

AGENDA

MATANUSKA-SUSITNA BOROUGH

350 East Dahlia Avenue, Palmer, Alaska 99645 – 907-861-7874

PLATTING OFFICER
Tyler Young

PLATTING CLERK
Connor Herren - Acting

PLATTING TECHNICIANS
Matthew Goddard
Chris Curlin
Cayman Reynolds



PLATTING BOARD
Chris Chiavetta, District 1
Vice Chair Michael Liebing, District 2
Michael Gillson, District 3
Reggie Carney, District 4
Chair Michelle Traxler, District 5
Vacant, District 6
Roman Fonov, District 7
Karla McBride, Alternate A
Vacant, Alternate B

PLATTING BOARD AGENDA **ASSEMBLY CHAMBERS** **350 E DAHLIA AVENUE PALMER**

PLATTING BOARD MEETING **1:00 P.M.** **October 15, 2026**

Ways you can participate in Platting Board meetings:

IN PERSON

IN WRITING: You can submit written comments by email to platting@matsu.gov or by mail to Matanuska-Susitna Borough, Platting Division, 350 E. Dahlia Avenue, Palmer, AK 99645

TELEPHONIC TESTIMONY: (Audio only)

(Please note that the Borough has experienced intermittent technical difficulties with the telephonic system and it is being provided as a courtesy, and only if working at the time of hearing. The hearing may proceed even if the telephonic system is not working. If you would like to be sure your comments are considered by the Board, submit them to the email address above by noon the business day prior to the meeting or present your comments in person)

- Dial 1-855-290-3803; you will hear “Joining conference” when you are admitted to the meeting.
- You will be automatically muted and able to listen to the meeting.
- When the Chair announces audience participation or a public hearing you would like to speak to, press *3; you will hear “Your hand has been raised.”
- When it is your turn to testify you will hear “Your line has been unmuted.”
- State your name for the record, spell your last name, and provide your testimony.

OBSERVE: You can observe the meeting via the live stream video at:

- <https://www.facebook.com/MatSuBorough>
- Matanuska-Susitna Borough – YouTube

1. CALL TO ORDER

A. Roll Call and Determination of Quorum (by Secretary)

Matanuska-Susitna Borough

Platting Board Regular Meeting

- B. Pledge of Allegiance
- C. Approval of Agenda

2. APPROVAL OF MINUTES

- A. October 1, 2026

3. AUDIENCE PARTICIPATION & PRESENTATIONS

- A. **PERSONS TO BE HEARD** (Three minutes per person for Items not scheduled for public hearing)

4. UNFINISHED BUSINESS

(None)

5. RECONSIDERATIONS/APPEALS

(None)

6. PUBLIC HEARINGS

- A. **AILERON ACRES**: The request is to create 6 lots from Tract E, Aero on Wolf Lake Phase II Addition 1, Plat #91-11, to be known as **AILERON ACRES**, containing 8.71 acres +/- . The property is located south of E. Beechcraft Road, west of N. Engstrom Road, and directly north of E. Hart Lake Loop (Tax ID #3778000T00E); within the NE ¼ Section 21, Township 18 North, Range 01 East, Seward Meridian, Alaska. In the North Lakes Community Council and in Assembly District #6. (Petitioner/Owner: Barbara Doty / D.E Southfork, LLC, Staff: Matthew Goddard, Case # 2026-101)

7. ITEMS OF BUSINESS & MISCELLANEOUS

(None)

8. PLATTING STAFF & OFFICER COMMENTS

- A. Adjudicatory (If needed)
 - *Definition*: Law. To hear and settle an issue or a question regarding code.
- B. Upcoming Platting Board Agenda Items (Staff: Tyler Young & Clerk: Connor Herren)
 - So far we have 1 case on the November 5, 2026 meeting.
 - Deception Bluff

9. BOARD COMMENTS

10. ADJOURNMENT

MINUTES

**MATANUSKA-SUSITNA BOROUGH
PLATTING BOARD MINUTES**

**REGULAR MEETING
October 1, 2026**

The regular meeting of the Matanuska-Susitna Borough Platting Board was held on October 1, 2026, at the Matanuska-Susitna Borough 350 E Dahlia Ave, Palmer, Alaska. Chair Traxler called the Meeting to order at 1:01 p.m.

1. CALL TO ORDER

A. ROLL CALL AND DETERMINATION OF QUORUM (by Administrative Specialist)

Platting Board members present and establishing a quorum:

Mr. Michael Liebing, District Seat #2
Mr. Michael Gillson, District Seat #3
Mr. Reggie Carney, District Seat #4
Ms. Michelle Traxler, District Seat #5
Ms. Karla McBride, Alternate A

Platting Board members absent and excused were:

Vacant, District seat #6
Vacant, Alternate B

Platting Board members absent were:

Mr. Chris Chiavetta, District Seat #1
Mr. Roman Fonov, District Seat #7

Staff in attendance:

Mr. Tyler Young, Platting Officer
Mr. Connor Herren, Acting Platting Board Clerk
Mr. Matthew Goddard, Platting Technician
Mr. Cayman Reynolds, Platting Technician

B. THE PLEDGE OF ALLEGIANCE

Platting Member Liebing led the pledge of allegiance.

C. APPROVAL OF THE AGENDA

Chair Traxler inquired if there were any changes to the agenda.

MOTION: Platting Member Liebing made motion to approve the Agenda. Platting Member McBride seconded.

VOTE: The Agenda were approved unanimously.

2. APPROVAL OF MINUTES

- September 17, 2026

MOTION: Platting Member Liebing made motion to approve the Minutes presented. Platting Member McBride seconded.

**MATANUSKA-SUSITNA BOROUGH
PLATTING BOARD MINUTES**

**REGULAR MEETING
October 1, 2026**

VOTE: The Minutes were approved unanimously.

3. AUDIENCE PARTICIPATION & PRESENTATIONS

PERSONS TO BE HEARD (Three minutes per person for items not scheduled for public hearing)
(None)

4. UNFINISHED BUSINESS

(None)

5. RECONSIDERATIONS/APPEALS

(None)

6. PUBLIC HEARINGS

A. **KOPPENBERG ESTATES PHASE 2:** The request is to create five lots from Lots 1 & 2, Koppenberg Estates, Plat #2023-94, (Tax ID #'s 8412000L001 & 8412000L002), to be known as Koppenberg Estates Phase 2, containing 72.32 acres +/- . The property is located directly north of S. Foxworth Drive and directly west of S. Alix Drive; within the SE ¼ Section 7, Township 16 North, Range 02 West, Seward Meridian, Alaska. In the Knik-Fairview Community Council and in Assembly District #5. (Petitioner/Owner: Aaron Koppenberg & Theo Koppenberg, Staff: Chris Curlin, Case # 2026-090)

Chair Traxler read the statement regarding Ex-Parte & Interest on quasi-judicial action into the record.

Connor Herren provided the mailing report:

- Stating that 114 public hearing notices were mailed out on September 8, 2026.

Staff gave an overview of the case:

- Staff recommends approval with 7 conditions and 6 findings of facts.

Platting Members Liebing and Traxler had questions for staff.

Chair Traxler invited the petitioner/petitioner's representative to give an overview.

The petitioner Aaron Koppenberg spoke.

Chair Traxler opened the public hearing for public testimony.

The following person spoke:

**MATANUSKA-SUSITNA BOROUGH
PLATTING BOARD MINUTES**

**REGULAR MEETING
October 1, 2026**

- Nathan Shanigan

There being no one else to be heard Chair Traxler closed the public hearing and invited the petitioner and/or the petitioner's representative to further discuss and answer any questions from the Board.

The petitioner Aaron Koppenberg spoke.

MOTION: Platting Member Liebing made a motion to approve the preliminary plat of Koppenberg Estates Phase 2. Platting Member Carney seconded the motion.

Discussion ensued.

MOTION: Platting member Liebing made a motion to amend the formatting of the conditions of approval. Platting member Carney seconded the motion.

VOTE: The motion passed without objection.

VOTE: The main motion passed without objection.

- B. **PROSPERITY ESTATES**: The request is to create 8 lots from Parcel 17N02E25D005, to be known as Prosperity Estates, containing 10.01 acres +/- . The property is located directly north of East Sullivan Avenue, directly west of South Caudill Road, and east of South Old Glenn Highway (Tax ID #17N02E25D005); within the SE ¼ Section 25, Township 17 North, Range 02 East, Seward Meridian, Alaska. In the Butte Community Council and in Assembly District #1. (*Petitioner/Owner: SJM Price Investments, LLC, Staff: Cayman Reynolds, Case # 2026-100*)

Chair Traxler read the statement regarding Ex-Parte & Interest on quasi-judicial action into the record.

Connor Herren provided the mailing report:

- Stating that 37 public hearing notices were mailed out on September 8, 2026.

Staff gave an overview of the case:

- Staff recommends approval with 9 conditions and 6 findings of facts.

Chair Traxler invited the petitioner/petitioner's representative to give an overview.

The petitioner's representative Dayna Rumfelt chose not to speak.

Chair Traxler opened the public hearing for public testimony,

**MATANUSKA-SUSITNA BOROUGH
PLATTING BOARD MINUTES**

**REGULAR MEETING
October 1, 2026**

There being no one to be heard Chair Traxler closed the public hearing and invited the petitioner and/or the petitioner's representative to further discuss and answer any questions from the Board.

The petitioner's representative Dayna Rumfelt spoke.

MOTION: Platting Member Liebing made a motion to approve the preliminary plat of Prosperity Estates. Platting Member Carney seconded the motion.

VOTE: The motion passed without objection.

7. ITEMS OF BUSINESS & MISCELLANEOUS
(None)

8. PLATTING STAFF & OFFICER COMMENTS

A. Adjudicatory (*if needed*)

B. Upcoming Platting Board Agenda Items

Platting Officer Tyler Young and Platting Clerk Connor Herren informed the Board of upcoming meetings.

- There is 1 case for October 15, 2026, Platting Board.
- Aileron Acres

9. BOARD COMMENTS.
(None)

10. ADJOURNMENT

With no further business to come before the Platting Board, Chair Traxler adjourned the meeting at **1:22 PM**.

**MATANUSKA-SUSITNA BOROUGH
PLATTING BOARD MINUTES**

**REGULAR MEETING
October 1, 2026**

ATTEST:

MICHELLE TRAXLER
Platting Board Chair

CONNOR HERREN
Platting Assistant

DRAFT

PUBLIC HEARINGS

6A

STAFF REVIEW AND RECOMMENDATIONS
PUBLIC HEARING
OCTOBER 15, 2026

PRELIMINARY PLAT: AILERON ACRES

LEGAL DESCRIPTION: SEC 21, T18N, R01E, SEWARD MERIDIAN AK

PETITIONERS: BARBARA DOTY – D.E. SOUTHFORK, LLC

SURVEYOR: LAVENDER SURVEY & MAPPING

ENGINEER: PANNONE ENGINEERING SERVICES, LLC

ENGINEER: FROSTED GROUND ENGINEERING

ACRES: 8.71 ± PARCELS: 6

REVIEWED BY: MATTHEW GODDARD CASE #: 2026-101

REQUEST: The request is to create 6 lots from Tract E, Aero on Wolf Lake Phase II Addition 1, Plat #91-11, to be known as **AILERON ACRES**, containing 8.71 acres +/- . The property is located south of E. Beechcraft Road, west of N. Engstrom Road, and directly north of E. Hart Lake Loop (Tax ID #3778000T00E); within the NE ¼ Section 21, Township 18 North, Range 01 East, Seward Meridian, Alaska. In the North Lakes Community Council and in Assembly District #6.

EXHIBITS:

SUPPORTING DOCUMENTATION:

Vicinity Map and Aerial Photos	PAGES – 1-5
Topographic Map and As-Built	PAGE – 6
Geotechnical Report	PAGES – 7-18
Plan and Profile	PAGES – 19-27
Section Line Easement Determination	PAGES – 28-31
Average Daily Traffic (ADT) Calculations	PAGES – 32-33
Stormwater Management Report	PAGES – 34-125
Agenda Plat	PAGE – 144

AGENCY COMMENTS

Department of Public Works Pre-Design and Engineering Division	PAGES – 126-135
Permit Center	PAGE – 136
North Lakes Community Council	PAGES – 137-138
Utilities	PAGES – 139-141
Public Comments	PAGES – 142-143

DISCUSSION: The proposed subdivision is creating six lots ranging in size between .93 acres and 2.26 acres. Access for all lots is from the proposed internal street. Access to the subdivision is from E. Hart Lake Loop, a Borough maintained road.

Access: Legal and physical access to the proposed lots are required pursuant to MSB 43.20.100 Access Required, MSB 43.20.120 Legal Access and MSB 43.20.140 Physical Access. Access requirements will be met once interior street is constructed.

Topographic map and As-Built: Topographic mapping and As-Built information was submitted (**Exhibit Page 6**) pursuant to MSB 43.15.016. Based on the submitted information there are currently no setback violations, nor will any be created by the recordation of the proposed Aileron Acres.

Soils Report: A geotechnical report was submitted (**Exhibit Pages 7-18**), pursuant to MSB 43.20.281(A). Steven R. Pannone, Registered Professional Engineer, notes that a soils investigation and site assessment for the proposed subdivision was completed at the request of the project owner. Three test holes were excavated to a depth of 16' on January 13th, 2026. GM and SM soils were encountered, pursuant to MSB 43.20.281(A)(1)(f), sieve analysis was provided for all three lots. As required by MSB 43.20.281, and based on available soils, existing water table information, ground water monitoring results, and the proposed preliminary plat; each of the proposed lots can provide at least 10,000 square feet of contiguous usable septic area and an additional 10,000 square feet of usable building area.

A preliminary Road and Drainage Plan was submitted and is at **Exhibit Pages 19-27**.

A section line easement determination was supplied by Lavender Survey and Mapping (**Exhibit Pages 28-31**).

Average Daily Traffic (ADT) Calculations are at **Exhibit Pages 32-33**. Based on the supplied ADT, the proposed internal street (Eshleman Way) will need to be constructed to Borough Residential Street Standards according to the 2022 Subdivision Construction Manual. No upgrades will be required for existing roads.

A stormwater management report was submitted and is at **Exhibit Pages 34-125**.

Comments:

Department of Public Works Pre-Design and Engineering Division (**Exhibit Pages 126-135**) submitted the following comments:

- PD&E will require a cross culvert under the proposed road, location to be determined later. Sheet C2.0 shows the available sight distance; however, the end points of the sight distance triangles are not located in the center of the approaching lane. Please revise.
- Please show how the minimum intersection angle of 70° is met per 2022 Subdivision Construction Manual A09.3.
- Please note that Engstrom Road is on the OSHP as a major collector, which requires a minimum right of way width of 80' per 2022 Subdivision Construction Manual B02. PD&E recommends the petitioner voluntarily designate a building setback on the plat to allow for future road expansion per B05.

Platting staff notes that the petitioner has worked with PD&E and provided an updated agenda plat showing the intersection angle and adding the requested building setback along N. Engstrom Road.

Development Services (**Exhibit Page 136**) has the following comments:

- Each access or encroachment constructed during subdivision road development shall be reported to the Permit Center for documentation. Cluster box pullout locations should be designed using the MSB Standard Drawing – Mailbox Pullouts, and in alignment with lot lines as shown on the plat layout.
- Any water system, sewer lines, or street lighting placed in the right-of-way shall require a utility permit.
- No other comments from Development Services.

North Lakes Community Council (**Exhibit Pages 137-138**) submitted the following comments:

- The NLCC does not oppose the development. The engineering analysis appears thorough and complete.
- We remain concerned about the traffic impact of all developments on Engstrom Road. We ask that any platting action adding traffic to Engstrom include a statement detailing the current Engstrom Road capacity (AADT), the estimated AADT before the development, and the AADT after the development. This transparency is important to the community, the Planning Commission, and to the Borough planners. This statement should be included in all staff reports for platting actions that affect Engstrom traffic load.

Platting Staff notes that an Average Daily Traffic Calculation was submitted as part of the case submittal and can be seen at Exhibit Pages 32 & 33.

Utilities: (Exhibit Pages 139-141)

ENSTAR did not respond.

GCI has no comments or objections to the plat.

MEA did not respond.

MTA has no comments.

Public Comments: (Exhibit Pages 142-143):

- Bruce & Lisa Ruhl, property owners to the northeast, submitted comments with concerns about the intersection of Bogard and Engstrom road.
- Clayton Childs, property owner to the southwest, submitted comments with objections to the subdivision due to the condition of Engstrom Road and the traffic congestion at Engstrom and Bogard.

At the time of staff report write-up, there were no responses to the Request for Comments from ADF&G; US Army Corps of Engineers; Fire Service Area #130 Central Mat-Su; Road Service Area #25 Bogard; MSB Emergency Services, Community Development, Assessments, or Planning; MEA or ENSTAR.

CONCLUSION: The preliminary plat of Aileron Acres is consistent with AS 29.40.070 Platting Regulations and MSB 43.15.016 Preliminary Plats. There were no objections from any federal or state agencies, Borough departments, or utilities. There were no objections to the plat from the public in response to the Notice of Public Hearing. Legal and physical access will exist to the proposed lots, consistent with MSB 43.20.100 Access Required, MSB 43.20.120 Legal Access and MSB 43.20.140 Physical Access. Frontage for the subdivision will exist, pursuant to MSB 43.20.320 Frontage. A soils report was submitted, pursuant to MSB 43.20.218(A)(1).

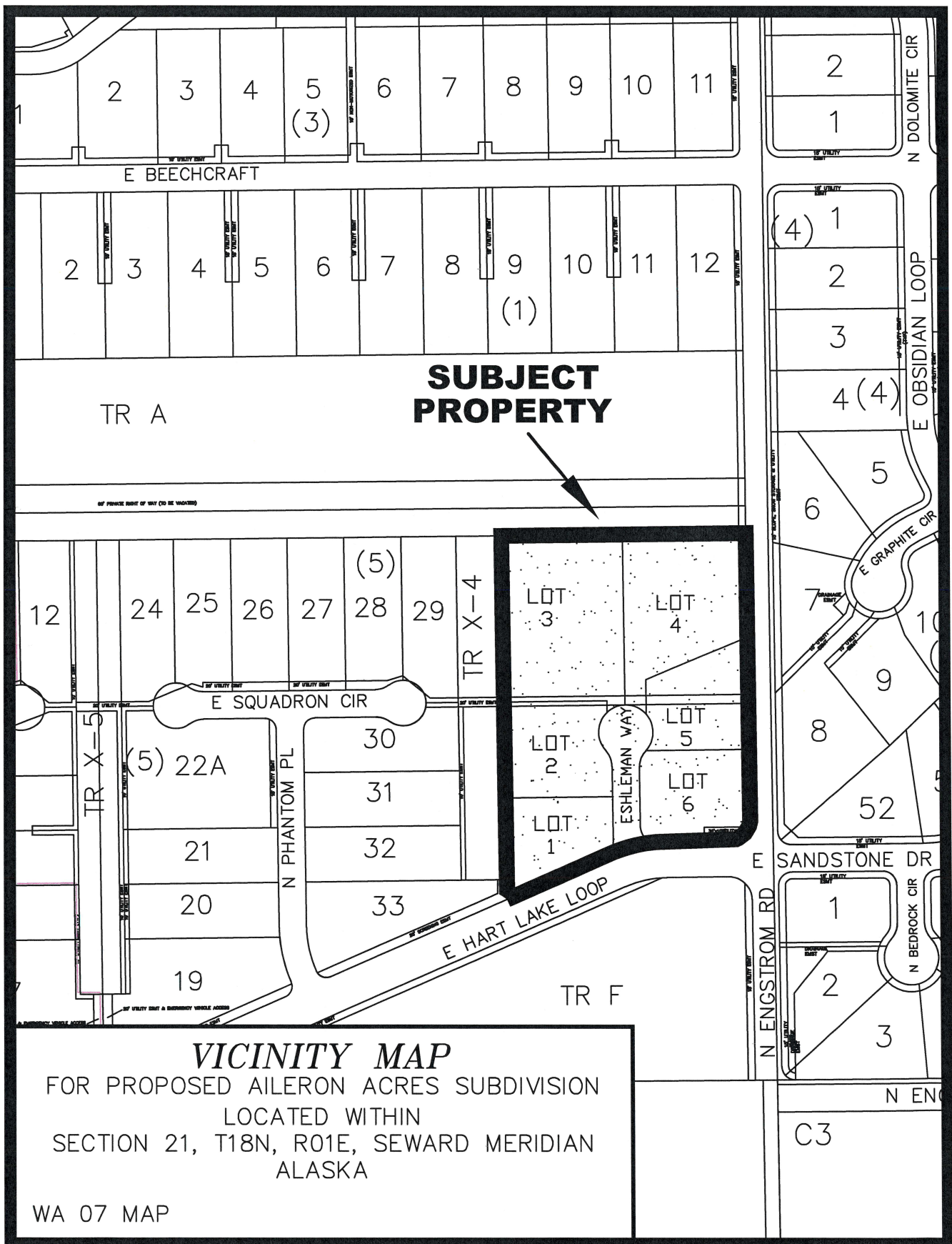
FINDINGS OF FACT

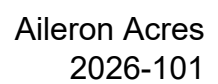
1. The plat of Aileron Acres is consistent with AS 29.40.070 Platting Regulations and MSB 43.15.016 Preliminary Plats.
2. A soils report was submitted, pursuant to MSB 43.20.281(A)(1)
3. All lots will have the required legal and physical access pursuant to MSB 43.20.100 Access Required, 43.20.120 Legal Access, & 43.20.140 Physical Access.
4. All lots will have the required frontage pursuant to MSB 43.20.320.
5. At the time of staff report write-up, there were no responses to the Request for Comments from ADF&G; US Army Corps of Engineers; Fire Service Area #130 Central Mat-Su; Road Service Area #25 Bogard; MSB Emergency Services, Community Development, Assessments, or Planning; MEA or ENSTAR.
6. There were no objections from any federal or state agencies, Borough departments, or utilities.
7. At the time the staff report was written there were two comments received from the public in response to the notice of public hearing, one with concerns and one with objections.

RECOMMENDATIONS OF CONDITIONS OF APPROVAL

Suggested motion: I move to approve the preliminary plat of Aileron Acres, Section 21, Township 18 North, Range 01 East, Seward Meridian, Alaska, contingent on staff recommendations

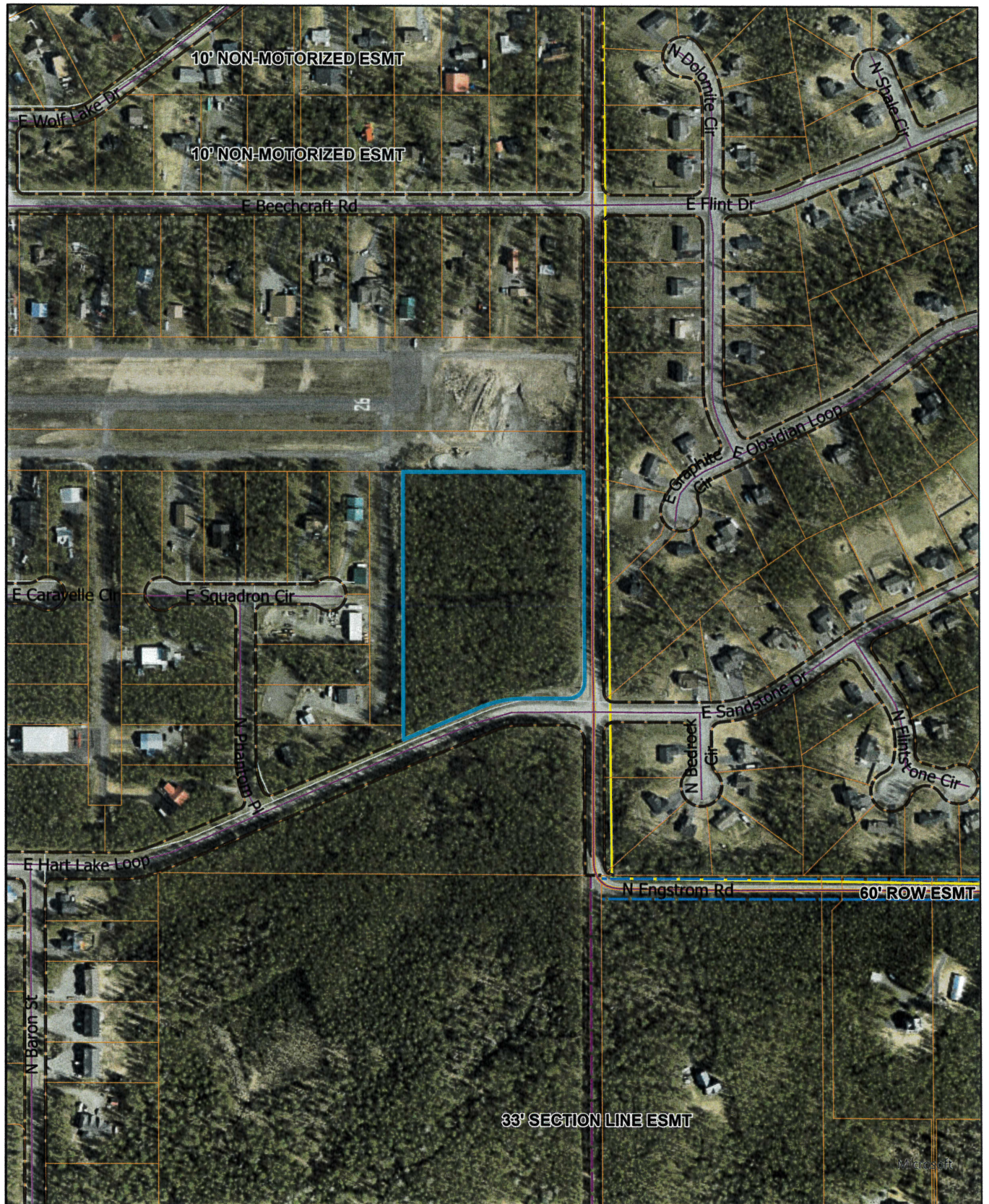
1. Taxes and special assessments must be paid in full for the year of recording, pursuant to MSB 43.15.053(F) and AS 40.15.020. Pay taxes and special assessments (LIDs), by CERTIFIED FUNDS OR CASH.
2. Provide updated Certificate to Plat executed within seven (7) days of recording of plat and submit Beneficiary Affidavit for any holders of a beneficial interest.
3. Pay postage and advertising fees.
4. Construct the internal road and cul-de-sac to residential street standard according to the 2022 Subdivision Construction Manual (SCM):
 - a) Submit drainage report and other construction plans to Department of Public Works (DPW) per SCM F01.2;
 - b) Arrange preconstruction conference with DPW per SCM F01.3, sign Subdivision Construction Plan, pay inspection fee, and obtain Notice to Proceed from Platting staff;
 - c) Arrange Pre-Final and Final Inspections with DPW per SCM F01.6 and F01.7 and submit Final Report to Platting per F01.8;
 - d) Obtain Certificate of Construction Acceptance from DPW per F01.9.
 - e) Submit as-built of streets and drainage improvements to Platting staff once construction is complete.
 - f) Obtain approval of street names from Platting Assistant.
5. Show all easements of record on final plat.
6. Submit recording fees, payable to Department of Natural Resources (DNR).
7. Submit plat in full compliance with Title 43.



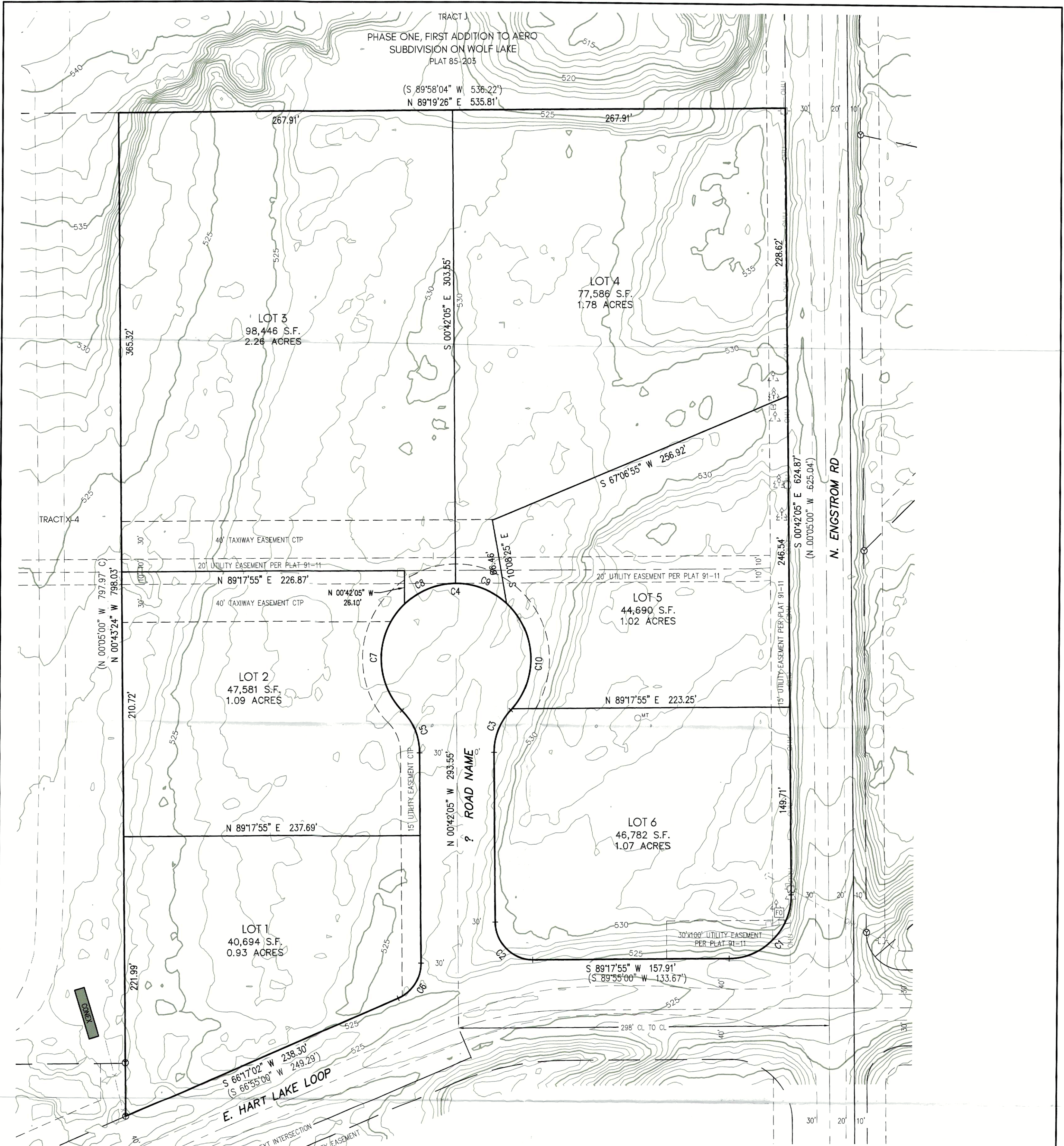








0 425 850 1,700 Feet

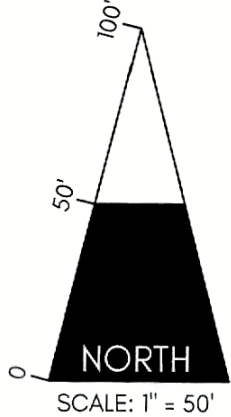


- NOTES
1. () DIMENSIONS ARE RECORD PER PLAT 91-11.
 2. UTILITIES OTHER THAN THOSE SHOWN MAY EXIST.

LAVENDER
SURVEY & MAPPING
720 N. YETI STREET, PALMER, AK 99645
DAYNA@LAVENDERSURVEY.COM (907)301-5177 AEC #226083

CURVE TABLE						
CURVE	LENGTH	RADIUS	DELTA	CHORD BEARING	CHORD	TANGENT
C1	78.54'	50.00'	90°00'00"	N 44°17'55" E	70.71'	50.00'
C2	47.12'	30.00'	90°00'00"	S 45°42'05" E	42.43'	30.00'
C3	37.82'	50.00'	43°20'30"	S 20°58'10" W	36.93'	19.87'
C4	279.27'	60.00'	266°41'01"	S 89°17'55" W	87.27'	63.58'
C5	37.82'	50.00'	43°20'30"	N 22°22'21" W	36.93'	19.87'
C6	35.07'	30.00'	66°59'07"	N 32°47'28" E	33.11'	19.85'
C7	94.64'	60.00'	90°22'12"	S 01°08'30" W	85.13'	60.39'
C8	45.00'	60.00'	42°58'19"	S 67°48'45" W	43.95'	23.62'
C9	45.00'	60.00'	42°58'19"	N 69°12'56" W	43.95'	23.62'
C10	94.64'	60.00'	90°22'12"	N 02°32'41" W	85.13'	60.39'

- LEGEND
- FOUND REBAR WITH PLASTIC CAP
 - FOUND REBAR
 - ⌈⌋ POWER POLE
 - ⌈⌋ GUY WIRE
 - ⌈⌋ FIBER OPTIC MANHOLE
 - ⌈⌋ TELEPHONE PEDESTAL
 - ⌈⌋ TELEPHONE CABINET
 - MT MONITORING TUBR
 - OHU --- OVERHEAD UTILITY
 - X --- 4' T-POST & WIRE FENCE
 - ⌈⌋ SUBDIVISION SIGN
 - 525 --- 5' MAJOR CONTOUR
 - 1' --- 1' MINOR CONTOUR



ORIGINAL SIZE: 18x24

RECEIVED
JUL 22 2026
PLATTING



ASBUILT -- NO CORNERS SET THIS DATE
I HEREBY CERTIFY THAT I HAVE PERFORMED
A SURVEY OF
TRACT E, PHASE TWO FIRST ADDITION TO
AERO SUBDIVISION ON WOLF LAKE, PLAT No.
91-11, PALMER RECORDING DISTRICT, ALASKA,
AND THAT THE IMPROVEMENTS AS DEPICTED
HEREON EXIST AS SHOWN IN RELATION TO
THE PROPERTY LINES. EASEMENTS OF RECORD
OTHER THAN THOSE SHOWN ON RECORDED
PLAT No. 91-11 ARE NOT SHOWN HEREON
UNLESS OTHERWISE NOTED.
DATE: 7/20/2026 FB: 2025-13
GRID: WA07 DRAWN: DJ/SPK
SCALE: 1" = 50' FILE: 25-629AB

Aileron Acres Subdivision

Engineers' Usable Area Report

Location:

NSN E. Hart Lake Loop
Aero On Wolf LK Phase II Addition 1 Tract E
Matanuska-Susitna Borough
Parcel ID: 46467

Prepared For:

Steppers Construction, Inc.
6282 E Beechcraft Road Wasilla, AK 99654
(907) 982 0375
aspen@steppersak.com

Prepared by:

Pannone Engineering Services, LLC.
P.O. Box 1807 Palmer, AK 99645
Phone: (907) 745 8200
Fax: (907) 745 8201
logan@panengak.com

Submitted By:

Logan J. Curtiss, EIT
Project Engineer
28 July, 2026

Steven R. Pannone, PE, F.ASCE
Principal Civil Engineer
28 July, 2026



Attachments:
Overall Site Layout
Soil Logs
Sieve Analysis Results

Mailing: P.O.Box 1807, Palmer, AK 99645
Telephone: (907) 745-8200 FAX: (907) 745-8201

RECEIVED

JUL 31 2026

PLATTING

Project Description

This Useable Area Report has been prepared to assess the suitability of on-site soils of the subject lot for wastewater disposal in accordance with MSB Title 43. At the request of the project owner our firm has conducted a soils investigation and site assessment for the proposed subdivision. The subject property consists of an 8.71-acre parent lot (Aero On Wolf LK Phase II Additional 1 Tract E) which is proposed to be subdivided into six lots, each with a minimum of 50,000 ft² total area.

Currently the site is undeveloped. The surrounding sites are not served or accessible to public water or sewer utilities; each future parcel as a part of this subdivision project will require individual private well and septic systems for service of water and wastewater utilities. The attached site layout illustrates the proposed subdivision, including a usable area delineation concept for each future lot. Three test holes were excavated to assess subsurface conditions and support subdivision feasibility; locations of the test holes conducted are shown on the attached site layout.

Topography & Site Conditions

The parcel is roughly an irregular rectangle: with its north boundary located along the Wolf Lake Airport runway; south boundary along E. Hart Lake Loop Rd; west along an existing private taxiway; and east boundary located along N. Engstrom Rd. The entirety of the parcel's terrain is gently rolling, with existing bluffs located to the east and primary surface runoff directed west toward the adjacent private taxiway. A 20-foot-wide utility easement traverses the site from east-west. No slopes exceeding 25% were identified within the property boundary based on the topography survey performed; with existing data indicating ~13 ft of total relief across the parent parcel. The proposed subdivision area appears to exist in a native, undisturbed state. Existing vegetation consists of dense mature growth spruce, cottonwood, and birch with localized devil's club and willow.

Subsurface Conditions

Three test holes (TH-1, TH-2, TH-3) were excavated January 13, 2026, by Steppers Construction, Inc. under the supervision of Pannone Engineering Services, LLC (PES). Sieve analyses were completed on representative samples (see attachments). Groundwater monitoring was performed via test hole standpipes; with all three holes observed dry on January 23, 2026.

Test hole 1 was characterized by a surface layer of organic material with silt, which appeared frozen from approximately (0.0 – 2.0) feet BGS at the time of excavation. This layer was underlain by poorly graded gravel with sand (GP) defined via sieve analysis to maintain a high silt content. This layer was found to extend from approximately (2.0 – 6.0) feet BGS. Beneath this, highly consolidated silty gravel with sand (GM) was encountered from approximately (6.0 – 15.0) feet BGS. No impermeable soil layers or ground water was observed during the excavation of this test hole.

Test hole 2 consisted of the same surface layer of organic material and frozen silts (OR/SM) extending from ground surface to (2.0) feet BGS. This layer was underlain by frozen silts extending from (2.0-3.0) feet BGS. Beneath this, poorly graded sandy gravel with silt (GP/SM) was encountered extending from approximately

Mailing: P.O.Box 1807, Palmer, AK 99645
Telephone: (907) 745-8200 FAX: (907) 745-8201

(3.0 – 5.0) feet BGS. The lower portion of this test hole consisted of cleaner poorly graded gravel with sand defined via sieve analysis as (GP) extending from approximately (10.0 – 16.0) feet BGS. No impermeable soil layers or ground water was observed during the excavation of this test hole. Test hole 3 was characterized by a surface layer of frozen organics and silts extending from (0.0 – 2.0) feet BGS. This layer was found to overlay similar poorly graded sandy gravel with silts (GP/SM) from approximately (2.0 – 7.0) feet BGS. Below this depth, well graded gravel with silt and sand (GW/GM) was encountered extending from (7.0 – 16.0) feet BGS. No impermeable soil layers or ground water was observed during the excavation of this test hole.

All test holes revealed receiving soil types well suited for the construction of private on-site wastewater disposal systems. Subsequent sieve analysis data for each test hole conducted is attached. Following ground water monitoring conducted on (01/23/2026): water was not observed within each of the test hole monitor tubes of test hole 1, test hole 2, and test hole 3 to their respective depths.

Useable Area Determination & Code Compliance (MSB 43.20.281)

As required by MSB 43.20.281, and based on the available soils, existing water table information, ground water monitoring results, and the proposed preliminary plat; each of the proposed lots can provide **≥ 10,000 ft² of contiguous usable septic area and an additional ≥ 10,000 ft² of usable building area**. In compliance with Matanuska Borough setback requirements, all designated septic areas shown on the attached site plan are located ≥ 100ft from all known surface waters, private wells, and wetlands in the area at the time of this evaluation. All usable septic and building areas shown lie outside of public use areas and easements and lie within the boundaries of the subdivision.

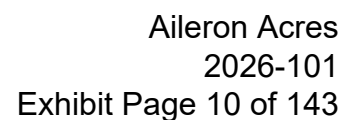
Conclusion

The subsurface conditions encountered (predominantly clean to slightly silty gravels/sands with HSG A classification and visual percolation rates < 1 min/in) indicate the site is suitable for individual onsite wastewater disposal systems on each proposed lot, provided final designs adhere to MSB Title 43, Alaska Department of Environmental Conservation (ADEC) wastewater disposal requirements and standard engineering practices. Groundwater was not encountered in test hole excavations, and all monitoring tubes were observed dry on 01/23/2026.

