JOHNSON FARMS REQUEST FOR PROPOSALS

Request for Low-Density, Residential Development
Partially Serviced, City-Owned Land located in Johnson Farms First Addition

Proposals Due: November 23, 2015 at 3:00 PM

REQUEST FOR PROPOSALS

The City of Moorhead, Minnesota is seeking proposals from qualified developers and builders for development of high quality low density residential development within the remaining City-owned partially serviced land in Johnson Farms subdivision. This area has been identified by the City as a priority development area and prime location for high quality residential investment.

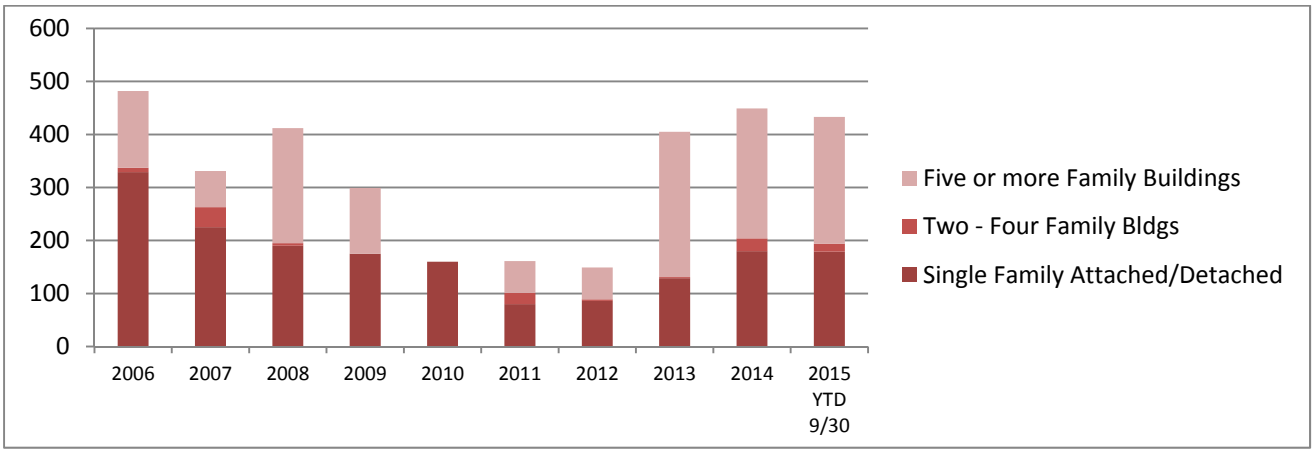
COMMUNITY

Moorhead, MN is a vibrant, growing community located in northwest MN and part of the Fargo-Moorhead metro area. Moorhead has more than 40,000 people that call it home and residents enjoy access to arts and culture, medical, shopping and employment opportunities within the entire metropolitan area with a total population of approximately 215,000. Moorhead prides itself as a community with strong neighborhoods and active community spirit.

Moorhead has:

- ✓ More than 40 neighborhood and regional parks connected by nearly 60 miles of bike amenities to facilitate a connected and active community.
- ✓ A world-class education system for learners of all ages with small class sizes for Moorhead public and private K-12 schools and five post-secondary college options for life-long learning including Concordia College and Minnesota State University - Moorhead.
- ✓ A strong, diverse economy and educated workforce with a current unemployment rate of 2.9%.

Residential Market: Moorhead's housing production as accelerated in the past three years and existing homes are also selling at a rapid rate indicating a strong consumer demand.



CITY GOALS FOR PROJECT

- Promote quality housing types with architectural appeal that complements the nature and character of the existing neighborhood.
- Achieve development that expands the City's property tax base, provides a market rate return on land, and minimizes the City's risk and exposure pursuant to any aspect of the development proposal.

CITY INCENTIVES

- **Make Moorhead Home Property Tax Rebate** – The City will provide a rebate of property taxes to the property owner for the first two years after construction of a new home under current terms of the program. NOTE: This program is currently set to expire December 31, 2016; however, the possibility does exist that this program could be extended beyond this date. For more information: http://www.makemoorheadhome.com/pdf/FAQ.pdf

- **First and New Home Incentive** – First-time homebuyers purchasing newly constructed homes in Moorhead may be eligible to receive a $5,000, 0% interest deferred loan, to be applied to special assessments. For more information: http://www.makemoorheadhome.com/new-home-incentive.php

PROJECT SCOPE

LAND AREA

The development area includes approximately 27.6 acres of land. Johnson Farms First Addition was established in 2005 with neighborhood amenities including a pond, sidewalks and shared-use path and a neighborhood park with playground equipment and is ready to support this proposed development. The subdivision is located in walking distance of Moorhead Public Schools S.G. Reinertsen Elementary, which opened in 2004, and the proposed site also has convenient access to the Southside Regional Park and the future Park Christian Elementary School.

NOTICE TO PROPOSERS

A large portion of the development area had been utilized as a stockpile site with areas of excavation and fill. The preliminary Geotechnical Engineering Report and Topographic Survey are attached. All new building construction requires footings to be placed on undisturbed soils or engineered soils compacted to proper proctor with results submitted to the Building Codes Office. **As noted within the attached Geotechnical Engineering Report** – *"Further study should be conducted prior to design and construction of specific residential projects within this development. We recommend these studies be performed at each lot to accommodate varying soil conditions and individual structure and foundation plans"*[1].

NOTE: The City is offering the property in "as is" condition and makes no representations or warranties regarding geology, soil stability, or environmental conditions.

DENSITY

Maximum density is the equivalent of 109 single-family residential units. The land is currently platted with 98 lots; Lots 2-12, Block 14, were anticipated to be split and each lot currently has two sewer wyes.

[1] Preliminary Geotechnical Engineering Report Johnson Farms Moorhead, MN. Midwest Testing Laboratory/Terracon.

ZONING

The area currently includes three residential zoning district classifications:

- Blocks 12 and 13: Residential Low Density - 2, RLD-2
- Blocks 10 and 11: Residential Low Density - 3, RLD-3
- Block 14: Residential Medium Density - 1, RMD-1

INFRASTRUCTURE

- A significant portion of the trunk infrastructure servicing this area is currently installed and has been assessed to the benefiting area.
- The construction of 20th Street South was completed in 2015 and assessments to benefitting properties will begin in 2017. Properties in the Development Area benefit from 20th Street improvements and will be assessed as noted below.
- Sanitary sewer capacity is limited to the equivalent of 109 single-family residential homes. There are no plans to increase sanitary sewer capacity. The proposed development must be compatible with the existing capacity.
- The selected developer will be expected to petition to install the local infrastructure including utilities, streets, curb, and gutter.
- Special assessment information is outlined in the following section.
- **A replat will be needed** to dedicate additional road right-of-way and easements along 20th Street South. The existing plat has a 70-foot right-of-way dedicated with no easements.
    - **The City will require a total right-of-way width of 85 feet for 20th Street South and a 15-foot wide drainage, utility and pedestrian easement between 36th Avenue South and the southeast corner of Lot 12 Block 14**.

LAND COST & SPECIAL ASSESSMENTS

- The base purchase price for the land is $1,600,000.
    - Up to 75% ($1,200,000) of the purchase price may be spread as uncertified special assessments to be amortized over 20 years at the existing project interest rates. First payable year will be 2017.
    - The remaining 25% ($400,000) of the sales price will be due as cash at closing.
- Development terms will be negotiated within the Purchase Agreement.
- A letter of credit or other acceptable form of security will be required in an amount totaling the first five (5) years of all special assessment installments to include specials to be re-spread and pending special assessments. Based on a purchase price of $1,600,000 with 75% being reassessed the letter of credit requirement would be $760,000.
- Below is a table outlining the portion of the purchase price to be re-spread as a special assessment, as well as pending special assessment amounts and the applicable assessment timelines and first payment dates:

Project Description	Amount to be Assessed	Construction Year	Assessment Year	Payable Year
75% of Purchase Price*	$1,200,000	Previous	Previous	2017
36th Avenue/18th Street Extension (2014)	$122,380	2014	2015	2017
20th Street Construction (2015)	$171,500	2015-2016	2016	2017
Misc. Concrete Improvements (2015)	$23,608	2015-2016	2016	2017
Total Assessments	**$1,517,488**			

**Based on a purchase price of* $1,600,000

PROPOSAL SUBMITTAL REQUIREMENTS

Digital and/or Paper copies of the proposal will be accepted. All submittals must be clearly marked: "*Residential Development Proposal: Johnson Farms*". PDF would be the preferred format for all digital submittals. Paper proposals and digital discs must be submitted to:

City of Moorhead
500 Center Avenue – 4th Floor of City Hall
PO Box 779
Moorhead MN 56561-0779
Attn: Amy Thorpe

Proposals are also accepted via email to lotsales@cityofmoorhead.com. The City is not responsible for proposals that are not able to be opened or too large for electronic submittal.

The City of Moorhead will require each proposal to outline all the elements to be included in the project and provide the following minimum information:

Cover Sheet
The cover sheet must include: Name of organization, address, contact person, contact information including email, phone and address. Additional information may include previous development projects completed, project architect, project general contractor, construction lender and any other consultants.

Project Information
The developer shall provide a project narrative describing the proposed development concept including proposed housing types. As applicable, the proposal should also include supplemental information, such as target demographic, total estimated market value of the improvements, proposed ownership, sample price points and a description of possible marketing strategies for the development concept.

The proposal must include a statement of understanding that replatting is needed to address additional right-of-way and easements needed for 20th Street South (see INFRASTRUCTURE section).

Financing Information
A statement of financial commitment noting the proposed purchase price and method/timing of payment to the City is required.

References
Please include references from two area lenders.

Timeline
A construction and phasing schedule that includes a timeline of improvements must be provided.

PERFORMANCE DEADLINE

The City of Moorhead encourages a quality project and aggressive construction schedule. The selected developer will petition to install utilities and streets in all or a portion of the project area in 2016. The final terms of the project and construction schedule will be outlined in a Purchase Agreement. A Purchase Agreement template is attached for the benefit of developer's review prior to RFP submission and subject to change.

NOTICE TO DEVELOPERS

The City reserves the right to reject any and all proposals and to advertise for new proposals.

The City Council, at its sole discretion, will select a "preferred developer" and initiate negotiations to enter into a Purchase Agreement. The preferred developer submitting the selected proposal will be required to provide the City a $1,000 security deposit within 72 hours of notification of selection. The deposit will be applied to the purchase of property or forfeited to the City if the developer fails to enter into a Purchase Agreement with the City within 60 days of the notification of selection.

PROJECTED SCHEDULE

Request for Proposals Issued:	October 27, 2015
Proposals Due:	**November 23, 2015 at 3:00 PM** City of Moorhead 500 Center Avenue – 4th Floor PO Box 779 Moorhead, MN 56560 Attn: Amy Thorpe
Notice of Award:	A "preferred developer" selection anticipated by December 8, 2015

Proposals should be clearly marked *"Residential Development Proposal: Johnson Farms"*

Proposals must be received by the date and time due to be considered.

The City of Moorhead reserves the right to change any dates.

