Town of Edson

Edson Wastewater Treatment Plant Upgrade – Geotechnical Investigation and Recommendations – Final

Prepared by:

AECOM
101 – 18817 Stony Plain Road NW 780 486 7000 tel
Edmonton, AB, Canada T5S 0C2 780 486 7070 fax
www.aecom.com

Project Number:

60330572 (401)

Date:

December 19, 2014

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AECOM

AECOM
101 – 18817 Stony Plain Road NW
Edmonton, AB, Canada T5S 0C2
www.aecom.com

780 486 7000 tel
780 486 7070 fax

December 22, 2014

Dawit Solomon, M.Sc., P.Eng.
Director of Engineering
Town of Edson
605 – 50 Street
Edson, AB T7E 1T7

Dear Mr. Solomon:

Project No: **60330572 (401)**

Regarding: **Edson Wastewater Treatment Plant Upgrade – Geotechnical Investigation and Recommendations – Final**

AECOM is pleased to submit our final report presenting the detailed geotechnical investigation and recommendations for the design of the proposed wastewater treatment plant upgrade in Edson, Alberta.

Should you have any questions or require additional information please contact the undersigned at (780) 486-7905.

Sincerely,
AECOM Canada Ltd.

Faris Alobaidy, M.Sc., P.Eng.
Senior Geotechnical Engineer
faris.alobaidy@aecom.com

FA:
Encl.

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Revision Log

Revision #	Revised By	Date	Issue / Revision Description
A	Muhammad Raja	November 14, 2014	Draft
B	F. Alobaidy / M. Raja	December 19, 2014	Draft 1

AECOM Signatures

Report Prepared By:

Muhammad Raja, E.I.T.
Junior Geotechnical Engineer

F. ALOBAIDY
December 22 2014

Report Reviewed By:

Faris Alobaidy, M.Sc., P.Eng.
Senior Geotechnical Engineer

PERMIT TO PRACTICE
AECOM CANADA LTD.
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1. Introduction

AECOM previously provided a Preliminary Design Report for the Town of Edson's wastewater treatment plant (WWTP) upgrade in March of this year. The report recommended a conventional activated sludge process based on a combined treatment unit where the bioreactor is in the annular space around the secondary clarifier complete with headworks providing fine screening and grit removal.

In response to the completion of finalized structure positions on the site, AECOM performed a geotechnical investigation to supplement the final design phase by drilling five testholes at specific structures locations (Headworks station, combined treatment unit, pump station and pipeline). The locations of the testholes are presented on Figure 1 in Appendix A.

This geotechnical report provides a summary of the geotechnical investigation carried out at the site and the encountered subsurface conditions. Geotechnical recommendations for the design and construction of the proposed upgrade are also provided.

1.1 Scope of Work

This geotechnical report addresses the following:

- Summary of work activities
- Location plan
- Detailed testhole records and laboratory test results
- General description of subsurface soil and groundwater conditions
- Foundation types with detailed design parameters
- Recommendations for excavation and backfill
- Utility trench preparation and backfill requirements
- Potential for corrosion and sulphate attack on construction material
- Gravel pavement structure for construction of the parking lot and access roads
- Frost design considerations
- Dewatering.

2. Methodology

2.1 Field Program

The geotechnical investigation program consisted of drilling five testholes within the future upgrade area. Figure 1 summarizes the location and depth of these testholes. Testholes TH14-04 and TH14-05 were drilled to depths of 5.8 metres below ground surface (mBGS) where the inlet pipe will be installed. Testhole TH14-03 was drilled to a depth of 19.50 mBGS at the proposed headworks station location. Testhole TH14-02 was drilled to a depth of 19.50 mBGS at the location of the proposed combined treatment unit. TH14-01 was drilled to a depth of 21.03 mBGS close to the location of the proposed treatment unit and headworks station. Due to poor ground conditions (soft clay and high groundwater) and accessibility issues (rig stuck), TH14-01 was moved closer to the treatment unit tanks. It was originally further east from the units.

Alberta One Call was contacted prior to the initiation of the drilling program to locate underground utilities. The testholes were advanced with both solid stem and hollow stem augers using a truck mounted drill rig contracted from Canadian Geological Drilling Inc.