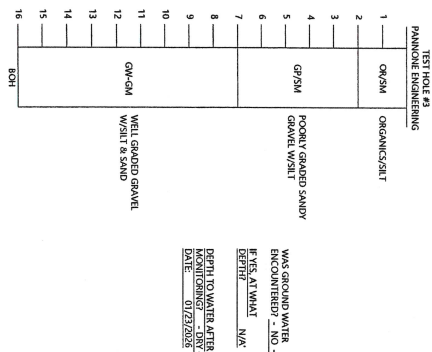
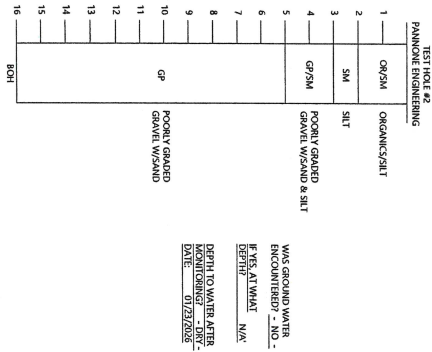
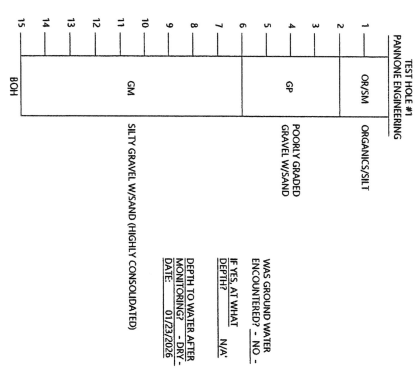
Disclaimer

The sole purpose of this report is to identify the suitability of the proposed subdivision to accept effluent from private onsite wastewater disposal systems and was created for the sole benefit of the owner listed above. This report does not constitute the design of any onsite wastewater disposal system. PES did not have access to neighboring parcels; locations of off-site wells, structures, water bodies, and other potential constraints were assessed using available record information and aerial imagery. Any party relying on this report and soils information to design an onsite wastewater disposal system shall do so at his or her own risk.

Mailing: P.O.Box 1807, Palmer, AK 99645
Telephone: (907) 745-8200 FAX: (907) 745-8201



SOIL LOGS AND PERCOLATION TESTS



DATE PERFORMED: 07/13/2026

SOIL TEST RESULTS ANALYSIS
• SAMPLE COLLECTED BETWEEN 1.0 FT AND 4.0 FT
• SEE ATTACHED SIEVE ANALYSIS RESULTS
• PERCOLATION RATE: 1.5 (IMPERVIOUSLY RATED) BWT 2.0 - 4.0 FT (Hydrologic Soil Group: HSG A)

READING	DATE	NET TIME	WATER LEVEL	NET DROP	DATE
1	07/13/26				
2					
3					
4					
5					
6					
7					
8					

DATE PERFORMED: 07/13/2026

SOIL TEST RESULTS ANALYSIS
• SAMPLE COLLECTED BETWEEN 1.0 FT AND 2.0 FT
• SEE ATTACHED SIEVE ANALYSIS RESULTS
• PERCOLATION RATE: 1.5 (IMPERVIOUSLY RATED) BWT 1.0 - 1.0 FT (Hydrologic Soil Group: HSG A)

READING	DATE	NET TIME	WATER LEVEL	NET DROP	DATE
1	07/13/26				
2					
3					
4					
5					
6					
7					
8					

DATE PERFORMED: 07/13/2026

SOIL TEST RESULTS ANALYSIS
• SAMPLE COLLECTED BETWEEN 1.0 FT AND 11.0 FT
• SEE ATTACHED SIEVE ANALYSIS RESULTS
• PERCOLATION RATE: 1.5 (IMPERVIOUSLY RATED) BWT 1.0 - 11.0 FT (Hydrologic Soil Group: HSG A)

READING	DATE	NET TIME	WATER LEVEL	NET DROP	DATE
1	07/13/26				
2					
3					
4					
5					
6					
7					
8					

COMMENTS: TEST HOLE EXCAVATED BY: STEPPERS CONSTRUCTION, INC.
PERFORMED BY: PANNONE ENGINEERING SERVICES, LLC. (CERTIFY THAT THIS TEST WAS PERFORMED IN ACCORDANCE WITH ALL STATE AND MUNICIPAL GUIDELINES IN EFFECT ON THE DATE OF THIS TEST.)

FOR MATSU-DOBOSHI REVIEW ONLY

STEPPERS CONSTRUCTION, INC.
AILERON ACRES SUBDIVISION
NSN EAST HART LAKE LOOP ROAD
WASILLA, AK 99645

PANNONE
ENGINEERING SERVICES, LLC
P.O. BOX 1807 PALMER, AK 99645
T: (907) 745-8200 F: (907) 745-8200

STEPPERS CONSTRUCTION, INC.
1000 E. BUCKLEBURY ROAD
WASILLA, AK 99645
(907) 942-0075
steph@stepscorp.com

DATE: 07/23/2026
SHEET NO.: CO.4
SHEET TOTAL: 2

DATE: 07/23/2026
SHEET NO.: CO.4
SHEET TOTAL: 2

Content Summary

Report No: MSR:261806-260126-260202

Document Number	Description	Activity Date	Page
MAT:26-0024-S01	Aggregate/Soil Test Report	1/26/2026	2
MAT:26-0024-S02	Aggregate/Soil Test Report	1/26/2026	3
MAT:26-0024-S03	Aggregate/Soil Test Report	1/26/2026	4
MAT:26-0024-S04	Aggregate/Soil Test Report	1/26/2026	5

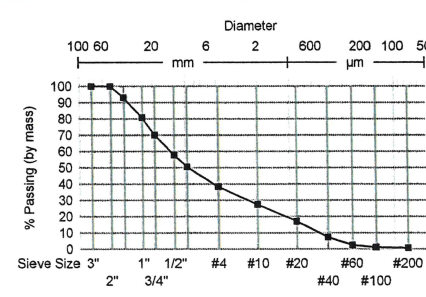


Alaska Testlab - Anchorage
1020 W International Airport Rd
Anchorage, AK 99518
Phone: 907-205-1987
Fax: 907-782-4409
info@alaskatestlab.com

Material Test Report

Report No: MAT:26-0024-S01
Issue No: 1

Client: Pannone Engineering PO Box 1807 Palmer, AK, 99645 Project: Aileron Acres N/A	Project Code: 261806 CC: Maria Kampsen Trevor Orear	The results contained below pertain only to the items tested below. This report should not be reproduced, except in full, without the prior written approval of Alaska Testlab or the agency.  Reviewed By: Cindy Zickefoose Title: Laboratory Supervisor Date: 1/27/2026
--	---	---

Sample Details				Particle Size Distribution	
Sample ID	26-0024-S01			Method:	ASTM D6913
Client Sample ID	TH-01 (3.0-4.0')			Drying By:	Oven
General Location	Aero On Wolf Lake			Date Tested:	1/26/2026
Location	Ph II Add 1 Tract E			Tested By:	Matthew Klee
Other Test Results					
Description	Method	Result	Limits		
Group Code	ASTM D2487	GP			
Group Name	Poorly graded gravel with sand				
Gravel (%)		62			
Sand (%)		37			
Fines (%)		1			
	ASTM D2487				
Tested By	Desirae Pascale				
Date Tested	1/26/2026				
Method	ASTM D6913	A			
Preparation Method	Oven Dry				
Composite Sieving?	Yes				
Separating Sieve(s)	No. 4				
Cu	ASTM D2487	26.34			
Cc		0.88			
Date Tested	1/26/2026				
				Chart	
					

Comments
N/A



Alaska Testlab - Anchorage
1020 W International Airport Rd
Anchorage, AK 99518
Phone: 907-205-1987
Fax: 907-782-4409
info@alaskatestlab.com

Material Test Report

Report No: MAT:26-0024-S02
Issue No: 1

Client: Pannone Engineering
PO Box 1807
Palmer, AK, 99645
Project: Aileron Acres

N/A

Project Code: 261806
CC: Maria Kampsen
Trevor Orear

The results contained below pertain only to the items tested below. This report should not be reproduced, except in full, without the prior written approval of Alaska Testlab or the agency.

Reviewed By: Cindy Zickefoose
Title: Laboratory Supervisor
Date: 1/27/2026

Sample Details

Sample ID 26-0024-S02
Client Sample ID TH-01 (10.0-11.0')
General Location Aero On Wolf Lake
Location Ph II Add 1 Tract E

Particle Size Distribution

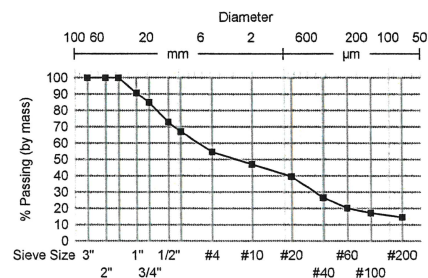
Method: ASTM D6913
Drying By: Oven
Date Tested: 1/23/2026
Tested By: Matthew Klee

Sieve Size	% Passing	Limits
3in	100	
2in	100	
1½in	100	
1in	91	
¾in	85	
½in	73	
3/8in	67	
No. 4	54.7	
No. 10	47	
No. 20	40	
No. 40	27	
No. 60	20	
No. 100	17	
No. 200	15	

Other Test Results

Description	Method	Result	Limits
Group Code	ASTM D2487	GM	
Group Name		Silty gravel with sand	
Liquid Limit		0	
Plasticity Index		0	
Gravel (%)		45	
Sand (%)		40	
Fines (%)		15	
	ASTM D2487		
Tested By		Desirae Pascale	
Date Tested		1/26/2026	
Method	ASTM D6913	A	
Preparation Method		Oven Dry	
Composite Sieving?		Yes	
Separating Sieve(s)		No. 4	
Cu	ASTM D2487		
Cc			
Date Tested		1/23/2026	

Chart



Comments

No Plasticity Index Test Performed
Soil Classification of Fines (-#200) in Sieve Analyses Assumed Unless Verified by Additional Testing

Material Test Report

Givens

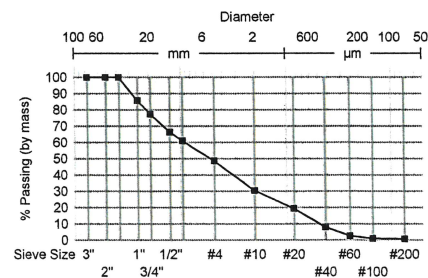
Sample Details

Particle Size Distribution

Other Test Results

Sieve Size	% Passing	Limits
3in	100	
2in	100	
1½in	100	
1in	86	
¾in	77	
½in	66	
3/8in	61	
No.4	48.8	
No.10	30	
No.20	19	
No.40	8	
No.60	3	
No.100	1	
No.200	1	

Chart



Comments

Page 4 of 5



Alaska Testlab - Anchorage
1020 W International Airport Rd
Anchorage, AK 99518
Phone: 907-205-1987
Fax: 907-782-4409
info@alaskatestlab.com

Material Test Report

Report No: MAT:26-0024-S04
Issue No: 1

Client: Pannone Engineering
PO Box 1807
Palmer, AK, 99645
Project: Aileron Acres
N/A

Project Code: 261806
CC: Maria Kampsen
Trevor Orear

The results contained below pertain only to the items tested below. This report should not be reproduced, except in full, without the prior written approval of Alaska Testlab or the agency.

[Signature]

Reviewed By: Cindy Zickefoose
Title: Laboratory Supervisor
Date: 1/27/2026

Sample Details

Sample ID 26-0024-S04
Client Sample ID TH-03 (10.0-11.0')
General Location Aero On Wolf Lake
Location Ph II Add 1 Tract E

Particle Size Distribution

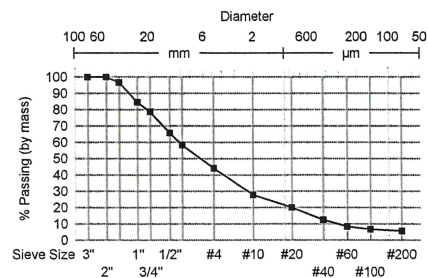
Method: ASTM D6913
Drying By: Oven
Date Tested: 1/26/2026
Tested By: Matthew Klee

Sieve Size	% Passing	Limits
3in	100	
2in	100	
1 1/2in	97	
1in	85	
3/4in	79	
1/2in	66	
3/8in	58	
No. 4	44.3	
No. 10	28	
No. 20	20	
No. 40	12	
No. 60	8	
No. 100	7	
No. 200	6	

Other Test Results

Description	Method	Result	Limits
Group Code	ASTM D2487	GW-GM	
Group Name	Well-graded gravel with silt and sand		
Atterberg Limits Estimated		Yes	
Gravel (%)		56	
Sand (%)		38	
Fines (%)		6	
	ASTM D2487		
Tested By	Desirae Pascale		
Date Tested	1/26/2026		
Method	ASTM D6913	A	
Preparation Method	Oven Dry		
Composite Sieving?	Yes		
Separating Sieve(s)	No. 4		
Cu	ASTM D2487	32.70	
Cc		1.60	
Date Tested	1/26/2026		

Chart



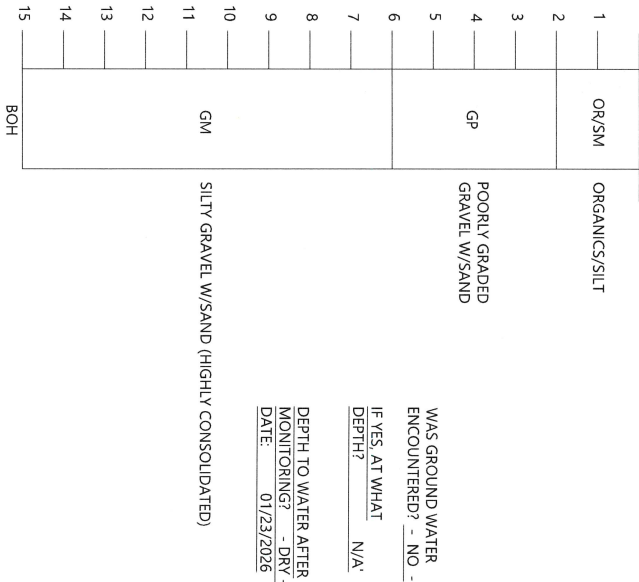
Comments

Soil Classification of Fines (#200) in Sieve Analyses Assumed Unless Verified by Additional Testing
No Plasticity Index Test Performed

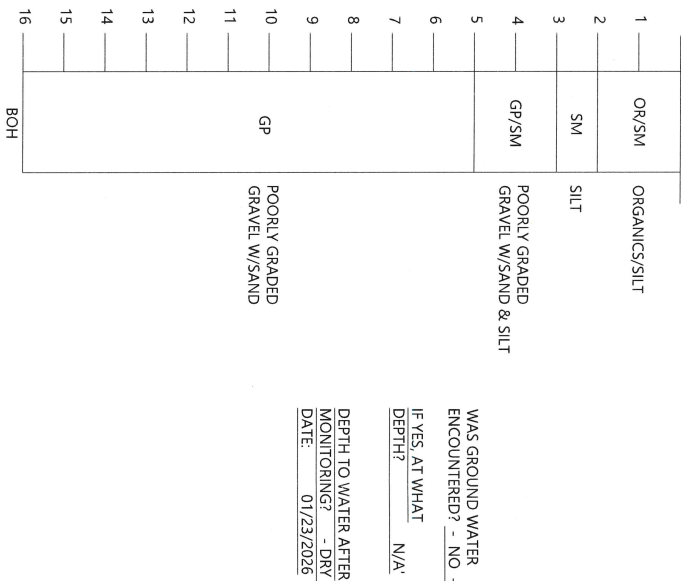


SOIL LOGS AND PERCOLATION TESTS

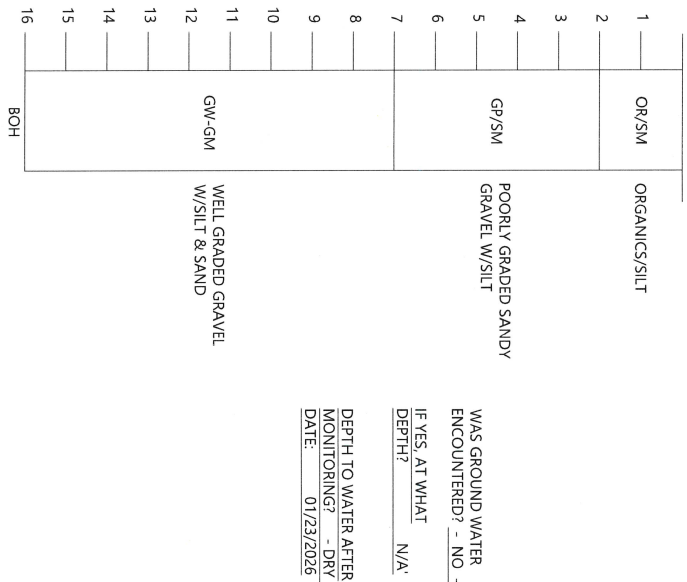
TEST HOLE #1
PANNONE ENGINEERING



TEST HOLE #2
PANNONE ENGINEERING



TEST HOLE #3
PANNONE ENGINEERING



DATE PERFORMED: 01/13/2026

- SOIL TEST RESULTS/ANALYSIS
- SAMPLE COLLECTED BETWEEN 3.0 FT AND 4.0 FT, & 10.0 FT AND 11.0 FT.
 - SEE ATTACHED SIEVE ANALYSIS RESULTS.
 - PERCOLATION RATE <1 (min/inch) (VISUALLY RATED BW 2.0 - 6.0 FT) (Hydrologic Soils Group: HSG A)

READING	DATE	NET TIME	WATER LEVEL READING	NET DROP	RATE (MP)
1	01/13/26				
2					
3					
4					
5					
6					
7					
8					

DATE PERFORMED: 01/13/2026

- SOIL TEST RESULTS/ANALYSIS
- SAMPLE COLLECTED BETWEEN 6.0 FT AND 7.0 FT.
 - SEE ATTACHED SIEVE ANALYSIS RESULTS.
 - PERCOLATION RATE <1 (min/inch) (VISUALLY RATED BW 5.0 - 16.0 FT) (Hydrologic Soils Group: HSG A)

READING	DATE	NET TIME	WATER LEVEL READING	NET DROP	RATE (MP)
1	01/13/26				
2					
3					
4					
5					
6					
7					
8					

DATE PERFORMED: 01/13/2026

- SOIL TEST RESULTS/ANALYSIS
- SAMPLE COLLECTED BETWEEN 10.0 FT AND 11.0 FT.
 - SEE ATTACHED SIEVE ANALYSIS RESULTS.
 - PERCOLATION RATE <1 (min/inch) (VISUALLY RATED BW 7.0 - 16.0 FT) (Hydrologic Soils Group: HSG A)

READING	DATE	NET TIME	WATER LEVEL READING	NET DROP	RATE (MP)
1	01/13/26				
2					
3					
4					
5					
6					
7					
8					

COMMENTS: TEST HOLE EXCAVATED BY: STEPPERS CONSTRUCTION, INC.

PERFORMED BY: PANNONE ENGINEERING SERVICES, LLC. I CERTIFY THAT THIS TEST
WAS PERFORMED IN ACCORDANCE WITH ALL STATE AND MUNICIPAL GUIDELINES IN EFFECT ON THE DATE OF THIS TEST.



#	DESCRIPTION	DATE
---	-------------	------



STEPPERS CONSTRUCTION, INC.
AILERON ACRES SUBDIVISION
NSN EAST HART LAKE LOOP ROAD
WASILLA, AK 99645

STEPPERS CONSTRUCTION, INC.
ASPEN SANDERS
6382 E BEECHCRAFT ROAD
WASILLA, AK 99645
(907) 982-0375
aspen@steppersak.com

JOB NO. 20260047
DATE 12 MAY 2026
DESIGNED BY SPB
REVIEWED

SHEET NAME

SOILS LOGS

SHEET NO.
C.0.4

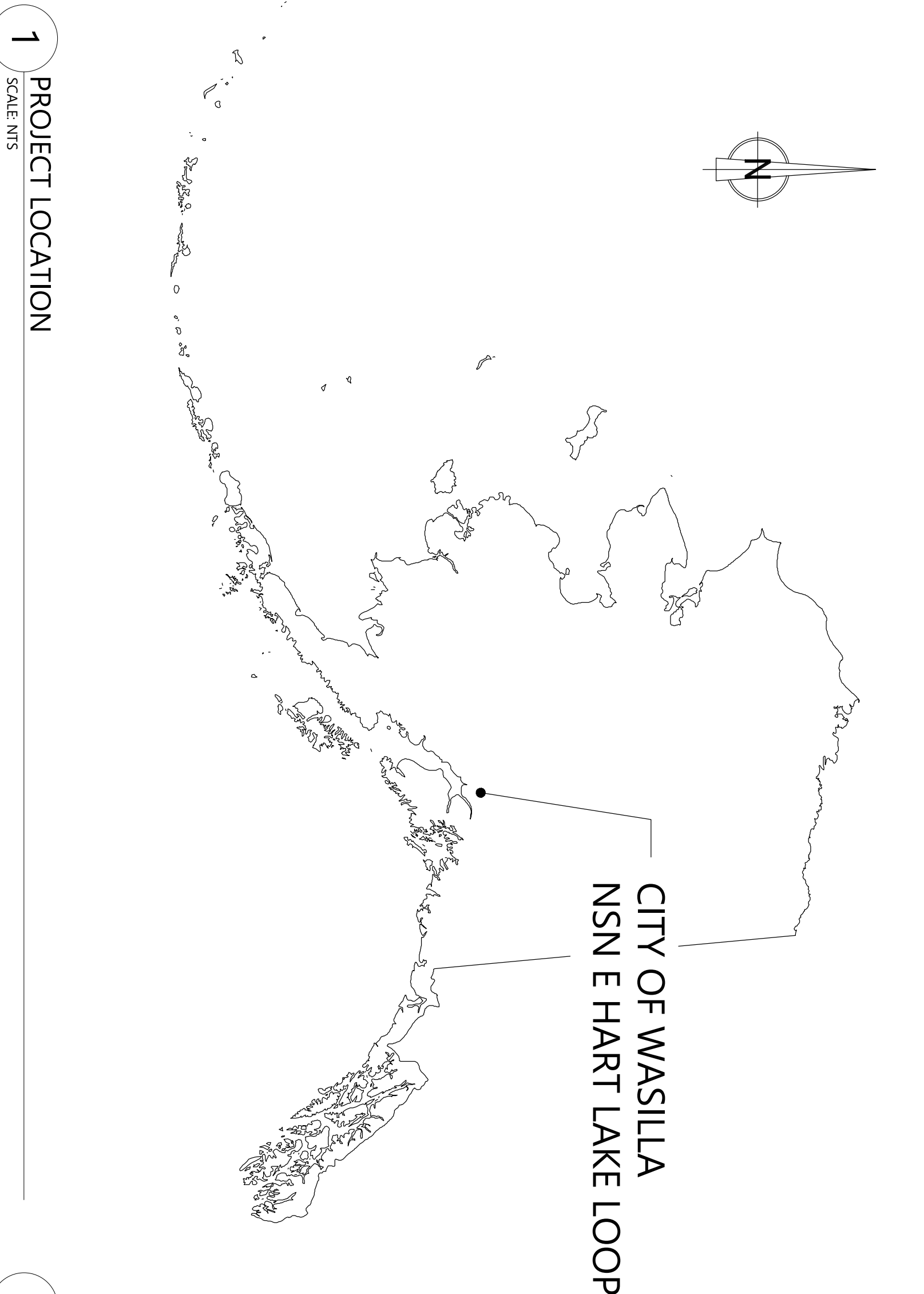
FOR MATSU-BOROUGH REVIEW ONLY

HALF SCALE WHEN PRINTED AT 11x17

AILERON ACRES

ROAD & PRELIMINARY DRAINAGE DESIGN

AERO ON WOLF LAKE PHASE II ADDITION 1 TRACT E
NSN EAST HART LAKE LOOP ROAD
WASILLA, AK 99654



1 PROJECT LOCATION
SCALE: NTS



2 VICINITY MAP
SCALE: NTS

SHEET INDEX	
SHEET NO.	SUBJECT
C0.1	COVER SHEET
C0.2	NOTES, LEGEND, & ABBREVIATIONS
C0.3	NOTES
C0.4	SOIL LOGS
C1.0	OVERALL SITE - USABLE AREA DESIGNATION
C1.1	PRELIMINARY DRAINAGE PLAN
C2.0	PROPOSED ROAD PLAN & PROFILE
C2.1	SIGHT DISTANCE DETAILS
C3.0	DETAILS



CALL BEFORE YOU DIG

LOCATE CALL CENTER	
ANCHORAGE AREA	278-3121
STATEWIDE	800-478-3121
WHO WILL LOCATE THE FOLLOWING	
ANCHORAGE TELEPHONE UTILITY - ANCHORAGE WATER & WASTEWATER UTILITY	
BUTLER AVIATION INC. - CHUGACH ELECTRIC ASSOCIATION	
ENSTAR NATURAL GAS COMPANY - MUNICIPAL LIGHT & POWER DEPARTMENT	
MUNICIPAL PUBLIC WORKS DEPT. STREET LIGHTS, STORM DRAINS & TRAFFIC SIGNALS	
PRIME CABLE TELEVISION - TESORO PETROLEUM CORP. - UNICAL OIL COMPANY	
ALASKA RAILROAD CORPORATION	265-2580
ALASCOM, INC.	264-8465
ALYESKA CABLE (GRIDWOOD)	562-3300
MATANUSKA ELECTRIC ASSOCIATION	694-2161
CHUGIAK & EAGLE RIVER	800/478-5150
BIG LAKE & PALMER	694-3121
MATANUSKA TELEPHONE ASSOCIATION	745-3121
CHUGIAK & EAGLE RIVER	333-2411
PALMER & VICINITY	552-3760
STATE OF ALASKA (DOT & P) STREET LIGHTS & STORM DRAINS	
U.S. ARMY (POL) MILITARY PETROLEUM FUEL LINES	
ANCHORAGE AREA UTILITY COMPANY	

STEPPERS CONSTRUCTION, INC.
AILERON ACRES SUBDIVISION
NSN EAST HART LAKE LOOP ROAD
WASILLA, AK 99645



JOB NO. DATE DRAWN REVIEWED	20260047 12 MAY 2026 LIC SRP
SHEET NAME COVER SHEET	
SHEET NO. C0.1	

GENERAL CONSTRUCTION NOTES

- CONTRACTOR SHALL COMPLETE CONSTRUCTION IN ACCORDANCE WITH IN THE MOST CURRENT EDITION OF THE MATANUSKA-SUSTNA BOROUGH SUBDIVISION CONSTRUCTION MANUAL AND ANY AND ALL APPLICABLE BOROUGH REGULATIONS.
- THE CONTRACTOR SHALL OBTAIN ALL NECESSARY LOCAL, STATE, AND FEDERAL PERMITS PRIOR TO BEGINNING CONSTRUCTION.
- CONTRACTOR SHALL MAINTAIN "REDLINE" RECORD DRAWINGS ON A CLEAN SET OF CONSTRUCTION DRAWINGS. THE CONTRACTOR SHALL MAINTAIN THE RECORD SURVEY NOTES AND SUBMIT DAILY TO THE ENGINEER. CONTRACTOR SHALL RECORD SURVEY NOTES FOR SUBMITTAL WITH RECORD DRAWINGS, INCLUDING HORIZONTAL AND VERTICAL LOCATIONS OF ALL UTILITIES ENCOUNTERED IN THE FIELD. CONTRACTOR SHALL RECORD ALL DEVIATIONS FROM THE PLANS.
- CONSTRUCTION OPERATIONS REQUIRED FOR THIS PROJECT SHALL REMAIN WITHIN EXISTING CITY OF WASILLA OR MATSU-BOROUGH AND STATE OF ALASKA RIGHTS-OF-WAY AND EASEMENTS, UNLESS OTHERWISE APPROVED IN WRITING BY THE ENGINEER AND THE AFFECTED PROPERTY OWNER.
- LOCATIONS DEPCTED FOR THE UTILITIES AND OTHER EXISTING FEATURES ARE APPROXIMATE. CONTRACTOR SHALL LOCATE AND VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION. ALL NECESSARY UTILITY RELOCATIONS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. THE REPLACEMENT AND REPAIR OF DAMAGED UTILITIES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
- UNDERGROUND ELECTRICAL, TELECOMMUNICATION, WATER, AND NATURAL GAS UTILITY LINES OCCUR WITHIN THE PROJECT AREA; CONTRACTOR SHALL COORDINATE WORK ACCORDINGLY. ALL WORK IN CLOSE PROXIMITY TO THE EXISTING UNDERGROUND LINES SHALL COMPLY WITH APPLICABLE FEDERAL, STATE AND LOCAL STATUTES, CODES, AND GUIDELINES, AND THE FACILITY CLEARANCE REQUIREMENTS OF THE GOVERNING UTILITY. CONTRACTOR SHALL HAND DIG WITHIN TWO FEET OF BURIED UTILITY FACILITIES, THE COST OF RELOCATING EXISTING UTILITIES SHALL BE BORNE BY THE DEVELOPER, IF NECESSARY.
- CONTRACTOR SHALL SAW CUT EXISTING PAVEMENT TO A LINE 2 FEET BEYOND THE PROPOSED IMPROVEMENTS. DURING THE INITIAL EXCAVATION WITHIN A TRAVEL LANE, FURTHER REMOVAL MAY BE REQUIRED, AS DIRECTED BY THE ENGINEER TO PROVIDE A PROPER TRANSITION BETWEEN NEW AND EXISTING PAVEMENT. SAW CUTS ACROSS ROAD LANES SHALL BE SKEWED AT AN ANGLE OF 15 TO 25 DEGREES WHERE MATCHING EXISTING ASPHALT.
- CONTRACTOR SHALL APPLY TACK COAT TO THE SAW CUT ASPHALT FACE PRIOR TO PAVING. CONTRACTOR SHALL SAW CUT CURB & GUTTER AND SIDEWALK AT THE NEAREST JOINT AT OR BEYOND REMOVAL LIMITS OR AS DIRECTED BY THE ENGINEER.
- LIMITS OF EXCAVATION AND BACKFILL SHALL BE AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER.
- CONTRACTOR SHALL REMOVE ORGANIC MATERIAL FROM THE SUBGRADE TO A DEPTH TO BE DETERMINED BY THE ENGINEER. CONTRACTOR SHALL UTILIZE EXCAVATED ORGANIC MATERIAL IN PLACE OF TOPSOIL OVER ALL DISTURBED AREAS. ORGANIC MATERIAL DEPTH SHALL BE FOUR INCHES.
- NO SLIT TRENCHING ALLOWED FOR TREE & STUMP REMOVAL.
- WORK AND MATERIALS REQUIRED FOR REMOVING LITTER OR DEBRIS THAT EXIST WITHIN THE PROJECT LIMITS ARE INCIDENTAL TO THE PROJECT.
- CONTRACTOR SHALL REPLACE ALL DISTURBED PROPERTY CORNERS AS NECESSARY.
- CONTRACTOR SHALL RESTORE DISTURBED PROPERTY TO PRECONSTRUCTION CONDITION(S) UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
- DEWATERING MAY BE REQUIRED TO REMOVE SURFACE AND SUBSURFACE WATER FROM THE ROADWAY AND UTILITY EXCAVATION.
- ALL BEDDING SHALL BE NATIVE MATERIAL CONFORMING TO AND MEETING THE SPECIFICATIONS OF CITY OF WASILLA OR MATSU-BOROUGH BEDDING REQUIREMENTS.
- ALL FILLS SHALL BE PLACED IN LIFTS NOT EXCEEDING 12 INCHES AND COMPACTED TO A MINIMUM OF 90% OF MAXIMUM DENSITY. FILLS UNDER BUILDING FOOTPRINTS, DRIVEWAYS, AND PARKING LOTS SHALL BE PLACED IN LIFTS NOT EXCEEDING 12 INCHES AND COMPACTED TO 95% OF MAXIMUM DENSITY.
- SWEEPING:
 - IMPLEMENTATION:
 - THE HAUL ROUTE WITHIN A 500-FOOT RADIUS OF THE CONSTRUCTION EXIT, OR FURTHER AS REQUIRED, SHALL BE CLEANED FROM CURB TO CURB THOROUGHLY AT THE END OF EACH DAY, AND MORE OFTEN AS NECESSARY TO ENSURE THAT SEDIMENT AND MUD IS NOT TRACKED ONTO ROADWAYS.
 - THE ENTIRE HAUL ROUTE SHALL BE CLEANED THOROUGHLY EACH WEEK
 - SEDIMENT SHALL BE REMOVED FROM ROADS BY SHOVELING OR PICKUP SWEEPING AND SHALL BE TRANSPORTED TO A CONTROLLED SEDIMENT DISPOSAL AREA. STREET WASHING WILL BE ALLOWED ONLY AFTER SEDIMENT IS REMOVED IN THIS MANNER. STREET SWEEPING EQUIPMENT, SUCH AS VACUUM TRUCKS, MUST BE EQUIPPED WITH AN EFFECTIVE BAGHOUSE OR OTHER FILTERING DEVICES.
 - THE USE OF SWEEPING EQUIPMENT WITH AIR POLLUTION CONTROL DEVICES THAT ARE IN DISREPAIR IS PROHIBITED.
 - MECHANICAL DEVICES WITHOUT FILTERING EQUIPMENT MAY BE USED ONLY WHEN WET SWEEPING METHODS ARE EFFECTIVELY EMPLOYED.
 - VACUUM SWEEPERS MUST BE USED WITH WATER.
 - THE USE OF LEAF BLOWERS AND OTHER SIMILAR EQUIPMENT FOR SWEEPING IS PROHIBITED.
 - MANUAL BROOM SWEEPING IS ALLOWED.
 - REASONABLE MEASURES MUST BE EMPLOYED TO PREVENT DUST FROM BECOMING AIRBORNE DURING ANY OPERATION WHERE PARTICULAR MATTER IS HANDLED, TRANSPORTED, OR STORED.
 - MAINTENANCE
 - EACH HOUR DURING HAULING OPERATIONS, CHECK TO SEE THAT SEDIMENT AND MUD ARE NOT TRACKED ONTO THE ROADWAYS.
- RIGHT-OF-WAY PERMIT REQUIRED FOR ALL WORK IN CITY OF WASILLA OR MATSU-BOROUGH RIGHTS OF WAY, INCLUDING BUT NOT LIMITED TO WATER AND SEWER SERVICE CONNECTIONS, NEW DRIVEWAYS, DRAINAGE IMPROVEMENTS, AND LANDSCAPING IMPROVEMENTS. ONLY CONTRACTORS WITH A CURRENT RIGHT-OF-WAY BOND ON FILE IN THE RIGHT-OF-WAY OFFICE MAY OBTAIN A RIGHT-OF-WAY PERMIT.
- ALL SLOPES COMPLETED BETWEEN APRIL 30 AND AUGUST 15 SHALL BE MATTED AND/OR SEEDED WITHIN 14 DAYS OF COMPLETION OR UPON COMPLETION OF 20,000 SF (1858 SQUARE METERS) OF EXPOSED SLOPE, WHICHEVER IS LESS. SLOPES COMPLETED BETWEEN AUGUST 15 AND APRIL 30 SHALL BE COVERED WITH MATTING MATERIAL AND SEEDED BETWEEN APRIL 30 AND AUGUST 15 OF THE FOLLOWING YEAR. WITHIN ROCK CUT AREAS, THE SOIL BACK SLOPES ABOVE THE BEDROCK SHALL BE MATTED AND SEEDED AS SOON AS PRACTICAL AFTER THE SLOPE IS EXPOSED. SEEDING DATES MAY BE ADJUSTED BY THE ENGINEER, DEPENDENT UPON ACTUAL WEATHER CONDITIONS ENCOUNTERED DURING CONSTRUCTION. SLOPES NOT SHOWING ADEQUATE GROWTH WITHIN 30 DAYS OF THE INITIAL SEEDING, AS DETERMINED BY THE ENGINEER, SHALL BE RE-SEEDED. PRIOR TO FINAL INSPECTION ALL SEEDED AREAS NOT SHOWING ADEQUATE GROWTH, AS DETERMINED BY THE ENGINEER, SHALL BE RE-SEEDED.
- HOURS OF OPERATION WILL BE BETWEEN 7:00AM AND 10:00PM MONDAY TO SATURDAY. ANY WORK SCHEDULED OUTSIDE THESE HOURS WILL REQUIRE A TEMPORARY NOISE PERMIT UNDER THE MATSU-BOROUGH (MSB 8.55, 110).

