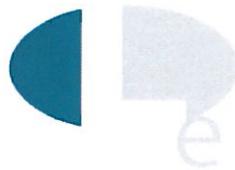


Roadway & Drainage Improvements Feasibility Study

35th Ave N (45th St N to Landview Road)
Landview Road (35th Ave N to 32nd Ave N)
32nd Ave N (Landview Road to West Dike)
32nd Ave N (Landview Road to 45th St N)

Reiles Acres, ND

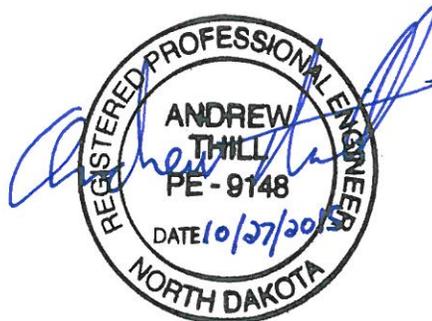
Project # 15016.2



Lowry
ENGINEERING

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Prepared by:
Andrew J. Thill, P.E.



October, 2015

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1. Introduction and Summary of Existing Infrastructure

Reile's Acres is located northwest of Fargo in Cass County, North Dakota. The town is bordered by Cass County Highway 20 to the north, 32nd Ave N to the south and 45th St N to the east. The City has expressed concerns about the safety, functionality, and drainage relating to several of the main roadways in town. Lowry Engineering was asked to review these concerns and make recommendations for improvement options on and along these roadways, as well as provide cost estimates for the construction of the related work. The areas of concern were broken up into 4 study areas. Existing conditions of each of the study areas is provided below. Furthermore, boring logs can be seen in the geotechnical report in **Appendix A**. The project vicinity and phasing map can be seen in **Appendix B**.

35th Ave N, from 45th St N to Landview Road: The current roadway width is +/- 18'. The current pavement section is 5.5" of asphalt pavement over +/- 14" of "base" material consisting of organic sand fill with trace amounts of gravel and no reinforcement or separation fabric. This section of road is too narrow for the comfortable passage of passing vehicles. This is especially evident if a vehicle is parked along the road, or if pedestrians are using the roadway. Drainage along this section is facilitated via road side ditches with culverts under driveways. There appears to be a drainage break at 46th St N that divides the west flowing and east flowing water. Existing drainage is poor and results in standing water in the ditches. The ditches seem adequate enough to provide conveyance of the high flow situations; however, inadequate slopes result in several problems that come from standing water such as, wet ditches that are difficult to mow, creation of mosquito breeding habitat and cat-tail / aquatic vegetation growth. As of the fall of 2015, the current asphalt pavement is in fair condition, with +/- 5% of the total surface area of the pavement needing patch repairs before an overlay. These patch repairs are necessary to remove severe fatigue and thermal cracking from the pavement.



Landview Road, from 35th Ave N to 32nd Ave NW: The current roadway width is +/- 19'. The current pavement section is 5.5" of asphalt pavement over +/- 12" of "base" material consisting of organic sand fill with trace amounts of gravel and no reinforcement or separation fabric. This section of road is too narrow for the comfortable passage of passing vehicles. This is especially evident if a vehicle is parked along the road, or if pedestrians are using the roadway. Drainage along this section is facilitated via road side ditches with culverts under driveways. There appears to be a north-south drainage break north of 35th Ave N roughly at the mid lot points of L1B4 and L1B5 of the 4th Addition (1st lots north of 35th Ave N). Existing drainage is poor and results in standing water in the ditches. The ditches seem adequate enough to provide conveyance of the high flow situations; however, inadequate slopes result in several problems that result from standing water such as, wet ditches that are difficult to mow, creation of mosquito breeding habitat and cat-tail / aquatic vegetation growth. As of the fall of 2015, the current asphalt pavement is in fair to poor condition, with +/- 10% of the total surface area of the pavement needing patch repairs before an overlay. These patch repairs are necessary to remove severe fatigue and thermal cracking from the pavement.



32nd Ave N, from Landview Road to the West Dike: The current roadway has a gravel surface and width of +/- 22'. The gravel is 18" thick with no reinforcement or separation fabric. This section of road, while still being wider than other roads in the study area, is still fairly narrow, especially with houses fronting it and the possibility of pedestrian use and street parking. Drainage along this section is facilitated via road side ditches with culverts under driveways. This area flows to the west and to a field swale to on the west side of the West Dike. The ditches seem adequate enough to provide conveyance of high flow situations; however, inadequate slopes result in several problems that come from standing water such as, wet ditches that are difficult to mow, creation of mosquito breeding habitat and cat-tail / aquatic vegetation growth. As this area is currently a fairly thick gravel section, little to no mitigation other than some minor grading will be necessary before installation of new pavement.



32nd Ave NW from Landview Road to 45th St: The current roadway width varies from 20' to 21'. The current pavement section is +/- 5" of asphalt pavement over +/- 13" of "base" material consisting of organic sand fill with trace amounts of gravel and no reinforcement or separation fabric. This section of road, while still being wider than other roads in the study area, is still fairly narrow, especially with houses fronting it and the possibility of pedestrian use and street parking. Drainage along this section is facilitated via road side ditches with culverts under driveways. On the north side of 32nd Ave N there appears to be a drainage break at L14B2 of the 1st Addition (2nd house west of 45th St) that divides the west and east flowing water. On the south side of 32nd Ave N there appears to be a drainage break at the field approach east of Landview Road that divides the west and east flowing water. Existing drainage is poor and results in standing water in the ditches. The ditches seem adequate enough to provide conveyance of the high flow situations; however, inadequate slopes result in several problems that result from standing water such as, wet ditches that are

difficult to mow, creation of mosquito breeding habitat and cat-tail / aquatic vegetation growth. As of the fall of 2015, the current asphalt pavement is in fair to poor condition, with +/- 10% of the total surface area of the pavement needing patch repairs before an overlay. These patch repairs are necessary to remove severe fatigue and thermal cracking from the pavement.



2. Sanitary Sewer and Water Main Improvements

Per conversations with Cass Rural Water District, there is no interest or plans on upgrading or replacing any of the existing water infrastructure in the near future. Currently, 35th Ave N east of Landview Road, 32nd Ave N east of Landview Road and Adams Drive do not have any rural water access. The scope of this study is roads and drainage, however, installing water improvements at the same time as major street projects is often the most cost effective and efficient way to make such improvements. Per conversations with Cass Rural Water, the total installed cost of water pipes to the un-served parts of town would be \$60 per LF. It would cost +/- \$100,000 to run water main and service stubs along the unserved portion of 35th and another +/- \$100,000 to run water main and service stubs along the unserved portions of 32nd Ave.

3. Proposed Roadway Improvements

After reviewing the current roadways, geotechnical report, topography survey and other local factors affecting these roads, We believe that a 28' rural cross section would be most appropriate for all of these roadways. The reasoning for this proposed section is to provide for the movement of pedestrians and temporary parking of vehicles, as well as for the normal two way movement of traffic. A 28' road allows for the safe passage of two vehicles, even with pedestrians present, and would allow a vehicle to safely pass a parked vehicle without causing a danger to those pedestrians. Considering the existing ditches, a rural section would be most cost effective to construct and would allow the roadway to stay high enough to provide access during flood events. Two cross

section options are being recommended for consideration by the City. These cross sections can be seen in **Appendix C**.

Option 1

Option 1 includes a full reconstruct of the existing roadway. The existing asphalt pavement appears to be in fair to poor condition with maybe another 5 years of life left. The poor existing base material and lack of a geotextile reinforcement fabric makes for concerns about the longevity of the road. A 5" asphalt section over 8" of new NDDOT Class 5 base over a NDDOT R1 fabric would be sufficient for these City collector roadways, which will serve residential traffic with periodic bus, garbage truck or delivery truck traffic. This option provides for the most sound roadway structure, however, it is the more expensive option and will also be the most intrusive to residents in ways such as having an extended construction timeline, and causing the roadway to be closed for the longest period of time.

Option 2 (Recommended)

Option 2 includes an expansion on the existing roadways, followed by a 2.5" pavement overlay. The idea with this option is to utilize as much of the existing roadway structure as possible. The widened parts will be a 5.5" asphalt section over NDDOT class 5 over NDDOT R1 fabric. The existing roadway will be reviewed and any failure locations such as severe fatigue or thermal cracking will be repaired, then 2.5" of new asphalt will be installed on top of the existing pavement. **Appendix A includes a report amendment showing this recommendation.**

The current roadways consist of both minor and severe fatigue cracking areas. It is practical to full depth patch the severe fatigue cracking areas; however, it is not practical to patch all the areas containing minor cracking. It should be noted that the original recommendation by the geotechnical engineer indicated that a 2" overlay would be sufficient per their calculations. However, due to the amount of minor fatigue cracking in these roads, I am recommending an extra ½" of pavement in order better minimize the reflection of these minor cracks, and to insure a longer pavement life. After reviewing the existing roadway conditions the Geotechnical Engineer concurred with this recommendation.

See **Appendix F** for examples of various types of pavement failures.

