APPENDIX I

Water Resources



A	р	ре	n d	iх	I -	Wa	ter	R	e s	s o	u	rс	е	S

THIS PAGE INTENTIONALLY LEFT BLANK

Table of Contents

Appendix I.1 Agency Correspondence

Appendix I.2 Water Resources Report

A	р	ре	n d	iх	I -	Wa	ter	R	e s	s o	u	rс	е	S

THIS PAGE INTENTIONALLY LEFT BLANK

Appendix I - Water Resources	
	Appendix I.1
	Agency Correspondence

A	р	ре	n d	iх	I -	Wa	ter	R	e s	s o	u	rс	е	S

THIS PAGE INTENTIONALLY LEFT BLANK

From: Carroll, Daniel < Daniel. Carroll@rsandh.com>

Sent: Tuesday, March 4, 2025 12:54 PM

To: scott.wilson@dnr.iowa.gov; floodplain-help@dnr.iowa.gov

Cc: Gentile, Nicholas <Nicholas.Gentile@rsandh.com>; Barrow, Julie <Julie.Barrow@rsandh.com>; Christopher, Darren <Darren.Christopher@rsandh.com>

Subject: NEPA/EA Early Agency Coordination Letter - Sioux Gateway Airport Runway Program

Mr. Wilson,

As a part of the Environmental Assessment associated with the Runway Program at the Sioux Gateway Airport, the attached document is the agency scoping document that was sent to all agencies in April 2024 that had jurisdiction over environmental resources that could be affected by the proposed project. At the time of agency scoping, floodplains were not identified as an environmental resource that could be affected. However, since agency scoping, the FEMA FIRMs have been revised, and the proposed project could now affect floodplains. Please review the information for project background only, as some of the information in this document is out of date (i.e., schedule) and let us know if you have any questions.

Thanks and we appreciate your cooperation in advance.

Dan

Daniel Carroll, PE

Senior Engineer, Water Resources 436 S Main St, Plymouth, MI 48170 O 734-456-7063 | M 313-300-3868 From: Ron Kueny <rkueny@sioux-city.org> Sent: Thursday, April 17, 2025 2:49 PM

To: Carroll, Daniel < Daniel. Carroll@rsandh.com>

Cc: Gentile, Nicholas <Nicholas.Gentile@rsandh.com>; Barrow, Julie <Julie.Barrow@rsandh.com>; Christopher, Darren <Darren.Christopher@rsandh.com>

Subject: [External] RE: SUX EA: City Coordination on Floodplains Impact

External Sender: Please use caution vith links and attachments

Mr. Carroll,

I am in receipt of your request and apologize for the delayed response. I've been out of the office for some time due to an unexpected family matter. Please note that the City of Sioux City floodplain requirements do align with FEMA's and IDNR's so I would concur that meeting those floodplain requirements will also satisfactorily meet the City of Sioux City's floodplain requirements. A local floodplain development permit will be required. Documentation submitted to the IDNR is typically the same/similar to the information required to be submitted for this permit. Also, note there is no cost for this permit but we do need to have it on file before work begins.

Any questions please advise.

Thanks, Ron

Ron Kueny

Zoning Enforcement Officer

City of Sioux City 405 6th Street P.O. Box 447 Sioux City, IA 51102

Phone # 712-279-6226

From: Carroll, Daniel < Daniel.Carroll@rsandh.com>

Sent: Wednesday, March 19, 2025 3:41 PM

To: Ron Kueny < rkueny@sioux-city.org >

Cc: Gentile, Nicholas < Nicholas .Gentile@rsandh.com >; Barrow, Julie < Julie.Barrow@rsandh.com >; Christopher, Darren < Darren .Christopher@rsandh.com >

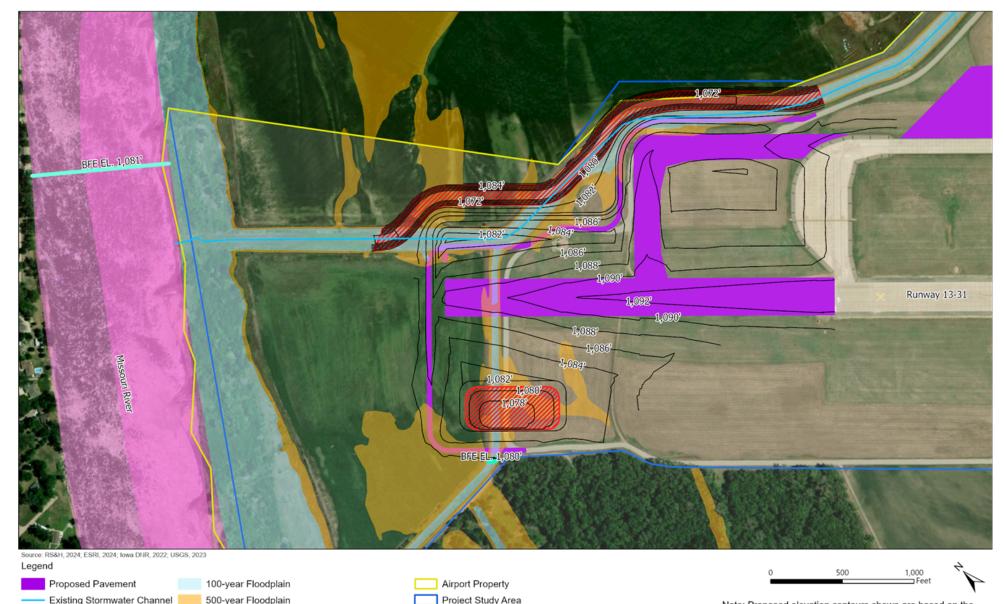
Subject: SUX EA: City Coordination on Floodplains Impact

CAUTION: This email originated from OUTSIDE of the organization. Please verify the sender and use caution if the message contains any attachments, links, or requests for information as this person may NOT be who they claim. If you are asked for your username and password, please call WCICC and DO NOT ENTER any data.

As mentioned in previous correspondence, the SUX NEXUS project intends to impact the 100-year floodplain at the Sioux City Airport. The proposed improvements intend to comply with relevant FEMA and IDNR floodplain criteria. We are requesting concurrence that meeting the floodplain requirements of both FEMA and the IDNR would be satisfactory to meet City requirements.

The proposed improvements will result in encroachment into the FEMA-delineated 100-year floodplain in both the reshaping of the major drainageway at the along the northern boundary of the airfield and as a result of filling drainage ditch in the area of the north end runway extension. The proposed improvements will create compensatory flood storage areas below the 100-year BFE as part of the proposed improvements. This area will contain approximately 4,700 cubic yards of flood storage.

Prior to construction, the Airport will obtain relevant IDNR Floodplain Permits that would document floodplain impacts. The improvements will be categorized as a channel realignment which will demonstrate no change in the 100-year BFE through proving that the realigned channel will have at least the same capacity as those in existing conditions and that proposed channel velocities would not cause excessive erosion. Additionally, the improvements will demonstrate no adverse impacts on floodwater backwater affects and that sufficient freeboard is maintained above the 100-year BFE. IDNR may also require a Letter of Map Change (LOMC) and/or Letter of Map Revision (LOMR) to be submitted to FEMA Region 7.



If you could respond back to this e-mail with concurrence that the propose action detailed above will be satisfactory to meet City requirements we would greatly appreciate it.

Project Study Area

Note: Proposed elevation contours shown are based on the North American Vertical Datum of 1988 (NAVD88).

Please let me know if you have any questions.

Base Flood Elevation (BFE)

500-year Floodplain

- Preliminary Proposed Elevation Contour (2 foot)

Proposed Floodplain Compensatory Storage

Thanks.

Daniel Carroll, PE

Floodway

Senior Engineer, Water Resources 436 S Main St, Plymouth, MI 48170 O 734-456-7063 | M 313-300-3868 Daniel.Carroll@rsandh.com rsandh.com |LinkedIn |Instagram |Facebook |Podcast

Stay up-todate with our latest news and insights.



From: Carroll, Daniel

Sent: Tuesday, March 4, 2025 1:02 PM

To: rkueny@sioux-city.org

Cc: Gentile, Nicholas < Nicholas < <a href="mailto:Nichol

Subject: NEPA/EA Early Agency Coordination Letter - Sioux Gateway Airport Runway Program

Mr. Keuny,

As a part of the Environmental Assessment associated with the Runway Program at the Sioux Gateway Airport, the attached document is the agency scoping document that was sent to all agencies in April 2024 that had jurisdiction over environmental resources that could be affected by the proposed project. At the time of agency scoping, floodplains were not identified as an environmental resource that could be affected. However, since agency scoping, the FEMA FIRMs have been revised, and the proposed project could now affect floodplains. Please review the information for project background only, as some of the information in this document is out of date (i.e., schedule) and let us know if you have any questions.

Thanks and we appreciate your cooperation in advance.

Dan

A	р	ре	n d	iх	I -	Wa	ter	R	e s	s o	u	rс	е	S

THIS PAGE INTENTIONALLY LEFT BLANK

Appendix I - Water Resources	
	Appendix I.2
	Water Resources Report
	Water Nesources Nepor
Sioux Catoway Airport Punway Improvemen	sta Praince Proft FA

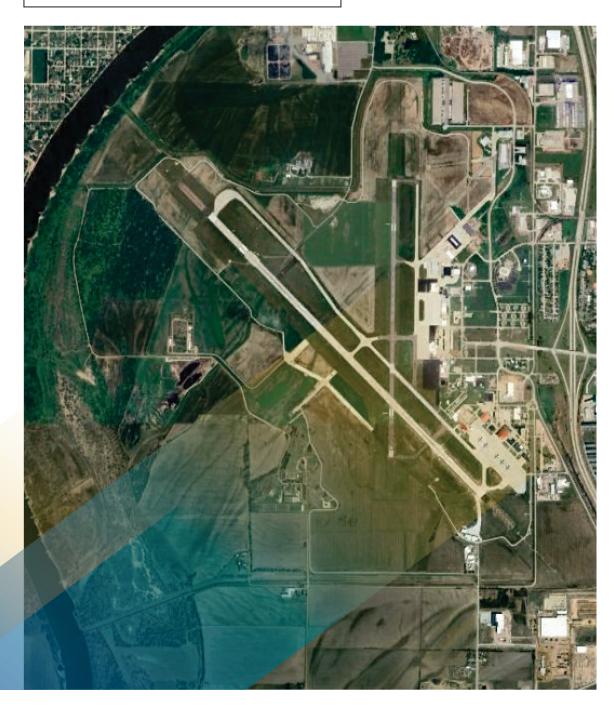
A	р	ре	n d	iх	I -	Wa	ter	R	e s	s o	u	rс	е	S

THIS PAGE INTENTIONALLY LEFT BLANK



June 2025

Sioux Gateway Airport Runway Improvements Project EA: Water Resources Analysis





Sioux Gateway Airport Runway Improvements Project EA: Water Resources Analysis

June 2025

Woodbury County, Iowa RS&H No.: 1014-4998-003

Prepared by RS&H Iowa, P.C. at the direction of the City of Sioux City

Table of Contents

1	Intro	oduction	1
2	Reg	ulatory Overview	1
	2.1	Iowa Stormwater Management Manual (ISWMM)	1
	2.1.1	Guideline 1: Use of Enhanced Design Practices for Stormwater Management	2
	2.1.2	Guideline 2: Stormwater Runoff Quality	3
	2.1.3		
	2.1.4		
	2.1.5		
	2.1.6		
	2.1.7	3	
	2.1.8	3	
3	Wat	er Quantity Analysis	5
	3.1	Drainage Basins	5
	3.2	Time of Concentration (T _c)	9
	3.3	Soils and Land Cover	
	3.4	Rainfall Depths	
	3.5	Peak Discharge	
	3.6	Future Design Considerations	
4		nnel Realignment	
5	Wat	er Quality Analysis	16
	5.1	Calculations	
	5.2	Future Design Considerations	17
6	Grou	undwater Analysis	17
	6.1	Regulatory Overview	17
	6.2	Groundwater Recharge	18
	6.3	Future Design Considerations	18
7	Floo	dplain Analysis	19
	7.1	Existing Floodplain Conditions	19
	7.2	Future Floodplain Conditions	
	7.2.1	Compensatory Storage Methodology	21
8	Con	clusion	21
9	Refe	rences	22

List of Tables

Table 1: Existing Drainage Basin Impervious Cover Summary	6
Table 2: Future Drainage Basin Impervious Cover Summary	6
Table 3: Comparison of Existing and Future Drainage Basin Impervious Cover	6
Table 4: Manning's Roughness Coefficient Values	9
Table 5: Land Cover and Curve Number Values	10
Table 6: Rainfall Depth	12
Table 7: Existing Basin Peak Discharge Summary	13
Table 8: Future Basin Peak Discharge Summary	13
Table 9: Comparison of Basin Peak Discharge Rates – 1-year, 24-hour Design Storm	14
Table 10: Comparison of Basin Peak Discharge Rates – 5-year, 24-hour Design Storm	14
Table 11: Comparison of Basin Peak Discharge Rates – 25-year, 24-hour Design Storm	14
Table 12: Comparison of Basin Peak Discharge Rates – 100-year, 24-hour Design Storm	15
Table 13: Channel Peak Flow Rate Summary	16
Table 14: Proposed Action Water Quality Volume Summary	17
Table 15: Proposed Action Groundwater Recharge Volume Requirements	18
List of Figures	
Figure 1: Existing Hydrologic Conditions	7
Figure 2: Future Hydrologic Conditions	8
Figure 3: Site Soils by HSG	11
Figure 4: Study Area Floodplains and Proposed Action	20
List of Attachments	
Attachment I-1 – Time of Concentration Calculations	
Attachment I-2 – NRCS Soil Survey	
Attachment I-3 – Curve Number and Peak Flow Calculations	
Attachment I-4 – Channel Realignment Capacity Calculations	
Attachment I-5 – Water Quality Calculations	
Attachment I-6 – Groundwater Recharge Calculations	
Attachment I-7 – FEMA FIRMs	
Attachment I-8 – Floodplain Compensatory Storage Calculations	
Attachment I-9 – Report of Geotechnical Exploration	

June 2025

1 Introduction

The City of Sioux City (Airport Sponsor) owns and operates the Sioux Gateway Airport (Airport), a public and military shared-use airport located in Woodbury County, Iowa, approximately seven (7) miles south of downtown Sioux City, Iowa. The Airport Sponsor contracted RS&H Iowa, P.C. (RS&H) to perform an Environmental Assessment (EA) for the Proposed Action at the Airport, which includes Runway 13-31 reconstruction, strengthening, and extension, parallel taxiway expansion, land acquisition, and other associated development to support the Airport. IAANG's 185th Air Refueling Wing (185th ARW) is the primary operator of the runway. Additional details on the Proposed Action can be found in **Section 1.6** of the EA narrative.

This report evaluates the hydrologic impact of the Proposed Action under the EA. RS&H analyzed the changes in surface water quantity and quality, as well as impacts to quantity of groundwater recharge resulting from the Proposed Action. Drainage analysis within this report was performed in accordance with the Iowa Stormwater Management Manual (ISWMM), dated September 2009, revised December 31st, 2019 (Chapter 3.01 *Unified Sizing Criteria*) and June 24th, 2020 (Chapter 1.05 *Stormwater Management Plan*).

2 Regulatory Overview

2.1 Iowa Stormwater Management Manual (ISWMM)

The ISWMM provides guidance for design, construction, and post-construction stormwater requirements for development in municipalities regulated by MS4 and Phase 1 and Phase 2 National Pollutant Discharge Elimination System (NPDES) permits issued by the Iowa Department of Natural Resources (IDNR). ISWMM Chapter 1 – Section 4, Stormwater Management Criteria, establishes 11 minimum stormwater management guidelines recommended for applicable new development or redevelopment sites with land disturbing activity of one (1) acre or more. The Proposed Action is a redevelopment site per the ISWMM definition including but not limited to, "creation or addition of impervious surfaces, replacement of impervious surface not part of routine maintenance, and land disturbing activities associated with structural or impervious development." Because the disturbed area of the Proposed Action is greater than one (1) acre, it is subject to these guidelines.

The ISWMM minimum stormwater management guidelines are as follows:

- 1. Use of Enhanced Design Practices for Stormwater Management
- 2. Stormwater Runoff Quality
- 3. Stream Channel Protection
- 4. Overbank Flood Protection
- 5. Extreme Flood Protection
- 6. Downstream Analysis
- 7. Groundwater Recharge
- 8. Construction Erosion and Sediment Control^
- 9. Stormwater Management System Operation and Maintenance (O&M)*
- 10. Pollution Prevention*^
- 11. Stormwater Management Plan*^

This analysis focuses on Guidelines 1 through 7 as they impact the proposed stormwater improvements at this stage of design. Guideline 11 is also discussed as it will be inclusive of the final design of the Proposed Action. Guidelines marked to be completed in final design and to be completed by the contractor prior to construction were not analyzed.

2.1.1 Guideline 1: Use of Enhanced Design Practices for Stormwater Management

Guideline 1 encourages preservation of natural drainage patterns on development sites by utilizing low impact development (LID) practices. LID identified in ISWMM Chapter 3 – Section 8, Low-Impact Development (LID) Hydrology, applicable for airport use include, but are not limited to, flatter slopes in pervious areas, minimal soil disturbance, infiltration swales, vegetative filter strips, disconnected impervious areas (DCIAs), and bioretention. LID can be incorporated alongside other Best Management Practices (BMPs) as described in ISWMM Chapter 4, BMP Types and Applications, to meet Guidelines 2, 3, and 7 below.

The Proposed Action would meet Guideline 1 by incorporating LID practices into final design, including but not limited to utilizing permanent stormwater BMPs that incorporate LID techniques. The Proposed Action would incorporate LID techniques, including disconnected impervious areas for airfield pavement that drains to vegetated areas and flattened slopes based on FAA grading criteria. Taxiway and runway safety areas could also act as vegetated filter strips and promoted runoff infiltration along the edges of taxiway and runway pavement, due to grading requirements and minimum distances from the edge of pavement based on FAA criteria.

^{*}To be completed in final design

[^]To be completed by contractor prior to construction

2.1.2 Guideline 2: Stormwater Runoff Quality

Guideline 2 establishes guidance for managing future conditions water quality via a stormwater management system to remove at least 80% of the calculated average total suspended solids (TSS) from the site. This treatment level can be reached by treating the water quality volume (WQv) for the site, which is determined by multiplying the 90th percentile annual rainfall event of 1.25 inches by the volumetric runoff coefficient (Rv) and the area of the site. A minimum WQv value of 0.2 inches per acre should be treated for individual drainage areas with less than 15% impervious cover.

The Proposed Action would meet Guideline 2 via permanent stormwater BMPs by treating runoff from the 90th percentile storm from all Redeveloped areas prior to its discharge off Airport property. Treatment infrastructure may include, but is not limited to, vegetative practices, infiltration facilities, bioretention facilities, and LID. Stormwater runoff quality analysis is in **Section 5** of this document.

2.1.3 Guideline 3: Stream Channel Protection

Guideline 3 is accomplished through the following three criteria:

- 1. Extended detention of the 1-year, 24-hour storm for a minimum 24-hour period;
- 2. Implementation of energy dissipation, streambank stabilization, and erosion prevention practices and structures to prevent downstream erosion and streambank damage; and,
- 3. Establishment of 100-foot riparian stream buffers, where feasible, on the development site. The following are recommended for different levels of development:
 - a. <u>New Development:</u> Establish an appropriate stream buffer by requiring a development setback from the stream centerline.
 - b. <u>Redevelopment:</u> Structural controls for bank stabilization where bank material erosion is of concern

The Proposed Action would meet all criteria for Guideline 3. The Proposed Action would include permanent stormwater BMPs to detain the volume of the 1-year, 24-hour storm for a period of 24 hours. Peak discharge from the Proposed Action for the 1-year, 24-hour storm are found in **Table 8** of this document. The Proposed Action would provide energy dissipation within permanent stormwater BMPs in final design, such as riprap, to limit downstream erosion and streambank damage. The Proposed Action would not impact the existing riparian stream buffers and is further than 100 feet from any stream bank.

2.1.4 Guideline 4: Overbank Flood Protection

Guideline 4 establishes guidance for flooding of downstream channels and from surcharging of downstream piped conveyances. This guideline requires that the future conditions 5-year, 24-

hour peak discharge rate does not exceed the existing conditions discharge rate. Guideline 4 works in conjunction with Guidelines 3 and 5 to provide effective peak flow control per the ISWMM.

The Proposed Action would meet Guideline 4 by utilizing permanent stormwater BMPs to meet existing conditions discharge rates for the 5-year, 24-hour storm in future conditions. Comparison of peak discharge rates from existing to future are found in **Table 9** of this document.

2.1.5 Guideline 5: Extreme Flood Protection

Guideline 5 establishes guidance for prevention of flooding due to major storm events. This guideline requires that the 100-year, 24-hour storm is controlled via one of the following measures:

- 1. Structural stormwater controls that maintain the 100-year floodplain; or
- 2. Providing conveyance sized to discharge the 100-year, 24-hour storm to a receiving water whose floodplain is not damaged by the increase in flow.

The Proposed Action would meet Guideline 5 by utilizing permanent stormwater BMPs to detain the 100-year, 24-hour storm such that future conditions flow rates are less than or equal to existing conditions and that the 100-year floodplain is maintained. Comparison of peak discharge rates from existing to future conditions are found in **Table 12** of this document.

2.1.6 Guideline 6: Downstream Analysis

Guideline 6 establishes guidance for limiting additional downstream impacts regarding peak flows and flooding. This guideline follows the 10 percent rule, which is based on the drainage area to an individual permanent stormwater BMP being 10% of a total corresponding downstream drainage area that the discharge from the permanent stormwater BMP has influence on. The analysis of the 10 percent rule is based on hydrologically modeling the drainage area to an individual permanent stormwater BMP and its downstream influence area for existing and future conditions, then designing the permanent stormwater BMP as to not increase peak flows from the 25-year, 24-hour storm at both the outlet from the BMP, as well as at downstream junctions to the end of its influence.

The Proposed Action would meet Guideline 6 by designing outlet controls in permanent stormwater BMPs to meet existing peak flow rates at site outlets and downstream design junctions in final design. Comparison of the 25-year, 24-hour storm peak discharge rates from existing to future conditions are found in

Table 11 of this document.

2.1.7 Guideline 7: Groundwater Recharge

Guideline 7 establishes guidance for site design to allow for stormwater runoff to infiltrate into the ground. This guideline requires that annual recharge from the future site conditions should approximate the annual recharge from existing conditions. Stormwater runoff from hotspots requires pretreatment before infiltration.

The Proposed Action would meet Guideline 7 by utilizing permanent stormwater BMPs to ensure future groundwater recharge volumes are met. Groundwater recharge is analyzed further in **Section 6** of this document.

2.1.8 Guideline 11: Stormwater Management Plan

Guideline 11 establishes guidance for developing a stormwater management plan for all new and redeveloped sites. The plan includes a narrative, technical information and analysis, and indication for how the proposed development meets Guidelines 1 through 10, as well as other local jurisdictional stormwater criteria. Analysis includes, but is not limited to, pre- and post-development hydrologic and hydraulic conditions of the site, impacts on water quality in post-development conditions, and sizing and location of stormwater infrastructure required to meet all ISWMM Guidelines and local jurisdictional requirements in post-development conditions. The stormwater management plan will be completed in final design.

3 Water Quantity Analysis

3.1 Drainage Basins

RS&H delineated the eight (8) existing drainage basins using existing Light Detection and Ranging (LiDAR) data from the United States Geological Survey (USGS). RS&H determined existing land cover for drainage basins utilizing Airport base file drawing information based on prior surveys. The future basins are assumed to not be modified as a result of the Proposed Action, with the exception of Basin A, which would include acquired land in the Proposed Action. Future land cover includes the modifications from the Proposed Action. **Table 1** and **Table 2** summarize the existing and future drainage basins. **Table 3** summarizes the comparison between existing and future drainage basin impervious land cover. **Figure 1** and **Figure 2** show the existing and future hydrologic conditions on site.

Table 1: Existing Drainage Basin Impervious Cover Summary

Basin	Area (acres)	Impervious Area (acres)	Percent Impervious
Α	242.20	33.20	13.7%
В	43.56	1.41	3.2%
С	34.01	3.69	10.8%
D	40.13	4.63	11.5%
E	15.92	3.42	21.5%
F	17.83	3.91	21.9%
G	154.17	50.39	32.7%
Н	358.45	72.46	20.2%

Note: gravel land use assumed 100% impervious in table above for simplicity of land use change.

Table 2: Future Drainage Basin Impervious Cover Summary

Basin	Area	Impervious	Percent
	(acres)	Area (acres)	Impervious
Α	243.67	44.99	18.5%
В	43.56	3.71	8.5%
С	34.01	4.08	12.0%
D	40.13	4.69	11.7%
E	15.92	3.42	21.5%
F	17.83	3.91	21.9%
G	154.17	51.68	33.5%
Н	358.45	82.30	23.0%

Note: gravel land use assumed 100% impervious in table above for simplicity of land use change.

Table 3: Comparison of Existing and Future Drainage Basin Impervious Cover

Basin	Existing Impervious Area (acres)	Future Impervious Area (acres)	Change in Area (acres)
Α	33.20	44.99	+11.78
В	1.41	3.71	+2.30
С	3.69	4.08	+0.39
D	4.63	4.69	+0.06
E	3.42	3.42	-
F	3.91	3.91	-
G	50.39	51.68	+1.29
Н	72.46	82.30	+9.84

Note: gravel land use assumed 100% impervious in table above for simplicity of land use change.

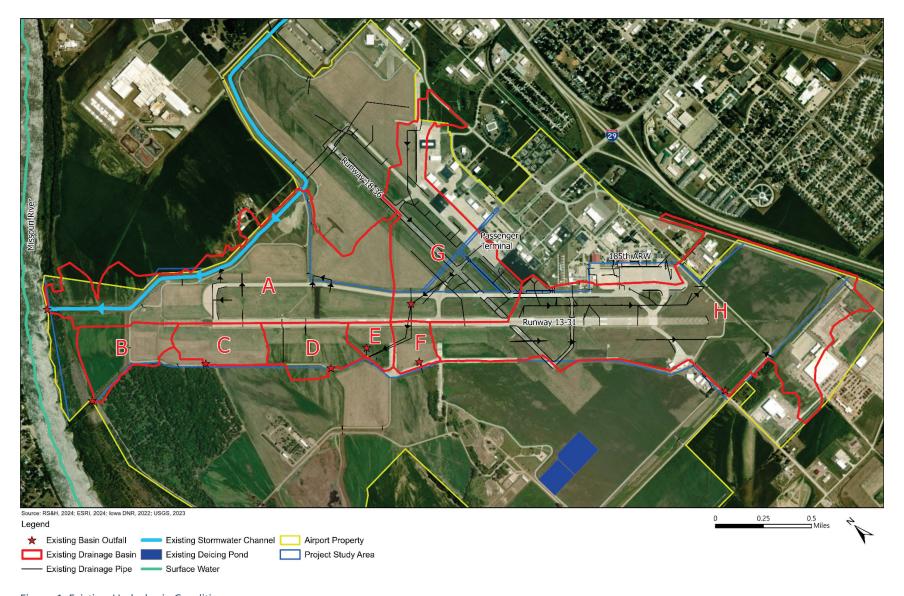


Figure 1: Existing Hydrologic Conditions

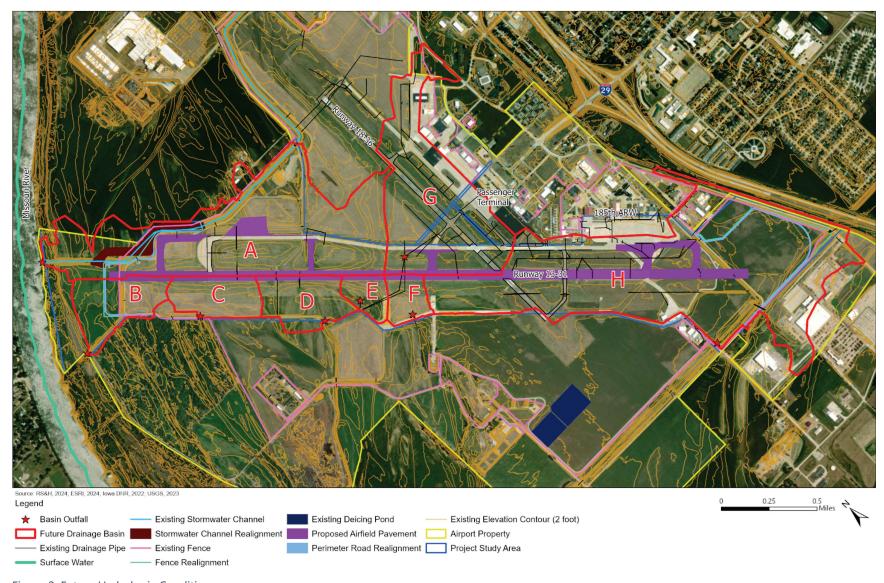


Figure 2: Future Hydrologic Conditions

3.2 Time of Concentration (T_c)

 T_c is the time it takes runoff to travel from the hydraulically most distant point of the basin to the point of interest and is used in calculating the peak runoff rate. RS&H calculated the T_c for each existing and future drainage basin utilizing the Natural Resources Conservation Service (NRCS) Runoff Method. T_c flow paths for existing basins were determined using existing LiDAR elevation data, stormwater infrastructure data provided by Airport personnel, and survey of site topography and stormwater infrastructure performed in April 2024. T_c flow paths for future basins were determined based on the existing basin flow paths with changes in land cover as a result of the Proposed Action. The rainfall depth used in T_c calculations is shown in **Table 6**. The Manning's roughness coefficients (n) used in T_c calculations are shown in **Table 4**. See **Attachment I-1** for T_c calculations.

Table 4: Manning's Roughness Coefficient Values

Material	Manning's Roughness Coefficient (n)
Smooth Surfaces*	0.011
Dense Grasses^	0.240
Reinforced Concrete	0.013
Pipe (RCP)	
Corrugated Metal	0.024
Pipe (CMP)	

^{*}Used for sheet flow calculations in impervious areas

3.3 Soils and Land Cover

Soil type and land cover within the Study Area impact the amount of runoff produced by rainfall. These site characteristics can be used to determine runoff curve numbers (CN) for the site, which indicate the site's runoff potential. RS&H utilized NRCS resources to determine the types of soil found on site at the Airport, as shown in **Figure 3** below. Dual Hydrologic Soil Group (HSG) classification C/D found on site was assumed to be HSG D in hydrologic calculations as a conservative approach. Udorthents, Loamy soil does not have an HSG classification (listed as N/A) and was assumed to be HSG D in hydrologic calculations as a conservative approach due to the unknown makeup of the soil. **Table 5** below presents the soil types, land covers, and CN values for the site. See **Attachment I-2** for the NRCS Soils Report.

[^]Used for sheet flow calculations in pervious areas

Sioux Gateway Airport Runway Improvements Project EA: Water Resources Analysis

Table 5: Land Cover and Curve Number Values

Soil Type	Land Cover Cur Description Num	
Hydrologic Soil	Good Condition 39	
Group (HSG) A	(grass cover >75%)	
HSG B	Good Condition	61
	(grass cover >75%)	
HSG C	Good Condition	74
	(grass cover >75%)	
HSG D	Good Condition 80	
	(grass cover >75%)	
HSG A	Gravel Road	76
HSG B	Gravel Road	85
HSG C	Gravel Road	89
HSG D	Gravel Road	91
Impervious	Paved Area, Roofs	98

Source: ISWMM, Table C3-S5-2

Sioux Gateway Airport Runway Improvements Project EA: Water Resources Analysis

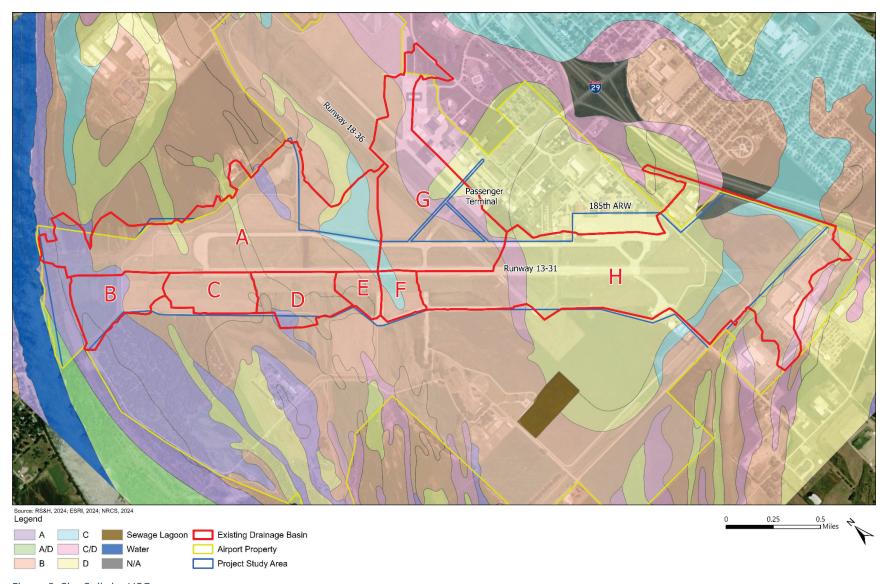


Figure 3: Site Soils by HSG

3.4 Rainfall Depths

RS&H utilized local rainfall depths from ISWMM Chapter 3 – Section 2, *Rainfall and Runoff Analysis*, Figure C3-S2-1 and Table C3-S2-3. The ISWMM requires analysis for runoff rates from the 1-year, 5-year, 25-year, and 100-year, 24-hour storm events. The ISWMM also requires water quality treatment of the 90th percentile cumulative frequency rainfall depth (1.25 inches). Rainfall depths for these design storms are provided in **Table 6**.

Table 6: Rainfall Depth

Design Storm	Rainfall Depth (inches)
Groundwater Recharge	1.00
90 th Percentile	1.25
1-Year, 24-hour	2.63
2-year, 24-hour*	3.01
5-Year, 24-hour	3.74
25-year, 24-hour	5.59
100-Year, 24-hour	7.67

^{*}Used in calculations for T_c

3.5 Peak Discharge

RS&H used the above variables and NRCS TR-55 methodology to determine peak discharge rates from existing and future drainage basins for the 1-, 5-, 25- and 100-year, 24-hour design storms required for analysis by Guidelines 3, 4, 5, and 6 of the ISWMM. **Table 7** and **Table 8** summarize the peak discharge rates in existing and future drainage basins. **Table 9**, **Table 10**, **Table 11**, and **Table 12** summarize the comparisons between existing and future drainage basin peak flow rates for the 1-year, 5-year, 25-year, and 100-year, 24-hour design storms. See **Attachment I-3** for existing and future CN and Peak Discharge calculations.

Table 7: Existing Basin Peak Discharge Summary

Basin	Area (acres)	Time of Concentration (minutes)	Curve Number	1-Year, 24- hour Peak Discharge (cubic feet per second [cfs])	5-Year, 24-hour Peak Discharge (cfs)	25-Year, 24-hour Peak Discharge (cfs)	100-Year, 24-hour Peak Discharge (cfs)
Α	242.20	112.0	65	20.46	65.79	169.74	312.80
В	43.56	34.8	47	0.20	2.63	17.23	49.81
С	34.01	30.8	65	6.11	20.63	52.13	96.89
D	40.13	54.3	63	4.06	15.04	41.14	77.72
E	15.92	26.5	69	5.29	13.72	31.64	56.26
F	17.83	39.2	72	6.56	15.10	33.13	57.46
G	154.17	84.7	78	53.17	109.45	223.63	354.45
Н	358.45	152.0	77	81.20	168.01	343.53	545.23

Table 8: Future Basin Peak Discharge Summary

Basin	Area (acres)	Time of Concentration (minutes)	Curve Number	1-Year, 24- hour Peak Discharge (cubic feet per second [cfs])	5-Year, 24-hour Peak Discharge (cfs)	25-Year, 24-hour Peak Discharge (cfs)	100-Year, 24-hour Peak Discharge (cfs)
Α	243.67	107.4	67	26.59	79.30	192.39	350.66
В	43.56	34.8	49	0.46	3.50	21.68	57.21
С	34.01	30.8	65	6.55	21.12	53.61	99.16
D	40.13	55.3	63	4.07	15.00	41.12	77.86
E	15.92	26.5	69	5.29	13.72	31.63	56.25
F	17.83	39.2	72	6.56	15.10	33.13	57.45
G	154.17	84.7	78	53.89	111.65	226.38	358.04
Н	358.45	152.0	78	83.78	172.08	349.79	553.41

Table 9: Comparison of Basin Peak Discharge Rates – 1-year, 24-hour Design Storm

Basin	Rainfall Event	Existing Peak Discharge (cubic feet per second [cfs])	Future Peak Discharge (cfs)	Change in Peak Discharge (cfs)
Α	1-year, 24-hour	20.46	26.59	+6.13
В	1-year, 24-hour	0.20	0.46	+0.26
С	1-year, 24-hour	6.11	6.55	+0.44
D	1-year, 24-hour	4.06	4.07	+0.01
E	1-year, 24-hour	5.29	5.29	-
F	1-year, 24-hour	6.56	6.56	-
G	1-year, 24-hour	53.17	53.89	+0.72
Н	1-year, 24-hour	81.20	83.78	+2.58

Table 10: Comparison of Basin Peak Discharge Rates – 5-year, 24-hour Design Storm

Basin	Rainfall Event	Existing Peak Discharge (cubic feet per second [cfs])	Future Peak Discharge (cfs)	Change in Peak Discharge (cfs)
Α	5-year, 24-hour	65.79	79.30	+13.51
В	5-year, 24-hour	2.63	3.50	+0.87
С	5-year, 24-hour	20.63	21.12	+0.49
D	5-year, 24-hour	15.04	15.00	-0.04
E	5-year, 24-hour	13.72	13.72	-
F	5-year, 24-hour	15.10	15.10	-
G	5-year, 24-hour	109.45	111.65	+2.20
Н	5-year, 24-hour	168.01	172.08	+4.07

Table 11: Comparison of Basin Peak Discharge Rates – 25-year, 24-hour Design Storm

Basin	Rainfall Event	Existing Peak Discharge (cubic feet per second [cfs])	Future Peak Discharge (cfs)	Change in Peak Discharge (cfs)
Α	25-year, 24-hour	169.74	192.39	+22.65
В	25-year, 24-hour	17.23	21.68	+4.45
С	25-year, 24-hour	52.13	53.61	+1.48
D	25-year, 24-hour	41.14	41.12	-0.02
E	25-year, 24-hour	31.64	31.63	-0.01
F	25-year, 24-hour	33.13	33.13	-
G	25-year, 24-hour	223.63	226.38	+2.75
Н	25-year, 24-hour	343.53	349.79	+6.26

Table 12: Comparison of	Basin Peak Discharge Rat	es – 100-year, 24-hour	Design Storm

Basin	Rainfall Event	Existing Peak Discharge (cubic feet per second [cfs])	Future Peak Discharge (cfs)	Change in Peak Discharge (cfs)
Α	100-year, 24-hour	312.80	350.66	+37.86
В	100-year, 24-hour	49.81	57.21	+7.40
С	100-year, 24-hour	96.89	99.16	+2.27
D	100-year, 24-hour	77.72	77.86	+0.14
E	100-year, 24-hour	56.28	56.25	-0.03
F	100-year, 24-hour	57.46	57.45	-0.01
G	100-year, 24-hour	354.45	358.04	+3.59
Н	100-year, 24-hour	545.23	553.41	+8.18

3.6 Future Design Considerations

ISWMM Chapter 4 – Section 3, *Structural Controls*, identifies the general design for stormwater facilities and may be used in final design to manage peak flows as required in ISWMM Chapter 1 – Section 4, *Stormwater Management Criteria*. Proposed permanent stormwater facilities should be designed to discharge at rates less than or equal to the existing conditions flow rates discussed in **Section 3.5** of this document. Proposed permanent stormwater facilities may also be designed to provide water quality treatment, thus contributing to the necessary water quality volumes discussed in **Section 5.1** of this document. The increases in peak flow rates and required water quality volumes as a result of the Proposed Action will require new permanent stormwater facilities and/or major modifications to existing stormwater collection and conveyance system to mitigate impacts. If new permanent stormwater facilities are necessary to be required in final design, the following permanent stormwater facilities are discussed in ISWMM Chapter 4 – Section 3, *Structural Controls*, to meet peak flow requirements:

- Infiltration Facilities
 - o Infiltration Trench
 - Infiltration Basin
- Extended Detention Basins (EDBs)

These permanent stormwater facilities should be designed to not interfere with known groundwater elevations and to limit standing water requirements to those outlined in the Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5200-33C, *Hazardous Wildlife Attractants on or Near Airports*.

4 Channel Realignment

The Proposed Action would realign the existing drainage channel at the northeast corner of the Study Area due to the realignment of the vehicle service road (VSR) and proposed taxiway pavement. The existing channel is a man-made, non-jurisdictional water feature. RS&H estimated the existing peak flow in the channel from existing upstream infrastructure, including a triple 84" RCP culvert and a single 24" RCP culvert, maximum flow rates added to the 100-year, 24-hour peak runoff flow from existing Basin A, which directly contributes to the channel. RS&H estimated the future peak flow in the channel with the same components used in the existing calculation, with the addition of impacts by the Proposed Action on the 100-year, 24-hour peak runoff flow for Basin A. Preliminary proposed grading has been developed which has a similar hydraulic capacity of the existing channel. **Table 13** below shows the channel capacity and peak discharge in existing and future conditions. See **Attachment I-4** for existing and future channel modeling and calculations.

Table 13: Channel Peak Flow Rate Summary

Condition	100-year Peak Discharge Rate (cubic feet per second)
Existing	1,715.41
Future	1,753.27
Change	+37.86

5 Water Quality Analysis

5.1 Calculations

ISWMM Chapter 1 – Section 4, *Stormwater Management Criteria*, Guideline 2 identifies the 90th percentile design storm to be used for volume-based treatment facility sizing. RS&H used the calculation methodology as described in the ISWMM Chapter 3 – Section 6, *Small Storm Hydrology*, to determine the WQv for each basin under the future conditions. The WQv is calculated based on impervious land cover and total area for each drainage basin. **Table 14** below summarizes the WQv required for each basin due to the Proposed Action. See **Attachment I-5** for water quality volume calculations.

Table 14: Proposed Action Water Quality Volume Summary

Basin	Future Conditions Required Water Quality Volume (acre-feet)	Future Conditions Required Water Quality Volume Peak Flow Rate (cubic feet per second)
Α	5.49	20.06
В	0.57	3.23
С	0.56	3.75
D	0.65	3.16
E	0.40	3.65
F	0.46	3.36
G	5.65	27.85
Н	9.58	30.54

5.2 Future Design Considerations

ISWMM Chapter 4, *BMP Types and Applications*, identifies the general requirements for stormwater quality facilities and may be used in final design to treat the WQv provided in **Section 5.1** of this document. ISWMM Chapter 3 – Section 8, *Low-Impact Development (LID) Hydrology*, also identifies LID and their applications in treating the WQv.

- Vegetative Practices
 - Vegetated Filter Strip
 - Grass Channel
- Infiltration Facilities
 - o Infiltration Trench
 - o Infiltration Basin
- Bioretention Facilities
- LID

6 Groundwater Analysis

6.1 Regulatory Overview

Relevant local, state, and federal regulations and statutes pertaining to groundwater include:

- Safe Water Drinking Act (SDWA)
- ISWMM Chapter 1 Section 4, Stormwater Management Criteria

As discussed in **Section 2.1.7** above, the ISWMM Chapter 1 – Section 4, *Stormwater Management Criteria*, Guideline 7 establishes guidance for groundwater recharge on new development and redevelopment sites.

6.2 Groundwater Recharge

The groundwater recharge guidance is attained by infiltrating the recharge volume (Rev). The Rev is considered part of the total WQv, therefore meeting the requirements of the Rev can be achieved by treating the WQv via structural or nonstructural BMPs. **Table 15** below summarizes the Rev required for each basin due to the Proposed Action. As stated in **Section 2.1.7**, annual recharge from future conditions should approximate that of existing conditions. To meet this, in final design the existing and future Rev values will be calculated, and the difference between the values will be used to size the required treatment for the increased impervious area. See **Attachment I-6** for groundwater recharge volume calculations.

Table 15. Propo	sed Action Grou	ndwater Recharge	volume Requirements

Basin	Future Conditions Required Groundwater Recharge Volume (acre-inches)
Α	42.74
В	3.52
С	3.88
D	4.46
E	3.25
F	3.71
G	49.10
Н	78.19

6.3 Future Design Considerations

ISWMM Chapter 4, *BMP Types and Applications*, identifies the general requirements for stormwater quality facilities and may be used in final design to ensure required groundwater recharge volumes in **Section 6.2** of this document are met. ISWMM Chapter 3 – Section 8, *Low-Impact Development (LID) Hydrology*, also identifies LID and their applications in promoting groundwater infiltration.

- Infiltration Facilities
 - Infiltration Trench
 - Infiltration Basin
- Bioretention Facilities
- LID

7 Floodplain Analysis

7.1 Existing Floodplain Conditions

The Missouri River is located approximately 60 feet northwest of the Project Study Area at its nearest point. The Proposed Action is located in Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) numbers 19193C0192E and 19193C0194E, dated July 17, 2024, as well as 19193C0213E, dated September 29th, 2011. The majority of the floodplain in the Study area is designated as Zone AE, which is defined as the 100-year (1-percent-annual-chance) floodplain where base flood elevations (BFEs) are established. The 100-year (1-percent-annual-chance) BFE of the Missouri River southwest of the Proposed Action is 1080.0 feet with respect to the North American Vertical Datum of 1988 (NAVD88). The 100-year (1-percent-annual-chance) floodplain extends into and through the Project Study Area via two floodplain reaches, one being the existing channel described in **Section 4** of this document. The 100-year floodplain BFE of this channel upstream of the Proposed Action is also 1081.0 feet NAVD88. The nearest 100-year floodplain cross section to both floodplain reaches nearest the Proposed Action is 1080.6 feet NAVD88. See **Figure 4** below for the FEMA-delineated floodplains and Proposed Action. See **Attachment 1-7** for FEMA FIRMs.

Sioux Gateway Airport Runway Improvements Project EA: Water Resources Analysis

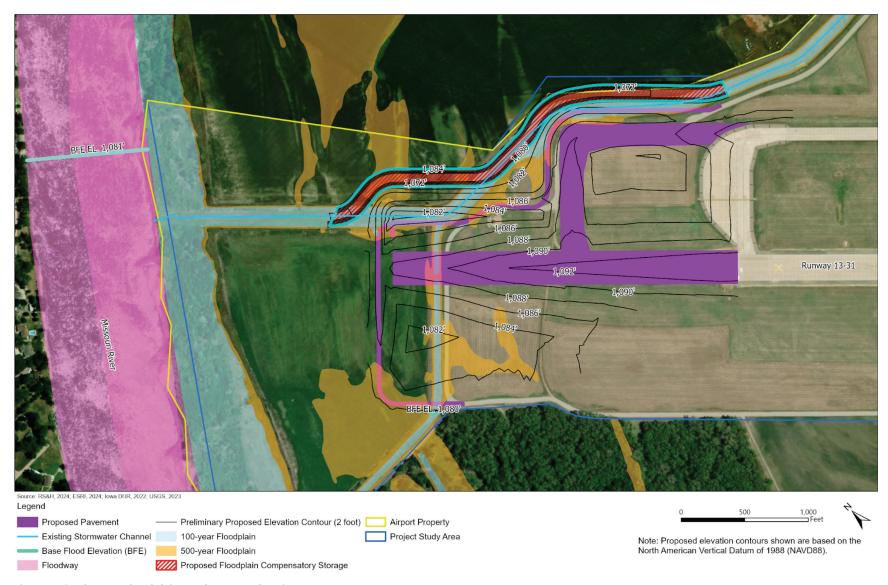


Figure 4: Study Area Floodplains and Proposed Action

7.2 Future Floodplain Conditions

The Proposed Action would place fill into the 100-year (1-percent-annual-chance) floodplain in two locations: the major channel realignment as discussed in Section 4, and along a ditch due to the runway extension. RS&H utilized preliminary proposed grading associated with the Proposed Action to determine the compensatory floodplain storage that would be implemented to offset fill placed negating adverse impacts to the floodplain. In final design, floodplain hydraulic modeling would verify that the Proposed Action would not result in an increase in the 100-year (1-percent-annual-chance) BFE.

7.2.1 Compensatory Storage Methodology

RS&H compared the available floodplain storage in existing and proposed conditions to verify that the Proposed Action would not result in a net decrease in floodplain storage volume. RS&H analyzed volume surfaces between the existing topographic data, proposed grading, and the 100-year (1-percent-annual-chance) BFE at 1080.6 feet NAVD88. Using these volume surfaces, RS&H determined the volume of compensatory storage by taking the storage volume below the 100-year floodplain BFE relative to the existing topography for existing conditions and the volume below 100-year floodplain BFE relative to the preliminary proposed grading for the Proposed Action. The storage volume in each condition was equal to the "fill volume" as determined in AutoCAD Civil 3D, which represents the amount of volume above existing and proposed surfaces to reach the floodplain elevation. This calculation ensures that any storage or fill above the floodplain elevation is not counted in the compensatory storage volume calculation as floodwater from the 100-year event would not stage high enough to be impacted by those factors. RS&H also only analyzed the volume within the defined 100-year floodplain in existing conditions. In proposed conditions, areas hydraulically connected to the 100-year floodplain were analyzed to ensure that additional low-lying areas were also not counted.

Preliminary proposed grading, shown in **Figure 4**, would include compensatory floodplain storage such that the Proposed Action would result in an additional 1,934 cubic yards of floodplain storage below the 100-year (1-percent-annual-chance) BFE. Therefore, the Proposed Action would not adversely affect the 100-year (1-percent-annual-chance) floodplain BFE. Floodplain compensatory storage calculations can be seen in **Attachment I-8**.

8 Conclusion

The Proposed Action would not exceed established significance thresholds, as defined in **Section 3.15** of the EA narrative. Impacts to surface waters, groundwater, and floodplains as a result of the Proposed Action would be considered minimal and would not impact overall water quantity and quality standards set by local, state, or federal jurisdictions. The Proposed Action will implement permanent stormwater BMPs to control future peak flows in accordance with ISWMM Guidelines 3, 4, 5, and 6. The Proposed Action will implement permanent stormwater

June 2025 21

BMPs and LID to meet water quality treatment targets in accordance with ISWMM Guidelines 1 and 2. The Proposed Action will also implement permanent stormwater BMPs and LID to meet groundwater recharge requirements in accordance with ISWMM Guideline 7. In final design, future stormwater infrastructure will need verification to ensure all ISWMM and FAA requirements are met.

9 References

Federal Aviation Administration. (2020, February 21). *Advisory Circular 150/5200-33C – Hazardous Wildlife Attractants on or near Airports.*

Federal Emergency Management Agency. (2011, September 29). Flood Insurance Rate Map: Woodbury County, Iowa and Incorporated Areas, Map Number 19193C0213E.

Federal Emergency Management Agency. (2024, July 17). Flood Insurance Rate Map: Woodbury County, Iowa and Incorporated Areas, Map Numbers 19193C0192E and 19193C0194E.

Iowa Department of Natural Resources. (2009, September). *Iowa Storm Water Management Manual.*

Natural Resources Conservation Service. (2023, June). Web Soil Survey.

United States Geological Survey. (2024). National Elevation Dataset.

June 2025 22

Sioux City Gateway Runway Improvements Project EA: Water Resources Analysis
Attachment I 1: Time of Concentration Calculations
Attachment I-1: Time of Concentration Calculations

 Comp. By:
 JKK

 Date:
 5/12/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Time of Concentration Calculations

Sub-Basin Name: Basin A
Condition: Existing

Sheet Flow [TR-55 equation 3-3]

	AB	
Surface Description	Smooth surfaces	
Manning's Roughness coeff., n	0.011	1
Flow Length, L should be < 100 ft	47	ft
Two-yr, 24-hr rainfall, P ₂	3.01	in
Elevation 1, E ₁	1098.00	ft
Elevation 2, E ₂	1097.81	ft
Land Slope, $s = (E_1 - E_2) / L$	0.00	ft/ft
Tt 0.007 n L $^{0.8}$ / (P ₂ $^{0.5}$ * s ^{0.4})	0.02	hr
	1.3] +

BC	
Dense	
grasses	
0.24	
53	ft
3.01	in
1097.81	ft
1097.29	ft
0.01	ft/f
0.20	hr
11.8	

_	
ft	
in	
ft	
ft	
ft/ft	
hr	
+	



Shallow Concentrated Flow [TR-55 figure 3-1]

	CD	
Surface Description	Unpaved	
Flow Length, L	1911	ft
Elevation 1, E ₁	1097.29	ft
Elevation 2, E ₂	1082.73	ft
Watercourse Slope, $s = (E_1 - E_2) / L$	0.008	
Velocity, V	1.41	
$T_t = L / (3600 \text{ V})$	0.38	
	22.6	

	_
EF	
Unpaved	
107	ft
1082.19	ft
1082.13	ft
0.001	ft/ft
0.38	ft/s
0.08	hr
4.7] +
	_

GH	
Unpaved	
1727	ft
1081.71	ft
1080.19	ft
0.001	ft/ft
0.48	ft/s
1.00	hr
60.1	+

87.4	min

ft/s

Open Channel Flow [TR-55 equation 3-4]

			_
		DE]
		Pipe	1
	Front Slope, s ₁		:1
Open Channel	Bottom width, B		ft
	Back Slope, s ₂		:1
	Depth, H		ft
Pipe	Diameter, D	24	in
Cross Sectional Fl	ow Area, a	3.14	sq
Wetted Perimeter,	P_{w}	6.28	ft
Hydraulic radius, r = a / P _w		0.50	ft
Flow Length, L		361	ft
Elevation 1, E ₁		1082.73	ft
Elevation 2, E ₂		1082.19	ft
Channel Slope, $s = (E_1 - E_2) / L$		0.001	ft/ft
Manning's Roughness coeff., n		0.013	1
Velocity, V = 1.49 r ^{2/3} * s ^{1/2} / n		2.79	ft/s
$T_t = L / (3600 V)$		0.04	ft/s
		2.2]

FG	7
Pipe	
	:1
	ft
	:1
	ft
30	in
4.91	sq ft
7.85	ft
0.63	ft
43	ft
1082.13	ft
1081.71	ft
0.010	ft/ft
0.013	7
8.28	ft/s
0.00	ft/s
0.1	7 +

1.00	
HL	
Pipe]
	:1
	ft
	:1
	ft
42	in
9.62	sq ft
11.00	ft
0.88	ft
84	ft
1080.19	ft
1072.86	ft
0.087	ft/ft
0.024	1
16.78	ft/s
0.00	ft/s
0.1	+

	_
IJ	
Channel	
4.50	:1
40.00	ft
4.50	:1
12.00	ft
	in
1128.00	sq ft
150.63	ft
7.49	ft
3809	ft
1072.86	ft
1066.00	ft
0.002	ft/ft
0.035	
6.92	ft/s
0.15	ft/s
9.2	=

11.5	mir

Sub-Basin Tc =	112.0	min

 Comp. By:
 JKK

 Date:
 5/12/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Time of Concentration Calculations

Sub-Basin Name: Basin B
Condition: Existing

Sheet Flow [TR-55 equation 3-3]

	AB						
Surface Description	Dense grasses						
Manning's Roughness coeff., n	0.24	1					
Flow Length, L should be < 100 ft	100	ft	ft	ft	ft		
Two-yr, 24-hr rainfall, P ₂	3.01	in	in	in	in		
Elevation 1, E ₁	1090.00	ft	ft	ft	ft		
Elevation 2, E ₂	1088.98	ft	ft	ft	ft		
Land Slope, $s = (E_1 - E_2) / L$	0.01	ft/ft	ft/ft	ft/ft	ft/ft		
Tt = 0.007 * (n * L $^{0.8}$ / (P ₂ $^{0.5}$ * s ^{0.4})	0.32	hr	hr	hr	hr		_
	19.3	+	+	+	=	19.3	min

Shallow Concentrated Flow [TR-55 figure 3-1]

	ВС]					
Surface Description	Unpaved	1	1				
Flow Length, L	900	ft	ft	ft	ft		
Elevation 1, E ₁	1088.98	ft	ft	ft	ft		
Elevation 2, E ₂	1079.77	ft	ft	ft	ft		
Watercourse Slope, $s = (E_1 - E_2) / L$	0.010	1	ft/ft	ft/ft	ft/ft		
Velocity, V	1.63	1	ft/s	ft/s	ft/s		
$T_t = L / (3600 \text{ V})$	0.15]	hr	hr	hr		
	9.2	+	+	+	=	9.2	min

Open Channel Flow [TR-55 equation 3-4]

		CD	1			Í	ı		
		CD	-	\vdash	\vdash				
		Channel	1						
	Front Slope, s ₁	4.00	:1	:1		:1	:1		
Open Channel	Bottom width, B	15.00	ft	ft		ft	ft		
Open Channel	Back Slope, s ₂	6.00	:1	:1		:1	:1		
	Depth, H	6.00	ft	ft		ft	ft		
Pipe	Diameter, D		in	in		in	in		
Cross Sectional F	low Area, a	270.00	sq ft	sq ft		sq ft	sq ft		
Wetted Perimeter	, P _w	76.24	ft	ft		ft	ft		
Hydraulic radius,	r = a / P _w	3.54	ft	ft		ft	ft		
Flow Length, L		1754	ft	ft		ft	ft		
Elevation 1, E ₁		1079.77	ft	ft		ft	ft		
Elevation 2, E ₂		1076.00	ft	ft		ft	ft		
Channel Slope, s	= (E ₁ - E ₂) / L	0.002	ft/ft	ft/ft		ft/ft	ft/ft		
Manning's Rough	ness coeff., n	0.035	1						
Velocity, V = 1.49	r ^{2/3} * s ^{1/2} / n	4.59	ft/s	ft/s		ft/s	ft/s		
$T_t = L / (3600 \text{ V})$	ĺ	0.11	ft/s	ft/s		ft/s	ft/s		
-		6.4	1 +	+		+	=	6.4	min

Sub-Basin Tc =	34.8	lmin

 Comp. By:
 JKK

 Date:
 5/12/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Time of Concentration Calculations

Sub-Basin Name: Basin C
Condition: Existing

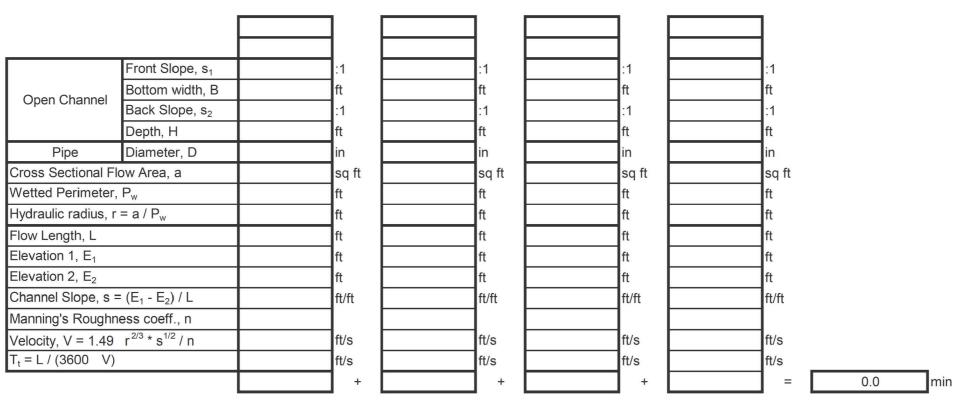
Sheet Flow [TR-55 equation 3-3]

	AB]	ВС						
Surface Description	Smooth surfaces		Dense grasses						
Manning's Roughness coeff., n	0.011	1	0.24		1				
Flow Length, L should be < 100 ft	92	ft	8	ft	ft	ft			
Two-yr, 24-hr rainfall, P ₂	3.01	in	3.01	in	in	in			
Elevation 1, E ₁	1092.00	ft	1090.79	ft	ft	ft			
Elevation 2, E ₂	1090.79	ft	1090.66	ft	ft	ft			
Land Slope, $s = (E_1 - E_2) / L$	0.01	ft/ft	0.02	ft/ft	ft/ft	ft/ft			
Tt = 0.007 * (n * L $^{0.8}$ / (P ₂ $^{0.5}$ * s ^{0.4})	0.02	hr	0.04	hr	hr	hr			
	1.4	+	2.1	+	+	=	3.5	m	iin

Shallow Concentrated Flow [TR-55 figure 3-1]

	CD]						
Surface Description	Unpaved	1						
Flow Length, L	1678	ft	ft	ft	ft			
Elevation 1, E ₁	1090.66	ft	ft	ft	ft			
Elevation 2, E ₂	1083.90	ft	ft	ft	ft			
Watercourse Slope, s = (E ₁ - E ₂) / L	0.004	1	ft/ft	ft/ft	ft/ft			
Velocity, V	1.02	1	ft/s	ft/s	ft/s			
$T_t = L / (3600 \text{ V})$	0.46]	hr	hr	hr			_
	27.3	+	+	+	=	27	'.3	min

Open Channel Flow [TR-55 equation 3-4]



		-
Sub-Basin Tc =	30.8	lmin

 Comp. By:
 JKK

 Date:
 5/12/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Time of Concentration Calculations

Sub-Basin Name: Basin D
Condition: Existing

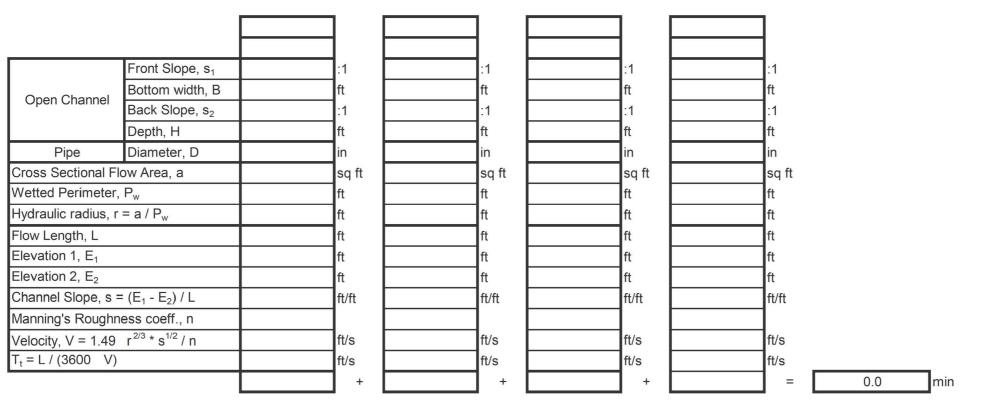
Sheet Flow [TR-55 equation 3-3]

	AB					
Surface Description	Smooth surfaces					
Manning's Roughness coeff., n	0.011	1	1			
Flow Length, L should be < 100 ft	100	ft	ft	ft	ft	
Two-yr, 24-hr rainfall, P ₂	3.01	in	in	in	in	
Elevation 1, E ₁	1092.00	ft	ft	ft	ft	
Elevation 2, E ₂	1090.59	ft	ft	ft	ft	
Land Slope, $s = (E_1 - E_2) / L$	0.01	ft/ft	ft/ft	ft/ft	ft/ft	
Tt = 0.007 * (n * L $^{0.8}$ / (P ₂ $^{0.5}$ * s ^{0.4})	0.02	hr	hr	hr	hr	
	1.4	+	+	+	=	1.4 min

Shallow Concentrated Flow [TR-55 figure 3-1]

	BC]	CD]	DE]			
Surface Description	Unpaved	1	Paved	1	Unpaved	1			
Flow Length, L	299	ft	13	ft	1711	ft	ft		
Elevation 1, E ₁	1090.59	ft	1086.26	ft	1086.12	ft	ft		
Elevation 2, E ₂	1086.26	ft	1086.12	ft	1084.00	ft	ft		
Watercourse Slope, $s = (E_1 - E_2) / L$	0.014	1	0.011	ft/ft	0.001	ft/ft	ft/ft		
Velocity, V	1.94	1	2.11	ft/s	0.57	ft/s	ft/s		
$T_t = L / (3600 \text{ V})$	0.04	1	0.00	hr	0.84	hr	hr		
	2.6	1 +	0.1	1 +	50.2	+	=	52.9	min

Open Channel Flow [TR-55 equation 3-4]



		_
Sub-Basin Tc =	54.3	lmin

 Comp. By:
 JKK

 Date:
 5/12/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Time of Concentration Calculations

Sub-Basin Name: Basin E
Condition: Existing

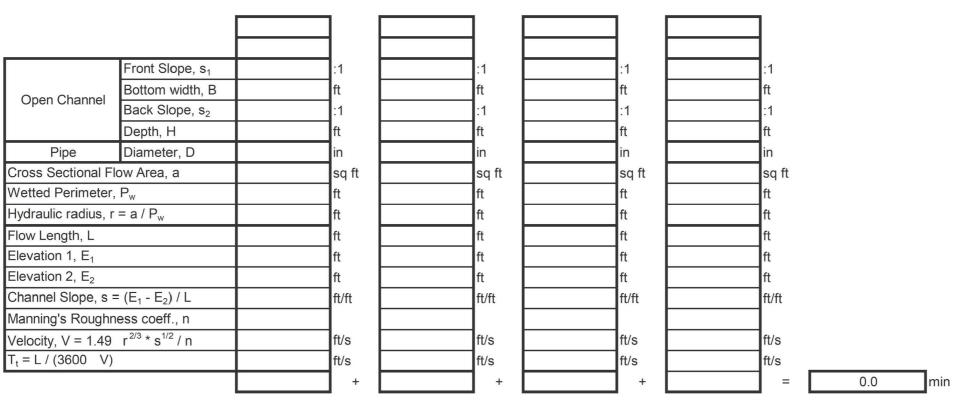
Sheet Flow [TR-55 equation 3-3]

	AB]					
Surface Description	Dense grasses						
Manning's Roughness coeff., n	0.24	1					
Flow Length, L should be < 100 ft	100	ft	ft	ft	ft		
Two-yr, 24-hr rainfall, P ₂	3.01	in	in	in	in		
Elevation 1, E ₁	1096.00	ft	ft	ft	ft		
Elevation 2, E ₂	1095.23	ft	ft	ft	ft		
Land Slope, $s = (E_1 - E_2) / L$	0.01	ft/ft	ft/ft	ft/ft	ft/ft		
Tt = 0.007 * (n * L $^{0.8}$ / (P ₂ $^{0.5}$ * s ^{0.4})	0.36	hr	hr	hr	hr		
	21.6	+	+	+	=	21.6	min

Shallow Concentrated Flow [TR-55 figure 3-1]

	ВС]					
Surface Description	Unpaved	1	1				
Flow Length, L	608	ft	ft	ft	ft		
Elevation 1, E ₁	1095.23	ft	ft	ft	ft		
Elevation 2, E ₂	1085.34	ft	ft	ft	ft		
Watercourse Slope, $s = (E_1 - E_2) / L$	0.016	1	ft/ft	ft/ft	ft/ft		
Velocity, V	2.06	1	ft/s	ft/s	ft/s		
$T_t = L / (3600 \text{ V})$	0.08]	hr	hr	hr		
	4.9	+	+	+	=	4.9 mi	ıin

Open Channel Flow [TR-55 equation 3-4]



Sub-Basin Tc =	26.5	lmin

 Comp. By:
 JKK

 Date:
 5/12/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Time of Concentration Calculations

Sub-Basin Name: Basin F
Condition: Existing

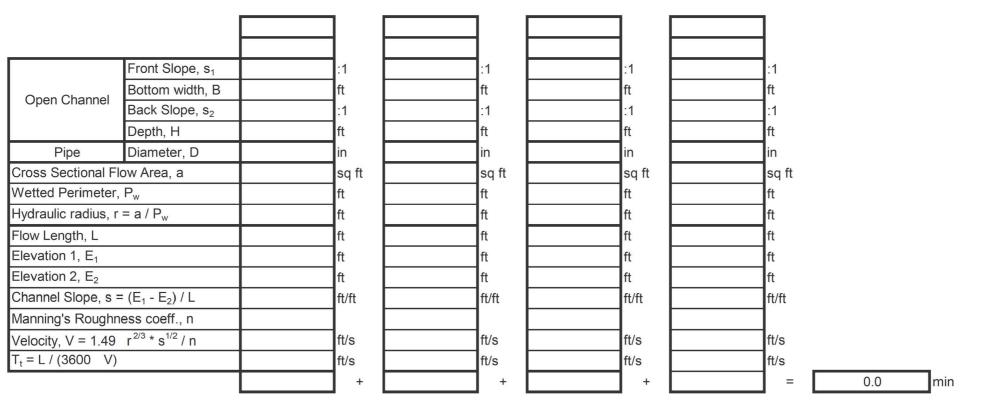
Sheet Flow [TR-55 equation 3-3]

	AB]					
Surface Description	Dense grasses						
Manning's Roughness coeff., n	0.24	1					
Flow Length, L should be < 100 ft	100	ft	ft	ft	ft		
Two-yr, 24-hr rainfall, P ₂	3.01	in	in	in	in		
Elevation 1, E ₁	1096.00	ft	ft	ft	ft		
Elevation 2, E ₂	1095.67	ft	ft	ft	ft		
Land Slope, $s = (E_1 - E_2) / L$	0.00	ft/ft	ft/ft	ft/ft	ft/ft		
Tt = 0.007 * (n * L $^{0.8}$ / (P ₂ $^{0.5}$ * s ^{0.4})	0.50	hr	hr	hr	hr		
	30.3	+	+	+	=	30.3	min

Shallow Concentrated Flow [TR-55 figure 3-1]

	ВС]					
Surface Description	Unpaved	1					
Flow Length, L	890	ft	ft	ft	ft		
Elevation 1, E ₁	1095.67	ft	ft	ft	ft		
Elevation 2, E ₂	1086.34	ft	ft	ft	ft		
Watercourse Slope, s = (E ₁ - E ₂) / L	0.010	1	ft/ft	ft/ft	ft/ft		
Velocity, V	1.65	1	ft/s	ft/s	ft/s		
$T_t = L / (3600 \text{ V})$	0.15]	hr	hr	hr		
	9.0	+	+	+	=	9.0 mi	in

Open Channel Flow [TR-55 equation 3-4]



Sub-Basin Tc =	39.2	lmin

 Comp. By:
 JKK

 Date:
 5/12/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Time of Concentration Calculations

Sub-Basin Name: Basin G (Page 1 of 2)

Condition: Existing

Sheet Flow [TR-55 equation 3-3]

	AB]					
Surface Description	Dense grasses						
Manning's Roughness coeff., n	0.24	1					
Flow Length, L should be < 100 ft	100	ft	ft	ft	ft		
Two-yr, 24-hr rainfall, P ₂	3.01	in	in	in	in		
Elevation 1, E ₁	1096.50	ft	ft	ft	ft		
Elevation 2, E ₂	1096.33	ft	ft	ft	ft		
Land Slope, $s = (E_1 - E_2) / L$	0.00	ft/ft	ft/ft	ft/ft	ft/ft		
Tt = 0.007 * (n * L $^{0.8}$ / (P ₂ $^{0.5}$ * s ^{0.4})	0.66	hr	hr	hr	hr		_
	39.4	+	+	+	=	39.4	min

Shallow Concentrated Flow [TR-55 figure 3-1]

	ВС]					
Surface Description	Unpaved	1					
Flow Length, L	587	ft	ft	ft	ft		
Elevation 1, E ₁	1096.33	ft	ft	ft	ft		
Elevation 2, E ₂	1095.34	ft	ft	ft	ft		
Watercourse Slope, $s = (E_1 - E_2) / L$	0.002	1	ft/ft	ft/ft	ft/ft		
Velocity, V	0.66	1	ft/s	ft/s	ft/s		
$T_t = L / (3600 \text{ V})$	0.25]	hr	hr	hr		
	14.8	+	+	+	=	14.8	min

Open Channel Flow [TR-55 equation 3-4]

		CD	7	DE	7	EF	7	FG	1		
		Pipe	1	Pipe	1	Pipe	1	Pipe	1		
	Front Slope, s ₁		:1		:1		:1		:1		
Onen Channel	Bottom width, B		ft		ft		ft		ft		
Open Channel	Back Slope, s ₂		1:1		:1		:1		:1		
	Depth, H		ft		ft		ft		ft		
Pipe	Diameter, D	12	in	15	in	18	in	21	in		
Cross Sectional F	low Area, a	0.79	sq ft	1.23	sq ft	1.77	sq ft	2.41	sq ft		
Wetted Perimeter	, P _w	3.14	ft	3.93	ft	4.71	ft	5.50	ft		
Hydraulic radius, ı	r = a / P _w	0.25	ft	0.31	ft	0.38	ft	0.44	ft		
Flow Length, L		931	ft	800	ft	347	ft	599	ft		
Elevation 1, E ₁		1093.01	ft	1088.80	ft	1087.50	ft	1086.75	ft		
Elevation 2, E ₂		1088.80	ft	1087.60	ft	1086.75	ft	1085.93	ft		
Channel Slope, s	= (E ₁ - E ₂) / L	0.005	ft/ft	0.002	ft/ft	0.002	ft/ft	0.001	ft/ft		
Manning's Roughr	ness coeff., n	0.013	1	0.013	1	0.013	1	0.013	1		
Velocity, V = 1.49	r ^{2/3} * s ^{1/2} / n	3.06	ft/s	2.04	ft/s	2.77	ft/s	2.44	ft/s		
$T_t = L / (3600 \text{ V})$		0.08	ft/s	0.11	ft/s	0.03	ft/s	0.07	ft/s		
		5.1	7 +	6.5	1 +	2.1	+	4.1	1 =	17.8	8 1

Sub-Basin Tc =	72.0	lmin

 Comp. By:
 JKK

 Date:
 5/12/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Time of Concentration Calculations

Sub-Basin Name: Basin G (Page 2 of 2)
Condition: Existing

Sheet Flow [TR-55 equation 3-3]

1						
Surface Description						
Manning's Roughness coeff., n		1				
Flow Length, L should be < 100 ft	ft	ft	ft	ft		
Two-yr, 24-hr rainfall, P ₂	in	in	in	in		
Elevation 1, E ₁	ft	ft	ft	ft		
Elevation 2, E ₂	ft	ft	ft	ft		
Land Slope, $s = (E_1 - E_2) / L$	ft/ft	ft/ft	ft/ft	ft/ft		
Tt = 0.007 * (n * L $^{0.8}$ / (P ₂ $^{0.5}$ * s ^{0.4})	hr	hr	hr	hr		
	+	+	+	=	0.0	min

Shallow Concentrated Flow [TR-55 figure 3-1]

1		1	1				
		1					
ft		ft	ft		ft		
ft		ft	ft		ft		
ft		ft	ft		ft		
		ft/ft	ft/ft		ft/ft		
1		ft/s	ft/s		ft/s		
1		hr	hr		hr		
+		+	+		=	0.0 mi	in
	ft ft ft		ft/s hr	ft/ft ft/ft ft/s ft/s hr hr	ft/ft ft/s ft/s hr hr	ft/ft ft/ft ft/ft ft/ft ft/ft ft/s ft/s	ft/ft ft/ft ft/ft ft/ft ft/ft ft/s ft/s

Open Channel Flow [TR-55 equation 3-4]

		GH		HI]	IJ]]		
		Pipe]	Pipe]	Pipe]]		
	Front Slope, s ₁		:1		:1		:1	:1		
Onen Channel	Bottom width, B		ft		ft		ft	ft		
Open Channel	Back Slope, s ₂		1:1		:1		:1	:1		
	Depth, H		ft		ft		ft	ft		
Pipe	Diameter, D	24	in	30	in	48	in	in		
Cross Sectional Flow Area, a		3.14	sq ft	4.91	sq ft	12.57	sq ft	sq ft		
Wetted Perimeter, P _w		6.28	ft	7.85	ft	12.57	ft	ft		
Hydraulic radius, r	= a / P _w	0.50	ft	0.63	ft	1.00	ft	ft		
Flow Length, L		301	ft	1299	ft	776	ft	ft		
Elevation 1, E ₁		1085.93	ft	1085.46	ft	1083.44	ft	ft		
Elevation 2, E ₂		1085.46	ft	1083.54	ft	1082.89	ft	ft		
Channel Slope, $s = (E_1 - E_2) / L$		0.002	ft/ft	0.001	ft/ft	0.001	ft/ft	ft/ft		
Manning's Roughness coeff., n		0.013	1	0.013	1	0.013	1	1		
Velocity, V = 1.49	r ^{2/3} * s ^{1/2} / n	2.85	ft/s	3.22	ft/s	3.05	ft/s	ft/s		
$T_t = L / (3600 \text{ V})$		0.03	ft/s	0.11	ft/s	0.07	ft/s	ft/s		
		1.8	1 +	6.7	1 +	4.2	1 +	1 =	12.7	n

Sub-Basin Tc =	84.7	min

 Comp. By:
 JKK

 Date:
 5/12/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

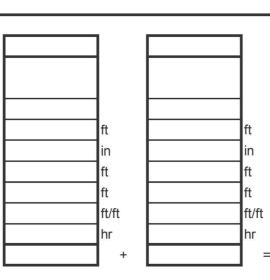
Time of Concentration Calculations

Sub-Basin Name: Basin H (Page 1 of 2)
Condition: Existing

Sheet Flow [TR-55 equation 3-3]

AB	
Smooth surfaces	
0.011	1
97	ft
3.01	in
1096.00	ft
1095.84	ft
0.00	ft/ft
0.06	hr
3.3	+
	Smooth surfaces 0.011 97 3.01 1096.00 1095.84 0.00 0.06

BC	
Dense	
grasses	
0.24	
3	ft
3.01	in
1095.84	ft
1095.81	ft
0.01	ft/ft
0.02	hr
1.2	-





Shallow Concentrated Flow [TR-55 figure 3-1]

	CD	
Surface Description	Unpaved	
Flow Length, L	1783	ft
Elevation 1, E ₁	1095.81	ft
Elevation 2, E ₂	1091.43	ft
Watercourse Slope, $s = (E_1 - E_2) / L$	0.002	
Velocity, V	0.80	
$T_t = L / (3600 \text{ V})$	0.62	
	37.2	

	_
EF]
Unpaved]
418	ft
1090.19	ft
1090.11	ft
0.000	ft/ft
0.22	ft/s
0.52	hr
31.2] +
•	_

GH		
Unpaved		
1235	ft	
1090.10	ft	
1088.09	ft	
0.002	ft/ft	
0.65	ft/s	
0.53	hr	
31.6	+	

ft	
ft	
ft	
ft/ft	
ft/s	
hr	_
=	

81 80 CO 181	
100.0	min

Open Channel Flow [TR-55 equation 3-4]

			_
		DE	1
		Pipe	1
	Front Slope, s ₁		:1
Open Channel	Bottom width, B		ft
Open Channel	Back Slope, s ₂		:1
	Depth, H		ft
Pipe	Diameter, D	15	in
Cross Sectional Fl	ow Area, a	1.23	sq
Wetted Perimeter,	3.93	ft	
Hydraulic radius, r	0.31	ft	
Flow Length, L		742	ft
Elevation 1, E ₁		1091.43	ft
Elevation 2, E ₂	1090.19	ft	
Channel Slope, s =	0.002	ft/ft	
Manning's Roughn	0.013	1	
Velocity, V = 1.49 $r^{2/3} * s^{1/2} / n$		2.16	ft/s
$T_t = L / (3600 V)$		0.10	ft/s
		5.7]
		_	

FG	
Pipe	
	:1
	ft
	:1
	ft
15	in
1.23	sq ft
3.93	ft
0.31	ft
170	ft
1090.11	ft
1090.10	ft
0.000	ft/ft
0.013	
0.40	ft/s
0.12	ft/s
7.0	7 +

	_
HI	
Pipe]
	:1
	ft
	:1
	ft
18	in
1.77	sq ft
4.71	ft
0.38	ft
1438	ft
1088.09	ft
1084.91	ft
0.002	ft/ft
0.013	1
2.80	ft/s
0.14	ft/s
8.6] +
0.0	

IJ	
Channel	
4.00	:1
0.00	ft
4.00	:1
4.00	ft
	in
64.00	sq ft
32.98	ft
1.94	ft
958	ft
1084.91	ft
1084.75	ft
0.000	ft/ft
0.035	
0.86	ft/s
0.31	ft/s
18.7	=

39.9	mir

Total Time of Concentration

Sub-Basin Tc = 144.4 min

 Comp. By:
 JKK

 Date:
 5/12/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Time of Concentration Calculations

Sub-Basin Name: Basin H (Page 2 of 2)

Condition: Existing

Sheet Flow [TR-55 equation 3-3]

Surface Description							
Manning's Roughness coeff., n							
Flow Length, L should be < 100 ft		ft	ft	ft			
Two-yr, 24-hr rainfall, P ₂		in	in	in			
Elevation 1, E ₁		ft	ft	ft			
Elevation 2, E ₂		ft	ft	ft			
Land Slope, $s = (E_1 - E_2) / L$		ft/ft	ft/ft	ft/ft			
Tt = 0.007 * (n * L $^{0.8}$ / (P ₂ $^{0.5}$ * s ^{0.4})		hr	hr	hr	_		
		+	+	=		0.0	min
				•			_

Shallow Concentrated Flow [TR-55 figure 3-1]

	1					
Surface Description	1					
Flow Length, L	ft			ft		
Elevation 1, E ₁	ft			ft		
Elevation 2, E ₂	ft			ft		
Watercourse Slope, $s = (E_1 - E_2) / L$	1	ft/ft		ft/ft		
Velocity, V	1	ft/s		ft/s		
$T_t = L / (3600 \text{ V})$]	hr		hr		_
	+	+		=	0.0	min
						_

Open Channel Flow [TR-55 equation 3-4]

		JK		KL		LM		MN	
		Pipe	1	Channel	1	Pipe	7	Channel	7
	Front Slope, s ₁		:1	1.25	:1		:1	5.00	:1
Onen Channel	Bottom width, B		ft	0.00	ft		ft	0.00	ft
Open Channel	Back Slope, s ₂		:1	1.75	:1		:1	3.00	:1
	Depth, H		ft	12.00	ft		ft	5.00	ft
Pipe	Diameter, D	24	in		in	84	in		in
Cross Sectional F	low Area, a	3.14	sq ft	216.00	sq ft	38.48	sq ft	100.00	sq
Wetted Perimeter	, P _w	6.28	ft	43.40	ft	21.99	ft	41.31	ft
Hydraulic radius, r	= a / P _w	0.50	ft	4.98	ft	1.75	ft	2.42	ft
Flow Length, L		56	ft	207	ft	60	ft	1235	ft
Elevation 1, E ₁		1084.75	ft	1082.05	ft	1078.82	ft	1078.81	ft
Elevation 2, E ₂		1082.05	ft	1078.82	ft	1078.81	ft	1076.68	ft
Channel Slope, s	= (E ₁ - E ₂) / L	0.048	ft/ft	0.016	ft/ft	0.000	ft/ft	0.002	ft/f
Manning's Roughr	ness coeff., n	0.013	7	0.035	1	0.024	1	0.035	1
Velocity, V = 1.49	r ^{2/3} * s ^{1/2} / n	15.85	ft/s	15.50	ft/s	1.16	ft/s	3.19	ft/s
$T_t = L / (3600 V)$		0.00	ft/s	0.00	ft/s	0.01	ft/s	0.11	ft/s
		0.1	1 +	0.2	7	0.9	7	6.5	7

Sub-Basin Tc =	152.0	lmin

Comp. By: JKK Date: 5/12/2025 Chk. By: LMM 10144998.003 Job No:

Time of Concentration Calculations

Sub-Basin Name: Basin A (Page 1 of 2)

Condition: Future

Sheet Flow [TR-55 equation 3-3]

	AB	
Surface Description	Smooth surfaces	
Manning's Roughness coeff., n	0.011	1
Flow Length, L (should be <= 100 ft)	47	ft
Two-yr, 24-hr rainfall, P ₂	3.01	in
Elevation 1, E ₁	1098.00	ft
Elevation 2, E ₂	1097.81	ft
Land Slope, $s = (E_1 - E_2) / L$	0.00	ft/f
Tt = 0.007 * $(n * L)^{0.8} / (P_2^{0.5} * s^{0.4})$	0.02	hr
	1.3	

ВС	
Dense	
grasses	
0.24	
53	ft
3.01	in
1097.81	ft
1097.29	ft
0.01	ft/ft
0.20	hr
11.8	+
·	

ft	
in	
ft	
ft	
ft/ft	
hr	
+	

13.1	min

Shallow Concentrated Flow [TR-55 figure 3-1]

CD	
Unpaved	1
1911	ft
1097.29	ft
1082.73	ft
0.008	1
1.41	1
0.38	
22.6	
	Unpaved 1911 1097.29 1082.73 0.008 1.41 0.38

	_
EF]
Unpaved]
107	ft
1082.19	ft
1082.13	ft
0.001	ft/ft
0.38	ft/s
0.08	hr
4.7] +

	_
GH	
Unpaved	
702	ft
1081.71	ft
1081.09	ft
0.001	ft/ft
0.48	ft/s
0.41	hr
24.4] +

_	
	HI
	Paved
ft	637
ft	1081.09
ft	1080.53
ft/ft	0.001
ft/s	0.60
hr	0.29
	17.6
_	·

69.3	min
	100

Open Channel Flow [TR-55 equation 3-4]

			_	
		DE]	
		Pipe	1	
	Front Slope, s ₁		:1	
Open Channel	Bottom width, B		ft	
	Back Slope, s ₂		:1	
	Depth, H		ft	
Pipe	Diameter, D	24	in	
Cross Sectional Fl	3.14	sq f		
Wetted Perimeter,	6.28	ft		
Hydraulic radius, r	= a / P _w	0.50	ft	
Flow Length, L		361	ft	
Elevation 1, E ₁		1082.73	ft	
Elevation 2, E ₂		1082.19	ft	
Channel Slope, s =	= (E ₁ - E ₂) / L	0.001	ft/ft	
Manning's Roughn	0.013	1		
Velocity, V = 1.49	2.79	ft/s		
$T_t = L / (3600 * V)$	$T_t = L / (3600 * V)$			
-		2.2] ₁	

FG]
Pipe]
	:1
	ft
	:1
	ft
30	in
4.91	sq ft
7.85	ft
0.63	ft
43	ft
1082.13	ft
1081.71	ft
0.010	ft/ft
0.013	
8.28	ft/s
0.00	ft/s
0.1] +

	_
:1	:1
ft	ft
:1	:1
ft	ft
in	in
sq ft	sq fl
ft	ft
ft/ft	ft/ft
ft/s	ft/s
 ft/s	ft/s
+	=
	•

Γ	2.2	min

Sub-Basin Tc =	84.6	lmin

 Comp. By:
 JKK

 Date:
 5/12/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Time of Concentration Calculations

Sub-Basin Name: Basin A (Page 2 of 2)

Condition: Future

Sheet Flow [TR-55 equation 3-3]

1		 				
			l			
Surface Description						
Manning's Roughness coeff., n		1	1			
Flow Length, L (should be <= 100 ft)	ft	ft	ft	ft		
Two-yr, 24-hr rainfall, P ₂	in	in	in	in		
Elevation 1, E ₁	ft	ft	ft	ft		
Elevation 2, E ₂	ft	ft	ft	ft		
Land Slope, $s = (E_1 - E_2) / L$	ft/ft	ft/ft	ft/ft	ft/ft		
Tt = 0.007 * $(n * L)^{0.8} / (P_2^{0.5} * s^{0.4})$	hr	hr	hr	hr		
	+	+	+	=	0.0	min

Shallow Concentrated Flow [TR-55 figure 3-1]

	IJ]						
Surface Description	Unpaved	1						
Flow Length, L	388	ft	ft	ft	ft			
Elevation 1, E ₁	1080.53	ft	ft	ft	ft			
Elevation 2, E ₂	1080.19	ft	ft	ft	ft			
Watercourse Slope, s = (E ₁ - E ₂) / L	0.001	1	ft/ft	ft/ft	ft/ft			
Velocity, V	0.48	1	ft/s	ft/s	ft/s			
$T_t = L / (3600 * V)$	0.23]	hr	hr	hr			_
	13.5	+	+	+	=	,	13.5	min

Open Channel Flow [TR-55 equation 3-4]