LEGEND - PLAN

EXISTING	PROPOSED	DESCRIPTION
---	---	PROPERTY LINE
---	---	EASEMENT OR EDGE OF GRAVEL
---	---	CENTERLINE
---	---	CURB & GUTTER
---	---	EDGE OF PAVEMENT
---	---	WATER MAIN
---	---	SEWER MAIN
---	---	STORM DRAIN MAIN
---	---	OVERHEAD ELECTRIC
---	---	OVERHEAD TELEPHONE
---	---	UNDERGROUND ELECTRIC
---	---	UNDERGROUND NATURAL GAS
---	---	FENCE
---	---	DRAINAGE ARROW
---	---	ELECTRICAL VAULT
---	---	GAS METER
---	---	GAS VALVE
---	---	SIGN
---	---	LIGHT POLE
---	---	WATER KEYBOX
---	---	WATER VALVE
---	---	WATER PLUG
---	---	WATER STUB
---	---	FIRE HYDRANT
---	---	SEWER MANHOLE
---	---	SEWER SERVICE
---	---	SEWER PLUG
---	---	CLEANOUT
---	---	STORM DRAIN MANHOLE
---	---	STORM DRAIN CATCH BASIN
---	---	STORM DRAIN CATCH BASIN MANHOLE
---	---	STORM DRAIN SERVICE
---	---	PAVEMENT REMOVAL LIMITS
---	---	TEST HOLE
---	---	PRIVATE/COMMUNITY WELL
---	---	LIMIT OF EXCAVATION
---	---	RAIN LEADER/ROOF DRAIN
---	---	PROTECTIVE WELL RADIUS
---	---	DITCH LINE / FLOW LINE

QUALITY CONTROL

- ANY MODIFICATION TO THE ATTACHED DESIGN AND REQUIREMENTS MUST BE APPROVED BY THE ENGINEER OF RECORD (EOR).
- THE CONTRACTOR MUST VERIFY AND COORDINATE ALL DIMENSIONS SHOWN ON THE DRAWINGS BEFORE STARTING ANY WORK OR FABRICATION. IN CASE OF DISCREPANCIES BETWEEN DRAWINGS, SPECIFICATIONS, REFERENCE STANDARDS, AND SITE CONDITIONS, THE MORE STRINGENT REQUIREMENTS MUST GOVERN. THE CONTRACTOR MUST NOTIFY THE ENGINEER OF DISCREPANCIES AND OBTAIN DIRECTION PRIOR TO CONSTRUCTION.
- NOTED DIMENSIONS GOVERN OVER SCALED DIMENSIONS. DO NOT SCALE DRAWINGS.
- DIMENSIONS AND QUANTITIES ARE THE CONTRACTORS RESPONSIBILITY AND WILL NOT BE REVIEWED BY PANNONE ENGINEERING SERVICES, LLC (PES).
- EMERGENCY CONTACT: STEPPERS CONSTRUCTION (907) 746 1880

GENERAL ABBREVIATIONS

AC	ASPHALT CONCRETE	(N)	NEW
AC	ASBESTOS CONCRETE	NIC	NOT IN CONTRACT
ADA	AMERICANS WITH DISABILITIES	NIS	NON-FROST -SUSCEPTIBLE
ADEC	ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION	NGWE	NO GROUND WATER ENCOUNTERED
AMMU	ANCHORAGE WATER & WASTEWATER UTILITY	NIS	NOT TO SCALE
AMC	ANCHORAGE MUNICIPAL CODE	OC	ON CENTER
APPROX	APPROXIMATE	OHE	OVERHEAD ELECTRIC
BC	BACK OF CURB	OHU	OVERHEAD UTILITY
BGS	BELOW GROUND SURFACE	(P)	PROPOSED
BM	BENCHMARK	PCC	PORTLAND CEMENT CONCRETE
BOX	BOTTOM OF EXCAVATION	PC	POINT-OF-CURVATURE
BOP	BEGINNING OF PROJECT	PCMP	PRE-COATED CORRUGATED METAL PIPE
BV	BUTTERFLY VALVE	PT	POINT-OF-TANGENCY
CB	CATCH BASIN	PVC	POLYVINYL CHLORIDE PIPE
CF	CUBIC FEET	PL	PROPERTY LINE
CFS	CUBIC FEET PER SECOND	RBC	RADIUS BACK OF CURB
C&G	CURB & GUTTER	RL	RAIN LEADER
CIP	CAST IRON PIPE	ROW	RIGHT OF WAY
CIPP	CURED-IN-PLACE PIPE	RP	RADIUS POINT
CL	CLASS	R&R	REMOVE & REPLACE
CL	CENTER LINE	RT	RIGHT
CL	CORRUGATED METAL PIPE	SC	SERVICE CONNECT
CMP	CLEANOUT	SD	STORM DRAIN
CO	CONCRETE PIPE	SDCB	STORM DRAIN CATCH BASIN
CP	CORRUGATED PLASTIC PIPE	SDMH	STORM DRAIN MANHOLE
CPP	CURVE RETURN	SI	STREET INTERSECTION
CR	COPPER	SL	STREET LIGHT
CU	DESIGN CRITERIA MANUAL	SP	SINGLE PUMPER
DCM	DUCTILE IRON PIPE	SS	SANITARY SEWER
DIP	DOUBLE PUMPER	SSMH	SANITARY SEWER MANHOLE
DV	DIVERTER VALVE	ST	STREET
ED	EXISTING	STA	STATION
(E)	EFFECTIVE DEPTH	STD	STANDARD
ED	EXISTING GRADE	SW	SIDEWALK
ELEV	ELEVATION	STB	TOP BACK OF CURB
EOC	EDGE OF CURB	TD	TOTAL DEPTH
EOR	ENGINEER OF RECORD	TH	TEST HOLE
EOP	EDGE OF PAVEMENT	T&E	TELEPHONE & ELECTRICAL EASEMENT
EPA	ENVIRONMENTAL PROTECTION AGENCY	THC	TOP OF CURB
ESMT	EASEMENT	TOS	TOP OF SLAB
F&I	FURNISH & INSTALL	TP	TOP OF PIPE
FC	FOUNDATION CLEANOUT	TV	CABLE TELEVISION
FF	FINISH FLOOR ELEVATION	TYP	TYPICAL
FG	FINISH GRADE	UGE	UNDERGROUND ELECTRIC
FH	FIRE HYDRANT	UGU	UNDERGROUND UTILITY
FL	FLOW LINE	UNO	UNLESS NOTED OTHERWISE
FND	FOUNDATION	UTL	UTILITY
FS	FLOW SPLITTER	VB	VALVE BOX
FTG	FOOTING	WL	WATER LINE
G	GAS		
GAL	US-GALLON		
GB	GRADE BREAK		
GWL	GROUND WATER LEVEL		
GV	GATE VALVE		
HCP	HANDICAP		
HDP	HIGH-DENSITY-POLYETHYLENE		
I&W	IN ACCORDANCE WITH		
INV	INVERT		
LC	LEVELING COURSE		
LF	LINEAL FOOT/FEET		
LT	LEFT		
MASS	MAXIMUM		
MAX	MAXIMUM		
ME	MATCH EXISTING		
MID	MID-POINT-OF-CURVE		
MIN	MINIMUM		
MOA	MUNICIPALITY OF ANCHORAGE		
MT	MONITOR TUBE		



#	DESCRIPTION	DATE
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 aspen@steppersak.com

FOR NO.	20260047
DATE	13 MAY 2026
DRAWN	LC
REVIEWED	SPB

SHEET NAME
 NOTES, LEGEND &
 ABBREVIATIONS

SHEET NO.
 C0.2

GENERAL SURVEY NOTES

1. SURVEY CONTROL PROVIDED BY DAVNA RUMFELT, LAVENDER SURVEYS. A TOPOGRAPHIC SURVEY WAS PERFORMED. ORIGIN OF EXISTING GRADE SURFACE DATA IS MAT-SU BOROUGH GIS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING EXISTING TOPOGRAPHIC CONDITION MATCHES DESIGN. IF THERE IS A SIGNIFICANT DEVIATION THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY. CONTROL RECEIVED BY PES ON 02/20/2026.
2. LOCATIONS DEPICTED FOR THE UTILITIES AND OTHER EXISTING FEATURES ARE APPROXIMATE. CONTRACTOR SHALL LOCATE AND VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION.
3. CONTOUR INTERVAL = 1 FOOT.
4. ALL ROADWAY SURFACES ARE ASPHALT UNLESS NOTED OTHERWISE.
5. A TITLE SEARCH WAS NOT PERFORMED BY PES. EASEMENTS OF RECORD OTHER THAN THOSE SHOWN ON THE LOT SURVEY MAY NOT BE SHOWN.
6. ALL DISTURBED PROPERTY CORNERS SHALL BE REPLACED BY THE CONTRACTOR.

DEMOLITION NOTES

1. LIMIT OF CLEARING AND GRUBBING IS RIGHT OF WAY AND TO THE BACK OF 15' UTILITY EASEMENT.
2. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE AN APPROVED DUMP SITE.
3. ALL STUMPS AND ORGANIC MATERIAL SHALL BE DISPOSED OF AT APPROVED PIT LOCATION AND AS SPECIFIED BY PIT STAFF.
4. UNUSABLE INORGANIC EXCAVATION SHALL BE DISPOSED AT AN APPROVED DUMP SITE.
5. NO SLIT TRENCHING ALLOWED FOR TREE AND STUMP DISPOSAL.

SWPPP NOTES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR EROSION AND SEDIMENT CONTROLS AS NECESSARY TO COMPLY WITH FEDERAL, STATE, AND MUNICIPAL LAWS THAT PROHIBIT UN-PERMITTED DISCHARGE OF POLLUTANTS, INCLUDING SEDIMENTS THAT ARE A RESULT OF EROSION AND OTHER CONSTRUCTION ACTIVITIES.
2. THE CONTRACTOR SHALL CONDUCT ALL WORK SO SEDIMENT IS NOT TRANSPORTED ONTO ROADWAYS OR ADJACENT PROPERTIES. AT A MINIMUM THE CONTRACTOR SHALL SWEEP UP ANY SEDIMENT TRACKED ONTO PAVED SURFACES IN PUBLIC RIGHTS OF WAY OR ACCESS EASEMENTS WITHIN 24 HOURS OF THE TRACKING TO MINIMIZE WASH-OFF OF SEDIMENT INTO STORM DRAINS OR WATERWAYS.
3. THE CONTRACTOR IS RESPONSIBLE FOR ALL DEWATERING EFFORTS. WATER PUMPED OR DIVERTED FROM THE SITE OR ANY EXCAVATION SHALL NOT BE DIVERTED OR PUMPED INTO A STORM DRAIN OR WATERWAY UNLESS A PERMIT IS OBTAINED FROM THE STATE OF ALASKA, MATSU-BOROUGH, AND EPA AS REQUIRED. THE CONTRACTOR SHALL PROVIDE A DISPOSAL SITE FOR ALL EXCESS WATER AND SHALL BE RESPONSIBLE FOR ALL NECESSARY PERMITS AND APPROVALS.
4. ALL CONSTRUCTION SHALL BE COMPLETED IN ACCORDANCE WITH THE MSB/EPA STORM WATER POLLUTION PREVENTION PLAN AND BEST MANAGEMENT PRACTICES FOR STORM WATER RUNOFF CONTROL.
5. ACCESS TO THE SITE SHALL BE SWEEP DAILY TO REMOVE ACCUMULATED MUD AND DIRT.
6. TOTAL PROPOSED DISTURBANCE IS ~27,984 sq.ft
7. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THE PROJECT CONFORMS THE STANDARDS LISTED ABOVE. ANY VIOLATIONS AND OR FINES ISSUED BY LOCAL GOVERNMENT, THE STATE OF ALASKA, OR THE EPA SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
8. ANY PRIVATE OR PUBLIC PROPERTY DISTURBED OUTSIDE OF THE PROJECT LIMITS SHALL BE REPLACED TO ITS ORIGINAL CONDITION. EXISTING DRAINAGE PATTERNS SHALL BE RESTORED BY THE CONTRACTOR AFTER CONSTRUCTION OF THE IMPROVEMENTS.

FILL & GRADING NOTES

1. ALL SLOPES TO BE STABILIZED IN ACCORDANCE WITH THE SWPPP AND THESE NOTES.
2. ALL FILL SHALL BE PLACED IN ONE FOOT LIFTS. MAXIMUM AND COMPACTED TO 95% MAXIMUM DENSITY. NO ROCK OR SIMILAR MATERIAL GREATER THAN TWELVE INCHES (12") SHALL BE BURIED OR PLACED IN FILL SITES.
3. PRIOR TO PLACING FILL, THE GROUND SHALL BE PREPARED TO RECEIVE FILL BY REMOVING VEGETATION, PROOF ROLLING THE AREA, AND SCARPING THE EXISTING GROUND SURFACE TO PROVIDE A BOND WITH THE PROPOSED FILL. ORGANIC SOILS MAY BE SPREAD OVER FINISHED SLOPES.
4. FILL MATERIAL SHALL MEET THE GRADATION OF MASS TYPE II/III WITH LESS THAN 6% PASSING THE #200 SIEVE. THE FRACTION OF MATERIAL PASSING THE #200 SIEVE SHALL NOT EXCEED 15% OF THE FRACTION PASSING THE #4 SIEVE.
5. FILL SHALL NOT BE PLACED ON FROZEN GROUND. FROZEN FILL SHALL NOT BE PLACED ON THE SITE.
6. THE TOE OF A FILL SLOPE SHALL BE MADE NOT NEARER TO A SITE BOUNDARY THAN $\frac{1}{2}$ THE HEIGHT OF THE SLOPE WITH A MINIMUM OF TWO (2) FEET AND A MAXIMUM OF TWENTY (20) FEET.
7. FILL SLOPES SHALL NOT BE CONSTRUCTED ON NATURAL SLOPES STEEPER THAN 50%. WHERE SLOPES ARE STEEPER THAN 20% AND THE FILL HEIGHT IS GREATER THAN FIVE (5) FEET, A BENCH UNDER THE TOE AT LEAST TEN (10) FEET WIDE SHALL BE CONSTRUCTED.
8. SLOPES SHALL BE 2:1 MAX (50%).
9. ALL DISTURBED AREAS NOT PAVED OR OTHERWISE USED FOR ACCESS SHALL BE STABILIZED WITH A MINIMUM OF FOUR (4) INCHES OF TOPSOIL AND SEED.
10. FINAL GRADING SHALL BE SUCH TO PROMOTE DRAINAGE FROM PONDING ON ALL LOCATIONS OF PAVEMENT.



#	DESCRIPTION	DATE
---	-------------	------



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DRAWN
REVIEWED
DATE
12 MAY 2026
LJC
SRP

SHEET NAME

NOTES

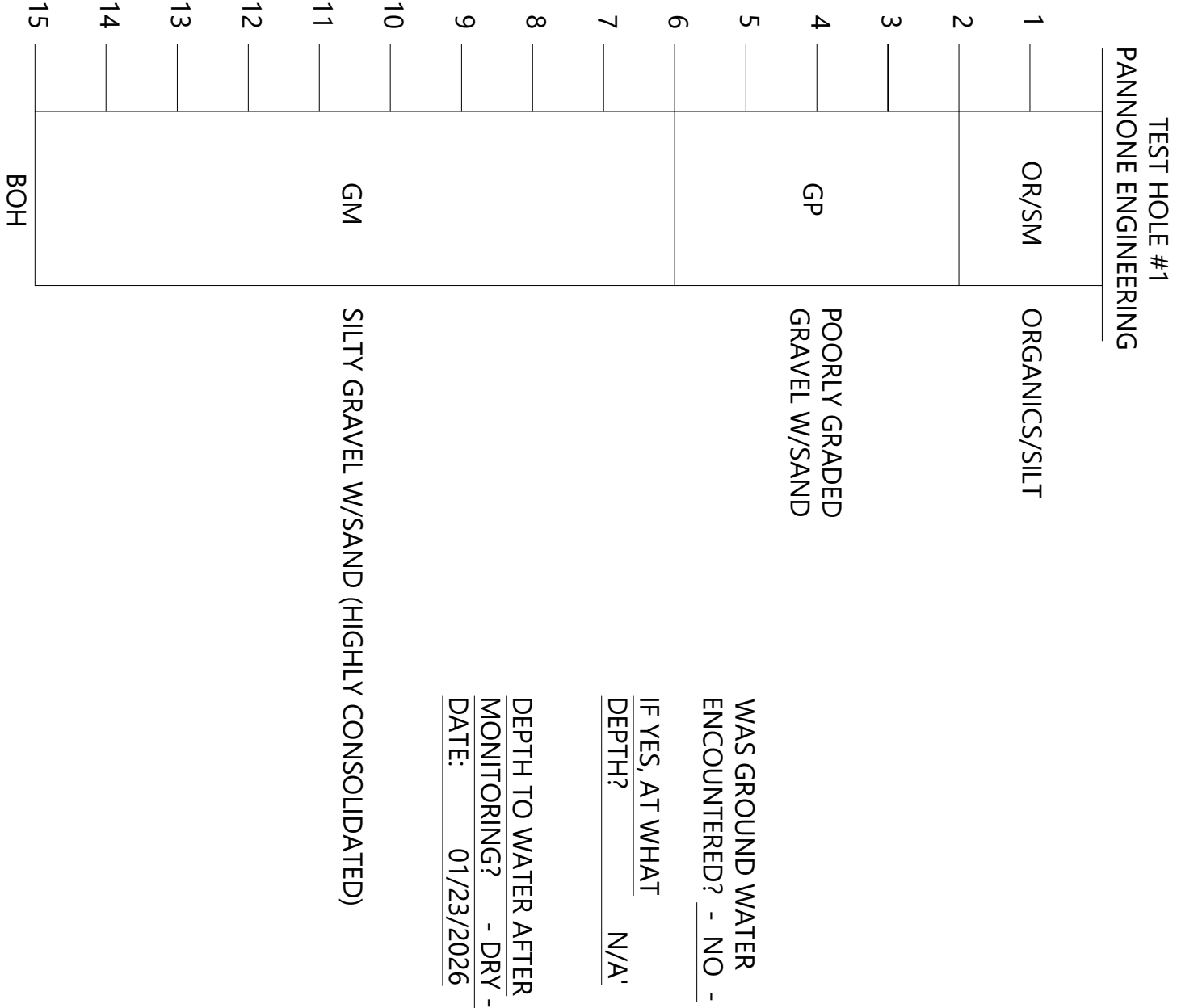
SHEET NO.

C0.3

FOR MATSU-BOROUGH REVIEW ONLY

HALF SCALE WHEN PRINTED AT 11x17

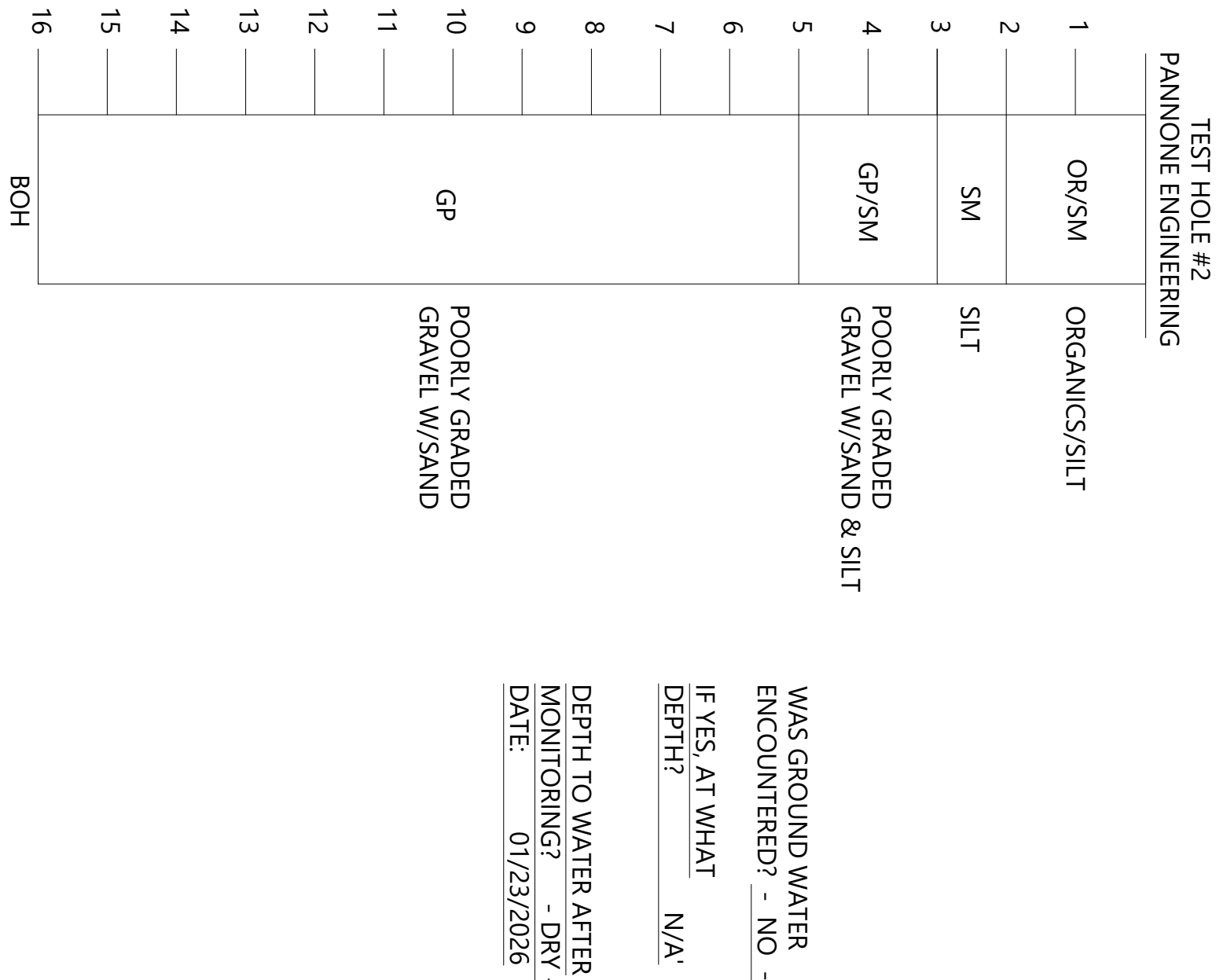
SOIL LOGS AND PERCOLATION TESTS



DATE PERFORMED: 01/13/2026

- SOIL TEST RESULTS/ANALYSIS
- SAMPLE COLLECTED BETWEEN 3.0 FT AND 4.0 FT & 10.0 FT AND 11.0 FT.
 - SEE ATTACHED SIEVE ANALYSIS RESULTS.
 - PERCOLATION RATE <1 (min/inch) (VISUALLY RATED BW 2.0 - 6.0 FT) (Hydrologic Soils Group: HSG A)

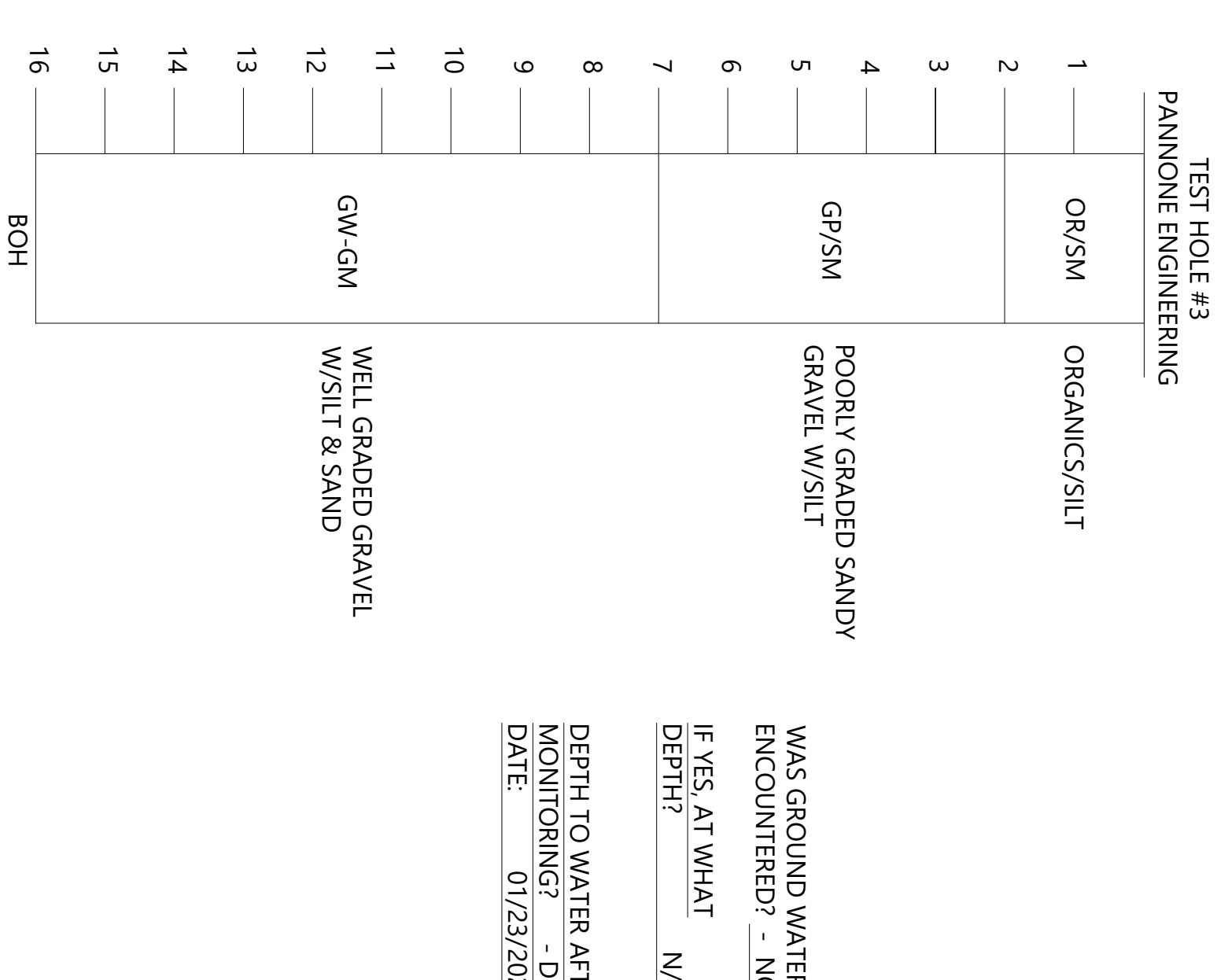
READING	DATE	NET TIME	WATER LEVEL READING	NET DROP	RATE (MP)
1	01/13/26				
2					
3					
4					
5					
6					
7					
8					



DATE PERFORMED: 01/13/2026

- SOIL TEST RESULTS/ANALYSIS
- SAMPLE COLLECTED BETWEEN 6.0 FT AND 7.0 FT.
 - SEE ATTACHED SIEVE ANALYSIS RESULTS.
 - PERCOLATION RATE <1 (min/inch) (VISUALLY RATED BW 5.0 - 16.0 FT) (Hydrologic Soils Group: HSG A)

READING	DATE	NET TIME	WATER LEVEL READING	NET DROP	RATE (MP)
1	01/13/26				
2					
3					
4					
5					
6					
7					
8					



DATE PERFORMED: 01/13/2026

- SOIL TEST RESULTS/ANALYSIS
- SAMPLE COLLECTED BETWEEN 10.0 FT AND 11.0 FT.
 - SEE ATTACHED SIEVE ANALYSIS RESULTS.
 - PERCOLATION RATE <1 (min/inch) (VISUALLY RATED BW 7.0 - 16.0 FT) (Hydrologic Soils Group: HSG A)

READING	DATE	NET TIME	WATER LEVEL READING	NET DROP	RATE (MP)
1	01/13/26				
2					
3					
4					
5					
6					
7					
8					



#	REVISIONS	DATE
1	DESCRIPTION	



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JOB NO. 20260047
DATE 12 MAY 2026
DRAWN LC
REVIEWED SRP

SHEET NAME
SOILS LOGS

SHEET NO.
C0.4

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HALF SCALE WHEN PRINTED AT 11x17

- NOTE:**
- PROPERTY BOUNDARIES, EASEMENTS, AND RIGHT OF WAY LIMITS AS DEPICTED ON THIS SHEET ARE A GENERAL REPRESENTATION AND SHOULD NOT BE INTERPRETED AS DEFINITIVE OR LEGALLY BINDING. FOR PRECISE BOUNDARY INFORMATION REFER TO THE PRELIMINARY PLAT.
 - WELL & SEPTIC AND DEVELOPMENT AREAS ARE SHOWN FOR REFERENCE ONLY. IT IS THE RESPONSIBILITY OF THE ENGINEER OR CONTRACTOR DESIGNING EACH RESPECTIVE SYSTEM OR LOT DEVELOPMENT TO ENSURE THE INSTALLATION COMPLIES WITH ALL APPLICABLE REQUIREMENTS AND REGULATIONS.

LEGEND

- SS 10,000FT² USABLE SEPTIC AREA
- SS 10,000FT² USABLE BUILDING AREA

NO DOCUMENTED WELLS OR SEPTICS W/IN 100' OF
SUBJECT SUBDIVISION NORTH PROPERTY BOUNDARY

TRACT A
AERO SUBDIVISION ON WOLF LAKE
PLAT 82-83

TRACT J
PHASE ONE, FIRST ADDITION TO AERO
SUBDIVISION ON WOLF LAKE
PLAT 85-203

(S 89°58'04" W 536.22')
(S 55.812' N 89°19'26" E)

(SEE NOTE 2)

(SEE NOTE 2)

LOT 4
75,586 S.F.
1.72 ACRES

LOT 3
98,446 S.F.
2.18 ACRES

WELL (E)
(APPROXIMATE LOCATION)

NO DOCUMENTED WELLS OR SEPTICS W/IN 100' OF
SUBJECT SUBDIVISION WEST PROPERTY BOUNDARY

LOT 7

NO DOCUMENTED WELLS OR SEPTICS W/IN 100' OF
SUBJECT SUBDIVISION EAST PROPERTY BOUNDARY

LOT 8
BLOCK 4
STONE CREEK PHASE 5
PLAT 2021-1

LOT 2
47,581 S.F.
1.12 ACRES

LOT 5
44,690 S.F.
1.02 ACRES

LOT 6
46,782 S.F.
1.07 ACRES

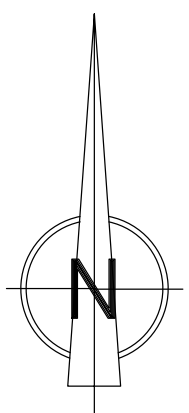
LOT 1
40,694 S.F.
0.93 ACRES

LOT 31
BLOCK 5
PHASE TWO FIRST
ADDITION TO AERO
SUBDIVISION ON
WOLF LAKE
PLAT 91-11

LOT 1
BLOCK 5
STONE CREEK PHASE 1
PLAT 2016-3

TRACT F
PHASE ONE, FIRST ADDITION TO AERO
SUBDIVISION ON WOLF LAKE
PLAT 85-203

VACANT LOT (UNDEVELOPED) - NO WELLS OR SEPTICS



1

OVERALL SITE - USABLE AREA DESIGNATION

SCALE: 1" = 50'

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HAIF SCALE WHEN PRINTED AT 11x17

SHEET NO.	
C1.0	
SHEET NAME	
OVERALL SITE - USABLE AREA DESIGNATION	
JOB NO.	
20260047	
DATE	
12 MAY 2026	
DRAWN	
LJC	
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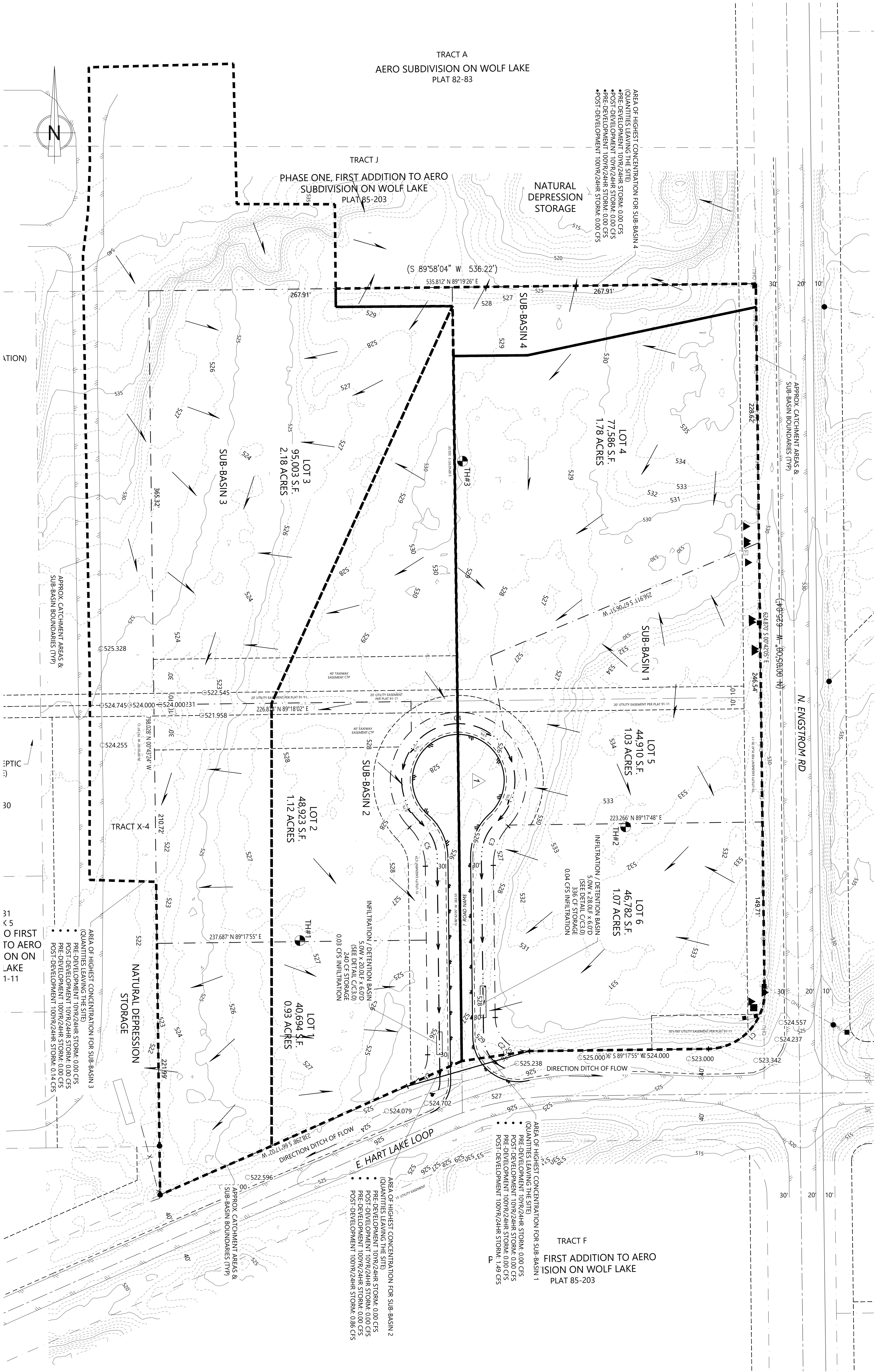
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REVISIONS	
#	DESCRIPTION
1	SOFT COPY FOR REVIEW
2	WASILLA COMMENTS



DATE & TIME: Monday, September 21, 2026 3:25:43 PM FILE PATH: P:\PES Work Files\CVILV\Aero On Wolf LK Ph 2 Addn 1 Tr E - Aileron Acres\Aero On Wolf LK Ph 2 Addn 1 Tr E - Aileron Acres - V2.dwg

1 PRELIMINARY DRAINAGE PLAN
SCALE: 1" = 40'



FOR MATSU-BOROUGH REVIEW ONLY

SHEET NO. C1.1	
PRELIMINARY DRAINAGE PLAN	
JOB NO. 20260047	DATE 12 MAY 2026
DRAWN LIC	REVIEWED SRP
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#	REVISION	DATE
1	ROW CHANGE IN SIZE	07/28/26



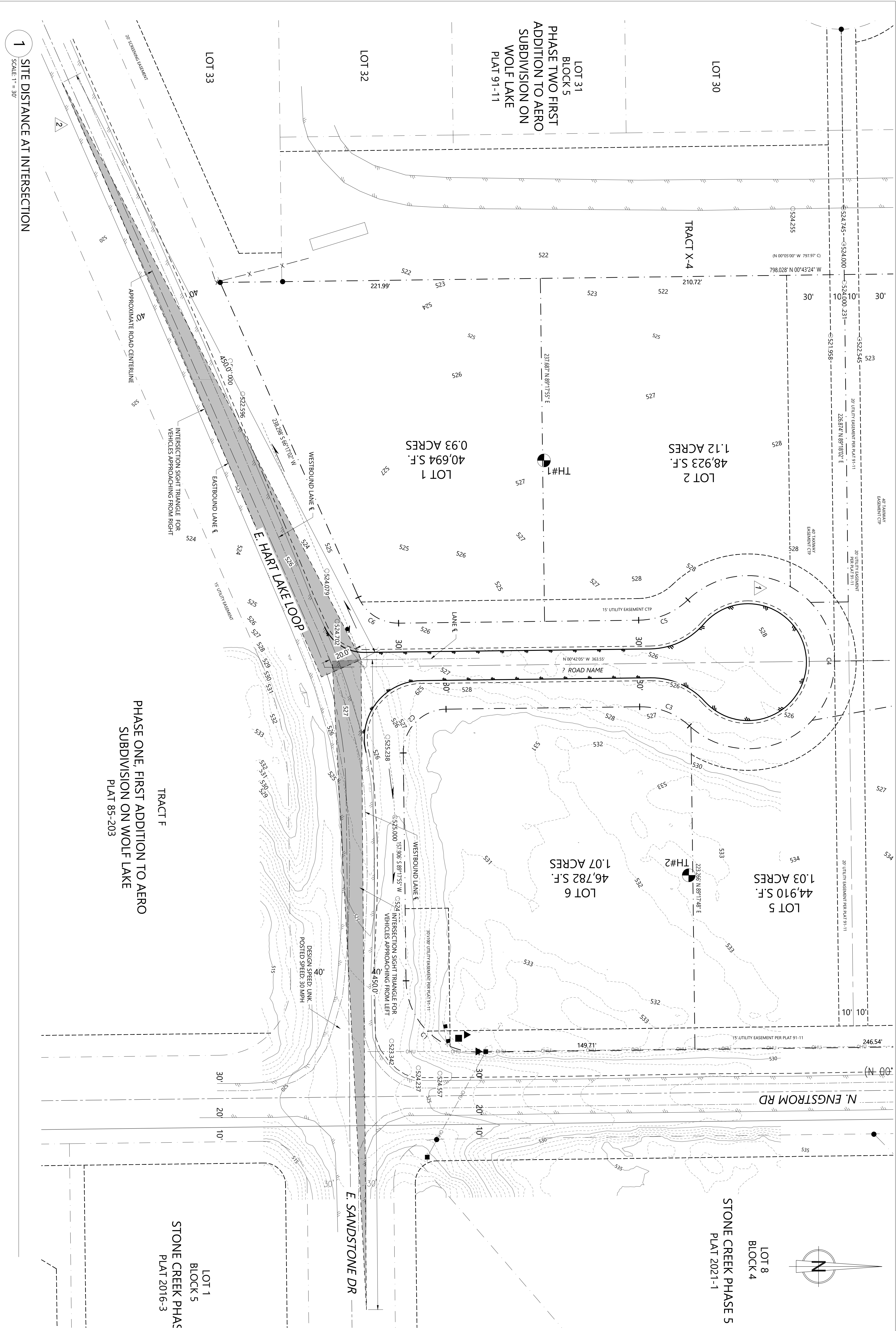


PANNONE
ENGINEERING SERVICES, LLC

FOR MATSU-BOROUGH REVIEW ONLY

C2.0

DATE & TIME: Monday, September 21, 2026 3:25:43 PM FILE PATH: P:\PES Work Files\CVIL\Aero On Wolf LK Ph 2 Addn 1 Tr E - Aileron Acres\Aero On Wolf LK Ph 2 Addn 1 Tr E - Aileron Acres - V2.dwg



1 SITE DISTANCE AT INTERSECTION
SCALE 1" = 30'

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#	DESCRIPTION	DATE
1	NOV 10/2026	10/26/26
2	NOV 10/2026	10/26/26



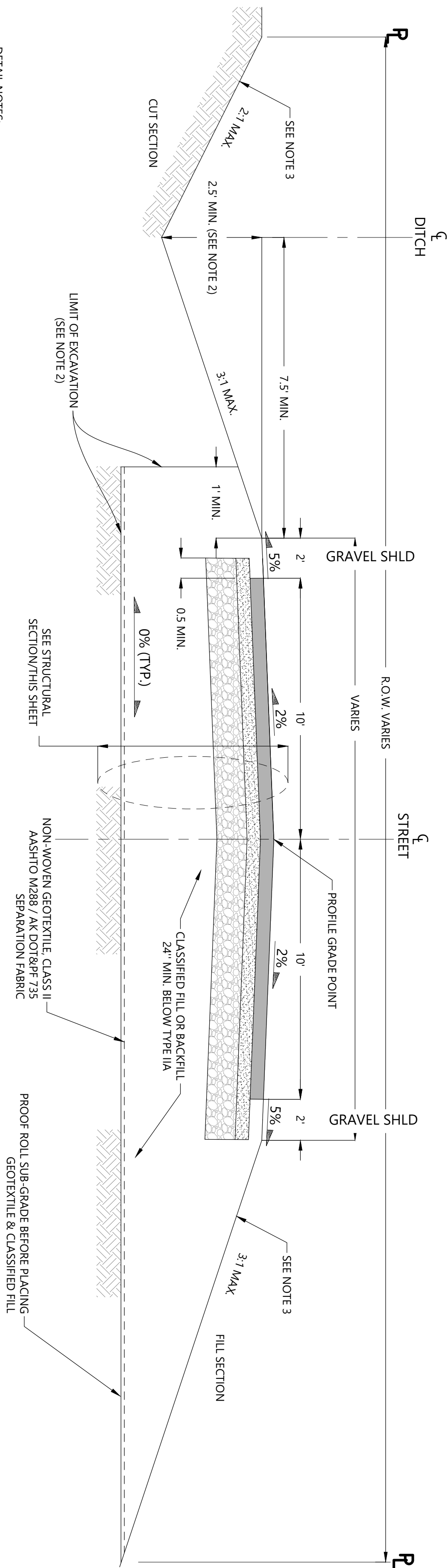
STEPPERS CONSTRUCTION, INC.
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JOB NO. 2026007
DATE 12 MAY 2026
DRAWN LJC
REVIEWED SRP