Points of Contact

Primary Points of Contact:
Amy Thorpe, Econ Dev Program Administrator - 218.299.5442
Kristie Leshovsky, City Planner – 218.299.5332

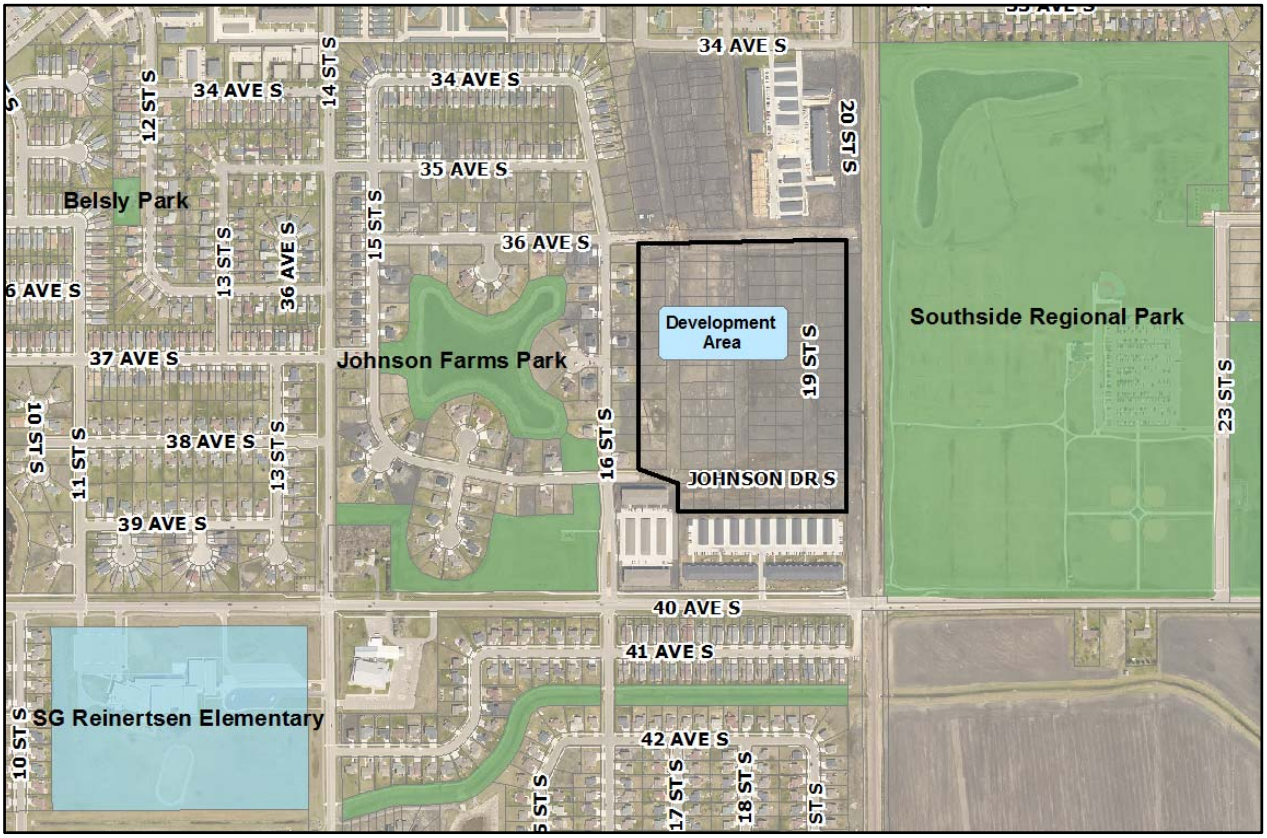
City Staff

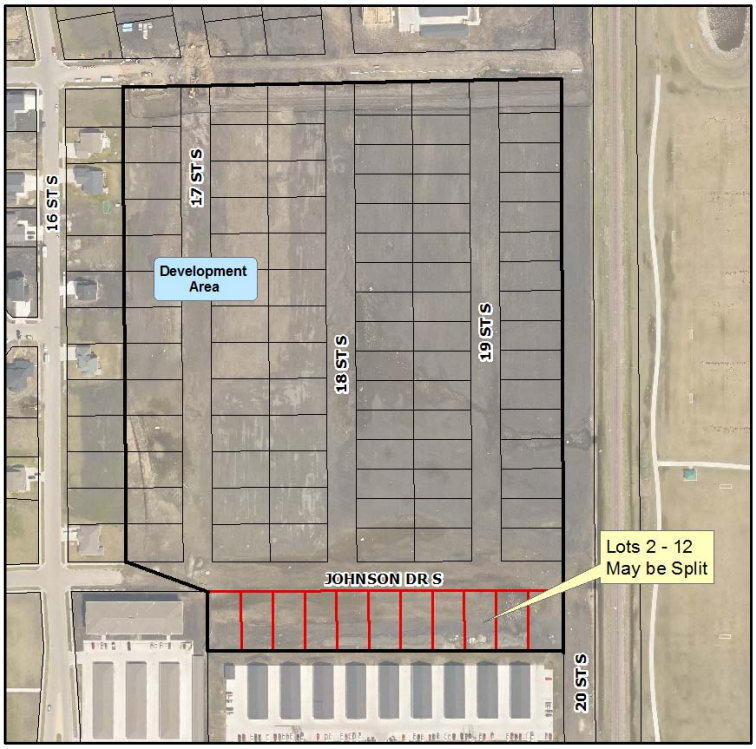
City Manager	Michael J. Redlinger	218.299.5305
Deputy City Manager	Scott A. Hutchins	218.299.5376
City Planner & Zoning Administrator	Kristie Leshovsky	218.299.5332
City Engineer	Robert Zimmerman	218.299.5393
Assistant City Engineer	Tom Trowbridge	218.299.5395
Finance Director	Wanda Wagner	218.299.5318

Moorhead Public Service

General Manager	Bill Schwandt	218.477.8004
Water Distribution Engineer	Kris Knutson	218.477.8071
Electrical Engineering Manager	Travis Schmidt	218.477.8084

Development Area



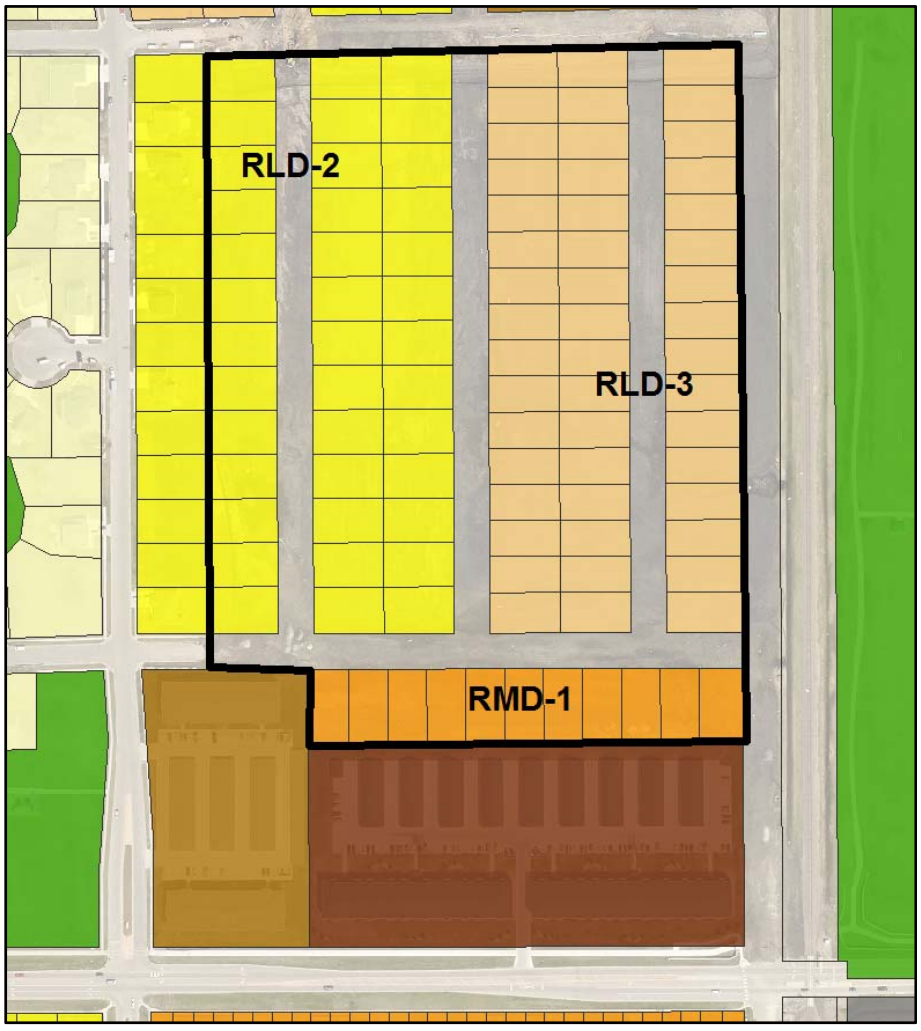


Zoning Information

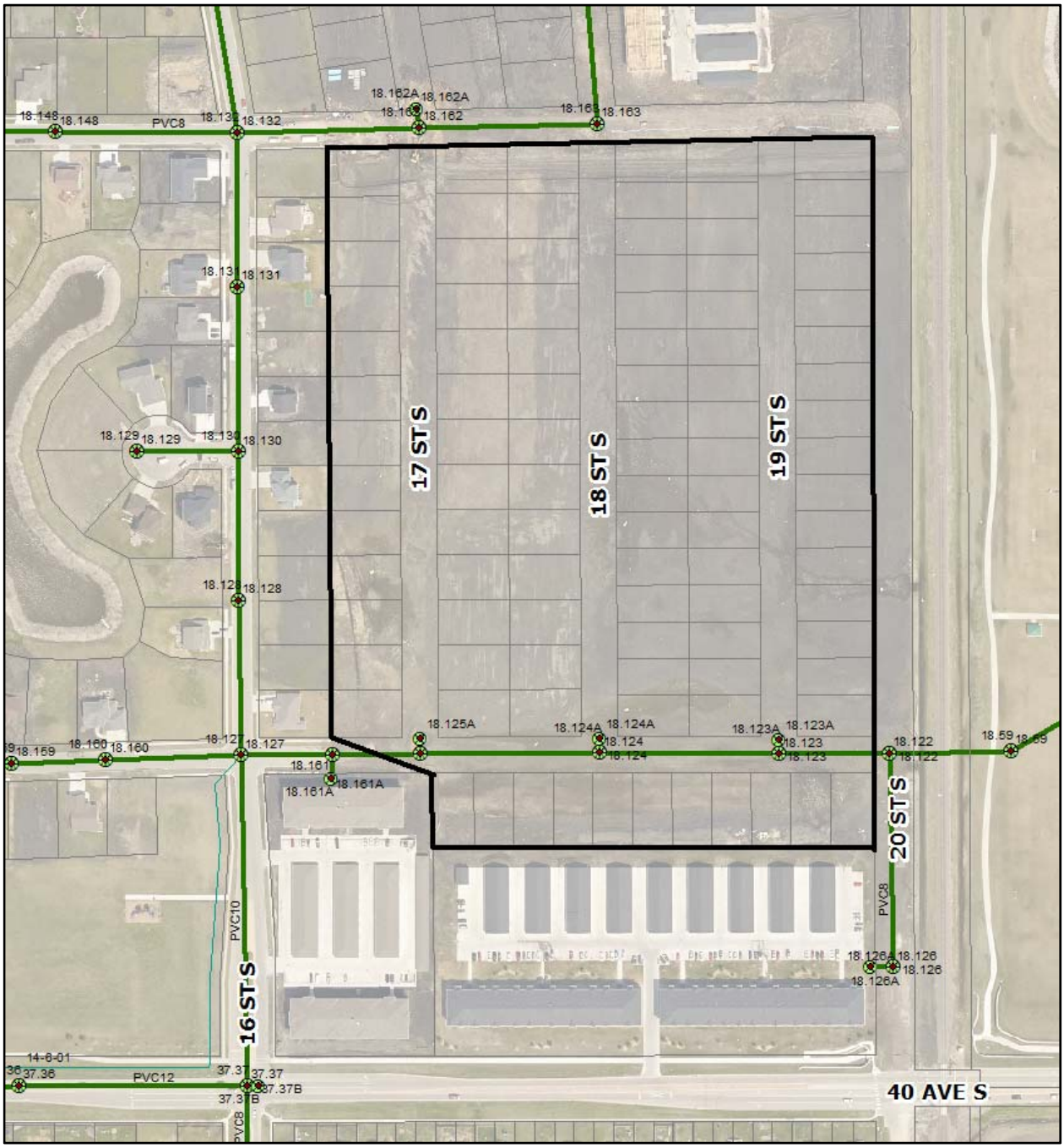
	Max Bldg. Height	Max Building Coverage	Max Impervious Surface Coverage	Front Yard	Rear Yard	Side Yard
RLD-2	35 ft.	33 1/3% of lot area	35% of lot area	25 ft.	25 ft.	Interior 5 ft.; Corner 12 ft. on the street side
RLD-3	35 ft.	40% of lot area	60% of lot area	25 ft.*	25 ft.	Interior 5 ft.; Corner 12 ft. on the street side
RMD-1	35 ft.	50% of lot area	60% of lot area	25 ft.*	25 ft.	Interior 5 ft.; Corner 12 ft. on the street side