			٠		7	1				
		JK	4	KL	1					
		Pipe	_	Channel	_]				
	Front Slope, s ₁		:1	4.50	:1	:1	:1			
Open Channel	Bottom width, B		ft	40.00	ft	ft	ft			
Open Channel	Back Slope, s ₂		:1	4.50	:1	:1	:1			
	Depth, H		ft	12.00	ft	ft	ft			
Pipe	Diameter, D	42	in		in	in	in			
Cross Sectional F	low Area, a	9.62	sq ft	1128.00	sq ft	sq ft	sq ft			
Wetted Perimeter	, P _w	11.00	ft	150.63	ft	ft	ft			
Hydraulic radius, ı	r = a / P _w	0.88	ft	7.49	ft	ft	ft			
Flow Length, L		84	ft	3809	ft	ft	ft			
Elevation 1, E ₁		1080.19	ft	1072.86	ft	ft	ft			
Elevation 2, E ₂		1072.86	ft	1066.00	ft	ft	ft			
Channel Slope, s	= (E ₁ - E ₂) / L	0.087	ft/ft	0.002	ft/ft	ft/ft	ft/ft			
Manning's Roughi	ness coeff., n	0.024	1	0.035	1	1				
Velocity, V = 1.49	* r ^{2/3} * s ^{1/2} / n	16.78	ft/s	6.92	ft/s	ft/s	ft/s			
$T_t = L / (3600 * V)$		0.00	ft/s	0.15	ft/s	ft/s	ft/s			
		0.1	1 +	9.2	1 +	1 +	=	9	9.3	mi

Sub-Basin Tc =	107.4	lmin

 Comp. By:
 JKK

 Date:
 5/12/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Time of Concentration Calculations

Sub-Basin Name: Basin B
Condition: Future

Sheet Flow [TR-55 equation 3-3]

	AB]					
Surface Description	Dense grasses						
Manning's Roughness coeff., n	0.24	1	1				
Flow Length, L (should be <= 100 ft)	100	ft	ft	ft	ft		
Two-yr, 24-hr rainfall, P ₂	3.01	in	in	in	in		
Elevation 1, E ₁	1090.00	ft	ft	ft	ft		
Elevation 2, E ₂	1088.98	ft	ft	ft	ft		
Land Slope, $s = (E_1 - E_2) / L$	0.01	ft/ft	ft/ft	ft/ft	ft/ft		
Tt = 0.007 * $(n * L)^{0.8} / (P_2^{0.5} * s^{0.4})$	0.32	hr	hr	hr	hr		
	19.3	+	+	+	=	19.3 mir	n

Shallow Concentrated Flow [TR-55 figure 3-1]

	ВС]					
Surface Description	Unpaved	1					
Flow Length, L	906	ft	ft	ft	ft		
Elevation 1, E ₁	1088.98	ft	ft	ft	ft		
Elevation 2, E ₂	1079.77	ft	ft	ft	ft		
Watercourse Slope, $s = (E_1 - E_2) / L$	0.010	1	ft/ft	ft/ft	ft/ft		
Velocity, V	1.63	1	ft/s	ft/s	ft/s		
T _t = L / (3600 * V)	0.15]	hr	hr	hr		
	9.3	+	+	+	=	9.3	min

Open Channel Flow [TR-55 equation 3-4]

			٠		1	I
		CD	1			
		Channel]			
	Front Slope, s ₁	4.00	:1	:1	:1	:1
Open Channel	Bottom width, B	15.00	ft	ft	ft	ft
Open Channel	Back Slope, s ₂	6.00	:1	:1	:1	:1
	Depth, H	6.00	ft	ft	ft	ft
Pipe	Diameter, D		in	in	in	in
Cross Sectional F	low Area, a	270.00	sq ft	sq ft	sq ft	sq ft
Wetted Perimeter	, P _w	76.24	ft	ft	ft	ft
Hydraulic radius, ı	r = a / P _w	3.54	ft	ft	ft	ft
Flow Length, L		1731	ft	ft	ft	ft
Elevation 1, E ₁		1079.77	ft	ft	ft	ft
Elevation 2, E ₂		1076.00	ft	ft	ft	ft
Channel Slope, s	= (E ₁ - E ₂) / L	0.002	ft/ft	ft/ft	ft/ft	ft/ft
Manning's Roughi	ness coeff., n	0.035	1			
Velocity, V = 1.49	* r ^{2/3} * s ^{1/2} / n	4.62	ft/s	ft/s	ft/s	ft/s
$T_t = L / (3600 * V)$)	0.10	ft/s	ft/s	ft/s	ft/s
		6.2	1 +	+	+	= 6.2 min

		_
Sub-Basin Tc =	34.8	min

 Comp. By:
 JKK

 Date:
 5/12/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Time of Concentration Calculations

Sub-Basin Name: Basin C
Condition: Future

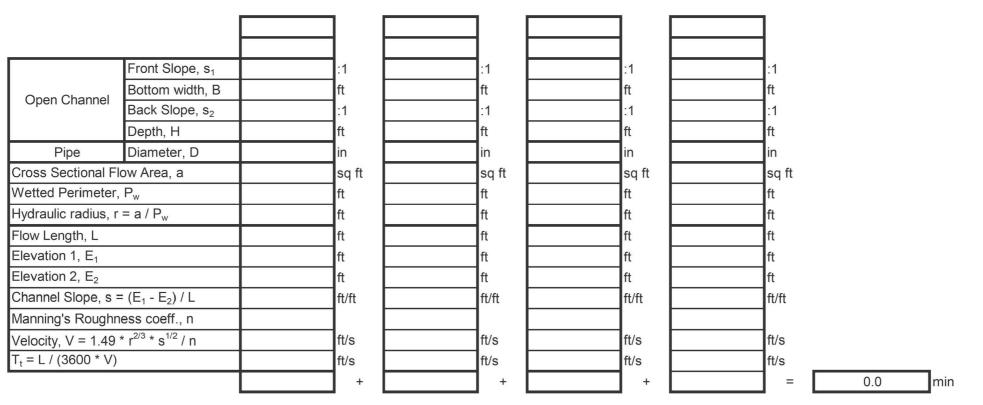
Sheet Flow [TR-55 equation 3-3]

	AB]	ВС]				
Surface Description	Smooth surfaces		Dense grasses					
Manning's Roughness coeff., n	0.011	1	0.24	1	1			
Flow Length, L (should be <= 100 ft)	92	ft	8	ft	ft	ft		
Two-yr, 24-hr rainfall, P ₂	3.01	in	3.01	in	in	in		
Elevation 1, E ₁	1092.00	ft	1090.79	ft	ft	ft		
Elevation 2, E ₂	1090.79	ft	1090.66	ft	ft	ft		
Land Slope, $s = (E_1 - E_2) / L$	0.01	ft/ft	0.02	ft/ft	ft/ft	ft/ft		
Tt = 0.007 * $(n * L)^{0.8} / (P_2^{0.5} * s^{0.4})$	0.02	hr	0.04	hr	hr	hr		
	1.4	+	2.1	+	+	=	3.5	min

Shallow Concentrated Flow [TR-55 figure 3-1]

	CD]					
Surface Description	Unpaved	1					
Flow Length, L	1678	ft	ft	ft	ft		
Elevation 1, E ₁	1090.66	ft	ft	ft	ft		
Elevation 2, E ₂	1083.90	ft	ft	ft	ft		
Watercourse Slope, s = (E ₁ - E ₂) / L	0.004	1	ft/ft	ft/ft	ft/ft		
Velocity, V	1.02	1	ft/s	ft/s	ft/s		
$T_t = L / (3600 * V)$	0.46]	hr	hr	hr		
	27.3	+	+	+	=	27.3	min

Open Channel Flow [TR-55 equation 3-4]



		-
Sub-Basin Tc =	30.8	lmin

 Comp. By:
 JKK

 Date:
 5/12/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Time of Concentration Calculations

Sub-Basin Name: Basin D
Condition: Future

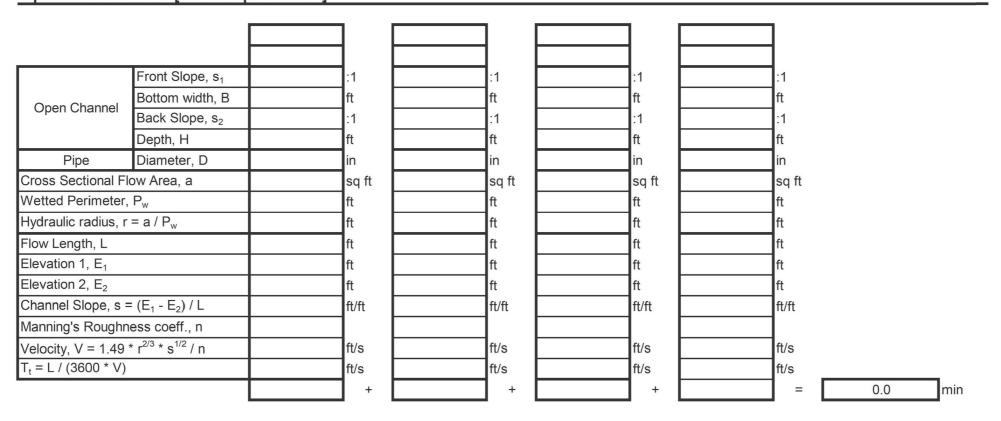
Sheet Flow [TR-55 equation 3-3]

	AB						
Surface Description	Smooth surfaces						
Manning's Roughness coeff., n	0.011	1					
Flow Length, L (should be <= 100 ft)	100	ft	ft	ft	ft		
Two-yr, 24-hr rainfall, P ₂	3.01	in	in	in	in		
Elevation 1, E ₁	1092.00	ft	ft	ft	ft		
Elevation 2, E ₂	1090.59	ft	ft	ft	ft		
Land Slope, $s = (E_1 - E_2) / L$	0.01	ft/ft	ft/ft	ft/ft	ft/ft		
Tt = 0.007 * $(n * L)^{0.8} / (P_2^{0.5} * s^{0.4})$	0.02	hr	hr	hr	hr		
	1.4	+	+	+	=	1.4	min

Shallow Concentrated Flow [TR-55 figure 3-1]

	ВС		CD		DE				
Surface Description	Unpaved		Paved		Unpaved				
Flow Length, L	298	ft	32	ft	1693	ft	ft		
Elevation 1, E ₁	1090.59	ft	1086.27	ft	1085.99	ft	ft		
Elevation 2, E ₂	1086.27	ft	1085.99	ft	1084.00	ft	ft		
Watercourse Slope, $s = (E_1 - E_2) / L$	0.014	1	0.009	ft/ft	0.001	ft/ft	ft/ft		
Velocity, V	1.94	1	1.90	ft/s	0.55	ft/s	ft/s		
$T_t = L / (3600 * V)$	0.04]	0.00	hr	0.85	hr	hr		_
	2.6	+	0.3	+	51.0	+	=	53.8	min

Open Channel Flow [TR-55 equation 3-4]



Sub-Basin Tc =	55.3	lmin

 Comp. By:
 JKK

 Date:
 5/12/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Time of Concentration Calculations

Sub-Basin Name: Basin E
Condition: Future

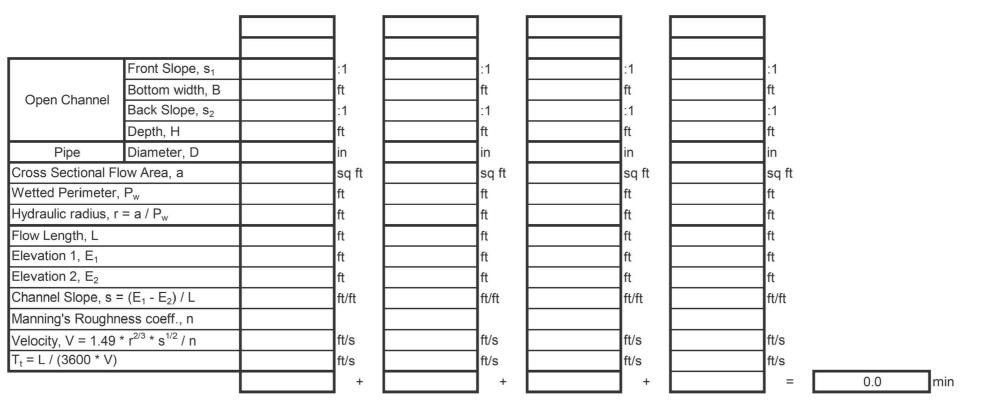
Sheet Flow [TR-55 equation 3-3]

	AB]				
Surface Description	Dense grasses					
Manning's Roughness coeff., n	0.24	1				
Flow Length, L (should be <= 100 ft)	100	ft	ft	ft	ft	
Two-yr, 24-hr rainfall, P ₂	3.01	in	in	in	in	
Elevation 1, E ₁	1096.00	ft	ft	ft	ft	
Elevation 2, E ₂	1095.23	ft	ft	ft	ft	
Land Slope, $s = (E_1 - E_2) / L$	0.01	ft/ft	ft/ft	ft/ft	ft/ft	
Tt = 0.007 * $(n * L)^{0.8} / (P_2^{0.5} * s^{0.4})$	0.36	hr	hr	hr	hr	
	21.6	+	+	+	=	21.6 min

Shallow Concentrated Flow [TR-55 figure 3-1]

	ВС]					
Surface Description	Unpaved	1					
Flow Length, L	608	ft	ft	ft	ft		
Elevation 1, E ₁	1095.23	ft	ft	ft	ft		
Elevation 2, E ₂	1085.34	ft	ft	ft	ft		
Watercourse Slope, s = (E ₁ - E ₂) / L	0.016	1	ft/ft	ft/ft	ft/ft		
Velocity, V	2.06	1	ft/s	ft/s	ft/s		
T _t = L / (3600 * V)	0.08]	hr	hr	hr		
	4.9	+	+	+	=	4.9	min

Open Channel Flow [TR-55 equation 3-4]



Sub-Basin Tc =	26.5	lmin

 Comp. By:
 JKK

 Date:
 5/12/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Time of Concentration Calculations

Sub-Basin Name: Basin F
Condition: Future

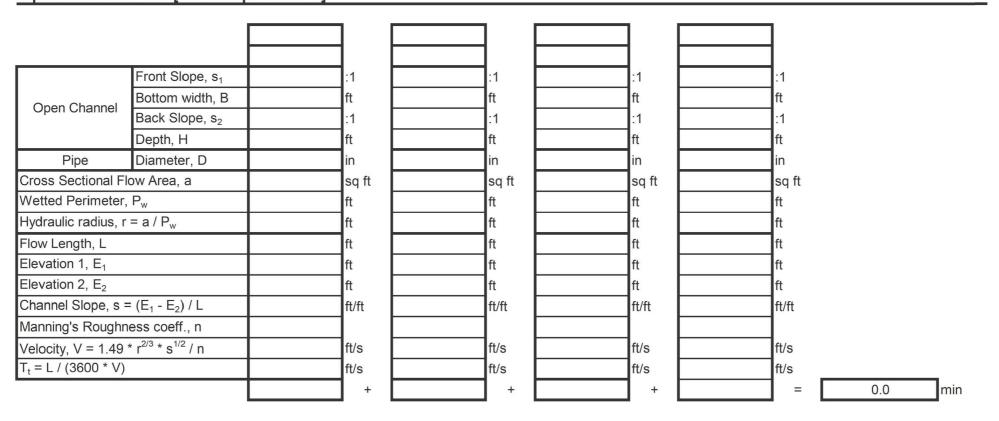
Sheet Flow [TR-55 equation 3-3]

	AB	1	1		ſ		I	
	AB	4						
Surface Description	Dense	l						
ourlace Description	grasses							
Manning's Roughness coeff., n	0.24	1	1					
Flow Length, L (should be <= 100 ft)	100	ft	ft		ft		ft	
Two-yr, 24-hr rainfall, P ₂	3.01	in	in		in		in	
Elevation 1, E ₁	1096.00	ft	ft		ft		ft	
Elevation 2, E ₂	1095.67	ft	ft		ft		ft	
Land Slope, $s = (E_1 - E_2) / L$	0.00	ft/ft	ft/ft		ft/ft		ft/ft	
Tt = 0.007 * $(n * L)^{0.8} / (P_2^{0.5} * s^{0.4})$	0.50	hr	hr		hr		hr	
	30.3	+	+		+		=	30.3 min

Shallow Concentrated Flow [TR-55 figure 3-1]

	ВС]					
Surface Description	Unpaved	1					
Flow Length, L	890	ft	ft	ft	ft		
Elevation 1, E ₁	1095.67	ft	ft	ft	ft		
Elevation 2, E ₂	1086.34	ft	ft	ft	ft		
Watercourse Slope, $s = (E_1 - E_2) / L$	0.010	1	ft/ft	ft/ft	ft/ft		
Velocity, V	1.65	1	ft/s	ft/s	ft/s		
T _t = L / (3600 * V)	0.15]	hr	hr	hr		
	9.0	+	+	+	=	9.0	min

Open Channel Flow [TR-55 equation 3-4]



Sub-Basin Tc =	39.2	lmin

Comp. By: JKK

Date: 5/12/2025

Chk. By: LMM

Job No: 10144998.003

39.4

Time of Concentration Calculations

Sub-Basin Name: Basin G (Page 1 of 2)
Condition: Future

Sheet Flow [TR-55 equation 3-3]

	AB]]
Surface Description	Dense grasses]]
Manning's Roughness coeff., n	0.24	1	1	1
Flow Length, L (should be <= 100 ft)	100	ft	ft	ft
Two-yr, 24-hr rainfall, P ₂	3.01	in	in	in
Elevation 1, E ₁	1096.50	ft	ft	ft
Elevation 2, E ₂	1096.33	ft	ft	ft
Land Slope, $s = (E_1 - E_2) / L$	0.00	ft/ft	ft/ft	ft/ft
Tt = $0.007 * (n * L)^{0.8} / (P_2^{0.5} * s^{0.4})$	0.66	hr	hr	hr
	39.4	7 +	7 +	٦ ٠

Shallow Concentrated Flow [TR-55 figure 3-1]

	ВС]						
Surface Description	Unpaved	1						
Flow Length, L	587	ft	ft	ft	ft			
Elevation 1, E ₁	1096.33	ft	ft	ft	ft			
Elevation 2, E ₂	1095.34	ft	ft	ft	ft			
Watercourse Slope, $s = (E_1 - E_2) / L$	0.002	1	ft/ft	ft/ft	ft/ft			
Velocity, V	0.66	1	ft/s	ft/s	ft/s			
T _t = L / (3600 * V)	0.25	1	hr	hr	hr			_
	14.8	+	+	+	=	14.	.8	min

Open Channel Flow [TR-55 equation 3-4]

		CD	٦	DE	٦	EF	٦	FG	٦	
		Pipe	1	Pipe	1	Pipe	1	Pipe	1	
	Front Slope, s ₁		1:1		1:1		1:1		1:1	
00	Bottom width, B		ft		ft		ft		ft	
Open Channel	Back Slope, s ₂		:1		:1		:1		:1	
	Depth, H		ft		ft		ft		ft	
Pipe	Diameter, D	12	in	15	in	18	in	21	in	
Cross Sectional F	low Area, a	0.79	sq ft	1.23	sq ft	1.77	sq ft	2.41	sq ft	
Wetted Perimeter	, P _w	3.14	ft	3.93	ft	4.71	ft	5.50	ft	
Hydraulic radius, r	r = a / P _w	0.25	ft	0.31	ft	0.38	ft	0.44	ft	
Flow Length, L		931	ft	800	ft	347	ft	599	ft	
Elevation 1, E ₁		1093.01	ft	1088.80	ft	1087.50	ft	1086.75	ft	
Elevation 2, E ₂		1088.80	ft	1087.60	ft	1086.75	ft	1085.93	ft	
Channel Slope, s	= (E ₁ - E ₂) / L	0.005	ft/ft	0.002	ft/ft	0.002	ft/ft	0.001	ft/ft	
Manning's Roughr	ness coeff., n	0.013	1	0.013	1	0.013	1	0.013	1	
Velocity, V = 1.49	* r ^{2/3} * s ^{1/2} / n	3.06	ft/s	2.04	ft/s	2.77	ft/s	2.44	ft/s	
$T_t = L / (3600 * V)$		0.08	ft/s	0.11	ft/s	0.03	ft/s	0.07	ft/s	
		5.1	+	6.5	+	2.1	+	4.1	7 =	17.8

Sub-Basin Tc =	72.0	min

 Comp. By:
 JKK

 Date:
 5/12/2025

 Chk. By:
 LMM

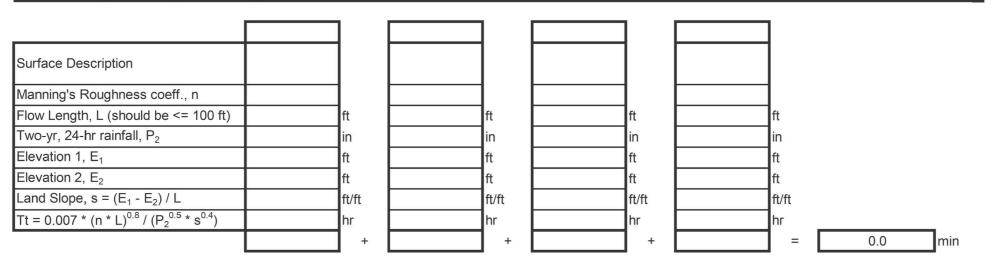
 Job No:
 10144998.003

Time of Concentration Calculations

Sub-Basin Name: Basin G (Page 2 of 2)

Condition: Future

Sheet Flow [TR-55 equation 3-3]



Shallow Concentrated Flow [TR-55 figure 3-1]

ft		ft	ft		ft		
ft		ft	ft		ft		
ft		ft	ft		ft		
		ft/ft	ft/ft		ft/ft		
		ft/s	ft/s		ft/s		
		hr	hr		hr		
+		+	+		=	0.0	min
	ft ft ft		ft/s hr	ft/s ft/s hr	ft/s ft/s hr hr	ft/s ft/s ft/s ft/s hr hr	ft/s ft/s ft/s ft/s hr hr

Open Channel Flow [TR-55 equation 3-4]

		GH	1	HI	1	IJ	1	1
		Pipe	1	Pipe	1	Pipe	7	1
	Front Slope, s ₁		:1		:1		:1]:1
Open Channel	Bottom width, B		ft		ft		ft	ft
Open Channel	Back Slope, s ₂		:1		:1		:1	:1
	Depth, H		ft		ft		ft	ft
Pipe	Diameter, D	24	in	30	in	48	in	in
Cross Sectional F	low Area, a	3.14	sq ft	4.91	sq ft	12.57	sq ft	sq ft
Netted Perimeter	, P _w	6.28	ft	7.85	ft	12.57	ft	ft
-lydraulic radius, r	r = a / P _w	0.50	ft	0.63	ft	1.00	ft	ft
low Length, L		301	ft	1299	ft	776	ft	ft
Elevation 1, E ₁		1085.93	ft	1085.46	ft	1083.44	ft	ft
Elevation 2, E ₂		1085.46	ft	1083.54	ft	1082.89	ft	ft
Channel Slope, s	= (E ₁ - E ₂) / L	0.002	ft/ft	0.001	ft/ft	0.001	ft/ft	ft/ft
Manning's Roughr	ness coeff., n	0.013	1	0.013	1	0.013	1	1
Velocity, V = 1.49	* r ^{2/3} * s ^{1/2} / n	2.85	ft/s	3.22	ft/s	3.05	ft/s	ft/s
$\Gamma_{\rm t} = L / (3600 * V)$		0.03	ft/s	0.11	ft/s	0.07	ft/s	ft/s
		1.8	1 +	6.7	1 +	4.2	1 +	= 12.7

Sub-Basin Tc =	84.7	lmin

 Comp. By:
 JKK

 Date:
 5/12/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

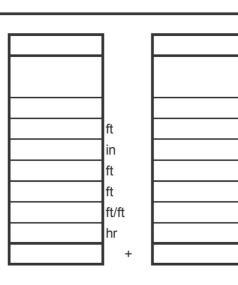
Time of Concentration Calculations

Sub-Basin Name: Basin H (Page 1 of 2)
Condition: Future

Sheet Flow [TR-55 equation 3-3]

		_
	AB	
Surface Description	Smooth surfaces	
Manning's Roughness coeff., n	0.011	1
Flow Length, L (should be <= 100 ft)	97	ft
Two-yr, 24-hr rainfall, P ₂	3.01	in
Elevation 1, E ₁	1096.00	ft
Elevation 2, E ₂	1095.84	ft
Land Slope, $s = (E_1 - E_2) / L$	0.00	ft/ft
Tt = 0.007 * $(n * L)^{0.8} / (P_2^{0.5} * s^{0.4})$	0.06	hr
	3.3] -
		-

ВС	
Dense	
grasses	
0.24	
3	ft
3.01	in
1095.84	ft
1095.81	ft
0.01	ft/f
0.02	hr
1.2	
<u>. </u>	



4.5 min

Shallow Concentrated Flow [TR-55 figure 3-1]

	CD	
Surface Description	Unpaved	
Flow Length, L	1783	ft
Elevation 1, E ₁	1095.81	ft
Elevation 2, E ₂	1091.43	ft
Watercourse Slope, $s = (E_1 - E_2) / L$	0.002	
Velocity, V	0.80	
$T_t = L / (3600 * V)$	0.62	
	37.2	

	_
EF]
Unpaved]
418	ft
1090.19	ft
1090.11	ft
0.000	ft/ft
0.22	ft/s
0.52	hr
31.2] +
	_

	_	
GH		
Unpaved		
1235	ft	
1090.10	ft	
1088.09	ft	
0.002	ft/ft	
0.65	ft/s	
0.53	hr	
31.6	+	
	-	

	_
100.0	min

Open Channel Flow [TR-55 equation 3-4]

		DE	
		Pipe	7
	Front Slope, s ₁		:1
Open Channel	Bottom width, B		ft
Open Channel	Back Slope, s ₂		:1
	Depth, H		ft
Pipe	Diameter, D	15	in
Cross Sectional Fl	ow Area, a	1.23	sq f
Wetted Perimeter,	P_{w}	3.93	ft
Hydraulic radius, r	= a / P _w	0.31	ft
Flow Length, L		742	ft
Elevation 1, E ₁		1091.43	ft
Elevation 2, E ₂		1090.19	ft
Channel Slope, s	= (E ₁ - E ₂) / L	0.002	ft/ft
Manning's Roughr	ess coeff., n	0.013	1
Velocity, V = 1.49	* r ^{2/3} * s ^{1/2} / n	2.16	ft/s
$T_t = L / (3600 * V)$		0.10	ft/s
		5.7] .

FG	
Pipe	
	:1
	ft
	:1
	ft
15	in
1.23	sq ft
3.93	ft
0.31	ft
170	ft
1090.11	ft
1090.10	ft
0.000	ft/ft
0.013	
0.40	ft/s
0.12	ft/s
7.0	+

	-
HI	
Pipe]
	:1
	ft
	:1
	ft
18	in
1.77	sq ft
4.71	ft
0.38	ft
1438	ft
1088.09	ft
1084.91	ft
0.002	ft/ft
0.013	1
2.80	ft/s
0.14	ft/s
8.6	+
	_

	-
IJ]
Channel]
4.00	:1
0.00	ft
4.00	:1
4.00	ft
	in
64.00	sq ft
32.98	ft
1.94	ft
958	ft
1084.91	ft
1084.75	ft
0.000	ft/ft
0.035]
0.86	ft/s
0.31	ft/s
18.7] =

39.9 min

Total Time of Concentration

Sub-Basin Tc = 144.4 min

 Comp. By:
 JKK

 Date:
 5/12/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Time of Concentration Calculations

Sub-Basin Name: Basin H (Page 2 of 2)

Condition: Future

Condition: Future

Sheet Flow [TR-55 equation 3-3]

					_				
Surface Description									
Manning's Roughness coeff., n									
Flow Length, L (should be <= 100 ft)			ft		ft		ft		
Two-yr, 24-hr rainfall, P ₂			in		in		in		
Elevation 1, E ₁			ft		ft		ft		
Elevation 2, E ₂			ft		ft		ft		
Land Slope, $s = (E_1 - E_2) / L$			ft/ft		ft/ft		ft/ft		
Tt = 0.007 * $(n * L)^{0.8} / (P_2^{0.5} * s^{0.4})$			hr		hr		hr		_
			+		+		=	0.0	min
	_	_		_	-	<u> </u>	-		

Shallow Concentrated Flow [TR-55 figure 3-1]

	1					
Surface Description	1					
Flow Length, L	ft			ft		
Elevation 1, E ₁	ft			ft		
Elevation 2, E ₂	ft			ft		
Watercourse Slope, $s = (E_1 - E_2) / L$	1	ft/ft		ft/ft		
Velocity, V	1	ft/s		ft/s		
T _t = L / (3600 * V)]	hr		hr		
	+	+		=	0.0	min
						_

Open Channel Flow [TR-55 equation 3-4]

		JK		KL		LM		MN			
		Pipe		Channel		Pipe]	Channel			
	Front Slope, s ₁		:1	1.25]	5.00	:1		
Open Channel	Bottom width, B		ft	0.00]	0.00	ft		
Open Channel	Back Slope, s ₂		:1	1.75			1	3.00	1:1		
	Depth, H		ft	12.00]	5.00	ft	7.6 r	
Pipe	Diameter, D	24	in			84]		in		
Cross Sectional F	low Area, a	3.14	sq ft	216.00	l í	38.48	1	100.00	sq ft		
Wetted Perimeter	, P _w	6.28	ft	43.40		21.99	1	41.31	ft		
Hydraulic radius, r	= a / P _w	0.50	ft	4.98		1.75]	2.42	ft		
low Length, L		56	ft	207		60	1	1235	ft		
Elevation 1, E ₁		1084.75	ft	1082.05		1078.82]	1078.81	ft		
Elevation 2, E ₂		1082.05	ft	1078.82		1078.81]	1076.68	ft		
Channel Slope, s	= (E ₁ - E ₂) / L	0.048	ft/ft	0.016		0.000]	0.002	ft/ft		
Manning's Roughr	ness coeff., n	0.013	1	0.035		0.024]	0.035	1		
Velocity, V = 1.49	* r ^{2/3} * s ^{1/2} / n	15.85	ft/s	15.50		1.16	1	3.19	ft/s		
$T_t = L / (3600 * V)$		0.00	ft/s	0.00		0.01]	0.11	ft/s		
		0.1	+	0.2		0.9	1	6.5	1 = [7.0	,

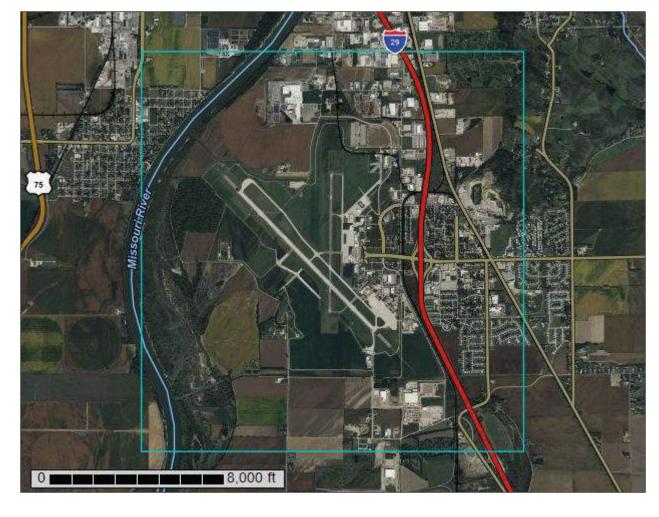
Sub-Basin Tc =	152.0	lmin

Sioux	City	Gateway	Runway	Improvements	Project	EA:	Water	Resources	Analysis
				•	Attach	me	ent I-	2: NRCS	Soil Survey



NRCS

Natural Resources Conservation Service A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants Custom Soil Resource Report for Dakota County, Nebraska, and Woodbury County, Iowa



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2 053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States
Department of Agriculture and other Federal agencies, State agencies including the
Agricultural Experiment Stations, and local agencies. The Natural Resources
Conservation Service (NRCS) has leadership for the Federal part of the National
Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Durafa an	_
Preface	
How Soil Surveys Are Made	
Soil Map	
Soil Map	
Legend	
Map Unit Legend	
Map Unit Descriptions	
Dakota County, Nebraska	
6308—Barney fine sandy loam, occasionally flooded	
7083—Sarpy loamy fine sand, occasionally flooded	
7710—Albaton silty clay, 0 to 2 percent slopes, occasionally flooded	. 19
7713—Albaton silty clay loam, 0 to 2 percent slopes, occasionally	
flooded	
7722—Blake silty clay loam, occasionally flooded	
7741—Haynie silt loam, 0 to 2 percent slopes, occasionally flooded	
7758—Modale silt loam, occasionally flooded	
7800—Owego silty clay, occasionally flooded	
7850—Sarpy fine sand, 3 to 11 percent slopes	
7880—Onawa silty clay, occasionally flooded	
9986—Miscellaneous water, sewage lagoon	
9999—Water	
Woodbury County, Iowa	
1F3—Ida silt loam, 20 to 30 percent slopes, severely eroded	
1G—Ida silt loam, 30 to 40 percent slopes	
2G—Hamburg silt loam, 40 to 75 percent slopes	
3E—Castana silt loam, 14 to 20 percent slopes	
12C—Napier silt loam, 5 to 9 percent slopes	
137—Haynie silt loam, deep loess, 0 to 2 percent slopes, rarely flooded	.36
144—Blake silty clay loam, 0 to 2 percent slopes, rarely flooded	
156—Albaton silty clay, 0 to 2 percent slopes, rarely flooded	. 39
170E—Napier-Castana silt loams, 9 to 20 percent slopes	.40
237—Sarpy loamy fine sand, 0 to 2 percent slopes, rarely flooded	. 42
237B—Sarpy loamy fine sand, 2 to 5 percent slopes, rarely flooded	.43
515—Percival silty clay, 0 to 2 percent slopes, rarely flooded	. 45
518—Morconick fine sandy loam, 0 to 2 percent slopes, rarely flooded	. 46
549—Modale complex, 0 to 2 percent slopes, occasionally flooded	.47
552—Owego silty clay, 0 to 2 percent slopes, rarely flooded	.49
945—Albaton silty clay, depressional, drained, 0 to 1 percent slopes,	
frequently flooded	. 50
1137—Haynie silt loam, 0 to 2 percent slopes, occasionally flooded	
1144—Blake silty clay loam, 0 to 2 percent slopes, occasionally flooded	
1146—Onawa silty clay, 0 to 2 percent slopes, occasionally flooded	
1237B—Sarpy loamy fine sand, 2 to 5 percent slopes, occasionally	
flooded	. 56

Custom Soil Resource Report

1238—Sarpy-Morconick complex, 0 to 2 percent slopes, occasionally
flooded57
1513—Grable-Morconick complex, 0 to 2 percent slopes, occasionally
flooded60
1524—Morconick fine sandy loam, 0 to 2 percent slopes, occasionally
flooded62
1525—Scroll silty clay, 0 to 2 percent slopes, occasionally flooded63
2515—Percival-Albaton complex, 0 to 2 percent slopes, occasionally
flooded65
3146—Onawa-Albaton complex, 0 to 2 percent slopes, rarely flooded 67
3275—Moville-Holly Springs, overwash complex, 0 to 2 percent
slopes, rarely flooded69
3513—Grable-Morconick complex, 0 to 2 percent slopes, rarely flooded71
3549—Modale complex, 0 to 2 percent slopes, rarely flooded74
5010—Pits, sand and gravel76
5040—Udorthents, loamy77
5044—Fluvaquents, 0 to 2 percent slopes, frequently flooded77
5060—Pits, clay
SL—Sewage lagoon79
W—Water79
References80

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

Custom Soil Resource Report

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

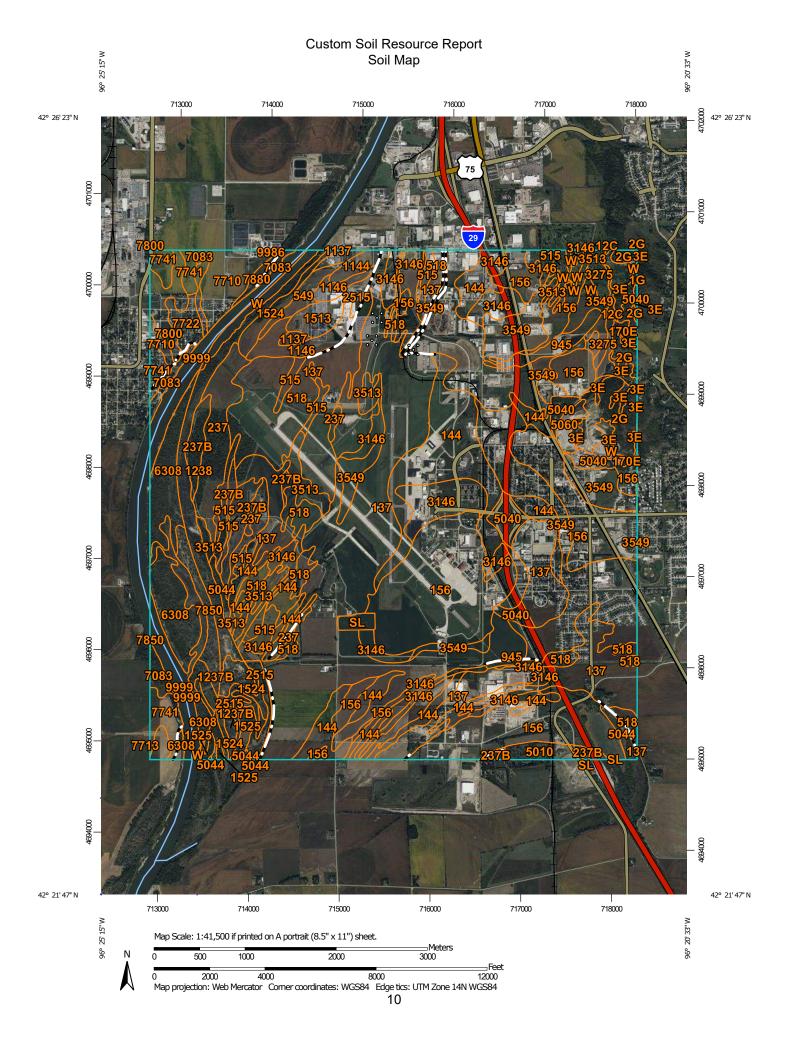
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons



Soil Map Unit Lines



Soil Map Unit Points

Special Point Features

Blowout



Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

+ Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

LOLIND

Spoil Area

Stony Spot



Very Stony Spot



Wet Spot Other



Special Line Features

Water Features

Streams and Canals

Transportation

+++ Rails

Interstate Highways

Major Roads

US Routes

Local Roads

Background

100

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at scales ranging from 1:12,000 to 1:20,000.

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

Source of Map: Natural Resources Conservation Service Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Dakota County, Nebraska Survey Area Data: Version 21, Sep 6, 2023

Soil Survey Area: Woodbury County, Iowa Survey Area Data: Version 33, Sep 12, 2023

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

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

Date(s) aerial images were photographed: Sep 19, 2022—Sep 20, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
6308	Barney fine sandy loam, occasionally flooded	241.3	3.2%
7083	Sarpy loamy fine sand, occasionally flooded	43.7	0.6%
7710	Albaton silty clay, 0 to 2 percent slopes, occasionally flooded	106.2	1.4%
7713	Albaton silty clay loam, 0 to 2 percent slopes, occasionally flooded	14.8	0.2%
7722	Blake silty clay loam, occasionally flooded	38.1	0.5%
7741	Haynie silt loam, 0 to 2 percent slopes, occasionally flooded	101.2	1.4%
7758	Modale silt loam, occasionally flooded	17.2	0.2%
7800	Owego silty clay, occasionally flooded	59.0	0.8%
7850	Sarpy fine sand, 3 to 11 percent slopes	55.3	0.7%
7880	Onawa silty clay, occasionally flooded	13.5	0.2%
9986	Miscellaneous water, sewage lagoon	2.0	0.0%
9999	Water	220.7	3.0%
Subtotals for Soil Survey Area		913.0	12.3%
Totals for Area of Interest		7,429.8	100.0%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1F3	lda silt loam, 20 to 30 percent slopes, severely eroded	16.1	0.2%
1G	Ida silt loam, 30 to 40 percent slopes	0.0	0.0%
2G	Hamburg silt loam, 40 to 75 percent slopes	116.4	1.6%
3E	Castana silt loam, 14 to 20 percent slopes	79.8	1.1%
12C	Napier silt loam, 5 to 9 percent slopes	28.4	0.4%
	Haynie silt loam, deep loess, 0 to 2 percent slopes, rarely flooded	1,751.1	23.6%
	Blake silty clay loam, 0 to 2 percent slopes, rarely flooded	593.9	8.0%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
156	Albaton silty clay, 0 to 2 percent slopes, rarely flooded	1,040.2	14.0%
170E	Napier-Castana silt loams, 9 to 20 percent slopes	12.2	0.2%
237	Sarpy loamy fine sand, 0 to 2 percent slopes, rarely flooded	152.4	2.1%
237B	Sarpy loamy fine sand, 2 to 5 percent slopes, rarely flooded	118.0	1.6%
<mark>515</mark>	Percival silty clay, 0 to 2 percent slopes, rarely flooded	153.4	2.1%
<u>518</u>	Morconick fine sandy loam, 0 to 2 percent slopes, rarely flooded	479.9	6.5%
549	Modale complex, 0 to 2 percent slopes, occasionally flooded	35.0	0.5%
552	Owego silty clay, 0 to 2 percent slopes, rarely flooded	7.1	0.1%
<mark>945</mark>)	Albaton silty clay, depressional, drained, 0 to 1 percent slopes, frequently flooded	49.5	0.7%
1137	Haynie silt loam, 0 to 2 percent slopes, occasionally flooded	21.8	0.3%
1144	Blake silty clay loam, 0 to 2 percent slopes, occasionally flooded	24.2	0.3%
1146	Onawa silty clay, 0 to 2 percent slopes, occasionally flooded	86.9	1.2%
1237B	Sarpy loamy fine sand, 2 to 5 percent slopes, occasionally flooded	37.2	0.5%
1238	Sarpy-Morconick complex, 0 to 2 percent slopes, occasionally flooded	147.7	2.0%
1513	Grable-Morconick complex, 0 to 2 percent slopes, occasionally flooded	44.2	0.6%
<mark>1524</mark>	Morconick fine sandy loam, 0 to 2 percent slopes, occasionally flooded	68.5	0.9%
1525	Scroll silty clay, 0 to 2 percent slopes, occasionally flooded	34.8	0.5%
2515	Percival-Albaton complex, 0 to 2 percent slopes, occasionally flooded	67.6	0.9%
3146	Onawa-Albaton complex, 0 to 2 percent slopes, rarely flooded	358.0	4.8%
3275	Moville-Holly Springs, overwash complex, 0 to 2 percent slopes, rarely flooded	37.3	0.5%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI	
	Grable-Morconick complex, 0 to 2 percent slopes, rarely flooded	107.7	1.5%	
	Modale complex, 0 to 2 percent slopes, rarely flooded	607.7	8.2%	
5010	Pits, sand and gravel	32.8	0.4%	
	Udorthents, loamy	86.9	1.2%	
5044	Fluvaquents, 0 to 2 percent slopes, frequently flooded	30.7	0.4%	
5060	Pits, clay	22.9	0.3%	
SL	Sewage lagoon	17.9	0.2%	
W	Water	48.0	0.6%	
Subtotals for Soil Survey Area		6,516.3	87.7%	
Totals for Area of Interest		7,429.8	100.0%	

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Dakota County, Nebraska

6308—Barney fine sandy loam, occasionally flooded

Map Unit Setting

National map unit symbol: gb0z Elevation: 1,000 to 1,500 feet

Mean annual precipitation: 26 to 28 inches Mean annual air temperature: 46 to 50 degrees F

Frost-free period: 140 to 160 days

Farmland classification: Not prime farmland

Map Unit Composition

Barney and similar soils: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Barney

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Loamy alluvium over sandy and gravelly alluvium

Typical profile

A - 0 to 6 inches: fine sandy loam 2Cg - 6 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Poorly drained Runoff class: Negligible

Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00

in/hr)

Depth to water table: About 0 to 18 inches

Frequency of flooding: Occasional Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Available water supply, 0 to 60 inches: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 5w

Hydrologic Soil Group: A/D

Ecological site: R102CY044NE - WET LAND

Forage suitability group: Not suited (G102CY000NE)

Other vegetative classification: Not suited (G102CY000NE)

Hydric soil rating: Yes

7083—Sarpy loamy fine sand, occasionally flooded

Map Unit Setting

National map unit symbol: gb2r Elevation: 1,000 to 1,500 feet

Mean annual precipitation: 26 to 28 inches Mean annual air temperature: 46 to 50 degrees F

Frost-free period: 140 to 160 days

Farmland classification: Not prime farmland

Map Unit Composition

Sarpy and similar soils: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sarpy

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Calcareous sandy alluvium

Typical profile

A - 0 to 7 inches: loamy fine sand C - 7 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 6 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Runoff class: Negligible

Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95

to 19.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: Occasional Frequency of ponding: None

Calcium carbonate, maximum content: 15 percent

Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): 3s Land capability classification (nonirrigated): 4s

Hydrologic Soil Group: A

Ecological site: F107XB015MO - Sandy/Loamy Floodplain Forest

Forage suitability group: Not suited (G102CY000NE)

Other vegetative classification: Not suited (G102CY000NE)

Hydric soil rating: No

7710—Albaton silty clay, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 2xbkt Elevation: 770 to 1,210 feet

Mean annual precipitation: 27 to 37 inches Mean annual air temperature: 49 to 54 degrees F

Frost-free period: 145 to 180 days

Farmland classification: Not prime farmland

Map Unit Composition

Albaton, occasionally flooded, and similar soils: 90 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Albaton, Occasionally Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Calcareous clayey alluvium

Typical profile

Ap - 0 to 7 inches: silty clay Cg - 7 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately

low (0.00 to 0.01 in/hr)

Depth to water table: About 0 to 12 inches

Frequency of flooding: Occasional Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm) Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): 3w Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: D

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: Yes

Minor Components

Onawa, occasionally flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: No

Blake, occasionally flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

7713—Albaton silty clay loam, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 2xbkw Elevation: 1,030 to 1,200 feet

Mean annual precipitation: 28 to 30 inches Mean annual air temperature: 49 to 50 degrees F

Frost-free period: 155 to 160 days

Farmland classification: Not prime farmland

Map Unit Composition

Albaton, occasionally flooded, and similar soils: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Albaton, Occasionally Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Calcareous clayey alluvium

Typical profile

Ap - 0 to 15 inches: silty clay loam Cg - 15 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately

low (0.00 to 0.01 in/hr)

Depth to water table: About 0 to 12 inches

Frequency of flooding: Occasional Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm) Available water supply, 0 to 60 inches: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): 3w Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: D

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: Yes

7722—Blake silty clay loam, occasionally flooded

Map Unit Setting

National map unit symbol: gb10 Elevation: 1,000 to 1,500 feet

Mean annual precipitation: 26 to 28 inches
Mean annual air temperature: 46 to 50 degrees F

Frost-free period: 140 to 160 days

Farmland classification: Prime farmland if drained

Map Unit Composition

Blake and similar soils: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blake

Settina

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Calcareous silty alluvium

Typical profile

A - 0 to 7 inches: silty clay loam
Cg1 - 7 to 16 inches: silty clay loam
Cg2 - 16 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches Drainage class: Somewhat poorly drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20

to 0.60 in/hr)

Depth to water table: About 18 to 36 inches

Frequency of flooding: Occasional Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Available water supply, 0 to 60 inches: High (about 11.5 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 1

Hydrologic Soil Group: C

Ecological site: F107XB016MO - Loamy Floodplain Forest Forage suitability group: Not suited (G102CY000NE)

Other vegetative classification: Not suited (G102CY000NE)

Hydric soil rating: No

7741—Haynie silt loam, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 2xbkn Elevation: 840 to 1,140 feet

Mean annual precipitation: 28 to 35 inches Mean annual air temperature: 49 to 53 degrees F

Frost-free period: 145 to 180 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Haynie, occasionally flooded, and similar soils: 80 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Haynie, Occasionally Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Calcareous silty alluvium

Typical profile

Ap - 0 to 7 inches: silt loam C - 7 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to

moderately high (0.14 to 1.42 in/hr)

Depth to water table: About 48 to 79 inches

Frequency of flooding: Occasional Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm) Available water supply, 0 to 60 inches: Very high (about 12.7 inches)

Interpretive groups

Land capability classification (irrigated): 2w Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: B

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Minor Components

Grable, occasionally flooded

Percent of map unit: 10 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Lossing, occasionally flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Albaton, occasionally flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: Yes

7758—Modale silt loam, occasionally flooded

Map Unit Setting

National map unit symbol: gb1z Elevation: 1,000 to 1,500 feet

Mean annual precipitation: 26 to 28 inches Mean annual air temperature: 46 to 50 degrees F

Frost-free period: 140 to 160 days

Farmland classification: Prime farmland if drained

Map Unit Composition

Modale and similar soils: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Modale

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Calcareous silty alluvium over clayey alluvium

Typical profile

C - 0 to 25 inches: silt loam 2Cg - 25 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches Drainage class: Somewhat poorly drained

Runoff class: Negligible

Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low

0.01 to 0.06 in/hr)

Depth to water table: About 18 to 36 inches

Frequency of flooding: Occasional Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Available water supply, 0 to 60 inches: High (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 1 Land capability classification (nonirrigated): 1

Hydrologic Soil Group: C

Ecological site: F107XB016MO - Loamy Floodplain Forest Forage suitability group: Not suited (G102CY000NE) Other vegetative classification: Not suited (G102CY000NE)

Hydric soil rating: No

7800—Owego silty clay, occasionally flooded

Map Unit Setting

National map unit symbol: gb2m Elevation: 1,000 to 1,500 feet

Mean annual precipitation: 26 to 28 inches Mean annual air temperature: 46 to 50 degrees F

Frost-free period: 140 to 160 days

Farmland classification: Prime farmland if drained

Map Unit Composition

Owego and similar soils: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Owego

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Calcareous clayey alluvium

Typical profile

A - 0 to 11 inches: silty clay 2Cg - 11 to 22 inches: silt loam 3Cg - 22 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Poorly drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately

low (0.00 to 0.06 in/hr)

Depth to water table: About 0 to 18 inches

Frequency of flooding: Occasional Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Available water supply, 0 to 60 inches: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): 3w Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: D

Ecological site: F107XB017MO - Clayey Floodplain Forest Forage suitability group: Not suited (G102CY000NE)

Other vegetative classification: Not suited (G102CY000NE)

Hydric soil rating: Yes

7850—Sarpy fine sand, 3 to 11 percent slopes

Map Unit Setting

National map unit symbol: gb2q Elevation: 1,000 to 1,500 feet

Mean annual precipitation: 26 to 28 inches Mean annual air temperature: 46 to 50 degrees F

Frost-free period: 140 to 160 days

Farmland classification: Not prime farmland

Map Unit Composition

Sarpy and similar soils: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sarpy

Setting

Landform: Dunes on flood plains Down-slope shape: Convex, linear Across-slope shape: Convex, linear Parent material: Sandy alluvium

Typical profile

A - 0 to 7 inches: fine sand

C - 7 to 60 inches: loamy fine sand

Properties and qualities

Slope: 2 to 11 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95

to 19.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Calcium carbonate, maximum content: 15 percent

Available water supply, 0 to 60 inches: Low (about 5.8 inches)

Interpretive groups

Land capability classification (irrigated): 4s Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: A

Ecological site: F107XB015MO - Sandy/Loamy Floodplain Forest

Forage suitability group: Not suited (G102CY000NE)

Other vegetative classification: Not suited (G102CY000NE)

Hydric soil rating: No

7880—Onawa silty clay, occasionally flooded

Map Unit Setting

National map unit symbol: gb2l Elevation: 1,000 to 1,500 feet

Mean annual precipitation: 26 to 28 inches Mean annual air temperature: 46 to 50 degrees F

Frost-free period: 140 to 160 days

Farmland classification: Prime farmland if drained

Map Unit Composition

Onawa and similar soils: 98 percent *Minor components*: 2 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Onawa

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Calcareous clayey alluvium over loamy alluvium

Typical profile

Ap - 0 to 7 inches: silty clay Cg - 7 to 18 inches: silty clay 2Cg - 18 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches Drainage class: Somewhat poorly drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low

0.01 to 0.06 in/hr)

Depth to water table: About 18 to 36 inches

Frequency of flooding: Occasional Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Available water supply, 0 to 60 inches: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): 2w Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: D

Ecological site: F107XB017MO - Clayey Floodplain Forest Forage suitability group: Not suited (G102CY000NE)

Other vegetative classification: Not suited (G102CY000NE)

Hydric soil rating: No

Minor Components

Albaton

Percent of map unit: 2 percent Landform: Flood plains Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest Other vegetative classification: Not suited (G102CY000NE)

Hydric soil rating: Yes

9986—Miscellaneous water, sewage lagoon

Map Unit Setting

National map unit symbol: gj3s

Elevation: 1,200 to 1,800 feet

Mean annual precipitation: 28 to 30 inches Mean annual air temperature: 50 to 54 degrees F

Frost-free period: 150 to 170 days

Farmland classification: Not prime farmland

Map Unit Composition

Miscellaneous water: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Miscellaneous Water

Interpretive groups

Land capability classification (irrigated): None specified Forage suitability group: Not suited (G102CY000NE)
Other vegetative classification: Not suited (G102CY000NE)

9999-Water

Map Unit Setting

National map unit symbol: gj3w Elevation: 3,500 to 5,250 feet

Mean annual precipitation: 22 to 24 inches Mean annual air temperature: 47 to 50 degrees F

Frost-free period: 120 to 150 days

Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Water

Interpretive groups

Land capability classification (irrigated): None specified Forage suitability group: Unnamed (G065XY0NENE)
Other vegetative classification: Unnamed (G065XY0NENE)

Hydric soil rating: Unranked

Woodbury County, Iowa

1F3—Ida silt loam, 20 to 30 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: 2sqr7 Elevation: 920 to 1,520 feet

Mean annual precipitation: 28 to 34 inches Mean annual air temperature: 48 to 52 degrees F

Frost-free period: 145 to 180 days

Farmland classification: Farmland of local importance

Map Unit Composition

Ida, severely eroded, and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ida, Severely Eroded

Setting

Landform: Loess hills

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Convex Across-slope shape: Convex Parent material: Calcareous loess

Typical profile

Ap - 0 to 4 inches: silt loam C - 4 to 79 inches: silt loam

Properties and qualities

Slope: 20 to 30 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to

moderately high (0.14 to 1.42 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Calcium carbonate, maximum content: 14 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm) Available water supply, 0 to 60 inches: Very high (about 12.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Ecological site: R107XB013MO - Calcareous Loess Protected Backslope Savanna, R107XB006MO - Calcareous Loess Exposed Backslope Prairie

Hydric soil rating: No

Minor Components

Monona, eroded

Percent of map unit: 10 percent

Landform: Loess hills

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Convex Across-slope shape: Convex

Ecological site: R107XB003MO - Deep Loess Exposed Backslope Savanna

Hydric soil rating: No

Burchard, eroded

Percent of map unit: 5 percent

Landform: Hillslopes

Landform position (two-dimensional): Backslope Landform position (three-dimensional): Side slope

Down-slope shape: Convex Across-slope shape: Convex

Ecological site: R107XB027IA - Calcareous Till Upland Prairie

Hydric soil rating: No

1G—Ida silt loam, 30 to 40 percent slopes

Map Unit Setting

National map unit symbol: 2sqr9 Elevation: 910 to 1.470 feet

Mean annual precipitation: 28 to 34 inches
Mean annual air temperature: 47 to 52 degrees F

Frost-free period: 145 to 180 days

Farmland classification: Farmland of local importance

Map Unit Composition

Ida and similar soils: 90 percent Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ida

Setting

Landform: Loess hills

Landform position (two-dimensional): Backslope, shoulder

Landform position (three-dimensional): Side slope

Down-slope shape: Convex Across-slope shape: Convex Parent material: Calcareous loess

Typical profile

Ap - 0 to 9 inches: silt loam C - 9 to 79 inches: silt loam

Properties and qualities

Slope: 30 to 40 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to

moderately high (0.14 to 1.42 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Calcium carbonate, maximum content: 14 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm) Available water supply, 0 to 60 inches: Very high (about 12.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: B

Ecological site: R107XB013MO - Calcareous Loess Protected Backslope Savanna, R107XB006MO - Calcareous Loess Exposed Backslope Prairie

Hydric soil rating: No

Minor Components

Monona

Percent of map unit: 5 percent

Landform: Loess hills

Landform position (two-dimensional): Backslope, shoulder

Landform position (three-dimensional): Side slope

Down-slope shape: Convex Across-slope shape: Convex

Ecological site: R107XB003MO - Deep Loess Exposed Backslope Savanna

Hydric soil rating: No

Steinauer

Percent of map unit: 5 percent

Landform: Loess hills

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Convex Across-slope shape: Convex

Ecological site: R107XB027IA - Calcareous Till Upland Prairie

Hydric soil rating: No

2G—Hamburg silt loam, 40 to 75 percent slopes

Map Unit Setting

National map unit symbol: 2y69l Elevation: 920 to 1,480 feet

Mean annual precipitation: 28 to 33 inches Mean annual air temperature: 48 to 52 degrees F

Frost-free period: 145 to 180 days

Farmland classification: Farmland of local importance

Map Unit Composition

Hamburg and similar soils: 95 percent

Minor components: 5 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hamburg

Setting

Landform: Loess hills

Landform position (two-dimensional): Backslope, shoulder

Landform position (three-dimensional): Side slope

Down-slope shape: Convex Across-slope shape: Convex Parent material: Calcareous loess

Typical profile

A - 0 to 4 inches: silt loam
AC - 4 to 14 inches: silt loam
C - 14 to 79 inches: silt loam

Properties and qualities

Slope: 40 to 75 percent

Depth to restrictive feature: More than 80 inches Drainage class: Somewhat excessively drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to

moderately high (0.14 to 1.42 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Calcium carbonate, maximum content: 20 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm) Available water supply, 0 to 60 inches: Very high (about 12.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: B

Ecological site: R107XB006MO - Calcareous Loess Exposed Backslope Prairie

Hydric soil rating: No

Minor Components

Liston

Percent of map unit: 5 percent

Landform: Hillslopes

Landform position (two-dimensional): Backslope, shoulder

Landform position (three-dimensional): Side slope

Down-slope shape: Convex Across-slope shape: Convex

Ecological site: R107XB027IA - Calcareous Till Upland Prairie

Hydric soil rating: No

3E—Castana silt loam, 14 to 20 percent slopes

Map Unit Setting

National map unit symbol: fh6r Elevation: 900 to 1,500 feet

Mean annual precipitation: 26 to 36 inches Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 155 to 200 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Castana and similar soils: 75 percent *Minor components*: 25 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Castana

Setting

Landform: Alluvial fans

Landform position (two-dimensional): Footslope Landform position (three-dimensional): Base slope

Down-slope shape: Concave Across-slope shape: Linear

Parent material: Silty local alluvium and colluvium

Typical profile

Ap - 0 to 8 inches: silt loam
A - 8 to 18 inches: silt loam
AC - 18 to 30 inches: silt loam
C1,C3 - 30 to 60 inches: silt loam

Properties and qualities

Slope: 14 to 20 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to

moderately high (0.14 to 1.42 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Available water supply, 0 to 60 inches: Very high (about 12.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: B

Ecological site: R107XB008MO - Loamy Footslope Savanna

Hydric soil rating: No

Minor Components

Napier

Percent of map unit: 10 percent

Landform: Alluvial fans

Landform position (two-dimensional): Footslope Landform position (three-dimensional): Base slope

Down-slope shape: Linear Across-slope shape: Convex

Ecological site: R107XB008MO - Loamy Footslope Savanna

Hydric soil rating: No

Dow, severely eroded

Percent of map unit: 10 percent

Landform: Hillslopes

Landform position (two-dimensional): Backslope Landform position (three-dimensional): Side slope

Down-slope shape: Linear Across-slope shape: Concave

Ecological site: R107XB013MO - Calcareous Loess Protected Backslope Savanna, R107XB006MO - Calcareous Loess Exposed Backslope Prairie

Hydric soil rating: No

Monona

Percent of map unit: 5 percent

Landform: Loess hills

Landform position (two-dimensional): Backslope Landform position (three-dimensional): Side slope

Down-slope shape: Convex Across-slope shape: Convex

Ecological site: R107XB003MO - Deep Loess Exposed Backslope Savanna

Hydric soil rating: No

12C—Napier silt loam, 5 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2sy78 Elevation: 910 to 1,470 feet

Mean annual precipitation: 28 to 35 inches Mean annual air temperature: 47 to 52 degrees F

Frost-free period: 145 to 180 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Napier and similar soils: 95 percent Minor components: 5 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Napier

Setting

Landform: Loess hills

Landform position (two-dimensional): Footslope Landform position (three-dimensional): Base slope

Down-slope shape: Linear Across-slope shape: Convex

Parent material: Local silty colluvium

Typical profile

Ap - 0 to 8 inches: silt loam
A - 8 to 29 inches: silt loam
Bw - 29 to 48 inches: silt loam
C - 48 to 79 inches: silt loam

Properties and qualities

Slope: 5 to 9 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to

moderately high (0.14 to 1.42 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Calcium carbonate, maximum content: 10 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm) Available water supply, 0 to 60 inches: Very high (about 13.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: B

Ecological site: R107XB008MO - Loamy Footslope Savanna

Hydric soil rating: No

Minor Components

Rawles, occasionally flooded

Percent of map unit: 3 percent Landform: Drainageways

Landform position (two-dimensional): Footslope Landform position (three-dimensional): Base slope

Down-slope shape: Linear Across-slope shape: Concave

Ecological site: R107XB024IA - Wet Upland Drainageway Prairie

Hydric soil rating: No

Monona

Percent of map unit: 2 percent

Landform: Loess hills

Landform position (two-dimensional): Backslope, shoulder

Landform position (three-dimensional): Side slope

Down-slope shape: Convex Across-slope shape: Linear

Ecological site: R107XB002MO - Deep Loess Upland Prairie

Hydric soil rating: No

137—Haynie silt loam, deep loess, 0 to 2 percent slopes, rarely flooded

Map Unit Setting

National map unit symbol: 2xbkp Elevation: 780 to 1,150 feet

Mean annual precipitation: 28 to 37 inches Mean annual air temperature: 49 to 54 degrees F

Frost-free period: 155 to 180 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Haynie, rarely flooded, and similar soils: 90 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Haynie, Rarely Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Calcareous silty alluvium

Typical profile

Ap - 0 to 7 inches: silt loam C - 7 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to

moderately high (0.14 to 1.42 in/hr)

Depth to water table: About 48 to 79 inches

Frequency of flooding: Rare Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm) Available water supply, 0 to 60 inches: Very high (about 12.7 inches)

Interpretive groups

Land capability classification (irrigated): 1 Land capability classification (nonirrigated): 1

Hydrologic Soil Group: B

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Minor Components

Percival, rarely flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: No

Sarpy, rarely flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Rise

Down-slope shape: Convex Across-slope shape: Linear

Ecological site: F107XB015MO - Sandy/Loamy Floodplain Forest

Hydric soil rating: No

144—Blake silty clay loam, 0 to 2 percent slopes, rarely flooded

Map Unit Setting

National map unit symbol: fh4n Elevation: 800 to 1,200 feet

Mean annual precipitation: 26 to 36 inches Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 155 to 200 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Blake, rarely flooded, and similar soils: 70 percent

Minor components: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blake, Rarely Flooded

Settina

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear Parent material: Silty alluvium

Typical profile

Ap - 0 to 7 inches: silty clay loam C1 - 7 to 24 inches: silty clay loam

C2 - 24 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches Drainage class: Somewhat poorly drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to

moderately high (0.14 to 1.42 in/hr)

Depth to water table: About 12 to 42 inches

Frequency of flooding: Rare Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Available water supply, 0 to 60 inches: Very high (about 12.6 inches)

Interpretive groups

Land capability classification (irrigated): 1 Land capability classification (nonirrigated): 1

Hydrologic Soil Group: C/D

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Minor Components

Onawa, rarely flooded

Percent of map unit: 15 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: No

Haynie, rarely flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Albaton, rarely flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: Yes

Owego, rarely flooded

Percent of map unit: 3 percent Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: Yes

Lakeport, rarely flooded

Percent of map unit: 2 percent Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: R107XB019MO - Wet Floodplain Prairie

Hydric soil rating: No

156—Albaton silty clay, 0 to 2 percent slopes, rarely flooded

Map Unit Setting

National map unit symbol: 2xbkv Elevation: 780 to 1,180 feet

Mean annual precipitation: 28 to 37 inches Mean annual air temperature: 49 to 54 degrees F

Frost-free period: 150 to 170 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Albaton, rarely flooded, and similar soils: 90 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Albaton, Rarely Flooded

Settina

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Calcareous clayey alluvium

Typical profile

Ap - 0 to 7 inches: silty clay Cg - 7 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately

low (0.00 to 0.01 in/hr)

Depth to water table: About 0 to 12 inches

Frequency of flooding: Rare Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm) Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: D

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: Yes

Minor Components

Onawa, rarely flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: No

Modale, rarely flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB026MO - Wet Floodplain Woodland

Hydric soil rating: No

170E—Napier-Castana silt loams, 9 to 20 percent slopes

Map Unit Setting

National map unit symbol: 2xblp Elevation: 1,070 to 1,410 feet

Mean annual precipitation: 28 to 31 inches
Mean annual air temperature: 48 to 49 degrees F

Frost-free period: 155 to 165 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Napier and similar soils: 70 percent

Castana and similar soils: 25 percent

Minor components: 5 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Napier

Setting

Landform: Loess hills

Landform position (two-dimensional): Footslope Landform position (three-dimensional): Base slope

Down-slope shape: Linear Across-slope shape: Convex

Parent material: Local silty colluvium

Typical profile

Ap - 0 to 8 inches: silt loam
A - 8 to 29 inches: silt loam
Bw - 29 to 48 inches: silt loam
C - 48 to 79 inches: silt loam

Properties and qualities

Slope: 9 to 14 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to

moderately high (0.14 to 1.42 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Calcium carbonate, maximum content: 10 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm) Available water supply, 0 to 60 inches: Very high (about 13.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: B

Ecological site: R107XB008MO - Loamy Footslope Savanna

Hydric soil rating: No

Description of Castana

Settina

Landform: Loess hills

Landform position (two-dimensional): Footslope Landform position (three-dimensional): Base slope

Down-slope shape: Linear Across-slope shape: Convex Parent material: Local silty colluvium

Typical profile

Ap - 0 to 8 inches: silt loam
A - 8 to 18 inches: silt loam
AC - 18 to 30 inches: silt loam
C - 30 to 60 inches: silt loam

Properties and qualities

Slope: 14 to 20 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to

moderately high (0.14 to 1.42 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm) Available water supply, 0 to 60 inches: Very high (about 12.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: B

Ecological site: R107XB008MO - Loamy Footslope Savanna

Hydric soil rating: No

Minor Components

Monona

Percent of map unit: 5 percent

Landform: Loess hills

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Convex Across-slope shape: Linear

Ecological site: R107XB002MO - Deep Loess Upland Prairie

Hydric soil rating: No

237—Sarpy loamy fine sand, 0 to 2 percent slopes, rarely flooded

Map Unit Setting

National map unit symbol: fh5r Elevation: 700 to 1,200 feet

Mean annual precipitation: 26 to 36 inches
Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 155 to 200 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Sarpy, rarely flooded, and similar soils: 95 percent

Minor components: 5 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sarpy, Rarely Flooded

Settina

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Rise

Down-slope shape: Convex Across-slope shape: Linear Parent material: Sandy alluvium

Typical profile

Ap - 0 to 6 inches: loamy fine sand C - 6 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Runoff class: Negligible

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very

high (1.42 to 14.17 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: Rare Frequency of ponding: None

Calcium carbonate, maximum content: 15 percent

Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): 3s Land capability classification (nonirrigated): 4s

Hydrologic Soil Group: A

Ecological site: F107XB015MO - Sandy/Loamy Floodplain Forest

Hydric soil rating: No

Minor Components

Haynie, rarely flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB015MO - Sandy/Loamy Floodplain Forest

Hydric soil rating: No

237B—Sarpy loamy fine sand, 2 to 5 percent slopes, rarely flooded

Map Unit Setting

National map unit symbol: fh5s Elevation: 700 to 1,650 feet

Mean annual precipitation: 26 to 36 inches
Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 155 to 200 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Sarpy, rarely flooded, and similar soils: 80 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sarpy, Rarely Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Rise

Down-slope shape: Convex Across-slope shape: Linear Parent material: Sandy alluvium

Typical profile

Ap - 0 to 6 inches: loamy fine sand C - 6 to 60 inches: fine sand

Properties and qualities

Slope: 2 to 5 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Runoff class: Negligible

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very

high (1.42 to 14.17 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: Rare Frequency of ponding: None

Calcium carbonate, maximum content: 15 percent

Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): 3s Land capability classification (nonirrigated): 4s

Hydrologic Soil Group: A

Ecological site: F107XB015MO - Sandy/Loamy Floodplain Forest

Hydric soil rating: No

Minor Components

Ticonic, rarely flooded

Percent of map unit: 10 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Onawa, rarely flooded

Percent of map unit: 10 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: No

515—Percival silty clay, 0 to 2 percent slopes, rarely flooded

Map Unit Setting

National map unit symbol: fh7s Elevation: 700 to 1,200 feet

Mean annual precipitation: 26 to 36 inches Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 155 to 200 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Percival, rarely flooded, and similar soils: 75 percent

Minor components: 25 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Percival, Rarely Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Clayey alluvium over sandy alluvium

Typical profile

Ap - 0 to 8 inches: silty clay Cg - 8 to 24 inches: silty clay

2Cg - 24 to 60 inches: stratified fine sand to loamy fine sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches Drainage class: Somewhat poorly drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately

low (0.00 to 0.01 in/hr)

Depth to water table: About 12 to 42 inches

Frequency of flooding: Rare Frequency of ponding: None

Calcium carbonate, maximum content: 25 percent

Available water supply, 0 to 60 inches: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: D

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: No

Minor Components

Morconick, rarely flooded

Percent of map unit: 10 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Convex Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Sarpy, rarely flooded

Percent of map unit: 10 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Rise

Down-slope shape: Convex Across-slope shape: Linear

Ecological site: F107XB015MO - Sandy/Loamy Floodplain Forest

Hydric soil rating: No

Albaton, rarely flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: Yes

518—Morconick fine sandy loam, 0 to 2 percent slopes, rarely flooded

Map Unit Setting

National map unit symbol: fhfc Elevation: 700 to 1,200 feet

Mean annual precipitation: 26 to 36 inches
Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 155 to 200 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Morconick, rarely flooded, and similar soils: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Morconick, Rarely Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Convex Across-slope shape: Linear

Parent material: Loamy alluvium over sandy alluvium

Typical profile

Ap - 0 to 7 inches: fine sandy loam

C1 - 7 to 13 inches: loam

2C2,2C8 - 13 to 80 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to

moderately high (0.14 to 1.42 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: Rare Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Available water supply, 0 to 60 inches: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3s

Hydrologic Soil Group: B

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

549—Modale complex, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: swq6 Elevation: 950 to 1,150 feet

Mean annual precipitation: 26 to 36 inches Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 155 to 200 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Modale, silt loam, occasionally flooded, and similar soils: 70 percent Modale, silty clay loam, occasionally flooded, and similar soils: 30 percent Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Modale, Silt Loam, Occasionally Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Silty alluvium over clayey alluvium

Typical profile

Ap - 0 to 7 inches: silt loam C1,C3 - 7 to 24 inches: silt loam 2Cg,3Cg3 - 24 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches Drainage class: Somewhat poorly drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately

low (0.00 to 0.01 in/hr)

Depth to water table: About 12 to 42 inches

Frequency of flooding: Occasional Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Available water supply, 0 to 60 inches: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 1

Hydrologic Soil Group: C

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Description of Modale, Silty Clay Loam, Occasionally Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Silty alluvium over clayey alluvium

Typical profile

Ap - 0 to 7 inches: silty clay loam Cg - 7 to 24 inches: silt loam 2Cg - 24 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches Drainage class: Somewhat poorly drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately

low (0.00 to 0.01 in/hr)

Depth to water table: About 12 to 42 inches

Frequency of flooding: Occasional Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Available water supply, 0 to 60 inches: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2s

Hydrologic Soil Group: C

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

552—Owego silty clay, 0 to 2 percent slopes, rarely flooded

Map Unit Setting

National map unit symbol: fh81 Elevation: 700 to 1.200 feet

Mean annual precipitation: 26 to 36 inches Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 155 to 200 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Owego, rarely flooded, and similar soils: 95 percent

Minor components: 5 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Owego, Rarely Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Clayey and silty alluvium

Typical profile

Ap - 0 to 8 inches: silty clay Bg - 8 to 14 inches: silty clay 2Cg - 14 to 23 inches: silt loam 3Ab - 23 to 32 inches: silty clay

3Bgb1,3Bssgk - 32 to 55 inches: silty clay

3Cssg,3Cg - 55 to 80 inches: clay

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Poorly drained Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately

low (0.00 to 0.01 in/hr)

Depth to water table: About 0 to 12 inches

Frequency of flooding: Rare Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Available water supply, 0 to 60 inches: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): 3w Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: D

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: Yes

Minor Components

Cooper, rarely flooded

Percent of map unit: 3 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: R107XB019MO - Wet Floodplain Prairie

Hydric soil rating: No

Percival, rarely flooded

Percent of map unit: 2 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: No

945—Albaton silty clay, depressional, drained, 0 to 1 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2xbky Elevation: 1,030 to 1,100 feet

Mean annual precipitation: 28 to 31 inches Mean annual air temperature: 49 to 50 degrees F

Frost-free period: 155 to 160 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Albaton, frequently flooded, drained, and similar soils: 90 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Albaton, Frequently Flooded, Drained

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Dip

Down-slope shape: Concave Across-slope shape: Concave

Parent material: Calcareous clayey alluvium

Typical profile

Ap - 0 to 7 inches: silty clay Cg - 7 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 1 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Very poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately

low (0.00 to 0.01 in/hr)

Depth to water table: About 0 to 12 inches

Frequency of flooding: Frequent Frequency of ponding: Occasional

Calcium carbonate, maximum content: 30 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm) Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4w

Hydrologic Soil Group: D

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: Yes

Minor Components

Percival, frequently flooded

Percent of map unit: 10 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: Yes

1137—Haynie silt loam, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 2xbkn Elevation: 840 to 1,140 feet

Mean annual precipitation: 28 to 35 inches Mean annual air temperature: 49 to 53 degrees F

Frost-free period: 145 to 180 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Haynie, occasionally flooded, and similar soils: 80 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Haynie, Occasionally Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Calcareous silty alluvium

Typical profile

Ap - 0 to 7 inches: silt loam C - 7 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to

moderately high (0.14 to 1.42 in/hr)

Depth to water table: About 48 to 79 inches

Frequency of flooding: Occasional Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm) Available water supply, 0 to 60 inches: Very high (about 12.7 inches)

Interpretive groups

Land capability classification (irrigated): 2w Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: B

Ecological site: F107XB016MO - Loamy Floodplain Forest

Minor Components

Grable, occasionally flooded

Percent of map unit: 10 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Lossing, occasionally flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Albaton, occasionally flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: Yes

1144—Blake silty clay loam, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: fh43 Elevation: 700 to 1,200 feet

Mean annual precipitation: 26 to 36 inches
Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 155 to 200 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Blake, occasionally flooded, and similar soils: 90 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blake, Occasionally Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear Parent material: Silty alluvium

Typical profile

Ap - 0 to 7 inches: silty clay loam C1 - 7 to 24 inches: silty clay loam C2 - 24 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches Drainage class: Somewhat poorly drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to

moderately high (0.14 to 1.42 in/hr)

Depth to water table: About 12 to 42 inches

Frequency of flooding: Occasional Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Available water supply, 0 to 60 inches: Very high (about 12.6 inches)

Interpretive groups

Land capability classification (irrigated): 2w Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: C/D

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Minor Components

Onawa, occasionally flooded

Percent of map unit: 10 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

1146—Onawa silty clay, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: fh45 Elevation: 700 to 1,200 feet

Mean annual precipitation: 26 to 36 inches Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 155 to 200 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Onawa, occasionally flooded, and similar soils: 75 percent

Minor components: 25 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Onawa, Occasionally Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Clayey alluvium over silty alluvium

Typical profile

Ap1,Ap2 - 0 to 9 inches: silty clay Cg1,Cg4 - 9 to 36 inches: silty clay 2Cg5,2Cg8 - 36 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches Drainage class: Somewhat poorly drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately

low (0.00 to 0.01 in/hr)

Depth to water table: About 12 to 42 inches

Frequency of flooding: Occasional Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Available water supply, 0 to 60 inches: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): 2w Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: D

Ecological site: F107XB017MO - Clayey Floodplain Forest

Minor Components

Onawa, silt loam, occasionally flooded

Percent of map unit: 10 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: No

Grable, occasionally flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Owego, rarely flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: Yes

Morconick, occasionally flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Convex Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

1237B—Sarpy loamy fine sand, 2 to 5 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: fh4f Elevation: 450 to 1,000 feet

Mean annual precipitation: 26 to 36 inches Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 155 to 200 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Sarpy, occasionally flooded, and similar soils: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sarpy, Occasionally Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Rise

Down-slope shape: Convex Across-slope shape: Linear Parent material: Sandy alluvium

Typical profile

Ap - 0 to 6 inches: loamy fine sand C - 6 to 60 inches: fine sand

Properties and qualities

Slope: 2 to 5 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Runoff class: Negligible

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very

high (1.42 to 14.17 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: Occasional Frequency of ponding: None

Calcium carbonate, maximum content: 15 percent

Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): 3s Land capability classification (nonirrigated): 4s

Hydrologic Soil Group: A

Ecological site: F107XB015MO - Sandy/Loamy Floodplain Forest

Hydric soil rating: No

1238—Sarpy-Morconick complex, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: swqh Elevation: 450 to 1,200 feet

Mean annual precipitation: 26 to 36 inches
Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 155 to 200 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Sarpy, occasionally flooded, and similar soils: 60 percent Morconick, occasionally flooded, and similar soils: 20 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sarpy, Occasionally Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Rise

Down-slope shape: Convex Across-slope shape: Linear Parent material: Sandy alluvium

Typical profile

Ap - 0 to 6 inches: loamy fine sand C - 6 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Runoff class: Negligible

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very

high (1.42 to 14.17 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: Occasional Frequency of ponding: None

Calcium carbonate, maximum content: 2 percent

Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): 3s Land capability classification (nonirrigated): 4s

Hydrologic Soil Group: A

Ecological site: F107XB015MO - Sandy/Loamy Floodplain Forest

Hydric soil rating: No

Description of Morconick, Occasionally Flooded

Settina

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Convex Across-slope shape: Linear

Parent material: Loamy alluvium over sandy alluvium

Typical profile

Ap - 0 to 7 inches: fine sandy loam

C1 - 7 to 13 inches: loam

2C2,2C8 - 13 to 80 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to

moderately high (0.14 to 1.42 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: Occasional Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Available water supply, 0 to 60 inches: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3s

Hydrologic Soil Group: B

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Minor Components

Percival, occasionally flooded

Percent of map unit: 12 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: No

Modale, occasionally flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Haynie, occasionally flooded

Percent of map unit: 3 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

1513—Grable-Morconick complex, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: swq0 Elevation: 700 to 1,200 feet

Mean annual precipitation: 26 to 36 inches
Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 155 to 200 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Grable, occasionally flooded, and similar soils: 70 percent Morconick, occasionally flooded, and similar soils: 20 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Grable, Occasionally Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Silty alluvium over sandy alluvium

Typical profile

Ap - 0 to 6 inches: silt loam C1 - 6 to 23 inches: silt loam 2C2 - 23 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to

moderately high (0.14 to 1.42 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: Occasional Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Available water supply, 0 to 60 inches: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2s

Hydrologic Soil Group: B

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Description of Morconick, Occasionally Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Convex Across-slope shape: Linear

Parent material: Loamy alluvium over sandy alluvium

Typical profile

Ap - 0 to 7 inches: fine sandy loam

C1 - 7 to 13 inches: loam

2C2,2C8 - 13 to 80 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to

moderately high (0.14 to 1.42 in/hr) Depth to water table: More than 80 inches

Frequency of flooding: Occasional Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Available water supply, 0 to 60 inches: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3s

Hydrologic Soil Group: B

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Minor Components

Percival, occasionally flooded

Percent of map unit: 10 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

1524—Morconick fine sandy loam, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: fh4w Elevation: 700 to 1,200 feet

Mean annual precipitation: 26 to 36 inches Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 155 to 200 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Morconick, occasionally flooded, and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Morconick, Occasionally Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Convex Across-slope shape: Linear

Parent material: Loamy alluvium over sandy alluvium

Typical profile

Ap - 0 to 7 inches: fine sandy loam

C1 - 7 to 13 inches: loam

2C2,2C8 - 13 to 80 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to

moderately high (0.14 to 1.42 in/hr) Depth to water table: More than 80 inches

Frequency of flooding: Occasional Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Available water supply, 0 to 60 inches: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3s

Hydrologic Soil Group: B

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Minor Components

Percival, occasionally flooded

Percent of map unit: 10 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: No

Albaton, undrained, occasionally flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: Yes

1525—Scroll silty clay, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: fh4x Elevation: 700 to 1,200 feet

Mean annual precipitation: 26 to 36 inches Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 155 to 200 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Scroll, occasionally flooded, and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scroll, Occasionally Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Clayey or silty alluvium over sandy alluvium

Typical profile

Ap - 0 to 7 inches: silty clay Cg1 - 7 to 11 inches: silt loam

2Cg2,2Cg3 - 11 to 60 inches: loamy fine sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches Drainage class: Somewhat poorly drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately

low (0.00 to 0.01 in/hr)

Depth to water table: About 12 to 42 inches

Frequency of flooding: Occasional Frequency of ponding: None

Calcium carbonate, maximum content: 25 percent

Available water supply, 0 to 60 inches: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): 2w Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: D

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Minor Components

Scroll, clay loam, occasionally flooded

Percent of map unit: 10 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Grable, occasionally flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

2515—Percival-Albaton complex, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: swqg Elevation: 700 to 1.200 feet

Mean annual precipitation: 26 to 36 inches Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 155 to 200 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Percival, occasionally flooded, and similar soils: 55 percent Albaton, occasionally flooded, and similar soils: 30 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Percival, Occasionally Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Clayey alluvium over sandy alluvium

Typical profile

Ap - 0 to 7 inches: clay Cg - 7 to 24 inches: silty clay

2Cg - 24 to 60 inches: stratified fine sand to loamy fine sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches Drainage class: Somewhat poorly drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately

low (0.00 to 0.01 in/hr)

Depth to water table: About 12 to 42 inches

Frequency of flooding: Occasional Frequency of ponding: None

Calcium carbonate, maximum content: 25 percent

Available water supply, 0 to 60 inches: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): 2w Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: D

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: No

Description of Albaton, Occasionally Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear Parent material: Clayey alluvium

Typical profile

Ap - 0 to 7 inches: silty clay Cg - 7 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Poorly drained

Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately

low (0.00 to 0.01 in/hr)

Depth to water table: About 0 to 12 inches

Frequency of flooding: Occasional Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Available water supply, 0 to 60 inches: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): 3w Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: D

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: Yes

Minor Components

Morconick, occasionally flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Convex Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Modale, silty clay loam, occasionally flooded

Percent of map unit: 3 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

Modale, silt loam, occasionally flooded

Percent of map unit: 3 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Grable, occasionally flooded

Percent of map unit: 2 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Albaton, silt loam, occasionally flooded

Percent of map unit: 2 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: Yes

3146—Onawa-Albaton complex, 0 to 2 percent slopes, rarely flooded

Map Unit Setting

National map unit symbol: swqf Elevation: 700 to 1,200 feet

Mean annual precipitation: 26 to 36 inches Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 155 to 200 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Onawa, rarely flooded, and similar soils: 55 percent Albaton, rarely flooded, and similar soils: 25 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Onawa, Rarely Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Clayey alluvium over silty alluvium

Typical profile

Ap1,Ap2 - 0 to 9 inches: silty clay Cg1,Cg4 - 9 to 36 inches: silty clay 2Cg5,2Cg8 - 36 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches Drainage class: Somewhat poorly drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately

low (0.00 to 0.01 in/hr)

Depth to water table: About 12 to 42 inches

Frequency of flooding: Rare Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Available water supply, 0 to 60 inches: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): 2w Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: D

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: No

Description of Albaton, Rarely Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear Parent material: Clayey alluvium

Typical profile

Ap - 0 to 7 inches: silty clay Cg - 7 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Poorly drained Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately

low (0.00 to 0.01 in/hr)

Depth to water table: About 0 to 12 inches

Frequency of flooding: Rare Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Available water supply, 0 to 60 inches: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): 3w Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: D

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: Yes

Minor Components

Modale, rarely flooded

Percent of map unit: 10 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Grable, rarely flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Onawa, silt loam, rarely flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: No

3275—Moville-Holly Springs, overwash complex, 0 to 2 percent slopes, rarely flooded

Map Unit Setting

National map unit symbol: swqb

Elevation: 600 to 1,300 feet

Mean annual precipitation: 26 to 36 inches Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 155 to 200 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Moville, rarely flooded, and similar soils: 70 percent

Holly springs, overwash, rarely flooded, and similar soils: 25 percent

Minor components: 5 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Moville, Rarely Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Silty alluvium over clayey alluvium

Typical profile

Ap - 0 to 6 inches: silt loam C1,C2 - 6 to 28 inches: silt loam 2AB1,2Bsskgb - 28 to 80 inches: clay

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches Drainage class: Somewhat poorly drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately

low (0.00 to 0.01 in/hr)

Depth to water table: About 12 to 42 inches

Frequency of flooding: Rare Frequency of ponding: None

Available water supply, 0 to 60 inches: High (about 10.0 inches)

Interpretive groups

Land capability classification (irrigated): 2w Land capability classification (nonirrigated): 2w

Hvdrologic Soil Group: D

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Description of Holly Springs, Overwash, Rarely Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear Parent material: Clayey alluvium

Typical profile

Ap - 0 to 6 inches: silty clay loam
A1 - 6 to 12 inches: silty clay loam
A2,A4 - 12 to 44 inches: silty clay
Bg1,Bg2 - 44 to 70 inches: silty clay
Cg - 70 to 80 inches: silty clay

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Poorly drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately

low (0.00 to 0.01 in/hr)

Depth to water table: About 0 to 12 inches

Frequency of flooding: Rare Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Available water supply, 0 to 60 inches: Moderate (about 8.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: D

Ecological site: R107XB019MO - Wet Floodplain Prairie

Hydric soil rating: Yes

Minor Components

Wilsey, rarely flooded

Percent of map unit: 5 percent Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: R107XB025IA - Loamy Floodplain Prairie

Hydric soil rating: No

3513—Grable-Morconick complex, 0 to 2 percent slopes, rarely flooded

Map Unit Setting

National map unit symbol: swq2 Elevation: 700 to 1,200 feet

Mean annual precipitation: 26 to 36 inches Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 155 to 200 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Grable, rarely flooded, and similar soils: 65 percent Morconick, rarely flooded, and similar soils: 20 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Grable, Rarely Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Silty alluvium over sandy alluvium

Typical profile

Ap - 0 to 6 inches: silt loam C1 - 6 to 23 inches: silt loam 2C2 - 23 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to

moderately high (0.14 to 1.42 in/hr) Depth to water table: More than 80 inches

Frequency of flooding: Rare Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Available water supply, 0 to 60 inches: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2s

Hydrologic Soil Group: B

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Description of Morconick, Rarely Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Convex Across-slope shape: Linear

Parent material: Loamy alluvium over sandy alluvium

Typical profile

Ap - 0 to 7 inches: fine sandy loam

C1 - 7 to 13 inches: loam

2C2,2C8 - 13 to 80 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to

moderately high (0.14 to 1.42 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: Rare Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Available water supply, 0 to 60 inches: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3s

Hydrologic Soil Group: B

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Minor Components

Percival, rarely flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: No

Blake, rarely flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Modale, loam, rarely flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

3549—Modale complex, 0 to 2 percent slopes, rarely flooded

Map Unit Setting

National map unit symbol: swq7 Elevation: 700 to 1,200 feet

Mean annual precipitation: 26 to 36 inches Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 155 to 200 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Modale, silty clay loam, rarely flooded, and similar soils: 35 percent Modale, silt loam, rarely flooded, and similar soils: 30 percent

Minor components: 35 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Modale, Silty Clay Loam, Rarely Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Silty alluvium over clayey alluvium

