

*\*Due to the COVID-19 concerns and social distancing recommendations, a virtual meeting is being offered. Participants wishing to speak on a topic should message the meeting moderator. All participants are asked to mute their individual computers at times when they are not speaking to minimize background noise. Join: <https://us02web.zoom.us/j/82965038057>*

**NOTICE OF A REGULAR MEETING  
BONDURANT PLANNING AND ZONING COMMISSION  
AUGUST 25, 2022**

**NOTICE IS HEREBY GIVEN** that a Regular Meeting of the City Council will be held at 6:00 PM on August 25, 2022, in the Bondurant City Center, 200 Second Street, Northeast, Bondurant, Polk County, Iowa. Said meeting is open and the public is encouraged to attend.

**AGENDA**

1. Call to Order
2. Roll Call
3. Perfecting and Approval of the Agenda
4. Approval of Minutes
  - a. August 11, 2022
5. Guests requesting to address the Planning and Zoning Commission
6. Action Items
  - a. RETURN TO TABLE - RESOLUTION NO. PZ-220728-19: Considering recommended approval of the Wisteria Crossing Preliminary Plat
7. Discussion Items -
8. Reports / Comments and appropriate action thereon:
  - a. Commission Members
  - b. Commission Chair
  - c. Planning & Community Development Director
  - d. City Administrator
  - e. City Council Liaison
9. Adjournment

# City of Bondurant

Planning and Zoning Commission

200 2<sup>nd</sup> St NE, PO Box 37

Bondurant, IA 50035



## Meeting Minutes

**DATE:** August 11, 2022 Torey Cuellar, Chair

### 1. Call to Order 6:00 pm

**Place** Bondurant City Hall (200 2nd St NE, PO Box 37)

**Special Note:** Due to concerns of the COVID-19 virus and social distancing recommendations, access to the meeting was also provided through a virtual meeting.

### 2. Roll Call

**Members Present:** Brian Clayton, Lisa Cameron, Torey Cuellar, Wes Hoyer, Karen Keeran, Andy Mains

**Members Absent:** Kristin Brostrom,

**City Official Present:** Planning & Community Development Director, Maggie Murray  
City Administrator Marketa Oliver, City Planner Isaac Pezley

### 3. Perfecting and Approval of the Agenda

Motion by Commission Member Mains, seconded by Commission Member Clayton to approve of the August 11, 2022, meeting agenda. Vote on Motion 6-0-0. Motion carried.

### 4. Approval of Minutes

Motion by Commission Member Mains, seconded by Commission Member Clayton to approve of the July 28, 2022 meeting minutes. Vote on Motion 6-0-0. Motion carried.

### 5. Guests requesting to address the Planning and Zoning Commission

None

### 6. Action Items

- A. RESOLUTION NO. PZ-220728-19: Considering recommended approval of the Wisteria Crossing Preliminary Plat.

Nolan Ernst, Stubbs Engineering, summarized the Wisteria Crossing Preliminary Plat. This is a residential subdivision with an existing zoning designation of R-2. Stubbs Engineering has submitted three subdivision layouts for the Commission to consider. Option A provides additional park land, Option 2 has the road connection to Pleasant

Street SE, and Option 3 which has the most available park land. Options 1 and 3 do not show a road connection to Pleasant Street SE. Commissioner Hoyer asked if the park land was altered in Option 2. Ernst stated no. Hoyer asked if Stubbs Engineering could provide the street connection as well as the additional park land. Ernst stated the additional parkland was offered in lieu of providing a street connection.

Commissioner Clayton asked for clarification on the elevation of the lots. Previously neighbors expressed concerns with the drainage and elevation of the proposed lots. Ernst stated the retention pond will be lower than the lots. Clayton asked if the swale shown on the site plan will be lower than the neighboring properties. Ernst stated yes, they will be.

City Administrator Oliver stated Prairie Point View Plat 1 has drainage issues. Branden Stubbs stated he met with the property owner with drainage issues and the property owner stated they had previous drainage issues. Oliver asked which neighbor Stubbs met with, he was unsure of their name, he stated they live at 1257 Lincoln Street SE. Bob Veenstra, City Engineer with V&K, stated there was a drainage issue before the subdivision was put in but the new subdivision made the issues worse.

Veenstra stated he does not see a drainage plan submitted with the site plan and believes a plan should be submitted. Stubbs stated he submitted a storm drainage report to the City for review and received comments. They made the adjustments and resubmitted it for review and has not received additional comments from the City.

Clayton stated that he would like to table this agenda item. The Commission was clear on what they wanted to see and Stubbs Engineering submitted three options. Clayton stated he felt the Commission agrees with Veenstra's comments.

Keeran stated the street name changes have not been made.

Stubbs stated at the last Commission meeting he thought there were two outstanding issues with the site plan. Commissioner Cuellar stated there were three issues identified, connection to Pleasant Street SE, drainage and park land dedication. Stubbs stated they wanted to submit multiple options for review but moving forward they will proceed with Option 2.

Motion by Commissioner Clayton, seconded by Commissioner Mains to table Resolution No. PZ-220728-19 considering recommended approval of the Wisteria Crossing Preliminary Plat.

Roll Call – Ayes: Commission Member Clayton, Commission Member Cameron, Commission Member Cuellar, Commission Member Keeran, Commission Member Mains, Commission Member Hoyer. Nays: none. Abstentions: none. Vote on Motion 6-0-0. Motion carried.

B. PUBLIC HEARING: Request for rezoning from Agricultural (A-1) to Planned Unit Development (R-5) on property at Parcel 231/00021-000-108.

Motion by Commissioner Mains, seconded by Commissioner Clayton to close the regular meeting and enter into public hearing.

Eric Cannon, Snyder & Associates, described where the property is located. Cannon stated because of the limited frontage the development can have a maximum of 30 lots. Due to this requirement the lots will be larger than normal. Cannon stated the subdivision will meet R-2 requirements except for the rear yard setbacks. Cannon stated they are requesting 30' rear yard setback requirements instead of 35' rear yard setbacks. Cannon added they are providing a sewer connection under Santiago Creek and Pleasant Street.

Keeran stated there may be some park users parking on the streets in this subdivision. Keeran also asked if the houses will be "cookie-cutter" houses or if there will be more variation with the larger lots. Eric Berkey, Berkey Home Builders, stated they plan on providing more housing options for this subdivision.

Clayton stated he believes there should be a sidewalk south to the City park. Cannon stated they were hoping to do a trail connection to the park to meet their park land requirements. Clayton stated he would like to see that trail connection on the plat.

Clayton stated the Commission has had issues with PUDs in the past and asked staff if there was a way to rezone this property with this one exception. Murray stated they would need to meet all R-2 requirements to rezone the property to R-2. Murray stated they would need to acquire a variance from the Board of Adjustment which would be tricky.

Clayton asked if the rezoning could be contingent upon the property being developed by this developer? Murray stated yes, the property could be rezoned with contingencies.

Clayton stated there is a floodplain located on this property, does the developer need special permission to build on the property. Cannon stated yes, they will need a Letter of Map Revision per fill (LOMRf). Cannon stated they have acquired these for other subdivisions.

Murray asked the Commission if basements should be included. Keeran stated yes, and it should be recorded to set a precedence.

Murray asked the Commission if screening should be included along the southern property lines. Cannon stated a perforated tile will be installed to help address stormwater issues. Cannon stated they have concerns about installing a swale or berm as it will make a small lot feel even smaller.

Clayton asked if the sewer line being installed across Santiago Creek is large enough to service the existing houses or will it be able to service future subdivisions. Cannon stated they are still in discussions about installing a 10" or 12" line but they should be able to service future subdivisions.

Brian Carter, 1000 McIntosh Street, asked the Commission and staff if there was ever plans to keep this property as greenspace instead of putting in additional housing. Oliver stated when the City acquired the property for the soccer fields they looked at purchasing this property as well but ultimately it was too expensive.

Murray read an email received by staff to the Commission.

Motion by Commissioner Mains, seconded by Commissioner Clayton to approve to close public hearing.

- C. RESOLUTION NO. PZ-220811-22: Considering recommended approval of the request for rezoning from Agricultural (A-1) to Planned Unit Development (R-5) on property at Parcel 231/00021-000-108.

Motion by Commissioner Clayton, seconded by Commissioner Mains to approve of Resolution No. PZ-220811-22 considering recommended approval of the request for rezoning from Agricultural (A-1) to Planned Unit Development (R-5) on property at Parcel 231/00021-000-108 subject to the following items:

- 1.) The development is completed by the applicant
- 2.) Basements are constructed on every property
- 3.) A trail connection is included connecting the subdivision to the Bondurant Recreational Sports Complex

- D. RESOLUTION NO. PZ-220811-23: Considering recommended approval of the site plan at 3410 Henry Street SW.

Brent Culp described the property to the Commission. Culp stated sewer will be extended from Wolf Creek Plat 11. Culp stated the building is a flex-type building with overhead doors placed throughout. Keeran asked if the bay doors will be the same color as the rest of the building. Marty Barkley stated the garage doors will be the same color. He added the building will not be yellow as shown on the site plan, instead it will be beige tones and will look like the existing flex-type buildings in this area. Barkley stated they will work with City staff to ensure their outer appearances matches with City Code.

Cameron stated parking in this area is a huge concern. Cameron stated she has concerns regarding the one way in one way out. Cameron stated the interior driving lanes should be wider. Clayton asked if they could include an additional street entrance. Culp stated they are required to have 24' wide driving lane and they are proposing a 25' wide driving lane. Murray stated she reached out to the Fire Department and they did not express concerns with one entrance. Cameron stated she would prefer to see two accesses to the property.

Clayton asked if there are tenants lined up for the building. Barkley stated not at this point.

Clayton stated there are vehicles being parked on the grass in this area and he wants to ensure that does not continue. Culp stated they are required to install 26 parking stalls and they are proposing 36.

Pitts stated the building is a speculative building and will likely attract office types businesses or commercial/industrial type businesses and not necessarily retail businesses.

Murray address the three code clarifications listed in the agenda statement. Culp stated they have no objections to the clarification.

Motion by Commissioner Mains, seconded by Commissioner Clayton to approve of Resolution No. PZ-220811-23 considering recommended approval of the site plan at 3410 Henry Street SW

Roll Call – Ayes: Commissioner Clayton, Commissioner Cameron, Commissioner Cuellar, Commissioner Keeran, Commissioner Mains, Commissioner Hoyer. Nays: none. Abstentions: none. Vote on Motion 6-0-0. Motion carried.

**7. Discussion Items – none.**

**8. Reports / Comments and appropriate action thereon**

a. Commission Members

Keeran – Asked staff if Dee and 2<sup>nd</sup> Street will be opened soon. Staff stated they were unsure and would need to check with Public Works.

Cameron – Stated concerns with Vision Electric. Cameron stated Vision Electric continues to expand their operation and it is an eyesore. Murray stated staff can enforce violations of outdoor storage and illegal parking. Cameron stated she also believes minimum landscaping requirements need to be addressed and increased. Cameron stated other cities are starting to enforce more aggressive landscaping requirements. Oliver stated the City will continue their street tree program this fall.

Clayton urged the Commission to reach out to their legislatures concerning cities providing tax breaks for properties located in school districts that do not traditionally serve their city.

b. Commission Chair – none

c. Planning & Community Development Director – none

d. City Administrator – none.

e. City Council Liaison – none.

**7. Adjournment**

Motion by Commissioner Mains, seconded by Commissioner Clayton to adjourn the August 11, 2022, meeting. Vote on Motion. Motion carried unanimously.

Meeting adjourned at 7:15 p.m.



**BUSINESS OF THE PLANNING AND ZONING COMMISSION  
BONDURANT, IOWA  
AGENDA STATEMENT**

Item No. 6.a.  
For Meeting of 8/25/2022  
**Resolution**

**TITLE:** RETURN TO TABLE - RESOLUTION NO. PZ-220728-19: Considering recommended approval of the Wisteria Crossing Preliminary Plat

**CONTACT PERSON:**

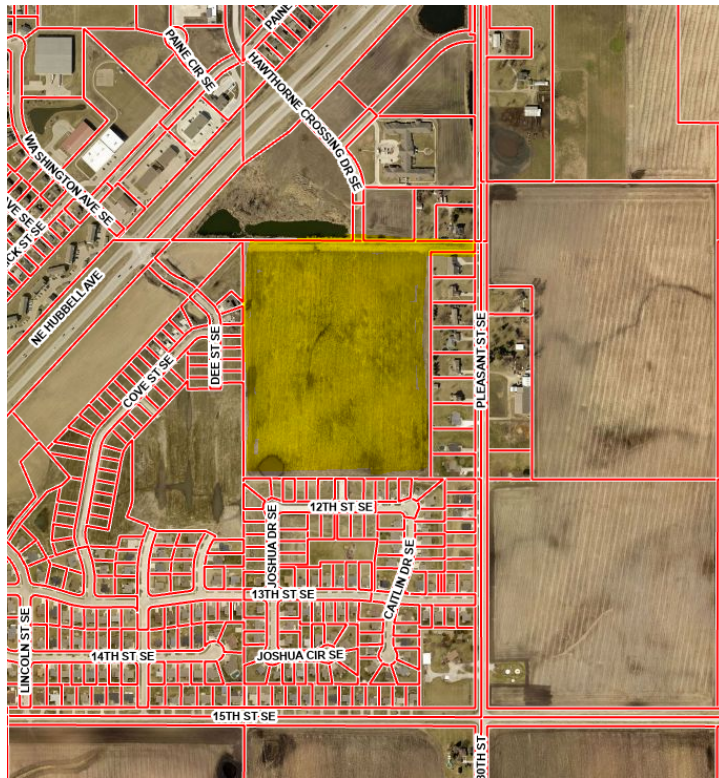
Maggie Murray, Planning & Community Development Director

**BRIEF HISTORY & ANALYSIS:** The Planning & Zoning Commission previously reviewed the Wisteria Crossing Preliminary Plat during their meetings on July 28, 2022 and August 11, 2022. The developer has since submitted only one version of the Wisteria Crossing Preliminary Plat for the Commission's review - this was known as Option 2 in the August 11th agenda packet. This attached Wisteria Crossing Preliminary Plat proposes 107 lots for single-family detached development with also a 1.64-acre public parkland area that has 10.77% street frontage. This preliminary plat also proposes a street connection out to Pleasant Street NE at this development area's northeast corner, as was previously requested by the Commission during their July 28th and August 11th meetings.

The Commission tabled the Wisteria Crossing Preliminary Plat during their August 11th meeting due to an incomplete stormwater management report/analysis. An updated stormwater management report/analysis was submitted by Stubbs Engineering on August 24th. Attached as part of this packet is a memo from Bob Veenstra, City Engineer, summarizing the attached stormwater management report. This memo notes the stormwater calculations and the updated preliminary plat show the concept for addressing the runoff from the rear yard areas located to the east of the east boundary of Wisteria Crossing. This memo also notes the overall concept presented by Stubbs Engineering to intercept and convey the runoff from the rear yards appears to be satisfactory. This memo also notes the level of detail submitted in the stormwater calculations for Wisteria Crossing is similar to the level of detail typically required by the City for a preliminary plat review.

For review by the Planning & Zoning Commission is recommended approval of one of the Wisteria Crossing Preliminary Plat. The preliminary plat developer is DR Horton. The preliminary plat was submitted by Stubbs Engineering. The Wisteria Crossing Preliminary Plat options range from 107 for single-family detached development on

32.7 acres. The lots proposed meet the Medium Density Residential (R-2) District requirements. The preliminary plat proposes a 1.64-acre public park with 10.77% street frontage. This preliminary plat area is located north of Wisteria Heights Plat 6, east of Prairie Point View Plats 1 and 2, west of Fox Run Plat 1, and south of Hawthorne Crossing. The Wisteria Crossing Preliminary Plat development area is highlighted in yellow below.



When considering preliminary plat requests, the Planning & Zoning Commission and City Council should take into account the following: the Comprehensive Plan/Future Land use Map, Zoning, Parkland Dedication, Streets, Pedestrian Connections, Utilities, the FEMA Floodplain, the City's Stream Buffer Ordinance, and Comments from City Officials and Private Utilities.

**Comprehensive Plan/Future Land Use Map** - the proposed single-family detached use is consistent with both the 2012 Future Land Use Map and the City's draft 2022 Future Land Use Map.

**Zoning** - this property is currently zoned as Medium Density Residential (R-2), so no rezoning is necessary as part of the development review/approval process. The submitted preliminary plat options show the minimum R-2 lot size requirement of 7,500 SF will be met. The preliminary plat shows and notes that all interior lots will be at least 65'-wide, which meets minimum R-2 lot width requirements. The preliminary plat options show/note that corner lots must be at least 80', which meets minimum Subdivision Code requirements for corner lots.

**Parkland Dedication** - 107 lots requires that at least 161 acres of public parkland be established. The preliminary plat shows 1.64 acres are proposed. 10.77% of this park's boundary will front the public street, which meets the Subdivision Code requirement of 10%.

**Streets** - the City Engineer has indicated that development of single-family lots within this Wisteria Crossing development area will not require a formal Traffic Impact Study due to the number of existing street connections proposed. This Wisteria Crossing subdivision will tie into the Prairie Point View subdivision to the west, the Wisteria Heights Plat 6 subdivision to the south, the Hawthorne Crossing subdivision to the north, and out to Pleasant Street SE to the east. .

**Pedestrian Connections** - sidewalks will be constructed on the residential lots at the time the lots are constructed. The developer will be responsible for installing public sidewalks along the detention basin street frontage and also along the public parkland street frontage. No public trail areas as proposed within this Wisteria Crossing development area, as the 2013 Parks, Trails, & Greenways Master Plan does not show any future trail connections through this development area.

**Utilities** - the Wisteria Crossing Preliminary Plat shows water mains to be constructed along all of the streets. The Wisteria Crossing Preliminary Plat shows a public sanitary sewer main along all of the streets. The Wisteria Crossing Preliminary Plat shows a detention basin located on Outlot Y - this Outlot Y will be privately owned and maintained. The updated stormwater management report has been received.

**FEMA Floodplain** - this development area is not within the 100-year floodplain.

**Stream Buffer Ordinance** - this development area is not subject to the City's Stream Buffer Ordinance.

**Comments from City Officials and Utilities-** Per Section 180.04.10 of the Subdivision Code, City Departments, private utilities, the Bondurant-Farrar Community School District, and the Post Office were notified of this preliminary plat for comment. Below is a summary of comments received:

- City Engineering - Bob Veenstra, City Engineer, reviewed and provided his initial feedback on the first draft preliminary plat submitted. Staff is awaiting confirmation from Bob that his previous review comments have been addressed. The attached resolution factors in any additional review comments by this department.
- Public Works - reviewed and agreed with City Engineering's review comments.
- Emergency Services - reviewed and noted no concerns.
- Northern Natural Gas - reviewed and noted no conflicts with the development proposed.

- Windstream - reviewed and provided a map of their area facilities.

**FUNDING SOURCE:** N/A

**STAFF RECOMMENDATION:** The following options exist for the Planning & Zoning Commission:

1. Recommended approval of Resolution No. PZ-220728-19, regarding the Wisteria Crossing Preliminary Plat.
2. Recommended approval of Resolution No. PZ-220728-19, regarding the Wisteria Crossing Preliminary Plat, subject to Code clarification items being addressed.
3. Recommended denial of Resolution No. PZ-220728-19, regarding the Wisteria Crossing Preliminary Plat.
4. Table pending additional information.

Staff recommends approval of the attached P&Z recommendation resolution, subject to the code clarification items listed on the agenda. Per guidance provided by the City Engineer, the level of detail included as part of the resubmitted stormwater management report is consistent with what is required by the Clty of Bondurant for the preliminary plat review/approval process.

**APPROVED FOR SUBMITTAL:**

**ATTACHMENTS:**

1. RES No PZ-220728-19
2. Wisteria Crossing Preliminary Plat
3. V&K Memo - Stormwater
4. Wisteria Crossing Storm Water Calculations

PLANNING AND ZONING COMMISSION  
RESOLUTION NO. PZ-220728-19

RESOLUTION REGARDING RECOMMENDED APPROVAL OF THE WISTERIA  
CROSSING PRELIMINARY PLAT, OPTION 2

WHEREAS, Stubbs Engineering submitted the Wisteria Crossing Preliminary Plat described as follows; AND

A PORTION OF THE WEST ½ OF THE SE ¼ OF SECTION 31, TOWNSHIP 80 NORTH, RANGE 22 WEST OF THE 5<sup>TH</sup> P.M., BONDURANT, POLK COUNTY, IA, MORE PARTICULARLY DESCRIBED AS: OUTLOT Y OF PRAIRIE POINT VIEW PLAT 1, AN OFFICIAL PLAT AS RECORDED IN BOOK 18253, PAGE 331, POLK COUNTY, IOWA.

WHEREAS, the developer is DR Horton; AND

WHEREAS, the preliminary plat area is zoned Medium Density Residential (R-2).

NOW, THEREFORE, BE IT RESOLVED, that the Planning and Zoning Commission recommends City Council approval of the Wisteria Crossing Preliminary Plat, subject to the following Code clarification items:

- 1.) That any additional preliminary plat review comments provided by City Engineering, Public Works, and Emergency Services shall be addressed with a resubmitted preliminary plat.
- 2.) That the developer shall be responsible for installing public sidewalks adjacent to any outlot at the time each outlot area is developed.

Moved by \_\_\_\_\_, Seconded by \_\_\_\_\_ to adopt.

ATTEST: I, Maggie Murray, Planning & Community Development Director, hereby certify that at a meeting of the Planning and Zoning Commission held on August 25, 2022; among other proceedings the above was adopted.

IN WITNESS WHEREOF, I have hereunto set my hand the day and year above written.

\_\_\_\_\_  
Maggie Murray, Planning & Community Development Director

| Action   | Yay | Nay | Abstain | Absent |
|----------|-----|-----|---------|--------|
| Hoyer    |     |     |         |        |
| Clayton  |     |     |         |        |
| Mains    |     |     |         |        |
| Keeran   |     |     |         |        |
| Cuellar  |     |     |         |        |
| Cameron  |     |     |         |        |
| Brostrom |     |     |         |        |

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Torey Cuellar, Commission Chair

UTILITY NOTE:

UTILITIES LOCATIONS ARE TAKEN FROM PUBLIC RECORDS AND FIELD SURVEYS. THE SURVEYOR AND ENGINEER MAKE NO GUARANTEE THAT ALL UTILITIES IN THE AREA ARE SHOWN. THE EXACT LOCATIONS AND ELEVATIONS OF ALL UTILITIES SHALL BE DETERMINED BY THE CONTRACTOR. IT IS ALSO THE RESPONSIBILITY OF THE CONTRACTOR TO ESTABLISH IF ANY ADDITIONAL UTILITIES OTHER THAN THE ONES SHOWN ON THE PLANS ARE PRESENT IN THE FIELD.

LEGAL DESCRIPTIONS:

A PORTION OF THE WEST ½ OF THE SE ¼ OF SECTION 31, TOWNSHIP 80 NORTH, RANGE 22 WEST OF THE 5<sup>TH</sup> P.M., BONDURANT, POLK COUNTY, IA, MORE PARTICULARLY DESCRIBED AS: OUTLOT Y OF PRAIRIE POINT VIEW PLAT 1, AN OFFICIAL PLAT AS RECORDED IN BOOK 18253, PAGE 331, POLK COUNTY, IOWA.

ZONING:

R-2 MEDIUM DENSITY RESIDENTIAL

SITE AREA:

32.123 ACRES (1,399,276.4 SQ FT)

BULK REGULATIONS:

R-2  
MINIMUM LOT AREA: 7,500 SQ. FT.  
10,000 SQ. FT. FOR TWO FAMILY DWELLINGS  
ADD 2,000 SQ. FT. FOR EACH ADDITIONAL UNIT  
MINIMUM LOT WIDTH: 65 FT. SINGLE FAMILY  
85 FT. TWO FAMILY  
ADD 20 FT. FOR EVERY ADDITIONAL UNIT  
80 FT. FOR CORNER LOTS

SETBACKS:

FRONT YARD: 30 FT.  
SIDE YARD: 15 FT. TOTAL SIDE YARD, 5 FT. MIN ON EACH SIDE, 1 & 1½ STORIES  
15 FT. TOTAL SIDE YARD, 7 FT. MIN ON EACH SIDE, 2 & 3 STORIES  
REAR YARD: 35 FT.

HEIGHT:

MAXIMUM HEIGHT: 35 FT.  
MAXIMUM NUMBER OF STORIES: 3 STORIES

PRELIMINARY PLAT  
FOR  
WISTERIA CROSSING  
BONDURANT, IA

PREPARED BY  
STUBBS ENGINEERING

VICINITY MAP



SHEET INDEX:

- 1 - COVER SHEET
- 2 - LOT LAYOUT
- 3 - LOT LAYOUT
- 4 - GRADING & UTILITIES
- 5 - GRADING & UTILITIES

OWNER:

MOORE INVESTMENTS INC  
4211 NE BELLAGIO CIR  
ANKENY, IA 50021  
CONTACT: RICHARD E MOORE

DEVELOPER:

DR HORTON  
1910 SW PLAZA SHOPS LN  
ANKENY, IA 50023  
CONTACT: JOSH MOULTON  
PHONE: (515) 620-4240

ENGINEER:

STUBBS ENGINEERING  
431 NE 72ND ST  
PLEASANT HILL, IA 50327  
CONTACT: BRANDEN STUBBS  
PHONE: (515) 979-8499

WISTERIA CROSSING  
BONDURANT, IA

STUBBS ENGINEERING  
431 NE 72ND ST, PLEASANT HILL, IA 50327  
(515) 979 - 8499



COVER SHEET

LEGEND:

- E W- EXISTING WATER
- E ST- EXISTING STORM
- E SS- EXISTING SANITARY
- P W- PROPOSED WATER
- P ST- PROPOSED STORM
- P SS- PROPOSED SANITARY
- ⦿ FIRE HYDRANT
- ⦿ WATER MAIN VALVE
- ⦿ STORM INTAKE
- ⦿ STORM FLARED END
- ⦿ STORM MANHOLE
- ⦿ SANITARY MANHOLE
- ⦿ STREET LIGHT



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.