* If garages does not face the street, front yard setback is 20 Ft.

Area Zoning Map

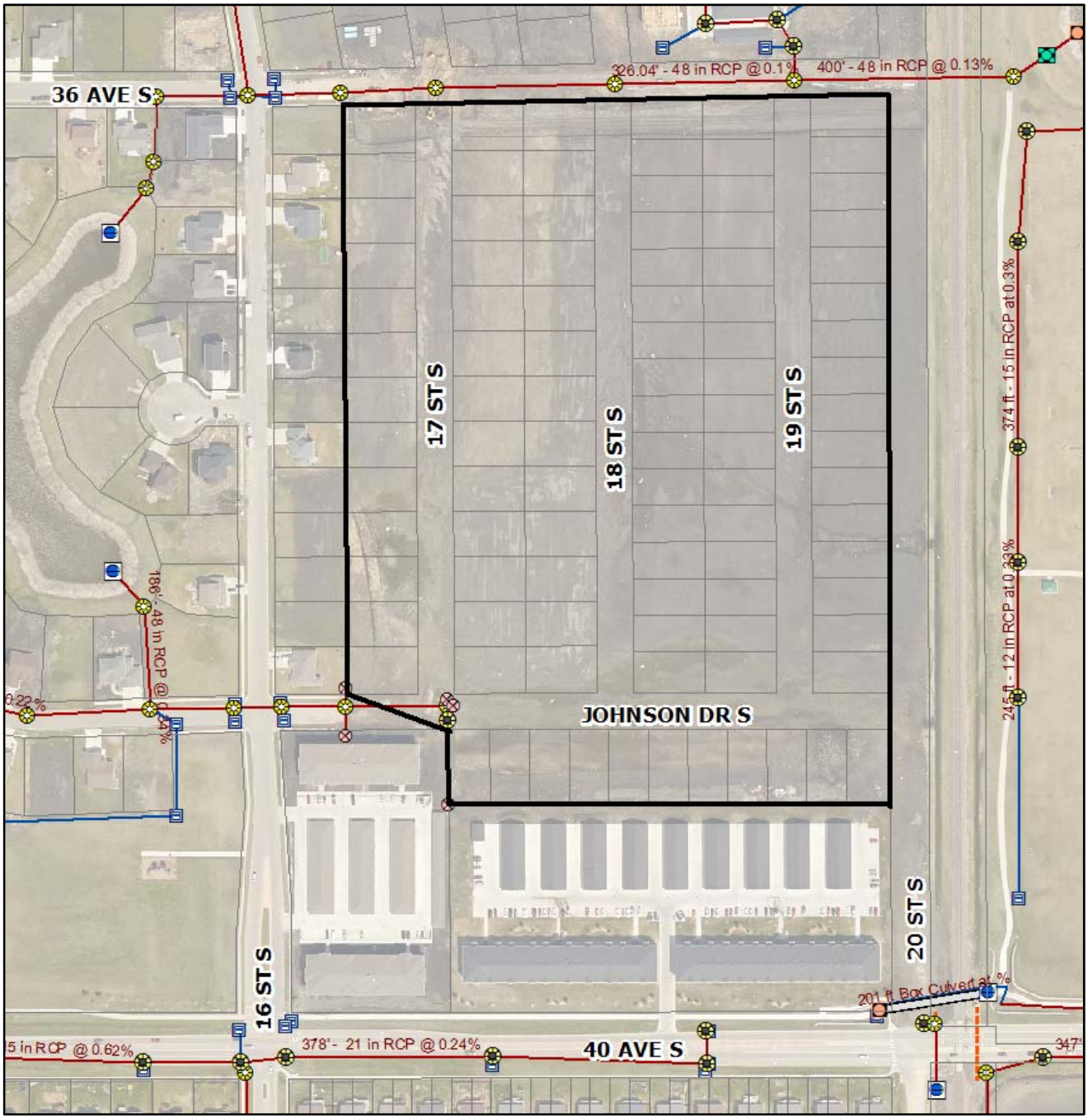


Infrastructure Maps – Sanitary Sewer



Infrastructure Maps – Storm Sewer

NOTE: there is storm sewer from 36th Ave S south to 40th Ave S that is not depicted on the map



Infrastructure Maps – Water

NOTE: there is a watermain from Johnson Dr S to the watermain stub on the apartment lot which is not depicted on the map

Preliminary Geotechnical Engineering Report

Johnson Farms
Moorhead, Minnesota
August 22, 2013
MTL/Terracon Project No. M1135051

Prepared for:
Moorhead City Engineers
Moorhead, MN

Prepared by:
Midwest Testing Laboratory/Terracon
Fargo, North Dakota

Midwest Testing LABORATORY, INC. A Terracon COMPANY

August 22, 2013

Midwest Testing LABORATORY, INC. A Terracon COMPANY

Moorhead City Engineers
P.O. Box 773
Moorhead, MN 56561-0779

Attn: Mr. Mark Osten, Construction Manager
P: 218.299.5394
E: mark.osten@ci.moorhead.mn.us

Re: Preliminary Geotechnical Engineering Report
Johnson Farms
Moorhead, Minnesota
MTL/Terracon Project Number: M1135051

Dear Mr. Osten:

Midwest Testing Laboratory (A Terracon Company) has completed the preliminary geotechnical engineering services for the above referenced project. This study was performed in general accordance with our Master Services Agreement Task Order number PM1130262 dated August 9, 2013. This report presents the findings of the subsurface exploration and provides preliminary geotechnical recommendations concerning use of the existing soil stockpiles and the design and construction of future projects.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Midwest Testing Laboratory - A Terracon Company

Joseph D. Vistad, EIT
Staff Geotechnical Engineer

Loel M. Fetting, PE
Geotechnical Department Manager

Enclosures

cc: 2 – Client (mail)
1 – Client (pdf)
1 – File

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Date: 8-22-13 Registration No. 18536
LOEL M. FETTING

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Preliminary geotechnical engineering services have been completed in the undeveloped Johnson Farms subdivision in Moorhead, Minnesota. As requested, seven (7) soil test borings were completed. The borings were advanced to depths ranging from about 16 to 26 feet below the existing ground surface.

Based on the information obtained from our subsurface exploration, the following geotechnical considerations were identified:

- The stockpiled soil varies from pile to pile. Stockpiled soil includes topsoil, tan fat clay mixed with silt, tan fat clay mixed with topsoil, and gray fat clay mixed with tan clay and topsoil. The stockpiled inorganic clay fill should be suitable for general grade increases across the development. Fat clays are not recommended for use as compacted fill below residential structures.

- The fat clays encountered are known to exhibit volume change with seasonal and yearly variations in soil moisture content. Therefore, some building and roadway movement may occur over the life of any future structures associated with the volume change potential of the soil. Due to their expansive nature, it is our opinion that the soils found in the stockpiles are not suitable for support of residential structures.

- The natural soils consist of layers of fat clay and silt below a thin layer of topsoil.

- We estimate a ground water level on the order of 3 to 4 feet below the natural grade at the time of our field activities. This corresponds to 92 to 93 feet of elevation as referenced to our temporary benchmark. We anticipate any groundwater seepage in open excavations would be controllable through use of a sump pump.

- The natural soils encountered at the site are susceptible to disturbance from construction traffic. Care should be taken to prevent disturbance of the natural soils.

This summary should be used in conjunction with the entire report for design purposes. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **GENERAL COMMENTS** should be read for an understanding of the report limitations.

PRELIMINARY GEOTECHNICAL ENGINEERING REPORT
JOHNSON FARMS
MOORHEAD, MINNESOTA

MTL/Terracon Project No. M1135051
August 22, 2013

1.0 INTRODUCTION

Preliminary geotechnical engineering services have been completed in the undeveloped Johnson Farms subdivision in Moorhead, Minnesota. As requested, seven (7) soil test borings were advanced to depths ranging from about 16 to 26 feet below the existing ground surface. Logs of the borings along with a site location map and boring location plan are included in Appendix A of this report.

This is a preliminary report and not intended for design and construction of future residential structures. Further investigation should be conducted on a site by site basis prior to any planned residential construction.

The purpose of these services is to provide information and preliminary geotechnical engineering recommendations relative to:

- subsurface soil conditions
- groundwater conditions
- use of existing stockpiled material
- earthwork
- pavement support

2.0 PROJECT INFORMATION

2.1 Project Description

A detailed project description is not available at the time of this preliminary report. It is assumed that the area will be developed into single family homes as well as streets and other related infrastructure. Final grade raise on the order of 3 to 4 feet above natural grade is expected. No opinions or analysis is given regarding the design of future residential structures. Further investigation, tailored to each individual structure, should be made at the time of design and construction.

2.2 Site Location and Description

Item	Description
Location	See Appendix A, Exhibit A-1: Site Location Plan
Site Layout	See Appendix A, Exhibit A-2: Boring Location Plan
Existing improvements	None. Open field with several soil stockpiles.
Current ground cover	Field and weeds.
Existing topography	Natural grade is relatively level, multiple stockpiles on site.

3.0 SUBSURFACE CONDITIONS

3.1 Typical Profile

In our soil test borings, we found that the soil stockpiles ranged in height and soil type. Stockpiles were evaluated at borings B-1, B-2 and B-7, and ranged in height from 2 ½ ft at boring B-1 to 11 ½ ft at boring B-7. The stockpile at boring B-1 consists of 5 ft of tan fat clay mixed with topsoil. At boring B-2, the stockpile is approximately 2 ½ feet of gray fat clay and topsoil. The stockpile at boring B-7 is about 11 ½ feet of brownish gray fat clay mixed with silt and traces of black topsoil. Borings B-3 through B-6 were conducted at or near natural grade.