4. Proposed Drainage Improvements

Option 1 (Recommended): The current ditches lack the slope to adequately remove nuisance water, but have historically proven to be able to convey the large flows of significant rain events. A solution to provide for drainage of the nuisance water, while at the same time keeping costs down, would be to install storm sewer along all the improved roads. This will be designed to convey nuisance water, but allow large flows from significant rain events to continue to utilize driveway culverts as they do today. Ditches would be re-graded to have

high spots at the culverts and inlets would be installed in the ditch bottoms at the mid points between the drives. Ideally, a 0.7% slope minimum would be maintained to properly convey the water to the inlets. This storm sewer would flow west along 35th Ave N and then south down Landview Road and then West along 32nd Ave N. At this point it would reach a lift station that would pump the water into the adjacent swale on the west side of the West Dike. The existing culvert with flap gate on the west end of 32nd Ave N would stay in place as it is today.

Option 2: This option would be the installation of a full storm sewer system capable of conveying the 5 or 10 year storm event. In this option larger pipes and a much larger lift station system would be installed. In this option we would most likely not replace driveway culverts and would run an analysis to make sure events in excess of the 5 or 10 year event would not harm property. This option would be the most expensive option.

The preliminary storm sewer layout can be seen in **Appendix D** and cost estimate can be seen in **Appendix G**.

5. Required Drainage Easements / Roadway Right of Way

The existing right of way (ROW) has been reviewed along with the existing easements along these roadways. This can be seen in **Appendix E**. The preliminary estimates are that 10' of "drainage & utility easement" will be needed along the north and south side of 35th Ave N. 15' of "drainage & utility easement" will be needed along the west and east side of Landview Road. 15' will be needed along the entire south side of 32nd Ave N and' along the north side of 32nd Ave N from Landview Road to 45th St N.

The above assumes that the landowner to the south of 32nd St N will facilitate this easement or provide /sell the ROW. If these negotiations are not successful, we did look at the impact of widening 32nd Ave to 28' but only widening to the north and not impacting anything south of the existing roadway. If this is the case the 15' of additional ROW on the north side of 32nd from Landview Road to 45th St. should still be sufficient.

It should be noted that there are "dry utility easements" along some of these roads. Our initial assumption is that these easements will not cover drainage improvements. However further discussion with an attorney may be needed if the City decides to proceed with easement / ROW acquisition.

6. Estimated Cost of Construction

A preliminary cost estimate for the construction of the various phases and options has been created and has been included as **Appendix G** of this report. The full project assuming the widening and overlay and nuisance water mitigation would cost +/- \$ 1.5 Million.

Appendix A
Geotechnical Report (NTI)



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October 20, 2015

Lowry Engineering
3330 Fiechtner Dr.
Suite 102
Fargo, ND 58103

Attn: Mr. Andrew Thill, P.E.

Re: Addendum to Geotechnical Report
Reiles Acres Paving - NTI Project # 15-13215.100
Reiles Acres, North Dakota

Background

This Addendum has been prepared to address additional requested information that was not provided in the October 2, 2015 geotechnical exploration report. Specific recommendations for asphalt pavement and aggregate base thicknesses have been requested based on assumed traffic conditions. We have been asked to assume that the residential streets will include 850 cars, 2 school buses, 1 garbage truck, and 5 delivery vans a day. We anticipate the traffic counts over a 20 year life cycle will produce 146,711 ESAL's using a Growth Rate of 6%, a Truck Factor of 1.7 ESAL / Truck, and 1.5% trucks.

We used a California Bearing Ratio of 4, as stated in the geotechnical report, to evaluate the required additional thickness required for an asphalt overlay, and the required asphalt thickness over 6" of Class 5 and NDDOT R1 geotextile fabric. We have made the assumptions that the subgrade beneath the existing pavement will exhibit poor drainage characteristics, and therefore we have assumed a full depth asphalt pavement for the overlay section.

Recommendations

It is our recommendation that decision to utilize an asphalt overlay should include an assessment of the existing pavement section. If the existing pavement section is performing poorly, you should consider removing and replacing the pavement section rather than an overlay. We recommend that the asphalt overlay, if utilized, should be no less than 2.5" inches based on visual past performance of the road. This would provide an 8" asphalt section over the existing subgrade.

New pavement construction should include construction of 5" of asphalt over a minimum 6" Class 5 section with underlying NDDOT R1 fabric. As stated in the geotechnical report, we recommend that you scarify and re-compact the underlying subgrade material prior to placement of the fabric and aggregate base. The subgrade should be graded to provided drainage of the aggregate base and prevent ponding of water.

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Standard of Care

Our work was performed to the standard of care normally exercised by other professionals practicing in this area at this time. No other warranty, expressed or implied, is made. You should contact NTI if you have any questions or concern.

Northern Technologies, Inc.

Josh Holmes, P.E. (ND)
Project Engineer

Dan Gibson, P.E. (ND,MN)
Project Engineer



Josh Holmes, P.E.
Date: 10/20/2015



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October 2, 2015

Lowry Engineering
3330 Fiechtner Dr.
Suite 102
Fargo, ND 58103

Attn: Mr. Andrew Thill, P.E.

Subject: Geotechnical Exploration and Consulting
Proposed Reiles Acres Paving
Reiles Acres, North Dakota
NTI Project No. 15-13215.100

The following presents findings from the geotechnical exploration of the select streets within the Reiles Acres development located northwest of Fargo, North Dakota. Soil borings were performed for 32nd Avenue NW, Landview Road NW, Bakers Lane, Adam Drive, and 35th Avenue N. It is our understanding that specific repairs for the respective roads have not been determined at this time.

Subsurface Exploration

The subsurface exploration program consisted of ten (10) soil test borings extended to depths of 6 feet. The borings were designated as SB-1 through SB-10 and were performed on September 10, 2015, at the approximate locations shown on the Boring Location Plan provided with this report. The borings were staggered between the drive lanes of the roads. Representative soil samples were recovered from auger cuttings and with a standard split-spoon sampler in general accordance with ASTM D 1586, the Standard Penetration Test. Soil samples were visually classified on the basis of texture and plasticity in general accordance with the Unified Soils Classification System and from Atterberg Limits results. The results of such tests are summarized on the boring logs and attached test forms. Our analysis, findings, and recommendations of this letter report are based upon interpretation of the Standard Penetration results, hand penetrometer test results obtained during classification of retained soils, reconnaissance of the project site, and experience with similar soils and projects.

35th Avenue N

The soil borings performed on 35th Avenue N. encountered 5 inches to 6 inches of asphalt pavement over organic sand fill, with a trace of gravel which extends to between 1.5 feet and 1.8 feet, underlain by buried topsoil consisting of black, organic clay extending 5 to 5.3 feet below grade. Native Glacial Lake Agassiz (GLA) soils consisting of fat clay was encountered beneath the buried topsoil. Geotechnical separation fabric was not encountered at the location of the soil borings.

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Landview Road NW

The soil borings performed on Landview Road NW encountered 5 inches to 6 inches of asphalt pavement over organic sand fill, with a trace of gravel or brown, gravelly sand which extends to 1.5 feet, underlain by buried topsoil consisting of black, organic clay extending 4.8 to 5.5 feet below grade. Native GLA soils consisting of transition fat clay was encountered beneath the buried topsoil. Geotechnical separation fabric was not encountered at the location of the soil borings.

32nd Avenue NW

Soil boring SB-5 encountered 5 inches asphalt pavement over organic sand fill, with a trace of gravel which extends to 1.5 feet, black to brown sandy clay fill with a trace of gravel extending to the termination depth of the boring. Soil boring SB-6 contained approximately 1.5 feet aggregate base underlain by similar black to brown sandy clay fill which extends to termination depth of boring. Geotechnical separation fabric was not encountered at the location of the soil borings.

Bakers Lane

Soil borings included 5 inches of asphalt pavement over organic clayey sand or sand with a trace of gravel which extends to 1.5 feet. Underlying soil at SB-7 consists of sandy clay fill with trace amounts of gravel to a depth of 4 feet followed by native fat clay soils with lenses of silt. SB-8 contained buried topsoil / organic clay beneath the clayey sand which extended to a depth of 3.5 feet, followed by native fat clay. Geotechnical separation fabric was not encountered at the location of the soil borings.

Adams Drive

The existing roadway consisted of 5 inches to 6 inches of asphalt pavement over black, sandy clay or dark brown sandy gravel extending from 2.8 feet to 3.5 feet. Underlying soils at SB-9 included clay fill which extends to the termination depth of the boring. SB-10 contains a layer of buried topsoil / organic fill extending to a depth of 3.5 feet underlain by native fat clay. Geotechnical separation fabric was not encountered at the location of the soil borings.

Recommendations

As stated, we have not been provided plans for proposed pavement construction or asphalt overlays for this project. It is our opinion that the organic fill and buried topsoil should not be reused for fill materials for reconstruction of the road or future expansion of the roadway, because they are highly susceptible to changes in moisture. We also recommend scarification and re-compaction of a minimum of 12" of the exposed clay subgrade to provide a uniform section that promotes positive drainage.

We estimate site soils have a California Bearing Ratio (CBR) of 4 based on previous test results and experience with Fargo / Moorhead area soils. We recommend that a CBR value no greater than 4 should be used for design of future pavements. Note that CBR values can lessen during the spring thaw.



We recommend using ND Dot Class 5 for aggregate base beneath future pavement construction. The aggregate base should be compacted using a large smooth drum roller to no less than 98 percent of the maximum density as obtained by the Standard Proctor test (ASTM D:698 or AASHTO T99).

