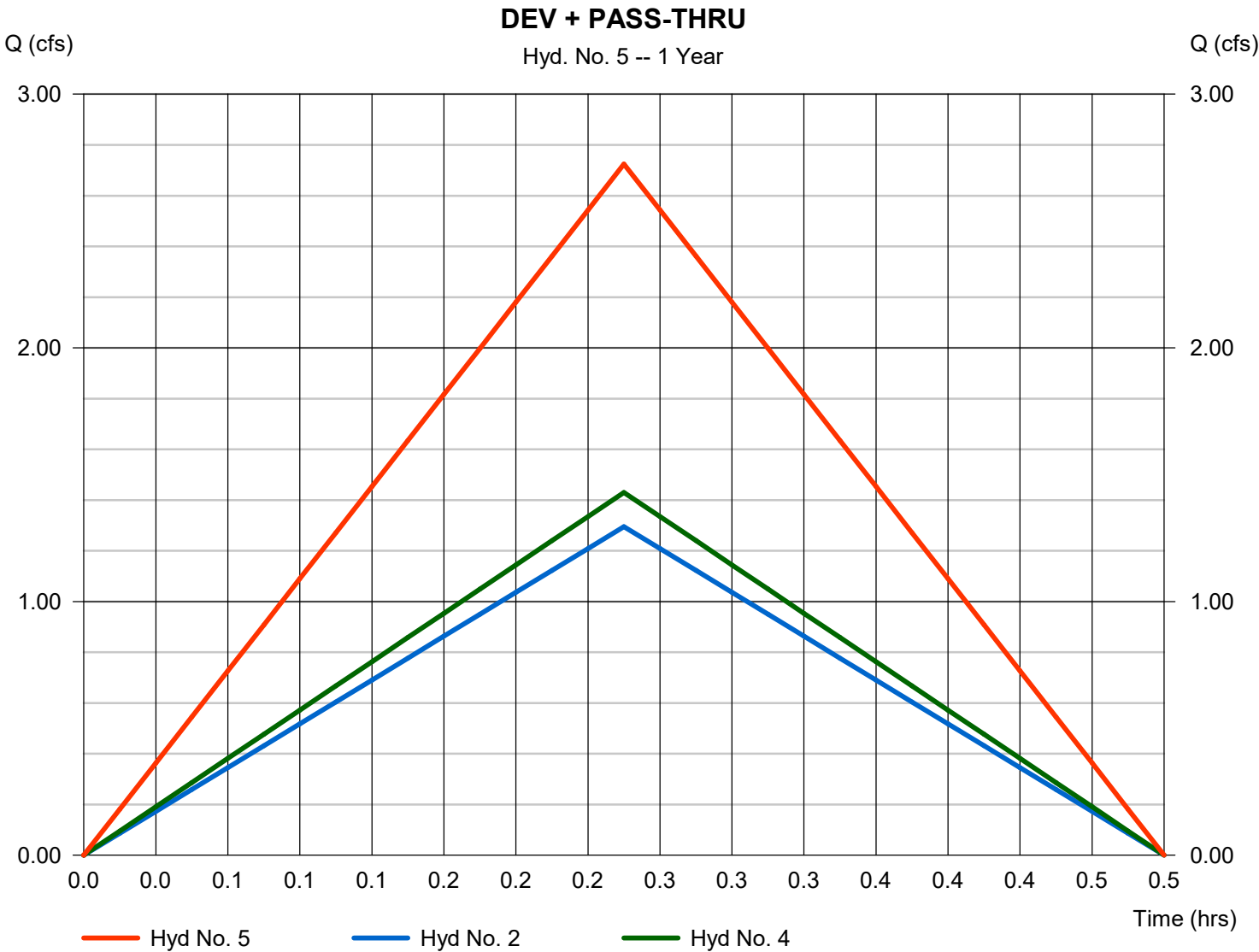


Hydrograph Report

Hyd. No. 5

DEV + PASS-THRU

Hydrograph type	= Combine	Peak discharge	= 2.725 cfs
Storm frequency	= 1 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 2,453 cuft
Inflow hyds.	= 2, 4	Contrib. drain. area	= 1.450 ac



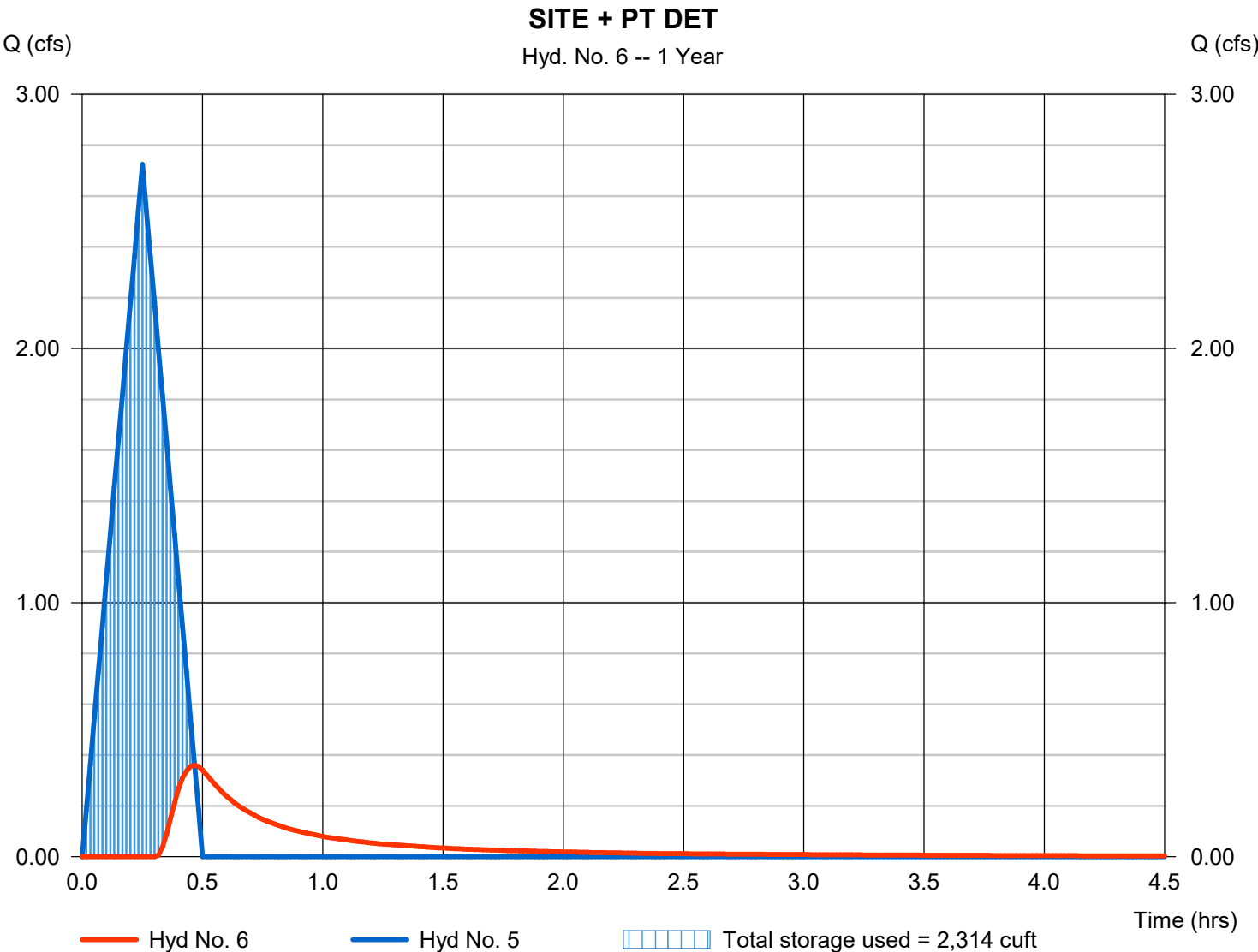
Hydrograph Report

Hyd. No. 6

SITE + PT DET

Hydrograph type	= Reservoir	Peak discharge	= 0.360 cfs
Storm frequency	= 1 yrs	Time to peak	= 0.47 hrs
Time interval	= 1 min	Hyd. volume	= 710 cuft
Inflow hyd. No.	= 5 - DEV + PASS-THRU	Max. Elevation	= 920.02 ft
Reservoir name	= UNDERGROUND STORAGE	Max. Storage	= 2,314 cuft

Storage Indication method used.



Pond No. 1 - UNDERGROUND STORAGE

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 918.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	918.00	20	0	0
1.00	919.00	1,120	570	570
1.75	919.75	1,960	1,155	1,725
2.00	920.00	2,240	525	2,250
3.00	921.00	3,360	2,800	5,050

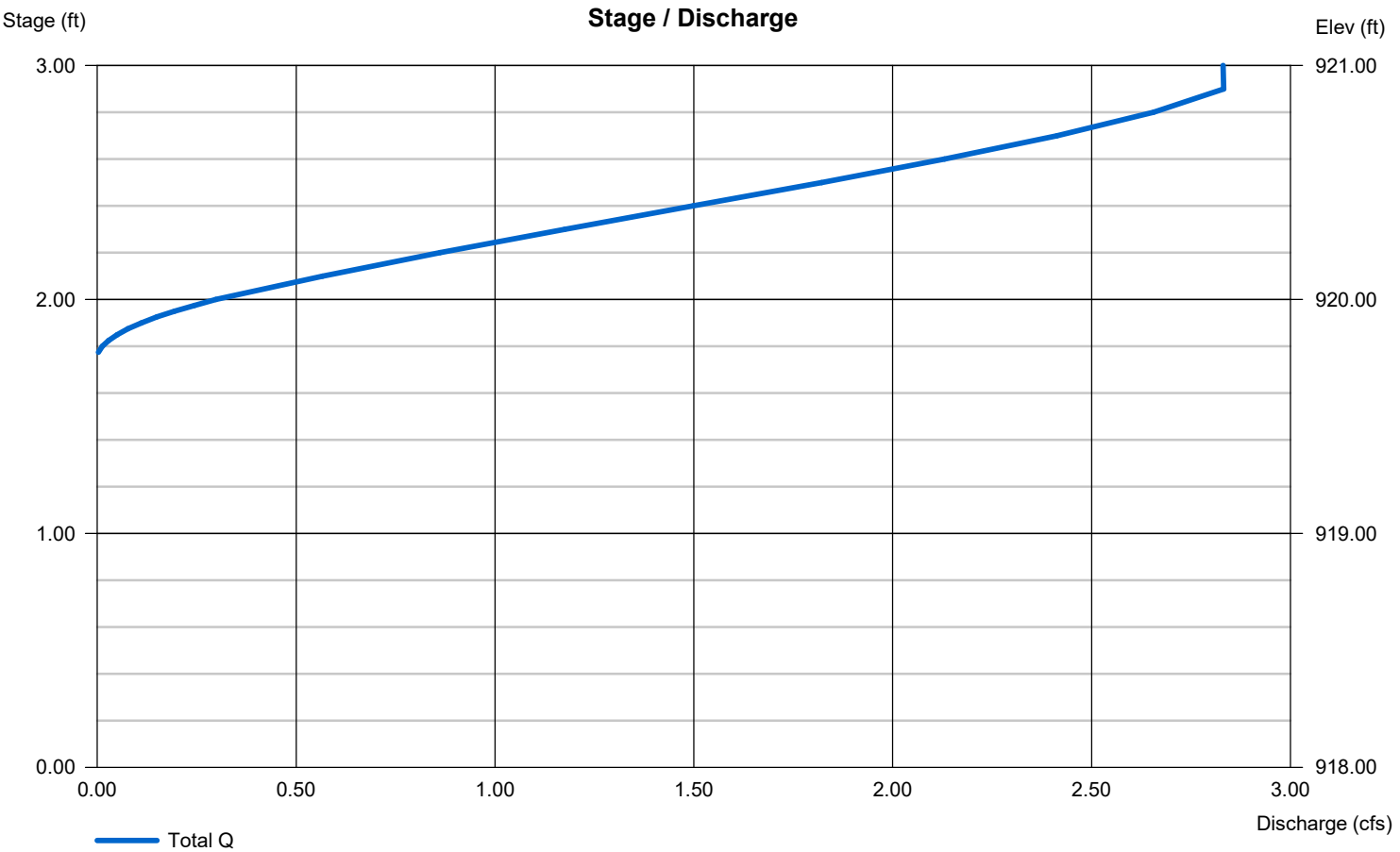
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	0.00	0.00	0.00
Span (in)	= 15.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 919.75	0.00	0.00	0.00
Length (ft)	= 40.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	1.137	1	15	1,024	-----	-----	-----	Existing DA
2	Rational	1.516	1	15	1,365	-----	-----	-----	Developed DA
3	Reservoir	0.000	1	n/a	0	2	919.52	1,365	SITE DETENTION
4	Rational	1.675	1	15	1,507	-----	-----	-----	Offsite (Pass-Thru)
5	Combine	3.191	1	15	2,872	2, 4	-----	-----	DEV + PASS-THRU
6	Reservoir	0.623	1	27	1,130	5	920.12	2,583	SITE + PT DET
7	SCS Runoff	1.699	2	722	5,121	-----	-----	-----	DEV SITE WQ
8	Reservoir	0.728	2	734	3,379	7	920.15	2,684	WQ DET
9	SCS Runoff	1.254	2	722	3,522	-----	-----	-----	DEV SITE CP
10	Reservoir	0.114	2	766	1,780	9	919.90	2,045	CP DET
base.gpw					Return Period: 2 Year			Friday, 09 / 6 / 2024	

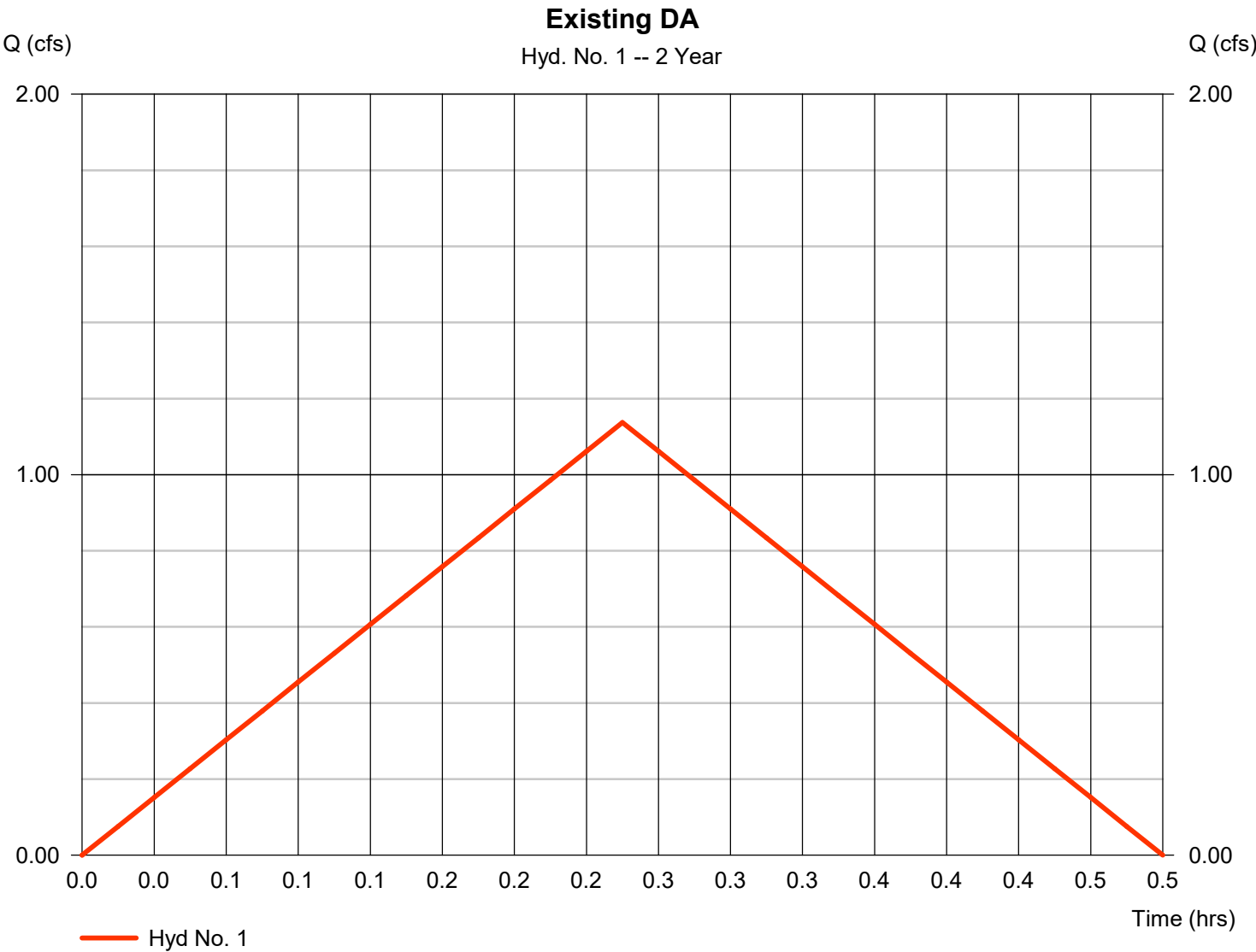
Hydrograph Report

Hyd. No. 1

Existing DA

Hydrograph type	= Rational	Peak discharge	= 1.137 cfs
Storm frequency	= 2 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 1,024 cuft
Drainage area	= 0.550 ac	Runoff coeff.	= 0.6*
Intensity	= 3.446 in/hr	Tc by User	= 15.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.330 x 0.35) + (0.220 x 0.98)] / 0.550



Hydrograph Report

Hyd. No. 2

Developed DA

Hydrograph type	= Rational	Peak discharge	= 1.516 cfs
Storm frequency	= 2 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 1,365 cuft
Drainage area	= 0.550 ac	Runoff coeff.	= 0.8*
Intensity	= 3.446 in/hr	Tc by User	= 15.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.160 x 0.35) + (0.390 x 0.98)] / 0.550



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

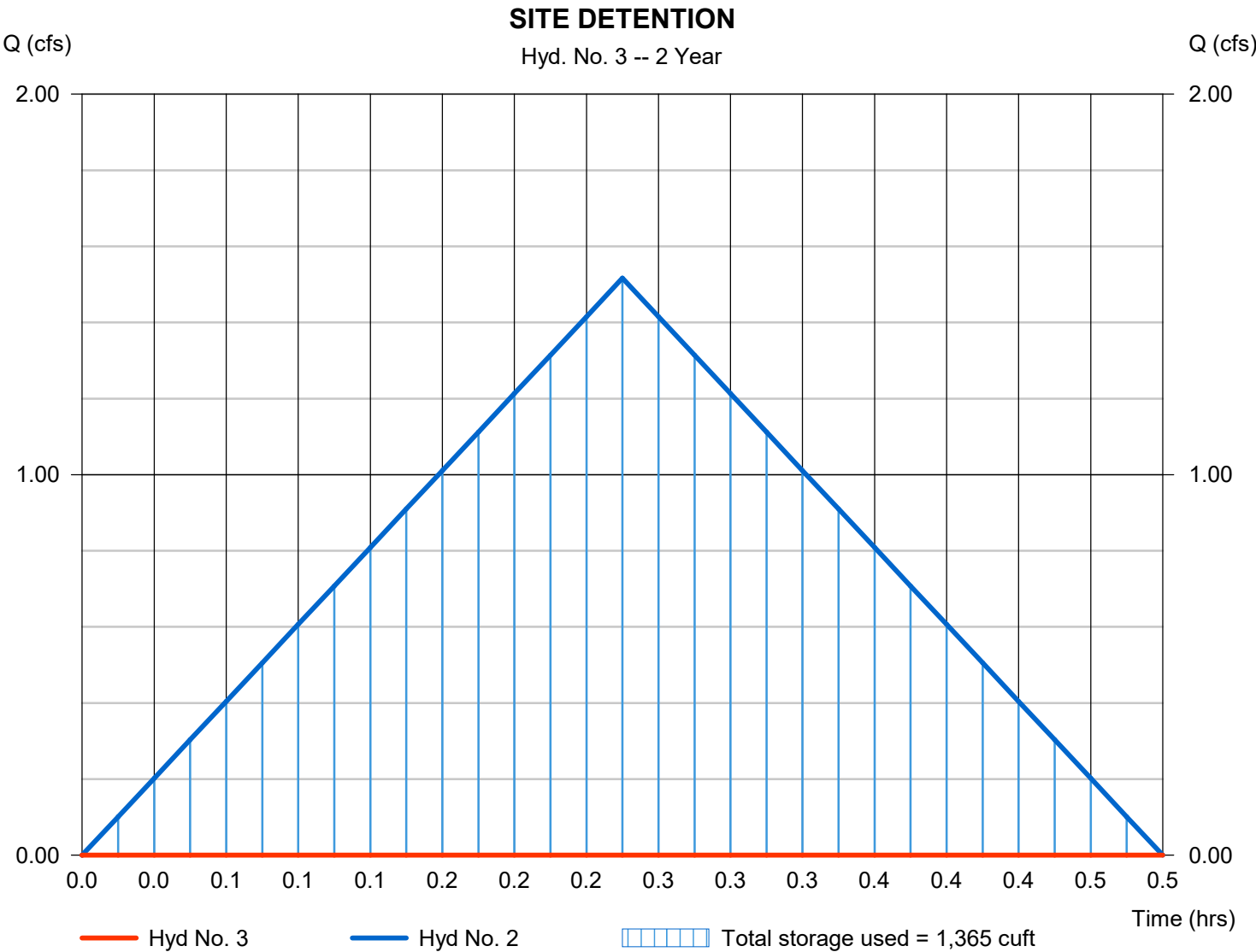
Friday, 09 / 6 / 2024

Hyd. No. 3

SITE DETENTION

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Developed DA	Max. Elevation	= 919.52 ft
Reservoir name	= UNDERGROUND STORAGE	Max. Storage	= 1,365 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Friday, 09 / 6 / 2024