Soil samples were visually classified in the field by AECOM personnel according to the Modified Unified Classification System for Soils. Disturbed grab samples were retrieved from the augers at select locations and Standard Penetration Tests (SPTs) were completed in all of the testholes at regular 1.5 metre (m) intervals. Relatively undisturbed Shelby tube samples were also obtained to determine the undrained shear strength and consolidation properties of the cohesive soil.

Slotted 25 millimetre (mm) standpipe piezometers were installed in all of the testholes to monitor groundwater conditions at the site. Installation details are provided on the testhole logs in Appendix B.

2.2 Laboratory Testing Program

The laboratory testing program consisted of:

- Moisture contents on all soil samples
- Nine Atterberg Limits
- Seven hydrometer (grain size analyses)
- One Consolidation Rebound test
- Six soil chemical tests
- One unconsolidated undrained triaxial test.

Laboratory test results are summarized on the testhole logs and are also included in Appendix C.

3. Subsurface Conditions

3.1 Inlet Pipe

Testholes TH14-04 and TH14-05 were drilled along the proposed inlet pipe alignment. The general soil profile encountered at the site consisted of clay fill underlain by clay. In testhole TH14-05 a layer of organics was encountered between the clay fill and clay layers.

3.1.1 Topsoil

Topsoil was encountered at the surface in testhole TH14-05. The thickness of topsoil was 200 mm. The topsoil was described as organic clay with trace silt, damp, dark brown and contained rootlets.

3.1.2 Clay Fill

Clay fill was encountered at the surface in testhole TH14-04 and underlying the topsoil layer in testhole TH14-05. The clay fill varied from 1.9 to 2.1 m in thickness. The clay fill was silty with trace sand. The clay fill was medium plastic and light to dark brown in colour. The clay fill contained rootlets and organics. In testhole TH14-04 SPT “N” values in the clay fill varied from 7 to 15 blows per 0.3 m, indicating that the clay fill was firm to stiff.

One Atterberg Limit test carried out on a clay fill sample indicated a liquid limit of 41.1% and a plastic limit of 21.7%. Moisture contents ranged from 18.4% to 40%.

3.1.3 Organics

An organic layer of 1.5 m thick was encountered in testhole TH14-05 underlying clay fill. It consisted of wood and peat and was brown to black in colour. An SPT “N” value of 8 blows per 0.3 m within the organic layer indicated a firm to stiff consistency. Moisture content was 31%.

3.1.4 Clay

Clay was encountered underlying the organic layer in testhole TH14-05. The clay was medium plastic, light brown in colour and was moist to wet. Silt pockets were observed with increasing depths. SPT “N” values within the clay layer ranged from 6 to 8 blows per 0.3 m, indicating a firm to stiff consistency.

One Atterberg Limit test carried out on a clay sample indicated a liquid limit of 41.5% and a plastic limit of 22.1%. Moisture contents in the clay ranged from 28.1% to 30.5%.

3.2 Headworks Station

Testhole TH14-03 was drilled at the proposed location for the headworks station. The general soil profile consisted of topsoil, underlain by clay underlain by clay till followed by clay shale. The soil types encountered in the testholes are summarized in the sections below and more details are included on the testhole logs in Appendix B.

3.2.1 Topsoil

Topsoil was encountered at the surface in testhole TH14-03. The topsoil was about 2.1 m thick and contained organic clay, rootlets, trace of silt and was dark brown in colour.

3.2.2 Clay

Clay was encountered underlying the topsoil and extended to 15.2 mBGS. The clay was silty and contained silt pockets and trace organics, and was medium plastic. The clay was grey to green and changed to light brown at 3.0 mBGS and was moist. The clay was sandy at 8.5 mBGS and silty at 10.7 mBGS. Trace gravel and cobbles were encountered at 14.7 mBGS.

SPT ”N” values within the upper 7 m of the clay ranged from 5 to 11 blows per 0.3 m, indicating that the clay was firm to stiff. SPT "N” values below the upper 7 m of the clay ranged from 17 to 31 blows per 0.3 m, indicating that the clay was very stiff to hard.