All pavement recommendations assume the subgrade soils and aggregate section below paved surfaces drain to subsurface piping for eventual discharge into storm sewer, ditching, or similar acceptable systems. Lack of drainage from both the surface of the pavement and subsurface will significantly reduce the capacity and longevity of the pavements.

We recommend pavements receive annual maintenance, as a minimum, to correct damages to the pavement structure, clean and infill cracks which develop, and repair or resurface areas which exhibit reduced subgrade performance. The lack of maintenance can lead to moisture infiltration of the pavement structure and softening of the subgrade soils. This, in turn, can degrade and result in poorly performing pavements with shortened life expectancy.

CLOSURE

Our conclusions and recommendations are predicated on observation and testing of the earthwork directed by Geotechnical Engineer of Record. Our opinions are based on data assumed representative of the site. However, the area coverage of borings in relation to the entire project is very small. For this and other reasons, we do not warrant conditions below the depth of our borings, or that the strata logged from our borings are necessarily typical of the site. Deviations from our recommendations by plans, written specifications, or field applications shall relieve us of responsibility unless our written concurrence with such deviations has been established.

This report has been prepared for the exclusive use of Lowry Engineering for specific application to Reiles Acres Paving in Reiles Acres located northwest of Fargo, North Dakota. Northern Technologies, Inc. has endeavored to comply with generally accepted geotechnical engineering practice common to the local area. Northern Technologies, Inc. makes no other warranty, expressed or implied.

Northern Technologies, Inc.

Josh Holmes, P.E. (ND)
Project Engineer

Dan Gibson, P.E. (ND, MN)
Senior Engineer

JH,dg



Josh Holmes, P.E.
Date: 10/2/2015

GEOTECHNICAL EVALUATION OF RECOVERED SOIL SAMPLES

We visually examined recovered soil samples to estimate distribution of grain sizes, plasticity, consistency, moisture condition, color, presence of lenses and seams, and apparent geologic origin. We then classified the soils according to the Unified Soil Classification System (ASTM D2488). A chart describing this classification system and general notes explaining soil sampling procedures are presented within appendices attachments.

The stratification depth lines between soil types on the logs are estimated based on the available data. In situ, the transition between type(s) may be distinct or gradual in either the horizontal or vertical directions. The soil conditions have been established at our specific boring locations only. Variations in the soil stratigraphy may occur between and around the borings, with the nature and extent of such change not readily evident until exposed by excavation. These variations must be properly assessed when utilizing information presented on the boring logs.

We request that you, your design team or contractors contact NTI immediately if local conditions differ from those assumed by this report, as we would need to review how such changes impact our recommendations. Such contact would also allow us to revise our recommendations as necessary to account for the changed site conditions.

FIELD EXPLORATION PROCEDURES

Soil Sampling – Standard Penetration Boring:

Soil sampling was performed according to the procedures described by ASTM D-1586. Using this procedure, a 2 inch O.D. split barrel sampler is driven into the soil by a 140 pound weight falling 30 inches. After an initial set of six inches, the number of blows required to drive the sampler an additional 12 inches is recorded (known as the penetration resistance (i.e. "N-value") of the soil at the point of sampling. The N-value is an index of the relative density of cohesionless soils and an approximation of the consistency of cohesive soils.

Soil Sampling – Power Auger Boring:

The boring(s) was/were advanced with a 6 inch nominal diameter continuous flight auger. As a result, samples recovered from the boring are disturbed, and our determination of the depth, extend of various stratum and layers, and relative density or consistency of the soils is approximate.

Soil Classification:

Soil samples were visually and manually classified in general conformance with ASTM D-2488 as they were removed from the sampler(s). Representative fractions of soil samples were then sealed within respective containers and returned to the laboratory for further examination and verification of the field classification. In addition, select samples were submitted for laboratory tests. Individual sample information, identification of sampling methods, method of advancement of the samples and other pertinent information concerning the soil samples are presented on boring logs and related report attachments.

General Notes

DRILLING & SAMPLING SYMBOLS		LABORATORY TEST SYMBOLS	
SYMBOL	DEFINITION	SYMBOL	DEFINITION
C.S.	Continuous Sampling	W	Moisture content-percent of dry weight
P.D.	2-3/8" Pipe Drill	D	Dry Density-pounds per cubic foot
C.O.	Cleanout Tube	LL, PL	Liquid and plastic limits determined in accordance with ASTM D 423 and D 424
3 HSA	3 1/4" I.D. Hollow Stem Auger	Q _u	Unconfined compressive strength-pounds per square foot in accordance with ASTM D 2166-66
4 FA	4" Diameter Flight Auger		
6 FA	6" Diameter Flight Auger		
2 1/2 C	2 1/2" Casing		
4 C	4" Casing		
D.M.	Drilling Mud	Pq	Penetrometer reading-tons/square foot
J.W.	Jet Water	S	Torvane reading-tons/square foot
H.A.	Hand Auger	G	Specific Gravity – ASTM D 854-58
NXC	Size NX Casing	SL	Shrinkage limit – ASTM 427-61
BXC	Size BX Casing	pH	Hydrogen ion content-meter method
AXC	Size AX casing	O	Organic content-combustion method
SS	2" O.D. Split Spoon Sample	M.A.*	Grain size analysis
2T	2" Thin Wall Tube Sample	C*	One dimensional consolidation
3T	3" Thin Wall Tube Sample	Q _c *	Triaxial Compression
			* See attached data Sheet and/or graph

Water Level Symbol

Water levels shown on the boring logs are the levels measured in the borings at the time and under the conditions indicated. In sand, the indicated levels can be considered reliable ground water levels. In clay soils, it is not possible to determine the ground water level within the normal scope of a test boring investigation, except where lenses or layers of more pervious water bearing soil is present and then a long period of time may be necessary to reach equilibrium. Therefore, the position of the water level symbol for cohesive or mixed soils may not indicate the true level of the ground water table. The available water level information is given at the bottom of the log sheet.

Descriptive Terminology

	DENSITY	"N" VALUE		CONSISTENCY	"N" VALUE
TERM			TERM		
Very Loose		0-4	Soft		0-4
Loose		5-8	Medium		5-8
Medium Dense		9 – 15	Rather Stiff		9 – 15
Dense		16 – 30	Stiff		16 – 30
Very Dense		Over 30	Very Stiff		Over 30

Standard "N" Penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2 inch OD split spoon.

Relative Proportions

TERMS	RANGE
Trace	0-5%
A little	5-15%
Some	15-30%
With	30-50%

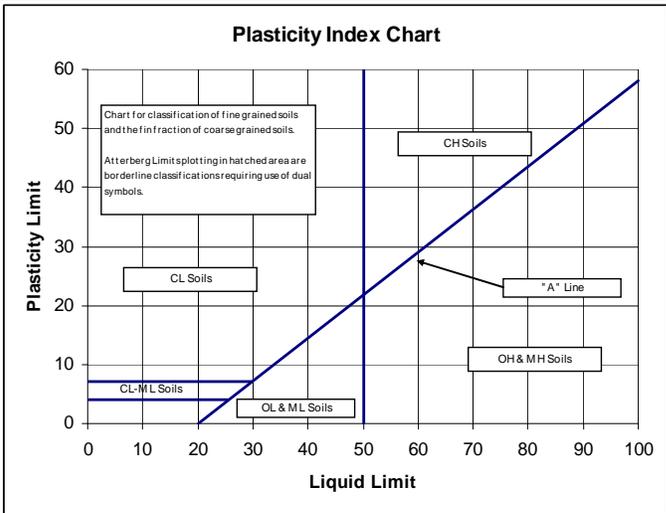
Particle Sizes

Boulders	Over 3"
Gravel - Coarse	3/4" – 3"
Medium	#4 – 3/4"
Sand - Coarse	#4 - #10
Medium	#10 - #40
Fine	#40 - #200
Silt and Clay	Determined by plasticity characteristics.

Note: Sieve sizes are U.S. Standard.

Classification of Soils for Engineering Purposes

ASTM Designation D-2487 and D 2488 (Unified Soil Classification System)

Major Divisions		Group Symbols	Typical Names	Classification Criteria		
Course Grained Soils More than 50% retained on No. 200 sieve *	Gravels 50% or more of coarse fraction retained on No. 4 sieve.	Clean Gravels	GW Well-graded gravels and gravel-sand mixtures, little or no fines.	Classification on basis of percentage of fines. Less than 5% passing No. 200 Sieve: GW, GP, SW, SP GM, GC, SM, SC More than 12% passing No. 200 Sieve: Borderline Classification From 5% to 12% passing No. 200 Sieve: requiring use of dual symbols.	$C_u = D_{60} / D_{10}$ greater than 4. $C_z = (D_{30})^2 / (D_{10} \times D_{60})$ between 1 & 3.	
		Gravels with Fines	GP Poorly graded gravels and gravel-sand mixtures, little or no fines.		Not meeting both criteria for GW materials.	
			GM Silty gravels, gravel-sand-silt mixtures.		Atterberg limits below "A" line, or P.I. less than 4. Atterberg limits plotting in hatched area are <i>borderline</i> classifications requiring use of dual symbols.	
		Clean Sands	GC Clayey gravels, gravel-sand-clay mixtures.		Atterberg limits above "A" line with P.I. greater than 7.	
			SW Well-graded sands and gravelly sands, little or no fines.		$C_u = D_{60} / D_{10}$ greater than 6. $C_z = (D_{30})^2 / (D_{10} \times D_{60})$ between 1 & 3.	
		Sands More than 50% of coarse fraction passes No. 4 sieve.	Clean Sands		SP Poorly-graded sands and gravelly sands, little or no fines.	Not meeting both criteria for SW materials.
	Sands with Fines				SM Silty sands, sand-silt mixtures.	Atterberg limits below "A" line, or P.I. less than 4. Atterberg limits plotting in hatched area are <i>borderline</i> classifications requiring use of dual symbols.
			SC Clayey sands, sand-clay mixtures.		Atterberg limits above "A" line with P.I. greater than 7.	
	Fine Grained Soils More than 50% passes No. 200 sieve *		Silts and Clays Liquid Limit of 50% or less		ML Inorganic silts, very fine sands, rock flour, silty or clayey fine sands.	
					CL Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.	
					OL Organic silts and organic silty clays of low plasticity.	
		Silts and Clays Liquid Limit greater than 50%.	MH Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts.			
CH Inorganic clays of high plasticity, fat clays.						
OH Organic clays of medium to high plasticity.						
Highly Organic Soils		Pt Peat, muck and other highly organic soils.				