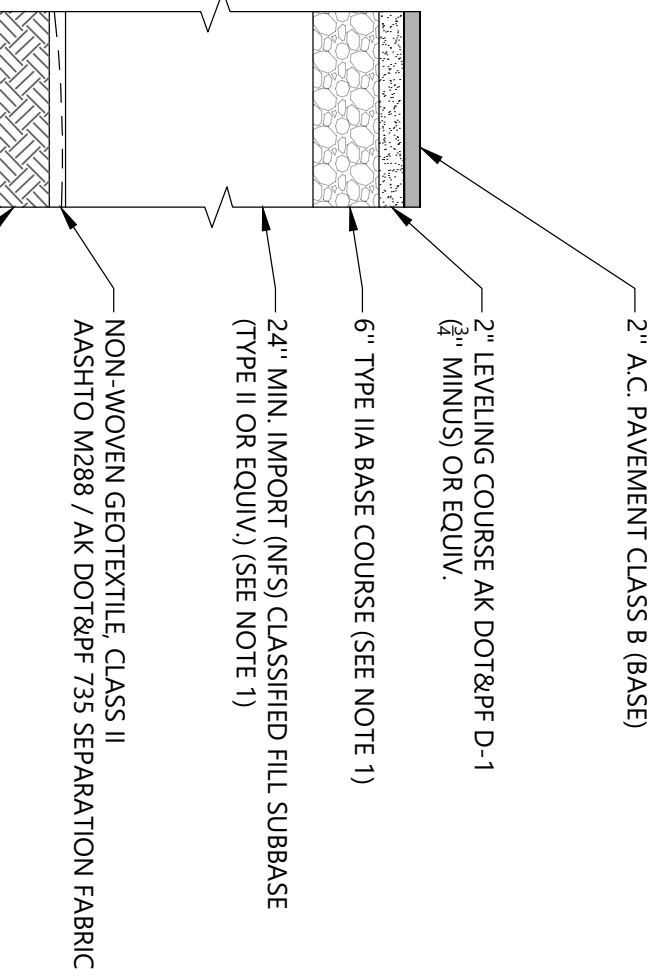
SHEET NAME
SIGHT DISTANCE
DETAILS

SHEET NO.
C2.1

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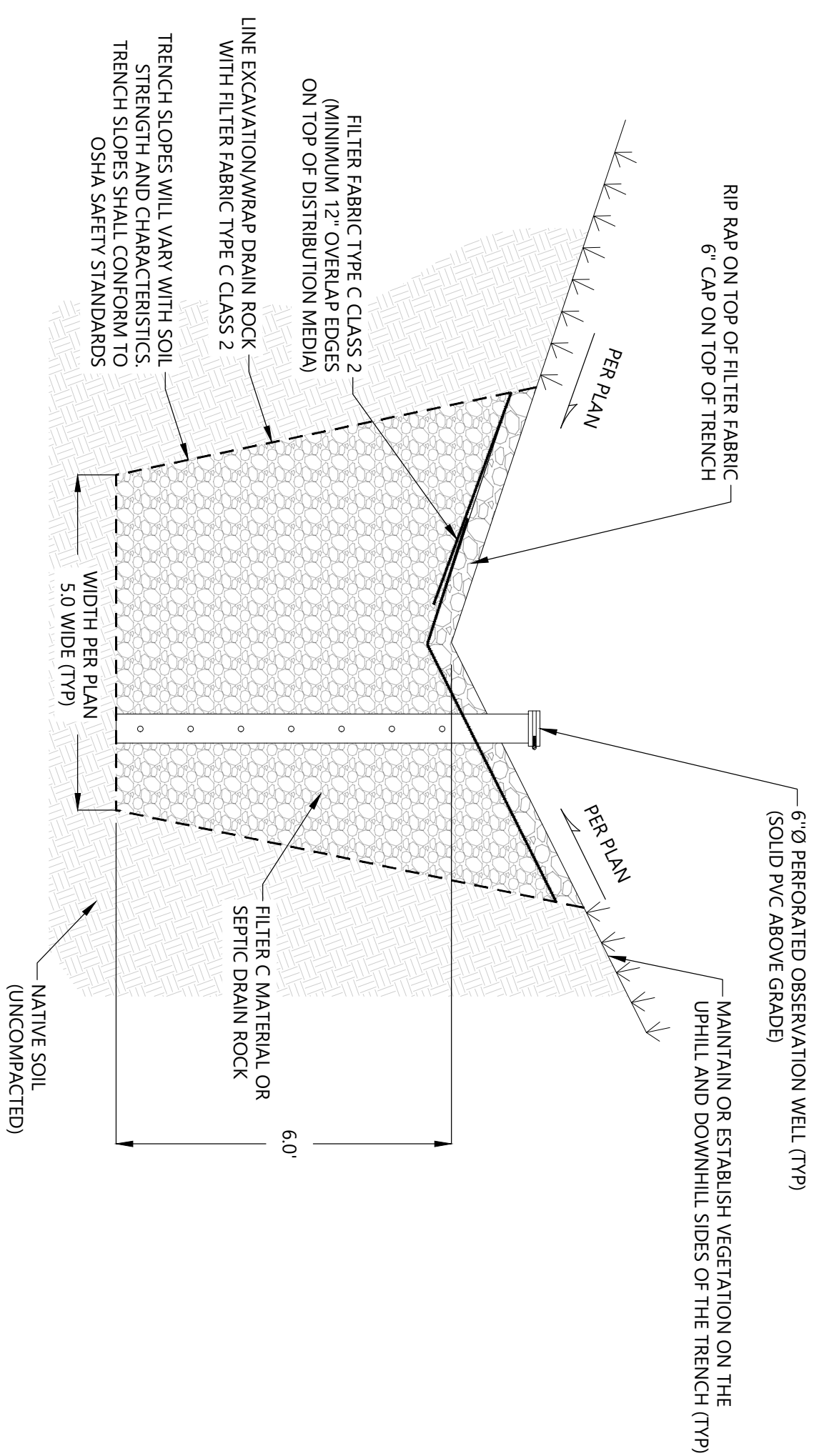
SUBBASE		BASE COURSE	
SIEVE	% PASSING	SIEVE	% PASSING
1 1/2"	-	1 1/2"	-
1"	-	1"	100
3/4"	-	3/4"	70-100
3/8"	-	3/8"	50-80
#4	20-60	#4	35-65
#8	-	#8	20-50
#50	-	#50	6-30
#200	0-10	#200	0-6



- DETAIL NOTES:**
- FOR EMBANKMENT FILL PROVIDE TYPE II FILL AND BACKFILL COMPACTED TO 95% MAXIMUM DENSITY.
 - MINIMUM DITCH DEPTH AT HIGH POINT AS INDICATED IN THESE PLANS SHALL BE 1.5 FEET OR 18 INCHES.
 - PLACE OR REMOVE AND GRADE MATERIAL IN A NEAT MANNER FROM EXCAVATION LIMITS TO EXISTING ELEVATION AT PROPERTY LINE OR AS DIRECTED BY THE ENGINEER. (MAXIMUM 2:1 CUT AND 3:1 FILL SLOPES)
 - STRIP EXISTING ORGANIC AND SILT MATERIAL (-2.0-3.0') TO EXISTING POORLY GRADED GRAVEL WITH SAND & SILT (GP-SM LAYER). SUBGRADE SHALL BE PROOF ROLLED PRIOR TO PLACEMENT GEOTEXTILE AND IMPORT MATERIAL.
 - PLACE NON-WOVEN GEOTEXTILE CLASS II ASHTO M288 /AK DOT&PF 735 SEPARATION FABRIC OR EQUIVALENT OVER EXISTING SUBGRADE.
 - SUBBASE - (ALL SECTIONS) PROVIDE 24" MINIMUM COMPACTED CLASSIFIED NFS MATERIAL MEETING THE SPECIFICATIONS AS LISTED ABOVE. MDA TYPE II, OR APPROVED EQUIVALENT. COMPACT TO ≥ 95% MODIFIED PROCTOR IN LIFTS NOT TO EXCEED 12".
 - ROADWAY SECTION IS INTENDED FOR RESIDENTIAL VEHICLE TRAFFIC AND LIGHT AIRCRAFT TAXI ACCESS. ANY WET, PUMPING, YIELDING, OR OTHERWISE UNSUITABLE SUBGRADE SHALL BE OVER-EXCAVATED AND REPLACED WITH NFS MATERIAL AS DIRECT BY THE ENGINEER.

A TYPICAL ROADWAY SECTION

SCALE NTS



- DETAIL NOTES:**
- OVERLAP ALL GEOTEXTILE SEAMS A MINIMUM OF ONE (1) FOOT.
 - TYPE C DRAINAGE GEOTEXTILE SHALL BE CLASS 2 AND HAVE AN APPARENT OPENING SIZE OF 0.25MM.
 - PES TO CONFIRM SOIL INFILTRATION RATE AT BOTTOM OF EXCAVATION AT TIME OF CONSTRUCTION.

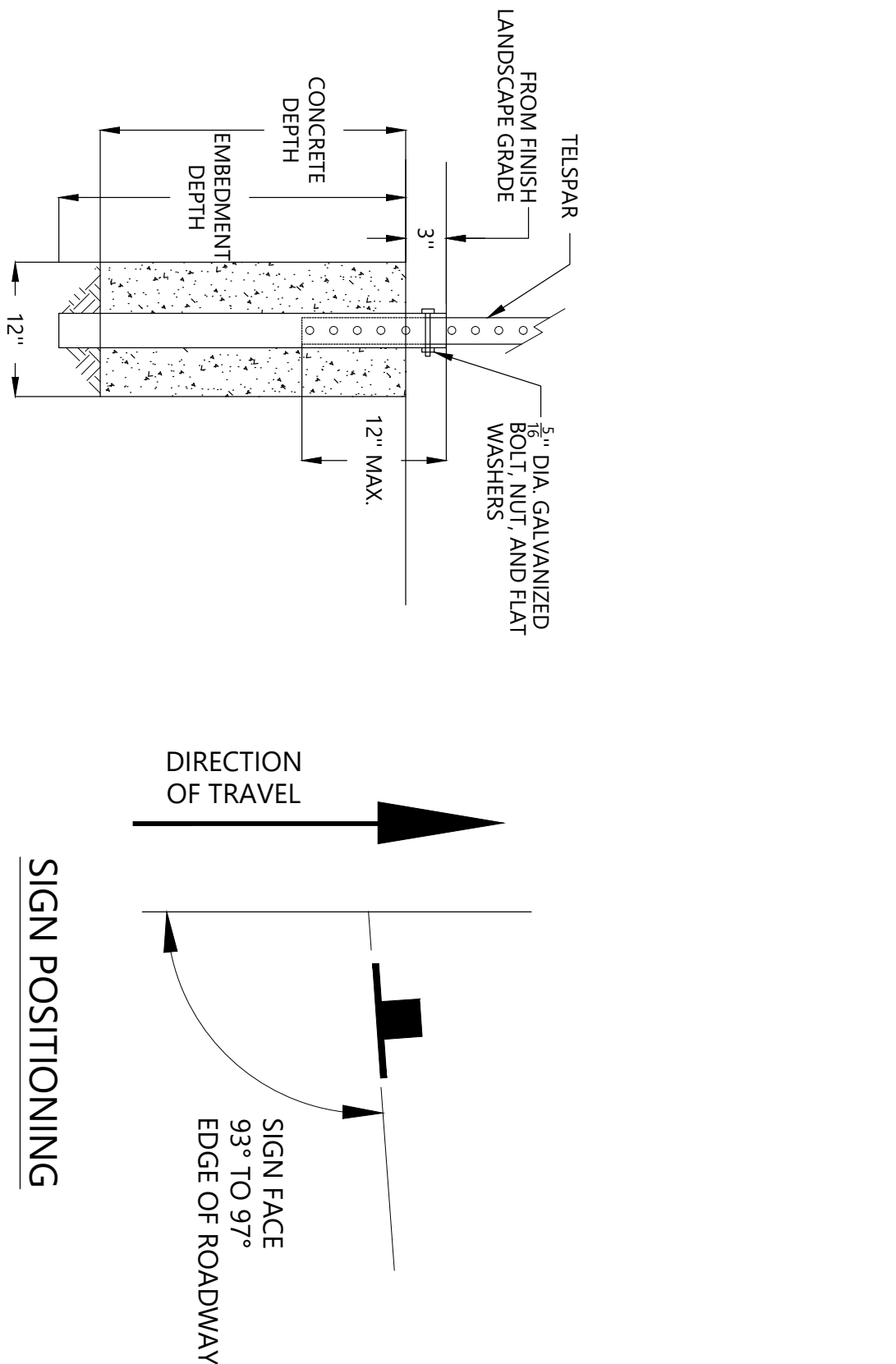
C INFILTRATION/DETENTION BASIN

SCALE NTS

B TYPICAL ROADWAY STRUCTURAL SECTION & MATERIAL SPECIFICATIONS

SCALE NTS

- DETAIL NOTES:**
- SUBJECT MATERIALS SHALL CONFORM TO PROPERTIES AND MINIMUM GRADATIONS AS LISTED IN THE TABLES SHOWN ABOVE. (NSB SUBDIVISION CONSTRUCTION MANUAL) OR BETTER UNLESS NOTED OTHERWISE.
 - ALL CLASSIFIED MATERIALS SHALL BE FREE FROM CLAY BALLS, VEGETABLE MATTER, OR OTHER DELETERIOUS MATTERS.



PERFORATED STEEL TUBES (P.S.T.) (12ga - .015" Wall Thickness)			
SIGN SURFACE AREA SQ. FT.	POST SIZE	EMBEDMENT DEPTH	CONCRETE DEPTH
7' OR LESS	2" X 2"	27"	24"
GREATER THAN 7'	2 1/2" X 2 1/2"	33"	30"

D SIGN DETAILS

SCALE NTS

- DETAIL NOTES:**
- UNLESS SHOWN OTHERWISE ON THE DRAWINGS, THE STANDARD SIGN OFFSET IS 12". THE MINIMUM IS 6".
 - ADD 6" TO MOUNTING HEIGHT ON UNPAVED ROADS.
 - PAINT ALL SIGN MOUNTING FASTENERS ON SIGN FACE A COLOR MATCHING THE SIGN FACE.
 - ATTACH ALL SIGNS ZEES AND BRACES MOUNTED TO THE POSTS WITH 5/16" BOLTS WITH SELF-LOCKING NUTS.



STEPPERS CONSTRUCTION, INC.
AILERON ACRES SUBDIVISION
NSN EAST HART LAKE LOOP ROAD
WASILLA, AK 99645

STEPPERS CONSTRUCTION, INC.
ASPEN SANDERS
6382 E BEECHCRAFT ROAD
WASILLA, AK 99645
(907) 982 0375
aspen@steppersak.com

CDR NO. 20760047
DATE 13 MAY 2026
DRAWN LJC
REVIEWED SRP

SHEET NAME
DETAILS

SHEET NO.

C3.0

FOR MATSU-BOROUGH REVIEW ONLY



RECEIVED

JUL 22 2026

PLATTING

203 S Cobb St
Palmer, AK 99645

July 20, 2026

Re: Section Line Determination for S $\frac{1}{2}$ NE $\frac{1}{4}$ Section 21, Township 18 North, Range 1 East, Seward Meridian.

Mr. Young,

The following is the results of my research on Section Line Easements along the east boundary of the S $\frac{1}{2}$ NE $\frac{1}{4}$ Section 21, Township 18 North, Range 1 East, Seward Meridian.

S $\frac{1}{2}$ NE $\frac{1}{4}$:

Survey approved: April 2, 1915

Data of Entry: November 6, 1953

Patent No.: 1142955

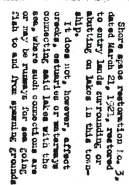
Patented from Federal Government to Woods on February 23, 1954.

33' Section Line Easement

Sincerely,

A handwritten signature in purple ink that reads "Dayna Rumfelt". The signature is stylized with a large, looped "D" and a long, sweeping horizontal line at the end.

Dayna Rumfelt, PLS CFedS
Lavender Survey & Mapping
Owner



Anchorage 025788
Form 4-1212
(April 1952)

The United States of America,

To all to whom these presents shall come, Greeting:

WHEREAS, a certificate of the Land Office at **Anchorage**, Alaska, is now deposited in the Bureau of Land Management, whereby it appears that pursuant to the act of Congress of **October 17, 1940** (54 Stat. 1191), entitled "An Act to authorize the lease or sale ~~of certain public lands in Alaska, and for other purposes,~~" and the acts supplemental ~~thereto,~~ **has been established** the claim of Noel William Woods and that the requirements of law pertaining to the claim have been met, for the following-described land:

Seward Meridian, Alaska.
T. 18 N., R. 1 E.,
Sec. 21, Lot 2, ~~SE 1/4, SW 1/4.~~

The area described contains **158.85** acres, according to the official plat of the survey of the said land, on file in the Bureau of Land Management:

NOW KNOW YE, That the UNITED STATES OF AMERICA, in consideration of the premises, DOES HEREBY GRANT unto the said claimant and to the heirs of the said claimant the tract above described; TO HAVE AND TO HOLD the same, together with all the rights, privileges, immunities, and appurtenances, of whatsoever nature, thereunto belonging, unto the said claimant and to the heirs and assigns of the said claimant forever; subject to (1) any vested and accrued water rights for mining, agricultural, manufacturing, or other purposes, and rights to ditches and reservoirs used in connection with such water rights, as may be recognized and acknowledged by the local customs, laws, and decisions of courts; (2) the reservation of a right-of-way for ditches or canals constructed by the authority of the United States, in accordance with the act of August 30, 1890 (26 Stat., 391, 43 U. S. C. sec. 945), and (3) the reservation of a right-of-way for roads, roadways, highways, tramways, trails, bridges, and appurtenant structures constructed or to be constructed by or under authority of the United States or by any State created out of the Territory of Alaska, in accordance with the act of July 24, 1947 (61 Stat., 418, 48 U. S. C. sec. 321d). There is also reserved to the United States a right-of-way for the construction of railroads, telegraph and telephone lines, in accordance with section 1 of the act of March 12, 1914 (38 Stat., 305, 48 U. S. C. sec. 305); excepting and reserving also, to the United States, pursuant to section 5 of the act of August 1, 1946 (60 Stat., 760, 42 U. S. C. sec. 1805), all uranium, thorium, or any other material which is or may be determined to be peculiarly essential to the production of fissionable materials, whether or not of commercial value, together with the right of the United States through its authorized agents or representatives at any time to enter upon the land and prospect for, mine, and remove the same. **Reserving, also, to the United States all the oil, gas and other mineral deposits, together with the right to prospect for, mine and remove the same under such regulations as the Secretary of the Interior may prescribe.**

IN TESTIMONY WHEREOF, the undersigned officer of the Bureau of Land Management, in accordance with section 1 of the act of June 17, 1948 (62 Stat., 476, 43 U. S. C. sec. 15), has, in the name of the United States, caused these letters to be made Patent, and the Seal of the Bureau to be hereunto affixed.

GIVEN under my hand, in the District of Columbia, the ~~TWENTY-~~
THIRD day of **FEBRUARY** in the year of
our Lord one thousand nine hundred and **FIFTY-FOUR**
and of the Independence of the United States the one hundred and
SEVENTY-EIGHTH.

For the Director, Bureau of Land Management.

By *John D. Smith*
Acting Chief, Patents Section.

RECORD OF PATENTS: Patent Number **1142955**

U. S. GOVERNMENT PRINTING OFFICE 16-60832-1

Frosted Ground Engineering Services, LLC

Project No. P20260704

Matanuska-Susitna Borough, Platting Division

350 E. Dahlia Ave.

Palmer, AK 99645

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JUL 22 2026

PLATTING

Aero On Wolf Lake Phase II Addition 1 Tract E: Aero On Wolf Lake Subdivision Traffic Study, Wasilla AK 99654

To whom it may concern,

This report is the summation of Average Daily Traffic (ADT) calculations associated with the subdivision of the aforementioned lot, on behalf of the owner and in coordination with Lavender Surveying. The project plans to divide the existing lots into six lots. Please see the table below for a summary of current and post development trip generation:

Table 1: E Hart Lake Loop Trip Generation

Aero Subdivision ADT		
Subdivision/Street Name	Lots	Count
Concorde RSB	9	90
Concord Block 1	6	60
T18NR1ES20	2	20
N Horizon View Drive	22	220
Aero On Wolf Lk PH1 Block 8	14	140
Aero On Wolf Lk PH1 Block 7	16	160
Aero On Wolf Lk PH2	20	200
N Skyvan Cir	24	240
N Dot Cirle	7	70
South Airpark Res Condos	6	60
Aero On Wolf Lk PH1 Block 8	6	60
N Huey Lane	19	190
N Whitman Place	17	170
N Baron Street	15	150
N Phantom Place	14	140
Pre-Development Total:		1970
Aero On Wolf Lake	6	60
Post-Development Total:		2030

E Hart Lake is currently classified as a minor collector, per the MSB 2022 Official Streets and Highways Plan (OSHP). Trip generations were considered between the intersections of E Rutan Ave and N Engstrom Road, assuming that all traffic between these intersections would go through the N Engstrom Road and E Hart Lake intersections.

Frosted Ground Engineering Services, LLC

Project No. P20260704

As can be seen on the table, both pre-development and post-development conditions are between an ADT of 1,001 – 3,000, which per the MSB 2022 Subdivision Construction Manual, classify as a residential collector.

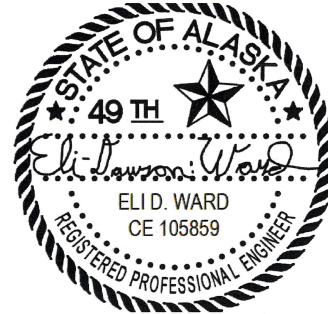
Construction of this subdivision should not have adverse impacts on E Hart Lake Road. If there are any questions, comments, or concerns, please do not hesitate to contact via phone: (907) 398-5272 or email: Eli@fg-eng.com.

July 16, 2026

Sincerely,

Eli D. Ward, PE

Principal Engineer



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JUL 31 2026

PLATTING

Aileron Acres Subdivision
Stormwater Management Report

Location:
NSN E. Hart Lake Loop
Aero On Wolf LK Phase II Addition 1 Tract E
Matanuska-Susitna Borough
Parcel ID: 46467

Prepared For:
Steppers Construction, Inc.
6282 E Beechcraft Road Wasilla, AK 99654
(907) 982 0375
aspen@steppersak.com

Prepared by:
Pannone Engineering Services, LLC.
P.O. Box 1807 Palmer, AK 99645
Phone: (907) 745 8200
Fax: (907) 745 8201
logan@panengak.com

Submitted By:

Logan J. Curtiss, EIT
Project Engineer
28 July, 2026

Steven R. Pannone, PE, F.ASCE
Principal Civil Engineer
28 July, 2026



Aileron Acres Subdivision
Drainage Report

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Aileron Acres Subdivision
Drainage Report

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Aileron Acres Subdivision
Drainage Report

Statement of Compliance

Pannone Engineering Services, LLC, verifies that this report has been prepared in compliance with the Matanuska-Susitna Borough (MSB) Subdivision Construction Manual (SCM) as well as other state and federal regulations as required.

Statement of Impact

Based on the analysis and calculations herein, the proposed modifications will not result in adverse storm water impacts on existing drainage or on a downstream property or watercourse. Post development runoff is retained onsite to the maximum extent practicable, and any discharge is minimal, non-erosive, and consistent with existing drainage patterns.

Methods and Assumptions

Rain fall data for this project was taken from the NOAA Precipitation Frequency Data Server NOAA 14 Atlas Volume 7 Version 2. This rainfall depth information and its entirety for the subject location is included in appendix B. Stormwater controls and calculations for this project are based on total rainfall for a 10-year and 100-year event of 2.26-inches and 3.70-inches respectively.

Time of concentration was calculated using the NRCS method.

The NRCS Unitless Hydrograph was used to calculate runoff quantities.

Curve number/s are taken from USDA TR-55 table 2.2a, 2.2b, 2.2c as applicable. Curve numbers are weighted in respect to represented areas only within certain portions of the watershed. Subbasins #1 and #2 are each comprised of two 1-acre lots and one 2-acre lot. For consistency and conservatism, curve numbers were assigned based on 1-acre residential classification in accordance with USDA TR-55 Table 2.2a.

Hydrologic Soil Group A conditions were assumed. Maximum sheet flow length was limited to 150 feet. Runoff quantities are presented as calculated without applying a minimum threshold to maintain accuracy.

Infiltration rates were conservatively assumed as 1 in/hr (0.000023 cfs/sf) for natural depression storage and approximately 1 ft/hr for trench systems based on existing test hole information performed by PES.

Aileron Acres Subdivision
Drainage Report

Project Description

Legal Description: Aero On Wolf LK Phase II Addition 1 Tract E (Parent Parcel)

Site Address: NSN E. Hart Lake Loop, Wasilla, AK

Description of Project:

Project Name: Aileron Acres (Proposed Subdivision Name)

Lot Size: 8.71 Acres (~379,408 ft²)

Anticipated Disturbance Area of Lot: 2.31 Acres (100,746 ft²)

This project consists of the new construction of an approximately 27,984 ft² residential access road, with access to a proposed six-lot subdivision and an anticipated private taxiway development. An area of approximately 0.64 acres will be disturbed by developing the initial residential access road. Total lot and taxiway development on the parent parcel is expected to be approximately 1.67 acres. Existing drainage patterns in the area will remain primarily unchanged. Based on the analysis performed the amount of runoff will not pose an adverse impact to any existing drainage facilities, downstream properties, or watercourses.



Figure 1: Project Location, Aerial Image from MSB Parcel Viewer

Aileron Acres Subdivision
Drainage Report

Site & Basin Characteristics

Pre-development Conditions:

The parent parcel, approximately 8.71 acres, is currently undeveloped. The parent parcel is to be subdivided into six (6) lots. Existing runoff generally flows from the eastern and northern portions of the site toward the southwest low-lying depression area, where it is retained and infiltrated or continues to the existing ditches along E. Hart Lake Loop Road. Slopes in the area of the proposed development primarily range from 0-10%. The total contributing basin consists of the project site and half of the adjacent taxiway to the west of the property (as indicated in the attached plans) as half of the existing taxiway influences the runoff generated from the proposed site in this location. There is a valley (low point channel) along the proposed lots 3 and lot 2, which borders the existing taxiway lot west of the subject parcel (Tract X-4). Existing runoff generated within the subject subbasin area generally flows from the eastern and northern portions of the site toward the southwest low-lying depression area (approximately 522' elevation contour), where it is retained and infiltrated onsite and on the adjacent taxiway parcel Tract X-4 east of the existing taxiway. Vegetated drainage ditches are present along this adjacent taxiway towards the location of this natural depression storage area.

The total basin considered for this site is 438, 214 ft² (10.06 acres). This area consists of natural trees, underbrush, and other vegetation. Due to the well-draining nature of the underlying soils in the area and the presence of substantial vegetation, organic litter, and low-lying catchments, runoff is not expected from the pre-construction basin under a design 10-year 24-hour storm event. During extremely rare 100-year storm events any runoff from this portion of the basin would be highly treated and not pose any risks to downstream properties or watercourses due to the proposed development.

Post-development Conditions:

Approximately 26.5% of the total site is anticipated to be disturbed for this project at full build-out, or about 100,746 ft². Only 27,984 ft² of disturbance will occur with the initial residential road development to provide access from E. Hart Lake Loop Road. Approximately 17,005 ft² and 55,757 ft² will be disturbed for taxiway and on-lot development, respectively, as lots are sold and developed in the future. The post development drainage basin will remain the same as preconstruction conditions.

Existing Conditions for Downstream Contributing Basins:

The project area is currently undeveloped. The site's existing topography suggests that the majority of the east of the parent parcels existing runoff generated from the site continues south towards the existing vegetated drainage ditches along E. Hart Lake Loop Road. Runoff flows east and west through these ditches towards the low-lying catchment areas east and west of the parent parcel. Storm water produced during typical storms will be retained and infiltrated along the proposed residential road prior to reaching these locations.

Aileron Acres Subdivision
Drainage Report

Land Cover Characteristics:

- Pre-development:

The project site is forested with primarily rolling terrain. Several low-lying heavily vegetated catchment areas are present throughout the site. These areas retain and infiltrate all runoff generated from the site.

- Post-development:

Approximately 2.31-acres or 26.5% of the total site will be disturbed by the construction of a 27,984 ft² residential access road, 17,005 ft² private taxiway access, and approximately 20,909 ft² of anticipated future residential development area. All disturbed areas are part of right of way construction will be re-seeded at the completion of the project. The remainder of the site will remain forested and vegetated. Approximately 19.5% of the site will be impervious surfaces, buildings and asphalt. The remainder of the site, or approximately 80.5%, will remain as previous surfaces or vegetated areas.

Quantities are based on four (4) basins for pre-construction and four (4) basins for post-construction.

Conveyance and Stream Locations:

There are no existing stream features within the project boundary or directly downstream of the project which overland runoff would directly discharge to. There are no wetlands within the project boundary or directly downstream of the project.

Soils:

The site is underlain by generally favorable granular soils with no evidence of shallow groundwater or impermeable layers within the explored depths. Across the lot, a shallow surface layer of frozen organic material and silts extends from ground surface to approximately 2.0 feet below ground surface (BGS). This layer is consistently underlain by predominantly gravelly soils with varying sand and silt contents. From approximately 2.0 to 7.0 feet BGS, soils consist primarily of poorly graded gravel with sand and silt (GP/SM to GP), transitioning at greater depths to more consolidated, well-graded gravel with sand and silt (GM to GW/GM) extending to the maximum explored depth of 16 feet BGS. All test holes remained dry during excavation and subsequent groundwater monitoring, indicating the absence of seasonal or perched groundwater at the time of investigation. Overall subsurface conditions across the lot are generally uniform and consist of granular soils with favorable drainage characteristics, with no observed groundwater or restrictive layers within the explored depths.

Aileron Acres Subdivision
Drainage Report

Slopes:

The predeveloped site generally slopes toward the existing southwestern low lying depression area at 3-6%. The post-developed site will maintain similar drainage patterns and site slopes.

Existing and Proposed Control Structures:

Existing runoff generated on the west half of the subject lot utilizes overland sheet flow and shallow concentrated flow across the entire site. Runoff is infiltrated into the ground surface. Runoff from the site enters the several low-lying catchment areas for retention and infiltration. A small portion of the site's runoff discharges into the natural depressions existing at the west corner of the lot and adjacent taxiway parcel in the areas east of the present taxiway. This runoff travels along the ditch/south into the large low-lying area at the southwest corner of the subject property for retention and infiltration.

The proposed runoff will utilize overland sheet flow across the paved areas and onto the existing vegetated areas north of the taxiway. Overland sheet flow will transition into shallow concentrated flow at approximately 150-feet. Shallow concentrated flow will be assumed to persist until runoff enters a ditch or catchment. All runoff from ordinary and design storm events will enter the low-lying depression storage at the southwest corner of the property. Runoff will be directed to the existing depression storage area and infiltrated onsite.

The runoff generated from the development within the areas of subbasin #1 & 2 or along the eastern portion of the lot will utilize sheet flow across primarily undeveloped areas. Overland sheet flow will transition to shallow concentrated flow at approximately 150-feet. Shallow concentrated flow continues until runoff enters the proposed ditches to be constructed along the residential access road. Runoff generated from typical storms in these areas will be retained and infiltrated on site.

FEMA Flood Zone

Based on the FEMA flood zone map lookup tool this property does not fall within an existing Flood plain area; therefore a Flood Plain use permit is not required.

Water of the United States

There are no known wetlands on this or surrounding properties. An Army Corps of Engineers permit is not required for the development of this project.

Aileron Acres Subdivision
Drainage Report

Stormwater Pollution Prevention Plan (SWPPP)

This phase of the project is limited to the initial residential roadway and associated infrastructure construction and will disturb less than one (1) acre of land (0.64 acres); therefore, a Notice of Intent (NOI) is not required at this time. Future development of individual subdivision lots may occur under separate permits and approvals and are not included in the proposed disturbance for this project.

Alaska Department of Fish and Game

There are no known fish bearing streams in the project area or within two (2) miles of the subject parcel.

Water Quality Treatment

Runoff generated by the first 0.5-inches of rainfall in a 24-hour period will be treated by infiltration and sheet flow through existing vegetation. The runoff volume from 0.5-inches of rainfall will be infiltrated onsite.

Extended Detention

The proposed stormwater management system provides effective detention through infiltration and natural depression storage. Calculated drawdown times for infiltration systems are significantly less than 24 hours, satisfying the intent of MSB extended detention criteria.

Conveyance Design

The pre-development and post development runoff was calculated in accordance with the methods stated above for a 1-year 24-hour, 10-year 24-hour, and 100-year 24-hour storm events. The pre-development and runoff calculations for the lot are reported in cubic feet per second (ft^3/s or CFS). Runoff quantities were calculated using the NRCS TR-55 methodology. The NRCS dimensionless unit hydrograph was used to estimate peak flow rates. Pre-treatment of the stormwater will occur in vegetated swales and lawns. The post-development runoff is based on a total of four (4) subbasins with a total travel length as follows: Subbasin #1 – 753LF, Subbasin #2 – 608LF, Subbasin #3 – 600LF, and Subbasin #4 – 120LF.

Runoff Rates for a 1-year 24-hour storm:

- Pre-development Runoff: 0 ft^3/s
- Post Construction Runoff: 0 ft^3/s

For the 1-year storm event the total rainfall is 1.17-inches. In accordance with the NRCS method; for the 1-year, 24-hour storm event, rainfall is less than the calculated initial abstraction (I_a) for all subbasins; therefore, no direct runoff is generated under pre- or post- development conditions.

Aileron Acres Subdivision
Drainage Report

Runoff Rates for a 10-year 24-hour storm:

- Pre-development Runoff: 0.00 ft³/s
- Post Construction Runoff: 0.10 ft³/s

Runoff Rates for a 100-year 24-hour storm:

- Pre-development Runoff: 0.00 ft³/s
- Post Construction Runoff: 2.6 ft³/s

The proposed conveyance system will consist of overland sheet flow and shallow concentrated flow across paved parking areas and driveways and shallow concentrated flow across lawn which will provide pre-treatment and infiltration of stormwater runoff, as well as channel flow within the proposed vegetated drainage ditches providing further treatment prior to infiltration along the proposed right of way.

The proposed design includes construction of new roadside drainage ditches which will convey runoff to, and integrate with, the existing vegetated ditch system along E. Hart Lake Loop Road. These runoff quantities are incidental to the design of the existing ditch/s. The proposed grading plan will direct runoff from the developed areas to existing control structures and vegetated drainage ditches prior to progressing to downstream watercourses via the existing vegetated drainage ditches of E. Hart Lake Loop Road. The existing and proposed ditches in the area of development are low flow and classified as Type A per the MSB SCM.

Detention and Peak Flow Control

Peak Flow Control:

Projected runoff volumes:

Runoff volumes for design were calculated using the NRCS TR-55 direct runoff (QDR) method. Peak flow rates were determined using basin-specific times of concentration and the NRCS dimensionless unit hydrograph. Each drainage basin was evaluated independently using its respective hydrologic parameters.

- Basin 1

Drainage Basin 1 consists of approximately 3.79 acres with a time of concentration of 47 minutes. The calculated peak flows are 0.063 cfs for the 10-year storm and 1.53 cfs for the 100-year storm. The 10-year runoff volume (QDR = 0.0115 inches) results in approximately 159 cubic feet of runoff.

A trench system providing approximately 336 cubic feet of storage will be constructed, resulting in a factor of safety greater than 2.0. The trench infiltration capacity, based on a worst-case assumed infiltration rate of 5 minutes per inch (~1 ft/hr) (based on conservative assumptions relative to observed site conditions in test holes performed by PES), is approximately 140 cubic feet per hour (0.039 cfs). This results in a drawdown time of approximately 1.1 hours, which is significantly less than the 24-hour requirement. During larger storm events, runoff exceeding infiltration capacity will

Aileron Acres Subdivision
Drainage Report

be temporarily stored behind a check berm located at the downgradient side of the trench. Upon overtopping, flow will be conveyed via shallow channelized flow within the proposed ditch system and discharged to the existing vegetated ditch along E. Hart Lake Loop.

- Basin 2

Drainage Basin 2 consists of approximately 2.01 acres with a time of concentration of 42.6 minutes. The calculated peak flows are 0.037 cfs for the 10-year storm and 0.892 cfs for the 100-year storm. The 10-year runoff volume (QDR = 0.0115 inches) results in approximately 84 cubic feet of runoff.

A trench system providing approximately 240 cubic feet of storage will be constructed, resulting in a factor of safety greater than 2.0. The trench infiltration capacity is assumed to be 5 minutes per inch (~1 ft/hr), corresponding to approximately 100 cubic feet per hour (0.03 cfs). This results in a drawdown time of approximately 0.6 hours, well below the 24-hour requirement. During storm events exceeding trench capacity, runoff will be temporarily stored behind a check berm at the downgradient end of the trench. Overtopping flow will be conveyed via shallow channelized flow within the proposed ditch system and discharged to the existing vegetated ditch along E. Hart Lake Loop.

- Basin 3 – Natural Depression Storage

Drainage Basin 3 consists of approximately 3.94 acres with a time of concentration of 19.8 minutes. The calculated peak flow for the 100-year storm is approximately 0.189 cfs. No runoff is generated during the 10-year storm event.

The basin discharges to a natural low-lying depression with an onsite area of approximately 1,886 square feet. Using a conservative infiltration rate of 0.000023 cfs/sf (1 in/hr), the onsite depression provides approximately 0.043 cfs of infiltration capacity.

When considering only the onsite depression, a small amount of residual flow may occur during the 100-year storm event. However, this flow is minimal (<0.15 cfs) and non-erosive.

The depression extends beyond the project boundary, with an additional 8,834 square feet of hydraulically connected offsite area that will remain undeveloped along the adjacent taxiway property. When included in the analysis, the total infiltration capacity increases to approximately 0.20–0.24 cfs, which exceeds the modeled 100-year peak flow. As a result, runoff from Basin 3 is expected to be fully infiltrated under post-development conditions. Overflow, if any, will follow the existing natural drainage path through the hydraulically connected depression system along the western property boundary and adjacent taxiway, where it will continue to infiltrate.

- Basin 4

Drainage Basin 4 consists of an undeveloped portion of the site that will remain in its existing vegetated condition. Hydrologic analysis indicates that no measurable runoff is generated from this basin for the 1-year, 10-year, or 100-year storm events.

Aileron Acres Subdivision
Drainage Report

The absence of runoff is attributed to the combination of well-draining Hydrologic Soil Group A soils, existing vegetation and organic ground cover, and available depression storage and infiltration capacity. As the area will remain undeveloped, existing hydrologic conditions will not be altered and no increase in runoff is anticipated. No stormwater conveyance or detention infrastructure is required for this basin.

No adverse increase in peak flow rates or runoff volume is anticipated for the 10-year storm event, and any increase during the 100-year storm event is minimal, controlled, and non-erosive.

The proposed drainage basin design meets the requirements of MSB SCM Table D-1 by conveying 10-year peak flows without damage, providing effective infiltration and storage for frequent storm events, and ensuring that post-development runoff does not adversely impact downstream properties or conveyance systems.

Flood Hazard:

All runoff from the post development 10-year 24-hour storm will be infiltrated onsite via the proposed infiltration structures.

Project Flood Bypass:

During extreme storm events exceeding design capacity, overflow will follow existing and proposed drainage pathways toward the southwest depression and adjacent ditch system within E. Hart Lake Loop Road,

Downstream Impacts:

The proposed development will not increase peak runoff rates beyond pre-development conditions for the 10-year storm event. Any runoff generated during larger storm events will be minimal, non-erosive, and conveyed through existing drainage pathways without adverse impact to downstream properties or infrastructure.

Erosion and Sedimentation Control

This project proposes the construction of new drainage ditches alongside utilization of existing vegetated ditches along E. Hart Lake Loop Road. Based on anticipated flow rates (<2cfs) and the existing and proposed ditch slopes, vegetated stabilization is sufficient and no riprap is required per MSB SCM Table D-2. Drainage swales will be low flow, Type A and be vegetated in accordance with table D-3.

Operation and Maintenance Plan

See Appendix C

Aileron Acres Subdivision
Drainage Report

Wetland Compliance

There are no wetland disturbances for this project. There are no mapped wetlands or watercourses within the project boundary.