Topsoil was encountered at most borings and ranged in thickness from ½ foot at boring B-6 to a maximum of 1 ½ feet at borings B-1 and B-2. No topsoil was encountered at borings B-3, B-5 and B-7. A layer of fat clay was encountered beneath the topsoil. If no topsoil was encountered, the fat clay is at existing grade (B-3 and B-5) or directly beneath the stock pile (B-7). This layer of fat clay is gray to brownish gray in color, and has a soft to stiff consistency. This soil includes lenses and laminations of silt at some locations. This fat clay layer ranges from 4 ½ to 8 ½ ft thick. Silt is encountered directly below the fat clay at each location. This layer ranges in thickness from 4 ft at boring B-6 to 7 ft at boring B-4. The silt has a loose density, and ranges from grayish brown to reddish brown in color. Borings B-1 and B-2 terminated within the silt layer. The remaining borings encountered soft to medium stiff fat clay beneath the silt.

Conditions at each boring location are indicated on the attached individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in situ, the transition between materials may be gradual. Details for each of the borings can be found on the boring logs in Appendix A of this report. A discussion of the field sampling is included in Appendix A.

3.2 Groundwater

The boreholes were observed while drilling and after completion for the presence and level of groundwater. In addition, three of the test borings were left open for several hours to obtain additional water level measurements. The water levels observed in the boreholes are noted on the attached boring logs, and are summarized below.

Boring Number	Depth to groundwater while drilling, (ft.)	Approximate depth to groundwater after drilling, (ft.)
B-3	Not encountered	3.5 (4 hour reading)
B-4	Not encountered	3.4 (7 hr reading)
B-5	9.3	3.6 (5 hour reading)

Due to the low permeability of the soils encountered in the borings, a relatively long period of time may be necessary for a groundwater level to develop and stabilize in a borehole in these materials. Long-term observations and piezometers or observation wells sealed from the influence of surface water are often required to define groundwater levels in materials of this type. Due to the observance of groundwater at these locations and from inspecting the samples, we anticipate the groundwater level was on the order of 3 to 4 feet below natural grade at the time of our field work. This corresponds to an elevation of 92 to 93 feet as measured from our temporary benchmark.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

Based on the results of the subsurface exploration, laboratory testing, and our analysis, it is our opinion that the stockpiled inorganic clays can be used as fill for general grade raise throughout the development, but not for support of structures. One stockpile contains topsoil which may be used to achieve finished grade. No opinions are given regarding footing and slab design for construction of any future residential structures. More detailed analysis should be done prior to, or at the time of, construction when more specific information is available regarding types, sizes and elevations of structures.

4.1.1 Expansive Soils

The stockpiled and natural fat clays encountered at the site have a potential for volume change with seasonal and yearly variations in soil moisture content. These soils swell upon wetting and shrink upon drying. Some movement and minor cracking of future residential structures should be anticipated. The possibility of cracking and other cosmetic damage may increase with modifications of the site which results in excessive wetting or drying of the expansive soils. Eliminating the risk of movement and cosmetic distress is not normally economically feasible.

4.1.2 Soil Stockpile Uses

Samples were collected from soil stockpiles at borings B-1, B-2, and B-7. Other stockpiles were given cursory investigation when an engineer was mobilized on site and exploratory holes were dug by hand.

Samples taken at the three boring sites revealed stockpiles consisting predominately of fat clay mixed with varying amounts of topsoil. The soils found in these stockpiles are not suitable for support of future residential structures. This soil may be used as fill to raise existing grades to the desired elevation. Additional stockpiles were observed by an engineer and found to be made up of similar clay soils. The tall stockpile located just southeast of boring B-1 appears to be composed of topsoil. This material is not suitable for support of structures and roadways, but may be used as final cover of fill to obtain finished grade. We recommend further monitoring of the stockpiled material at the time of construction. Fat clays are not recommended as fill below any future residential structures due to the volume change potential of the soil.

4.2 Earthwork

4.2.1 Site Preparation

Prior to placing engineered fill, we recommend the existing fill and topsoil be excavated from any proposed construction area. We also recommend that detailed investigation be conducted at each lot to accommodate individual building design and soil conditions at each site. We further recommend an experienced geotechnical engineer be retained to evaluate the bearing material for the foundations, floor slab and pavement subgrade soils to evaluate whether additional subgrade excavation is required.

4.2.2 Material Requirements

Compacted inorganic clay fill should only be used for general grade raise throughout the development and not be placed under any future residential structures. The inorganic clay fill should be placed in 6 inch lifts and compacted to a minimum of 90% of the standard proctor maximum density (ASTM D698) for general grade raises. Compaction to a minimum of 95% of standard proctor maximum density (ASTM D698) is recommended beneath pavements.

4.2.3 Earthwork Construction Considerations

We estimate a ground water level on the order of 3 to 4 feet below natural grade at the time of our field activities. This depth corresponds to an elevation of 92 to 93 ft based on our temporary benchmark. We expect any groundwater encountered would be controllable by sump pumping.

The natural soils encountered at the site are susceptible to disturbance from construction traffic, especially when wet and saturated. Construction traffic should not be allowed to travel directly on the soils exposed by excavation. If any of the natural soils become disturbed during construction, they should be excavated to an undisturbed level and replaced with engineered fill or concrete.

4.3 Pavements

In our opinion, use of the existing inorganic fat clay subgrade soil for support of roadway pavement is feasible. Due to the fat clay with a standard penetration test results (N-value) on the order of 6 or greater, we recommend using an estimated California Bearing Ratio of 3 for pavement design. This value was estimated using information obtained from the field at borings B-2, B-3 and B-6 and through laboratory testing. We recommend the estimated CBR value be evaluated at the time of construction.

The fat clays encountered are known to exhibit volume change with variations in soil moisture content. Due to the expansive nature of these soils, pavement movement and cracking should be expected to occur. For long term pavement performance, the pavement should have good surface drainage. A maintenance program consisting of filling and maintaining the cracks that develop is needed for long term pavement performance. Providing a drained granular aggregate base or subbase course should provide improved pavement performance.

4.3.1 Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water to catch basins. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section.

4.3.2 Pavement Maintenance

Preventive maintenance should be planned and provided for through an on-going pavement management program. Preventive maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment. Preventive maintenance consists of both localized maintenance (e.g. crack and joint sealing and patching) and global maintenance (e.g. surface sealing). Preventive maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements. Prior to implementing any maintenance, additional engineering observation is recommended to determine the type and extent of preventive maintenance.

Even with periodic maintenance, some movements and related cracking may still occur and repairs may be required.

5.0 GENERAL COMMENTS

Further study should be conducted prior to design and construction of specific residential projects within this development. We recommend these studies be performed at each lot to accommodate varying soil conditions and individual structure and foundation plans.

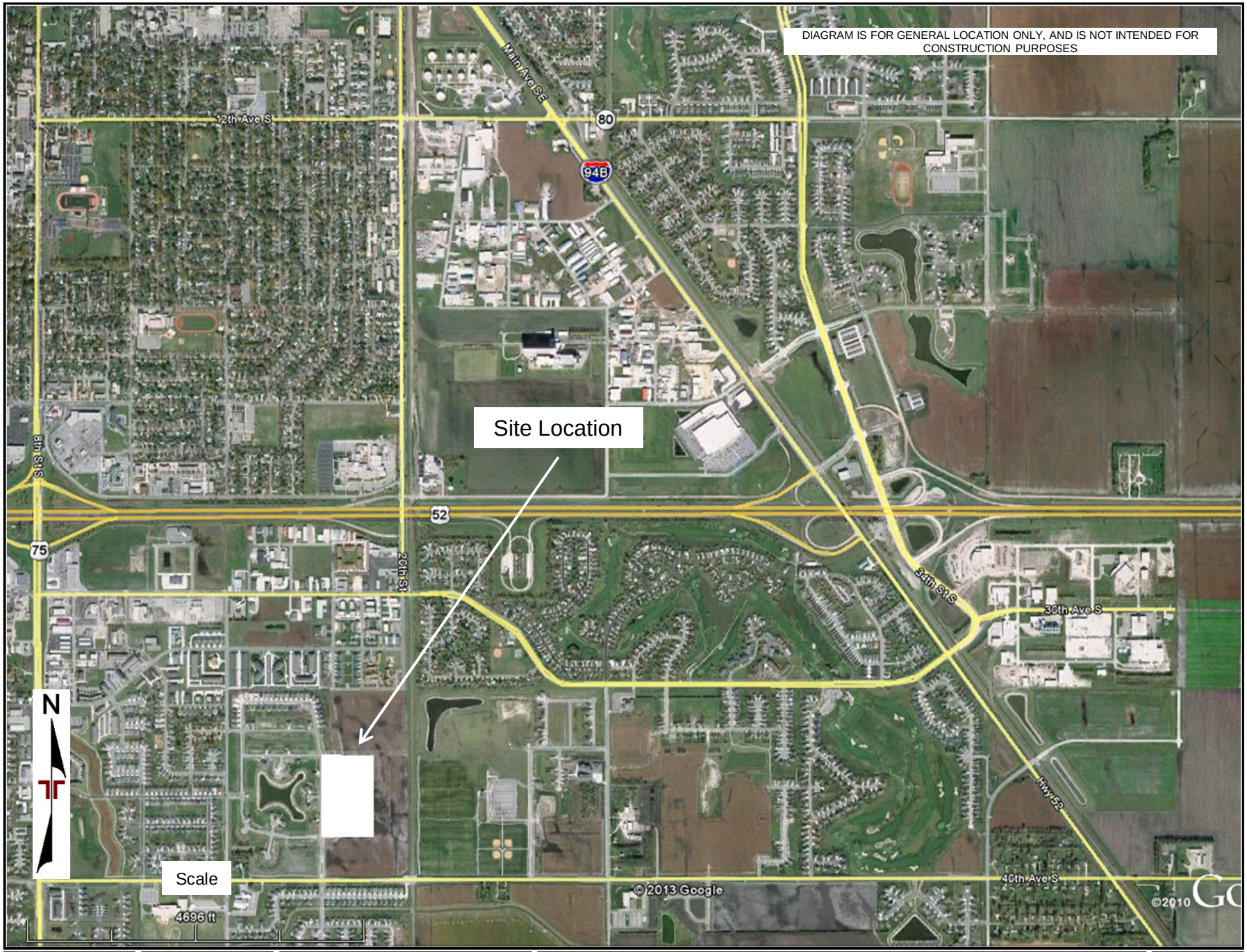
The analysis and preliminary recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless MTL/Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

MTL/Terracon should be retained during the construction phase of projects to observe earthwork and to perform necessary tests and observations during subgrade preparation; proofrolling; placement and compaction of compacted structural fill; backfilling of excavations into the completed subgrade; and just prior to construction of building floor slabs.