PLACEMENT and COMPACTION OF ENGINEERED FILL

Unless otherwise superseded within the body of the Geotechnical Exploration Report, the following criteria shall be utilized for placement of engineered fill on project. This includes, but is not limited to earthen fill placement to improve site grades, fill placed below structural footings, fill placed interior of structure, and fill placed as backfill of foundations.

Engineered fill placed for construction, if necessary should consist of natural, non-organic, competent soils native to the project area. Such soils may include, but are not limited to gravel, sand, or clays with Unified Soil Classification System (ASTM D2488) classifications of GW, SP, SM, CL or CH. Use of silt or clayey silt as project fill will require additional review and approval of project Geotechnical Engineer of Record. Such soils have USCS classifications of ML, MH, ML-CL, MH-CH. Use of topsoil, marl, peat, other organic soils construction debris and/or other unsuitable materials as fill is not allowed. Such soils have USCS classifications of OL, OH, Pt.

Engineered fill, classified as clay, should be tempered such that the moisture content at the time of placement is equal to and no more than 3 percent above the optimum content for as defined by the appropriate proctor test. Likewise, engineered fill classified as gravel or sand should be tempered such that the moisture content at the time of placement is within 3 percent of the optimum content.

All engineered fill for construction should be placed in individual 8 inch maximum depth lifts. Each lift of fill should be compacted by large vibratory equipment until the in-place soil density is equal to or greater than the criteria established within the following tabulation.

Type of Construction	Compaction Criteria (% respective Proctor) ¹	
	Clay	Sand or Gravel
General Embankment Fill	95 to 100	Min. 95
Engineered Fill below Foundations	95 to 98	Min. 98
Engineered Fill below Floor Slabs	95 to 98	Min. 95
Engineered Fill placed against Foundation Walls	95 to 98	95 to 100
Engineered Fill placed as Pavement Subgrade	Min. 95	Min. 95
Engineered Fill placed as Pavement Aggregate Base	NA	Min. 98
Engineered Fill placed within Utility Trench (to within 3 feet of pavement aggregate base or final grade)	Min. 95	Min. 95
Engineered Fill placed as Utility Trench Fill (within 3 feet of pavement aggregate base or final grade)	Min. 98	Min. 98

Note 1 Unless otherwise required, compaction criteria shall be based on the Standard Proctor Test (ASTM D698).

Density tests should be taken during engineered fill placement to document earthwork has achieved necessary compaction of the material(s). Recommendations for interior fill placement and backfill of foundation walls are presented within other sections of this report.



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Google earth

feet
meters





Northern Technologies, Inc.
3522 4th Ave S
 Fargo, ND 58103-2224
 Telephone: 701-232-1822

CLIENT Reiles Acres

PROJECT NAME Reiles Acres Paving

PROJECT NUMBER 15-13215.100

PROJECT LOCATION Reiles Acres, North Dakota

BORING NUMBER SB-1

DATE STARTED 9/10/15 COMPLETED 9/10/15

GROUND ELEVATION _____ HOLE SIZE 6 1/2 inches

DRILLING CONTRACTOR NTI

GROUND WATER LEVELS:

DRILLING METHOD 3 1/4 in H.S.A

AT TIME OF DRILLING --- No water encountered

LOGGED BY Chris Nelson CHECKED BY Josh Holmes

AT END OF DRILLING ---

NOTES _____

AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.4		5" of Asphalt	AU 1									
1.8		BURIED TOPSOIL, ORGANIC CLAY, (OH) black	SS 2	28	2-4-6 (10)		88	32				
5.0		FAT CLAY, (CH) gray	SS 3	72	3-4-4 (8)	3.0	96	27				
6.0		Bottom of borehole at 6.0 feet.										

BORING NUMBER SB-2

DATE STARTED 9/10/15 COMPLETED 9/10/15

GROUND ELEVATION _____ HOLE SIZE 6 1/2 inches

DRILLING CONTRACTOR NTI

GROUND WATER LEVELS:

DRILLING METHOD 3 1/4 in H.S.A

AT TIME OF DRILLING --- No water encountered

LOGGED BY Chris Nelson CHECKED BY Josh Holmes

AT END OF DRILLING ---

NOTES _____

AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		6" of Asphalt	AU 1									
1.5		BURIED TOPSOIL, ORGANIC CLAY, (OH) black	SS 2	33	4-5-5 (10)		88	32				
5.3		FAT CLAY, (CH) gray, medium, transition	SS 3	78	3-4-4 (8)	3.1	97	27				
6.0		Bottom of borehole at 6.0 feet.										



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CLIENT Reiles Acres

PROJECT NAME Reiles Acres Paving

PROJECT NUMBER 15-13215.100

PROJECT LOCATION Reiles Acres, North Dakota

BORING NUMBER SB-3

DATE STARTED 9/10/15 COMPLETED 9/10/15

GROUND ELEVATION _____ HOLE SIZE 6 1/2 inches

DRILLING CONTRACTOR NTI

GROUND WATER LEVELS:

DRILLING METHOD 3 1/4 in H.S.A

AT TIME OF DRILLING --- No water encountered

LOGGED BY Chris Nelson CHECKED BY Josh Holmes

AT END OF DRILLING ---

NOTES _____

AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		6" of Asphalt	AU 1									
1.5		FILL, GRAVELLY SAND, brown										
		BURIED TOPSOIL, ORGANIC CLAY, (OH) black										
			SS 2	56	4-4-6 (10)			30				
5		FAT CLAY, (CH) black to dark gray, transition	SS 3	78	3-3-4 (7)		95	34				
6.0												
Bottom of borehole at 6.0 feet.												

BORING NUMBER SB-4

DATE STARTED 9/10/15 COMPLETED 9/10/15

GROUND ELEVATION _____ HOLE SIZE 6 1/2 inches

DRILLING CONTRACTOR NTI

GROUND WATER LEVELS:

DRILLING METHOD 3 1/4 in H.S.A

AT TIME OF DRILLING --- No water encountered

LOGGED BY Chris Nelson CHECKED BY Josh Holmes

AT END OF DRILLING ---

NOTES _____

AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.4		5" of Asphalt	AU 1									
1.5		FILL, SAND, black, trace gravel										
		TOPSOIL, ORGANIC CLAY, (OH) black										
			SS 2	22	4-4-6 (10)		99	22				
5		FAT CLAY, (CH) dark gray to black, medium, transition	SS 3	56	3-3-5 (8)	2.3	91	31				
6.0												
Bottom of borehole at 6.0 feet.												



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3522 4th Ave S
 Fargo, ND 58103-2224
 Telephone: 701-232-1822

CLIENT Reiles Acres

PROJECT NAME Reiles Acres Paving

PROJECT NUMBER 15-13215.100

PROJECT LOCATION Reiles Acres, North Dakota

BORING NUMBER SB-5

DATE STARTED 9/10/15 COMPLETED 9/10/15

GROUND ELEVATION _____ HOLE SIZE 6 1/2 inches

DRILLING CONTRACTOR NTI

GROUND WATER LEVELS:

DRILLING METHOD 3 1/4 in H.S.A

AT TIME OF DRILLING --- No water encountered

LOGGED BY Chris Nelson CHECKED BY Josh Holmes

AT END OF DRILLING ---

NOTES _____

AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.4		5" of Asphalt	AU 1									
1.5		FILL, SAND, black, trace gravel										
		FILL, SANDY CLAY, black to brown, trace gravel	SS 2	17	4-2-4 (6)							
5			SS 3	33	3-3-3 (6)			16				
6.0												
Bottom of borehole at 6.0 feet.												

BORING NUMBER SB-6

DATE STARTED 9/10/15 COMPLETED 9/10/15

GROUND ELEVATION _____ HOLE SIZE 6 1/2 inches

DRILLING CONTRACTOR NTI

GROUND WATER LEVELS:

DRILLING METHOD 3 1/4 in H.S.A

AT TIME OF DRILLING --- No water encountered

LOGGED BY Chris Nelson CHECKED BY Josh Holmes

AT END OF DRILLING ---

NOTES _____

AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
		FILL, GRAVEL, brown	AU 1									
1.5		FILL, SANDY CLAY, black to brown, with gravel	SS 2	33	3-3-3 (6)							
4.0												
5		FILL, CLAY, brown to black	SS 3	67	2-2-4 (6)	2.4	99	29				
6.0												
Bottom of borehole at 6.0 feet.												