One Atterberg Limit test carried out on a sample of clay indicated a liquid limit of 40.9% and a plastic limit of 22.6%. Moisture contents in the clay ranged from 21.1% to 40.2%.

3.2.3 Clay Till

Clay till was encountered underlying clay. The clay till contained trace sand, trace silt and trace gravel. The clay till was medium plastic, grey in colour and wet. SPT "N” values of 17 and 29 blows per 0.3 m indicated that the clay till was very stiff.

One Atterberg limit test carried out on a clay till sample indicated a liquid limit of 35% and a plastic limit of 17.8%. Moisture contents in the clay till ranged from 18% to 19.9%.

3.2.4 Clay Shale

Clay shale was encountered underlying the clay till and extended to the testhole termination depth at 19.5 mBGS. The clay shale contained trace sand and was hard and grey in colour. An SPT “N” value of 41 blows per 0.3 m indicated that the clay shale was hard.

3.3 Combined Treatment Unit

Testhole TH14-02 was drilled at the proposed location of the treatment unit. The general soil profile consisted of clay fill, clay followed by clay shale. The soil types encountered in the testholes are summarized in the sections below and more details are included on the testhole logs in Appendix B.

3.3.1 Clay Fill

Clay fill was encountered at the surface and extended to a depth of 4.8 mBGS. The clay fill contained trace silt and trace sand, organics and rootlets. The clay fill was medium plastic and humid, and the colour varied from black brown to grey. Grey seams of clay and wood were observed at 2.2 mBGS and at 3.1 mBGS, respectively. SPT “N” values ranged from 4 to 6 blows per 0.3 m, indicating that the clay fill was soft to firm.

One Atterberg Limit test conducted on a clay fill sample indicated a liquid limit of 42.4% and a plastic limit of 23.4%. Moisture contents in the clay fill ranged from 28.4% to 43%.

3.3.2 Clay

Clay was encountered underlying the clay fill and extended to a depth of 18.2 mBGS. The clay was very silty, sandy with trace gravel. The clay was medium plastic, greenish brown to brown in colour and was moist to wet. The clay was silty at 8.8 mBGS and contained sand pockets at 11.6 mBGS. Trace cobbles were encountered at 15.9 mBGS.

SPT ”N” values varied between 6 and 8 blows per 0.3 m within the upper 7 m of the clay deposit which indicated that the clay was firm to stiff. SPT ”N” values below the upper 7 m of the clay deposit varied between 20 and 59 blows per 0.3 m, indicating that the clay was very stiff to hard.

One Atterberg Limit test conducted on a clay sample indicated a liquid limit of 43.4% and a plastic limit of 21.6%. Moisture contents in the clay ranged from 17.8% to 35.4%.

Consolidation test results on a relatively undisturbed clay sample gave a preconsolidation pressure (Pc) = 450 kPa, compression index (Cc) = 0.332, recompression index (Ccr) = 0.067, initial void ratio (e_0) = 0.87 and initial moisture content = 30.49%. The test was performed as per ASTM D2435.

3.3.3 Clay Shale

Clay shale was encountered underlying clay and extended to the testhole termination depth at 19.5 mBGS. The clay shale contained some sand and trace of gravel and was interbedded with sandstone. The SPT ”N” value of 50 blows per 152 mm indicated auger refusal and very hard clay shale.

3.4 Treatment Unit and Pump Station

Testhole TH14-01 was drilled between the proposed location for the combined treatment units and the pump station. The general soil profile in descending order consisted of topsoil, clay fill, clay, clay till and clay shale. The soil types encountered in the testholes are summarized in the sections below and more details are included on the testhole logs in Appendix B.

3.4.1 Topsoil

Topsoil was encountered at the surface in testhole TH14-01. The topsoil was about 0.25 m thick and contained organics, rootlets, trace of silt and was dark brown in colour.

3.4.2 Clay Fill

Clay fill was encountered below topsoil. The clay fill contained some silt, rootlets and organics. The clay fill was low plastic, dark to light brown and damp. SPT ”N” values ranged from 5 to 7 blows per 0.3 m, indicating the clay fill was firm.