Hyd. No. 4

Offsite (Pass-Thru)

Hydrograph type	= Rational	Peak discharge	= 1.675 cfs
Storm frequency	= 2 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 1,507 cuft
Drainage area	= 0.900 ac	Runoff coeff.	= 0.54*
Intensity	= 3.446 in/hr	Tc by User	= 15.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.630 x 0.35) + (0.270 x 0.98)] / 0.900

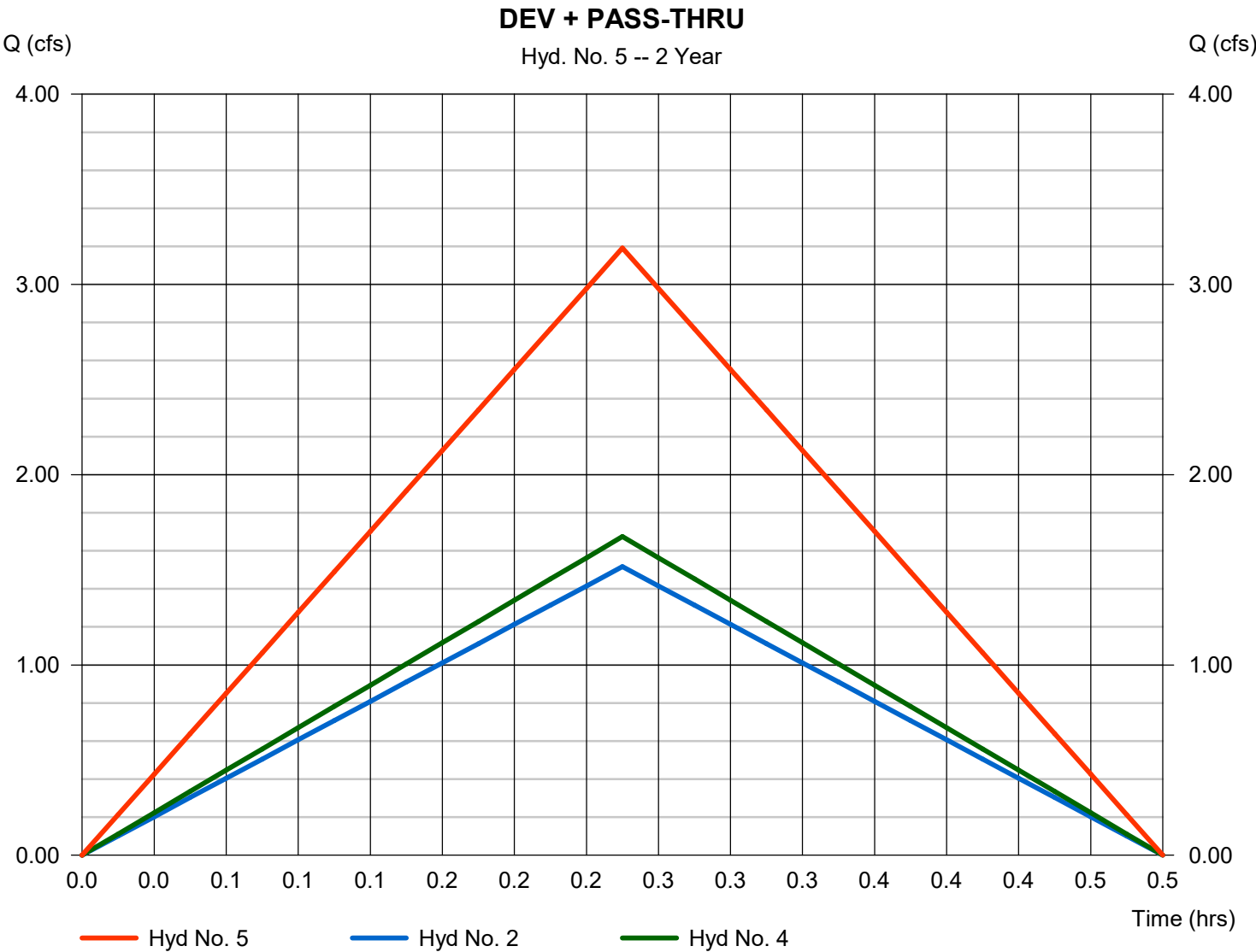


Hydrograph Report

Hyd. No. 5

DEV + PASS-THRU

Hydrograph type	= Combine	Peak discharge	= 3.191 cfs
Storm frequency	= 2 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 2,872 cuft
Inflow hyds.	= 2, 4	Contrib. drain. area	= 1.450 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

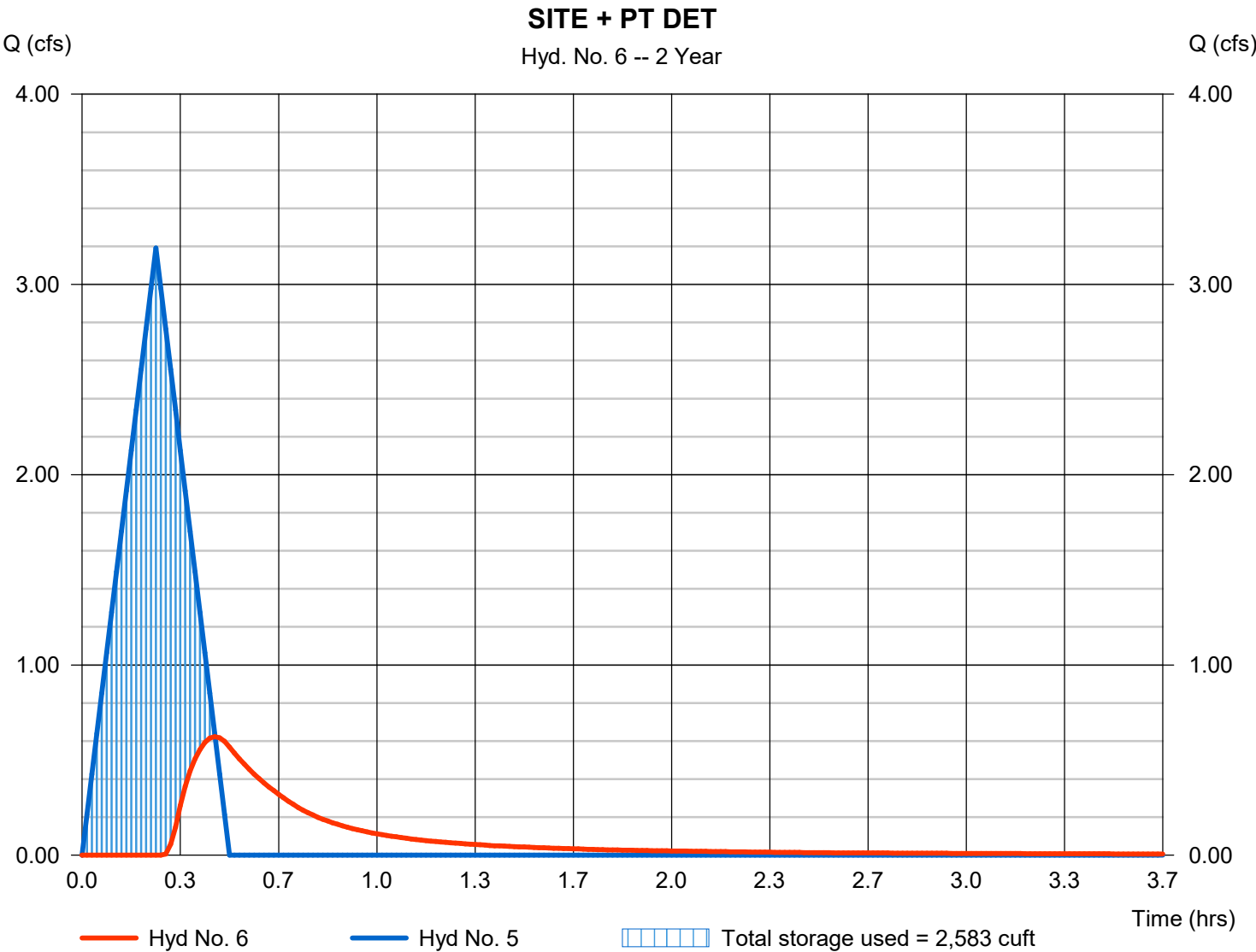
Friday, 09 / 6 / 2024

Hyd. No. 6

SITE + PT DET

Hydrograph type	= Reservoir	Peak discharge	= 0.623 cfs
Storm frequency	= 2 yrs	Time to peak	= 0.45 hrs
Time interval	= 1 min	Hyd. volume	= 1,130 cuft
Inflow hyd. No.	= 5 - DEV + PASS-THRU	Max. Elevation	= 920.12 ft
Reservoir name	= UNDERGROUND STORAGE	Max. Storage	= 2,583 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	1.416	1	15	1,274	-----	-----	-----	Existing DA
2	Rational	1.888	1	15	1,699	-----	-----	-----	Developed DA
3	Reservoir	0.000	1	n/a	0	2	919.73	1,699	SITE DETENTION
4	Rational	2.085	1	15	1,877	-----	-----	-----	Offsite (Pass-Thru)
5	Combine	3.973	1	15	3,575	2, 4	-----	-----	DEV + PASS-THRU
6	Reservoir	1.073	1	26	1,833	5	920.27	2,999	SITE + PT DET
7	SCS Runoff	2.135	2	722	6,525	-----	-----	-----	DEV SITE WQ
8	Reservoir	1.179	2	732	4,783	7	920.30	3,094	WQ DET
9	SCS Runoff	1.697	2	722	4,794	-----	-----	-----	DEV SITE CP
10	Reservoir	0.476	2	738	3,052	9	920.07	2,436	CP DET
base.gpw					Return Period: 5 Year			Friday, 09 / 6 / 2024	

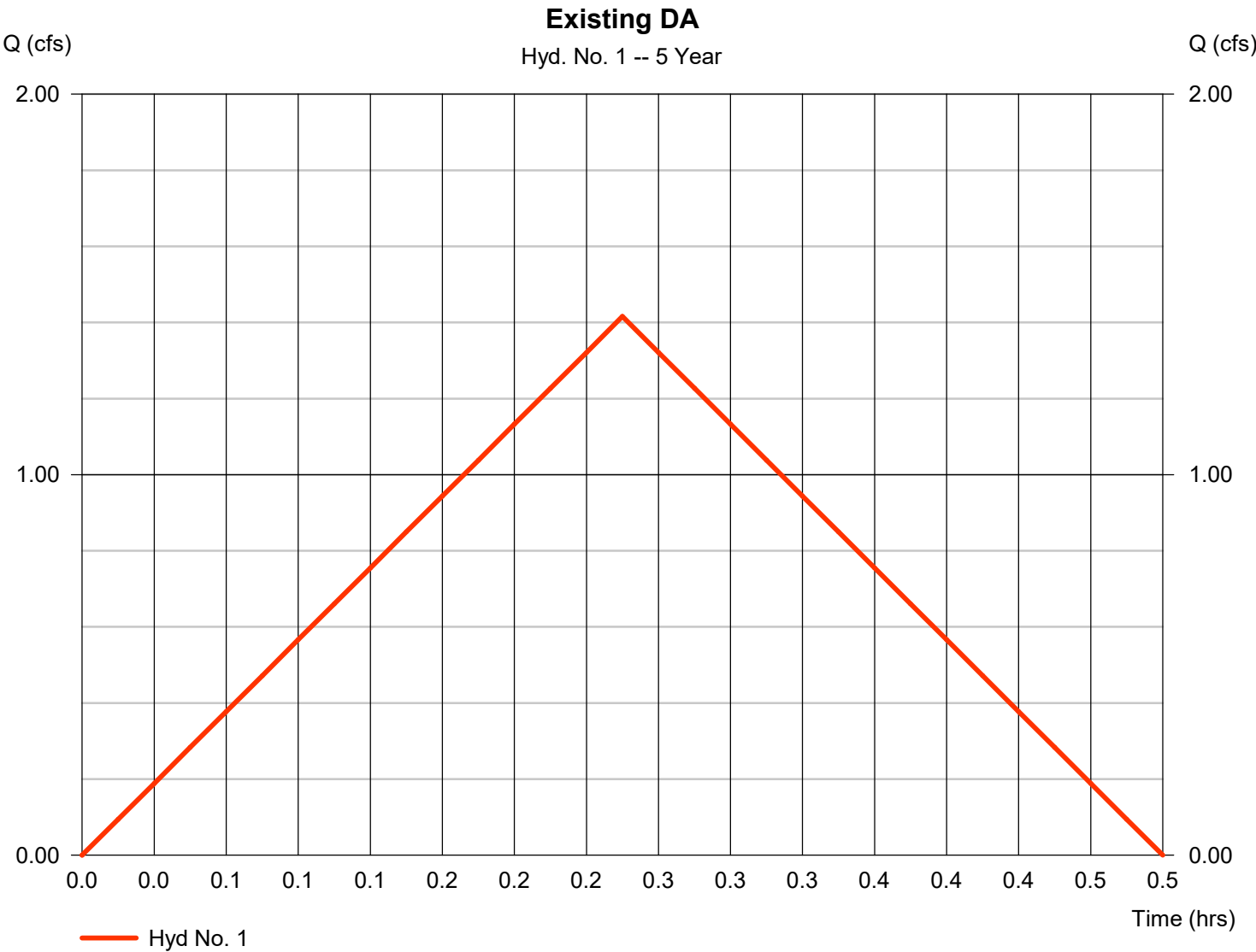
Hydrograph Report

Hyd. No. 1

Existing DA

Hydrograph type	= Rational	Peak discharge	= 1.416 cfs
Storm frequency	= 5 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 1,274 cuft
Drainage area	= 0.550 ac	Runoff coeff.	= 0.6*
Intensity	= 4.290 in/hr	Tc by User	= 15.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.330 x 0.35) + (0.220 x 0.98)] / 0.550



Hydrograph Report

Hyd. No. 2

Developed DA

Hydrograph type	= Rational	Peak discharge	= 1.888 cfs
Storm frequency	= 5 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 1,699 cuft
Drainage area	= 0.550 ac	Runoff coeff.	= 0.8*
Intensity	= 4.290 in/hr	Tc by User	= 15.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.160 x 0.35) + (0.390 x 0.98)] / 0.550



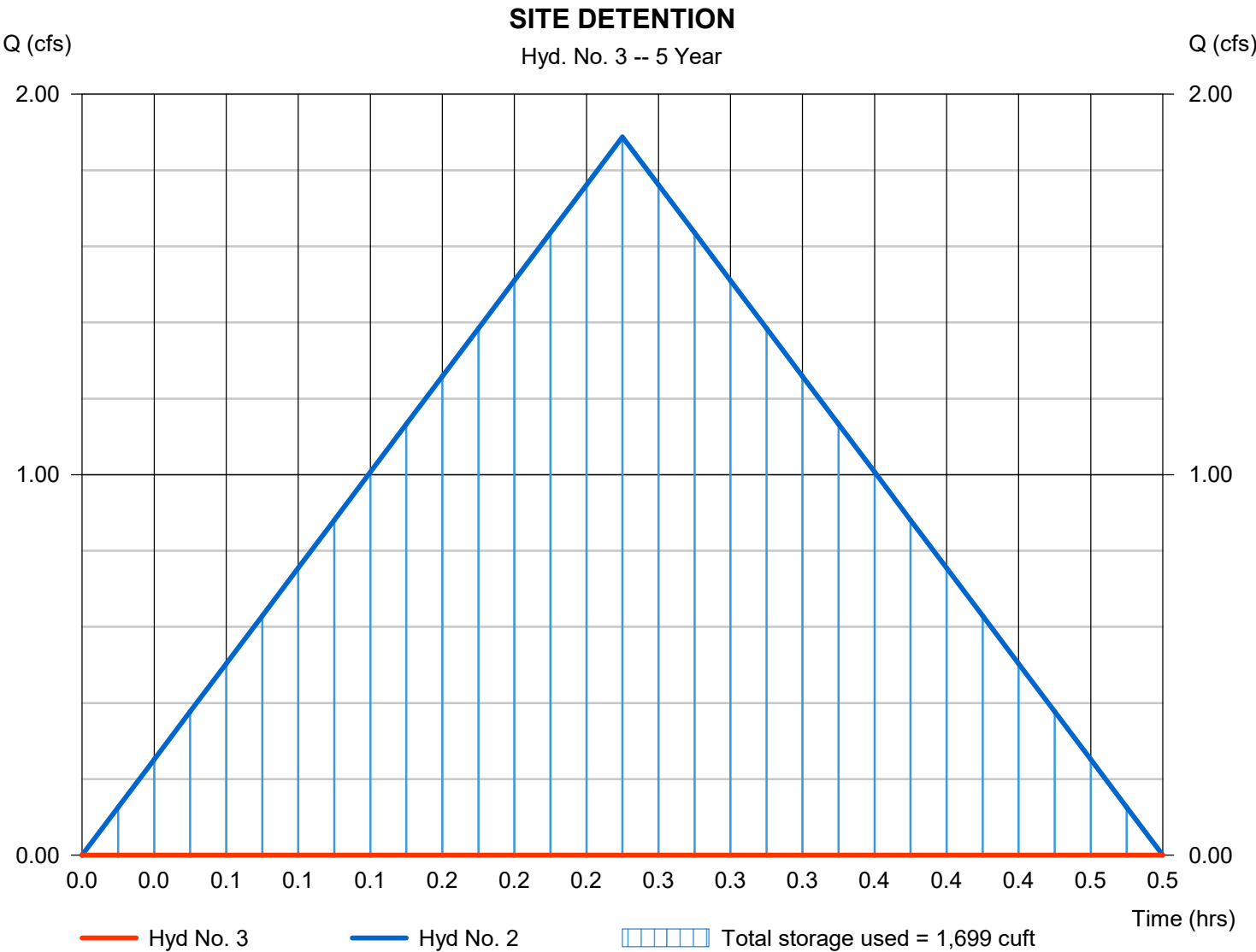
Hydrograph Report

Hyd. No. 3

SITE DETENTION

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 5 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Developed DA	Max. Elevation	= 919.73 ft
Reservoir name	= UNDERGROUND STORAGE	Max. Storage	= 1,699 cuft

Storage Indication method used.