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 Fargo, ND 58103-2224
 Telephone: 701-232-1822

CLIENT Reiles Acres

PROJECT NAME Reiles Acres Paving

PROJECT NUMBER 15-13215.100

PROJECT LOCATION Reiles Acres, North Dakota

BORING NUMBER SB-7

DATE STARTED 9/10/15 COMPLETED 9/10/15

GROUND ELEVATION _____ HOLE SIZE 6 1/2 inches

DRILLING CONTRACTOR NTI

GROUND WATER LEVELS:

DRILLING METHOD 3 1/4 in H.S.A

AT TIME OF DRILLING --- No water encountered

LOGGED BY Chris Nelson CHECKED BY Josh Holmes

AT END OF DRILLING ---

NOTES _____

AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.4		5" of Asphalt	AU 1									
1.5		FILL, SAND, black, trace gravel										
		FILL, SANDY CLAY, brown to gray, trace gravel										
4.0			SS 2	56	3-4-6 (10)	3.9	91	30				
5												
6.0		FAT CLAY, (CH) light brown to light gray, medium, with lenses of silt	SS 3	89	2-3-3 (6)	2.1	85	36				
Bottom of borehole at 6.0 feet.												

BORING NUMBER SB-8

DATE STARTED 9/10/15 COMPLETED 9/10/15

GROUND ELEVATION _____ HOLE SIZE 6 1/2 inches

DRILLING CONTRACTOR NTI

GROUND WATER LEVELS:

DRILLING METHOD 3 1/4 in H.S.A

AT TIME OF DRILLING --- No water encountered

LOGGED BY Chris Nelson CHECKED BY Josh Holmes

AT END OF DRILLING ---

NOTES _____

AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.4		5" of Asphalt	AU 1									
1.5		FILL, CLAYEY SAND, black										
		BURIED TOPSOIL, ORGANIC CLAY, (OH) black										
3.5			SS 2	56	4-3-5 (8)							
5												
6.0		FAT CLAY, (CH) gray to brown, medium	SS 3	56	3-3-4 (7)	2.4	101	30				
Bottom of borehole at 6.0 feet.												



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3522 4th Ave S
 Fargo, ND 58103-2224
 Telephone: 701-232-1822

CLIENT Reiles Acres

PROJECT NAME Reiles Acres Paving

PROJECT NUMBER 15-13215.100

PROJECT LOCATION Reiles Acres, North Dakota

BORING NUMBER SB-9

DATE STARTED 9/10/15 COMPLETED 9/10/15

GROUND ELEVATION _____ HOLE SIZE 6 1/2 inches

DRILLING CONTRACTOR NTI

GROUND WATER LEVELS:

DRILLING METHOD 3 1/4 in H.S.A

AT TIME OF DRILLING --- No water encountered

LOGGED BY Chris Nelson CHECKED BY Josh Holmes

AT END OF DRILLING ---

NOTES _____

AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.5		6" of Asphalt	AU 1									
		FILL, SANDY CLAY, black, with gravel										
3.5		FILL, FAT CLAY, brown to gray	SS 2	44	3-4-6 (10)							
5												
6.0			SS 3	56	2-3-4 (7)	2.5	95	30				
Bottom of borehole at 6.0 feet.												

BORING NUMBER SB-10

DATE STARTED 9/10/15 COMPLETED 9/10/15

GROUND ELEVATION _____ HOLE SIZE 6 1/2 inches

DRILLING CONTRACTOR NTI

GROUND WATER LEVELS:

DRILLING METHOD 3 1/4 in H.S.A

AT TIME OF DRILLING --- No water encountered

LOGGED BY Chris Nelson CHECKED BY Josh Holmes

AT END OF DRILLING ---

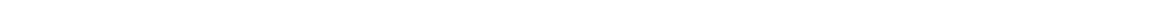
NOTES _____

AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
0.4		5" of Asphalt	AU 1									
		FILL, SANDY GRAVEL, dark brown										
2.8		BURIED TOPSOIL, ORGANIC CLAY, (OH) black to gray, transition	SS 2	67	2-3-4 (7)	2.9	94	31				
3.5		FAT CLAY, (CH) brown to gray, medium										
5												
6.0			SS 3	78	2-2-3 (5)	2.0	95	32				
Bottom of borehole at 6.0 feet.												

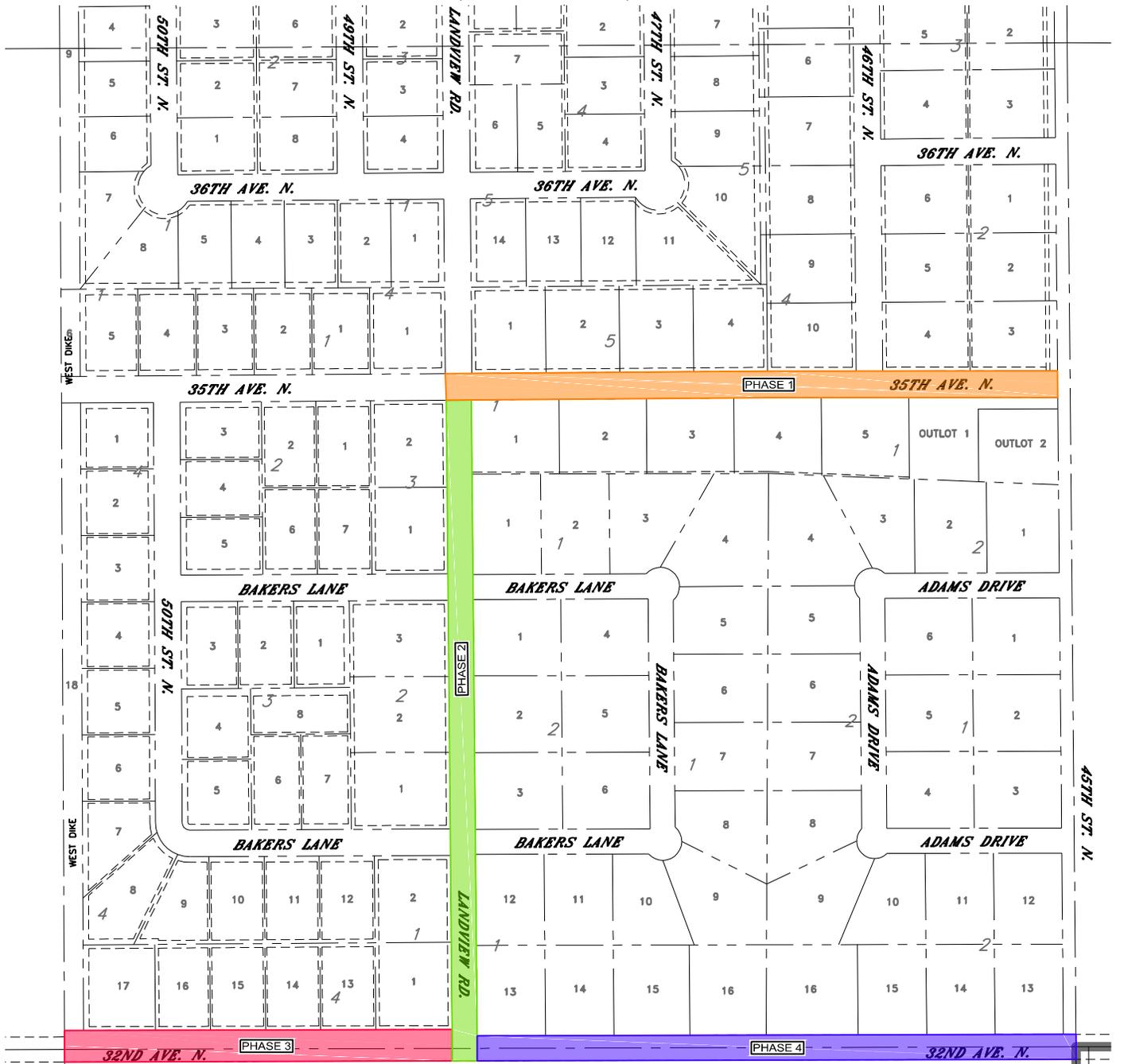
Appendix B

Project Vicinity & Phasing Map

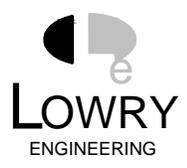
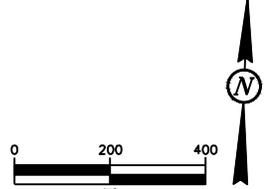


VICINITY-PHASING MAP

ROADWAY FEASIBILITY STUDY
REILE'S ACRES, CASS COUNTY, NORTH DAKOTA



- PHASE 1
- PHASE 2
- PHASE 3
- PHASE 4



3330 FIECHTNER DRIVE - SUITE 102
FARGO, NORTH DAKOTA 58103

**ROADWAY FEASIBILITY STUDY
REILE'S ACRES
CASS COUNTY, NORTH DAKOTA**

**PRELIMINARY
NOT FOR
CONSTRUCTION**

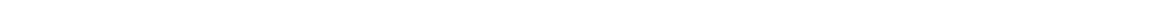
LE JOB #	15016.2
PROJECT DATE:	10/12/2015
DRAWN BY:	RJW
APPROVED BY:	AJT
SHEET:	1 OF 1