BRANDEN W. STUBBS, P.E. DATE

LICENSE NUMBER 25335

MY LICENSE RENEWAL DATE IS DECEMBER 31, 2022

PAGES OR SHEETS COVERED BY THIS SEAL:

DATE: 08.19.22

DRAWN BY: NDE

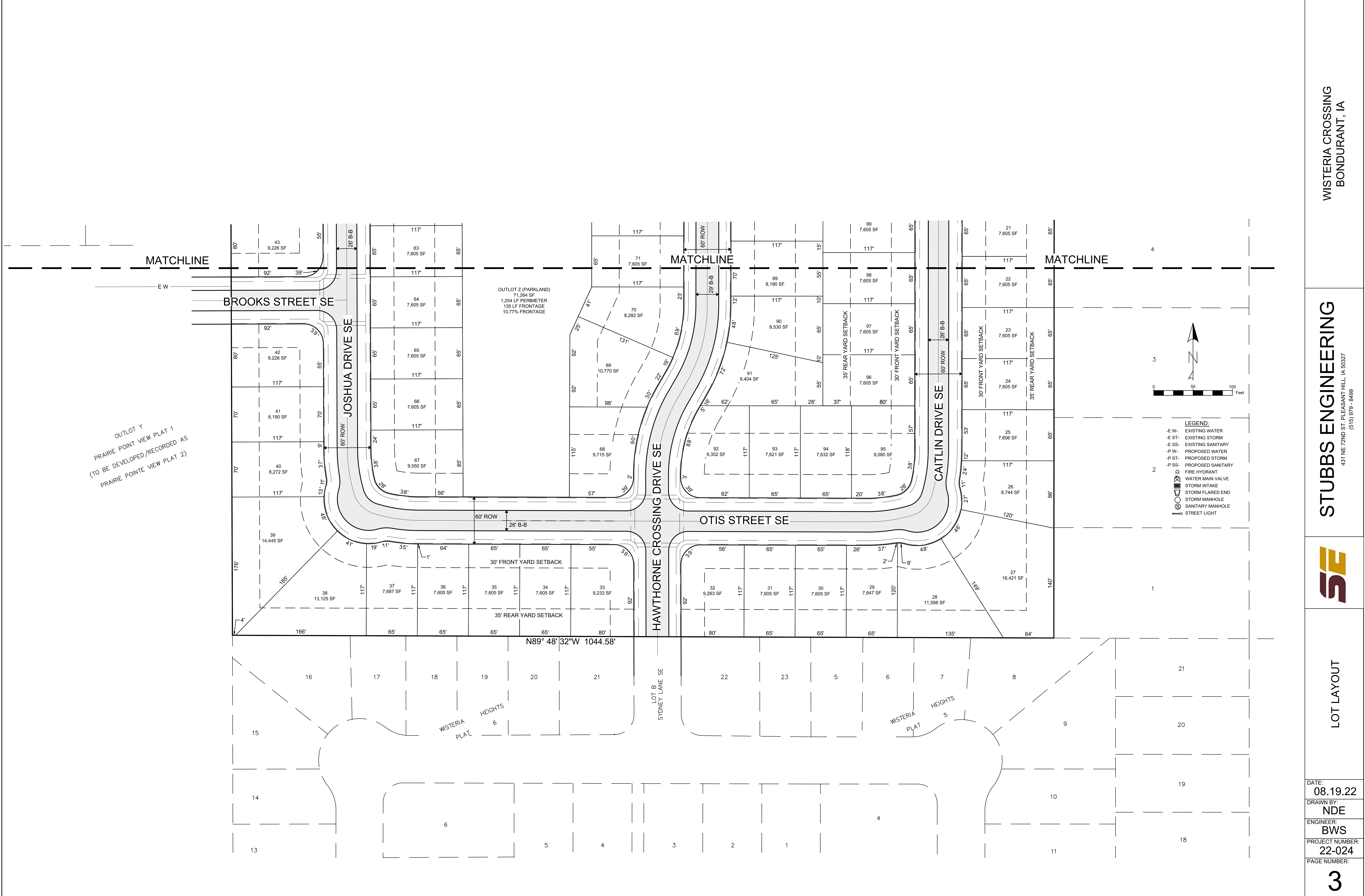
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PROJECT NUMBER: 22-024

PAGE NUMBER:

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WISTERIA CROSSING  
BONDURANT, IA

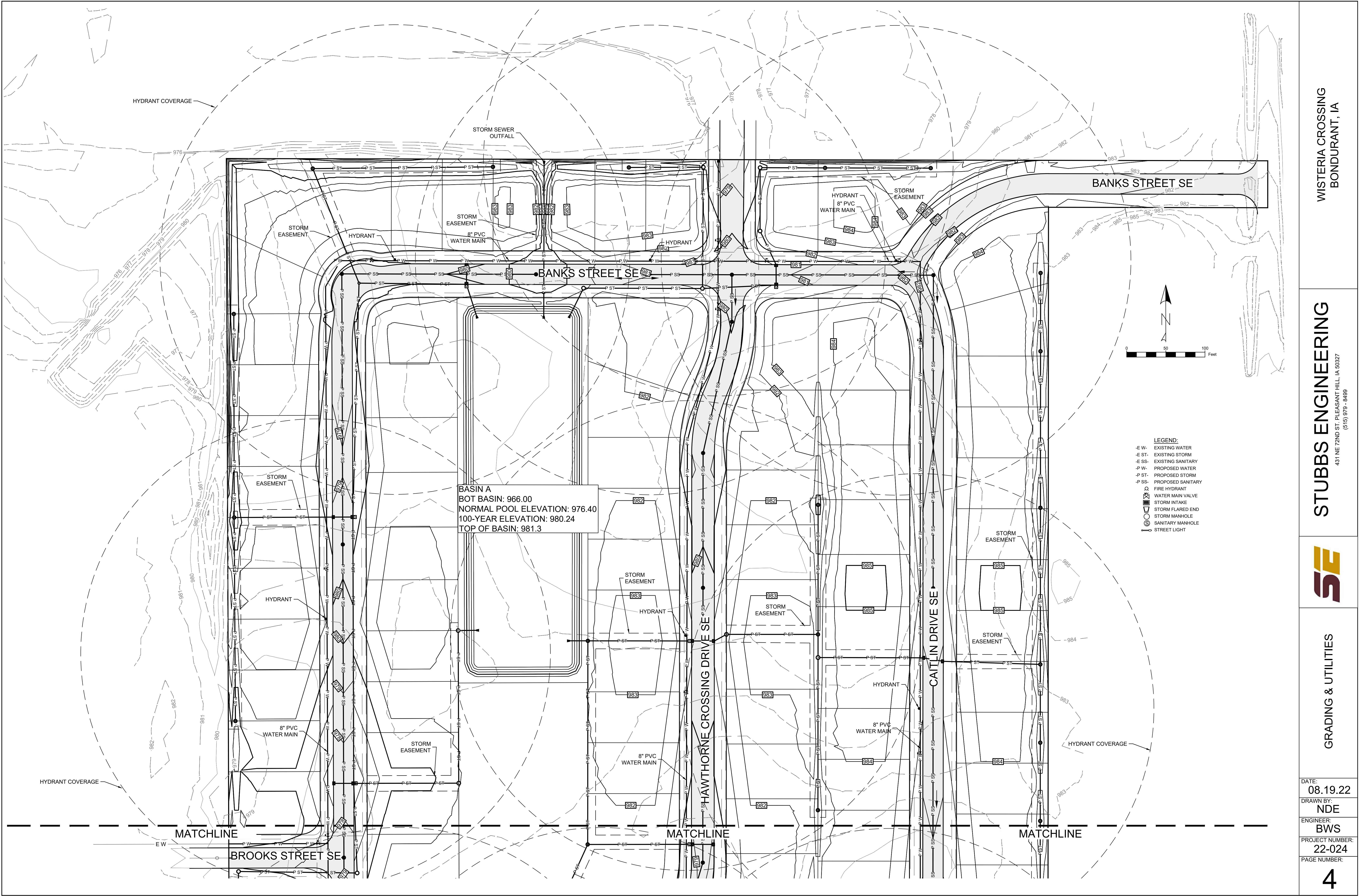
STUBBS ENGINEERING  
431 NE 72ND ST. PLEASANT HILL, IA 50327  
(515) 979-8499



LOT LAYOUT

DATE: 08.19.22  
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ENGINEER: BWS  
PROJECT NUMBER: 22-024  
PAGE NUMBER:

3



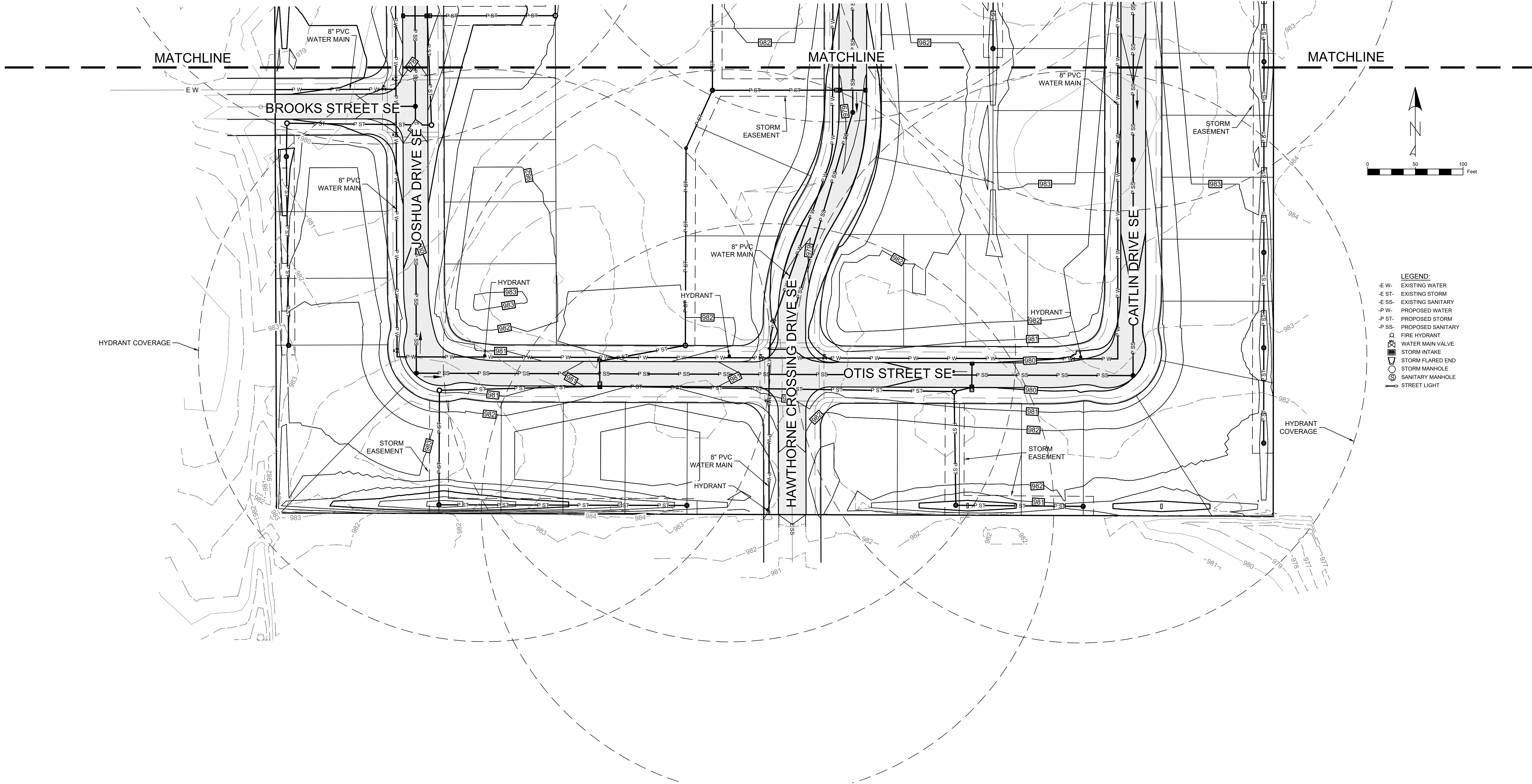
WISTERIA CROSSING  
BONDURANT, IA

STUBBS ENGINEERING  
431 NE 72ND ST. PLEASANT HILL, IA 50327  
(515) 979-8499



GRADING & UTILITIES

DATE: 08.19.22  
DRAWN BY: NDE  
ENGINEER: BWS  
PROJECT NUMBER: 22-024  
PAGE NUMBER:





**VEENSTRA & KIMM INC.**

3000 Westown Parkway  
West Des Moines, Iowa 50266

515.225.8000 // 800.241.8000  
www.v-k.net

August 25, 2022

Maggie Murray  
City of Bondurant  
200 Second Street NE  
P.O. Box 37  
Bondurant, Iowa 50035

BONDURANT, IOWA  
WISTERIA CROSSING PRELIMINARY PLAT  
STORMWATER CALCULATIONS

The writer has completed a preliminary review of the Stormwater Calculations that were submitted on August 24, 2022 for the Wisteria Crossing project. The calculations evaluate the requirements for stormwater detention and set forth the concept plan for addressing stormwater throughout the Wisteria Crossing development.

The stormwater calculations and the updated preliminary plat show the concept for addressing runoff from the rear yard areas located to the east of the east boundary of Wisteria Crossing. The concept plan involves the construction of a continuous north south swale into which the surface runoff would flow. Low flows would be absorbed into the ground and collected in a perforated under drain. Larger volumes of runoff would be captured in intakes located at low points in the swale. This concept for collecting the rear yard stormwater drainage is similar to the concept used in several recent subdivisions. The overall concept presented by Stubbs Engineering to intercept and convey the runoff from the rear yards to the east appears to be satisfactory.

The level of detail submitted in the stormwater calculations for Wisteria Crossing is similar to the level of detail typically required by the City for preliminary plat. The level of detail normally includes the sizing of the stormwater detention basin, the determination of the outlet flow, outlet location and the concept for collecting stormwater drainage within and adjacent to the subdivision. What is not typically included is the detailed sizing of individual storm sewer pipes. The individual storm sewer pipes are typically not designed at this stage in the process. The storm sewer pipes and sizing are submitted for review as part of the construction plan review.

For the Wisteria Crossing stormwater calculations there is no detailed information on the size, capacity or elevation of individual reaches of storm sewer. It is assumed that information will be provided as part of the storm sewer calculations.

The details regarding the storm sewer sizing and hydraulic analysis would normally be reviewed at the construction plan stage if Wisteria Crossing moves forward that level of detail would be required as part of the construction plan review. The review of the construction plans is to confirm the system as designed performs as portrayed in the original stormwater drainage report or stormwater calculations.

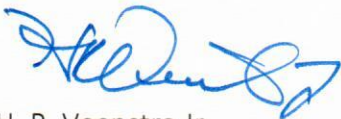
With respect to the specifics of the stormwater calculations the following is noted:

1. Onsite stormwater drainage is calculated for the 32 acre Wisteria Crossing site.
2. The predevelopment runoff during a 5 year recurrence interval storm is 37.61 cfs.
3. The stormwater analysis for the onsite area was based on a CN of 71. The offsite area to the east was evaluated based on a CN of 74. These assumptions appear reasonable.
4. The stormwater analysis was undertaken using TR55 model. This method of analysis is satisfactory under SUDAS.
5. The stormwater calculations identify offsite areas contributing flow including the offsite areas to the east. In a 100 year recurrence interval storm event the offsite contributing flow is 12.59 cfs.
6. All of the stormwater is routed to a single stormwater detention basin.
7. The allowable release rate from the site is 50.20 cfs, or the total of the 37.61 cfs from the onsite area and 12.59 cfs from the offsite area that is routed in an undetained manner.
8. The proposed release rate from the site is 49.97 cfs. The 49.97 cfs release rate would be satisfactory as it is less than the allowable 50.20 cfs.
9. The release pipe from the stormwater detention basin is routed northerly and discharges overland to a low area located just north of Wisteria Crossing.
10. The low lying area to the north generally extends westerly almost to the NE Hubbell right-of-way.
11. As part of previous comments, the writer noted Stubbs Engineering should confirm the outlet area to the north is satisfactory.
12. As part of the final stormwater analysis Stubbs Engineering will need to confirm whether there are any areas that do not naturally flow toward the release point proposed by Stubbs Engineering.

13. The detention basin includes an overflow section. Any basin overtopping would be routed northerly to the discharge area to the north of the site.
14. The preliminary plat shows a single wet bottom detention basin.
15. The pool elevation in the detention basin is 976.40.
16. In a 100 year storm event the maximum water surface elevation in the stormwater detention basin is 980.24, or an increase of 3.84 feet above the pool elevation.
17. The rear yard elevations to the east of the southeast corner of the site are in the range of 982 to 983. In a 100 year storm event there is approximately two feet of head available between the rear yard areas and the maximum hydraulic grade line in the detention basin. The storm sewers that will be designed as part of the construction plans need to recognize this limitation.
18. The preliminary plat indicates the overflow elevation for the detention basin is 981.30 or 1.06 feet above the maximum 100 year pond elevation. The City normally requires one foot of freeboard. The preliminary plat and stormwater calculations would indicate this level of freeboard is provided.
19. The stormwater detention calculations indicate at the maximum stage in a 100 year storm event the stored volume of flow in the detention basin will be approximately 245,000 cubic feet.

If you have any questions or comments concerning the project, please contact the writer at 515-225-8000, or at [bveenstra@v-k.net](mailto:bveenstra@v-k.net).

VEENSTRA & KIMM, INC.



H. R. Veenstra Jr.

HRVJr:rdp  
4285 - 131

Cc: Marketa Oliver, City of Bondurant  
John Horton, City of Bondurant

# STORM WATER CALCULATIONS

FOR

## WISTERIA CROSSING

BONDURANT, IOWA

VICINITY MAP:



PREPARED BY:

**STUBBS ENGINEERING**

431 NE 72<sup>ND</sup> ST, PLEASANT HILL, IA 50327

August 24, 2022

Table 1: Runoff Summary

| Runoff Recurrence Interval | Pre-Development Peak Discharge (cfs) | Post-Development Peak Discharge (cfs) | Contributing Offsite Discharge (cfs) |
|----------------------------|--------------------------------------|---------------------------------------|--------------------------------------|
| 5 yr                       | 37.61                                | 84.63                                 | 4.38                                 |
| 100 yr                     | 118.968.8                            | 199.82                                | 12.59                                |

Table 2: Allowable Release Rate

| Allowable Release Rate (cfs) |   | On Site Pre-Developed Peak Discharge Rate – 5 yr |   | Contributing Off Site Developed Peak Discharge – 100 yr |
|------------------------------|---|--------------------------------------------------|---|---------------------------------------------------------|
| 50.20                        | = | 37.61                                            | + | 12.59                                                   |

Table 3: Proposed Release Rate

| Proposed Release Rate (cfs) |   | Post-Developed Detained Peak Discharge Rate – 100 yr |
|-----------------------------|---|------------------------------------------------------|
| 49.97                       | = | 49.97                                                |

\*Offsite discharge routed through proposed storm sewer & basins.

## **Pre-Development Runoff Analysis**

### **Watershed Area**

Square shaped 32-acre farm ground located South of Hubbell Avenue and North of 12<sup>th</sup> Street and West of Pleasant Street. The existing site has varying slopes from 1-3%, sloping in different directions. The existing catchment map in the appendix depicts with contours how the southeast corner of the site is a low point. The southwest corner is also a low area. And the site generally slopes northward to the existing offsite pond.

### **Time of Concentration**

The time of concentration was calculated using TR-55 as performed by AutoCAD Civil 3D. Time of concentrations shown in the Appendix.

### **Precipitation Model**

The precipitation model and rainfall duration for the design storm was simulated using TR-55 as performed in Autodesk Storm and Sanitary Analysis 2019 based on the 5-year, 24-hour storm duration for total rainfall amounts from Table 2B-2.06: Section 5 – Central Iowa per Iowa Statewide Urban Design and Specifications (SUDAS).

### **Soil Type**

The effective curve number used for pre-development runoff analysis was 71 based on soil type of Class C in a meadow terrain. Curve number 74 is used for offsite basins as they are grassed areas.

### **Runoff Method**

The method used to project runoff and peak discharge was TR-55.



## **Post-Development Runoff Analysis**

### **Eastern Property(s) Drainage Concern**

The designed swale along the eastern property line sits lower than the grades along the property line. There is a perforated flat storm pipe with 2-feet of pea gravel that will have intakes within low points of the swale. This perforated pipe connects to the RCP infrastructure onsite that outfalls to the retention pond. The perforated pipe will have minor storm event flows while larger storm events may overland flow to a rear yard intake.

### **Watershed Area**

The proposed development consists of single-family lots with a centrally located park and retention pond. Swales with intakes perimeter the site. The onsite retention pond will feature an inverted outfall pipe that will outfall to the pond to the north. The retention pond will have an emergency spillway located on the north side of the pond.

### **Time of Concentration**

The time of concentration was calculated using TR-55 as performed by AutoCAD Civil 3D. 15-minute minimum time of concentration was used.

### **Precipitation Model**

The precipitation model and rainfall duration for the design storm was simulated using the Modified Rational Method as performed in Autodesk Storm and Sanitary Analysis 2019 based on the 100-year, 24-hour storm duration for total rainfall amounts from Table 2B-2.06: Section 5 – Central Iowa per Iowa Statewide Urban Design and Specifications (SUDAS).

### **Runoff Method**

The method used to project runoff and peak discharge was TR-55 for basin sizing.

Results for basin sizing are shown in the Appendix.

## **References**

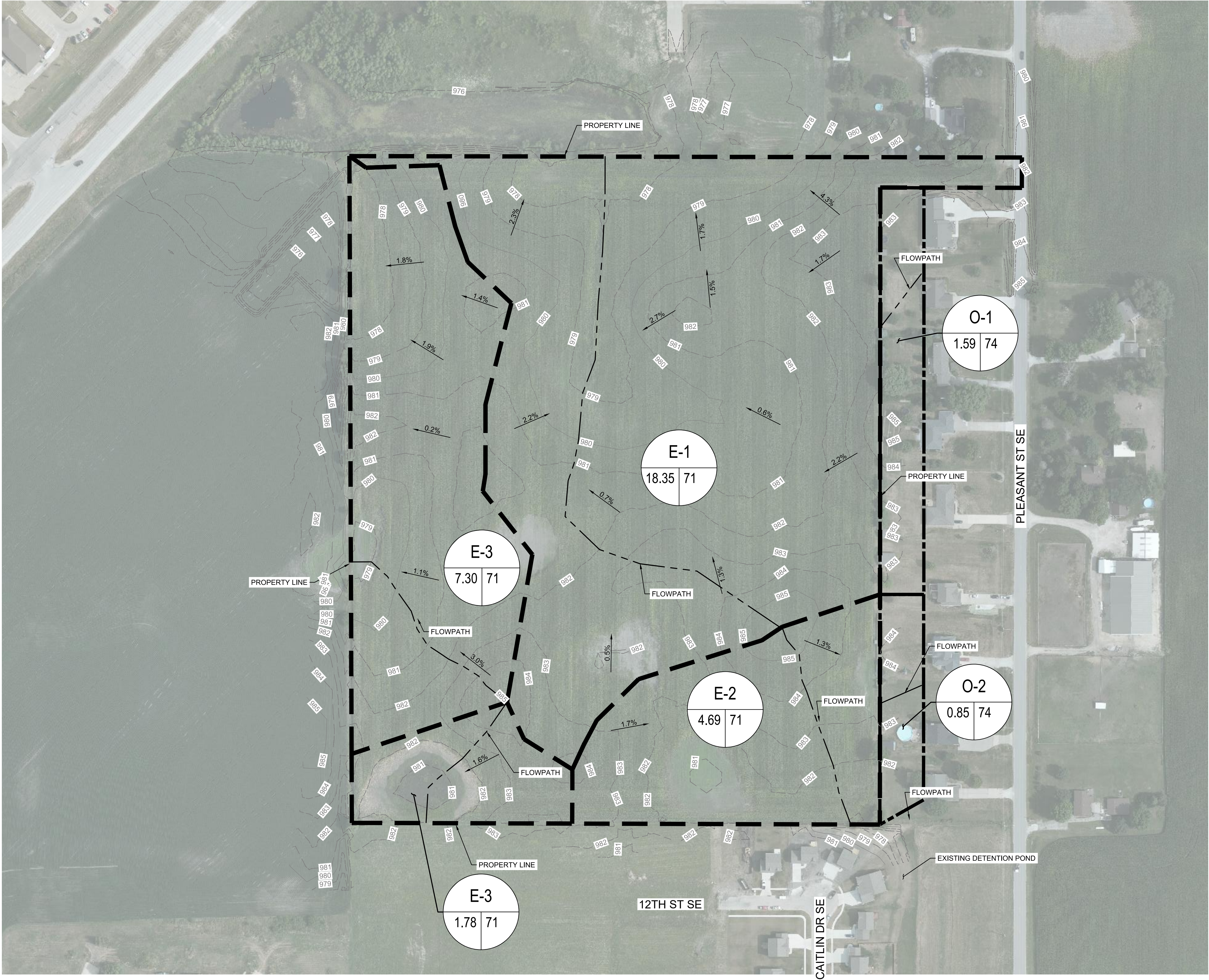
Statewide Urban Design and Specifications. Edition 2022.