Hydrograph Report

Hyd. No. 4

Offsite (Pass-Thru)

Hydrograph type	= Rational	Peak discharge	= 2.085 cfs
Storm frequency	= 5 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 1,877 cuft
Drainage area	= 0.900 ac	Runoff coeff.	= 0.54*
Intensity	= 4.290 in/hr	Tc by User	= 15.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.630 x 0.35) + (0.270 x 0.98)] / 0.900

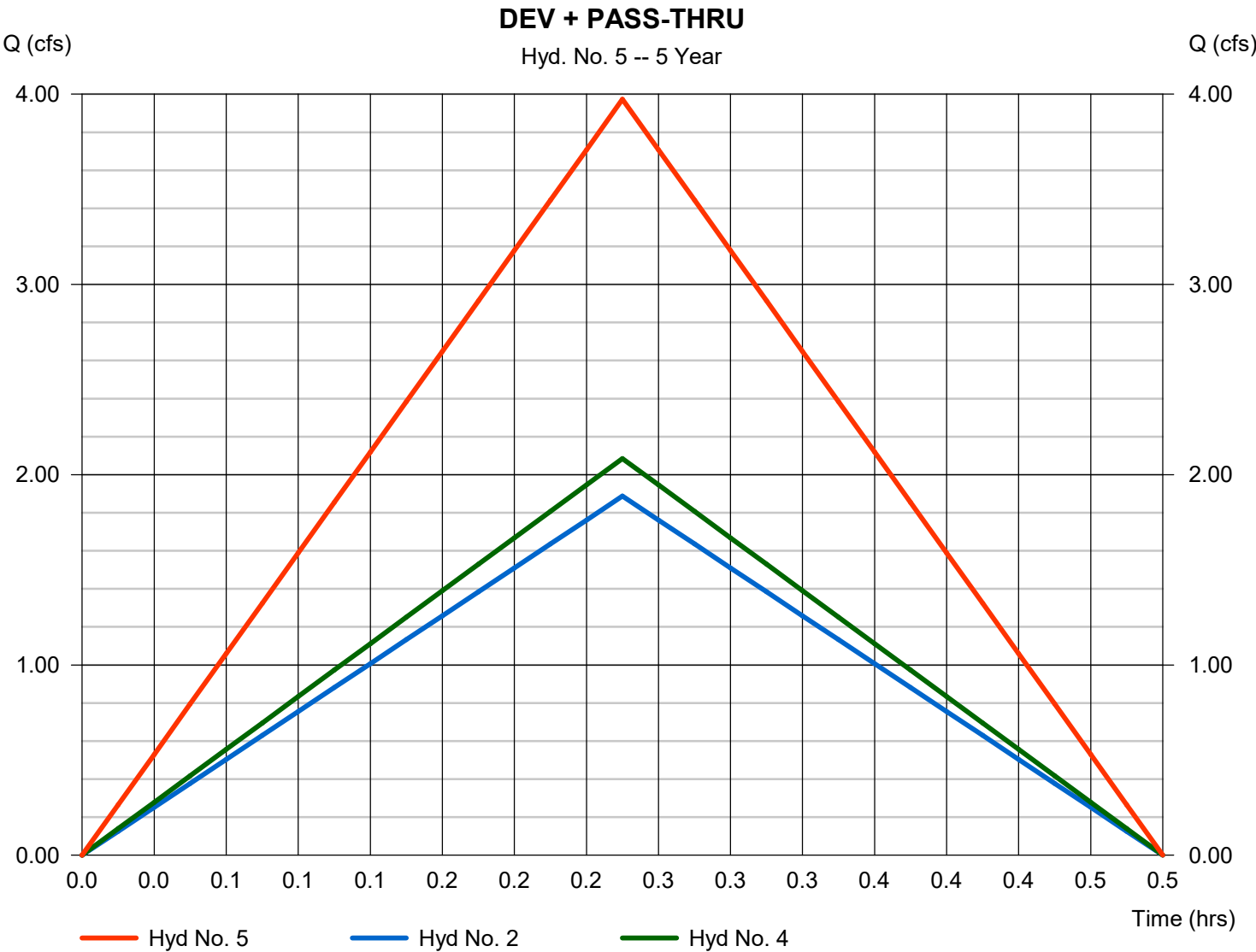


Hydrograph Report

Hyd. No. 5

DEV + PASS-THRU

Hydrograph type	= Combine	Peak discharge	= 3.973 cfs
Storm frequency	= 5 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 3,575 cuft
Inflow hyds.	= 2, 4	Contrib. drain. area	= 1.450 ac



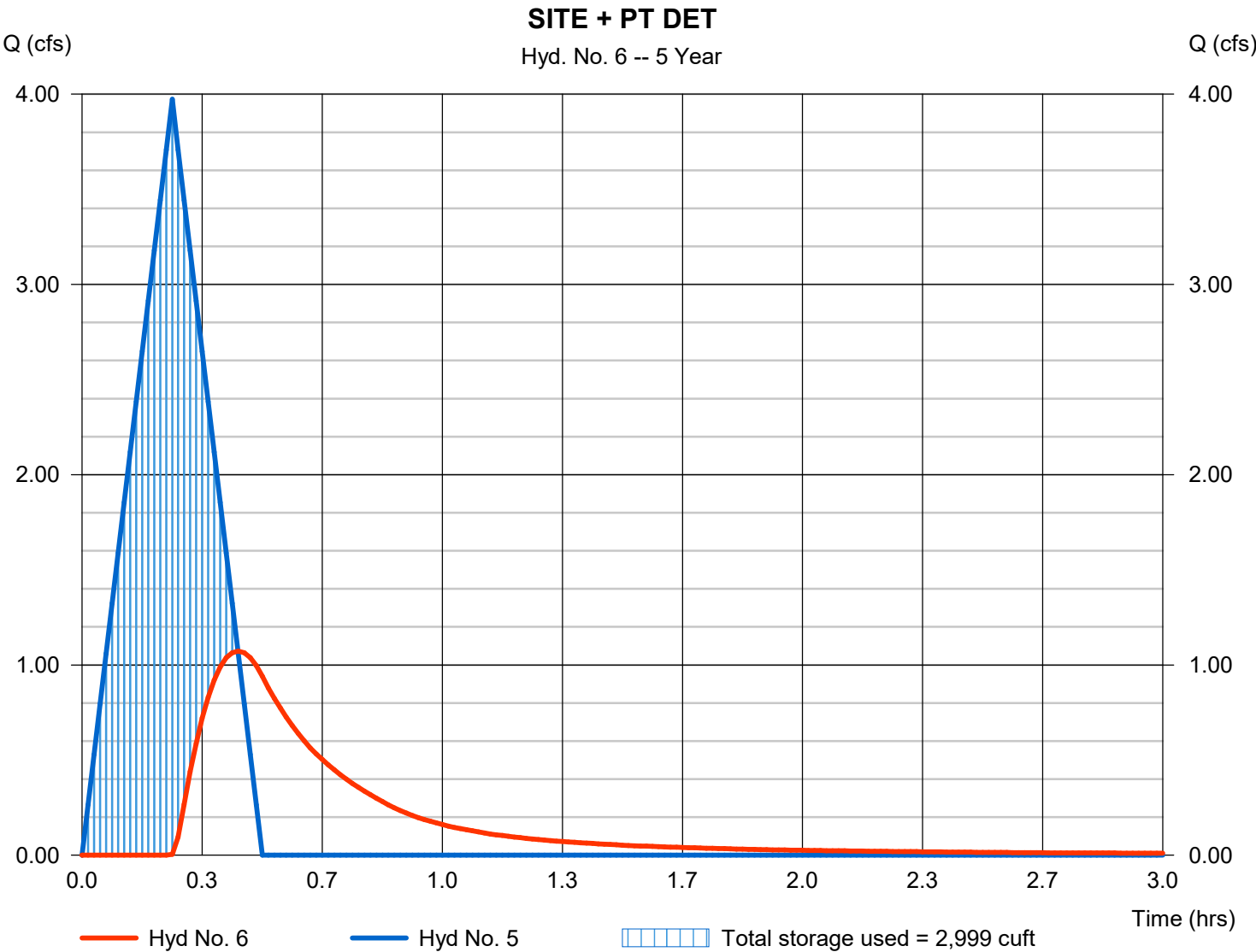
Hydrograph Report

Hyd. No. 6

SITE + PT DET

Hydrograph type	= Reservoir	Peak discharge	= 1.073 cfs
Storm frequency	= 5 yrs	Time to peak	= 0.43 hrs
Time interval	= 1 min	Hyd. volume	= 1,833 cuft
Inflow hyd. No.	= 5 - DEV + PASS-THRU	Max. Elevation	= 920.27 ft
Reservoir name	= UNDERGROUND STORAGE	Max. Storage	= 2,999 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	1.647	1	15	1,482	-----	-----	-----	Existing DA
2	Rational	2.196	1	15	1,977	-----	-----	-----	Developed DA
3	Reservoir	0.063	1	30	234	2	919.86	1,960	SITE DETENTION
4	Rational	2.426	1	15	2,183	-----	-----	-----	Offsite (Pass-Thru)
5	Combine	4.622	1	15	4,160	2, 4	-----	-----	DEV + PASS-THRU
6	Reservoir	1.447	1	25	2,418	5	920.38	3,326	SITE + PT DET
7	SCS Runoff	2.521	2	722	7,779	-----	-----	-----	DEV SITE WQ
8	Reservoir	1.550	2	730	6,037	7	920.42	3,415	WQ DET
9	SCS Runoff	2.095	2	722	5,960	-----	-----	-----	DEV SITE CP
10	Reservoir	0.865	2	734	4,218	9	920.20	2,813	CP DET
base.gpw					Return Period: 10 Year			Friday, 09 / 6 / 2024	

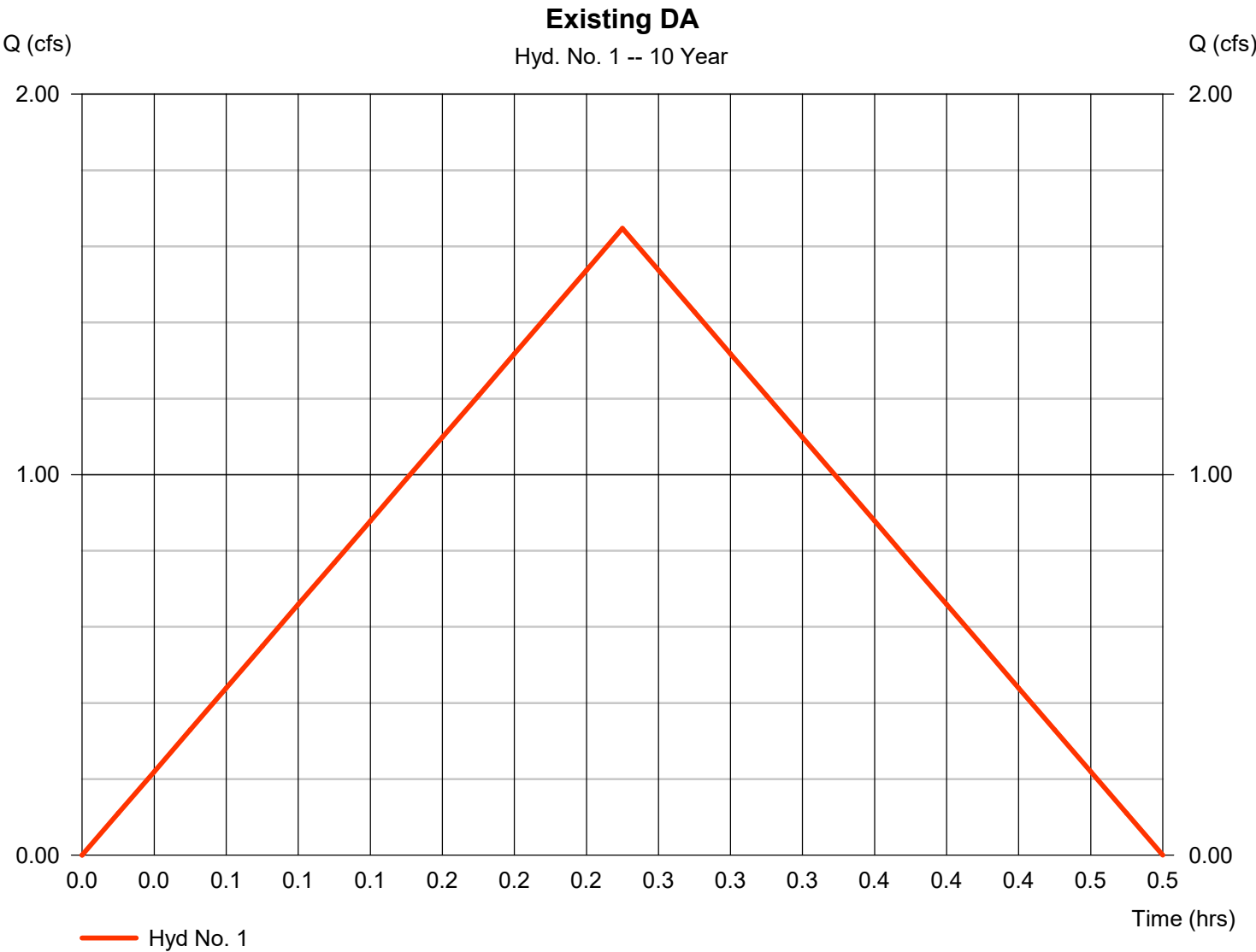
Hydrograph Report

Hyd. No. 1

Existing DA

Hydrograph type	= Rational	Peak discharge	= 1.647 cfs
Storm frequency	= 10 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 1,482 cuft
Drainage area	= 0.550 ac	Runoff coeff.	= 0.6*
Intensity	= 4.991 in/hr	Tc by User	= 15.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.330 x 0.35) + (0.220 x 0.98)] / 0.550



Hydrograph Report

Hyd. No. 2

Developed DA

Hydrograph type	= Rational	Peak discharge	= 2.196 cfs
Storm frequency	= 10 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 1,977 cuft
Drainage area	= 0.550 ac	Runoff coeff.	= 0.8*
Intensity	= 4.991 in/hr	Tc by User	= 15.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.160 x 0.35) + (0.390 x 0.98)] / 0.550



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

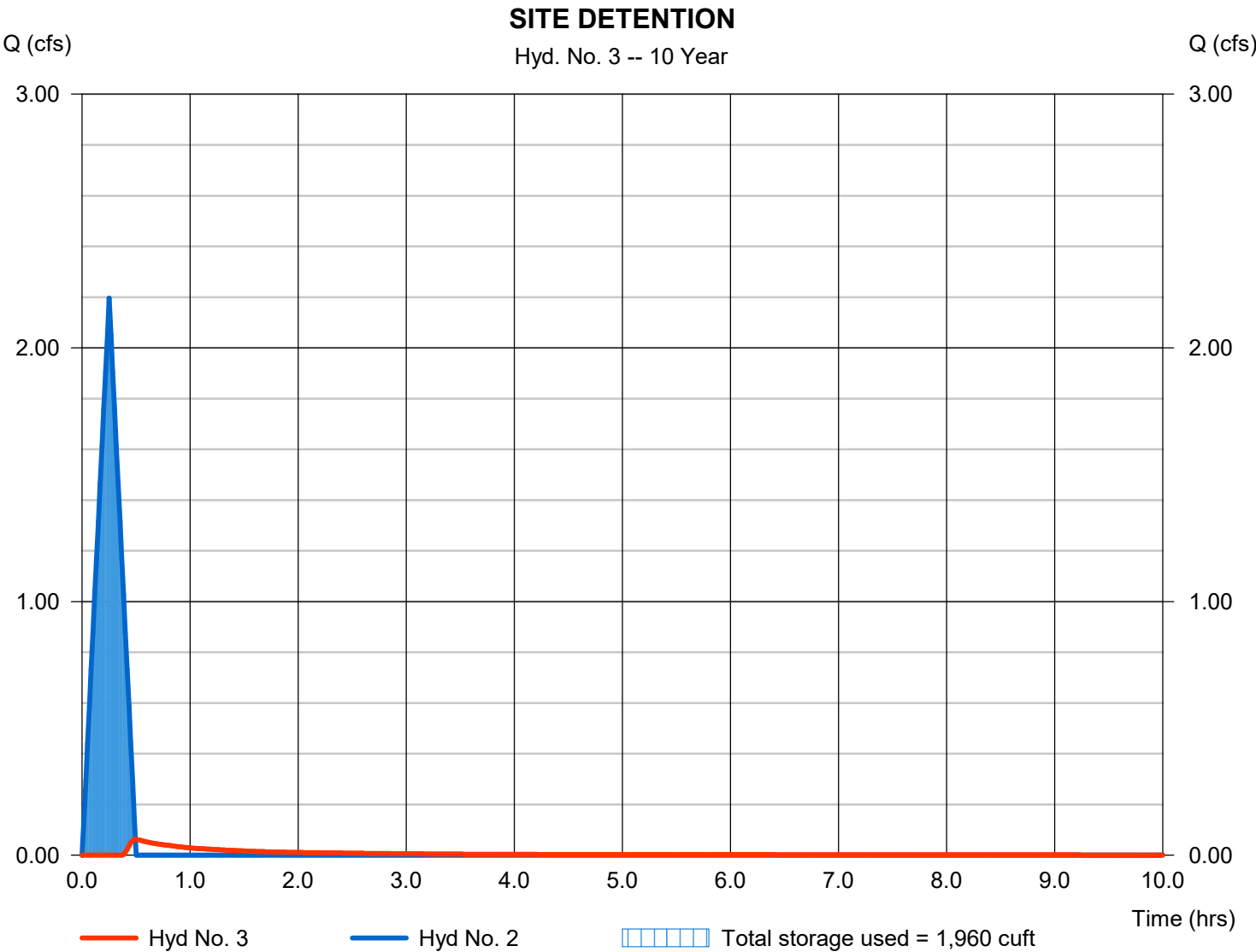
Friday, 09 / 6 / 2024

Hyd. No. 3

SITE DETENTION

Hydrograph type	= Reservoir	Peak discharge	= 0.063 cfs
Storm frequency	= 10 yrs	Time to peak	= 0.50 hrs
Time interval	= 1 min	Hyd. volume	= 234 cuft
Inflow hyd. No.	= 2 - Developed DA	Max. Elevation	= 919.86 ft
Reservoir name	= UNDERGROUND STORAGE	Max. Storage	= 1,960 cuft

Storage Indication method used.



Hydrograph Report

Hyd. No. 4

Offsite (Pass-Thru)

Hydrograph type	= Rational	Peak discharge	= 2.426 cfs
Storm frequency	= 10 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 2,183 cuft
Drainage area	= 0.900 ac	Runoff coeff.	= 0.54*
Intensity	= 4.991 in/hr	Tc by User	= 15.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.630 x 0.35) + (0.270 x 0.98)] / 0.900



Hydrograph Report

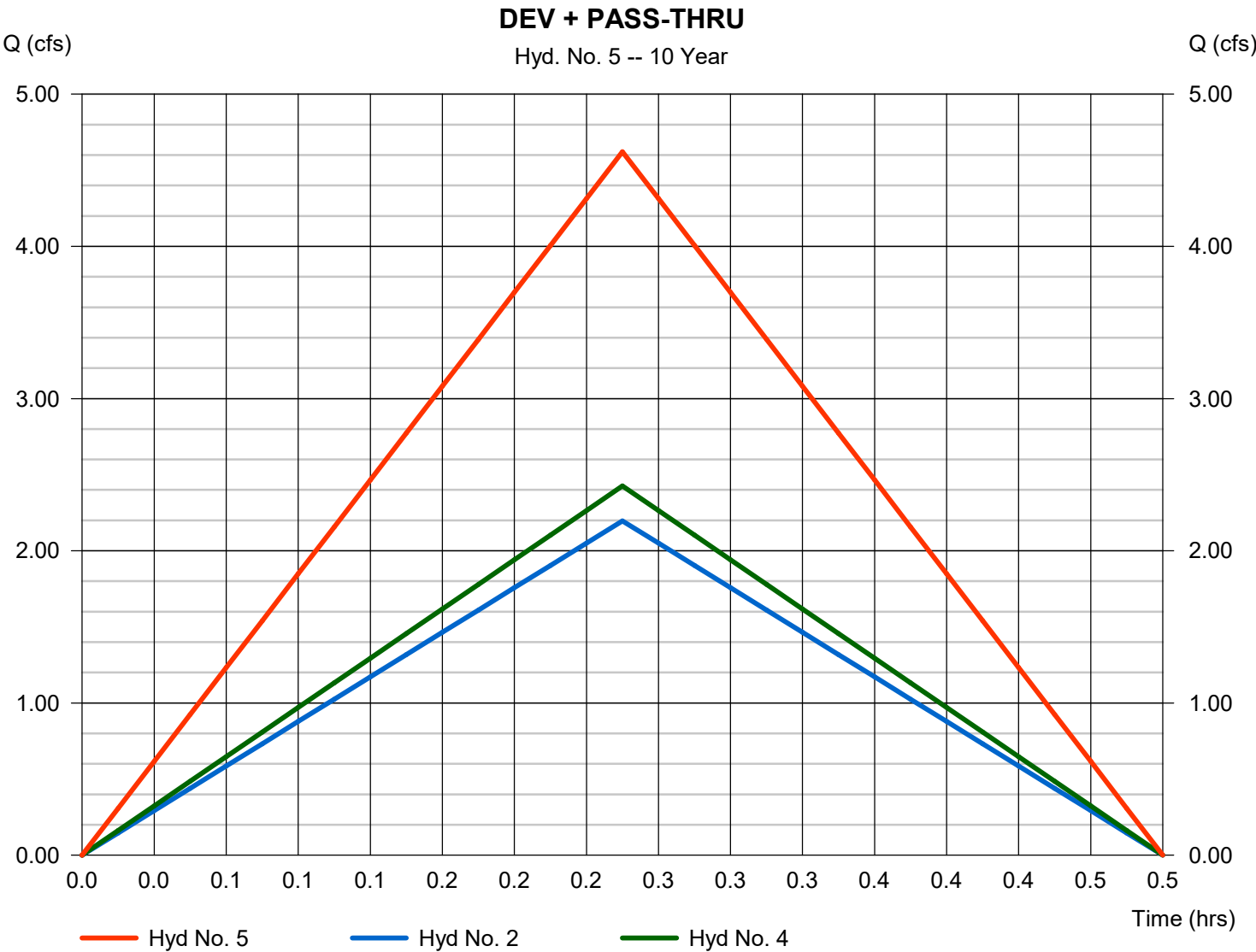
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Friday, 09 / 6 / 2024