Typical profile

Ap - 0 to 7 inches: silty clay loam Cg - 7 to 24 inches: silt loam

2Cg,3Cg3 - 24 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches Drainage class: Somewhat poorly drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately

low (0.00 to 0.01 in/hr)

Depth to water table: About 12 to 42 inches

Frequency of flooding: Rare Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Available water supply, 0 to 60 inches: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 1

Hydrologic Soil Group: C

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Description of Modale, Silt Loam, Rarely Flooded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Silty alluvium over clayey alluvium

Typical profile

Ap - 0 to 7 inches: silt loam C1,C3 - 7 to 24 inches: silt loam 2Cg,3Cg3 - 24 to 60 inches: clay

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches Drainage class: Somewhat poorly drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately

low (0.00 to 0.01 in/hr)

Depth to water table: About 12 to 42 inches

Frequency of flooding: Rare Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Available water supply, 0 to 60 inches: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): 1 Land capability classification (nonirrigated): 1

Hydrologic Soil Group: D

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Minor Components

Onawa, rarely flooded

Percent of map unit: 15 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: No

Owego, rarely flooded

Percent of map unit: 10 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB017MO - Clayey Floodplain Forest

Hydric soil rating: Yes

Blake, rarely flooded

Percent of map unit: 5 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Haynie, rarely flooded

Percent of map unit: 2 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

Cooper, rarely flooded

Percent of map unit: 2 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: R107XB019MO - Wet Floodplain Prairie

Hydric soil rating: No

Morconick, rarely flooded

Percent of map unit: 1 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Convex Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

Hydric soil rating: No

5010—Pits, sand and gravel

Map Unit Setting

National map unit symbol: 2zv8y Elevation: 750 to 1,600 feet

Mean annual precipitation: 27 to 37 inches Mean annual air temperature: 45 to 51 degrees F

Frost-free period: 140 to 180 days

Farmland classification: Not prime farmland

Map Unit Composition

Pits, sand and gravel: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

5040—Udorthents, loamy

Map Unit Setting

National map unit symbol: fh7c Elevation: 660 to 980 feet

Mean annual precipitation: 34 to 41 inches
Mean annual air temperature: 48 to 54 degrees F

Frost-free period: 175 to 210 days

Farmland classification: Not prime farmland

Map Unit Composition

Udorthents, loamy and similar soils: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents, Loamy

Setting

Parent material: Loamy manipulated materials

Properties and qualities

Depth to restrictive feature: More than 80 inches Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Interpretive groups

Land capability classification (irrigated): None specified Ecological site: F105XY013WI - Loamy-Silty Upland

Hydric soil rating: Unranked

5044—Fluvaquents, 0 to 2 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: fh7d Elevation: 1,050 to 1,250 feet

Mean annual precipitation: 26 to 36 inches Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 155 to 200 days

Farmland classification: Not prime farmland

Map Unit Composition

Fluvaquents, frequently flooded, ponded, and similar soils: 75 percent

Minor components: 25 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fluvaquents, Frequently Flooded, Ponded

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Dip

Down-slope shape: Linear Across-slope shape: Concave Parent material: Alluvium

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Poorly drained

Runoff class: Very low

Depth to water table: About 0 to 12 inches

Frequency of flooding: Frequent Frequency of ponding: Frequent

Interpretive groups

Land capability classification (irrigated): None specified Ecological site: R107XB019MO - Wet Floodplain Prairie

Hydric soil rating: Yes

Minor Components

Udifluvents, frequently flooded

Percent of map unit: 25 percent

Landform: Flood plains

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Talf

Down-slope shape: Linear Across-slope shape: Linear

Ecological site: F107XB016MO - Loamy Floodplain Forest

5060—Pits, clay

Map Unit Setting

National map unit symbol: 2zv8w Elevation: 770 to 1.340 feet

Mean annual precipitation: 28 to 35 inches
Mean annual air temperature: 49 to 49 degrees F

Frost-free period: 150 to 165 days

Farmland classification: Not prime farmland

Map Unit Composition

Pits, clay: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

SL—Sewage lagoon

Map Unit Setting

National map unit symbol: rt93 Elevation: 660 to 980 feet

Mean annual precipitation: 34 to 41 inches Mean annual air temperature: 48 to 54 degrees F

Frost-free period: 175 to 210 days

Farmland classification: Not prime farmland

Map Unit Composition

Sewage lagoon: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

W-Water

Map Unit Setting

National map unit symbol: fh9b

Mean annual precipitation: 33 to 38 inches

Mean annual air temperature: 46 to 52 degrees F

Frost-free period: 170 to 200 days

Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

References

American Association of State Highway and Transportation Officials (AASHTO . 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2 053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2 053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2 053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Sioux	City	Gateway	Runway	Improveme	ents Project	EA: Water	Resources	Analysis
	A.	ttachm	ent I-3	3: Curve	Number	and Pea	ak Flow (Calculations
	A ⁻	ttachm	ent I-3	3: Curve	Number	and Pea	ak Flow (Calculations
	A [·]	ttachm	ent I-3	3: Curve	Number	and Pea	ak Flow (Calculations
	A [·]	ttachm	ent I-3	3: Curve	Number	and Pea	ak Flow (Calculations
	A [·]	ttachm	ent I-3	3: Curve	Number	and Pea	ak Flow (Calculations
	A	ttachm	ent I-3	3: Curve	Number	and Pea	ak Flow (Calculations
	A	ttachm	ent I-3	3: Curve	Number	and Pea	ak Flow (Calculations
	A	ttachm	ent I-3	3: Curve	Number	and Pea	ak Flow (Calculations
	A	ttachm	ent I-3	3: Curve	Number	and Pea	ak Flow (Calculations
	A	ttachm	ent I-3	3: Curve	Number	and Pea	ak Flow (Calculations
	A	ttachm	ent I-3	3: Curve	Number	and Pea	ak Flow (Calculations
	A	ttachm	ent I-3	3: Curve	Number	and Pe	ak Flow (Calculations
	A	ttachm	ent I-3	3: Curve	Number	and Pea	ak Flow (Calculations
	A	ttachm	ent I-3	3: Curve	Number	and Pe	ak Flow (Calculations
	A	ttachm	ent I-3	3: Curve	Number	and Pe	ak Flow	Calculations
	A	ttachm	ent I-3	3: Curve	Number	and Pea	ak Flow	Calculations
	A	ttachm	ent I-3	3: Curve	Number	and Pea	ak Flow	Calculations

Sioux Gateway Airport Runway Program EA

Comp. By: JKK
Date: 5/13/2025
Chk. By: LMM
Job No: 10144998.003

TR-55 Worksheet 2: Curve Number and Runoff

Subbasin Name: Basin A
Condition: Existing

Curve Number (TR-55 Table 2-2)

 Total Area:
 10,550,294 sf
 242.20 ac

 Pervious Area:
 9,097,237 sf
 208.84 ac

 Gravel Area:
 452,511 sf
 10.39 ac

 Impervious Area:
 1,000,546 sf
 22.97 ac

HSG	Description	CN	Area	CN*A
Α	Good Condition (grass cover >75%)	39	26.78	1044.3
В	Good Condition (grass cover >75%)	61	148.34	9048.5
С	Good Condition (grass cover >75%)	74	23.56	1743.1
D	Good Condition (grass cover >75%)	80	10.17	813.9
Α	Gravel Road	76	1.70	129.2
В	Gravel Road	85	8.49	721.5
D	Gravel Road	91	0.20	18.2
				0.0
Impervious	Paved Area, Roofs	98	22.97	2251.0
Totals: 242.20				
Composite Curve Number:				

Runoff

Frequency
Rainfall (ISWMM Table C3-S2-3, 24-hour)
Potential Maximum Retention (Use TR-55 Equation 2-4)
Runoff (Use TR-55 Equation 2-3)

yr
Rin
Rin Q

in

- 1							
		Recurrence Interval (yr)					
	1	5	25	100			
	2.63	3.74	5.59	7.67			
	5.36	5.36	5.36	5.36			
	0.351	0.887	2.067	3.641			

0.38 mi²

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

TR-55 Worksheet 2: Curve Number and Runoff

Subbasin Name: Basin B
Condition: Existing

Curve Number (TR-55 Table 2-2)

 Total Area:
 1,897,555 sf
 43.56 ac

 Pervious Area:
 1,828,915 sf
 41.99 ac

 Gravel Area:
 48,023 sf
 1.10 ac

 Impervious Area:
 20,617 sf
 0.47 ac

	00.04				
	28.91	1127.5			
	13.08	797.7			
	0.57	43.5			
	0.53	45.1			
		0.0			
	0.47	46.4			
otals: 43.56					
Composite Curve Number:					
8	В				

Runoff

Frequency
Rainfall (ISWMM Table C3-S2-3, 24-hour)
Potential Maximum Retention (Use TR-55 Equation 2-4)
Runoff (Use TR-55 Equation 2-3)

yr

P in
Q in

Recurrence Interval (yr)					
1	5	25	100		
2.63	3.74	5.59	7.67		
11.15	11.15	11.15	11.15		
0.014	0.180	0.779	1.785		

0.07 mi²

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

TR-55 Worksheet 2: Curve Number and Runoff

Subbasin Name: Basin C
Condition: Existing

Curve Number (TR-55 Table 2-2)

Total Area: **1,481,656** sf 34.01 ac 1,320,148 sf Pervious Area: 30.31 ac Gravel Area: **23,778** sf 0.55 ac **137,730** sf Impervious Area: 3.16 ac

HSG	Description	CN	Area	CN*A
В	Good Condition (grass cover >75%)	61	30.31	1848.7
В	Gravel Road	85	0.55	46.4
				0.0
Impervious	Paved Area, Roofs	98	3.16	309.9
Totals:			34.01	2205.0
Composite Curve Number:			=	64.82
				=

Runoff

Frequency		yr
Rainfall (ISWMM Table C3-S2-3, 24-hour)	Р	in
Potential Maximum Retention (Use TR-55 Equation 2-4)	S	in
Runoff (Use TR-55 Equation 2-3)	Q	in

Recurrence Interval (yr)				
1	5	25	100	
2.63	3.74	5.59	7.67	
5.43	5.43	5.43	5.43	
0.342	0.872	2.043	3.610	

0.05 mi²

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

TR-55 Worksheet 2: Curve Number and Runoff

Subbasin Name: Basin D
Condition: Existing

Curve Number (TR-55 Table 2-2)

0.06 mi² Total Area: 1,748,174 sf 40.13 **1,546,005** sf Pervious Area: 35.49 ac Gravel Area: **27,649** sf 0.63 ac 174,487 sf Impervious Area: 4.01 ac

Description	CN	Area	CN*A		
Good Condition (grass cover >75%)	39	3.17	123.7		
Good Condition (grass cover >75%)	61	32.32	1971.4		
Gravel Road	76	0.19	14.6		
Gravel Road	85	0.44	37.6		
			0.0		
Paved Area, Roofs	98	4.01	392.6		
otals: 40.13					
composite Curve Number:					
	Good Condition (grass cover >75%) Good Condition (grass cover >75%) Gravel Road Gravel Road	Good Condition (grass cover >75%) Good Condition (grass cover >75%) Gravel Road Gravel Road Gravel Road 85	Good Condition (grass cover >75%) 39 3.17 Good Condition (grass cover >75%) 61 32.32 Gravel Road 76 0.19 Gravel Road 85 0.44 Paved Area, Roofs 98 4.01		

Frequency		yr
Rainfall (ISWMM Table C3-S2-3, 24-hour)	Р	in
Potential Maximum Retention (Use TR-55 Equation 2-4)	S	in
Runoff (Use TR-55 Equation 2-3)	Q	in

Recurrence Interval (yr)					
1	5	25	100		
2.63	3.74	5.59	7.67		
5.80	5.80	5.80	5.80		
0.297	0.794	1.918	3.443		

Comp. By: JKK
Date: 5/13/2025
Chk. By: LMM
Job No: 10144998.003

TR-55 Worksheet 2: Curve Number and Runoff

Subbasin Name: Basin E
Condition: Existing

Curve Number (TR-55 Table 2-2)

Total Area:	693,468 sf	15.92	ac
Pervious Area:	544,287 sf	12.50	ac
Gravel Area:	526 sf	0.01	ac
Impervious Area:	148,273 sf	3.40	ac

HSG	Description	CN	Area	CN*A	
В	Good Condition (grass cover >75%)	61	12.37	754.3	
С	Good Condition (grass cover >75%)	74	0.13	9.5	
В	Gravel Road	85	0.01	1.0	
				0.0	
Impervious	Paved Area, Roofs	98	3.40	333.6	
Totals:					
Composite Curve Number:					

Runoff

Frequency		yr
Rainfall (ISWMM Table C3-S2-3, 24-hour)	Р	in
Potential Maximum Retention (Use TR-55 Equation 2-4)	S	in
Runoff (Use TR-55 Equation 2-3)	Q	in

Recurrence Interval (yr)				
1	5	25	100	
2.63	3.74	5.59	7.67	
4.48	4.48	4.48	4.48	
0.483	1.103	2.400	4.075	

 0.02 mi^2

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

TR-55 Worksheet 2: Curve Number and Runoff

Subbasin Name: Basin F
Condition: Existing

Curve Number (TR-55 Table 2-2)

 Total Area:
 776,689 sf
 17.83 ac

 Pervious Area:
 606,453 sf
 13.92 ac

 Gravel Area:
 0 sf
 0.00 ac

 Impervious Area:
 170,236 sf
 3.91 ac

HSG	Description	CN	Area	CN*A
В	Good Condition (grass cover >75%)	61	9.61	585.9
С	Good Condition (grass cover >75%)	74	4.32	319.5
				0.0
Impervious	Paved Area, Roofs	98	3.91	383.0
Totals:			17.83	1288.4
Composite Curve Number:			<u>=</u>	72.26

Runoff

Frequency		yr
Rainfall (ISWMM Table C3-S2-3, 24-hour)	Р	in
Potential Maximum Retention (Use TR-55 Equation 2-4)	S	in
Runoff (Use TR-55 Equation 2-3)	Q	in

Recurrence Interval (yr)					
1	5	25	100		
2.63	3.74	5.59	7.67		
3.84	3.84	3.84	3.84		
0.608	1.297	2.685	4.435		

0.03 mi²

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

TR-55 Worksheet 2: Curve Number and Runoff

Subbasin Name: Basin G
Condition: Existing

Curve Number (TR-55 Table 2-2)

 Total Area:
 6,715,860 sf
 154.17 ac
 0.24 mi²

 Pervious Area:
 4,517,728 sf
 103.71 ac

 Gravel Area:
 9,561 sf
 0.22 ac

 Impervious Area:
 2,188,571 sf
 50.24 ac

HSG	Description	CN	Area	CN*A
В	Good Condition (grass cover >75%)	61	66.92	4082.3
С	Good Condition (grass cover >75%)	74	1.35	99.9
D	Good Condition (grass cover >75%)	80	35.44	2835.2
D	Gravel Road	91	0.22	20.0
				0.0
Impervious	Paved Area, Roofs	98	50.24	4923.8
Totals:			154.17	11961.1
Composite Curve Number:				77.58

Frequency		yr
Rainfall (ISWMM Table C3-S2-3, 24-hour)	Р	in
Potential Maximum Retention (Use TR-55 Equation 2-4)	S	in
Runoff (Use TR-55 Equation 2-3)	Q	in

Recurrence Interval (yr)					
1	5	25	100		
2.63	3.74	5.59	7.67		
2.89	2.89	2.89	2.89		
0.852	1.652	3.179	5.039		

Comp. By: JKK
Date: 5/13/2025
Chk. By: LMM
Job No: 10144998.003

TR-55 Worksheet 2: Curve Number and Runoff

Subbasin Name: Basin H
Condition: Existing

Curve Number (TR-55 Table 2-2)

 Total Area:
 15,614,065 sf
 358.45 ac

 Pervious Area:
 12,311,307 sf
 282.63 ac

 Gravel Area:
 256,141 sf
 5.88 ac

 Impervious Area:
 3,046,617 sf
 69.94 ac

HSG Description CN Area CN*A В Good Condition (grass cover >75%) 61 112.71 6875.4 С Good Condition (grass cover >75%) 74 18.74 1386.8 Good Condition (grass cover >75%) D 80 151.18 12094.1 **Gravel Road** В 85 0.26 22.5 С **Gravel Road** 89 0.29 26.0 5.32 D **Gravel Road** 91 484.4 0.0 Impervious Paved Area, Roofs 98 69.94 6854.2 Totals: 358.45 27743.4 Composite Curve Number: 77.40

Runoff

Frequency
Rainfall (ISWMM Table C3-S2-3, 24-hour)
Potential Maximum Retention (Use TR-55 Equation 2-4)
Runoff (Use TR-55 Equation 2-3)

yr

P in

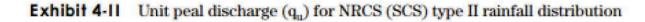
Q in

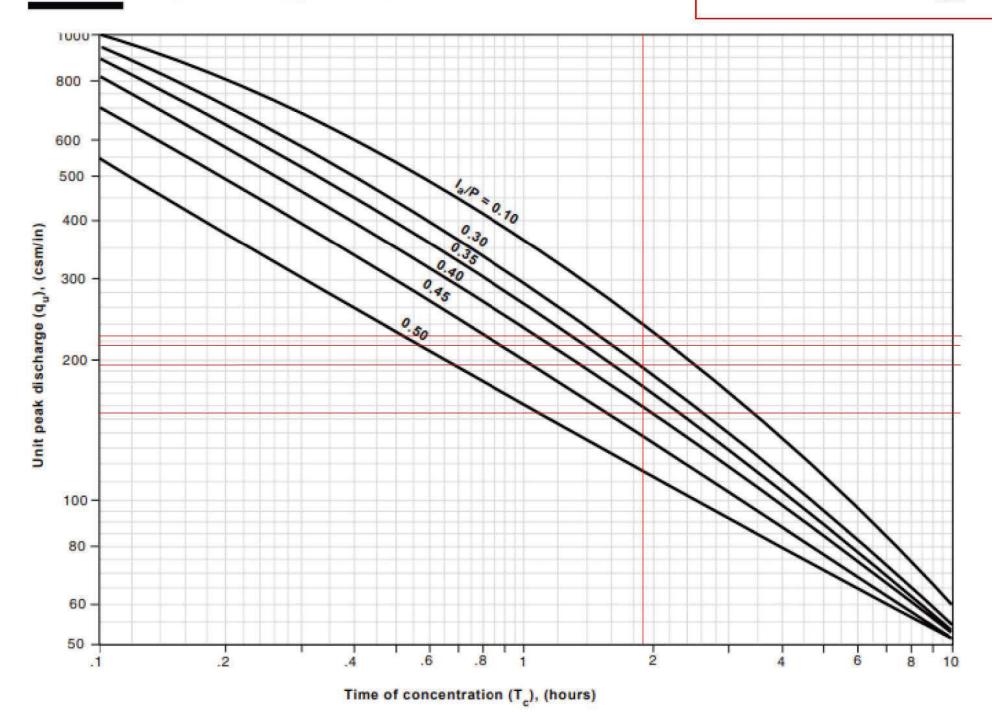
Recurrence Interval (yr)					
1	5	25	100		
2.63	3.74	5.59	7.67		
2.92	2.92	2.92	2.92		
0.843	1.639	3.162	5.018		

0.56 mi²

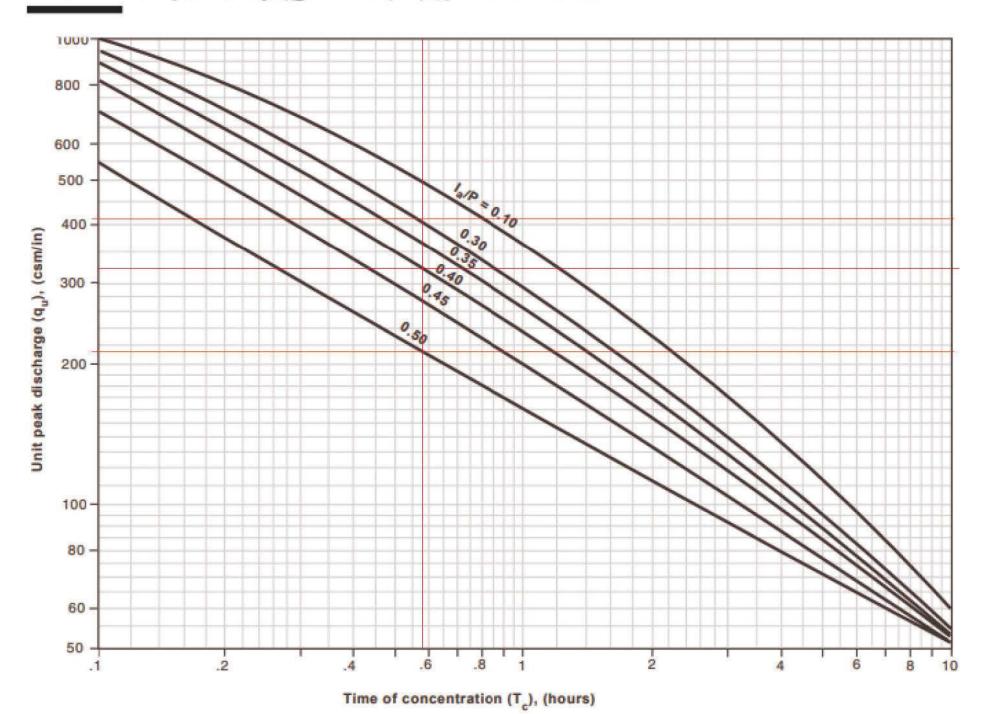
(210-650-H, 2nd Ed., Feb 2021)

650-2.23

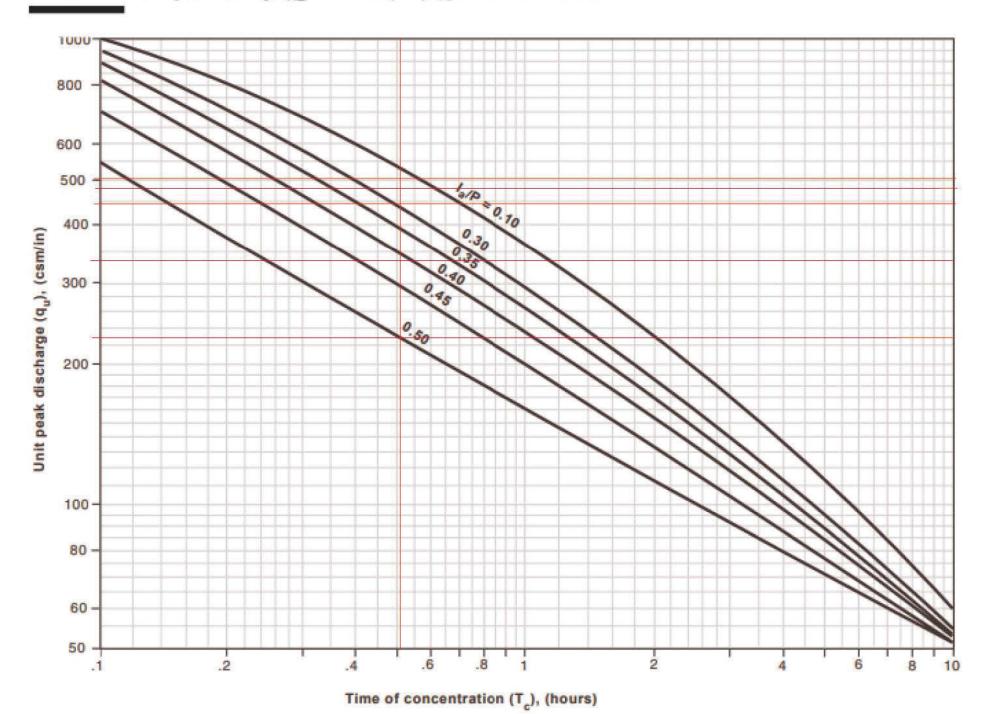




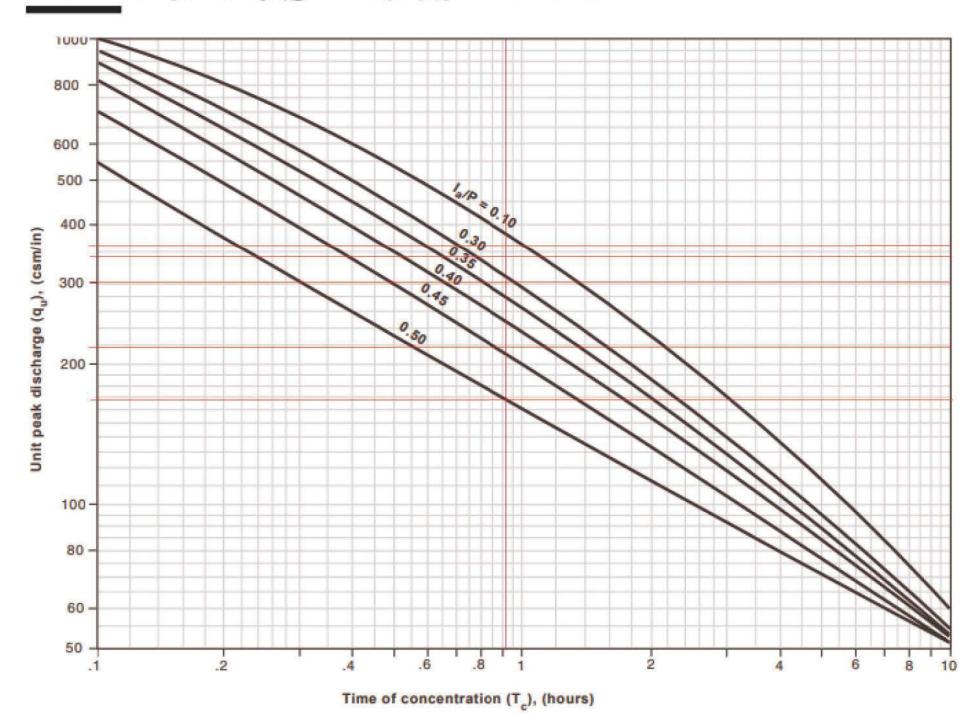
 $\textbf{Exhibit 4-II} \quad \text{Unit peal discharge } (q_u) \text{ for NRCS (SCS) type II rainfall distribution}$



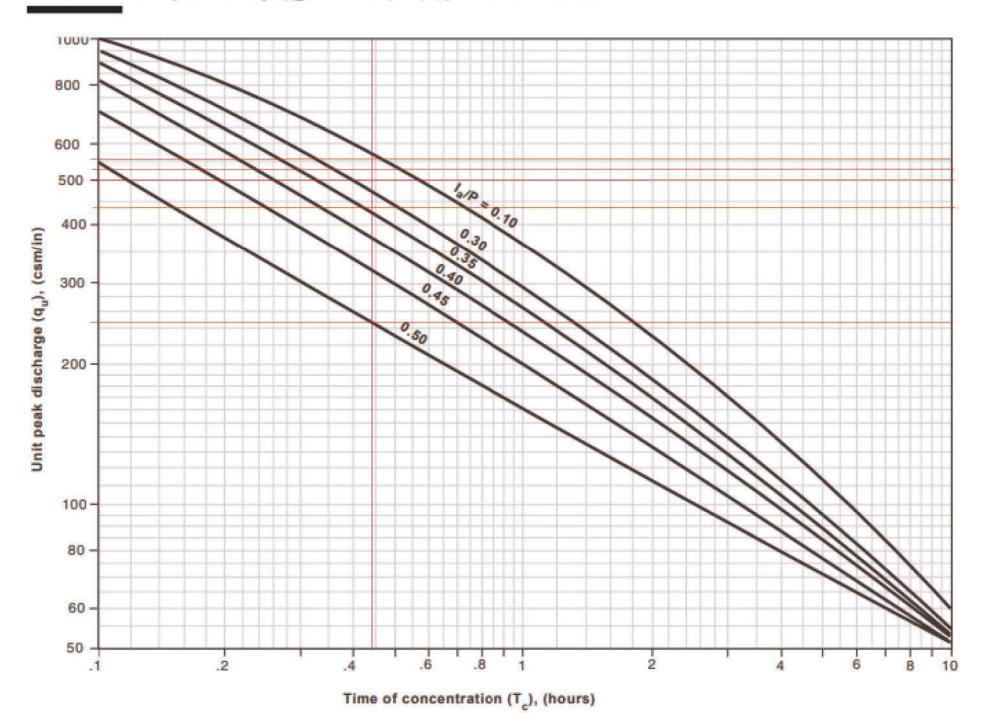
 $\textbf{Exhibit 4-II} \quad \text{Unit peal discharge } (q_u) \text{ for NRCS (SCS) type II rainfall distribution}$



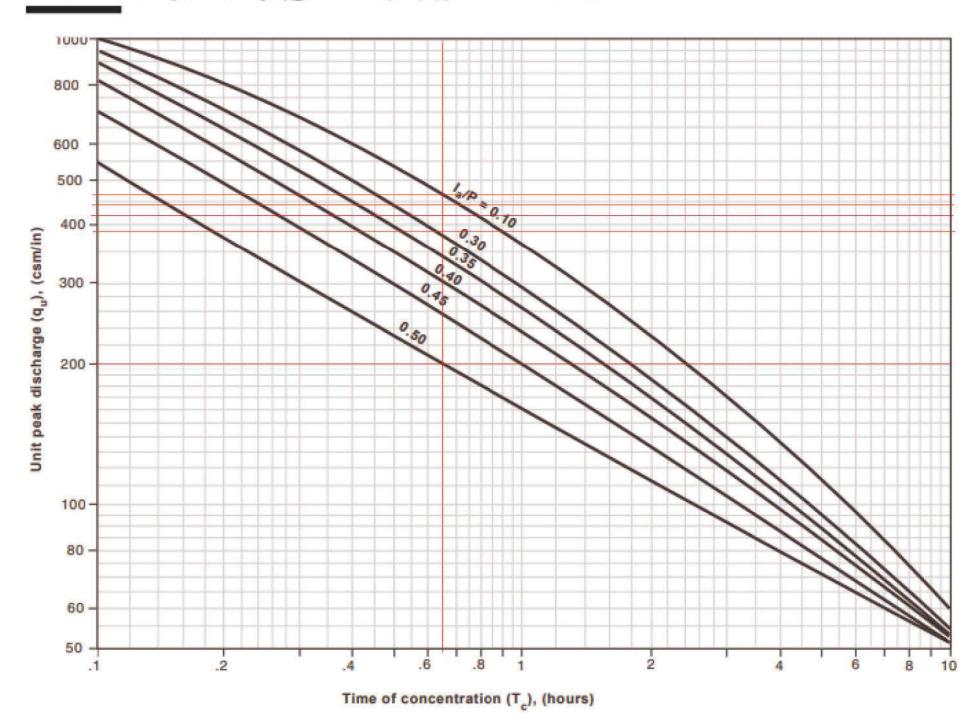
 $\textbf{Exhibit 4-II} \quad \text{Unit peal discharge } (q_u) \text{ for NRCS (SCS) type II rainfall distribution}$



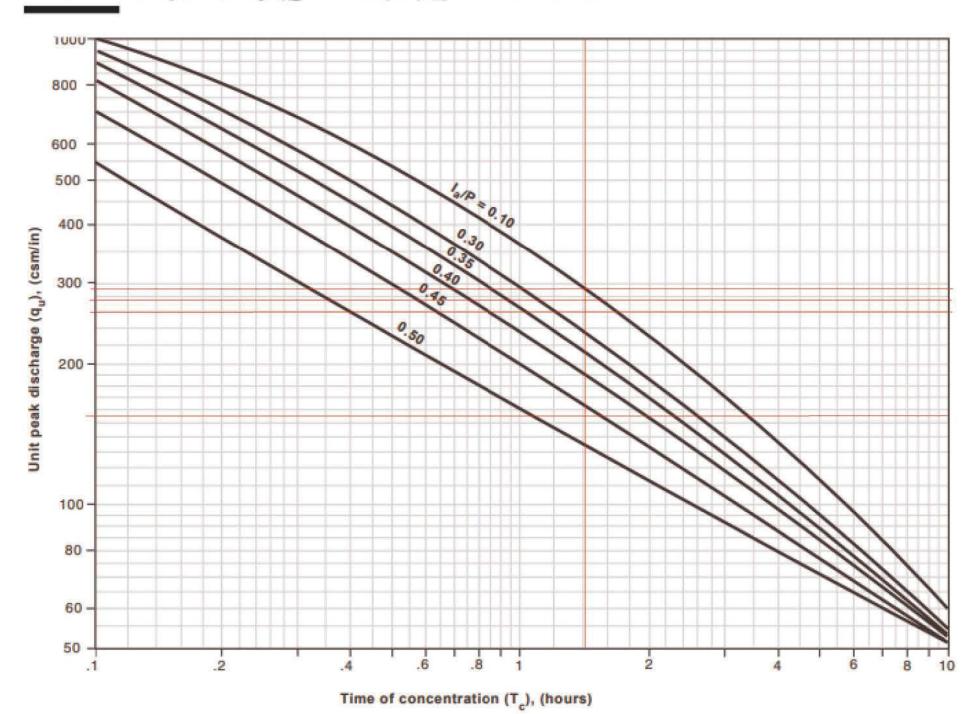
 $\textbf{Exhibit 4-II} \quad \text{Unit peal discharge } (q_u) \text{ for NRCS (SCS) type II rainfall distribution}$



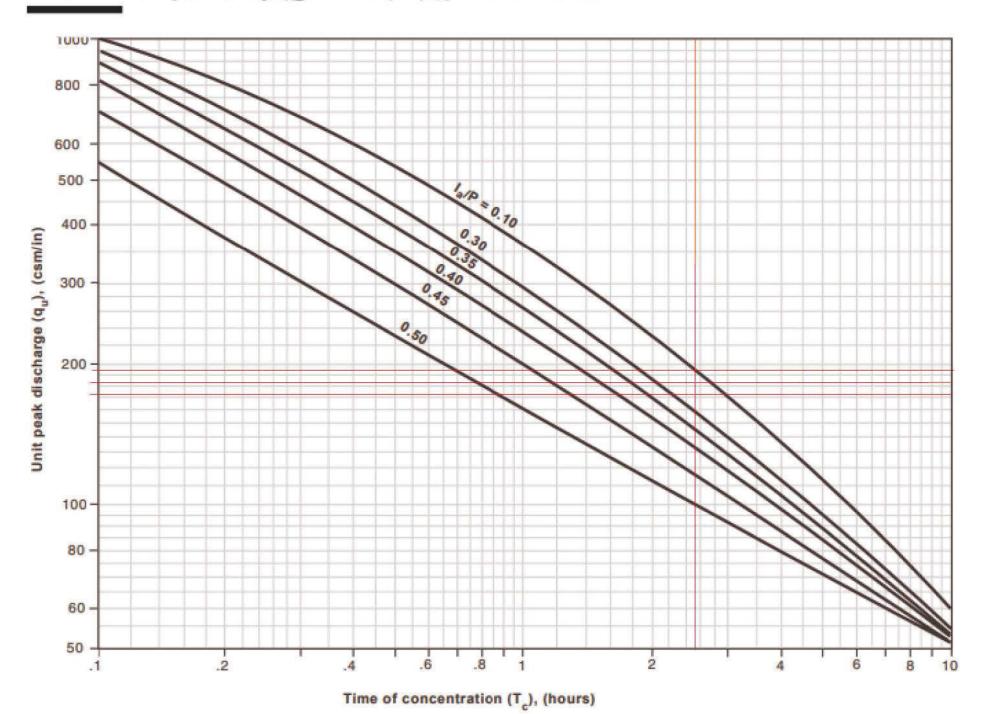
 $\textbf{Exhibit 4-II} \quad \text{Unit peal discharge } (q_u) \text{ for NRCS (SCS) type II rainfall distribution}$



 $\textbf{Exhibit 4-II} \quad \text{Unit peal discharge } (q_n) \text{ for NRCS (SCS) type II rainfall distribution}$



 $\textbf{Exhibit 4-II} \quad \text{Unit peal discharge } (q_n) \text{ for NRCS (SCS) type II rainfall distribution}$



Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

TR-55 Worksheet 3: Graphical Peak Discharge

Sub-Basin Name: Basin A
Condition: Existing

Data

Drainage Area	\mathbf{A}_{m}	=	0.38	mi ²
Runoff Curve Number (From TR-55 Worksheet 2)	CN	=	65.11	
Potential Maximum Retention (From TR-55 Worksheet 2)	S	=	5.36	
Time of Concentration (From TR-55 Worksheet 3)	T_C	=	1.87	hr
Rainfall Distribution		=	II.	
Pond and Swamp Area		=		$\%$ of A_m

Frequency		yr
Rainfall (IDF 24-hour)	Р	in
Initial Abstraction (Use TR-55 Table 4-1)	l _a	in
Compute	I _a /P	
Unit Peak Discharge (Use TR-55 Exhibit 4-II)	\mathbf{q}_{u}	csm/in
Runoff (From TR-55 Worksheet 2)	Q	in
Pond and Swamp Adjustment Factor (Use TR-55 Table 4-2)	F_p	
Peak Discharge (Where $Q_p = q_u A_m Q F_p$)	\mathbf{Q}_{p}	cfs
	-	

Recurrence Interval					
1	5	25	100		
2.63	3.74	5.59	7.67		
1.072	1.072	1.072	1.072		
0.41	0.29	0.19	0.14		
154	196	217	227		
0.351	0.887	2.067	3.641		
1.0	1.0	1.0	1.0		
20.46	65.79	169.74	312.80		

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

TR-55 Worksheet 3: Graphical Peak Discharge

Sub-Basin Name: Basin B
Condition: Existing

Data

Drainage Area	\mathbf{A}_{m}	=	0.07	mi ²
Runoff Curve Number (From TR-55 Worksheet 2)	CN	=	47.29	
Potential Maximum Retention (From TR-55 Worksheet 2)	S	=	11.15	
Time of Concentration (From TR-55 Worksheet 3)	T_C	=	0.58	hr
Rainfall Distribution		=	II	
Pond and Swamp Area		=		$\%$ of A_m

Frequency		yr
Rainfall (IDF 24-hour)	Р	in
Initial Abstraction (Use TR-55 Table 4-1)	l _a	in
Compute	I _a /P	
Unit Peak Discharge (Use TR-55 Exhibit 4-II)	\mathbf{q}_{u}	csm/in
Runoff (From TR-55 Worksheet 2)	Q	in
Pond and Swamp Adjustment Factor (Use TR-55 Table 4-2)	F_p	
Peak Discharge (Where $Q_p = q_u A_m Q F_p$)	\mathbf{Q}_{p}	cfs

Recurrence Interval				
1	5	25	100	
2.63	3.74	5.59	7.67	
2.229	2.229	2.229	2.229	
0.85	0.60	0.40	0.29	
214	214	325	410	
0.014	0.180	0.779	1.785	
1.0	1.0	1.0	1.0	
0.20	2.63	17.23	49.81	

 Comp. By:
 JKK

 Date:
 5/13/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

TR-55 Worksheet 3: Graphical Peak Discharge

Sub-Basin Name: Basin C
Condition: Existing

Data

Drainage Area	\mathbf{A}_{m}	=	0.05	mi ²
Runoff Curve Number (From TR-55 Worksheet 2)	CN	=	64.82	
Potential Maximum Retention (From TR-55 Worksheet 2)	S	=	5.43	
Time of Concentration (From TR-55 Worksheet 3)	T_{C}	=	0.51	hr
Rainfall Distribution		=	II	
Pond and Swamp Area		=		$\%$ of A_m

Frequency		yr
Rainfall (IDF 24-hour)	Р	in
Initial Abstraction (Use TR-55 Table 4-1)	l _a	in
Compute	I _a /P	
Unit Peak Discharge (Use TR-55 Exhibit 4-II)	\mathbf{q}_{u}	csm/in
Runoff (From TR-55 Worksheet 2)	Q	in
Pond and Swamp Adjustment Factor (Use TR-55 Table 4-2)	F_p	
Peak Discharge (Where $Q_p = q_u A_m Q F_p$)	Q_p	cfs
	-	

Recurrence Interval				
1	5	25	100	
2.63	3.74	5.59	7.67	
1.085	1.085	1.085	1.085	
0.41	0.29	0.19	0.14	
336	445	480	505	
0.342	0.872	2.043	3.610	
1.0	1.0	1.0	1.0	
6.11	20.63	52.13	96.89	

 Comp. By:
 JKK

 Date:
 5/13/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

TR-55 Worksheet 3: Graphical Peak Discharge

Sub-Basin Name: Basin D
Condition: Existing

Data

Drainage Area	\mathbf{A}_{m}	=	0.06	mi ²
Runoff Curve Number (From TR-55 Worksheet 2)	CN	=	63.29	
Potential Maximum Retention (From TR-55 Worksheet 2)	S	=	5.80	
Time of Concentration (From TR-55 Worksheet 3)	T _C	=	0.91	hr
Rainfall Distribution		=	II	
Pond and Swamp Area		=		% of A _m

Frequency		yr
Rainfall (IDF 24-hour)	Р	in
Initial Abstraction (Use TR-55 Table 4-1)	l _a	in
Compute	I _a /P	
Unit Peak Discharge (Use TR-55 Exhibit 4-II)	\mathbf{q}_{u}	csm/in
Runoff (From TR-55 Worksheet 2)	Q	in
Pond and Swamp Adjustment Factor (Use TR-55 Table 4-2)	F_p	
Peak Discharge (Where $Q_p = q_u A_m Q F_p$)	\mathbf{Q}_{p}	cfs

Recurrence Interval				
1	5	25	100	
2.63	3.74	5.59	7.67	
1.160	1.160	1.160	1.160	
0.44	0.31	0.21	0.15	
218	302	342	360	
0.297	0.794	1.918	3.443	
1.0	1.0	1.0	1.0	
4.06	15.04	41.14	77.72	

 Comp. By:
 JKK

 Date:
 5/13/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

TR-55 Worksheet 3: Graphical Peak Discharge

Sub-Basin Name: Basin E
Condition: Existing

Data

Drainage Area	\mathbf{A}_{m}	=	0.02	mi ²
Runoff Curve Number (From TR-55 Worksheet 2)	CN	=	69.04	
Potential Maximum Retention (From TR-55 Worksheet 2)	S	=	4.48	
Time of Concentration (From TR-55 Worksheet 3)	T _C	=	0.44	hr
Rainfall Distribution		=	П	
Pond and Swamp Area		=		% of A _m

Frequency		yr
Rainfall (IDF 24-hour)	Р	in
Initial Abstraction (Use TR-55 Table 4-1)	l _a	in
Compute	I _a /P	
Unit Peak Discharge (Use TR-55 Exhibit 4-II)	\mathbf{q}_{u}	csm/in
Runoff (From TR-55 Worksheet 2)	Q	in
Pond and Swamp Adjustment Factor (Use TR-55 Table 4-2)	F_p	
Peak Discharge (Where $Q_p = q_u A_m Q F_p$)	\mathbf{Q}_{p}	cfs

Recurrence Interval				
1	5	25	100	
2.63	3.74	5.59	7.67	
0.897	0.897	0.897	0.897	
0.34	0.24	0.16	0.12	
440	500	530	555	
0.483	1.103	2.400	4.075	
1.0	1.0	1.0	1.0	
5.29	13.72	31.64	56.26	

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

TR-55 Worksheet 3: Graphical Peak Discharge

Sub-Basin Name: Basin F
Condition: Existing

Data

Drainage Area	\mathbf{A}_{m}	=	0.03	mi ²
Runoff Curve Number (From TR-55 Worksheet 2)	CN	=	72.26	
Potential Maximum Retention (From TR-55 Worksheet 2)	S	=	3.84	
Time of Concentration (From TR-55 Worksheet 3)	T_{C}	=	0.65	hr
Rainfall Distribution		=	II.	
Pond and Swamp Area		=		$\%$ of A_m

Frequency		yr
Rainfall (IDF 24-hour)	Р	in
Initial Abstraction (Use TR-55 Table 4-1)	l _a	in
Compute	I _a /P	
Unit Peak Discharge (Use TR-55 Exhibit 4-II)	\mathbf{q}_{u}	csm/in
Runoff (From TR-55 Worksheet 2)	Q	in
Pond and Swamp Adjustment Factor (Use TR-55 Table 4-2)	F_p	
Peak Discharge (Where $Q_p = q_u A_m Q F_p$)	Q_p	cfs
	•	

Recurrence Interval					
1	5	25	100		
2.63	3.74	5.59	7.67		
0.768	0.768	0.768	0.768		
0.29	0.21	0.14	0.10		
387	418	443	465		
0.608	1.297	2.685	4.435		
1.0	1.0	1.0	1.0		
6.56	15.10	33.13	57.46		

 Comp. By:
 JKK

 Date:
 5/13/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

TR-55 Worksheet 3: Graphical Peak Discharge

Sub-Basin Name: Basin G
Condition: Existing

Data

Drainage Area	\mathbf{A}_{m}	=	0.24	mi ²
Runoff Curve Number (From TR-55 Worksheet 2)	CN	=	77.58	
Potential Maximum Retention (From TR-55 Worksheet 2)	S	=	2.89	
Time of Concentration (From TR-55 Worksheet 3)	T_{C}	=	1.41	hr
Rainfall Distribution		=	II	
Pond and Swamp Area		=		% of A _m

Frequency		yr
Rainfall (IDF 24-hour)	Р	in
Initial Abstraction (Use TR-55 Table 4-1)	l _a	in
Compute	I_a/P	
Unit Peak Discharge (Use TR-55 Exhibit 4-II)	\mathbf{q}_{u}	csm/in
Runoff (From TR-55 Worksheet 2)	Q	in
Pond and Swamp Adjustment Factor (Use TR-55 Table 4-2)	F_p	
Peak Discharge (Where $Q_p = q_u A_m Q F_p$)	Q_p	cfs
	•	

	Recurrence Interval				
1	5	25	100		
2.63	3.74	5.59	7.67		
0.578	0.578	0.578	0.578		
0.22	0.15	0.10	0.08		
259	275	292	292		
0.852	1.652	3.179	5.039		
1.0	1.0	1.0	1.0		
53.17	109.45	223.63	354.45		

 Comp. By:
 JKK

 Date:
 5/13/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

TR-55 Worksheet 3: Graphical Peak Discharge

Sub-Basin Name: Basin H
Condition: Existing

Data

Drainage Area	\mathbf{A}_{m}	=	0.56	mi ²
Runoff Curve Number (From TR-55 Worksheet 2)	CN	=	77.40	1111
Potential Maximum Retention (From TR-55 Worksheet 2)	S	=	2.92	
Time of Concentration (From TR-55 Worksheet 3)	T _C	=	2.53	hr
Rainfall Distribution		=	II	
Pond and Swamp Area		=		% of A _m

Frequency		yr
Rainfall (IDF 24-hour)	Р	in
Initial Abstraction (Use TR-55 Table 4-1)	l _a	in
Compute	I _a /P	
Unit Peak Discharge (Use TR-55 Exhibit 4-II)	\mathbf{q}_{u}	csm/in
Runoff (From TR-55 Worksheet 2)	Q	in
Pond and Swamp Adjustment Factor (Use TR-55 Table 4-2)	F_p	
Peak Discharge (Where $Q_p = q_u A_m Q F_p$)	\mathbf{Q}_{p}	cfs

Recurrence Interval				
1	5	25	100	
2.63	3.74	5.59	7.67	
0.584	0.584	0.584	0.584	
0.22	0.16	0.10	0.08	
172	183	194	194	
0.843	1.639	3.162	5.018	
1.0	1.0	1.0	1.0	
81.20	168.01	343.53	545.23	

Comp. By: JKK Date: 5/13/2025 Chk. By: LMM Job No: 10144998.003

TR-55 Worksheet 2: Curve Number and Runoff

Subbasin Name: Basin A **Condition: Future**

HSG

Α

В

С

D

Α В

D

Curve Number (TR-55 Table 2-2)

Total Area: 10,550,294 sf 242.20 ac Pervious Area: 8,595,069 sf 197.32 Gravel Area: **464,533** sf 10.66 Impervious Area: **1,490,693** sf 34.22 ac

Description CN CN*A Area Good Condition (grass cover >75%) 39 26.43 1030.9 Good Condition (grass cover >75%) 61 139.13 8486.8 Good Condition (grass cover >75%) 74 23.57 1744.3 Good Condition (grass cover >75%) 80 654.6 8.18 **Gravel Road** 76 1.73 131.4 **Gravel Road** 741.8 85 8.73 **Gravel Road** 91 0.21 18.8 0.0 3353.7 Impervious Paved Area, Roofs 98 34.22 242.20 16162.5 Composite Curve Number: 66.73

Runoff

Totals:

Frequency yr Rainfall (ISWMM Table C3-S2-3, 24-hour) in Potential Maximum Retention (Use TR-55 Equation 2-4) S in Runoff (Use TR-55 Equation 2-3) Q in

Recurrence Interval (yr)				
1 5 25 100				
2.63	3.74	5.59	7.67	
4.99	4.99	4.99	4.99	
0.403	0.974	2.202	3.819	

0.38 mi²

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

TR-55 Worksheet 2: Curve Number and Runoff

Subbasin Name: Basin B
Condition: Future

Curve Number (TR-55 Table 2-2)

 Total Area:
 1,897,555 sf
 43.56 ac
 0.07 mi²

 Pervious Area:
 1,736,144 sf
 39.86 ac

 Gravel Area:
 51,965 sf
 1.19 ac

 Impervious Area:
 109,445 sf
 2.51 ac

HSG	Description	CN	Area	CN*A
Α	Good Condition (grass cover >75%)	39	28.18	1098.8
В	Good Condition (grass cover >75%)	61	11.68	712.5
A	Gravel Road	76	0.86	65.0
В	Gravel Road	85	0.34	28.7
				0.0
Impervious	Paved Area, Roofs	98	2.51	246.2
Totals:	43.56	2151.3		
Composite Curve Number:	posite Curve Number:			

Frequency		yr
Rainfall (ISWMM Table C3-S2-3, 24-hour)	Р	in
Potential Maximum Retention (Use TR-55 Equation 2-4)	S	in
Runoff (Use TR-55 Equation 2-3)	Q	in

Recurrence Interval (yr)					
1 5 25 100					
2.63	3.74	5.59	7.67		
10.25	10.25	10.25	10.25		
0.031	0.239	0.909	1.990		

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

TR-55 Worksheet 2: Curve Number and Runoff

Subbasin Name: Basin C
Condition: Future

Curve Number (TR-55 Table 2-2)

Total Area: **1,481,656** sf 34.01 ac **1,303,661** sf Pervious Area: 29.93 ac Gravel Area: **20,244** sf 0.46 ac **157,751** sf Impervious Area: 3.62 ac

HSG	Description	CN	Area	CN*A
В	Good Condition (grass cover >75%)	61	29.93	1825.6
В	Gravel Road	85	0.46	39.5
				0.0
Impervious	Paved Area, Roofs	98	3.62	354.9
otals:				2220.0
Composite Curve Number:	posite Curve Number:			65.27
				4

Runoff

Frequency		yr
Rainfall (ISWMM Table C3-S2-3, 24-hour)	Р	in
Potential Maximum Retention (Use TR-55 Equation 2-4)	S	in
Runoff (Use TR-55 Equation 2-3)	Q	in

Recurrence Interval (yr)				
1	100			
2.63	3.74	5.59	7.67	
5.32	5.32	5.32	5.32	
0.356	0.895	2.080	3.658	

 0.05 mi^2

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

TR-55 Worksheet 2: Curve Number and Runoff

Subbasin Name: Basin D
Condition: Future

Curve Number (TR-55 Table 2-2)

Total Area:	1,748,174 sf	40.13	ac	0.06 mi ²
Pervious Area:	1,543,948 sf	35.44	ac	
Gravel Area:	26,029 sf	0.60	ac	
Impervious Area:	178,197 sf	4.09	ac	

HSG	Description	CN	Area	CN*A	
Α	Good Condition (grass cover >75%)	39	3.17	123.5	
В	Good Condition (grass cover >75%)	61	32.28	1968.9	
Α	Gravel Road	76	0.19	14.5	
В	Gravel Road	85	0.41	34.5	
				0.0	
Impervious	Paved Area, Roofs	98	4.09	400.9	
Totals: 40.13					
Composite Curve Number:					

Frequency		yr
Rainfall (ISWMM Table C3-S2-3, 24-hour)	Р	in
Potential Maximum Retention (Use TR-55 Equation 2-4)	S	in
Runoff (Use TR-55 Equation 2-3)	Q	in

Recurrence Interval (yr)				
1 5 25 1				
2.63	3.74	5.59	7.67	
5.79	5.79	5.79	5.79	
0.299	0.797	1.923	3.449	

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

TR-55 Worksheet 2: Curve Number and Runoff

Subbasin Name: Basin E
Condition: Future

Curve Number (TR-55 Table 2-2)

Total Area:	693,468 sf	15.92	ac
Pervious Area:	544,677 sf	12.50	ac
Gravel Area:	518 sf	0.01	ac
Impervious Area:	148,273 sf	3.40	ac

HSG	Description	CN	Area	CN*A	
В	Good Condition (grass cover >75%)	61	12.37	754.9	
С	Good Condition (grass cover >75%)	74	0.13	9.6	
В	Gravel Road	85	0.01	1.0	
				0.0	
Impervious	Paved Area, Roofs	98	3.40	333.6	
Totals:					
Composite Curve Number:					

Runoff

Frequency		yr
Rainfall (ISWMM Table C3-S2-3, 24-hour)	Р	in
Potential Maximum Retention (Use TR-55 Equation 2-4)	S	in
Runoff (Use TR-55 Equation 2-3)	Q	in

Recurrence Interval (yr)				
1	5	25	100	
2.63	3.74	5.59	7.67	
4.49	4.49	4.49	4.49	
0.483	1.103	2.399	4.074	

0.02 mi²

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

TR-55 Worksheet 2: Curve Number and Runoff

Subbasin Name: Basin F
Condition: Future

Curve Number (TR-55 Table 2-2)

 Total Area:
 776,689 sf
 17.83 ac

 Pervious Area:
 606,453 sf
 13.92 ac

 Gravel Area:
 0 sf
 0.00 ac

 Impervious Area:
 170,236 sf
 3.91 ac

HSG	Description	CN	Area	CN*A	
В	Good Condition (grass cover >75%)	61	9.61	585.9	
С	Good Condition (grass cover >75%)	74	4.32	319.4	
				0.0	
Impervious	Paved Area, Roofs	98	3.91	383.0	
Totals: 17.83					
Composite Curve Number:					
				-	

Runoff

Frequency
Rainfall (ISWMM Table C3-S2-3, 24-hour)
Potential Maximum Retention (Use TR-55 Equation 2-4)
Runoff (Use TR-55 Equation 2-3)

yr

P in

Q in

Recurrence Interval (yr)				
1	25	100		
2.63	3.74	5.59	7.67	
3.84	3.84	3.84	3.84	
0.608	1.297	2.685	4.435	

0.03 mi²

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

TR-55 Worksheet 2: Curve Number and Runoff

Subbasin Name: Basin G
Condition: Future

Curve Number (TR-55 Table 2-2)

 Total Area:
 6,715,860 sf
 154.17 ac

 Pervious Area:
 4,464,687 sf
 102.50 ac

 Gravel Area:
 9,567 sf
 0.22 ac

 Impervious Area:
 2,241,606 sf
 51.46 ac

HSG	Description	CN	Area	CN*A
В	Good Condition (grass cover >75%)	61	65.69	4007.0
С	Good Condition (grass cover >75%)	74	1.35	100.1
D	Good Condition (grass cover >75%)	80	35.45	2836.4
D	Gravel Road	91	0.22	20.0
				0.0
Impervious	Paved Area, Roofs	98	51.46	5043.1
Totals: 154.17				
Composite Curve Number:			77.88	

Runoff

Frequency		yr
Rainfall (ISWMM Table C3-S2-3, 24-hour)	Р	in
Potential Maximum Retention (Use TR-55 Equation 2-4)	S	in
Runoff (Use TR-55 Equation 2-3)	Q	in

Recurrence Interval (yr)			
1	5	25	100
2.63	3.74	5.59	7.67
2.84	2.84	2.84	2.84
0.867	1.673	3.207	5.073

0.24 mi²

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

TR-55 Worksheet 2: Curve Number and Runoff

Subbasin Name: Basin H
Condition: Future

Curve Number (TR-55 Table 2-2)

 Total Area:
 15,614,065 sf
 358.45 ac
 0.56 mi²

 Pervious Area:
 12,006,667 sf
 275.64 ac
 ac

 Gravel Area:
 195,389 sf
 4.49 ac
 ac

 Impervious Area:
 3,412,010 sf
 78.33 ac
 ac

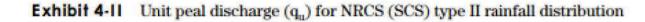
HSG	Description	CN	Area	CN*A
В	Good Condition (grass cover >75%)	61	113.00	6893.0
С	Good Condition (grass cover >75%)	74	17.37	1285.4
D	Good Condition (grass cover >75%)	80	145.26	11621.1
В	Gravel Road	85	0.05	4.3
D	Gravel Road	91	4.44	403.6
				0.0
Impervious	Paved Area, Roofs	98	78.33	7676.2
als:		•	358.45	27883.7
omposite Curve Number:			77.79	

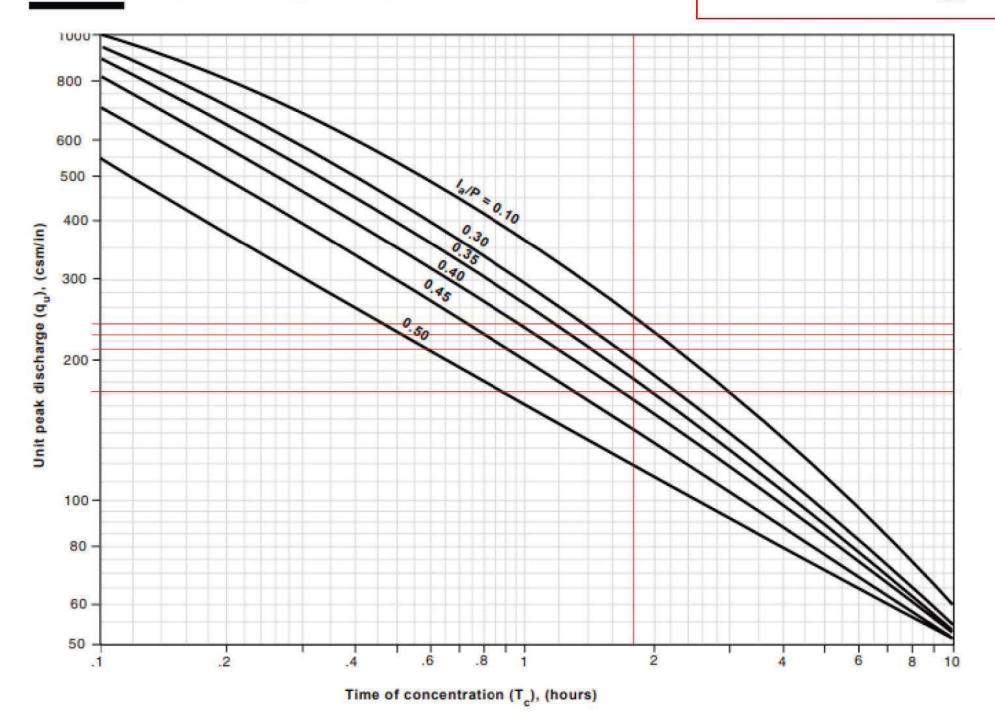
Frequency		yr
Rainfall (ISWMM Table C3-S2-3, 24-hour)	Р	in
Potential Maximum Retention (Use TR-55 Equation 2-4)	S	in
Runoff (Use TR-55 Equation 2-3)	Q	in

	Recurrence Interval (yr)			
1	5	25	100	
2.63	3.74	5.59	7.67	
2.86	2.86	2.86	2.86	
0.863	1.667	3.199	5.063	

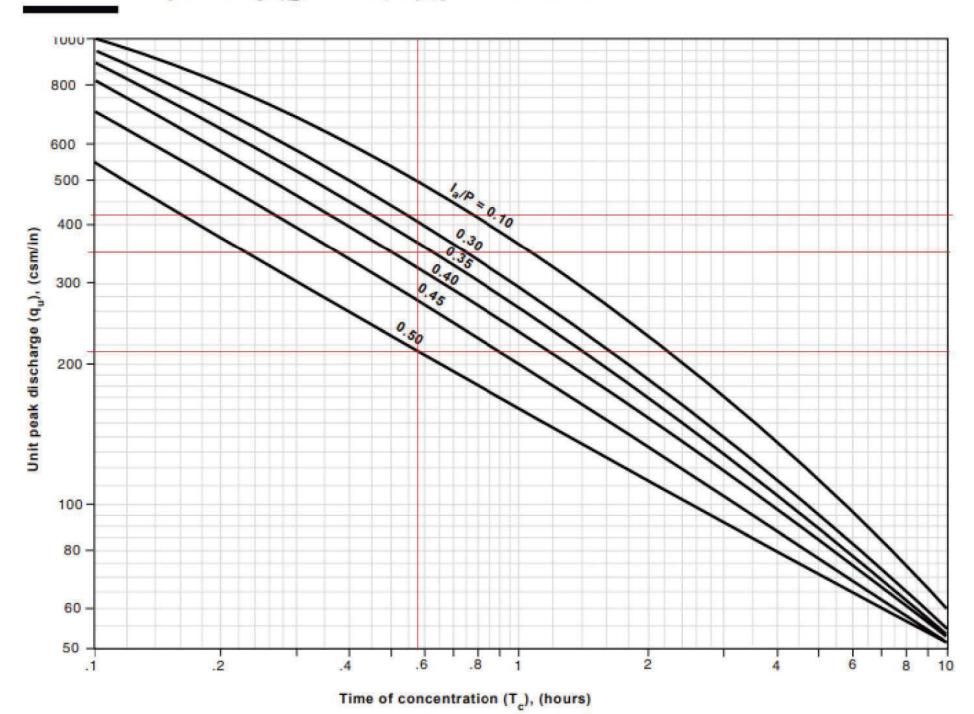
(210-650-H, 2nd Ed., Feb 2021)

650-2.23

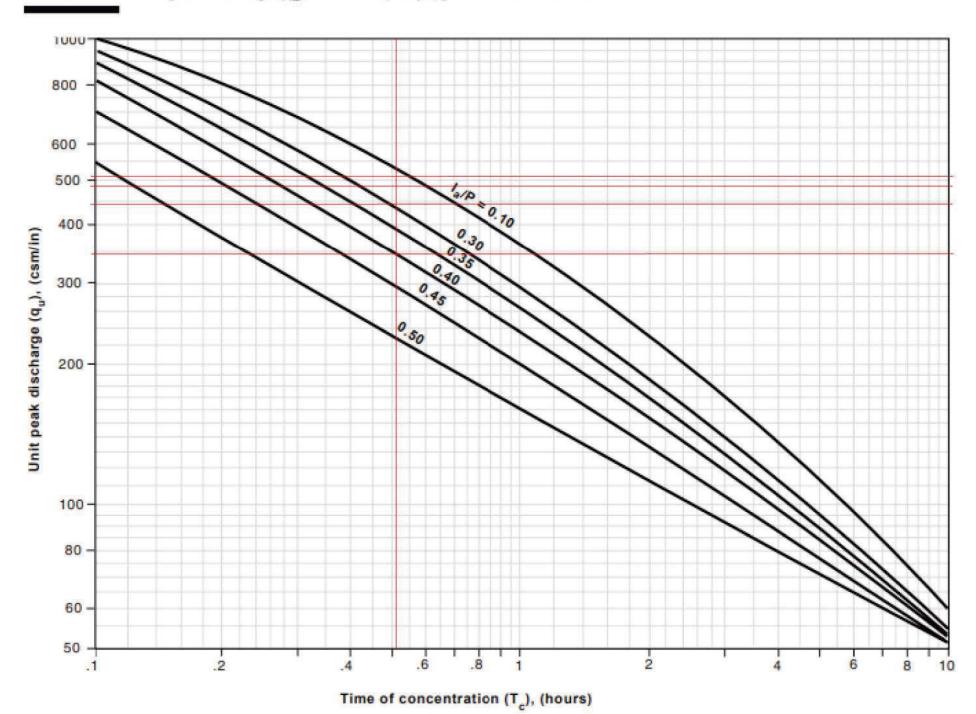




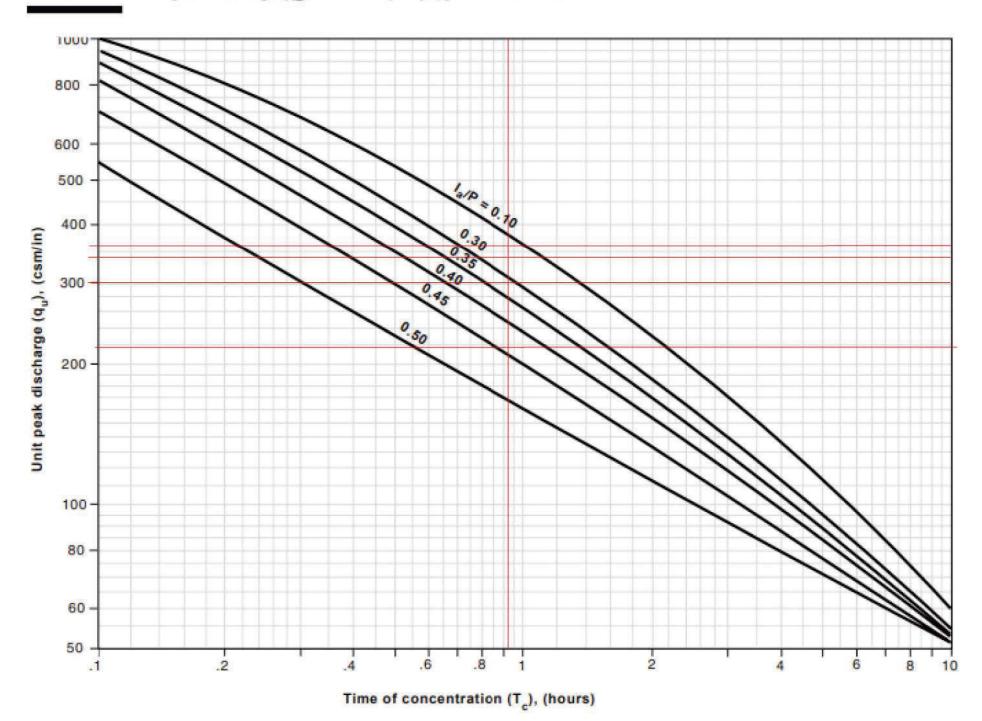
 $\textbf{Exhibit 4-II} \quad \text{Unit peal discharge } (q_u) \text{ for NRCS (SCS) type II rainfall distribution}$



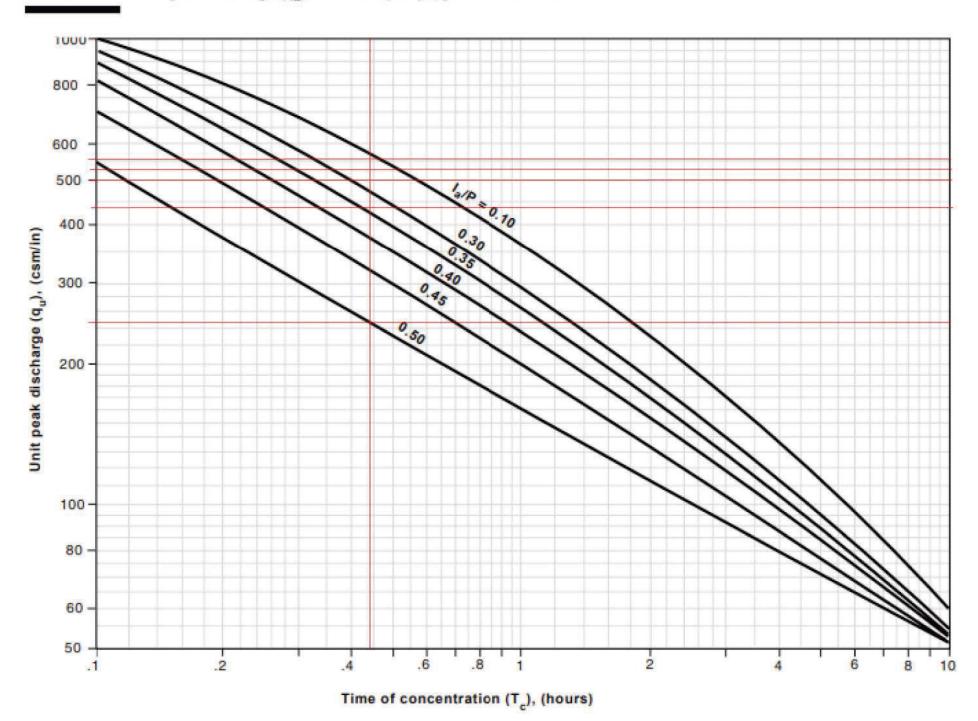
 $\textbf{Exhibit 4-II} \quad \text{Unit peal discharge } (q_u) \text{ for NRCS (SCS) type II rainfall distribution}$



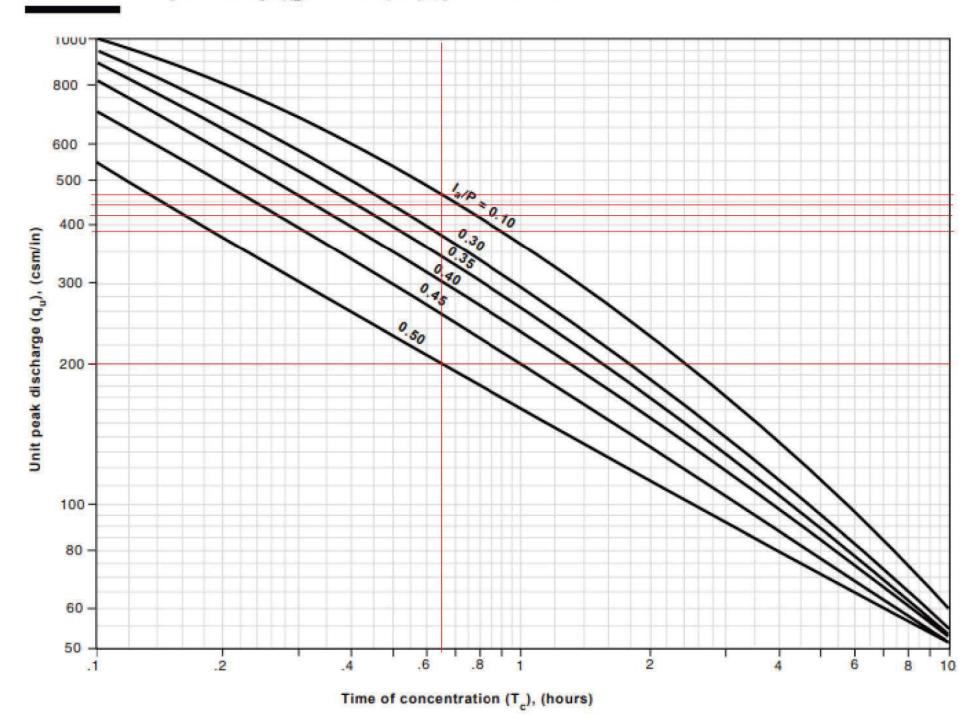
 $\textbf{Exhibit 4-II} \quad \text{Unit peal discharge } (q_u) \text{ for NRCS (SCS) type II rainfall distribution}$



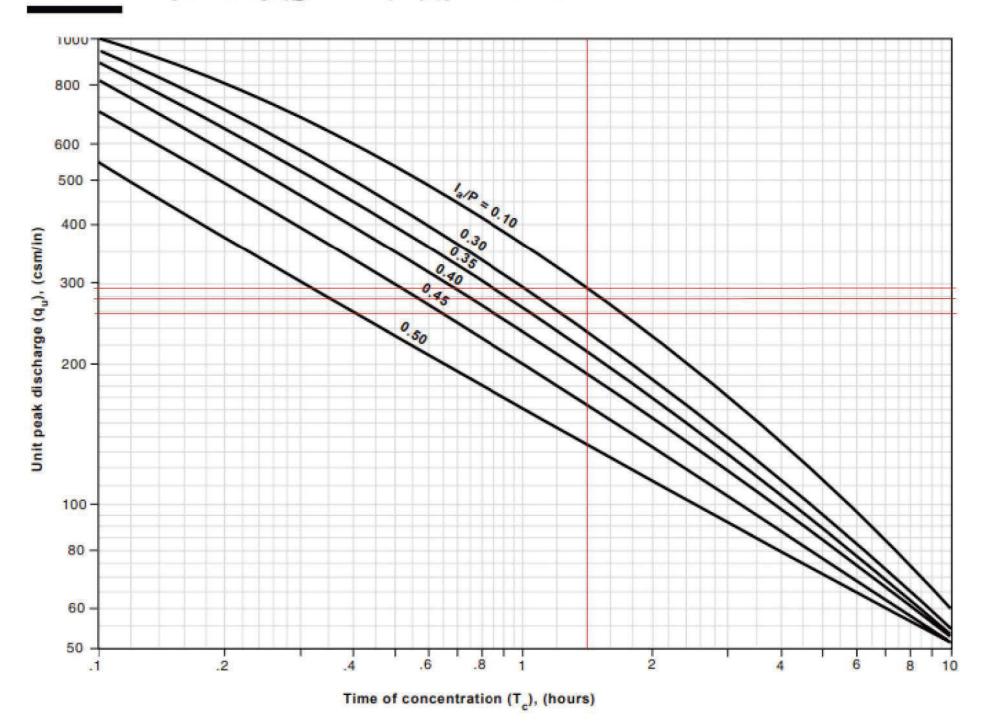
 $\textbf{Exhibit 4-II} \quad \text{Unit peal discharge } (q_u) \text{ for NRCS (SCS) type II rainfall distribution}$



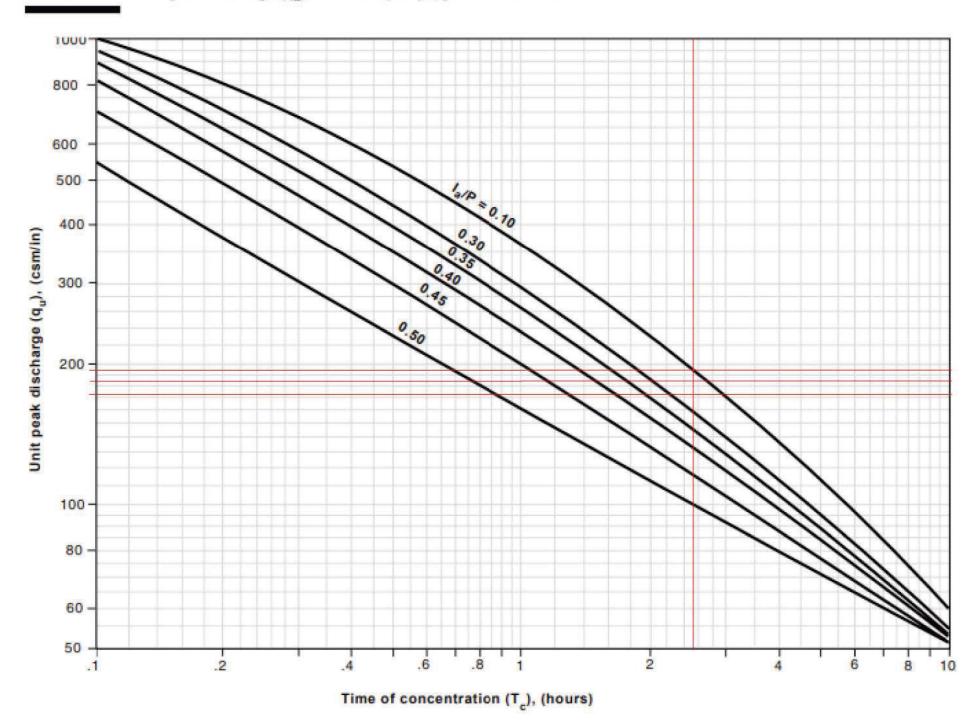
 $\textbf{Exhibit 4-II} \quad \text{Unit peal discharge } (q_u) \text{ for NRCS (SCS) type II rainfall distribution}$



 $\textbf{Exhibit 4-II} \quad \text{Unit peal discharge } (q_u) \text{ for NRCS (SCS) type II rainfall distribution}$



 $\textbf{Exhibit 4-II} \quad \text{Unit peal discharge } (q_u) \text{ for NRCS (SCS) type II rainfall distribution}$



Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

TR-55 Worksheet 3: Graphical Peak Discharge

Sub-Basin Name: Basin A
Condition: Future

Data

Drainage Area	\mathbf{A}_{m}	=	0.38	mi^2
Runoff Curve Number (From TR-55 Worksheet 2)	CN	=	66.73	
Potential Maximum Retention (From TR-55 Worksheet 2)	S	=	4.99	
Time of Concentration (From TR-55 Worksheet 3)	T_C	=	1.79	hr
Rainfall Distribution		=	II	
Pond and Swamp Area		=		$\%$ of A_m

Frequency		yr
Rainfall (IDF 24-hour)	Р	in
Initial Abstraction (Use TR-55 Table 4-1)	l _a	in
Compute	I _a /P	
Unit Peak Discharge (Use TR-55 Exhibit 4-II)	\mathbf{q}_{u}	csm/in
Runoff (From TR-55 Worksheet 2)	Q	in
Pond and Swamp Adjustment Factor (Use TR-55 Table 4-2)	F_p	
Peak Discharge (Where $Q_p = q_u A_m Q F_p$)	\mathbf{Q}_{p}	cfs

Recurrence Interval				
1	5	25	100	
2.63	3.74	5.59	7.67	
0.998	0.998	0.998	0.998	
0.38	0.27	0.18	0.13	
171	212	228	240	
0.408	0.983	2.216	3.838	
1.0	1.0	1.0	1.0	
26.59	79.30	192.39	350.66	

 Comp. By:
 JKK

 Date:
 5/13/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

TR-55 Worksheet 3: Graphical Peak Discharge

Sub-Basin Name: Basin B
Condition: Future

Data

Drainage Area	\mathbf{A}_{m}	=	0.07	mi ²
Runoff Curve Number (From TR-55 Worksheet 2)	CN	=	49.39	
Potential Maximum Retention (From TR-55 Worksheet 2)	S	=	10.25	
Time of Concentration (From TR-55 Worksheet 3)	T_C	=	0.58	hr
Rainfall Distribution		=	II	
Pond and Swamp Area		=		$\%$ of A_m

Frequency		yr
Rainfall (IDF 24-hour)	Р	in
Initial Abstraction (Use TR-55 Table 4-1)	l _a	in
Compute	I _a /P	
Unit Peak Discharge (Use TR-55 Exhibit 4-II)	\mathbf{q}_{u}	csm/in
Runoff (From TR-55 Worksheet 2)	Q	in
Pond and Swamp Adjustment Factor (Use TR-55 Table 4-2)	F_p	
Peak Discharge (Where $Q_p = q_u A_m Q F_p$)	\mathbf{Q}_{p}	cfs

Recurrence Interval				
1	5	25	100	
2.63	3.74	5.59	7.67	
2.050	2.050	2.050	2.050	
0.78	0.55	0.37	0.27	
213	213	349	421	
0.032	0.241	0.913	1.996	
1.0	1.0	1.0	1.0	
0.46	3.50	21.68	57.21	

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

TR-55 Worksheet 3: Graphical Peak Discharge

Sub-Basin Name: Basin C
Condition: Future

Data

Drainage Area	\mathbf{A}_{m}	=	0.05	mi ²
Runoff Curve Number (From TR-55 Worksheet 2)	CN	=	65.27	
Potential Maximum Retention (From TR-55 Worksheet 2)	S	=	5.32	
Time of Concentration (From TR-55 Worksheet 3)	T_C	=	0.51	hr
Rainfall Distribution		=	II	
Pond and Swamp Area		=		$\%$ of A_m

Frequency		yr
Rainfall (IDF 24-hour)	Р	in
Initial Abstraction (Use TR-55 Table 4-1)	l _a	in
Compute	I _a /P	
Unit Peak Discharge (Use TR-55 Exhibit 4-II)	\mathbf{q}_{u}	csm/in
Runoff (From TR-55 Worksheet 2)	Q	in
Pond and Swamp Adjustment Factor (Use TR-55 Table 4-2)	F_p	
Peak Discharge (Where $Q_p = q_u A_m Q F_p$)	\mathbf{Q}_{p}	cfs
	-	

Recurrence Interval				
1	5	25	100	
2.63	3.74	5.59	7.67	
1.064	1.064	1.064	1.064	
0.40	0.28	0.19	0.14	
346	444	485	510	
0.356	0.895	2.080	3.658	
1.0	1.0	1.0	1.0	
6.55	21.12	53.61	99.16	

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

TR-55 Worksheet 3: Graphical Peak Discharge

Sub-Basin Name: Basin D
Condition: Future

Data

Drainage Area	\mathbf{A}_{m}	=	0.06	mi^2
Runoff Curve Number (From TR-55 Worksheet 2)	CN	=	63.35	
Potential Maximum Retention (From TR-55 Worksheet 2)	S	=	5.79	
Time of Concentration (From TR-55 Worksheet 3)	T_{C}	=	0.92	hr
Rainfall Distribution		=	II	
Pond and Swamp Area		=		$\%$ of A_m

Frequency		yr
Rainfall (IDF 24-hour)	Р	in
Initial Abstraction (Use TR-55 Table 4-1)	l _a	in
Compute	I _a /P	
Unit Peak Discharge (Use TR-55 Exhibit 4-II)	\mathbf{q}_{u}	csm/in
Runoff (From TR-55 Worksheet 2)	Q	in
Pond and Swamp Adjustment Factor (Use TR-55 Table 4-2)	F_p	
Peak Discharge (Where $Q_p = q_u A_m Q F_p$)	\mathbf{Q}_{p}	cfs

Recurrence Interval				
1	5	25	100	
2.63	3.74	5.59	7.67	
1.157	1.157	1.157	1.157	
0.44	0.31	0.21	0.15	
217	300	341	360	
0.299	0.797	1.923	3.449	
1.0	1.0	1.0	1.0	
4.07	15.00	41.12	77.86	

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

TR-55 Worksheet 3: Graphical Peak Discharge

Sub-Basin Name: Basin E
Condition: Future

Data

Drainage Area	\mathbf{A}_{m}	=	0.02	mi ²
Runoff Curve Number (From TR-55 Worksheet 2)	CN	=	69.03	
Potential Maximum Retention (From TR-55 Worksheet 2)	S	=	4.49	
Time of Concentration (From TR-55 Worksheet 3)	T_{C}	=	0.44	hr
Rainfall Distribution		=	II.	
Pond and Swamp Area		=		$\%$ of A_m

Frequency		yr
Rainfall (IDF 24-hour)	Р	in
Initial Abstraction (Use TR-55 Table 4-1)	l _a	in
Compute	I _a /P	
Unit Peak Discharge (Use TR-55 Exhibit 4-II)	\mathbf{q}_{u}	csm/in
Runoff (From TR-55 Worksheet 2)	Q	in
Pond and Swamp Adjustment Factor (Use TR-55 Table 4-2)	F_p	
Peak Discharge (Where $Q_p = q_u A_m Q F_p$)	Q_p	cfs
	•	

	Recurrence Interval				
1	5	25	100		
2.63	3.74	5.59	7.67		
0.897	0.897	0.897	0.897		
0.34	0.24	0.16	0.12		
440	500	530	555		
0.483	1.103	2.399	4.074		
1.0	1.0	1.0	1.0		
5.29	13.72	31.63	56.25		

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

TR-55 Worksheet 3: Graphical Peak Discharge

Sub-Basin Name: Basin F
Condition: Future

Data

Drainage Area	\mathbf{A}_{m}	=	0.03	mi^2
Runoff Curve Number (From TR-55 Worksheet 2)	CN	=	72.26	
Potential Maximum Retention (From TR-55 Worksheet 2)	S	=	3.84	
Time of Concentration (From TR-55 Worksheet 3)	T_{C}	=	0.65	hr
Rainfall Distribution		=	II	
Pond and Swamp Area		=		$\%$ of A_m

Frequency		yr
Rainfall (IDF 24-hour)	Р	in
Initial Abstraction (Use TR-55 Table 4-1)	l _a	in
Compute	I _a /P	
Unit Peak Discharge (Use TR-55 Exhibit 4-II)	\mathbf{q}_{u}	csm/in
Runoff (From TR-55 Worksheet 2)	Q	in
Pond and Swamp Adjustment Factor (Use TR-55 Table 4-2)	F_p	
Peak Discharge (Where $Q_p = q_u A_m Q F_p$)	\mathbf{Q}_{p}	cfs
	-	

Recurrence Interval				
1	5	25	100	
2.63	3.74	5.59	7.67	
0.768	0.768	0.768	0.768	
0.29	0.21	0.14	0.10	
387	418	443	465	
0.608	1.297	2.685	4.435	
1.0	1.0	1.0	1.0	
6.56	15.10	33.13	57.45	

 Comp. By:
 JKK

 Date:
 5/13/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

TR-55 Worksheet 3: Graphical Peak Discharge

Sub-Basin Name: Basin G
Condition: Future

Data

Drainage Area	\mathbf{A}_{m}	=	0.24	mi ²
Runoff Curve Number (From TR-55 Worksheet 2)	CN	=	77.88	
Potential Maximum Retention (From TR-55 Worksheet 2)	S	=	2.84	
Time of Concentration (From TR-55 Worksheet 3)	T _C	=	1.41	hr
Rainfall Distribution		=	П	
Pond and Swamp Area		=		% of A _m

Frequency		yr
Rainfall (IDF 24-hour)	Р	in
Initial Abstraction (Use TR-55 Table 4-1)	l _a	in
Compute	I _a /P	
Unit Peak Discharge (Use TR-55 Exhibit 4-II)	\mathbf{q}_{u}	csm/in
Runoff (From TR-55 Worksheet 2)	Q	in
Pond and Swamp Adjustment Factor (Use TR-55 Table 4-2)	F_p	
Peak Discharge (Where $Q_p = q_u A_m Q F_p$)	Q_p	cfs
	•	

Recurrence Interval				
1	5	25	100	
2.63	3.74	5.59	7.67	
0.568	0.568	0.568	0.568	
0.22	0.15	0.10	0.07	
258	277	293	293	
0.867	1.673	3.207	5.073	
1.0	1.0	1.0	1.0	
53.89	111.65	226.38	358.04	

 Comp. By:
 JKK

 Date:
 5/13/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

TR-55 Worksheet 3: Graphical Peak Discharge

Sub-Basin Name: Basin H
Condition: Future

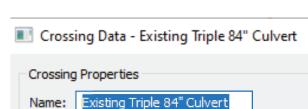
Data

Drainage Area	\mathbf{A}_{m}	=	0.56	mi ²
Runoff Curve Number (From TR-55 Worksheet 2)	CN	=	77.79	
Potential Maximum Retention (From TR-55 Worksheet 2)	S	=	2.86	
Time of Concentration (From TR-55 Worksheet 3)	T_C	=	2.53	hr
Rainfall Distribution		=	H.	
Pond and Swamp Area		=		$\%$ of A_m

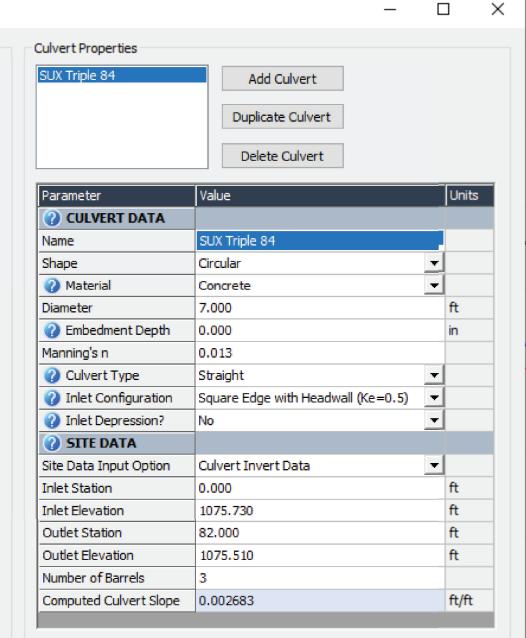
Frequency		yr
Rainfall (IDF 24-hour)	Р	in
Initial Abstraction (Use TR-55 Table 4-1)	l _a	in
Compute	I _a /P	
Unit Peak Discharge (Use TR-55 Exhibit 4-II)	\mathbf{q}_{u}	csm/in
Runoff (From TR-55 Worksheet 2)	Q	in
Pond and Swamp Adjustment Factor (Use TR-55 Table 4-2)	F_p	
Peak Discharge (Where $Q_p = q_u A_m Q F_p$)	Q_p	cfs
	•	