Miscellaneous

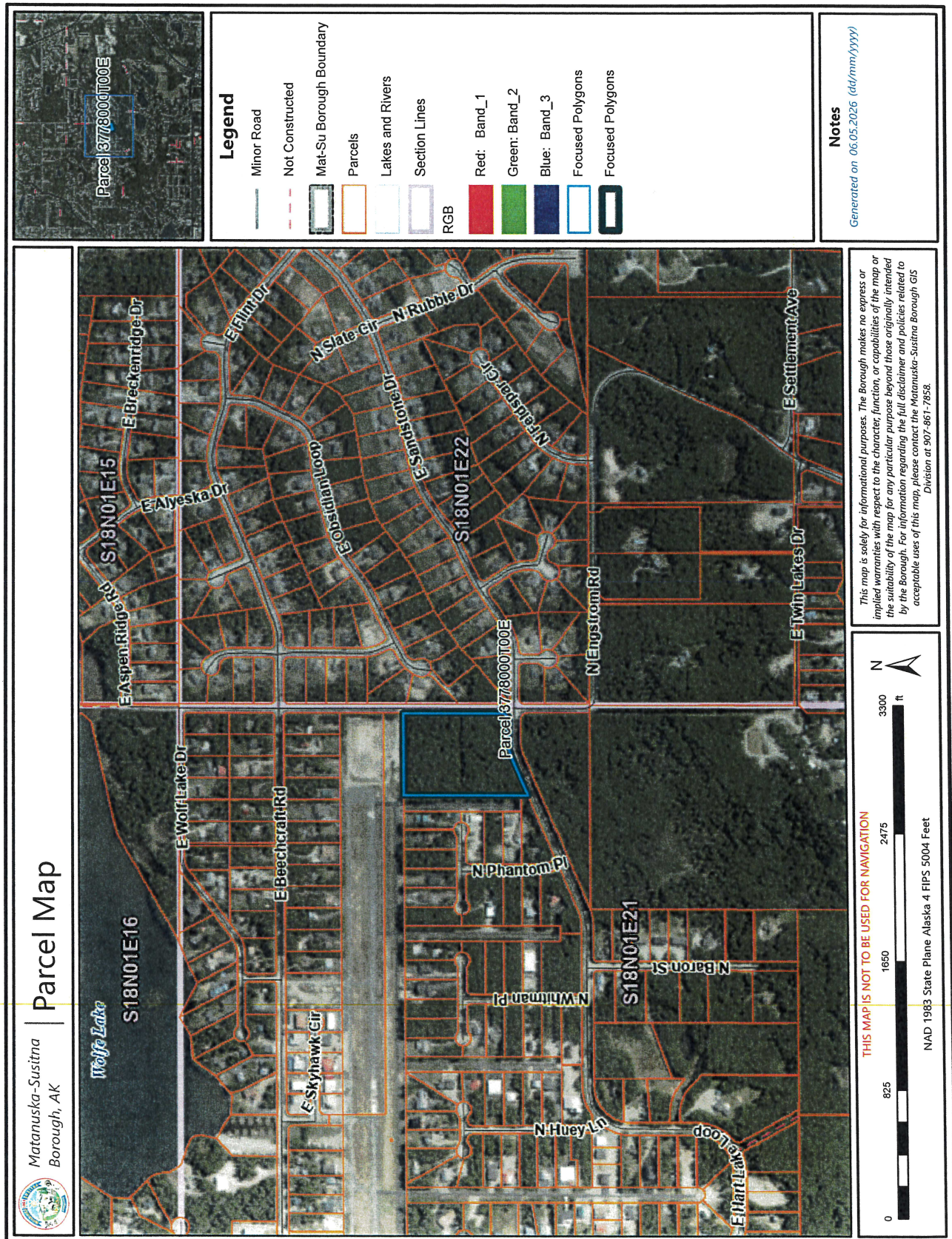
- A. All disturbed areas which are not developed for buildings, driveways and right-of-way areas shall be revegetated.
- B. There are no water bodies downstream of the project which will be affected by the proposed development.
- C. The proposed subdivision will be served by private on-site water and sewer services.

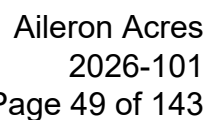
Conclusion

Based on the analysis and calculations provided, the proposed development will not result in adverse impacts to onsite or downstream systems. Stormwater runoff will be effectively managed through infiltration, storage, and controlled conveyance in accordance with MSB SCM requirements.

Appendix A

Maps





Appendix B

Calculations & Data

BASIN #1

• BASIN AREA = $A = 3.794 \text{ AC}$

• $Q_{10YR} = Q_{DR} = 0.0115 \text{ IN}$ (SPREAD SHEET)

• TRENCH WIDTH = $W = 5 \text{ FT}$

• TRENCH DEPTH = $D = 6 \text{ FT}$

• VOID RATION OF = $e = 0.40 \text{ (TYP.)}$
MEDIA

— VOLUME RUN OFF —

$$V = \frac{Q_{DR}}{12} (A) (43560) = \left(Q_{DR} \left(\frac{1 \text{ FT}}{12 \text{ IN}} \right) \times A \left(43560 \frac{\text{SF}}{\text{AC}} \right) \right)$$

$$V = \frac{0.0115 (3.794) (43560)}{12}$$

$$V = 158.38 \sim 159 \text{ CF}$$

— STORAGE Eq. (FOR LENGTH) —

$$V = W \cdot D \cdot L \cdot n \Rightarrow 5(6)(28)(0.4) = 336 \text{ CF} = V_{\text{PROVIDED}}$$

$$\Rightarrow L = \frac{V}{W D n}$$

$$L = \frac{159}{(5)(6)(0.40)} = \frac{159}{12} = 13.25 \text{ (MIN.) LF}$$

• $FS = 2.0 (13.25) = 26.5 \text{ LF}$ **SAY 28 LF**

— INFILTRATION RATE —

• TAKEN AS 5 MPI (VIS. RATED SWR. 1 MPI PER TESTHOLES)

$$\star 5 \text{ MIN/IN} = \frac{60 \text{ MIN/HR}}{5 \text{ MIN/IN}} = 12 \text{ IN/HR} = 1 \text{ FT/HR} \quad (I = 1 \text{ FT/HR})$$

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JOB TITLE AILERON ACRES NO. _____

SUBJECT _____

BY LJR CHECKED _____ DATE _____ SHEET 1 OF 3

— BOTTOM INFILTRATION AREA —

$$* A_{BOT} = WL \Rightarrow 5 \times 28 \Rightarrow 140 SF$$

— INFILTRATION CAPACITY —

$$* Q_{INF} = A_{BOT}(I)$$

$$Q_{INF} = 140 SF (1 FT/HR) \\ = 140 CF/HR$$

— DRAWDOWN TIME —

$$* t = \frac{V}{Q_{INF}}$$

$$t = \frac{159 CF}{140 CF/HR}$$

$$t = 1.13 \text{ HOURS}$$

$$\bullet V_{REQ} < V_{PROVIDED} \quad t < 24 \text{ HR (OK)} \\ 159 CF < 336 CF \quad 1.13 < 24 \text{ HR}$$

■ BASIN # 2

$$\bullet A = 2.009 \text{ AC}$$

$$\bullet Q_{10HR} = Q_{DR} = 0.0115 \text{ IN (SPREAD SHEET)}$$

$$\bullet W = 5 \text{ FT}$$

$$\bullet D = 6 \text{ FT}$$

$$\bullet C = 0.40$$

→ RUNOFF VOLUME

$$V = \frac{0.0115}{12} (2.009) (43560) = 83.86 \sim 84 CF (ROD)$$

$$L = \frac{84}{5(6)(0.40)} \Rightarrow 7 \text{ LF (MIN.)}$$

$$\bullet FS = 2.0 (7) \Rightarrow 14.0 \text{ MIN.}$$

$$Q_{INF} = 70 SF (1 FT/HR) \Rightarrow 70 CF/HR \\ t = 84 CF / 70 CF \Rightarrow 1.2 \text{ HRS}$$

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/// BASIN #2 (CONTINUED)

$$V_{\text{PROVIDED}} = 5(6)(14.6)(0.4) = 168 \text{ CF STORAGE}$$

$$84 \text{ CF} < 168 \text{ CF} \checkmark$$

$$1.2 \text{ HRS} < 24 \text{ HR} \checkmark$$

/// BASIN #3

INFILTRATION RATE TAKEN AS:

$$I_{\text{IN}}/\text{HR} = (1 \text{ ft} \times 1 \text{ ft} \times \frac{1}{12}) = 0.083 \text{ CF/HR}$$

$$= 0.083 \text{ CF/HR} \times \frac{1}{60} \times \frac{1}{60} = 0.000023 \text{ CFS/SF}$$

WETLAND INFILTRATION RATE

$$0.000023 \text{ CFS/SF (SF AREA)}$$

$$\text{AREA OF WETLAND} = 1886 \text{ ft}^2$$

(ONLY INCLUDES ON-PROPERTY PORTION SUBJECT TO
RECEIVE RUNOFF)

$$\text{INFILTRATION} = 1886 \text{ ft}^2 \times 0.000023 \text{ CFS/SF} \\ = 0.043 \sim 0.04 \text{ CFS}$$

AREA WILL INFILTRATE RUNOFF AT 0.04 CFS

$$\text{PROJECTED } Q_{100\text{YR}} = 0.145 \text{ CFS}$$

(INCLUSIVE OF OFF-PROPERTY AREA OF DEPRESSION RAIN
W/IN TAXI-WAY ROW NOT TO BE DEVELOPED)

$$\text{INFILTRATION} = 10,270 \text{ ft}^2 \times 0.000023 \text{ CFS/SF} \\ = 0.236 \sim 0.24 \text{ CFS}$$

• AREA WILL INFILTRATE AT 0.24 CFS

$$\text{PROJECTED } Q_{100\text{YR}} = 0.00 \text{ CFS}$$

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BY LJR CHECKED _____ DATE _____ SHEET 2 OF 3

AILERON ACRES SUBDIVISION DRAINAGE CALCULATION PACKAGE

Curve Number (CN) Sources

Reference for obtaining CN values for agricultural and urban/residential land use: USDA Natural Resources Conservation Service, National Engineering Handbook, Part 630 Hydrology, Chapter 9, Hydrologic Soil-Cover Complexes. <http://www.wcc.nrcs.usda.gov/ftpref/wntsc/H&H/NEHhydrology/ch9.pdf>

Reference for calculating weighted average CN: USDA Natural Resources Conservation Service, National Engineering Handbook, Part 630 Hydrology, Chapter 10, Estimation of Direct Runoff from Storm Rainfall. <http://www.wcc.nrcs.usda.gov/ftpref/wntsc/H&H/NEHhydrology/ch10.pdf>

NOTE: All of the CN Values in this package are for Antecedent Runoff Condition II (ARC II) which are average conditions.

Direct Runoff Depth (QDR) Equations

Potential maximum retention after runoff begins: $S = (1000/CN) - 10$

Initial Abstraction: $I_a = 0.2S$

Direct Runoff Depth: $QDR = [(P - 0.2S)^2] / (P + 0.8S)$

Where: P = total rainfall depth for design storm, in; CN = runoff curve number; S = potential maximum retention after runoff begins, in; QDR = total direct runoff from design storm, in.

Source for ARC I, ARC II & ARC III CN values is Table 10.1 in: USDA, Natural Resources Conservation Service, National Engineering Handbook, Part 630 Hydrology, Chapter 10, Estimation of Direct Runoff from Storm Rainfall <http://www.wcc.nrcs.usda.gov/ftpref/wntsc/H&H/NEHhydrology/ch10.pdf>

CN Reference Table 1

USDA Natural Resources Conservation Service, National Engineering Handbook, Part 630 Hydrology, Chapter 9, Hydrologic Soil-Cover Complexes.

Table 2-2a Runoff curve numbers for urban areas ^{1/}

Cover type and hydrologic condition	Cover description	Average percent impervious area %	Curve numbers for hydrologic soil group			
			A	B	C	D
<i>Fully developed urban areas (vegetation established)</i>						
Open space (lawns, parks, golf courses, cemeteries, etc.) ^{2/}						
Poor condition (grass cover < 50%)			68	79	86	89
Fair condition (grass cover 50% to 75%)			49	69	79	84
Good condition (grass cover > 75%)			39	61	74	80
Impervious areas:						
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)			98	98	98	98
Streets and roads:						
Paved; curbs and storm sewers (excluding right-of-way)			98	98	98	98
Paved; open ditches (including right-of-way)			83	89	92	93
Gravel (including right-of-way)			76	85	89	91
Dirt (including right-of-way)			72	82	87	89
Western desert urban areas:						
Natural desert landscaping (pervious areas only) ^{4/}			63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)			96	96	96	96
Urban districts:						
Commercial and business		85	89	92	94	95
Industrial		72	81	88	91	93
Residential districts by average lot size:						
1/8 acre or less (town houses)		65	77	85	90	92
1/4 acre		38	61	75	83	87
1/3 acre		30	57	72	81	86
1/2 acre		25	54	70	80	85
1 acre		20	51	68	79	84
2 acres		12	46	65	77	82
<i>Developing urban areas</i>						
Newly graded areas (pervious areas only, no vegetation) ^{5/}			77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).						

CN Reference Table 2

USDA Natural Resources Conservation Service, National Engineering Handbook, Part 630 Hydrology, Chapter 9, Hydrologic Soil-Cover Complexes.

Table 2-2b Runoff curve numbers for cultivated agricultural lands 1/

Cover type	Treatment 2/	Cover description	Hydrologic condition 3/	Curve numbers for hydrologic soil group			
				A	B	C	D
Fallow	Bare soil Crop residue cover (CR)		—	77	86	91	94
			Poor	76	85	90	93
			Good	74	83	88	90
Row crops	Straight row (SR)		Poor	72	81	88	91
			Good	67	78	85	89
	SR + CR		Poor	71	80	87	90
			Good	64	75	82	85
	Contoured (C)		Poor	70	79	84	88
			Good	65	75	82	86
	C + CR		Poor	69	78	83	87
			Good	64	74	81	85
	Contoured & terraced (C&T)		Poor	66	74	80	82
			Good	62	71	78	81
Small grain	C&T+ CR		Poor	65	73	79	81
			Good	61	70	77	80
	SR		Poor	65	76	84	88
			Good	63	75	83	87
	SR + CR		Poor	64	75	83	86
			Good	60	72	80	84
	C		Poor	63	74	82	85
			Good	61	73	81	84
	C + CR		Poor	62	73	81	84
			Good	60	72	80	83
Close-seeded or broadcast legumes or rotation meadow	C&T		Poor	61	72	79	82
			Good	59	70	78	81
	C&T+ CR		Poor	60	71	78	81
			Good	58	69	77	80
	SR		Poor	66	77	85	89
			Good	58	72	81	85
	C		Poor	64	75	83	86
			Good	55	69	78	83
	C&T		Poor	63	73	80	83
			Good	51	67	76	80

CN Reference Table 3

USDA Natural Resources Conservation Service, National Engineering Handbook, Part 630 Hydrology, Chapter 9, Hydrologic Soil-Cover Complexes.

Table 2-2c Runoff curve numbers for other agricultural lands ^{1/}

Cover type	Cover description	Hydrologic condition	Curve numbers for hydrologic soil group			
			A	B	C	D
Pasture, grassland, or range—continuous forage for grazing. ^{2/}		Poor	68	79	86	89
		Fair	49	69	79	84
		Good	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay.		—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element. ^{3/}		Poor	48	67	77	83
		Fair	35	56	70	77
		Good	30 ^{4/}	48	65	73
Woods—grass combination (orchard or tree farm). ^{5/}		Poor	57	73	82	86
		Fair	43	65	76	82
		Good	32	58	72	79
Woods. ^{6/}		Poor	45	66	77	83
		Fair	36	60	73	79
		Good	30 ^{4/}	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.		—	50	74	82	86

Roughness Coefficient References

Tables below give ranges of values for overland and channel flow roughness coefficients for various surfaces.

Source: Missouri DOT, Engineering Policy Guide, Category 749, Hydrologic Analysis : https://epg.modot.org/index.php?title=Category:749_Hydrologic_Analysis#749.5.3.2_

Roughness Coefficients for Overland Flow

Type of Surface	N
Dense Growth	0.40 to 0.50
Pasture	0.30 to 0.40
Lawns	0.20 to 0.30
Bluegrass Sod	0.20 to 0.50
Short-Grass Prairie	0.10 to 0.20
Sparse Vegetation	0.05 to 0.13
Bare Clay-Loam Soil (Eroded)	0.01 to 0.03
Concrete - Asphalt	
Very Shallow Depths < 1/4"	0.10 to 0.15
Shallow Depths > 1/4"	0.05 to 0.10
Deciduous Timberland	0.50 to 0.70
Conifer Timberland	0.60 to 0.80
Source: Ponce et al. (1989)	

Source: Missouri DOT, Engineering Policy Guide, Category 749, Hydrologic Analysis
https://epg.modot.org/index.php?title=Category:749_Hydrologic_Analysis#749.5.3.2_

Manning's n for Channels (Chow, 1959).

4. Excavated or Dredged Channels			
a. Earth, straight, and uniform			
1. clean, recently completed	0.016	0.018	0.020
2. clean, after weathering	0.018	0.022	0.025
3. gravel, uniform section, clean	0.022	0.025	0.030
4. with short grass, few weeds	0.022	0.027	0.033
b. Earth winding and sluggish			
1. no vegetation	0.023	0.025	0.030
2. grass, some weeds	0.025	0.030	0.033
3. dense weeds or aquatic plants in deep channels	0.030	0.035	0.040
4. earth bottom and rubble sides	0.028	0.030	0.035
5. stony bottom and weedy banks	0.025	0.035	0.040
6. cobble bottom and clean sides	0.030	0.040	0.050
c. Dragline-excavated or dredged			
1. no vegetation	0.025	0.028	0.033
2. light brush on banks	0.035	0.050	0.060
d. Rock cuts			
1. smooth and uniform	0.025	0.035	0.040
2. jagged and irregular	0.035	0.040	0.050
e. Channels not maintained, weeds and brush uncut			
1. dense weeds, high as flow depth	0.050	0.080	0.120
2. clean bottom, brush on sides	0.040	0.050	0.080
3. same as above, highest stage of flow	0.045	0.070	0.110
4. dense brush, high stage	0.080	0.100	0.140

Source: Oregon State University Reference tables for Manning's n values for Channels
https://www.fsl.orst.edu/geowater/FX3/help/8_Hydraulic_Reference/Mannings_n_Tables.htm

Curve Number (CN) Calculations - Pre-Construction - Basin 1

Determine CN Value for Basin Pre-Construction

SUB-BASIN #1

Option 1: Single Hydrologic Soil-Cover Complex for Watershed:

Curve Number for Watershed, CNII = (NOTE: If the weighted average CN is to be used, this Cell must be blank.)

Option 2: Multiple Hydrologic Soil-Cover Complexes for Watershed:

(Calculation of Weighted Average CN)

Sub Area	Area, A		CNII	A*CNII	
No.	(acres)				
1	3.484	Woods	30	104.5	
2	0.310	Grass	39	12.09	
3					
4					
5					
6					
7					
8					
9					
10					
SA =		3.794	SA*CNII =		116.6
Weighted Average CNII =		30.7			
Weighted CNII value=		31			

Curve Number (CN) Calculations - Post-Construction - Basin 1

Determine CN Value for Basin Post-Construction
SUB-BASIN #1

Option 1: Single Hydrologic Soil-Cover Complex for Watershed:

Curve Number for Watershed, CNII = (NOTE: If the weighted average CN is to be used, this Cell must be blank.)

Option 2: Multiple Hydrologic Soil-Cover Complexes for Watershed:
(Calculation of Weighted Average CN)

Sub Area No.	Area, A (acres)		CNII	A*CNII
1	0.774	Imper.		0.0
2	0.310	Grass		0
3	0.190	Gravel		0.0
4	2.520	Woods		0.0
5				
6				
7				
8				
9				
10				
SA =	3.794		SA*CNII =	0.0
Weighted Average CNII = 0.0				
Weighted CNII Value =				51

Time of Concentration - Pre-Construction - Basin 1 - NRCS Lag Equation

Calculation of Watershed Time of Concentration Pre-Construction

NOTE: The Time of Concentration is calculated below by several different equations/methods. You will need to provide input information about the watershed and select the Time of Concentration calculated by the method that is most suitable for your watershed.

Time of Concentration using One Equation for Entire Watershed

Inputs

Length of Flow Path, L = ft Ground Slope, S =

Calculation of TOC using the NRCS Lag Equation:

Runoff curve number, CN = SCS Lag Equation Travel Time (TOC), t_t = min

The SCS Lag equation was developed by the Soil Conservation Service. It from agricultural watersheds and is most valid for rural watersheds.

The NRCS Lag equation: $t = 0.00526[(1000/CN) - 910.7]L^{0.8}/S^{0.5}$

Where: L = length of flow path in ft S = surface slope in ft
CN = Runoff Curve Number

Time of Concentration using More than One Equation

Time of Concentration - Post-Construction - Basin 1 - NRCS Sheet/Shallow Concentrated/Channel Flow Method

B. Calculation of TOC using the NRCS Method

Note that you must subdivide the

watershed into 3 parts, an overland flow, shallow concentrated flow, and a channel flow part

Overland Flow Path Length, L = 150 ft Overland Flow Ground Slope, S = 0.0250 ft/ft Overland Flow Resistance Factor, n = 0.45 24 hour rainfall, P = 1.47 in Overland Flow Travel Time, to = 44.0 min (Calculated using Manning Kinematic Equation)	Shallow Concentrated Flow Path Length, L = 223 ft Shallow Concentrated Flow Ground Slope, S = 0.0200 ft/ft Click on the green cell and the arrow to its right to select the type of surface. Unpaved Surface Shallow Concentrated Flow Velocity, Vsc = 2.28 ft/sec Shallow Concentrated Flow Travel Time, tsc = 1.6 min (Calculated using the Velocity Method)
Channel Flow Path Length, L = 380 ft Channel Flow Ground Slope, S = 0.0050 ft/ft Manning Roughness Coefficient, n = 0.025 Channel Flow Travel Time, tc = 1.36 min	Bankfull Cross-Sectional Area of Flow, A = 15.6 ft² Bankfull Wetted Perimeter, P = 13.50 ft Channel Flow Velocity, Vc = 4.646 ft/sec (calculated using the Manning Equation) NRCS Method Travel Time (TOC), t6 (= to + tsc + tc) = 47.0 min

Selection of Time of Concentration for Stormwater Runoff Calculation

min

$$t_1 = \frac{0.42 (nL)^{0.8}}{P^{0.5} S^{0.4}}$$

Manning Kinematic Equation - U.S. units

t1 = overland sheet flow runoff travel time, min

n = Manning roughness coefficient, dimensionless

L = length of the flow path, ft (Max. L should be : P = 2 year, 24 hr rainfall, in

S = ground slope, ft/ft

Equations for NRCS Velocity Method for Shallow Concentrated Flow

t2 = L/(60V)

for unpaved surface: V = 16.1345S^{0.5}

for paved surface: V = 20.3282S^{0.5}

where:

t2 = shallow concentrated flow runoff travel time

L = length of the flow path, ft

V = shallow concentrated flow velocity, ft/sec

S = surface slope, ft/ft

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

Manning Equation for Open Channel Flow

V = Q/A

R = A/P

t3 = L/(60V)

Where: Q = channel flow rate, cfs

V = average velocity of flow, ft/sec

A = channel cross-sectional area, ft²

P = wetted perimeter of channel, ft

S = channel bottom slope, ft/ft

n = Manning roughness coefficient for channel

L = Length of Flow Path, ft

t3 = travel time for channel flow, min

Direct Runoff Depth (QDR) - Pre-Construction 1-Year, 24-Hour Storm - Basin 1

Basin Direct Runoff Hydrograph from Storm Rainfall

Calculate Total Direct Runoff from Design Storm (Pre)

Inputs

Total Rainfall Depth for Design Storm, P = in

Watershed CN value from Worksheet 2, CNII =
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = in

Initial Abstraction Ia=0.2S in

Total Direct Runoff from Design Storm (ARC II), QDRII = in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI =

Potential maximum retention after runoff begins, SIII = in

Total Direct Runoff from Design Storm (ARC I), QDRI = in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII =

Potential maximum retention after runoff begins, SIII = in

Total Direct Runoff from Design Storm (ARC III), QDRIII = in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

AMC II

Total Direct Runoff from Design Storm
to use in Worksheet 4, QDR = in

Direct Runoff Depth (QDR) - Post-Construction 1-Year, 24-Hour Storm - Basin 1

Basin Direct Runoff Hydrograph from Storm Rainfall Calculate Total Direct Runoff from Design Storm (Post)

Inputs

Total Rainfall Depth for Design Storm, P = 1.17 in

Watershed CN value from Worksheet 2, CNII = 51
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = 9.6 in

Initial Abstraction Ia=0.2S 1.9 in

Total Direct Runoff from Design Storm (ARC II), QDRII = 0.0000 in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI = 31
Potential maximum retention after runoff begins, SIII = 22.3 in
Total Direct Runoff from Design Storm (ARC I), QDRI = 0.0000 in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII = 70
Potential maximum retention after runoff begins, SIII = 4.3 in
Total Direct Runoff from Design Storm (ARC III), QDRIII = 0.0213 in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

AMC II

Total Direct Runoff from Design Storm
to use in Worksheet 4, QDR = 0.0000 in

Direct Runoff Hydrograph - Pre-Construction 1-Year, 24-Hour Storm - Basin 1

Inputs

Watershed Time of Concentration, T_c = hr
Watershed Area, A = mi²

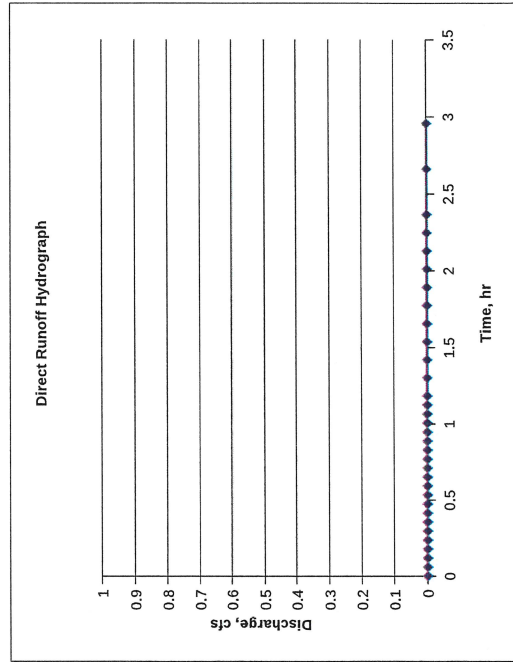
Calculations

Direct Runoff Volume from Storm, QDR = in
(value from Worksheet 3)
Time to Peak, T_p = hr
Peak Discharge, q_p = cfs

Direct Runoff Hydrograph

Time, hr	Flow, cfs
----------	-----------

0	0
0.059111111	0.0
0.118222222	0.0
0.177333333	0.0
0.236444444	0.0
0.295555556	0.0
0.354666667	0.0
0.413777778	0.0
0.472888889	0.0
0.532	0.0
0.591111111	0.0
0.650222222	0.0
0.709333333	0.0
0.768444444	0.0
0.827555556	0.0
0.886666667	0.0
0.945777778	0.0
1.004888889	0.0
1.064	0.0
1.123111111	0.0
1.182222222	0.0
1.241333333	0.0
1.300444444	0.0
1.359555556	0.0
1.418666667	0.0
1.477777778	0.0
1.536888889	0.0
1.595999999	0.0
1.655111111	0.0
1.714222222	0.0
1.773333333	0.0
1.832444444	0.0
1.891555556	0.0
1.950666667	0.0
2.009777778	0.0
2.068888889	0.0
2.128	0.0
2.187111111	0.0
2.246222222	0.0
2.305333333	0.0
2.364444444	0.0
2.423555556	0.0
2.482666667	0.0
2.541777778	0.0
2.600888889	0.0
2.66	0.0
2.719111111	0.0
2.778222222	0.0
2.837333333	0.0
2.896444444	0.0
2.955555556	0.0



Direct Runoff Hydrograph - Post-Construction 1-Year, 24-Hour Storm - Basin 1

Inputs

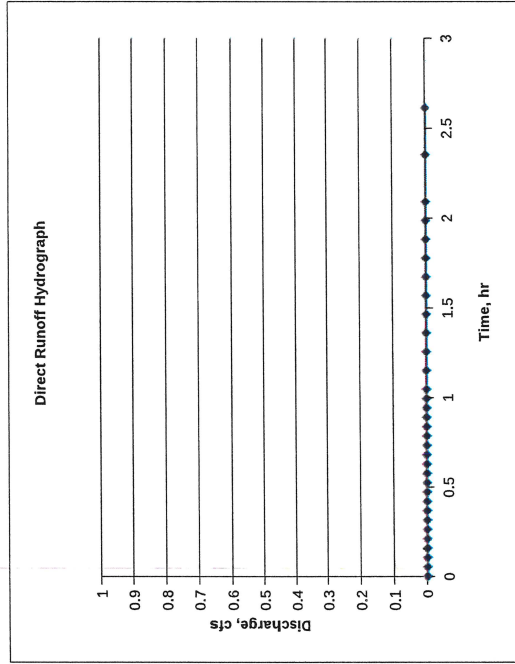
Watershed Time of Concentration, T_c = hr
Watershed Area, A = mi²

Calculations

Direct Runoff Volume from Storm, QDR = in
(value from Worksheet 3)
Time to Peak, T_p = hr
Peak Discharge, q_p = cfs

Direct Runoff Hydrograph

Time, hr	Flow, cfs
0	0
0.052222222	0.0
0.104444444	0.0
0.156666667	0.0
0.208888889	0.0
0.261111111	0.0
0.313333333	0.0
0.365555556	0.0
0.417777778	0.0
0.47	0.0
0.522222222	0.0
0.574444444	0.0
0.626666667	0.0
0.678888889	0.0
0.731111111	0.0
0.783333333	0.0
0.835555556	0.0
0.887777778	0.0
0.94	0.0
0.992222222	0.0
1.044444444	0.0
1.148888889	0.0
1.253333333	0.0
1.357777778	0.0
1.462222222	0.0
1.566666667	0.0
1.671111111	0.0
1.775555556	0.0
1.88	0.0
1.984444444	0.0
2.088888889	0.0
2.35	0.0
2.611111111	0.0



Direct Runoff Depth (QDR) - Pre-Construction 10-Year, 24-Hour Storm - Basin 1

Basin Direct Runoff Hydrograph from Storm Rainfall

Calculate Total Direct Runoff from Design Storm (Pre)

Inputs

Total Rainfall Depth for Design Storm, P = in

Watershed CN value from Worksheet 2, CNII =
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = in

Initial Abstraction Ia=0.2S in

Total Direct Runoff from Design Storm (ARC II), QDRII = in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI =

Potential maximum retention after runoff begins, SIII = in

Total Direct Runoff from Design Storm (ARC I), QDRI = in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII =

Potential maximum retention after runoff begins, SIII = in

Total Direct Runoff from Design Storm (ARC III), QDRIII = in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

AMC II

Total Direct Runoff from Design Storm
to use in Worksheet 4, QDR = in

Direct Runoff Depth (QDR) - Post-Construction 10-Year, 24-Hour Storm - Basin 1

Basin Direct Runoff Hydrograph from Storm Rainfall

Calculate Total Direct Runoff from Design Storm (Post)

Inputs

Total Rainfall Depth for Design Storm, P = 2.26 in

Watershed CN value from Worksheet 2, CNII = 51
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = 9.6 in

Initial Abstraction Ia=0.2S 1.9 in

Total Direct Runoff from Design Storm (ARC II), QDRII = 0.0115 in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI = 31
Potential maximum retention after runoff begins, SIII = 22.3 in
Total Direct Runoff from Design Storm (ARC I), QDRI = 0.0000 in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII = 70
Potential maximum retention after runoff begins, SIII = 4.3 in
Total Direct Runoff from Design Storm (ARC III), QDRIII = 0.3460 in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

AMC II

Total Direct Runoff from Design Storm
to use in Worksheet 4, QDR = 0.0115 in

Direct Runoff Hydrograph - Pre-Construction 10-Year, 24-Hour Storm - Basin 1

Inputs

Watershed Time of
Concentration, T_c = hr

Watershed Area, A = mi²

Calculations

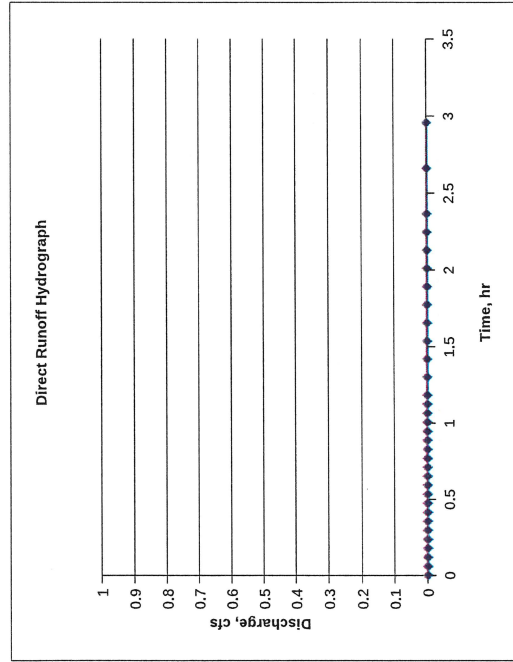
Direct Runoff Volume
from Storm, QDR = in
(value from Worksheet 3)

Time to Peak, T_p = hr

Peak Discharge, q_p = cfs

Direct Runoff Hydrograph

Time, hr	Flow, cfs
0	0
0.059111111	0.0
0.118222222	0.0
0.177333333	0.0
0.236444444	0.0
0.295555556	0.0
0.354666667	0.0
0.413777778	0.0
0.472888889	0.0
0.532	0.0
0.591111111	0.0
0.650222222	0.0
0.709333333	0.0
0.768444444	0.0
0.827555556	0.0
0.886666667	0.0
0.945777778	0.0
1.004888889	0.0
1.064	0.0
1.123111111	0.0
1.182222222	0.0
1.300444444	0.0
1.418666667	0.0
1.536888889	0.0
1.655111111	0.0
1.773333333	0.0
1.891555556	0.0
2.009777778	0.0
2.128	0.0
2.246222222	0.0
2.364444444	0.0
2.66	0.0
2.955555556	0.0



Direct Runoff Hydrograph - Post-Construction 10-Year, 24-Hour Storm - Basin 1

Inputs

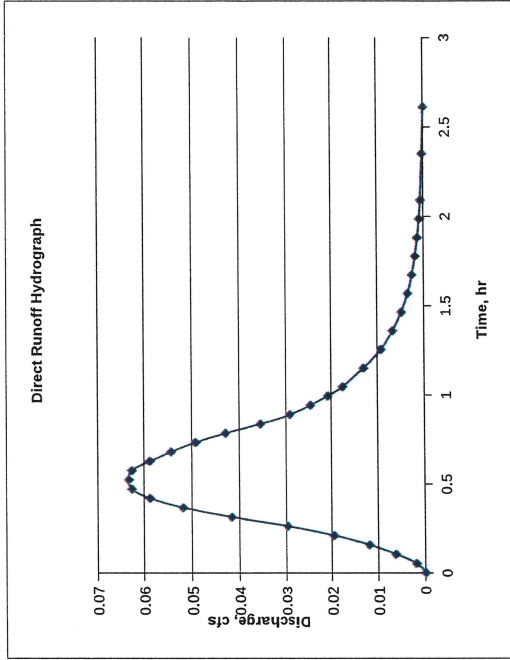
Watershed Time of Concentration, T_c = hr
Watershed Area, A = mi²

Calculations

Direct Runoff Volume from Storm, QDR = in
(value from Worksheet 3)
Time to Peak, T_p = hr
Peak Discharge, q_p = cfs

Direct Runoff Hydrograph

Time, hr	Flow, cfs
0	0
0.052222222	0.0
0.104444444	0.0
0.156666667	0.0
0.208888889	0.0
0.261111111	0.0
0.313333333	0.0
0.365555556	0.1
0.417777778	0.1
0.47	0.1
0.522222222	0.1
0.574444444	0.1
0.626666667	0.1
0.678888889	0.1
0.731111111	0.0
0.783333333	0.0
0.835555556	0.0
0.887777778	0.0
0.94	0.0
0.992222222	0.0
1.044444444	0.0
1.148888889	0.0
1.253333333	0.0
1.357777778	0.0
1.462222222	0.0
1.566666667	0.0
1.671111111	0.0
1.775555556	0.0
1.88	0.0
1.984444444	0.0
2.088888889	0.0
2.35	0.0
2.611111111	0.0



Direct Runoff Depth (QDR) - Pre-Construction 100-Year, 24-Hour Storm - Basin 1

Basin Direct Runoff Hydrograph from Storm Rainfall

Calculate Total Direct Runoff from Design Storm (Pre)

Inputs

Total Rainfall Depth for Design Storm, P = in

Watershed CN value from Worksheet 2, CNII =
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = in

Initial Abstraction Ia=0.2S in

Total Direct Runoff from Design Storm (ARC II), QDRII = in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI =
Potential maximum retention after runoff begins, SIII = in
Total Direct Runoff from Design Storm (ARC I), QDRI = in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII =
Potential maximum retention after runoff begins, SIII = in
Total Direct Runoff from Design Storm (ARC III), QDRIII = in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

Total Direct Runoff from Design Storm
to use in Worksheet 4, QDR = in

Direct Runoff Depth (QDR) - Post-Construction 100-Year, 24-Hour Storm - Basin 1

Basin Direct Runoff Hydrograph from Storm Rainfall Calculate Total Direct Runoff from Design Storm (Post)

Inputs

Total Rainfall Depth for Design Storm, P = 3.7 in
Watershed CN value from Worksheet 2, CNII = 51
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = 9.6 in
Initial Abstraction Ia=0.2S 1.9 in
Total Direct Runoff from Design Storm (ARC II), QDRII = 0.2778 in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI = 31
Potential maximum retention after runoff begins, SIII = 22.3 in
Total Direct Runoff from Design Storm (ARC I), QDRI = 0.0000 in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII = 70
Potential maximum retention after runoff begins, SIII = 4.3 in
Total Direct Runoff from Design Storm (ARC III), QDRIII = 1.1337 in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

AMC II

Total Direct Runoff from Design Storm
to use in Worksheet 4, QDR = 0.2778 in

Direct Runoff Hydrograph - Pre-Construction 100-Year, 24-Hour Storm - Basin 1

Inputs

Watershed Time of
Concentration, T_c = hr

Watershed Area, A = mi²

Calculations

Direct Runoff Volume
from Storm, QDR = in
(value from Worksheet 3)

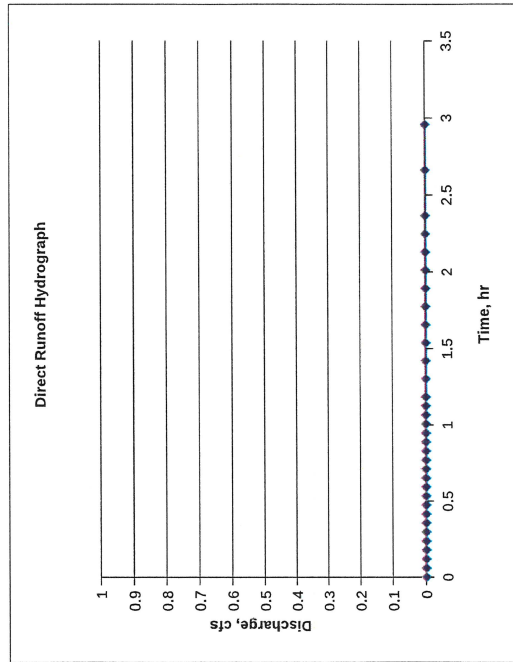
Time to Peak, T_p = hr

Peak Discharge, q_p = cfs

Direct Runoff Hydrograph

Time_hr Flow_cfs

0	0
0.059111111	0.0
0.118222222	0.0
0.177333333	0.0
0.236444444	0.0
0.295555556	0.0
0.354666667	0.0
0.413777778	0.0
0.472888889	0.0
0.532	0.0
0.591111111	0.0
0.650222222	0.0
0.709333333	0.0
0.768444444	0.0
0.827555556	0.0
0.886666667	0.0
0.945777778	0.0
1.004888889	0.0
1.064	0.0
1.123111111	0.0
1.182222222	0.0
1.300444444	0.0
1.418666667	0.0
1.536888889	0.0
1.655111111	0.0
1.773333333	0.0
1.891555556	0.0
2.009777778	0.0
2.128	0.0
2.246222222	0.0
2.364444444	0.0
2.66	0.0
2.955555556	0.0



Direct Runoff Hydrograph - Post-Construction 100-Year, 24-Hour Storm - Basin 1

Inputs

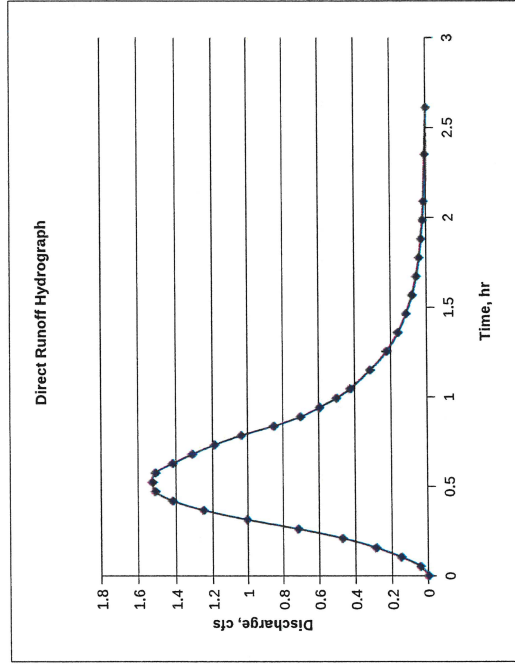
Watershed Time of Concentration, Tc = hr
Watershed Area, A = mi²

Calculations

Direct Runoff Volume from Storm, QDR = in
(value from Worksheet 3)
Time to Peak, Tp = hr
Peak Discharge, qp = cfs

Direct Runoff Hydrograph

Time, hr	Flow, cfs
0	0
0.052222222	0.0
0.104444444	0.2
0.156666667	0.3
0.208888889	0.5
0.261111111	0.7
0.313333333	1.0
0.365555556	1.3
0.417777778	1.4
0.47	1.5
0.522222222	1.5
0.574444444	1.5
0.626666667	1.4
0.678888889	1.3
0.731111111	1.2
0.783333333	1.0
0.835555556	0.9
0.887777778	0.7
0.94	0.6
0.992222222	0.5
1.044444444	0.4
1.148888889	0.3
1.253333333	0.2
1.357777778	0.2
1.462222222	0.1
1.566666667	0.1
1.671111111	0.1
1.775555556	0.0
1.88	0.0
1.984444444	0.0
2.088888889	0.0
2.35	0.0
2.611111111	0.0



Curve Number (CN) Calculations - Pre-Construction - Basin 2

Determine CN Value for Basin Pre-Construction
SUB-BASIN #2

Option 1: Single Hydrologic Soil-Cover Complex for Watershed:

Curve Number for Watershed, CNII = (NOTE: If the weighted average CN is to be used, this Cell must be blank.)