Hyd. No. 5

DEV + PASS-THRU

Hydrograph type	= Combine	Peak discharge	= 4.622 cfs
Storm frequency	= 10 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 4,160 cuft
Inflow hyds.	= 2, 4	Contrib. drain. area	= 1.450 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

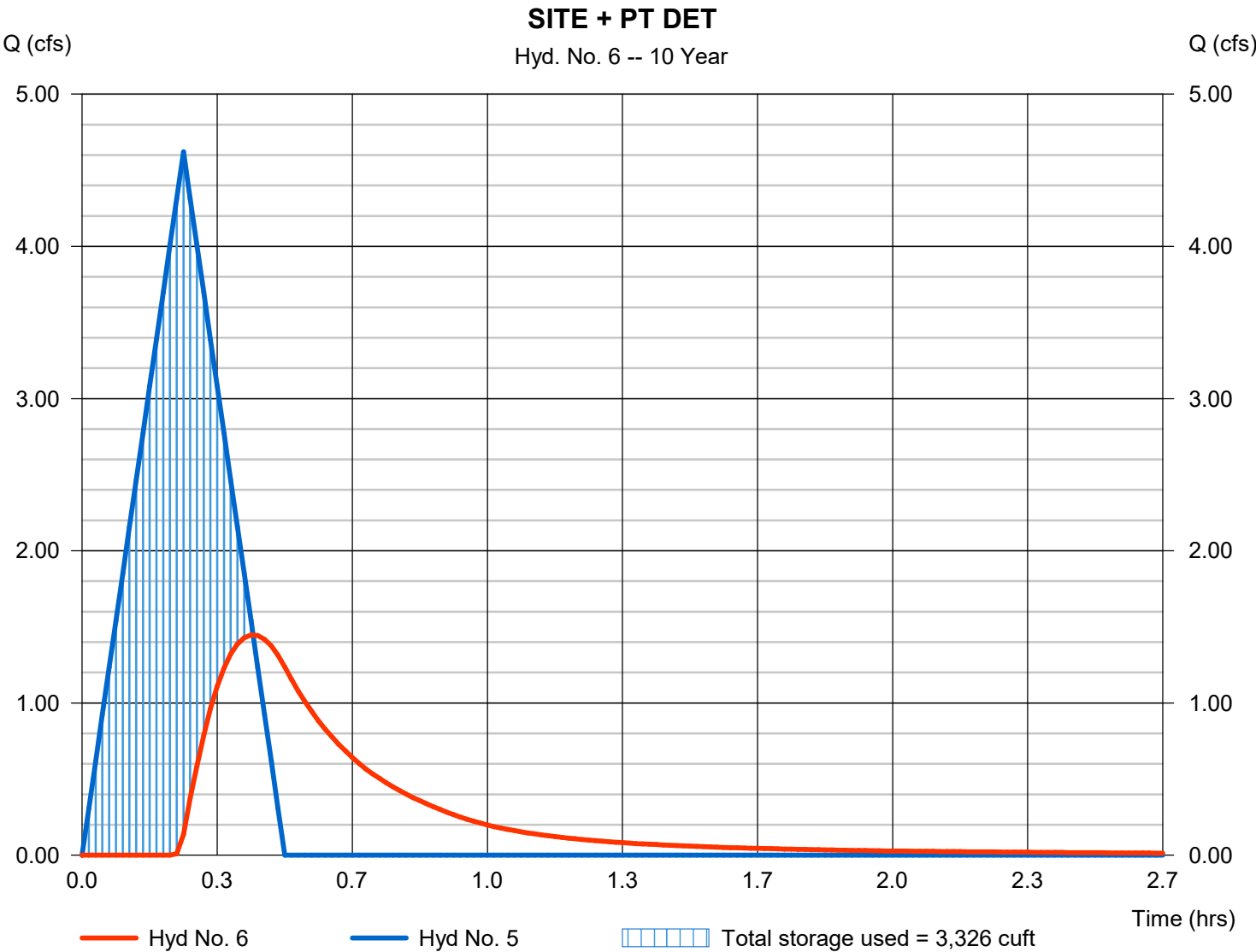
Friday, 09 / 6 / 2024

Hyd. No. 6

SITE + PT DET

Hydrograph type	= Reservoir	Peak discharge	= 1.447 cfs
Storm frequency	= 10 yrs	Time to peak	= 0.42 hrs
Time interval	= 1 min	Hyd. volume	= 2,418 cuft
Inflow hyd. No.	= 5 - DEV + PASS-THRU	Max. Elevation	= 920.38 ft
Reservoir name	= UNDERGROUND STORAGE	Max. Storage	= 3,326 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	1.981	1	15	1,783	-----	-----	-----	Existing DA
2	Rational	2.642	1	15	2,378	-----	-----	-----	Developed DA
3	Reservoir	0.312	1	28	636	2	920.01	2,264	SITE DETENTION
4	Rational	2.918	1	15	2,626	-----	-----	-----	Offsite (Pass-Thru)
5	Combine	5.560	1	15	5,004	2, 4	-----	-----	DEV + PASS-THRU
6	Reservoir	1.971	1	25	3,262	5	920.55	3,786	SITE + PT DET
7	SCS Runoff	3.101	2	722	9,675	-----	-----	-----	DEV SITE WQ
8	Reservoir	2.012	2	730	7,933	7	920.56	3,823	WQ DET
9	SCS Runoff	2.696	2	722	7,754	-----	-----	-----	DEV SITE CP
10	Reservoir	1.451	2	732	6,012	9	920.39	3,329	CP DET
base.gpw					Return Period: 25 Year			Friday, 09 / 6 / 2024	

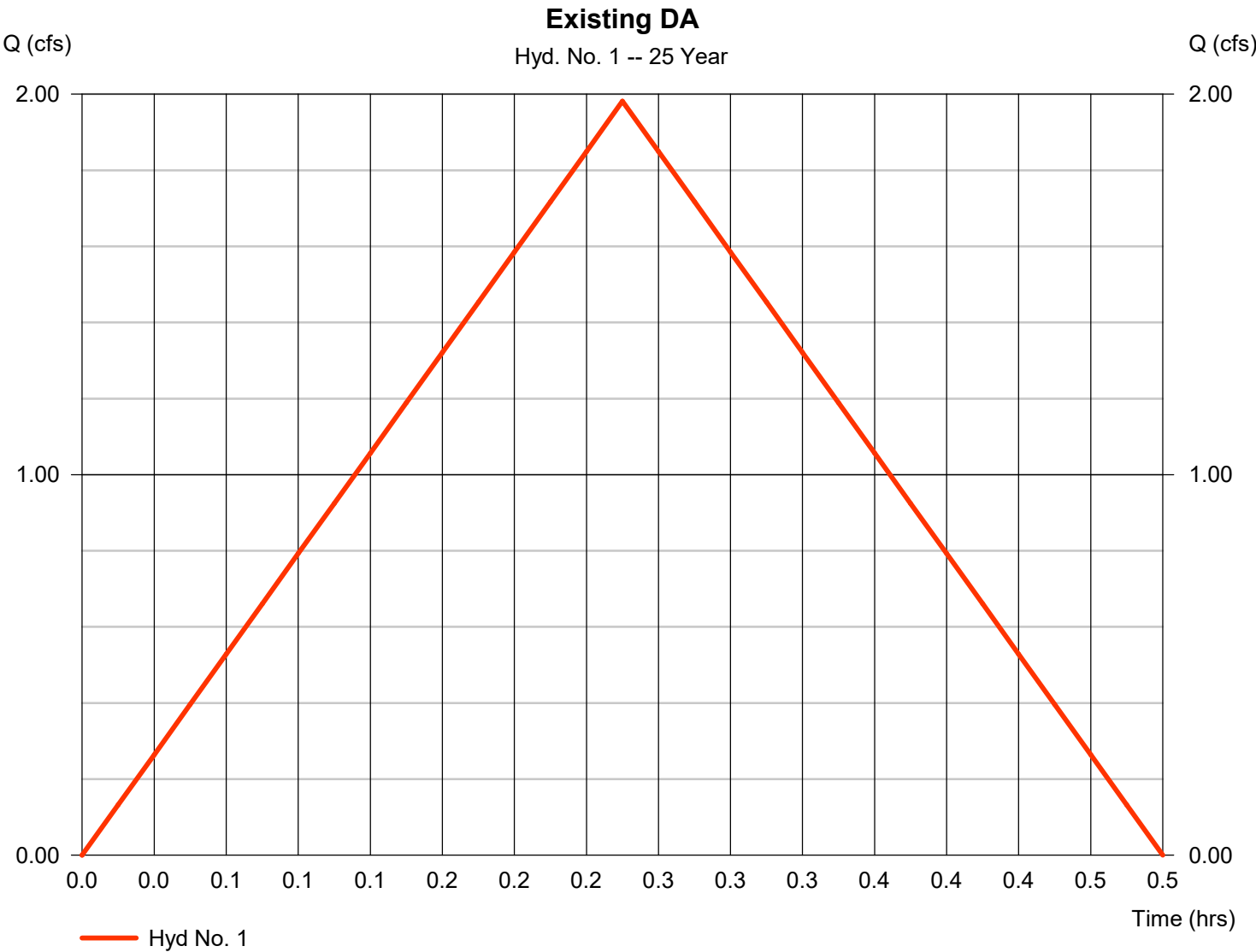
Hydrograph Report

Hyd. No. 1

Existing DA

Hydrograph type	= Rational	Peak discharge	= 1.981 cfs
Storm frequency	= 25 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 1,783 cuft
Drainage area	= 0.550 ac	Runoff coeff.	= 0.6*
Intensity	= 6.004 in/hr	Tc by User	= 15.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.330 x 0.35) + (0.220 x 0.98)] / 0.550



Hydrograph Report

Hyd. No. 2

Developed DA

Hydrograph type	= Rational	Peak discharge	= 2.642 cfs
Storm frequency	= 25 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 2,378 cuft
Drainage area	= 0.550 ac	Runoff coeff.	= 0.8*
Intensity	= 6.004 in/hr	Tc by User	= 15.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.160 x 0.35) + (0.390 x 0.98)] / 0.550



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

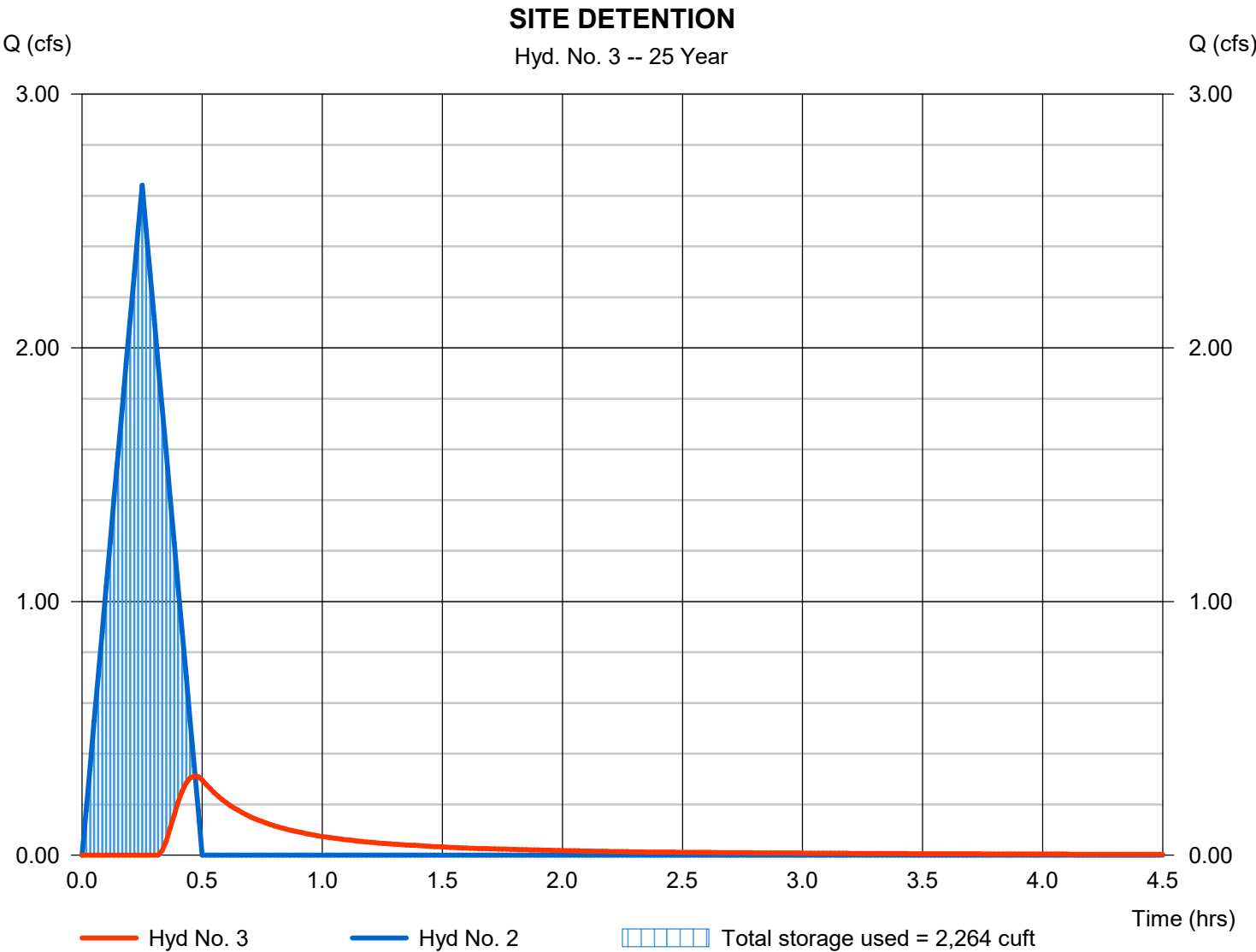
Friday, 09 / 6 / 2024

Hyd. No. 3

SITE DETENTION

Hydrograph type	= Reservoir	Peak discharge	= 0.312 cfs
Storm frequency	= 25 yrs	Time to peak	= 0.47 hrs
Time interval	= 1 min	Hyd. volume	= 636 cuft
Inflow hyd. No.	= 2 - Developed DA	Max. Elevation	= 920.01 ft
Reservoir name	= UNDERGROUND STORAGE	Max. Storage	= 2,264 cuft

Storage Indication method used.



Hydrograph Report

Hyd. No. 4

Offsite (Pass-Thru)

Hydrograph type	= Rational	Peak discharge	= 2.918 cfs
Storm frequency	= 25 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 2,626 cuft
Drainage area	= 0.900 ac	Runoff coeff.	= 0.54*
Intensity	= 6.004 in/hr	Tc by User	= 15.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.630 x 0.35) + (0.270 x 0.98)] / 0.900

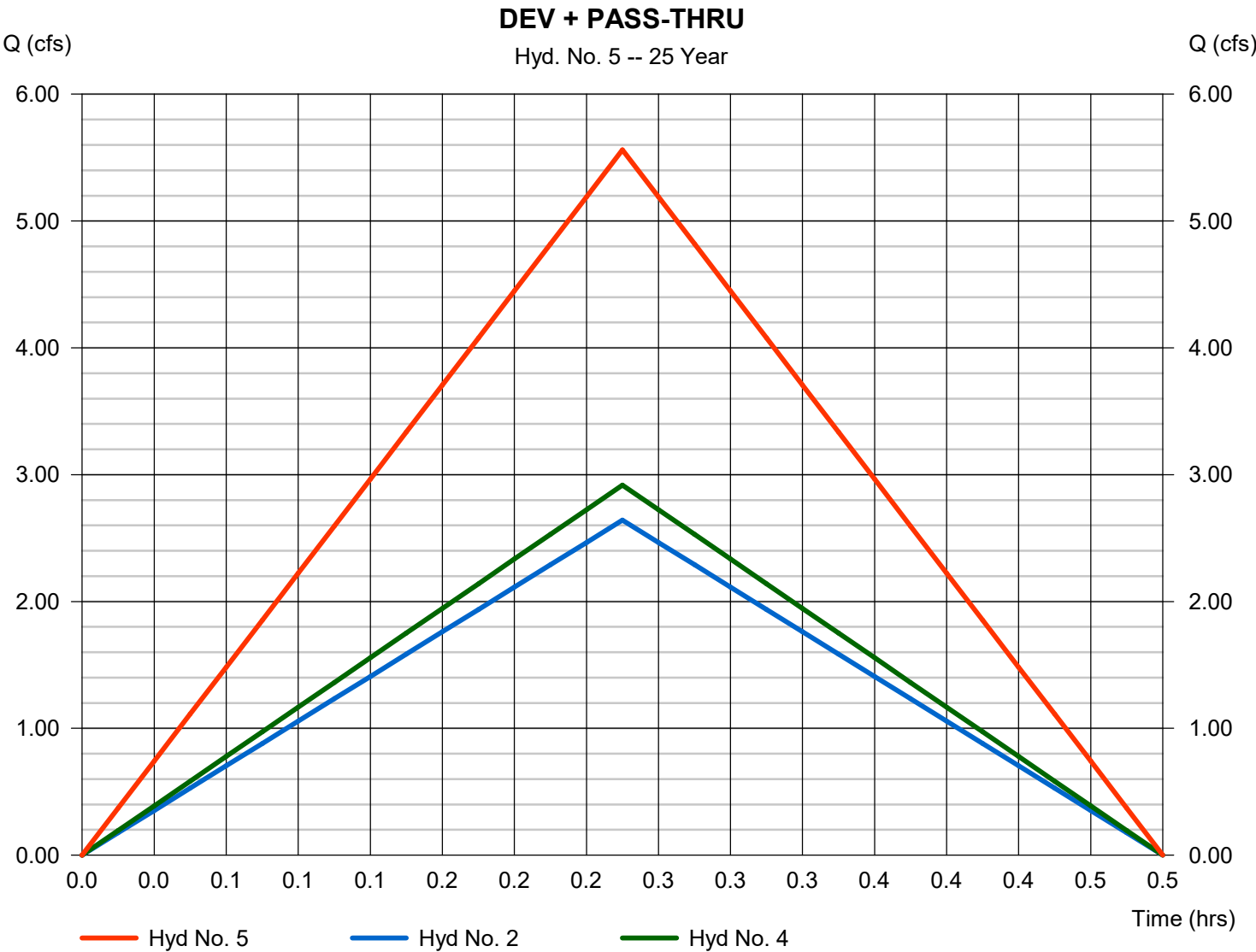


Hydrograph Report

Hyd. No. 5

DEV + PASS-THRU

Hydrograph type	= Combine	Peak discharge	= 5.560 cfs
Storm frequency	= 25 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 5,004 cuft
Inflow hyds.	= 2, 4	Contrib. drain. area	= 1.450 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