**VICINITY
MAP**

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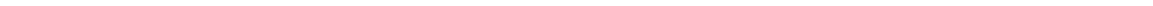
Appendix C

Proposed Roadway Cross-Sections



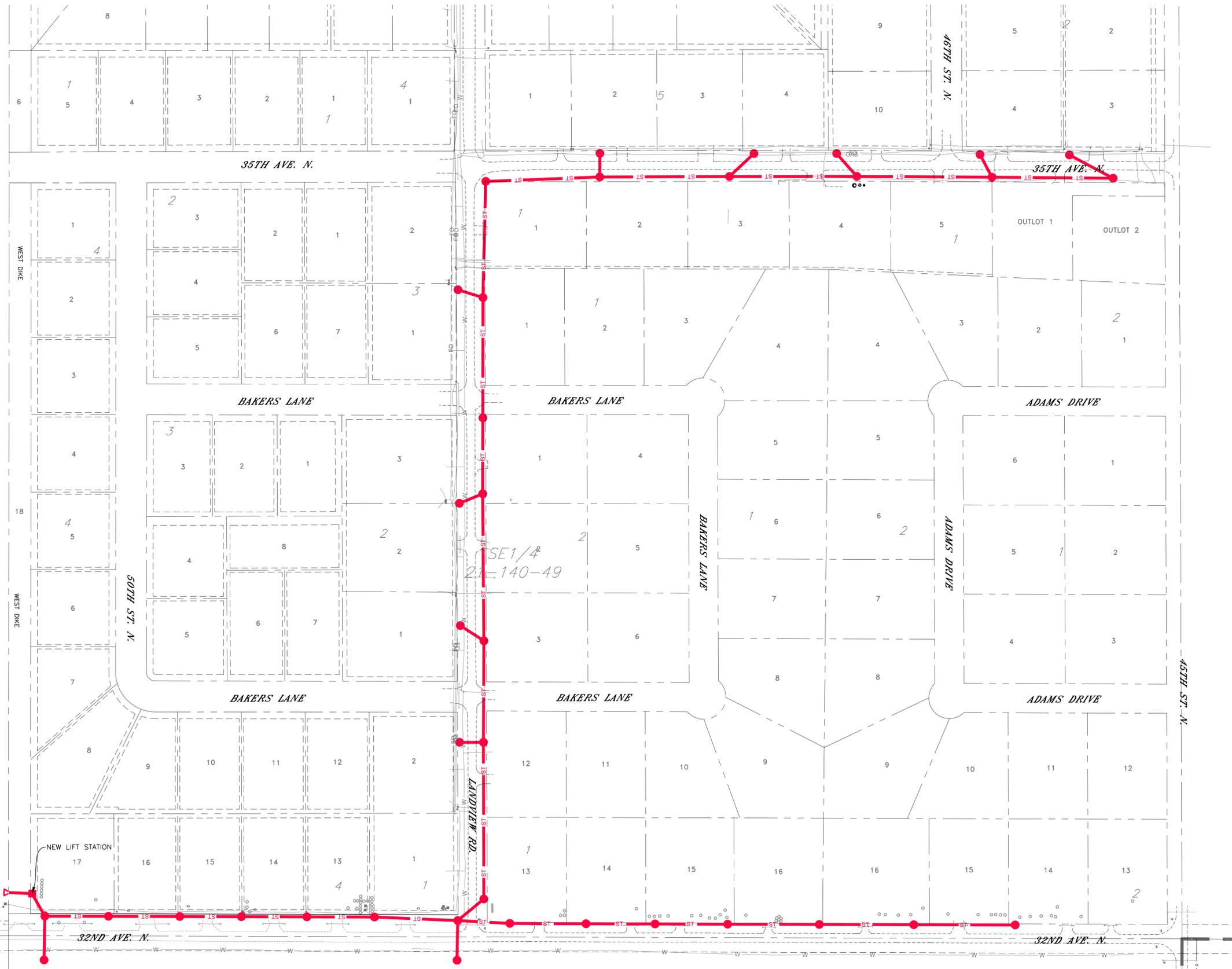
Appendix D

Proposed Preliminary Storm Sewer & Lift Station Layout

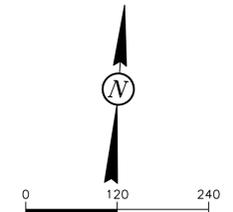


PRELIMINARY STORM LAYOUT

ROADWAY FEASIBILITY STUDY
REILE'S ACRES, NORTH DAKOTA



HORIZONTAL CONTROL:
NAD83 - NORTH DAKOTA STATE PLANES - SOUTH ZONE
INTERNATIONAL FEET - (NAD83-SPC-ND-SIF)
VERTICAL CONTROL:
NGS MONUMENT # G47
NAVD 88 DATUM ELEVATION=893.10'



CALL BEFORE YOU DIG
NORTH DAKOTA
UTILITIES UNDERGROUND LOCATION SERVICE
1-800-795-0555

LOWRY
ENGINEERING
3330 FIECHTNER DRIVE - SUITE 102
FARGO, NORTH DAKOTA 58103



ROADWAY FEASIBILITY STUDY
REILE'S ACRES
CASS COUNTY, NORTH DAKOTA

PRELIMINARY
NOT FOR
CONSTRUCTION

LE JOB #	15016.2
PROJECT DATE:	10/20/2015
CHECKED BY:	RJW
DRAWN BY:	MJA
APPROVED BY:	AJT
SHEET:	1 OF 1

OVERALL LAYOUT
C-1

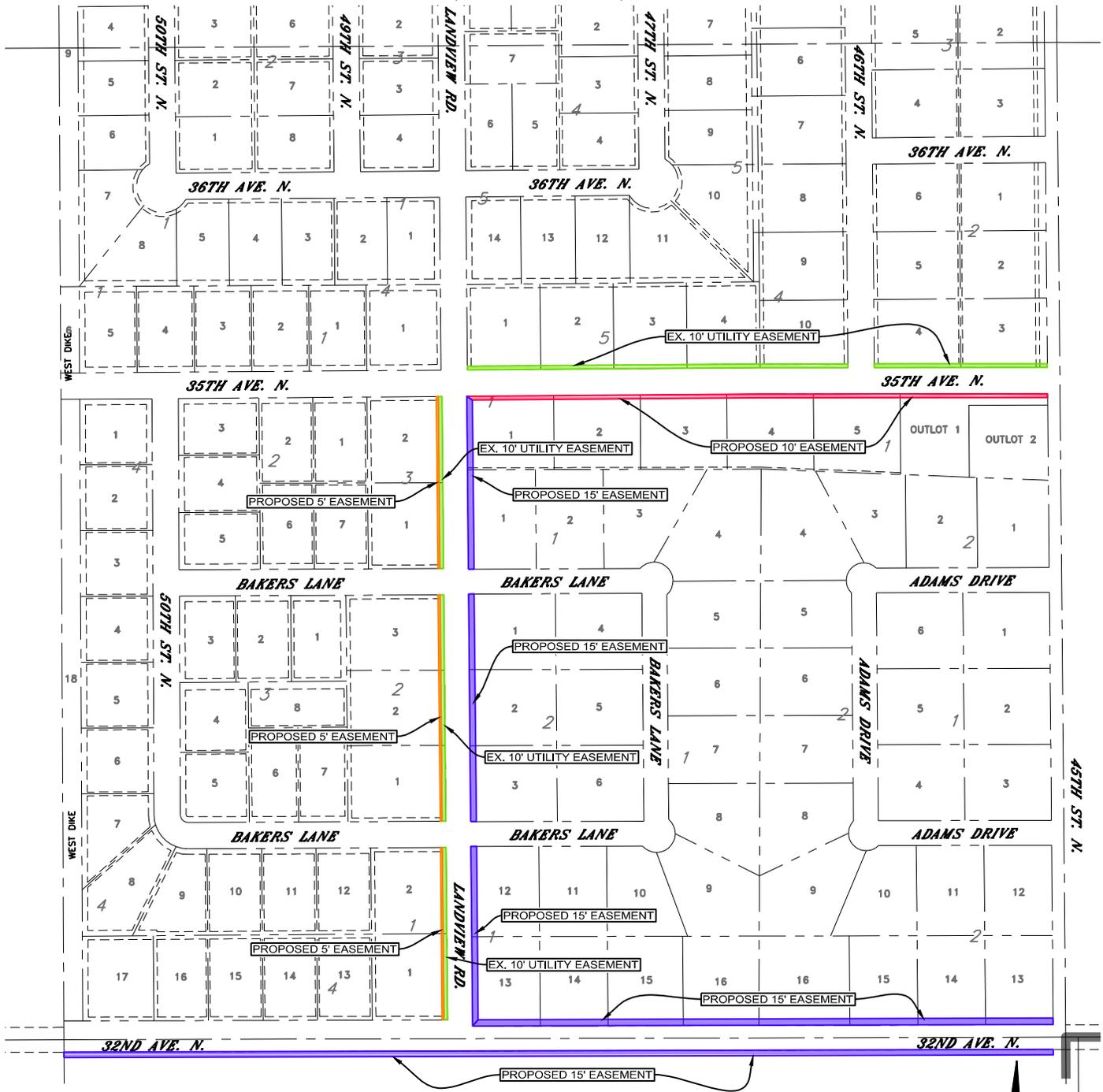
10/22/15 10:36:51 AM Z:\Projects_2015\15016.2 - Reile's Roadway Projects Feasibility Study\Drawings\15016.2_Preliminary Storm.dwg