Option 2: Multiple Hydrologic Soil-Cover Complexes for Watershed:
(Calculation of Weighted Average CN)

Sub Area		Area, A		CNII	A*CNII
No.	(acres)				
1	1.934	Woods	30	58.0	
2	0.075	Grass	39	2.925	
3					
4					
5					
6					
7					
8					
9					
10					
SA =		2.009	SA*CNII =		60.9
Weighted Average CNII =		30.3	Weighted CNII value=		30

Curve Number (CN) Calculations - Post-Construction - Basin 2

Determine CN Value for Basin Post-Construction

SUB-BASIN #2

Option 1: Single Hydrologic Soil-Cover Complex for Watershed:

Curve Number for Watershed, CNII = (NOTE: If the weighted average CN is to be used, this Cell must be blank.)

Option 2: Multiple Hydrologic Soil-Cover Complexes for Watershed:

(Calculation of Weighted Average CN)

Sub Area No.	Area, A (acres)		CNII	A*CNII
1	0.849	Imper.		0.0
2	0.267	Grass		0
3	0.191	Gravel		0.0
4	0.702	Woods		0.0
5				
6				
7				
8				
9				
10				

SA = SA*CNII =

Weighted Average CNII =

Weighted CNII Value =

Time of Concentration - Pre-Construction - Basin 2 - NRCS Lag Equation

Calculation of Watershed Time of Concentration Pre-Construction

NOTE: The Time of Concentration is calculated below by several different equations/methods. You will need to provide input information about the watershed and select the Time of Concentration calculated by the method that is most suitable for your watershed.

Time of Concentration using One Equation for Entire Watershed

Inputs

Length of Flow Path, L =	310	ft	Ground Slope, S =	0.00871
Calculation of TOC using the NRCS Lag Equation:				
Runoff curve number, CN =	30	SCS Lag Equation		
		Travel Time (TOC), t _t =	51.8	min

The SCS Lag equation was developed by the Soil Conservation Service. It from agricultural watersheds and is most valid for rural watersheds.

The NRCS Lag equation: $t = 0.00526[(1000/CN) - 910.7]L^{0.8}/S^{0.5}$

Where: L = length of flow path in ft S = surface slope in ft
CN = Runoff Curve Number

Time of Concentration using More than One Equation

Time of Concentration - Post-Construction - Basin 2 - NRCS Sheet/Shallow Concentrated/Channel Flow Method

B. Calculation of TOC using the NRCS Method

Note that you must subdivide the

watershed into 3 parts, an overland flow, shallow concentrated flow, and a channel flow part

Overland Flow Path Length, L = 150 ft	Shallow Concentrated Flow Path Length, L = 38 ft
Overland Flow Ground Slope, S = 0.0300 ft/ft	Shallow Concentrated Flow Ground Slope, S = 0.0660 ft/ft
Overland Flow Resistance Factor, n = 0.45	Click on the green cell and the arrow to its right to select the type of surface. Unpaved Surface
24 hour rainfall, P = 1.47 in	
Overland Flow Travel Time, to = 40.9 min (Calculated using Manning Kinematic Equation)	
Shallow Concentrated Flow Velocity, Vsc = 4.14 ft/sec	Shallow Concentrated Flow Travel Time, tsc = 0.2 min (Calculated using the Velocity Method)
Channel Flow Path Length, L = 420 ft	Bankfull Cross-Sectional Area of Flow, A = 15.6 ft ²
Channel Flow Ground Slope, S = 0.0050 ft/ft	Bankfull Wetted Perimeter, P = 13.50 ft
Manning Roughness Coefficient, n = 0.025	Channel Flow Velocity, Vc = 4.646 ft/sec (calculated using the Manning Equation)
Channel Flow Travel Time, tc = 1.51 min	
NRCS Method Travel Time (TOC), t6 (= to + tsc + tc) = 42.6 min	

t1 = overland sheet flow runoff travel time, min
n = Manning roughness coefficient, dimensionless
L = length of the flow path, ft (Max. L should be :
P = 2 year, 24 hr rainfall, in
S = ground slope, ft/ft

$$t_1 = \frac{0.42 (nL)^{0.8}}{P^{0.5} S^{0.4}}$$

Manning Kinematic Equation - U.S. units

Equations for NRCS Velocity Method for Shallow Concentrated Flow

t2 = L/(60V)
for unpaved surface: V = 16.1345S^{0.5}
for paved surface: V = 20.3282S^{0.5}

where:
t2 = shallow concentrated flow runoff travel time
L = length of the flow path, ft
V = shallow concentrated flow velocity, ft/sec
S = surface slope, ft/ft

$$V = Q/A$$

$$R = A/P$$

$$t3 = L/(60V)$$

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

Manning Equation for Open Channel Flow

Where: Q = channel flow rate, cfs
V = average velocity of flow, ft/sec
A = channel cross-sectional area, ft²
P = wetted perimeter of channel, ft
S = channel bottom slope, ft/ft
n = Manning roughness coefficient for channel
L = Length of Flow Path, ft
t3 = travel time for channel flow, min

Selection of Time of Concentration for Stormwater Runoff Calculation

42.6 min

Direct Runoff Depth (QDR) - Pre-Construction 1-Year, 24-Hour Storm - Basin 2

Basin Direct Runoff Hydrograph from Storm Rainfall

Calculate Total Direct Runoff from Design Storm (Pre)

Inputs

Total Rainfall Depth for Design Storm, P = in

Watershed CN value from Worksheet 2, CNII =
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = in

Initial Abstraction Ia=0.2S in

Total Direct Runoff from Design Storm (ARC II), QDRII = in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI =

Potential maximum retention after runoff begins, SIII = in

Total Direct Runoff from Design Storm (ARC I), QDRI = in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII =

Potential maximum retention after runoff begins, SIII = in

Total Direct Runoff from Design Storm (ARC III), QDRIII = in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

AMC II

Total Direct Runoff from Design Storm
to use in Worksheet 4, QDR = in

Direct Runoff Depth (QDR) - Post-Construction 1-Year, 24-Hour Storm - Basin 2

Basin Direct Runoff Hydrograph from Storm Rainfall Calculate Total Direct Runoff from Design Storm (Post)

Inputs

Total Rainfall Depth for Design Storm, P = 1.17 in

Watershed CN value from Worksheet 2, CNII = 51
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = 9.6 in

Initial Abstraction Ia=0.25 in

Total Direct Runoff from Design Storm (ARC II), QDRII = 0.0000 in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI = 31

Potential maximum retention after runoff begins, SIII = 22.3 in

Total Direct Runoff from Design Storm (ARC I), QDRI = 0.0000 in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII = 70

Potential maximum retention after runoff begins, SIII = 4.3 in

Total Direct Runoff from Design Storm (ARC III), QDRIII = 0.0213 in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

AMC II

Total Direct Runoff from Design Storm
to use in Worksheet 4, QDR = 0.0000 in

Direct Runoff Hydrograph - Pre-Construction 1-Year, 24-Hour Storm - Basin 2

Inputs

Watershed Time of Concentration, T_c = hr

Watershed Area, A = mi²

Calculations

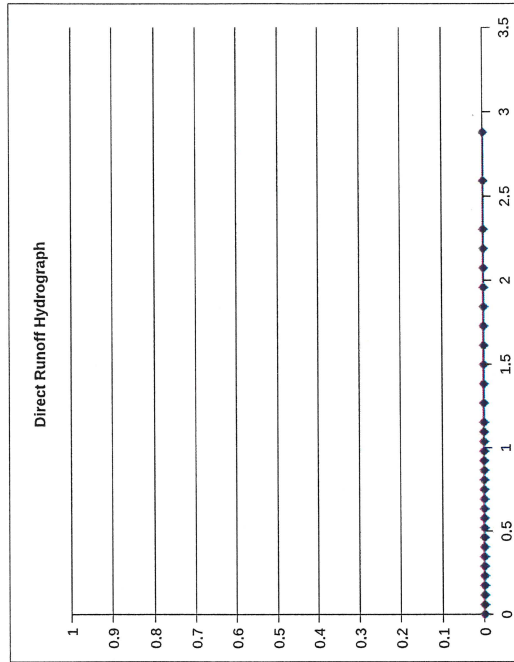
Direct Runoff Volume from Storm, QDR = in
(value from Worksheet 3)

Time to Peak, T_p = hr

Peak Discharge, q_p = cfs

Direct Runoff Hydrograph

Time_hr	Flow_cfs
0	0
0.05755556	0.0
0.11511111	0.0
0.17266667	0.0
0.23022222	0.0
0.28777778	0.0
0.34533333	0.0
0.40288889	0.0
0.46044444	0.0
0.518	0.0
0.57555556	0.0
0.63311111	0.0
0.69066667	0.0
0.74822222	0.0
0.80577778	0.0
0.86333333	0.0
0.92088889	0.0
0.97844444	0.0
1.036	0.0
1.09355556	0.0
1.15111111	0.0
1.26622222	0.0
1.38133333	0.0
1.49644444	0.0
1.61155556	0.0
1.72666667	0.0
1.84177778	0.0
1.95688889	0.0
2.072	0.0
2.18711111	0.0
2.30222222	0.0
2.59	0.0
2.87777778	0.0



Direct Runoff Hydrograph - Post-Construction 1-Year, 24-Hour Storm - Basin 2

Inputs

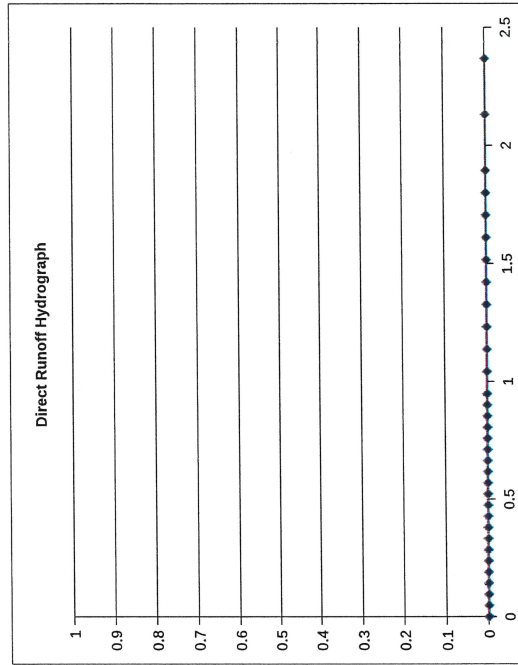
Watershed Time of Concentration, Tc = hr
Watershed Area, A = mi²

Calculations

Direct Runoff Volume from Storm, QDR = in
(value from Worksheet 3)
Time to Peak, Tp = hr
Peak Discharge, qp = cfs

Direct Runoff Hydrograph

Time, hr	Flow, cfs
0	0
0.047333333	0.0
0.094666667	0.0
0.142	0.0
0.189333333	0.0
0.236666667	0.0
0.284	0.0
0.331333333	0.0
0.378666667	0.0
0.426	0.0
0.473333333	0.0
0.520666667	0.0
0.568	0.0
0.615333333	0.0
0.662666667	0.0
0.71	0.0
0.757333333	0.0
0.804666667	0.0
0.852	0.0
0.899333333	0.0
0.946666667	0.0
1.041333333	0.0
1.136	0.0
1.230666667	0.0
1.325333333	0.0
1.42	0.0
1.514666667	0.0
1.609333333	0.0
1.704	0.0
1.798666667	0.0
1.893333333	0.0
2.13	0.0
2.366666667	0.0



Direct Runoff Depth (QDR) - Pre-Construction 10-Year, 24-Hour Storm - Basin 2

Basin Direct Runoff Hydrograph from Storm Rainfall

Calculate Total Direct Runoff from Design Storm (Pre)

Inputs

Total Rainfall Depth for Design Storm, P = in

Watershed CN value from Worksheet 2, CNII =
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = in

Initial Abstraction Ia=0.2S in

Total Direct Runoff from Design Storm (ARC II), QDRII = in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI =

Potential maximum retention after runoff begins, SIII = in

Total Direct Runoff from Design Storm (ARC I), QDRI = in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII =

Potential maximum retention after runoff begins, SIII = in

Total Direct Runoff from Design Storm (ARC III), QDRIII = in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

AMC II

Total Direct Runoff from Design Storm
to use in Worksheet 4, QDR = in

Direct Runoff Depth (QDR) - Post-Construction 10-Year, 24-Hour Storm - Basin 2

Basin Direct Runoff Hydrograph from Storm Rainfall

Calculate Total Direct Runoff from Design Storm (Post)

Inputs

Total Rainfall Depth for Design Storm, P = 2.26 in

Watershed CN value from Worksheet 2, CNII = 51
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = 9.6 in

Initial Abstraction Ia=0.25 in

Total Direct Runoff from Design Storm (ARC II), QDRII = 0.0115 in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI = 31
Potential maximum retention after runoff begins, SIII = 22.3 in
Total Direct Runoff from Design Storm (ARC I), QDRI = 0.0000 in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII = 70
Potential maximum retention after runoff begins, SIII = 4.3 in
Total Direct Runoff from Design Storm (ARC III), QDRIII = 0.3460 in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

AMC II

Total Direct Runoff from Design Storm
to use in Worksheet 4, QDR = 0.0115 in

Direct Runoff Hydrograph - Pre-Construction 10-Year, 24-Hour Storm - Basin 2

Inputs

Watershed Time of
Concentration, T_c = hr

Watershed Area, A = mi²

Calculations

Direct Runoff Volume
from Storm, QDR = in
(value from Worksheet 3)

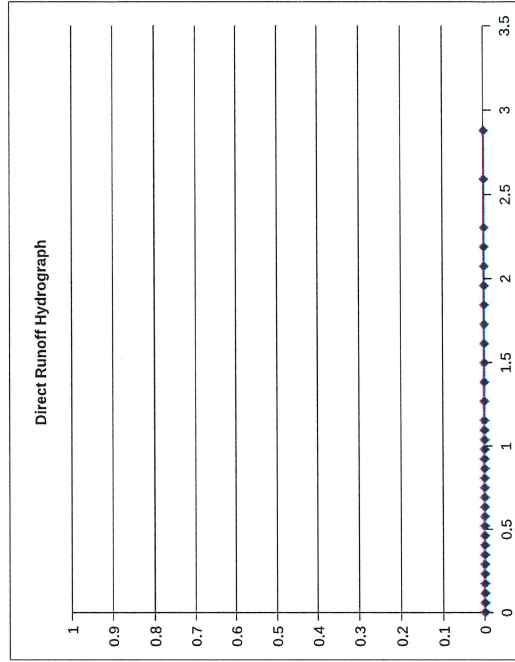
Time to Peak, T_p = hr

Peak Discharge, q_p = cfs

Direct Runoff Hydrograph

Time, hr Flow, cfs

0	0
0.057555556	0.0
0.115111111	0.0
0.172666667	0.0
0.230222222	0.0
0.287777778	0.0
0.345333333	0.0
0.402888889	0.0
0.460444444	0.0
0.518	0.0
0.575555556	0.0
0.633111111	0.0
0.690666667	0.0
0.748222222	0.0
0.805777778	0.0
0.863333333	0.0
0.920888889	0.0
0.978444444	0.0
1.036	0.0
1.093555556	0.0
1.151111111	0.0
1.266222222	0.0
1.381333333	0.0
1.496444444	0.0
1.611555556	0.0
1.726666667	0.0
1.841777778	0.0
1.956888889	0.0
2.072	0.0
2.187111111	0.0
2.302222222	0.0
2.59	0.0
2.877777778	0.0



Direct Runoff Hydrograph - Post-Construction 10-Year, 24-Hour Storm - Basin 2

Inputs

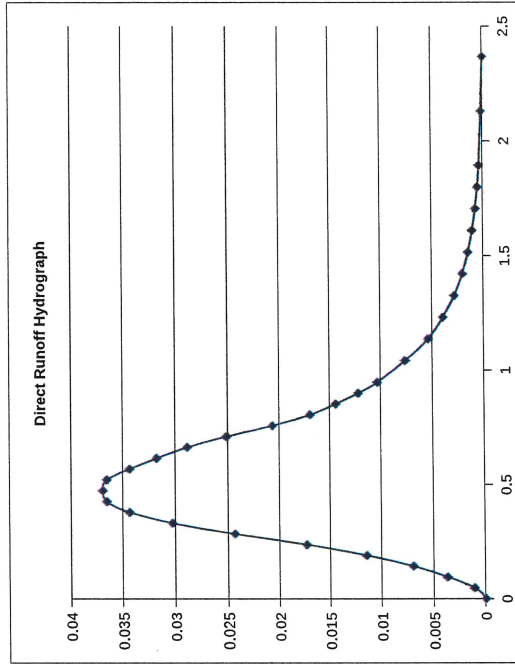
Watershed Time of Concentration, T_c = hr
Watershed Area, A = mi²

Calculations

Direct Runoff Volume from Storm, QDR = in
(value from Worksheet 3)
Time to Peak, T_p = hr
Peak Discharge, q_p = cfs

Direct Runoff Hydrograph

Time, hr	Flow, cfs
0	0
0.047333333	0.0
0.094666667	0.0
0.142	0.0
0.189333333	0.0
0.236666667	0.0
0.284	0.0
0.331333333	0.0
0.378666667	0.0
0.426	0.0
0.473333333	0.0
0.520666667	0.0
0.568	0.0
0.615333333	0.0
0.662666667	0.0
0.71	0.0
0.757333333	0.0
0.804666667	0.0
0.852	0.0
0.899333333	0.0
0.946666667	0.0
1.041333333	0.0
1.136	0.0
1.230666667	0.0
1.325333333	0.0
1.42	0.0
1.514666667	0.0
1.609333333	0.0
1.704	0.0
1.798666667	0.0
1.893333333	0.0
2.13	0.0
2.366666667	0.0



Direct Runoff Depth (QDR) - Pre-Construction 100-Year, 24-Hour Storm - Basin 2

Basin Direct Runoff Hydrograph from Storm Rainfall

Calculate Total Direct Runoff from Design Storm (Pre)

Inputs

Total Rainfall Depth for Design Storm, P = in

Watershed CN value from Worksheet 2, CNII =
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = in

Initial Abstraction Ia=0.2S in

Total Direct Runoff from Design Storm (ARC II), QDRII = in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI =

Potential maximum retention after runoff begins, SIII = in

Total Direct Runoff from Design Storm (ARC I), QDRI = in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII =

Potential maximum retention after runoff begins, SIII = in

Total Direct Runoff from Design Storm (ARC III), QDRIII = in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

AMC II

Total Direct Runoff from Design Storm in
to use in Worksheet 4, QDR =

Direct Runoff Depth (QDR) - Post-Construction 100-Year, 24-Hour Storm - Basin 2

Basin Direct Runoff Hydrograph from Storm Rainfall Calculate Total Direct Runoff from Design Storm (Post)

Inputs

Total Rainfall Depth for Design Storm, P = 3.7 in

Watershed CN value from Worksheet 2, CNII = 51
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = 9.6 in

Initial Abstraction Ia=0.2S 1.9 in

Total Direct Runoff from Design Storm (ARC II), QDRII = 0.2778 in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI = 31
Potential maximum retention after runoff begins, SIII = 22.3 in
Total Direct Runoff from Design Storm (ARC I), QDRI = 0.0000 in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII = 70
Potential maximum retention after runoff begins, SIII = 4.3 in
Total Direct Runoff from Design Storm (ARC III), QDRIII = 1.1337 in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

AMC II

Total Direct Runoff from Design Storm
to use in Worksheet 4, QDR = 0.2778 in

Direct Runoff Hydrograph - Pre-Construction 100-Year, 24-Hour Storm - Basin 2

Inputs

Watershed Time of
Concentration, T_c = hr

Watershed Area, A = mi²

Calculations

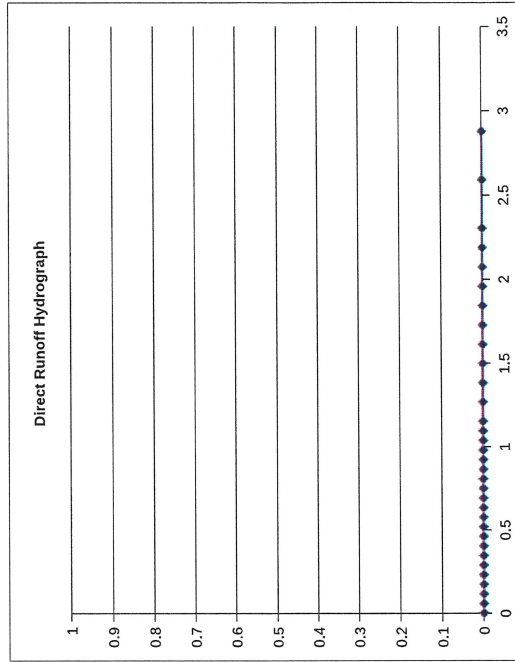
Direct Runoff Volume
from Storm, QDR = in
(value from Worksheet 3)

Time to Peak, T_p = hr

Peak Discharge, q_p = cfs

Direct Runoff Hydrograph

Time, hr	Flow, cfs
0	0
0.057555556	0.0
0.115111111	0.0
0.172666667	0.0
0.230222222	0.0
0.287777778	0.0
0.345333333	0.0
0.402888889	0.0
0.460444444	0.0
0.518	0.0
0.575555556	0.0
0.633111111	0.0
0.690666667	0.0
0.748222222	0.0
0.805777778	0.0
0.863333333	0.0
0.920888889	0.0
0.978444444	0.0
1.036	0.0
1.093555556	0.0
1.151111111	0.0
1.266222222	0.0
1.381333333	0.0
1.496444444	0.0
1.611555556	0.0
1.726666667	0.0
1.841777778	0.0
1.956888889	0.0
2.072	0.0
2.187111111	0.0
2.302222222	0.0
2.59	0.0
2.877777778	0.0



Direct Runoff Hydrograph - Post-Construction 100-Year, 24-Hour Storm - Basin 2

Inputs

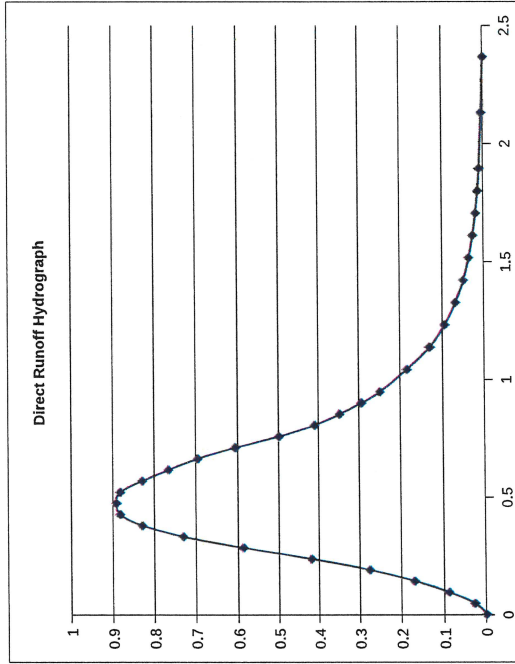
Watershed Time of Concentration, T_c = hr
Watershed Area, A = mi²

Calculations

Direct Runoff Volume from Storm, QDR = in
(value from Worksheet 3)
Time to Peak, T_p = hr
Peak Discharge, q_p = cfs

Direct Runoff Hydrograph

Time, hr	Flow, cfs
0	0
0.047333333	0.0
0.094666667	0.1
0.142	0.2
0.189333333	0.3
0.236666667	0.4
0.284	0.6
0.331333333	0.7
0.378666667	0.8
0.426	0.9
0.473333333	0.9
0.520666667	0.9
0.568	0.8
0.615333333	0.8
0.662666667	0.7
0.71	0.6
0.757333333	0.5
0.804666667	0.4
0.852	0.3
0.899333333	0.3
0.946666667	0.2
1.041333333	0.2
1.136	0.1
1.230666667	0.1
1.325333333	0.1
1.42	0.0
1.514666667	0.0
1.609333333	0.0
1.704	0.0
1.798666667	0.0
1.893333333	0.0
2.13	0.0
2.366666667	0.0



Curve Number (CN) Calculations - Pre-Construction - Basin 3

Determine CN Value for Basin Pre-Construction

SUB-BASIN #3

Option 1: Single Hydrologic Soil-Cover Complex for Watershed:

Curve Number for Watershed, CNII = (NOTE: If the weighted average CN is to be used, this Cell must be blank.)

Option 2: Multiple Hydrologic Soil-Cover Complexes for Watershed:
(Calculation of Weighted Average CN)

Sub Area		Area, A		CNII	A*CNII
No.	(acres)				
1	2.989	Woods	30	89.7	
2	0.740	Brush	35	25.9	
3	0.21	Imper.	83	17.4	
4					
5					
6					
7					
8					
9					
10					
SA =		3.94	SA*CNII =		133.0
Weighted Average CNII =		33.8			
Weighted CNII value=					34

Curve Number (CN) Calculations - Post-Construction - Basin 3

Determine CN Value for Basin Post-Construction

SUB-BASIN #3

Option 1: Single Hydrologic Soil-Cover Complex for Watershed:

Curve Number for Watershed, CNII = (NOTE: If the weighted average CN is to be used, this Cell must be blank.)

Option 2: Multiple Hydrologic Soil-Cover Complexes for Watershed:

(Calculation of Weighted Average CN)

Sub Area No.	Area, A (acres)	CNII	A*CNII
1	2.576	30	77.3
2	0.821	35	28.735
3	0.541	83	44.9
4			
5			
6			
7			
8			
9			
10			
SA =	3.94	SA*CNII =	150.9
Weighted Average CNII =	38.3	Weighted CNII Value =	38

Time of Concentration - Pre-Construction - Basin 3 - NRCS Lag Equation

Calculation of Watershed Time of Concentration Pre-Construction

NOTE: The Time of Concentration is calculated below by several different equations/methods. You will need to provide input information about the watershed and select the Time of Concentration calculated by the method that is most suitable for your watershed.

Time of Concentration using One Equation for Entire Watershed

Inputs

Length of Flow Path, L = ft

Ground Slope, S =

Calculation of TOC using the NRCS Lag Equation:

SCS Lag Equation

Runoff curve number, CN =

Travel Time (TOC), t_t =

min

The SCS Lag equation was developed by the Soil Conservation Service. It from agricultural watersheds and is most valid for rural watersheds.

The NRCS Lag equation: $t = \frac{0.00526[(1000/CN) - 910.7]L^{0.8}}{S^{0.5}}$

Where: L = length of flow path in ft
CN = Runoff Curve Number
S = surface slope in ft

Time of Concentration using More than One Equation

Time of Concentration - Post-Construction - Basin 3 - NRCS Sheet/Shallow Concentrated/Channel Flow Method

B. Calculation of TOC using the NRCS Method

Note that you must subdivide the

watershed into 3 parts, an overland flow, shallow concentrated flow, and a channel flow part

Overland Flow Path Length, L = 150 ft Overland Flow Ground Slope, S = 0.0190 ft/ft Overland Flow Resistance Factor, n = 0.09 24 hour rainfall, P = 1.47 in Overland Flow Travel Time, to = 13.6 min (Calculated using Manning Kinematic Equation)	Shallow Concentrated Flow Path Length, L = 50 ft Shallow Concentrated Flow Ground Slope, S = 0.0734 ft/ft Click on the green cell and the arrow to its right to select the type of surface. Unpaved Surface Shallow Concentrated Flow Velocity, Vsc = 4.37 ft/sec Shallow Concentrated Flow Travel Time, tsc = 0.2 min (Calculated using the Velocity Method)
Channel Flow Path Length, L = 400 ft Channel Flow Ground Slope, S = 0.0722 ft/ft Manning Roughness Coefficient, n = 0.400 Channel Flow Travel Time, tc = 6.04 min	Bankfull Cross-Sectional Area of Flow, A = 15.6 ft² Bankfull Wetted Perimeter, P = 13.50 ft Channel Flow Velocity, Vc = 1.103 ft/sec (calculated using the Manning Equation) NRCS Method Travel Time (TOC), t6 (= to + tsc + tc) = 19.8 min

Selection of Time of Concentration for Stormwater Runoff Calculation

19.8 min

$$t_1 = \frac{0.42 (nL)^{0.8}}{P^{0.5} S^{0.4}}$$
 Manning Kinematic Equation - U.S. units
 t1 = overland sheet flow runoff travel time, min
 n = Manning roughness coefficient, dimensionless
 L = length of the flow path, ft (Max. L should be :
 P = 2 year, 24 hr rainfall, in
 S = ground slope, ft/ft

Equations for NCRS Velocity Method for Shallow Concentrated Flow

t2 = L/(60V)
 for unpaved surface: V = 16.1345S^{0.5}
 for paved surface: V = 20.3282S^{0.5}

where:
 t2 = shallow concentrated flow runoff travel time
 L = length of the flow path, ft
 V = shallow concentrated flow velocity, ft/sec
 S = surface slope, ft/ft

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$
 Manning Equation for Open Channel Flow
 V = Q/A
 R = A/P
 t3 = L/(60V)

Where: Q = channel flow rate, cfs
 V = average velocity of flow, ft/sec
 A = channel cross-sectional area, ft²
 P = wetted perimeter of channel, ft
 S = channel bottom slope, ft/ft
 n = Manning roughness coefficient for channel
 L = Length of Flow Path, ft
 t3 = travel time for channel flow, min

Direct Runoff Depth (QDR) - Pre-Construction 1-Year, 24-Hour Storm - Basin 3

Basin Direct Runoff Hydrograph from Storm Rainfall
Calculate Total Direct Runoff from Design Storm (Pre)

Inputs

Total Rainfal Depth for Design Storm, P = 1.17 in
Watershed CN value from Worksheet 2, CNII = 34
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = 19.6 in
Initial Abstraction Ia=0.2S 3.9 in
Total Direct Runoff from Design Storm (ARC II), QDRII = 0.0000 in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI = 17
Potential maximum retention after runoff begins, SIII = 48.8 in
Total Direct Runoff from Design Storm (ARC I), QDRI = 0.0000 in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII = 53
Potential maximum retention after runoff begins, SIII = 8.9 in
Total Direct Runoff from Design Storm (ARC III), QDRIII = 0.0000 in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

AMC II

Total Direct Runoff from Design Storm
to use in Worksheet 4, QDR = 0.0000 in

Direct Runoff Depth (QDR) - Post-Construction 1-Year, 24-Hour Storm - Basin 3

Basin Direct Runoff Hydrograph from Storm Rainfall Calculate Total Direct Runoff from Design Storm (Post)

Inputs

Total Rainfall Depth for Design Storm, P = in

Watershed CN value from Worksheet 2, CNII =
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = in

Initial Abstraction Ia=0.25 in

Total Direct Runoff from Design Storm (ARC II), QDRII = in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI =
Potential maximum retention after runoff begins, SIII = in
Total Direct Runoff from Design Storm (ARC I), QDRI = in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII =
Potential maximum retention after runoff begins, SIII = in
Total Direct Runoff from Design Storm (ARC III), QDRIII = in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

Total Direct Runoff from Design Storm
to use in Worksheet 4, QDR = in

Direct Runoff Hydrograph - Pre-Construction 1-Year, 24-Hour Storm - Basin 3

Inputs

Watershed Time of Concentration, T_c = hr
Watershed Area, A = mi²

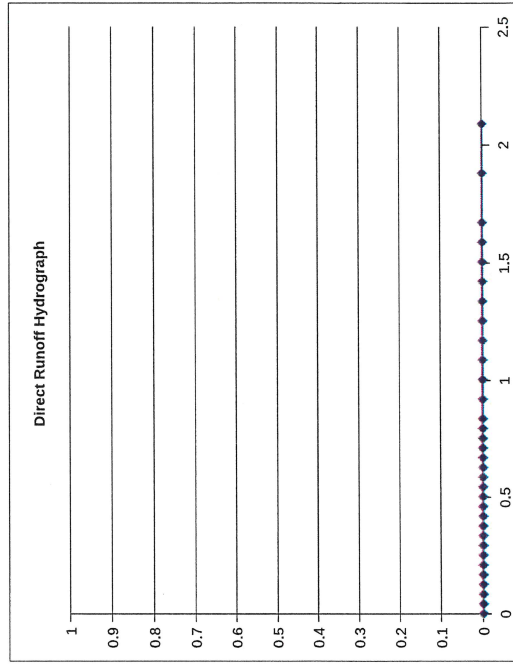
Calculations

Direct Runoff Volume from Storm, QDR = in
(value from Worksheet 3)
Time to Peak, T_p = hr
Peak Discharge, q_p = cfs

Direct Runoff Hydrograph

Time_hr Flow_cfs

0	0
0.041777778	0.0
0.083555556	0.0
0.125333333	0.0
0.167111111	0.0
0.208888889	0.0
0.250666667	0.0
0.292444444	0.0
0.334222222	0.0
0.376	0.0
0.417777778	0.0
0.459555556	0.0
0.501333333	0.0
0.543111111	0.0
0.584888889	0.0
0.626666667	0.0
0.668444444	0.0
0.710222222	0.0
0.752	0.0
0.793777778	0.0
0.835555556	0.0
0.919111111	0.0
1.002666667	0.0
1.086222222	0.0
1.169777778	0.0
1.253333333	0.0
1.336888889	0.0
1.420444444	0.0
1.504	0.0
1.587555556	0.0
1.671111111	0.0
1.88	0.0
2.088888889	0.0



Direct Runoff Hydrograph - Post-Construction 1-Year, 24-Hour Storm - Basin 3

Inputs

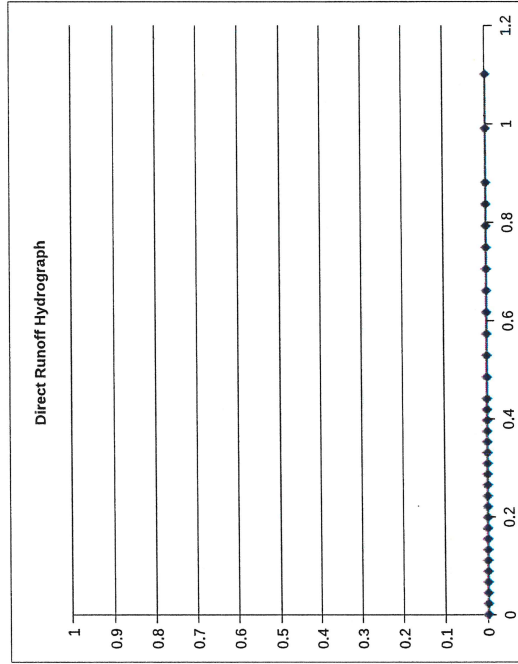
Watershed Time of Concentration, T_c = hr
Watershed Area, A = mi²

Calculations

Direct Runoff Volume from Storm, QDR = in
(value from Worksheet 3)
Time to Peak, T_p = hr
Peak Discharge, q_p = cfs

Direct Runoff Hydrograph

Time, hr	Flow, cfs
0	0
0.022	0.0
0.044	0.0
0.066	0.0
0.088	0.0
0.11	0.0
0.132	0.0
0.154	0.0
0.176	0.0
0.198	0.0
0.22	0.0
0.242	0.0
0.264	0.0
0.286	0.0
0.308	0.0
0.33	0.0
0.352	0.0
0.374	0.0
0.396	0.0
0.418	0.0
0.44	0.0
0.484	0.0
0.528	0.0
0.572	0.0
0.616	0.0
0.66	0.0
0.704	0.0
0.748	0.0
0.792	0.0
0.836	0.0
0.88	0.0
0.99	0.0
1.1	0.0



Direct Runoff Depth (QDR) - Pre-Construction 10-Year, 24-Hour Storm - Basin 3

Basin Direct Runoff Hydrograph from Storm Rainfall

Calculate Total Direct Runoff from Design Storm (Pre)

Inputs

Total Rainfall Depth for Design Storm, P = in

Watershed CN value from Worksheet 2, CNII =
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = in

Initial Abstraction Ia=0.2S in

Total Direct Runoff from Design Storm (ARC II), QDRII = in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI =

Potential maximum retention after runoff begins, SIII = in

Total Direct Runoff from Design Storm (ARC I), QDRI = in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII =

Potential maximum retention after runoff begins, SIII = in

Total Direct Runoff from Design Storm (ARC III), QDRIII = in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

AMC II

Total Direct Runoff from Design Storm
to use in Worksheet 4, QDR = in

Direct Runoff Depth (QDR) - Post-Construction 10-Year, 24-Hour Storm - Basin 3

Basin Direct Runoff Hydrograph from Storm Rainfall

Calculate Total Direct Runoff from Design Storm (Post)

Inputs

Total Rainfall Depth for Design Storm, P = in

Watershed CN value from Worksheet 2, CNII =
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = in

Initial Abstraction Ia=0.2S in

Total Direct Runoff from Design Storm (ARC II), QDRII = in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI = in

Potential maximum retention after runoff begins, SIII = in

Total Direct Runoff from Design Storm (ARC I), QDRI = in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII = in

Potential maximum retention after runoff begins, SIII = in

Total Direct Runoff from Design Storm (ARC III), QDRIII = in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

AMC II

Total Direct Runoff from Design Storm
to use in Worksheet 4, QDR = in

Direct Runoff Hydrograph - Pre-Construction 10-Year, 24-Hour Storm - Basin 3

Inputs

Watershed Time of
Concentration, T_c = hr

Watershed Area, A = mi²

Calculations

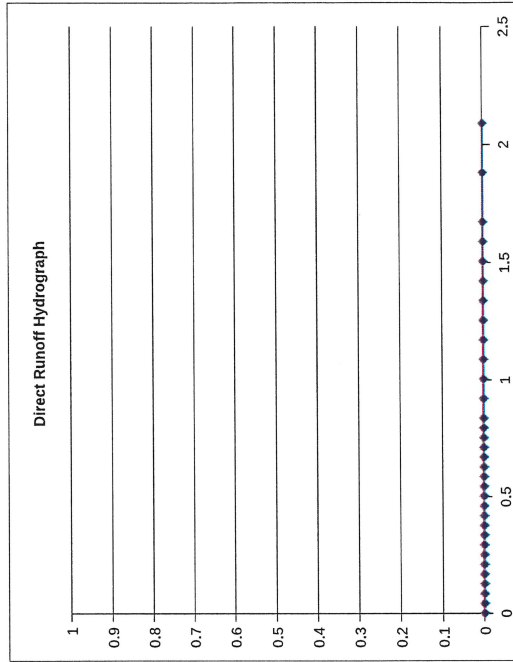
Direct Runoff Volume
from Storm, QDR = in
(value from Worksheet 3)