	Recurrence Interval				
1	5	25	100		
2.63	3.74	5.59	7.67		
0.572	0.572	0.572	0.572		
0.22	0.15	0.10	0.07		
173	184	195	195		
0.865	1.670	3.203	5.067		
1.0	1.0	1.0	1.0		
83.78	172.08	349.79	553.41		

Stoux City dateway Kullway IIIIpi	rovements Project EA: Water Resources A	
Attachment I-4: Ch	annel Realignment Canacity C	alculations
Attachment I-4: Ch	annel Realignment Capacity C	alculations
Attachment I-4: Ch	annel Realignment Capacity C	alculations
Attachment I-4: Ch	annel Realignment Capacity C	alculations
Attachment I-4: Ch	annel Realignment Capacity C	alculations
Attachment I-4: Ch	annel Realignment Capacity C	alculations
Attachment I-4: Ch	annel Realignment Capacity C	alculations
Attachment I-4: Ch	annel Realignment Capacity C	alculations
Attachment I-4: Ch	annel Realignment Capacity C	alculations
Attachment I-4: Ch	annel Realignment Capacity C	alculations
Attachment I-4: Ch	annel Realignment Capacity C	alculations
Attachment I-4: Ch	annel Realignment Capacity C	alculations
Attachment I-4: Ch	annel Realignment Capacity C	alculations
Attachment I-4: Ch	annel Realignment Capacity C	alculations
Attachment I-4: Ch	annel Realignment Capacity C	alculations
Attachment I-4: Ch	annel Realignment Capacity C	alculations



Parameter	Value	Units
DISCHARGE DATA		
Discharge Method	Minimum, Design, and Maximum	
Minimum Flow	1000.000	cfs
Design Flow	1300.000	cfs
Maximum Flow	2000.000	cfs
() TAILWATER DATA		
Channel Type	Trapezoidal Channel	
Bottom Width	30.000	ft
Side Slope (H:V)	4.000	_:1
Channel Slope	0.0020	ft/ft
Manning's n (channel)	0.035	
Channel Invert Elevation	1075.510	ft
Rating Curve	View	
ROADWAY DATA		
Roadway Profile Shape	Constant Roadway Elevation ▼	
First Roadway Station	0.000	ft
Crest Length	50.000	ft
Crest Elevation	1086.000	ft
Roadway Surface	Paved 🔻	
Top Width	50.000	ft



Help Click on any 🕡 icon for help on a specific topic

Low Flow

AOP Ene

Energy Dissipation

Analyze Crossing

OK

Cancel

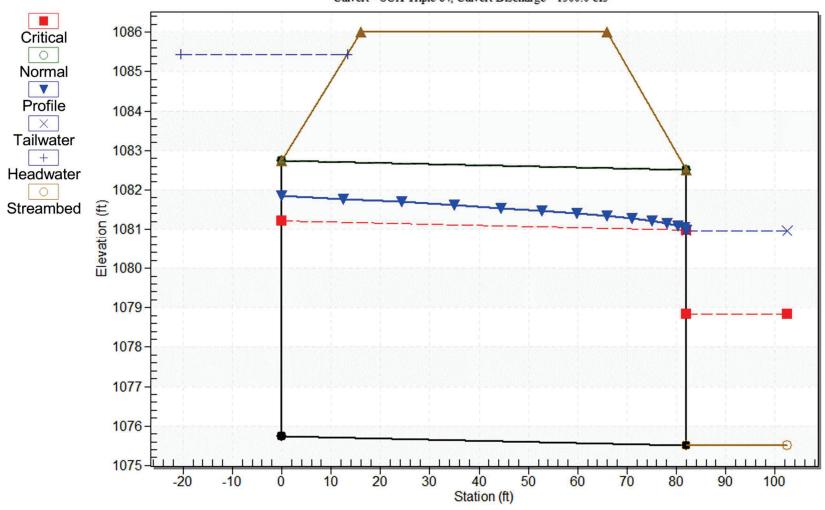
.:

Headwater Elevation (ft)	Total Discharge (cfs)	SUX Triple 84 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1083.68	1000.00	1000.00	0.00	1
1084.21	1100.00	1100.00	0.00	1
1084.74	1200.00	1200.00	0.00	1
1085.44	1300.00	1300.00	0.00	1
1086.15	1400.00	1391.19	8.80	6
1086.55	1500.00	1438.97	61.01	5
1086.87	1600.00	1477.05	122.94	5
1087.16	1700.00	1510.35	189.64	5
1087.43	1800.00	1540.46	259.50	4
1087.68	1900.00	1568.26	331.71	4
1087.93	2000.00	1594.21	405.77	4
1086.00	1372.14	1372.14	0.00	Overtopping

Peak Culvert Discharge Rate

Water Surface Profile Plot for Culvert: Triple 84" RCP

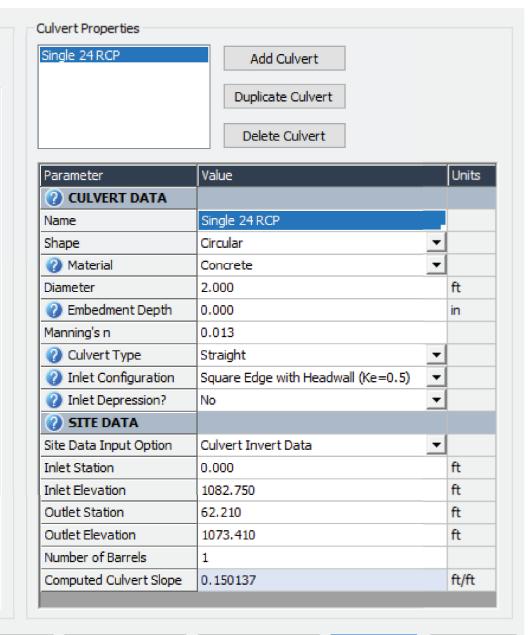
Crossing - SUX Triple 84, Design Discharge - 1300.0 cfs
Culvert - SUX Triple 84, Culvert Discharge - 1300.0 cfs



Crossing Properties

Name: Existing Single 24" Culvert

Parameter	Value	Units
() DISCHARGE DATA		
Discharge Method	Minimum, Design, and Maximum	-
Minimum Flow	10.000	cfs
Design Flow	25.000	cfs
Maximum Flow	50.000	cfs
() TAILWATER DATA		
Channel Type	Trapezoidal Channel	-
Bottom Width	15.000	ft
Side Slope (H:V)	4.000	_:1
Channel Slope	0.0020	ft/ft
Manning's n (channel)	0.035	
Channel Invert Elevation	1074.000	ft
Rating Curve	View	
ROADWAY DATA		
Roadway Profile Shape	Constant Roadway Elevation	-
First Roadway Station	0.000	ft
Crest Length	3.000	ft
Crest Elevation	1087.670	ft
Roadway Surface	Paved	-
Top Width	3.000	ft



Help

Click on any (2) icon for help on a specific topic

Low Flow

AOP

Energy Dissipation

Analyze Crossing

OK

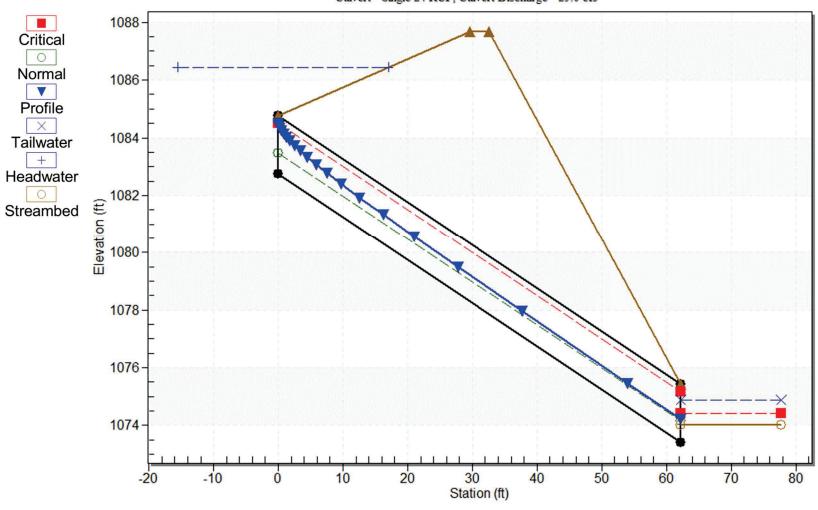
Cancel

Headwater Elevation (ft)	Total Discharge (cfs)	Single 24 RCP Discharge	Roadway Discharge (cfs)	Iterations
1084.31	10.00	10.00	0.00	1
1084.74	14.00	14.00	0.00	1
1085.25	18.00	18.00	0.00	1
1085.87	22.00	22.00	0.00	1
1086.44	25.00	25.00	0.00	1
1087.55	30.00	30.00	0.00	1
1088.04	34.00	31.94	2.06	6
1088.33	38.00	33.03	4.97	5
1088.58	42.00	33.94	8.06	5
1088.81	46.00	34.76	11.24	5
1089.02	50.00	35.48	14.52	5
1087.67	30.47	30.47	0.00	Overtopping

Peak Culvert Discharge Rate

Water Surface Profile Plot for Culvert: 24" RCP

Crossing - Single 24 RCP, Design Discharge - 25.0 cfs Culvert - Single 24 RCP, Culvert Discharge - 25.0 cfs



Future Channel Realignment Required Flow Hydraulic Capacity

Condition	Triple 84" Culvert Peak Flow (cfs)	Single 24" Culvert Peak Flow (cfs)	Basin A 100-year Peak Runoff (cfs)	Total Peak Flow Rate (cfs)
Existing	1372.14	30.47	312.8	1715.41
Future	1372.14	30.47	350.66	1753.27
Change	-	-	37.86	37.86

Sioux City Gateway Runway	Improvements Project EA: Water Resources Analysis
	Attachment I F. Water Quality Calculations
	Attachment 1-5: Water Quality Calculations
	Attachment I-5: Water Quality Calculations
	Attachment 1-5: Water Quality Calculations

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

Water Quality Volume & Peak Flow

Sub-basin Name: Basin A

Condition: Future

Water Quality Storm (in) (P): 1.25

Water Quality Volume (WQv)

Area	243.67	ac
Impervious	44.99	ac
% Impervious	18.46	%
Rv (ISWMM Equation C3-S6-1)	0.22	
Water Quality Volume (WQv) (ISWMM Equation C3-S6-2)	5.49	ac-ft
WQv	239011	cu ft
Water Quality Runoff Volume (Qa) (Qa = 1.25*Rv)	0.27	watershed in

Drainage Area	0.38	sq mi
Modified CN (ISWMM Equation C3-S6-3)	83.93	
Initial Abstraction (Use TR-55 Table 4-1) (I _a)	0.38	in
I _a /P	0.31	
Unit Peak Discharge (Use TR-55 Exhibit 4-II) (q _u)	195	csm/in
Potential Maximum Retention (Use TR-55 Equation 2-4) (S)	1.91	in
Runoff (From TR-55 Worksheet 2) (Q)	0.27	in
WQv Peak Flow (Qwq)	20.06	cfs

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

Water Quality Volume & Peak Flow

Sub-basin Name: Basin B

Condition: Future

Water Quality Storm (in) (P): 1.25

Water Quality Volume (WQv)

Area	43.56	ac
Impervious	3.71	ac
% Impervious	8.52	%
Rv (ISWMM Equation C3-S6-1)	0.13	
Water Quality Volume (WQv) (ISWMM Equation C3-S6-2)	0.57	ac-ft
WQv	25033	cu ft
Water Quality Runoff Volume (Qa) (Qa = 1.25*Rv)	0.16	watershed in

Drainage Area	0.07	sq mi
Modified CN (ISWMM Equation C3-S6-3)	79.28	
Initial Abstraction (Use TR-55 Table 4-1) (I _a)	0.52	in
I _a /P	0.42	
Unit Peak Discharge (Use TR-55 Exhibit 4-II) (q _u)	300	csm/in
Potential Maximum Retention (Use TR-55 Equation 2-4) (S)	2.61	in
Runoff (From TR-55 Worksheet 2) (Q)	0.16	in
WQv Peak Flow (Qwq)	3.23	cfs

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

Water Quality Volume & Peak Flow

Sub-basin Name: Basin C

Condition: Future

Water Quality Storm (in) (P): 1.25

Water Quality Volume (WQv)

Area	34.01	ac
Impervious	4.08	ac
% Impervious	12.00	%
Rv (ISWMM Equation C3-S6-1)	0.16	
Water Quality Volume (WQv) (ISWMM Equation C3-S6-2)	0.56	ac-ft
WQv	24378	cu ft
Water Quality Runoff Volume (Qa) (Qa = 1.25*Rv)	0.20	watershed in

Drainage Area	0.05	sq mi
Modified CN (ISWMM Equation C3-S6-3)	81.11	
Initial Abstraction (Use TR-55 Table 4-1) (I _a)	0.47	in
I _a /P	0.37	
Unit Peak Discharge (Use TR-55 Exhibit 4-II) (q _u)	357	csm/in
Potential Maximum Retention (Use TR-55 Equation 2-4) (S)	2.33	in
Runoff (From TR-55 Worksheet 2) (Q)	0.20	in
WQv Peak Flow (Qwq)	3.75	cfs

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

Water Quality Volume & Peak Flow

Sub-basin Name: Basin D

Condition: Future

Water Quality Storm (in) (P): 1.25

Water Quality Volume (WQv)

Area	40.13	ac
Impervious	4.69	ac
% Impervious	11.69	%
Rv (ISWMM Equation C3-S6-1)	0.16	
Water Quality Volume (WQv) (ISWMM Equation C3-S6-2)	0.65	ac-ft
WQv	28257	cu ft
Water Quality Runoff Volume (Qa) (Qa = 1.25*Rv)	0.19	watershed in

		1
Drainage Area	0.06	sq mi
Modified CN (ISWMM Equation C3-S6-3)	80.95	
Initial Abstraction (Use TR-55 Table 4-1) (I _a)	0.47	in
I _a /P	0.38	
Unit Peak Discharge (Use TR-55 Exhibit 4-II) (q _u)	260	csm/in
Potential Maximum Retention (Use TR-55 Equation 2-4) (S)	2.35	in
Runoff (From TR-55 Worksheet 2) (Q)	0.19	in
WQv Peak Flow (Qwq)	3.16	cfs

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

Water Quality Volume & Peak Flow

Sub-basin Name: Basin E

Condition: Future

Water Quality Storm (in) (P): 1.25

Water Quality Volume (WQv)

Area	15.92	ac
Impervious	3.42	ac
% Impervious	21.48	%
Rv (ISWMM Equation C3-S6-1)	0.24	
Water Quality Volume (WQv) (ISWMM Equation C3-S6-2)	0.40	ac-ft
WQv	17578	cu ft
Water Quality Runoff Volume (Qa) (Qa = 1.25*Rv)	0.30	watershed in

Drainage Area	0.02	sq mi
Modified CN (ISWMM Equation C3-S6-3)	85.06	
Initial Abstraction (Use TR-55 Table 4-1) (I _a)	0.35	in
I _a /P	0.28	
Unit Peak Discharge (Use TR-55 Exhibit 4-II) (q _u)	483	csm/in
Potential Maximum Retention (Use TR-55 Equation 2-4) (S)	1.76	in
Runoff (From TR-55 Worksheet 2) (Q)	0.30	in
WQv Peak Flow (Qwq)	3.65	cfs

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

Water Quality Volume & Peak Flow

Sub-basin Name: Basin F

Condition: Future

Water Quality Storm (in) (P): 1.25

Water Quality Volume (WQv)

Area	17.83	ac
Impervious	3.91	ac
% Impervious	21.93	%
Rv (ISWMM Equation C3-S6-1)	0.25	
Water Quality Volume (WQv) (ISWMM Equation C3-S6-2)	0.46	ac-ft
WQv	20013	cu ft
Water Quality Runoff Volume (Qa) (Qa = 1.25*Rv)	0.31	watershed in

Drainage Area	0.03	sq mi
Modified CN (ISWMM Equation C3-S6-3)	85.22	
Initial Abstraction (Use TR-55 Table 4-1) (I _a)	0.35	in
I _a /P	0.28	
Unit Peak Discharge (Use TR-55 Exhibit 4-II) (q _u)	390	csm/in
Potential Maximum Retention (Use TR-55 Equation 2-4) (S)	1.73	in
Runoff (From TR-55 Worksheet 2) (Q)	0.31	in
WQv Peak Flow (Qwq)	3.36	cfs

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

Water Quality Volume & Peak Flow

Sub-basin Name: Basin G

Condition: Future

Water Quality Storm (in) (P): 1.25

Water Quality Volume (WQv)

Area	154.17	ac
Impervious	51.68	ac
% Impervious	33.52	%
Rv (ISWMM Equation C3-S6-1)	0.35	
Water Quality Volume (WQv) (ISWMM Equation C3-S6-2)	5.65	ac-ft
WQv	246026	cu ft
Water Quality Runoff Volume (Qa) (Qa = 1.25*Rv)	0.44	watershed in

Drainage Area	0.24	sq mi
Modified CN (ISWMM Equation C3-S6-3)		·
Initial Abstraction (Use TR-55 Table 4-1) (I _a)	0.25	in
I _a /P	0.20	
Unit Peak Discharge (Use TR-55 Exhibit 4-II) (q _u)	263	csm/in
Potential Maximum Retention (Use TR-55 Equation 2-4) (S)	1.26	in
Runoff (From TR-55 Worksheet 2) (Q)	0.44	in
WQv Peak Flow (Qwq)	27.85	cfs

Comp. By: JKK

Date: 5/13/2025

Chk. By: LMM

Job No: 10144998.003

Water Quality Volume & Peak Flow

Sub-basin Name: Basin H

Condition: Future

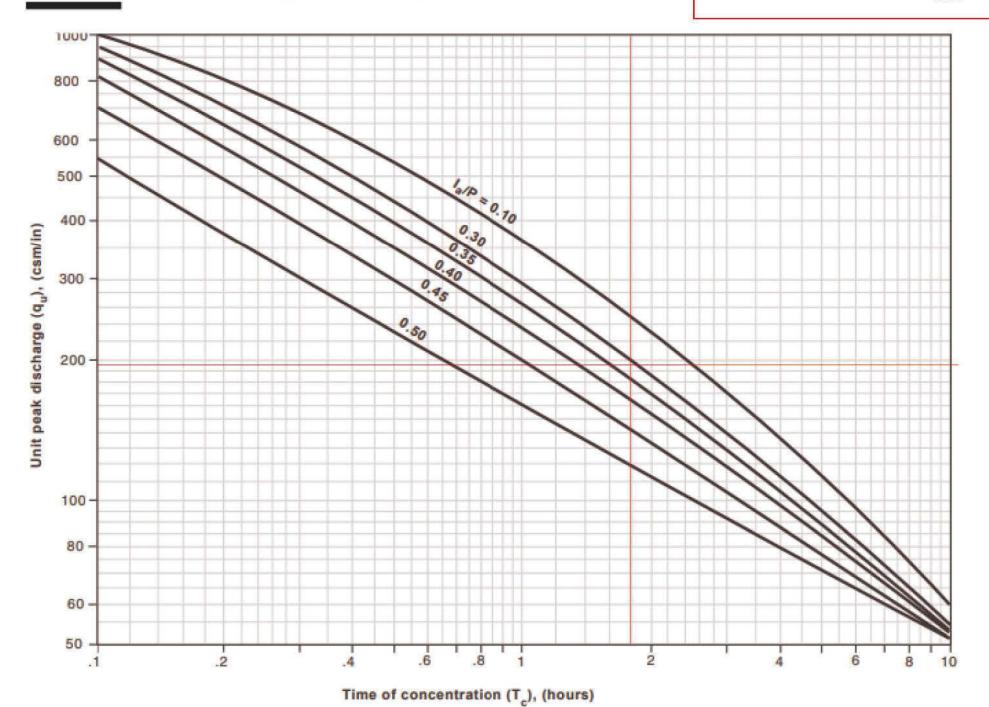
Water Quality Storm (in) (P): 1.25

Water Quality Volume (WQv)

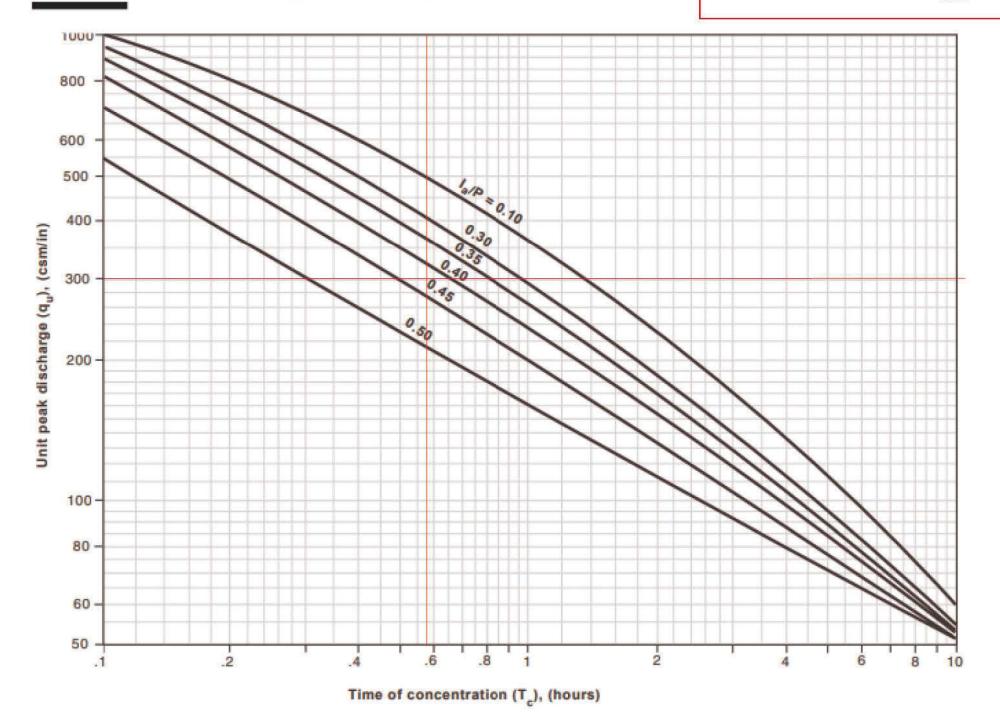
Area	358.45	ac
Impervious	82.3	ac
% Impervious	22.96	%
Rv (ISWMM Equation C3-S6-1)	0.26	
Water Quality Volume (WQv) (ISWMM Equation C3-S6-2)	9.58	ac-ft
WQv	417416	cu ft
Water Quality Runoff Volume (Qa) (Qa = 1.25*Rv)	0.32	watershed in

Drainage Area	0.56	sq mi
Modified CN (ISWMM Equation C3-S6-3)	85.58	
Initial Abstraction (Use TR-55 Table 4-1) (I _a)	0.34	in
I _a /P	0.27	
Unit Peak Discharge (Use TR-55 Exhibit 4-II) (q _u)	170	csm/in
Potential Maximum Retention (Use TR-55 Equation 2-4) (S)	1.69	in
Runoff (From TR-55 Worksheet 2) (Q)	0.32	in
WQv Peak Flow (Qwq)	30.54	cfs

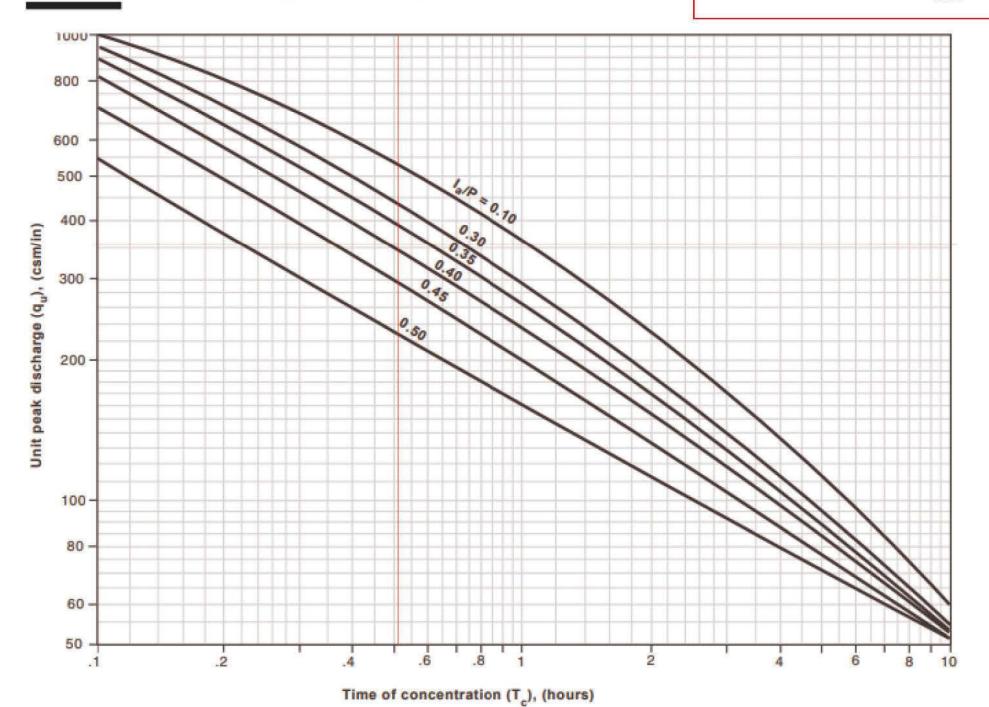






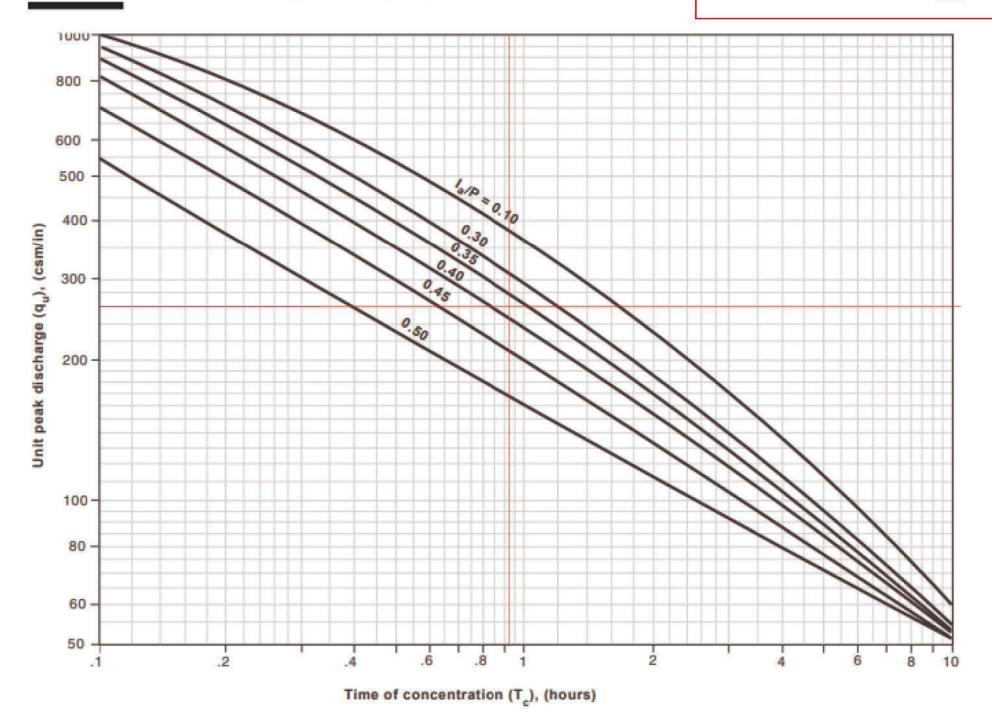


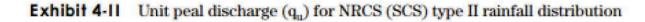


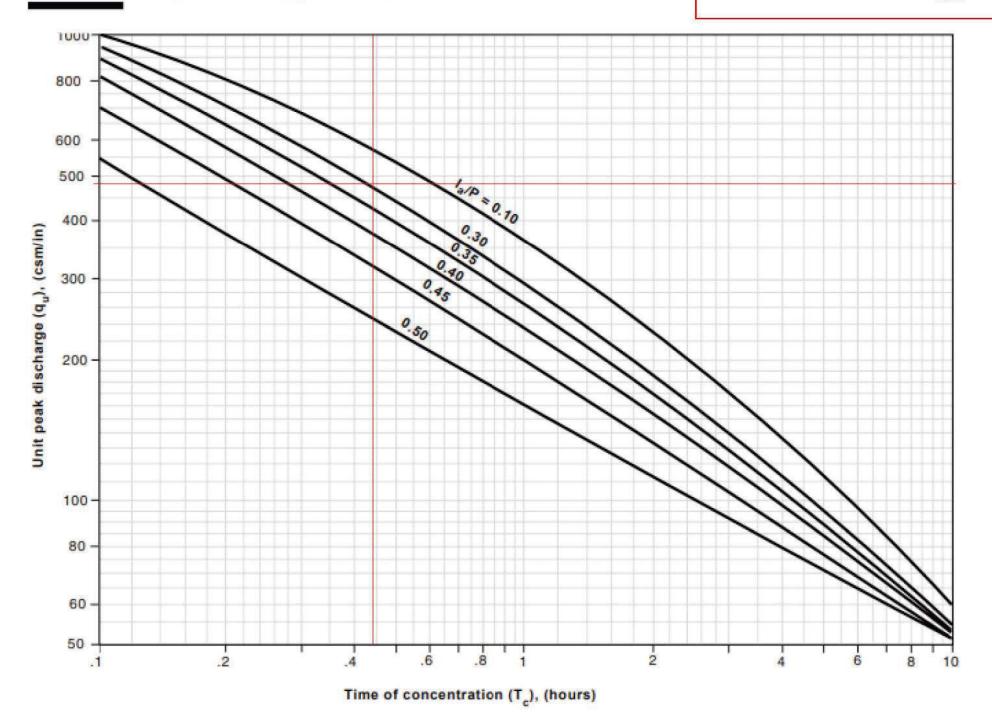


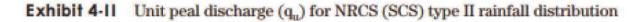
(210-650-H, 2nd Ed., Feb 2021)

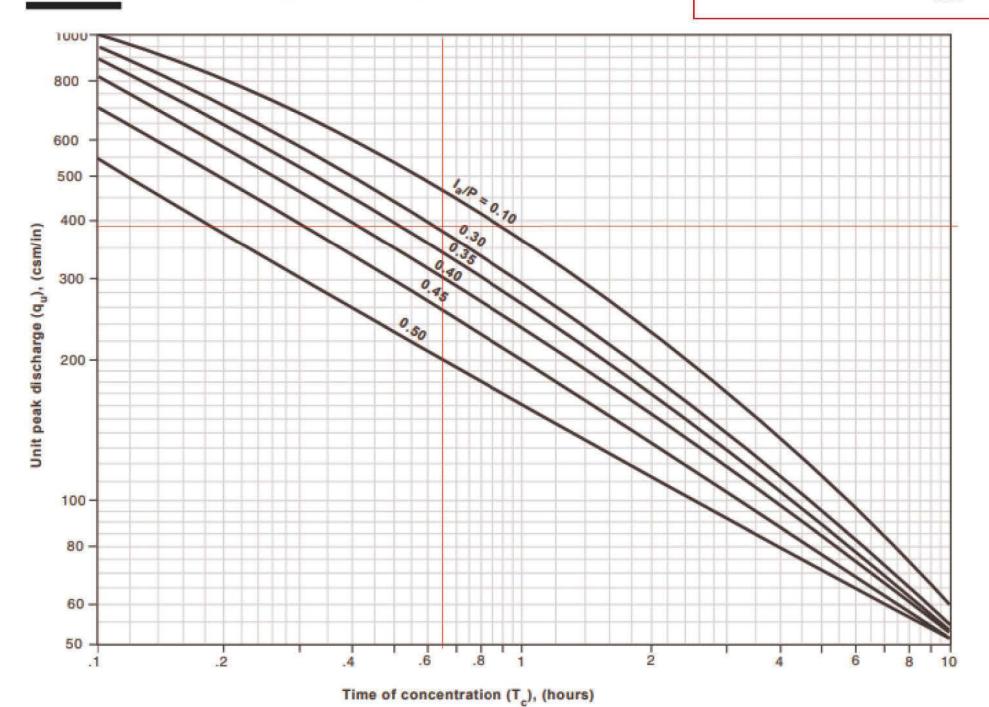




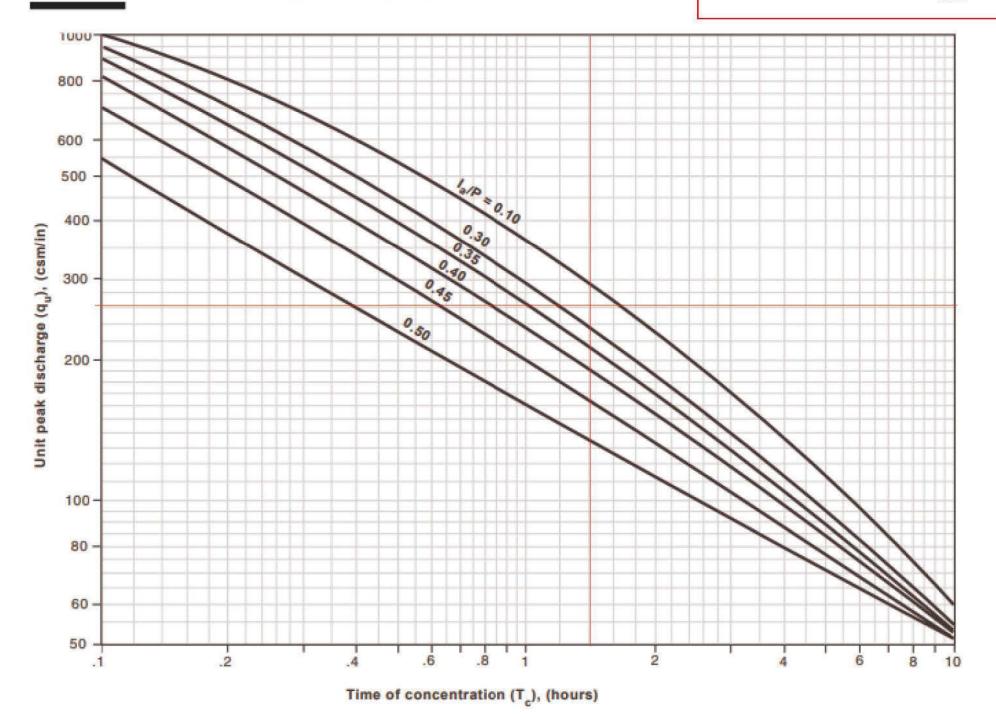


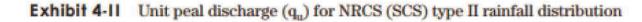


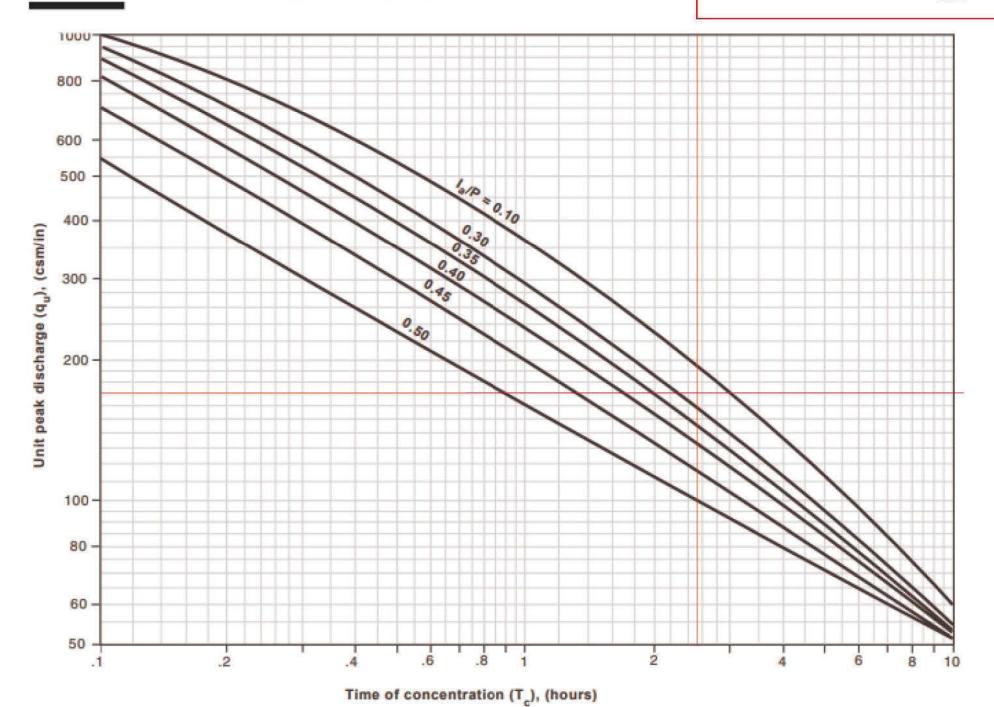












Sioux City Gate	way Runway Impro	ovements Project E	A: Water Resources Analysis	
	A + + = = +	I C. Craundur	aton Dachanas Calaula	4:
	Attachment	I-6: Groundw	ater Recharge Calcula	ations
	Attachment	I-6: Groundw	ater Recharge Calcula	ations
	Attachment	I-6: Groundw	ater Recharge Calcula	ations
	Attachment	I-6: Groundw	ater Recharge Calcula	ations
	Attachment	I-6: Groundw	ater Recharge Calcula	ations
	Attachment	I-6: Groundw	ater Recharge Calcula	ations
	Attachment	I-6: Groundw	ater Recharge Calcula	ations
	Attachment	I-6: Groundw	ater Recharge Calcula	ations
	Attachment	I-6: Groundw	ater Recharge Calcula	ations
	Attachment	I-6: Groundw	ater Recharge Calcula	ations
	Attachment	I-6: Groundw	ater Recharge Calcula	ations
	Attachment	I-6: Groundw	ater Recharge Calcula	ations
	Attachment	I-6: Groundw	ater Recharge Calcula	ations
	Attachment	I-6: Groundw	ater Recharge Calcula	ations
	Attachment	I-6: Groundw	ater Recharge Calcula	ations
	Attachment	I-6: Groundw	ater Recharge Calcula	ations
	Attachment	I-6: Groundw	ater Recharge Calcula	ations
	Attachment	I-6: Groundw	ater Recharge Calcula	ations

 Comp. By:
 JKK

 Date:
 5/13/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Groundwater Recharge

Sub-basin Name: Basin A

Condition: Future

Recharge Depth (in) 1.00 *ISWMM Section 3.01

Groundwater Recharge Volume (Rev)

Measured Impervious	1959571	sq ft
Runoff Coefficient (C)	0.95	
Groundwater Recharge Volume (Rev) (ISWMM Equation 3.01-2-1)	42.74	ac-in
Rev	155133	cu ft

 Comp. By:
 JKK

 Date:
 5/13/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Groundwater Recharge

Sub-basin Name: Basin B

Condition: Future

Recharge Depth (in) 1.00 *ISWMM Section 3.01

Groundwater Recharge Volume (Rev)

Measured Impervious	161608	sq ft
Runoff Coefficient (C)	0.95	
Groundwater Recharge Volume (Rev) (ISWMM Equation 3.01-2-1)	3.52	ac-in
Rev	12794	cu ft

 Comp. By:
 JKK

 Date:
 5/13/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Groundwater Recharge

Sub-basin Name: Basin C

Condition: Future

Recharge Depth (in) 1.00 *ISWMM Section 3.01

Groundwater Recharge Volume (Rev)

Measured Impervious	177725	sq ft
Runoff Coefficient (C)	0.95	
Groundwater Recharge Volume (Rev) (ISWMM Equation 3.01-2-1)	3.88	ac-in
Rev	14070	cu ft

 Comp. By:
 JKK

 Date:
 5/13/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Groundwater Recharge

Sub-basin Name: Basin D

Condition: Future

Recharge Depth (in) 1.00 *ISWMM Section 3.01

Groundwater Recharge Volume (Rev)

Measured Impervious	204296	sq ft
Runoff Coefficient (C)	0.95	
Groundwater Recharge Volume (Rev) (ISWMM Equation 3.01-2-1)	4.46	ac-in
Rev	16173	cu ft

 Comp. By:
 JKK

 Date:
 5/13/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Groundwater Recharge

Sub-basin Name: Basin E

Condition: Future

Recharge Depth (in) 1.00 *ISWMM Section 3.01

Groundwater Recharge Volume (Rev)

Measured Impervious	148975	sq ft
Runoff Coefficient (C)	0.95	
Groundwater Recharge Volume (Rev) (ISWMM Equation 3.01-2-1)	3.25	ac-in
Rev	11794	cu ft

 Comp. By:
 JKK

 Date:
 5/13/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Groundwater Recharge

Sub-basin Name: Basin F

Condition: Future

Recharge Depth (in) 1.00 *ISWMM Section 3.01

Groundwater Recharge Volume (Rev)

Measured Impervious	170320	sq ft
Runoff Coefficient (C)	0.95	
Groundwater Recharge Volume (Rev) (ISWMM Equation 3.01-2-1)	3.71	ac-in
Rev	13484	cu ft

 Comp. By:
 JKK

 Date:
 5/13/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Groundwater Recharge

Sub-basin Name: Basin G

Condition: Future

Recharge Depth (in) 1.00 *ISWMM Section 3.01

Groundwater Recharge Volume (Rev)

Measured Impervious	2251225	sq ft
Runoff Coefficient (C)	0.95	
Groundwater Recharge Volume (Rev) (ISWMM Equation 3.01-2-1)	49.10	ac-in
Rev	178222	cu ft

 Comp. By:
 JKK

 Date:
 5/13/2025

 Chk. By:
 LMM

 Job No:
 10144998.003

Groundwater Recharge

Sub-basin Name: Basin H

Condition: Future

Recharge Depth (in) 1.00 *ISWMM Section 3.01

Groundwater Recharge Volume (Rev)

sq ft	3584988	Measured Impervious
	0.95	Runoff Coefficient (C)
ac-in	78.19	Groundwater Recharge Volume (Rev) (ISWMM Equation 3.01-2-1)
2 cu ft	283812	Rev

Sioux City Gateway	Runway Improvements	Project EA: Water	Resources Analys	sis

Attachment I-7: FEMA FIRMs



FLOOD HAZARD INFORMATION

SEE RIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM FAMEL LAYOUT THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT HTTPS://MSC.FEMA.GOV

Without Base Flood Elevation (BFE) Zone A,V, A99 With BFE or Depth Zone AE, AO, AH, VE

0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zove X Future Conditions 1% Annual Chance Flood Hazard Zone X

Area with Reduced Flood Risk due to Levee See Notes. Zone X

Area with Flood Risk due to Levee Zone D

NO SCREEN Areas of Minimal Flood Hazard Zone X Area of Undetermined Flood Hazard Zo. Channel, Culvert, or Storm Sewer

Levee, Dike, or Floodwall | 18.2 | 17.5 | Cross Sections with 1% Annual Chance | 17.5 | Water Surface Elevation | Coastal Transect | Coastal Transect Baseline | Coastal Transect | Coastal Tra

Profile Baseline Hydrographic Feature

Base Flood Elevation Line (BFE)

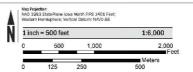
Limit of Study

Jurisdiction Boundary OTHER FEATURES

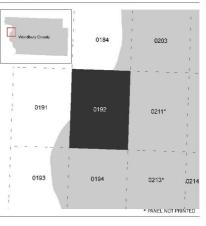
NOTES TO USERS

To determine if flood insurance is available in this community, confact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

SCALE



PANEL LOCATOR



National Flood Insurance Program FEMA

NATIONAL FLOOD INSURANCE PROGRAM

WOODBURY COUNTY, IOWA







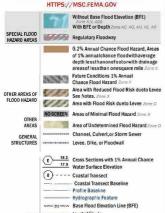
FEMA

VERSION NUMBER 2.6.4.1 MAP NUMBER 19193C0192E MAP REVISED JULY 17, 2024



FLOOD HAZARD INFORMATION

SEE RIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT HTTPS://MSC.FEMA.GOV



OTHER FEATURES

NOTES TO USERS

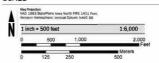
For information and questions about this flood insurance Rate Map (FIRM), evaluable products associated with this FRM, adducing instince, ventions the current rate date for each FIRM about Fixed to be offer products, or the Annional Fixed services. Program (4879) in general, please call the products, and the Annional Fixed services. Program (4879) in general, please call the Map Service Central ventions at the Map Service Central ventions and Central ventions of the map of the Map Service Central ventions and the Map Service Central ventions are serviced to the Map Service Central ventions and the Map

the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

To determine if flood insurance is available in this community confact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620

base map information anown on this First, was provided it digital terms by the united states decological survey (USOS). This information was derived from digital orthopholography at a 2-foot resolution from photography dated 2019

SCALE



PANEL LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM

WOODBURY COUNTY, IOWA And Incorporated Areas PANEL 194 or 675



Collins

National Flood Insurance Program

COMMUNITY	NUMBER	PANEL	SUFFI
SIOUX CITY, CITY OF	190298	0194	87
WOODBURY COUNTY	190536	0194	¥ .

VERSION NUMBER 2.6.4.1 MAP NUMBER 19193C0194E MAP REVISED JULY 17, 2024

National Flood Hazard Layer FIRMette

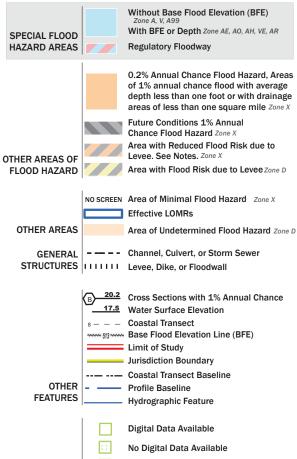




Legend

MAP PANELS

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



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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/10/2025 at 11:08 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

Unmapped

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

Sioux City Gateway Runway Improvements Project EA: Water Resources Analysis
Attachment I & Floodplain Compensatory Calculations
Attachment I-8: Floodplain Compensatory Calculations
Attachment I-8: Floodplain Compensatory Calculations
Attachment I-8: Floodplain Compensatory Calculations
Attachment I-8: Floodplain Compensatory Calculations
Attachment I-8: Floodplain Compensatory Calculations
Attachment I-8: Floodplain Compensatory Calculations
Attachment I-8: Floodplain Compensatory Calculations
Attachment I-8: Floodplain Compensatory Calculations
Attachment I-8: Floodplain Compensatory Calculations
Attachment I-8: Floodplain Compensatory Calculations
Attachment I-8: Floodplain Compensatory Calculations
Attachment I-8: Floodplain Compensatory Calculations
Attachment I-8: Floodplain Compensatory Calculations
Attachment I-8: Floodplain Compensatory Calculations
Attachment I-8: Floodplain Compensatory Calculations
Attachment I-8: Floodplain Compensatory Calculations
Attachment I-8: Floodplain Compensatory Calculations
Attachment I-8: Floodplain Compensatory Calculations
Attachment I-8: Floodplain Compensatory Calculations
Attachment I-8: Floodplain Compensatory Calculations
Attachment I-8: Floodplain Compensatory Calculations
Attachment I-8: Floodplain Compensatory Calculations

5/12/25, 12:41 PM CutFillReport.html

Cut/Fill Report

Generated: 2025-05-12 12:41:27

By user: **GentileN**

Drawing:

Name	Туре	Cut Factor	Fill Factor	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)
PROPOSED STORAGE VOLUME	full	1.000	1.000	430810.05	18850.48	65564.55	46714.07 <fill></fill>
EX STORAGE VOLUME	full	1.000	1.000	720223.39	58986.72	64630.67	5643.96 <fill></fill>

Totals	934 cubic yards				
	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)	
Total	1151033.44	77837.19	130195.22	52358.03 <fill></fill>	

^{*} Value adjusted by cut or fill factor other than 1.0

Sioux City Gateway Runway Improvements Project EA: Water Resources Analysis
Attachment I-9: Report of Geotechnical Exploration





REPORT OF GEOTECHNICAL EXPLORATION

Sioux Gateway Airport, Siouxland Nexus Project Sioux City, Iowa

AET Project No. P-0025900

Date: December 20, 2024

Prepared for:

RS&H, Inc.

Geotechnical • Materials
Forensic • Environmental
Building Technology
Petrography/Chemistry

American Engineering Testing 550 Cleveland Avenue North St. Paul, MN 55114-1804 TeamAET.com • 800.972.6364



December 20, 2024

RS&H, Inc. 4525 Airport Approach Rd, Suite A Duluth, MN 55811

Attn: Mr. Darren Christopher

RE: Geotechnical Exploration

Sioux Gateway Airport, Siouxland Nexus Project

Sioux City, Iowa

AET Report No. P-0025900

Dear Mr. Christopher:

American Engineering Testing, Inc. (AET) is pleased to present the results to date of our subsurface exploration program and geotechnical engineering review for the Sioux Gateway Airport Siouxland Nexus project in Sioux City, Iowa. These services were performed according to Work Order No. 1 from RS&H dated April 10, 2024.

Please contact us if you have any questions about the report. We can also be contacted to arrange construction observation and testing services during the earthwork phase.

Sincerely,

American Engineering Testing, Inc.

Neil G. Lund Senior Project Manager nlund@teamaet.com 612-369-3163



SIGNATURE PAGE

Prepared for:		Prepared by:				
		American Engineering Testing, Inc. 550 Cleveland Avenue North St. Paul, Iowa 55114				
Attn:		(651) 659-9001/www.TeamAET.com				
Authored by:		Reviewed by:				
Name Title		Name Title				
report was prepar supervision and tl	at this plan, specification, or ed by me or under my direct hat I am a duly Licensed neer in the State of Iowa.					
Name:						
Date:	License #:					



TABLE OF CONTENTS

	<u>Page</u>
TRANSMITTAL LETTERTABLE OF CONTENTS	i
1.0 INTRODUCTION	
2.0 SCOPE OF SERVICES	1
3.0 PROJECT INFORMATION	2
4.0 SUBSURFACE EXPLORATION AND TESTING	3
4.1 Field Exploration Program	3
4.2 Soil Laboratory Testing	3
4.3 Petrographic Analysis	3
5.0 SITE CONDITIONS	4
5.1 Geology and Site Description	4
5.2 Pavement and Subsurface Soils	4
5.3 Groundwater	4
5.4 Concrete Petrographic Analysis	5
6.0 RECOMMENDATIONS	5
6.1 Structure Grading	5
6.2 Embankment and Ditch Grading	
6.2 Foundation Design	7
6.3 Exterior Building Backfilling	
6.4 Pavements	
7.0 CONSTRUCTION CONSIDERATIONS	
7.1 Potential Difficulties	
7.2 Excavation Backsloping	
7.3 Observation and Testing	
8.0 TEST STANDARDS	
9.0 LIMITATIONS	10

APPENDIX A – Boring Log Notes
Unified Soil Classification System
AASHTO Soil Classification System
Boring Locations (provided by RS&H)



Subsurface Boring Logs Pavement Core Photographs Proctor and CBR Test Results Report of Petrographic Analysis

APPENDIX B – Geotechnical Report Limitations and Guidelines for Use



1.0 INTRODUCTION

The proposed Siouxland Nexus Project at the Sioux Gateway Airport (SUX) in Sioux City, Iowa will include reconstruction and expansion of Runway 13-31 among many other related projects. To assist in planning and design, RS&H authorized American Engineering Testing, Inc. (AET) to conduct a subsurface exploration program at the site, conduct soil laboratory testing, and perform a geotechnical engineering review for the project. This report presents the current results of our services.

2.0 SCOPE OF SERVICES

AET's services were performed according to our revised proposal to RS&H dated December 1, 2023, which was authorized via Work Order No. 1 on April 10, 2024. The authorized scope consisted of the following:

- Coordinating the planning, site access, and utility clearances with RS&H, our drilling subcontractor Certified Testing Services, Inc. (CTS), and airport personnel.
- Performing 100 standard penetration test (SPT) borings to a depth of 10 feet for runways, taxiways, and apron reconstructions or expansion and blast pad construction.
- Performing 34 SPT borings to a depth of 20 feet for various proposed structures.
- Performing 6 SPT borings to a depth of 50 feet for ditch regrading at the northwest end
 of the site. This was later revised to 30-foot borings.
- In October 2024, the project team requested additional borings near the apron reconstruction to evaluate the soil conditions at potential structures in the area.
- Cut cores through the existing pavement at each boring location, and in five proposed locations without an associated boring.
- In October 2024, the project team requested additional pavement cores on the Runway 13-31 apron to evaluate the condition of the asphalt pavement and underlying stabilized full-depth reclamation (SFDR).
- Measure and record the groundwater level (if encountered) at the time of drilling.
- Perform bulk and thinwall sampling for laboratory testing where pertinent.
- Install two piezometers to monitor the groundwater level within the proposed ditch area.
- Backfill the boreholes and patch the core holes with quick-set, high strength grout.
- Performing soil laboratory testing including moisture content, California Bearing Ratio (CBR), Atterberg limits, sieve analyses, and triaxial compression tests.
- Providing this report with our results and recommendations. We understand RS&H will
 complete the pavement thickness designs. We will provide additional recommendations
 for grading, foundation design and construction of project elements when details are



available.

Following project authorization, RS&H removed some of the originally proposed borings from the scope, resulting in the following:

- 85 borings to 10 feet
- 11 borings to 20 feet
- 6 borings to 50 feet
- 7 standalone pavement cores

Also following authorization, at the request of RS&H we performed petrographic analysis on pavement cores extracted from the runway and apron. The purpose of this analysis was to document evidence of alkali-silica reactivity (ASR) within the concrete.

In October 2024, the project team also requested the completion of double-ring infiltrometer (DRI) tests at 10 sites at the runway perimeter outside of the runway safety area. We performed these tests as requested in November 2024 and the results were provided under separate cover.

These services were intended for geotechnical purposes only. The scope is not intended to explore for the presence or extent of environmental contamination in the soil or groundwater.

3.0 PROJECT INFORMATION

Based on a preliminary plan provided by RS&H, we understand the following construction is proposed:

- Runway 13-31 reconstruction. This will require the removal of the existing concrete pavement, regrading, and pavement replacement.
- Hardened overruns (1,000 feet long) at each end of Runway 13-31.
- Blast pads (1,000 feet long) at the end of each hardened overrun.
- Localizers at the end of each blast pad.
- Aircraft arresting systems.
- Demolition of existing taxiways and construction of new connectors for Taxiway A.
- Extension of Taxiway A at Runway 13.
- A warm-up/holding off Taxiway A near Runway 13.
- Perimeter roads at each end of the runway.
- Ditch regrading for drainage improvements north of Runway 13.
- Assorted structures including localizers and pre-fabricated, at-grade buildings such as the



localizer building, MARSR building and glide slope buildings.

The above stated information represents our understanding of the proposed construction. This information is an integral part of our engineering review. It is important that you contact us if there are changes from our description so that we can evaluate whether modifications to our recommendations are appropriate. We intend to update this report with recommendations for grading, pavement construction and support of structures once soil borings are complete and more detailed design information is available.

4.0 SUBSURFACE EXPLORATION AND TESTING

4.1 Field Exploration Program

The subsurface exploration program conducted for the project to date consisted of 82 standard penetration test borings. RS&H provided the number of borings, boring depths, and boring locations. The logs of the borings and details of the methods used appear in Appendix A. The logs contain information concerning soil layering, soil classification, geologic origins, and moisture condition. A density description or consistency is also noted for the natural soils, which is based on the standard penetration resistance (N-value).

The boring locations are shown on Figure 1 in Appendix A. The borings were located and marked in the field by RS&H personnel or their subcontractors.

4.2 Soil Laboratory Testing

The laboratory test program included moisture-density testing and CBR testing of cohesive soils. The test results appear in Appendix A on the individual boring logs adjacent to the samples upon which they were performed, or on the data sheets following the logs.

4.3 Petrographic Analysis

AET performed a petrographic analysis on six pavement cores in accordance with AET Standard Operating Procedure 24- LAB-001, "Petrographic Examination of Hardened Concrete," ASTM C856-latest revision. The complete report is attached in the Appendix.

The petrographic analysis consisted of reviewing the cement paste and aggregate qualities on a whole basis on sawcut, lapped, and fractured sections; performing reflected light microscopy at magnifications up to 160x; documenting the depth of carbonation using a phenolphthalein pH indicator solution; and characterizing the paste-coarse aggregate bond quality was by fracturing a sound section of the concrete with a rock hammer.



5.0 SITE CONDITIONS

5.1 Geology and Site Description

The SUX property is situated within the Missouri Alluvial Plain and the principal native soil type includes floodplain alluvial soils that vary widely in texture and composition, with significant fine-grained (silt and clay) deposits. The site is generally flat, with elevations varying by less than 10 feet. Nearby areas are subject to flooding and occasional high groundwater conditions are possible.

5.2 Pavement and Subsurface Soils

The overall subsurface soil profile at the borings in paved areas consisted of an average of about 11 ½ inches of concrete underlain by variable depths of apparent aggregate base that sometimes appeared to be up to 30 inches thick. Photos of the pavement cores are included in the appendix, which generally show the concrete is in good material condition. A single boring on Taxiway A at Runway 31 encountered a thin layer of bituminous pavement over a thin layer of concrete.

In unpaved areas, the topsoil materials were typically composed of lean clay or fat clay, occasionally with trace roots; we also noted silty sand and silt with sand material at the surface, or surface gravel on upgraded roadways. Fill soils were generally clayey and extended on average to about 4 feet in depth.

The native soils are comprised mostly of lean clay and fat clay at shallow depths, and sandy soils at greater depths, each with variable color, moisture content and unit weight. Additional comments on the evaluation of recovered soil samples are presented within the report appendices.

5.3 Groundwater

Measurable groundwater was encountered during drilling operations at a depth of about 2 feet in two locations, and 10 feet at a third location. Given the limited nature of these observations across the site and the layered soil profile present in the borings, it is likely these observations represent a perched groundwater condition.

The boreholes were not open long enough for groundwater to seep through the lean and fat clay and silt soils to its true hydrostatic levels, and piezometers would be required for long-term monitoring of local conditions. The depth to groundwater can also vary annually and seasonally precipitation. Such soils and other regional dependent conditions may produce groundwater



entry of project excavations. We direct your attention to other report sections and appendices concerning groundwater issues and subsurface drainage.

5.4 Concrete Petrographic Analysis

For our petrographic analysis of the concrete pavement, we selected six cores (from locations B-002, B-007, B-011, B-015, B-022, and B-057) to analyze for the presence of ASR. Our conclusion based on petrographic lab work is that the core samples did not exhibit any evidence of bulk, expansive ASR. An innocuous level of alkali-silica gel deposits was documented in core samples #2, #11, #22, and #57. The deposits were present within air voids adjacent to a few shale fine aggregate particles. Core samples #7 and #15 contained similar shale particles; however, no secondary gel deposits were found in these cores. The reactivity has not caused any emanating or expansive cracking in the core samples.

The coarse aggregate in the samples consisted of quarried and crushed fossiliferous limestone. No evidence of any ASR of the coarse aggregates was found. Based on the reported age of the pavement and the petrographic observations of the core samples, we do not expect the concrete to be susceptible to long-term, bulk/expansive ASR.

Our complete Report of Petrographic Analysis is attached in the report Appendix.

6.0 RECOMMENDATIONS

The following section assumes buildings and structures will consist of slab-on-grade or shallow footing construction and provides general recommendations. We will update this section when structure information becomes available.

6.1 Structure Grading

6.1.1 Excavations

To prepare the building or structure areas for shallow foundation and slab support, we recommend complete excavation of the fill, topsoil, and soft or unstable clayey and silty soils, thereby exposing stiffer clayey materials or coarse sandy alluvial soils. This may necessitate subcutting depending on the nature of each structure and foundation; we can provide detailed recommendations on potential subcuts with additional structural design information.

Subcut recommendations will be limited to our interpretation of each exploration location. Since conditions will vary away from these locations, we recommend that AET geotechnical personnel observe and confirm the competency of the soils in the entire excavation bottom



prior to new fill or footing placement.

Where the excavation extends below foundation grade, the excavation bottom and resultant engineered fill system must be oversized laterally beyond the planned outside edges of the foundations to properly support the loads exerted by that foundation. This excavation/engineered fill lateral extension should at least be equal to the vertical depth of fill needed to attain foundation grade at that location (i.e., 1:1 lateral oversize).

6.1.2 Fill Placement and Compaction

Fill placed to attain grade for foundation support should be compacted in thin lifts, such that the entire lift achieves a minimum compaction level of 98% of the standard maximum dry unit weight per ASTM D698 (Standard Proctor test). Fill placed which supports the floor slab only (outside of the 1:1 oversize zone below footings) can have a reduced minimum compaction level of 95% of the standard maximum dry unit weight.

Soils encountered in our borings that can be reused as fill include lean clay, sandy lean clay, clayey sand, silty sand and sand. We caution that it will be difficult to properly grade and compact soils described as silt (or silt with sand) and fat clay. Additionally, these soil types are moderately to highly frost-susceptible and may result in differential movement under foundations and across the sites. These soils should be replaced with imported or on-site fill meeting the moisture and compaction requirements described elsewhere in this report. We will update our subcut recommendations when structure foundation details are available.

If there are areas where fill is placed on slopes, we recommend benching the sloped surface (benches cut parallel to the slope contour) prior to placing the fill. Benching is recommended where slopes are steeper than 1:4 (V:H).

6.2 Embankment and Ditch Grading

We recommend grading and soil compaction for new ditch areas in general accordance with FAA Advisory Circular (AC) 150/5370-10H, *Standard Specifications for Construction of Airports*, including Item P-151 (Clearing and Grubbing), Item P-152 (Excavation, Subgrade, and Embankment).

Remove topsoil where encountered as described in Item P-152-2.2, and stockpile all salvageable topsoil for future use.

Per Item P-152-1.3, "[m]aterials containing vegetable or organic matter, such as muck, peat,



organic silt, or sod shall be considered unsuitable for use in embankment construction." Shallow soils in the ditch area included silt and sandy silt to depths of about 7 feet, which then overlay coarse alluvial sands. Although not unsuitable by the above definition, these soils will be difficult to compact, particularly when wet, and should not be used to construct new embankments where possible. Removing these soils will also reduce the risk of long-term settlement of the embankment sections where additional loads are applied. Place any unsuitable material in designated waste areas per P-152-2.5.

Compact all embankment materials as described in Item P-152-2.10.

6.2 Foundation Design

Our current assumption is that structures will be supported on conventional spread foundations placed on competent native soils as described in this report and verified by field observations. We recommend perimeter foundations for heated building space is placed such that the bottom is a minimum of 42 inches below exterior grade. We recommend foundations for unheated building space (such as canopy foundations) be extended to a minimum of 60 inches below exterior grade.

Assuming the foundation soils will be treated as described above and based on the conditions encountered in our borings, our opinion is the building foundations can be designed based on a net maximum allowable soil bearing pressure of 2,000 psf for each of the following structures:

- Localizers, at both ends of Runway 13-31 ends
- Glide slope antenna and shelter locations; based on the depth of fill and nature of the structure and foundation, some removals may be required to reach native soils with this bearing capacity at 7 feet in depth
- Aircraft arrest system pits
- Apron-adjacent structures some removals required to reach native soils at approximately 7 feet below grade

It is our judgment the stated design pressure will have a factor of safety of at least 3 against the ultimate bearing capacity. We judge that total settlements under this loading should not exceed 1 inch. We also judge that differential settlements of conditions depicted by the borings should not exceed ½ inch. These are preliminary recommendations that will need to be revised when more detailed information on proposed site structures is available.



6.3 Exterior Building Backfilling

Many of the on-site soils are at least moderately frost susceptible. Because of this, certain design considerations are needed to mitigate these frost effects. For details, we refer you to the attached sheet entitled "Freezing Weather Effects on Building Construction."

6.4 Pavements

6.4.1 Design CBR

We performed eight CBR tests on composite bulk samples obtained from the borings as detailed in Table 6.4.1. The complete Proctor and CBR reports follow in the Appendix.

Sample	Boring Location(s)	Soil Classification	Maximum Dry Density (pcf) ^(A)	CBR (%) ^(B)
1	B-66, B-68, B-95	Sandy Silt (ML)	114.3	28
2	B-82, B-85, B-87	Silty Sand, a little gravel, mostly fine grained (SM)	126.7	36
3	B-1, B-2, B-6	Sandy Lean Clay, a little gravel (CL)	114.4	8
4	B-10, B-13, B-15	Gravelly Silty Sand, mostly medium grained (SM)	121.9	91
5	B-22, B-26, B-28	Sandy Lean Clay, a little gravel (CL)	105.8	4
6	B-35, B-40, B-42	Silty Sand w/Gravel, medium grained (SM)	121.9	2
7	B-51, B-54, B-57	Sandy Lean Clay, with gravel (CL)	113.3	3
8	B-30, B-36, B-63	Sandy Lean Clay, Brown (CL)	116.9	4

Table 6.4.1. CBR Test Results

It appears the CBR results for Samples 1, 2 and 4 contained more than typical gravel content, suggesting the bulk materials also included various proportions of aggregate base in addition to subgrade soils. The results of the remaining samples appear to be more typical for the soil types encountered within the subgrade zone in the areas drilled for this project.

If discounting the Sample 1, 2 and 4 results from the CBR sample set, the resulting design CBR (average minus one standard deviation) per FAA AC 150/5320-6G, Section 3.15.6.5, is 2.2 percent. FAA guidelines recommend subgrade stabilization for design CBRs of less than 3; we provide an estimated cement content for stabilization in the following section.

⁽A) ASTM D 1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort

⁽B) Reported at 95 percent of maximum dry density



6.4.2 Soil Stabilization

Laboratory mix design for soil stabilization was not a part of AET's scope of services. However, given the results of the CBR tests, we understand the project team intends to stabilize subgrade materials per FAA guidelines for pavement construction.

AET tested subgrade soils at Sioux Gateway Airport in 2018 and reported results in our report 28-01244E. The work included bulk sampling of the materials on Runway 18-36 (formerly 17-35) and performing several sets of laboratory tests including pH tests, organic content tests, freeze-thaw durability at various cement contents, and unconfined compressive strength tests of the prepared samples with both lime and cement as stabilizing materials.

Based on the results of previous tests, it appeared cement stabilization strength was maximized at 10% cement content. However, no cement content met the minimum required strength of 250 psi suggested by the US Army Corps of Engineers UFC 3-250-11 manual. In addition, long-term durability was limited, and each cement content exceeded the maximum loss recommended by the ASTM D560 standard.

Lime-treated soils exhibited similar strength characteristics as the cement, with a maximum compressive strength at 10% lime content, and sufficient strength at 8% cement to meet the guidelines set by the National Lime Association *Mixture Design and Testing Procedures for Lime Stabilized Soil*.

In the absence of additional testing, we recommend using the same material and proportions used on the reconstruction of Runway 18-36. In-situ moisture content, soil plasticity, soil pH and soil organic content, among other things, will affect the suitability of the selected stabilization medium at the chosen proportions. Prior to construction, we recommend performing additional testing to evaluate stabilization options and estimate quantities.

7.0 CONSTRUCTION CONSIDERATIONS

7.1 Potential Difficulties

7.1.1 Runoff Water in Excavation

Water can be expected to collect in the excavation bottom during times of inclement weather or snow melt. To allow observation of the excavation bottom, to reduce the potential for soil disturbance, and to facilitate filling operations, we recommend water be removed from within the excavation during construction. Based on the soils encountered, we anticipate the



groundwater can be handled with conventional sump pumping.

7.1.2 Disturbance of Soils

The on-site soils can be disturbed under construction traffic, especially if the soils are wet. If soils become disturbed, they should be subcut to the underlying undisturbed soils. The subcut soils can then be dried and recompacted back into place, or they should be removed and replaced with drier imported fill.

7.1.3 Cobbles and Boulders

The soils at this site can include cobbles and boulders. This may make excavating procedures somewhat more difficult than normal if they are encountered.

7.2 Excavation Backsloping

If excavation faces are not retained, the excavations should maintain maximum allowable slopes in accordance with OSHA Regulations (Standards 29 CFR), Part 1926, Subpart P, "Excavations" (can be found on www.osha.gov). Even with the required OSHA sloping, water seepage or surface runoff can potentially induce sideslope erosion or sloughing which could require slope maintenance.

7.3 Observation and Testing

The recommendations in this report are based on the subsurface conditions found at our test boring locations. Since the soil conditions can be expected to vary away from the soil boring locations, we recommend on-site observation by a geotechnical engineer/technician during construction to evaluate these potential changes. Soil density testing should also be performed on new fill placed to document that project specifications for compaction have been satisfied.

8.0 TEST STANDARDS

When we refer to an ASTM Standard in this report, we mean that our services were performed in general accordance with that standard. Compliance with any other standards referenced within the specified standard is neither inferred nor implied.

9.0 LIMITATIONS

Within the limitations of scope, budget, and schedule, we have endeavored to provide our services according to generally accepted geotechnical engineering practices at this time and location. Other than this, no warranty, express or implied, is intended.



Important information regarding risk management and proper use of this report is given in Appendix B entitled "Geotechnical Report Limitations and Guidelines for Use."



Appendix A

Boring Log Notes
Unified Soil Classification System
AASHTO Soil Classification System
Boring Locations (provided by RS&H)
Subsurface Boring Logs
Pavement Core Photographs
Proctor and CBR Test Results
Report of Petrographic Analysis

Appendix A Geotechnical Field Exploration and Testing Report No. P-0025900

A.1 FIELD EXPLORATION

The subsurface conditions at the site were explored by drilling and sampling standard penetration test borings. The locations of the borings appear on Figure 1, preceding the Subsurface Boring Logs in this appendix.

A.2 SAMPLING METHODS

A.2.1 Split-Spoon Samples (SS)

Standard penetration (split-spoon) samples were collected in general accordance with ASTM: D1586.The ASTM test method consists of driving a 2-inch O.D. split-barrel sampler into the in-situ soil with a 140-pound hammer dropped from a height of 30 inches. The sampler is driven a total of 18 inches into the soil. After an initial set of 6 inches, the number of hammer blows to drive the sampler the final 12 inches is known as the standard penetration resistance or N-value.

A.2.2 Disturbed Samples (DS)/Spin-up Samples (SU)

Sample types described as "DS" or "SU" on the boring logs are disturbed samples, which are taken from the flights of the auger. Because the auger disturbs the samples, possible soil layering and contact depths should be considered approximate.

A.2.3 Sampling Limitations

Unless observed in a sample, contacts between soil layers are estimated based on the spacing of samples and the action of drilling tools. Cobbles, boulders, and other large objects generally cannot be recovered from test borings, and they may be present in the ground even if they are not noted on the boring logs.

Determining the thickness of "topsoil" layers is usually limited, due to variations in topsoil definition, sample recovery, and other factors. Visual-manual description often relies on color for determination, and transitioning changes can account for significant variation in thickness judgment. Accordingly, the topsoil thickness presented on the logs should not be the sole basis for calculating topsoil stripping depths and volumes. If more accurate information is needed relating to thickness and topsoil quality definition, alternate methods of sample retrieval and testing should be employed.

A.3 CLASSIFICATION METHODS

Soil descriptions shown on the boring logs are based on the Unified Soil Classification (USC) system. The USC system is described in ASTM: D2487 and D2488. Where laboratory classification tests (sieve analysis or Atterberg Limits) have been performed, accurate classifications per ASTM: D2487 are possible. Otherwise, soil descriptions shown on the boring logs are visual-manual judgments. Charts are attached which provide information on the USC system, the descriptive terminology, and the symbols used on the boring logs.

Visual-manual judgment of the AASHTO Soil Group is also noted as a part of the soil description. A chart presenting details of the AASHTO Soil Classification System is also attached.

The boring logs include descriptions of apparent geology. The geologic depositional origin of each soil layer is interpreted primarily by observation of the soil samples, which can be limited. Observations of the surrounding topography, vegetation, and development can sometimes aid this judgment.

A.4 WATER LEVEL MEASUREMENTS

The groundwater level measurements are shown at the bottom of the boring logs. The following information appears under "Water Level Measurements" on the logs:

- Date and Time of measurement
- Sampled Depth: lowest depth of soil sampling at the time of measurement
- Casing Depth: depth to bottom of casing or hollow-stem auger at time of measurement
- Cave-in Depth: depth at which measuring tape stops in the borehole
- Water Level: depth in the borehole where free water is encountered
- Drilling Fluid Level: same as Water Level, except that the liquid in the borehole is drilling fluid

The true location of the water table at the boring locations may be different than the water levels measured in the boreholes. This is possible because there are several factors that can affect the water level measurements in the borehole. Some of these factors include: permeability of each soil layer in profile, presence of perched water, amount of time between water level readings, presence of drilling fluid, weather conditions, and use of borehole casing.

Appendix A Geotechnical Field Exploration and Testing Report No. P-0025900

A.5 LABORATORY TEST METHODS

A.5.1 Water Content Tests

Conducted per AET Procedure 01-LAB-010, which is performed in general accordance with ASTM: D2216 and AASHTO: T265.

A.5.2 Atterberg Limits Tests

Conducted per AET Procedure 01-LAB-030, which is performed in general accordance with ASTM: D4318 and AASHTO: T89, T90.

A.5.3 Sieve Analysis of Soils (thru #200 Sieve)

Conducted per AET Procedure 01-LAB-040, which is performed in general conformance with ASTM: D6913, Method A.

A.5.4 Particle Size Analysis of Soils (with hydrometer)

Conducted per AET Procedure 01-LAB-050, which is performed in general accordance with ASTM: D422 and AASHTO: T88.

A.5.5 Unconfined Compressive Strength of Cohesive Soil

Conducted per AET Procedure 01-LAB-080, which is performed in general accordance with ASTM: D2166 and AASHTO: T208.

A.5.6 Laboratory Soil Resistivity using the Wenner Four-Electrode Method

Conducted per AET Procedure 01-LAB-090, which is performed using Soil Box apparatus in the laboratory in general accordance with ASTM: G57

A.5.7 Organic Content Tests

Conducted per AET Procedure 20-SOI-010, which is performed in general accordance with ASTM D2974, Test Method C.

A.6 TEST STANDARD LIMITATIONS

Field and laboratory testing is done in general conformance with the described procedures. Compliance with any other standards referenced within the specified standard is neither inferred nor implied.

A.7 SAMPLE STORAGE

Unless notified to do otherwise, we routinely retain representative samples of the soils recovered from the borings for a period of 30 days.

UNIFIED SOIL CLASSIFICATION SYSTEM ASTM Designations: D 2487, D2488

AMERICAN ENGINEERING TESTING, INC.



		ASTNI Des	signations: D 2487, D248	00		TESTING, INC.
G is it for		1.1.10			Soil Classification	<u>Notes</u>
			Names Using Laboratory Tests ^A	Group Symbol	Group Name ^B	ABased on the material passing the 3-in (75-mm) sieve.
Coarse-Grained Soils More	Gravels More than 50% coarse	Clean Gravels Less than 5%	$Cu \ge 4$ and $1 \le Cc \le 3^E$	GW	Well graded gravel ^F	^B If field sample contained cobbles or boulders, or both, add "with cobbles or
than 50% retained on	fraction retained on No. 4 sieve	$fines^C$	Cu<4 and/or 1>Cc>3 ^E	GP	Poorly graded gravel	boulders, or both" to group name. CGravels with 5 to 12% fines require dual
No. 200 sieve		Gravels with Fines more	Fines classify as ML or MH	GM	Silty gravel ^{F.G.H}	symbols: GW-GM well-graded gravel with silt
		than 12% fines	Fines classify as CL or CH	GC	Clayey gravelF.G.H	GW-GC well-graded gravel with silt
	Sands 50% or more of coarse	Clean Sands	Cu≥6 and 1≤Cc≤3 ^E	SW	Well-graded sand ^I	GP-GC poorly graded gravel with clay
	fraction passes	Less than 5% fines ^D	Cu<6 and/or 1>Cc>3 ^E	SP	Poorly-graded sand ^I	DSands with 5 to 12% fines require dual symbols:
	No. 4 sieve	Sands with	Fines classify as ML or MH	SM	Silty sand ^{G.H.I}	SW-SM well-graded sand with silt SW-SC well-graded sand with clay
		Fines more than 12% fines		SC	Clayey sand ^{G.H.I}	SP-SM poorly graded sand with silt SP-SC poorly graded sand with clay
Fine-Grained Soils 50% or	Silts and Clays Liquid limit less	inorganic	PI>7 and plots on or above "A" line ^J	CL	Lean clay ^{K.L.M}	$(D_{30})^2$
more passes the No. 200	than 50		PI<4 or plots below "A" line ^J	ML	Silt ^{K.L.M}	$^{\rm E}{ m Cu} = { m D}_{60}/{ m D}_{10}, \qquad { m Cc} = { m D}_{10}{ m x}{ m D}_{60}$
sieve		organic	<u>Liquid limit</u> —oven dried <0.75	OL	Organic clay ^{K.L.M.N}	FIf soil contains >15% sand, add "with
(see Plasticity Chart below)			Liquid limit – not dried		Organic silt ^{K.L.M.O}	sand" to group name. GIf fines classify as CL-ML, use dual
Chart below)	Silts and Clays Liquid limit 50	inorganic	PI plots on or above "A" line	СН	Fat clay ^{K.L.M}	symbol GC-GM, or SC-SM. HIf fines are organic, add "with organic
	or more		PI plots below "A" line	МН	Elastic silt ^{K.L.M}	fines" to group name. If soil contains ≥15% gravel, add "with
		organic	Liquid limit–oven dried <0.75	; ОН	Organic clay ^{K.L.M.P}	gravel" to group name.
			Liquid limit – not dried		Organic silt ^{K.L.M.Q}	JIf Atterberg limits plot is hatched area, soil is a CL-ML silty clay.
Highly organic soil			Primarily organic matter, in color, and organic in odo		Peat ^R	KIf soil contains 15 to 29% plus No. 200 add "with sand" or "with gravel",
						group name. MIf soil contains ≥30% plus No. 200, predominantly gravel, add "gravelly" to group name. NPI≥4 and plots on or above "A" line. OPI<4 or plots below "A" line. PPI plots on or above "A" line. QPI plots below "A" line. RFiber Content description shown below.
				MH o	R OH	Fiber Content description shown below.
			ML or	OL		
				Plasticity Chart		
	ADDIT	IONAL TERMI	NOLOGY NOTES USED BY AE	T FOR SOIL IDE	ENTIFICATION AND	DESCRIPTION
<u>Term</u>	Grain Size Particle S	Size	Gravel Percentages Term Percent	Consistency Term	of Plastic Soils N-Value, BPF	Relative Density of Non-Plastic Soils Term N-Value, BPF
Boulders Cobbles Gravel Sand Fines (silt & cl.	• /	2" to 3" 4 sieve sieve	A Little Gravel 3% - 14% With Gravel 15% - 29% Gravelly 30% - 50%	Very Soft Soft Firm Stiff Very Stiff Hard	less than 2 2 - 4 5 - 8 9 - 15 16 - 30 Greater than 30	Very Loose 0 - 4 Loose 5 - 10 Medium Dense 11 - 30 Dense 31 - 50 Very Dense Greater than 50
D (Dry): M (Moist):	isture/Frost Condition (MC Column) Absence of moisture touch. Damp, although free visible. Soil may sti	e, dusty, dry to water not ill have a high	Layering Notes Laminations: Layers less than ½" thick of differing material or color.	Peat I Term Fibric Peat:	Fiber Content (Visual Estimate) Greater than 67%	Organic Description (if no lab tests) Soils are described as <u>organic</u> , if soil is not peat and is judged to have sufficient organic fines content to influence the Liquid Limit properties. <u>Slightly organic</u> used for borderline cases. <u>Root Inclusions</u>
W (Wet/ Waterbearing):	water content (over Free water visible, in describe non-plastic Waterbearing usuall sands and sand with	ntended to soils.	Lenses: Pockets or layers greater than ½" thick of differing	Hemic Peat: Sapric Peat:	33 – 67% Less than 33%	With roots: Judged to have sufficient quantity of roots to influence the soil properties. Trace roots: Small roots present, but not judged to be in sufficient quantity to
F (Frozen):	Soil frozen		material or color.			significantly affect soil properties.

AASHTO SOIL CLASSIFICATION SYSTEM

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS

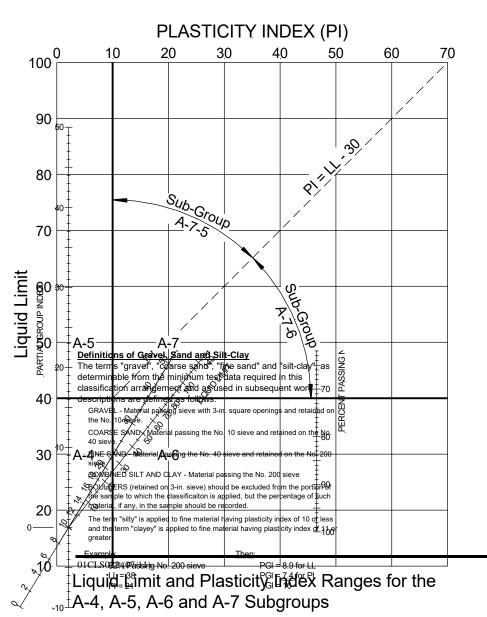
Classification of Soils and Soil-Aggregate Mixtures

General Classification			Gra	nular Mate	rials				Silt-Clay	Materials	
General Classification		(3	5% or less	passing N	lo. 200 sie	ve)		(More tha	ın 35% pas	ssing No. 2	200 sieve)
	А	-1			А	-2					A-7
Group Classification	A-1-a	A-1-b	A-3	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7-5
	A-1-a	A-1-0	A-3	A-2-4	A-2-3	A-2-0	A-2-1	A-4	A-3	A-0	A-7-6
Sieve Analysis, Percent passing:											
No. 10 (2.00 mm)	50 max.										
No. 40 (0.425 mm)	30 max.	50 max.	51 min.								
No. 200 (0.075 mm)	15 max.	25 max.	10 max.	35 max.	35 max.	35 max.	35 max.	36 min.	36 min.	36 min.	36 min.
Characteristics of Fraction Passing No. 40 (0.425 mm)											
Liquid limit				40 max.	41 min.	40 max.	41 min.	40 max.	41 min.	40 max.	41 min.
Plasticity index	6 m	nax.	N.P.	10 max.	10 max.	11 min.	11 min.	10 max.	10 max.	11 min.	11 min.
Usual Types of Significant Constituent Materials		agments, and Sand	Fine Sand	Silty	or Clayey (Gravel and	Sand	Silty	Soils	Claye	y Soils
General Ratings as Subgrade			Exc	ellent to G	ood				Fair to	Poor	

The placing of A-3 before A-2 is necessary in the "left to right elimination process" and does not indicate superiority of A-3 over A-2.

Plasticity index of A-7-5 subgroup is equal to or less than LL minus 30. Plasticity index of A-7-6 subgroup is greater than LL minus 30.

Group A-8 soils are organic clays or peat with organic content >5%.



AMERICAN ENGINEERING TESTING, INC.

Symbol

DRILLING AND SAMPLING SYMBOLS

Definition

Symbol

Symbol	Definition
AR:	Sample of material obtained from cuttings blown out
	the top of the borehole during air rotary procedure.
D 11 31	
B, H, N:	Size of flush-joint casing
CAS:	Pipe casing, number indicates nominal diameter in
	inches
G 0 TT	
COT:	Clean-out tube
DC:	Drive casing; number indicates diameter in inches
DM:	Drilling mud or bentonite slurry
DR:	Driller (initials)
DS:	Disturbed sample from auger flights
DP:	Direct push drilling; a 2.125 inch OD outer casing
DI.	
	with an inner 1½ inch ID plastic tube is driven
	continuously into the ground.
FA:	Flight auger; number indicates outside diameter in
ra.	
	inches
HA:	Hand auger; number indicates outside diameter
HSA:	Hollow stem auger; number indicates inside diameter
IISA.	G .
	in inches
LG:	Field logger (initials)
MC:	Column used to describe moisture condition of
Wie.	
	samples and for the ground water level symbols
N (BPF):	Standard penetration resistance (N-value) in blows per
	foot (see notes)
NQ:	NQ wireline core barrel
PQ:	PQ wireline core barrel
RDA:	Rotary drilling with compressed air and roller or drag
	bit.
DDE	
RDF:	Rotary drilling with drilling fluid and roller or drag bit
REC:	In split-spoon (see notes), direct push and thin-walled
	tube sampling, the recovered length (in inches) of
	sample. In rock coring, the length of core recovered
	(expressed as percent of the total core run). Zero
	indicates no sample recovered.
SS:	Standard split-spoon sampler (steel; 1.5" is inside
SS.	
	diameter; 2" outside diameter); unless indicated
	otherwise
SU	Spin-up sample from hollow stem auger
TW:	Thin-walled tube; number indicates inside diameter in
	inches
WASH:	Sample of material obtained by screening returning
WINDII.	
	rotary drilling fluid or by which has collected inside
	the borehole after "falling" through drilling fluid
WH:	Sampler advanced by static weight of drill rod and
,,,,,,	and the second s
	hammer
WR:	Sampler advanced by static weight of drill rod
94mm:	94 millimeter wireline core barrel
<u>▼:</u>	Water level directly measured in boring
<u>* .</u>	water level directly incastifed in borning

Estimated water level based solely on sample

TEST SYMBOLS

Definition

23111201	Deminion
CONS:	One-dimensional consolidation test
DEN:	Dry density, pcf
DST:	Direct shear test
E:	Pressuremeter Modulus, tsf
HYD:	Hydrometer analysis
LL:	Liquid Limit, %
LP:	Pressuremeter Limit Pressure, tsf
OC:	Organic Content, %
PERM:	Coefficient of permeability (K) test; F - Field;
	L - Laboratory
PL:	Plastic Limit, %
q _p :	Pocket Penetrometer strength, tsf (approximate)
q _c :	Static cone bearing pressure, tsf
q _u :	Unconfined compressive strength, psf
R:	Electrical Resistivity, ohm-cms
RQD:	Rock Quality Designation of Rock Core, in percent
	(aggregate length of core pieces 4" or more in length
	as a percent of total core run)
SA:	Sieve analysis
TRX:	Triaxial compression test
VSR:	Vane shear strength, remolded (field), psf
VSU:	Vane shear strength, undisturbed (field), psf
WC:	Water content, as percent of dry weight
%-200 :	Percent of material finer than #200 sieve

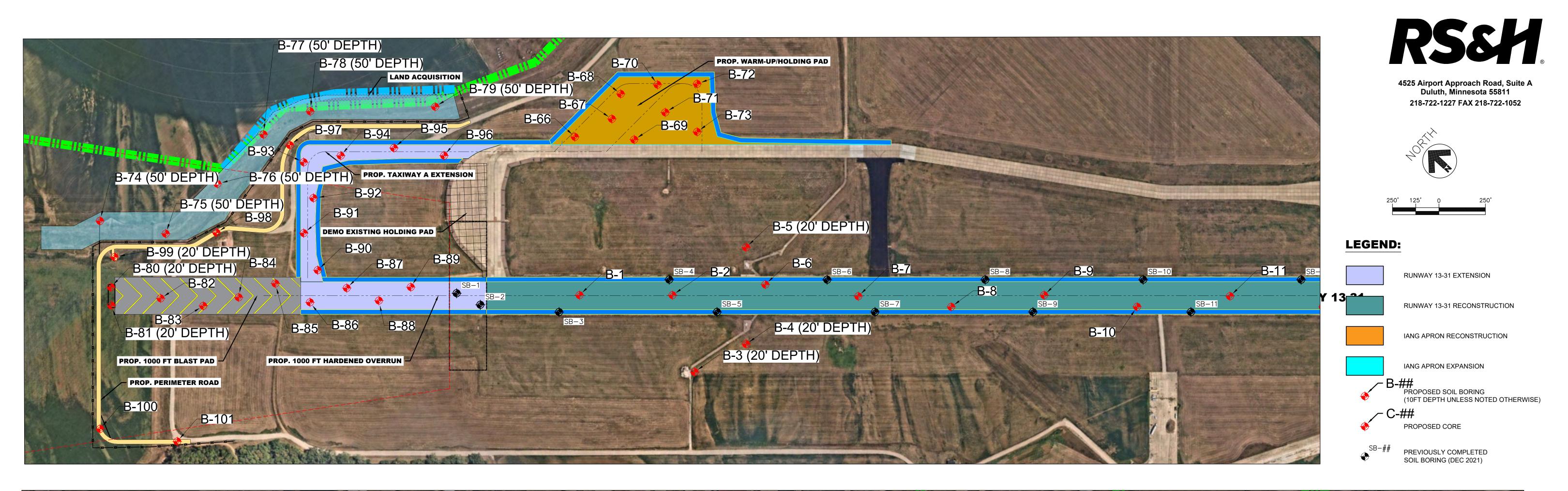
STANDARD PENETRATION TEST NOTES

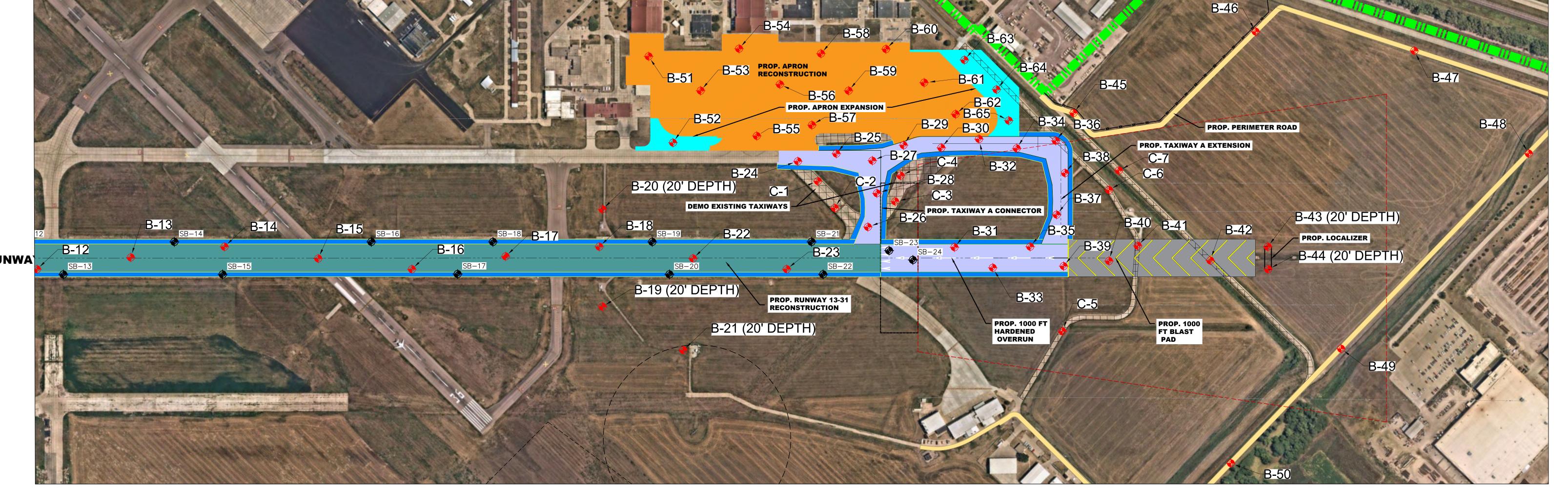
The standard penetration test consists of driving a split-spoon sampler with a drop hammer counting the number of blows applied in each of three 6" increments of penetration. If the sampler is driven less than 18" (usually in highly resistant material), permitted in ASTM: D1586, the blows for each complete 6" increment and for each partial increment is on the boring log. For partial increments, the number of blows is shown to the nearest 0.1' below the slash.