Appendix E

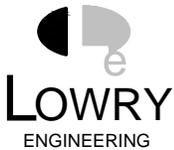
Potential Easement Areas (Construction / Drainage)

PROPOSED EASEMENT MAP

ROADWAY FEASIBILITY STUDY
REILE'S ACRES, CASS COUNTY, NORTH DAKOTA



- PROPOSED 5 FOOT EASEMENT
- PROPOSED 10 FOOT EASEMENT
- PROPOSED 15 FOOT EASEMENT
- EXISTING 10' UTILITY EASEMENT
(MAY REQUIRE COORDINATION WITH DRY UTILITY COMPANIES)



3330 FIECHTNER DRIVE - SUITE 102
FARGO, NORTH DAKOTA 58103

**ROADWAY FEASIBILITY STUDY
REILE'S ACRES
CASS COUNTY, NORTH DAKOTA**

**PRELIMINARY
NOT FOR
CONSTRUCTION**

LE JOB #	15016.2
PROJECT DATE:	10/12/2015
DRAWN BY:	RJW
APPROVED BY:	AJT
SHEET:	1 OF 1

**EASEMENT
MAP**

Appendix F Pavement Failure Examples



Fatigue Cracking (“Alligating”)



Thermal Cracking

Appendix G

Construction Cost Estimates

**REILE'S ROADWAY PROJECT
CASS COUNTY, NORTH DAKOTA**

Owner: City of Reile's Acres
4635 35th Avenue North
Reile's Acres, ND 58102
PH: 701-364-2827

Civil Engineer: Lowry Engineering
3330 Fiechtner Dr. Ste. 102
Fargo, ND 58103
PH: 701-235-0199

35th Ave N- PRELIMINARY COST ESTIMATE

<u>No.</u>	<u>Bid Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Total Price</u>
<u>OPTION 1-OVERLAY & WIDENING</u>					
ROADWAY					
1	Gravel-NDDOT Class 5 - 6"	900	CY	\$40.00	\$36,000.00
2	NDDOT Class 29 HBP	1,050	TON	\$90.00	\$94,500.00
3	Geotextile Fabric	2,000	SY	\$2.00	\$4,000.00
4	Common Excavation	10,000	CY	\$4.00	\$40,000.00
5	Import	3,000	CY	\$8.00	\$24,000.00
6	New Concrete Drive	100	SY	\$50.00	\$5,000.00
7	New Asphalt Drive	100	SY	\$40.00	\$4,000.00
8	Patch Ex. Pavement	200	SY	\$50.00	\$10,000.00
ROADWAY ITEMS TOTAL:					\$217,500.00
REMOVAL					
9	Topsoil Strip, Salvage and Replace (6" assumed)	1600	CY	\$4.00	\$6,400.00
10	Sawcut & Remove Ex. Concrete Drive	130	SY	\$10.00	\$1,300.00
11	Sawcut & Remove Ex. Asphalt Drive	160	SY	\$10.00	\$1,600.00
12	Dry Utility Relocation	1	LS	\$30,000.00	\$30,000.00
REMOVAL ITEMS TOTAL:					\$39,300.00
10% Contingencies					\$25,680.00
TOTAL BID OPTION 1:					\$282,480.00

<u>No.</u>	<u>Bid Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Total Price</u>
<u>OPTION 2-RECONSTRUCTION</u>					
ROADWAY					
1	Gravel-NDDOT Class 5 - 6"	1,300	CY	\$40.00	\$52,000.00
2	NDDOT Class 29 HBP	1,500	TON	\$90.00	\$135,000.00
3	Geotextile Fabric	6,000	SY	\$2.00	\$12,000.00
4	Common Excavation	10,000	CY	\$4.00	\$40,000.00
5	Import	3,000	CY	\$8.00	\$24,000.00
6	New Concrete Drive	100	SY	\$50.00	\$5,000.00
7	New Asphalt Drive	100	SY	\$40.00	\$4,000.00
ROADWAY ITEMS TOTAL:					\$272,000.00
REMOVAL					
8	Topsoil Strip, Salvage and Replace (6" assumed)	1500	CY	\$4.00	\$6,000.00
9	Removal of Ex. Asphalt Pavement & Base	3200	SY	\$9.00	\$28,800.00
10	Sawcut & Remove Ex. Concrete Drive	130	SY	\$10.00	\$1,300.00
11	Sawcut & Remove Ex. Asphalt Drive	160	SY	\$10.00	\$1,600.00
12	Dry Utility Relocation	1	LS	\$30,000.00	\$30,000.00
REMOVAL ITEMS TOTAL:					\$67,700.00
10% Contingencies					\$33,970.00
TOTAL BID OPTION 2:					\$373,670.00

REILE'S ROADWAY PROJECT
CASS COUNTY, NORTH DAKOTA

Owner: City of Reile's Acres
 4635 35th Avenue North
 Reile's Acres, ND 58102
 PH: 701-364-2827

Civil Engineer: Lowry Engineering
 3330 Fiechtner Dr. Ste. 102
 Fargo, ND 58103
 PH: 701-235-0199

LANDVIEW ROAD-COST ESTIMATE

<u>No.</u>	<u>Bid Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Total Price</u>
<u>OPTION 1-OVERLAY & WIDENING</u>					
ROADWAY					
1	Gravel-NDDOT Class 5 - 6"	800	CY	\$40.00	\$32,000.00
2	NDDOT Class 29 HBP	1,200	TON	\$90.00	\$108,000.00
3	Geotextile Fabric	2,000	SY	\$2.00	\$4,000.00
4	Common Excavation	10,000	CY	\$4.00	\$40,000.00
5	Import	3,000	CY	\$8.00	\$24,000.00
6	New Concrete Drive	50	SY	\$50.00	\$2,500.00
7	New Asphalt Drive	100	SY	\$40.00	\$4,000.00
8	Patch Ex. Pavement	400	SY	\$50.00	\$20,000.00
ROADWAY ITEMS TOTAL:					\$234,500.00
REMOVAL					
9	Topsoil Strip, Salvage and Replace (6" assumed)	2200	CY	\$4.00	\$8,800.00
10	Sawcut & Remove Ex. Concrete Drive	50	SY	\$10.00	\$500.00
11	Sawcut & Remove Ex. Asphalt Drive	150	SY	\$10.00	\$1,500.00
12	Dry Utility Relocation	1	LS	\$30,000.00	\$30,000.00
REMOVAL ITEMS TOTAL:					\$40,800.00
10% Contingencies					\$27,530.00
TOTAL BID OPTION 1:					\$302,830.00

<u>No.</u>	<u>Bid Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Total Price</u>
<u>OPTION 2-RECONSTRUCTION</u>					
ROADWAY					
1	Gravel-NDDOT Class 5 - 6"	1,400	CY	\$40.00	\$56,000.00
2	NDDOT Class 29 HBP	1,600	TON	\$90.00	\$144,000.00
3	Geotextile Fabric	6,500	SY	\$2.00	\$13,000.00
4	Common Excavation	10,000	CY	\$4.00	\$40,000.00
5	Import	3,000	CY	\$8.00	\$24,000.00
6	New Concrete Drive	50	SY	\$50.00	\$2,500.00
7	New Asphalt Drive	100	SY	\$40.00	\$4,000.00
ROADWAY ITEMS TOTAL:					\$283,500.00
REMOVAL					
8	Topsoil Strip, Salvage and Replace (6" assumed)	2100	CY	\$4.00	\$8,400.00
9	Removal of Ex. Asphalt Pavement & Base	3800	SY	\$9.00	\$34,200.00
10	Sawcut & Remove Ex. Concrete Drive	50	SY	\$10.00	\$500.00
11	Sawcut & Remove Ex. Asphalt Drive	150	SY	\$10.00	\$1,500.00
12	Dry Utility Relocation	1	LS	\$30,000.00	\$30,000.00
REMOVAL ITEMS TOTAL:					\$74,600.00
10% Contingencies					\$35,810.00
TOTAL BID OPTION 2:					\$393,910.00

**REILE'S ROADWAY PROJECT
CASS COUNTY, NORTH DAKOTA**

Owner: City of Reile's Acres
4635 35th Avenue North
Reile's Acres, ND 58102
PH: 701-364-2827

Civil Engineer: Lowry Engineering
3330 Fiechtner Dr. Ste. 102
Fargo, ND 58103
PH: 701-235-0199

32ND AVE (WEST OF LANDVIEW)-COST ESTIMATE

<u>No.</u>	<u>Bid Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Total Price</u>
<u>OPTION 1-OVERLAY & WIDENING</u>					
ROADWAY					
1	NDDOT Class 29 HBP	1,000	TON	\$90.00	\$90,000.00
2	Geotextile Fabric	3,700	SY	\$2.00	\$7,400.00
3	Common Excavation	10,000	CY	\$4.00	\$40,000.00
4	Import	3,000	CY	\$8.00	\$24,000.00
ROADWAY ITEMS TOTAL:					\$161,400.00
REMOVAL					
5	Topsoil Strip, Salvage and Replace (6" assumed)	1300	CY	\$4.00	\$5,200.00
6	Remove 4" Ex. Gravel, Replace on Shoulders	400	CY	\$30.00	\$12,000.00
7	Dry Utility Relocation	1	LS	\$30,000.00	\$30,000.00
REMOVAL ITEMS TOTAL:					\$47,200.00
10% Contingencies					\$20,860.00
TOTAL BID OPTION 1:					\$229,460.00