Iowa Stormwater Management Manual. October 2009.

## **Appendix**



STORM WATER REPORT  
FOR  
WISTERIA CROSSING



0100200

Feet

N

CATCHMENT NAME

\*E-1

6.885

CATCHMENT AREA (ACRES)

CATCHMENT CURVE NUMBER

\*NOTE

EXISTING BASINS DENOTED WITH AN "E" PREFIX.  
OFFSITE EXISTING BASINS DENOTED WITH A "O" PREFIX.

LEGEND:

CATCHMENT BOUNDARY

OFFSITE CATCHMENT BOUNDARY

FLOWPATH

Bondurant, IA

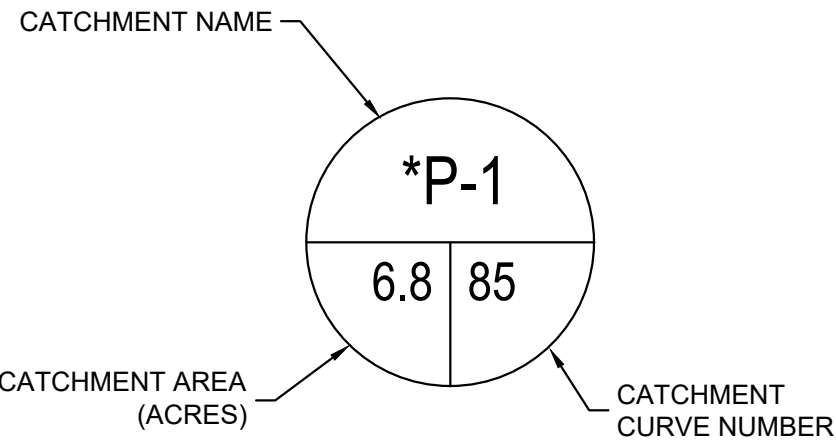
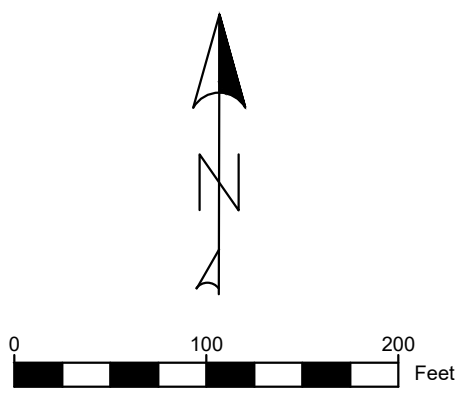
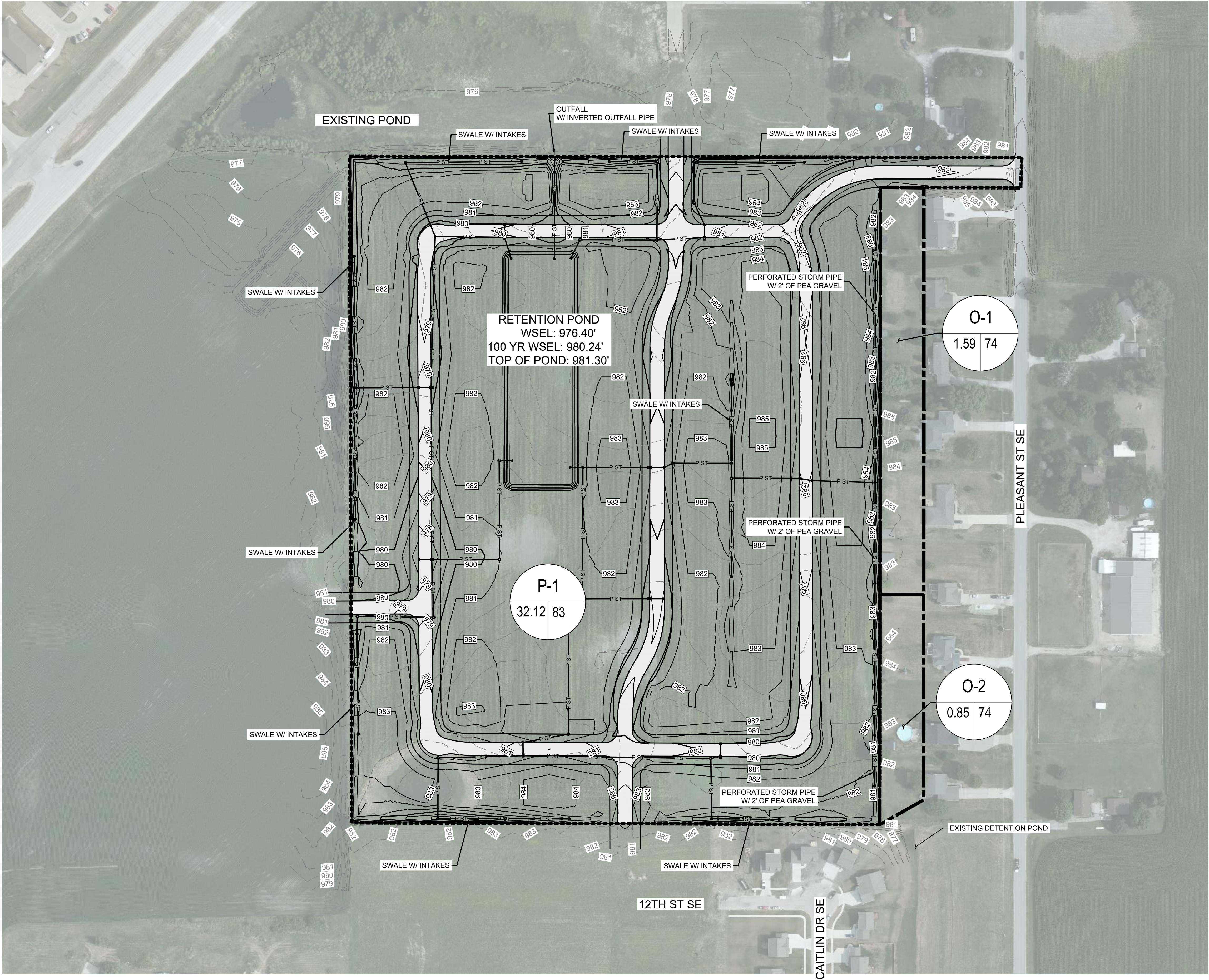
STUBBS ENGINEERING  
431 NE 72ND ST. PLEASANT HILL, IA 50327  
(515) 979 - 8499



EXISTING CATCHMENT  
MAP

DATE: 08/24/22  
DRAWN BY: NDE  
ENGINEER: BWS  
PROJECT NUMBER: 22-024  
PAGE NUMBER:

STORM WATER REPORT  
FOR  
WISTERIA CROSSING



\*NOTE

PROPOSED BASINS DENOTED WITH A "P" PREFIX.  
OFFSITE BASINS DENOTED WITH A "O" PREFIX.

LEGEND:

--- CATCHMENT BOUNDARY  
- - - OFFSITE CATCHMENT BOUNDARY

Bondurant, IA

STUBBS ENGINEERING

431 NE 72ND ST. PLEASANT HILL, IA 50327  
(515) 979 - 8499

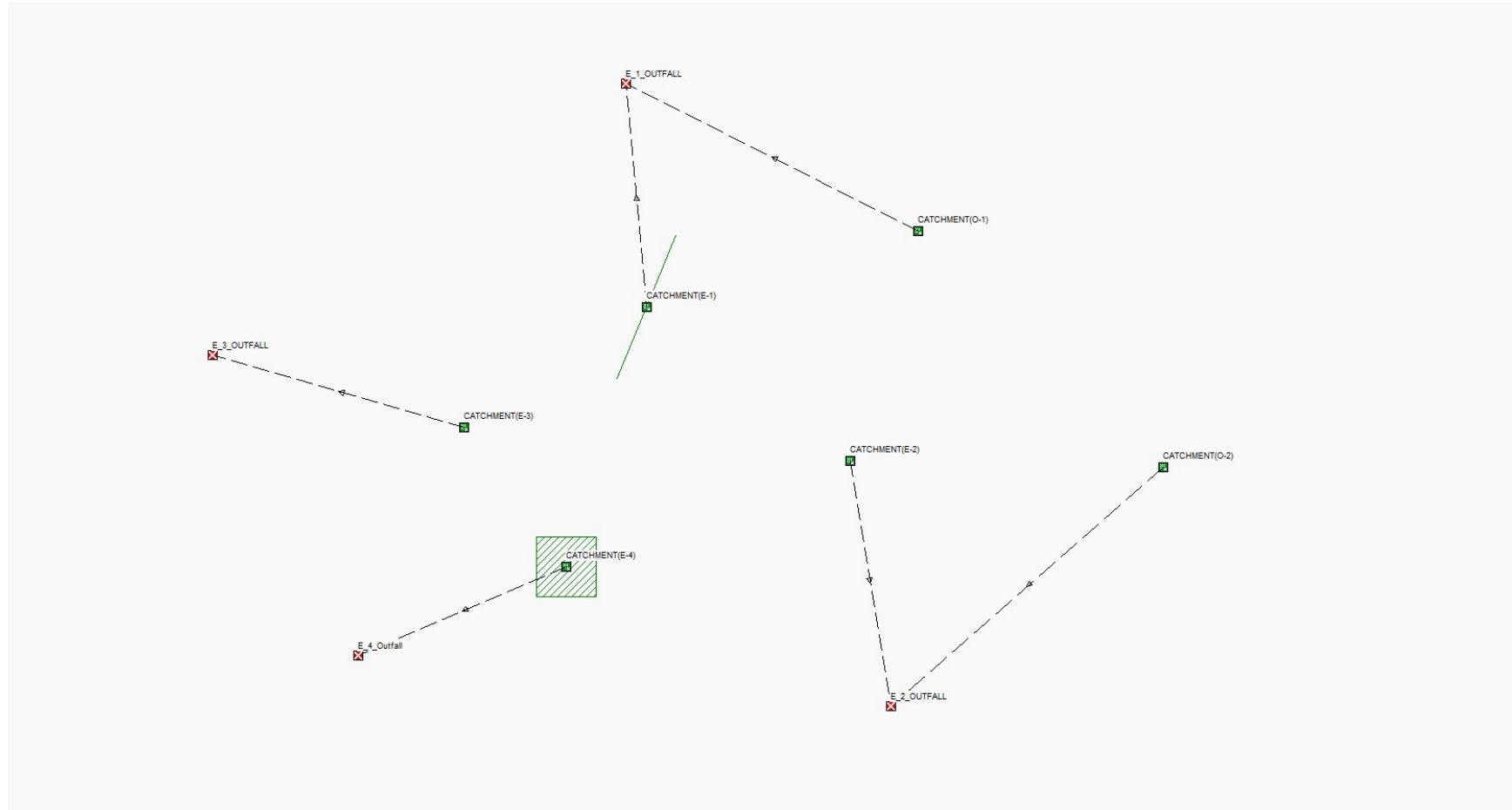


PROPOSED CATCHMENT  
MAP

DATE: 08/24/22  
DRAWN BY: NDE  
ENGINEER: BWS  
PROJECT NUMBER: 22-024  
PAGE NUMBER:

1

## WISTERIA CROSSING - EXISTING BASIN CALCULATIONS



Project Description

File Name ..... Existing Calcs.SPF

Project Options

Flow Units ..... CFS  
Elevation Type ..... Elevation  
Hydrology Method ..... SCS TR-55  
Time of Concentration (TOC) Method ..... SCS TR-55  
Link Routing Method ..... Hydrodynamic  
Enable Overflow Ponding at Nodes ..... YES  
Skip Steady State Analysis Time Periods .. NO

Analysis Options

Start Analysis On ..... Apr 08, 2019 00:00:00  
End Analysis On ..... Apr 09, 2019 00:00:00  
Start Reporting On ..... Apr 08, 2019 00:00:00  
Antecedent Dry Days ..... 0 days  
Runoff (Dry Weather) Time Step ..... 0 01:00:00 days hh:mm:ss  
Runoff (Wet Weather) Time Step ..... 0 00:05:00 days hh:mm:ss  
Reporting Time Step ..... 0 00:05:00 days hh:mm:ss  
Routing Time Step ..... 30 seconds

Number of Elements

|                              | Qty |
|------------------------------|-----|
| Rain Gages .....             | 7   |
| Subbasins.....               | 6   |
| Nodes.....                   | 4   |
| <i>Junctions</i> .....       | 0   |
| <i>Outfalls</i> .....        | 4   |
| <i>Flow Diversions</i> ..... | 0   |
| <i>Inlets</i> .....          | 0   |
| <i>Storage Nodes</i> .....   | 0   |
| Links.....                   | 0   |
| <i>Channels</i> .....        | 0   |
| <i>Pipes</i> .....           | 0   |
| <i>Pumps</i> .....           | 0   |
| <i>Orifices</i> .....        | 0   |
| <i>Weirs</i> .....           | 0   |
| <i>Outlets</i> .....         | 0   |
| Pollutants .....             | 0   |
| Land Uses .....              | 0   |

Rainfall Details

| SN | Rain Gage ID | Data Source | Data Source ID | Rainfall Type | Rain Units | State | County | Return Period (years) | Rainfall Depth (inches) | Rainfall Distribution |
|----|--------------|-------------|----------------|---------------|------------|-------|--------|-----------------------|-------------------------|-----------------------|
| 1  |              | Time Series | 5-Year         | Cumulative    | inches     | None  | None   | 5                     | 3.81                    | SCS Type II 24-hr     |

## Subbasin Summary

| SN | Subbasin ID    | Area<br>(ac) | Peak Rate<br>Factor | Weighted<br>Curve<br>Number | Total<br>Rainfall<br>(in) | Total<br>Runoff<br>(in) | Total<br>Runoff<br>Volume<br>(ac-in) | Peak<br>Runoff<br>(cfs) | Time of<br>Concentration<br>(days hh:mm:ss) |
|----|----------------|--------------|---------------------|-----------------------------|---------------------------|-------------------------|--------------------------------------|-------------------------|---------------------------------------------|
| 1  | CATCHMENT(E-1) | 18.35        | 484.00              | 71.00                       | 3.81                      | 1.27                    | 23.23                                | 16.60                   | 0 00:37:38                                  |
| 2  | CATCHMENT(E-2) | 4.69         | 484.00              | 71.00                       | 3.81                      | 1.27                    | 5.94                                 | 7.16                    | 0 00:15:00                                  |
| 3  | CATCHMENT(E-3) | 7.30         | 484.00              | 71.00                       | 3.81                      | 1.27                    | 9.24                                 | 11.14                   | 0 00:15:00                                  |
| 4  | CATCHMENT(E-4) | 1.78         | 484.00              | 71.00                       | 3.81                      | 1.27                    | 2.25                                 | 2.71                    | 0 00:15:00                                  |
| 5  | CATCHMENT(O-1) | 1.60         | 484.00              | 74.00                       | 3.81                      | 1.46                    | 2.33                                 | 2.86                    | 0 00:15:00                                  |
| 6  | CATCHMENT(O-2) | 0.85         | 484.00              | 74.00                       | 3.81                      | 1.46                    | 1.24                                 | 1.52                    | 0 00:15:00                                  |

Node Summary

| SN | Element<br>ID | Element<br>Type | Invert<br>Elevation | Ground/Rim<br>(Max)<br>Elevation | Initial<br>Water<br>Elevation | Surcharge<br>Elevation | Ponded<br>Area | Peak<br>Inflow | Max HGL<br>Elevation<br>Attained | Max<br>Surcharge<br>Depth<br>Attained | Min<br>Freeboard<br>Attained | Time of<br>Peak<br>Flooding<br>Occurrence | Total<br>Flooded<br>Volume | Total Time<br>Flooded |
|----|---------------|-----------------|---------------------|----------------------------------|-------------------------------|------------------------|----------------|----------------|----------------------------------|---------------------------------------|------------------------------|-------------------------------------------|----------------------------|-----------------------|
|    |               |                 | (ft)                | (ft)                             | (ft)                          | (ft)                   | (ft²)          | (cfs)          | (ft)                             | (ft)                                  | (ft)                         | (days hh:mm)                              | (ac-in)                    | (min)                 |
| 1  | E_1_OUTFALL   | Outfall         | 0.00                |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                              |                                           |                            |                       |
| 2  | E_2_OUTFALL   | Outfall         | 0.00                |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                              |                                           |                            |                       |
| 3  | E_3_OUTFALL   | Outfall         | 0.00                |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                              |                                           |                            |                       |
| 4  | E_4_Outfall   | Outfall         | 0.00                |                                  |                               |                        |                | 0.00           | 0.00                             |                                       |                              |                                           |                            |                       |

## Subbasin Hydrology

### Subbasin : CATCHMENT(E-1)

#### Input Data

Area (ac) ..... 18.35  
Peak Rate Factor ..... 484.00  
Weighted Curve Number ..... 71.00  
Rain Gage ID ..... 5-Year

#### Composite Curve Number

| Soil/Surface Description     | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Meadow                       | 18.35           | C             | 71.00           |
| Composite Area & Weighted CN | 18.35           |               | 71.00           |

#### Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8})) / ((P^{0.5}) * (S_f^{0.4}))$$

Where :

T<sub>c</sub> = Time of Concentration (hr)  
n = Manning's roughness  
L<sub>f</sub> = Flow Length (ft)  
P = 2 yr, 24 hr Rainfall (inches)  
S<sub>f</sub> = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 \* (S<sub>f</sub><sup>0.5</sup>) (unpaved surface)  
V = 20.3282 \* (S<sub>f</sub><sup>0.5</sup>) (paved surface)  
V = 15.0 \* (S<sub>f</sub><sup>0.5</sup>) (grassed waterway surface)  
V = 10.0 \* (S<sub>f</sub><sup>0.5</sup>) (nearly bare & untilled surface)  
V = 9.0 \* (S<sub>f</sub><sup>0.5</sup>) (cultivated straight rows surface)  
V = 7.0 \* (S<sub>f</sub><sup>0.5</sup>) (short grass pasture surface)  
V = 5.0 \* (S<sub>f</sub><sup>0.5</sup>) (woodland surface)  
V = 2.5 \* (S<sub>f</sub><sup>0.5</sup>) (forest w/heavy litter surface)  
T<sub>c</sub> = (L<sub>f</sub> / V) / (3600 sec/hr)

Where:

T<sub>c</sub> = Time of Concentration (hr)  
L<sub>f</sub> = Flow Length (ft)  
V = Velocity (ft/sec)  
V = Velocity (ft/sec)

Channel Flow Equation :

V = (1.49 \* (R<sup>2/3</sup>) \* (S<sub>f</sub><sup>0.5</sup>)) / n  
R = A<sub>q</sub> / W<sub>p</sub>  
T<sub>c</sub> = (L<sub>f</sub> / V) / (3600 sec/hr)

Where :

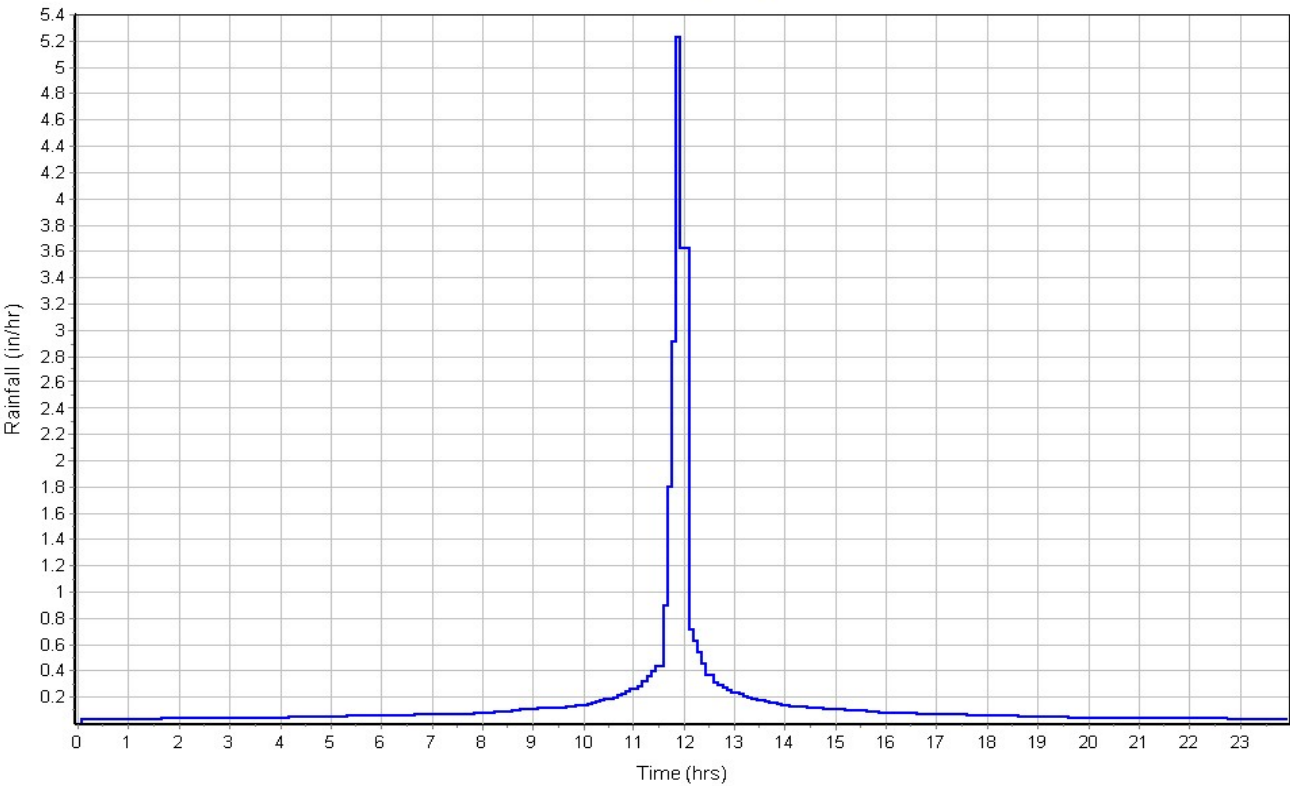
T<sub>c</sub> = Time of Concentration (hr)  
L<sub>f</sub> = Flow Length (ft)  
R = Hydraulic Radius (ft)  
A<sub>q</sub> = Flow Area (ft<sup>2</sup>)  
W<sub>p</sub> = Wetted Perimeter (ft)  
V = Velocity (ft/sec)  
S<sub>f</sub> = Slope (ft/ft)  
n = Manning's roughness

|                                        | Subarea       | Subarea | Subarea |
|----------------------------------------|---------------|---------|---------|
|                                        | A             | B       | C       |
| Sheet Flow Computations                |               |         |         |
| Manning's Roughness :                  | 0.24          | 0.00    | 0.00    |
| Flow Length (ft) :                     | 100           | 0.00    | 0.00    |
| Slope (%) :                            | 1.5           | 0.00    | 0.00    |
| 2 yr, 24 hr Rainfall (in) :            | 3.08          | 0.00    | 0.00    |
| Velocity (ft/sec) :                    | 0.10          | 0.00    | 0.00    |
| Computed Flow Time (min) :             | 16.32         | 0.00    | 0.00    |
|                                        |               |         |         |
|                                        | Subarea       | Subarea | Subarea |
|                                        | A             | B       | C       |
| Shallow Concentrated Flow Computations |               |         |         |
| Flow Length (ft) :                     | 1100          | 0.00    | 0.00    |
| Slope (%) :                            | 1.5           | 0.00    | 0.00    |
| Surface Type :                         | Grass pasture | Unpaved | Unpaved |
| Velocity (ft/sec) :                    | 0.86          | 0.00    | 0.00    |
| Computed Flow Time (min) :             | 21.32         | 0.00    | 0.00    |
| Total TOC (min) .....                  | 37.64         |         |         |