Time to Peak, T_p = hr

Peak Discharge, q_p = cfs

Direct Runoff Hydrograph

Time, hr	Flow, cfs
0	0
0.041777778	0.0
0.083555556	0.0
0.125333333	0.0
0.167111111	0.0
0.208888889	0.0
0.250666667	0.0
0.292444444	0.0
0.334222222	0.0
0.376	0.0
0.417777778	0.0
0.459555556	0.0
0.501333333	0.0
0.543111111	0.0
0.584888889	0.0
0.626666667	0.0
0.668444444	0.0
0.710222222	0.0
0.752	0.0
0.793777778	0.0
0.835555556	0.0
0.919111111	0.0
1.002666667	0.0
1.086222222	0.0
1.169777778	0.0
1.253333333	0.0
1.336888889	0.0
1.420444444	0.0
1.504	0.0
1.587555556	0.0
1.671111111	0.0
1.88	0.0
2.088888889	0.0



Direct Runoff Hydrograph - Post-Construction 10-Year, 24-Hour Storm - Basin 3

Inputs

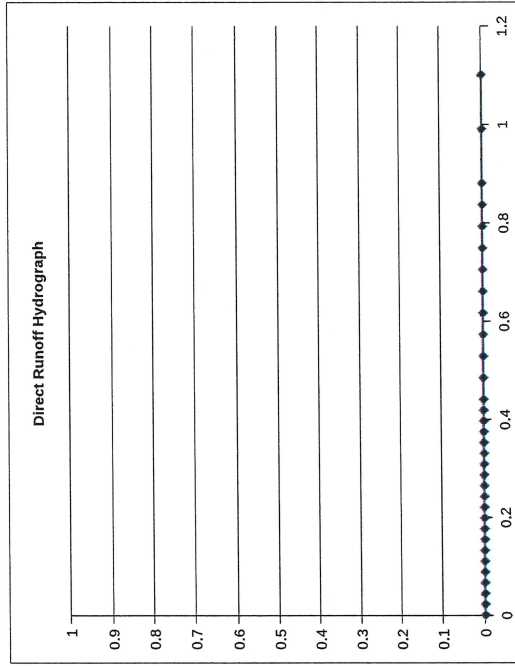
Watershed Time of Concentration, T_c = hr
Watershed Area, A = mi²

Calculations

Direct Runoff Volume from Storm, QDR = in
(value from Worksheet 3)
Time to Peak, T_p = hr
Peak Discharge, q_p = cfs

Direct Runoff Hydrograph

Time, hr	Flow, cfs
0	0
0.022	0.0
0.044	0.0
0.066	0.0
0.088	0.0
0.11	0.0
0.132	0.0
0.154	0.0
0.176	0.0
0.198	0.0
0.22	0.0
0.242	0.0
0.264	0.0
0.286	0.0
0.308	0.0
0.33	0.0
0.352	0.0
0.374	0.0
0.396	0.0
0.418	0.0
0.44	0.0
0.484	0.0
0.528	0.0
0.572	0.0
0.616	0.0
0.66	0.0
0.704	0.0
0.748	0.0
0.792	0.0
0.836	0.0
0.88	0.0
0.99	0.0
1.1	0.0



Direct Runoff Depth (QDR) - Pre-Construction 100-Year, 24-Hour Storm - Basin 3

Basin Direct Runoff Hydrograph from Storm Rainfall

Calculate Total Direct Runoff from Design Storm (Pre)

Inputs

Total Rainfall Depth for Design Storm, P = in

Watershed CN value from Worksheet 2, CNII =
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = in

Initial Abstraction Ia=0.2S in

Total Direct Runoff from Design Storm (ARC II), QDRII = in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI =

Potential maximum retention after runoff begins, SIII = in

Total Direct Runoff from Design Storm (ARC I), QDRI = in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII =

Potential maximum retention after runoff begins, SIII = in

Total Direct Runoff from Design Storm (ARC III), QDRIII = in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

Total Direct Runoff from Design Storm
to use in Worksheet 4, QDR = in

Direct Runoff Depth (QDR) - Post-Construction 100-Year, 24-Hour Storm - Basin 3

Basin Direct Runoff Hydrograph from Storm Rainfall

Calculate Total Direct Runoff from Design Storm (Post)

Inputs

Total Rainfall Depth for Design Storm, P = 3.7 in

Watershed CN value from Worksheet 2, CNII = 38
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = 16.1 in

Initial Abstraction Ia=0.25 in

Total Direct Runoff from Design Storm (ARC II), QDRII = 0.0140 in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI = 21
Potential maximum retention after runoff begins, SIII = 37.6 in
Total Direct Runoff from Design Storm (ARC I), QDRI = 0.0000 in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII = 58
Potential maximum retention after runoff begins, SIII = 7.2 in
Total Direct Runoff from Design Storm (ARC III), QDRIII = 0.5341 in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

AMC II

Total Direct Runoff from Design Storm
to use in Worksheet 4, QDR = 0.0140 in

Direct Runoff Hydrograph - Pre-Construction 100-Year, 24-Hour Storm - Basin 3

Inputs

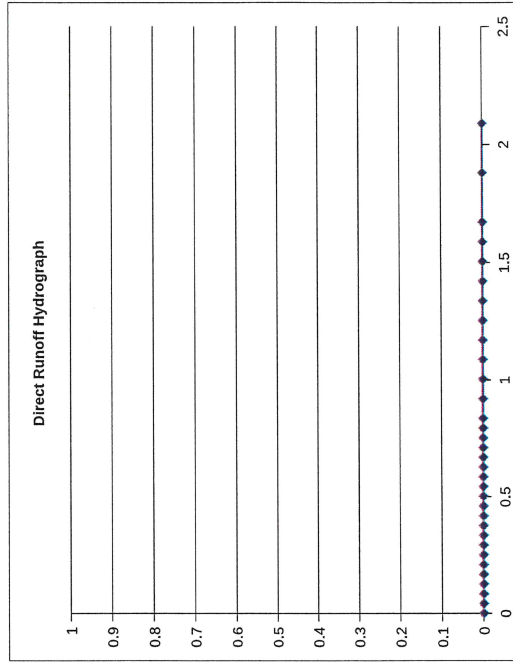
Watershed Time of Concentration, $T_c =$ hr
Watershed Area, $A =$ mi²

Calculations

Direct Runoff Volume from Storm, QDR = in
(value from Worksheet 3)
Time to Peak, $T_p =$ hr
Peak Discharge, $q_p =$ cfs

Direct Runoff Hydrograph

Time, hr	Flow, cfs
0	0
0.041777778	0.0
0.083555556	0.0
0.125333333	0.0
0.167111111	0.0
0.208888889	0.0
0.250666667	0.0
0.292444444	0.0
0.334222222	0.0
0.376	0.0
0.417777778	0.0
0.459555556	0.0
0.501333333	0.0
0.543111111	0.0
0.584888889	0.0
0.626666667	0.0
0.668444444	0.0
0.710222222	0.0
0.752	0.0
0.793777778	0.0
0.835555556	0.0
0.877333333	0.0
0.919111111	0.0
0.960888889	0.0
1.002666667	0.0
1.044444444	0.0
1.086222222	0.0
1.128	0.0
1.169777778	0.0
1.211555556	0.0
1.253333333	0.0
1.295111111	0.0
1.336888889	0.0
1.378666667	0.0
1.420444444	0.0
1.462222222	0.0
1.504	0.0
1.545777778	0.0
1.587555556	0.0
1.629333333	0.0
1.671111111	0.0
1.712888889	0.0
1.754666667	0.0
1.796444444	0.0
1.838222222	0.0
1.88	0.0
2.088888889	0.0



Direct Runoff Hydrograph - Post-Construction 100-Year, 24-Hour Storm - Basin 3

Inputs

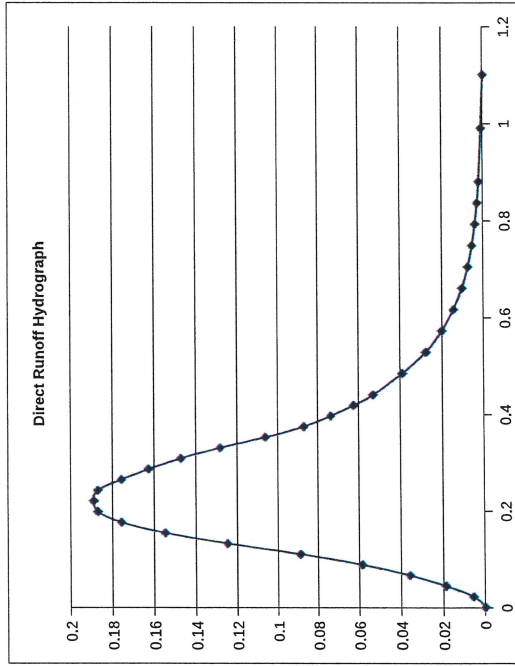
Watershed Time of
Concentration, T_c = hr
Watershed Area, A = mi²

Calculations

Direct Runoff Volume
from Storm, QDR = in
(value from Worksheet 3)
Time to Peak, T_p = hr
Peak Discharge, q_p = cfs

Direct Runoff Hydrograph

Time, hr	Flow, cfs
0	0
0.022	0.0
0.044	0.0
0.066	0.0
0.088	0.1
0.11	0.1
0.132	0.1
0.154	0.2
0.176	0.2
0.198	0.2
0.22	0.2
0.242	0.2
0.264	0.2
0.286	0.2
0.308	0.1
0.33	0.1
0.352	0.1
0.374	0.1
0.396	0.1
0.418	0.1
0.44	0.1
0.484	0.0
0.528	0.0
0.572	0.0
0.616	0.0
0.66	0.0
0.704	0.0
0.748	0.0
0.792	0.0
0.836	0.0
0.88	0.0
0.99	0.0
1.1	0.0



Curve Number (CN) Calculations - Pre-Construction - Basin 4

Determine CN Value for Basin Pre-Construction
SUB-BASIN #4

Option 1: Single Hydrologic Soil-Cover Complex for Watershed:

Curve Number for Watershed, CNII = (NOTE: If the weighted average CN is to be used, this Cell must be blank.)

Option 2: Multiple Hydrologic Soil-Cover Complexes for Watershed:
(Calculation of Weighted Average CN)

Sub Area		Area, A			
No.	(acres)		CNII		A*CNII
1	0.312	Woods	30		9.4
2	0.007	Grass	39		0.273
3					
4					
5					
6					
7					
8					
9					
10					
SA =		0.32	SA*CNII =		9.6
Weighted Average CNII =		30.2	Weighted CNII value=		30

Curve Number (CN) Calculations - Post-Construction - Basin 4

Determine CN Value for Basin Post Construction

SUB-BASIN #4

Option 1: Single Hydrologic Soil-Cover Complex for Watershed:

Curve Number for Watershed, CNII = (NOTE: If the weighted average CN is to be used, this Cell must be blank.)

Option 2: Multiple Hydrologic Soil-Cover Complexes for Watershed:
(Calculation of Weighted Average CN)

Sub Area No.	Area, A (acres)	CNII	A*CNII
1	0.312	30	9.4
2	0.007	39	0.273
3			
4			
5			
6			
7			
8			
9			
10			
SA = 0.32			SA*CNII = 9.6
Weighted Average CNII = 30.2			
Weighted CNII Value =			30

Time of Concentration - Pre-Construction - Basin 4 - NRCS Lag Equation

Calculation of Watershed Time of Concentration Pre-Construction

NOTE: The Time of Concentration is calculated below by several different equations/methods. You will need to provide input information about the watershed and select the Time of Concentration calculated by the method that is most suitable for your watershed.

Time of Concentration using One Equation for Entire Watershed

Inputs

Length of Flow Path, L = ft Ground Slope, S =

Calculation of TOC using the NRCS Lag Equation:

Runoff curve number, CN = SCS Lag Equation Travel Time (TOC), t_t = min

The SCS Lag equation was developed by the Soil Conservation Service. It from agricultural watersheds and is most valid for rural watersheds.

The NRCS Lag equation: $t = 0.00526[(1000/CN) - 910.7]L^{0.8}/S^{0.5}$

Time of Concentration using More than One Equation

Where: L = length of flow path in ft S = surface slope in ft
CN = Runoff Curve Number

Time of Concentration - Post-Construction - Basin 4 - NRCS Lag Equation

Calculation of Watershed Time of Concentration Post-Construction

NOTE: The Time of Concentration is calculated below by several different equations/methods. You will need to provide input information about the watershed and select the Time of Concentration calculated by the method that is most suitable for your watershed.

Time of Concentration using One Equation for Entire Watershed

Inputs

Length of Flow Path, L = 120 ft Ground Slope, S = 0.0895

Calculation of TOC using the NRCS Lag Equation:

Runoff curve number, CN = 30 SCS Lag Equation Travel Time (TOC), t₄ = 7.6 min

The SCS Lag equation was developed by the Soil Conservation Service. It from agricultural watersheds and is most valid for rural watersheds.

The NRCS Lag equation: $t = 0.00526[(1000/CN) - 910.7]L^{0.8}/S^{0.5}$

Where: L = length of flow path in ft S = surface slope in ft
CN = Runoff Curve Number

Time of Concentration using More than One Equation

Direct Runoff Depth (QDR) - Pre-Construction 1-Year, 24-Hour Storm - Basin 4

Basin Direct Runoff Hydrograph from Storm Rainfall
Calculate Total Direct Runoff from Design Storm (Pre)

Inputs

Total Rainfall Depth for Design Storm, P = in
Watershed CN value from Worksheet 2, CNII =
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = in
Initial Abstraction Ia=0.2S in
Total Direct Runoff from Design Storm (ARC II), QDRII = in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI =
Potential maximum retention after runoff begins, SIII = in
Total Direct Runoff from Design Storm (ARC I), QDRI = in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII =
Potential maximum retention after runoff begins, SIII = in
Total Direct Runoff from Design Storm (ARC III), QDRIII = in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

AMC II

Total Direct Runoff from Design Storm
to use in Worksheet 4, QDR = in

Direct Runoff Depth (QDR) - Post-Construction 1-Year, 24-Hour Storm - Basin 4

Basin Direct Runoff Hydrograph from Storm Rainfall Calculate Total Direct Runoff from Design Storm (Post)

Inputs

Total Rainfall Depth for Design Storm, P = 1.17 in

Watershed CN value from Worksheet 2, CNII = 30
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = 23.1 in

Initial Abstraction Ia=0.2S 4.6 in

Total Direct Runoff from Design Storm (ARC II), QDRII = 0.0000 in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI = 15
Potential maximum retention after runoff begins, SIII = 56.7 in
Total Direct Runoff from Design Storm (ARC I), QDRI = 0.0000 in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII = 50
Potential maximum retention after runoff begins, SIII = 10.0 in
Total Direct Runoff from Design Storm (ARC III), QDRIII = 0.0000 in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

AMC II

Total Direct Runoff from Design Storm
to use in Worksheet 4, QDR = 0.0000 in

Direct Runoff Hydrograph - Pre-Construction 1-Year, 24-Hour Storm - Basin 4

Inputs

Watershed Time of
Concentration, T_c = hr

Watershed Area, A = mi²

Calculations

Direct Runoff Volume
from Storm, QDR = in
(value from Worksheet 3)

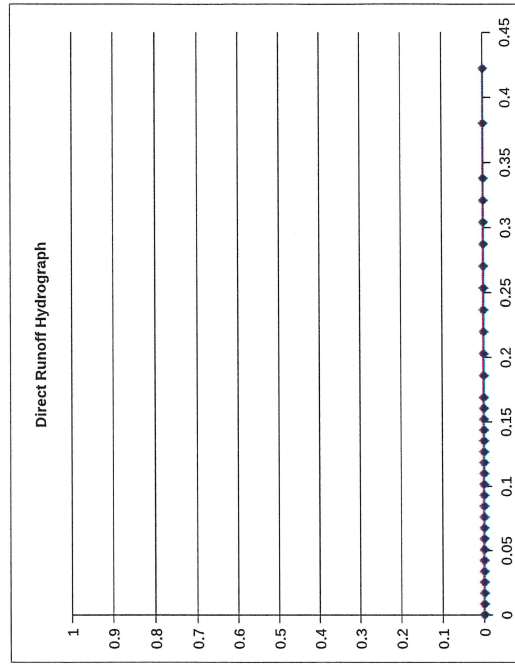
Time to Peak, T_p = hr

Peak Discharge, q_p = cfs

Direct Runoff Hydrograph

Time_hr Flow_cfs

0	0
0.008444444	0.0
0.016888889	0.0
0.025333333	0.0
0.033777778	0.0
0.042222222	0.0
0.050666667	0.0
0.059111111	0.0
0.067555556	0.0
0.076	0.0
0.084444444	0.0
0.092888889	0.0
0.101333333	0.0
0.109777778	0.0
0.118222222	0.0
0.126666667	0.0
0.135111111	0.0
0.143555556	0.0
0.152	0.0
0.160444444	0.0
0.168888889	0.0
0.185777778	0.0
0.202666667	0.0
0.219555556	0.0
0.236444444	0.0
0.253333333	0.0
0.270222222	0.0
0.287111111	0.0
0.304	0.0
0.320888889	0.0
0.337777778	0.0
0.38	0.0
0.422222222	0.0



Direct Runoff Hydrograph - Post-Construction 1-Year, 24-Hour Storm - Basin 4

Inputs

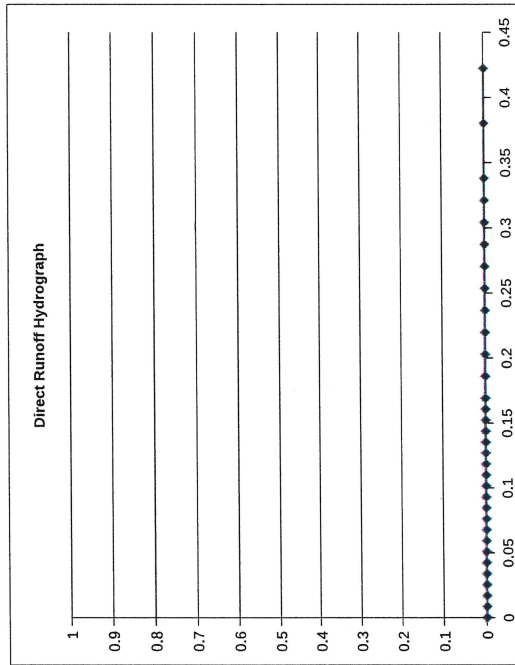
Watershed Time of Concentration, Tc = hr
Watershed Area, A = mi²

Calculations

Direct Runoff Volume from Storm, QDR = in
(value from Worksheet 3)
Time to Peak, Tp = hr
Peak Discharge, qp = cfs

Direct Runoff Hydrograph

Time, hr	Flow, cfs
0	0
0.008444444	0.0
0.016888889	0.0
0.025333333	0.0
0.033777778	0.0
0.042222222	0.0
0.050666667	0.0
0.059111111	0.0
0.067555556	0.0
0.076	0.0
0.084444444	0.0
0.092888889	0.0
0.101333333	0.0
0.109777778	0.0
0.118222222	0.0
0.126666667	0.0
0.135111111	0.0
0.143555556	0.0
0.152	0.0
0.160444444	0.0
0.168888889	0.0
0.185777778	0.0
0.202666667	0.0
0.219555556	0.0
0.236444444	0.0
0.253333333	0.0
0.270222222	0.0
0.287111111	0.0
0.304	0.0
0.320888889	0.0
0.337777778	0.0
0.38	0.0
0.422222222	0.0



Direct Runoff Depth (QDR) - Pre-Construction 10-Year, 24-Hour Storm - Basin 4

Basin Direct Runoff Hydrograph from Storm Rainfall Calculate Total Direct Runoff from Design Storm (Pre)

Inputs

Total Rainfall Depth for Design Storm, P = in
Watershed CN value from Worksheet 2, CNII =
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = in
Initial Abstraction Ia=0.2S in
Total Direct Runoff from Design Storm (ARC II), QDRII = in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI =
Potential maximum retention after runoff begins, SIII = in
Total Direct Runoff from Design Storm (ARC I), QDRI = in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII =
Potential maximum retention after runoff begins, SIII = in
Total Direct Runoff from Design Storm (ARC III), QDRIII = in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

AMC II

Total Direct Runoff from Design Storm
to use in Worksheet 4, QDR = in

Direct Runoff Depth (QDR) - Post-Construction 10-Year, 24-Hour Storm - Basin 4

Basin Direct Runoff Hydrograph from Storm Rainfall Calculate Total Direct Runoff from Design Storm (Post)

Inputs

Total Rainfall Depth for Design Storm, P = 2.26 in
Watershed CN value from Worksheet 2, CNII = 30
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = 23.1 in
Initial Abstraction Ia=0.25 4.6 in
Total Direct Runoff from Design Storm (ARC II), QDRII = 0.0000 in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI = 15
Potential maximum retention after runoff begins, SIII = 56.7 in
Total Direct Runoff from Design Storm (ARC I), QDRI = 0.0000 in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII = 50
Potential maximum retention after runoff begins, SIII = 10.0 in
Total Direct Runoff from Design Storm (ARC III), QDRIII = 0.0066 in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

AMC II

Total Direct Runoff from Design Storm
to use in Worksheet 4, QDR = 0.0000 in

Direct Runoff Hydrograph - Pre-Construction 10-Year, 24-Hour Storm - Basin 4

Inputs

Watershed Time of
Concentration, T_c = hr

Watershed Area, A = mi²

Calculations

Direct Runoff Volume
from Storm, QDR = in
(value from Worksheet 3)

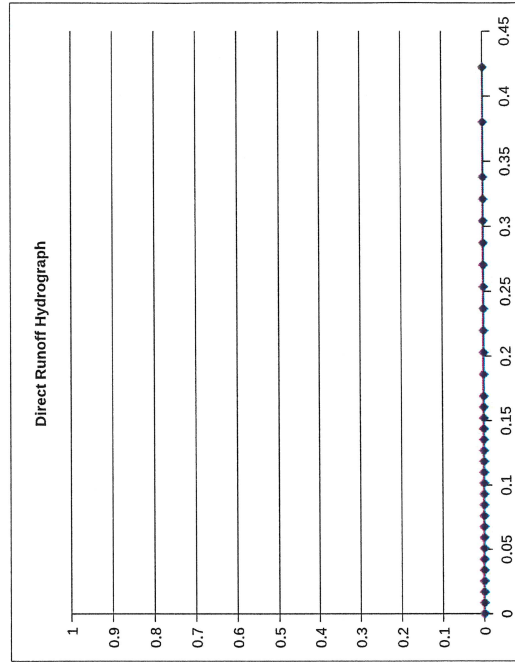
Time to Peak, T_p = hr

Peak Discharge, q_p = cfs

Direct Runoff Hydrograph

Time_hr Flow_cfs

0	0
0.008444444	0.0
0.016888889	0.0
0.025333333	0.0
0.033777778	0.0
0.042222222	0.0
0.050666667	0.0
0.059111111	0.0
0.067555556	0.0
0.076	0.0
0.084444444	0.0
0.092888889	0.0
0.101333333	0.0
0.109777778	0.0
0.118222222	0.0
0.126666667	0.0
0.135111111	0.0
0.143555556	0.0
0.152	0.0
0.160444444	0.0
0.168888889	0.0
0.185777778	0.0
0.202666667	0.0
0.219555556	0.0
0.236444444	0.0
0.253333333	0.0
0.270222222	0.0
0.287111111	0.0
0.304	0.0
0.320888889	0.0
0.337777778	0.0
0.38	0.0
0.422222222	0.0



Direct Runoff Hydrograph - Post-Construction 10-Year, 24-Hour Storm - Basin 4

Inputs

Watershed Time of Concentration, T_c = hr
Watershed Area, A = mi²

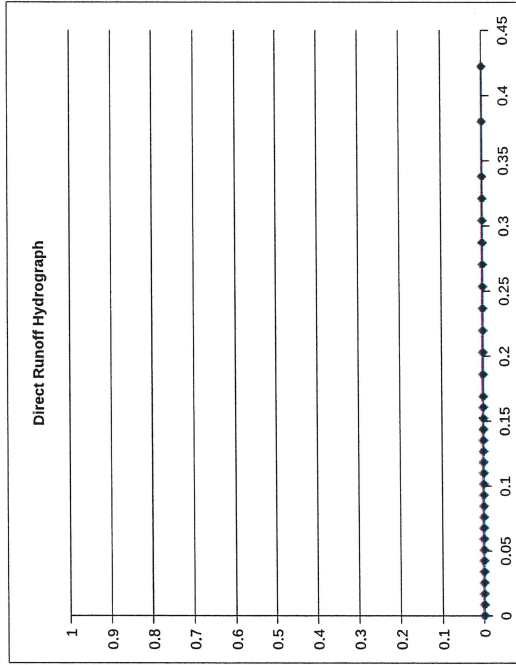
Calculations

Direct Runoff Volume from Storm, QDR = in
(value from Worksheet 3)
Time to Peak, T_p = hr
Peak Discharge, q_p = cfs

Direct Runoff Hydrograph

Time, hr Flow, cfs

0	0
0.008444444	0.0
0.016888889	0.0
0.025333333	0.0
0.033777778	0.0
0.042222222	0.0
0.050666667	0.0
0.059111111	0.0
0.067555556	0.0
0.076	0.0
0.084444444	0.0
0.092888889	0.0
0.101333333	0.0
0.109777778	0.0
0.118222222	0.0
0.126666667	0.0
0.135111111	0.0
0.143555556	0.0
0.152	0.0
0.160444444	0.0
0.168888889	0.0
0.185777778	0.0
0.202666667	0.0
0.219555556	0.0
0.236444444	0.0
0.253333333	0.0
0.270222222	0.0
0.287111111	0.0
0.304	0.0
0.320888889	0.0
0.337777778	0.0
0.38	0.0
0.422222222	0.0



Direct Runoff Depth (QDR) - Pre-Construction 100-Year, 24-Hour Storm - Basin 4

Basin Direct Runoff Hydrograph from Storm Rainfall Calculate Total Direct Runoff from Design Storm (Pre)

Inputs

Total Rainfall Depth for Design Storm, P = in

Watershed CN value from Worksheet 2, CNII =
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = in

Initial Abstraction Ia=0.2S in

Total Direct Runoff from Design Storm (ARC II), QDRII = in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI =
Potential maximum retention after runoff begins, SIII = in
Total Direct Runoff from Design Storm (ARC I), QDRI = in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII =
Potential maximum retention after runoff begins, SII = in
Total Direct Runoff from Design Storm (ARC III), QDRIII = in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

Total Direct Runoff from Design Storm
to use in Worksheet 4, QDR = in

Direct Runoff Depth (QDR) - Post-Construction 100-Year, 24-Hour Storm - Basin 4

Basin Direct Runoff Hydrograph from Storm Rainfall Calculate Total Direct Runoff from Design Storm (Post)

Inputs

Total Rainfall Depth for Design Storm, P = 3.7 in

Watershed CN value from Worksheet 2, CNII = 30
[for antecedent runoff condition II (ARC II) - average conditions]

Calculation of Total Direct Runoff for AMC II:

Potential maximum retention after runoff begins, SII = 23.1 in

Initial Abstraction Ia=0.2S 4.6 in

Total Direct Runoff from Design Storm (ARC II), QDRII = 0.0000 in
[for antecedent runoff condition II (ARC II) - average conditions]

Determination of total direct runoff values for ARC I and ARC III:

Watershed CN value for ARC I, CNI = 15

Potential maximum retention after runoff begins, SIII = 56.7 in
Total Direct Runoff from Design Storm (ARC I), QDRI = 0.0000 in
[for antecedent runoff condition I (ARC I) - drier than average conditions]

Watershed CN value for ARC III, CNIII = 50

Potential maximum retention after runoff begins, SIII = 10.0 in
Total Direct Runoff from Design Storm (ARC III), QDRIII = 0.2470 in
[for antecedent runoff condition III (ARC III) - wetter than average conditions]

Choose which Antecedent Runoff Condition to use in Worksheet 4:

Click on the yellow cell at the right and then
on the arrow to the right of it to select the
Antecedent Runoff Condition to use in
Worksheet 4.

AMC II

Total Direct Runoff from Design Storm
to use in Worksheet 4, QDR = 0.0000 in

Direct Runoff Hydrograph - Pre-Construction 100-Year, 24-Hour Storm - Basin 4

Inputs

Watershed Time of
Concentration, T_c = hr

Watershed Area, A = mi²

Calculations

Direct Runoff Volume
from Storm, QDR = in
(value from Worksheet 3)

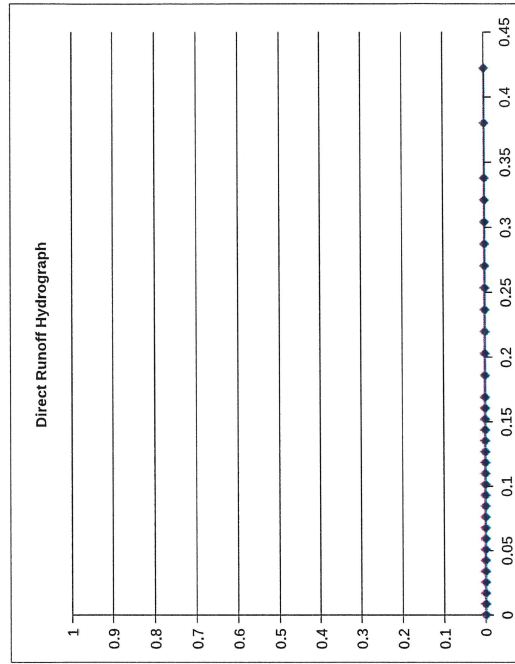
Time to Peak, T_p = hr

Peak Discharge, q_p = cfs

Direct Runoff Hydrograph

Time, hr Flow, cfs

0	0
0.008444444	0.0
0.016888889	0.0
0.025333333	0.0
0.033777778	0.0
0.042222222	0.0
0.050666667	0.0
0.059111111	0.0
0.067555556	0.0
0.076	0.0
0.084444444	0.0
0.092888889	0.0
0.101333333	0.0
0.109777778	0.0
0.118222222	0.0
0.126666667	0.0
0.135111111	0.0
0.143555556	0.0
0.152	0.0
0.160444444	0.0
0.168888889	0.0
0.185777778	0.0
0.202666667	0.0
0.219555556	0.0
0.236444444	0.0
0.253333333	0.0
0.270222222	0.0
0.287111111	0.0
0.304	0.0
0.320888889	0.0
0.337777778	0.0
0.38	0.0
0.422222222	0.0



Direct Runoff Hydrograph - Post-Construction 100-Year, 24-Hour Storm - Basin 4

Inputs

Watershed Time of Concentration, T_c = hr
Watershed Area, A = mi²

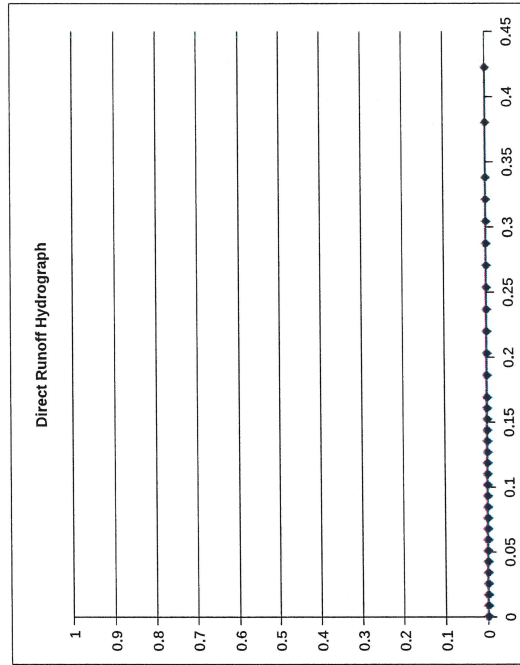
Calculations

Direct Runoff Volume from Storm, QDR = in
(value from Worksheet 3)
Time to Peak, T_p = hr
Peak Discharge, q_p = cfs

Direct Runoff Hydrograph

Time, hr Flow, cfs

0	0
0.008444444	0.0
0.016888889	0.0
0.025333333	0.0
0.033777778	0.0
0.042222222	0.0
0.050666667	0.0
0.059111111	0.0
0.067555556	0.0
0.076	0.0
0.084444444	0.0
0.092888889	0.0
0.101333333	0.0
0.109777778	0.0
0.118222222	0.0
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0.135111111	0.0
0.143555556	0.0
0.152	0.0
0.160444444	0.0
0.168888889	0.0
0.185777778	0.0
0.202666667	0.0
0.219555556	0.0
0.236444444	0.0
0.253333333	0.0
0.270222222	0.0
0.287111111	0.0
0.304	0.0
0.320888889	0.0
0.337777778	0.0
0.38	0.0
0.422222222	0.0



Appendix C

Stormwater Operations & Maintenance

Stormwater Operations and Maintenance Plan Aileron Acres Subdivision

Prepared for Steppers Construction Inc.

1. Purpose

This Stormwater Operations and Maintenance (O&M;) Plan has been prepared for the proposed Aileron Acres Subdivision to provide general inspection, operation, and maintenance guidance for the roadside drainage conveyance system and associated infiltration trench facilities constructed as part of the subdivision improvements. The intent of the drainage system is to collect, convey, attenuate, and infiltrate stormwater runoff generated within the subdivision while minimizing erosion, nuisance ponding, sediment transport, and offsite impacts.

2. Stormwater Facilities

The stormwater management system generally consists of roadside ditch conveyance systems, culverts, and infiltration trench facilities constructed within or adjacent to the ditch alignments. The infiltration trenches are intended to promote infiltration of runoff into native soils and reduce concentrated discharge from the development area. The facilities are intended to function through gravity flow and infiltration and contain no active mechanical components.

3. Responsible Party

Unless otherwise accepted or maintained by a public agency, the stormwater drainage facilities shall be maintained by the property owner, homeowners' association (HOA), or other legally responsible entity established for subdivision maintenance responsibilities. Responsibility for long-term maintenance shall transfer with ownership unless otherwise documented by recorded agreement.

4. Inspection Requirements

The stormwater drainage system should be visually inspected at minimum annually and additionally following major rainfall events, rapid snowmelt events, or spring breakup conditions. Inspections should identify evidence of sediment accumulation, erosion, standing water, clogging, damaged culverts, excessive vegetation growth, settlement, or other conditions that may impair system performance.

5. Maintenance Activities

Routine maintenance activities may include sediment removal from ditches and infiltration trenches, vegetation management, removal of accumulated debris, culvert cleaning, restoration of positive drainage, repair of localized erosion, and replacement or rehabilitation of trench rock where infiltration capacity has substantially diminished over time. Snow storage should be managed to minimize direct placement of sediment-laden snow within infiltration facilities where practicable.

6. Sediment and Erosion Control

Sediment accumulation is anticipated to be the primary long-term maintenance consideration for the infiltration trench facilities. If excessive sediment buildup or standing water is observed for extended durations beyond anticipated drawdown periods, accumulated sediment should be removed and affected trench material replaced or rehabilitated as necessary to restore infiltration performance.

7. Modifications and Alterations

The drainage system, ditch geometry, culverts, and infiltration trenches shall not be altered, filled, blocked, or modified in a manner that adversely impacts drainage performance or runoff conveyance without review by a qualified professional and approval from the applicable governing authority, if required.

8. General Notes

This Operations and Maintenance Plan is intended to provide general guidance for long-term functionality of the subdivision drainage system. Actual maintenance frequency may vary depending on site conditions, seasonal runoff characteristics, sediment loading, and future development patterns. Proper maintenance is necessary to preserve drainage capacity and infiltration performance over time.

Recommended Maintenance Item	Recommended Frequency
General visual inspection	Annually and after major storm events
Sediment/debris removal	As needed
Culvert inspection and cleaning	Annually
Vegetation maintenance	As needed during growing season
Erosion repair	As needed
Infiltration trench rehabilitation	As necessary based on performance

Matthew Goddard

From: Tammy Simmons
Sent: Tuesday, September 29, 2026 3:39 PM
To: Matthew Goddard
Cc: Brad Sworts; Jamie Taylor; Wheeler Nevels; Tammy Simmons
Subject: RE: FW: FW: RFC Aileron Acres (MG)

Hello Matthew,

Thank you for the revised documents. Please note that PD&E will still require a cross culvert. The developer's engineer shall determine the best location and show it on the drainage plan with the drainage report. PD&E has no further comments.

Thank you.

PD&E Review Group

From: Matthew Goddard <Matthew.Goddard@matsu.gov>
Sent: Wednesday, September 23, 2026 10:00 AM
To: Jamie Taylor <Jamie.Taylor@matsu.gov>; Wheeler Nevels <Wheeler.Nevels@matsu.gov>; Tammy Simmons <Tammy.Simmons@matsu.gov>; Pre-Design & Engineering <pde@matsu.gov>
Subject: FW: FW: FW: RFC Aileron Acres (MG)

Good morning PD&E,

I received some updated information on Aileron Acres and am forwarding them to you for your review.

If you could be sure to forward any comments you may have after reviewing these documents no later than October 1st it would be appreciated.

Have a great day,

Matthew Goddard
Platting Specialist
907-861-7881
Matthew.Goddard@matsu.gov

From: Dayna Rumfelt <dayna@lavendersurvey.com>
Sent: Wednesday, September 23, 2026 8:08 AM
To: Matthew Goddard <Matthew.Goddard@matsu.gov>
Cc: Aspen Sanders <aspen@steppersak.com>; Logan Curtis <Logan@panengak.com>; Steve Pannone <steve@panengak.com>
Subject: Re: FW: FW: RFC Aileron Acres (MG)

[EXTERNAL EMAIL - CAUTION: Do not open unexpected attachments or links.]

Matthew Goddard

From: Tammy Simmons
Sent: Tuesday, September 1, 2026 4:00 PM
To: Matthew Goddard
Cc: Brad Sworts; Jamie Taylor; Wheeler Nevels; Tammy Simmons
Subject: RE: RFC Aileron Acres (MG)

Hello Matthew,

PD&E will require a cross culvert under the proposed road, location to be determined later. Sheet C2.0 shows the available sight distance; however, the end points of the sight distance triangles are not located in the center of the approaching lane. Please revise.

Please show how the minimum intersection angle of 70° is met per 2022 Subdivision Construction Manual A09.3.

Please note that Engstrom Road is on the OSHP as a major collector, which requires a minimum right of way width of 80' per 2022 Subdivision Construction Manual B02. PD&E recommends the petitioner voluntarily designate a building setback on the plat to allow for future road expansion per B05.

Thank you.

PD&E Review Group

From: Matthew Goddard <Matthew.Goddard@matsu.gov>
Sent: Monday, August 24, 2026 4:48 PM
To: Myers, Sarah E E (DFG) <sarah.myers@alaska.gov>; Percy, Colton T (DFG) <colton.percy@alaska.gov>; CEPOA-SM-RD-Pagemaster <regpagemaster@usace.army.mil>; president@nlakes.cc; communications@nlakes.cc; secretary@nlakes.cc; davemtp@mtaonline.net; Brian Davis <Brian.Davis@matsu.gov>; Fire Code <Fire.Code@matsu.gov>; noffkejl@gmail.com; Permit Center <Permit.Center@matsu.gov>; Code Compliance <Code.Compliance@matsu.gov>; Kendra Johnson <Kendra.Johnson@matsu.gov>; Land Management <Land.Management@matsu.gov>; Jillian Morrissey <Jillian.Morrissey@matsu.gov>; Tom Adams <Tom.Adams@matsu.gov>; Brad Sworts <Brad.Sworts@matsu.gov>; Jamie Taylor <Jamie.Taylor@matsu.gov>; Wheeler Nevels <Wheeler.Nevels@matsu.gov>; Tammy Simmons <Tammy.Simmons@matsu.gov>; Pre-Design & Engineering <pde@matsu.gov>; Amie Jacobs <Amie.Jacobs@matsu.gov>; Katrina Kline <katrina.kline@matsu.gov>; MSB Farmers <MSB.Farmers@matsu.gov>; Planning <MSB.Planning@matsu.gov>; Alex Strawn <Alex.Strawn@matsu.gov>; Tyler Young <Tyler.Young@matsu.gov>; Taunnie Boothby <Taunnie.Boothby@matsu.gov>; msbaddressing <MSBAddressing@matsu.gov>; eric.r.schuler@usps.gov; Fonov <Fonov@matsu.gov>; Andrew Fraiser <andrew.fraiser@enstarnaturalgas.com>; ROW <row@enstarnaturalgas.com>; Right of Way Dept. <row@mtasolutions.com>; OSP Design Group <ospdesign@gci.com>; mearow@mea.coop
Subject: RFC Aileron Acres (MG)

Hello,

The following link is a request for comments for the proposed Aileron Acres.