APPENDIX A
FIELD EXPLORATION



Project Manager:	JDV
Drawn by:	JDV
Checked by:	LMF
Approved by:	LMF

Project No.	M3135051
Scale:	See above
Date:	8-19-2013

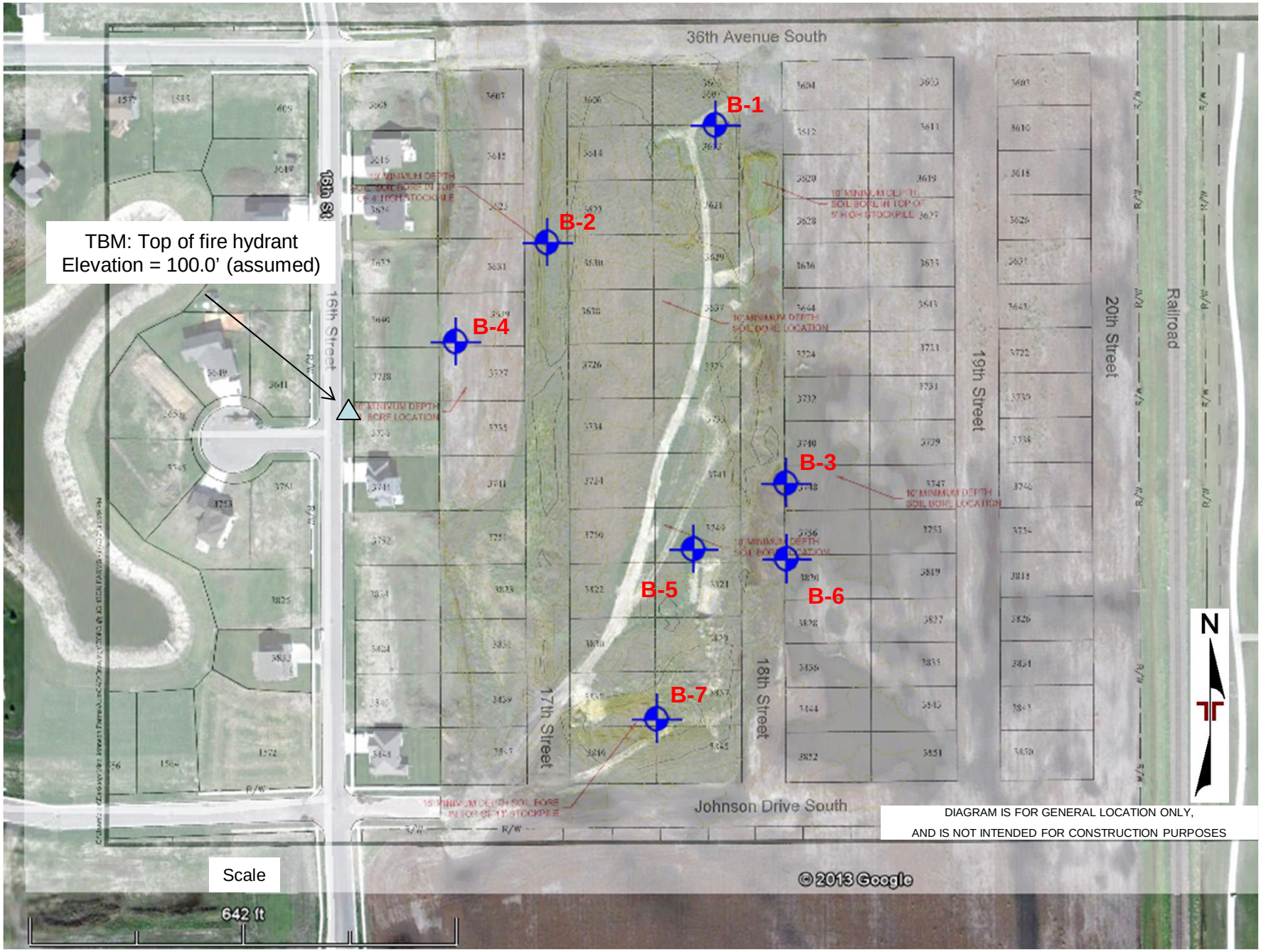
Midwest Testing Laboratory, Inc.
A Terracon Company
4102 7th Avenue North Fargo, North Dakota 58102
PH. (701) 282-9633 FAX. (701) 282-9635

SITE LOCATION MAP

Johnson Farms
Moorhead, Minnesota

EXHIBIT

A-1



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Midwest Testing Laboratory, Inc.
A Terracon Company
4102 7th Avenue North Fargo, North Dakota 58102
PH. (701) 282-9633 FAX. (701) 282-9635

BORING LOCATION PLAN

Johnson Farms
Moorhead, Minnesota

EXHIBIT

A-2

Field Exploration Description

Seven (7) soil test borings were completed on August 13, 2013. The borings were advanced at the approximate locations indicated on Exhibit A-2. The borings were laid out in the field using a handheld GPS. Locations of the borings were selected based upon a map provided by the client, and to accommodate access of our truck mounted drill rig. Ground surface elevations indicated on the boring logs were measured in the field using a surveyor's level and rod. The surface elevations were referenced to the top of the fire hydrant in front of lot #3736 on 16th Street (see Exhibit A-2) and are provided to the nearest ½ foot. The locations and elevations should be considered accurate only to the degree implied by the means and methods to define them. The top of the hydrant is assumed to be at elevation 100.0 feet.

The borings were drilled with a truck-mounted rotary drill rig using 3 ¼ hollow stem to advance the boreholes. Soil samples were obtained using both spilt-barrel and Shelby tube sampling procedures in accordance with ASTM Specifications D1586 and D1587, respectively.

In the split-barrel sampling procedure the number of blows required to advance a standard 2-inch O.D., 1-3/8-inch I.D spilt-barrel sampler from 6 to 18 inches of penetration by means of a 140-pound hammer with a free fall of 30 inches is used to obtain the Standard Penetration Test (SPT) or N-value. The SPT is used to estimate the in-situ relative density of cohesionless soils and the consistency of cohesive soils. A manual rope and cathead hammer was used to drive the split-barrel sampler. In the Shelby tube sampling procedure, a thin wall seamless steel tube with a sharp cutting edge is pushed into the soil by hydraulic pressure to obtain a relatively undisturbed sample of cohesive soil.

The samples were tagged for identification, sealed to reduce moisture loss, and taken to our laboratory for further examination, testing, and classification. Information provided on the boring logs attached to this report includes soil descriptions, consistency evaluations, boring depths, sampling intervals, and groundwater conditions. The borings were backfilled with auger cuttings prior to the drill crew leaving the site.

A field log of each boring was prepared by the drill crew. These logs included visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. Final boring logs included with this report represent the engineer's interpretation of the field logs and include modifications based on laboratory observation and tests of the samples.

BORING LOG NO. B-1

PROJECT: Johnson Farms

CLIENT: Moorhead City Engineers
Moorhead, Minnesota

SITE:
Moorhead, Minnesota

LOCATION See Exhibit A-2

Latitude: 46.83753° Longitude: -96.74992°

Surface Elev.: 100.5 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY TORVANE/HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	ORGANIC
0.0	**FILL - FAT CLAY**, mostly grayish brown, some black topsoil				6	3-4-4 N=8						
					5	3-3-3 N=6			23		61-25-36	2
5.0		5			5	3-3-4 N=7						
5.0	95.5											
6.5	**TOPSOIL**, black, medium stiff											
6.5	94											
	FAT CLAY (CH), brownish gray mottled, medium stiff				10	3-3-4 N=7	3500 (HP)		32			
		10			21		2500 (HP)	1550	37	83		
12.5	88											
	SILT (ML), reddish brown, loose, with lenses of clay				12	3-4-6 N=10						
		15			12	2-2-2 N=4			31			
16.0	84.5											
	Boring Terminated at 16 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Mobile Downhole

Advancement Method:
Hollow Stem Auger 0-14.5'

Abandonment Method:
Borings backfilled with soil cuttings. Reversed auger upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Not measurable before HSA removal.

Midwest Testing LABORATORY, INC.
A Terracon COMPANY
4102 7th Ave. North
Fargo, North Dakota

Boring Started: 8/13/2013 Boring Completed: 8/13/2013

Drill Rig: Mobile B-53 Driller: DW

Project No.: M1135051 Exhibit: A-4

BORING LOG NO. B-2

PROJECT: Johnson Farms

CLIENT: Moorhead City Engineers
Moorhead, Minnesota

SITE:
Moorhead, Minnesota

LOCATION See Exhibit A-2

Latitude: 46.8371° Longitude: -96.7503°

Surface Elev.: 99.5 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY TORVANE/HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	ORGANIC
			5	2-3-3 N=6			23		55-28-27	5
2.5	97									
			6	3-4-5 N=9						
4.0	95.5									
		5	10	3-4-4 N=8	4000 (HP)		26			
			12	3-4-4 N=8	3500 (HP)		34			
9.0	90.5									
		10	14	3-4-5 N=9	2500 (HP)		38			
12.5	87									
			12	3-4-3 N=7						
		15	15	3-4-3 N=7			36			
16.0	83.5									

FILL - TOPSOIL WITH FAT CLAY, black with light gray, substantial roots in sample

TOPSOIL, black, stiff

FAT CLAY (CH), dark gray to brownish gray, stiff

FAT CLAY (CH), brownish gray mottled, stiff, with lenses and laminations of silt

SILT (ML), brownish gray, loose

Boring Terminated at 16 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Mobile Downhole

Advancement Method:
Hollow Stem Auger 0-14.5'

Abandonment Method:
Borings backfilled with soil cuttings. Reversed auger upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Not measurable before HSA removal.

Midwest Testing LABORATORY, INC.
A Terracon COMPANY
4102 7th Ave. North
Fargo, North Dakota

Boring Started: 8/13/2013 Boring Completed: 8/13/2013

Drill Rig: Mobile B-53 Driller: DW

Project No.: M1135051 Exhibit: A-5

BORING LOG NO. B-3

PROJECT: Johnson Farms

CLIENT: Moorhead City Engineers
Moorhead, Minnesota

SITE:
Moorhead, Minnesota

LOCATION See Exhibit A-2

Latitude: 46.83677° Longitude: -96.75005°

Surface Elev.: 95.5 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY TORVANE/HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	ORGANIC
	FAT CLAY (CH), gray to brownish gray mottled, medium stiff to stiff, with lenses and laminations of silt				6	4-3-4 N=7						
			▼		8	3-4-5 N=9	4000 (HP)		37			
		5			12	2-3-3 N=6	3500 (HP)		48			
7.5	88											
	SILT (ML), light grayish brown, loose to medium dense				12	3-3-3 N=6			30			
		10			14	3-5-6 N=11						
12.0	83.5											
	FAT CLAY (CH), gray, soft				14	3-2-2 N=4						
		15			10	2-1-2 N=3	500 (HP)		72			
16.0	79.5											
	Boring Terminated at 16 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Mobile Downhole

Advancement Method:
Hollow Stem Auger 0-14.5'

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Not measurable before HSA removal.

Dry cave-in at 8.2' (0 hrs).

▼ *3.5' after 4 hrs (cave-in at 5.6').*

Midwest Testing LABORATORY, INC.
A Terracon COMPANY
4102 7th Ave. North
Fargo, North Dakota

Boring Started: 8/13/2013 Boring Completed: 8/13/2013

Drill Rig: Mobile B-53 Driller: DW

Project No.: M1135051 Exhibit: A-6

BORING LOG NO. B-4

PROJECT: Johnson Farms

CLIENT: Moorhead City Engineers
Moorhead, Minnesota

SITE:
Moorhead, Minnesota

LOCATION See Exhibit A-2

Latitude: 46.83669° Longitude: -96.75148°

Surface Elev.: 96 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY TORVANE/HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	ORGANIC
1.0	95				8	3-4-4 N=8						
TOPSOIL, black												
5.5	90.5				6	5-5-6 N=11	4500 (HP)		27			
FAT CLAY (CH), gray, stiff		5	▼		21		4500 (HP)	1760	32	87		
12.5	83.5				8	5-4-3 N=7						
SILT (ML), reddish brown, loose, with lenses and laminations of clay		10			12	3-3-3 N=6			30			
16.0	80				14	3-4-3 N=7	2500 (HP)		62			
FAT CLAY (CH), brownish gray mottled, soft to medium stiff		15			14	1-1-2 N=3	1500 (HP)		74			
Boring Terminated at 16 Feet												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Mobile Downhole

Advancement Method:
Hollow Stem Auger 0-14.5'

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Not measurable before HSA removal.