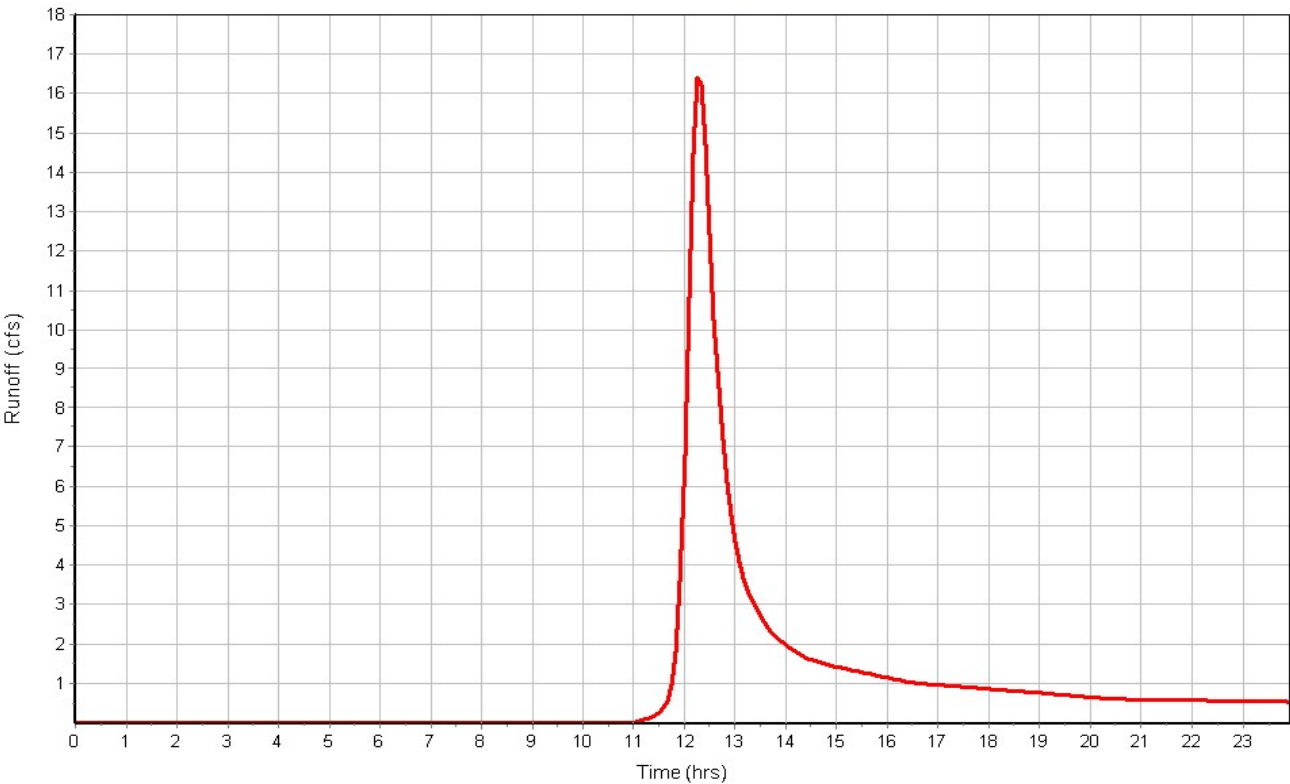
### Subbasin Runoff Results

|                                             |            |
|---------------------------------------------|------------|
| Total Rainfall (in) .....                   | 3.81       |
| Total Runoff (in) .....                     | 1.27       |
| Peak Runoff (cfs) .....                     | 16.60      |
| Weighted Curve Number .....                 | 71.00      |
| Time of Concentration (days hh:mm:ss) ..... | 0 00:37:38 |

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : CATCHMENT(E-2)

Input Data

Area (ac) ..... 4.69  
Peak Rate Factor ..... 484.00  
Weighted Curve Number ..... 71.00  
Rain Gage ID ..... 5-Year

Composite Curve Number

| Soil/Surface Description     | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Meadow                       | 4.69            | C             | 71.00           |
| Composite Area & Weighted CN | 4.69            |               | 71.00           |

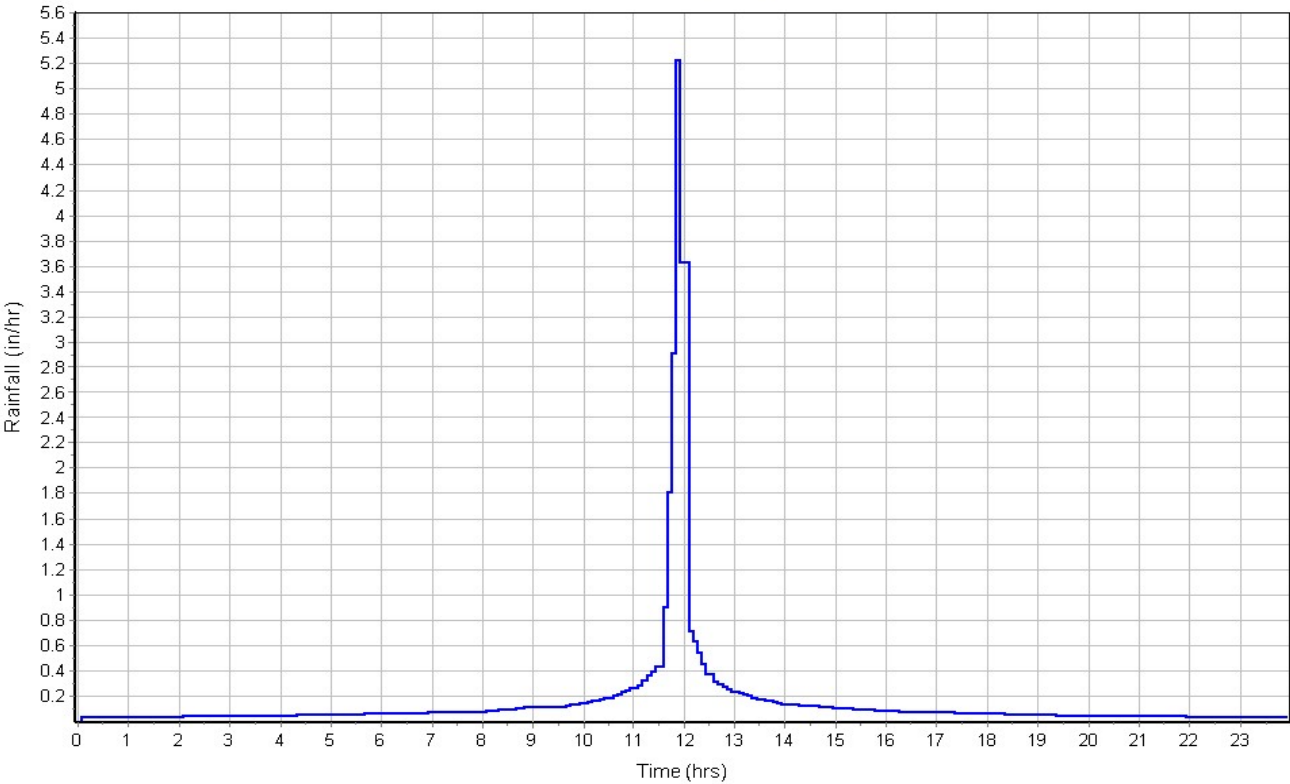
Time of Concentration

User-Defined TOC override (minutes): 15.00

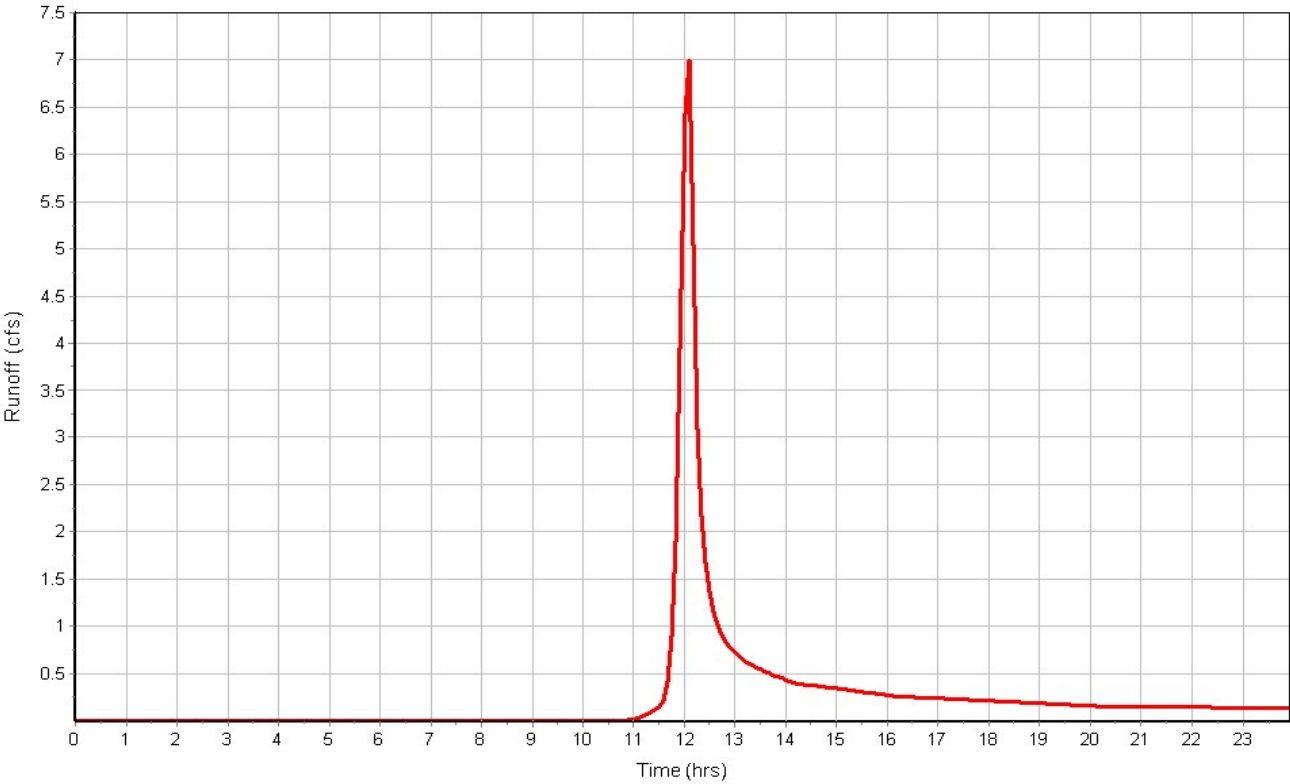
Subbasin Runoff Results

Total Rainfall (in) ..... 3.81  
Total Runoff (in) ..... 1.27  
Peak Runoff (cfs) ..... 7.16  
Weighted Curve Number ..... 71.00  
Time of Concentration (days hh:mm:ss) ..... 0 00:15:00

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : CATCHMENT(E-3)

Input Data

Area (ac) ..... 7.30  
Peak Rate Factor ..... 484.00  
Weighted Curve Number ..... 71.00  
Rain Gage ID ..... 5-Year

Composite Curve Number

| Soil/Surface Description     | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Meadow                       | 7.30            | C             | 71.00           |
| Composite Area & Weighted CN | 7.30            |               | 71.00           |

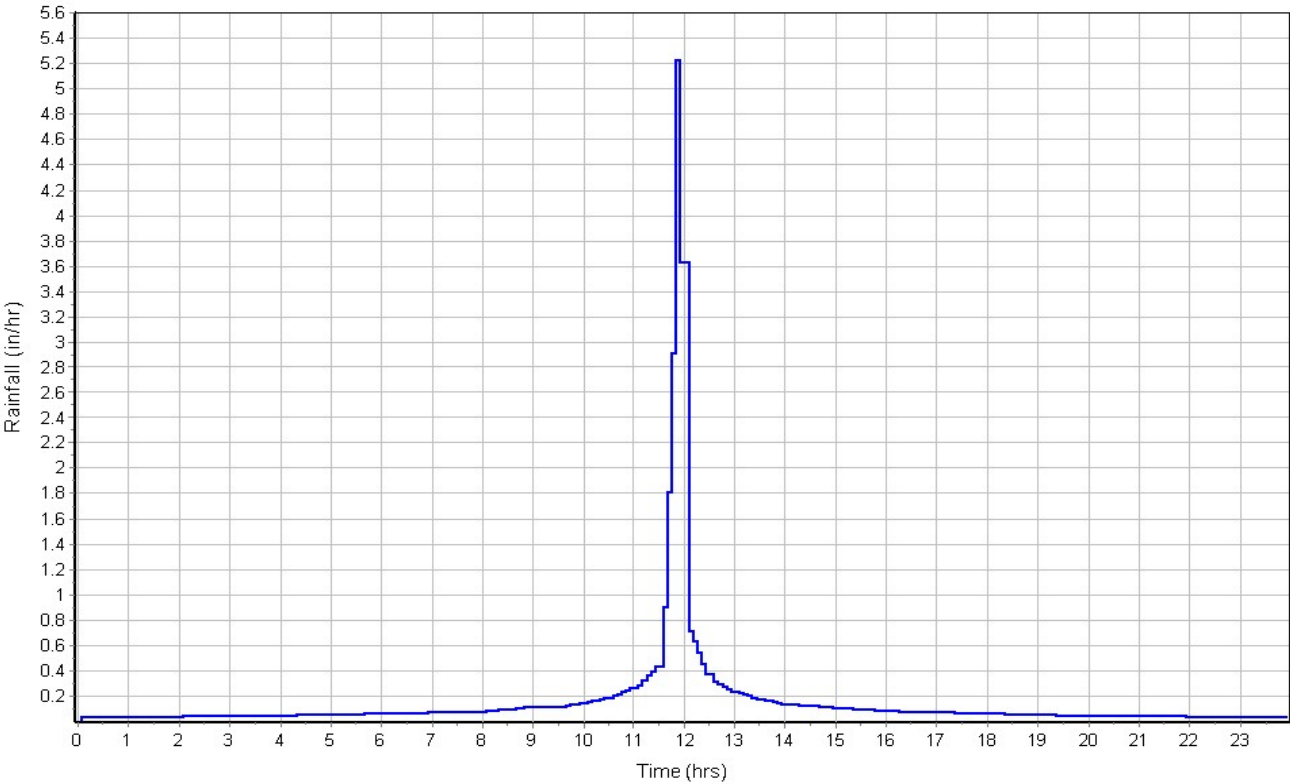
Time of Concentration

User-Defined TOC override (minutes): 15.00

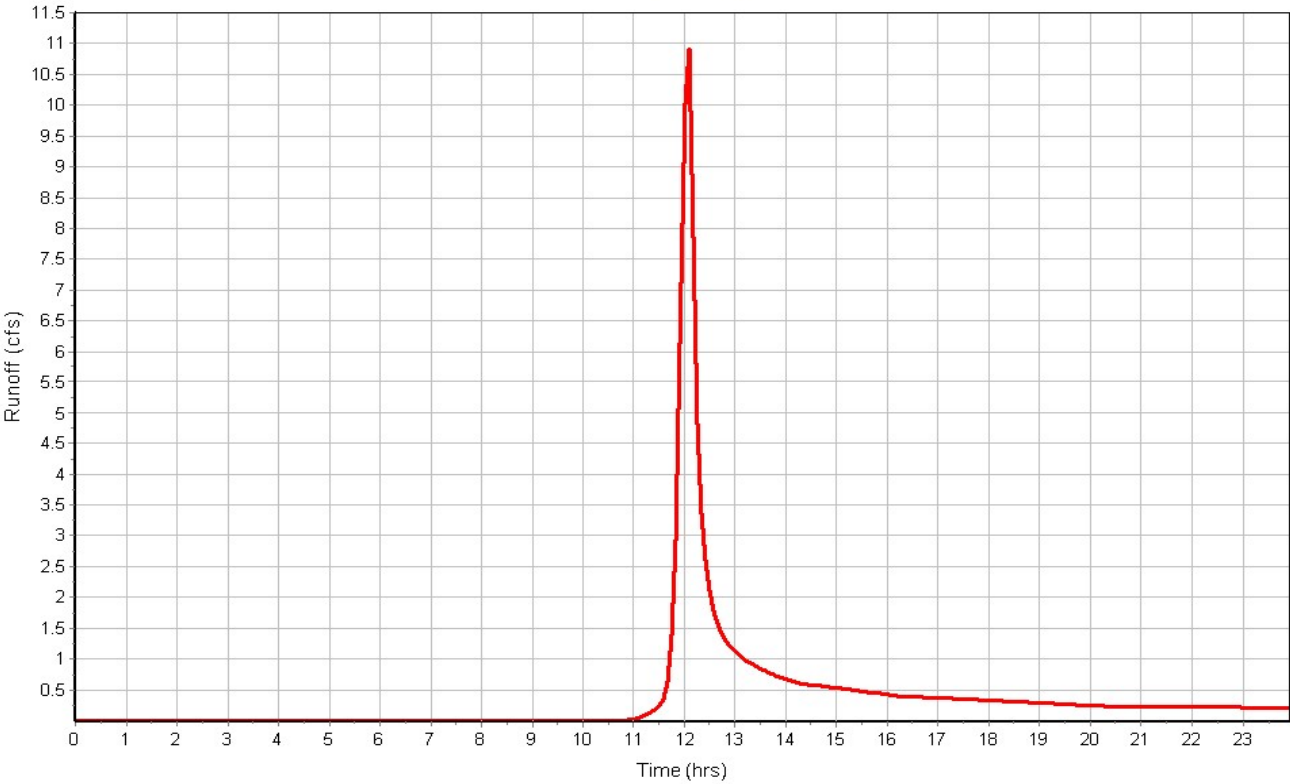
Subbasin Runoff Results

Total Rainfall (in) ..... 3.81  
Total Runoff (in) ..... 1.27  
Peak Runoff (cfs) ..... 11.14  
Weighted Curve Number ..... 71.00  
Time of Concentration (days hh:mm:ss) ..... 0 00:15:00

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : CATCHMENT(E-4)

Input Data

Area (ac) ..... 1.78  
Peak Rate Factor ..... 0.00  
Weighted Curve Number ..... 71.00  
Rain Gage ID ..... 5-Year

Composite Curve Number

| Soil/Surface Description     | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Meadow                       | 1.78            | C             | 71.00           |
| Composite Area & Weighted CN | 1.78            |               | 71.00           |

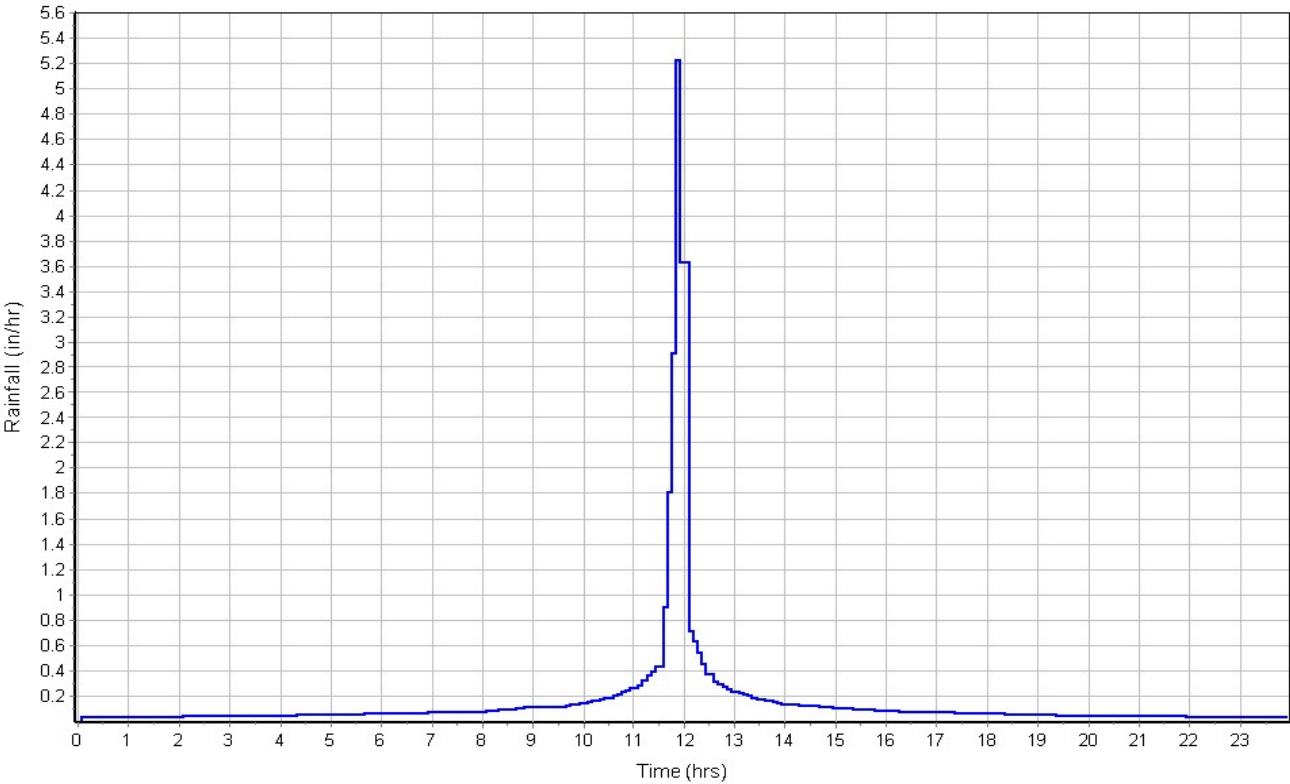
Time of Concentration

User-Defined TOC override (minutes): 15.00

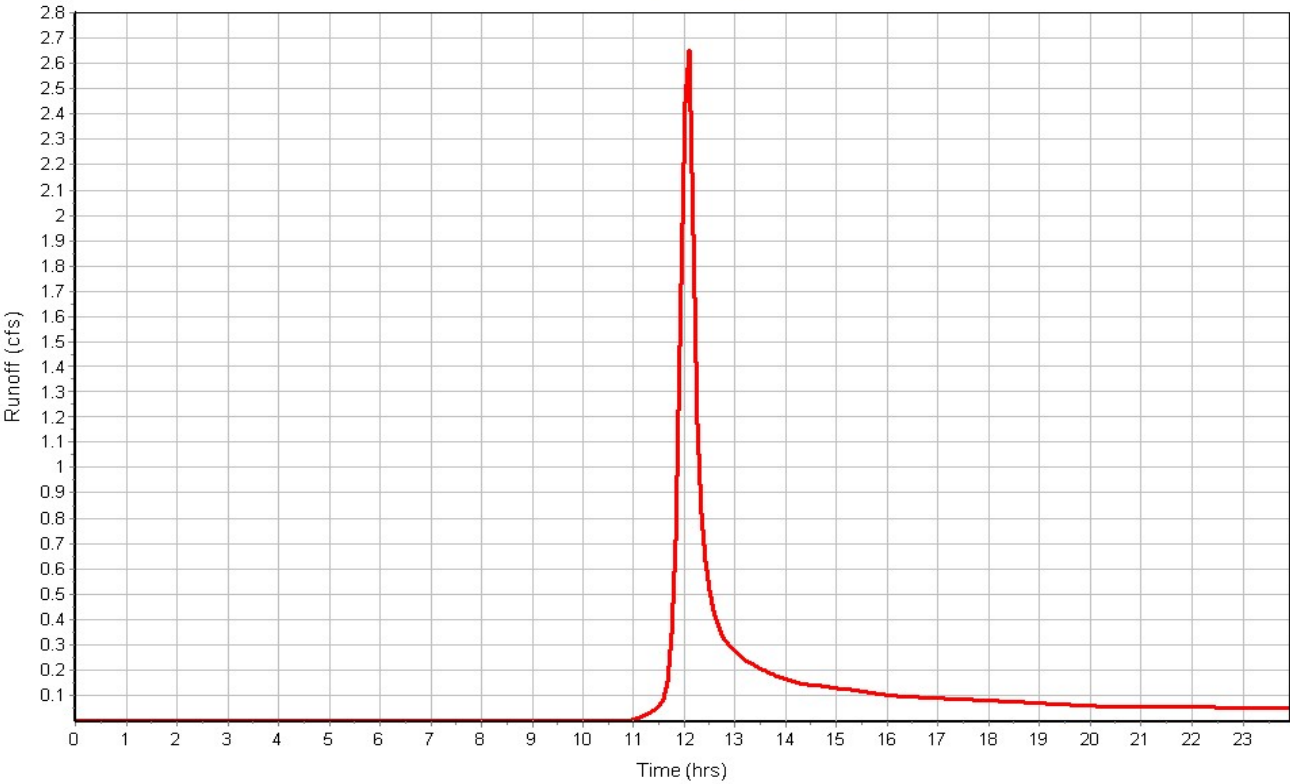
Subbasin Runoff Results

Total Rainfall (in) ..... 3.81  
Total Runoff (in) ..... 1.27  
Peak Runoff (cfs) ..... 2.71  
Weighted Curve Number ..... 71.00  
Time of Concentration (days hh:mm:ss) ..... 0 00:15:00

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : CATCHMENT(O-1)

Input Data

Area (ac) ..... 1.60  
Peak Rate Factor ..... 484.00  
Weighted Curve Number ..... 74.00  
Rain Gage ID ..... 100-Year

Composite Curve Number

| Soil/Surface Description     | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| OffsiteBackYardsGrassed      | 1.60            | C             | 74.00           |
| Composite Area & Weighted CN | 1.60            |               | 74.00           |