Please ensure all comments have been submitted by September 14, 2026, so they can be incorporated in the staff report packet that will be presented during the public hearing.

 [Aileron Acres](#)

Feel free to contact me if you have any questions.

Thank you,

Matthew Goddard
Platting Specialist
907-861-7881
Matthew.Goddard@matsu.gov

Matthew Goddard

From: Matthew Goddard
Sent: Thursday, September 10, 2026 10:12 AM
To: 'Dayna Rumfelt'; Aspen Sanders; Logan Curtis; Steve Pannone
Subject: RE: FW: FW: RFC Aileron Acres (MG)

Good morning Dayna,

This is a request.

Per the 2022 SCM, Section B05 Future Corridors:

Subdivisions shall be designed in a manner that does not conflict with the LRTP or the OSHP.

Subdivisions containing future road corridors identified in the LRTP or OSHP are encouraged to include the future road corridor as part of the road layout of the subdivision.

Building setbacks prohibiting the location of any permanent structure within the future corridor may be voluntarily designated on the final plat. The area within the future road corridor shall be excluded from usable septic area calculations. The area within the future road corridor and building setbacks shall be excluded from usable building calculations.

Have a great day,

Matthew Goddard
Platting Specialist
907-861-7881
Matthew.Goddard@matsu.gov

From: Dayna Rumfelt <dayna@lavendersurvey.com>
Sent: Thursday, September 10, 2026 8:53 AM
To: Matthew Goddard <Matthew.Goddard@matsu.gov>; Aspen Sanders <aspen@steppersak.com>; Logan Curtis <Logan@panengak.com>; Steve Pannone <steve@panengak.com>
Subject: Re: FW: FW: RFC Aileron Acres (MG)

[EXTERNAL EMAIL - CAUTION: Do not open unexpected attachments or links.]

Good morning Matthew,

Thanks for the additional information. Please clarify whether this is a request or a requirement.

Thank you.

Dayna Rumfelt PLS, CFedS
Lavender Survey & Mapping
203 S Cobb St.
Palmer, AK 99645
907.301.5177

www.lavendersurvey.com

<https://www.facebook.com/lavendersurveyandmapping>

For any survey requests, please contact our team at admin@lavendersurvey.com. Thank you!

Lavender's mailing address has changed.

On Thu, Sep 10, 2026 at 8:44 AM Matthew Goddard <Matthew.Goddard@matsu.gov> wrote:

Good morning Dayna,

Please see below DPW's response to your request for clarification.

Matthew Goddard

Platting Specialist

[907-861-7881](tel:907-861-7881)

Matthew.Goddard@matsu.gov

From: Tammy Simmons <Tammy.Simmons@matsu.gov>

Sent: Tuesday, September 8, 2026 2:06 PM

To: Matthew Goddard <Matthew.Goddard@matsu.gov>

Cc: Brad Sworts <Brad.Sworts@matsu.gov>; Jamie Taylor <Jamie.Taylor@matsu.gov>; Wheeler Nevels <Wheeler.Nevels@matsu.gov>; Tammy Simmons <Tammy.Simmons@matsu.gov>

Subject: RE: FW: RFC Aileron Acres (MG)

Hello Matthew,

The preliminary plat show the right of way for Engstrom Road is 60' wide. PD&E requests a 35' building setback along Engstrom Road to allow for future right of way acquisition and road widening.

Thank you.

PD&E Review Group

From: Matthew Goddard <Matthew.Goddard@matsu.gov>
Sent: Friday, September 4, 2026 4:44 PM
To: Jamie Taylor <Jamie.Taylor@matsu.gov>; Wheeler Nevels <Wheeler.Nevels@matsu.gov>; Tammy Simmons <Tammy.Simmons@matsu.gov>; Pre-Design & Engineering <pde@matsu.gov>
Subject: FW: FW: RFC Aileron Acres (MG)

Good afternoon PD&E,

Please see below a request for clarification on your comments made for Aileron Acres.

Thank you,

Matthew Goddard

Platting Specialist

[907-861-7881](tel:907-861-7881)

Matthew.Goddard@matsu.gov

From: Dayna Rumpfelt <dayna@lavendersurvey.com>
Sent: Friday, September 4, 2026 4:11 PM
To: Matthew Goddard <Matthew.Goddard@matsu.gov>; Logan Curtis <Logan@panengak.com>; Aspen Sanders <aspen@steppersak.com>
Subject: Re: FW: RFC Aileron Acres (MG)

[EXTERNAL EMAIL - CAUTION: Do not open unexpected attachments or links.]

Hi Matthew,

Thank you for the feedback from PD&E. Since the existing right-of-way along Engstrom Road is already 80 feet in this area, could PD&E please clarify how much additional building setback they recommend to accommodate potential future road expansion under B05?

Providing the specific setback width being requested would help the petitioner better understand and address PD&E's recommendation.

Dayna Rumfelt PLS, CFedS

Lavender Survey & Mapping

[203 S Cobb St.](#)

[Palmer, AK 99645](#)

[907.301.5177](#)

www.lavendersurvey.com

<https://www.facebook.com/lavendersurveyandmapping>

For any survey requests, please contact our team at admin@lavendersurvey.com. Thank you!

Lavender's mailing address has changed.

On Fri, Sep 4, 2026 at 8:01 AM Matthew Goddard <Matthew.Goddard@matsu.gov> wrote:

Hello Dayna,

Please see below comments received from PD&E regarding Aileron Acres.

Have a great day,

Matthew Goddard

Platting Specialist

[907-861-7881](tel:907-861-7881)

Matthew.Goddard@matsu.gov

From: Tammy Simmons <Tammy.Simmons@matsu.gov>

Sent: Tuesday, September 1, 2026 4:00 PM

To: Matthew Goddard <Matthew.Goddard@matsu.gov>

Cc: Brad Sworts <Brad.Sworts@matsu.gov>; Jamie Taylor <Jamie.Taylor@matsu.gov>; Wheeler Nevels <Wheeler.Nevels@matsu.gov>; Tammy Simmons <Tammy.Simmons@matsu.gov>

Subject: RE: RFC Aileron Acres (MG)

Hello Matthew,

PD&E will require a cross culvert under the proposed road, location to be determined later. Sheet C2.0 shows the available sight distance; however, the end points of the sight distance triangles are not located in the center of the approaching lane. Please revise.

Please show how the minimum intersection angle of 70° is met per 2022 Subdivision Construction Manual A09.3.

Please note that Engstrom Road is on the OSHP as a major collector, which requires a minimum right of way width of 80' per 2022 Subdivision Construction Manual B02. PD&E recommends the petitioner voluntarily designate a building setback on the plat to allow for future road expansion per B05.

Thank you.

PD&E Review Group

From: Matthew Goddard <Matthew.Goddard@matsu.gov>
Sent: Monday, August 24, 2026 4:48 PM
To: Myers, Sarah E E (DFG) <sarah.myers@alaska.gov>; Percy, Colton T (DFG) <colton.percy@alaska.gov>; CEPOA-SM-RD-Pagemaster <regpagemaster@usace.army.mil>; president@nlakes.cc; communications@nlakes.cc; secretary@nlakes.cc; davemtp@mtaonline.net; Brian Davis <Brian.Davis@matsu.gov>; Fire Code <Fire.Code@matsu.gov>; noffkejl@gmail.com; Permit Center <Permit.Center@matsu.gov>; Code Compliance <Code.Compliance@matsu.gov>; Kendra Johnson <Kendra.Johnson@matsu.gov>; Land Management <Land.Management@matsu.gov>; Jillian Morrissey <Jillian.Morrissey@matsu.gov>; Tom Adams <Tom.Adams@matsu.gov>; Brad Sworts <Brad.Sworts@matsu.gov>; Jamie Taylor <Jamie.Taylor@matsu.gov>; Wheeler Nevels <Wheeler.Nevels@matsu.gov>; Tammy Simmons <Tammy.Simmons@matsu.gov>; Pre-Design & Engineering <pde@matsu.gov>; Amie Jacobs <Amie.Jacobs@matsu.gov>; Katrina Kline <katrina.kline@matsu.gov>; MSB Farmers <MSB.Farmers@matsu.gov>; Planning <MSB.Planning@matsu.gov>; Alex Strawn <Alex.Strawn@matsu.gov>; Tyler Young <Tyler.Young@matsu.gov>; Taunnie Boothby <Taunnie.Boothby@matsu.gov>; msbaddressing <MSBAddressing@matsu.gov>; eric.r.schuler@usps.gov; Fonov <Fonov@matsu.gov>; Andrew Fraiser <andrew.fraiser@enstarnaturalgas.com>; ROW <row@enstarnaturalgas.com>; Right of Way Dept. <row@mtasolutions.com>; OSP Design Group <ospdesign@gci.com>; meadow@mea.coop
Subject: RFC Aileron Acres (MG)

Hello,

The following link is a request for comments for the proposed Aileron Acres.

Please ensure all comments have been submitted by September 14, 2026, so they can be incorporated in the staff report packet that will be presented during the public hearing.

 [Aileron Acres](#)

Feel free to contact me if you have any questions.

Thank you,

Matthew Goddard

Platting Specialist

[907-861-7881](tel:907-861-7881)

Matthew.Goddard@matsu.gov

Matthew Goddard

From: Permit Center
Sent: Monday, August 24, 2026 4:51 PM
To: Matthew Goddard
Subject: RE: RFC Aileron Acres (MG)

Each access or encroachment constructed during subdivision road development shall be reported to the Permit Center for documentation. Cluster box pullout locations should be designed using the MSB Standard Drawing – Mailbox Pullouts, and in alignment with lot lines as shown on the plat layout.

Any water system, sewer lines, or street lighting placed in the right-of-way shall require a utility permit.

No other comments from Development Services.

Brandon Tucker
Permit Technician
[Development Services Division](#)
Matanuska-Susitna Borough
350 E Dahlia Ave
Palmer AK 99645
P (907) 861-7871
F (907) 861-8158

From: Matthew Goddard <Matthew.Goddard@matsu.gov>
Sent: Monday, August 24, 2026 4:48 PM
To: Myers, Sarah E E (DFG) <sarah.myers@alaska.gov>; Percy, Colton T (DFG) <colton.percy@alaska.gov>; CEPOA-SM-RD-Pagemaster <regpagemaster@usace.army.mil>; president@nlakes.cc; communications@nlakes.cc; secretary@nlakes.cc; davemtp@mtaonline.net; Brian Davis <Brian.Davis@matsu.gov>; Fire Code <Fire.Code@matsu.gov>; noffkejl@gmail.com; Permit Center <Permit.Center@matsu.gov>; Code Compliance <Code.Compliance@matsu.gov>; Kendra Johnson <Kendra.Johnson@matsu.gov>; Land Management <Land.Management@matsu.gov>; Jillian Morrissey <Jillian.Morrissey@matsu.gov>; Tom Adams <Tom.Adams@matsu.gov>; Brad Sworts <Brad.Sworts@matsu.gov>; Jamie Taylor <Jamie.Taylor@matsu.gov>; Wheeler Nevels <Wheeler.Nevels@matsu.gov>; Tammy Simmons <Tammy.Simmons@matsu.gov>; Pre-Design & Engineering <pde@matsu.gov>; Amie Jacobs <Amie.Jacobs@matsu.gov>; Katrina Kline <katrina.kline@matsu.gov>; MSB Farmers <MSB.Farmers@matsu.gov>; Planning <MSB.Planning@matsu.gov>; Alex Strawn <Alex.Strawn@matsu.gov>; Tyler Young <Tyler.Young@matsu.gov>; Taunnie Boothby <Taunnie.Boothby@matsu.gov>; msbaddressing <MSBAddressing@matsu.gov>; eric.r.schuler@usps.gov; Fonov <Fonov@matsu.gov>; Andrew Fraiser <andrew.fraiser@enstarnaturalgas.com>; ROW <row@enstarnaturalgas.com>; Right of Way Dept. <row@mtasolutions.com>; OSP Design Group <ospdesign@gci.com>; mearow@mea.coop
Subject: RFC Aileron Acres (MG)

Hello,

The following link is a request for comments for the proposed Aileron Acres.
Please ensure all comments have been submitted by September 14, 2026, so they can be incorporated in the staff report packet that will be presented during the public hearing.

 [Aileron Acres](#)

Matthew Goddard

From: Rod Hanson <rod@nlakes.cc>
Sent: Saturday, August 29, 2026 7:47 PM
To: Matthew Goddard
Cc: David Crawford; JOLLEEN COLEMAN; Colleen Vague; Nichole Smith; Mark Saddler; John Miller; Sharon Johnson; Alex Strawn
Subject: Re: RFC Aileron Acres (MG)

[EXTERNAL EMAIL - CAUTION: Do not open unexpected attachments or links.]

To: Matthew Goddard, MSB Platting Department
cc: NLCC Board Members / NL:CC Transportation Committee Members / MSB Planning Director

Mathew,

Thank you for the request for comments. We've reviewed the materials provided as part of the RFC and discussed this proposed development with our membership at the monthly North Lakes Community Council meeting on August 27, 2026. Please include these comments in the meeting packet for the Platting Board.

1. The NLCC does not oppose the development. The engineering analysis appears thorough and complete.
2. We remain concerned about the traffic impact of all developments on Engstrom Road. We ask that any platting action adding traffic to Engstrom include a statement detailing the current Engstrom Road capacity (AADT), the estimated AADT before the development, and the AADT after the development. This transparency is important to the community, the Planning Commission, and to the Borough planners. This statement should be included in all staff reports for platting actions that affect Engstrom traffic load.

Thank you,

Rod Hanson
President, North Lakes Community Council
rod@nlakes.cc
907-841-8735

On Mon, Aug 24, 2026 at 4:48 PM Matthew Goddard <Matthew.Goddard@matsu.gov> wrote:

Hello,

The following link is a request for comments for the proposed Aileron Acres.

Please ensure all comments have been submitted by September 14, 2026, so they can be incorporated in the staff report packet that will be presented during the public hearing.

☐ [Aileron Acres](#)

Feel free to contact me if you have any questions.

Thank you,

Matthew Goddard

Platting Specialist

[907-861-7881](tel:907-861-7881)

Matthew.Goddard@matsu.gov

--

You received this message because you are subscribed to the Google Groups "Secretary" group.

To unsubscribe from this group and stop receiving emails from it, send an email to

secretary+unsubscribe@nlakes.cc.

To view this discussion visit

<https://groups.google.com/a/nlakes.cc/d/msgid/secretary/EA2PR16MB6180D9C8BE3202092E532BA0F3AF2%40EA2PR16MB6180.namprd16.prod.outlook.com>.

Matthew Goddard

From: OSP Design Group <ospdesign@gci.com>
Sent: Tuesday, August 25, 2026 10:51 AM
To: Matthew Goddard
Cc: OSP Design Group
Subject: RE: RFC Aileron Acres (MG)
Attachments: Agenda Plat.pdf

[EXTERNAL EMAIL - CAUTION: Do not open unexpected attachments or links.]

Matthew,

In review GCI has no comments or objections to the plat, attached is the signed plat for your records.

Thanks,

GCI | OSP Design

1001 Northway Dr., 1st Floor, Anchorage, AK 99508

e: OSPDesign@gci.com | w: www.gci.com

From: Matthew Goddard <Matthew.Goddard@matsu.gov>
Sent: Monday, August 24, 2026 4:48 PM
To: Myers, Sarah E E (DFG) <sarah.myers@alaska.gov>; Percy, Colton T (DFG) <colton.percy@alaska.gov>; CEPOA-SM-RD-Pagemaster <regpagemaster@usace.army.mil>; president@nlakes.cc; communications@nlakes.cc; secretary@nlakes.cc; davemtp@mtaonline.net; Brian Davis <Brian.Davis@matsu.gov>; Fire Code <Fire.Code@matsu.gov>; noffkejl@gmail.com; Permit Center <Permit.Center@matsu.gov>; Code Compliance <Code.Compliance@matsu.gov>; Kendra Johnson <Kendra.Johnson@matsu.gov>; Land Management <Land.Management@matsu.gov>; Jillian Morrissey <Jillian.Morrissey@matsu.gov>; Tom Adams <Tom.Adams@matsu.gov>; Brad Sworts <Brad.Sworts@matsu.gov>; Jamie Taylor <Jamie.Taylor@matsu.gov>; Wheeler Nevels <Wheeler.Nevels@matsu.gov>; Tammy Simmons <Tammy.Simmons@matsu.gov>; Pre-Design & Engineering <pde@matsu.gov>; Amie Jacobs <Amie.Jacobs@matsu.gov>; Katrina Kline <katrina.kline@matsu.gov>; MSB Farmers <MSB.Farmers@matsu.gov>; Planning <MSB.Planning@matsu.gov>; Alex Strawn <Alex.Strawn@matsu.gov>; Tyler Young <Tyler.Young@matsu.gov>; Taunnie Boothby <Taunnie.Boothby@matsu.gov>; msbaddressing <MSBAddressing@matsu.gov>; eric.r.schuler@usps.gov; Fonov <Fonov@matsu.gov>; Andrew Fraiser <andrew.fraiser@enstarnaturalgas.com>; ROW <row@enstarnaturalgas.com>; Right of Way Dept. <row@mtasolutions.com>; OSP Design Group <ospdesign@gci.com>; mearow@mea.coop
Subject: RFC Aileron Acres (MG)

[EXTERNAL EMAIL - CAUTION: Do not open unexpected attachments or links.]

Hello,

The following link is a request for comments for the proposed Aileron Acres.

Please ensure all comments have been submitted by September 14, 2026, so they can be incorporated in the staff report packet that will be presented during the public hearing.

Matthew Goddard

From: Holly Sparrow <hsparrow@mtasolutions.com>
Sent: Tuesday, August 25, 2026 11:38 AM
To: Matthew Goddard
Subject: RE: RFC Aileron Acres (MG)

[EXTERNAL EMAIL - CAUTION: Do not open unexpected attachments or links.]

Hello,

MTA has no comments for Aileron Acres.

Thank you for the opportunity to comment.

Holly Sparrow, Sr. Right of Way Agent

1740 S. Chugach St., Palmer, Alaska 99645

Office: (907) 761-2599 | www.mtasolutions.com



From: Matthew Goddard <Matthew.Goddard@matsu.gov>
Sent: Monday, August 24, 2026 4:48 PM
To: Myers, Sarah E E (DFG) <sarah.myers@alaska.gov>; Percy, Colton T (DFG) <colton.percy@alaska.gov>; CEPOA-SM-RD-Pagemaster <regpagemaster@usace.army.mil>; president@nlakes.cc; communications@nlakes.cc; secretary@nlakes.cc; davemtp@mtaonline.net; Brian Davis <Brian.Davis@matsu.gov>; Fire Code <Fire.Code@matsu.gov>; noffkejl@gmail.com; Permit Center <Permit.Center@matsu.gov>; Code Compliance <Code.Compliance@matsu.gov>; Kendra Johnson <Kendra.Johnson@matsu.gov>; Land Management <Land.Management@matsu.gov>; Jillian Morrissey <Jillian.Morrissey@matsu.gov>; Tom Adams <Tom.Adams@matsu.gov>; Brad Sworts <Brad.Sworts@matsu.gov>; Jamie Taylor <Jamie.Taylor@matsu.gov>; Wheeler Nevels <Wheeler.Nevels@matsu.gov>; Tammy Simmons <Tammy.Simmons@matsu.gov>; Pre-Design & Engineering <pde@matsu.gov>; Amie Jacobs <Amie.Jacobs@matsu.gov>; Katrina Kline <katrina.kline@matsu.gov>; MSB Farmers <MSB.Farmers@matsu.gov>; Planning <MSB.Planning@matsu.gov>; Alex Strawn <Alex.Strawn@matsu.gov>; Tyler Young <Tyler.Young@matsu.gov>; Taunnie Boothby <Taunnie.Boothby@matsu.gov>; msbaddressing <MSBAddressing@matsu.gov>; eric.r.schuler@usps.gov; Fonov <Fonov@matsu.gov>; Andrew Fraiser <andrew.fraiser@enstarnaturalgas.com>; ROW <row@enstarnaturalgas.com>; Right of Way Dept. <row@mtasolutions.com>; OSP Design Group <ospdesign@gci.com>; mearow@mea.coop
Subject: RFC Aileron Acres (MG)

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hello,

MATANUSKA-SUSITNA BOROUGH
PLATTING DIVISION
350 EAST DAHLIA AVENUE
PALMER, ALASKA 99645

58090803L006 84
RUHL BRUCE D & LISA K
7587 E OBSIDIAN LOOP
WASILLA, AK 99654

NOTIFICATION OF PUBLIC HEARING

The Matanuska-Susitna Borough Platting Board will consider the following:

PETITIONER/OWNER: BARBARA DOTY / D.E. SOUTHFORK LLC

REQUEST: The request is to create 6 lots from Tract E, Aero on Wolf Lake Phase II Addition 1, Plat #91-11, to be known as **AILERON ACRES**, containing 8.71 acres +/- . The property is located south of E. Beechcraft Road, west of N. Engstrom Road, and directly north of E. Hart Lake Loop (Tax ID #3778000T00E); within the NE ¼ Section 21, Township 18 North, Range 01 East, Seward Meridian, Alaska. In the North Lakes Community Council and in Assembly District #6.

The Matanuska-Susitna Borough Platting Board will hold a public hearing in the Assembly Chambers at the Dorothy Swanda Jones Building, 350 E. Dahlia Avenue, Palmer, Alaska on the proposed Subdivision. The public hearing is scheduled for **October 15, 2026**, starting at 1:00 p.m. We are sending you this notice as required by State Law and Borough Ordinances.

For comments regarding the proposed action, this form may be used for your convenience by filling in the information below and mail this notice to the MSB Platting Division, 350 E. Dahlia Avenue, Palmer, Alaska 99645 or e-mail: platting@matsugov.us. Comments received from the public after the platting packet has been written will be given to the Platting Board in a "Hand-Out" the day of the meeting. **All public comments are due one (1) day prior, by 12:00 p.m.** To request additional information please contact the Platting Technician, Matthew Goddard at (907) 861-7881. To view the agenda or meeting packet please go to the following link: <https://matsu.gov/boards/platting-board>.

☐ No Objection ☐ Objection ☒ Concern

Name: Bruce+Lisa Kuhl Address: 7587 E. Obsidian Loop

Comments: Our concern is the intersection of Bagart and Engstrom. Needs a stop light or Rd. About. If There is a traffic control in place, Build all you want.

Bruce+Lisa Kuhl

9-23-26

Case # 2026-101 MG

Note: Vicinity map Located on Reverse Side

CERTIFICATE OF OWNERSHIP

I HEREBY CERTIFY THAT I AM THE OWNER OF THE PROPERTY SHOWN AND DESCRIBED ON THIS PLAN AND THAT I ADOPT THIS PLAN OF SUBDIVISION BY MY FREE CONSENT.

D.E. SOUTHFORK, LLC
6382 E. BEECHCRAFT RD
WASILLA, ALASKA 99654

DATE

NOTARY ACKNOWLEDGMENT

SUBSCRIBED AND SWORN TO BEFORE ME THIS ____ DAY OF _____, 2026.

FOR: _____

NOTARY FOR THE STATE OF ALASKA MY COMMISSION EXPIRES

PLANNING & LAND USE DIRECTOR'S CERTIFICATE

I HEREBY CERTIFY THAT THIS SUBDIVISION PLAN HAS BEEN FOUND TO COMPLY WITH THE LAND SUBDIVISION REGULATIONS OF THE MATANUSKA-SUSITNA BOROUGH, AND THAT THE PLAT HAS BEEN APPROVED BY THE PLATTING AUTHORITY BY PLAT RESOLUTION NO. _____ DATED _____, 2026, AND THAT THIS PLAT HAS BEEN APPROVED FOR RECORDING IN THE PALMER RECORDING DISTRICT, THIRD JUDICIAL DISTRICT, STATE OF ALASKA, IN WHICH THE PLAT IS LOCATED.

PLANNING & LAND USE DIRECTOR

DATE

ATTEST: _____
PLATTING CLERK

CERTIFICATION OF PAYMENT OF TAXES

I HEREBY CERTIFY THAT ALL CURRENT TAXES AND SPECIAL ASSESSMENTS, THROUGH _____, 2026, AGAINST THE PROPERTY, INCLUDED IN THE SUBDIVISION OR RESUBDIVISION, HEREON HAVE BEEN PAID.

MATANUSKA-SUSITNA BOROUGH TAX COLLECTION OFFICIAL

DATE

NOTES:

- ALL BEARINGS SHOWN ARE TRUE BEARINGS SHOWN AS ORIENTED TO THE BASIS OF BEARING AND THE DISTANCES SHOWN ARE REDUCED TO HORIZONTAL FIELD DISTANCE.
- RECORD DIMENSIONS () ON THIS PLAT ARE FROM PLAT No. 91-11 EXCEPT WHERE OTHERWISE NOTED.
- NO INDIVIDUAL WATER SUPPLY SYSTEM OR SEWAGE DISPOSAL SYSTEM SHALL BE PERMITTED ON ANY LOT UNLESS THE SYSTEM IS LOCATED, CONSTRUCTED AND EQUIPPED IN ACCORDANCE WITH THE REQUIREMENTS, STANDARDS AND RECOMMENDATIONS OF THE STATE OF ALASKA, DEPARTMENT OF ENVIRONMENTAL CONSERVATION, WHICH GOVERNS THOSE SYSTEMS.
- THERE MAY BE FEDERAL, STATE AND LOCAL REQUIREMENTS GOVERNING LAND USE. IT IS THE RESPONSIBILITY OF THE INDIVIDUAL PARCEL OWNER TO OBTAIN A DETERMINATION WHETHER SUCH REQUIREMENTS APPLY TO THE DEVELOPMENT OF PARCELS SHOWN HEREON.

LEGEND

- FOUND 2-1/2" BRASS MONUMENT
- FOUND 1/2" REBAR
- SET 5/8" X 30" REBAR WITH ORANGE PLASTIC CAP
- SURVEYED
- UNSURVEYED

N 89°59'09" E 670.00' MEASURED

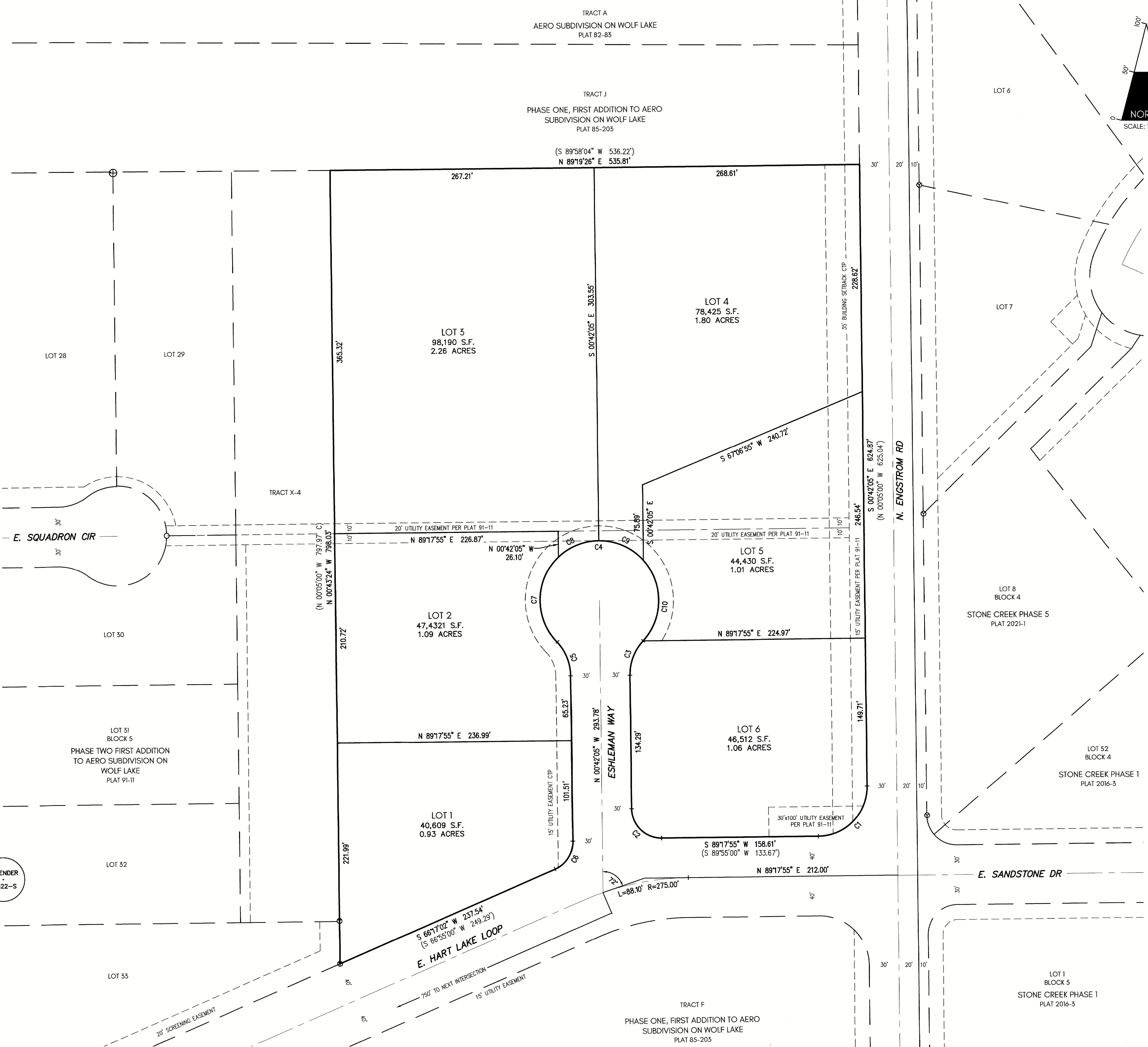
(N 89°59'00" E 670.00') RECORD DATA PER PLAT 91-11

(360.00' C) COMPUTED DATA PER PLAT 91-11

SURVEYOR'S CERTIFICATE

I CERTIFY THAT I AM PROPERTY REGISTERED AND LICENSED TO PRACTICE LAND SURVEYING IN THE STATE OF ALASKA, THAT THIS PLAT REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECT SUPERVISION, THAT THE MONUMENTS SHOWN EXIST AS DESCRIBED, AND THAT ALL DIMENSIONS AND OTHER DETAILS ARE CORRECT.

DATE: _____ REGISTRATION No. 13522



CURVE TABLE						
CURVE	LENGTH	RADIUS	DELTA	CHORD BEARING	CHORD	TANGENT
C1	78.54'	50.00'	90°00'00"	N 44°17'55" E	70.71'	50.00'
C2	47.12'	30.00'	90°00'00"	S 45°42'05" E	42.43'	30.00'
C3	37.82'	50.00'	43°20'30"	S 20°58'10" W	36.83'	19.87'
C4	278.27'	60.00'	266°41'01"	S 89°17'55" W	87.27'	63.58'
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C7	94.64'	60.00'	90°22'12"	S 01°06'30" W	85.13'	60.39'
C8	45.00'	60.00'	42°58'19"	S 67°46'45" W	43.95'	23.62'
C9	50.88'	60.00'	48°35'25"	N 66°24'23" W	49.37'	27.08'
C10	88.75'	60.00'	84°45'05"	N 00°15'52" E	80.88'	54.74'

PLAT OF
AILERON ACRES
A SUBDIVISION OF TRACT E, PHASE TWO FIRST ADDITION
TO AERO SUBDIVISION ON WOLF LAKE, PLAT 91-11,
PALMER RECORDING DISTRICT, THIRD JUDICIAL DISTRICT, STATE OF ALASKA
LOCATED WITHIN
NE1/4 OF SECTION 21, TOWNSHIP 18 NORTH, RANGE 1 EAST,
SEWARD MERIDIAN, ALASKA,
CONTAINING 8.71 ACRES, MORE OR LESS.

LAVENDER
SURVEY & MAPPING
720 N. YETI STREET, PALMER, AK 99645
DAYNA@LAVENDERSURVEY.COM (907)301-5177

DRAWN BY: SPK GRID: WA07 FB: 2026- DATE: 9/23/2026
CHECKED BY: DMR FILE: 25-629 SCALE: 1" = 50' SHEET: 1 OF 1

CERTIFICATE OF OWNERSHIP
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D.E. SOUTHFORK, LLC DATE _____
6382 E. BEECHCRAFT RD
WASILLA, ALASKA 99654

NOTARY ACKNOWLEDGMENT
SUBSCRIBED AND SWORN TO BEFORE ME THIS _____ DAY OF _____, 2026.

FOR: _____

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PLANNING & LAND USE DIRECTOR DATE _____

ATTEST: _____
PLATTING CLERK

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MATANUSKA-SUSITNA BOROUGH TAX COLLECTION OFFICIAL DATE _____

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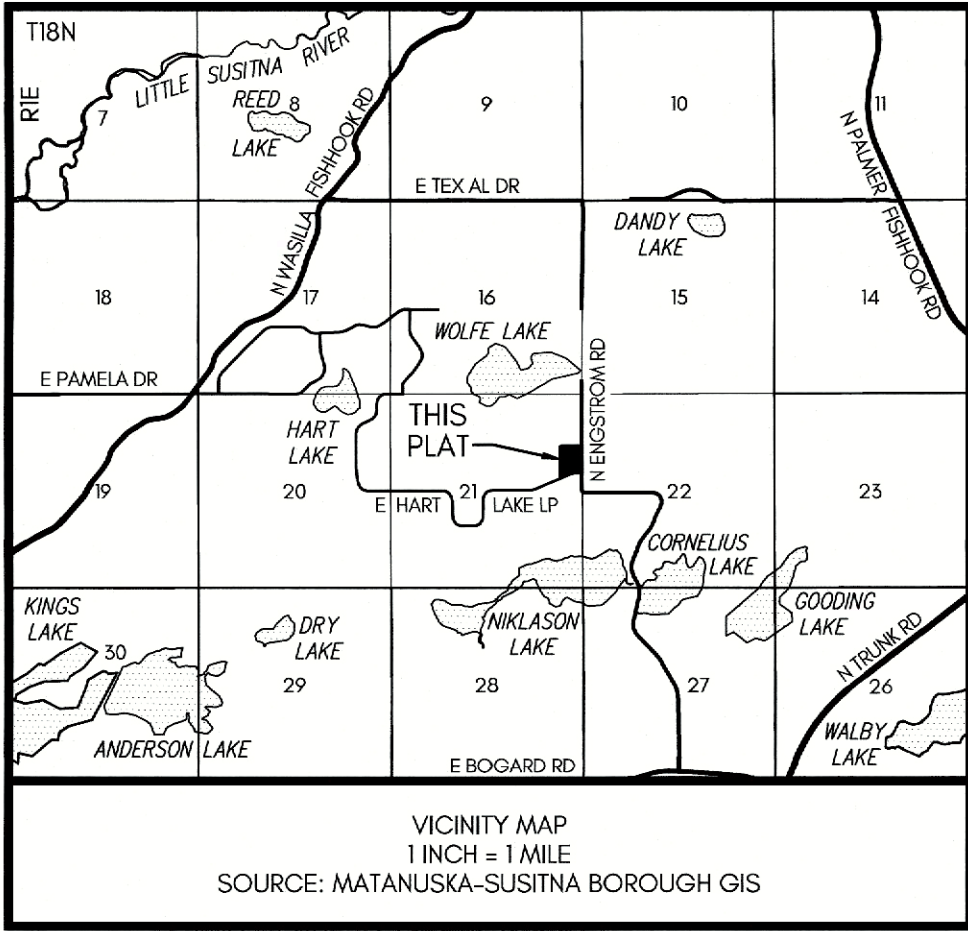
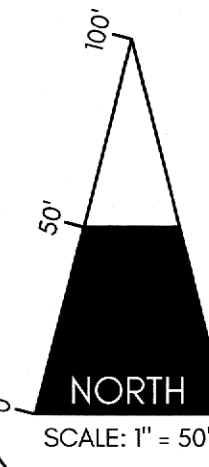
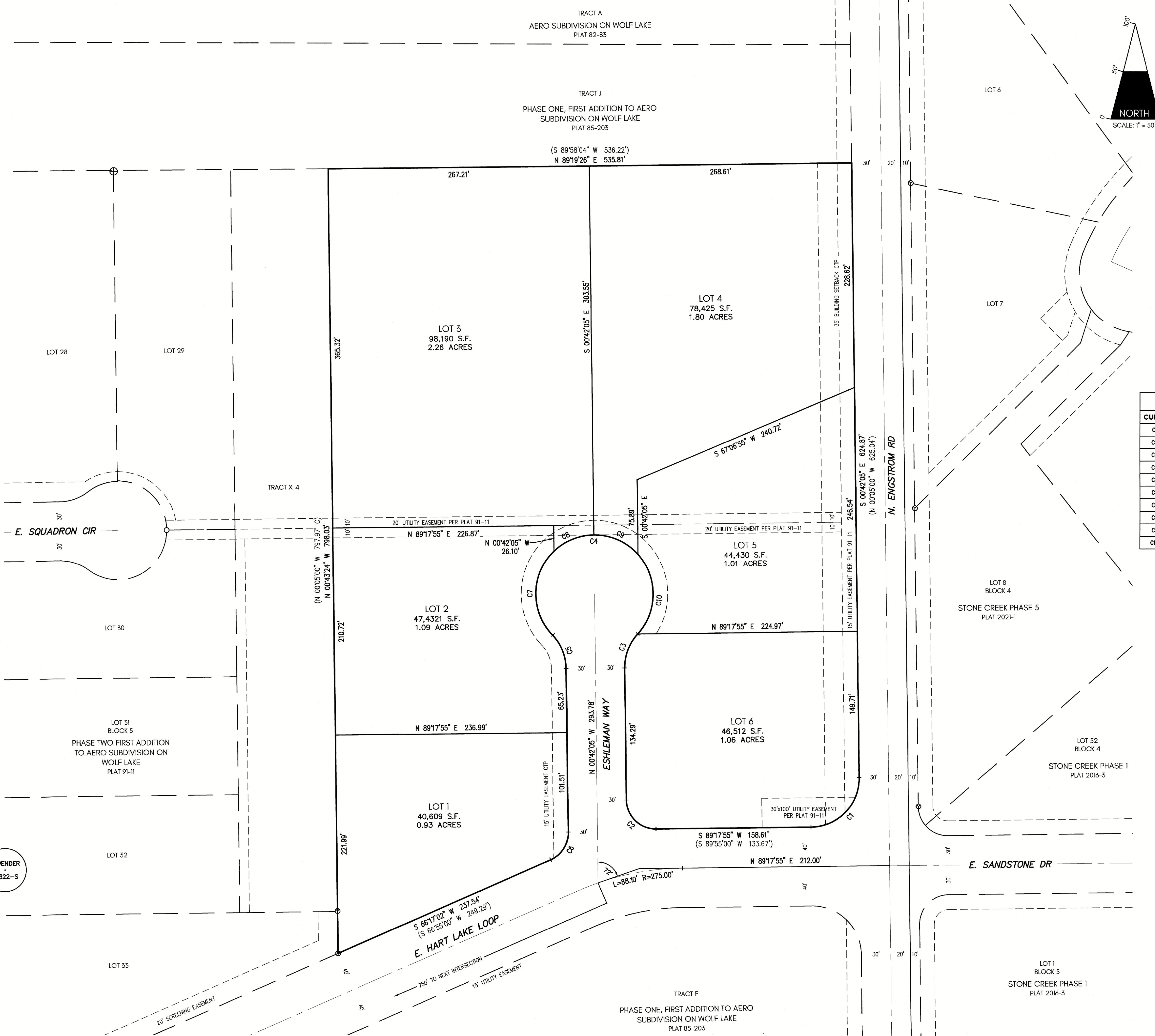
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DATE: _____ REGISTRATION No. 13322



CURVE TABLE							
CURVE	LENGTH	RADIUS	DELTA	CHORD BEARING	CHORD	TANGENT	
C1	78.54'	50.00'	90°00'00"	N 44°17'55" E	70.71'	50.00'	
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Agenda Copy

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AILERON ACRES
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CONTAINING 8.71 ACRES, MORE OR LESS.

LAVENDER

SURVEY & MAPPING
720 N. YETI STREET, PALMER, AK 99645
DAYNA@LAVENDERSURVEY.COM (907)301-5177

DRAWN BY: SPK	GRID: WA07	FB: 2026--	DATE: 9/23/2026
CHECKED BY: DMR	FILE: 25--629	SCALE: 1" = 50'	SHEET: 1 OF 1