3.4.3 Clay

Clay was encountered underlying clay fill and extended to 17.3 mBGS. The clay was silty with trace sand and trace gravel. The clay was medium plastic, greenish brown and was wet. Sand pockets were encountered at 7.9 mBGS. The clay became very silty at 13.4 mBGS. Trace cobbles were observed at the 11.5 mBGS. The SPT ”N” values ranged from 6 to 23, indicating the clay was firm to very stiff.

Moisture contents in the clay ranged from 17.8% to 45.8%. Atterberg Limit test results indicated liquid limits of 41.8% and 30.2% and plastic limits of 22.7% and 17.5%.

One unconsolidated undrained triaxial compressive strength test carried out on a relatively undisturbed clay sample indicated undrained shear strength of 48.5 kPa.

3.4.4 Clay Till

Clay till was encountered underlying sand. The clay till contained trace sand, some silt and some gravel. The clay till was medium plastic, grey in colour and wet. SPT ”N” values of 24 and 37 blows per 0.3 m indicated that the clay till was very stiff to hard.

3.4.5 Clay Shale

Clay shale was encountered underlying clay and extended to the testhole termination depth at 21.03 mBGS. The clay shale contained trace sand, trace gravel and the SPT ”N” value of 60 blows per 0.3 m indicated that the clay shale was hard.

3.5 Groundwater Conditions

Standpipes were installed in five testholes to assess groundwater conditions in the proposed area. The water levels were measured upon completion of the drilling on November 6, 2014 and December 11, 2014. The groundwater level observations are outlined in Table 1 below. Standpipe installation details are provided in the testhole logs attached in Appendix B.

Table 1: Measured Groundwater Level Depths and Elevations

Testhole No.	Ground Elevation (m)	Groundwater Depths (mBGS) upon Completion	Groundwater Depths (mBGS) on November 6, 2014	Groundwater Elevation (m) on November 6, 2014	Groundwater Depths (mBGS) on December 11, 2014	Groundwater Elevation (m) on December 11, 2014
TH14-01	896.783	12.5	2.18	894.60	2.20	894.58
TH14-02	898.672	10.67	3.31	895.36	3.55	895.12
TH14-03	897.331	9.18	1.92	895.41	2.21	895.12
TH14-04	898.703	-	1.44	897.26	1.78	896.92
TH14-05	897.849	5.6	1.63	896.22	1.49	896.36

It should be noted that the above groundwater observations are relatively short term and may not be representative of stable groundwater levels. Groundwater levels are subject to change depending on seasonal and environmental factors such as precipitation, and therefore; actual groundwater levels at the time of construction may vary from those reported in this investigation. Further monitoring is recommended to establish stable groundwater levels.

3.6 Frost Penetration

The depth of frost penetration in the Edson area, for bare ground with no snow cover and a 50 year return Air Freezing Index (AFI) of 2,350°C days, is estimated to be 2.5 m for cohesive materials and 3.5 m for cohesionless materials.

3.7 Soil Chemistry

Electrochemical tests were conducted on soil samples from testholes TH14-01, TH14-02, TH14-03 and TH14-04 to determine water soluble sulphate content, chloride content, pH and resistivity. A summary of test results, expected degree of corrosion, potential for sulphate attack of the subsurface soils are presented in Table 2.

Table 2: Electrochemical Test Results

Testhole No.	Depth (mBGS)	Soil Type	pH	Resistivity (ohm-cm)	Chloride Content (%)	Sulphate Content (%)	Expected Degree of Corrosion	Potential for Sulphate Attack
TH14-01	5.0	Clay	7.82	3010	0.0011	0.0014	Corrosive	Low
TH14-02	2.4	Clay Fill	6.83	670	0.0016	0.0072	Extremely Corrosive	Low
	11.2	Silt	7.62	1270	0.0010	0.019	Highly Corrosive	Low
TH14-03	3.4	Clay	7.71	3490	0.0011	0.00089	Corrosive	Low
	13.2	Sandy Silt	7.42	1010	0.00067	0.015	Highly Corrosive	Low
TH14-04	3.4	Silty Clay	7.74	3560	0.00074	0.0016	Corrosive	Low

4. Discussions and Recommendations

4.1 General Site Assessment

It is our understanding that the proposed combined treatment unit structure will be a reinforced concrete structure with the foundation base at an approximate elevation of EL=892.3 m. The proposed headworks station structure will be a two story concrete building with a basement base at elevation EL=892.3 m. Based on findings of the testholes, the foundation bases of the headworks station and treatment unit are expected to be situated within the clay layer at an approximate elevation of 892.3 m.