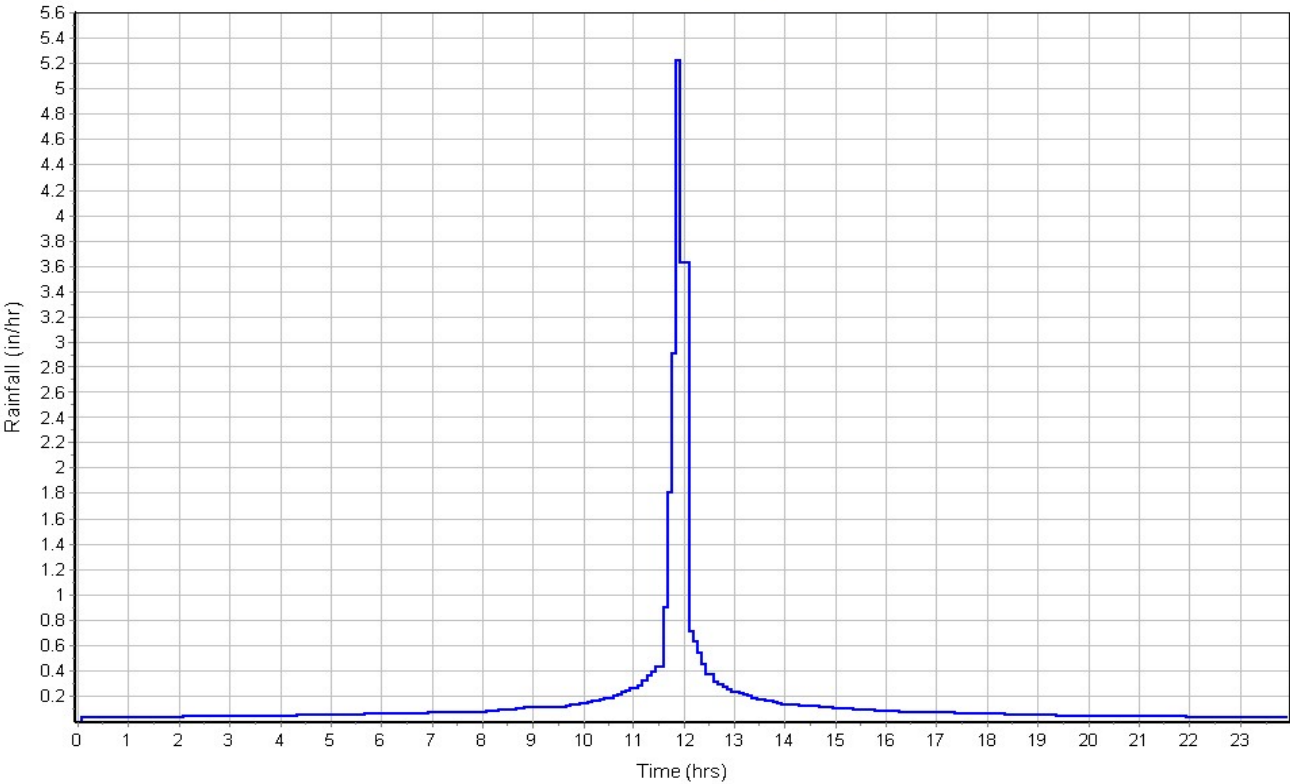
Time of Concentration

User-Defined TOC override (minutes): 15

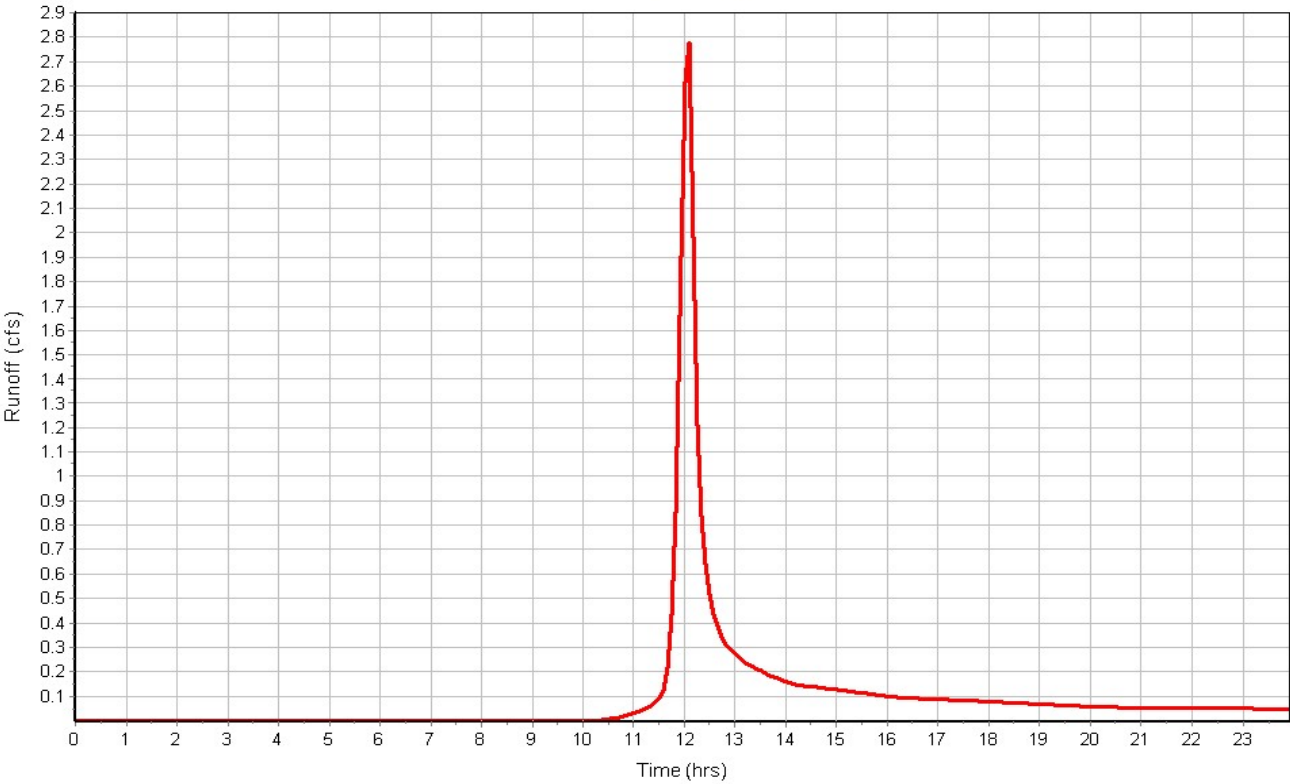
Subbasin Runoff Results

Total Rainfall (in) ..... 3.81  
Total Runoff (in) ..... 1.46  
Peak Runoff (cfs) ..... 2.86  
Weighted Curve Number ..... 74.00  
Time of Concentration (days hh:mm:ss) ..... 0 00:15:00

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : CATCHMENT(O-2)

Input Data

Area (ac) ..... 0.85  
Peak Rate Factor ..... 484.00  
Weighted Curve Number ..... 74.00  
Rain Gage ID ..... 100-Year

Composite Curve Number

| Soil/Surface Description     | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| GrassedBackYards             | 0.85            | C             | 74.00           |
| Composite Area & Weighted CN | 0.85            |               | 74.00           |

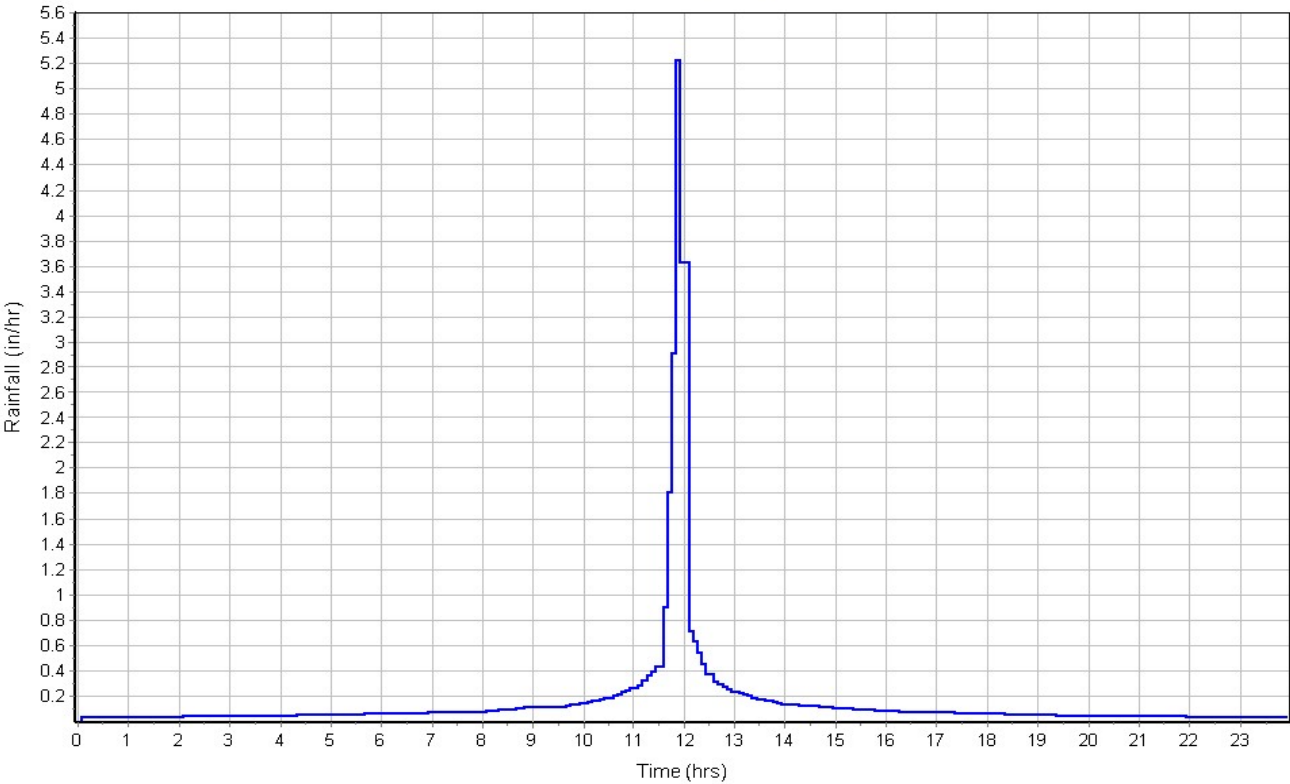
Time of Concentration

User-Defined TOC override (minutes): 15

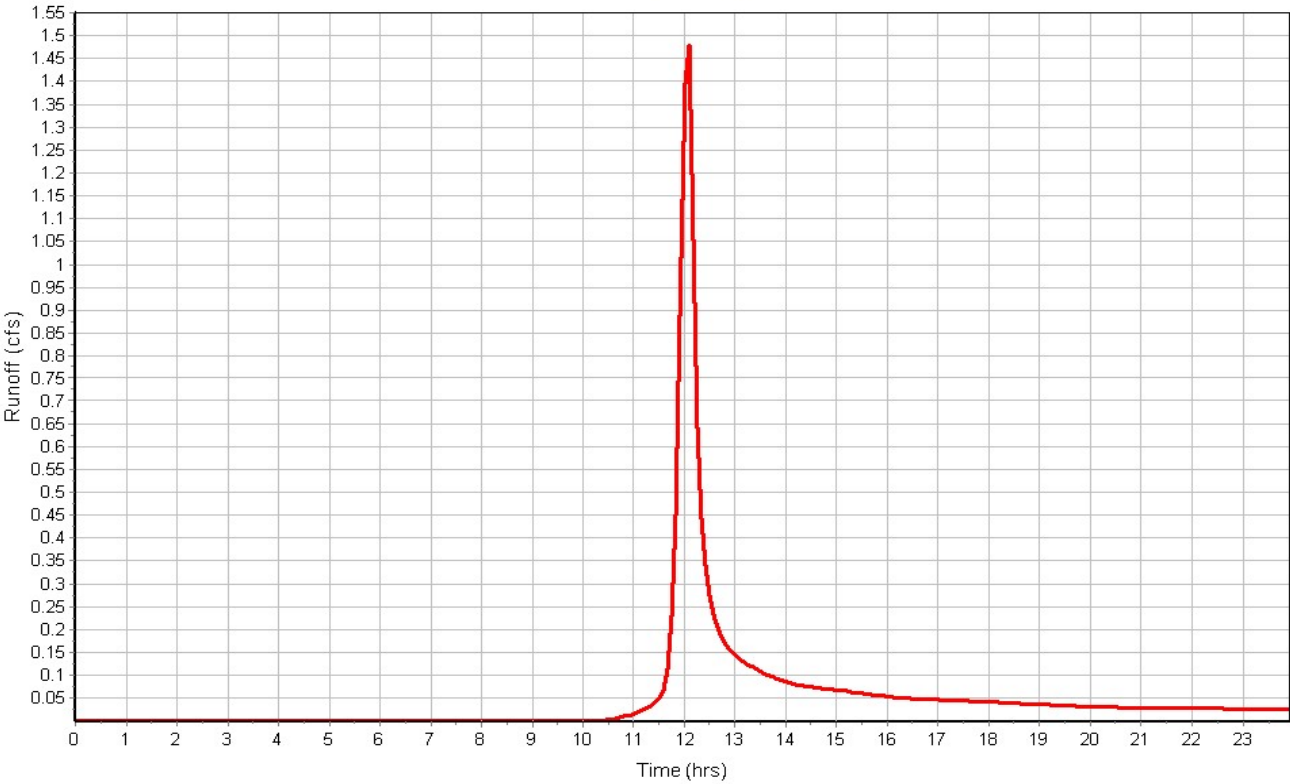
Subbasin Runoff Results

Total Rainfall (in) ..... 3.81  
Total Runoff (in) ..... 1.46  
Peak Runoff (cfs) ..... 1.52  
Weighted Curve Number ..... 74.00  
Time of Concentration (days hh:mm:ss) ..... 0 00:15:00

Rainfall Intensity Graph



Runoff Hydrograph



Project Description

File Name ..... Existing Calcs.SPF

Project Options

Flow Units ..... CFS  
Elevation Type ..... Elevation  
Hydrology Method ..... SCS TR-55  
Time of Concentration (TOC) Method ..... SCS TR-55  
Link Routing Method ..... Hydrodynamic  
Enable Overflow Ponding at Nodes ..... YES  
Skip Steady State Analysis Time Periods ..... NO

Analysis Options

Start Analysis On ..... Apr 08, 2019 00:00:00  
End Analysis On ..... Apr 09, 2019 00:00:00  
Start Reporting On ..... Apr 08, 2019 00:00:00  
Antecedent Dry Days ..... 0 days  
Runoff (Dry Weather) Time Step ..... 0 01:00:00 days hh:mm:ss  
Runoff (Wet Weather) Time Step ..... 0 00:05:00 days hh:mm:ss  
Reporting Time Step ..... 0 00:05:00 days hh:mm:ss  
Routing Time Step ..... 30 seconds

Number of Elements

|                              | Qty |
|------------------------------|-----|
| Rain Gages .....             | 7   |
| Subbasins.....               | 6   |
| Nodes.....                   | 4   |
| <i>Junctions</i> .....       | 0   |
| <i>Outfalls</i> .....        | 4   |
| <i>Flow Diversions</i> ..... | 0   |
| <i>Inlets</i> .....          | 0   |
| <i>Storage Nodes</i> .....   | 0   |
| Links.....                   | 0   |
| <i>Channels</i> .....        | 0   |
| <i>Pipes</i> .....           | 0   |
| <i>Pumps</i> .....           | 0   |
| <i>Orifices</i> .....        | 0   |
| <i>Weirs</i> .....           | 0   |
| <i>Outlets</i> .....         | 0   |
| Pollutants .....             | 0   |
| Land Uses .....              | 0   |

Rainfall Details

| SN | Rain Gage ID | Data Source | Data Source ID | Rainfall Type | Rain Units | State | County | Return Period (years) | Rainfall Depth (inches) | Rainfall Distribution |
|----|--------------|-------------|----------------|---------------|------------|-------|--------|-----------------------|-------------------------|-----------------------|
| 1  |              | Time Series | 100-Year       | Cumulative    | inches     | None  | None   | 100                   | 7.12                    | SCS Type II 24-hr     |

## Subbasin Summary

| SN | Subbasin ID    | Area<br>(ac) | Peak Rate<br>Factor | Weighted<br>Curve<br>Number | Total<br>Rainfall<br>(in) | Total<br>Runoff<br>(in) | Total<br>Runoff<br>Volume<br>(ac-in) | Peak<br>Runoff<br>(cfs) | Time of<br>Concentration<br>(days hh:mm:ss) |
|----|----------------|--------------|---------------------|-----------------------------|---------------------------|-------------------------|--------------------------------------|-------------------------|---------------------------------------------|
| 1  | CATCHMENT(E-1) | 18.35        | 484.00              | 71.00                       | 7.12                      | 3.83                    | 70.19                                | 53.59                   | 0 00:37:38                                  |
| 2  | CATCHMENT(E-2) | 4.69         | 484.00              | 71.00                       | 7.12                      | 3.83                    | 17.94                                | 22.27                   | 0 00:15:00                                  |
| 3  | CATCHMENT(E-3) | 7.30         | 484.00              | 71.00                       | 7.12                      | 3.83                    | 27.92                                | 34.66                   | 0 00:15:00                                  |
| 4  | CATCHMENT(E-4) | 1.78         | 484.00              | 71.00                       | 7.12                      | 3.83                    | 6.81                                 | 8.44                    | 0 00:15:00                                  |
| 5  | CATCHMENT(O-1) | 1.60         | 484.00              | 74.00                       | 7.12                      | 4.15                    | 6.63                                 | 8.22                    | 0 00:15:00                                  |
| 6  | CATCHMENT(O-2) | 0.85         | 484.00              | 74.00                       | 7.12                      | 4.15                    | 3.52                                 | 4.37                    | 0 00:15:00                                  |

## Node Summary

| SN | Element ID  | Element Type | Invert Elevation | Ground/Rim (Max) Elevation | Initial Water Elevation | Surcharge Elevation | Ponded Area | Peak Inflow | Max HGL Elevation Attained | Max Surcharge Depth Attained | Min Freeboard Attained | Time of Peak Flooding Occurrence | Total Flooded Volume | Total Time Flooded |
|----|-------------|--------------|------------------|----------------------------|-------------------------|---------------------|-------------|-------------|----------------------------|------------------------------|------------------------|----------------------------------|----------------------|--------------------|
|    |             |              | (ft)             | (ft)                       | (ft)                    | (ft)                | (ft²)       | (cfs)       | (ft)                       | (ft)                         | (ft)                   | (days hh:mm)                     | (ac-in)              | (min)              |
| 1  | E_1_OUTFALL | Outfall      | 0.00             |                            |                         |                     |             | 0.00        | 0.00                       |                              |                        |                                  |                      |                    |
| 2  | E_2_OUTFALL | Outfall      | 0.00             |                            |                         |                     |             | 0.00        | 0.00                       |                              |                        |                                  |                      |                    |
| 3  | E_3_OUTFALL | Outfall      | 0.00             |                            |                         |                     |             | 0.00        | 0.00                       |                              |                        |                                  |                      |                    |
| 4  | E_4_Outfall | Outfall      | 0.00             |                            |                         |                     |             | 0.00        | 0.00                       |                              |                        |                                  |                      |                    |

## Subbasin Hydrology

### Subbasin : CATCHMENT(E-1)

#### Input Data

Area (ac) ..... 18.35  
Peak Rate Factor ..... 484.00  
Weighted Curve Number ..... 71.00  
Rain Gage ID ..... 5-Year

#### Composite Curve Number

| Soil/Surface Description     | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Meadow                       | 18.35           | C             | 71.00           |
| Composite Area & Weighted CN | 18.35           |               | 71.00           |

#### Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8})) / ((P^{0.5}) * (S_f^{0.4}))$$

Where :

$T_c$  = Time of Concentration (hr)  
 $n$  = Manning's roughness  
 $L_f$  = Flow Length (ft)  
 $P$  = 2 yr, 24 hr Rainfall (inches)  
 $S_f$  = Slope (ft/ft)

Shallow Concentrated Flow Equation :

$V = 16.1345 * (S_f^{0.5})$  (unpaved surface)  
 $V = 20.3282 * (S_f^{0.5})$  (paved surface)  
 $V = 15.0 * (S_f^{0.5})$  (grassed waterway surface)  
 $V = 10.0 * (S_f^{0.5})$  (nearly bare & untilled surface)  
 $V = 9.0 * (S_f^{0.5})$  (cultivated straight rows surface)  
 $V = 7.0 * (S_f^{0.5})$  (short grass pasture surface)  
 $V = 5.0 * (S_f^{0.5})$  (woodland surface)  
 $V = 2.5 * (S_f^{0.5})$  (forest w/heavy litter surface)  
 $T_c = (L_f / V) / (3600 \text{ sec/hr})$

Where:

$T_c$  = Time of Concentration (hr)  
 $L_f$  = Flow Length (ft)  
 $V$  = Velocity (ft/sec)  
 $S_f$  = Slope (ft/ft)

Channel Flow Equation :

$V = (1.49 * (R^{2/3}) * (S_f^{0.5})) / n$   
 $R = A_q / W_p$   
 $T_c = (L_f / V) / (3600 \text{ sec/hr})$

Where :

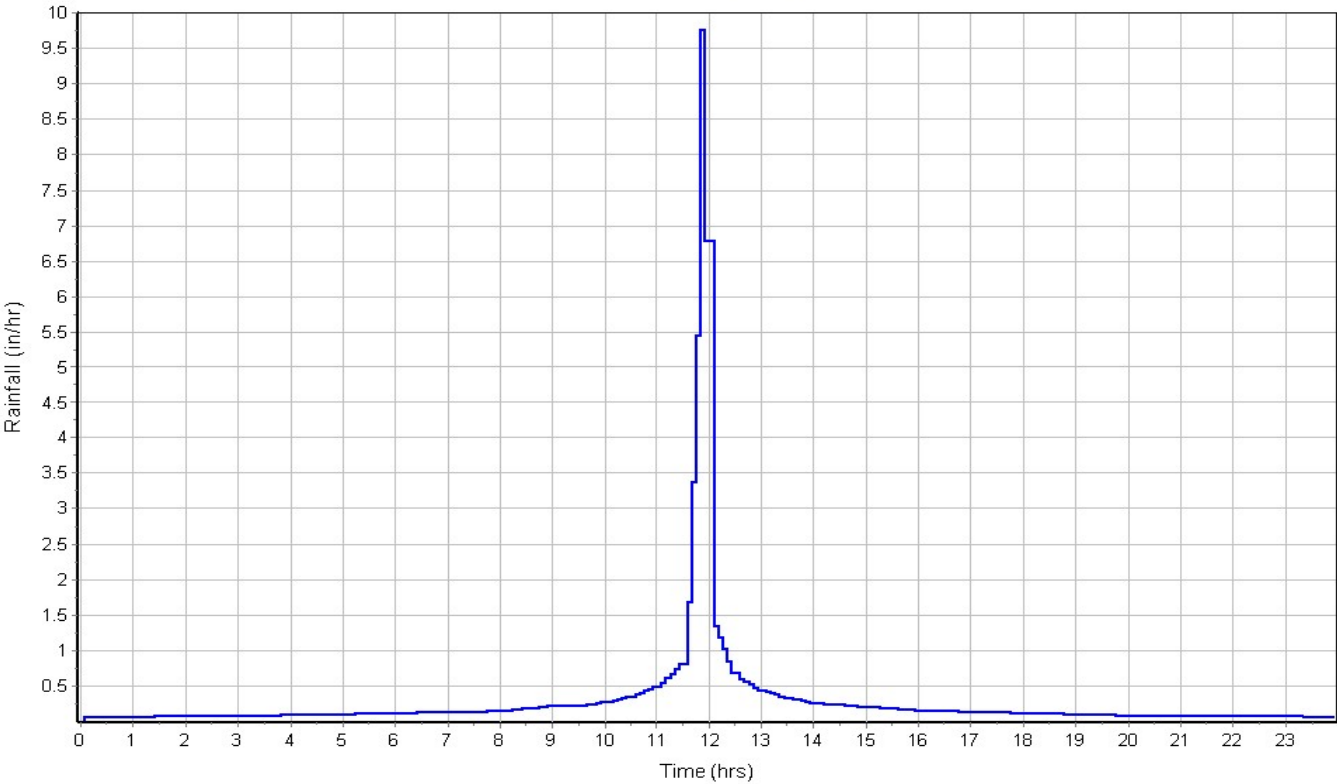
$T_c$  = Time of Concentration (hr)  
 $L_f$  = Flow Length (ft)  
 $R$  = Hydraulic Radius (ft)  
 $A_q$  = Flow Area (ft<sup>2</sup>)  
 $W_p$  = Wetted Perimeter (ft)  
 $V$  = Velocity (ft/sec)  
 $S_f$  = Slope (ft/ft)  
 $n$  = Manning's roughness

|                                        |               |         |         |
|----------------------------------------|---------------|---------|---------|
| Sheet Flow Computations                | Subarea       | Subarea | Subarea |
|                                        | A             | B       | C       |
|                                        | 0.24          | 0.00    | 0.00    |
|                                        | 100           | 0.00    | 0.00    |
|                                        | 1.5           | 0.00    | 0.00    |
|                                        | 3.08          | 0.00    | 0.00    |
|                                        | 0.10          | 0.00    | 0.00    |
| Computed Flow Time (min) :             | 16.32         | 0.00    | 0.00    |
|                                        |               |         |         |
| Shallow Concentrated Flow Computations | Subarea       | Subarea | Subarea |
|                                        | A             | B       | C       |
|                                        | 1100          | 0.00    | 0.00    |
|                                        | 1.5           | 0.00    | 0.00    |
|                                        | Grass pasture | Unpaved | Unpaved |
|                                        | 0.86          | 0.00    | 0.00    |
|                                        | 21.32         | 0.00    | 0.00    |
| Computed Flow Time (min) :             |               |         |         |
| Total TOC (min) .....                  | 37.64         |         |         |