The length of sample recovered, as shown on the "REC" column, may be greater than the distance indicated in the N column. The disparity is because the N-value is recorded below the initial 6" set (unless partial penetration defined in ASTM: D1586 is encountered) whereas the length of sample recovered is for the entire sampler drive (which may even extend more than 18").

appearance

 ∇ :







AET JC	OB NO: P-0025900	1					LO	G OF	ВО	RING N	О	B-	001 ((p. 1 c	of 1)	
PROJE	CT: Sioux City Gatev	way Airpo	ort; Sioux	City,	IA											
SURFA	CE ELEVATION:		LATITUD	E:				LO	NGI	TUDE:		1				
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		Gl	EOLOGY	N	MC	SĄ	AMPLE FYPE	REC IN.					TESTS
FEET	11.5" Concrete pavement				FIL	L					11 11	WC	DEN	LL	PL	%-#200
1 -	10.5" Base fill, mostly sand brown (A-1-b)	d with silt	and gravel,		-	L	33	M		SS	14					
3 -	FILL, mostly lean clay, a li and brown (A-6)	ittle silty sa	and, gray				17	M	X	SS	16					
4 -	FILL, mixture of lean clay	and silt, gr	ray and		-				!							
6 -	brown (A-6)	, 0	·				11	M	\\ {t	SS	18					
7 - 8 -	FILL, mixture of lean clay brow (A-6 & A-7-6)	and fat cla	y, gray and	1	_		7	М		SS	18					
9 - 10 - 11 -	LEAN CLAY, gray and br lenses of silt (CL) (A-6)	ed, soft,		FIN AL	IE LUVIUM	4	М	1	SS	18						
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 CO CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	END OF BORING															
DEF	 PTH: DRILLING METHOD			WAT	L ER L	EVEL MEA	SURF	L EMEN	TS				 	OTE:	BEEE	R TO
P-00,		DATE	TIME	SAMPI DEPT		CASING DEPTH		/E-IN PTH	_	ORILLIN UID LE	NG VET	WATE LEVE		юте: ГНЕ А		
<u>0-</u>	.9½' 2.25" HSA			11.0		9.5	DE	гиП	ГL	OID LE	VEL	Non		SHEET		
N-LAT				11.0		7.0	9	.0				Non		XPLA	NATIO	ON OF
BORIN COMP	NG LETED:													ERMIN	OLOC	GY ON
DR: B														TH	IS LO	3



AET JC	DB NO: P-0025900)					LO	G OF	ВО	RING N	О	B-	002	(p. 1 d	of 1)	
PROJE	CT: Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
SURFA	CE ELEVATION:		LATITUE	DE:				LO	NGI	TUDE:		1				
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		Gl	EOLOGY	N	MC	SĄ	AMPLE ΓΥΡΕ	REC					TESTS
FEET	12.5" Concrete pavement				FIL	L					1111	WC	DEN	LL	PL	%-#200
1 -	-					L	16	M	V	SS	12					
	7.5" Base						10	141		55	12					
3 -	FILL, mostly lean clay, a land silty sand, brown and	ittle sandy gray (A-6)	lean clay				12	M		SS	16					
4 —									\							
5 —							8	M		SS	18					
6 - 7 -									1							
8 -	LEAN CLAY, gray and br	own mottle	ed firm	////	FIN	IE.	8	M	M	SS	18					
9 –	lenses of silt (CL) (A-6)	own moun	, iiiii,		ALI	LUVIUM			<u> </u>							
10 -	SAND, fine grained, brow laminations of lean clay (S	n, moist, lo	oose,			ARSE LUVIUM	_									
11 -	END OF BORING	oP) (A-30			ALI	LUVIUNI	5	M	M	SS	18					
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 O G G G G G G G G G G G G																
S DEF	TH: DRILLING METHOD			WAT	ER L	EVEL MEA	SURF	 EMEN	TS					OTE:	BEEE	R TO
0-0 P-00-	9½' 2.25" HSA	DATE	TIME	SAMPI DEPT	LED IH	CASING DEPTH		/E-IN PTH	_	ORILLIN UID LE	NG VEL	WATE LEVE	ER EL	THE A	TTAC	HED
LAT-L(5/14/24		11.0		9.5						Non		SHEET XPLA1		
BORIN	IG	5/14/24		11.0	U		9	.0				Non				ON OF GY ON
S COMP	LETED: 5/14/24 K LG: AK Rig: 4														IS LO	
≰ ¬ν. D	IN LO. AIN Ng. 7								1							

03/2011



AET JO	OB NO: P-0025900)					LO	G OF	BOI	RING N	O	B-	003 ((p. 1 a	of 1)	
PROJEC	Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
SURFA	CE ELEVATION:		LATITUE	DE:	1			LO	NGI	ΓUDE:		ı				
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		G	EOLOGY	N	MC	SA	MPLE YPE	REC					TESTS
FEET	FILL, mostly silty sand, tra	ace roots h	rown		FIL	1.			」 加		11 11	WC	DEN	LL	PL	%-#200
1 -	(A-2-4)	10013, 0	70 WH					M	}							
									}							
3 -	FAT CLAY, a little brown of lean clay (CH) (A-7-6)	n mottled, i	firm, a lens		FIN AL	NE LUVIUM	6	M	M	SS	18					
4 —									3							
5 —	LEAN CLAY, brown and mottled, soft, lenses of fat	grayish bro	own aminations				4	M	17	SS	18					
6 —	of silt (CL) (A-7-6)								H							
7 —	SAND, fine grained, brow laminations of silt (SP) (SI	n, moist, lo	oose,			ARSE LUVIUM			13							
8 -		·)				20 / 101/1	6	M		SS	10					
9 —	SAND, fine grained, brow	n maist la	aga ta						[]							
10 -	medium dense (SP) (A-3)	n, moist, ic	ose to													
11 -							6	M		SS	18					
12 —									}							
13 -							14	M	\bigvee	SS	18					
75/05/21 14 —									1							
15 —									13							
16 –							11	M	\mathbb{N}	SS	18					
16 — 17 —									}							
14 — 15 — 16 — 175/2000 SIONX CITY GATEWAY AIRPORT GPU AET+CPT+WELL GDU T 12/2000 SIONX CITY GATEWAY AIRPORT GPU AET+CPT+WELL GDU T 12/2000 SIONX CITY GATEWAY AIRPORT GPU AET+CPT+WELL GDU T 12/2000 SIONX CITY GATEWAY AIRPORT GPU AET+CPT+WELL GDU T 12/2000 SIONX CITY GATEWAY AIRPORT GPU AIRPORT GATEWAY									<u>}</u>							
									}}							
20 –							12	M	M	CC	10					
∑ 21 −							13	M	М	SS	18					
XNOIS 21	END OF BORING															
DEP	TH: DRILLING METHOD			WAT	ER L	EVEL MEA	SURE	EMEN	TS				N	NOTE:	REFE	R TO
୦-1 <u>୨</u>	91/3'	DATE	TIME	SAMPI DEPT	LED TH	CASING DEPTH	CAV DE	Æ-IN PTH	FL	ORILLIN UID LE	NG VEL	WATE LEVE	ER L	THE A	TTAC	HED
VI-LON												Non		SHEET	S FOF	R AN
NODE:																ON OF
BORIN COMPI	LETED: 5/17/24								_				T]		IOLOC IS LOC	GY ON
₽ DR:	LG: Rig:													111	IN LOC	



AET JOI	B NO: P-0025900					LC	G OF	BO	RING N	O	B-	004	(p. 1 c	of 1)	
PROJEC	Sioux City Gatev	vay Airpo	rt; Sioux	City, I	A										
	CE ELEVATION:		LATITUD	E:		_	LON	NGI	TUDE:						
DEPTH IN FEET	MATERIAL D	ESCRIPTIO	N		GEOLOGY	N	MC	SA	MPLE TYPE	REC IN.	_	0 & LA DEN	BORAT		
FEET	LEAN CLAY, trace roots,	brown (CL	L) (A-6)		FINE			<u>-</u> -{{			wc	DEN	LL	PL	%-#200
1 -					ALLUVIUM		M	}							
2 —	SANDY SILT, grayish bro	wn moist	medium					1							
3 —	dense to loose (ML) (A-4)	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	mediam			14	M		SS	18					
4 -								<u></u>							
5 —	GAND 6	• . 1			COARGE	6	M	M	SS	18					
6 —	SAND, fine grained, brown medium dense (SP) (A-3)	ı, moıst, lo	ose to		COARSE ALLUVIUM										
7 —								{							
8 —						6	M	X	SS	18					
9 —								<u> </u>							
10 —						12	M		SS	20					
11 -								\mathbb{N}							
	END OF BORING														
DEP	TH: DRILLING METHOD			WATE	ER LEVEL ME	 STIDE	MEN	 TS							
		DATE	TIME	SAMPL DEPT		_	E-IN PTH	I	ORILLIN	\G_	WATE LEVE		NOTE: THE A		
0-9	01/2'	<i>D.</i> 111 <i>D</i>	11.111	DEPT.	H DEPTH	DE	PIH	FL	UID LE	VEL	None		SHEET		
											1 1011		XPLA		
BORING COMPL	G LETED:											T	ERMIN	OLOC	SY ON
DR:	LG: Rig:												TH	IS LO	G

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24



AET JO	OB NO: P-0025900)					LO	G OF	BO	RING N	О	B-	-005 ((p. 1 d	of 1)	
PROJE	CT: Sioux City Gate	way Airpo	ort; Sioux	city,	IA											
SURFA	CE ELEVATION:		LATITUI	DE:				LO	NGI	TUDE:		1				
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GE	EOLOGY	N	MC	SĄ	AMPLE ΓΥΡΕ	REC		D& LA			1
FEET	FILL, mixture of lean clay	and silty s	and		FILI	Γ.			\ /		11.11	WC	DEN	LL	PL	%-#20
1 -	grayish brown and brown	and sincy si	una,				5	M		SS	19					
3 -	SANDY SILT, grayish bro laminations of sand (ML)	own, moist, (A-4)	, loose,		FIN	E LUVIUM	7	M	M	SS	18					
4 -									1							
5 -	SILTY SAND, fine graine mottled, moist, loose (SM)	ed, brown a (A-2-40)	nd gray		COA	ARSE LUVIUM	5	M	M	SS	18					
6 - 7 -									[]							
8 -							5	M	M	SS	18					
9 -									 							
10 -	SAND, fine grained, brow medium dense (SP) (A-3)	n, moist, lo	oose to				7	M	M	SS	18					
11 -									<u>}</u>							
12 -							11	M		SS	18					
13 – 42/02/21 14 –									<u> </u>							
15 -							14	M		SS	18					
16 -									/\ {}							
17 –									}							
14 - 15 - 15 - 15 - 16 - 17,000 BORIN COMP WITAT-LONG P.0025900 SIOOLX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDJ 112/20/24 PET-CORP WITAT-LONG P.0025900 SIOOLX CITY GATEWAY AIRPORT.GPJ AET-CPT+WELL.GDJ 112/20/24 PET-CPT-WELL.GDJ 112/24 PET-CPT									<u>}</u>							
20 –							14	M	\ \{\}	SS	18					
21 -	END OF BORING				:		17	141	A	o	10					_
<u>8</u> <u>DE1</u>	DELL DOLL DIC METHOD			\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	TDII	EXTEL MATE A	cime	TA ALTENT	тс				<u> </u>			
DEF 0-1	PTH: DRILLING METHOD 9½' 3.25" HSA	DATE	TIME	SAMP DEP		EVEL MEA CASING DEPTH		EMEN /E-IN PTH	_	ORILLIN UID LE	NG VEL	WATE LEVE		NOTE: THE A		
KI T		5/13/24		21.	-+	19.5		1.0				Non		SHEET	S FOF	R AN
W.	, , , , , , , , , , , , , , , , , , ,													XPLA		
BORIN COMP	NG PLETED: 5/13/24												T			GY ON
₽ DR:	LG: RH Rig: 63													TH	IS LO	į.



Al	ET JO	B NO:	P-0025900)					LO	G OF	BO	RING N	О	B-	006 ((p. 1 c	of 1)	
PF	ROJEC	CT:	Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
SU	IRFA	CE EL	EVATION:		LATITUE	E:				LO	NGľ	ΓUDE:						
DEI	PTH N ET		MATERIAL I	DESCRIPTIO	ON		Gl	EOLOGY	N	MC	SĄ	MPLE TYPE	REC IN.					TESTS
FE	EI	14"	Concrete pavement				FIL	1.			LAI		11 11	WC	DEN	LL	PL	%-#200
	1 -	1.	Concrete pavement								<u>}</u>							
		√4" H	Base, fill, mostly silty s ces of concrete, brown	and with gr	ravel and				8	M	M	SS	16					
	2 –	FIL	L, mostly clayey sand,	a little sand	d, brownisl	$\frac{1}{n}$				141		55						
	3 –	gray	y and brown (A-6)						23	M	IXI	SS						
	4	SIL	T, brown, moist, mediu	ım dense 1	aminations		FIN	JE	_		 							
	5 —	of le	ean clay (ML) (A-4)					LUVIUM	1.1		M	aa						
	6 -								11	M	\mathbb{N}	SS						
	0 7	SAI	ND WITH SILT, fine g	rained lie	ht brown		· CO	ARSE	-		}							
	7 -	moi	ist, loose (SP-SM) (A-3	8)	nt brown,			LUVIUM										
	8 –								7	M	M	SS						
	9 –	CII	TY SAND, fine graine	d brown r	moist						}							
	10 -	loos	se, laminations of silt (S	SM) (A-2-4	1)													
									5	M	M	SS	18					
	11	EN	D OF BORING															
4																		
12/20/2																		
-GDT																		
+WELL																		
T+CPT.																		
PJ AEI																		
ORT.GF																		
AIRPO																		
IEWAY																		
ΓY GA																		
DXX CI																		
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24				1														
-0025	DEP	TH:	DRILLING METHOD			1		EVEL MEA	1		_	אוז וואט	JG	WATE		NOTE:		
ONG	0-9½' 3.25" HSA			DATE	TIME	SAMP) DEP		CASING DEPTH		PTH	FL	ORILLIN UID LE	VEL	WATE	_	THE A SHEET		
-LAT-L				5/13/24		11.	V	9.5	11	1.0				Non		SHEE I XPLAI		
N B	ORIN		D: 5/13/24															GY ON
_'I	R:	LETEI L	.G: RH Rig: 63													TH	IS LO	3



	AET JO	B NO: P-002590 0)					LC	G OF	ВО	RING N	О	B-	007 ((p. 1 c	of 1)	
	PROJEC	Sioux City Gate	way Airpo	ort; Sioux (City,	IA											
		CE ELEVATION:		LATITUDE	E:				LO	NGI	TUDE:						
I	DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		G	EOLOGY	N	MC	SĄ	AMPLE FYPE	REC					TESTS
\vdash	FEET	13" Concrete pavement				FIL	1.					11 11	WC	DEN	LL	PL	%-#200
	1 -	-						39	M	V	SS						
		6.5" Base FILL, mostly sandy lean cl	lov vrith a 1	ittle gravel		-			1,1	\mathbb{N}	55						
	2	brown and gray (A-6)								M	~~	1.0					
	3 —	FILL, mixture of sandy lea with sand with a little silty	an clay and sand and s	lean clay ravel.				27	M	M	SS	16					
	4 -	brown (A-6)	E	,,						}							
	5 —									<u>{ </u>							
	3 7							28	M	X	SS	16					
	6 –									1 3							
	7 -									13							
	8 –							8	M	X	SS	16					
									 }								
	9 –	CAND C 11'14	1	· , 1·	10,000		ADCE			1							
	10 —	SAND, fine grained, light dense (SP) (A-3)	brown, mo	ist, medium			ARSE LUVIUM	15	M	X	SS	16					
	11 -	END OF BORING								\mathbb{A}							
		END OF BORING															
0/24																	
12/20																	
L.GDT																	
L+WEL																	
T+CPI																	
PJ AE																	
DRT.G																	
AIRPO																	
EWAY																	
Y GAT																	
XCIT																	
0 SIOL																	
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	DEP	TH: DRILLING METHOD		<u> </u>			EVEL MEA			_		ı			NOTE:	REFE	R TO
NG P-(0-9	9½' 2.25" HSA	DATE	TIME	SAMPI DEPT	LED TH	CASING DEPTH	CAV	/E-IN PTH	FL.	DRILLI UID LE	VEL	WATE LEVE	ER ,	ТНЕ А	TTAC	HED
AT-LOP			5/14/24		11.0	0	9.5						Non	e	SHEET	S FOI	R AN
/J-W-[DORRY		5/14/24		11.0	0		9	.0				Non		XPLA		
	BORIN COMPI	LETED: 5/14/24												T]			GY ON
AET	DR: B]	K LG: AK Rig: 4													ΊH	IS LO	Ĵ



AET JC	DB NO: P-0025900)				LC	OG OF	ВО	RING N	О	B-	-008	(p. 1 d	of 1)	
PROJE	CT: Sioux City Gate	way Airpo	ort; Sioux	City,	IA										
SURFA	CE ELEVATION:		LATITUI	DE:			LO	NGI	TUDE:						
DEPTH	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SA	AMPLE TYPE	REC	FIELI	O & LA	BORA	ΓORY '	TESTS
IN FEET						11	IVIC	L	TYPE	IN.	WC	DEN	LL	PL	%-#20
	12.25" Concrete pavement				FILL			\mathbb{N}							
1 -	6.5" Base					21	M	$ \lambda $	SS	10					
2 —	FILL, mostly sandy lean cl pieces of concrete, brown	lay with ??	??? and					$\left(\cdot \right)$							
3 -	,					54	M	X	SS	14					
								\ ₹}							
4 -								1							
5 —	FILL, mostly lean clay, a l brown, a little dark brown	ittle silt, gr (A-6)	ay and			8	M	\bigvee	SS	16					
6 -								\square							
_								{}							
7 -								V	aa	16					
8 -						6	M	\mathbb{N}	SS	16					
9 —	SAND, fine grained, brow dense (SP) (A-3)	n, moist, n	nedium		COARSE ALLUVIUM			}							
10 -	dense (SI) (II S)														
						27	M	X	SS						
11 -	END OF BORING														
20/24															
12															
15 															
×+															
<u> </u>															
A Ld															
2. 2.															
호 호 호															
EWA															
≻ GA															
5 X															
CORP W-IA-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT GPJ AEL+CPT+WELL.GDJ 17220024 BOWN B															
DEP	PTH: DRILLING METHOD		1		ER LEVEL MEA	_		_					NOTE:	REFE	R TO
하 진	9½' 2.25" HSA	DATE	TIME	SAMPI DEPT	ED CASING H DEPTH	CAV	VE-IN PTH	FL.	DRILLIN UID LE	NG VEL	WATI LEVE	ER EL	THE A	TTAC	HED
		5/14/24		11.0							Non	e	SHEET	rs foi	R AN
*		5/14/24		11.0)	9	0.0				Non				ON OF
BORIN COMP	IG LETED: 5/14/24											T			GY ON
DR: B	K LG: AK Rig: 4												TH	IS LO	G

03/2011



AET JC	DB NO: P-0025900)					LO	G OF	BO	RING N	O	B-	009 ((p. 1 c	of 1)	
PROJE	CT: Sioux City Gates	way Airpo	ort; Sioux	City,	IA											
	CE ELEVATION:		LATITUI	DE:				LO	NGI	ΓUDE:		1				
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOL	OGY	N	MC	SA	MPLE YPE	REC) & LA			
FEET	12" Concrete pavement				FILL				LYI		111.	WC	DEN	LL	PL	%-#20 0
1 -	-								}							
	FILL, mostly clayey sand v brown (A-6)	with a little	gravel,				40	M	M	SS	13					
2 -	, ´						40	IVI		33	13					
3 -	FILL, mostly lean clay, bro	own and gr	ray (A-6)				18	M	M	SS	18					
4 -							10	IVI	A	33	10					
4	SILTY SAND, fine graine mottled, moist, medium de	d, brown a	nd gray		COARS ALLUV	E TUM			[1]							
5 —	(may be fill)	1150 (5141) (1121)		OR FIL	L	16	M	X	SS	18					
6 -																
7 -									}							
,							13	M	M	SS	18					
8 -							13	IVI		33	10					
9 -	SILT, brown and gray mot	tled moist	medium	43	FINE				}							
10 -	dense (ML) (A-4)	tica, moisi	, medium		ALLUV	TUM										
10	SAND, fine grained, brown	n moist m	nedium		COARS	E	16	M	X	SS						
11 -	\dense (SP) (A-3)	ii, iiioisi, ii	Caram	_/	ALLUV	TUM										
	END OF BORING															
20/24																
DT 12/																
ILL.GD																
T+WE																
11 14 10 10 10 10 10 10 10 10 10 10 10 10 10																
PJ AE																
ORT.G																
AIRP																
EWAY																
Y GAT																
XCIT																
0 8101																
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 O ED D D D D D D D D D D D D	PTH: DRILLING METHOD			WAT	ER LEVE	L MEA	SURE	EMEN	TS					NOTE:	REFE	R TO
0 n _	9½'	DATE	TIME	SAMP DEP	LED CA	SING EPTH	CAV	Æ-IN PTH	FL	ORILLIN UID LE	NG VEL	WATE LEVE	ER .	ГНЕ А	TTAC	HED
Nol-	~· -											Non	_	SHEET	S FOI	R AN
W-LA													E	XPLA	NATIO	ON OF
BORIN COMP	NG LETED: 5/13/24												T	ERMIN	OLOG	GY ON
DR:	LG: RH Rig: 63													TH	IS LO	G



	AET JC	P-0025900)				LO	OG OF	ВО	RING N	О	B-	010	(p. 1 d	of 1)	
	PROJE	Sioux City Gate	way Airpo	ort; Sioux	City,	IA										
	SURFA	CE ELEVATION:		LATITUD	E:	1		LO	NGI	TUDE:		1				
	DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SĄ	AMPLE TYPE	REC					TESTS
-	FEET	12" Concrete pavement			1	FILL			 }		111.	WC	DEN	LL	PL	%-#200
	1 —	-				TILL			}							
	1	6" Apparent base, mostly a pieces of concrete, possible	gravelly silt e recycled	ty sand with	h	-			 							
	2 —	\(A-1-b)]											
	3 —	FILL, mostly gravelly silty concrete, grayish brown (p	sand with ossible bas	pieces of se) (A-1-b)			60	M	X	SS	16					
	4 —	FILL, mostly lean clay, gra	ay and brov	vn (A-6)					 }							
	5 —															
	6 —						20	M	X	SS	18					
									 }							
	7 —	FILL, mixture of lean clay and brown (A-6 and A-2-4		and, gray					\bigcup							
	8 —	·			////		14	M	X	SS	18					
	9 —	LEAN CLAY, gray and br and laminations of silt (CL	rown mottle L) (A-6)	ed, lenses		FINE ALLUVIUM	[SS						
	10 —								M							
	11 -						20	M		SS	12					
		END OF BORING														
0/24																
12/2(
L.GD.																
T+WEL																
T+CP																
PJ AE																
DRT.G																
AIRP																
EWAY																
Y GAT																
XCIT																
O SIOL																
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	DEP	TH: DRILLING METHOD		ı	1	ER LEVEL MI								NOTE:	REFE	R TO
NG P-	0-	9½'	DATE	TIME	SAMPI DEP	LED CASING TH DEPTH	G CA'	VE-IN EPTH	FL.	ORILLIN UID LE	NG VEL	WATE LEVE	ER EL	THE A	TTAC	HED
4T-LOI			5/13/24									1.9		SHEET		
77-W-L/	DORR													XPLA		
COR	BORIN COMP	LETED: 5/13/24											T	ERMIN		
AET	DR:	LG: Rig:												IΉ	IS LO	J



AET JO	P-0025900 P-0025900					LC	OG OF	ВО	RING N	О	B-	011	(p. 1 c	of 1)	
PROJEC	Sioux City Gate	way Airpo	ort; Sioux	City,	IA										
SURFA	CE ELEVATION:		LATITUE	DE:			LO	NGI	TUDE:						
DEPTH IN FEET	MATERIAL I	DESCRIPTIO)N		GEOLOGY	N	MC	SĄ	AMPLE TYPE	REC		1	1	1	TESTS
FĒÈT						1,	1,110		IYPE	IN.	WC	DEN	LL	PL	% -#200
	12.25" Concrete pavement				FILL			\mathbb{N}							
1 -	FILL, mostly silty sand wi	th a little g	ravel,			85	M		SS	14					
2 —	brown (A-2-4) (possible ba	ase)													
3 -	EU I	1 1	1			21	M	XI	SS	16					
	FILL, mostly lean clay wit and a little reddish brown	n sana, gra (A-6)	y, brown					R							
4 -								1							
5 —						13	M	X	SS	18					
6 -								II							
7 -								1							
						9	M	\mathbb{N}	SS	18					
8 -															
9 —	SILT, brown, moist, very	loose (ML) (A-4)		FINE	-		\{\}							
10 -	•				ALLUVIUM	4	M		SS						
11 -						4	M	Λ	22						
	END OF BORING														
4															
12/20/2															
GDT															
WELL.															
+ CPT+															
AET+															
T.GPJ															
RPOR															
NAY A															
GATE\															
CIT															
XNOIS															
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT GPJ AET+CPT+WELL.GDT 12/20/24 GMOO	TH: DRILLING METHOD			WAT	L ER LEVEL ME.	⊥ ASURI	L EMEN	TS	<u> </u>	<u> </u>	1		NOTE:	REEL	R TO
D-00	01/1 2 250 350	DATE	TIME	SAMPI DEPT	ı		VE-IN PTH	_	DRILLIN UID LE	NG VE	WATI LEVE		THE A		
<u>U-</u>	9½' 3.25" HSA	5/13/24		11.0		DE	/i 111	1,1	OID LE	· V Lib	Non		SHEET		
 		5/13/24		11.0		9	0.0				Non		XPLA	NATIO	ON OF
BORIN COMP	G LETED: 5/13/24												ERMIN	10LO	GY ON
DR: B													TH	IS LO	G



	AET JO	B NO: P-002590 0)					LO	G OF	BO	RING N	О	B-	012	(p. 1 c	of 1)	
	PROJEC	Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
		CE ELEVATION:		LATITUD	E:				LO	\GI	ΓUDE:		1				
	DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		Gl	EOLOGY	N	MC	SA	MPLE YPE	REC IN.			BORAT		
-	FEET	13" Concrete pavement				FIL	L			1		11.11	WC	DEN	LL	PL	%-#20 0
	1 -	-							M	Д	SS						
		11" Base, fill, mostly recycgravel, brown (A-1-b)	cled concre	te and				35	M	M	SS	14					
	2 —	FILL, mixture of sandy lea little gravel, gray and brow	an clay and	lean clay, a	i l				111	Д	55	1.					
	3 —	little gravel, gray and brow	vn (A-6)					13	M	M	SS	16					
	4 —									Д							
	_									<u>{1</u>							
	5 —							9	M	X	SS	11					
	6 —									<u> </u>							
	7 -	LEAN CLAY, brown mot	tled, soft (C	CL) (A-6)		FIN	IE LUVIUM			[[
	8 –						20 110111	4	M	X	SS	18					
	0 7									\ \ \							
	9 –									}							
	10 —							3	M	M	SS	16					
	11 —	The of popula							141	\triangle	55	10					
		END OF BORING															
24																	
12/20/;																	
GDT																	
WELL																	
+CPT+																	
J AET																	
T.GPJ																	
IRPOF																	
WAY A																	
GATE\																	
Ç																	
SIOUX																	
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	DEP	TH: DRILLING METHOD			WAT	⊥ ER L	EVEL MEA	SURE	L EMEN	L ΓS					L NOTE:	REFE	R TO
P-00.			DATE	TIME	SAMPI DEPT		CASING DEPTH	1	Æ-IN PTH		ORILLIN UID LE	NG VET	WATE LEVE		THE A		
LONG	0-9	9½' 3.25" HSA	5/13/24		11.0		9.5		1.0	rL	OID LE	VEL	None	_	SHEET		
V-LAT-			3/13/24		11.		7.3	1.1					1 4011		XPLA		
ORP V	BORIN COMPI	G LETED: 5/13/24												-	ERMIN	OLOC	Y ON
AET_C	DR:	LG: RH Rig: 63													TH	IS LOC	G

03/2011



	AET JO	B NO: P-0025900					LO	G OF	BO	RING N	O	B-	013 (р. 1 с	of 1)	
	PROJEC	Sioux City Gatev	vay Airpo	ort; Sioux	City, l	Í A										
L	SURFAC	CE ELEVATION:		LATITUD	ÞΕ:		_	LO	NGľ	ΓUDE:						
	DEPTH IN	MATERIAL D	ESCRIPTIO	N		GEOLOGY	N	MC	SA	MPLE YPE	REC) & LA			
-	IN FEET					TH I			131	IPE	IN.	WC	DEN	LL	PL	% -#200
		12" Concrete pavement				FILL		M	\{\}							
	1 -	6" Apparent base, mostly g	enerally si	lty sand				M	1							
	2 —	with pieces of concrete, gra (possible recycled concrete	iyish brow)	n (A-1-b)				1,1	11							
	3 —	FILL, mostly lean clay, gra	yish browi	n (A-6)	_		10	M	V	SS	10					
								1,1		22	10					
	4 -	LEAN CLAY, grayish brow	wn (A-6)			FINE ALLUVIUM			H							
	5 —					ALLUVIUM			M							
	6 -						9	M	$ \lambda $	SS	12					
									H							
	7 -	SILT, brown, a little gray n	nottled, ver	ry loose					1							
	8 —	(ML) (A-4)							M							
	9 –						3	M	$ \lambda $	SS	14					
		LEAN CLAY, brown and g mottled, soft, laminations of	grayish bro of silt (CL)	own (A-6)					H							
	10 —	, ,	,	,			4	M	V	SS						
	11 -							1,1	\mathbb{N}	22						
		END OF BORING														
0/24																
12/2																
L.GDT																
+WEL																
T+CPI																
J AE																
RT.GF																
AIRPO																
WAY,																
GATE																
Ç																
SIOU																
25900	DEP	TH: DRILLING METHOD			WATI	ER LEVEL MEA	SURE	EMEN	TS		l	I .		NOTE:	REFE	R TO
P-00	Δ.	01/1	DATE	TIME	SAMPI DEPT	ED CASING H DEPTH	CAV	/E-IN PTH	LI	ORILLIN UID LE	NG VET	WATE LEVE	ER ,	тне а		
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	0-9	J ² /2			DEPI	II DELIH	DE	LIH	rL	OID LE	VEL	Non		SHEET		
V-LAT-											-+	1 1011		XPLA	NATIO	ON OF
ORP V	BORIN	G LETED: 5/13/24									+		TI	ERMIN	OLO	SY ON
AET_C	DR:	LG: Rig:									\top			TH	IS LO	G
	03/2011	0		ı	1)1-DF	IR-060



	AET JO	P-0025900)				LC	G OF	BO	RING N	O	B-	014	(p. 1 c	of 1)	
	PROJEC	Sioux City Gates	way Airpo	ort; Sioux	City,	IA										
		CE ELEVATION:		LATITUE	DE:	T		LO	NGI	TUDE:						
	DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SĄ	MPLE ΓΥΡΕ	REC		1			TESTS
	FEET	12' Concrete pavement				FILL			LY.		11 11	WC	DEN	LL	PL	%-#200
	1 -	<u>-</u>							<u>}</u>							
		FILL, mostly silty sand wit (A-2-4)	th gravel, b	orown					}}							
	2 —	,							\mathcal{M}							
	3 —	FILL, mostly lean clay, dan	rk brown (A	A-6)		FILL OR TOPSOIL	18	M	X	SS	18					
	4 -	LEAN CLAY, brown and	gray mottle	ed, soft to		FINE	1		H							
	5 —	LEAN CLAY, brown and firm, lenses of silt (CL) (A	6)	,		ALLUVIUM			M	aa	1.0					
	6 -						6	M	\mathbb{N}	SS	18					
	7 —								R							
	8 -						3	M	X	SS	18					
	9 –								 }							
	10 —															
	11 -						6	M		SS	18					
		END OF BORING														
20/24																
T 12/2																
ELL.GD																
PT+WE																
ET+CF																
GPJ A																
PORT																
YAIR																
\TEW#																
/S ∠LI																
oux c																
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	DEP	TH: DRILLING METHOD			WAT	 ER LEVEL MEA	SIIDE	EMEN	 TS							
P-0025	DEP		DATE	TIME	1	1			_	ORILLIN	NG	WATE		NOTE:		
ONG.	0-9	9½'	DATE	THVIE	SAMPI DEPT	LED CASING TH DEPTH	DE	/E-IN PTH	FL	ORILLIN UID LE	VEL	WATE		ГНЕ А SHEET		
-LAT-L												Non		XPLAI		
JRP W	BORIN	G LETED: 5/13/24							-							GY ON
AET_CO	DR:	LG: Rig:												TH	IS LO	3



AET J	OB NO: P-0025900)					LC	G OF	ВО	RING N	О	B-	015	(p. 1 d	of 1)	
PROJE	Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
	ACE ELEVATION:		LATITUI	DE:				LO	NGI	TUDE:		1				
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GI	EOLOGY	N	MC	SĄ	AMPLE FYPE	REC				1	TESTS
FEET	12.5" Concrete pavement				FIL	L					11 11	WC	DEN	LL	PL	%-#200
1 -						_	25	M	V	SS						
	23.5" Base							""	\mathbb{N}	55						
2 -										~~						
3 -	FILL, mostly lean clay, gra	ay and brov	vn (A-6)		1		9	M	\mathbb{N}	SS	14					
4 -		•	, ,						}							
5 -									17							
	LEAN CLAY, gray and br little reddish brown, firm,	own mottle	ed and a		FIN ALI	IE LUVIUM	6	M	X	SS	16					
6 -	(CL) (A-6)	Tarriria (1011)	or sin						1 3							
7 -	_								[1]							
8 -							4	M	X	SS	18					
9 -									R							
9-									1							
10 -							5	M	X	SS	18					
11 -	END OF BORING								H							1
	END OF BOILING															
10/24																
T 12/2																
LL.GD																
T+WE																
14 14 14 14																
SPJ AI																
ORT.O																
Y AIRP																
TEWA																
∐ Z																
טאַ																
000 810																
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 OO OO OO OO OO OO OO OO OO	PTH: DRILLING METHOD			1		EVEL MEA			_	יי ז זו סר	JG	W/ATT		NOTE:		
0 ON O	-9½' 2.25" HSA	DATE	TIME	SAMPI DEPT	_	CASING DEPTH	DE	/E-IN PTH	FL	DRILLIN UID LE	VEL	WATE LEVE		THE A		
LAT-LC		5/14/24		11.0		9.5						Non		SHEET		
BORI	NG	5/14/24		11.0	U		9	0.0			_	Non		EXPLAI ERMIN		
S COM	PLETED: 5/14/24								-						IS LO	
b DR: I	BK LG: AK Rig: 4															

03/2011



AET J	OB NO: P-002590 0)					LO	G OF	BOI	RING N	О	B-	016	(p. 1 c	of 1)	
PROJE	Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
	ACE ELEVATION:		LATITUD	E:	<u> </u>			LO	NGI'	ΓUDE:						
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEO	LOGY	N	MC	SA	MPLE YPE	REC IN.			BORAT		1
FEET	13" Concrete pavement				FILL				밁		12.11	wc	DEN	LL	PL	%-#20 0
1 -	_							M	H							
	12" Base, fill, mostly recyc gravel, brown (A-1-b)	cled concre	ete and				56	M	M	SS	16					
2 -	FILL, mostly sandy lean cl	lay, brown	(A-6)						\square							
3 -	FILL, mostly fat clay, dark	gray (A-7	-6)				11	M	\mathbb{N}	SS	18					
4 -	FAT CLAY, gray and brown	441	f (CII)		FINE											
5 -	(A-7-6)	wn motuea	, IIIII (CH)		ALLU	VIUM			1							
							7	M	X	SS	18					
6 -									13							
7 -	_								[1]							
8 -	LEAN CLAY, gray and br (CL) (A-6)	own mottle	ed, firm				5	M	X	SS	18					
									H							
9 -									1							
10 -							6	M	X	SS	18					
11 -	END OF BORING			_////					H							
	END OF BORENO															
0/24																
T 12/2																
LL.GD.																
T+WE																
TI +CP																
JPJ AF																
ORT.0																
Y AIRP																
TEWA																
D X C																
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24		1														
DE DE	EPTH: DRILLING METHOD					EL MEA			1	יי ז זומי	JG	WATT	7 D	NOTE:		
0 ONG	9-9½' 3.25" HSA	DATE	TIME	SAMPI DEPT	_	CASING DEPTH		E-IN PTH	FL	ORILLIN UID LE	VEL	WATE LEVE	L	THE A		
LAT-L(5/13/24		11.0	0	9.5	11	1.0				Non		SHEET XPLAI		
BORI	NG													ERMIN		
	PLETED: 5/13/24								-						IS LO	
₽ DR:	LG: RH Rig: 63															



AH	ET JO	B NO: P-0025900						LC	G OF	ВО	RING N	О	B-	017	(p. 1 c	of 1)	
PR	OJEC	Sioux City Gates	way Airpo	ort; Sioux	City,	IA											
		CE ELEVATION:		LATITUI	DE:	1			LO	NGI	TUDE:		<u> </u>				
DEI	PTH N ET	MATERIAL I	DESCRIPTIO	ON		G	EOLOGY	N	MC	SĄ	AMPLE FYPE	REC IN.			1		TESTS
FE	EI	12" Concrete pavement				FIL	L			1 /			WC	DEN	LL	PL	% -#200
	1 —							46	M	V	SS	10					
		18" Base							1,1	\mathbb{N}	55						
	2 –	TYT 1 C 1 1 1 1	11					_		M	~~						
	3 —	FILL, mostly fat clay, dark (A-7-6)	gray and t	orown				7	M	M	SS	14					
	4 -									}							
	5 —									11							
	3 –							7	M	X	SS	16					
	6 –									1 3							
	7	LEAN CLAY, gray and br	own mottle	ed firm	////	FIN	JE.			13							
	8 –	(CL) (A-6)	own moun	, mm		AL	LUVIUM	5	M	X	SS	18					
										// 打							
	9 –									13							
	10 -							5	M	X	SS	18					
	11	END OF BORING								H							
		END OF BORING															
0/24																	
12/2(
L.GDT																	
T+WEL																	
T+CP																	
PJ AE																	
ORT.G																	
AIRP																	
EWA																	
Y GAT																	
Z C C																	
00000																	
002590	DEP	TH: DRILLING METHOD			_		EVEL MEA			_					NOTE:	REFE	R TO
NG P.	0-9	0½' 2.25" HSA	DATE	TIME	SAMPI DEPT	ED H	CASING DEPTH	CAV	/E-IN PTH	FL	DRILLII UID LE	VEL	WATE LEVE	ER L	THE A	TTAC	HED
AT-LO			5/13/24		11.0	0	9.5						Non	_	SHEET		
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	AD INT	C	5/14/24		11.0	0		9	.0				Non		XPLA]		
		G LETED: 5/13/24												— ^{T]}	ERMIN TH		
P D	R: B l	K LG: AK Rig: 4													ΙH	IS LOC	J

03/2011



AET JO	OB NO:	P-0025900)					LC	G OF	BOI	RING N	О	B-	018	(p. 1	of 1)	
PROJE	ECT:	Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
SURFA	CE ELEV	ATION:		LATITUD	E:	1			LO	NGI'	ΓUDE:						
DEPTH IN FEET		MATERIAL I	DESCRIPTIO	ON		GEO	LOGY	N	MC	SA	MPLE YPE	REC		O & LA		1	
FEET						FILL				1	IFE	IN.	WC	DEN	LL	PL	%-#200
	13" C	oncrete pavement				FILL				[}							
1 -	9" Ba	se, fill, mixture of re-	cycled cond	crete over				18	M	M	SS	16					
2 -	Silty s	and with gravel, gray	and brown	n (A-2-4) led_stiff to		FINE	n.m.n.	10	1,1	H	22						
3 -	firm,	CLAY, dark gray and (CH/CL) (A-7-6)	i gray mot	ica, sum to		ALLU	JVIUM			\bigvee	~~						
								9	M		SS	16					
4 -	LEAN	CLAY, gray and re	ddish brow	n mottled,						<u> </u>							
5 -	firm (CL) (A-6)						7	M	M	SS	10					
6 -								,	1,1	Д	22						
7 -	1																
8 -	-							5	M	X	SS	18					
9 -										1							
										17							
10 -								4	M	X	SS	17					
11 -	END	OF BORING			////					H						-	
0/24																	
12/2																	
L.GDJ																	
± ME																	
[14]																	
o AE																	
RT.GF																	
AIRPO																	
WAY																	
GATE																	
FIO																	
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24																	
DE 25900	PTH: I	DRILLING METHOD			WAT	ER LEV	/EL MEA	SURE	EMEN'	TS		1			NOTE:	REFE	R TO
00-A	01/1	250 110 4	DATE	TIME	SAMPI DEPT	LED Ç	CASING DEPTH	CAV	Æ-IN PTH	FI	ORILLIN UID LE	NG VEI	WATI LEVE		THE A		
	-9½'	3.25" HSA	5/13/24		11.0		9.5		1.0	1.T		, V LL	Non		SHEET		
-LAT			0,10,24		11.	_	, . .	-					. 1011		XPLA		
BORII	NG PLETED:	5/13/24												$\overline{}_{T}$	ERMIN	10LO	GY ON
DR:		RH Rig: 63													TH	IS LO	G

03/2011



	AET JO	B NO:	P-0025900)					LC	G OF	BO	RING N	О	B-	020	(p. 1 c	of 1)	
	PROJEC	CT:	Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
		CE ELEVA	TION:		LATITUD	E:	1			LO	NGI	TUDE:		ı				
D	EPTH IN FEET		MATERIAL 1	DESCRIPTIO	ON		GE	EOLOGY	N	MC	SĄ	MPLE ΓΥΡΕ	REC IN.			BORAT	1	
H'	FEET	FILL m	nostly lean clay, tra	ce roots b	rown		FIL	L OR					11 11	WC	DEN	LL	PL	%-#20 0
	1 -	ı illi, ii	lostry rean eray, tro	10013, 01	lown		FIN		4	M	V	SS	18					
							7 1121			1,1	\mathbb{N}	55						
	2	LEAN (CLAY, brown and	gray mottle	ed, firm		FIN	E LUVIUM	_		M	99						
	3 —	(CL) (A	(may be fill)				OR	FILL	7	M	M	SS						
	4 -	LEANI	CLAY, brown mot	tlad firms 1	amaga af ail	. ////					[]							
	5 —	(CL) (A	-6) (may be fill)	uea, mm, i	enses of sir						113							
									7	M	X	SS	18					
	6 –										13							
	7	FAT CI	LAY, grayish brow	n and redd	ish brown		FIN	E			17							
	8 –	mottled.	, stiff to firm (CH)	(A-7-6)			ALI	LUVIUM	11	M	X	SS						
	9 –										1							
											11							
	10 —								8	M	X	SS	18					
	11	END O	F BORING								H						-	
20/24																		
T+WELL.GDT 12/20/24																		
ELL.GE																		
PT+WE																		
ET +CF																		
GPJ A																		
PORT.																		
Y AIR																		
ATEW/																		
) 																		
XNO OXX																		
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CP	DEP	тп. гл	RILLING METHOD			WAT	ED 11	EVEL MEA	CIDI	EMENT	L Te							
P-002£	DEP	тп. ОК	ALLING METHOD	DATE	TIME			EVEL MEA CASING			_	ORJIJIN	NG	WATE		NOTE:		
ONG	0-9	9½' 3.2	25" HSA	DATE	TIME	SAMPI DEPT		CASING DEPTH	ĎĖ	/E-IN PTH	FĹ	ORILLIN UID LE	VEL	WATE		THE A SHEET		
-LAT-L				5/13/24		11.0	U	9.5			-			Non		XPLA]		
ORP W	BORIN	G	5/13/24				\dashv				-							GY ON
_"	DR:		RH Rig: 63												$\overline{}$	TH	IS LO	G



AET JC	DB NO: P-0025900)					LO	G OF	BO	RING N	O	B-0)20A	(p. 1	of 1)	
PROJE	CT: Sioux City Gates	way Airpo	ort; Sioux	City,	[A											
SURFA	CE ELEVATION:		LATITUD:	E:				LO	NGI	ΓUDE:		ı				
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GI	EOLOGY	N	MC	SA	MPLE TYPE	REC IN.			BORAT		
FEET	LEAN CLAY WITH A LI	TTLE CD	ANTEL	V////	FIN	TIC:				IIL	111.	WC	DEN	LL	PL	%-#200
1 -	trace roots, dark grayish br)		LUVIUM		M	\ \ \ \ \							
3 -	LEAN CLAY, gray and br laminations of silt (CL/CH	rown mottle () (A-7-6)	ed, firm,				6	M	M	SS	14					
4 -									 }							
5 —	LEAN CLAY, gray and br (CL) (A-6)	rown mottle	ed, firm				6	M		SS	18					
6 -								171		55	10					
7 —	_								1							
8 -							5	M		SS	18					
9 -	SILTY SAND, fine graine loose, laminations of silt (\$\)	d, brown, 1	moist,			ARSE LUVIUM			\mathbb{A}							
10 -) (/	-,				6	M	X	SS	14					
11 -									 }							
12 -	SANDY SILT, gray and br (ML) (A-4)	rown mottl	ed, loose		FIN ALI	IE LUVIUM	7	M	M	SS	18					
14 — 15 — 15 — 15 — 16 — 17 — 16 — 17 — 18 — 17 — 18 — 19 — 17 — 18 — 19 — 19 — 19 — 19 — 19 — 19 — 19	GAND G		1.		GO	A D.G.E.			/\ {]							
15 —	SAND, fine grained, brown dense, lenses of silty sand	n, moist, m (SP) (A-3)	nedium			ARSE LUVIUM	14	M		SS	18					
16 – 17 –									/\ {{							
18 –									\{\}							
A N N N N N N N N N N N N N N N N N N N									}							
M 20 -																
원 21 -							13	M	\bigvee	SS	18					
S 000 S D D D	END OF BORING	1		****			GI ID F									
DEF	PTH: DRILLING METHOD	DATE	TDA			EVEL MEA CASING			т —	ORILLIN	NG	WATE		NOTE:		
<u>9</u> 0-1	9½'	DATE	TIME	SAMPI DEPT	Ή	CASING DEPTH	DE	E-IN PTH	FL	ORILLIN UID LE	VEL	WATE		THE A' SHEET		
-LAT-I												Non		XPLAI		
BORING COMP	NG LETED: 5/13/24															GY ON
DR:	LG: Rig:													TH	IS LO	3



AET J	JOB NO: P-0025900)				LO	G OF	BOI	RING N	O	B-	021 ((p. 1 c	of 1)	
PROJ	ECT: Sioux City Gates	way Airpo	ort; Siou	x City,	IA										
	ACE ELEVATION:		LATITUI	DE:	T		LO	NGI'	ΓUDE:		1				
DEPTH IN FEET	H MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SA	MPLE YPE	REC) & LAI		1	
FEET	GRAVEL, gray and brown	•			FILL			IAI		11 11	WC	DEN	LL	PL	%-#20
1	FILL mostly lean clay tra		ray and				M	}}							
2	LEAN CLAY, dark grayis (A-7-6)				FINE ALLUVIUM	7	M		SS	12					
3	LEAN CLAY, brown and (CL) (A-7-6)	gray mottle	ed, firm					\\ \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\							
5	LEAN CLAY, brown and (CL) (A-6)	gray mottle	ed, firm			5	M		SS	14					
7	LEAN CLAY, grayish bro	wn brown	mottled					}							
8	firm laminations of silt (C	L/CH) (A-	7-6)			8	M	X	SS	18					
9								!							
10						7	M		SS	18					
12								{}							
13	_					8	M		SS	16					
7/21 14 15								}							
15 + MEL 16						6	M	X I	SS	16					
PAETA 17	_							}							
CORP W-LAT-LONG P-00255000 SIOUX CITY GATEWAY AIRPORT GPJ AET+CPT+WELL.GDT 12/20/24 12	SANDY SILT, grayish bro	own, moist,	, loose					\ \{ \{							
19 20 20								[]							
21 21	END OF BORING					7	M	M	SS	12					
00 810		1													
IO -00259	EPTH: DRILLING METHOD				ER LEVEL MEA			_	יייתמ	ıc	W/A TT		NOTE:		
<u>0</u>	19½'	DATE	TIME	SAMPI DEPT	ED CASING H DEPTH	CAV DEI	E-IN PTH	FL	ORILLIN UID LE	VEL	WATE LEVE		ГНЕ А		
LAT-LC										_	Non		SHEET VDI A1		
₩ BOR	ING							-		\dashv			XPLAI ERMIN		JN OF GY ON
OR:	<u>PLETED: 5/17/24</u> LG: Rig:									\perp		-		IS LO	
<i di.<="" td=""><td>LO. Nig.</td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></i>	LO. Nig.							1							



	AET JO	P-0025900)					LO	G OF	ВО	RING N	О	B-	022	(p. 1 c	of 1)	
	PROJEC	Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
		CE ELEVATION:		LATITUE	DE:				LO	NGI	TUDE:						
	DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GE	EOLOGY	N	MC	SĄ	AMPLE FYPE	REC IN.	_		BORAT		
	FEET	12.5" Concrete pavement				FILI	L			1 /			WC	DEN	LL	PL	%-#200
	1 -							16	M	V	SS	12					
		8" Base	1 .	1					1,1	\mathbb{N}	55	12					
	2 -	FILL, mostly lean clay, da piece of bituminous (A-6)	rk gray and	brown,						M	~~	1.0					
	3 —							11	M	M	SS	16					
	4 —	LEANCLAY convende		. 1 C	////	FIN	E			}							
	5 —	LEAN CLAY, gray and br (CL) (A-6)	rown moule	a, mm		ALL	LUVIUM			11							
								6	M	X	SS	16					
	6 -									1 3							
	7 —	LEAN CLAY, brown, firm	n lenses of	silt (CL)						[1]							
	8 -	(A-6)	ii, ienses ei	511 (02)				6	M	X	SS	16					
										<i>₹</i>							
	9 –									13							
	10 -							5	M	X	SS	14					
	11 -	END OF BORING				1-				H							
		END OF BORING															
0/24																	
T 12/2																	
L.GD.																	
T+WE																	
T+CP.																	
PJ AE																	
ORT.G																	
AIRP																	
(EWA																	
-\ GA																	
UXCI																	
00 810																	
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	DEP	TH: DRILLING METHOD		Ι			EVEL MEA			_					NOTE:	REFE	R TO
NG P-	0-9	9½' 2.25" HSA	DATE	TIME	SAMPI DEPT	LED TH	CASING DEPTH	CAV DE	/E-IN PTH	FL	DRILLIN UID LE	NG VEL	WATE LEVE	ER L	THE A	TTAC	HED
AT-LO			5/13/24		11.0		9.5						Non		SHEET		
PW-L	BUDIN	TG.	5/13/24		11.0	0		9	.0				Non		EDM		
		G LETED: 5/13/24												T.	ERMIN TH	IS LOC	
AET	DR: B	K LG: AK Rig: 4													IH	IS LUC	J



AET JO	B NO: P-0025900						LC	G OF	BO	RING N	О	B-	023	(p. 1 c	of 1)	
PROJEC	Sioux City Gatev	vay Airpo	ort; Sioux	City,	IA											
	CE ELEVATION:		LATITUDI	E:	1			LO	NGI	TUDE:						
DEPTH IN FEET	MATERIAL D	DESCRIPTIO	ON		GE	EOLOGY	N	MC	SA	AMPLE ΓΥΡΕ	REC IN.			BORAT		
FEET	Concrete pavement				FIL	T.			l I		11.11	WC	DEN	LL	PL	%-#200
1 -	-				1	_		M	<u>}</u>							
	FILL, mostly sandy lean cl brownish gray (A-6)	ay with a li	ittle gravel,					112	<u>}</u>							
2 —									M	~~	1.0					
3 —	LEAN CLAY, dark gray, s	tiff (CL) (A	A-6)		FIN	E	14	M	M	SS	18					
4 —					ALI	LUVIUM			}							
5 —	LEAN CLAY, gray and breddish brown mottled, firm	n (CL) (A-	-6)													
							7	M	IXI	SS	14					
6 –									Ц							
7 —									1							
8 –							7	M	X	SS	14					
9 —									\square							
10	SILTY SAND, fine grained	d, brown, r	noist, loose		CO	ARSE			1							
10 -	(SM) (A-2-4)				ALI	LUVIUM	7	M	X	SS	18					
11 -									\square							
	END OF BORING															
DEP	TH: DRILLING METHOD			WAT	ER L	EVEL MEA	SURE	EMEN	TS		1		1	NOTE:	REFE	R TO
0-9	9½'	DATE	TIME	SAMPI DEPT	LED TH	CASING DEPTH	CAV DE	Æ-IN PTH	FL	ORILLIN UID LE	NG VEL	WATE LEVE	ER L	THE A	TTAC	HED
	· -											Non	e	SHEET	S FOF	AN
B0555														XPLA		
BORIN COMPI	G LETED: 5/13/24												T	ERMIN		
DR:	LG: Rig:													TH	IS LO	j

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24



AET J	OB NO: P-0025900						LO	G OF	BOI	RING N	O	B-	024 ((p. 1 c	of 1)	
PROJI	ECT: Sioux City Gatev	vay Airpo	ort; Sioux	City,	IA											
	ACE ELEVATION:		LATITUD	E:			_	LON	NGI	ΓUDE:						
DEPTH IN FEET	I MATERIAL D	ESCRIPTIO	ON		GE	OLOGY	N	MC	SA	MPLE YPE	REC IN.) & LA			
FEET	8" Concrete pavement				FILI				LYI		111.	WC	DEN	LL	PL	%- #200
1	7 1 51 D 611 11 1	ed hitumir	าดบร		TILL				}							
	pavement (A-1-a)]				M	}							
2 -	12" Concrete pavement 4.5" Base fill, mostly sand	with cilt a	nd gravel						{}							
3 -			_						M							
1	FILL, mixture of lean clay dark gray (A-6)	and fat cla	y, gray and	1			8	M	X	SS	18					
4	FAT CLAY, gray and brow		£ (CII	////	FINI				\square							
5 -	$A = \begin{pmatrix} A & CLA & G & G \\ (A-7-6) & G & G \end{pmatrix}$	vn mottied	, nrm (CH) /////////////////////////////////////	ALL	UVIUM	7	M	X	SS	10					
6 -	_															
									{}							
7	LEAN CLAY, brown and (CL) (A-6)	gray mottle	ed firm				7	M	M	CC	10					
8 -	(CL) (A-0)						7	M	M	SS	18					
9 -	_								}							
10	FAT CLAY, brown, firm (CH) (A-7-	6)						<u>{ </u>							
10			,				7	M	X	SS	18					
11	END OF BORING															
20/24																
T 12/2																
T+WELL.GDT 12/20/24																
I+WEI																
PJ AE																
DRT.GI																
AIRPO																
₩A∀																
GATE																
Ç CI																
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CP- MOSE MOSE MOSE MOSE MOSE MOSE MOSE MOSE																
DE 25900	EPTH: DRILLING METHOD			WATI	ER LE	EVEL MEA	SURE	EMEN	TS		l	1		IOTE:	REFE	R TO
D-00	01/1 2 25H HGA	DATE	TIME	SAMPI DEPT	ED	CASING DEPTH	CAV	/E-IN PTH	FI	ORILLIN UID LE	NG VET	WATE LEVE			TTAC	
)-9½' 3.25" HSA	5/14/24		11.0	_	9.5		1.0	IL	OID LE	▼ LiL	Non			rs for	
V-LAT		C/ I I/ 24		11.(-	7.0	1.				\dashv	1 1011			NATIC	
BORI COM	NG PLETED: 5/14/24										$\overline{}$			ERMIN	OLOC	GY ON
DR:	LG: RH Rig: 63													TH	IS LO	3

03/2011



AET JOB N	NO: P-002590 0)				LC	OG OF	ВО	RING N	O	B-	-025	(p. 1 c	of 1)	
PROJECT:	Sioux City Gate	way Airpo	ort; Sioux	City,	IA										
SURFACE I	ELEVATION:		LATITUD	E:			LO	NGI	TUDE:						
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SĄ	AMPLE ГҮРЕ	REC					TESTS
								L	IYPE	IIN.	WC	DEN	LL	PL	%-#20
$1 - \begin{bmatrix} \mathbf{F} \\ \mathbf{tr} \end{bmatrix}$	ILL, mostly sandy lean of ace roots, brown and ligh	lay with a l it brown	ittle gravel,		FILL	5	M		SS	12					
2 - 3 -						7	M		SS	10					
4 – 5 – F.	AT CLAY, brown mottle	ed, firm (Cl	H) (A-7-6)		FINE			\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\							
6 –					ALLUVIUM	7	M	\\ \{\}	SS	14					
7 L 8 – (C	EAN CLAY, brown and CL) (A-6)	gray mottle	ed, firm			5	M);	SS	12					
9 – 10 – S	ILT, brown, moist to wet	, loose (MI	L) (A-4)			5	M	\{\{\}	SS						
	END OF BORING														
DEPTH:	: DRILLING METHOD			WAT	 ER LEVEL MEA	 SURF	EMEN'	TS				<u> </u>	JOTE	DEFE	ED TO
		DATE	TIME	SAMPI DEPT		1	/E-IN PTH	_	DRILLIN UID LE	NG VEI	WATI LEVE		NOTE: THE A		
0-9½'	2.25" HSA	5/14/24		11.0		DE	. 111	11		100	Non		SHEET		
		5/14/24		11.0		9	0.0			\dashv	Non		XPLA	NATIO	ON OF
BORING COMPLET	TED: 5/14/24						-						ERMIN	IOLO	GY ON
DR: BK	LG: AK Rig: 4												TH	IS LO	G



AET JC	DB NO: P-002590 0)					LC	G OF	BOI	RING N	O	B-	026	(p. 1 c	of 1)	
PROJEC	CT: Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
	CE ELEVATION:		LATITUD	E:	1			LO	NGI	ΓUDE:						
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GE	EOLOGY	N	MC	SA	MPLE YPE	REC IN.) & LA			1
FEET	12.75" Concrete pavement				FILI	r			LYI		111.	WC	DEN	LL	PL	%-#20 0
1 -	_				TILI	L			}							
	9.5" Base fill, mostly recyclimestone aggregate, gray	cled concre	te with				30	M	M	SS	15					
2 —	FILL, mostly sandy lean cl	lay, grayish	brown				30	IVI	\triangle	55	13					
3 —	\(\(\((A-6)\)\) FILL, mostly fat clay, dark]			9	M	M	SS	18					
4 -	(A-7-6)							IVI		33	10					
	FAT CLAY, brownish gra (A-7-6)	y to brown	, firm (CH)		FIN. ALI	E LUVIUM			<u></u>							
5 —	(11 / 0)						5	M	X	SS	18					
6 -									L7							
7 -									<u>}</u>							
							7	M	M	SS	18					
8 -							,	111	Д	55	10					
9 —	LEAN CLAY, brown, firm	1 (CL) (A-6	<u> </u>						X							
10 -	,	(02) (11	~)				_		M							
							5	M	\mathbb{N}	SS	18					
11 -	END OF BORING															
T+WELL.GDT 12/20/24																
1 TO																
/ELL.G																
W+T4W																
AET+C																
GPJ ,																
PORT																
NY AIR																
VTEW/																
/5 <u>}</u>																
OUX																
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CP- AMOOG JEG AMOOG AM				****			<u> </u>									
DEP	DEPTH: DRILLING METHOD DATI					EVEL MEA			_	יו דומר	JG	W/A TI		NOTE:		
9 <u>0</u> -	0-9½' 3.25" HSA		TIME	SAMPI DEPT	-	CASING DEPTH		/E-IN PTH	FL	ORILLIN UID LE	VEL	WATE LEVE		THE A		
AT-LC		5/14/24		11.0	0	9.5	11	1.0				Non		SHEET		
BORIN	ĪG				_									XPLA]		
	LETED: 5/14/24				_						\perp				IS LO	SY ON
₽ DR:	LG: RH Rig: 63													111	10 LO	ی



AET JO	B NO: P-0025900						LO	G OF	BO	RING N	O	B-	027	(p. 1 c	of 1)	
PROJEC	Sioux City Gatev	way Airpo	ort; Sioux	City, l	ΙA											
	CE ELEVATION:		LATITUD	DE:				LO	\GI	ΓUDE:						
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	DΝ		GE	OLOGY	N	MC	SĄ	MPLE TYPE	REC IN.		1	BORAT		
FEET 1 —	LEAN CLAY, trace roots, dark brown mottled, firm (grayish bro CL/CH) (A	own and A-7-6)		FINE	E JUVIUM			}		IIV.	WC	DEN	LL	PL	%-#200
2 - 3 -							5	M	\ \ \ \ \ \ \	SS	12					
4 - 5 - 6 -	LEAN CLAY, brown and laminations of silt (CL/CH	gray mottle) (A-7-6)	ed, firm,				7	М	\{\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	SS	12					
7 - 8 -	LEAN CLAY, brown and (CL) (A-6)	gray mottle	ed, firm				7	М	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	SS	8					
9 - 10 - 11 -	SILT, brown, moist, loose, (ML) (A-4) END OF BORING	lenses of l	ean clay				5	М	<u>{</u> }	SS	10					
DEP	TH: DRILLING METHOD			WATI	ER LE	EVEL MEA	SURE	EMEN	ΓS		I	1	1	NOTE:	REFE	R TO
0-9	01/4'	DATE	TIME	SAMPL DEPT	LED	CASING DEPTH	CAV DE	Æ-IN PTH	FI.	ORILLIN UID LE	NG VEL	WATE LEVE	ER	THE A		
U->	7/2			-2.1	-							Non		SHEET	S FOR	R AN
													E	XPLA	NATIC	N OF
BORIN COMPL	G LETED: 5/14/24												T.	ERMIN		
DR:	LG: Rig:										T			TH	IS LO	j.

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24



	AET JO	B NO: P-0025900)				LC	OG OF	ВО	RING N	О	B-	028	(p. 1	of 1)	
	PROJEC	Sioux City Gate	way Airpo	ort; Sioux	City,	IA										
	SURFAC	CE ELEVATION:		LATITUD	E:	ı		LO	NGI	TUDE:		1				
	DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SĄ	AMPLE TYPE	REC IN.				1	TESTS
	FEET	FILL, mixture of sandy ler	a clay with	a little		FILL			 		111.	WC	DEN	LL	PL	%-#200
	1 - 2 -	gravel, lean clay and silty s bituminous pavement, browlight brown (A-6)	sand, a pied	ce of	d	TILL	6	M		SS	12					
	3 —						17	M	N N	SS	10					
	4 — 5 —	FAT CLAY, gray and brow	wn mottled	,		FINE	7	M	\{\{\}	SS	14					
	6 — 7 —	laminations of silt (CH) (A	A-7-6)			ALLUVIUM			\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\							
	8 — 9 —	LEAN CLAY, gray and br soft (CL) (A-6)	own mottle	ed, firm to			5	M	 } }	SS	14					
	10 -						4	M		SS	16					
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT. GPJ AET+CPT+WELL. GDT 12/20/24		END OF BORING														
25900 5	DEP	TH: DRILLING METHOD			WAT	L ER LEVEL ME	ASURI	L EMEN	TS		<u> </u>			l NOTE:	REEL	ER TO
ONG P-002	0-9		DATE 5/14/24	TIME	SAMPI DEPT	LED CASING TH DEPTH		VE-IN PTH	_	DRILLIN UID LE	NG VEL	WATI	ER EL	THE A SHEET	TTAC	HED
'-LAT-L			5/14/24 5/14/24		11.0 11.0		-	0.0	+		\dashv	Non Non				ON OF
CORPW	BORIN COMPI	G LETED: 5/14/24	3/14/24		11.			•••				11011		ERMIN		GY ON
AET	DR: B]	K LG: CA Rig: 4												111	TO LO	J

03/2011



	AET JO	B NO: P-0025900)					LO	G OF	BOI	RING N	О	B-	029	(p. 1 d	of 1)	
	PROJEC	Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
		CE ELEVATION:		LATITUE	E:				LO	NGI	ΓUDE:		1				
D	EPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEO	LOGY	N	MC	SA	MPLE TYPE	REC IN.		1	BORAT	I	
-	FEET	11.75" Concrete pavement				FILL						1111	wc	DEN	LL	PL	% -#20
	1 -	_						39	M	V	SS	14					
		11.25" Base fill, mostly gr brown (A-1-b)	avelly silty	sand,					141	\mathbb{N}	55	17					
	2	FILL, mostly sandy lean cl	lay, a little	gravel,						M							
	3 —	brown (A-6)						9	M	X	SS	14					
	4 —									3							
	_	FAT CLAY, brown and gr	ay mottled	, firm (CH) ////	FINE				17							
	5 –	(A-7-6)	J	,		ALLU	VIUM	7	M	X	SS	18					
	6 –									H							
	7 -									1							
	8 –							6	M	X	SS	14					
	8									H							
	9 —	SILT, brown, moist, loose,	ean clay						<u>}</u>								
	10 -	(ML) (A-4)						5	M	M	SS	14					
	11 —	END OF BODDING								Ν							
		END OF BORING															
24																	
12/20/																	
GD.																	
WELL																	
+CPT																	
) AET																	
RT.GP.																	
IRPOF																	
WAY A																	
GATE																	
Z CIT																	
SIOUS																	
25900	DEP	TH: DRILLING METHOD			WAT	ER LEV	EL MEA	SURE	EMEN	TS		I	I	Ή,	NOTE:	REFF	R TO
P-00	Λ.4	11/1 2 2511 ITCA	DATE	TIME	SAMPI DEPT	LED C	CASING DEPTH	CAV	Æ-IN PTH	FI	ORILLIN UID LE	NG VEI	WATE LEVE	ER	THE A		
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	0-9	0½' 2.25" HSA	5/14/24		11.0		9.5	ונועם	. 111	I L		· · LL	Non	,L	SHEET		
W-LAT			5/14/24		11.0								Non	— -	XPLA	NATIO	ON OF
SORP.	BORIN COMPI	G LETED: 5/14/24													ERMIN	OLOG	GY ON
. "	DR: B														TH	IS LO	G

03/2011



AET JO	B NO: P-0025900						LO	G OF	BO	RING N	O	B-	030 ((p. 1 c	f 1)	
PROJEC	Sioux City Gatev	vay Airpo	rt; Sioux (City, 1	A											
	CE ELEVATION:		LATITUDE	l:			_	LON	\GI	TUDE:						
DEPTH IN FEET	MATERIAL D	ESCRIPTIO	N		GE	EOLOGY	N	MC	SA	MPLE TYPE	REC IN.	WC	DEN	BORAT LL		ΓESTS %-#200
FEEI	Concrete pavement				FIL	L			Į ∤∤			wc	DEN	LL	PL	70-#200
1 —	-	1101 1	1 1						}							
2	FILL, mostly sand lean clar sand, brown and gray								}							
2 —	FAT CLAY, dark gray and mottled, firm (CH) (A-7-6)	a little bro	wn		FIN ALI	E LUVIUM	7	M	M	SS	14					
3 —	motiled, mm (CH) (A-7-0)				1 121		/	IVI	M	33	14					
4 —									抖							
5 —	FAT CLAY, brown and gr	ay mottled,	firm to													
	stiff (CH) (A-7-6)						8	M	X	SS	14					
6 —									13							
7 —									[]							
8 –							9	M	X	SS	16					
0									<u> </u>							
9 –									乜							
10 —	LEAN CLAY, gray and brolenses of silt (CL) (A-6)	own mottle	d, firm,				8	M	X	SS	16					
11 -	lenses of silt (CL) (A-6) END OF BORING								$/ \setminus$							
	END OF BORING															
DEP	TH: DRILLING METHOD			WATE	ER LI	EVEL MEA	SURE	MEN	ΓS				\	NOTE:	REFE	R TO
0-9	9½'	DATE	TIME	SAMPL DEPT	ED H	CASING DEPTH	CAV DEI	E-IN PTH	FL	ORILLIN UID LE	IG VEL	WATE LEVE	ER .	THE A	TTAC	HED
<u> </u>	· / w											Non	e	SHEET	S FOF	R AN
													E	XPLA	NATIO	N OF
BORIN COMPI	G LETED: 5/14/24												T	ERMIN		
DR:	LG: Rig:				T						T			TH	IS LO	3

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24



A	ET JO	P-0025900					LC	G OF	BO	RING N	О	B-	031 ((p. 1 c	of 1)	
P	ROJEC	Sioux City Gatev	vay Airpo	ort; Sioux	City,	IA										
		CE ELEVATION:		LATITUD	E:	T		LO	NGI	ΓUDE:		1				
DE	PTH IN EET	MATERIAL D	ESCRIPTIO	N		GEOLOGY	N	MC	SĄ	MPLE TYPE	REC					TESTS
FI	EET	10" Bituminous pavement				FILL			ly.		1111	WC	DEN	LL	PL	%-#200
	1 -	14" Base fill, mostly sand v	with cilt wi	th gravel												
		brown (A-1-b)	with sift wi	uii gravei,			12	M	M	SS	16					
	2	LEAN CLAY, dark gray ar firm (CL) (A-6) (may be fil	nd brown r	nottled,		FINE ALLUVIUM	1		M	CC						
	3 —	mm (CL) (A-0) (may be m	11)			OR FILL	7	M		SS						
	4 -								{							
	5 —	LEAN CLAY, brown and g	gray mottle	ed, firm		FINE ALLUVIUM	١			99						
		(CL) (A-6)				ALLOVION	5	M	M	SS						
	6 –								}							
	7 —															
	8 –						5	M	M	SS						
	9 –	SILT, brown, moist to wet, (A-4)	very loose	e (ML)					1							
	10 -	(A-1)							13							
							4	M/W		SS						
	11	END OF BORING														
4																
2/20/2																
GDT 1																
WELL.																
+CPT+																
J AET																
RT.GP.																
AIRPO																
=WAY																
/ GATE																
X CIT																
00 8101																
AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	DEP'	TH: DRILLING METHOD				ER LEVEL MEA	1		_					NOTE:	REFE	R TO
NG P.	0-9	9½' 3.25" HSA	DATE	TIME	SAMPI DEPT	ED CASING H DEPTH	CAV DE	/E-IN PTH	FL	ORILLIN UID LE	VEL	WATE LEVE		THE A		
AT-LC			5/13/24		11.0	9.5	11	1.0				Non		SHEET		
A A	BORIN	G												XPLAI ERMIN		
	COMPI	LETED: 5/13/24							-						IS LO	
# D	R:	LG: RH Rig: 63												211		

03/2011



AET JO	DB NO: P-0025900)					LO	G OF	ВО	RING N	О	B-	032 ((p. 1 c	of 1)	
PROJE	CT: Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
	CE ELEVATION:		LATITUD	E:				LO	NGI	TUDE:		1				
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEC	OLOGY	N	MC	SĄ	AMPLE ΓΥΡΕ	REC					TESTS
FEET	12" Concrete pavement				FILL						11 11	WC	DEN	LL	PL	%-#20 0
1 -	_						12	M	V	SS	18					
	3" Base fill FILL, mixture of lean clay	and sandy	lean clay	_/	-		12	1,1	\mathbb{N}	55						
2 -	brown and gray (A-6)	and sandy	ream etay,				_		M	99	1.0					
3 -	LEAN CLAY, gray and br	own mottle	ed, firm to		FINE	,	7	M	M	SS	16					
4 -	soft (CL) (A-6)				ALLU	JVIUM			}							
5 -									13							
							5	M	X	SS	14					
6 -									1 3							
7 -	_								[1]							
8 -							3	M	X	SS	10					
									<u></u>							
9 -	SILT WITH SAND, brown loose (ML) (A-4)	n, moist to	wet, very						1							
10 -	100SC (WIL) (A-4)						3	M	X	SS	16					
11 -	END OF BORING			Щ					H							
	LIND OF BOILING															
10/24																
T 12/2																
LL.GD																
T+WE																
ET +CP																
PJ AI																
ORT.0																
Y AIRP																
TEWA																
∐7 GA																
OUX CI																
CORP W-1AT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT GPJ AET+CPT+WELL.GDT 12/20/24 O HE HE		1			<u> </u>		<u> </u>									
DEI	PTH: DRILLING METHOD			1		VEL MEA			_	יו זומר	JG	W/ATT		NOTE:		
<u>9</u> 0-	9½' 2.25" HSA	DATE	TIME	SAMPI DEPT		CASING DEPTH	DE	/E-IN PTH	FL	ORILLIN UID LE	VEL	WATE LEVE		THE A		
LAT-LC		5/14/24		11.0		9.0		•				Non		SHEET XPLA1		
ĕ BORIN	NG	5/14/24		11.0)		9	.0			_	Non		ERMIN		
S COMP	LETED: 5/14/24				+				\vdash				- '		IS LO	
DR: B	K LG: AK Rig: 4													_		

03/2011



AET J	OB NO: P-0025900)					LOG	OF l	BOR	ING N	O	B-	033 ((p. 1 c	of 1)	
PROJE	Sioux City Gates	way Airpo	ort; Sioux	City,	[A											
	ACE ELEVATION:		LATITUI	DE:			. ;	LON	IGIT	UDE:		1				
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOG'	Y :	N N	ИС	SA	MPLE YPE	REC IN			BORAT		
FEET	6" Bituminous pavement				FILL				되		11 11	WC	DEN	LL	PL	%-#200
1 -	22" Base fill, mostly silty s	sand with g	ravel,	_	TILL				}							
	brown (A-1-b)								}							
2 -		11	441 1	////	EINIE				\$ I							
3 -	LEAN CLAY, dark gray a firm (CL) (A-6) (may be fi	na brown r ill)	nottled,		FINE ALLUVIU	M	5	M	X	SS	14					
1									 							
4 -	LEAN CLAY, gray and br (A-6)	own mottle	ed (CL)						1]							
5 -							7	M	\bigvee	SS	18					
6 -																
7 -									${}$							
							5	M	\bigvee	SS	18					
8 -	_						3	M	\bigvee	33	18					
9 -	SILT, brown and gray mot	tlad maist	looso						}							
10 -	(ML)(A-4)	tica, moist,	, loose						\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\							
10							7	M	X	SS	18					
11 -	END OF BORING								+							
20/24																
T 12/2																
LL.GD																
T+WE																
14CP																
PJ AE																
DRT.G																
AIRPO																
=WAY																
GATE																
X C C																
nois																
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	EPTH: DRILLING METHOD			WAT	ER LEVEL N	ÆASU	UREM	ENT	S		•	1		NOTE:	REFE	R TO
D-0-0)-9½' 2.25" HSA	DATE	TIME	SAMPI DEPT	ED CASIN H DEPT	IG C	CAVE- DEPT	-IN H	FI I	RILLIN JID LE	NG VEL	WATE LEVE		THE A		
J- LOX	1-7/2 2.23 NSA	5/13/24		11.0						ناب سد	, 111	None		SHEET	S FOR	AN
		5/13/24		11.0			9.0					None	— -	XPLA	NATIC	N OF
BORI COM	NG PLETED: 5/13/24													ERMIN	OLOC	Y ON
	BK LG: AK Rig: 4													TH	IS LOC	j .