Groundwater levels recorded in standpipe piezometers installed at the site ranged from 1.44 to 3.55 mBGS (EL = 894.58 m to 897.26 m). However, it is expected that these short-term water levels may increase or decrease depending on the precipitation and drainage conditions on site.

The main issues for the site are:

- The relatively high groundwater levels which could result in difficulties in mobility of construction equipment
- The wet and soft ground conditions below the base of the treatment plant and building foundations.

Recommendations and considerations for the design and construction of the development are provided in the following sections.

4.2 Dewatering

High groundwater levels could potentially result in various difficulties during construction including reduced traffic mobility for heavy equipment and difficulties with placement and compaction of fill. To facilitate excavations, earthworks and foundation installations, construction will need to be carried out under relatively dry conditions. Therefore, grading for surface drainage improvements should be undertaken in the early stages of construction such that surface runoff is directed off the construction areas.

Based on observations of groundwater conditions in the testholes, the groundwater table within the area was relatively high, between 1.44 mBGS and 3.55 mBGS. It is anticipated that excavations for foundations and pipeline construction will extend below existing water level. Therefore, a dewatering system should be provided. The Contractor will be responsible for designing and implementing a dewatering system that maintains a dry, undisturbed subgrade. To avoid disturbance to the subgrade, the groundwater elevation should be maintained at least 600 mm below the subgrade level during the entire period of excavation, foundations construction, fill placement and compaction. Dewatering should consist of sumps, wells or well point (or a combination of these methods) capable of lowering the groundwater below the lowest level of the excavation.

4.3 Subgrade Preparation for Foundations

All organics, other deleterious materials and fill materials, should be stripped and removed from within the areas where structural support will be required. Initial grading operations should also be focused on providing surface drainage improvements such that precipitation and surface runoff is directed off the construction area. Proof rolling should be carried out to identify loose or soft spots. Soft soils should be sub-excavated to more competent soil and backfilled using suitable engineered fill compacted to 98% of the Standard Proctor Maximum Dry Density (SPMDD) within 2% of the optimum moisture content (OMC). Engineered fill may consist of low to medium plastic clay or clay till, or granular material and should be placed in lifts not exceeding 150 mm in compacted thickness.

Topsoil and excavated materials retrieved from the site may be re-used in landscaping areas or in areas where structural support may not be required.

4.4 Subgrade Preparation for Pipes

The following provides recommendations for general subgrade preparation in order to produce a uniform bearing condition for the proposed piping foundation. If soft or unstable areas are encountered, these areas should be over-excavated to expose the underlying more competent soil, or to a maximum depth of 600 mm, and replaced with gravel material or general engineered fill comprised of low to medium plastic clay fill compacted to a minimum 95% of the SPMDD. A layer of geogrid BX 1200 or equivalent should be placed directly on the bottom of the subgrade when the soft deposit extends deeper than 600 mm below the design subgrade elevation. Subgrade soils should be inspected and evaluated by a geotechnical engineer during construction to confirm their suitability for pipe support.

4.5 Pipeline Buoyancy

If the groundwater table is located above the crown of the pipeline and the pipeline is not full, the pipeline will be subjected to a buoyant force. The buoyant force will be resisted by the weight of the pipe and the soil above the crown of the pipe. Assuming that the groundwater table is at the ground surface, the weight of the soil can be taken as:

Ws = 9XHXD

Where:

H = Distance from ground surface to the crown of the pipe in (m)
D = Diameter of the pipe in (m)
Ws = Weight of the soil in (kN/m)

4.6 Trenching and Excavations

All excavations should be carried out in accordance with Alberta Occupational Health and Safety Regulations. Cut slopes in native soils may encounter clay fill and clay.