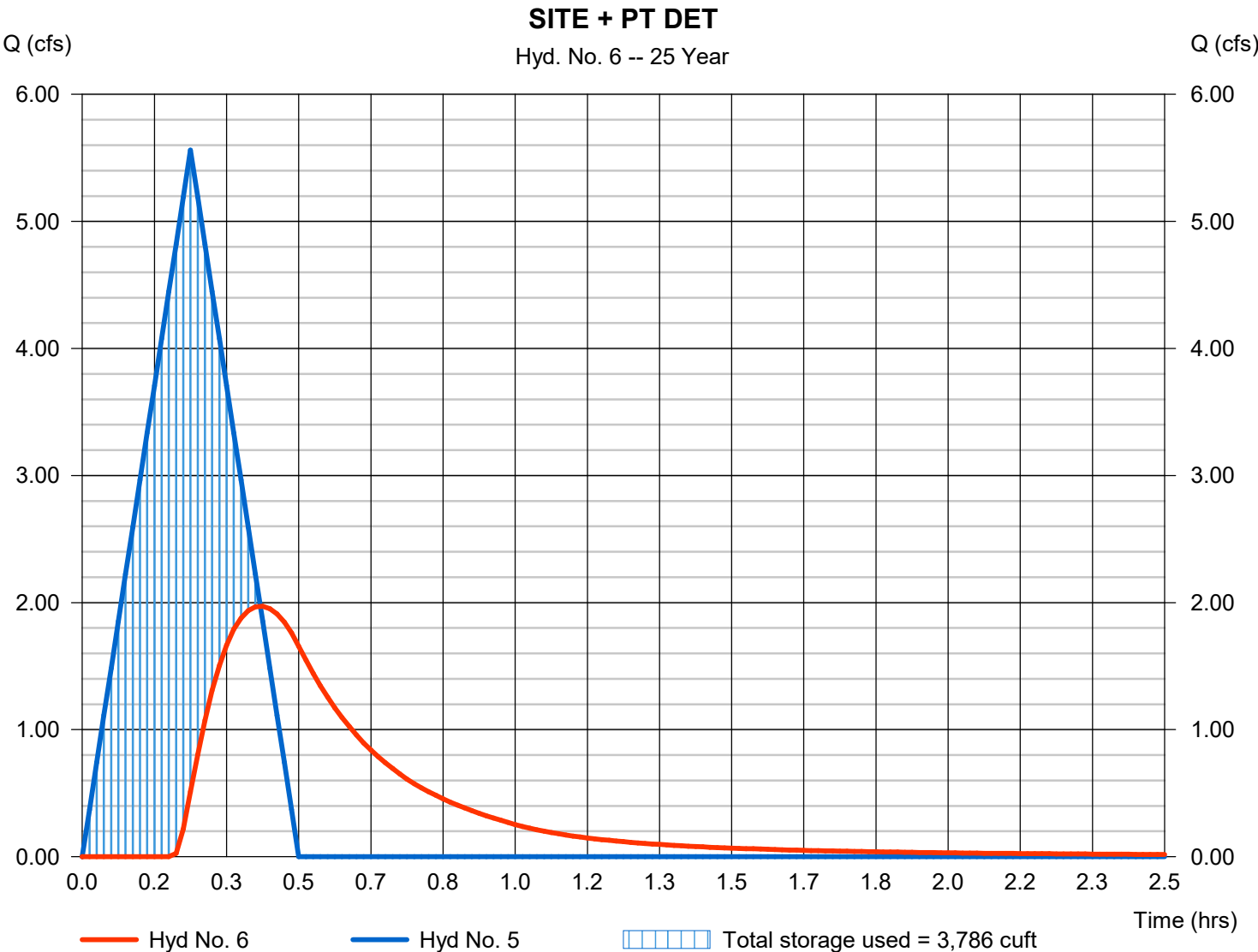
Friday, 09 / 6 / 2024

Hyd. No. 6

SITE + PT DET

Hydrograph type	= Reservoir	Peak discharge	= 1.971 cfs
Storm frequency	= 25 yrs	Time to peak	= 0.42 hrs
Time interval	= 1 min	Hyd. volume	= 3,262 cuft
Inflow hyd. No.	= 5 - DEV + PASS-THRU	Max. Elevation	= 920.55 ft
Reservoir name	= UNDERGROUND STORAGE	Max. Storage	= 3,786 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	2.244	1	15	2,019	-----	-----	-----	Existing DA
2	Rational	2.992	1	15	2,692	-----	-----	-----	Developed DA
3	Reservoir	0.508	1	27	950	2	920.08	2,469	SITE DETENTION
4	Rational	3.304	1	15	2,974	-----	-----	-----	Offsite (Pass-Thru)
5	Combine	6.296	1	15	5,666	2, 4	-----	-----	DEV + PASS-THRU
6	Reservoir	2.349	1	24	3,924	5	920.68	4,147	SITE + PT DET
7	SCS Runoff	3.584	2	722	11,264	-----	-----	-----	DEV SITE WQ
8	Reservoir	2.331	2	730	9,521	7	920.67	4,128	WQ DET
9	SCS Runoff	3.198	2	722	9,278	-----	-----	-----	DEV SITE CP
10	Reservoir	1.905	2	730	7,536	9	920.53	3,725	CP DET
base.gpw					Return Period: 50 Year			Friday, 09 / 6 / 2024	

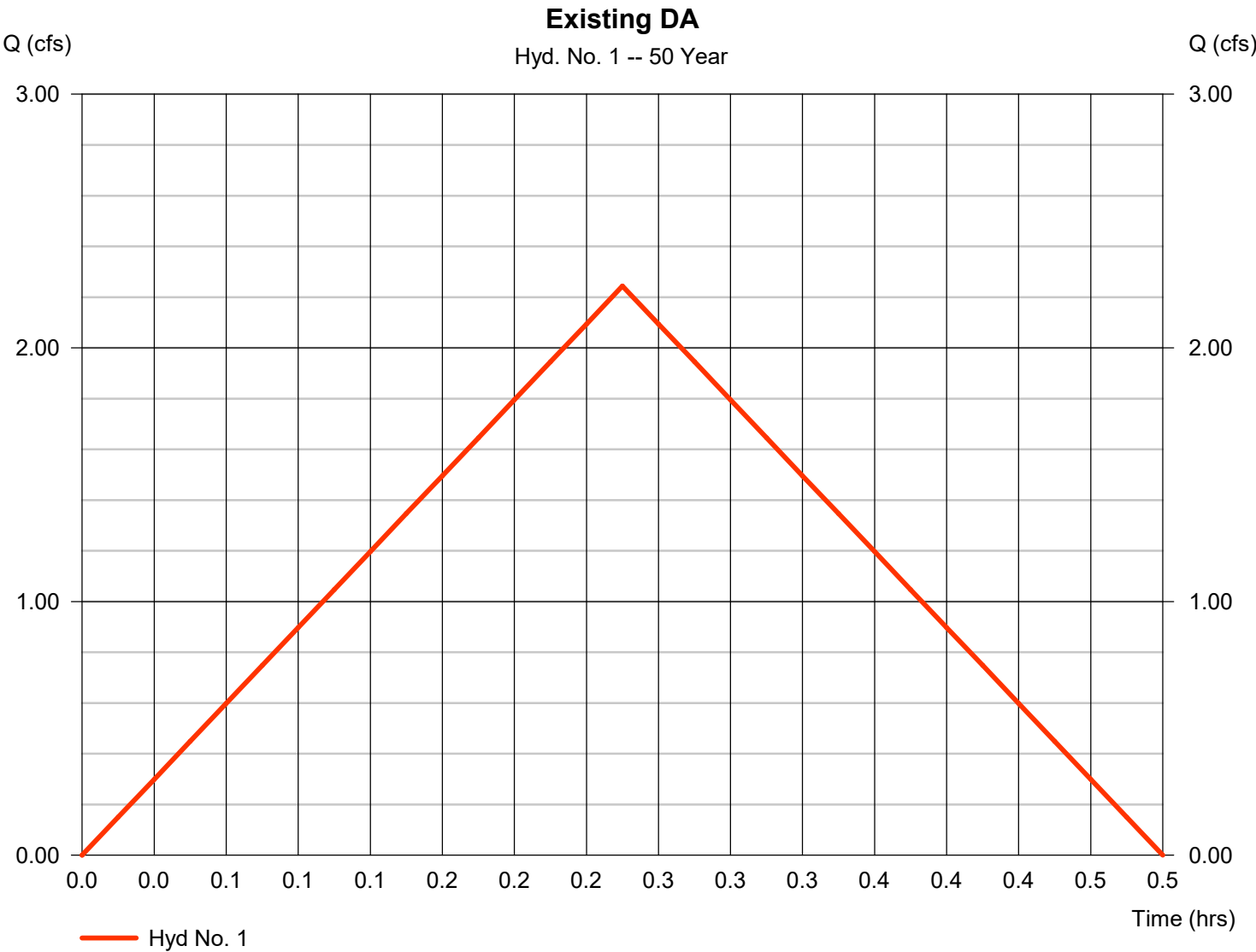
Hydrograph Report

Hyd. No. 1

Existing DA

Hydrograph type	= Rational	Peak discharge	= 2.244 cfs
Storm frequency	= 50 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 2,019 cuft
Drainage area	= 0.550 ac	Runoff coeff.	= 0.6*
Intensity	= 6.799 in/hr	Tc by User	= 15.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.330 x 0.35) + (0.220 x 0.98)] / 0.550



Hydrograph Report

Hyd. No. 2

Developed DA

Hydrograph type	= Rational	Peak discharge	= 2.992 cfs
Storm frequency	= 50 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 2,692 cuft
Drainage area	= 0.550 ac	Runoff coeff.	= 0.8*
Intensity	= 6.799 in/hr	Tc by User	= 15.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.160 x 0.35) + (0.390 x 0.98)] / 0.550



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

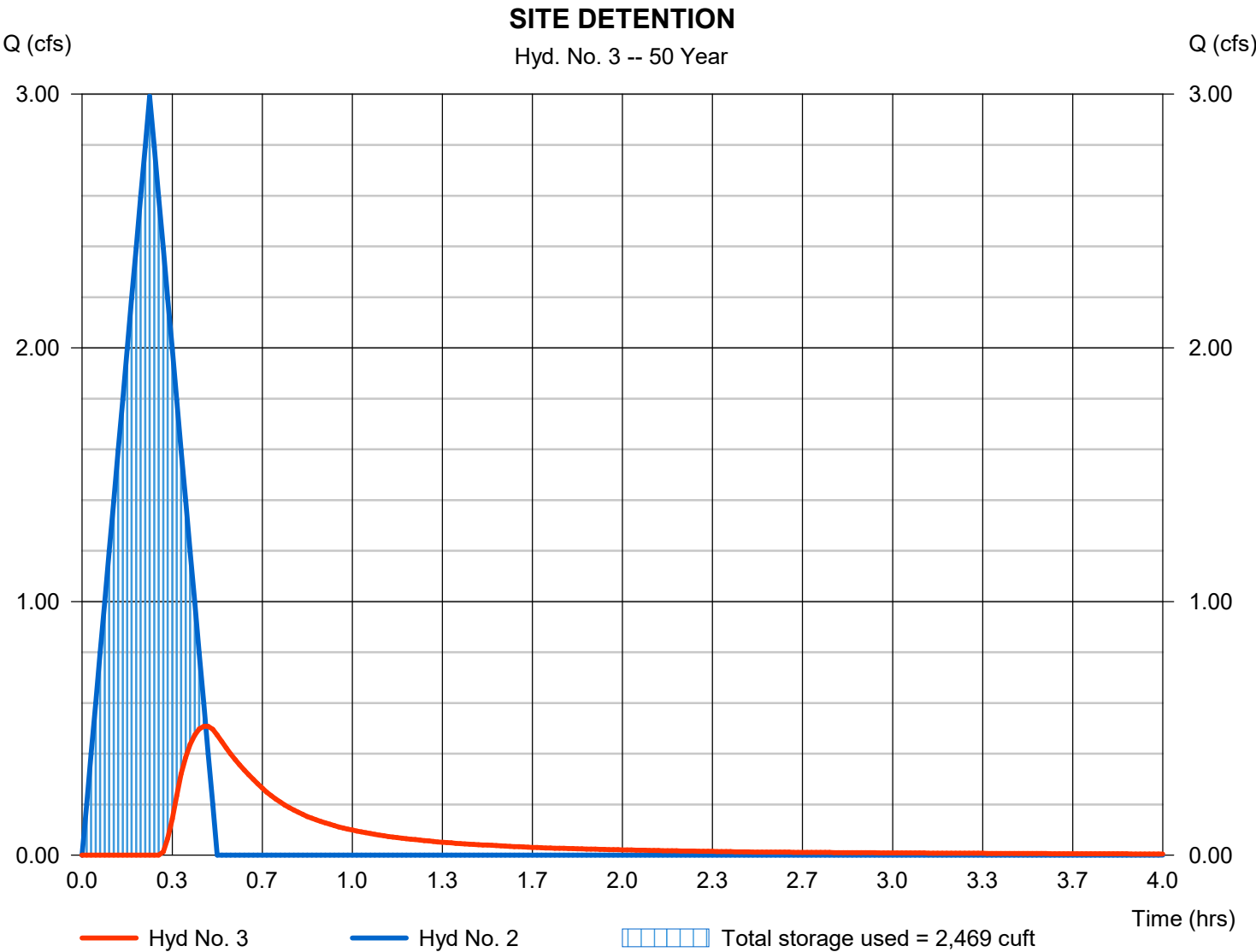
Friday, 09 / 6 / 2024

Hyd. No. 3

SITE DETENTION

Hydrograph type	= Reservoir	Peak discharge	= 0.508 cfs
Storm frequency	= 50 yrs	Time to peak	= 0.45 hrs
Time interval	= 1 min	Hyd. volume	= 950 cuft
Inflow hyd. No.	= 2 - Developed DA	Max. Elevation	= 920.08 ft
Reservoir name	= UNDERGROUND STORAGE	Max. Storage	= 2,469 cuft

Storage Indication method used.



Hydrograph Report

Hyd. No. 4

Offsite (Pass-Thru)

Hydrograph type	= Rational	Peak discharge	= 3.304 cfs
Storm frequency	= 50 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 2,974 cuft
Drainage area	= 0.900 ac	Runoff coeff.	= 0.54*
Intensity	= 6.799 in/hr	Tc by User	= 15.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.630 x 0.35) + (0.270 x 0.98)] / 0.900



Hydrograph Report

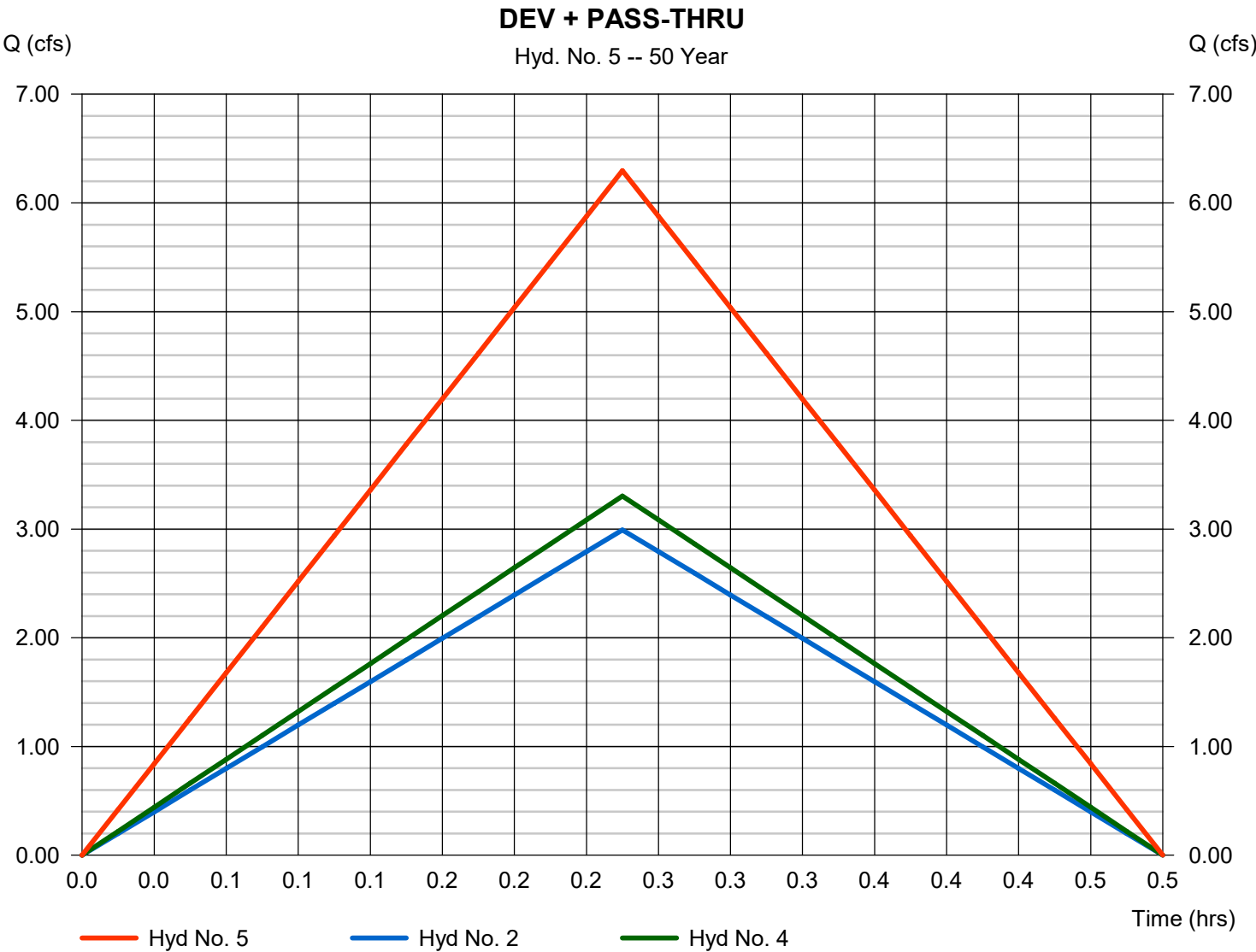
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Friday, 09 / 6 / 2024

Hyd. No. 5

DEV + PASS-THRU

Hydrograph type	= Combine	Peak discharge	= 6.296 cfs
Storm frequency	= 50 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 5,666 cuft
Inflow hyds.	= 2, 4	Contrib. drain. area	= 1.450 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

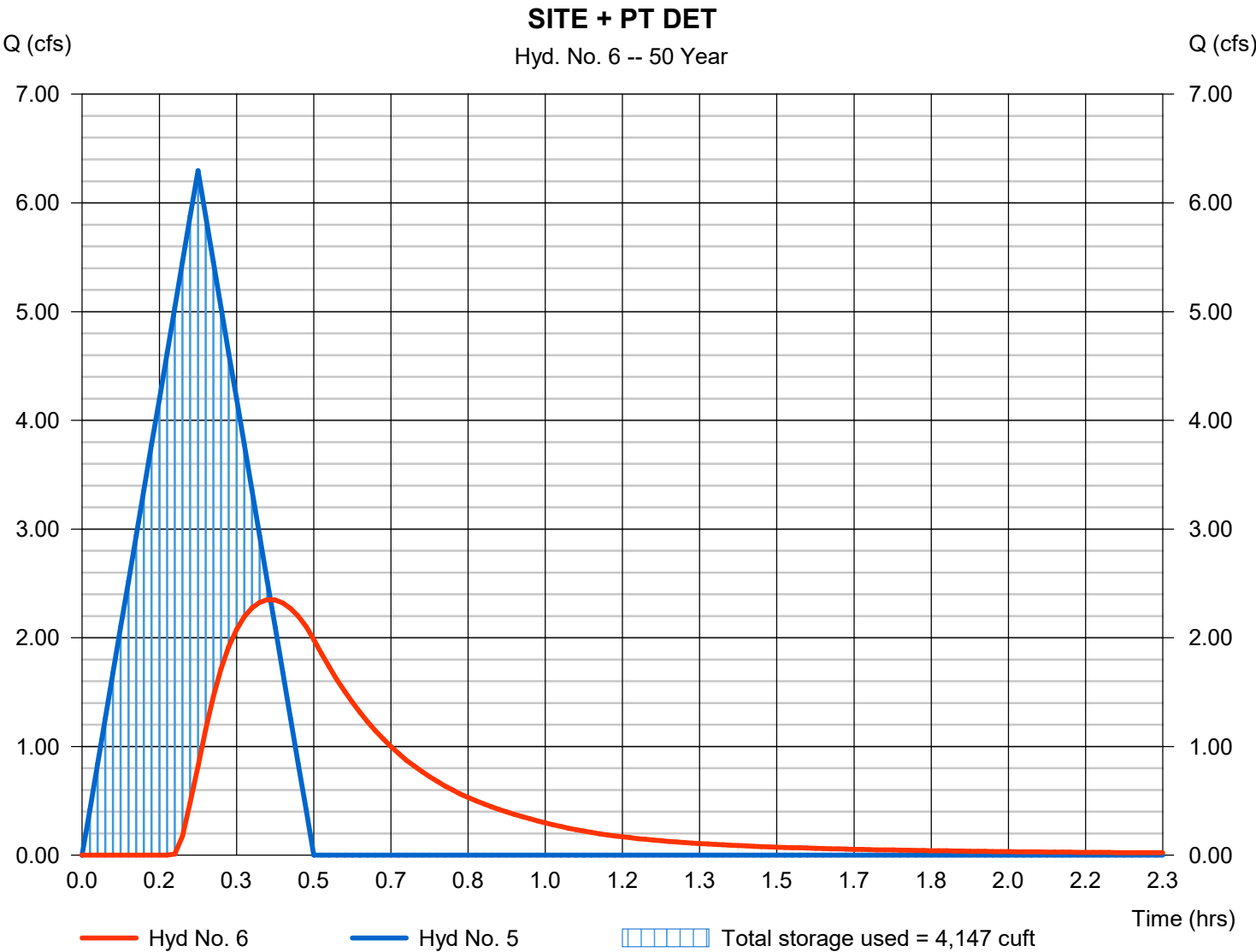
Friday, 09 / 6 / 2024

Hyd. No. 6

SITE + PT DET

Hydrograph type	= Reservoir	Peak discharge	= 2.349 cfs
Storm frequency	= 50 yrs	Time to peak	= 0.40 hrs
Time interval	= 1 min	Hyd. volume	= 3,924 cuft
Inflow hyd. No.	= 5 - DEV + PASS-THRU	Max. Elevation	= 920.68 ft
Reservoir name	= UNDERGROUND STORAGE	Max. Storage	= 4,147 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	2.513	1	15	2,262	-----	-----	-----	Existing DA
2	Rational	3.351	1	15	3,016	-----	-----	-----	Developed DA
3	Reservoir	0.715	1	27	1,274	2	920.15	2,671	SITE DETENTION
4	Rational	3.701	1	15	3,331	-----	-----	-----	Offsite (Pass-Thru)
5	Combine	7.052	1	15	6,347	2, 4	-----	-----	DEV + PASS-THRU
6	Reservoir	2.681	1	24	4,605	5	920.81	4,530	SITE + PT DET
7	SCS Runoff	4.089	2	722	12,932	-----	-----	-----	DEV SITE WQ
8	Reservoir	2.621	2	730	11,190	7	920.79	4,449	WQ DET
9	SCS Runoff	3.723	2	722	10,892	-----	-----	-----	DEV SITE CP
10	Reservoir	2.322	2	730	9,150	9	920.67	4,120	CP DET
base.gpw					Return Period: 100 Year			Friday, 09 / 6 / 2024	