AET JO	B NO: P-0025900)					LO	G OF	ВО	RING N	O	B-	034 ((p. 1 c	of 1)	
PROJEC	Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
	CE ELEVATION:		LATITUD	E:	1			LO	NGI	TUDE:						
DEPTH IN FEET	MATERIAL I	DESCRIPTIC)N		GI	EOLOGY	N	MC	SĄ	AMPLE ΓΥΡΕ	REC IN.					TESTS
1 -	LEAN CLAY, trace roots, (CL) (A-6)	grayish bro	own, firm		FIN	PSOIL/ IE LUVIUM	5	M		SS	16	WC	DEN	LL	PL	%-#200
2 - 3 - 4 -	LEAN CLAY, brown mott (CL) (A-6) SILT, brown mottled, mois				FIN ALI	TE LUVIUM	3	M		SS						
5 — 6 — 7 —	SILTY SAND, fine graine (SM) (A-2-4)				ALI	ARSE LUVIUM	7	M	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	SS	14					
8 – 9 –	SILT, brown, moist to wet laminations of lean clay (N	, very loose IL) (A-4)	2,		FIN ALI	TE LUVIUM	2	M		SS	16					
10 -							3	M	M	SS						
11 —	END OF BORING															
DEP	TH: DRILLING METHOD					EVEL MEA			1					NOTE:	REFE	R TO
0-9	9½' 3.25" HSA	DATE	TIME	SAMPI DEPT	LED TH	CASING DEPTH	CAV DE	Æ-IN PTH	FL	ORILLIN UID LE	NG VEL	WATE LEVE	R L	THE A	TTAC	HED
		5/16/24		11.0	0	9.5						Non		SHEET		
DOPP:		5/16/24		11.0	0		9	.0				Non		XPLA		
BORIN COMPI	G LETED: 5/16/24												TI	ERMIN		
DR: B l	K LG: AK Rig: 4													TH	IS LO	3

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24



	AET JO	P-0025900)					LO	G OF	BOI	RING N	О	B-	035	(p. 1 c	of 1)	
	PROJEC	Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
		CE ELEVATION:		LATITUE	DE:	1		_	LO	NGI'	ΓUDE:						
	DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOG	ŝΥ	N	МС	SA	MPLE YPE	REC			BORAT		
	FEET	6" Bituminous pavement				FILL				LAI		111.	WC	DEN	LL	PL	%-#200
	1 -	18" Base, fill, mostly sand brown (A-1-b)	with silt w	rith gravel,		FILL				} }							
	2 -	FILE (1.11	1 1 1			EILL OD				<u>H</u>							
	3 —	FILL, mostly lean clay, gramottled (A-6)	ay and dark	gray		FILL OR FINE ALLUVIU	лМ	5	M	M	SS	14					
	4 —	LEAN CLAY, gray and br	rown mottle	ed, firm		FINE ALLUVIU	ıM			!							
	5 —	(CL/CH) (A-7-6)				ALLOVIC)1 V1	6	M	X	SS	16					
	6 - 7 -									}							
	8 -							7	M	M	SS	18					
	9 —									}							
	10 —							7	M	M	SS	18					
	11 -	END OF BORING															
4																	
T 12/20/24																	
WELL.GD																	
VET+CPT+																	
RT.GPJ /																	
AY AIRPO																	
Y GATEM																	
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24																	
25900	DEP	TH: DRILLING METHOD			WAT	ER LEVEL :	MEAS	SURE	MEN'	TS		<u> </u>	<u> </u>		NOTE:	REFE	R TO
JNG P-00.	0-9	9½' 3.25" HSA	DATE	TIME	SAMPI DEPT		_	CAV DEI		FL	ORILLIN UID LE	NG VEL	WATE LEVE	ER L	THE A	TTAC	HED
AT-LC			5/13/24		11.0	9.5	5	11	.0				Non		SHEET		
R W-L	BORIN	G													XPLAI ERMIN		
r COF	COMPI	LETED: 5/13/24														IS LO	
AET	DR:	LG: RH Rig: 63													111	ייי דייו	,

03/2011



AET J	OB NO: P-002590 0)					LC	G OF	BO	RING N	О	B-	036	(p. 1 c	of 1)	
PROJI	ECT: Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
	ACE ELEVATION:		LATITUD	E:				LO	NGI	TUDE:						
DEPTH IN FEET	I MATERIAL I	DESCRIPTIO	ON		GI	EOLOGY	N	MC	SA	MPLE TYPE	REC					TESTS
FEET					FIL	т				III	IIN.	WC	DEN	LL	PL	%-#200
	8" Concrete pavement FILL, mostly sand, brown	(4.2)			FIL	L			[1]							
1 -	FILL, mostly fat clay, dark		orav	_			4	M	IXI	SS	12					
2 -	(7)	. gruj um e	5-47						\mathbb{H}							
3 -	LEAN CLAY, brown mot	tled, soft (C	CL) (A-6)		FIN ALI	E LUVIUM	4	M		SS	14					
4 -	_								<u></u>							
5 -							4	M		SS	12					
7 -									}							
8 -	SILTY SAND, fine graine	d. brown, 1	noist, loos	e ::::	CO	ARSE	9	M		SS	16					
9 -	(SM) (A-2-4)				ALI	LUVIUM			13							
	SANDY SILT, brown, mo wet (ML) (A-4)	ist to about	t 10' then			XED LUVIUM			13							
10 -							6	M/W	/X	SS	15					
11 -	END OF BORING								H							1
AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 SUD SUD SUD SUD SUD SUD SUD SUD SUD SU																
-LAT-LONG P-0025900 SIOUX CITY GATE	D-9½' 3.25" HSA	DATE 5/15/24	TIME	WAT SAMPI DEPT 11.0	LED TH	EVEL MEA CASING DEPTH 9.5	CAV DE	EMEN VE-IN PTH	_	DRILLIN UID LE	NG VEL	WATE LEVE	ER L)	NOTE: THE A SHEET XPLA	TTAC	HED R AN
BORI	NG								\vdash							GY ON
COM	PLETED: 5/15/24												-		IS LO	
₩ DR:	LG: RH Rig: 63															

03/2011



AE'	T JOB 1	NO: P-0025900	ı				LO	G OF	ВО	RING N	O	B-	037 (р. 1 с	of 1)	
PRO	OJECT:	Sioux City Gatev	way Airpo	ort; Sioux	City, l	[A										
SUF	RFACE	ELEVATION:		LATITUD	E:		_	LO	NGľ	ΓUDE:						
DEP IN FEE	TH	MATERIAL D	DESCRIPTIO	Ν		GEOLOGY	N	MC	SA	MPLE TYPE	REC IN.		0 & LA			
FEE		EAN CLAY, trace roots,	dark brow	n (CL)	V////	TOPSOIL OR			1			wc	DEN	LL	PL	%-#200
	1 -	A-6) (may be fill)	dark brown	ii (CL)		FILL		M		SS						
	$\frac{2}{3}$	EAN CLAY, trace roots, CL/CH) (A-7-6) (may be to	grayish brofill)	own, firm		FINE ALLUVIUM OR FILL	8	M	M	SS	6					
	4 — F 5 — b	AT CLAY, grayish brown lack, firm to stiff (CH) (A	n and brow 1-7-6) (may	n, a little be fill)			5	M	<u>R</u>	SS	20					
	6 - 7 -								\\ \{\}							
	8 - I 9 -	EAN CLAY, brown, a lit o firm, lenses of silty sand	tle gray mo l and silt (C	ottled, stiff CL) (A-6)			9	M	N N	SS						
1	0 -						8	M		SS						
1	1	END OF BORING					0	171	И							
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24																
-00259(DEPTH	: DRILLING METHOD				ER LEVEL MEA			_	N T	,, T	****		NOTE:	REFE	R TO
ONG P.	0-91/2	•	DATE	TIME	SAMPI DEPT	ED CASING H DEPTH	CAV DE	/E-IN PTH	FL	ORILLIN UID LE	VEL	WATE LEVE	L	ГНЕ А		
AT-LC												Non		SHEET		
₹ BO	BORING													XPLAI		ON OF GY ON
	MPLE:								_				IS LO			
₩ DR 03/20		LG: Rig:													IR-060	



AET JOE	NO: P-002590 0)					LC	OG OF	ВО	RING N	O	B-	038	(p. 1 c	of 1)	
PROJEC	Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
SURFAC	E ELEVATION:		LATITUD	E:				LO	NGI	TUDE:						
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GE	EOLOGY	N	MC	SĄ	AMPLE TYPE	REC		D & LA			1
					FIL	т				LIPE	IIN.	WC	DEN	LL	PL	% -#20
	FILL, mostly fat clay, trace brown (A-7-6)	e roots, dar	k gray and		FIL.	L	7	M		SS	12					
3 —	FILL, mixture of lean clay gray (A-6)	and silt, b	rown and				4	M	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	SS	8					
5 —							7	M	<u>{</u> }	SS	10					
6 - 7 -									\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\							
8 - 9 -	SILTY SAND, fine graine of silt (SM) (A-2-4)	d, brown, 1	moist, lens		COAL	ARSE LUVIUM	11	M	\\ {{\chi}	SS	10					
10	LEAN CLAY, gray and br	ovvm mottle	ad ant		FIN	TC	4	M	1	SS	16					
11 —	(CL) (A-6)	OWII IIIOUIG	eu, son		ALI	LUVIUM	4	M	\mathbb{N}	33	10					
DEPT	H: DRILLING METHOD			WAT	ER LI	EVEL MEA	SURI	EMEN	TS					NOTE:	REFF	R TO
0-9	½' 2.25" HSA	DATE	TIME	SAMPI DEPT	LED TH	CASING DEPTH	CAV	VE-IN PTH	FI	DRILLIN UID LE	NG VEL	WATI LEVE		THE A		
U-91	/ <u>/</u>	5/14/24		11.0		9.5						Non		SHEET	rs foi	R AN
		5/14/24		11.0	0		9	0.0				Non		XPLA	NATIO	ON OF
BORING COMPLI	ETED: 5/14/24												T	ERMIN		
DR: BK	LG: AK Rig: 4													TH	IS LO	G



AE.	Γ JOB NC	P-0025900)				LC	OG OF	BO	RING N	О	B-	-039	(p. 1 c	of 1)	
PRO	OJECT:	Sioux City Gate	way Airpo	ort; Sioux	City,	IA										
SUR	FACE EI	LEVATION:		LATITUE	DE:			LO	NGľ	TUDE:						
DEPT IN FEE	ГН	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SA	AMPLE FYPE	REC		1	1		TESTS
FEE	I .								I SI	IYPE	IIN.	WC	DEN	LL	PL	%-#20
	20'	Bituminous pavement 'Base, fill, mostly silty	sand with	oravel	_	FILL			{ {							
	bro	own (A-1-b)	Suria Willi	514701,				M	[]							
	2 LE 3 - (Cl	AN CLAY, gray and br L) (A-6)	rown mottle	ed, firm		FINE ALLUVIUM	5	M	M	SS	14					
	4 -								1							
	5 —						6	M	M	SS	18					
	6 - 7 -								1							
	8 –						5	M		SS	18					
	9 –								!							
1	0 -						5	M		SS	18					
1	1 EN	D OF BORING			(////											
12/20/24																
VELL.GDT																
T+CPT+V																
RT.GPJ AE																
Y AIRPOR																
GATEWA																
CORPW-IAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24																
[DEPTH:	DRILLING METHOD			WAT	 ER LEVEL ME <i>l</i>	 ASURI	EMEN] TS					NOTE:	REEL	R TO
NG P-00.	0-91/2'	2.25" HSA	DATE	TIME	SAMPI DEPT		_	VE-IN EPTH	_	ORILLIN UID LE	NG VEL	WATI LEVE		THE A		
Į-LO Į-LO			5/13/24		11.0	9.5						Non	e	SHEET	ſS FOI	R AN
Y-K			5/13/24		11.0	0	9	0.0				Non		EXPLA		
BO CO	RING MPLETE	D: 5/13/24											T			GY ON
	: BK 1	LG: AK Rig: 4												TH	IS LO	G

03/2011



	AET JO	B NO: P-002590 0)					LC	G OF	ВО	RING N	О	B-	040 ((p. 1 c	of 1)	
	PROJEC	Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
		CE ELEVATION:		LATITUD	E:				LO	NGI	TUDE:		1				
	DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GE	EOLOGY	N	MC	SĄ	AMPLE ΓΥΡΕ	REC			1		TESTS
-	FEET	FILL, mostly fat clay, brow	un and aray	z (A 7 6)		FILI	r					111.	WC	DEN	LL	PL	%-#20 0
	1 —	TILL, mostry fat clay, brov	wii aliu gray	y (A-7-0)		I IL	L	3	M	V	SS	18					
	1								141		55	10					
	2 —	FAT CLAY, gray and brow	wn mottled	, firm (CH		FIN	E										
	3 —	(A-7-6)				ALI	LUVIUM	5	M	X	SS	18					
	4 —									1							
										17							
	5 —							6	M	X	SS	18					
	6 —									// 扫							
	7 —									1							
	0							7	M		SS						
	8 —																
	9 —									{}							
	10 —	SILT, brown and gray mot (ML/CL-ML) (A-4)	tled, wet, v	very loose				3	M/W		SS	18					
	11 -							3	1V1/ VV	Λ	33	10					
	11	END OF BORING															
4																	
2/20/2																	
3DT 1																	
VELL.																	
ZPT+V																	
AET+(
.GPJ																	
PORT																	
Y AIR																	
TEW																	
₹ Z																	
UX CI																	
00 SIC			T														
AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	DEP	TH: DRILLING METHOD	1		1		EVEL MEA			_			***		NOTE:	REFE	R TO
NG P.	0-9	9½' 3.25" HSA	DATE	TIME	SAMPI DEPT	LED TH	CASING DEPTH	CAV DE	/E-IN PTH	FL	ORILLIN UID LE	NG VEL	WATE LEVE	ER L	THE A	TTAC	HED
4T-LO			5/14/24		11.0	0	9.5	11	1.0				Non		SHEET		
W-L/	DOPE :														XPLA		
COR	BORIN COMP	G LETED: 5/14/24												T			GY ON
AET	DR:	LG: RH Rig: 63													TH	IS LO	ថ



AET JO	OB NO: P-002590 0)					LC	G OF	BO	RING N	O	B-	041 ((p. 1 c	of 1)	
PROJE	Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
	ACE ELEVATION:		LATITUE	E:				LO	NGI	ΓUDE:		1				
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GI	EOLOGY	N	MC	SĄ	MPLE TYPE	REC IN.) & LA			1
FEET	8" Concrete pavement				FIL	ĭ					111.	WC	DEN	LL	PL	%- #200
1 -	0 U.D. (711			[/////	FIN		3	M	V	SS	10					
	LEAN CLAY, dark brown	and brown	n mottled,		AL	LUVIUM		141	\mathbb{N}	55	10					
2 -	- \soft (CL) (A-6) LEAN CLAY, brown mot	tled, firm (CL) (A-6)	J <i> </i>			_		M							
3 -	· ·		, , ,				5	M	M	SS	14					
4 -									X							
_	FAT CLAY, brown and gr	ay mottled	, soft (CH)						13							
5 -	(A-7-6)						3	M	X	SS	18					
6 -									1							
7 -	_								[]							
8 -	SAND WITH SILT, fine g loose (SP-SM) (A-3)	grained, bro	wn, moist	,		ARSE LUVIUM	9	M	X	SS	10					
9 -						LC VICIVI			R							
9-	SILT, brown, moist to wet lean clay and sand (ML) (A	, very loos	e, lenses of		FIN AL	IE LUVIUM			11							
10 -		1 1)					4	M	X	SS	12					
11 -	END OF BORING								H						-	
20/24																
T+WELL.GDT 12/20/24																
ELL.GE																
PT+W																
ET +C																
GPJ A																
PORT																
AY AIR																
ATEW/																
<u>9</u> \																
XNOI																
CORP W-LAT-LONG P-00255000 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CP-	 PTH: DRILLING METHOD			WAT	FR I	EVEL MEA	SIDE	MEN	 7T						<u></u>	
P-002		DATE	TIME	SAMPI DEPT		CASING DEPTH		/E-IN PTH	_	ORILLIN UID LE	NG	WATE LEVE			REFE TTAC	
<u>0</u>	-9½' 2.25" HSA	5/16/24	THVIE	DEPT 11.0	-	9.5	DE	PTH	FL	UID LE	VEL	Non			TS FOF	
-TAT-		5/16/24		11.0		7.5	q	.0			-	Non			NATIC	
BORII	NG PLETED: 5/16/24	J/ 10/27		11.(_	••			+	1 1011			OLOC	
. 4	BK LG: AK Rig: 4													TH	IS LO	G

03/2011



Note	AET J	JOB NO: P-002590	0					LC	G OF	ВО	RING N	О	B-	042 ((p. 1 c	of 1)	
DEPTH FIET	PROJ	Sioux City Gate	eway Airpo	ort; Sioux	City,	IA											
FEET MATERIAL DESCRIPTION GEOLOGY N MC TYPE IN. WC DEN LL PL %#. 9" Concrete pavement FILL, mixture of lean clay and fat clay, brown and gray (A-6) 4 M SS 16 4 M SS 14 R SANDY SILT, brown, moist, loose (ML (A-4) SANDY SILT, brown, moist, loose (ML (A-4) SILTY SAND, fine grained, brown, moist, loose (SM) (A-2-4) END OF BORING				LATITUD	E:	1			LO	NGI	ΓUDE:						
9" Concrete pavement 1	DEPTH IN	H MATERIAL	DESCRIPTION	ON		G	EOLOGY	N	MC	SĄ	MPLE	REC		1		I	1
FILL, mixture of lean clay and fat clay, brown and gray (A-6) 4 M SS 16 4 M SS 14 5 - 4 M SS 12 5 - 5 - 4 M SS 12 6 - 7 - SANDY SILT, brown, moist, loose (ML (A-4) MLUVIUM ALLUVIUM ALLUVI	FEET					FII	I.			LY.		11 11	wc	DEN	LL	PL	V₀-#200
2 - and gray (A-6)	1	1	v and fat cla	ıv brown		-			M	<u>}</u>							
3 -		and gray (A-6)	, and lat or	.,, 5161				4	M	M	SS	16					
4 M SS 14 5 -	2																
5 - 6 - 7 - SANDY SILT, brown, moist, loose (ML (A-4) MIXED ALLUVIUM 6 M SS 14	3	-						4	M		SS	14					
SANDY SILT, brown, moist, loose (ML (A-4) 8 - 9 - SILTY SAND, fine grained, brown, moist, loose (SM) (A-2-4) 10 - END OF BORING ALLUVIUM ALLUVIUM ALLUVIUM SS 12 MIXED ALLUVIUM 6 M SS 14 Final COARSE ALLUVIUM 7 M SS 16	4	_															
SANDY SILT, brown, moist, loose (ML (A-4) 8 - 9 - SILTY SAND, fine grained, brown, moist, loose (SM) (A-2-4) 10 - END OF BORING ALLUVIUM ALLUVIUM ALLUVIUM SS 12 MIXED ALLUVIUM 6 M SS 14 Final COARSE ALLUVIUM 7 M SS 16	5									51							
SANDY SILT, brown, moist, loose (ML (A-4) 8 -	,							4	M	X	SS	12					
8 - SILTY SAND, fine grained, brown, moist, loose (SM) (A-2-4) 10 - 7 M SS 16 END OF BORING	6									1							
SILTY SAND, fine grained, brown, moist, loose (SM) (A-2-4) 10 - 7 M SS 16 END OF BORING	7	SANDY SILT, brown, m	oist, loose (ML (A-4)		MI AL	XED LUVIUM			[1]							
9 - SILTY SAND, fine grained, brown, moist, loose (SM) (A-2-4) 10 - 7 M SS 16 END OF BORING	8							6	M	X	SS	14					
SM) (A-2-4)		SILTY SAND, fine grain	ed, brown, 1	moist, loose	e			1		H							
END OF BORING	9	(SM) (A-2-4)				AL	LUVIUM			1							
END OF BORING	10	-						7	M	X	SS	16					
	11	END OF BORING								H							1
EWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24		En de de Boran de															
EWAY AIRPORT GPJ AET+CPT+WELL,GDT 1220/24																	
EWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12%	20/24																
EWAY AIRPORT.GPJ AET+CPT+WELL.GD	12/2																
EWAY AIRPORT.GPJ AET+CPT+WE	ILL.GD																
EWAY ARPORT.GPJ AET+CF	T+WE																
EWAY AIRPORT.GPJ A	ET+CF																
EWAY AIRPORT.	GPJ A																
EWAY AIR	PORT.																
	Y AIR																
	TEWA																
	<u></u>																
	OUXC																
DEPTH. DRILLING METHOD WATER LEVEL MEASUREMENTS	IS 0008	EDTH. DRILLING ACTUON			337.4.75	EPI	EMEL ME 4	CIDI	יי אידוע או	TC							
DEPTH: DRILLING METHOD WATER LEVEL MEASUREMENTS NOTE: REFER TO SAMPLED CASING CAVE-IN DRILLING WATER THE ATTENT OF THE PROPERTY OF THE ATTENT	P-0025	EFIH: DKILLING METHOD	D. A. TITE	TD C				1		_	ORILLIN	NG	WATE				
DATE TIME SAMPLED CASING CAVE-IN DRILLING WATER LEVEL THE ATTACHED DEPTH DEPTH DEPTH FLUID LEVEL SHEETS FOR AN SHEETS FOR AN	900	0-9½' 3.25" HSA		TIME						FĹ	UID LE	VEL					
5/15/24 11.0 9.5 11.0 None SHEETS FOR AN EXPLANATION O	-LAT-L		5/15/24		11.0	U	9.5	13	1.0				Non				
BORING COMMITTEE 5/15/24 TERMINOLOGY O	BORI	ING															
THIS LOG	□ DR·																

03/2011



	AET JO	B NO: P-0025900	1				LC	OG OF	BO	RING N	O	B-	043	(p. 1 c	of 1)	
	PROJEC	Sioux City Gatev	way Airpo	ort; Sioux	City,	IA										
		CE ELEVATION:		LATITUD	DE:	I		LO	NGI	ΓUDE:		I				
	DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SA	MPLE YPE	REC				I	TESTS
ŀ	FEET	Frozen to 2"							L)		111.	WC	DEN	LL	PL	%-#200
	1 -	1102011 10 2						F/M	<u>}</u>							
	2 —	LEAN CLAY, brown and	oray firm	to stiff	////	FINE	1		H							
	3 —	laminations of silt (CL) (A	-7-6) (poss	sible fill		ALLUVIUM OR FILL	7	M		SS	12	25				
	4 —								1							
	5 — 6 —						9	M	A	SS	12	18				
	7 —								1							
	8 –	SANDY SILT, light brown medium dense (SM) (A-4)	n, moist, lo	oose to		FINE ALLUVIUM	9	M		SS	12					
	9 —								1							
	10 —						13	M	X	SS	12					
	11 -								[]							
	12 -								}							
12/20/24	13 — 14 —	SAND, fine grained, light laminations of silt (SP) (A-	brown, mo -3)	oist, loose,		COARSE ALLUVIUM			! }							
ELL.GDT	15 —						8	M	M	SS	11					
T+CPT+W	16 —								/\ {}							
T.GPJ AE	17 —								\{\}							
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT GPJ AET+CPT+WELL GDT 12/20/24	18 — 19 —	SAND WITH SILT, fine g loose, laminations of sandy	grained, bro silt (SP-S	own, moist, SM) (A-3)	,				} } }							
GATEWA	20 -						7	M	\ \{\}	SS	10					
TID XUC	21 —	END OF BORING					/	IVI	А		10					
)IS 006		THE DRIVE DISCUSSION OF THE PROPERTY OF THE PR					Gr TE									
-0025	DEP	TH: DRILLING METHOD			1	ER LEVEL MEA	1		_	או ז וואל	JG	WATE		NOTE:		
J DNC	0-19	9½'	DATE	TIME	SAMPI DEPT	ED CASING TH DEPTH	DE	VE-IN PTH	FL	ORILLIN UID LE	VEL	WATE LEVE		ГНЕ А		
LAT-L														SHEET XPLA1		
RP W-	BORIN	G 11/25/24														GY ON
AET_CO	COMPI DR:	LETED: 11/25/24 LG: Rig:											\dashv		IS LO	



AET	JOB NO: P-0025900)				LC	OG OF	BOI	RING N	О	B-	044 ((p. 1 c	of 1)	
PRO.	Sioux City Gates	way Airpo	ort; Sioux	City,	IA										
SURF	FACE ELEVATION:		LATITUD	E:			LO	NGI	ΓUDE:		1				
DEPTI IN FEET	H MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SA	MPLE YPE	REC) & LA			
FEET	Frozen to 1.5"							' 	IIL	111.	WC	DEN	LL	PL	% -#200
							F/M	}							
1							F/IVI	{}							
2	LEAN CLAY, grayish bro	wn and lig	ht brown,		FINE	1		<u>{1</u>							
3	firm, lenses and lamination	ns of silt (Č	CL) (A-7-6		ALLUVIUM OR FILL	6	M	X	SS	12	26				
								R							
4	LEAN CLAY, grayish bro	vva fimo (1	CI)(A 7.6		FINE	-		1							
5	LEAN CLAT, grayish bro	wn, mm (CL) (A-7-0 _.) /////	ALLUVIUM	6	M	X	SS	18	35				
6															
7	LEAN CLAY, brown and	grayish bro	own					}							
	mottled, firm, laminations SILT WITH SAND, brown					8	M	M	SS	8	31				
8	$= \frac{\text{SILT WITH SAND, blown}}{\text{(A-4)}}$	ii, iii0ist, ic	ose (MIL)			0	IVI		33	8	31				
9	_							}							
10															
						10	M	X	SS	10	25				
11								P							
12	_							}							
13								{ }							
20/24	SAND, fine grained, light (SP) (A-3)	brown, mo	oist, dense		COARSE ALLUVIUM			${}$							
14								\mathbb{Z}							
15	-					31	M	\mathbb{N}	SS	8					
₹ † 16								\square							
TET +C								{ }							
4 ☐ 17								${}$							
18	SILTY SAND, fine graine	d, brown, 1	moist,					${}$							
¥ N 19	medium dense (SM) (A-2-	4)	ŕ					X							
TEW 30								H							
20 <u>≥</u>						15	M	X	SS	8					
21	END OF BORING							\cap							
000 810															
D -0025	EPTH: DRILLING METHOD			ı	ER LEVEL MEA	1		_	ADII I IN	JC	WATI		NOTE:		
<u>0</u>	-19½'	DATE	TIME	SAMPI DEPT	CED CASING DEPTH	DE	VE-IN PTH	FĽ	ORILLIN UID LE	VEL	WATE LEVE		ГНЕ А		
LAT-LC													SHEET VDI A1		
CONP W-LAT-LONG P-00255000 SIOUX CITY GATEWAY AIRPORT GPJ AETT-CPT-WELL.GDT 12/20/24 12/20/24 12/20/24 12/20/24 12/20/24 12/20/24	ING												XPLAI ERMIN		ON OF GY ON
S CON	MPLETED: 11/25/24													IS LO	
₽ DR:	LG: Rig:												411		•



AET JO	DB NO: P-0025900	1				LC	OG OF	BOI	RING N	O	B-	045 (p. 1	of 1)	
PROJEC	CT: Sioux City Gatev	way Airpo	ort; Sioux	City, l	ÍA										
	CE ELEVATION:		LATITUD	E:			LO	NGIT	ΓUDE:		I				
DEPTH IN FEET	MATERIAL D	DESCRIPTIO	ON		GEOLOGY	N	MC	SĄ	MPLE YPE	REC					TESTS
FEET								121	IFE	IN.	WC	DEN	LL	PL	%-#200
1 - 2 -	LEAN CLAY, grayish bro	wn and ligh	ht brown,		FINE ALLUVIUM			\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\		_					
3 - 4 - 5 -	stiff, lenses of silt (CL) (A	-/-6 and A	-6)		ALLOVION	9	M	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	SS	7	17				
6 -	SILTY SAND, fine grained	d, brown, r	noist, loose		COARSE	9	M	\ \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	SS	10	26				
8 —	(SM) (A-2-4)				ALLUVIUM	7	M	\ \ \{\	SS	8					
9 -	SILT, brown, moist to wet, clay and lean clay (ML) (A	ses of silty		FINE ALLUVIUM	7	M/W	1	SS	9	30					
00 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	DEPTH: DRILLING METHOD														
DEP DEP	DEPTH: DRILLING METHOD				ER LEVEL MEA				. n. r	,, T	****		NOTE:	REFE	R TO
ල් 0 -:	9½'	DATE	TIME	SAMPL DEPT	ED CASING H DEPTH	CAV DE	/E-IN PTH	FL	ORILLIN UID LE	VEL	WATE LEVE	ER ,	ГНЕ А	TTAC	HED
AT-LOI													SHEET		
A DCDE													XPLA		
	IG LETED: 11/16/24											TI			GY ON
b DR: 03/2011	LG: Rig:											IS LO	G √R-060		



	AET JO	DB NO: P-0025900	1				LC	G OF	BO	RING N	О	B-	046	(p. 1 c	of 1)	
	PROJEC	Sioux City Gates	way Airpo	ort; Sioux	City,	IA										
	SURFA	CE ELEVATION:		LATITUD	E:	I		LO	NGI	TUDE:						
	DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SA	MPLE TYPE	REC					TESTS
	FEET									ITE	IIN.	WC	DEN	LL	PL	%-#200
	1 —								}							
	2 — 3 —	LEAN CLAY, brown and laminations of silt (CL) (A	light brown -6 and A-4	n, firm,		FINE ALLUVIUM	7	M	X	SS	6	20				
	4 — 5 —	SILT, light brown, moist, l (ML) (A-4)	oose to me	dium dense	:	FINE ALLUVIUM OR LOESS			!							
	6 —					OR EGES	7	M	\ {{	SS	12	6				
	7 — 8 —						14	M		SS	7	8				
	9 — 10 —	SILTY SAND, fine graine	d, light bro	wn, moist.		COARSE ALLUVIUM	13	M	\{\frac{1}{2}}	SS	12					
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	11 —	medium dense (SM) (A-2-END OF BORING	.,		7.4	OR LOESS										
900 SIOUX CITY GATEWAY																
-00258	DEP	TH: DRILLING METHOD				ER LEVEL MEA	_		_	N 11 1 1	IC.	177 A TOTAL		NOTE:	REFE	R TO
NG P.	0-9	9½'	DATE	TIME	SAMPI DEPT	ED CASING H DEPTH	CAV DE	/E-IN PTH	FL	ORILLIN UID LE	VEL	WATE LEVE		THE A		
AT-LO														SHEET		
PW-L	BORIN	[G												XPLA1		
COR	COMP	LETED: 11/16/24														GY ON
AET	DR:	LG: Rig:												111	IS LO	J



	AET JC	OB NO: P-0025900)				LC	G OF	ВО	RING N	О	B-	047	(p. 1 c	of 1)	
	PROJEC	Sioux City Gate	way Airpo	ort; Sioux	City,	IA										
	SURFA	CE ELEVATION:		LATITUD	E:	T		LO	NGI	TUDE:						
	DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SĄ	AMPLE ГҮРЕ	REC					TESTS
	FEET									IIFE	IIN.	WC	DEN	LL	PL	%-#200
	1 -								}							
	1								}							
	2 -	LEAN CLAY, trace roots, and brown mottled, stiff, la	dark grayi	sh brown		FINE			21							
	3 -	and brown mottled, stiff, la (A-7-6)	aminations	of silt (CL)) ////	ALLUVIUM	9	M	X	SS	10	26				
	4 -								1							
		LEAN CLAY, trace roots, brown, stiff, laminations o	brown and f silt (CL)	l light (A-7-6)					17							
	5 —		,	,			9	M	X	SS	12	31				
	6 -								H							
	7 —	SILTY SAND, fine graine medium dense to loose, lar	d, light bro	own, moist,					1							
	8 -	(SM) (A-2-4)	illiations C	n sandy sin			11	M	X	SS	14					
	8 -															
	9 –								}							
	10 -						7	M	M	SS	12					
	11 -							IVI	Δ	55	12					
		END OF BORING														
24																
12/20/2																
GDT																
WELL																
+CPT+																
J AET																
RT.GP.																
IRPOF																
WAY A																
GATE)																
S																
SIOUX																
25900	DEF	TH: DRILLING METHOD			WAT	L ER LEVEL MEA	L ASURI	L EMEN	TS		<u> </u>			l NOTE:	REEE	R TO
, P-00			DATE	TIME	SAMPI DEPT	1	1	/E-IN PTH	I	DRILLII UID LE	NG VET	WATE LEVE		юте. ГНЕ А		
-LONG	0-	9½'			DELI	II DEFIN	DE	1 1111	FL	OID LE	VEL	LEVE		SHEET		
V-LAT-													-	XPLA	NATIO	ON OF
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	BORIN COMP	IG LETED: 11/16/24											T	ERMIN	(OLO	GY ON
AET C	DR:	LG: Rig:												TH	IS LO	3



	AET JC	DB NO: P-0025900	ı				LC	G OF	BO	RING N	О	B-	048 ((p. 1 c	of 1)	
	PROJE	Sioux City Gates	way Airpo	ort; Sioux (City,	IA										
	SURFA	CE ELEVATION:		LATITUDE	E:	T		LO	NGľ	ΓUDE:		ı				
	DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SA	MPLE TYPE	REC					TESTS
ŀ	FEET								L)		1111.	WC	DEN	LL	PL	%-#200
	1 —								1							
	2 — 3 —	LEAN CLAY, brown and reddish brown mottled, firm	grayish brond to stiff (own, a little CL) (A-7-6)		FINE ALLUVIUM	8	M		SS	12	35				
	4 — 5 —						9	M	\{\{\}	SS	13	33				
	6 —	SAND WITH SILT, fine g reddish brown mottled, mo	rained, bro	own and		COARSE			\ {}	55						
	7 — 8 —	reddish brown mottled, mo (A-2-4)	ist, loose ((SP-SM)		ALLUVIUM	8	M		SS	14					
	9 — 10 —	LEAN CLAY, gray and re soft, lenses of silt and lami	ddish brow	n mottled,		FINE	3	M	{} \/	SS	12	32				
24	11 -	soft, lenses of silt and lami (A-6) END OF BORING	nations of	sand (CL)		ALLUVIUM										
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24																
J AET+CPT+V																
Y AIRPORT.GF																
CITY GATEWA																
SIOUX																
25900	DEP	TH: DRILLING METHOD			WAT	L ER LEVEL ME <i>A</i>	SURE	EMEN	TS		I	I.	N	NOTE:	REFF	R TO
3 P-00	n	9½'	DATE	TIME	SAMPI DEPT	LED CASING TH DEPTH	CAV	/E-IN PTH	FI	ORILLIN UID LE	NG VEL	WATE LEVE		ТНЕ А		
-LON(U -,	<i>)</i>												SHEET	S FOF	R AN
W-LA													E	XPLA	NATIO	ON OF
CORP	BORIN COMP	IG LETED: 11/16/24											T			GY ON
AET_	DR:	LG: Rig:												TH	IS LO	3



AET JO	OB NO: P-0025900	1				LC	G OF	BO	RING N	О	B-	049 ((p. 1 c	of 1)	
PROJE	Sioux City Gates	way Airpo	ort; Sioux	City,	IA										
SURFA	ACE ELEVATION:		LATITUD	E:	1		LO	NGI	ΓUDE:		1				
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SA	MPLE TYPE	REC		1			TESTS
FEET	LEAN CLAY, trace roots,	brown (CI	(4.6)	V////	FINE					111.	WC	DEN	LL	PL	%-#200
1 -	(tilled field)	orown (Cr	2) (A-0)		ALLUVIUM OR FILL		M	}}							
2 -	LEAN CLAY, dark brown	, firm (CL)) (A-6)		TOPSOIL			3							
3 -	LEAN CLAY, brown, firm	n (CL) (A-6	5)		FINE ALLUVIUM	7	M	X IZ	SS	12					
5 -	FAT CLAY, grayish brown	n and brow	n mottled,					<u>}</u>							
6 -	firm (CH) (A-7-6) SILT, brown, moist, loose	(ML) (A-4	+)			8	M	X F3	SS	14					
7 -	SANDY SILT, brown, mo	ist, mediun	n dense to		-			<u></u>							
8 -	loose (ML) (A-4)					11	M	X FT	SS	12					
9 -								₹ <u>₹</u>	gg	12					
11 -	END OF BORING					9	M	\mathbb{N}	SS	12					
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 OO GOOD SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24															
DE 25900	PTH: DRILLING METHOD			WAT	L ER LEVEL MEA	L SURI	L EMEN	TS		<u> </u>	<u> </u>		l NOTE:	REEE	R TO
P-00.		DATE	TIME	SAMPI DEP	1	1	VE-IN PTH	т —	ORILLIN UID LE	NG VET	WATE LEVE		юте. ГНЕ А		
	-9½'			DEP	DEFIN	DE	1 111	I'L	OID LE	V LL	Non		SHEET		
W-LAT													XPLA	NATIO)N OF
BORII COMI	NG PLETED: 5/17/24											TI	ERMIN	OLO	GY ON
DR:	LG: Rig:												TH	IS LO	3

03/2011



AET JO	DB NO: P-0025900)				LC	G OF	ВО	RING N	O	B-	050	(p. 1 d	of 1)	
PROJE	CT: Sioux City Gates	way Airpo	ort; Sioux	City,	IA										
SURFA	CE ELEVATION:		LATITUE	DE:	T		LO	NGI	TUDE:		1				
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SĄ	AMPLE ΓΥΡΕ	REC					TESTS
FEET	8.5" Concrete pavement				FILL					111.	WC	DEN	LL	PL	%-#20 0
1 -	GY T 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	loose, lense	es of lean		FINE ALLUVIUM	9	M		SS	18					
2 -	SILT, brown, moist, very l	oose (ML)	(A-4)		_			$\left(\cdot \right)$							
3 -		, ,				4	M		SS	14					
4 5	LEAN CLAY, brown, soft	t (CL) (A-6	5)					\{\}							
6 -						4	M		SS	16					
7 -								{}							
8 -						3	M	\[\]	SS	12					
9 –	FAT CLAY, gray and brow lenses of lean clay (CH) (A	wn mottled	, firm,					1							
10 -] () () (-	- , ,				5	M	X	SS	12					
11 -	END OF BORING							\cap							
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 GORD W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24															
DEI	TH: DRILLING METHOD			WAT	ER LEVEL ME	 ASURI	 EMEN	TS					NOTE:	REFE	R TO
0-d 9NG 0-	9½' 2.25" HSA	DATE	TIME	SAMPI DEPT		CAV DE	VE-IN PTH	FL.	ORILLIN UID LE	NG VEL	WATE LEVE	ER EL	THE A	TTAC	HED
LAT-LC		5/16/24		11.0							Non		SHEET		
BORIN	NG	5/16/24		11.0	J	9	0.0	-			Non		EXPLAI ERMIN		ON OF GY ON
S COMP	LETED: 5/16/24							-						IS LO	
₽ DR: B	K LG: AK Rig: 4			1		1						1			

03/2011



A	ET JO	B NO: P-002590 0)					LO	G OF	ВО	RING N	О	B-	051 ((p. 1 d	of 1)	
P	ROJE	Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
		CE ELEVATION:		LATITUDI	E:	1			LO	NGI	TUDE:		1				
DE	PTH IN EET	MATERIAL I	DESCRIPTIO	ON		GI	EOLOGY	N	MC	SĄ	AMPLE FYPE	REC					TESTS
FI	EET	12" Concrete pavement				FIL	L					1111	WC	DEN	LL	PL	%-#200
	1 -	8" Base fill, mostly silty sa	and with or	avel brown		-		8	M		SS	16					
	2 -	$\neg (A-2-4)$								\square							
	3 —	FILL, mixture of sandy leads brown and gray (A-6 and A	an clay, silt A-4)	y sand,				10	M	\mathbb{N}	SS	16					
	4 —									1							
	5 —	LEAN CLAY, brown and lenses of fat clay and lamin	gray mottle	ed, firm, silt (CL)		FIN ALI	IE LUVIUM	5	M		SS	16					
	6 — 7 —	(A-6)		,						1							
	8 —							5	M		SS	16					
	9 –									}							
	10 -							5	M	\bigvee	SS	16					
	11 -	END OF BORING			_////	1				H							+
2/20/24																	
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24																	
-CPT+WE																	
3PJ AET+																	
IRPORT.0																	
IEWAY A																	
CITY GAI																	
SIOUX																	
025900	DEP	TH: DRILLING METHOD			WAT	ER L	EVEL MEA	SURE	EMEN	TS	<u> </u>	<u> </u>	I		NOTE:	REFE	R TO
NG P-00	0-9	9½' 2.25" HSA	DATE	TIME	SAMPI DEPT	LED TH	CASING DEPTH	CAV DE	/E-IN PTH	FL.	DRILLIN UID LE	NG VEL	WATE LEVE		THE A		
AT-LO			5/16/24		11.0	0	9.5						Non		SHEET		
W.L.	ODIN	G	5/16/24		11.0	0		9	.0				Non		XPLA1		
		LETED: 5/16/24												$ \mid$ ^T			GY ON
I de)R: B	K LG: AK Rig: 4													111	IS LO	J



	AET JO	B NO: P-0025900)					LO	G OF	BO	RING N	O	B-	052	(p. 1 c	of 1)	
	PROJEC	Sioux City Gates	way Airpo	ort; Sioux	City,	IA											
		CE ELEVATION:		LATITUI	DE:	T			LO	NGI	ΓUDE:						
	DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOG	GY	N	MC	SA	MPLE YPE	REC			BORAT		
	FEET	FILL, mostly lean clay, gra	av gravich	brown		FILL				LYI		111.	WC	DEN	LL	PL	%-#20 0
	1 -	trace roots	iy, grayisii	orown,		TILL				}							
										}							
	2 –									21							
	3 –	FILL, mostly silty sand with (A-2-4)	th gravel, b	orown				7	M	M	SS	10					
	4 -	· · · ·								13							
		FAT CLAY, gray, firm, lead of lean clay and silt (CH) (nses and la (A-7-6)	minations		FINE ALLUVIU	JM			17							
	5 —	,	,					7	M	X	SS	12					
	6 -									H							
	7 –									乜							
								6	M	M	SS	12					
	8 -									\square							
	9 –									{}							
	10 -							7	M	M	SS	12					
	11 -							/	M	Μ		12					
		END OF BORING															
4																	
2/20/2																	
3DT 1																	
VELL.																	
CPT+V																	
AET+C																	
GPJ																	
PORT																	
Y AIR																	
TEW/																	
√2 T																	
UXC																	
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24			1											<u> </u>			
00259	DEP	TH: DRILLING METHOD			_	ER LEVEL				1	N FT = -	16	*** -		NOTE:	REFE	R TO
NG P-	0-9	9½'	DATE	TIME	SAMPI DEPT	ED CASI H DEP	NG TH	CAV DE	E-IN PTH	FL	ORILLIN UID LE	NG VEL	WATE LEVE	ER L	THE A	TTAC	HED
4T-LO													Non		SHEET		
/ 7- M ∈	Dobas														XPLA		
		G LETED: 5/14/24												T.	ERMIN		
AET		LG: Rig:													TH	IS LO	j



AET JO	OB NO: P-0025900)					LO	G OF	ВО	RING N	О	B-	053	(p. 1 c	of 1)	
PROJE	CT: Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
	CE ELEVATION:		LATITUDI	E:				LO	NGI	TUDE:		1				
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GE	EOLOGY	N	MC	SĄ	AMPLE FYPE	REC IN.	_				TESTS
FEET	16" Concrete pavement				FIL	L			1 /			WC	DEN	LL	PL	%-#20 0
1 -						_	20	M	V	SS	16					
	7" Base fill, mostly recycle with a piece of geo fabric,	ed concrete	and gravel						\mathbb{N}							
2 -	With a piece of geo fabric, FILL, mixture of lean clay	light brown clayey sai	n (A-1-b) nd and silt	-/			1.4	M	M	CC	10					
3 -	FILL, mixture of lean clay with pieces of concrete, br brown	own, gray	and light				14	M	\mathbb{N}	SS	18					
4 -	- Orown								}							
5 -																
							17	M	M	SS	8					
6 -									F							
7 -	_								17							
8 -	LEAN CLAY, brown, firm	n (CL) (A-	6)		FIN ALI	E LUVIUM	5	M	X	SS	10					
9 –	_								13							
									17							
10 -							5	M	X	SS	14					
11 -	END OF BORING								\cap							
2/20/24																
3DT 13																
WELL.C																
CPT+																
AET+																
KT.GPJ																
AIRPOF																
WAY A																
GATE																
X C C																
nois c																
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 O	PTH: DRILLING METHOD					EVEL MEA	1		_				1	NOTE:	REFE	R TO
일 0-	-9½' 2.25" HSA	DATE	TIME	SAMPI DEPT	LED TH	CASING DEPTH	CAV DE	Æ-IN PTH	FL.	DRILLIN UID LE	NG VEL	WATE LEVE	ER L	THE A	TTAC	HED
AT-LOI		5/16/24		11.0	0	9.5						Non		SHEET		
DODIN	NG	5/16/24		11.0	0		9	.0				Non		XPLA1		
	NG PLETED: 5/16/24				_								— ^{TI}	ERMIN TH	IOLOC IS LOC	
₽ DR: B	BK LG: AK Rig: 4													111	io LUC	J



	AET JO	B NO: P-0025900	1					LO	G OF	BO	RING N	О	B-	054	(p. 1 c	of 1)	
	PROJEC	Sioux City Gatev	way Airpo	ort; Sioux	City,	IA											
		CE ELEVATION:		LATITUD	E:				LO	NGI	ΓUDE:						
D	EPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		G	EOLOGY	N	MC	SA	MPLE YPE	REC IN.			BORAT		
H'	FEEI	14' Concrete pavement				FII	L			IAI		12.11	WC	DEN	LL	PL	%-#200
	1 -	Tr Concrete pavement								<u>}</u>							
		FILL, mostly gravel with s (A-1-b) (apparent base)	ilt and san	d, brown						}							
	2	FILL, mixture of fat clay, 1	ean clay a	nd a little	1			1.0		M	aa	1.0					
	3 —	silt, gray and brown (A-7-6	5)					10	M	M	SS	12					
	4 -									X							
	_									17							
	5 —							5	M	X	SS	12					
	6 –									R							
	7 -									1							
	8 —							4	M	X	SS	12					
		LEAN CLAY, gray and br lenses of silty sand (CL) (A	own mottle A-6)	ed, soft,		FIN AL	NE LUVIUM			H							
	9 –	(02)	2 0)							1							
	10 —	SILTY SAND, fine graine	d. brown. 1	moist. loos	e	CO	ARSE	5	M	M	SS	8					
	11 —	(SM) (A-2-4)	, 010, 1			AL	LUVIUM			\mathbb{N}							
		END OF BORING															
24																	
12/20/																	
GD.																	
WELL																	
+CPT																	
- AET																	
T.GPJ																	
IRPOR																	
WAY A																	
SATEV																	
CITY C																	
X N O																	
5900 8	DEP	TH: DRILLING METHOD			WAT	ER I	EVEL MEA	SURF	 EMEN	∐ TS					LOTE	DEFF	D TO
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24			DATE	TIME	SAMP DEP				E-IN PTH	т —	ORILLIN UID LE	NG_	WATE LEVE		NOTE: THE A		
ONG	0-9	9½'	DATE	THVIL	DEP	ſΉ	DEPTH	DE.	PTH	FL	UID LE	VEL		_	THE A SHEET		
-LAT-L													Non		XPLA		
ORP W	BORIN	G LETED: 5/16/24													ERMIN		
<u>-1</u>	DR:	LETED: 5/16/24 LG: Rig:													TH	IS LO	ĵ

03/2011



AE	Т ЈО	B NO:	P-0025900)					LC	G OF	BO	RING N	О	B-	055 ((p. 1 c	of 1)	
PR	OJEC	CT:	Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
		CE ELI	EVATION:		LATITUD	E:				LO	NGI	ΓUDE:		1				
DEP IN FEI	TH 1		MATERIAL I	DESCRIPTIO	ON		G	EOLOGY	N	MC	SA	MPLE TYPE	REC					TESTS
FEI	ET	14"	Concrete pavement				FIL	T			 		111.	WC	DEN	LL	PL	%-#200
	1 -	17	concrete pavement				111				}							
		11.5	" FILL, mostly gravel crete and a piece of geo	with pieces	s of					м	M	SS	12					
	2 –	\redc	lish brown			_/				M	A	33	12					
	3	\FIL	L, mixture of fat clay a y, gray and brown (A-7	nd lean cla -6)	y, dark		FIN	JE	_	M	M	SS	16					
	4 –	FA	ΓCLAY, gray and brow	wn mottled	, firm (CH)		AL	LUVIUM										
	_	(A-7	/-6)								17							
	5 –								7	M	X	SS	18					
	6 –										1							
	7 -										13							
	8 –								7	M	X	SS	18					
											H							
	9 —	LEA	AN CLAY, brown and	gray mottle	ed, firm						团							
1	10 -	(CL) (A-6)						7	M	M	SS	17					
1	11 -	TAII	D OF BORING				_				\mathbb{N}							
		ENI	D OF BURING															
/24																		
12/20																		
-GDT																		
+WELL																		
-t-CPT																		
J AEI																		
RT.GF																		
AIRPO																		
EWAY																		
GATE																		
X E																		
NOIS																		
AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 G	DEP	TH:	DRILLING METHOD			WAT	ER L	EVEL MEA	SURE	EMEN	TS			•	1	NOTE:	REFE	R TO
G P-0	0-0	9½'	3.25" HSA	DATE	TIME	SAMPI DEPT	LED	CASING DEPTH	CAV DE	/E-IN PTH	FL	ORILLIN UID LE	NG VEL	WATE LEVE	ER L	ГНЕ А	TTAC	HED
N L LON	U -2	- / 4	21011	5/15/24		11.0		9.5		1.0				Non		SHEET	S FOI	R AN
W-LA															E	XPLA	NATIO)N OF
S CC	ORIN OMPI	G LETED	D: 5/15/24												T			GY ON
₩ DF	₹:	L	G: RH Rig: 63													TH	IS LO	Ĵ

03/2011



AE	T JO	B NO:	P-0025900)					LO	G OF	BO	RING N	О	B-	056	(p. 1 c	of 1)	
PR	OJEC	CT:	Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
		CE EL	EVATION:		LATITUE	DE:				LO	NGI	TUDE:		1				
DEP IN FEI	TH		MATERIAL I	DESCRIPTIO	ON		GE	EOLOGY	N	MC	SA	MPLE ΓΥΡΕ	REC IN.			1		TESTS
FEI	21	11.2	25" Concrete pavement	<u> </u>			FIL	L			 }			WC	DEN	LL	PL	%-#20 0
	1 -		L, mostly silty sand, br		4)						1							
									6	M	\mathbb{N}	SS	13					
	2 –	FIL	L, mostly fat clay, dark	gray (A-7	-6)						\square							
	3		CLAY, gray and brow	wn mottled	, firm (CH		FIN	E	7	M	X	SS	17					
	4	(A-	7-6) AN CLAY, brownish g	rav and gra	v mottled.		ALI	LUVIUM			H							
	5 –	firn	n (CL) (A-6)	, g	.,				_		M	aa	1.0					
	6 –								5	M	\mathbb{N}	SS	18					
	0 7										}							
	7 –																	
	8 –								5	M	M	SS	15					
	9	CAI	NDY SILT, grayish bro	aven moist	loogo						[]							
	10 –	(MI	L) (A-4)	owii, iiioist,	10086													
									5	M	M	SS	18					
	11 +	EN.	D OF BORING															
4																		
12/20/2																		
GDT 1																		
WELL.																		
+CPT+																		
J AET																		
RT.GP.																		
AIRPO																		
:WAY																		
GATE																		
X E																		
0 SIOL																		
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	DEP'	TH:	DRILLING METHOD			1		EVEL MEA	1		т —					NOTE:	REFE	R TO
NG P.	0-9)¹/₂'	3.25" HSA	DATE	TIME	SAMPI DEPT	LED TH	CASING DEPTH	CAV	/E-IN PTH	FL	ORILLIN UID LE	NG VEL	WATE LEVE	ER L	THE A	TTAC	HED
AT-LO				5/15/24		11.0	0	9.5	11	1.0				Non			rs for	
N DC	ORIN	G															NATIO	
	OMPI	LETEI									_				-		IOLOG IS LOG	
₽ DI	₹:	L	G: RH Rig: 63													ΙП	וט בטל	J



AET J	OB NO:	P-0025900)				LC	OG OF	ВО	RING N	O	B-	-057	(p. 1 c	of 1)	
PROJI	ECT:	Sioux City Gate	way Airpo	ort; Sioux	City,	IA										
SURFA	ACE ELEV	ATION:		LATITUD	E:			LO	NGI	TUDE:						
DEPTH IN FEET	[MATERIAL I	DESCRIPTIO)N		GEOLOGY	N	MC	SA	AMPLE TYPE	REC	FIELI	0 & LA	BORA		TESTS
FËÈT	I						1	IVIC	Ĺ	ГҮРЕ	IN.	WC	DEN	LL	PL	%-#20
	13.75'	'Concrete pavement	t			FILL			\mathbb{N}							
1 -	9.25' I	Base fill, mostly silty	sand with	gravel.			12	M	X	SS	14					
2 -	brown	(A-1-b)				FINE										
3 -	(CII)	CLAY, gray to grayis (A-7-6)	sh brown, s	stiff to firm		ALLUVIUM	9	M	X	SS	18					
		,														
4 -	-								\							
5 -	_							M	\bigvee	SS	10					
							6	M	\mathbb{N}	22	18					
6 -									X							
7 -	-								17							
8 -							5	M	X.	SS	18					
9 -									R							
9.									1							
10 -							6	M		SS	18					
11 -	END	OF BORING							$/\!\!\!/$							
	END	OF BURING														
54																
12/20/																
GD1																
WELL																
CPT+																
AET+																
POR																
₹																
ATEW																
<u>ق</u> <u>۲</u>																
OX O																
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24									<u> </u>						<u> </u>	
DE OE	EPTH: I	DRILLING METHOD				ER LEVEL MEA	1		_	יי זיים	ıc	W/A T		NOTE:		
<u>ဂ</u> ီ 0)-9½' 2	2.25" HSA	DATE	TIME	SAMPI DEPT	ED CASING H DEPTH	DE	VE-IN PTH	FL	DRILLIN UID LE	VEL	WATI LEVE		THE A		
AT-LC			5/16/24		11.0							Non		SHEET		
₽ DODI	NG		5/16/24		11.0)	9	0.0	_			Non		EXPLA		
BORI COM	PLETED:	5/16/24							_				T			GY ON
b DR: l	BK LG:	AK Rig: 4												IH	IS LO	J



	AET JO	P-0025900)					LC	G OF	ВО	RING N	О	B-	058 ((p. 1 c	of 1)	
	PROJEC	Sioux City Gates	way Airpo	ort; Sioux	City,	IA											
		CE ELEVATION:		LATITUI	DE:	1			LO	NGI	TUDE:		1				
	DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GI	EOLOGY	N	MC	SĄ	AMPLE ΓΥΡΕ	REC					TESTS
	FEET	12.5" Concrete pavement				FIL	Ι.			」 い		111.	WC	DEN	LL	PL	%-#200
	1 -	<u>-</u>					L.			}							
		FILL, mostly silty sand wire pieces of concrete, brown	th a little gr	ravel and				12	M	M	SS	12					
	2 –							12	141		55	12					
	3 –	FAT CLAY, gray and brow firm (CH) (A-7-6)	wn mottled	, stiff to		FIN ALI	IE LUVIUM	9	M	M	SS	18					
	4 -								1,1	Д	55						
										<u>{1</u>							
	5 —							8	M	X	SS	18					
	6 –									H							
	7 -									샙							
								8	M	M	SS	18					
	8 —									\square							
	9 –									{ }							
	10 -							_	M	M	aa	10					
	11							7	M	M	SS	18					
	11 -	END OF BORING															
4																	
2/20/2																	
1D1 1																	
ÆLL.G																	
M+T4																	
VET +C																	
GPJ /																	
PORT																	
Y AIR																	
TEWA																	
T GA																	
UX CI																	
AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24			1											<u> </u>			
-00259	DEP	TH: DRILLING METHOD			1		EVEL MEA			_	DW -	IG	***		NOTE:	REFE	R TO
NG P.	0-9	9½' 3.25" HSA	DATE	TIME	SAMPI DEPT	ED TH	CASING DEPTH	CAV DE	/E-IN PTH	FL	ORILLIN UID LE	NG VEL	WATE LEVE	ER L	ГНЕ А	TTAC	HED
AT-LO			5/15/24		11.0	0	9.5	11	1.0				Non		SHEET		
PW-L	DODE	C													XPLA		
	BORIN COMPI	G LETED: 5/15/24												T			GY ON
AET	DR:	LG: RH Rig: 63													1H	IS LO	Ĵ

03/2011



AET JC	P-0025900 P-0025900)				LC	G OF	BOI	RING N	o	B-	059 ((p. 1 c	of 1)	
PROJEC	Sioux City Gates	way Airpo	ort; Sioux	City,	IA										
SURFA	CE ELEVATION:		LATITUD	DE:			LO	NGI	ΓUDE:						
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SA	MPLE YPE	REC	_				TESTS
FĒĒT						1		1 3	YPE	IIN.	WC	DEN	LL	PL	% -#200
	6" Concrete pavement FILL, mostly silty sand, br	own nossi	ble	_	FILL			{ }							
1 -	waterbearing in fill at abou	it 1.5' (A-2	-4)				$ \bigvee_{i=1}^{M}$	1							
2 —							-	1							
3 —						12	M	V	SS	10					
								\mathbb{N}							
4 -	LEAN CLAY, gray and br	own mottle	ed, stiff		FINE ALLUVIUM			H							
5 —	(CL) (A-6)				ALLOVION	9	M	\mathbb{N}	SS	12					
6 -								\square							
								{ }							
7 -	FAT CLAY, gray, firm (C	H/CL) (A-	7-6)					M	aa	1.4					
8 —						8	M	\mathbb{N}	SS	14					
9 —								}							
10 -								13							
10	LEAN CLAY, grayish bro	wn, firm (CL) (A-6)			7	M	X	SS	8					
11 -	END OF BORING														
20/24															
12/															
H + L															
4CP															
PJ AE															
ORT.G															
AIRP															
EWAY															
GAT															
X CI															
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 AET+CPT-WELL.GDT 12/20/24 AET-CPT-WELL.GDT 12/20/24															
DEF DEF	TH: DRILLING METHOD			WAT	ER LEVEL MEA	SURI	EMEN'	TS					NOTE:	REFE	R TO
0 n	9½'	DATE	TIME	SAMPI DEPT	LED CASING TH DEPTH	CAV	/E-IN PTH	FL.	ORILLIN UID LE	NG VEL	WATI LEVE	ER .	THE A	TTAC	HED
NO	Z 1 %	5/16/24		2.0			.0	T		-	1.8		SHEET	S FOI	R AN
M-LA		5/16/24		2.0			.0				1.7		XPLA	NATIO	ON OF
BORIN COMP	IG LETED: 5/16/24											T	ERMIN	IOLOG	GY ON
DR:	LG: Rig:												TH	IS LO	G



AET JO	OB NO: P-002590	00				LC	G OF	BO	RING N	О	B-	060	(p. 1 c	of 1)	
PROJE	Sioux City Gat	eway Airp	ort; Sioux	City,	IA										
SURFA	ACE ELEVATION:		LATITUD	DE:	<u> </u>		LO	NGI	TUDE:						
DEPTH IN FEET	MATERIAI	DESCRIPTION	ON		GEOLOGY	N	MC	SA	MPLE TYPE	REC			1	CORY	TESTS
FËÈT						1,	.,,,		YPE	IN.	WC	DEN	LL	PL	%-#200
	13" Concrete pavement				FILL			\mathbb{R}							
1 -	10" FIll, mostly silty sand	d with a littl	e lean clay		-			M							
2 -	and gravel, brown and a FAT CLAY, gray, firm (- ////	FINE	3	M	X	SS	13					
3 -	(fill)	CII) (A-7-0 ₂) (may be		ALLUVIUM OR FILL			\square							
	FAT CLAY, brown mott	led firm (C	H) (A-7-6)		FINE	7	M	X	SS	16					
4 -	TAT CLAT, brown mou	icu, iiiii (C	II) (A-7-0)		ALLUVIUM			<u> </u>							
5 -							М	M	SS	0					
						6	M	M	22	8					
6 -	I FAN CLAVA	11	1 0					3							
7 -	LEAN CLAY, brown and lenses of wet silt at about	d gray mottl t 10.3' (CL)	ed, firm, (A-6)					17							
8 -		,	,			5	M	IXI	SS	18					
								H							
9 -								团							
10 -						4	M	M	SS						
11 -	The or nonvic							\mathbb{N}							
	END OF BORING														
4															
2/20/2															
1 TOS															
VELL.															
V+T4C															
AET+0															
GPJ.															
PORT															
¥ AIR															
\TEW															
<u>T</u>															
Σ Σ															
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 O O O O O O O O O O O O O O O O O O O															
DEI	PTH: DRILLING METHOD		1	1	ER LEVEL MEA			_					NOTE:	REFE	R TO
의 이-	-9½' 3.25" HSA	DATE	TIME	SAMPI DEPT	LED CASING TH DEPTH	CAV DE	/E-IN PTH	FL	ORILLIN UID LE	NG VEL	WATE LEVE	ER	THE A	TTAC	HED
AT-LO											Non		SHEET		
													XPLA		
BORIN COMP	NG PLETED: 5/15/24											T			GY ON
₽ DR:	LG: RH Rig: 63												TH	IS LO	j



	AET JO	DB NO: P-0025900	1				LC	G OF	ВО	RING N	О	B-	061	(p. 1 c	of 1)	
	PROJEC	Sioux City Gater	way Airpo	ort; Sioux	City,	IA										
	SURFA	CE ELEVATION:		LATITUD	E:	T		LO	NGI	TUDE:		1				
	DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SĄ	AMPLE ΓΥΡΕ	REC					TESTS
	FEET	Concrete pavement				FILL			LY.		11 11	WC	DEN	LL	PL	%-#200
	1 -	Concrete pavement							<u>}</u>							
		6" Apparent base, gravel w	vith sand a	nd silt,					<u>}</u>							
	2 -	brown and reddish brown (FILL, mostly fat clay, dark	(A-1-a)		_		7	M	M	SS	14					
	3 -	brown (A-7-6)	gray to gr	ayısıı			'	M		33	14					
	4 -								\{							
	5 —	FAT CLAY, gray and brov (A-7-6)	wn mottled	, stiff (CH)		FINE ALLUVIUM	9	M		SS	14					
	6 -								 }							
	7 —								1							
							6	M	M	SS	12					
	8 -	LEAN CLAY, gray and br lens of silt (CL) (A-6)	own mottle	ed, firm,												
	9 -								}							
	10 -	SILT, gray and brown mot waterbearing, very loose, lo	tled, moist enses of w	to aterbearing			3	M/W	, M	SS	16					
	11 -	sand below about 10' (ML) END OF BORING	(A-4)						\mathbb{N}							
		END OF BURING														
3/24																
12/20																
L.GD.																
T+WE																
ET+CP																
3PJ A																
PORT.																
YAIR																
ATEW#																
ITY G/																
ONXO																
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	DEP	TH: DRILLING METHOD			WAT	 ER LEVEL ME <i>l</i>	SURI	EMEN	L TS					10777	D===	
P-002			DATE	TIME	SAMPI DEPT	1		/E-IN PTH	I	ORILLI	NG_	WATE LEVE		ЮТЕ: ГНЕ А		
LONG	0-9	9½'	DATE	THVIL	DEPT	H DEPTH	DE	РТН	FL	UID LE	VEL	Non		SHEET		
V-LAT-												14011		XPLA		
ORPV	BORIN COMP	G LETED: 5/16/24											$\overline{}$	ERMIN	IOLO(GY ON
AET C	DR:	LG: Rig:												TH	IS LO	Ĵ



AET JO	B NO: P-0025900)				LC	OG OF	ВО	RING N	О	B-	-062	(p. 1	of 1)	
PROJEC	Sioux City Gate	way Airpo	ort; Sioux	City,	IA										
SURFAC	CE ELEVATION:		LATITUI	DE:		_	LO	NGI	TUDE:						
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SĄ	AMPLE ГҮРЕ	REC		O & LA			
FĒÈT						1,			IYPE	IN.	WC	DEN	LL	PL	%-#20
	14.5" Concrete pavement				FILL			\{\}							
1 -	10" Base fill, mostly silty s	sand with g	ravel,					\bigvee							
2 —	brown (A-1-b)	_			FINE	18	M		SS	12					
3 –	FAT CLAY, gray and brown firm (CH) (A-7-6)	wn mottled	, stiff to		ALLUVIUM			\square							
						9	M		SS	17					
4 -								<u> </u>							
5 —						7	M	\mathbb{N}	SS	18					
6 -						,	111	\square	55						
								{							
7 -															
8 –						7	M	X	SS	17					
9 –								1							
	SILT, brown, moist, loose	(MI) (A-4)					13							
10 -	SIL1, blown, moist, loose	(ML) (A-1	,			7	M	X	SS	17					
11 -	END OF BORING							$/\!\!\!/$							-
	END OF BORING														
DEP 0-9 BORIN COMPI															
,															
DEP	TH: DRILLING METHOD			WAT	ER LEVEL MEA	ASURI	EMEN	TS				N	NOTE:	REFE	R TO
0-9	0½' 3.25" HSA	DATE	TIME	SAMPI DEPT	LED CASING TH DEPTH	CAV DF	VE-IN PTH	FI.	DRILLIN UID LE	NG VEL	WATI LEVE	ER .	THE A	TTAC	HED
J-2	TIL SIES HISTA	5/15/24		11.0			1.0				Non		SHEET	rs foi	R AN
													XPLA	NATIO	ON OF
BORIN COMPI	G LETED: 5/15/24											TI	ERMIN	OLO	GY ON
DR:	LG: RH Rig: 63												TH	IS LO	G



AET J	JOB NO: P-0025900)					LC	G OF	ВО	RING N	О	B-	063	(p. 1 c	of 1)	
PROJ	ECT: Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
	ACE ELEVATION:		LATITUD	E:				LO	NGI	TUDE:						
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GE	EOLOGY	N	MC	SĄ	AMPLE FYPE	REC IN.		I			TESTS
FEET	FILL, mostly lean clay wit	th sand, a li	ttle gravel,		FILI	L			1		12.11	WC	DEN	LL	PL	%-#200
1	trace roots, grayish brown	(A-6)					11	M		SS	18					
3							4	M		SS	10					
4									 							
5	LEAN CLAY, brown and (CL) (A-6)	gray mottle	ed, soft		FIN:	E LUVIUM	2	M	M	SS	8					
6									}							
8	LEAN CLAY, brown and (CL/CH) (A-7-6)	gray mottle	ed, soft				3	M	M	SS	18					
9	SANDY SILT, brown, mo	oist to wet,	loose (ML)		MIX	KED LUVIUM			1							
10	- (A-4)				ALL	LO V IOWI	5	M/W		SS	18					
11	END OF BORING															
12/20/24																
ELL.GDT .																
+CPT+WE																
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT GPJ AET+CPT+WELL.GDT 12/20/24 OOG W.J.A. AET-CPT+WELL.GDT 12/20/24 DOG TO THE WAY AIRPORT GPJ AET+CPT+WELL.GDT 12/20/24																
AIRPORT																
SATEWAY																
X GIT																
1000 SIO	EDEN DEN LES COMPAGNACIONES			****		TARE LAW :	OL 12-1	2) (5)	TC							
P-0025	EPTH: DRILLING METHOD	DATE	TIME			EVEL MEA CASING			_	DRILLI	NG	WATE		NOTE:		
000	0-9½' 2.25" HSA	DATE 5/16/24	TIME	SAMPI DEPT	-	CASING DEPTH	DE	/E-IN PTH	FĹ	DRILLIN UID LE	VĒL	WATE LEVE		THE A SHEET		
-LAT-I		5/16/24		11.0 11.0		9.5	0	.0				Non		XPLA		
≥ BORI	ING IPLETED: 5/16/24	3/10/24		11.				.0				14011				GY ON
DR:									\perp					TH	IS LO	Ĵ

03/2011



AET JC	DB NO: P-0025900)					LO	G OF	BO	RING N	О	B-	064 ((p. 1 c	of 1)	
PROJE	CT: Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
	CE ELEVATION:		LATITUD	E:	1			LO	NGI	TUDE:						
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GE	EOLOGY	N	MC	SA	MPLE TYPE	REC IN.			1		TESTS
1 -	FILL, mostly lean clay wit dark brown and brown (A-	h sand, trac -6)	ce roots,		FIL	L	9	M		SS	16	WC	DEN	LL	PL	%-#20 0
3 -							5	M		SS	14					
4 5 6 7	LEAN CLAY, brown and soft (CL) (A-6)	a little redo	lish brown,	,	FIN ALI	IE LUVIUM	4	M	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	SS	18					
8 -	SILTY SAND, fine graine waterbearing, loose, lenses	ed, brown, 1 s of silt (SN	moist to (A-2-4)			ARSE LUVIUM	6	M	\\ {{}	SS	18					
9 - 10 - 11 -	SILT, brown and reddish by very loose, lenses of lean of	orown mott clay (ML) (led, moist, A-4)		FIN ALI	E LUVIUM	3	М	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	SS	18					
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	END OF BORING															
DEF	TH: DRILLING METHOD			WAT	ER L	EVEL MEA	SURE	EMEN'	TS		<u> </u>		N	NOTE:	REFE	R TO
0 00	9½' 2.25" HSA	DATE	TIME	SAMPI DEPT	LED	CASING DEPTH	CAV	Æ-IN PTH	FI	ORILLIN UID LE	NG VEL	WATE LEVE		THE A		
JOI-	9/2 4.4 5 NSA	5/16/24		11.0		9.5	DE.	1	1.1	-110 LL	, 22	Non	_	SHEET	'S FOF	t AN
W-LA]		5/16/24		11.0			9	.0				Non		XPLA	NATIC	N OF
BORIN COMP	IG LETED: 5/16/24												T	ERMIN		
	K LG: AK Rig: 4													TH	IS LOC	ĩ

03/2011



AET JO	B NO: P-0025900					LC	G OF	BOI	RING N	О.	B-	065 (p. 1 c	of 1)	
PROJEC	Sioux City Gate	way Airpo	ort; Sioux	City,	IA										
	CE ELEVATION:		LATITUDE	E:	T		LO	NGI	ΓUDE:						
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	Ν		GEOLOGY	N	MC	SA	MPLE YPE	REC IN.) & LA			
FEET	EII I magatha aga da laga at	i41	1 1		FILL	-		1	IIL	IIN.	WC	DEN	LL	PL	%- #200
	FILL, mostly sandy lean cl	ay wun gra	ivei, brown		FILL		M		SS						
1 -	EH I41	1: 14	_												
2 —	FILL, mostly sand, cement LEAN CLAY, brown, firm			- ////	FINE	+		51							
3 -	and silt (CL) (A-6)	,	,		ALLUVIUM	5	M	X	SS	16					
								R							
4 -								【】							
5 —						4	M		SS	16					
6 -															
7	SAND, fine grained, brow	n, moist, m	nedium	_////	COARSE			{}							
7 —	dense (SP) (A-3)				ALLUVIUM	11	M	M	SS	16					
8 -						11	M	\mathbb{N}	33	16					
9 –	SANDY SILT, brown, we	,	MIXED			}									
10 —	loose (ML) (A-4)		ALLUVIUM												
10				2	M	X	SS	18							
11 -	END OF BORING														
20/24															
12/															
ILL.GD															
T+WE															
14-F															
P A															
ORT.0															
AIRP															
EWA															
Y GAI															
X															
0 8101															
DEP	TH: DRILLING METHOD			WAT	ER LEVEL ME	ASURI	EMEN	TS				N	NOTE:	REFE	R TO
0 0- 9	9½' 3.25" HSA	DATE	TIME	SAMPI DEPT	LED CASING TH DEPTH	CAV	/E-IN PTH	FL	ORILLIN UID LE	NG VEL	WATE LEVE	ER ,	ГНЕ А	TTAC	HED
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 CORP W-LAT-LONG P-00 CORP	TINIE	5/15/24		9.5		+	1.0				Wet		SHEET	S FOR	R AN
W-LA												E	XPLA	NATIO	ON OF
BORIN COMPI	G LETED: 5/15/24											TI	ERMIN		
b DR:	LG: RH Rig: 63													IS LO	
03/2011													(01-DF	IR-060



AET JO	OB NO: P-0025900	1				LC	G OF	BO	RING N	О	B-	066 ((p. 1 c	of 1)	
PROJE	Sioux City Gates	way Airpo	ort; Sioux	City,	IA										
SURFA	CE ELEVATION:		LATITUD	E:	T		LO	NGľ	TUDE:		1				
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SĄ	MPLE ΓΥΡΕ	REC					TESTS
FEET	SILTY SAND, trace roots	fine grain	ad brown	- गुन	COARSE			L)		111.	WC	DEN	LL	PL	%-#200
1 -	medium dense (SM) (A-2-	4)	ed, brown,		ALLUVIUM OR FILL			}}							
2 -	-					14	M	N FJ	SS	14					
3 -	LEAN CLAY, grayish bro	wn and bro	own		FINE	- 14	IVI	\ \ \{\pi\}	33	14					
5 -	mottled, firm, lenses of silt	and sand	(CL) (A-6)		ALLUVIUM			<u></u>							
6 -	-					5	M	\\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\	SS	14					
7 -	SILTY SAND, fine graine	d, brown, 1	noist, loose	e	COARSE			}							
8 -	(SM) (A-2-4)		ŕ		ALLUVIUM	5	M	X	SS	12					
9 -	SAND, fine grained, brow	n moist m	nedium					1							
10 -	dense (SP) (A-3) END OF BORING	n, moist, n	learum			21	M	\mathbb{N}	SS	6					
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 O O O O O O O O O O O O O O O O O O O															
DEI	PTH: DRILLING METHOD			WAT	LEVEL MEA	SURE	EMEN	TS		<u> </u>			l NOTE:	REFE	I TO
0 h-0 n-	-9½'	DATE	TIME	SAMPI DEP	LED CASING TH DEPTH	CAV DE	/E-IN PTH	I FL	ORILLIN UID LE	NG VEL	WATE LEVE		тне а		
NOT-L	~·•										Non		SHEET	S FOI	R AN
M-LA												E	XPLA	NATIO	ON OF
BORIN COMP	NG PLETED: 5/16/24											T1			GY ON
₽ DR:	LG: Rig:												TH	IS LO	Ğ



PROJECT: Sioux City Gateway Airport; Sioux City, IA SURFACE ELEVATION: LATITUDE: LONGITUDE: DEPTH IN FEET MATERIAL DESCRIPTION GEOLOGY N MC SAMPLE TYPE IN. WC DEN LL PI SILT (ML) SAND, fine grained, light brown, moist, loose ALLUVIUM	Y TESTS
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
MATERIAL DESCRIPTION GEOLOGY N MC SAMPLE REC TYPE IN. WC DEN LL PI TOPSOIL FINE	
SILT (ML) TOPSOIL FINE	Z %-#20(
SILT (ML)	
SAND fine grained light brown moist loose (ALLUVIUM)	
(SP)(A-3) COARSE	
ALLUVIUM	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
SANDY SILT, brown, moist, very loose, lenses 5 — Sand and a lawingtion of least along (ML) (A. A.) ALLI VIIIM 2. A.	
of sand and a lamination of lean clay (ML) (A-4)	
7 SAND, fine grained, light brown, moist, loose, COARSE	
lenses of silt and laminations of lean clay (SP) 8 - (A-3) ALLUVIUM 7 M SS 14	
$\begin{vmatrix} 10 - \end{vmatrix}$ $\begin{vmatrix} 9 & M & \times \\ & & & \end{vmatrix}$ SS $\begin{vmatrix} 17 & & & & & & & & & & & & & & & & & & $	
11 END OF BORING	
14-ME	
[Hand Page	
TIEWS	
DEPTH: DRILLING METHOD WATER LEVEL MEASUREMENTS NOTE: RE 0-9½' 3.25" HSA DATE TIME SAMPLED DEPTH DEPTH DRILLING WATER LEVEL MEASUREMENTS 11/15/24 None BORING COMPLETED: 11/15/24 TERMINOL	
DEPTH: DRILLING METHOD WATER LEVEL MEASUREMENTS NOTE: RE SAMPLED CASING CAVE-IN DRILLING WATER THE ATTA-	
DATE TIME SAMPLED CASING CAVE-IN DRILLING WATER LEVEL THE ATTA	
None SHEETS F	
BORING COMPLETED: 11/15/24 TERMINOL	
DR: CF LG: MH Rig: 68C	ЭG



AET JO	OB NO:	P-0025900)					LO	G OF	BO	RING N	О	B-	068	(p. 1 c	of 1)	
PROJE	CT:	Sioux City Gates	way Airpo	ort; Sioux	City,	IA											
		ATION:		LATITUD	E:				LO	NGI	ΓUDE:		1				
DEPTH IN FEET		MATERIAL I	DESCRIPTIO	ON		G	EOLOGY	N	MC	SA	MPLE TYPE	REC IN.		& LA			1
FEET	1	WITH SAND, trace	roots brow	un Verv	ПП	FIN	JF			1		11 11	WC	DEN	LL	PL	%-#20 0
1 -	loose	(ML) (A-4)	10013, 010	vii, very		AL	LUVIUM	3	M		SS	2					
2 -								4	M	M	SS	8					
3 -	EAT	OV AV 1 1	1:-1-1	441 - 1						/\ } }							
5 -	soft (0	CLAY, gray and redo CH) (A-7-6)	iish drown	mottied,				3	M		SS	18					
6 -	SANI loose,), fine grained, brow laminations of lean	n, moist, vo	ery loose to	<i> </i>		ARSE LUVIUM			/\ } }							
8 -			. , ,					4	M	M	SS	18					
9 -	_									7							
10 -								10	M	M	SS	18					
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 GORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 GORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 GORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 GORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 GORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 GORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 GORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT-WELL.GDT 12/20/24 GORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET-CPT-WELL.GDT 12/20/24 GORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET-CPT-WELL.GDT 12/20/24 GORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET-CPT-WELL.GDT 12/20/24 GORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET-CPT-WELL.GDT 12/20/24 GORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET-CPT-WELL.GDT 12/20/24 GORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET-CPT-WELL.GDT 12/20/24 GORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET-CPT-WELL.GDT 12/20/24 GORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET-CPT-WELL.GDT 12/20/24 GORP W-LAT-LONG P-0025900 SIOUX GATEWAY AIRPORT.GPJ AET-CPT-WELL.GDT 12/20/24 GORP W-LAT-LONG P-0025900 SIOUX GATEWAY AIRPORT.GPJ AET-CPT-WELL-GDT 12/20/24 GORP W-LAT-LONG P-0025900 SIOUX GATEWAY AIRPORT.GPJ AIRP	END	OF BORING															
000 SIOUX CITY GATEWAY AIRPOR																	
O0256 DEI	PTH: I	DRILLING METHOD					EVEL MEA	1		_	ייי זימי	IC	XX A COT		NOTE:	REFE	R TO
<u>0</u> <u>0</u> -	-9½'	3.25" HSA	DATE	TIME	SAMP DEP	LED TH	CASING DEPTH	DE	/E-IN PTH	FL	ORILLIN UID LE	VEL	WATE LEVE		THE A		
AT-LC			5/15/24		11.	0	9.5	11	1.0				Non		SHEET		
BORIN	NG														XPLA1		
	PLETED:	5/15/24										_			ERMIN		
F DR:	LG:	RH Rig: 63													111	IS LO	J



	AET JO	DB NO: P-0025900)					LO	G OF	ВО	RING N	О	B-	069 ((p. 1 a	of 1)	
	PROJEC	Sioux City Gater	way Airpo	ort; Sioux	City,	IA											
	SURFA	CE ELEVATION:		LATITUD	E:				LO	NGI	TUDE:		1				
	DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GI	EOLOGY	N	MC	SĄ	AMPLE ГҮРЕ	REC IN.) & LA			
	FEET	FILL, mostly silty sand, tra	ace roots h	rown		FIL	Ι.			L7		11 11	WC	DEN	LL	PL	% -#200
	1 -	(A-2-4)	ice 100is, c	nown			L			}}							
										}}							
	2 -									\mathcal{M}							
	3 -							16	M	X	SS	14					
	4 -	LEAN CLAY, gray and br firm, laminations of silty sa	own mottle	ed, stiff to		FIN	IE LUVIUM										
	_	be fill)	and (CL) (A-0) (Illay			LC VICIVI			21							
	5 —							5	M	X	SS	16					
	6 -									P							
	7 -	SILTY SAND, fine graine	d brown i	moist verv		CO	ARSE			13							
	8 -	loose (SM) (A-2-4)	a, orown, i	moist, very			LUVIUM	4	M	X	SS	16					
										 }							
	9 -	SAND WITH SILT, fine g very loose with lenses and	grained, bro	own, moist,						1							
	10 -	silty sand (SP-SM) (A-3)			•	: :		4	M	X	SS	16					
	11 -	SILTY SAND, fine graine mottled, moist, very loose	d, brown a with lamin	nd gray		-				H							
		\silt (SM) (A-2-4)]												
		END OF BORING															
0/24																	
12/2																	
L.GD.																	
T+WEI																	
T+CP.																	
PJ AE																	
ORT.G																	
/ AIRP																	
TEWA)																	
- GA																	
UX CI-																	
OO SIC			T														
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT GPJ AET+CPT+WELL: GDT 12/20/24	DEP	TH: DRILLING METHOD		<u> </u>			EVEL MEA					IG.	137 A (TO)		NOTE:	REFE	R TO
NG P	0-	9½'	DATE	TIME	SAMP DEP	TH	CASING DEPTH	DE	/E-IN PTH	FL	DRILLIN UID LE	VEL	WATE LEVE		THE A		
AT-LC													Non		SHEET		
3P W-L	BORIN	G													XPLAI ERMIN		
T COF	COMP	LETED: 5/17/24														IS LO	
AET	DR:	LG: Rig:															



AET JO	B NO: P-0025900						LC	G OF	BO	RING N	O	B-	070 ((p. 1 c	of 1)	
PROJEC	Sioux City Gatev	vay Airpo	ort; Sioux	City,	IA											
	CE ELEVATION:		LATITUD	E:				LON	NGI	ΓUDE:		ı				
DEPTH IN FEET	MATERIAL D	ESCRIPTIC	Ν		G	EOLOGY	N	MC	SA	MPLE TYPE	REC IN.			BORAT		1
FEET 1 -	SANDY SILT, trace roots, (ML/SM) (A-4)	brown, mo	oist		FIN AL	NE LUVIUM		M	<i>Y</i>		IIV.	WC	DEN	LL	PL	%-#200
2 - 3 -	SANDY SILT, brown, more lean clay and laminations of	ist, loose, l	enses of (SM) (A-4)				6	М	XI XI	SS	18					
4 - 5 -							9	M	<u>}</u> }	SS	18					
6 - 7 -							5	М	}	SS	18					
8 — 9 —									/\ { {							
10 –	SAND, fine grained, brown, moist, very loose (SP) (A-3)				CO	ARSE LUVIUM	4	M	M	SS	18					
	END OF BORING															
DEP	TH: DRILLING METHOD		WAT	ER L	EVEL MEA	SURE	EMEN	TS					NOTE:	REFE	R TO	
0-0	9½'	TIME	SAMP DEP	LED TH	CASING DEPTH	CAV DE	Æ-IN PTH	FL	ORILLIN UID LE	NG VEL	WATE LEVE	ER]	THE A	TTAC	HED	
<u> </u>	- ,										Non	e	SHEET	S FOR	R AN	
														XPLA		
BORIN COMPI	G LETED: 5/17/24												T	ERMIN		
DR:	LG: Rig:													TH	IS LO	G

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24



	AET JO	P-0025900					LC	G OF	BOI	RING N	O	B-	071	(p. 1 c	of 1)			
	PROJEC	CT:	Sioux City Gates	way Airpo	rt; Sioux	City,	IA											
		CE EL	EVATION:		LATITUD	E:				LO	NGI	ΓUDE:		I _				
D	EPTH IN FEET		MATERIAL I	DESCRIPTIO)N		GE	EOLOGY	N	MC	SA	MPLE YPE	REC IN.					TESTS
'	EET	SIL	T (MI)			Ш	LTOF	PSOIL			」 加		1111	WC	DEN	LL	PL	%-#200
	1 -	SIL	T (ML) T (ML)				FIN	E			}							
							ALI	LUVIUM			}							
	2	SAN	ND, fine grained, light	brown, mo	ist, loose,			ARSE LUVIUM	_		M	~~						
	3 —	iens	es of silty sand and silt	ty clay (SP)	(A-3)		ALI	LO V IOIVI	5	M	\mathbb{N}	SS	16					
	4 —										1							
	_						<i>:</i>				17							
	5 —								5	M	X	SS	18					
	6 —										R							
	7	SAN	ND, fine grained, light	brown mo	ist mediun	1					13							
	8 –	dens	se (SP) (A-3)	orown, mo	ist, meatun				14	M	X	SS	18					
											H							
	9 –										Ц							
	10 —								12	M		SS	18					
	11										A							
		EN	D OF BORING															
124																		
12/20																		
-GD																		
+WELL																		
+CPT																		
J AET																		
RT.GP.																		
IRPOF																		
WAY A																		
GATE																		
CIT																		
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24																		
\$ 22000 \$	DEP	TH:	DRILLING METHOD		WAT	TER LI	EVEL MEA	SURE	L EMEN	TS		<u> </u>		<u> </u>	l NOTE:	DEEL	D TO	
P-00%				TIME	SAMP DEP		CASING DEPTH		/E-IN PTH	1	ORILLIN UID LE	NG.	WATE LEVE		THE A			
LONG	0-9	9½'	3.25" HSA	-11.11	DEP	1H	DEPTH	DE	riH	FL	UID LE	VEL	Non		SHEET			
V-LAT												+	14011		XPLA			
ORP v	BORIN COMPI	DRING DMPLETED: 11/15/24											+					GY ON
. 4	DR: C		G: MH Rig: 68C												\dashv	TH	IS LO	G
	/2011		145.000		<u> </u>											01-DI	IR-060	



AET JO	OJECT: P-0025900 Sioux City Gateway Airport; Sioux City, IA							BOI	RING N	O	B-	072 (p. 1 c	of 1)	
PROJEC	CT: Sioux City Gatev	way Airpo	ort; Sioux	City,	IA										
	CE ELEVATION:		LATITUD	E:			LO	NGI'	ΓUDE:						
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SA	MPLE YPE	REC IN.		& LAI			
FEET	EILI mintana efilem elev				FILL OR				IIL	IIN.	WC	DEN	LL	PL	%-#200
1 -	FILL, mixture of lean clay brown (A-6)	and siit, tr	ace roots,		FINE ALLUVIUM		M	}							
3 -	SANDY SILT, brown, mo of lean clay (ML) (A-4)	ist, very lo	ose, lenses		FINE ALLUVIUM	4	M	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	SS	18					
5 —	SILT, light brown, moist, l	oose (ML)	(A-4)			7	M	}	SS	18					
6 — 7 —	SILTY SAND, fine graine	d brown r	noist loose	. 44	COARSE			\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\							
8 - 9 -	(SM) (A-2-4)				ALLUVIUM	4	M	\\ {\}	SS	18					
10 —	SAND WITH SILT, fine g loose (A-3)	rained, bro	own, moist,			5	M	11	SS	18					
11 -	END OF BORING			[-:-[]	·.			\cap							
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 COST DESCRIPTION OF P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24															
S DEP	TH: DRILLING METHOD			WAT	 ER LEVEL ME	 ASURI	 EMEN	 TS					IOTE	DEEE	D TO
P-002		DATE	TIME	SAMP DEP		_	VE-IN PTH	_	ORILLIN UID LE	VG.	WATE LEVE		ЮТЕ: ГНЕ А		
<u>0-9</u>	9½'	111711	DEP	IH DEPTH	DE	РΙΉ	FL	u id LE	VEL	None	— ,	SHEET			
-LAT											11011		XPLAI		
BORIN COMP	IG LETED: 5/17/24								+		TI	ERMIN	OLOC	GY ON	
DR:	LG: Rig:											\dashv	TH	IS LO	G
03/2011	<u>o</u> .	<u>I</u>	l	<u> </u>	1									01-DF	IR-060



	AET JO	P-0025900)					LO	G OF	BO	RING N	О	B-	073	(p. 1 c	of 1)	
	PROJEC	Sioux City Gater	way Airpo	ort; Sioux	City,	IA											
		CE ELEVATION:		LATITUE	DE:				LO	NGI	TUDE:		1				
	DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEO	LOGY	N	MC	SĄ	MPLE TYPE	REC					TESTS
	FEET	LEAN CLAY, trace roots,	oravish br	own (CL)	V///	FINE				LY.		11 11	WC	DEN	LL	PL	%-#200
	1 -	(A-6)	gray ish or	own (CL)		ALLU	JVIUM		M	<u>}</u>							
										}							
	2 —	LEAN CLAY, grayish bro laminations of silt and sand	wn, stiff, le	enses and				12	M	M	SS	16					
	3 -	SILT, brown, moist, loose,				1		12	IVI	Д	33	10					
	4 -	(ML) (A-4)								\{\}							
	5 —							5	м	M	SS	14					
	6 -)	M	\square	33	14					
		SAND, fine grained, light	brown mo	ist loose		COAF	RSE			\{							
	7 —	(SP) (A-3)	010 (11, 1110	104, 1000		ALLU	JVIUM			M	aa	12					
	8 -							9	M		SS	12					
	9 –									 							
	10 -							_		M		1.0					
								7	M	M	SS	16					
	11 -	END OF BORING															
24																	
12/20/																	
GDT.																	
+WELI																	
T+CPT																	
PJ AE																	
ORT.G																	
/ AIRP																	
TEWA																	
TY GA																	
D X C																	
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	DEP	THE DRIVE BLOCK STREET			XX/ 4.00	EDIE	TEL NE:	or me	an der i	TC						<u> </u>	<u></u>
P-0025	DEP	TH: DRILLING METHOD	DATE	TIME	1		VEL MEA			_	ORILLIN	NG	WATE		NOTE:		
ONG	0-9	9½'	DATE	TIME	SAMPI DEPT	TH I	CASING DEPTH	DE	/E-IN PTH	FĹ	ORILLIN UID LE	VEL	WATE		THE A SHEET		
'-LAT-L													Non		XPLA1		
ORP W	BORIN	G LETED: 5/12/24															GY ON
AET C	DR:														TH	IS LO	G



AET JO	DB NO: P-0025900)				LC	OG OF	BORING N	Ю	B-	074	(p. 1	of 2)	
PROJEC	CT: Sioux City Gate	way Airpo	rt; Sioux	City, I	A									
SURFA	CE ELEVATION:		LATITUD	E:			LO	NGITUDE:						
DEPTH IN	 MATERIAL I	DESCRIPTIC)N		GEOLOGY	N	MC	SAMPLE TYPE	REC) & LA	l	1	1
IN FEET						1,		TYPE	IN.	WC	DEN	LL	PL	%- #20
,	SILT				TOPSOIL		M							
1 -	SILT, brown, moist, loose and a lens of silty clay (M.	, lenses of s	silty sand		FINE ALLUVIUM		IVI							
2 -		<i>L) 1</i> 1			OR MIXED ALLUVIUM			31						
3 —						6	M	SS	18					
4 —								E						
	SAND, fine grained, light	brown, mo	ist, mediur	n	COARSE			11						
5 —	dense (SP) A-3	,	,		ALLUVIUM	18	M	X ss	16					
6 —								R						
7 —	SAND, fine grained, light	hroven and	hrown					[1]						
8 —	mottled, moist, very loose,	lamination	s of silt			4	M	$ \rangle $ ss	15					
	(SP) A-3							II						
9 —								<u>}</u>						
10 —						4	M	\bigvee ss	15					
11 —														
12 —	SAND, fine grained, light medium dense (SP) A-3	brown, mo	ist, loose to)		7	M	SS	15					
13 —	medium dense (SI) A-3					'	IVI	\bigcup 33	13					
14 —														
15 —														
						14	M	SS	15					
16 —														
17 —								}						
18 —	SAND, fine to medium gra	nined brow	n moist to											
19 —	about 19½' then waterbear	ing, mediur	n dense to	' E			_							
19	loose (SP) A-3						Ţ	<u>}</u>						
20 —						13	W	$ \rangle $ ss	15					
21 —								H H						
		1												
DEP	TH: DRILLING METHOD				ER LEVEL MEA	1						NOTE:	REFE	R TO
0-29	9½' 3.25" HSA	DATE	TIME	SAMPL DEPT	ED CASING H DEPTH	CAV	/E-IN PTH	DRILLII FLUID LE	NG VEL	WATI LEVE		THE A		
		11/25/24	2:09	19.5	21.0					19.5		SHEET		
14 — 15 — 16 — 17 — 18 — 19 — 20 — 21 — DEP 0-29	ĪG													ON OF GY ON
COMP	LETED: 11/25/24												IS LO	
DR: C	F LG: MH Rig: 68C											ш	יט דטי	J



								054		C (C)		
		LO	G OF	BO	RING N	O	B-	074 (p. 2 (of 2)		
Sioux City Gateway Airport; Sioux C	City, l	[A										
LATITUDE:				LO	\GI	TUDE:		I				
MATERIAL DESCRIPTION		GEOLOGY	N	MC	SĄ	AMPLE	REC					1
	Territoria.					IIIL	IIV.	WC	DEN	LL	PL	%-#20 0
ND, fine to medium grained, brown, moist to at 19½' then waterbearing, medium dense to the (SP) A-3 <i>(continued)</i>					\ \ \ \ \							
					<u>{</u>							
			6	W		SS	16					
					}							
					<u>}</u>							
					}							
					<u>}</u>							
			11	W		SS	17					
O OF BORING												
116	MATERIAL DESCRIPTION ID, fine to medium grained, brown, moist to at 19½' then waterbearing, medium dense to be (SP) A-3 (continued)	P-0025900 Sioux City Gateway Airport; Sioux City, I LATITUDE: MATERIAL DESCRIPTION ID, fine to medium grained, brown, moist to at 19½' then waterbearing, medium dense to be (SP) A-3 (continued)	P-0025900 Sioux City Gateway Airport; Sioux City, IA LATITUDE: MATERIAL DESCRIPTION GEOLOGY ID, fine to medium grained, brown, moist to it 19½' then waterbearing, medium dense to e (SP) A-3 (continued) O OF BORING	P-0025900 Sioux City Gateway Airport; Sioux City, IA LATITUDE: MATERIAL DESCRIPTION GEOLOGY N ID, fine to medium grained, brown, moist to it 19½' then waterbearing, medium dense to e (SP) A-3 (continued) 6 OF BORING	P-0025900 Sioux City Gateway Airport; Sioux City, IA LATITUDE: MATERIAL DESCRIPTION GEOLOGY N MC ID, fine to medium grained, brown, moist to it 19½' then waterbearing, medium dense to e (SP) A-3 (continued) 6 W OF BORING	P-0025900 Sioux City Gateway Airport; Sioux City, IA LATITUDE: LONG MATERIAL DESCRIPTION GEOLOGY N MC S/ ID, fine to medium grained, brown, moist to it 19½' then waterbearing, medium dense to e (SP) A-3 (continued) 6 W OF BORING	P-0025900 Sioux City Gateway Airport; Sioux City, IA LATITUDE: LONGITUDE: MATERIAL DESCRIPTION GEOLOGY N MC SAMPLE TYPE ID, fine to medium grained, brown, moist to to 19½' then waterbearing, medium dense to to (SP) A-3 (continued) 6 W SS OF BORING	P-0025900 Sioux City Gateway Airport; Sioux City, IA LATITUDE: MATERIAL DESCRIPTION GEOLOGY N MC SAMPLE TYPE IN. GEOLOGY N MC SAMPLE REC TY	P-0025900 Sioux City Gateway Airport; Sioux City, IA LATITUDE: MATERIAL DESCRIPTION GEOLOGY N MC SAMPLE TYPE IN FIELD WC TO BE TO SAMPLE IN FIELD WC TO BE TO SAMPLE IN FIELD WC TO BE TO BE	P-0025900 Sioux City Gateway Airport; Sioux City, IA LATITUDE: LATITUDE: MATERIAL DESCRIPTION GEOLOGY N MC SAMPLE TYPE N TYPE FIELD & LATITUDE: WC DEN DEN OF BORING 111 W SS 16 STOPE FIELD & LATITUDE: SAMPLE TYPE N WC DEN 111 DEN OF BORING	P-0025900 Sioux City Gateway Airport; Sioux City, IA LATITUDE: LONGITUDE: MATERIAL DESCRIPTION GEOLOGY N MC SAMPLE REC TYPE IN. WC DEN ILL ID, fine to medium grained, brown, moist to it 19½ then waterbearing, medium dense to e (SP) A-3 (continued) 6 W SS 16 OF BORING OF BORING	P-0025900 LOG OF BORING NO. B-074 (p. 2 of 2)

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24



AET JO	DB NO: P-0025900		LC	G OF	BO	RING N	О	B-	075	(p. 1 c	of 2)				
PROJE	CT: Sioux City Gate	way Airpo	ort; Sioux	City, IA	L										
SURFA	CE ELEVATION:		LATITUI	DE:			LO	NGI	TUDE:		1				
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	N		GEOLOGY	N	MC	SA	AMPLE FYPE	REC IN.				1	TESTS
FEET					TILL					111.	WC	DEN	LL	PL	% -#200
1 -	FILL, mostly lean clay, bro	_				8	M		SS	23	18				
2 -	SANDY SILT, trace roots, loose (ML) (A-4)	, light brow	n, moist,		COARSE ALLUVIUM			H							
3 -	SILTY SAND, fine graine loose (SM) (A-2-4)	d, light bro	wn, moist	,		5	M	X	SS	18					
4 -								 {{							
5 -	LEAN CLAY, grayish bro mottled, soft, lenses of san (A-7-6)	wn and red dy silt (CL	ldish brow /CH)	n F	INE ALLUVIUM	4	M	M	SS	16	36				
6 -	(A-7-0)							H							
7 -								<u>{</u> {}							
8 -						3	M	M	SS	16	39				
9 -								1							
10 -	LEAN CLAY, gray, soft, 1	lenses of sa	ndy silt			2	M	X	SS	15	52				
11 -	(CL/CH) (A-7-6)		·					/\ {}							
12 -	SILT, gray, wet, very loose	e, lenses of	silty clay												
13 -	(ML) (A-4)					2	M		SS	15	32				
14 -								}							
15 –	20 then waterbearing, loos	brown, mos se to very lo	ist to abou cose to		COARSE ALLUVIUM	7	M	M	SS	15					
16 -	loose (SP) (A-3)							1							
17 –								}							
18 -								\{\}							
19 -								}							
20 -						9	M/W	M	SS	16					
14 15 15 15 15 15 16 17 17 18 17 18 17 18 19 18 19	-							/\ {}	55						
DEI	PTH: DRILLING METHOD			WATER	LEVEL MEA	CITE	EMENT	[] TS							
P-002		DATE	TIME	SAMPLE DEPTH		1	/E-IN PTH	_	ORILLIN UID LE	NG.	WATE LEVE		NOTE: THE A		
0-2	9½' 3.25" HSA	11/14/24	10:48	26.0	24.5	DE	ΥΙΉ	FL	UID LE	VEL	22.0		SHEET		
V-LAŢ		11/17/27	10.70	20.0	27.3						22.0	'			ON OF
BORIN COMP	NG LETED: 11/14/24											T	ERMIN	IOLO	GY ON
DR: C													TH	IS LO	G