The temporary side slopes through the clay and/or clay fill should not be steeper than 1.5 horizontal to 1 vertical (1.5H: 1V) up to a maximum height of 3 m. The temporary side slopes of excavations of greater than 3 m up to 6 m in clay and/or clay fill should not be steeper than 2H: 1V. If seepage, sloughing and/or flowing soils are encountered, slopes need to be made flatter under the direction of a geotechnical engineer. If the sloping of sidewalls is not practical, the excavation should be supported by temporary shoring. Shoring should be adequately designed to support vertical sidewalls of the excavation by considering the lateral earth pressure and hydrostatic pressures. The temporary shoring must be removed as the backfill is brought up.

If sand is encountered during excavation, the temporary side slopes of excavations above the groundwater table in sand should not be steeper than 2H: 1V to a maximum height of 3 m. Flatter slopes and drainage will be required below the groundwater table. The appropriate side slopes will depend on the drainage method, controlling groundwater infiltration into the excavation and the time interval the trench is left open. A geotechnical engineer should be consulted for excavations deeper than 3 m to assess the stability of the slopes.

Temporary slopes must be excavated in stages and must not be left open and unattended during construction downtime. If excessive groundwater seepage is encountered or excavations are required to be left open for extended periods of time, flatter side slopes or shoring may be required to provide a safe working environment.

Temporary shoring may be required at locations where unsupported open cutting cannot be carried out. Roadway protection (shoring) systems should be designed and implemented in accordance with the relevant Alberta Occupational Health and Safety Regulations. Any shoring system must be designed by a licensed Professional Engineer, experienced in such designs. At a minimum, all shoring must extend at least 0.5 m above the top of the existing ground surface to prevent soil loss into the excavation.

Temporary surcharge loads, such as excavated material, construction materials and equipment, should be placed such that the toe of the surcharge is at a minimum distance equal to the depth of the excavation. Vehicles delivering materials should be kept back from the edge of the excavation by at least one-half of the depth of excavation. All excavations should be protected from surface run-off and checked regularly for signs of sloughing, especially after periods of precipitation. Small earth falls from the side slopes are a potential source of danger to workers and must be guarded against.

4.7 Backfill

Materials used for general backfill at the site should consist of low to medium plastic clay or clay till, or granular fill. Where structural support is not required, the backfill should be compacted to a minimum of 95% of the SPMDD within 2% of the OMC, up to 1.5 m below design grade. Backfill within 1.5 m of design grade should be compacted to a minimum of 98% of the SPMDD within 2% of the OMC. The compacted thickness of each lift of backfill should not exceed 150 mm. The excavated clay showed moisture contents exceeding the estimated optimum values, therefore this material will be suitable as a source of fill in areas where subgrade support is not required.

4.8 Foundations for Headworks Station

The soil conditions commencing at depths of 9 to 10 m below the existing ground surface are generally not favorable for shallow footings or raft foundations due to the relatively high moisture contents (28.5% to 42.8%) and soft to firm ground conditions. Therefore, shallow footings or raft foundations are not considered feasible options without ground improvement or the soft clay layer is removed up to a depth of 10 mBGS. Without ground improvement or where the settlement of structures cannot be tolerated, deep foundations will be the most feasible option to support the headworks building structure.

4.8.1 Deep Foundations

Based on the subsurface conditions at this location, driven steel “H” piles, open or closed – end steel pipe piles are considered suitable pile types to support the headworks building foundation loads. Drilled cast-in-place concrete piles can also be considered as another alternative to driven piles. A temporary casing will be required for the installation of such piles. Should drilled cast-in-place concrete piles be considered, recommendations for this foundation type can be provided upon request.

4.8.1.1 Driven Steel Piles

Driven open or closed – end pipe piles or steel “H” piles steel piles may be designed to carry compressive loading on the basis of the allowable skin friction and end bearing resistance given in Table 3 below.

Table 3: Design Parameters for Driven Steel Piles (Testhole TH14-03)

Elevation (m)	Soil Type	End Bearing Pressure (kPa)		Skin Friction (kPa)	
		Ultimate	Factored	Ultimate	Factored
897 to 894.5	Topsoil	-	-	0	0
894.5 to 891	Clay	-	-	0	0
891 to 887	Clay	-	-	25	10
887 to 882	Clay	750	300	50	20
882 to 879	Clay Till	1200	480	60	24
Below 879	Clay Shale	1200	480	60	24

For limit states, design a resistance factor of 0.4 should be applied on the ultimate ULS geotechnical resistance to obtain the factored ULS geotechnical compression resistance. The resistance factors are in accordance with the Canadian Foundation Engineering Manual (2006) and the National Building Code (2005). A resistance factor of 0.5 can be used if a pile driving analyzer test (PDA) is carried out to confirm the ultimate pile capacity and establish the pile driving criteria for building piles.