**REILE'S ROADWAY PROJECT
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3330 Fiechtner Dr. Ste. 102
Fargo, ND 58103
PH: 701-235-0199

32nd AVE (EAST OF LANDVIEW)-COST ESTIMATE

<u>No.</u>	<u>Bid Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Total Price</u>
<u>OPTION 1-OVERLAY & WIDENING</u>					
ROADWAY					
1	Gravel-NDDOT Class 5 - 6"	650	CY	\$40.00	\$26,000.00
2	NDDOT Class 29 HBP	1,000	TON	\$90.00	\$90,000.00
3	Geotextile Fabric	1,600	SY	\$2.00	\$3,200.00
4	Common Excavation	10,000	CY	\$4.00	\$40,000.00
5	Import	3,000	CY	\$8.00	\$24,000.00
6	New Asphalt Drive	150	SY	\$40.00	\$6,000.00
7	Patch Ex. Pavement	400	SY	\$50.00	\$20,000.00
ROADWAY ITEMS TOTAL:					\$209,200.00
REMOVAL					
8	Topsoil Strip, Salvage and Replace (6" assumed)	1700	CY	\$4.00	\$6,800.00
9	Sawcut & Remove Ex. Asphalt Drive	180	SY	\$10.00	\$1,800.00
10	Dry Utility Relocation	1	LS	\$30,000.00	\$30,000.00
REMOVAL ITEMS TOTAL:					\$38,600.00
10% Contingencies					\$24,780.00
TOTAL BID OPTION 1:					\$272,580.00

<u>No.</u>	<u>Bid Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Total Price</u>
<u>OPTION 2-RECONSTRUCTION</u>					
ROADWAY					
1	Gravel-NDDOT Class 5 - 6"	1,200	CY	\$40.00	\$48,000.00
2	NDDOT Class 29 HBP	1,400	TON	\$90.00	\$126,000.00
3	Geotextile Fabric	5,700	SY	\$2.00	\$11,400.00
4	Common Excavation	10,000	CY	\$4.00	\$40,000.00
5	Import	3,000	CY	\$8.00	\$24,000.00
6	New Asphalt Drive	120	SY	\$40.00	\$4,800.00
ROADWAY ITEMS TOTAL:					\$254,200.00
REMOVAL					
7	Topsoil Strip, Salvage and Replace (6" assumed)	1600	CY	\$4.00	\$6,400.00
8	Removal of Ex. Asphalt Pavement & Base	3500	SY	\$9.00	\$31,500.00
9	Sawcut & Remove Ex. Asphalt Drive	180	LF	\$10.00	\$1,800.00
10	Dry Utility Relocation	1	LS	\$30,000.00	\$30,000.00
					\$69,700.00
10% Contingencies					\$32,390.00
TOTAL BID OPTION 2:					\$356,290.00

**REILE'S ROADWAY PROJECT
CASS COUNTY, NORTH DAKOTA**

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4635 35th Avenue North
Reile's Acres, ND 58102
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Civil Engineer: Lowry Engineering
3330 Fiechtner Dr. Ste. 102
Fargo, ND 58103
PH: 701-235-0199

STORM SEWER-OPTION 1-COST ESTIMATE

<u>No.</u>	<u>Bid Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Total Price</u>
<u>NUISANCE WATER DESIGN</u>					
35TH AVE N					
1	12" Yard Inlet	11	EA	<u>\$2,000.00</u>	<u>\$22,000.00</u>
2	12" Storm Pipe	1,796	LF	<u>\$30.00</u>	<u>\$53,880.00</u>
3	Remove and Replace Culvert	264	LF	<u>\$40.00</u>	<u>\$10,560.00</u>
4	New Flared End Section	18	EA	<u>\$250.00</u>	<u>\$4,500.00</u>
35th Ave N ITEMS TOTAL:					<u>\$90,940.00</u>
LANDVIEW ROAD					
1	12" Yard Inlet	10	EA	<u>\$2,000.00</u>	<u>\$20,000.00</u>
2	12" Storm Pipe	1,939	LF	<u>\$30.00</u>	<u>\$58,170.00</u>
3	Remove and Replace Culvert	121	LF	<u>\$40.00</u>	<u>\$4,840.00</u>
4	New Flared End Section	10	EA	<u>\$250.00</u>	<u>\$2,500.00</u>
Landview Road ITEMS TOTAL:					<u>\$85,510.00</u>
32ND AVE N (WEST OF LANDVIEW)					
1	12" Yard Inlet	9	EA	<u>\$2,000.00</u>	<u>\$18,000.00</u>
2	12" Storm Pipe	1,250	LF	<u>\$30.00</u>	<u>\$37,500.00</u>
3	Lift Station	1	EA	<u>\$30,000.00</u>	<u>\$30,000.00</u>
4	Remove and Replace Culvert	243	LF	<u>\$40.00</u>	<u>\$9,720.00</u>
5	New Flared End Section	12	EA	<u>\$250.00</u>	<u>\$3,000.00</u>
32nd Ave N (West of Landview) ITEMS TOTAL:					<u>\$98,220.00</u>
32ND AVE N (EAST OF LANDVIEW)					
1	12" Yard Inlet	7	EA	<u>\$2,000.00</u>	<u>\$14,000.00</u>
2	12" Storm Pipe	1,266	LF	<u>\$30.00</u>	<u>\$37,980.00</u>
3	Remove and Replace Culvert	177	LF	<u>\$40.00</u>	<u>\$7,080.00</u>
4	New Flared End Section	16	EA	<u>\$250.00</u>	<u>\$4,000.00</u>
32nd Ave N (East of Landview) ITEMS TOTAL:					<u>\$63,060.00</u>
10% Contingencies					<u>\$33,773.00</u>
TOTAL BID OPTION 1:					<u>\$371,503.00</u>

**REILE'S ROADWAY PROJECT
CASS COUNTY, NORTH DAKOTA**

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4635 35th Avenue North
Reile's Acres, ND 58102
PH: 701-364-2827

Civil Engineer: Lowry Engineering
3330 Fiechtner Dr. Ste. 102
Fargo, ND 58103
PH: 701-235-0199

STORM SEWER-OPTION 2-COST ESTIMATE

<u>No.</u>	<u>Bid Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Total Price</u>
<u>FIVE YEAR STORM DESIGN</u>					
35TH AVE N					
1	27" Manhole	5	EA	\$2,000.00	\$10,000.00
2	48" Manhole	5	EA	\$4,000.00	\$20,000.00
3	60" Manhole	1	EA	\$5,000.00	\$5,000.00
4	12" Storm Pipe	370	LF	\$30.00	\$11,100.00
5	15" Storm Pipe	275	LF	\$35.00	\$9,625.00
6	18" Storm Pipe	307	LF	\$40.00	\$12,280.00
7	24" Storm Pipe	843	LF	\$50.00	\$42,150.00
8	Abandon/Remove Existing Culverts	9	EA	\$500.00	\$4,500.00
35th Ave N ITEMS TOTAL:					\$114,655.00
LANDVIEW ROAD					
1	27" Manhole	4	EA	\$2,000.00	\$8,000.00
2	60" Manhole	5	EA	\$5,000.00	\$25,000.00
3	72" Manhole	1	EA	\$7,000.00	\$7,000.00
4	12" Storm Pipe	236	LF	\$30.00	\$7,080.00
5	27" Storm Pipe	708	LF	\$55.00	\$38,940.00
6	30" Storm Pipe	563	LF	\$60.00	\$33,780.00
7	36" Storm Pipe	432	LF	\$80.00	\$34,560.00
8	Abandon/Remove Existing Culverts	5	EA	\$500.00	\$2,500.00
Landview Road ITEMS TOTAL:					\$156,860.00

<u>No.</u>	<u>Bid Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Total Price</u>
32nd AVE N (WEST of LANDVIEW)					
1	48" Manhole	2	EA	\$4,000.00	\$8,000.00
2	72" Manhole	7	EA	\$7,000.00	\$49,000.00
3	Lift Station	1	EA	\$100,000.00	\$100,000.00
4	21" Storm Pipe	190	LF	\$45.00	\$8,550.00
5	42" Storm Pipe	344	LF	\$90.00	\$30,960.00
6	48" Storm Pipe	655	LF	\$100.00	\$65,500.00
7	Abandon/Remove Existing Culverts	6	EA	\$500.00	\$3,000.00
32nd Ave N (West of Landview) ITEMS TOTAL:					\$265,010.00
32nd AVE N (EAST of LANDVIEW)					
1	27" Manhole	1	EA	\$2,000.00	\$2,000.00
2	48" Manhole	6	EA	\$4,000.00	\$24,000.00
3	12" Storm Pipe	230	LF	\$30.00	\$6,900.00
4	15" Storm Pipe	423	LF	\$35.00	\$14,805.00
5	18" Storm Pipe	322	LF	\$40.00	\$12,880.00
6	21" Storm Pipe	292	LF	\$45.00	\$13,140.00
7	Abandon/Remove Existing Culverts	8	EA	\$500.00	\$4,000.00
32nd Ave N (East of Landview) ITEMS TOTAL:					\$77,725.00
10% Contingencies					\$61,425.00
TOTAL BID OPTION 2:					\$675,675.00