	TESTING												
AET JOB NO:	P-0025900		LO	G OF	BO	RING N	O	B-	075 (p. 2 (of 2)		
PROJECT:	Sioux City Gateway Airport; Sioux C	ity,	IA .										
	LATITUDE:		T	_	LON	IGI	TUDE:						
DEPTH IN FEET	MATERIAL DESCRIPTION		GEOLOGY	N	MC	SĄ	AMPLE ГҮРЕ	REC) & LAI	BORAT		
				1,	.,,,		LYPE	IN.	WC	DEN	LL	PL	% -#200
20' th	(D), fine grained, light brown, moist to about nen waterbearing, loose to very loose to e (SP) (A-3) (continued)		COARSE ALLUVIUM (continued)			\ \ \ \ \							
24 —						<u>}</u>							
25 —				4	W	X	SS	16					
26 –						}							
27 – 28 –						{ }							
						{{							
29 —						\mathbb{I}							
30 —				7	W	X	SS	19					
31 END	OF BORING												

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24



AET JO	OB NO: P-0025900			LC	G OF	BO	RING N	O	B-	076 ((p. 1 c	of 2)			
PROJE	CT: Sioux City Gates	way Airpo	rt; Sioux	City, IA	L										
SURFA	CE ELEVATION:		LATITUE	DE:			LO	NGI	ΓUDE:						
DEPTH IN FEET	MATERIAL I	DESCRIPTIC	N		GEOLOGY	N	MC	SA	MPLE YPE	REC					TESTS
FEET				F	ILL			1 1		111.	WC	DEN	LL	PL	%-#200
1 -	FILL, mostly lean clay, tra light brown (A-6) SANDY SILT, trace roots	,		/ F	INE LLUVIUM	5	M		SS	20	11				
3 -	lenses of silt (ML) (A-4)	, orown, me	oisi, ioose,		EEC VICIVI	2	M		SS	16	17				
								H							
5 -	SAND, fine grained, light medium dense, a lens of sa about 12½' (SP) (A-3)	brown, mo	ist, loose t d fat clay a		OARSE LLUVIUM	2	M	11111	SS	18					
7 -	(81) (818)														
8 -						5	M	XX	SS	18					
9 -	-														
10 -						7	M	X	SS	18					
11 -															
12 -									aa						
13 -							M	***	SS						
14 -															
15 -						14	M		SS	17					
16 - 17 -								!							
18 –								}							
N AIRPO	SILTY SAND, a little grav brown, moist, medium den	vel, fine gra se (SM) (A	ined, -2-4)					}							
20 -						14	M	M	SS	6					
14 - 15700 PROPERTY OF THE PRO						17	171	/ 打	55	0					
ν DFI	PTH: DRILLING METHOD			WATER	LEVEL MEA	SURF	 EMFN'	[] TS					LOTE	DEEE	D TC
0 0_2	9½' 3.25" HSA	DATE	TIME	SAMPLE DEPTH		1	/E-IN PTH	_	ORILLIN UID LE	NG VEL	WATE LEVE		NOTE: THE A		
NOT-L		11/14/24	1:40	26.0	24.5						23.0		SHEET	S FOI	R AN
NODE:	IC														ON OF
S COMP	NG PLETED: 11/14/24											TI			GY ON
₽ DR: C	CF LG: MH Rig: 68C												1H	IS LO	J



ENGII	NEERING TESTING										
AET JO	B NO: P-0025900		LO	G OF	BORING 1	NO	B-	076 (p. 2 c	of 2)	
PROJEC	Sioux City Gateway Airport; Sioux City,	IA									
	LATITUDE:			LON	IGITUDE:						
DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC	FIELD	& LAI	BORAT	ORY 7	TESTS
FEET	MATERIAL DESCRIPTION	GLOLOGI	IN	MC	TYPE	IN.	WC	DEN	LL	PL '	% -#200
23 —	SILTY SAND, a little gravel, fine grained, brown, moist, medium dense (SM) (A-2-4) \(\text{(continued)}\) SAND WITH SILT, trace organics, fine grained,			<u>_</u>	}						
24 – 25 –	gray, waterbearing, very loose to loose (SP-SM) (A-3)		2	W	}} ss	16					
26 –					/\ } }						
27 – 28 –					!						
29 –											
30 —			7	w	SS	19					
31 —	END OF BORING				/ \						

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24



AET JC	OB NO: P-002590 0			LO	G OF	BO	RING N	O	B-	077	(p. 1 c	of 2)			
PROJE	CT: Sioux City Gate	way Airpo	rt; Sioux	City, I	A										
	CE ELEVATION:		LATITUE	DE:			LO	NGI	TUDE:						
DEPTH IN FEET	MATERIAL I	DESCRIPTIC	N		GEOLOGY	N	MC	SA	MPLE TYPE	REC IN.		1			TESTS
FEET					TOPSOIL			1		11 11	WC	DEN	LL	PL	%-#20
1 -	(A-6)		. ,		FINE ALLUVIUM	11	M		SS	22	7				
2 —	SILT, brown, moist, loose SAND, fine grained, light			_/	COARSE	-		H							
3 -	23' then waterbearing, med loose, a lens of gray silty s organics at about 30' (SP)	dium dense	to verv	ı	ALLUVIUM	14	M	A	SS	18					
4 -	organics at about 30' (SP)	(A-3)						\{\}							
5 —						17	M	M	SS	17					
6 -								 }							
7 -								1							
8 -						16	M	\mathbb{N}	SS	18					
9 –								}							
10 -	10 —					18	M	M	SS	18					
11 -								1 1 1 1 1 1 1 1 1 1							
12 -								[]							
13 -						23	M	M	SS	18					
14 -								1							
15 –						11	M	M	SS	16					
16 -								1							
B 17 -								}}							
18 –								}							
19 -															
\begin{align*} 20 - \\ \begin{align*}						17	M		SS	18					
14 — 15 — 16 — 175/2000 SIOONX CITY GATEWAY AIRPORT GATEWAY AI								1							
DEF	TH: DRILLING METHOD			WATE	R LEVEL MEA	SURE	EMEN	TS		l .			NOTE:	REFE	R TO
<u>ဗို့ 0-2</u>	9½' 3.25" HSA	TIME	SAMPLI DEPTI	ED CASING H DEPTH	CAV DE	/E-IN PTH	FL	ORILLIN UID LE	NG VEL	WATE LEVE	ER L	ТНЕ А	TTAC	HED	
AT-LO		11/14/24	2:43	26.0	24.5						23.0		SHEET		
₩ BODIN	IG												XPLA		
Ö COMP	IG LETED: 11/14/24												IS LOC	GY ON	
₽ DR: C	CF LG: MH Rig: 68C												111	וט בטל	J



AET JO	B NO: P-0025900		LO	G OF 1	BO	RING N	O	B-	077 (p. 2 c	of 2)		
PROJEC	CT: Sioux City Gateway Airport; Sioux Ci	ity,	IA										
	LATITUDE: _				LON	\GI	ΓUDE:						
DEPTH IN FEET	MATERIAL DESCRIPTION		GEOLOGY	N	MC	SA	MPLE TYPE	REC IN.	WC	0 & LAI DEN	LL		TESTS %-#200
23 – 24 –	SAND, fine grained, light brown, moist to about 23' then waterbearing, medium dense to very loose, a lens of gray silty sand with trace organics at about 30' (SP) (A-3) (continued)		COARSE ALLUVIUM (continued)		<u></u>	222222			wc	DEN	LL		70-#200
25 —				4	W	M	SS	16					
26 -						[]							
27 – 28 –						{{ {{							
29 –						{ {							
30 —				7	W	M	SS	16					
31 —	END OF BORING												

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24



AET JO	OB NO: P-0025900)				LC	G OF	BOF	RING N	O	B-	078 ((p. 1 a	of 2)	
PROJE	Sioux City Gate	way Airpo	rt; Sioux	City, L	4										
	CE ELEVATION:		LATITUE	DE:			LO	NGIT	TUDE:		1				
DEPTH IN FEET	MATERIAL I	DESCRIPTIC	οN		GEOLOGY	N	MC	SA	MPLE YPE	REC					TESTS
FEET								口,	1112	111.	WC	DEN	LL	PL	%-#200
1 -							M	}}							
3 -	SILTY CLAY, trace roots, laminations of fine sand (C	CL-ML) (A	-4)	/	FINE ALLUVIUM	5	M	X1	SS	18	29				
4 -	SILT, brown and reddish bloose (ML) (A-4)	prown mott	led, moist,	,				/\ } }							
5 -	SAND, fine grained, light medium dense, a laminatio	brown, mo	ist, loose to lay at abou	o : !	COARSE ALLUVIUM	8	M		SS	18					
6 -	15' (SP) (A-3)							<u>}</u>							
7 - 8 -						5	M		SS	16					
9 -								}							
10 -						7	M	M	SS	18					
11 -								F							
12 -						5	M		SS	18					
75/02/ZT 14 -								<u>}</u>							
15 -						10	M		SS	18					
16 -								<u>}</u>							
17 -	-							}							
NO N								}							
20 -						15	M	M FJ	SS	18					
14 - 15700Z 1570							141	\	55	10					
S DEI	 PTH: DRILLING METHOD			WATE	R LEVEL MEA	 SURF	 EMEN	[] TS					IOTE	DEFE	D TO
9N 0-2	29½' 3.25" HSA	DATE	TIME	SAMPLE DEPTE			/E-IN PTH	_	RILLIN JID LE	NG VEL	WATE LEVE		NOTE: THE A		
AT-LO		11/14/24	4:06	26.0	24.5						24.0		SHEET		
A DODB	- IC														ON OF
BORIN COMP	PLETED: 11/14/24							_				$ \mid$ ^{Tl}			GY ON
DR: C	CF LG: MH Rig: 68C												1H	IS LO	J



ENGIN	NEERING TESTING												
AET JO	B NO: P-0025900		LO	G OF	BO	RING N	O	B-	078 (p. 2 o	of 2)		
PROJEC	CT: Sioux City Gateway Airport; Sioux C	ity,]	IA										
	LATITUDE:		ı		LON	\GI	TUDE:						
DEPTH IN FEET	MATERIAL DESCRIPTION		GEOLOGY	N	MC	SA	MPLE TYPE	REC	FIELD	& LAI	BORAT	ORY T	ΓESTS
FËÈT				11	IVIC		TYPE	IN.	WC	DEN	LL	PL	%- #200
23 —	SAND, fine grained, light brown, moist, loose to medium dense, a lamination of lean clay at about 15' (SP) (A-3) <i>(continued)</i>		COARSE ALLUVIUM (continued)			}							
24 —					<u> </u>	<u>{</u>							
25 —	SILTY SAND, trace roots and organics, fine grained, gray, waterbearing, loose (SM) (A-2-4)			5	W	M	SS	18					
26 –						/ \ {}							
27 —						{}							
28 —						\ \ \							
29 —						<u>}</u>							
30 —	SAND, fine grained, light brown, waterbearing,			6	W	M	SS	16					
31	loose (SP) (A-3) END OF BORING					$\overline{}$							

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24



AET JO	OB NO: P-002590 0)				LC	G OF	BOF	RING N	О	B-	079	(p. 1 c	of 2)	
PROJEC	CT: Sioux City Gate	way Airpo	ort; Sioux	City,	IA										
	CE ELEVATION:		LATITUE	E:	T		LO	NGIT	TUDE:						
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SA	MPLE YPE	REC IN.		0 & LA	I		1
FEET					TOPSOIL			ly.		11 11	WC	DEN	LL	PL	%-#20
1 -	SILT (ML)			$ \parallel$ \parallel	FINE		M	}							
					ALLUVIUM			}							
2 -	SILTY SAND, fine graine loose (SM) (A-2-4)	ed, light bro	own, moist,		COARSE ALLUVIUM	5	M	M	SS	18					
3 -							IVI	A	SS	10					
4 —								X							
5 —	SILT, trace roots, brown, 1 (A-4)	moist, loose	e (ML)		FINE ALLUVIUM	6	M	M	SS	17	28				
6 -	(A-7)				11220 110111	0	M		33	1 /	28				
								}							
7 -	SAND, fine grained, light medium dense (SP) (A-3)	brown, mo	ist, loose to)	COARSE ALLUVIUM	_			~~						
8 -	medium dense (SP) (A-3)				ALLOVION	7	M	\mathbb{N}	SS	17					
9 —								}							
10 -															
						25	M	\mathbb{N}	SS	18					
11 -								[]							
12 —								13							
13 -						21	M	\mathbb{N}	SS	18					
702/21 14 —								[]							
15 —								13							
L+WEL						13	M	\mathbb{N}	SS	17					
[6] 16 —								[]							
[편] 17 —								}							
14 — 15 — 15 — 16 — 17 — 16 — 17 — 18 — 17 — 18 — 18 — 19 — 18 — 19 — 19 — 19 — 19															
\[\frac{1}{8} \]								{{							
20 —								1							
20 A						11	M	X	SS	16					
21 -								[]							
DEP	TH: DRILLING METHOD			WAT	 ER LEVEL ME <i>A</i>	SURE	L EMEN'	∐∤∐ TS					OTE:	REFE	R TO
0 4 3	01/! 2 25!! 110 4	DATE	TIME	SAMPI DEPT	ED CASING H DEPTH	CAV	/E-IN PTH	FII	RILLIN JID LE	NG VFI	WATI LEVE		THE A		
9001 1	9½' 3.25" HSA	11/14/24	4:55	26.0		100	11	1.1.	2112 111	122	24.0		SHEET		
												E	XPLA]	NATIO	ON OF
BORIN COMP	IG LETED: 11/14/24											T			GY ON
DR: C	F LG: MH Rig: 68C												TH	IS LO	G



AET JO	B NO: P-0025900		LO	G OF	BO	RING N	O.	В-	079 (p. 2 o	of 2)		
PROJEC		itv.]	ΙA	20	0 01					(P		
111012	LATITUDE:	• •			LON	\GI	TUDE:						
DEPTH			CEOLOGY.					REC	FIELD	& LAI	BORAT	ORY 7	ΓESTS
DEPTH IN FEET	MATERIAL DESCRIPTION		GEOLOGY	N	MC	5	AMPLE ΓΥΡΕ	ÎN.	WC	DEN	LL	PL	% -#200
23 — 24 —	SAND, fine grained, light brown, moist, loose to medium dense (SP) (A-3) <i>(continued)</i>		COARSE ALLUVIUM (continued)		•	? ?????							
25 —	SAND, fine grained, light brown, waterbearing,			9	W	₹ <u>₹</u>	SS	12					
26 —	loose, lenses of gray, fat clay and lean clay (SP) \((A-3 \) and A-7-6)					\ ₹							
27 —	SAND, a little gravel, trace roots, fine to medium grained, gray, waterbearing, loose (SP) (A-3)					\ \ \ \							
28 —						}							
29 —						<u>}</u>							
30 — 31 —				9	W	X	SS						
	END OF BORING												

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24



AET JC	AET JOB NO: P-0025900									BO	RING N	O	B-	080 ((p. 1 c	of 1)	
PROJEC	CT:	Sioux City Gates	way Airpo	ort; Sioux	City,	IA											
	CE EL	EVATION:		LATITUD	E:	1			LO	NGI	TUDE:		1				
DEPTH IN FEET		MATERIAL I	DESCRIPTIO	ON		GF	EOLOGY	N	MC	SA	MPLE TYPE	REC					TESTS
FEET						TOI	PSOIL			」 加		11 11	WC	DEN	LL	PL	%-#20
1 —	SIL	Т				FIN			M	}} }}							
2 —										1							
3 —	lens	NDY SILT, brown, mo ses of silty sand and lan L) A-4	ist, mediur ninations o	n dense, of lean clay			IE LUVIUM MIXED	12	M		SS	17					
4 —	(171)	L) A-1				ALI	LUVIUM			{}							
5 —	LE	AN CLAY, gray, firm, clay (CL) A-7-6	lamination	s of silt and	i ///	FIN ALI	IE LUVIUM	8	M		SS	10	33				
6 —										R							
7 —	SIL den	T WITH SAND, brown ase (ML) A-4	n, moist, m	nedium				11	M	11	SS	16					
8 - 9 -	med	ND, fine grained, light dium dense, laminations a clay (SP) A-6	brown, mo s of silt, sil	oist, loose to	o 1		ARSE LUVIUM	11	141		55	10					
10 —	Tear	Telay (SI) A-0						6	M) }	SS	15					
11 -									111	/\ {}	55	10					
12 —										13							
13 —								14	M		SS	16					
14 —										<u>}</u>							
Ö 15 −								9	M		SS	15					
16 —										}							
전 전 전 전 전 전 전 전 전 전 전 전 7 7 8 8 8 8 8 8										\{\}							
14 — 15 7 157500										\$							
8 В 20 —								16	M	KI	SS	15					
[21 -	EN	D OF BORING				:				V							-
	EIN	D OF BOKING															
DEP DEP	TH:	DRILLING METHOD			1		EVEL MEA			_					NOTE:	REFE	R TO
립 일 0-1 5	9½'	3.25" HSA	DATE	TIME	SAMPI DEPT	LED TH	CASING DEPTH	CAV DEI	/E-IN PTH	FL	ORILLIN UID LE	VEL	WATE LEVE	ER EL	ГНЕ А	TTAC	HED
AT-LO															SHEET		
⊋ BORIN	IG.																ON OF
COMP	LETEI													^{T]}		IOLOC IS LOC	GY ON
b DR: C	F I	.G: MH Rig: 68C													111	io LO(J



AET JO)B NO	P-0025900)				LC	G OF	BO	RING N	О	B-	081	(p. 1 d	of 1)	
PROJE	CT:	Sioux City Gate	way Airpo	ort; Sioux	City,	IA										
SURFA	CE EL	LEVATION:		LATITUD	E:	T		LO	NGI	ΓUDE:						
DEPTH IN FEET		MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SA	MPLE YPE	REC IN.					TESTS
FEET						TOPSOIL OR			'	. 11 L	111.	WC	DEN	LL	PL	% -#20
1 -	SIL	Т				FILL FINE ALLUVIUM		M	1							
3 -	SA	NDY LEAN CLAY, br ses of fine sand (CL) A	rown mottle -6	ed, stiff,		OR FILL MIXED ALLUVIUM OR FILL	12	M	\$1	SS	18					
4 - 5 -	LE.	AN CLAY, brown and	grayish bro	own_		FINE			<u>{</u>							
6 -	mo	ttled, firm, lenses of fat	clay (CL)	A-7-6		ALLUVIUM	6	M	\\ {}	SS	18	26				
7 - 8 -	SIL	T, brown and gray mot ses of lean clay (ML) A	tled, moist	, very loose	;,		3	М		SS	16					
9 -	SA	ND, fine grained, light ttled, moist, loose to me	brown		COARSE ALLUVIUM	8	M	\{\{\}	SS	18						
11 -	lam	nination of lean clay at a nination of silt at about 2	and a			0	IVI	\ \{\}	33	10						
12 -							13	M) }	SS	17					
14 –	_								<u>}</u>							
15 –							12	M	M	SS	17					
16 – 17 –									{} {}							
18 –	-								\{\} \{\}							
19 –	-							,,,	<u>}</u>	g c						
14 - 1570000 POOLY ALL ON THE PROPERTY OF THE	EN	D OF BORING					7	M	\bigwedge	SS						
000 NEI	 TH:	DRILLING METHOD			WAT	 ER LEVEL MEA	SIDE	MEN	 TS							
0-1	9½'	3.25" HSA	DATE	TIME	SAMPI DEPT			EMEN /E-IN PTH	т —	ORILLIN UID LE	NG VEL	WATE LEVE	ER EL	NOTE: THE A	TTAC	HED
AT-LC												Non		SHEET		
⊋ BORIN	JG.													XPLA1		
E COMP	LETE								-						IS LO	GY ON
F DR: C	CF I	LG: MH Rig: 68C												111	וט בטו	



	AET JC	DB NO: P-0025900	ı					LO	G OF	BO	RING N	О	B-	082	(p. 1 c	of 1)	
	PROJE	Sioux City Gatev	way Airpo	ort; Sioux	City,	IA											
L	SURFA	CE ELEVATION:		LATITUE	ÞΕ:				LO	NGI	TUDE:						
	DEPTH IN FEET	MATERIAL I	DESCRIPTIO	DΝ		GE	OLOGY	N	MC	SA	MPLE TYPE	REC					TESTS
-	FEET	SILTY SAND, trace roots,	hroum (A	2.4)	गुन	FILI	7					111.	WC	DEN	LL	PL	%-#200
	1 —	SILT I SAND, trace roots,	brown (A	-2-4)		FILI	L		M	}							
	1								IVI	}							
	2 —					: :				21							
	3 —							4	M	X	SS	18					
	4 —					:				13							
										[]							
	5 —					:		4	M	IXI	SS	18					
	6 —	SILTY SAND, fine graine loose to loose, lens of silt (d, brown, 1 SM) (A-2-	noist, very 4)			ARSE LUVIUM			H							
	7 —									团							
	0	SAND, fine grained, brown	n, moist, lo	oose (SP)		· <u>·</u>		9	M	M	SS	18					
	8 —	(A-3)		, ,													
	9 —									}							
	10 —							5	M	M	SS	18					
	11 -								IVI	М	33	10					
	11	END OF BORING															
42																	
12/20/2																	
GDT																	
WELL.																	
÷ L																	
- AET																	
T.GPJ																	
IRPOF																	
NAY A																	
GATE/																	
CIT																	
SIOUX																	
AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	DEF	TH: DRILLING METHOD			WAT	ER LE	EVEL MEA	SURE	EMEN	TS		<u> </u>			l NOTE:	REEE	R TO
P-00;	0	01/4	DATE	TIME	SAMP DEP	LED	CASING DEPTH	CAV	/E-IN PTH	I	ORILLIN UID LE	NG.	WATE LEVE		чоте. Гне а		
LONG	0-	9½'			DEP	111	DELIU	DE.	1 111	FL	OID LE	VEL	Non		SHEET		
W-LAT													1 1011		XPLA	NATIO	ON OF
ORP	BORIN COMP	IG LETED: 5/17/24												T	ERMIN	OLOC	GY ON
AET_C	DR:	LG: Rig:													TH	IS LO	G



AET JC	DB NO: P-0025900)				LO	G OF	ВО	RING N	О	B-	083	(p. 1 c	of 1)	
PROJE	CT: Sioux City Gate	way Airpo	ort; Sioux	City,	IA										
	CE ELEVATION:		LATITUD	E:	T	_	LO	NGI	TUDE:		1				
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SĄ	AMPLE FYPE	REC			BORAT		1
1 -	FILL, mixture of silty sand clay, brown and a little gra	l, lean clay y (A-2-4)	, a little fat		FILL		М		SS	19	WC	DEN	LL	PL	%-#200
3 -	LEAN CLAY, gray and br (CL) (A-6)	rown mottle	ed, firm		FINE ALLUVIUM	8	M		SS	18					
5 - 6 -	SILTY SAND, fine graine medium dense (SM) (A-2- SAND, fine grained, light medium dense (SP) (A-3)	4)			COARSE ALLUVIUM	4	M	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	SS	18					
7 - 8 - 9 -						19	M		SS	15					
10 -						13	M		SS	18					
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 COMMON AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	END OF BORING														
DEF	PTH: DRILLING METHOD				ER LEVEL MEA	1		т —	ח און זו אכ	NG	WATE		NOTE:		
<u>9</u> 0-	9½' 3.25" HSA	DATE	TIME	SAMPI DEPT	LED CASING THE DEPTH	DE	E-IN PTH	FL	DRILLIN UID LE	VEL	WATE		THE A SHEET		
/-LAT-I											Non		XPLA		
BORING COMP	IG LETED: 5/13/24												ERMIN		
DR:	LG: RH Rig: 63												TH	IS LO	G

03/2011



AET J	OB NO: P-0025900)					LO	G OF	ВО	RING N	О	B-	084 ((p. 1 c	of 1)	
PROJI	ECT: Sioux City Gates	way Airpo	ort; Sioux	City,	ΙA											
	ACE ELEVATION:		LATITUD	E:				LO	NGI	TUDE:		1				
DEPTH IN FEET	I MATERIAL I	DESCRIPTIO	ON		GE	EOLOGY	N	MC	SĄ	MPLE TYPE	REC IN.		& LA		I	
FEET	FILL, mostly lean clay wit	h sand trad	re roots		FIL	Ι.					11	WC	DEN	LL	PL	%-#20 0
1 -	brown	ii saiia, iia	<i>c</i> 100ts,			_	4	M	V	SS	16					
	FILL, mostly sand, trace ro	oots, brown	n (A-3)		-				\mathbb{N}							
2 -	FILL, mostly clayey sand,	brown (A	6)				10	M	M	SS	16					
3 -	I ILL, mostry crayey sand,	orown (A-	0)				10	IVI	Д	55	10					
4 -	_								\{							
5 -	FILL, mixture of silt and figray (A-4 and A-7-6)	at clay, bro	wn and				10	M	M	SS	16					
6 -							10	IVI	Д	SS	10					
									\mathbb{X}							
7 -	SILTY SAND, fine graine moist, loose (SM) (A-2-4)	d, brown n	nottled,			ARSE LUVIUM	6	M	M	SS	14					
8 -							0	IVI	\square	SS	14					
9 -	_								\{							
10 -	SAND, fine grained, brow of lean clay (SP) (A-3)	n, moist, lo	ose, a lens				10	M	M	SS	14					
11 -							10	IVI	М	33	14					
	END OF BORING															
/24																
T+WELL.GDT 12/20/24																
L.GDT																
I+WEL																
T+CP1																
PJ AE																
ORT.G																
Y AIRP																
TEWA																
TY GA																
DUX																
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CP-	EDTH. DRILL BLOADERIOS			XX 4 777	EDI		or me	EN ACCS TO	TC							
P-0025	EPTH: DRILLING METHOD	DATE	TDAG			EVEL MEA CASING			_	ORILI IN	NG	WATE		NOTE:		
0 0 0)-9½' 2.25" HSA	DATE	TIME	SAMPI DEPT	-	CASING DEPTH	DE	E-IN PTH	FĹ	ORILLIN UID LE	VEL	WATE	_	THE A SHEET		
-LAT-		5/14/24 5/14/24		11.0 11.0		9.5	O	.0				Non Non		XPLA]		
BORI COM	NG PLETED: 5/14/24	3/14/24		11.(<i>y</i>		9	•0				14011				GY ON
. 4	BK LG: AK Rig: 4								\vdash					TH	IS LO	3



AET JOI	P-0025900						LO	G OF	BO	RING N	O	B-	085	(p. 1 c	of 1)	
PROJEC	Sioux City Gatev	vay Airpo	rt; Sioux	City, l	ÍΑ											
	CE ELEVATION:		LATITUDE	E:	ı		_	LON	\GI	TUDE:		1				
DEPTH IN FEET	MATERIAL D	ESCRIPTIO	N		GE	OLOGY	N	MC	SĄ	AMPLE ΓΥΡΕ	REC IN.			BORAT		
1 —	LEAN CLAY, trace roots, (A-6)	grayish bro	own (CL)		FINE ALL	E UVIUM		M	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\			wc	DEN	LL	PL	%-#200
2 3 4 	SANDY SILT, brown, mor	st, loose, l	ens of lean				9	M		SS	18					
5 —	SAND, fine grained, light l dense (SP) (A-3)	orown, moi	st, medium		COA ALL	ARSE UVIUM	18	M	\{\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	SS	18					
7 – 8 – 9 –							17	M		SS	18					
10 —							25	M	<u>{</u>	SS	20					
11 —	END OF BORING															
DEP	ΓΗ: DRILLING METHOD			WATI	ER LE	EVEL MEA	SURE	MEN.	ΓS					NOTE:	REFE	R TO
0-9	91/31	DATE	TIME	SAMPL DEPT	ED H	CASING DEPTH	CAV DEI	E-IN PTH	FL	ORILLIN UID LE	IG VEL	WATE LEVE	R L	THE A	TTAC	HED
<u> </u>	·-											Non		SHEET	'S FOF	R AN
Day-														EXPLA		
BORING COMPL	G ETED: 5/14/24												T	ERMIN		
DR:	LG: Rig:													TH	IS LO	j

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24



AET JO	OB NO: P-0025900)					LO	G OF	BOI	RING N	O	B-	086	(p. 1 c	of 1)	
PROJE	CT: Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
	CE ELEVATION:		LATITUD	E:				LO	NGI	ΓUDE:						
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GE	OLOGY	N	MC	SA	MPLE YPE	REC IN.			BORAT		
FEET	5" Bituminous pavement				FILI	Ī.		M	<u> </u>		11 11	WC	DEN	LL	PL	%- #200
1 -	14" Base fill, mostly sand	with silt wi	th gravel,	1		_										
	brown (A-2-4) FILL, mostly sandy lean cl	av with a l	ittle gravel				2	M	X	SS	18					
2 -	brown and gray (A-6)	ay willi a i	ittie graver,	'			10		M	CC	1.6					
3 -	LEAN CLAY WITH SAN	D, gray an	d brown		FINI	E	10	M		SS	16					
4 -	mottled, stiff (CL) (A-6) LEAN CLAY, gray, stiff (CL) (A-6)			ALL	LUVIUM			}							
5 -																
	SANDY LEAN CLAY, gr stiff (CL) (A-6)	ay and bro	wn mottled	l, [///	MIX ALL	KED LUVIUM	12	M	M	SS	18					
6 -									[]							
7 -	SAND, fine grained, light	brown, mo	ist, mediun	1 ////		ARSE			17							
8 -	dense (SP) (A-3)				ALL	LUVIUM	25	M	X	SS	18					
9 –									<u> 11</u>							
10							1.2		M	aa						
10 -							12	M		SS						
11 -	END OF BORING			1:1					\Box							
T+WELL.GDT 12/20/24																
100 100																
VELL. G																
CPT+V																
AET+																
T.GPJ																
IRPOR																
WAY A																
GATE																
<u></u>																
SIOU																
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CP- MOOB GOOD G	PTH: DRILLING METHOD			WAT	ER LE	EVEL MEA	SURE	EMEN'	TS				1	NOTE:	REFE	R TO
ο Λ _	.9½' 3.25" HSA	DATE	TIME	SAMPI DEPT	LED TH	CASING DEPTH	CAV DE	Æ-IN PTH	FL	ORILLIN UID LE	NG VEL	WATE LEVE		THE A		
NO 1-1	// VIMU 11U/1	5/13/24		11.0		9.5		1.0				Non		SHEET	S FOF	R AN
A-LA													E	XPLA	NATIC	N OF
BORIN COMP	NG PLETED: 5/13/24				\Box								T	ERMIN		
₩ DR:	LG: RH Rig: 63													TH	IS LO	j

03/2011



AET JO	B NO: P-0025900					_	LO	G OF	BO	RING N	О	B-	087	(p. 1 c	of 1)	
PROJEC	Sioux City Gatev	vay Airpo	rt; Sioux	City, l	IA											
	CE ELEVATION:		LATITUD	E:			_	LON	\GI	TUDE:		1				
DEPTH IN FEET	MATERIAL D	ESCRIPTIO)N		GEO	OLOGY	N	MC	SA	MPLE TYPE	REC IN.			BORAT		
FEET	5" Bituminous pavement				FILL				LAI		11 11	wc	DEN	LL	PL	%-#200
1 -	Apparent base, sand with s (A-1-b)	ilt and grav	vel, brown			,		M	}} {{							
2 —	SILTY SAND, fine grained	d, brown, n	noist,		COA	RSE			<u>{1</u>							
3 —	medium dense, lenses of si laminations of silt (SM) (A	lt with sand	d and		ALL	UVIUM	13	M		SS	14					
4 – 5 –									<u> </u>							
6 –	SAND, fine grained, brown medium dense, laminations	n, moist, lo	ose to				19	M	X	SS	18					
7 —	(A-3)		()						<u>र</u>							
8 –							10	M	X	SS	18					
9 –									R							
10 —						15	M		ſ	18						
11 —									L							
	END OF BORING															
DEP	TH: DRILLING METHOD		WATI	ER LE	VEL MEA	SURF	MEN	[]					NOTE	DEEE	D. TO	
		DATE	TIME	SAMPI DEPT		CASING DEPTH		E-IN PTH	I	ORILLIN	IG.	WATE LEVE		NOTE: THE A		
0-9) ½'			DEPT	Н	DEPIH	DEI	riH	FL	UID LE	VEL	None		SHEET		
												1 1011		EXPLA	NATIC	N OF
BORING COMPL	G LETED: 5/14/24												Т	ERMIN	OLOC	Y ON
DR:	LG: Rig:													TH	IS LO	j

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24



AET JC	P-0025900)					LO	G OF	ВО	RING N	О	B-	088	(p. 1 d	of 1)	
PROJEC	Sioux City Gate	way Airpo	ort; Sioux	City,	ΙΑ											
	CE ELEVATION:		LATITUD	E:	1			LO	NGI	TUDE:		1				
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLO	OGY	N	MC	SĄ	AMPLE ΓΥΡΕ	REC					TESTS
FEET	5.75" Bituminous pavemen	nt			FILL						1111	WC	DEN	LL	PL	%-#200
1 -	30.25" Base, fill, mostly sa gravel, brown (A-1-b)		lt and		TILL		25	M		SS	12					
3 -				11.1			11	M		SS	16					
4 -	SILTY SAND, fine graine about 8' then waterbearing loose (SM) (A-2-4)	d, brown, i , medium d	noist to lense to		COARS ALLUV	E IUM			\ \ \ \\							
5 —							13	M		SS	18					
7 -									P							
8 -							6	M		SS	18					
9 –									<u>{</u>							
10 -	SAND, fine grained, brow of silty sand (SP) (A-3) END OF BORING	n, moist, lo	ose, lenses	3			10	M	X	SS	18					
12/20/24																
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 GORD W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24																
J AET+CPT																
RPORT.GP																
ATEWAY AI																
OUX CITY G																
DEP	TH: DRILLING METHOD			WAT	ER LEVE	MEA	SIDE	MEN	 2T							
DEP	9½' 2.25" HSA	DATE	TIME	SAMPI DEPT		SING PTH		EMEN /E-IN PTH	_	ORILLII UID LE	NG VEL	WATE LEVE		NOTE: THE A		
AT-LO		5/14/24		11.0	9	0.5						Non		SHEET		
→ BORIN	[G	5/14/24		11.0	0		9	.0				Non		XPLA]		
	LETED: 5/14/24										_				IOLOG IS LOG	GY ON
₽ DR: B	K LG: AK Rig: 4													111	is LO	J



	AET JO	B NO: P-002590 0)					LO	G OF	BO	RING N	O	B-	089	(p. 1 c	of 1)	
	PROJEC	Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
	SURFAC	CE ELEVATION:		LATITUD	E:				LO	ŊĠľ	TUDE:		1				
	DEPTH IN FEET	MATERIAL I	DESCRIPTIO	DΝ		GI	EOLOGY	N	MC	SA	MPLE TYPE	REC			BORAT		
	FEET	5" Bituminous pavement				FIL	T		M	ļ.,	III	IIN.	WC	DEN	LL	PL	%-#20 0
	1	FILL, mostly sand with sil	t with grav	el, brown	1	FIL	L		M	<u>{</u> {							
	1 -	(A-1-b)	S	,				25	M	X	SS	18					
	2 —	SILTY SAND, fine graine	d, grayish	brown and		CO	ARSE			\mathbb{H}							
	3 –	reddish brown mottled, mo (SM) (A-2-4) (may be fill)	oist, mediui	n dense		ALI OR	LUVIUM FILL	13	M	X	SS	18					
		(SWI) (N-2-4) (May be IIII)								H							
	4 -	CANDY OUT 11	1	1			VED			团							
	5 —	SANDY SILT, gray and b medium dense (ML) (A-4)	rown mottl (may be fi	ed, moist, ll)		ALI	XED LUVIUM	11	M	V	SS	17					
	6 –		. •			OR	FILL			\square							
										{ }							
	7 -	LEAN CLAY, trace roots,	brown and	l gray		FIN	E LUVIUM			M							
	8 -	mottled with a little black, be fill)	firm (CL)	(A-6) (may		OR	FILL	8	M	M	SS	18					
	9 –									R							
										17							
	10	SILTY SAND, fine graine	d, brown, 1	noist, loose	, [[[CO	ARSE LUVIUM	7	M	X	SS	18					
	11 -	(SM) (A-2-4) END OF BORING				ALI	LUVIUM			H						_	
		Did of Borning															
)/24																	
12/20																	
GDT.																	
+WELI																	
+CPT																	
J AET																	
RT.GP																	
IRPOF																	
NAY A																	
3ATE																	
CIT																	
SIOUX																	
5900 S	DEP	TH: DRILLING METHOD			WAT	ER L	EVEL MEA	SURF	MEN	⊥ TS					IOTE	DEFE	D TC
P-002			DATE	TIME	SAMPI	LED	CASING DEPTH		E-IN PTH	т —	ORILLIN UID LE	NG	WATE LEVE		NOTE: THE A		
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	0-9	9½' 3.25" HSA		THVIL	DEPT	ГН				FL	UID LE	VEL		_	THE A SHEET		
-LAT-L			5/13/24		11.0	U	9.5	[1]	1.0	-			Non		SHEE I XPLAI		
RP W.	BORIN	G 5/12/24				-									ERMIN		
AET_CO		LG: RH Rig: 63												\dashv		IS LOC	
Ā	DK:	LG. KH Kig: US															

03/2011



AET JOB	NO: P-0025900)				LC	OG OF	ВО	RING N	O	B-	-090	(p. 1 c	of 1)	
PROJECT	Sioux City Gate	way Airpo	ort; Sioux	City,	IA										
SURFACE	E ELEVATION:		LATITUD	E:	1		LO	NGI	TUDE:						
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SĄ	AMPLE TYPE	REC	-	D & LA		1	1
						ļ			IYPE	IIN.	WC	DEN	LL	PL	%-#2 0
1 -	FILL, mixture of silty sand roots, brown (A-2-4 and A	d and lean of the second control of the seco	clay, trace		FILL	5	M		SS	18					
3 -	SILTY SAND, fine graine (SM) (A-2-4)	ed, brown, 1	noist, loose	e	COARSE ALLUVIUM	6	M	\(\)	SS	16					
4 — 5 —						8	M	\{\frac{1}{2}}	SS	18					
6 -								\\ \{\}							
8 –	SAND, fine grained, brow laminations of lean clay (S	n, moist, lo SP) (A-3)	oose,			10	M	\\ \{\}	SS	16					
9 -						8	M	<u>{</u> }	SS	16					
11 +	END OF BORING							/ \ 							
DEPT	H: DRILLING METHOD			WAT	 ER LEVEL ME <i>l</i>	 SURI	 EMEN	L TS				<u> </u>	JOTE	DEEL	
		DATE	TIME	SAMPI DEP		_	/E-IN PTH	_	DRILLIN UID LE	NG VEI	WATI LEVE		NOTE: THE A		
0-9%	2' 2.25" HSA	5/14/24		11.0		DE	1 111	1,T	OID LE	V L'L	Non		SHEET		
		5/14/24		11.0		9	0.0				Non		XPLA	NATIO	ON OF
BORING COMPLE	ETED: 5/14/24												ERMIN	10LO	GY ON
DR: BK													TH	IS LO	G



AET JO	B NO: P-0025900						LO	G OF	BO	RING N	O	B-	091 ((p. 1 c	of 1)	
PROJEC	Sioux City Gatev	way Airpo	rt; Sioux (City, l	ΙA											
	CE ELEVATION:		LATITUDE	E:				LON	\GI	TUDE:		T				
DEPTH IN FEET	MATERIAL I	DESCRIPTION	N		GE	OLOGY	N	MC	SA	MPLE TYPE	REC IN.	WC	0 & LA DEN	BORAT LL		ΓESTS %-#200
1 -	FILL, mixture of silty sand and fat clay, brown and gra	l, sandy lear ny (A-2-4 ar	n clay, silt nd A-6)		FILI	<u> </u>	4	М	M	SS	19	WC	DEN	LL	FL	70-#200
2 – 3 –							11	M	N P	SS	18					
4 — 5 — 6 —	SAND, fine grained, light medium dense (SP) (A-3)	brown, mois	st, loose to				17	M	<u>}</u>	SS	18					
7 – 8 – 9 –							9	M	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	SS	18					
10 —							13	M	M	SS	18					
11	END OF BORING															
DEP	TH: DRILLING METHOD					EVEL MEA								NOTE:	REFE	R TO
0-9	9½' 3.25" HSA	DATE	TIME	SAMPL DEPT	ED	CASING DEPTH	CAV DE	E-IN PTH	FL.	ORILLIN UID LE	VEL	WATE LEVE	R L	ГНЕ А	TTAC	HED
				11.0	0	9.5	11	1.0				Non		SHEET		
BORIN	G				_									XPLAI ERMIN		ON OF SY ON
COMPI DR:	LETED: LG: Rig:										\dashv		- '		IS LO	

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24



AET JO	B NO: P-0025900	ı					LO	G OF	BO	RING N	O	B-	092 ((p. 1 c	of 1)	
PROJEC	Sioux City Gates	way Airpo	rt; Sioux	City, l	IA											
	CE ELEVATION:		LATITUDE	E:	<u> </u>		_	LON	\GI	TUDE:		l				
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	N		GEO	OLOGY	N	МС	SA	MPLE TYPE	REC IN.	WC	0 & LAI	BORAT LL		FESTS %-#200
1 -	SILTY SAND, fine graine (SM) (A-2-4)	d, brown, m	noist, loose		COA ALL	RSE UVIUM	5	M	M	SS	20	wc	DEN	LL	IL	70-#200
2 – 3 –							8	M	M	SS	18					
4 – 5 – 6 –	SAND, fine grained, light medium dense (SP) (A-3)	brown, moi	st, loose to				17	M	₹ <u>₹</u>	SS	18					
7 — 8 —							5	M		SS	18					
9 – 10 –							11	M	<u>}</u>	SS	18					
11	END OF BORING							1,1	\mathbb{N}	55						
DEP	TH: DRILLING METHOD					VEL MEA			_					NOTE:	REFE	R TO
0-9	9½' 3.25" HSA	DATE	TIME	SAMPL DEPT	ED (CASING DEPTH	CAV DEI	E-IN PTH	FL	ORILLIN UID LE	IG VEL	WATE LEVE	L	ГНЕ А		
		5/15/24		11.0)	9.5	11	.0				Non		SHEET		
BORIN	G _													XPLAI ERMIN		ON OF GY ON
COMPL	LETED: 5/15/24				_						-				IS LO	
DR:	LG: TA Rig: 63													111	is LO	ן נ

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24



	AET JO	B NO: P-002590 0)				LC	OG OF	ВО	RING N	Ю	B-	093	(p. 1 c	of 1)	
	PROJEC	Sioux City Gate	way Airpo	ort; Sioux	City,	IA										
		CE ELEVATION:		LATITUD	E:	T		LO	NGI	TUDE:		1				
D	EPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SĄ	AMPLE TYPE	REC		1			TESTS
	FEET	FILL, mostly sandy silt, br	own (A-4)			FILL					1111	WC	DEN	LL	PL	%-#200
	1 —	Tibb, mostly sandy sin, or	OWII (21 1)			1122	5	M	V	SS	16					
									\mathbb{N}							
	2 —							\ \ \		GG	1.4					
	3 —						6	M		SS	14					
	4 —								}							
	5 —	SAND, fine grained, light	brown, mo	ist, mediun	1	COARSE ALLUVIUM										
		dense (SP) (A-3)				ALLUVIUM	12	M	X	SS	16					
	6 —								X							
	7 —								17							
	8 -						11	M	X	SS	14					
	9 –								H							
	10 —) \ }}							
	10 —						15	M	X	SS	16					
	11 —	END OF BORING														
2/20/24																
3DT 1																
WELL.																
CPT+/																
AET+																
RT.GPJ																
AIRPOF																
WAY /																
GATE																
XCI																
nois o																
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	DEP	TH: DRILLING METHOD				ER LEVEL MI							1	NOTE:	REFE	R TO
NG P-C	0-9	9½' 2.25" HSA	DATE	TIME	SAMPI DEPT	ED CASING H DEPTH	G CAY	VE-IN PTH	FL	DRILLI UID LE	NG VEL	WATI LEVE	ER L	THE A	TTAC	HED
AT-LOI			5/16/24		11.0	9.5						Non		SHEET		
N-W-L	BORIN	G	5/16/24		11.0)	9	0.0				Non		XPLA		
	COMPI	LETED: 5/16/24							-				T		IS LO	GY ON
AET	DR: B	K LG: AK Rig: 4												111	io LO	J



AET JO	B NO: P-0025900)				LC	OG OF	ВО	RING N	О	B-	094 ((p. 1 c	of 1)	
PROJEC	Sioux City Gate	way Airpo	ort; Sioux	City,	IA										
SURFAC	CE ELEVATION:		LATITUE	DE:	1		LO	NGI	TUDE:						
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SĄ	AMPLE ГҮРЕ	REC					TESTS
FEET	FILL, mostly sandy silt, br	rown (A-4)			FILL				LIFE	IIN.	WC	DEN	LL	PL	%-#200
1 —		,		////		4	M	V	SS	18					
	LEAN CLAY, brown, sof	t (CL) (A-6	o)		FINE ALLUVIUM		1,1	\mathbb{N}	22						
3 -	SAND, fine grained, light (SP) (A-3)	brown, mo	ist, loose		COARSE ALLUVIUM	6	M	X	SS	16					
4 — 5 —								\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\							
6 –						6	M	\\ {}	SS	16					
7 —	SAND WITH SILT, fine g moist, loose (SP-SM) (A-3	grained, lig	ht brown,			6	M	1	SS	16					
8 - 9 -	SILT, brown, moist, loose	lamination	ns of sand		FINE	_		/\ {}							
10 —	(ML) (A-4)	, idiimidiloi	is of sure		ALLUVIUM	6	M		SS	16					
DEP	TH: DRILLING METHOD			WAT	ER LEVEL MEA	ASURI	EMEN'	TS					NOTE:	REFE	FR TO
0-9	9½' 2.25" HSA	DATE	TIME	SAMPI DEPT	LED CASING TH DEPTH	CAV	VE-IN PTH	FI	DRILLIN UID LE	NG VEL	WATI LEVE		THE A		
U-2	III	5/16/24		11.0							Non		SHEET	rs foi	R AN
		5/16/24		11.0)	9	0.0				Non	e E	XPLA	NATIO	ON OF
BORIN COMPI	G LETED: 5/16/24											T			GY ON
DR: B l	K LG: AK Rig: 4												TH	IS LO	Ġ



	AET JO	DB NO: P-0025900)					LO	G OF	BO	RING N	О	B-	095	(p. 1 c	of 1)	
	PROJEC	CT: Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
		CE ELEVATION:		LATITUD	E:				LO	NGI	TUDE:						
	DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GI	EOLOGY	N	MC	SA	AMPLE ΓΥΡΕ	REC IN.		I	BORAT	1	
ŀ	FEET	FILL, mostly silty sand wi \(\concrete, brown (A-1-b) \)	th gravel a	nd pieces o	f	FIL				M		111.	WC	DEN	LL	PL	%-#20 (
	1 - 2 -	SILT, brown, moist, loose clay and fine sand (ML)	, lamination A-4)	ns of lean		ALI	LUVIUM	13	M	\mathbb{N}	SS	18					
	3 —							6	M	M	SS	13					
	4 — 5 —									?							
	6 -							5	M	\\ {}	SS	14					
	7 — 8 —	SILTY SAND, fine graine to very loose, lenses and la below 10' (SM) (A-2-4)	d, brown, 1 minations	noist, loose of fat clay	e		ARSE LUVIUM	5	M	11	SS	16					
	9 –	below 10' (SM) (A-2-4)								<u> </u>							
	10 —							4	M	M	SS	12					
	11 -	END OF BORING															
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24																	
+WELL.GD																	
AET+CPT																	
PORT.GPJ																	
EWAY AIR																	
CITY GAT																	
SIOU																	
025900	DEP	TH: DRILLING METHOD		T			EVEL MEA	SURE	EMEN'	TS				1	NOTE:	REFE	R TO
JG P-0	0-	9½' 2.25" HSA	DATE	TIME	SAMPI DEPT	LED TH	CASING DEPTH	CAV DE	Æ-IN PTH	FL	ORILLIN UID LE	NG VEL	WATE LEVE	ER L	THE A	TTAC	HED
11-10			5/16/24		11.0	0	9.5						Non	e	SHEET	'S FOR	AN
W-LA			5/16/24		11.0	0		9	.0				Non		XPLA		
CORF	BORIN COMP	IG LETED: 5/16/24												T	ERMIN		
AET	DR: B	K LG: AK Rig: 4													TH	IS LOC	j



AET J	OB NO: P-0025900)					LO	G OF	BO	RING N	О	B-	096	(p. 1 c	of 1)	
PROJE	Sioux City Gates	way Airpo	ort; Sioux	City,	IA											
	ACE ELEVATION:		LATITUE	DE:				LO	NGI	TUDE:		1				
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		G	EOLOGY	N	MC	SA	MPLE ΓΥΡΕ	REC IN.			BORAT	I	1
FEET	SILT, trace roots, brown, 1	oose (ML/	CL) (A-4)		FIN	Œ			1			WC	DEN	LL	PL	%-#20 0
1 -		(1.12)	-2) (11 1)		AL	LUVIUM	8	M	V	SS	21					
									\mathbb{N}							
2 -	SILT, brown, moist, very l sand (ML) (A-4)	oose, lense	es of silty				4	M	M	SS	18					
3 -	Sund (ML) (MA)						4	IVI		33	10					
4 -	_								{							
5 -							_									
							5	M	M	SS	18					
6 -	SAND, fine grained, brow dense, a lens of silty sand (n, moist, m	nedium			ARSE LUVIUM			[]							
7 -	delise, a lens of stity saild ((SI) (A-3)			: 1	Le viewi			13							
8 -							15	M	X	SS	18					
9 -									13							
10					: :				17							
10 -							29	M	IXI	SS	18					
11 -	END OF BORING			.:	·.				\cap							
2/20/24																
TOS																
VELL. G																
CPT+V																
AET																
T.GPJ																
RPOR																
× ∀ ∀ ∀ ∀ ∀ ∀																
GATE																
Ç F																
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24																
DE DE	EPTH: DRILLING METHOD			WAT	ER L	EVEL MEA	SURE	EMEN'	TS				N	NOTE:	REFE	R TO
ο υ)-9½' 3.25" HSA	DATE	TIME	SAMP DEP	LED TH	CASING DEPTH	CAV DE	/E-IN PTH	FL	ORILLIN UID LE	NG VEL	WATE LEVE		THE A		
	7/2 UIBO HOA	5/15/24		11.		9.5		1.0			\top	Non	_	SHEET	S FOF	R AN
A-LA														XPLA		
BORI COMI	NG PLETED: 5/15/24												T	ERMIN		
₩ DR:	LG: RH Rig: 63													TH	IS LO	3

03/2011



AET JO	OB NO:	P-0025900)				LC	G OF	BOI	RING N	О	B-	097	(p. 1 c	of 1)	
PROJE	CT:	Sioux City Gates	way Airpo	rt; Sioux	City, l	IA										
		ATION:		LATITUD	ÞΕ:	T		LO	NGI'	ΓUDE:						
DEPTH IN FEET		MATERIAL I	DESCRIPTIO	N		GEOLOGY	N	MC	SĄ	MPLE YPE	REC			BORAT		1
FEET	1				V////		<u> </u>	_	1 	ILE	IN.	WC	DEN	LL	PL	%-#200
1 -	(CL) (FINE ALLUVIUM OR FILL		M	1							
2 -	SANI (SP) (O, fine grained, light A-3)	brown, moi	ist, loose		COARSE ALLUVIUM			<u>}</u>							
3 -							8	M	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	SS	16	12				
4 -	1								}							
5 - 6 -							8	M	M	SS	16					
7 -	-								1							
8 -	-						7	M		SS	16					
9 -									P							
10 -	-						10	M	M	SS	17					
11 -	END	OF BORING			<u> </u>				<u>/ </u>							
12/20/24																
ELL.GDT																
+CPT+WE																
GPJ AET																
AIRPORT.																
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 MOOB GEORGIAN AET+CPT+WELL.GDT 12/20/24 GEORGIAN AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24																
(CITY G¢																
SIOU)																
DEI	PTH: I	ORILLING METHOD			WATI	ER LEVEL MEA	SURE	EMEN	TS		l .	I		NOTE:	REFF	R TO
D P-00	01/!	2 25" HS A	DATE	TIME	SAMPI DEPT	ED CASING H DEPTH	CAV	Æ-IN PTH	FI	ORILLIN UID LE	NG VFI	WATE LEVE		THE A		
NO J-	.9½' 3	3.25" HSA	11/15/24		DEI I	DEITH			1.1	~ III	,	Non		SHEET	rs foi	R AN
M-LAT														XPLA	NATIO	ON OF
BORIN COMP	NG PLETED:	11/15/24												ERMIN	IOLOG	GY ON
DR: C		MH Rig: 68 C													IS LO	
03/2011															01-DI	HR-060



	AET JO	P-0025900)					LO	G OF	BO	RING N	О	B-	098	(p. 1 c	of 1)	
	PROJEC	Sioux City Gate	way Airpo	ort; Sioux	City,	IA											
		CE ELEVATION:		LATITUDE	Ξ:			_	LO	NGľ	TUDE:						
	DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GI	EOLOGY	N	MC	SA	AMPLE ΓΥΡΕ	REC IN.			BORAT		
	FEET	FILL, mostly silty sand wi	th gravel at	nd nieces of	:	FIL	L			1 /		1111	WC	DEN	LL	PL '	%-#200
	1 -	concrete, brown (A-1-b)	in graver ar	ia pieces of			_	39	M	V	SS	16					
									111	\mathbb{N}	22	10					
	2 -							(2)	,,	M	99	10					
	3 —							63	M	M	SS	10					
	4 -									}							
	5 —									113							
		SILTY SAND, fine graine medium dense to loose (SI	d, brown, 1	noist,		CO	ARSE LUVIUM	15	M	X	SS	10					
	6 -	mediam dense to reese (Si	(1121)							1							
	7 —									11							
	8 -							6	M	X	SS	14					
	9 –									1							
	9 -	SAND WITH SILT, fine g very loose (SP-SM) (A-3)	grained, bro	own, moist,						11							
	10 -	(SI SIII) (II S)						4	M	X	SS	14					
	11 -	END OF BORING								H							
		27,2 01 2014.70															
20/24																	
T 12/2																	
IL.GD																	
T+WE																	
ET+CF																	
3PJ A																	
PORT.																	
YAIR																	
TEWA																	
₹ T																	
DXXC																	
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24		THE DRIVE TO STATE OF THE STATE	1		****	ED X		CI ID =		TC							
-0025	DEP	TH: DRILLING METHOD	.				EVEL MEA			_	או ז זוא	NG	WATE		NOTE:		
4 SNC	0-9	9½' 2.25" HSA	DATE	TIME	SAMPI DEPT	_	CASING DEPTH	DE	E-IN PTH	FL	ORILLIN UID LE	VEL	WATE LEVE	_	THE A		
LAT-L(5/16/24		11.0		9.5		•				Non		SHEET XPLA1		
RP W-	BORIN	G LETED: 5/16/24	5/16/24		11.0	ו		9	.0				Non		ERMIN		
AET_COI		LETED: 5/16/24 K LG: AK Rig: 4														IS LOC	
Æ	$ DK; \mathbf{D} $	IN LU. AIN KIG: 4															

03/2011



AET JC	-					LC)G OF	BORING N	Ю	B	-099	(p. 1	of 1)	
PROJE	CT: Sioux City G	ateway Airpo	ort; Sioux	City,	IA									
	CE ELEVATION:		LATITUE	DE:	<u> </u>	_	LO	NGITUDE:		T				
DEPTH IN FEET	MATERI	AL DESCRIPTION	ON		GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC		BORA'		TESTS %-#20
	CH T				TOPSOIL			{}						
1 -	SILT				FINE ALLUVIUM		M							
2 —	FAT CLAY, trace roo	ts, brown, firm	,					\$11						
3 -	laminations of silt (CH	I) A-7-6				7	M	SS	18	31				
4 -								[]						
5 —	SAND, fine grained, lense of silt at about 4	ight brown, mo ½' (SP) A-3	ist, loose,	a	COARSE ALLUVIUM	10	M	SS	16					
6 -								<u> </u>						
7 -								11						
8 -						7	M	SS	15					
9 –								}						
10 -	SILTY CLAY, brown (CL/ML)	, firm, laminati	on of silt		FINE ALLUVIUM	6	M	SS SS	15	36				
11 -	SILTY SAND, fine gr brown mottled, moist,	ained, brown a loose (SM) A-	nd reddish 2-4		COARSE ALLUVIUM			<u>}</u>						
12 —	SAND, fine grained, li	ight brown and	brown					17						
13 —	mottled, moist, loose to	o medium dens	e (SP) A-3			11	M	SS	15					
14 -														
15 —						11	M	\bigvee ss	15					
16 -								/\ 扫						
17 —														
18 -								{						
10	SAND, fine to medium about 20½' then water	n grained, brow bearing, loose (vn, moist to (SP) A-3)				{						
14 15 16 17 18 19 20 21 DEF 0-1		<i>5,</i>	` /											
20 -						6	$ ar{lacktriangle} $	ss						
21 -	END OF BORING													
DEF	 PTH: DRILLING METHO	DD		WAT	 ER LEVEL ME <i>A</i>	L SURI	L EMEN	TS			1,	JOTE	DEEL	D TO
0.1		DATE	TIME	SAMPI DEPT		1	VE-IN PTH	DRILLI FLUID LE	NG EVEI	WATI LEVI		NOTE: THE A		
0-1	9½' 3.25" HSA	11/25/24	11:46	19.5		DE	1 111	LOID LI	. v	20.5		SHEE	ΓS FOI	R AN
		11120121	12.10	17.0								EXPLA	NATIO	ON OF
BORIN	NG LETED: 11/25/24										-T	ERMIN	OLOC	GY ON
DR: C											\dashv	TH	IS LO	G



AET JO	OB NO: P-0025900						LO	G OF	BOI	RING N	O	B-	100 (p. 1 c	of 1)	
PROJE	CT: Sioux City Gate	way Airpo	rt; Sioux	City,	IA											
SURFA	CE ELEVATION:		LATITUD	E:	1			LO	NGI'	ΓUDE:		I				
DEPTH IN FEET	MATERIAL 1	DESCRIPTIO	DΝ		G	EOLOGY	N	MC	SA	MPLE YPE	REC) & LAI			T
FEET				1	ТО	DCOH			121	IFE	IN.	WC	DEN	LL	PL	%-#200
1 - 2 -	SILT, brown mottled, moi of lean clay (ML) A-4 (po	st, loose, lassible fill)	minations		FIN	PSOIL NE LUVIUM A FILL		M	177771			30				
3 -							6	М	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	SS	18					
5 - 6 -	LEAN CLAY, brown mot of silt (CL) A-6	tled, firm, la	aminations	5	FIN AL	NE LUVIUM	6	<u>_</u>	1 <u>}</u> {} {}	SS	18	31				
7 - 8 - 9 -	SILTY SAND, fine graine brown mottled, moist, very SAND WITH SILT, fine g very loose (SP-SM) A-3	loose (SM	() A-2-4		AL OR AL CO	OARSE LUVIUM MIXED LUVIUM OARSE	4	M		SS	13					
10 -	SILTY SAND, fine graine very loose, lenses of silt (S	d, gray, wa SM) A-2-4	terbearing <u>,</u>	[1] [1]	AL	LUVIUM	3	W	13	SS	13					
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24																
DEI DEI	PTH: DRILLING METHOD			1		EVEL MEA			_					NOTE:	REFE	R TO
စ္ခါ 0 -	.9½' 3.25" HSA	DATE	TIME	SAMP DEP	LED TH	CASING DEPTH	CAV DE	Æ-IN PTH	FL	ORILLIN UID LE	VEL	WATE LEVE	ER -	ГНЕ А	TTAC	HED
VI-LO)		11/25/24	9:39	4.:	5	6.0						5.5		SHEET	S FOI	R AN
W-LA													E	XPLA	NATIO	ON OF
BORIN COMP	NG LETED: 11/25/24												TI			GY ON
DR: C	CF LG: MH Rig: 68C														IS LO	
03/2011															01-DI	IR-060

03/2011



AET JO	B NO: P-002590 0)					LO	G OF	BO	RING N	O	B-	101 ((p. 1 c	of 1)	
PROJEC	Sioux City Gate	way Airpo	rt; Sioux (City, 1	ÍΑ											
	CE ELEVATION:		LATITUDE	l:				LON	NGI	TUDE:						
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	Ν		G]	EOLOGY	N	MC	SA	AMPLE ΓΥΡΕ	REC IN.			BORAT		1
FEET 1 -	FILL, mostly silty sand wi concrete, brown	th gravel an	nd pieces of		FIL	L	19	M	M	SS	19	WC	DEN	LL	PL	%-#200
2 —	FILL, mixture of lean clay silt, brown and gray (A-6)	and fat cla	y, a little		-		6	M		SS	16					
3 – 4 –							6	IVI	\ {}	33	10					
5 —							9	M		SS	18					
6 - 7 -	SAND, fine grained, light medium dense (SP) (A-3)	brown, moi	ist, loose to			ARSE LUVIUM			1							
8 –							9	M	X F1	SS	18					
9 - 10 -							20	M	<u>{</u>	SS	18					
11 —	END OF BORING								/\ 							
DEP	TH: DRILLING METHOD			WAT	ER L	EVEL MEA	SURE	MEN	TS			•	1	NOTE:	REFE	R TO
0-9	0½' 3.25" HSA	DATE	TIME	SAMPI DEPT	ED H	CASING DEPTH	CAV DEI	E-IN PTH	FL	ORILLIN UID LE	NG VEL	WATE LEVE	R L	THE A	TTAC	HED
		5/15/24		11.0)	9.5	11	.0				Non	e	SHEET	S FOR	R AN
	~													XPLA		
BORIN COMPI	G LETED: 5/15/24												T	ERMIN		
DR:	LG: RH Rig: 63													TH	IS LO	3

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24



PROJECT:	Sioux City Gat	eway Airpo	ort; Sioux	City, I	<u>A</u>								
SURFACE	ELEVATION:		LATITUE	DE:			LO	NGITUDE:					
DEPTH		_ DESCRIPTIO			GEOLOGY	X ™	MC		REC IN.	FIELI) & LA	BORAT	ſΟΙ
IN FEET	MATERIAI)N		GEOLOGI	N	MC	SAMPLE TYPE	IN.	WC	DEN	LL	I
1 -													
2 I	LEAN CLAY, trace root brown mottled, stiff, lam	s, brown and	l light		FINE ALLUVIUM	14		<u> </u>	12	1.0			
3 - (A-7-6) (possible fill	mations of s.	iit (CL)		OR FILL	14	M	X ss 权	12	18			
5 —						5	M	SS SS	12	16			
o ¬ a	LEAN CLAY, trace root and a little reddish brown	s, brown, lig n mottled, fir	ht brown m (CL)		FINE ALLUVIUM]	IVI		12	10			
7 -	A-7-6)					6	M	SS SS	10	35			
8 - 9 -						6	M		10	33			
10 5	SAND WITH SILT, fine oose, a lens of silty sand	grained, bro	own, moist		COARSE ALLUVIUM	10	N 4	<u> </u>	10				
11 -	oose, a iens of stity saile	i (31 - 3141) (<i>P</i>	- <i>-</i>)		I I I I I I I I I I I I I I I I I I I	10	M	X ss {{	12				
12 —								1					
l r	SILTY SAND, fine grain nedium dense (SM) (A-	ned, brown, 1 2-4)	noist,										
14 - 15 -	. , ,					1.2							
16 —						13	M	SS 된	14				
17 —													
18 S	SAND, fine grained, ligh nedium dense, a lens of	nt brown, mo lean clav (SF	ist, dense t	o				1					
19 - 1	,		, , ,					[]					
21 -						38	M	X ss 籽	12				
DEPTH	: DRILLING METHOD			WATE	ER LEVEL MEA	SURE	EMEN	TS			 	NOTE:	RI
0-241/2	.'	DATE	TIME	SAMPL DEPTI	ED CASING H DEPTH	CAV DE	/E-IN PTH	DRILLIN FLUID LE	NG VEL	WATI LEVE	ER EL	THE A SHEET	TT
												SHEE I XPLAI	
	ГЕD: 11/15/24											ERMIN	ЮI
DR:	LG: Rig:		1									TH	12 I



ENGIN	NEERING TES	STING												
AET JO	B NO:	P-0025900			LO	G OF	BORIN	IG NO	Э	B-	102 (p. 2 o	of 2)	
PROJEC	CT:	Sioux City Gateway Airport; Sioux	City, l	\mathbf{A}										
	_	LATITUDI	E:			LON	NGITUI	DE: _						
DEPTH		MATERIAL DESCRIPTION		GEOLOGY		MC	SAMI	PLE	REC	FIELD	& LAI	BORAT	ORY 7	ΓESTS
DEPTH IN FEET		MATERIAL DESCRIPTION		GEOLOGI	N	MC	SAMI TYF	PE	ĪN.	WC	DEN	LL	PL	%-#200
23 —	SAND medium (contin	, fine grained, light brown, moist, dense to m dense, a lens of lean clay (SP) (A-3) mued))				}							
24 —							}}						l	
25 —					13	M	S	SS	16				ı	
26 —	END (OF BORING												
													ſ	
													ſ	
													ſ	
													ſ	
													ſ	
													ſ	
													ſ	
													ſ	
													ſ	
													ſ	
													ſ	
													ſ	
													ſ	
													Ĭ	
													Ĭ	
													l	
													ì	

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24



AET JO	OB NO: P-0025900)				LC	G OF	BOI	RING N	O	B-	103 (p. 1 (of 2)	
PROJE	Sioux City Gates	way Airpo	ort; Sioux	City,	ÍA .										
SURFA	CE ELEVATION:		LATITUE	DE:			LO	NGI	ΓUDE:		ı				
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SA	MPLE YPE	REC					TESTS
FEET								' 	IIL	1111.	WC	DEN	LL	PL	%-#200
1 -								}} {{							
3 -	LEAN CLAY, trace roots, brown mottled, very stiff to clay and laminations of sile (possible fill)	o firm, lens	ses of fat		FINE ALLUVIUM OR FILL	16	M	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	SS	12	26				
4 - 5 -	(possible IIII)					12	M	\{\frac{1}{2}}	SS	12	28				
6 - 7 -	_							\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\							
8 -						6	M	X Y	SS	10	39				
9 -	SILTY SAND, fine graine	d, brown, a	a little		COARSE ALLUVIUM	_		<u>}</u>							
11 -	reddish brown mottled, mo (A-2-4)	oist, loose ((SM)		ALLOVIOM	5	M	X R	SS	10					
12 -	_							!							
13 - 14 -								}} }}							
14 - 15 - 15 - 15 - 16 - 17 - 18 - 17 - 18 - 17 - 18 - 19 - 19 - 19 - 19 - 19 - 19 - 19	SAND WITH SILT, fine g medium dense, a lens of si	grained, bro lt (SP-SM)	own, moist (A-3)	,		27	M	X	SS	12					
16 -								 							
NA LGD. 18 -	SAND, fine grained, light	hrough mo	ist loose					\{\}							
WAY AIRP	(SP) (A-3)	orown, mo	15t, 100sc					<u>}</u>							
20 -						9	M		SS	12					
×nois 006															
DEI	PTH: DRILLING METHOD			1	ER LEVEL MEA	1		_	יו דומר	JG	W/A TT		NOTE:		
<u>0-2</u>	241/2'	DATE	TIME	SAMPI DEPT	ED CASING TH DEPTH	DE	/E-IN PTH	FL	ORILLIN UID LE	VEL	WATE LEVE		ГНЕ А		
LAT-LC													SHEET		
BORIN	NG							-							ON OF GY ON
. 1	PLETED: 11/15/24											- -		IS LO	
₩ DR:	LG: Rig:			1											



ENGI	NEERING TE	STING											
AET JO	B NO:	P-0025900			LO	G OF	BORING N	Ю	B-	103 (p. 2 o	f 2)	
PROJEC	CT:	Sioux City Gateway Airport; Siou	x City, l	A									
	-	LATITU:	DE:			LON	NGITUDE:	-					
DEPTH		MATERIAL DESCRIPTION		GEOLOGY		MC	SAMPLE	REC	FIELD	& LAI	BORAT	ORY 7	ΓESTS
DEPTH IN FEET		WATERIAL DESCRIPTION		GEOLOGI	N	MC	SAMPLE TYPE	ĪN.	WC	DEN	LL	PL	%-#200
23 —	(SP) (A	o, fine grained, light brown, moist, loose A-3) <i>(continued)</i>											
24 —	SAND medium (A-3)	o, fine to medium grained, brown, moist, m dense, laminations of black silt (SP)					}						
25 —	(113)				11	M	SS SS	12					
26 —	END (OF BORING											

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24



AET JO	DB NO: P-0025900					LC	OG OF	BOR	ING N	O	B-	104 (p. 1 c	of 2)	
PROJEC	Sioux City Gates	way Airpo	ort; Sioux	City,	IA										
SURFA	CE ELEVATION:		LATITUD	E:	T		LO	NGIT	UDE:						
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SAN	MPLE YPE	REC IN.					TESTS
FEET								H.	1112	IIN.	WC	DEN	LL	PL	%-#200
1 -								} {{							
3 -	SILTY CLAY, trace roots, lean clay and silt (CL-ML)		ft, lenses o	f	FINE ALLUVIUM	4	M		SS	12	27				
4 — 5 —	LEAN CLAY, brown and lenses of silt and silty clay	gray mottle (CL) (A-7	ed, firm, -6)			6	M	{ }	SS	14	36				
6 -								\ \ \ \ \ \							
8 —						6	M	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	SS	16	28				
9 —	SANDY SILT, brown mot (ML) (A-4)	tled, wet, l	enses of sil	t	FINE ALLUVIUM/ MIXED	3	M/W		SS	6	30				
11 -					ALLUVIUM			1							
13 — 14 — 15 — 16 — 17 — 18 — 18 — 19 — 19 — 10 —	LEAN CLAY, gray, soft, l laminations of silt (CL) (A	enses of si -6)	lty clay and	l //	FINE ALLUVIUM										
16 —						2	M	X {{	SS	10	41				
17 — 18 — 18 —	LEAN CLAY, gray, very s	soft (CL) (A	A-6)					11111							
19 — 20 —						1	M	<u>}</u>	SS	12	49				
21 —						1	1 V1	\\ \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	טט	12	1 7				
DEP	TH: DRILLING METHOD				ER LEVEL MEA			1				N	IOTE:	REFE	R TO
집 일 0-2 4	4½'	DATE	TIME	SAMPI DEPT	ED CASING H DEPTH	CAV DE	VE-IN PTH	DI FLU	RILLIN VID LE	NG VEL	WATI LEVE	ER /	ГНЕ А	TTAC	HED
TO I													SHEET		
S DODD															ON OF
S COMP	IG LETED: 11/15/24							_				TI			GY ON
DR:	LG: Rig:												111	IS LO	J



ENGI	NEERING TE	STING											
AET JO	B NO:	P-0025900			LO	G OF	BORING N	Ю	B-	104 (p. 2 o	of 2)	
PROJEC	CT:	Sioux City Gateway Airport; Sioux	City,	IA									
	_	LATITUI	DE:			LON	NGITUDE:						
DEPTH				CEOLOGY.				REC	FIELI) & LAI	BORAT	ORY	TESTS
DEPTH IN FEET		MATERIAL DESCRIPTION		GEOLOGY	N	MC	SAMPLE TYPE	IN.	WC	DEN	LL	PL	%-#200
	LEAN	CLAY, gray, very soft (CL) (A-6)					13						
23 —	(contin	,		COARSE			[]						
	mediur	Y SAND, fine grained, brown, moist, m dense, lenses of sand and lenses of gra	y	ALLUVIUM			 						
24 —	lean cl	ay (SM) (A-2-4)					<u>}</u>						
25 —					18	M	\bigvee ss	12					
26					10	171	\bigvee 33	12					
26 —	END (OF BORING											

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24



AET JO	OB NO: P-0025900)				LC	G OF	BOF	RING N	O	B-	105 (p. 1 c	of 2)	
PROJE	Sioux City Gates	way Airpo	ort; Sioux	City, l	A										
	ACE ELEVATION:		LATITUE	DE:		_	LO	NGIT	ΓUDE:		1				
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SA	MPLE YPE	REC		1			TESTS
FEET	FILL				FILL			」 加		111.	WC	DEN	LL	PL	%-#200
1 -					TILL			}							
								}							
3 -	FILL, mostly lena clay, grabrown, possible brick at ab A-6)	yish brow out 7' (A-7	n and 7-6 and			7	M	M	SS	12	31				
4 -	_							}							
5 -						3	M	M	SS	8	28				
6 -								[]							
7 -	LEAN CLAY, brown and firm, lenses of silt and lam (CL) (A-7-6, A-6 and A-4)	gray mottle inations of	ed, soft to		FINE ALLUVIUM	3	M	M	SS	14	39				
9 -		,						1							
10 -	-					5	M	M	SS	8	28				
11 -								<u>}</u>							
12 -	-							}							
13 -								}							
14 - 15 -								[}							
16 -						4	M		SS	10	30				
17 -	_							}							
18 -	_							}							
78 AWII 19 -	_														
20 -	-					5	M		SS	9	5				
460 DE 15 - 16 - 17 - 18 - 17 - 18 - 18 - 19 - 18 - 19 - 18 - 19 - 18 - 19 - 19	-							7							
DE DE	PTH: DRILLING METHOD			WATI	ER LEVEL MEA	SURE	EMEN	TS				N	NOTE:	REFE	R TO
일 0-2	24½'	DATE	TIME	SAMPL DEPT	ED CASING H DEPTH	CAV DE	/E-IN PTH	FLU	ORILLIN UID LE	VEL	WATE LEVE	ER ,	ГНЕ А	TTAC	HED
AT-LO													SHEET		
BORII	NG							-							ON OF GY ON
S COM	PLETED: 11/15/24							\vdash						IS LO	
₩ DR:	LG: Rig:														



AET JC	DB NO: P-0025900			LO	G OF	BO	RING N	Ο.	B-	105 (p. 2 c	of 2)	
PROJE	Sioux City Gateway Airport; Sioux C	City, I	IA										
	LATITUDE	:		_	LON	IGI	TUDE:						
DEPTH IN FEET	MATERIAL DESCRIPTION		GEOLOGY	N	MC	SA	AMPLE ГҮРЕ	REC	FIELI	& LAI	BORAT	ORY 7	ΓESTS
FEET	WENTERENE DESCRIPTION			11	IVIC		ГҮРЕ	IN.	WC	DEN	LL	PL	%-#200
23 - 24 - 25 -	SILTY SAND, fine grained, brown, moist, medium dense, a lens of silt at about 24.5' (SM) (A-2-4)		FINE ALLUVIUM (continued) COARSE ALLUVIUM	16	M	******	gg	16					
				16	M	M	SS	16				1	
26 -	END OF BORING												

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24



AET	JO	B NO: P-0025900					LC	G OF	BO	RING N	О	B-	106	(p. 1 c	of 1)	
PRO	JEC	Sioux City Gatev	way Airpo	ort; Sioux	City,	IA										
SURI	FAC	CE ELEVATION:		LATITUD	E:			LO	NGľ	TUDE:						
DEPTI IN FEET	Н	MATERIAL D	DESCRIPTIO	DΝ		GEOLOGY	N	MC	SĄ	AMPLE ГҮРЕ	REC			l		TESTS
FEET						FILL				IIFE	IIN.	WC	DEN	LL	PL	%-#200
		Concrete pavement				FILL			}							
1	-	Possible aggregate base				_			\{\}							
2	-	SILTY CLAY WITH SAN	D, brown,	a little		FINE	1		51							
3	4	reddish brown mottled, ver (possible fill)	y stiff (CL	-ML) (A-4)	ALLUVIUM OR FILL	18	M	X	SS	16	22				
		(possiole IIII)							1							
4		SILT, brown, moist, loose	(MT) (A 4	`		FINE	-		11							
5	-	SIL1, brown, moist, loose	(ML) (A-4	.)		ALLUVIUM	8	M	X	SS	10	26				
6	_															
									}							
7	7	LEAN CLAST 1	.1 11:1	1					M	a a	10	20				
8	-	LEAN CLAY, brown, a lit mottled, firm, lenses and la	minations	of silt and			6	M	M	SS	18	30				
9	_	silty clay (CL) (A-7-6)							}							
10									17							
10							6	M	X	SS	18	41				
11	+	END OF BORING							H							
0/24																
12/2																
L.GD1																
I+WEL																
I+CP1																
J AE																
RT.GF																
AIRPO																
WAY,																
GATE																
∑ Z																
NOOIS																
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24	EP	TH: DRILLING METHOD			WAT	L ER LEVEL MEA	ASURI	L EMEN	TS	<u> </u>	<u> </u>			NOTE:	REEL	R TO
P-00.			DATE	TIME	SAMP DEP			/E-IN PTH	I	DRILLIN	NG.	WATE LEVE		THE A		
LONG	0-9	9½'			DEP.	IH DEPIH	DE	PIH	FL	UID LE	VEL	LEVE		SHEET		
Y-LAT-														XPLA		
BOR CON		G LETED: 11/25/24														GY ON
DR:	/11° L	LG: Rig:												TH	IS LO	G



PROJECT	Sioux City Gate	eway Airpo	ort; Sioux	City,	IA									
	ELEVATION:		LATITUD	E: _			LO	NGITU	DE:					
DEPTH					CEOL OCA					REC	FIELI) & LA	BORA	ГОІ
IN FEET	MATERIAL	DESCRIPTIO	DN		GEOLOGY	N	MC	SAM TY	PE	REC IN.	WC	DEN	LL	I
1 —														
2 1	FILL, mostly sandy lean	clav, trace ro	oots, brown		FILL			KI						
, []	LEAN CLAY, grayish br	own and lig	ht brown,			12	M	X	SS	18	16			
4 - 8	possible fill)	ons of sift (C	L) (A-7-0)					1						
	EAN CLAY gravish br	own and lig	ht brown		FINE			13						
5 - 1	LEAN CLAY, grayish br mottled, firm, lenses and silty clay (CL) (A-7-6 and	laminations	of silt and		ALLUVIUM	7	M	X	ss	18	33			
6 -	sifty clay (CL) (A-7-0 and	1 A-4)						<u> </u>						
7 —								[1]						
8 - 5	SILTY SAND, fine grain medium dense, lamination	ed, brown, 1	moist,		COARSE ALLUVIUM	11	M	X	ss	12				
9 - 1	neutum dense, famination	is of siit (SI	vi) (A-2-4)		ALLUVIUM			 						
	SAND, fine grained, ligh	t brown, mo	ist. mediun	1				13						
10 – 6	dense (SP)	,	,			15	M	X	SS	13				
11 —								P						
12 —														
13 —														
14 —														
								1						
15 —						14	M	X	SS	12				
16 —								P						
17 —														
18 —														
19 —														
								17						
20 —						26	M	X	SS	10				
21	END OF BORING			11	•									
 DEPTH	H: DRILLING METHOD			WAT	 ER LEVEL MEA	SURF	 EMEN	TS					JOTE	ים.
		DATE	TIME	SAMPI DEPT			/E-IN PTH	DR FLUI	ILĻĮŅ	IG.	WATI LEVE		NOTE: THE A	
0-191/2	2			DEFI	II DELIH	DE.	тП	FLUI	D LE	v EL	LEVI		SHEET	
												E	XPLA	NA
BORING COMPLE	ГЕD: 11/25/24											T	ERMIN	
DR:	LG: Rig:												TH	IS :



AET JC	DB NO: P-0025900						LC	G OF	BOI	RING N	О	B-	108 ((p. 1 c	of 1)	
PROJE	CT: Sioux City Gates	way Airpo	ort; Sioux	City,	IA											
	CE ELEVATION:		LATITUD	E:				LO	NGI	ΓUDE:						
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GE	EOLOGY	N	MC	SA	MPLE YPE	REC					TESTS
FEET) 기		111.	WC	DEN	LL	PL	%-#20
1 -									}}							
2 —	FILL, mostly lean clay, a l	ittle silt a l	little gravel		FILI	Γ.	_		1							
3 -	and brick, trace roots, brov (A-7-6 and A-4)	vn and ligh	it brown			L	10	M		SS	14	26				
4 -									<u>{</u>							
5 -							10	M		SS	10	31				
7 -									P							
8 -	LEAN CLAY, gray and br stiff, laminations of silt (C	rown mottle L/CH) (A-	ed, firm to 7-6)		FIN ALI	E LUVIUM	7	M	M	SS	16	35				
9 –									}							
10 —							12	M	M	SS	14	31				
11 -									/\ 打							
12 —									}							
13 -	LEAN CLAY, gray and br laminations of silt (CL) (A	rown mottle -7-6)	ed, firm,						}							
14 — 15 —		,							[]							
13 +MEL +MEL 16 –							6	M	\[\]	SS	18	37				
2 V PET 17 —									}							
18 —	SILTY SAND, fine graine	d, grayish	brown,			ARSE			{ }							
AA AR 19 −	moist, medium dense, lami (SM) (A-2-4)	nations of	sandy silt		ALI	LUVIUM			[]							
14 — 157000 80000 8000 8100 15 — 15 — 15 — 15 — 15 — 15 — 15 — 1							12	M		SS	14					
21 -	END OF BORING			11.15	•											
DEF	TH: DRILLING METHOD			WAT	ER LI	EVEL MEA	SURE	EMEN'	TS					NOTE:	REFE	R TO
ඉ 0-1	91/3'	DATE	TIME	SAMPI DEPT	LED	CASING DEPTH	CAV DE	Æ-IN PTH	FL	ORILLIN UID LE	NG VEL	WATE LEVE		ТНЕ А		
NO 1-1	214				\dashv									SHEET	S FOR	R AN
M-LA													Е	XPLA	NATIC)N OF
BORIN COMP	IG LETED: 11/25/24												T			GY ON
₽ DR:	LG: Rig:													TH	IS LO	Ĵ



AET JO	AET JOB NO: P-0025900 PROJECT: Sioux City Gateway Airport; Sioux City, IA						LOG OF BORING NO. B-109 (p. 1 of 2)								
PROJE	Sioux City Gates	way Airpo	ort; Sioux	City,	IA										
	ACE ELEVATION:		LATITUE	DE:	T		LO	NGI'	ΓUDE:		I				
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SA	MPLE YPE	REC IN.					TESTS
FEET	¬3" SILT			4	TOPSOIL			H			WC	DEN	LL	PL	%-#200
1 -	SILT brown moist loose	lamination	ns of lean		FINE ALLUVIUM		M	\ \{							
2 -								<u>{1</u>							
3 -						6	M		SS	18					
4 -								}							
5 -	A-4	ist, loose (ML/SM)		FINE ALLUVIUM OR MIXED	5	M		SS	18					
6 -			.1 1		ALLUVIUM			H							
7 -	loose (ML) A-4				FINE ALLUVIUM			17							
8 -	SAND, fine grained, light (SP) A-3	brown, mo	oist, loose		COARSE ALLUVIUM	7	M	X I	SS	16					
9 -								1							
10 -	_					5	M		SS	16					
11 -								13							
12 -								[1]							
13 -						7	M	\mathbb{N}	SS	16					
14 -								<u>}</u>							
15 -						8	M	M	SS	15					
16 -								/\ 打							
14 - 15 - 15 - 15 - 16 - 17 - 18 - 17 - 18 - 17 - 18 - 19 - 19 - 19 - 19 - 19 - 19 - 19	_							}							
18 -	SAND, fine to medium gra	ined, brow	vn, moist to)	· -			}							
¥ 19 −	about 19½' then waterbear	ing, loose ((SP) A-3					1							
ME 20 -						9	W		SS	15					
<u> </u>						9	**	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	55	13					
900 SIC					:			比							
DEI	PTH: DRILLING METHOD	D. 1.777	TIP C	1	ER LEVEL MEA			_)RII I IN	NG	WATE		NOTE:		
<u>0-2</u>	29½' 3.25" HSA	DATE	TIME	SAMP: DEP	LED CASING TH DEPTH	DE	E-IN PTH	FL	ORILLIN UID LE	VEL	WATE		ГНЕ А ЅНЕЕТ		
/-LAT-								-		+	Non				ON OF
BORIN O COMP	NG PLETED: 11/25/24									+					GY ON
DR: C													TH	IS LO	3



	AET JOB NO: P-0025900						DΩ	RING N	0	R.	109 (n 2 (f 2)	
PROJEC							DO.	MING IV	o. <u> </u>	<u></u>	10) (p. 2 (11 2)	
PROJEC	υ1:	LATITUDE:				LON	JCI	TUDE:						
DEPTH		LATITODE.				LOI			DEG	FIELI) & LAI	ORAT	ORY	TESTS
DEPTH IN FEET		MATERIAL DESCRIPTION		GEOLOGY	N	MC	SA	AMPLE FYPE	REC IN.	WC	DEN	LL	PL	%-#200
23 —	SANE about (contin	O, fine to medium grained, brown, moist to 19½' then waterbearing, loose (SP) A-3 mued)					}							
24 – 25 –							{} \/						ĺ	
26 -					7	W	\ {{	SS	15					
27 —							\ \ \							
28 —							{{						ĺ	
29 —							[]							
30 -					8	W	X	SS	16					
	END	OF BORING												

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24



AET JC	AET JOB NO: P-00259 PROJECT: Sioux City Gar)				LC	OG OF	ВО	RING N	Ю	B- 1	110.1	(p. 1	of 2)	
PROJEC	CT:	Sioux City Gates	way Airpo	ort; Sioux	City,	IA										
	CE ELEV	ATION:		LATITUD	E:	T		LO	NGI	TUDE:		1				
DEPTH IN FEET		MATERIAL I	DESCRIPTIO	ON		GEOLOGY	N	MC	SĄ	AMPLE TYPE	REC IN.			BORA	1	
FEET											1111	WC	DEN	LL	PL	%-#20 0
1 -								M		SS						
2 —									()							
3 -	SANI (A-3)), fine grained, light	brown, mo	ist (SP)		COARSE ALLUVIUM	[M	X	SS						
4 -									1							
5 —	of lear	Y SAND, fine graine n clay (SM) (A-2-4)	d, brown, 1	noist, a len	S			M		SS						
6 -									}							
8 -	SANI (SP) (O, fine grained, light A-3)	brown, mo	ist, loose			9	M	V	SS						
9 –									<u>}</u>							
10 —							9	M	77	SS						
11 -		OF BORING						IVI	Δ	33						
CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24 CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24																
DEP	TH: I	DRILLING METHOD			WAT	L ER LEVEL MI	EASURI	EMEN	TS			<u> </u>	<u> </u>	NOTE:	REFF	R TO
ව 0-	0-9½' 3.25" HSA DATE TIME			TIME	SAMPI DEPT	LED CASING	G CAV	VE-IN PTH	FL.	DRILLIN UID LE	NG VEL	WATI LEVE		THE A		
AT-LO												Non	e	SHEE	ΓS FOI	R AN
PODEN	IC								_					EXPLA		
	BORING COMPLETED:								+				T.	ERMIN TH		
₽ DR: C	F LG:	MH Rig: 68 C												111	IS LO	J