Dry cave-in at 10.3' (0 hrs).

▼ *3.4' after 7 hrs (cave-in at 5.3').*

Midwest Testing LABORATORY, INC.
A Terracon COMPANY
4102 7th Ave. North
Fargo, North Dakota

Boring Started: 8/13/2013 Boring Completed: 8/13/2013

Drill Rig: Mobile B-53 Driller: DW

Project No.: M1135051 Exhibit: A-7

BORING LOG NO. B-5

PROJECT: Johnson Farms

CLIENT: Moorhead City Engineers
Moorhead, Minnesota

SITE:
Moorhead, Minnesota

LOCATION See Exhibit A-2

Latitude: 46.83584° Longitude: -96.75005°

Surface Elev.: 96 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY TORVANE/HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	ORGANIC
FAT CLAY (CH), brownish gray, medium stiff												
					6	2-3-3 N=6	3500 (HP)		27			
3.5	92.5		▼		16		2500 (HP)	1850	36	83		
FAT CLAY (CH), grayish brown, soft, with lenses and laminations of silt		5			10	2-2-2 N=4	1500 (HP)		44			
7.0	89											
SILT (ML), reddish brown, loose					12	6-3-4 N=7			33			
9.5	86.5		▽									
SILT (ML), gray, loose		10			12	2-2-2 N=4			36			
12.5	83.5											
FAT CLAY (CH), dark gray, soft to medium stiff					14	2-2-3 N=5						
16.0	80	15			14	1-2-1 N=3	1000 (HP)		73			
Boring Terminated at 16 Feet												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Mobile Downhole

Advancement Method:
Hollow Stem Auger 0-14.5'

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Not measurable before HSA removal.
▽ *9.3' after 0 hrs (cave-in at 9.5').*
▼ *3.6' after 5 hrs (cave-in at 5.9').*

Midwest Testing LABORATORY, INC. A Terracon COMPANY
4102 7th Ave. North
Fargo, North Dakota

Boring Started: 8/13/2013 Boring Completed: 8/13/2013
Drill Rig: Mobile B-53 Driller: DW
Project No.: M1135051 Exhibit: A-8

BORING LOG NO. B-6

PROJECT: Johnson Farms

CLIENT: Moorhead City Engineers
Moorhead, Minnesota

SITE:
Moorhead, Minnesota

LOCATION See Exhibit A-2

Latitude: 46.8358° Longitude: -96.74949°

Surface Elev.: 100.5 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY TORVANE/HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	ORGANIC
0.5	100									
TOPSOIL, black										
FAT CLAY (CH), gray, soft			6	3-3-4 N=7						
			8	2-2-2 N=4	1000 (HP)		38			
4.0	96.5									
FAT CLAY (CH), grayish brown, medium stiff, with lenses and laminations of silt		5	8	3-3-4 N=7						
			10	2-3-3 N=6	2000 (HP)		33			
9.0	91.5									
SILT (ML), brownish gray, loose		10	12	2-3-4 N=7			36			
			14	2-2-2 N=4						
13.0	87.5									
FAT CLAY (CH), dark gray, medium stiff		15	12	2-3-3 N=6	2000 (HP)		57			
16.0	84.5									
Boring Terminated at 16 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Mobile Downhole

Advancement Method:
Hollow Stem Auger 0-14.5'

Abandonment Method:
Borings backfilled with soil cuttings. Reversed auger upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Not measurable before HSA removal.

Midwest Testing LABORATORY, INC.
A Terracon COMPANY
4102 7th Ave. North
Fargo, North Dakota

Boring Started: 8/13/2013 Boring Completed: 8/13/2013

Drill Rig: Mobile B-53 Driller: DW

Project No.: M1135051 Exhibit: A-9

BORING LOG NO. B-7

PROJECT: Johnson Farms

CLIENT: Moorhead City Engineers
Moorhead, Minnesota

SITE:
Moorhead, Minnesota

LOCATION See Exhibit A-2

Latitude: 46.83514° Longitude: -96.75027°

Surface Elev.: 111 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY TORVANE/HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	ORGANIC
	FILL - FAT CLAY, brownish gray				4	3-4-5 N=9						
					3	2-3-3 N=6			17			
		5			5	3-4-5 N=9			23			3
					8	4-5-6 N=11			27		66-31-35	
		10			8	2-3-4 N=7			29			
11.5	99.5											
	FAT CLAY (CH), brownish gray mottled, stiff				12	4-5-7 N=12	5000 (HP)		23			
		15			22		2500 (HP)	2120	36	85		
20.0	91											
	SILT (ML), reddish brown, loose	20			10	1-2-2 N=4			37			
25.0	86											
26.0	**FAT CLAY (CH)**, dark gray, medium stiff	25			12	2-3-4 N=7	3000 (HP)		47			
85												
	Boring Terminated at 26 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Mobile Downhole

Advancement Method:
Hollow Stem Auger 0-24.5'

Abandonment Method:
Borings backfilled with soil cuttings. Reversed auger upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Not measurable before HSA removal.

Midwest Testing LABORATORY, INC.
A Terracon COMPANY
4102 7th Ave. North
Fargo, North Dakota

Boring Started: 8/13/2013 Boring Completed: 8/13/2013

Drill Rig: Mobile B-53 Driller: DW

Project No.: M1135051 Exhibit: A-10

APPENDIX B
SUPPORTING INFORMATION

Laboratory Testing

Representative samples were selected for laboratory analysis. The testing program consisted of determining moisture content, dry density, unconfined compressive strength, organic content and Atterberg limits. The laboratory test results can be found on the boring logs, opposite the samples they represent.

Descriptive classifications of the soils indicated on the boring logs are in accordance with the General Notes in Appendix C and the Unified Soil Classification System. Also shown are estimated Unified Soil Classification Symbols. A brief description of this classification system is included in Appendix C of this report. All classification was by visual manual procedures.

APPENDIX C
SUPPORTING DOCUMENTS

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING


Auger


Split Spoon


Shelby Tube


Macro Core


Ring Sampler


Rock Core


Grab Sample


No Recovery

WATER LEVEL


Water Initially Encountered


Water Level After a Specified Period of Time


Water Level After a Specified Period of Time

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

(HP)	Hand Penetrometer
(T)	Torvane
(b/f)	Standard Penetration Test (blows per foot)
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength, Qu, psf**	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**
Very Loose	0 - 3	0 - 6	Very Soft	less than 500	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	500 to 1,000	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium-Stiff	1,000 to 2,000	5 - 7	5 - 9
Dense	30 - 50	59 - 98	Stiff	2,000 to 4,000	8 - 14	10 - 18
Very Dense	> 50	≥ 99	Very Stiff	4,000 to 8,000	15 - 30	19 - 42
			Hard	> 8,000	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

Midwest Testing LABORATORY, INC. A Terracon COMPANY

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line [J]		CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K,L,M,N]
			Liquid limit - not dried			Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K,L,M,P]
			Liquid limit - not dried			Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

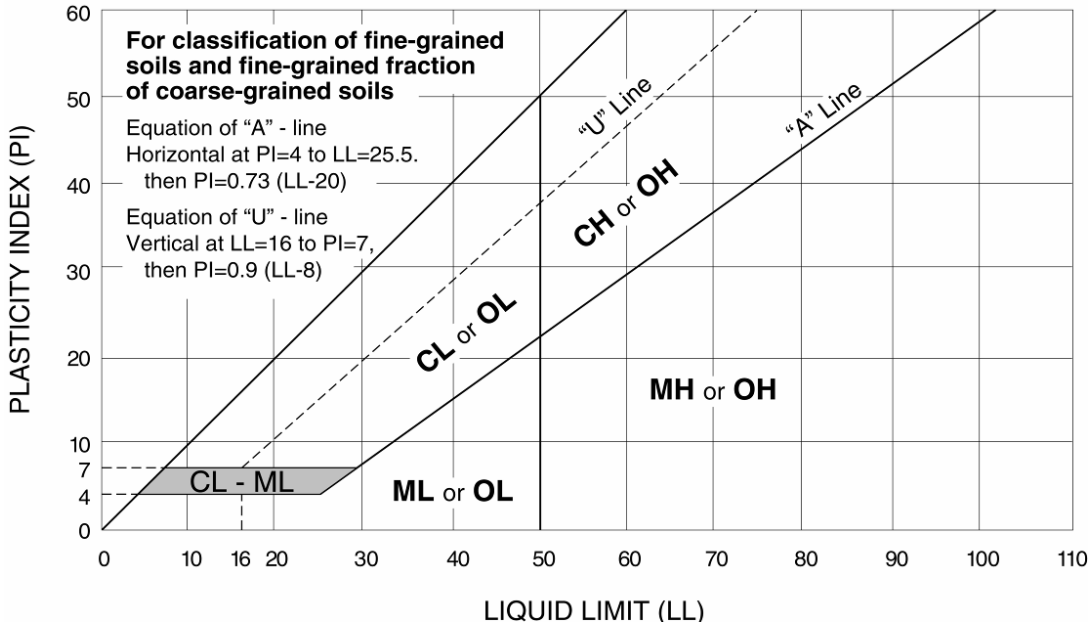
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



36th Avenue South

16th Street

17th Street

18th Street

19th Street

20th Street

Railroad

Johnson Drive South

1577 1585 3609 3617 3625 3633 3649 3641 3657 3745 3753 3761 3825 3833 1572 1564 556

3608 3607 3616 3615 3624 3623 3632 3631 3640 3639 3728 3727 3736 3735 3744 3741 3752 3751 3824 3823 3824 3831 3840 3839 3848 3847

3606 3605 3607 3614 3613 3622 3621 3630 3629 3638 3637 3726 3725 3734 3733 3724 3741 3750 3749 3822 3821 3830 3829 3838 3837 3846 3845

3604 3603 3612 3611 3620 3619 3628 3627 3636 3635 3644 3643 3724 3723 3732 3731 3740 3739 3748 3747 3756 3755 3820 3819 3828 3827 3836 3835 3844 3843 3852 3851

3602 3610 3618 3626 3634 3642 3722 3730 3738 3746 3754 3818 3826 3834 3842 3850

10' MINIMUM DEPTH SOIL BORE IN TOP OF 4' HIGH STOCKPILE

10' MINIMUM DEPTH SOIL BORE LOCATION

10' MINIMUM DEPTH SOIL BORE IN TOP OF 5' HIGH STOCKPILE

10' MINIMUM DEPTH SOIL BORE LOCATION

10' MINIMUM DEPTH SOIL BORE LOCATION

15' MINIMUM DEPTH SOIL BORE IN TOP OF 11' STOCKPILE

R/W

0 30 60 120

CITY OF MOORHEAD MINNESOTA ENGINEERING DEPARTMENT

DRAWN BY	CHECKED BY	APPROVED BY
TAO	MEO	TET

S.P. No. . ENG. No. LEGAL No.

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Signature - Project Engineer

January 29, 2013
Date

Thomas E. Trowbridge
Name - Project Engineer

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License No.