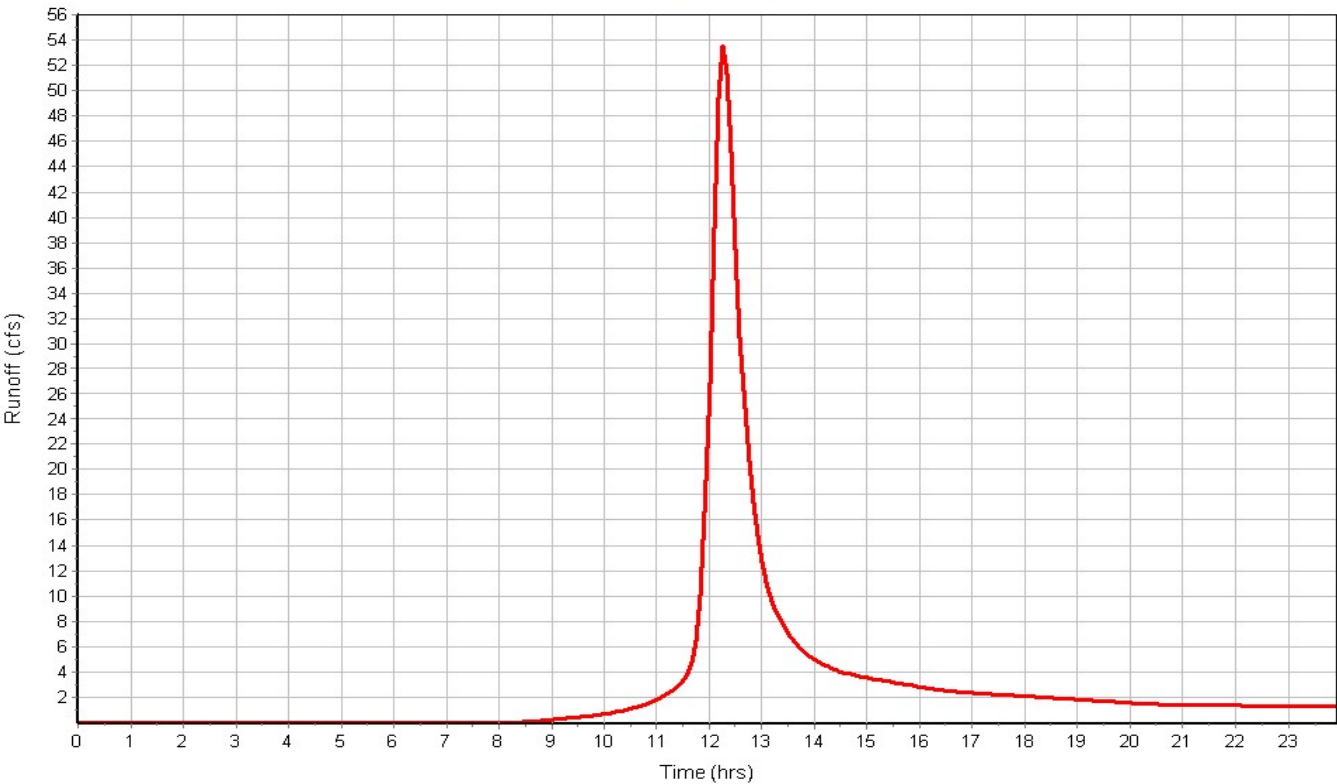
### Subbasin Runoff Results

|                                             |            |
|---------------------------------------------|------------|
| Total Rainfall (in) .....                   | 7.12       |
| Total Runoff (in) .....                     | 3.83       |
| Peak Runoff (cfs) .....                     | 53.59      |
| Weighted Curve Number .....                 | 71.00      |
| Time of Concentration (days hh:mm:ss) ..... | 0 00:37:38 |

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : CATCHMENT(E-2)

Input Data

Area (ac) ..... 4.69  
Peak Rate Factor ..... 484.00  
Weighted Curve Number ..... 71.00  
Rain Gage ID ..... 5-Year

Composite Curve Number

| Soil/Surface Description     | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Meadow                       | 4.69            | C             | 71.00           |
| Composite Area & Weighted CN | 4.69            |               | 71.00           |

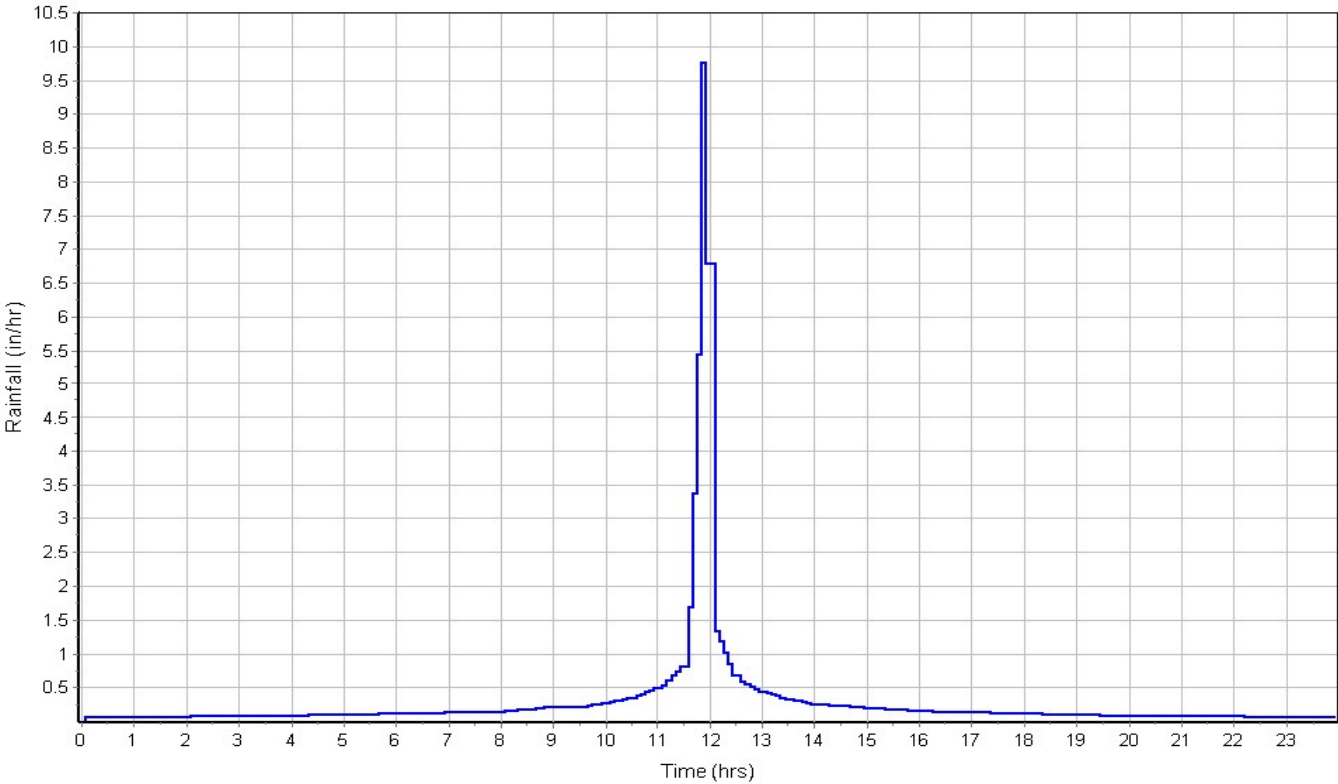
Time of Concentration

User-Defined TOC override (minutes): 15.00

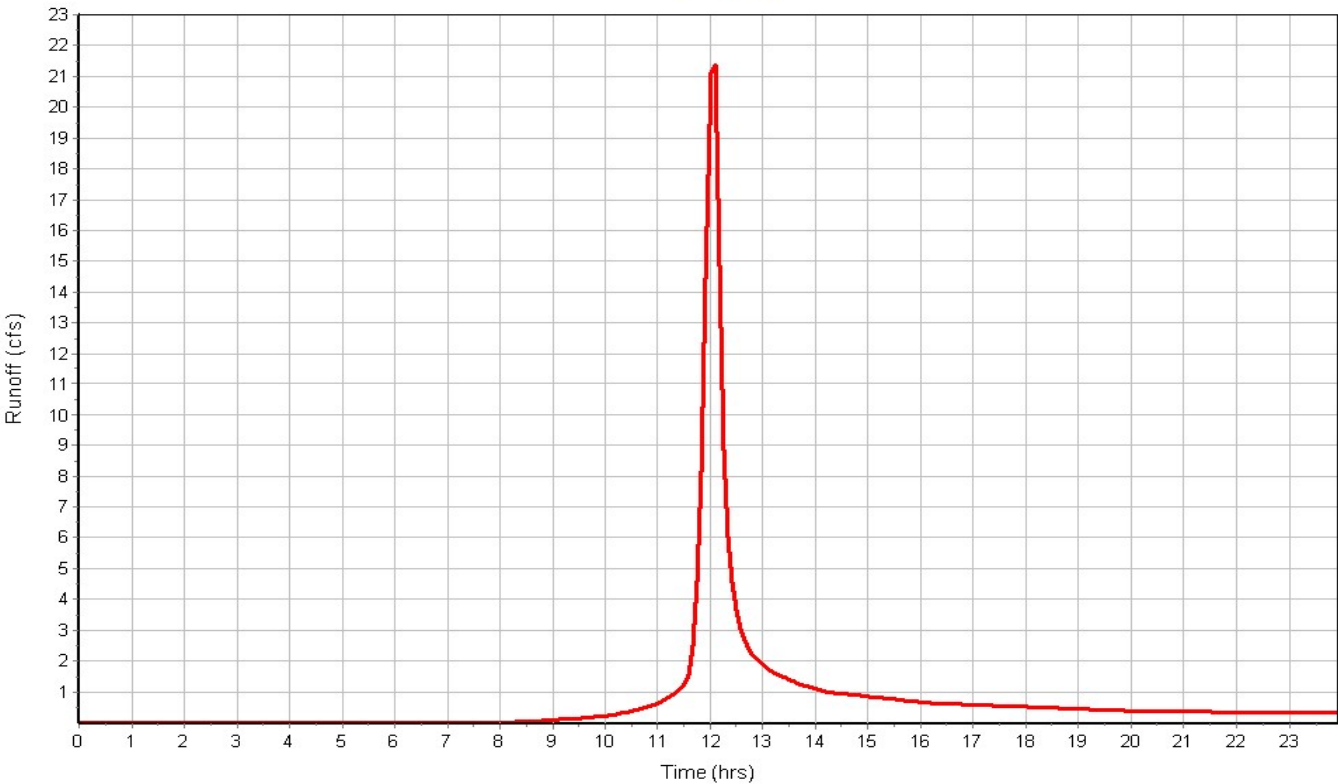
Subbasin Runoff Results

Total Rainfall (in) ..... 7.12  
Total Runoff (in) ..... 3.83  
Peak Runoff (cfs) ..... 22.27  
Weighted Curve Number ..... 71.00  
Time of Concentration (days hh:mm:ss) ..... 0 00:15:00

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : CATCHMENT(E-3)

Input Data

Area (ac) ..... 7.30  
Peak Rate Factor ..... 484.00  
Weighted Curve Number ..... 71.00  
Rain Gage ID ..... 5-Year

Composite Curve Number

| Soil/Surface Description     | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Meadow                       | 7.30            | C             | 71.00           |
| Composite Area & Weighted CN | 7.30            |               | 71.00           |

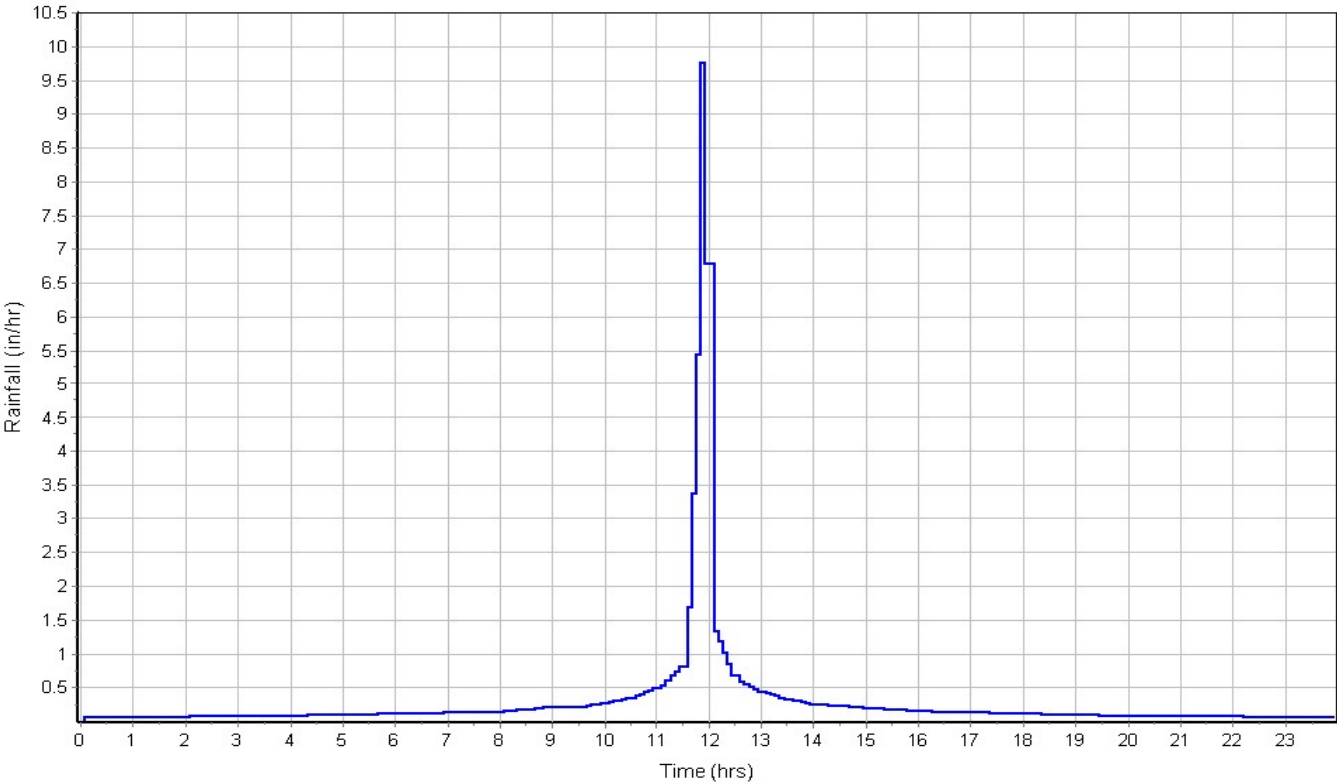
Time of Concentration

User-Defined TOC override (minutes): 15.00

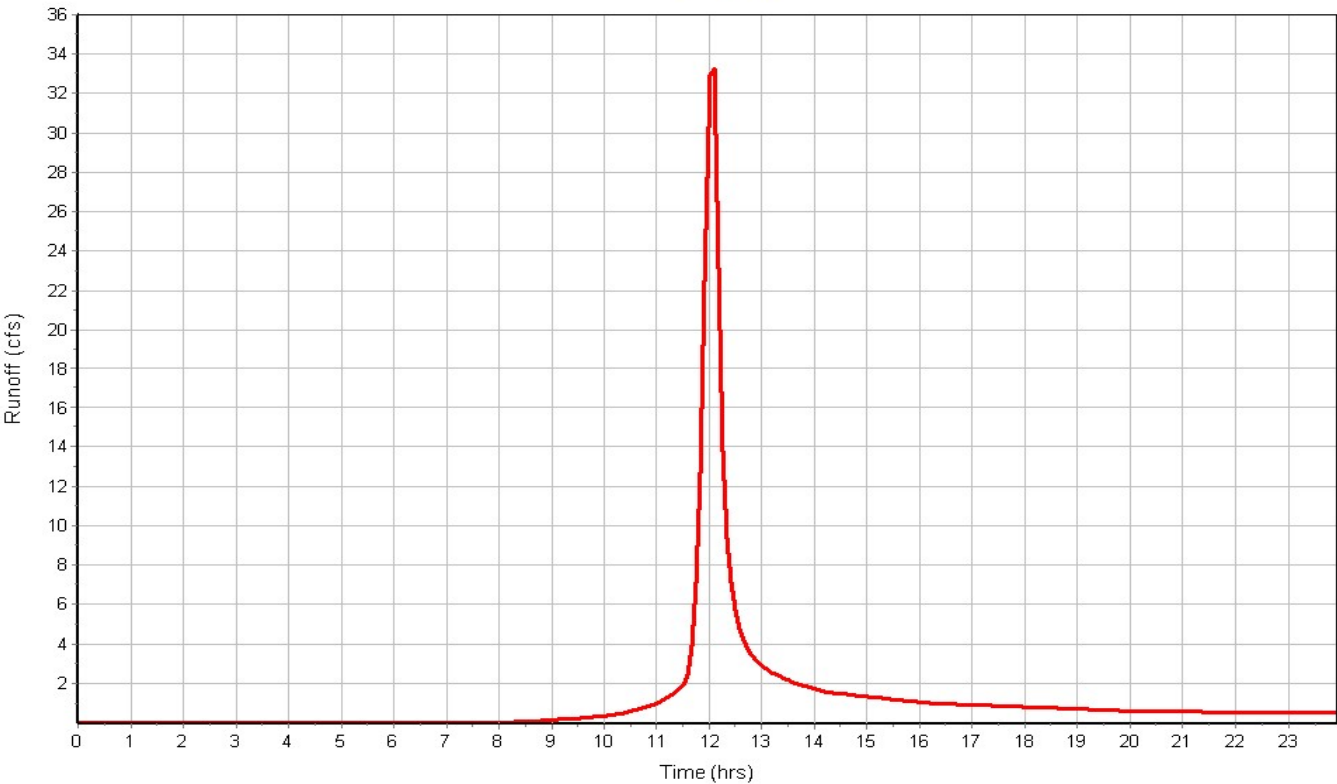
Subbasin Runoff Results

Total Rainfall (in) ..... 7.12  
Total Runoff (in) ..... 3.83  
Peak Runoff (cfs) ..... 34.66  
Weighted Curve Number ..... 71.00  
Time of Concentration (days hh:mm:ss) ..... 0 00:15:00

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : CATCHMENT(E-4)

Input Data

Area (ac) ..... 1.78  
Peak Rate Factor ..... 484.00  
Weighted Curve Number ..... 71.00  
Rain Gage ID ..... 5-Year

Composite Curve Number

| Soil/Surface Description     | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| Meadow                       | 1.78            | C             | 71.00           |
| Composite Area & Weighted CN | 1.78            |               | 71.00           |

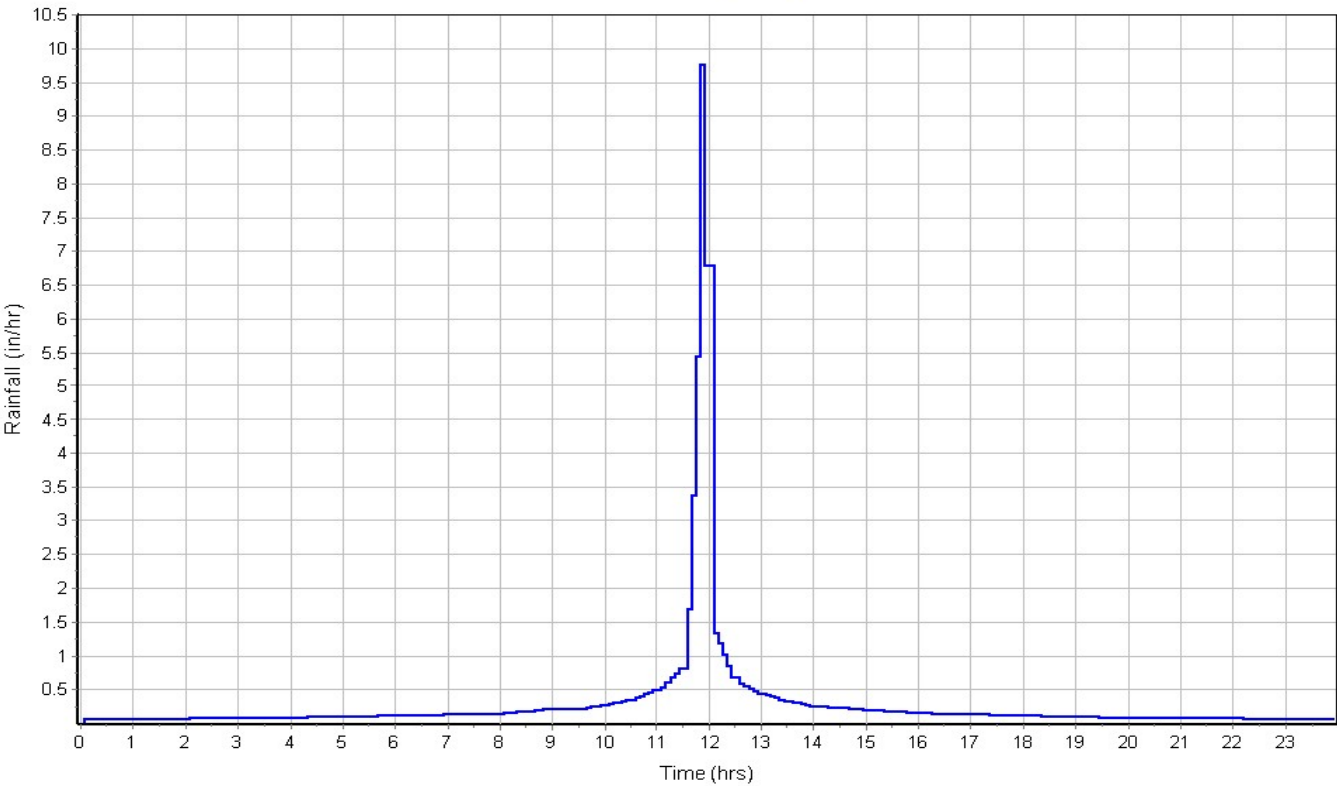
Time of Concentration

User-Defined TOC override (minutes): 15.00

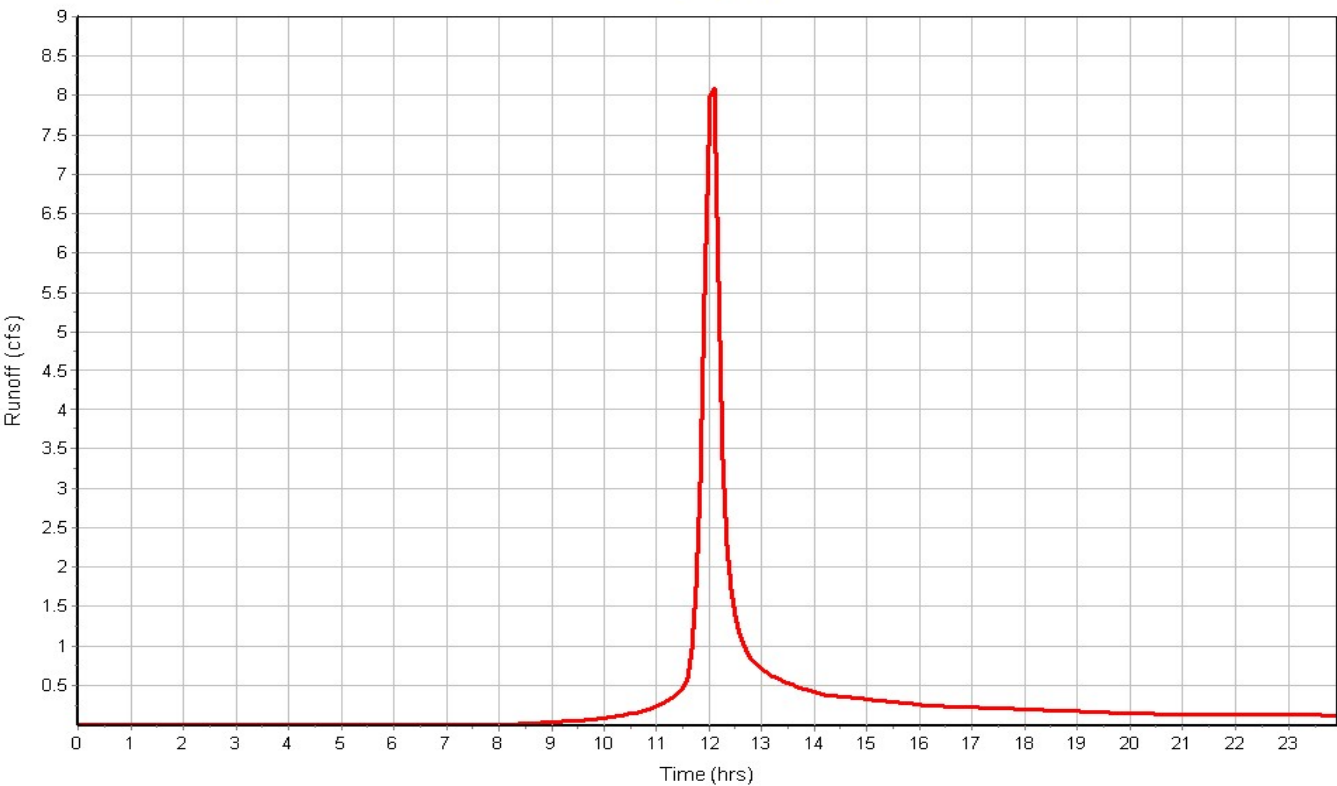
Subbasin Runoff Results

Total Rainfall (in) ..... 7.12  
Total Runoff (in) ..... 3.83  
Peak Runoff (cfs) ..... 8.44  
Weighted Curve Number ..... 71.00  
Time of Concentration (days hh:mm:ss) ..... 0 00:15:00