03/2011



AET JOB NO:				LOG OF BORING NO. B-110.1 (p. 2 of 2)								
PROJECT:	Sioux City Gateway Airport; Sioux Ci	ity, I	A									
	LATITUDE:				LON	IGITUDE:						
DEPTH IN FEET	MATERIAL DESCRIPTION		GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELI) & LA	BORAT	ORY '	TE
FEET	MATERIAL DESCRIPTION		GEOLOGI	N	MC	TYPE	IN.	WC	DEN	LL	PL	1
								20				
								20				
												-



AET JC	AET JOB NO: P-0025900 PROJECT: Sioux City Gateway Airport; Sioux City, IA					LC	G OF	BOI	RING N	O	B-1	10.2	(p. 1	of 2)	
PROJEC	CT: Sioux City Gate	way Airpo	ort; Sioux	city, L	A										
SURFA	CE ELEVATION:		LATITUI	DE:			LO	NGI'	ΓUDE:						
DEPTH IN FEET	MATERIAL I	DESCRIPTIO	N		GEOLOGY	N	MC	SA	MPLE YPE	REC					TESTS
FEET	SILT			<u> </u>	TOPSOIL			」 [打		11 11	WC	DEN	LL	PL	%-#20
1 -							M	}							
	SILT			-	FINE ALLUVIUM			}							
2 -	CAND WITH OUT C	. 1 1. 1	. 1		COARCE	_ ا		M	GG	10					
3 —	SAND WITH SILT, fine g moist, loose (SP-SM) A-3	grained, ligh	nt brown,		COARSE ALLUVIUM	5	M	\mathbb{N}	SS	18					
4 —								}							
5 —	SILTY SAND, fine graine	d, brown, n	noist, very	7											
	loose, a lense of lean clay	(SM) A-2-4	4			3	M	X	SS	16					
6 -								3							
7 —	SAND, fine grained, light	brown, moi	ist, loose					17							
8 -	(SP) A-3					9	M	X	SS	17					
9 –								1 3							
								13							
10 —						9	M	X	SS	17					
11 -								H							
12 -								1							
12						8	M		SS	16					
13 -								 }							
14 —								}							
15 —						7	M	M	SS	16					
₹ 16 -						,	112								
AET +C								}							
4 ☐ 17 —								}							
18 ㅡ	SAND, fine to medium gra	ained, light	brown,					}							
₹ 19 –	moist to about 21' then was dense to very loose (SP) A	terbearing, : 3	medium					}							
돌 절 20 -															
<u></u>						11	M	\mathbb{N}	SS	16					
21 -							-	}							
14 — 15 — 16 — 17 CORP W-LAT-LONG P-00255000 SIOUX CITY GATEWAY AIRPORT GPJ AET+CPT+WELL GDJ AET+CPT+WELL GDJ AET+CPT+WELL GDJ AET+CPT+WELL GDJ AET+CPT-WELL GDJ AET+CPT-WELL GDJ AET-CPT-WELL GD	TH: DRILLING METHOD			WATE	R LEVEL MEA	L SURE	L EMEN	ル TS				 N	l NOTE:	BEEE	IR TO
- B-00:	DATE			SAMPLI DEPTI		_	/E-IN PTH	_	ORILLIN UID LE	NG VET	WATE LEVE		юте. ГНЕ А		
0-29	9½' 3.25" HSA	11/25/24	1:15	24.5	26.0	DE.	1111	FL	OID LE	V EL	21.0		SHEET		
W-LAT													XPLA	NATIO	ON OF
BORIN COMP	IG LETED: 11/25/24											T			GY ON
DR: C	F LG: MH Rig: 68C												TH	IS LO	G



AET JO	B NO: P-00259		LO	G OF	ВО	RING N	O	B-1	10.2	(p. 2	of 2)												
PROJEC	Sioux City Ga	teway Airport; Sioux Ci	ity, l	ÍA.								& LABORATORY TESTS DEN LL PL %-#200											
		LATITUDE:				LON	\GI	TUDE:		I													
DEPTH IN FEET	MATERIA	L DESCRIPTION		GEOLOGY	N	MC	SĄ	AMPLE ГҮРЕ	REC IN.														
FEET	SAND, fine to medium moist to about 21' then y dense to very loose (SP)	waterbearing, medium					<u>}</u>		IIN.	WC	DEN	LL	PL 	%-#20 0									
24 —	dense to very loose (SI)	A-3 (commuea)					}																
25 —					7	W	V	SS	15														
26 –							/\ }}																
27 —							}}																
28 –							}} }}																
29 – 30 –							[} \/																
31	LEAN CLAY, trace roo END OF BORING	ts, gray, soft (CL) A-7-6		FINE ALLUVIUM /	4	W/M	M	SS	15														

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24



AET JO	AET JOB NO: P-0025900 PROJECT: Sioux City Gateway Airport; Sioux City, 1						G OF	BO	RING N	O	B-	111 ((p. 1 d	of 2)	
PROJE	CT: Sioux City Gate	way Airpo	ort; Sioux	City, IA	L										
SURFA	CE ELEVATION:		LATITUD	E:			LO	NGľ	TUDE:		1				
DEPTH IN FEET	MATERIAL 1	DESCRIPTIO	ON		GEOLOGY	N	MC	SĄ	AMPLE ΓΥΡΕ	REC					TESTS
FEET				1 7	OPSOIL			1 /		11 11	WC	DEN	LL	PL	%-#20
1 -	A PANA CE ANA	1 7	(GT.)			6	M	V	SS	20	18				
	LEAN CLAY, trace roots, (A-6)	brown, fir	m (CL)		INE LLUVIUM			\mathbb{N}							
2 -	SANDY SILT, brown, mo	viet vervile	052.8		OR FILL TINE	4	M	M	SS	18	18				
3 -	lamination of lean clay at a	about 2.5' (ose, a ML) (A-4)		LLUVIUM	4	IVI		33	10	10				
4 -								\{							
5 -								M	99	1.0	22				
6 -						3	M	\mathbb{N}	SS	18	23				
								}							
7 -															
8 -	SAND, fine grained, light to about 20' then waterbea	ring, very l	oose to		COARSE LLUVIUM	6	M	M	SS	18					
9 –	medium dense, a piece of (A-3)	wood at abo	out 30' (SP)				}							
10 -															
						5	M	M	SS	18					
11 -								[]							
12 -								13							
13 -						11	M	X	SS	16					
7/02/21 14 -								1							
15 -								17							
+WELL						5	M	X	SS	16					
16 -								1							
17 -								}							
18 –								}}							
지 19 -								}							
ATEWA								1							
5 ≥0 −						15	W	X	SS	16				!	
21 -								1 3							
14 - 15 - 15 - 15 - 16 - 17 - 18 - 17 - 18 - 17 - 18 - 19 - 18 - 19 - 19 - 19 - 19 - 19	TH: DRILLING METHOD			WATEL	LEVEL MEA	SURF	EMEN	[] TS					LOTT	DEET	
P-002		DATE	TIME	SAMPLE DEPTH		1	/E-IN PTH	_	ORILLIN UID LE	VG.	WATI LEVE		NOTE: THE A		
9NO 1 0-2	9½' 3.25" HSA	11/14/24	11:43	21.0	19.5	DE	LIH	FL	UID LE	VEL	21.(SHEET		
W-LAT		11111111111	11.10	21.0	17.0						#1,(XPLA		
BORIN COMP	IG LETED: 11/14/24											T	ERMIN	(OLOC	GY ON
DR: C													TH	IS LO	G



AET JOE	B NO: P-0025900		LO	G OF	ВО	RING N	O	B-	111 (p. 2 c	of 2)		
PROJEC	T: Sioux City Gateway Airport; Sioux Ci	ity, l	ÍA.										
	LATITUDE:				LON	\GI	TUDE:						
DEPTH IN FEET	MATERIAL DESCRIPTION		GEOLOGY	N	МС	SĄ	AMPLE ГҮРЕ	REC IN.	WC	0 & LAI DEN	LL		TESTS %-#200
	SAND, fine grained, light brown to brown, moist to about 20' then waterbearing, very loose to medium dense, a piece of wood at about 30' (SP) (A-3) (continued)		COARSE ALLUVIUM (continued)			1111111				DLIV	EL		70 11 200
26 –				4	W	\ ₹	SS	18					
27 —						{ {							
28 –						{{							
29 —						<u>}</u>							
30 —				29	W	M	SS						
31	END OF BORING												

03/2011

AET_CORP W-LAT-LONG P-0025900 SIOUX CITY GATEWAY AIRPORT.GPJ AET+CPT+WELL.GDT 12/20/24

B-001 B-002 B-006









Pavement Core Photographs

Cores B-001, B-002, and B-006

Geotechnical Exploration

Sioux Gateway Airport, Siouxland Nexus Project Sioux City, IA

Date: 6/21/2024

B-007

B-008

B-009









Cores B-007, B-008, and B-009

Geotechnical Exploration

Sioux Gateway Airport, Siouxland Nexus Project Sioux City, IA

Date: 6/21/2024

B-010



B-012









Cores B-010, B-011, and B-012

Geotechnical Exploration

Sioux Gateway Airport, Siouxland Nexus Project Sioux City, IA

Date: 6/21/2024

B-013 B-014 B-015









Cores B-013, B-014, and B-015

Geotechnical Exploration

Sioux Gateway Airport, Siouxland Nexus Project Sioux City, IA

Date: 6/21/2024

B-016

B-017

B-019









Cores B-016, B-017, and B-019

Geotechnical Exploration

Sioux Gateway Airport, Siouxland Nexus Project Sioux City, IA

Date: 6/21/2024

B-022

B-023

B-024









Cores B-022, B-023, and B-024

Geotechnical Exploration

Sioux Gateway Airport, Siouxland Nexus Project Sioux City, IA

Date: 6/21/2024

B-026 B-029 B-030









Cores B-026, B-029, and B-030

Geotechnical Exploration

Sioux Gateway Airport, Siouxland Nexus Project Sioux City, IA

Date: 6/21/2024

B-032



B-041









Cores B-032, B-036, and B-041

Geotechnical Exploration

Sioux Gateway Airport, Siouxland Nexus Project Sioux City, IA

Date: 6/21/2024

B-042

B-050

B-051







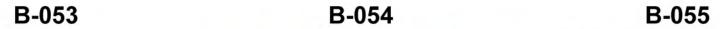


Cores B-042, B-050, and B-051

Geotechnical Exploration

Sioux Gateway Airport, Siouxland Nexus Project Sioux City, IA

Date: 6/21/2024









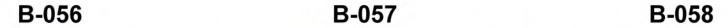


Cores B-053, B-054, and B-055

Geotechnical Exploration

Sioux Gateway Airport, Siouxland Nexus Project
Sioux City, IA

Date: 6/21/2024









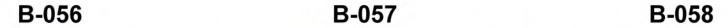


Cores B-056, B-057, and B-058

Geotechnical Exploration

Sioux Gateway Airport, Siouxland Nexus Project Sioux City, IA

Date: 6/21/2024











Cores B-056, B-057, and B-058

Geotechnical Exploration

Sioux Gateway Airport, Siouxland Nexus Project Sioux City, IA

Date: 6/21/2024

B-059 B-060 B-061









Cores B-059, B-060, and B-061

Geotechnical Exploration

Sioux Gateway Airport, Siouxland Nexus Project Sioux City, IA

Date: 6/21/2024

B-062 C-1 C-2









Pavement Core Photographs

Cores B-062, C-1, and C-2

Geotechnical Exploration

Sioux Gateway Airport, Siouxland Nexus Project Sioux City, IA

Date: 6/21/2024

C-3 C-4 C-5









Pavement Core Photographs

Cores C-3, C-4, and C-5

Geotechnical Exploration

Sioux Gateway Airport, Siouxland Nexus Project Sioux City, IA

Date: 6/21/2024

C-6 C-7







Pavement Core Photographs

Cores C-6, , and C-7

Geotechnical Exploration

Sioux Gateway Airport, Siouxland Nexus Project Sioux City, IA

Date: 6/21/2024

AET Project P-0025900



Draft Report - Subject to change pending final review

Material Test Report

Report No: MAT:AET-158477-S1

Client: Reynolds Smith & Hills, Inc CC:

Project: Sioux Gateway Airport Siouxland Nexus

Date of Issue: 8/6/2024

Particle Size Distribution

Sioux City IA **Job No:** P-0025900

Sample Details

 Sample ID
 AET-158477-S1

 Field Sample ID
 B-66, B-68, B-95

 Date Sampled
 5/17/2024

Source

Material Sandy Silt, Brown (ML)

Specification Sampling Method

Location Composite: B-66,, B-68, B-95, Jar #306

Date Submitted

Other Test Results

Description	Method	Result	Limits
Maximum Dry Unit Weight (lbf/ft³)	ASTM D 1557	114.3	
Corrected Maximum Dry Unit Weight (lbf/ft³)		114.3	
Optimum Water Content (%)		12.2	
Corrected Optimum Water Content (%)		12.2	
Method		Α	
Preparation Method		Dry	
Retained Sieve No 4 (4.75mm) (%)		2	
Date Tested		6/13/2024	
CBR At 0.1in (%)	ASTM D 1883		
CBR At 0.2in (%)			
Maximum Dry Density (lb/ft³)		114.3	
Date Tested		7/5/2024	

Chart

Comments



Draft Report - Subject to change pending final review

Material Test Report

Report No: MAT:AET-158477-S2

Client: Reynolds Smith & Hills, Inc CC:

Project: Sioux Gateway Airport Siouxland Nexus

Date of Issue: 8/6/2024

Particle Size Distribution

Sioux City IA

Job No: P-0025900

Sample Details

 Sample ID
 AET-158477-S2

 Field Sample ID
 B-82, B-85, B-87

 Date Sampled
 5/17/2024

Source

Material Silty Sand, a little gravel, mostly fine grained, Brown (SM)

Specification Sampling Method

Location Composite: B-82,, B-85, B-87, Jar #305

Date Submitted

Other Test Results

Description	Method	Result	Limits
Maximum Dry Unit Weight (lbf/ft³)	ASTM D 1557	123.8	
Corrected Maximum Dry Unit Weight (lbf/ft³)		126.7	
Optimum Water Content (%)		10.4	
Corrected Optimum Water Content (%)		9.6	
Method		В	
Preparation Method		Dry	
Retained Sieve 3/8" (9.5mm) (%)		9	
Specific Gravity (Oversize)		2.68	
Date Tested		6/13/2024	
CBR At 0.1in (%)	ASTM D 1883		
CBR At 0.2in (%)			
Maximum Dry Density (lb/ft³)		126.7	
Date Tested		6/28/2024	

Chart

Comments



Particle Size Distribution

Material Test Report

Report No: MAT:AET-158477-S3

Client: Reynolds Smith & Hills, Inc CC:

Draft Report - Subject to change pending final review

Project: Sioux Gateway Airport Siouxland Nexus

Date of Issue: 8/6/2024

Sioux City IA P-0025900

Sample Details

 Sample ID
 AET-158477-S3

 Field Sample ID
 B-1, B-2, B-6

 Date Sampled
 5/17/2024

Source

Job No:

Material Sandy Lean Clay, a little gravel, Brown (CL)

Specification Sampling Method

Location Composite: B-1,, B-2, B-6, Jar #382

Date Submitted

Other Test Results			
Description	Method	Result	Limits
Maximum Dry Unit Weight (lbf/ft³)	ASTM D 1557	114.4	
Corrected Maximum Dry Unit Weight (lbf/ft³)		114.4	
Optimum Water Content (%)		15.0	
Corrected Optimum Water Content (%)		15.0	
Method		В	
Preparation Method		Dry	
Retained Sieve 3/8" (9.5mm) (%)		1	
Date Tested		7/12/2024	
CBR At 0.1in (%)	ASTM D 1883		
CBR At 0.2in (%)			
Maximum Dry Density (lb/ft³)		114.4	
Date Tested		7/19/2024	

Chart

Comments



Draft Report - Subject to change pending final review

Material Test Report

Report No: MAT:AET-158477-S4

Client: Reynolds Smith & Hills, Inc CC:

Project: Sioux Gateway Airport Siouxland Nexus

Date of Issue: 8/6/2024

Particle Size Distribution

Sioux City IA

Job No: P-0025900

Sample Details

 Sample ID
 AET-158477-S4

 Field Sample ID
 B-10, B-13, B-15

 Date Sampled
 5/17/2024

Source

Material Gravelly Silty Sand, mostly medium grained, Brown (SM)

Specification Sampling Method

Location Composite: B-10,, B-13, B-15, Jar #346

Date Submitted

Other Test Results

Description	Method	Result	Limits
Maximum Dry Unit Weight (lbf/ft³)	ASTM D 1557	116.1	
Corrected Maximum Dry Unit Weight (lbf/ft³)		124.4	
Optimum Water Content (%)		13.8	
Corrected Optimum Water Content (%)		11.1	
Method		В	
Preparation Method		Dry	
Retained Sieve 3/8" (9.5mm) (%)		22	
Specific Gravity (Oversize)		2.68	
Date Tested		6/28/2024	
CBR At 0.1in (%)	ASTM D 1883		
CBR At 0.2in (%)			
Maximum Dry Density (lb/ft³)		121.9	
Date Tested		7/17/2024	

Chart

Comments



Draft Report - Subject to change pending final review

Material Test Report

Report No: MAT:AET-158477-S5

Client: Reynolds Smith & Hills, Inc CC:

Project: Sioux Gateway Airport Siouxland Nexus

Date of Issue: 8/6/2024

Particle Size Distribution

Sioux City IA P-0025900

Sample Details

 Sample ID
 AET-158477-S5

 Field Sample ID
 B-22, B-26, B-28

 Date Sampled
 5/17/2024

Source

Job No:

Material Sandy Lean Clay, a little gravel, Brown (CL)

Specification Sampling Method

Location Composite: B-22, B-26, B-28, Jar #378

Date Submitted

Other Test Results			
Description	Method	Result	Limits
Maximum Dry Unit Weight (lbf/ft³)	ASTM D 1557	105.8	
Corrected Maximum Dry Unit Weight (lbf/ft³)		105.8	
Optimum Water Content (%)		17.6	
Corrected Optimum Water Content (%)		17.6	
Method		В	
Preparation Method		Dry	
Retained Sieve 3/8" (9.5mm) (%)		1	
Date Tested		7/11/2024	
CBR At 0.1in (%)	ASTM D 1883		
CBR At 0.2in (%)			
Maximum Dry Density (lb/ft³)		105.8	
Date Tested		7/16/2024	

Chart

Comments



Draft Report - Subject to change pending final review

Material Test Report

Report No: MAT:AET-158477-S6

Client: Reynolds Smith & Hills, Inc CC:

Project: Sioux Gateway Airport Siouxland Nexus

Date of Issue: 8/6/2024

Particle Size Distribution

Sioux City IA

Job No: P-0025900

Sample Details

 Sample ID
 AET-158477-S6

 Field Sample ID
 B-35, B-40, B-42

 Date Sampled
 5/17/2024

Source

Material Silty Sand w/Gravel, medium grained, Dark Brown (SM)

Specification Sampling Method

Location Composite: B-35,, B-40, B-42, Jar #350

Date Submitted

Other Test Results

Description	Method	Result	Limits
Maximum Dry Unit Weight (lbf/ft³)	ASTM D 1557	120.1	
Corrected Maximum Dry Unit Weight (lbf/ft³)		121.9	
Optimum Water Content (%)		9.9	
Corrected Optimum Water Content (%)		9.5	
Method		В	
Preparation Method		Dry	
Retained Sieve 3/8" (9.5mm) (%)		5	
Specific Gravity (Oversize)		2.68	
Date Tested		6/28/2024	
CBR At 0.1in (%)	ASTM D 1883		
CBR At 0.2in (%)			
Maximum Dry Density (lb/ft³)		121.9	
Date Tested		7/15/2024	

Chart

Comments



Draft Report - Subject to change pending final review

Material Test Report

Report No: MAT:AET-158477-S7

Client: Reynolds Smith & Hills, Inc CC:

Project: Sioux Gateway Airport Siouxland Nexus

Date of Issue: 8/6/2024

Particle Size Distribution

Sioux City IA **Job No:** P-0025900

Sample Details

 Sample ID
 AET-158477-S7

 Field Sample ID
 B-51, B-54, B-57

 Date Sampled
 5/17/2024

Source

Material Sandy Lean Clay, with gravel, Brown (CL)

Specification Sampling Method

Location Composite: B-51,, B-54, B-57, Jar #381

Date Submitted

Other Test Results			
Description	Method	Result	Limits
Maximum Dry Unit Weight (lbf/ft³)	ASTM D 1557	113.3	
Corrected Maximum Dry Unit Weight (lbf/ft³)		113.3	
Optimum Water Content (%)		15.1	
Corrected Optimum Water Content (%)		15.1	
Method		В	
Preparation Method		Dry	
Retained Sieve 3/8" (9.5mm) (%)		2	
Date Tested		7/12/2024	
CBR At 0.1in (%)	ASTM D 1883		
CBR At 0.2in (%)			
Maximum Dry Density (lb/ft³)		113.3	
Date Tested		7/22/2024	

Chart

Comments



Draft Report - Subject to change pending final review

Material Test Report

Report No: MAT:AET-158477-S8

Client: Reynolds Smith & Hills, Inc CC:

Project: Sioux Gateway Airport Siouxland Nexus

Date of Issue: 8/6/2024

Particle Size Distribution

Sioux City IA

Job No: P-0025900

Sample Details

 Sample ID
 AET-158477-S8

 Field Sample ID
 B-30, B-36, B-63

 Date Sampled
 5/17/2024

Source

Material Sandy Lean Clay, Brown (CL)

Specification Sampling Method

Location Composite: B-31,, B-36, B-63, Jar #307

Date Submitted

Maximum Dry Density (lb/ft³)

Date Tested

Other Test Results Description Method Result Limits Maximum Dry Unit Weight (lbf/ft³) **ASTM D 1557** 116.9 Corrected Maximum Dry Unit Weight (lbf/ft3) 116.9 Optimum Water Content (%) 12.6 Corrected Optimum Water Content (%) 12.6 Method Α Dry Preparation Method Retained Sieve No 4 (4.75mm) (%) **Date Tested** 6/13/2024 CBR At 0.1in (%) **ASTM D 1883** CBR At 0.2in (%)

Chart

Comments

N/A

116.9

7/16/2024



California Bearing Ratio Report

Report No: CBR:AET-158477-S1

Client: Reynolds Smith & Hills, Inc CC:

Project: Sioux Gateway Airport Siouxland Nexus

change pending final review

Draft Report - Subject to

Date of Issue: 8/6/2024

Sioux City IA

Job No: P-0025900

Sample Details

Sample ID: AET-158477-S1 **Field ID:** B-66, B-68, B-95

Date Sampled: 5/17/2024

Sampling Method:

Source: Material: Sandy Silt, Brown (ML)

Specification:

Location: Composite: B-66,, B-68, B-95, Jar #306

Tested By: Gregory Burgess Date Tested: 7/5/2024

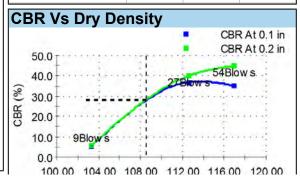
Stress vs Penetration 1300.0 1100.0 1000.0 900.0 800.0 Stress (PSI) 700.0 600.0 500.0 400.0 300.0 200.0 9Blows 100.0 0.2 0.3 0.4 0.5 0.0 0.1 Penetration (in)

Overall Results

ASTM D 1883

CBR At 0.1in (%): 28
CBR At 0.2in (%): 29
At Dry Density (lb/ft³): 108.6

Test Results			
Blows	27	9	54
Comp. Eff.	ASTM D 1557	ASTM D 1557	ASTM D 1557
Initial MC (%)	12.5	12.8	12.7
MC of Top 1in (%)	19.1	24.5	17.8
MC After (%)	15.1	19.2	14.1
DD Before (lb/ft³)	112.55	103.28	116.88
DD After (lb/ft³)	112.32	102.79	116.33
CBR (%)	40.0	5.8	45.0
% MDD	98.5	90.4	102.3
Sample Condition	Soaked	Soaked	Soaked
Immersion Period (h)	96	96	96
Surcharge (lb)	10.00	10.00	10.00
Swell (%)	0.72	1.29	0.57



Comments

Sample CBR measured at 95% max dry density as determined by ASTM D1557



California Bearing Ratio Report

Report No: CBR:AET-158477-S2

Client: Reynolds Smith & Hills, Inc CC:

Project: Sioux Gateway Airport Siouxland Nexus

Draft Report - Subject to change pending final review

Sioux City IA

Job No: P-0025900

Date of Issue: 8/6/2024

Sample Details

Sample ID: AET-158477-S2 **Field ID:** B-82, B-85, B-87

Date Sampled: 5/17/2024

Sampling Method:

Source: Material: Silty Sand, a little gravel, mostly fine grained,

Brown (SM)

Specification:

Location: Composite: B-82,, B-85, B-87, Jar #305

Tested By: Gregory Burgess Date Tested: 6/28/2024

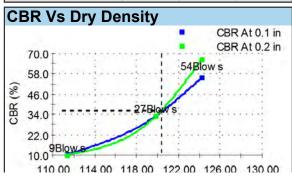
Stress vs Penetration 1500.0 1300.0 1200.0 1100.0 1000.0 900.0 Stress (PSI) 800.0 700.0 600.0 27Blows 500.0 400.0 300.0 200.0 100.0 0.0 0.4 0.5 0.0 Penetration (in)

Overall Results

ASTM D 1883

CBR At 0.1in (%): 36
CBR At 0.2in (%): 36
At Dry Density (lb/ft³): 120.4

Test Results			
Blows	27	9	54
Comp. Eff.	ASTM D 1557	ASTM D 1557	ASTM D 1557
Initial MC (%)	9.9	9.7	9.8
MC of Top 1in (%)	14.6	16.5	12.4
MC After (%)	11.6	15.0	10.9
DD Before (lb/ft³)	119.85	111.36	124.23
DD After (lb/ft³)	120.84	111.53	124.82
CBR (%)	33.1	10.5	66.4
% MDD	94.6	87.9	98.0
Sample Condition	Soaked	Soaked	Soaked
Immersion Period (h)	96	95	96
Surcharge (lb)	10.00	10.00	10.00
Swell (%)	0.28	0.31	0.00



Comments

Sample CBR measured at 95% max dry density as determined by ASTM D1557 corrected by ASTM D4718.



California Bearing Ratio Report

Report No: CBR:AET-158477-S3

8/6/2024

Client: Reynolds Smith & Hills, Inc CC:

Project: Sioux Gateway Airport Siouxland Nexus

change pending final review

Draft Report - Subject to

Sioux City IA

Date of Issue:

ate of issue:

Job No: P-0025900

Sample Details

Sample ID: AET-158477-S3 **Field ID:** B-1, B-2, B-6

Date Sampled: 5/17/2024

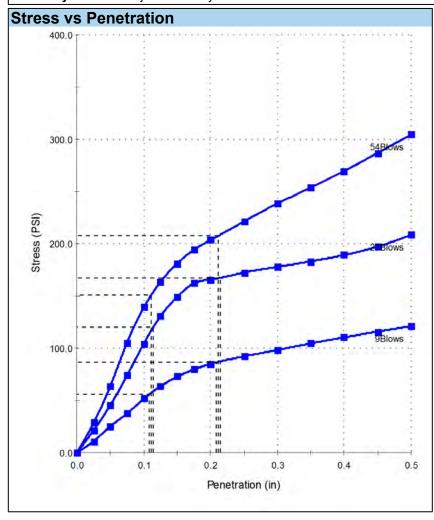
Sampling Method:

Source: Sandy Lean Clay, a little gravel, Brown (CL)

Specification:

Location: Composite: B-1,, B-2, B-6, Jar #382

Tested By: Benjamin Pomroy Date Tested: 7/19/2024

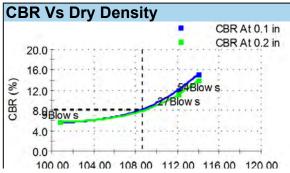


Overall Results

ASTM D 1883

CBR At 0.1in (%): 8
CBR At 0.2in (%): 8
At Dry Density (lb/ft³): 108.7

Test Results			
Blows	27	9	54
Comp. Eff.	ASTM D 1557	ASTM D 1557	ASTM D 1557
Initial MC (%)	15.2	14.9	15.3
MC of Top 1in (%)	22.3	26.3	22.1
MC After (%)	18.5	23.2	16.5
DD Before (lb/ft³)	112.08	100.72	113.99
DD After (lb/ft³)	110.44	98.84	113.11
CBR (%)	12.0	5.8	15.1
% MDD	98.0	88.1	99.7
Sample Condition	Soaked	Soaked	Soaked
Immersion Period (h)	94	94	94
Surcharge (lb)	10.00	10.00	10.00
Swell (%)	2.47	2.92	2.13





California Bearing Ratio Report

Report No: CBR:AET-158477-S4

8/6/2024

Client: Reynolds Smith & Hills, Inc CC:

Project: Sioux Gateway Airport Siouxland Nexus

Date of Issue:

Sioux City IA

Job No: P-0025900

Sample Details

Sample ID: AET-158477-S4 **Field ID:** B-10, B-13, B-15

Date Sampled: 5/17/2024

Sampling Method:

Source: Material: Gravelly Silty Sand, mostly medium grained,

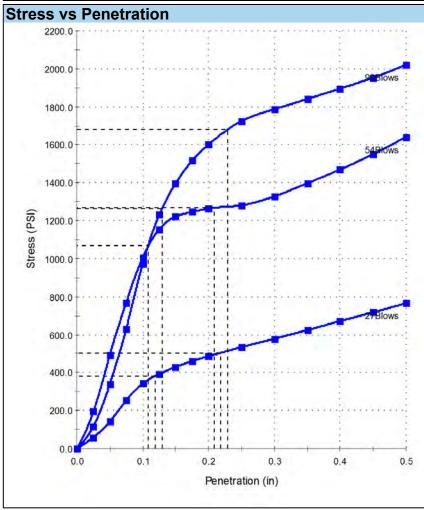
Brown (SM)

Draft Report - Subject to change pending final review

Specification:

Location: Composite: B-10,, B-13, B-15, Jar #346

Tested By: Benjamin Pomroy Date Tested: 7/17/2024

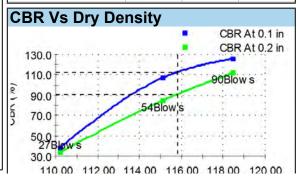


Overall Results

ASTM D 1883

CBR At 0.1in (%): 113
CBR At 0.2in (%): 91
At Dry Density (lb/ft³): 115.8

Test Results			
Blows	27	90	54
Comp. Eff.	ASTM D 1557	ASTM D 1557	ASTM D 1557
Initial MC (%)	12.3	11.4	12.4
MC of Top 1in (%)	19.9	17.0	16.7
MC After (%)	17.6	14.3	15.7
DD Before (lb/ft³)	110.19	118.45	115.09
DD After (lb/ft³)	109.78	117.82	114.96
CBR (%)	38.2	126.2	107.0
% MDD	90.4	97.2	94.4
Sample Condition	Soaked	Soaked	Soaked
Immersion Period (h)	96	96	96
Surcharge (lb)	10.00	10.00	10.00
Swell (%)	0.76	0.50	0.33





California Bearing Ratio Report

Report No: CBR:AET-158477-S5

Client: Reynolds Smith & Hills, Inc CC:

Project: Sioux Gateway Airport Siouxland Nexus

Draft Report - Subject to change pending final review

Sioux City IA

Job No: P-0025900

Date of Issue: 8/6/2024

Sample Details

Sample ID: AET-158477-S5 **Field ID:** B-22, B-26, B-28

Date Sampled: 5/17/2024

Sampling Method:

Source: Material: Sandy Lean Clay, a little gravel, Brown (CL)

Specification:

Location: Composite: B-22,, B-26, B-28, Jar #378

Tested By: Benjamin Pomroy Date Tested: 7/16/2024

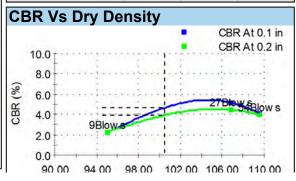
Stress vs Penetration 90.0 80.0 70.0 60.0 70.0 30.0 30.0 30.0 10.0 10.0 Penetration (in)

Overall Results

ASTM D 1883

CBR At 0.1in (%): 5
CBR At 0.2in (%): 4
At Dry Density (lb/ft³): 100.5

Test Results			
Blows	27	9	54
Comp. Eff.	ASTM D 1557	ASTM D 1557	ASTM D 1557
Initial MC (%)	17.2	17.3	18.1
MC of Top 1in (%)	31.0	37.2	32.2
MC After (%)	24.3	29.2	21.2
DD Before (lb/ft³)	106.85	95.04	109.51
DD After (lb/ft³)	99.99	89.74	104.23
CBR (%)	5.2	2.3	4.2
% MDD	101.0	89.8	103.5
Sample Condition	Soaked	Soaked	Soaked
Immersion Period (h)	96	96	96
Surcharge (lb)	10.00	10.00	10.00
Swell (%)	6.65	6.70	7.02





California Bearing Ratio Report

Report No: CBR:AET-158477-S6

Client: Reynolds Smith & Hills, Inc

Project: Sioux Gateway Airport Siouxland Nexus Draft Report - Subject to change pending final review

Date of Issue: 8/6/2024

Sioux City IA P-0025900 Job No:

Sample Details

Sample ID: Field ID: B-35, B-40, B-42 AET-158477-S6

Date Sampled:

5/17/2024

Sampling Method:

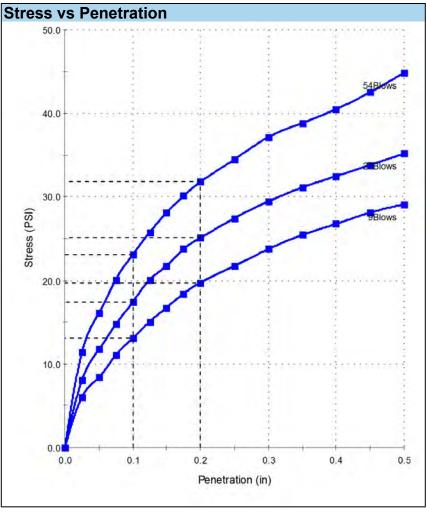
Source: Material: Silty Sand w/Gravel, medium grained, Dark

Brown (SM)

Specification:

Location: Composite: B-35,, B-40, B-42, Jar #350

Tested By: **Date Tested:** 7/15/2024 Benjamin Pomroy

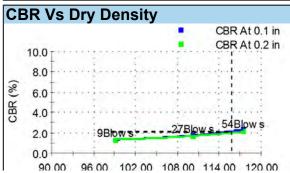


Overall Results

ASTM D 1883

CBR At 0.1in (%): CBR At 0.2in (%): At Dry Density (lb/ft3): 115.8

Test Results				
Blows	27	9	54	
Comp. Eff.	ASTM D 1557	ASTM D 1557	ASTM D 1557	
Initial MC (%)	10.4	10.6	10.3	
MC of Top 1in (%)	30.5	33.7	28.0	
MC After (%)	22.0	27.0	17.7	
DD Before (lb/ft³)	110.26	99.07	117.40	
DD After (lb/ft³)	101.16	92.85	108.33	
CBR (%)	1.7	1.3	2.3	
% MDD	90.5	81.3	96.3	
Sample Condition	Soaked	Soaked	Soaked	
Immersion Period (h)	96	96	96	
Surcharge (lb)	10.00	10.00	10.00	
Swell (%)	10.50	7.51	10.67	





California Bearing Ratio Report

Report No: CBR:AET-158477-S7

Client: Reynolds Smith & Hills, Inc CC:

Project: Sioux Gateway Airport Siouxland Nexus

change pending final review

Draft Report - Subject to

Date of Issue: 8/6/2024

Sioux City IA

Job No: P-0025900

Sample Details

Sample ID: AET-158477-S7 **Field ID:** B-51, B-54, B-57

Date Sampled: 5/17/2024

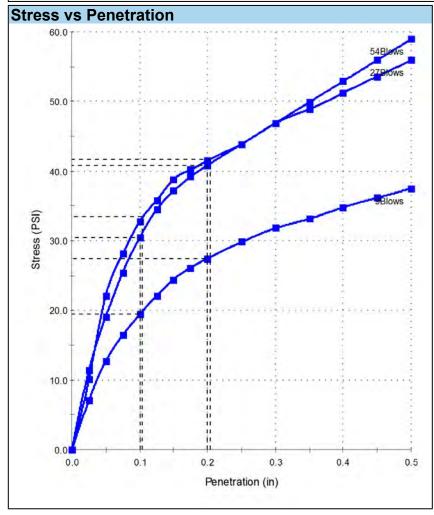
Sampling Method:

Source: Material: Sandy Lean Clay, with gravel, Brown (CL)

Specification:

Location: Composite: B-51,, B-54, B-57, Jar #381

Tested By: Benjamin Pomroy Date Tested: 7/22/2024

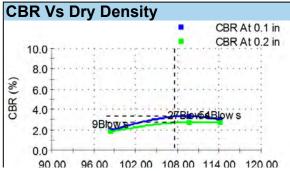


Overall Results

ASTM D 1883

CBR At 0.1in (%): 3
CBR At 0.2in (%): 3
At Dry Density (lb/ft³): 107.6

Test Results			
Blows	27	9	54
Comp. Eff.	ASTM D 1557	ASTM D 1557	ASTM D 1557
Initial MC (%)	15.4	15.5	15.5
MC of Top 1in (%)	30.8	33.8	28.8
MC After (%)	21.7	25.8	19.3
DD Before (lb/ft³)	109.68	98.33	114.02
DD After (lb/ft³)	103.34	90.56	107.73
CBR (%)	3.3	1.9	3.0
% MDD	96.8	86.8	100.6
Sample Condition	Soaked	Soaked	Soaked
Immersion Period (h)	96	96	96
Surcharge (lb)	10.00	10.00	10.00
Swell (%)	7.39	10.49	7.02





California Bearing Ratio Test Report

Report No: CBR:AET-158477-S8

8/6/2024

Client: Reynolds Smith & Hills, Inc CC:

Project: Sioux Gateway Airport Siouxland Nexus

Sioux City IA

Job No: P-0025900

Sample Details

 Sample ID:
 AET-158477-S8
 Field ID:
 B-30, B-36, B-63

 Date Sampled:
 5/17/2024
 Sampled By:
 Roger Hanson

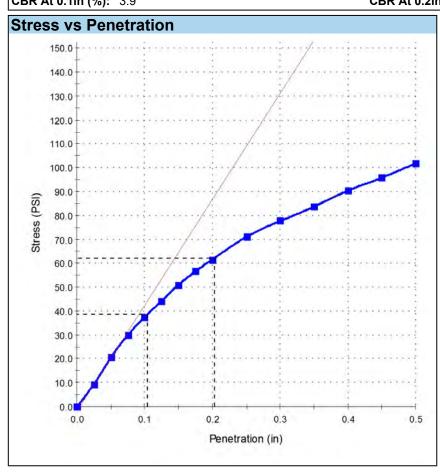
Sampling Method:

Source: Material: Sandy Lean Clay, Brown (CL)

Specification: Location: Composite: B-31,, B-36, B-63, Jar #307

 Tested By:
 Benjamin Pomroy
 Date Tested:
 7/17/2024

 CBR At 0.1in (%):
 3.9
 CBR At 0.2in (%):
 4.2



Test Results

Draft Report - Subject to change pending final review

ASTM D 1883 CBR At 0.1in (%): 3.9 CBR At 0.2in (%): 4.2

Compactive Effort: ASTM D 1557

Number of Blows: % of Maximum Dry Density: 96.1 Dry Density Before Soaking (lb/ft3): 112.4 Dry Density After Soaking (lb/ft³): 106.5 MC Before Compaction (%): 12.3 MC After Compaction (%): 13.7 Moisture Content of Top 1in (%): 26.2 Average Moisture Content (%): 19.5 Maximum Dry Density (lb/ft3): 116.9 Optimum Moisture Content (%): 12.6 Sample Condition: Soaked Immersion Period (h): 96 Swell (%): 5.7 Surcharge Mass (lb): 10.00 Date Tested: 7/17/2024



REPORT OF PETROGRAPHIC ANALYSIS

Project:

Sioux Gateway Airport, Siouxland Nexus Sioux City, Iowa

Reported To:

RS&H, Inc. 4525 Airport Approach Rd, Suite A Duluth, MN 55811

Attn: Darren Christopher

AET Project No.: P-0025900 **Date:** August 3, 2024

INTRODUCTION

This report presents the results of laboratory work performed by our firm on six concrete core samples that were procured by AET personnel and submitted to AET's petrographic laboratory by Mr. Neil Lund on July 25, 2024. We understand the concrete cores were obtained from the above-referenced location and were procured through the full-depth of the runway pavement. We also understand that the presence of alkali-silica reactivity (ASR) within the concrete is in question. The concrete is thought to be approximately 30 years old. The scope of our work was limited to performing petrographic analysis on the samples to document the presence/severity of any ASR in the concrete cores.

CONCLUSIONS

Based on our observations and analysis:

- 1. The analyzed core samples did not exhibit any evidence of bulk, expansive ASR. An innocuous level of alkali-silica gel deposits were documented in core samples #2, #11, #22, and #57. The deposits were present within air voids adjacent to a few shale fine aggregate particles. Core samples #7 and #15 contained similar shale particles; however, no secondary gel deposits were found in these cores. The reactivity has not caused any emanating or expansive cracking in the core samples. The coarse aggregate in the samples consisted of quarried and crushed fossiliferous limestone. No evidence of any ASR of the coarse aggregates was found. Based on the reported age of the pavement and the petrographic observations of the core samples, we do not expect the concrete to be susceptible to long-term, bulk/expansive ASR.
- 2. It is common for many concretes to exhibit minute or innocuous levels of ASR of fine aggregate that does not result in expansive cracking or negatively impact durability or service life. The natural sand fine aggregate in the analyzed core samples contained a very small portion of shale. While the quantity of shale was not formally quantified, it was visually estimated to



comprise less than 1% of the fine aggregate and was likely less than 0.5%. The sand composition was consistent with natural glacial deposits of southern Minnesota and northern lowa. These deposits are known to contain particles derived from the Pierre Shale. Many concretes in this region have been produced with similar sand and in AET's experience have not shown evidence of bulk expansion from ASR. Further, the Pierre Shale is known to be a 'fast reactor' often producing secondary alkali-silica gel within twenty-four hours of a concrete's life, with typically little or no additional reactivity thereafter.

3. The concrete samples exhibited diamond-grooved or saw-cut top surfaces with minor mortar erosion/traffic worn surfaces. Carbonation was very shallow for the reported age of the concrete, ranging from mostly negligible up to 4 mm (5/32") depth. The concrete samples were well consolidated and appeared air entrained.

SAMPLE IDENTIFICATION

Sample Type: Hardened Concrete Cores

Sample ID	<u>Diameter</u>	<u>Length</u>
#2	152 mm (6")	330 mm (13")
#11	152 mm (6")	343 mm (13-1/2")
#22	152 mm (6")	330 mm (13")

TEST RESULTS

Our complete petrographic analysis documentation appears on the attached sheets entitled 24-LAB-001 "Petrographic Examination of Hardened Concrete, ASTM C856." A brief summary of the general physical characteristics of the concrete is as follows:

- 1. The coarse aggregate was comprised of 25 mm (1") nominal sized quarried and crushed limestone that appeared well graded and exhibited good overall distribution. The fine aggregate was a natural glacial sand.
- 2. The paste color ranged from light brownish gray to light and medium gray. The paste hardness was judged to be moderate (Mohs \sim 3) with the paste/aggregate bond considered good.
- 3. The top surfaces were diamond grooved and exhibited traffic wear/mortar erosion. The depth of carbonation ranged from the top surfaces was mostly negligible but was observed locally 'spiking' along sub-vertical microcracking to 16 mm (5/8").

Report of Petrographic Analysis **Sioux Gateway, Sioux Nexus,** Sioux City, IA August 3, 2024 AET Project No. P-0025900



TEST PROCEDURES

Laboratory testing was performed on July 26, 2024, and subsequent dates. Our procedures were as follows:

1.0 Petrographic Analysis

A petrographic analysis was performed in accordance with AET Standard Operating Procedure 24-LAB-001, "Petrographic Examination of Hardened Concrete," ASTM C856-latest revision. The petrographic analysis consisted of reviewing the cement paste and aggregate qualities on a whole basis on saw cut, lapped, and fractured sections. Reflected light microscopy was performed under an Olympus SZX-12 binocular stereozoom microscope at magnifications up to 160x. The depth of carbonation was documented using a phenolphthalein pH indicator solution applied on freshly saw cut and lapped surfaces of the concrete sample. The paste-coarse aggregate bond quality was determined by fracturing a sound section of the concrete in the laboratory with a rock hammer.

REMARKS

The test sample will be retained for a period of at least sixty days from the date of this report. Unless further instructions are received by that time, the sample may be discarded. Test results relate only to the items tested. No warranty, expressed or implied, is made.

We appreciate the opportunity to have been of service to you on this project. If you have any questions regarding the information presented in this report or if we can be of additional assistance, please contact us.

Report Prepared By

American Engineering Testing, Inc.

Bradley Walter / Petrographic Technician

brwalter@teamAET.com

Senior Petrographer/Geologist

MN License #50337

blemcke@teamAET.com

Work: 651-659-1362

24-LAB-001 PETROGRAPHIC EXAMINATION OF HARDENED CONCRETE, ASTM C856

Project No.P-0025900Date:8/2/2024Date reviewed:8/2/2024Sample ID:#2Performed by:B. WalterReviewed by:B. Lemcke

I. GENERAL OBSERVATIONS

1. Sample Dimensions: Our analysis was performed on a 330 mm (13") x 146 mm (5-3/4") x 51 mm (2") thick lapped profile section and a 76 mm (3") x 52 mm (2") thin section that were sawcut and prepared from the original 152 mm (6") diameter x 330 mm (13") long core.

2. Surface Conditions:

Top: Rough, diamond grooved surface exhibiting traffic wear/erosion.

Bottom: Rough, irregular, formed surface; placed on grade.

3. Reinforcement: None observed.

4. General Physical Conditions: The top surface of the concrete was diamond grooved with three parallel saw-cuts that were approximately 5 mm (3/16") wide by 3 mm (1/8") deep. The top surface exhibited mortar erosion/traffic wear with several exposed fine aggregate surfaces. A few sub-vertical drying-shrinkage microcracks proceeded from the top surface up to a maximum observed depth of 12 mm (1/2"). Carbonation from the top surface was negligible but was observed along sub-vertical microcracking up to 12 mm (1/2") depth. A few secondary deposits of white, acicular ettringite were observed within the bottom approximately 20 mm (13/16") of the core. A single deposit of alkali-silica gel was observed filling an air void adjacent to a reactive shale fine aggregate particle at approximately 51 mm (2") from the bottom surface of the core. A few shale fine aggregate particles with fine internal microcracking were observed in the sample. The concrete was well consolidated and appeared air-entrained.

II. AGGREGATE

 Coarse: 25 mm (1") nominal sized quarried and crushed stone consisting of fossiliferous limestone. The particles were mostly sub-angular in shape. The coarse aggregate appeared well graded and exhibited good overall distribution.

Fine: Natural quartz, feldspar, and lithic sand (carbonates, chert, granite, and basalt with a
few iron oxide and shale particles). The grains were mostly sub-rounded with many
smaller sub-angular particles. The fine aggregate appeared well graded and exhibited
good overall uniform distribution.

III. CEMENTITIOUS PROPERTIES

1. Air Content: Not documented.

2. Depth of carbonation: Negligible but spiking up to 12 mm (1/2") depth from the top surface

along surficial sub-vertical microcracking.

3. Paste/aggregate bond: Good.

4. Paste color: Light brownish gray (Munsell® 5YR 6/1) overall, darkening to

medium dark gray (Munsell® N4) within base 20 mm (13/16") depth

from the bottom surface.

5. Paste hardness: Moderate (Mohs ≈3.0).

24-LAB-001 Petrographic Examination of Hardened Concrete Sample ID: #2
AET Project No. P-0025900

Page 2 of 2

6. Microcracking: A few sub-vertical microcracks were observed extending from the

top surface ranging from 4 mm (5/32") up to 12 mm (1/2") deep.

7. Secondary deposits: Colorless to white acicular ettringite was observed within the dark colored base 20 mm (13/16") layer of the paste. A single deposit of

alkali-silica gel was observed filling an air void adjacent to a

reactive shale fine aggregate particle at approximately 51 mm (2")

from the bottom surface.

24-LAB-001 PETROGRAPHIC EXAMINATION OF HARDENED CONCRETE, ASTM C856

Project No.P-0025900Date:8/2/2024Date reviewed:8/3/2024Sample ID:#7Performed by:B. WalterReviewed by:B. Lemcke

I. GENERAL OBSERVATIONS

1. Sample Dimensions: Our analysis was performed on a 362 mm (14-1/4") x 140 mm (5-1/2") x 51 mm (2") thick lapped profile section and a 76 mm (3") x 52 mm (2") thin section that were saw-cut and prepared from the original 152 mm (6") diameter x 362 mm (14-1/4") long core.

2. Surface Conditions:

Top: Rough, diamond grooved surface exhibiting traffic wear/erosion.

Bottom: Rough, irregular, formed surface; placed on grade.

3. Reinforcement: None observed.

4. General Physical Conditions: The top surface of the concrete was diamond grooved with three parallel saw-cuts that were approximately 5 mm (3/16") wide by 3 mm (1/8") deep. The top surface exhibited mortar erosion/traffic wear with several exposed fine aggregate surfaces. A few sub-vertical drying-shrinkage microcracks proceeded from the top surface up to a maximum observed depth of 9 mm (3/8"). Carbonation from the top surface was negligible but was observed along sub-vertical microcracking up to 9 mm (3/8") depth. A few secondary deposits of white, acicular ettringite were observed within the bottom approximately 10 mm (3/8") of the core. Secondary deposits of alkali-silica gel were not observed in the sample. However, a few shale fine aggregate particles with fine internal microcracking were observed in the sample. The concrete was well consolidated and appeared air-entrained.

II. AGGREGATE

 Coarse: 25 mm (1") nominal sized quarried and crushed stone consisting of fossiliferous limestone. The particles were mostly sub-angular in shape. The coarse aggregate appeared well graded and exhibited good overall distribution.

2. Fine: Natural quartz, feldspar, and lithic sand (carbonates, chert, granite, and basalt with a few iron oxide and shale particles). The grains were mostly sub-rounded with many smaller sub-angular particles. The fine aggregate appeared fairly graded and exhibited good overall uniform distribution.

III. CEMENTITIOUS PROPERTIES

1. Air Content: Not documented.

2. Depth of carbonation: Negligible but spiking up to 9 mm (3/8") depth from the top surface

along surficial sub-vertical microcracks.

3. Paste/aggregate bond: Good.

4. Paste color: Light brownish gray (Munsell® 5YR 6/1) overall, darkening to

medium dark gray (Munsell® N4) within base 20 mm (13/16") depth

from the bottom surface.

5. Paste hardness: Moderate (Mohs ≈3.0).

24-LAB-001 Petrographic Examination of Hardened Concrete Sample ID: #7
AET Project No. P-0025900

Page 2 of 2

6. Microcracking: Several sub-vertical microcracks were observed extending from the

top surface ranging from 4 mm (5/32") up to 9 mm (3/8") deep.

7. Secondary deposits: Colorless to white acicular ettringite was observed within the dark

colored base 10 mm (3/8") layer of the paste.

24-LAB-001 PETROGRAPHIC EXAMINATION OF HARDENED CONCRETE, ASTM C856

Project No.P-0025900Date:8/2/2024Date reviewed:8/3/2024Sample ID:#11Performed by:B. WalterReviewed by:B. Lemcke

I. GENERAL OBSERVATIONS

1. Sample Dimensions: Our analysis was performed on a 343 mm (13-1/2") x 140 mm (5-1/2") x 44 mm (1-3/4") thick lapped profile section and a 76 mm (3") x 52 mm (2") thin section that were saw-cut and prepared from the original 140 mm (5-1/2") diameter x 343 mm (13-1/2") long core.

2. Surface Conditions:

Top: Rough, diamond grooved surface exhibiting traffic wear/erosion.

Bottom: Rough, irregular, formed surface; placed on thin concrete base layer.

3. Reinforcement: None observed.

4. General Physical Conditions: The top surface of the concrete was diamond grooved with three parallel saw-cuts that were approximately 5 mm (3/16") wide by 3 mm (1/8") deep. The top surface exhibited mortar erosion/traffic wear with several exposed fine aggregate surfaces. The sample was a composite core containing a thin (~1") dark gray base concrete that was overlain with the concrete pavement. The light brownish gray comprised the top 292 mm (11-1/2") of the sample, separated from the concrete by a construction joint oriented sub-horizontal to the top surface. A few sub-vertical drying-shrinkage microcracks proceeded from the top surface up to a maximum observed depth of 13 mm (1/2"). Carbonation from the top surface was negligible but was observed along sub-vertical microcracking up to 13 mm (1/2") depth. A few secondary deposits of white, acicular ettringite were observed in proximity, approximately 10 mm (3/8") deep, in either direction from of the construction joint. A single deposit of alkali-silica gel was observed within microcracks in a shale fine aggregate particle at approximately 65 mm (2-9/16") from the bottom surface of the core. A few shale fine aggregate particles with fine internal microcracking were observed within the sample. The concrete was well consolidated and appeared air-entrained.

II. AGGREGATE

 Coarse: 25 mm (1") nominal sized quarried and crushed stone consisting of fossiliferous limestone. The particles were mostly sub-angular in shape. The coarse aggregate appeared well graded and exhibited good overall distribution.

2. Fine: Natural quartz, feldspar, and lithic sand (carbonates, chert, granite, and basalt with a few iron oxide and shale particles). The grains were mostly sub-rounded with many smaller sub-angular particles. The fine aggregate appeared well graded and exhibited good overall uniform distribution.

III. CEMENTITIOUS PROPERTIES

1. Air Content: Not documented.

2. Depth of carbonation: Negligible but spiking up to 13 mm (1/2") depth from the top surface

along surficial sub-vertical microcracking.

3. Paste/aggregate bond: Good.

4. Paste color: Light brownish gray (Munsell® 5YR 6/1) overall.

24-LAB-001 Petrographic Examination of Hardened Concrete Sample ID: #11
AET Project No. P-0025900

Page 2 of 2

5. Paste hardness: Moderate (Mohs ≈3.0).

6. Microcracking: A few sub-vertical microcracks were observed extending from the

top surface ranging from 3 mm (1/8") up to 13 mm (1/2") deep.

7. Secondary deposits: Colorless to white acicular ettringite was observed within 10 mm

(3/8") on either side of the construction joint near the base of the core sample. A single deposit of alkali-silica gel was observed filling an air void adjacent to a reactive shale fine aggregate particle at

approximately 65 mm (2-9/16") from the bottom surface of the core.

24-LAB-001 PETROGRAPHIC EXAMINATION OF HARDENED CONCRETE, ASTM C856

Project No.P-0025900Date:8/2/2024Date reviewed:8/3/2024Sample ID:#15Performed by:B. WalterReviewed by:B. Lemcke

I. GENERAL OBSERVATIONS

1. Sample Dimensions: Our analysis was performed on a 330 mm (13") x 133 mm (5-1/4") x 44 mm (1-3/4") thick lapped profile section and a 76 mm (3") x 52 mm (2") thin section that were saw-cut and prepared from the original 152 mm (6") diameter x 330 mm (13") long core.

2. Surface Conditions:

Top: Rough, diamond grooved surface exhibiting traffic wear/erosion.

Bottom: Rough, irregular, formed surface; placed on grade.

3. Reinforcement: None observed.

4. General Physical Conditions: The top surface of the concrete was diamond grooved with three parallel saw-cuts that were approximately 5 mm (3/16") wide by 5 mm (3/16") deep. The top surface exhibited mortar erosion/traffic wear with several exposed fine aggregate surfaces. A few sub-vertical drying-shrinkage microcracks proceeded from the top surface up to a maximum observed depth of 30 mm (1-3/16"). Carbonation from the top surface was negligible but was observed along sub-vertical microcracking up to 15 mm (9/16") depth. A few secondary deposits of white, acicular ettringite were observed within the bottom approximately 20 mm (13/16") of the core. Secondary deposits of alkali-silica gel were not observed in the sample. However, a few shale fine aggregate particles with fine internal microcracking were observed in the sample. The concrete was well consolidated and appeared air-entrained.

II. AGGREGATE

 Coarse: 25 mm (1") nominal sized quarried and crushed stone consisting of fossiliferous limestone. The particles were mostly sub-angular in shape. The coarse aggregate appeared well graded and exhibited good overall distribution.

2. Fine: Natural quartz, feldspar, and lithic sand (carbonates, chert, granite, and basalt with a few iron oxide and shale particles). The grains were mostly sub-rounded with many smaller sub-angular particles. The fine aggregate appeared well graded and exhibited good overall uniform distribution.

III. CEMENTITIOUS PROPERTIES

1. Air Content: Not documented.

2. Depth of carbonation: Negligible but spiking up to 15 mm (9/16") depth from the top

surface along surficial sub-vertical microcracking.

3. Paste/aggregate bond: Good.

4. Paste color: Light brownish gray (Munsell® 5YR 6/1) overall, darkening to

medium dark gray (Munsell® N4) within base 20 mm (13/16") depth

from the bottom surface.

5. Paste hardness: Moderate (Mohs ≈3.0).

24-LAB-001 Petrographic Examination of Hardened Concrete Sample ID: #15
AET Project No. P-0025900

Page 2 of 2

6. Microcracking: A few sub-vertical microcracks were observed extending from the

top surface ranging from 4 mm (5/32") up to 30 mm (1-3/16") deep.

7. Secondary deposits: Colorless to white acicular ettringite was observed within the dark

colored base 20 mm (13/16") layer of the paste.

24-LAB-001 PETROGRAPHIC EXAMINATION OF HARDENED CONCRETE, ASTM C856

Project No.P-0025900Date:8/2/2024Date reviewed:8/3/2024Sample ID:#22Performed by:B. WalterReviewed by:B. Lemcke

I. GENERAL OBSERVATIONS

1. Sample Dimensions: Our analysis was performed on a 330 mm (13") x 140 mm (5-1/2") x 51 mm (2") thick lapped profile section and a 76 mm (3") x 52 mm (2") thin section that were sawcut and prepared from the original 152 mm (6") diameter x 330 mm (13") long core.

2. Surface Conditions:

Top: Rough, diamond grooved surface exhibiting traffic wear/erosion.

Bottom: Rough, irregular, formed surface; placed on grade.

3. Reinforcement: None observed.

4. General Physical Conditions: The top surface of the concrete was diamond grooved with four parallel saw-cuts that were approximately 5 mm (3/16") wide by 5 mm (3/16") deep. The top surface exhibited mortar erosion/traffic wear with several exposed fine aggregate surfaces. A few sub-vertical drying-shrinkage microcracks proceeded from the top surface up to a maximum observed depth of 16 mm (5/8"). Carbonation from the top surface was negligible but was observed along sub-vertical microcracking up to 16 mm (5/8") depth. A few secondary deposits of white, acicular ettringite were observed within the bottom approximately 15 mm (9/16") of the core. A single deposit of alkali-silica gel was observed filling an air void adjacent to a reactive shale fine aggregate particle at approximately 60 mm (2-3/8") from the bottom surface of the core. An entrapped-sized air void at approximately 76 mm (3") depth from the top surface was thinly lined with colorless alkali-silica gel. The reactive particle was not observed on the lapped surface, but was likely a shale fine aggregate particle. A few shale fine aggregate particles with fine internal microcracking were observed in the sample. The concrete was well consolidated and appeared air-entrained.

II. AGGREGATE

1. Coarse: 25 mm (1") nominal sized quarried and crushed stone consisting of fossiliferous limestone. The particles were mostly sub-angular in shape. The coarse aggregate appeared well graded and exhibited good overall distribution.

2. Fine: Natural quartz, feldspar, and lithic sand (carbonates, chert, granite, and basalt with a few iron oxide and shale particles). The grains were mostly sub-rounded with many smaller sub-angular particles. The fine aggregate appeared well graded and exhibited good overall uniform distribution.

III. CEMENTITIOUS PROPERTIES

1. Air Content: Not documented.

2. Depth of carbonation: Negligible but spiking up to 16 mm (5/8") depth from the top surface

along surficial sub-vertical microcracking.

3. Paste/aggregate bond: Good.

24-LAB-001 Petrographic Examination of Hardened Concrete

Sample ID: #22

AET Project No. P-0025900

Page 2 of 2

4. Paste color: Light brownish gray (Munsell® 5YR 6/1) overall, darkening to

medium dark gray (Munsell® N4) within base 20 mm (13/16") depth

from the bottom surface.

5. Paste hardness: Moderate (Mohs ≈3.0).

6. Microcracking: A few sub-vertical microcracks were observed extending from the

top surface ranging from 5 mm (3/16") up to 16 mm (5/8") deep.

7. Secondary deposits: Colorless to white acicular ettringite was observed within the dark

colored base 15 mm (9/16") layer of the paste. A single deposit of alkali-silica gel was observed filling an air void adjacent to a reactive shale fine aggregate particle at approximately 60 mm (2-

3/8") from the bottom surface. An entrapped-sized air void at approximately 76 mm (3") depth from the top surface was thinly

lined with colorless alkali-silica gel.

24-LAB-001 PETROGRAPHIC EXAMINATION OF HARDENED CONCRETE, ASTM C856

Project No.P-0025900Date:8/2/2024Date reviewed:8/3/2024Sample ID:#57Performed by:B. WalterReviewed by:B. Lemcke

I. GENERAL OBSERVATIONS

1. Sample Dimensions: Our analysis was performed on a 375 mm (14-3/4") x 140 mm (5-1/2") x 51 mm (2") thick lapped profile section and a 76 mm (3") x 52 mm (2") thin section that were saw-cut and prepared from the original 152 mm (6") diameter x 375 mm (14-3/4") long core.

2. Surface Conditions:

Top: Rough, broomed finish surface exhibiting traffic wear/erosion.

Bottom: Rough, irregular surface placed on black felt substrate.

3. Reinforcement: None observed.

4. General Physical Conditions: The top surface of the concrete was a flat, broomed finish surface that exhibited mortar erosion/traffic wear with several exposed fine aggregate surfaces. During preparation, the core sample was intentionally broken approximately 178 mm (7") from the top surface for ease of preparation. A few sub-vertical drying-shrinkage microcracks proceeded from the top surface up to a maximum observed depth of 6 mm (1/4"). Carbonation from the top surface was negligible. A single deposit of alkali-silica gel was observed filling an air void proximate to a reactive shale fine aggregate particle at approximately 19 mm (3/4") depth from the top surface of the core. A few shale fine aggregate particles with fine internal microcracking were observed in the sample. The concrete was well consolidated and appeared air-entrained.

II. AGGREGATE

1. Coarse: 25 mm (1") nominal sized quarried and crushed stone consisting of fossiliferous limestone. The particles were mostly sub-angular in shape. The coarse aggregate appeared well graded and exhibited good overall distribution.

2. Fine: Natural quartz, feldspar, and lithic sand (carbonates, chert, granite, and basalt with a few iron oxide and shale particles). The grains were mostly sub-rounded with many smaller sub-angular particles. The fine aggregate appeared well graded and exhibited good overall uniform distribution.

III. CEMENTITIOUS PROPERTIES

1. Air Content: Not documented.

Depth of carbonation: Negligible
 Paste/aggregate bond: Good.

4. Paste color: Very light gray (Munsell® N8).

5. Paste hardness: Moderate (Mohs ≈3.0).

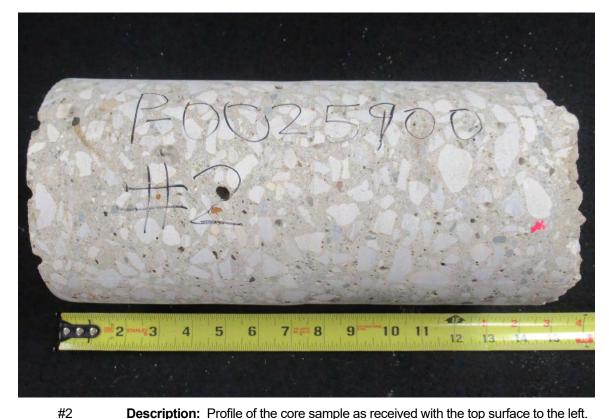
6. Microcracking: A few sub-vertical drying-shrinkage microcracks proceeded from

the top surface up to a maximum observed depth of 6 mm (1/4").

7. Secondary deposits: Colorless to white acicular ettringite was observed within the dark

colored base 10 mm (3/8") layer of the paste.





Sample ID:

Description: Profile of the core sample as received with the top surface to the left.

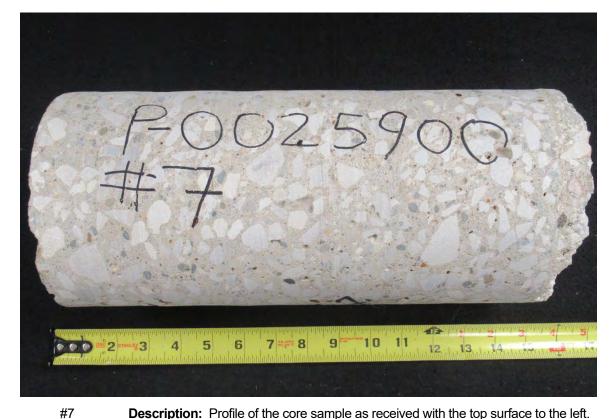


Photo: 2

Sample ID:

Description: The diamond grooved top surface of the sample as received.





Sample ID:

Description: Profile of the core sample as received with the top surface to the left.

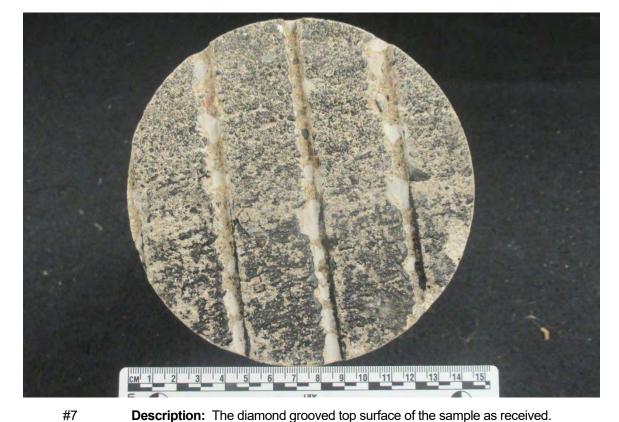
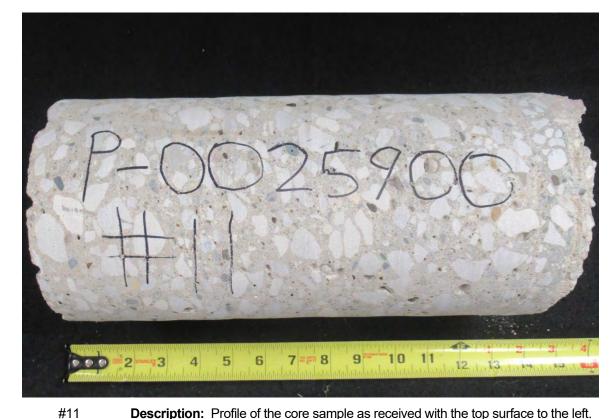


Photo: 4

Sample ID:

Description: The diamond grooved top surface of the sample as received.





Sample ID:

Description: Profile of the core sample as received with the top surface to the left.

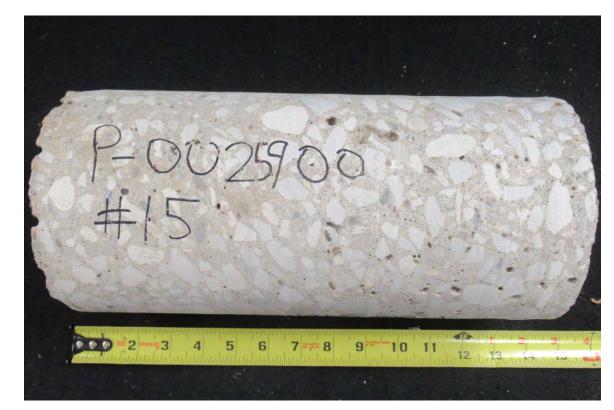


Photo: 6

Sample ID:

Description: The diamond grooved top surface of the sample as received. #11





Sample ID:

#15

Description: Profile of the core sample as received with the top surface to the left.



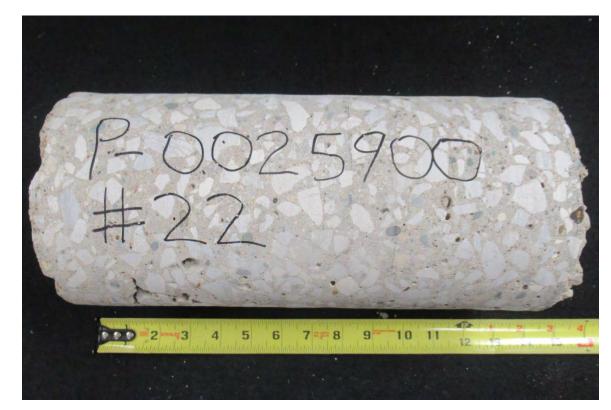
Photo: 8

Sample ID:

#15

Description: The diamond grooved top surface of the sample as received.





Sample ID:

#22

Description: Profile of the core sample as received with the top surface to the left.

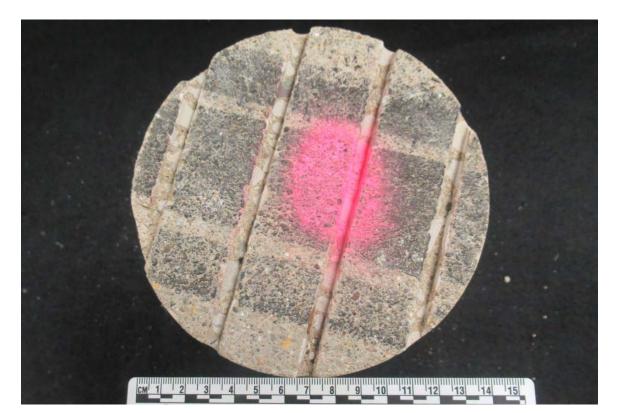


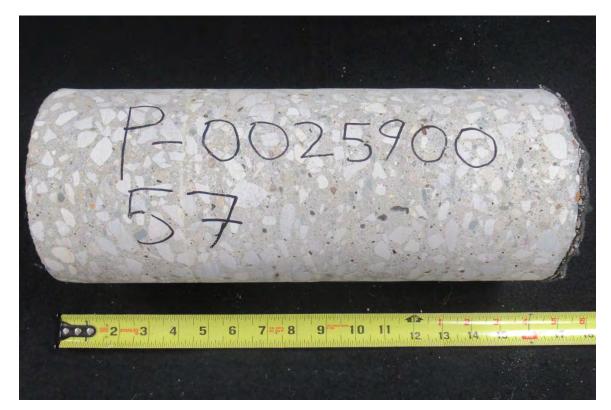
Photo: 10

Sample ID:

#22

Description: The diamond grooved top surface of the sample as received.





Sample ID:

#57

Description: Profile of the core sample as received with the top surface to the left.



Photo: 12

Sample ID:

#57

Description: The broomed top surface of the sample as received.





Photo: 13

#2





Photo: 14

#7



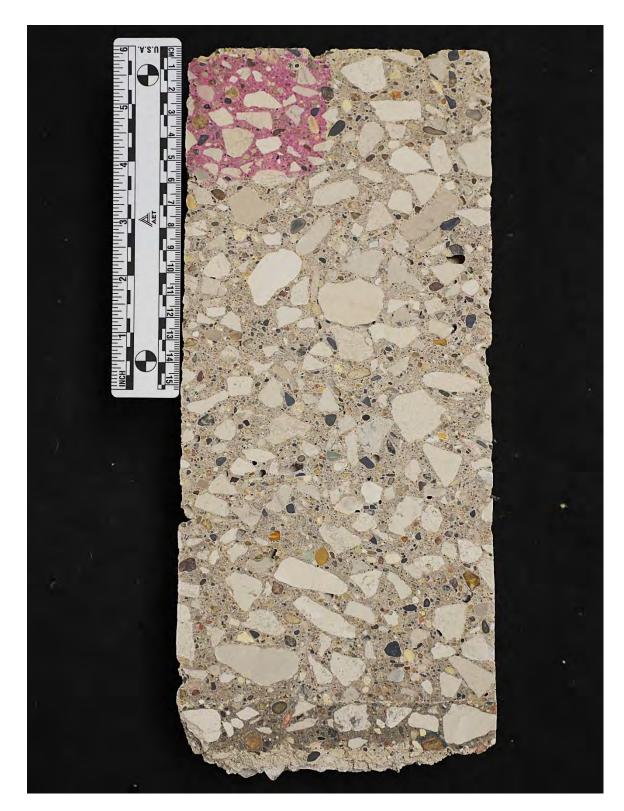


Photo: 15





Photo: 16





Photo: 17

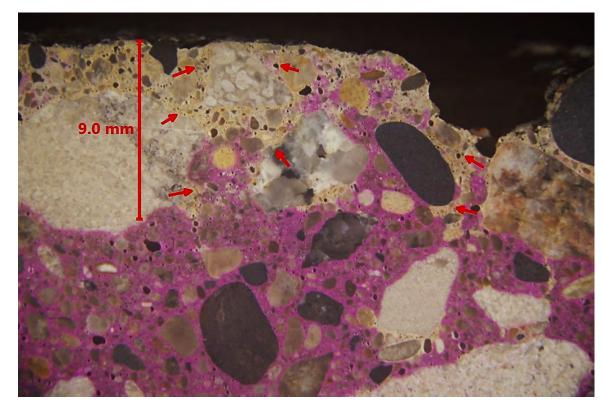
#22





Photo: 18





Sample ID: Mag:

Description: Sub-vertical microcrack (red arrows) extending from the top surface approximately 9 mm (3/8") deep, viewed in saw cut and lapped core profile under low magnification.

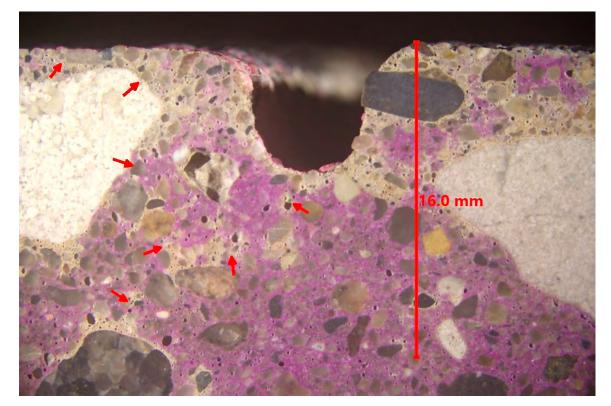


Photo: 20

Sample ID: Mag:

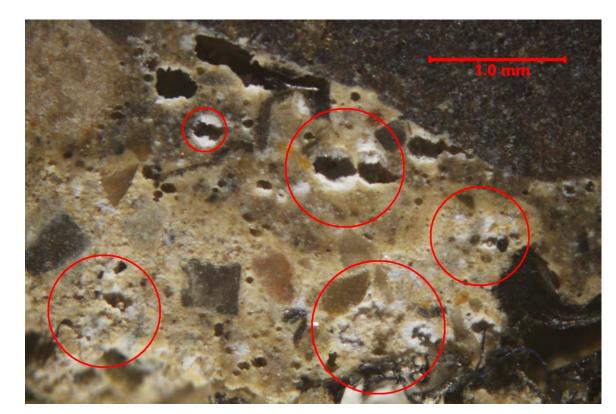
#15 7x

#7

7x

Description: Sub-vertical microcrack (red arrows) extending from the top surface approximately 16 mm (5/8") deep, viewed in saw cut and lapped core profile under low magnification.





Sample ID: Mag: #2 50x **Description:** Secondary ettringite deposits within air voids (red circles), viewed in saw cut and lapped core profile under magnification.

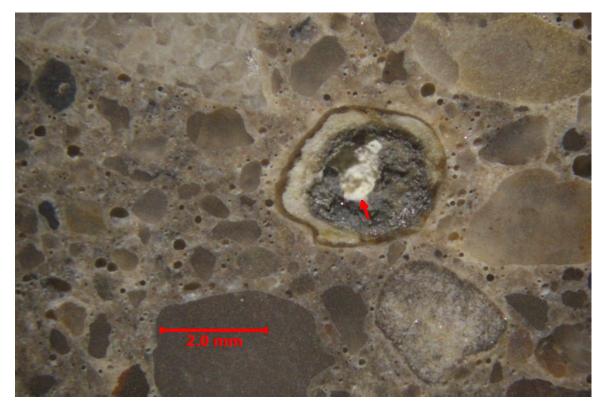


Photo: 22

Sample ID: Mag:

#2 20x **Description:** White alkali-silica gel filling an air void (red arrow) proximal to a reactive shale fine aggregate particle. Viewed on saw cut and lapped core profile under low magnification.





Sample ID: Mag:

#11 25x **Description:** White alkali-silica gel (red arrow) within a reactive shale fine aggregate particle. Viewed on saw cut and lapped core profile under low magnification.

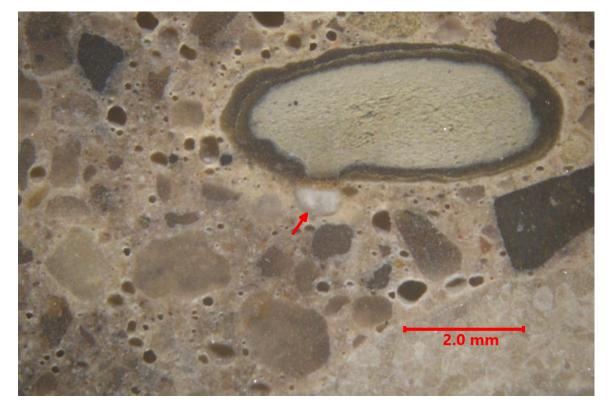


Photo: 24

Sample ID: Mag:

#22 32x **Description:** White alkali-silica gel filling an air void (red arrow) proximal to a reactive shale fine aggregate particle. Viewed on saw cut and lapped core profile under low magnification.

FREEZING WEATHER EFFECTS ON BUILDING CONSTRUCTION

GENERAL

Because water expands upon freezing and soils contain water, soils which are allowed to freeze will heave and lose density. Upon thawing, these soils will not regain their original strength and density. The extent of heave and density/strength loss depends on the soil type and moisture condition. Heave is greater in soils with higher percentages of fines (silts/clays). High silt content soils are most susceptible, due to their high capillary rise potential which can create ice lenses. Fine grained soils generally heave about 1/4" to 3/8" for each foot of frost penetration. This can translate to 1" to 2" of total frost heave. This total amount can be significantly greater if ice lensing occurs.

DESIGN CONSIDERATIONS

Clayey and silty soils can be used as perimeter backfill, although the effect of their poor drainage and frost properties should be considered. Basement areas will have special drainage and lateral load requirements which are not discussed here. Frost heave may be critical in doorway areas. Stoops or sidewalks adjacent to doorways could be designed as structural slabs supported on frost footings with void spaces below. With this design, movements may then occur between the structural slab and the adjacent on-grade slabs. Non-frost susceptible sands (with less than 40% by weight passing a #40 sieve and no more than 5% by weight passing a #200 sieve) can be used below such areas. Depending on the function of surrounding areas, the sand layer may need a thickness transition away from the area where movement is critical. With sand placement over slower draining soils, subsurface drainage would be needed for the sand layer. High density extruded polystyrene insulation could be used within the sand to reduce frost penetration, thereby reducing the sand thickness needed. We caution that insulation placed near the surface can increase the potential for ice glazing of the surface.

The possible effects of adfreezing should be considered if clayey or silty soils are used as backfill. Adfreezing occurs when backfill adheres to rough surfaced foundation walls and lifts the wall as it freezes and heaves. This occurrence is most common with masonry block walls, unheated or poorly heated building situations and clay backfill. The potential is also increased where backfill soils are poorly compacted and become saturated. The risk of adfreezing can be decreased by placing a low friction separating layer between the wall and backfill.

Adfreezing can occur on exterior piers (such as deck, fence, or other similar pier footings), even if a smooth surface is provided. This is more likely in poor drainage situations where soils become saturated. Additional footing embedment and/or widened footings below the frost zones (which include tensile reinforcement) can be used to resist uplift forces. Specific designs would require individual analysis.

CONSTRUCTION CONSIDERATIONS

Foundations, slabs and other improvements which may be affected by frost movements should be insulated from frost penetration during freezing weather. If filling takes place during freezing weather, all frozen soils, snow and ice should be stripped from areas to be filled prior to new fill placement. The new fill should not be allowed to freeze during transit, placement or compaction. This should be considered in the project scheduling, budgeting and quantity estimating. It is usually beneficial to perform cold weather earthwork operations in small areas where grade can be attained quickly rather than working larger areas where a greater amount of frost stripping may be needed. If slab subgrade areas freeze, we recommend the subgrade be thawed prior to floor slab placement. The frost action may also require reworking and recompaction of the thawed subgrade.

Appendix A Geotechnical Field Exploration and Testing Report No. P-0025900

A.1 FIELD EXPLORATION

The subsurface conditions at the site were explored by drilling and sampling standard penetration test borings. The locations of the borings appear on Figure 1, preceding the Subsurface Boring Logs in this appendix.

A.2 SAMPLING METHODS

A.2.1 Split-Spoon Samples (SS)

Standard penetration (split-spoon) samples were collected in general accordance with ASTM: D1586.The ASTM test method consists of driving a 2-inch O.D. split-barrel sampler into the in-situ soil with a 140-pound hammer dropped from a height of 30 inches. The sampler is driven a total of 18 inches into the soil. After an initial set of 6 inches, the number of hammer blows to drive the sampler the final 12 inches is known as the standard penetration resistance or N-value.

A.2.2 Disturbed Samples (DS)/Spin-up Samples (SU)

Sample types described as "DS" or "SU" on the boring logs are disturbed samples, which are taken from the flights of the auger. Because the auger disturbs the samples, possible soil layering and contact depths should be considered approximate.

A.2.3 Sampling Limitations

Unless observed in a sample, contacts between soil layers are estimated based on the spacing of samples and the action of drilling tools. Cobbles, boulders, and other large objects generally cannot be recovered from test borings, and they may be present in the ground even if they are not noted on the boring logs.

Determining the thickness of "topsoil" layers is usually limited, due to variations in topsoil definition, sample recovery, and other factors. Visual-manual description often relies on color for determination, and transitioning changes can account for significant variation in thickness judgment. Accordingly, the topsoil thickness presented on the logs should not be the sole basis for calculating topsoil stripping depths and volumes. If more accurate information is needed relating to thickness and topsoil quality definition, alternate methods of sample retrieval and testing should be employed.

A.3 CLASSIFICATION METHODS

Soil descriptions shown on the boring logs are based on the Unified Soil Classification (USC) system. The USC system is described in ASTM: D2487 and D2488. Where laboratory classification tests (sieve analysis or Atterberg Limits) have been performed, accurate classifications per ASTM: D2487 are possible. Otherwise, soil descriptions shown on the boring logs are visual-manual judgments. Charts are attached which provide information on the USC system, the descriptive terminology, and the symbols used on the boring logs.

Visual-manual judgment of the AASHTO Soil Group is also noted as a part of the soil description. A chart presenting details of the AASHTO Soil Classification System is also attached.

The boring logs include descriptions of apparent geology. The geologic depositional origin of each soil layer is interpreted primarily by observation of the soil samples, which can be limited. Observations of the surrounding topography, vegetation, and development can sometimes aid this judgment.

A.4 WATER LEVEL MEASUREMENTS

The groundwater level measurements are shown at the bottom of the boring logs. The following information appears under "Water Level Measurements" on the logs:

- Date and Time of measurement
- Sampled Depth: lowest depth of soil sampling at the time of measurement
- Casing Depth: depth to bottom of casing or hollow-stem auger at time of measurement
- Cave-in Depth: depth at which measuring tape stops in the borehole
- Water Level: depth in the borehole where free water is encountered
- Drilling Fluid Level: same as Water Level, except that the liquid in the borehole is drilling fluid

The true location of the water table at the boring locations may be different than the water levels measured in the boreholes. This is possible because there are several factors that can affect the water level measurements in the borehole. Some of these factors include: permeability of each soil layer in profile, presence of perched water, amount of time between water level readings, presence of drilling fluid, weather conditions, and use of borehole casing.

Appendix A Geotechnical Field Exploration and Testing Report No. P-0025900

A.5 LABORATORY TEST METHODS

A.5.1 Water Content Tests

Conducted per AET Procedure 01-LAB-010, which is performed in general accordance with ASTM: D2216 and AASHTO: T265.

A.5.2 Atterberg Limits Tests

Conducted per AET Procedure 01-LAB-030, which is performed in general accordance with ASTM: D4318 and AASHTO: T89, T90.

A.5.3 Sieve Analysis of Soils (thru #200 Sieve)

Conducted per AET Procedure 01-LAB-040, which is performed in general conformance with ASTM: D6913, Method A.

A.5.4 Particle Size Analysis of Soils (with hydrometer)

Conducted per AET Procedure 01-LAB-050, which is performed in general accordance with ASTM: D422 and AASHTO: T88.

A.5.5 Unconfined Compressive Strength of Cohesive Soil

Conducted per AET Procedure 01-LAB-080, which is performed in general accordance with ASTM: D2166 and AASHTO: T208.

A.5.6 Laboratory Soil Resistivity using the Wenner Four-Electrode Method

Conducted per AET Procedure 01-LAB-090, which is performed using Soil Box apparatus in the laboratory in general accordance with ASTM: G57

A.5.7 Organic Content Tests

Conducted per AET Procedure 20-SOI-010, which is performed in general accordance with ASTM D2974, Test Method C.

A.6 TEST STANDARD LIMITATIONS

Field and laboratory testing is done in general conformance with the described procedures. Compliance with any other standards referenced within the specified standard is neither inferred nor implied.

A.7 SAMPLE STORAGE

Unless notified to do otherwise, we routinely retain representative samples of the soils recovered from the borings for a period of 30 days.

Siouxland Nexus Project
Sioux Gateway Airport, Sioux City, Iowa
August 6, 2024
AET Report No. P-0025900



Appendix B

Geotechnical Report Limitations and Guidelines for Use

Appendix B Geotechnical Report Limitations and Guidelines for Use Report No. P-0025900

B.1 REFERENCE

This appendix provides information to help you manage your risks relating to subsurface problems which are caused by construction delays, cost overruns, claims, and disputes. This information was developed and provided by GBA¹, of which we are a member firm.

B.2 RISK MANAGEMENT INFORMATION

B.2.1 Understand the Geotechnical Engineering Services Provided for this Report

Geotechnical engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical engineering services is typically a geotechnical engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

B.2.2 Geotechnical Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared solely for the client.

Likewise, geotechnical engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- · for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. If you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

¹ Geoprofessional Business Association, 15800 Crabbs Branch Way, Suite 300, Rockville, MD 20855 Telephone: 301/565-2733: www.geoprofessional.org, 2019

Appendix B Geotechnical Report Limitations and Guidelines for Use Report No. P-0025900

B.2.3 Read the Full Report

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. Read and refer to the report in full.

B.2.4 You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- · the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- · the composition of the design team; or
- · project ownership.

As a rule, always inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

B.2.5 Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

B.2.6 This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations only after observing actual subsurface conditions exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist do exist, the recommendations can be relied upon, assuming no other changes have occurred. The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.

B.2.7 This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- · confer with other design-team members;
- · help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

B.2.8 Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical engineering report, along with any attachments or appendices, with your contract documents, but be certain to note conspicuously that you've included the material for information purposes only. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the

Appendix B Geotechnical Report Limitations and Guidelines for Use Report No. P-0025900

report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, only from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and be sure to allow enough time to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

B.2.9 Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. Read these provisions closely. Ask questions. Your geotechnical engineer should respond fully and frankly.

B.2.10 Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical engineering study. For that reason, a geotechnical engineering report does not usually provide environmental findings, conclusions, or recommendations, e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Unanticipated subsurface environmental problems have led to project failures. If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

B.2.11 Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, proper implementation of the geotechnical engineer's recommendations will not in itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. Geotechnical engineers are not building-envelope or mold specialists.

	Αr	pen	dix	I -	Water	R	es	o u	rce	9 S
--	----	-----	-----	-----	-------	---	----	-----	-----	-----

THIS PAGE INTENTIONALLY LEFT BLANK