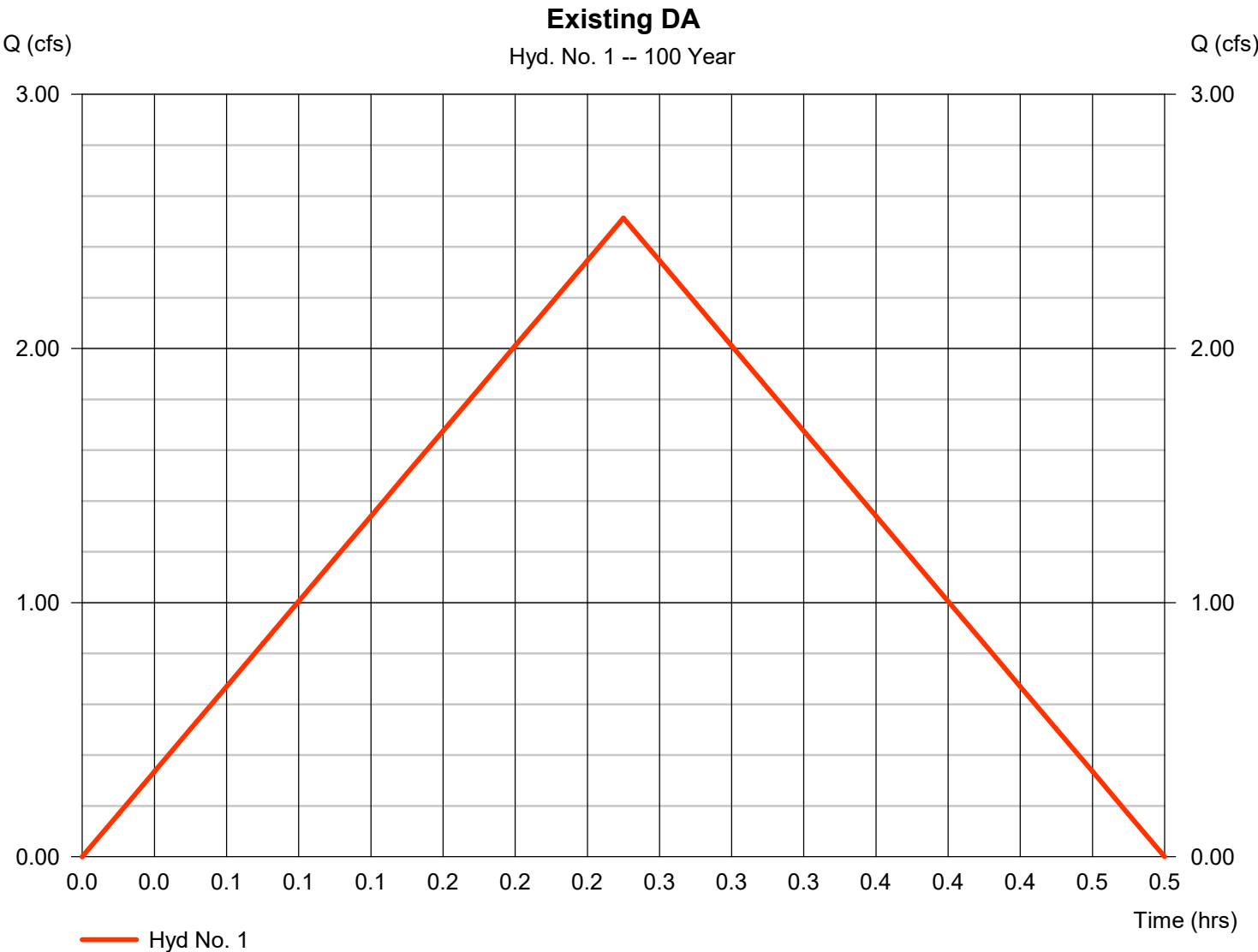
Hydrograph Report

Hyd. No. 1

Existing DA

Hydrograph type	= Rational	Peak discharge	= 2.513 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 2,262 cuft
Drainage area	= 0.550 ac	Runoff coeff.	= 0.6*
Intensity	= 7.616 in/hr	Tc by User	= 15.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.330 x 0.35) + (0.220 x 0.98)] / 0.550



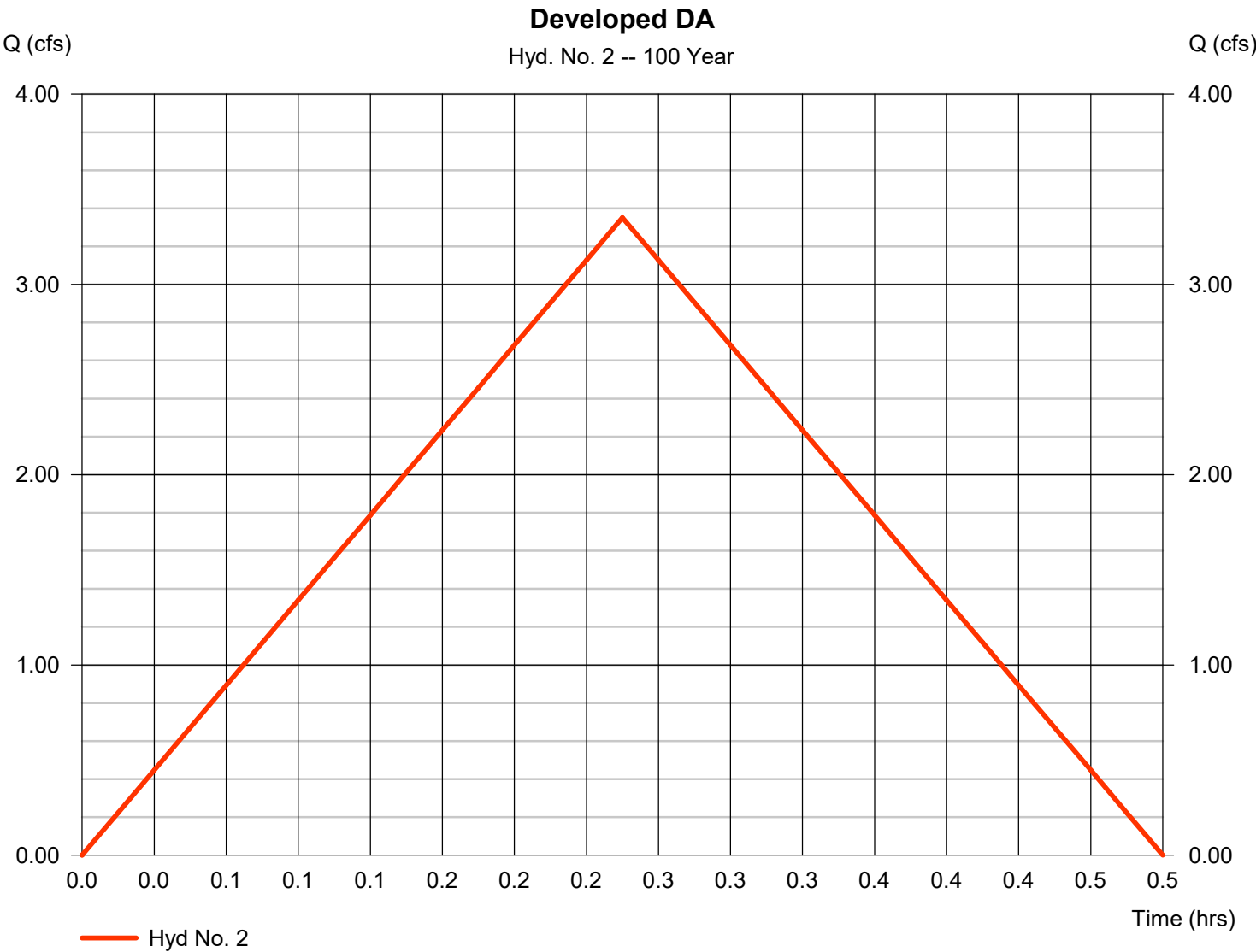
Hydrograph Report

Hyd. No. 2

Developed DA

Hydrograph type	= Rational	Peak discharge	= 3.351 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 3,016 cuft
Drainage area	= 0.550 ac	Runoff coeff.	= 0.8*
Intensity	= 7.616 in/hr	Tc by User	= 15.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.160 x 0.35) + (0.390 x 0.98)] / 0.550



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

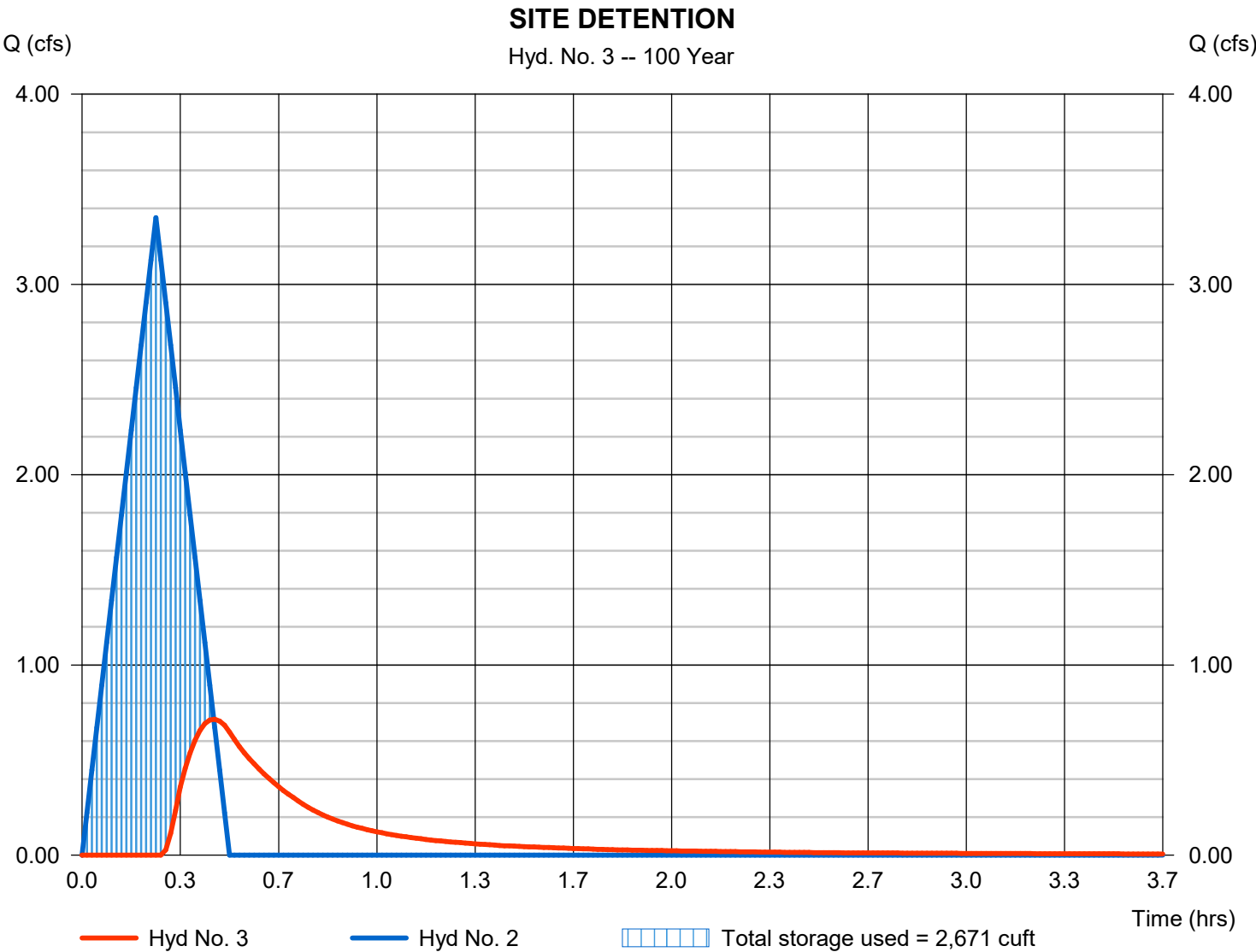
Friday, 09 / 6 / 2024

Hyd. No. 3

SITE DETENTION

Hydrograph type	= Reservoir	Peak discharge	= 0.715 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.45 hrs
Time interval	= 1 min	Hyd. volume	= 1,274 cuft
Inflow hyd. No.	= 2 - Developed DA	Max. Elevation	= 920.15 ft
Reservoir name	= UNDERGROUND STORAGE	Max. Storage	= 2,671 cuft

Storage Indication method used.



Hydrograph Report

Hyd. No. 4

Offsite (Pass-Thru)

Hydrograph type	= Rational	Peak discharge	= 3.701 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 3,331 cuft
Drainage area	= 0.900 ac	Runoff coeff.	= 0.54*
Intensity	= 7.616 in/hr	Tc by User	= 15.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.630 x 0.35) + (0.270 x 0.98)] / 0.900



Hydrograph Report

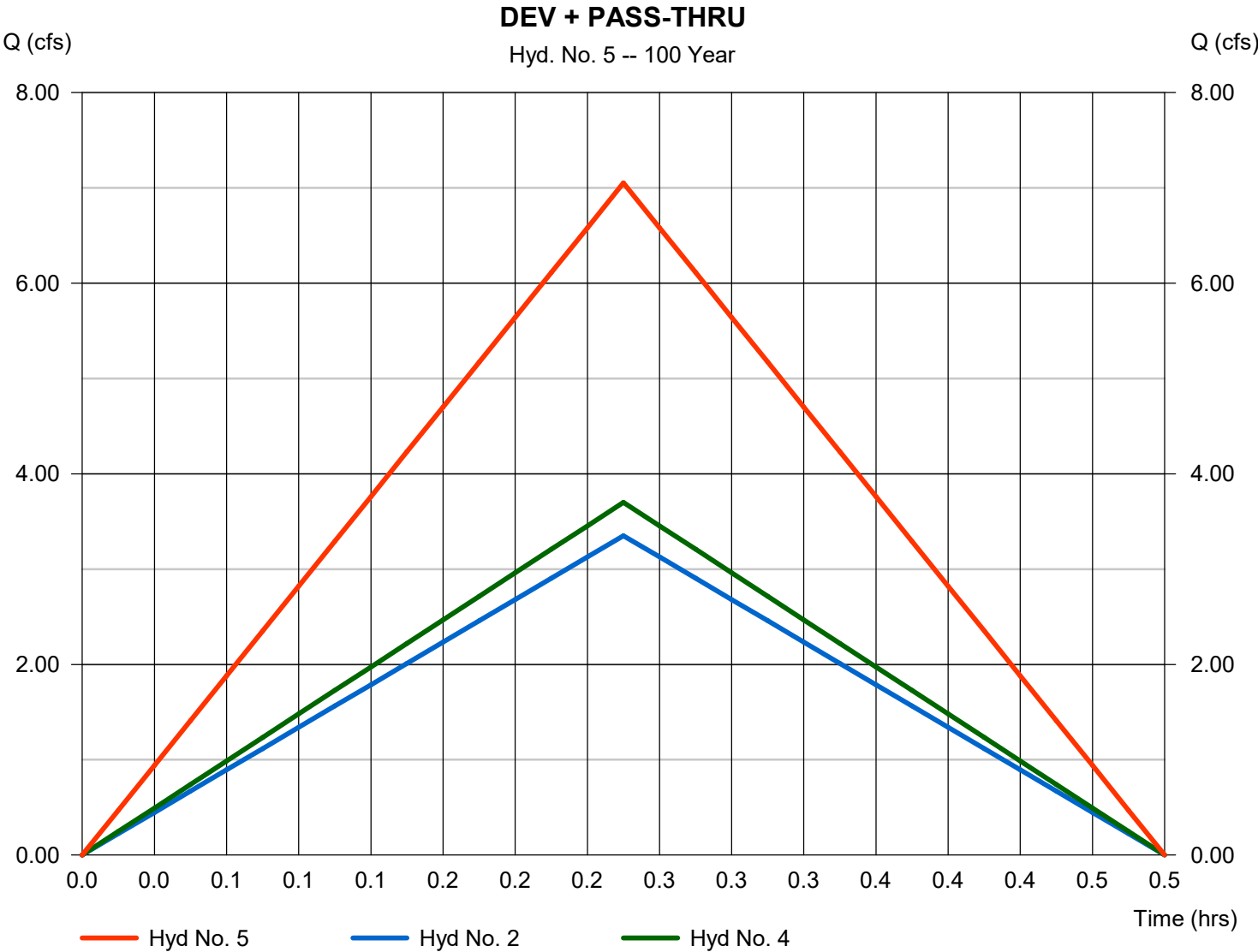
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Friday, 09 / 6 / 2024

Hyd. No. 5

DEV + PASS-THRU

Hydrograph type	= Combine	Peak discharge	= 7.052 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 6,347 cuft
Inflow hyds.	= 2, 4	Contrib. drain. area	= 1.450 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

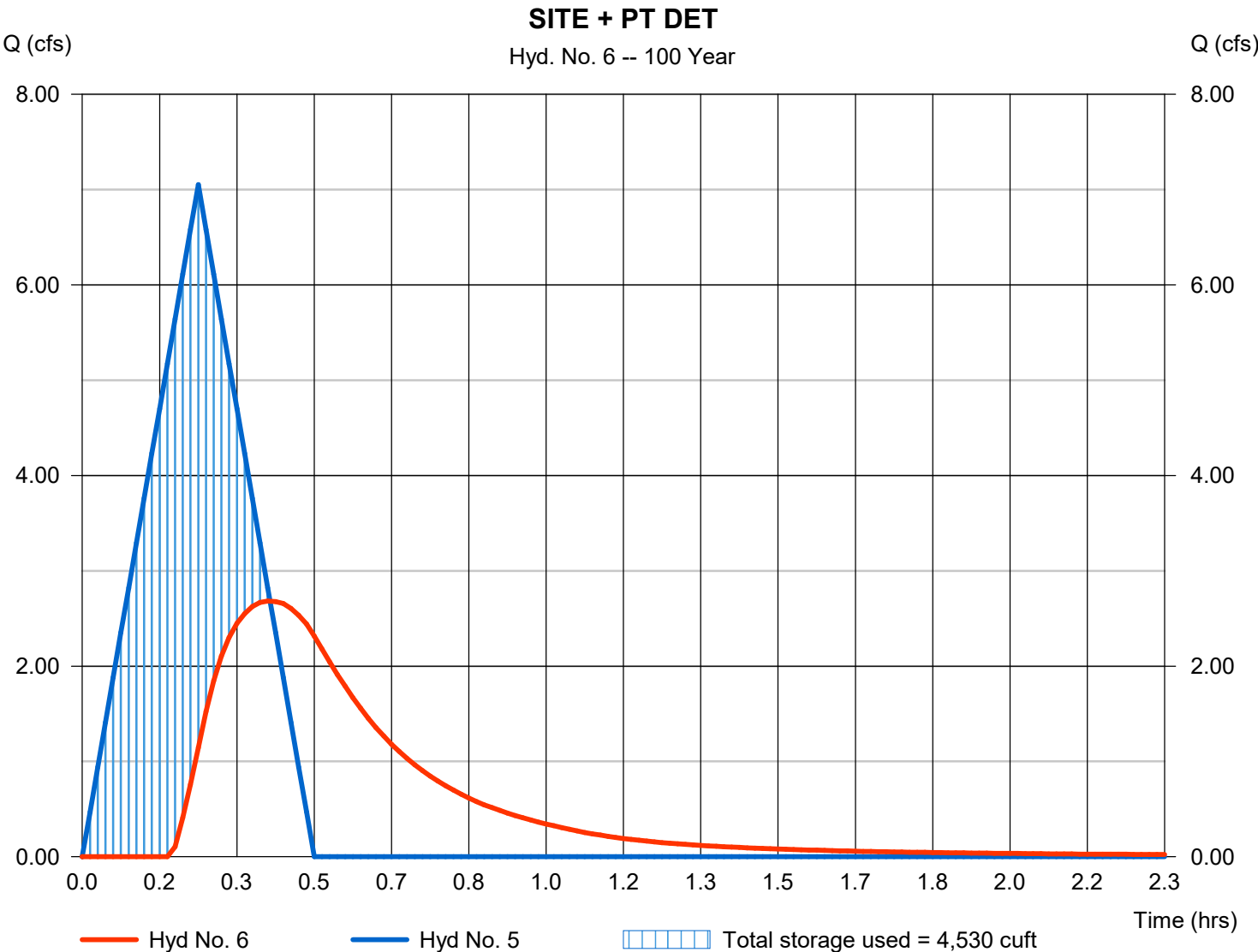
Friday, 09 / 6 / 2024

Hyd. No. 6

SITE + PT DET

Hydrograph type	= Reservoir	Peak discharge	= 2.681 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.40 hrs
Time interval	= 1 min	Hyd. volume	= 4,605 cuft
Inflow hyd. No.	= 5 - DEV + PASS-THRU	Max. Elevation	= 920.81 ft
Reservoir name	= UNDERGROUND STORAGE	Max. Storage	= 4,530 cuft

Storage Indication method used.