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : CATCHMENT(O-1)

Input Data

Area (ac) ..... 1.60  
Peak Rate Factor ..... 484.00  
Weighted Curve Number ..... 74.00  
Rain Gage ID ..... 100-Year

Composite Curve Number

| Soil/Surface Description     | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| OffsiteBackYardsGrassed      | 1.60            | C             | 74.00           |
| Composite Area & Weighted CN | 1.60            |               | 74.00           |

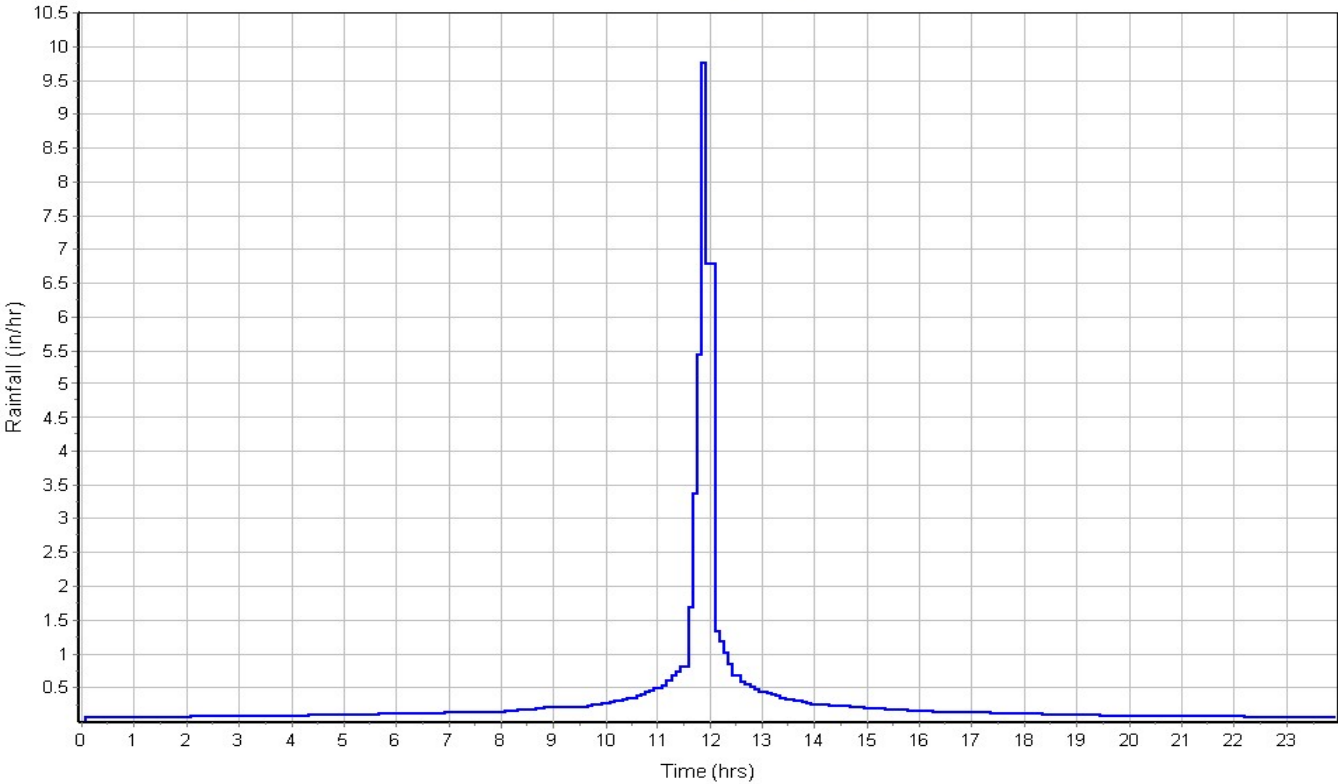
Time of Concentration

User-Defined TOC override (minutes): 15

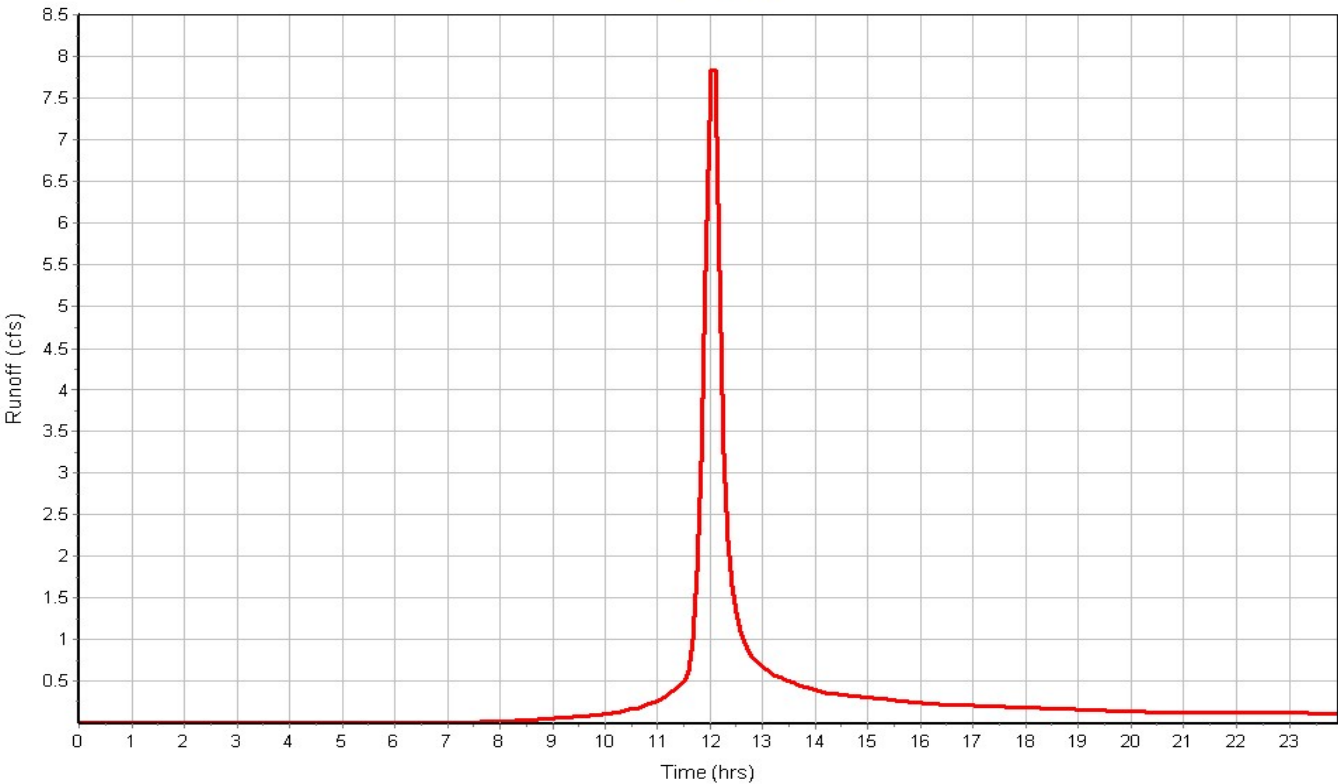
Subbasin Runoff Results

Total Rainfall (in) ..... 7.12  
Total Runoff (in) ..... 4.15  
Peak Runoff (cfs) ..... 8.22  
Weighted Curve Number ..... 74.00  
Time of Concentration (days hh:mm:ss) ..... 0 00:15:00

Rainfall Intensity Graph



Runoff Hydrograph



**Subbasin : CATCHMENT(O-2)**

**Input Data**

Area (ac) ..... 0.85  
Peak Rate Factor ..... 484.00  
Weighted Curve Number ..... 74.00  
Rain Gage ID ..... 100-Year

**Composite Curve Number**

| Soil/Surface Description     | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| GrassedBackYards             | 0.85            | C             | 74.00           |
| Composite Area & Weighted CN | 0.85            |               | 74.00           |

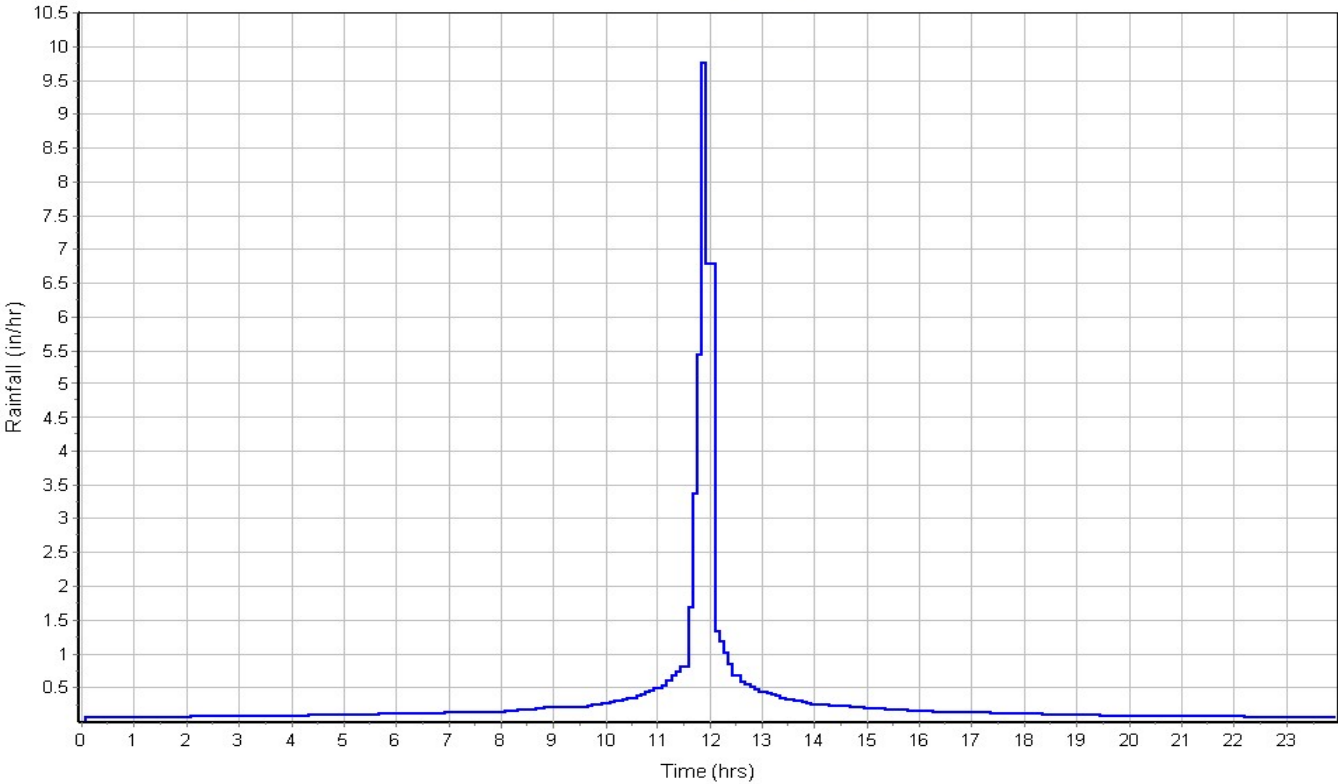
**Time of Concentration**

User-Defined TOC override (minutes): 15

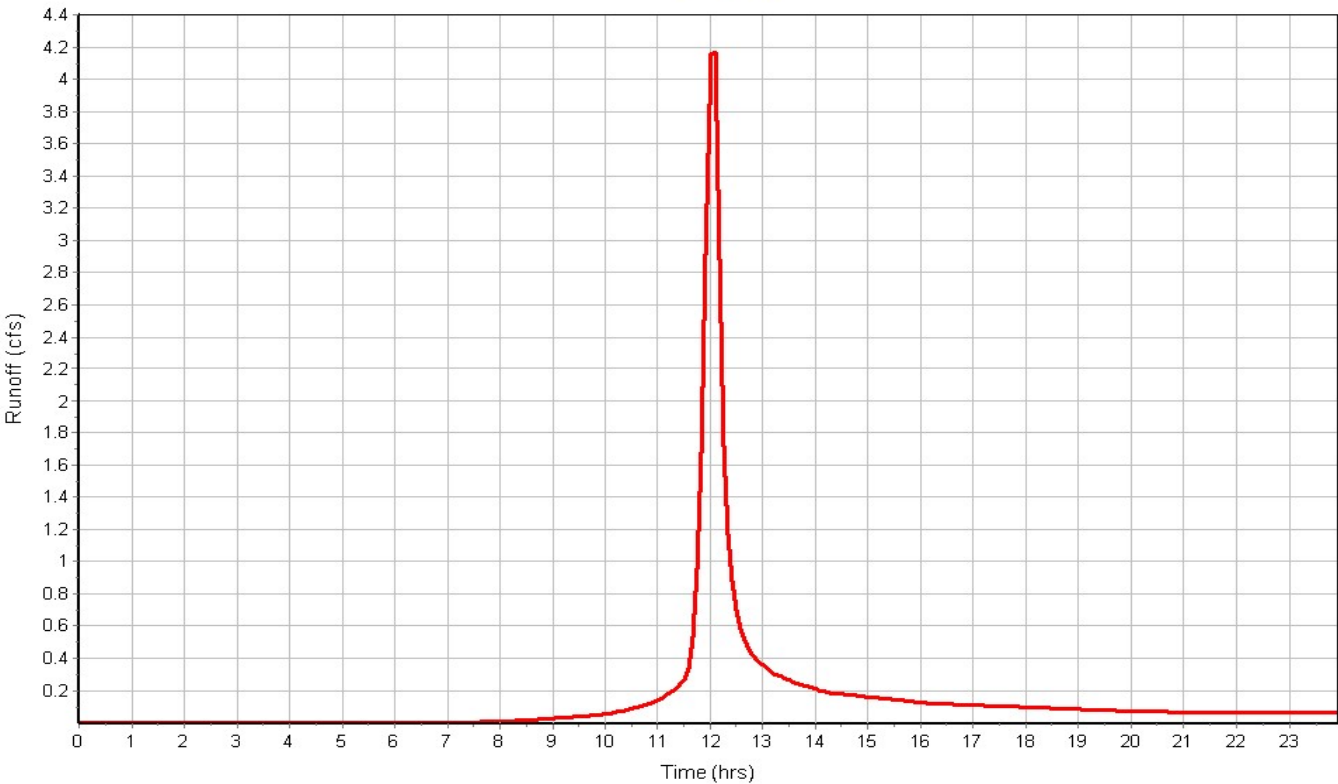
**Subbasin Runoff Results**

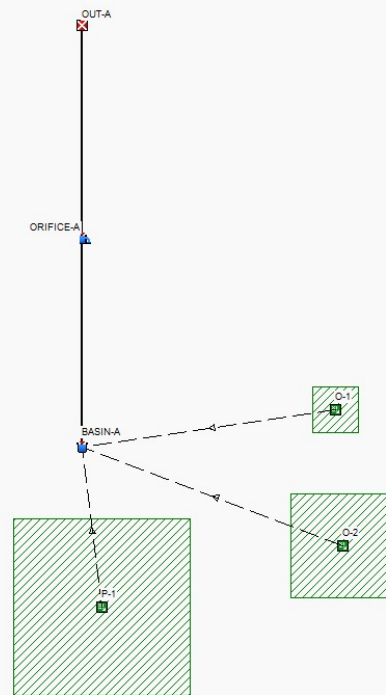
Total Rainfall (in) ..... 7.12  
Total Runoff (in) ..... 4.15  
Peak Runoff (cfs) ..... 4.37  
Weighted Curve Number ..... 74.00  
Time of Concentration (days hh:mm:ss) ..... 0 00:15:00

Rainfall Intensity Graph



Runoff Hydrograph





Project Description

File Name ..... Wisteria Developed 100 yr

Project Options

Flow Units ..... CFS  
Elevation Type ..... Elevation  
Hydrology Method ..... SCS TR-55  
Time of Concentration (TOC) Method ..... SCS TR-55  
Link Routing Method ..... Hydrodynamic  
Enable Overflow Ponding at Nodes ..... YES  
Skip Steady State Analysis Time Periods ..... NO

Analysis Options

Start Analysis On ..... Apr 08, 2019 00:00:00  
End Analysis On ..... Apr 09, 2019 00:00:00  
Start Reporting On ..... Apr 08, 2019 00:00:00  
Antecedent Dry Days ..... 0 days  
Runoff (Dry Weather) Time Step ..... 0 01:00:00 days hh:mm:ss  
Runoff (Wet Weather) Time Step ..... 0 00:05:00 days hh:mm:ss  
Reporting Time Step ..... 0 00:05:00 days hh:mm:ss  
Routing Time Step ..... 30 seconds

Number of Elements

Qty  
Rain Gages ..... 7  
Subbasins ..... 3  
Nodes ..... 2  
    Junctions ..... 0  
    Outfalls ..... 1  
    Flow Diversions ..... 0  
    Inlets ..... 0  
    Storage Nodes ..... 1  
Links ..... 1  
    Channels ..... 0  
    Pipes ..... 0  
    Pumps ..... 0  
    Orifices ..... 1  
    Weirs ..... 0  
    Outlets ..... 0  
Pollutants ..... 0  
Land Uses ..... 0

Rainfall Details

| SN | Rain Gage ID | Data Source | Data Source ID | Rainfall Type | Rain Units | State | County | Return Period (years) | Rainfall Depth (inches) | Rainfall Distribution |
|----|--------------|-------------|----------------|---------------|------------|-------|--------|-----------------------|-------------------------|-----------------------|
| 1  |              | Time Series | 100-Year       | Cumulative    | inches     | None  | None   | 100                   | 7.12                    | SCS Type II 24-hr     |

Subbasin Summary

| SN | Subbasin ID | Area (ac) | Peak Rate Factor | Weighted Curve Number | Total Rainfall (in) | Total Runoff (in) | Total Runoff Volume (ac-in) | Peak Runoff (cfs) | Time of Concentration (s hh:mm:ss) |
|----|-------------|-----------|------------------|-----------------------|---------------------|-------------------|-----------------------------|-------------------|------------------------------------|
| 1  | O-1         | 1.60      | 484.00           | 74.00                 | 7.12                | 4.15              | 6.63                        | 8.22              | 0 00:15:00                         |
| 2  | O-2         | 0.85      | 484.00           | 74.00                 | 7.12                | 4.15              | 3.52                        | 4.37              | 0 00:15:00                         |
| 3  | P-1         | 32.12     | 484.00           | 83.00                 | 7.12                | 5.14              | 165.14                      | 199.82            | 0 00:15:00                         |

Node Summary

| SN | Element ID | Element Type | Invert Elevation (ft) | Ground/Rim (Max) Elevation (ft) | Initial Water Elevation (ft) | Surcharge Elevation (ft) | Ponded Area (ft²) | Peak Inflow (cfs) | Max HGL Elevation Attained (ft) | Total Flooded Volume (ac-in) | Total Time Flooded (min) |
|----|------------|--------------|-----------------------|---------------------------------|------------------------------|--------------------------|-------------------|-------------------|---------------------------------|------------------------------|--------------------------|
| 1  | OUT-A      | Outfall      | 976.40                |                                 |                              |                          |                   | 49.97             | 976.40                          |                              |                          |
| 2  | BASIN-A    | Storage Node | 976.40                | 981.30                          | 976.40                       |                          | 0.00              | 204.81            | 980.24                          | 0.00                         | 0.00                     |

Link Summary

| SN | Element ID | Element Type | From (Inlet) Node | To (Outlet) Node | Length (ft) | Inlet Invert Elevation (ft) | Outlet Invert Elevation (ft) | Average Slope (%) | Diameter or Height (in) | Manning's Roughness | Peak Flow (cfs) |
|----|------------|--------------|-------------------|------------------|-------------|-----------------------------|------------------------------|-------------------|-------------------------|---------------------|-----------------|
| 1  | ORIFICE-A  | Orifice      | BASIN-A           | OUT-A            |             | 976.40                      | 976.40                       |                   | 30.800                  |                     | 49.97           |

## Subbasin Hydrology

### Subbasin : O-1

#### Input Data

Area (ac) ..... 1.60  
Peak Rate Factor ..... 484.00  
Weighted Curve Number ..... 74.00  
Rain Gage ID ..... 10-Year

#### Composite Curve Number

| Soil/Surface Description     | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| BackYardsGrassed             | 1.60            | C             | 74.00           |
| Composite Area & Weighted CN | 1.60            |               | 74.00           |

#### Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8})) / ((P^{0.5}) * (S_f^{0.4}))$$

Where :

T<sub>c</sub> = Time of Concentration (hr)  
n = Manning's roughness  
L<sub>f</sub> = Flow Length (ft)  
P = 2 yr, 24 hr Rainfall (inches)  
S<sub>f</sub> = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 \* (S<sub>f</sub><sup>0.5</sup>) (unpaved surface)  
V = 20.3282 \* (S<sub>f</sub><sup>0.5</sup>) (paved surface)  
V = 15.0 \* (S<sub>f</sub><sup>0.5</sup>) (grassed waterway surface)  
V = 10.0 \* (S<sub>f</sub><sup>0.5</sup>) (nearly bare & untilled surface)  
V = 9.0 \* (S<sub>f</sub><sup>0.5</sup>) (cultivated straight rows surface)  
V = 7.0 \* (S<sub>f</sub><sup>0.5</sup>) (short grass pasture surface)  
V = 5.0 \* (S<sub>f</sub><sup>0.5</sup>) (woodland surface)  
V = 2.5 \* (S<sub>f</sub><sup>0.5</sup>) (forest w/heavy litter surface)  
T<sub>c</sub> = (L<sub>f</sub> / V) / (3600 sec/hr)

Where:

T<sub>c</sub> = Time of Concentration (hr)  
L<sub>f</sub> = Flow Length (ft)  
V = Velocity (ft/sec)  
S<sub>f</sub> = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 \* (R<sup>2/3</sup>) \* (S<sub>f</sub><sup>0.5</sup>)) / n  
R = A<sub>q</sub> / W<sub>p</sub>  
T<sub>c</sub> = (L<sub>f</sub> / V) / (3600 sec/hr)

Where :

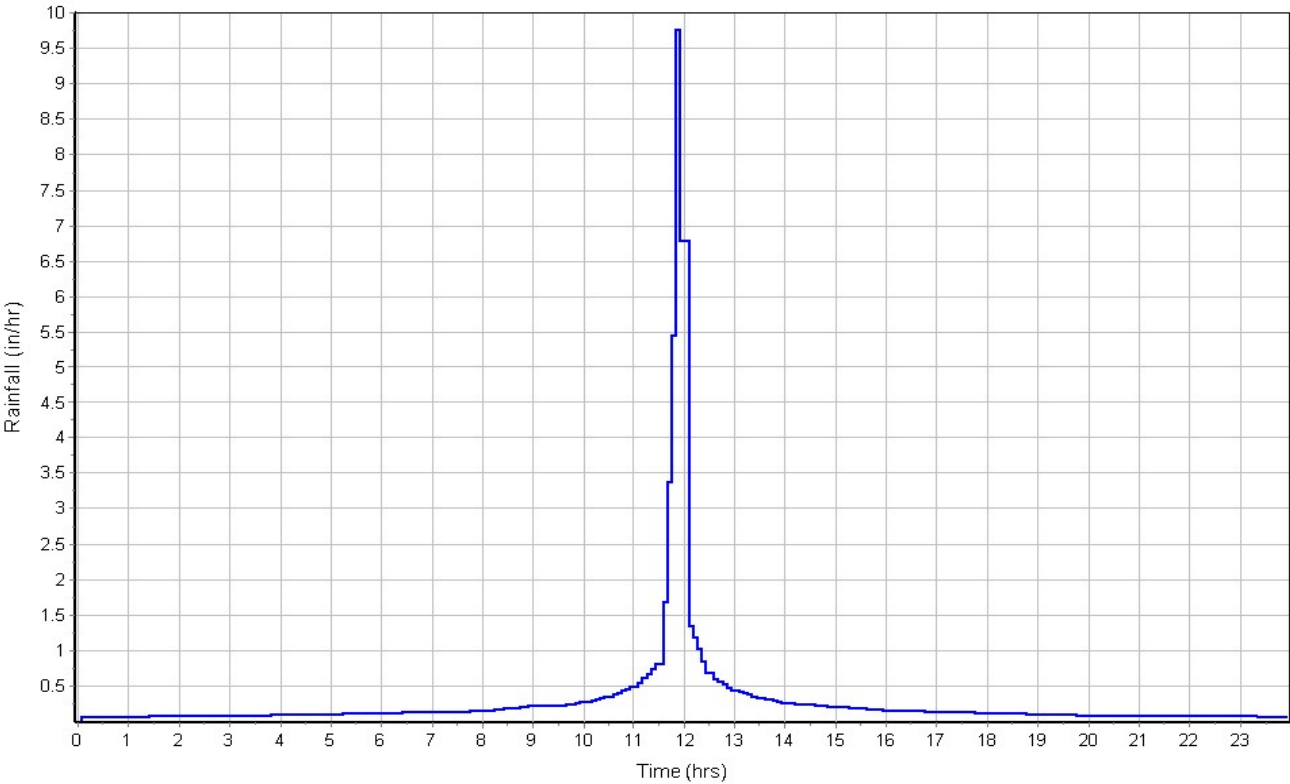
T<sub>c</sub> = Time of Concentration (hr)  
L<sub>f</sub> = Flow Length (ft)  
R = Hydraulic Radius (ft)  
A<sub>q</sub> = Flow Area (ft<sup>2</sup>)  
W<sub>p</sub> = Wetted Perimeter (ft)  
V = Velocity (ft/sec)  
S<sub>f</sub> = Slope (ft/ft)  
n = Manning's roughness