Johnson Farms Topography

Johnson Farms
Moorhead, MN
Topography

SHEET 2 OF 7

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36th Avenue South

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1577 1585 3609 3617 3625 3633 3649 3641 3657 3745 3761 3753 3825 3833 1572 1564 556

3608 3607 3616 3615 3624 3623 3632 3631 3640 3639 3728 3727 3736 3735 3744 3741 3752 3751 3824 3823 3824 3831 3840 3839 3848 3847

909.60 BLDG
909.60 BLDG
911.02 BLDG
909.01 BLDG

3606 3605 3607 3614 3613 3622 3621 3630 3629 3638 3637 3726 3725 3734 3733 3724 3741 3750 3749 3822 3821 3830 3829 3838 3837 3846 3845

1+00 2+00 3+00 4+00 5+00 6+00 7+00 8+00 9+00 10+00 11+00 12+00

3604 3603 3612 3611 3620 3619 3628 3627 3636 3635 3644 3643 3724 3723 3732 3731 3740 3739 3748 3747 3756 3755 3820 3819 3828 3827 3836 3835 3844 3843 3852 3851

3602 3610 3618 3626 3634 3642 3722 3730 3738 3746 3754 3818 3826 3834 3842 3850

R/W

0 30 60 120

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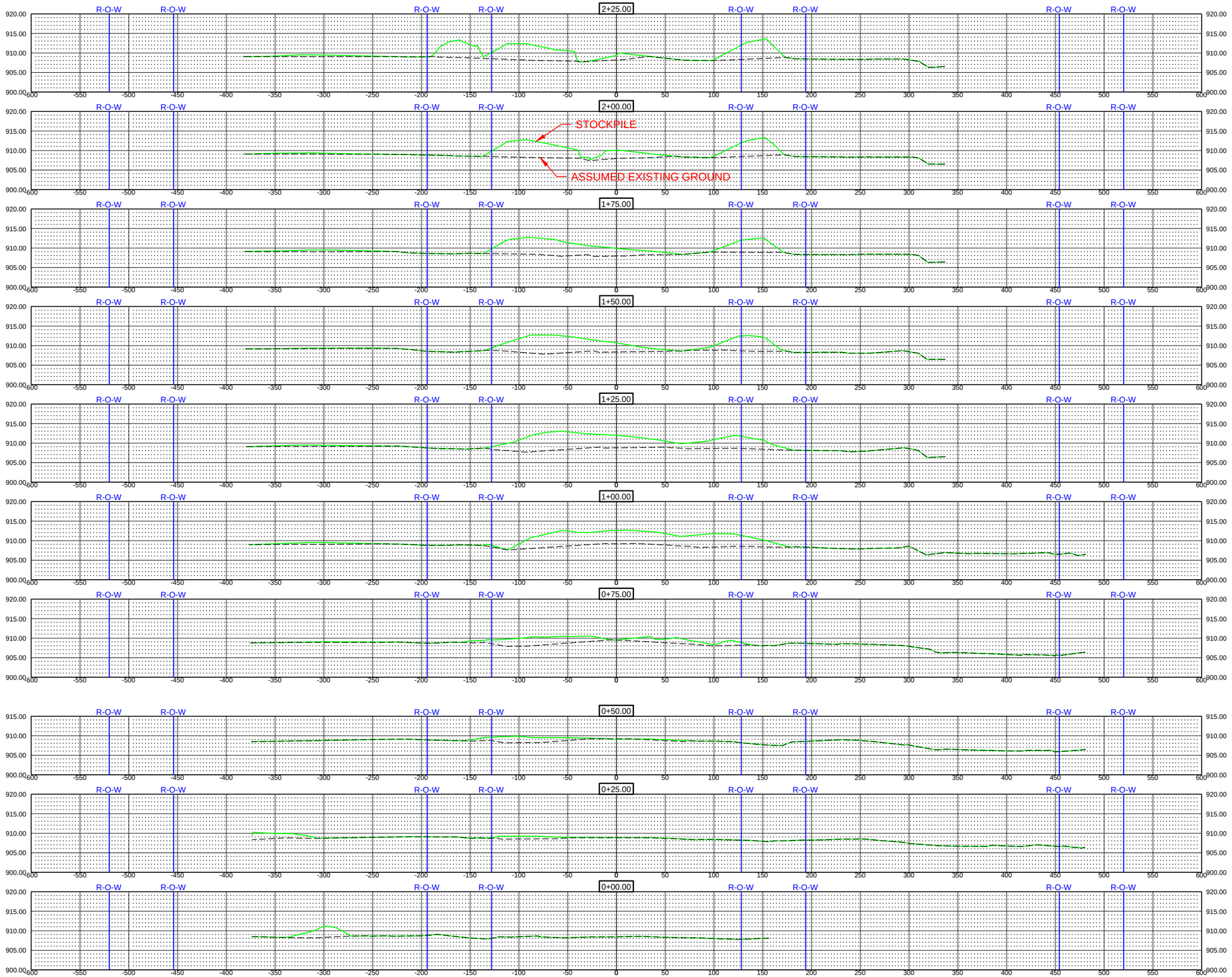

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Johnson Farms Cross-Sections

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SHEET **2** OF **7**

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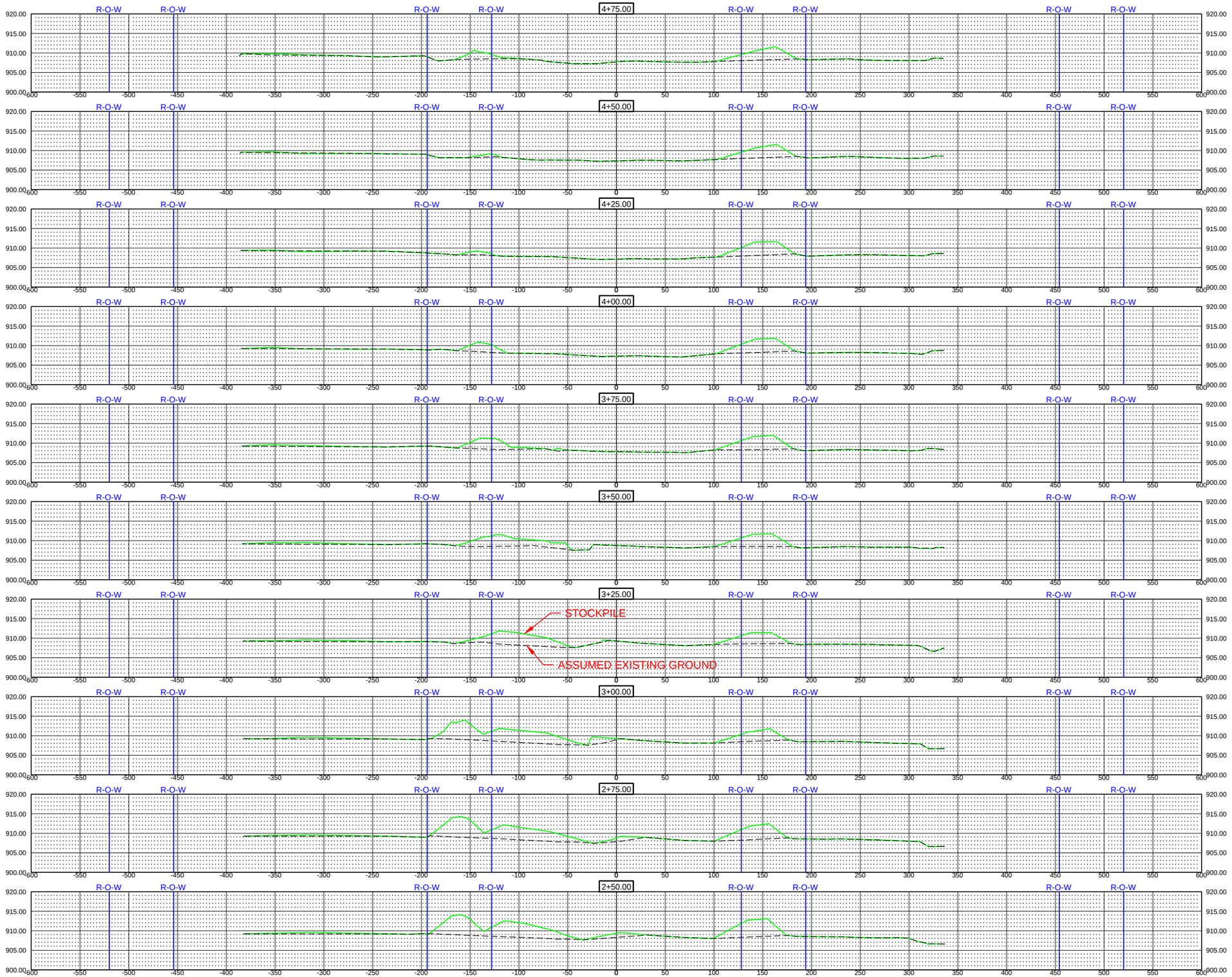

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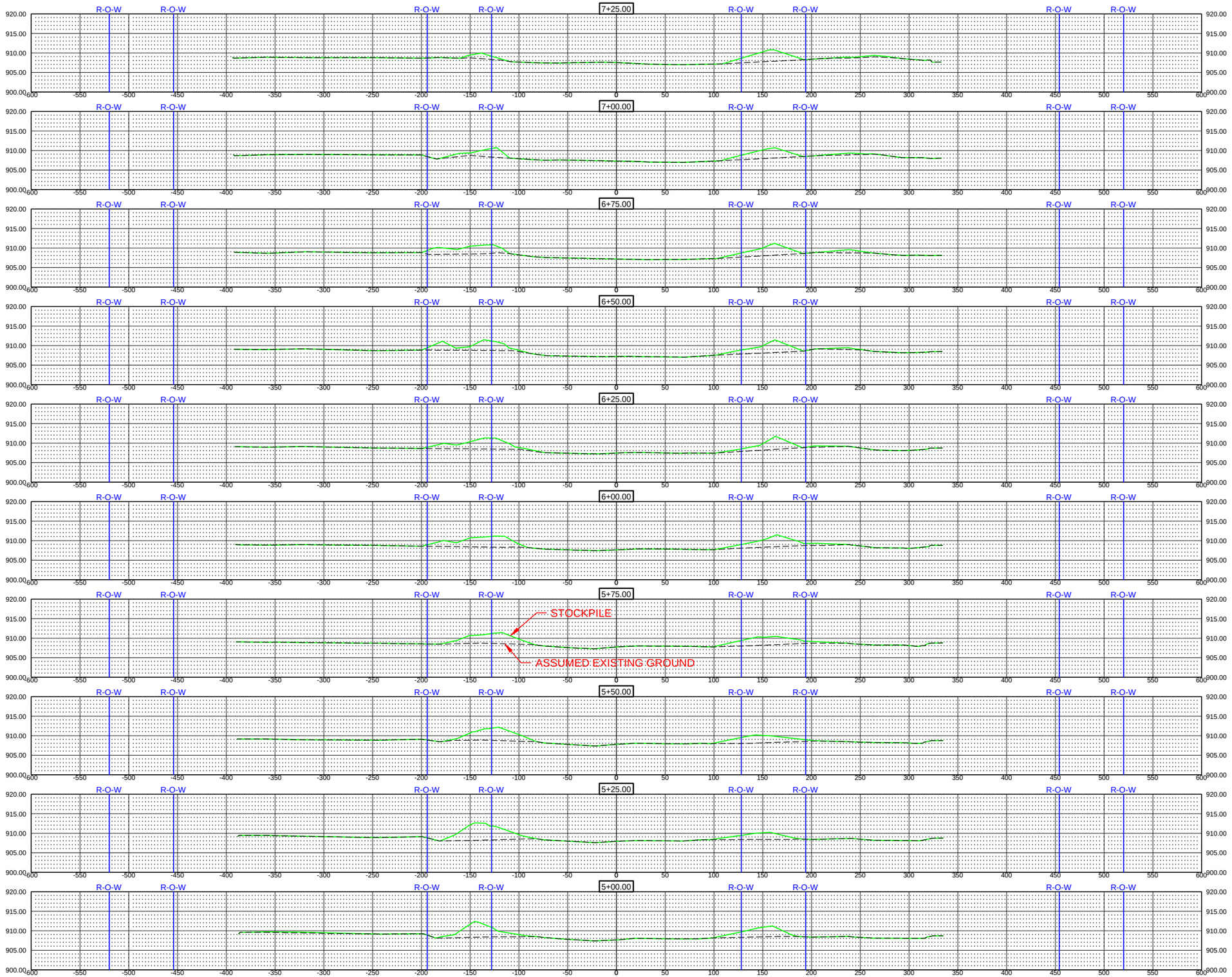