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Send the completed permit application and supporting documents to Justin Ernst from Bolton & Menk at Justin.Ernst@bolton-menk.com or call 515-259-9190 x2786.

APPLICATION FOR DEVELOPMENT REVIEW SITE PLAN/SITE PLAN AMENDMENT

APPLICANT INFORMATION

APPLICANT NAME & EMAIL
Windsor Presbyterian Church

ADDRESS
6301 University Ave,

CITY, STATE, ZIP
Windsor Heights, IA 50324

PHONE

FAX

Acceptance of Applicant

I, the undersigned, certify that the information on this application to the best of my knowledge, is true and correct. I further certify that I have a legal interest in the property in question, and/or that I am legally able to represent all other persons or entities with interest in this property.

In addition to the application fee of \$300.00, I understand I am responsible for all development review costs invoiced on a Monthly basis for services performed by City staff or City consultants on my behalf.

Print Applicant's Name

Applicant's Signature

Date

DEVELOPMENT TEAM

Project Manager
Shane Devick, CEC

Address
2400 86th St. Ste 12

Phone
5152764884

Fax
na

E-Mail Address
devick@ceclac.com

Attorney/Other

Address

Phone

Fax

E-Mail Address

DATE SUBMITTED

PROJECT TITLE

Parking Expansion

PROJECT ADDRESS

6301 University Ave

LOT #

SUBDIVISION

Please provide seven copies (24"x36" maximum) of all plans and one copy of the project drainage report. In addition, a digital copy (.pdf format preferred) of all plan sheets and drainage report shall be provided.

In order for a submittal to be determined as complete, the following basic information should be provided:

	Submitted	Accepted
Traffic Study (as required by City Engineer)	☒	☐
Site Survey	☒	☐
Dimension Plan	☒	☐
Grading Plan	☒	☐
Utility Plan	☒	☐
Landscape Plan	☒	☐
Drainage Report	☒	☐
Architectural Plans	☒	☐
Lighting Plans	☐	☐
Name & Address of All Properties within 200 ft	☐	☐

For additional detail on the type of information necessary for each of the items above can be found on the back of this form or by contacting the City Administrator.

Additional Information:

Application Approval

- ☐ Approved
☐ Denied

Planner or Authorized Representative

Date

SITE PLAN SUBMITTAL REQUIREMENTS FOR DEVELOPMENT REVIEW

The complexity of the proposed construction will dictate whether all of the items below are needed for a complete submittal. If there are any questions as to which items are needed, please contact the City Administrator prior to submitting.

Site Survey - All of the existing site features, including property lines (including metes and bounds), rights-of-way, streets, buildings and structures, driveways and parking lots, public and private sidewalks, landscaping, utilities, topography, easements (including book and page) and legal description should be provided either on a separate Site Survey sheet or included within one of the other plan sheets.

In the case of a Site Plan Amendment, the extent of the site survey should cover the area of proposed construction and the adjoining areas that may be impacted by the proposed improvements. For example, if new hard surface area is included, the existing storm intakes (rim and inverts), storm sewer pipe (size and slope), and detention areas (control structure and volume) should be included in the site survey.

Dimension Plan - All proposed improvements should be accurately shown to scale and dimensioned. Additionally, narrative information such as property owner, legal description, vicinity sketch, construction schedule, property zoning, benchmark, required setbacks, parking counts, site characteristics/impervious surface calculations, and Windsor Heights standard notes should be included.

Grading Plan - Existing and proposed topography should be provided at a maximum interval of 2-feet. Additional spot elevation detail should be provided for finished floor elevations of all structures, retaining walls (top and bottom elevations), along handicapped routes of access (route and ramp grades), curb lines of minimum sloped parking and drive areas and drainage swales with minimum slopes.

Additionally, any site that is located within the Floodplain will need to list the 100-year flood elevation based on the latest adopted FIRM. All proposed building within the Floodplain will need to be elevated to at least 1-foot above the 100-year flood elevation.

Utility Plans - Existing and proposed utilities should be accurately shown in plan view and should identify all of the following: structure type, casting type, rim elevation, invert elevation, pipe material, pipe size, and pipe slope.

If the proposed utility improvements are intended to be public, a plan and profile will be required.

A fire hydrant radius map will need to be provided which demonstrates that all of the building is contained within a 250-foot radius of a hydrant. Usually large buildings may require additional coverage.

Landscape Plan - Existing and proposed landscape features should be accurately shown (trees, shrubbery and ground covers) and appropriately labeled (size and type). Open space calculations and resulting landscaping requirements should be listed (street trees, open space trees, buffer trees).

Foundation plantings, screening materials (headlights, mechanical units, dumpster enclosures), bio-retention areas and other decorative features such as monument signs, flag poles, fountains, patios and bike racks should be detailed.

Drainage Report - The project drainage report in accordance with the Iowa Stormwater Management Manual will need to be provided for all new construction projects. The drainage report should include the following: site characteristics, post development analysis, stormwater conveyance, stormwater management and supporting drawings and calculations.

A full drainage report will be required for most Site Plan Amendments unless the Community Development Director determines that the scale and scope of the project is minor enough to not have a negative impact on the existing storm sewer system.

Architectural Plans - A preliminary floor plan (including at least an indication of building dimension, exits and mechanical rooms) will need to be provided. Additionally, elevation drawings of all sides of the proposed construction will need to be provided (elevation drawings should include representation of all roof mounted mechanical units and anticipated screening materials). It is recommended that a colored rendering be provided (at a minimum, the elevation drawings should include notes on the materials and colors).

Lighting Plan - All proposed lighting (pole lights, building lights, up-lights, canopy lights) should be indicated on the dimension and/or architectural plans. A manufacturers cut sheet including pole and fixture type, wattage and shielding should be provided.

A site photometric plan will need to be provided for all new construction projects. At a minimum, the plan should include all fixtures, provide the max./min./avg. light levels across the site, and represent the anticipated foot-candle levels at the property lines.

Traffic Study - Project should not reduce the existing level of traffic service on adjacent streets. Compensating improvements will be required to mitigate impact on street system operations. At the discretion of the City Engineer, a traffic impact study may be required as part of the site plan submittal.

Name & Address - of all properties within 200 feet shall be provided in a reproducible electronic format in order to provide mailings for public notices.

Storm Water Management Plan

Windsor Presbyterian Church
6301 University Ave, Windsor Heights IA

4-24-24

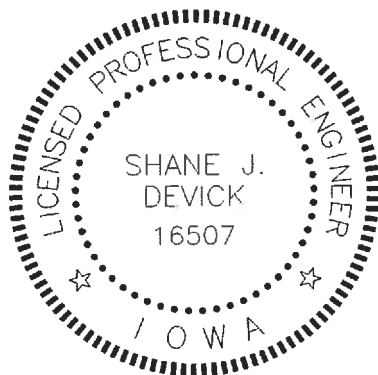
CEC job # E9213

By:



Civil Engineering Consultants, Inc.

Civil Engineering Consultants, Inc.
2400 86th Street, Suite 12
Urbandale, IA 50322
515-276-4884



I HEREBY CERTIFY THAT THIS ENGINEERING DOCUMENT
WAS PREPARED BY ME OR UNDER MY DIRECT PERSONAL
SUPERVISION AND THAT I AM A DULY LICENSED
PROFESSIONAL ENGINEER UNDER THE LAWS OF THE
STATE OF IOWA.

SHANE J. DEVICK, IOWA LIC. NO. 16507 DATE
MY LICENSE RENEWAL DATE IS DECEMBER 31, 2024
PAGES OR SHEETS COVERED BY THIS SEAL:

E9213
4-24-24

PRE-DEVELOPMENT CONDITIONS

This site is located in the northwest quadrant of the intersection of University Avenue and 63rd St., City of Windsor Heights. The address is 6301 University Ave.

Currently the site has three existing residences.

The site is approximately 0.55 acres. The existing homes will be demolished.

POST-DEVELOPMENT CONDITIONS

The purpose of the proposed project is to construct a parking lot for the Church directly adjacent to the south.

CONTRIBUTING OFF-SITE DRAINAGE

There is 0.9 acres offsite pass through flows from the west.

WETLANDS

There are no wetlands associated with this project. Reference the National Wetlands Inventory included at the end of this report.

FLOODWAYS AND FLOODPLAINS

There are no floodplains located within this property. Reference the included FEMA print at the end of this report.

PRE-DEVELOPMENT RUNOFF ANALYSIS

WATERSHED AREA

The watershed is 0.55 acres. A drainage area map is included.

TIME OF CONCENTRATION

The time of concentration is calculated at 9.6 minutes. See included Worksheet 2B-3.01

PRECIPITATION MODEL

The rainfall duration is inputted from the Rainfall Intensity Duration Frequency Curve tables provided in SUDAS. The modelling is achieved with the HydroFlow software.

RAINFALL LOSS METHOD

Runoff coefficients and Curve Numbers used:

HYDROLOGIC SOIL GROUP

The site is a combination of the below soil types:
4138C – Clarion-Urban land complex, 100.0% of soils, type B Hydrologic
Soil Group

Supporting documents are included at the end of this report.

RUNOFF MODEL

Routing of the storms is necessary for determination of the peak storms and volumes. The HydroFlow program, AutoCAD based, was used for the routing calculations.

PRE-DEVELOPED ALLOWED RUNOFF

See included hydrograph output

5 year storm = 1.00 cfs

PASS THROUGH FLOWS

See included pass through flows map

A = 0.9 acres

Composite C value:

Area of impervious: 0.27 acres, C = 0.98

Area of pervious: 0.63 acres, C = 0.35

Comp. C = 0.54

Q100 = 4.13 cfs

METHODOLOGY FOR DETENTION

See included drainage area map.

The maximum release rate is equal to the 5 year storm + 100 year pass through.

Rate = 1.00 cfs + 4.13 = 5.13

POST-DEVELOPMENT RUNOFF ANALYSIS

WATERSHED AREA

The watershed is 0.55 acres for both pre and post development. A drainage area map is included.

TIME OF CONCENTRATION

The time of concentration is calculated at 4.2 minutes. See attached worksheets.

0 1/4"=30' (1:1200) 11/25/2024 10:05:49 AM



#### ##### ##### #####	DATE:	APR 25, 2024
	DATE OF SURVEY:	
	DESIGNED BY:	
	DRAWN BY:	
Pass Through Flows To Cables		
SHEET # OF #		
####		
CEC		
Civil Engineering Consultants, Inc. 2400 86th Street, Unit 12 · Urbandale, Iowa 50322 515.276.4884 · mail@cediac.com		

Hydrograph Report

Hyd. No. 1

Existing Conditions

Hydrograph type	= Rational	Peak discharge	= 1.007 cfs
Storm frequency	= 5 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 604 cuft
Drainage area	= 0.550 ac	Runoff coeff.	= 0.35
Intensity	= 5.232 in/hr	Tc by User	= 10.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Monday, 05 / 13 / 2024

Hyd. No. 3

Pass through

Hydrograph type	= Rational	Peak discharge	= 4.132 cfs
Storm frequency	= 100 yrs	Time to peak	= 12 min
Time interval	= 1 min	Hyd. volume	= 2,975 cuft
Drainage area	= 0.900 ac	Runoff coeff.	= 0.54
Intensity	= 8.503 in/hr	Tc by User	= 12.00 min
IDF Curve	= SampleFHA.idf	Asc/Rec limb fact	= 1/1

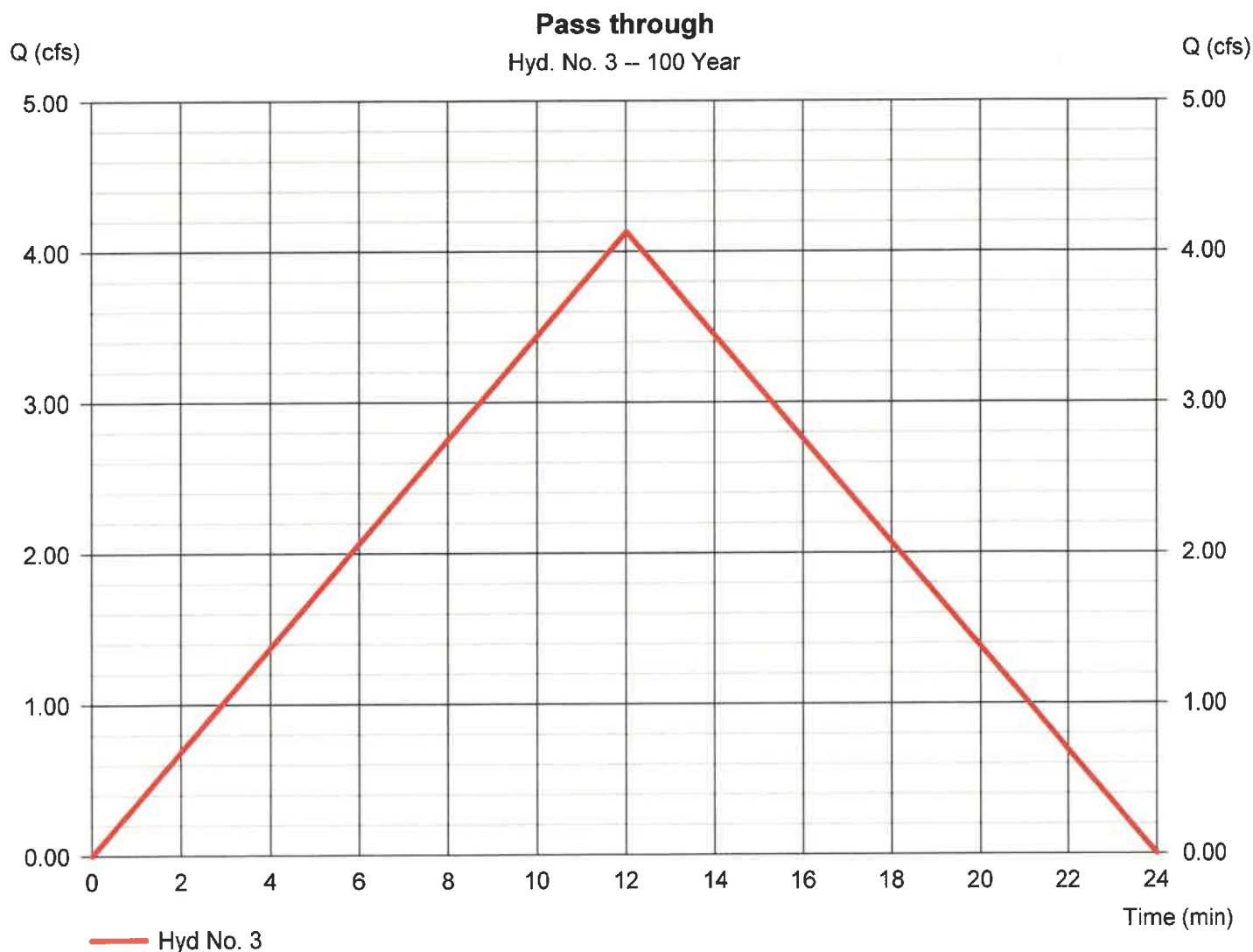


Table 2B-4.01: Runoff Coefficients for the Rational Method

Cover Type and Hydrologic Condition	Runoff Coefficients for Hydrologic Soil Group											
	A			B			C			D		
	5	10	100	5	10	100	5	10	100	5	10	100
Open Space (lawns, parks, golf courses, cemeteries, etc.)												
Poor condition (grass cover < 50%)	.25	.30	.50	.45	.55	.65	.65	.70	.80	.70	.75	.85
Fair condition (grass cover 50% to 75%)	.10	.10	.15	.25	.30	.50	.45	.55	.65	.60	.65	.75
Good condition (grass cover > 75%)	.05	.05	.10	.15	.20	.35	.35	.40	.55	.50	.55	.65
Impervious Areas												
Parking lots, roofs, driveways, etc. (excluding ROW)	.95	.95	.98	.95	.95	.98	.95	.95	.98	.95	.95	.98
Streets and roads:												
Paved; curbs & storm sewers (excluding ROW)	.95	.95	.98	.95	.95	.98	.95	.95	.98	.95	.95	.98
Paved; open ditches (including ROW)	---	---	---	.70	.75	.85	.80	.85	.90	.80	.85	.90
Gravel (including ROW)	---	---	---	.60	.65	.75	.70	.75	.85	.75	.80	.85
Dirt (including ROW)	---	---	---	.55	.60	.70	.65	.70	.80	.70	.75	.85
Urban Districts (excluding ROW)												
Commercial and business (85% impervious)	---	---	---	---	---	---	.85	.85	.90	.90	.90	.95
Industrial (72% impervious)	---	---	---	---	---	---	.80	.80	.85	.80	.85	.90
Residential Districts by Average Lot Size (excluding ROW)¹												
1/8 acre (36% impervious)	---	---	---	---	---	---	.55	.60	.70	.65	.70	.75
1/4 acre (36% impervious)	---	---	---	---	---	---	.55	.60	.70	.65	.70	.75
1/3 acre (33% impervious)	---	---	---	---	---	---	.55	.60	.70	.65	.70	.75
1/2 acre (20% impervious)	---	---	---	---	---	---	.45	.50	.65	.60	.65	.70
1 acre (11% impervious)	---	---	---	---	---	---	.40	.45	.60	.55	.60	.65
2 acres (11% impervious)	---	---	---	---	---	---	.40	.45	.60	.55	.60	.65
Newly Graded Areas (pervious areas only, no vegetation)												
Agricultural and Undeveloped												
Meadow - protected from grazing (pre-settlement).....	.10	.10	.25	.10	.15	.30	.30	.35	.55	.45	.50	.65
Straight Row Crops												
Straight Row (SR)	Poor Condition	.33	.39	.55	.52	.58	.71	.70	.74	.84	.78	.89
	Good Condition	.24	.30	.46	.45	.51	.66	.62	.67	.78	.73	.86
SR + Crop Residue (CR).....	Poor Condition	.31	.37	.54	.50	.56	.70	.67	.72	.82	.75	.87
	Good Condition	.19	.25	.41	.38	.45	.61	.55	.60	.73	.62	.78
Contoured (C)	Poor Condition	.29	.35	.52	.47	.53	.70	.60	.65	.77	.70	.84
	Good Condition	.21	.26	.43	.38	.45	.61	.55	.60	.73	.65	.80
C+CR	Poor Condition	.27	.33	.50	.45	.51	.66	.57	.63	.75	.67	.82
	Good Condition	.19	.25	.41	.36	.43	.59	.52	.58	.71	.62	.78
Contoured & Terraced (C&T).....	Poor Condition	.22	.28	.45	.36	.43	.59	.50	.56	.70	.55	.73
	Good Condition	.16	.22	.38	.31	.37	.54	.45	.51	.66	.52	.71
C&T + CR	Poor Condition	.13	.19	.35	.31	.37	.54	.45	.51	.66	.52	.71
	Good Condition	.10	.16	.32	.27	.33	.50	.43	.49	.65	.50	.70

¹ The average percent impervious area shown was used to develop composite coefficients.