User-Defined TOC override (minutes): 15.00

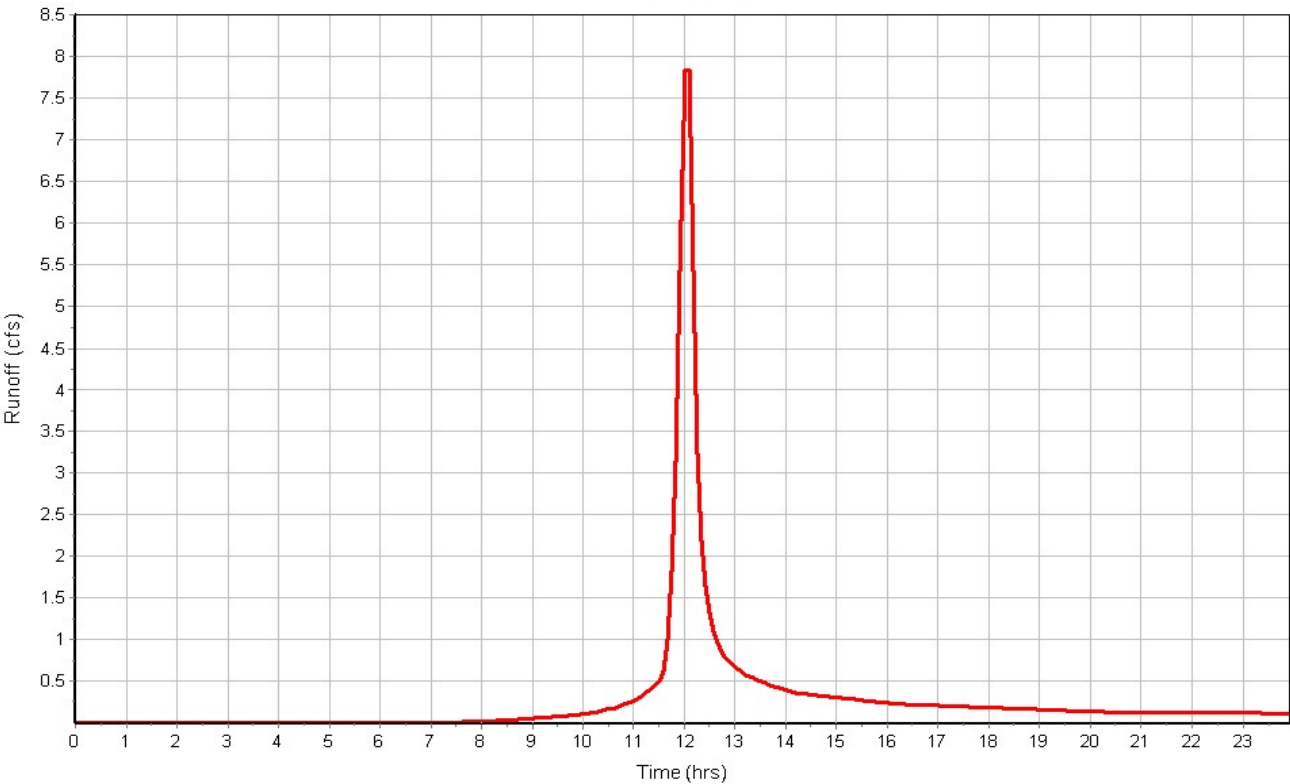
#### Subbasin Runoff Results

Total Rainfall (in) ..... 7.12  
Total Runoff (in) ..... 4.15  
Peak Runoff (cfs) ..... 8.22  
Weighted Curve Number ..... 74.00  
Time of Concentration (days hh:mm:ss) ..... 0 00:15:00

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : O-2

Input Data

Area (ac) ..... 0.85  
Peak Rate Factor ..... 484.00  
Weighted Curve Number ..... 74.00  
Rain Gage ID ..... 10-Year

Composite Curve Number

| Soil/Surface Description     | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|------------------------------|-----------------|---------------|-----------------|
| BackYardsGrassed             | 0.85            | C             | 74.00           |
| Composite Area & Weighted CN | 0.85            |               | 74.00           |

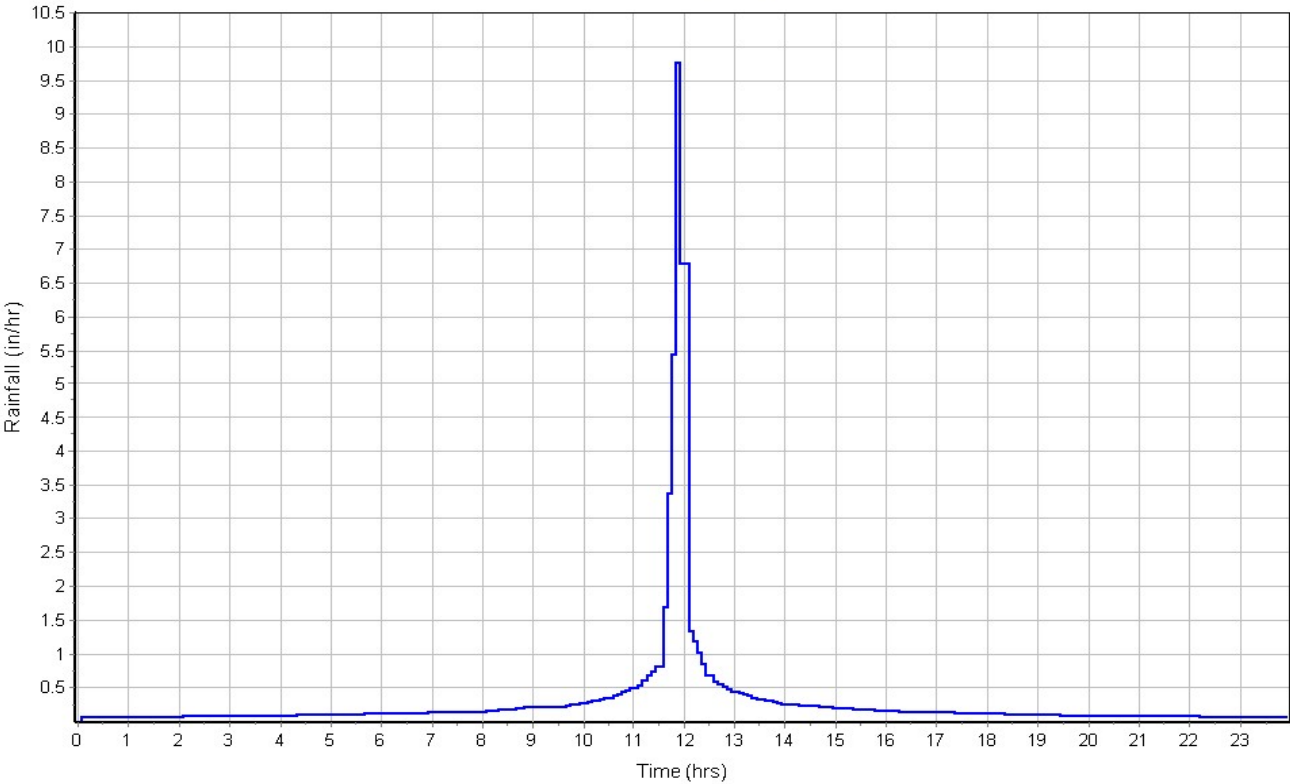
Time of Concentration

User-Defined TOC override (minutes): 15.00

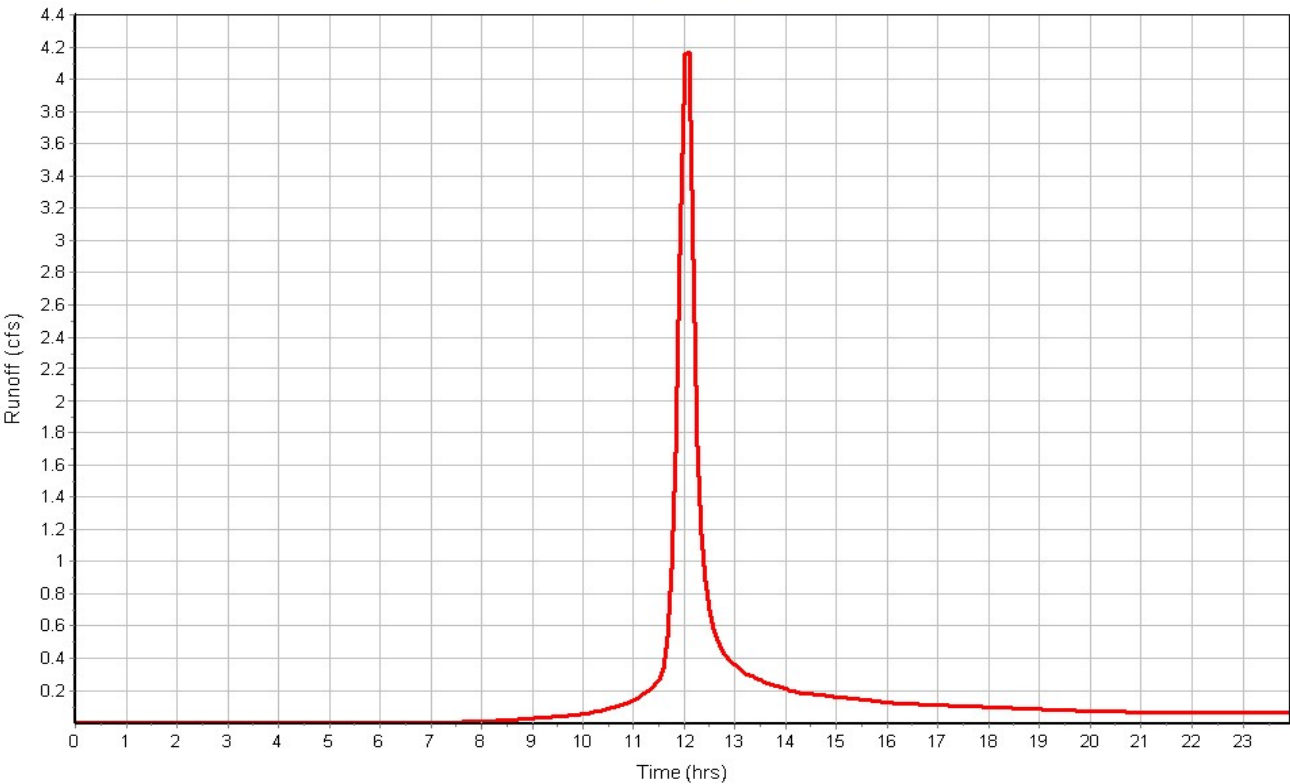
Subbasin Runoff Results

Total Rainfall (in) ..... 7.12  
Total Runoff (in) ..... 4.15  
Peak Runoff (cfs) ..... 4.37  
Weighted Curve Number ..... 74.00  
Time of Concentration (days hh:mm:ss) ..... 0 00:15:00

Rainfall Intensity Graph



Runoff Hydrograph



**Subbasin : P-1**

**Input Data**

Area (ac) ..... 32.12  
Peak Rate Factor ..... 484.00  
Weighted Curve Number ..... 83.00  
Rain Gage ID ..... 10-Year

**Composite Curve Number**

| Soil/Surface Description      | Area<br>(acres) | Soil<br>Group | Curve<br>Number |
|-------------------------------|-----------------|---------------|-----------------|
| 1/4 acre lots, 38% impervious | 32.12           | C             | 83.00           |
| Composite Area & Weighted CN  | 32.12           |               | 83.00           |

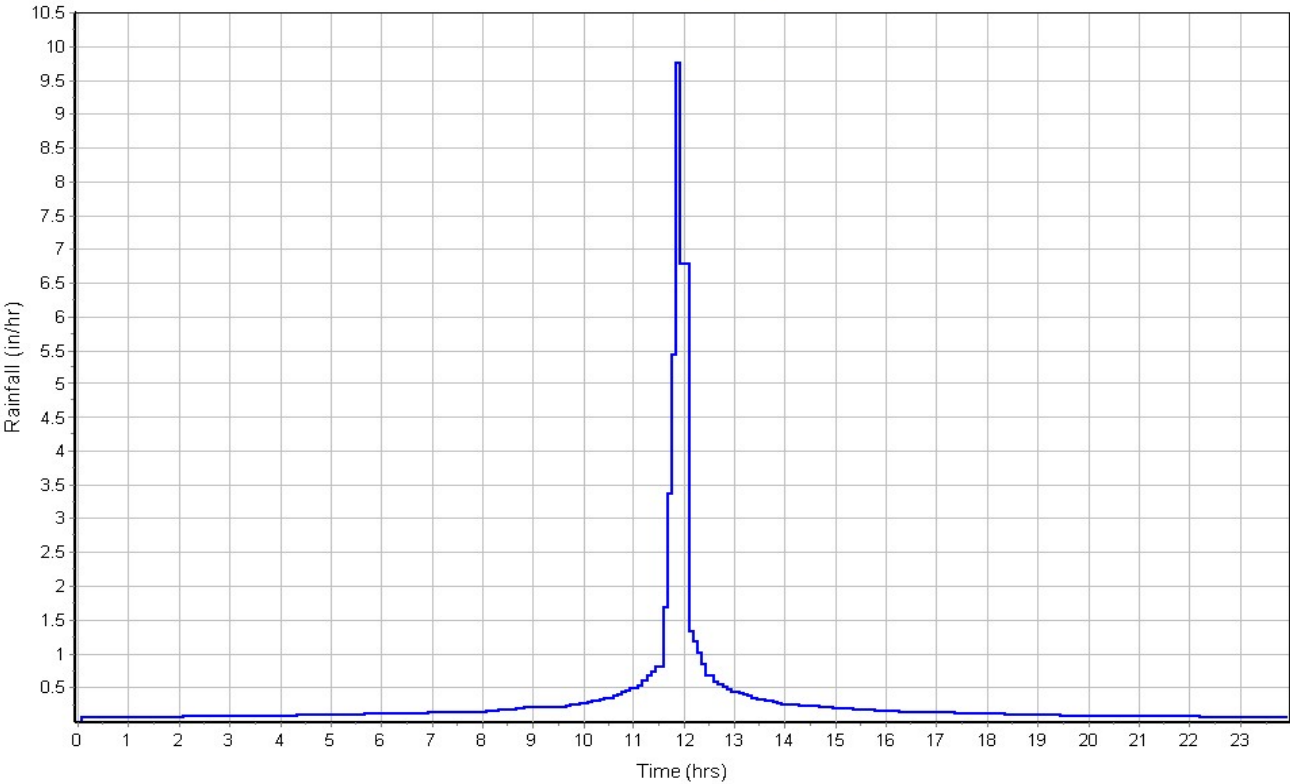
**Time of Concentration**

User-Defined TOC override (minutes): 15.00

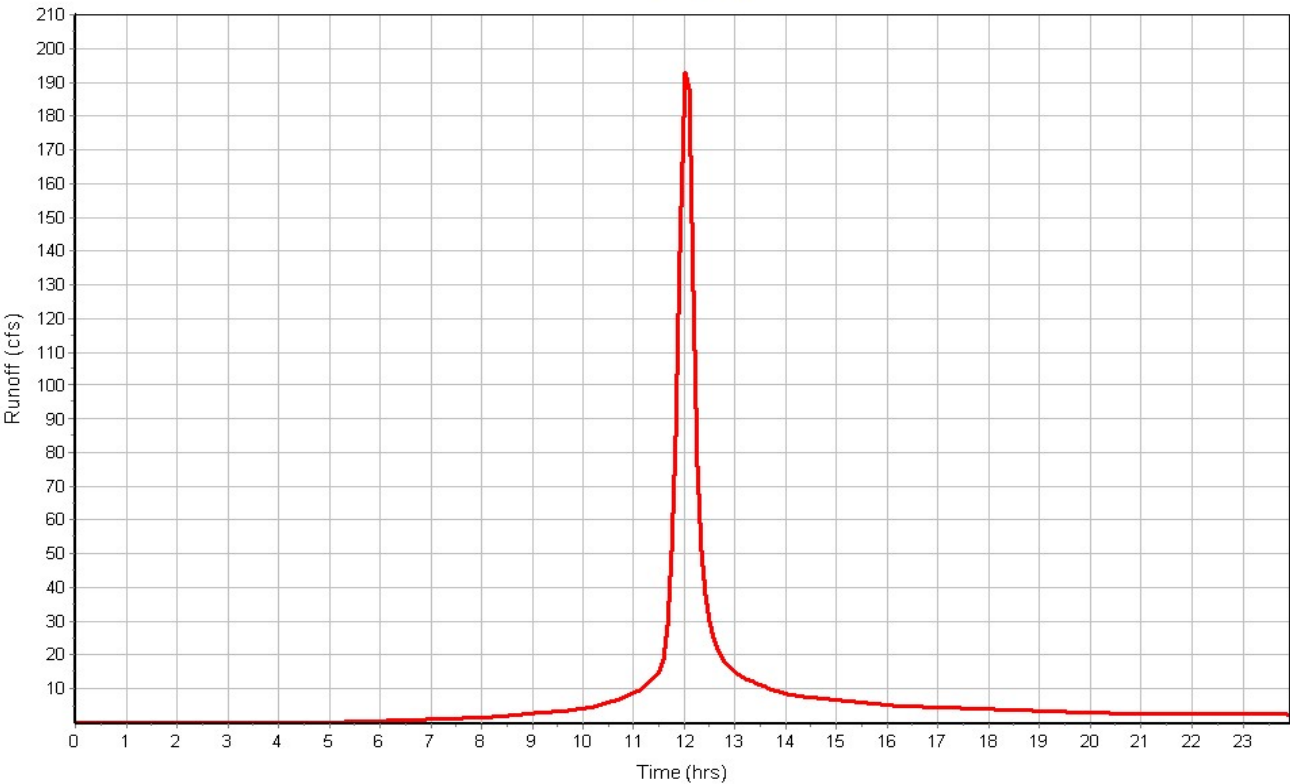
**Subbasin Runoff Results**

Total Rainfall (in) ..... 7.12  
Total Runoff (in) ..... 5.14  
Peak Runoff (cfs) ..... 199.82  
Weighted Curve Number ..... 83.00  
Time of Concentration (days hh:mm:ss) ..... 0 00:15:00

Rainfall Intensity Graph



Runoff Hydrograph



Storage Nodes

Storage Node : BASIN-A

Input Data

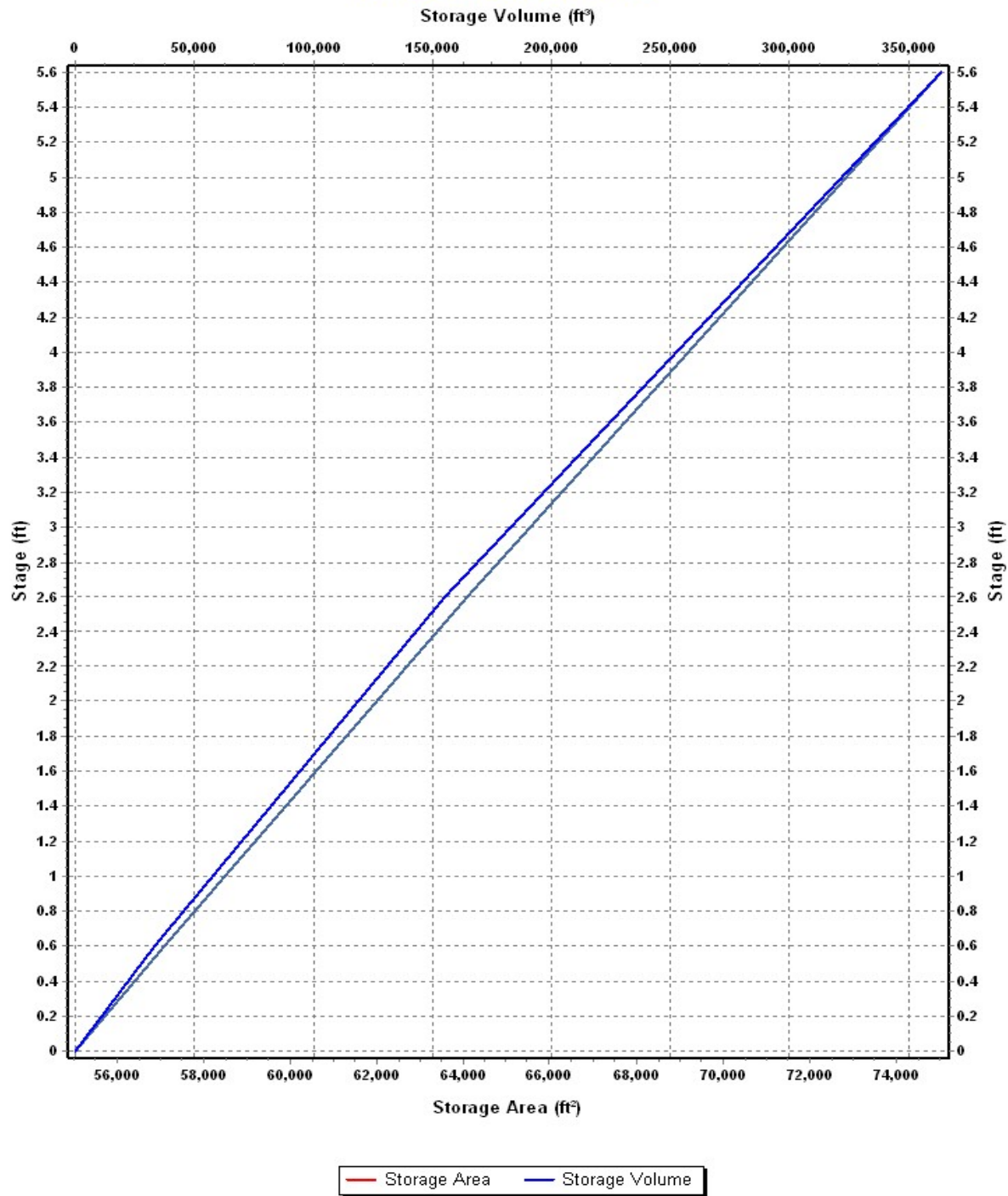
|                              |        |
|------------------------------|--------|
| Invert Elevation (ft)        | 976.40 |
| Max (Rim) Elevation (ft)     | 981.30 |
| Max (Rim) Offset (ft)        | 4.90   |
| Initial Water Elevation (ft) | 976.40 |
| Initial Water Depth (ft)     | 0.00   |
| Ponded Area (ft²)            | 0.00   |
| Evaporation Loss             | 0.00   |

Storage Area Volume Curves

Storage Curve : BasinA

| Stage | Storage Area | Storage Volume |
|-------|--------------|----------------|
| (ft)  | (ft²)        | (ft³)          |
| 0     | 55047.065    | 0.000          |
| 0.6   | 57103.0763   | 33645.04       |
| 2.6   | 64103.4729   | 154851.59      |
| 5.6   | 75028.1829   | 363549.07      |

### Storage Area Volume Curves



Storage Node : BASIN-A (continued)

Outflow Orifices

| SN | Element<br>ID | Orifice<br>Type | Orifice<br>Shape | Flap<br>Gate | Circular<br>Orifice<br>Diameter<br>(in) | Rectangular<br>Orifice<br>Height<br>(in) | Rectangular<br>Orifice<br>Width<br>(in) | Orifice<br>Invert<br>Elevation<br>(ft) | Orifice<br>Coefficient |
|----|---------------|-----------------|------------------|--------------|-----------------------------------------|------------------------------------------|-----------------------------------------|----------------------------------------|------------------------|
| 1  | ORIFICE-A     | Bottom          | CIRCULAR         | No           | 30.80                                   |                                          |                                         | 976.40                                 | 0.61                   |

Output Summary Results

|                                         |         |
|-----------------------------------------|---------|
| Peak Inflow (cfs)                       | 204.81  |
| Peak Lateral Inflow (cfs)               | 204.81  |
| Peak Outflow (cfs)                      | 49.97   |
| Peak Exfiltration Flow Rate (cfm)       | 0.00    |
| Max HGL Elevation Attained (ft)         | 980.24  |
| Max HGL Depth Attained (ft)             | 3.84    |
| Average HGL Elevation Attained (ft)     | 976.85  |
| Average HGL Depth Attained (ft)         | 0.45    |
| Time of Max HGL Occurrence (days hh:mm) | 0 12:26 |
| Total Exfiltration Volume (1000-ft³)    | 0.000   |
| Total Flooded Volume (ac-in)            | 0       |
| Total Time Flooded (min)                | 0       |
| Total Retention Time (sec)              | 0.00    |



**BUSINESS OF THE PLANNING AND ZONING COMMISSION  
BONDURANT, IOWA  
AGENDA STATEMENT**

Item No. 8.e.  
For Meeting of 8/25/2022  
**Reports and Comments**

**TITLE:** City Council Liaison

**CONTACT PERSON:**

**BRIEF HISTORY & ANALYSIS:**

**FUNDING SOURCE:**

**STAFF RECOMMENDATION:**

**APPROVED FOR SUBMITTAL:**

**ATTACHMENTS:** None