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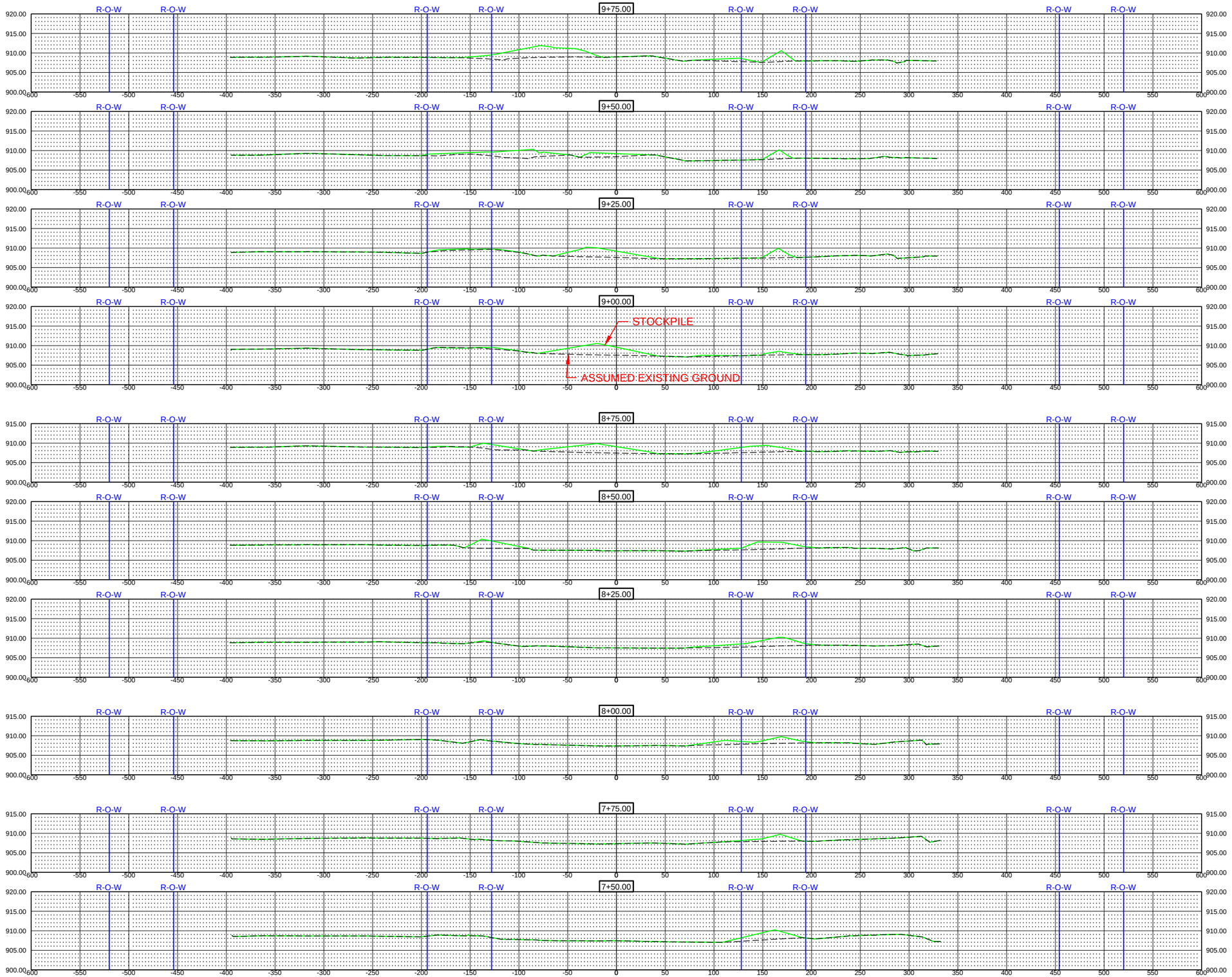

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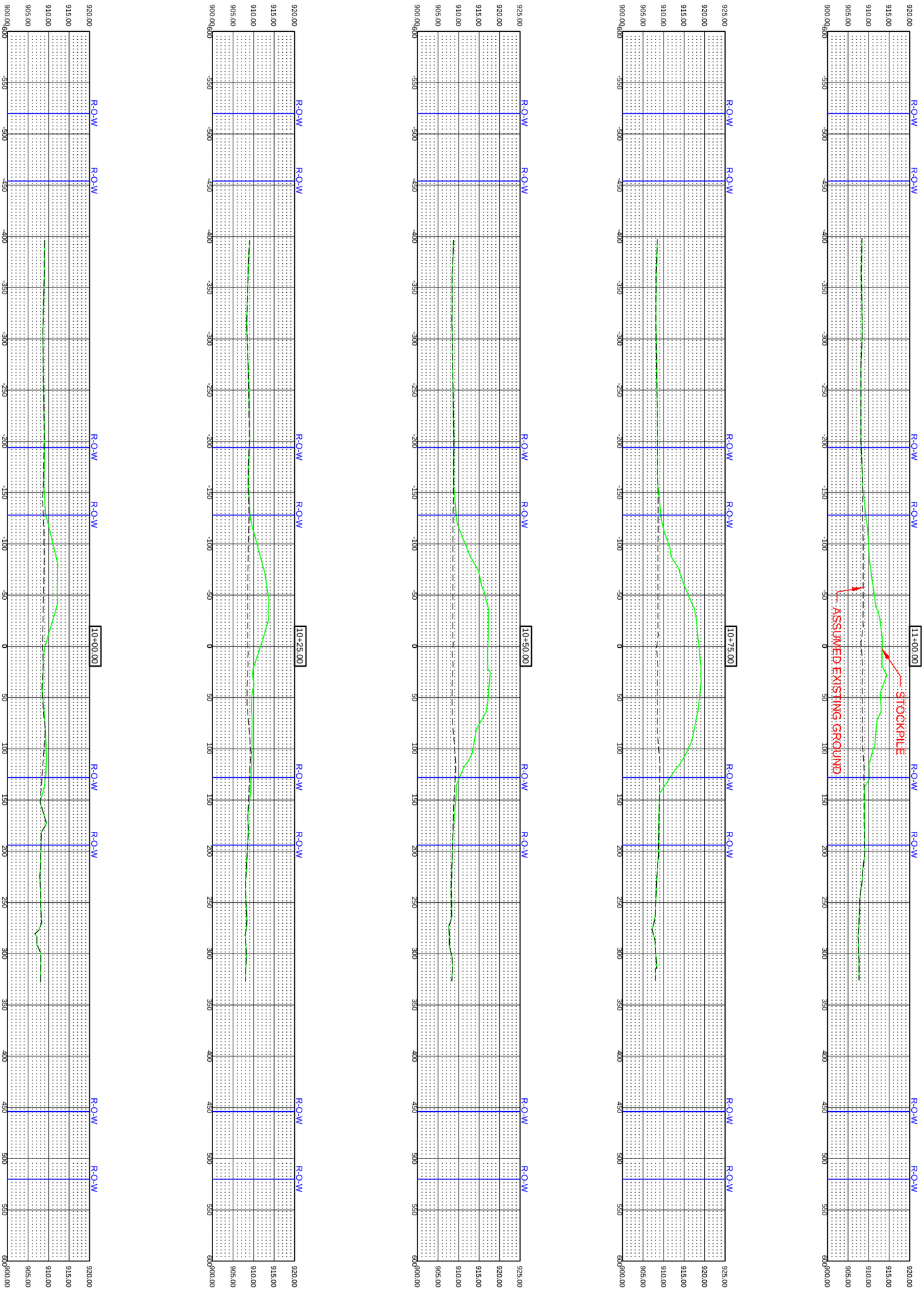

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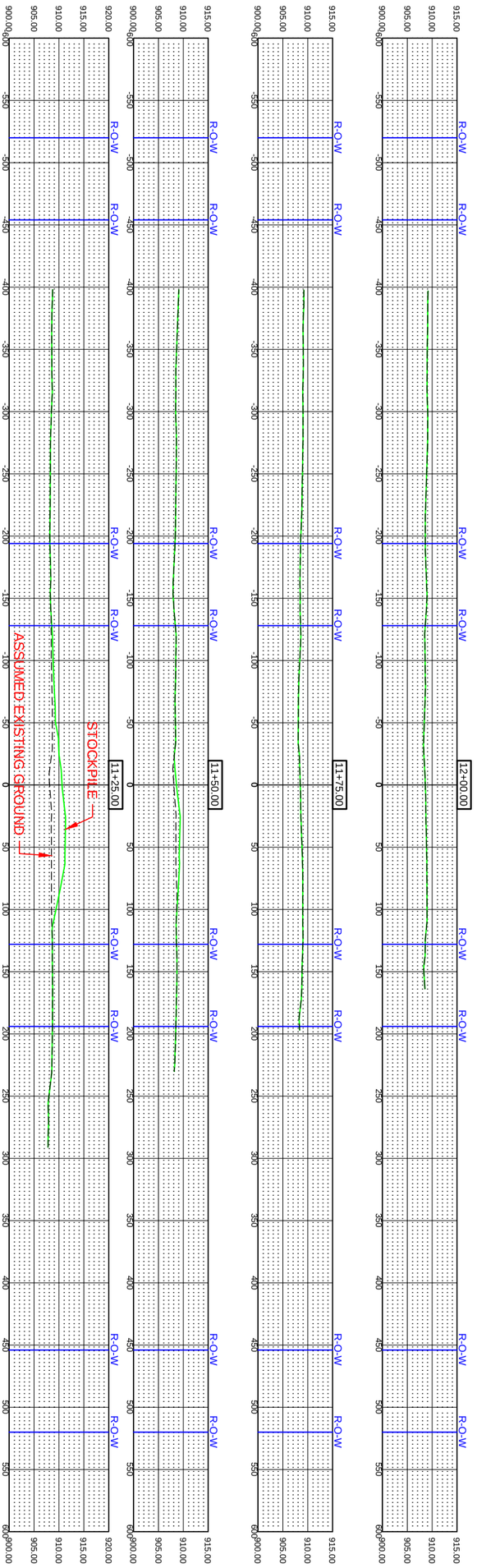
SHEET 2 OF 7



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