Note: Rational coefficients were derived from SCS CN method

- b. Composite Runoff Analysis:** Care should be taken not to average runoff coefficients for large segments that have multiple land uses of a wide variety (i.e., business to agriculture). However, within similar land uses, it is often desirable to develop a composite runoff coefficient based on the percentage of different types of surface in the drainage area. The composite procedure can be applied to an entire drainage area, or to typical sample blocks as a guide to selection of reasonable values of the coefficient for an entire area.

Worksheet 2B-3.01: Time of Concentration (T_c) or Travel Time (T_t)

Project Windsor Presbyterian By SJD Date 5-13-24
 Location 63rd & University Checked _____ Date _____

Circle one: Present Developed

Circle one: T_c T_t through subarea

T_c for Pass Through Flows

Notes: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only)

1. Surface description (Table 2B-3.01).....
2. Manning's roughness coeff., n (Table 2B-3.01).....
3. Flow Length, L (Total L less than or equal to 300')...
4. Two year, 24 hour rainfall, P_2
5. Land slope, s.....
6. $T_t = \frac{0.007(nL)^{0.8}}{(\sqrt{P_2})^{0.4}}$ Compute T_t

Segment ID

Dense Grass		
0.24		
ft	100	
in	3.08	
ft / ft	.045	
hr	.18	+
		= .18

Shallow concentrated flow

7. Surface description (paved or unpaved).....
8. Flow length, L.....
9. Watercourse slope, s.....
10. Average velocity, V (Figure 2B-3.01).....
11. $T_t = \frac{L}{3600V}$ Compute T_t

Segment ID

ft	150	
ft / ft	.073	
ft / s	1.85	
hr	.02	+
		= .02

Open channel / pipe flow

12. Cross sectional flow area, a.....
13. Wetted perimeter, P_w
14. Hydraulic radius, $r = \frac{a}{P_w}$ Compute r.....
15. Channel slope, s.....
16. Manning's roughness coeff., n.....
17. $V = \frac{1.49r^{2/3}s^{1/2}}{n}$ Compute V.....
18. Flow length, L.....
19. $T_t = \frac{L}{3600V}$ Compute T_t
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11 and 19).....

Segment ID

ft ²		
ft		
ft		
ft / ft		
ft / s		
ft		
hr		+
		= .20
		= .20

12 min

Project Windsor Presbyterian By SJD Date 4/24/24
 Location 63rd & University Checked _____ Date _____
 Circle one: Present Developed

Notes: Space for as many as two segments per flow type can be used for each worksheet.

Segment ID

- | | | | |
|---------|-------|---|--|
| ent ID | | | |
| | Dense | | |
| | 0.24 | | |
| ft | 100 | | |
| in | 3.08 | | |
| ft / ft | .06 | | |
| hr | .15 | + | |
- =

Segment ID

- | | | | |
|---------|-----|---|--|
| ent ID | | | |
| | | | |
| ft | 43 | | |
| ft / ft | .07 | | |
| ft / s | 1.8 | | |
| hr | .01 | + | |
- =

Segment ID

- | | | |
|-----------------|--|--|
| Student ID | | |
| ft ² | | |
| ft | | |
| ft | | |
| ft / ft | | |
| | | |
| ft / s | | |
| ft | | |
| hr | | |
- +

=

166
- =

166

Revised: 2013 Edition

Project Windsor Church By SSD Date 4/25/24
Location 6300 S University Checked _____ Date _____
Circle one: Present ☒ Developed ☐

Notes: Space for as many as two segments per flow type can be used for each worksheet.

Sheet flow (Applicable to T_c only)

1. Surface description (Table 2B-3.01).....
2. Manning's roughness coeff, n (Table 2B-3.01).....
3. Flow Length, L (Total L less than or equal to 300')...
4. Two year, 24 hour rainfall, P₂.....
5. Land slope,
s.....
6. $T_t = \frac{0.007(nL)^{0.8}}{(\sqrt{P_2} s^{0.4})}$ Compute T_t.....

Daese		
Grass		
0.24		
20		
3.08		
.1		
.06	+	

=

7. Surface description (paved or unpaved).....
8. Flow length,
L.....
9. Watercourse slope, s.....
10. Average velocity, V (Figure 2B-3.01).....
11. $T_t = \frac{L}{3600V}$ Compute T_t

188		
.04		
4		
.01	+	

=

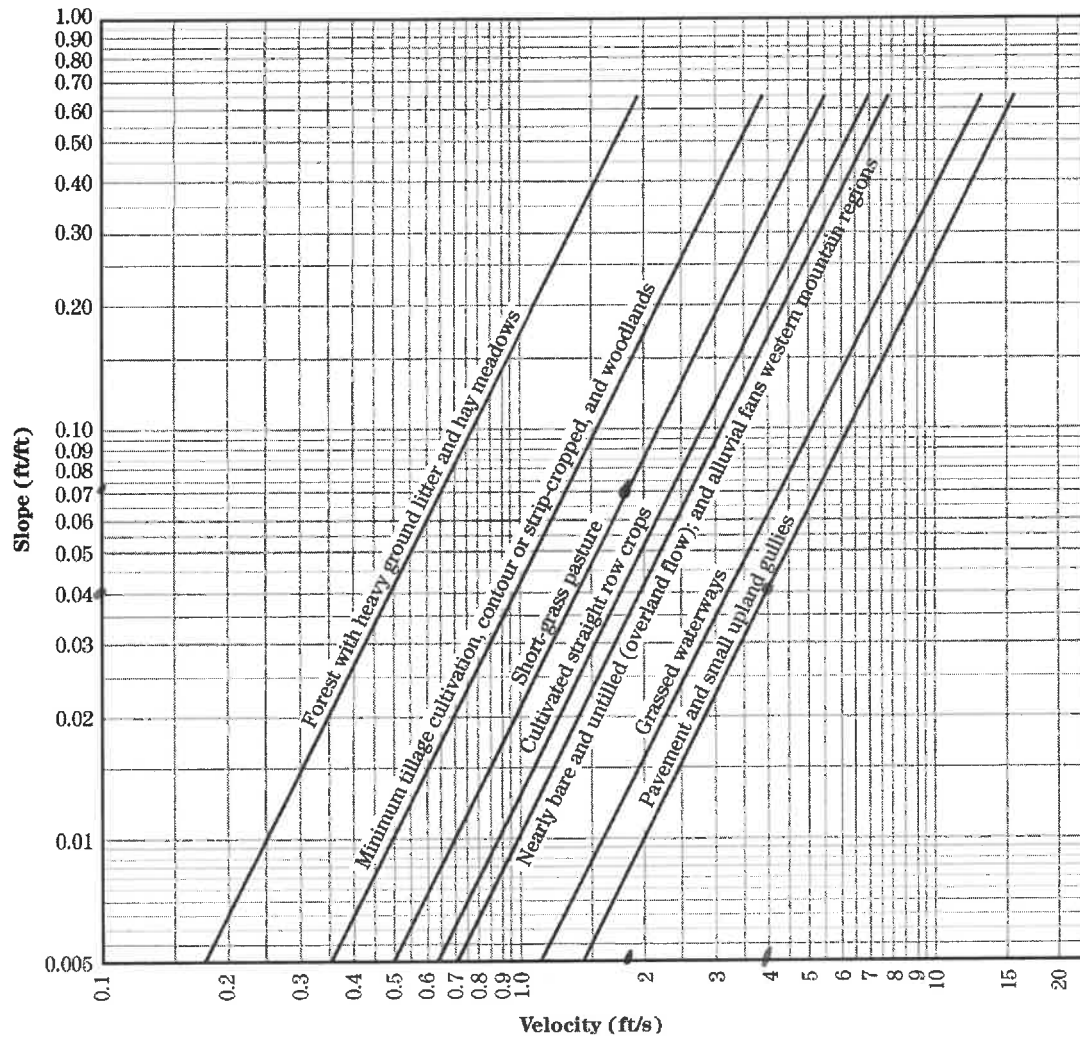
12. Cross sectional flow area, a
13. Wetted perimeter, P_w
14. Hydraulic radius, $r = \frac{a}{P_w}$ Compute r
15. Channel slope, s
16. Manning's roughness coeff, n
17. $V = \frac{1.49r^{2/3}s^{1/2}}{n}$ Compute V
18. Flow length,
 L
19. $T_t = \frac{L}{3600V}$ Compute T_t
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11 and 19)

	+		=	
--	---	--	---	--

.....

hr .07

4.2 wdh

Figure 2B-3.01: Velocity Versus Slope for Shallow Concentrated Flow

Source: NRCS National Engineering Handbook, Part 630, Chapter 15

Table 2B-3.02: Equations and Assumptions Developed from Figure 2B-3.01

Flow Type	Depth (feet)	Manning's n	Velocity Equation (ft/s)
Pavement and small upland gullies	0.2	0.025	$V = 20.238(s)^{0.5}$
Grassed waterways (and unpaved urban areas)	0.4	0.050	$V = 16.135(s)^{0.5}$
Nearly bare and untilled (overland flow); and alluvial fans	0.2	0.051	$V = 9.965(s)^{0.5}$
Cultivated straight row crops	0.2	0.058	$V = 8.762(s)^{0.5}$
Short-grass prairie	0.2	0.073	$V = 6.962(s)^{0.5}$
Minimum tillage cultivation, contour or strip-cropped, and woodlands	0.2	0.101	$V = 5.032(s)^{0.5}$
Forest with heavy ground litter and hay meadows	0.2	0.202	$V = 2.516(s)^{0.5}$

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres In AOI	Percent of AOI
4138C	Clarion-Urban land complex, 5 to 9 percent slopes	0.5	100.0%
Totals for Area of Interest		0.5	100.0%

Soil Map—Polk County, Iowa



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

4/24/2024
Page 1 of 3
Page 132 of 137

MAP LEGEND

Area of Interest (AOI)		Area of Interest (AOI)		Soils		Soil Map Unit Polygons		Soil Map Unit Lines		Soil Map Unit Points		Special Point Features		Blowout		Borrow Pit		Clay Spot		Closed Depression		Gravel Pit		Gravelly Spot		Landfill		Lava Flow		Marsh or swamp		Mine or Quarry		Miscellaneous Water		Perennial Water		Rock Outcrop		Saline Spot		Sandy Spot		Severely Eroded Spot		Sinkhole		Slide or Slip		Sodic Spot
Water Features		Streams and Canals		Transportation		Rails		Interstate Highways		US Routes		Major Roads		Local Roads		Aerial Photography																																		
Background		Aerial Photography																																																

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.
Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Polk County, Iowa
Survey Area Data: Version 26, Sep 12, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial Images were photographed: May 29, 2020—Jun 12, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Polk County, Iowa

4138C—Clarion-Urban land complex, 5 to 9 percent slopes

Map Unit Setting

National map unit symbol: fvnn
Elevation: 950 to 1,500 feet
Mean annual precipitation: 23 to 35 inches
Mean annual air temperature: 43 to 50 degrees F
Frost-free period: 165 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Clarion and similar soils: 60 percent
Urban land: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clarion

Setting

Landform: Ground moraines
Landform position (two-dimensional): Shoulder, backslope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy supraglacial till

Typical profile

Ap - 0 to 7 inches: loam
A1,A2 - 7 to 18 inches: loam
Bw1,Bw2 - 18 to 36 inches: loam
C1,C2 - 36 to 60 inches: loam

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 1.42 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Available water supply, 0 to 60 inches: High (about 11.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R103XY004MN - Loamy Upland Prairies

Hydric soil rating: No

Data Source Information

Soil Survey Area: Polk County, Iowa
Survey Area Data: Version 26, Sep 12, 2023

National Flood Hazard Layer FIRMette

93°42'34"W 41°36'17"N



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE)
Zone A, V, X
- With BFE or Depth *Zone AE, AH, VE, AP*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Area of 1% Annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes, *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS

- NO SCREEN
- Area of Minimal Flood Hazard *Zone X*
- Effective LOMRS
- Area of Undetermined Flood Hazard *Zone*

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- Cross Sections with 1% Annual Chance
- Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS

- Digital Data Available
- No Digital Data Available
- Unmapped

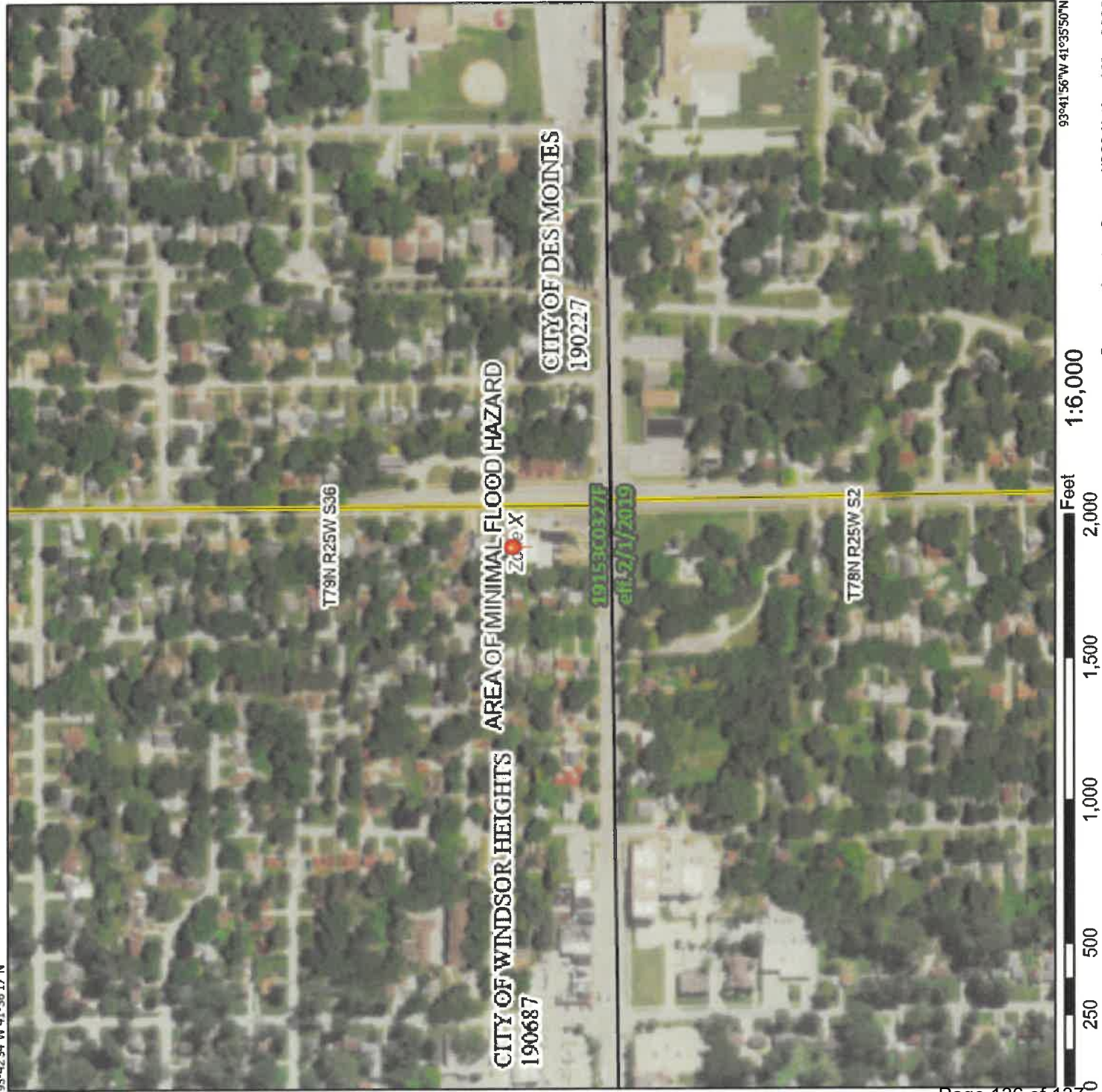


The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards.

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **4/24/2024 at 5:00 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

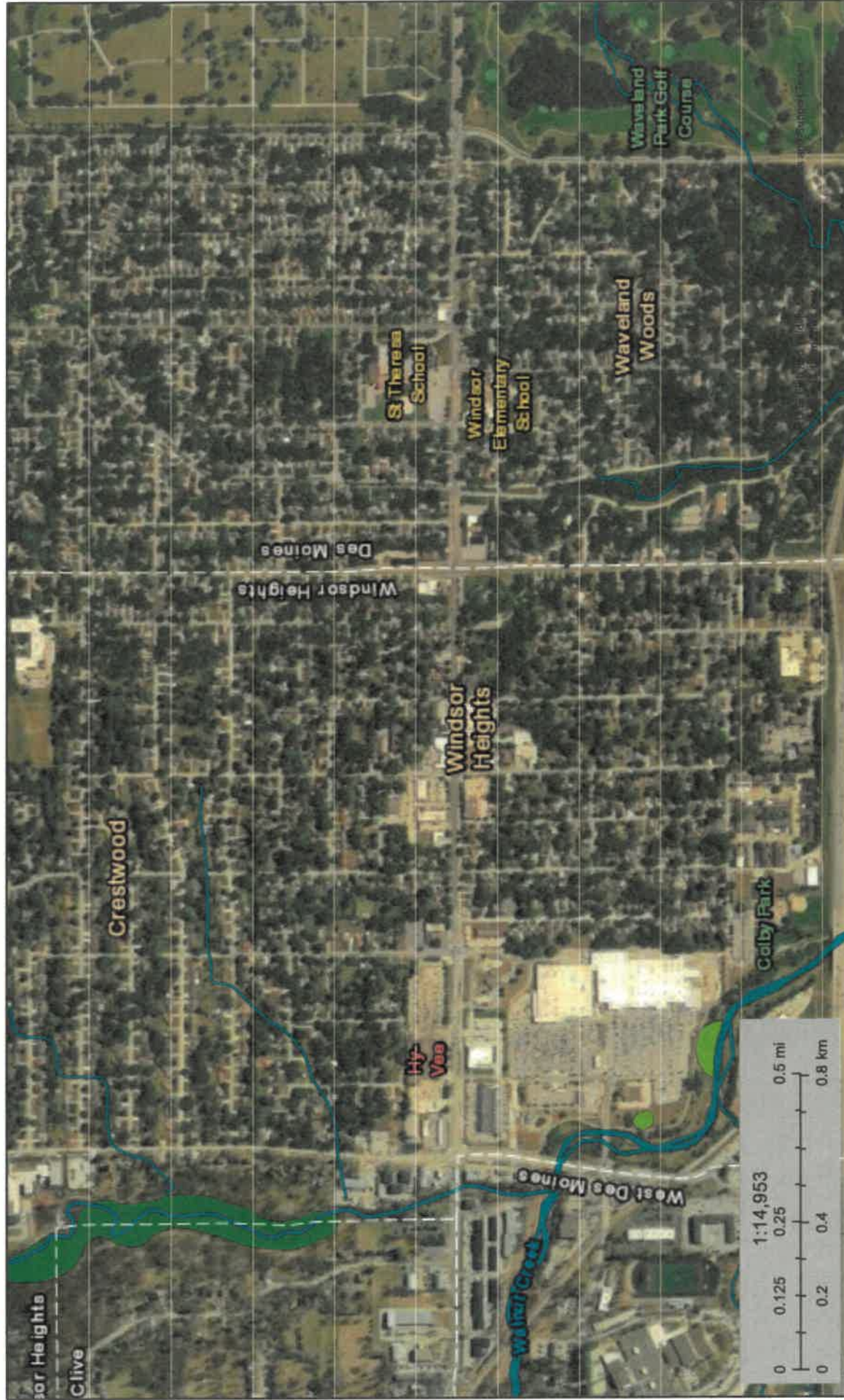




U.S. Fish and Wildlife Service

National Wetlands Inventory

Wetlands



April 24, 2024

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
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