The followings are recommendations for driven steel pile installation:

- For open end or closed end pipe piles, only the exterior surface area of the pile in contact with the soil should be used in the calculation of the frictional resistance. For steel H-piles, the surface area should include the exterior sides of the two flanges plus twice the depth of the web.
- In calculating frictional resistance for a steel “H” section, the gross area at the tip may be taken as the cross-section of a rectangle bounded by the flanges. For close end pipe piles, the gross area may be taken as that enclosed by the outer diameter of the pile section.
- The vertical load capacity of steel piles, determined using the recommended shaft friction and end bearing parameters, should be limited to no more than cross-sectional area of steel multiplied by 0.35 fy, where fy is the yield strength of the steel.
- Negative skin friction should be considered where additional fill will be placed for site grading. An average ultimate downdrag 3.5 times the fill thickness (Hf) in kPa for cohesionless fills and 25 kPa for cohesive fills. A negative skin friction of 25 kPa should be considered in the native settling subgrade.
- Steel piles should be driven with a piling hammer of appropriate size and rated energy, depending on the pile design load requirements. The maximum driving energy should not exceed 630 J per blow per square centimetre of steel cross-sectional area to avoid damage of the pile section.
- To limit structural damage to the pile, piles should not be driven beyond practical refusal, which may be taken as 10 to 12 blows per 25 mm penetration for the last 250 mm of penetration for the recommended hammer energies. This criterion is a preliminary guide to estimate the size of pile driving hammer that may be required for construction.
- The ability of a pile driving hammer to drive the proposed piles to the required capacity should be confirmed using wave equation analysis (GRLWEAP software) once the details regarding the proposed hammer configuration and the pile size is known. The required termination criteria should also be determined using wave equation analysis once the hammer energies, hammer type and pile details are known.
- A minimum centre-to-centre pile spacing should be three pile diameters or three pile flange widths.
- Heave of adjacent piles is a concern where groups of piles are installed at about 3D spacing or less and should be monitored throughout the driving. All piles indicating heave should be re-driven. When piles are re-driven, they should achieve additional penetration approximately equal to the amount of heave originally recorded.
- Prior to the pile installation, the piles should be inspected to confirm that the material specifications are satisfied. The piles should be free from protrusions, including protruding welds which could create voids in the soil around the pile during driving. If a driving shoe is used, it must not protrude beyond the outside diameter of the pile.

- Monitoring of the pile installation by qualified personnel is recommended to verify that the piles are installed in accordance with design assumptions. For each pile, a complete pile driving record in terms of the number of blows per 250 mm of penetration and the final set of the pile should be recorded by inspector and reviewed by the geotechnical engineer.
- The recommendations provided, herein, for the design and construction of pile foundations should be reviewed and revised as required, once the grade elevations have been identified and established.

4.8.1.2 Pile Installation Inspection

The performance of the foundations will depend on the quality of workmanship during construction. This is particularly important for foundation installations where variations in soil conditions could occur. Therefore, it is recommended that inspection be provided by experienced geotechnical personnel during foundation installation to confirm that the piles are installed in competent material and that stratigraphy is similar to that which has been assumed for the design.

4.9 Grade Beams

Where pile foundations are used, grade beams are generally required to transfer wall loads to the tops of the piles. To prevent heaving of the grade beam due to frost or swelling of the underlying soils, a non-collapsible void form such as Geospan or equivalent of a minimum thickness of 150 mm, may be used. The non-collapsible void form may also be used in areas where there is potential for groundwater ingress below the void form. The grade beams should be designed to withstand upward heave forces equal to approximately 38 kPa. Alternatively, a collapsible void form such as Dynavoid (as produced by Beaver Plastics) may be used where the grade beams or pile caps will be constructed above the water table and will not be subject to future water ingress and freezing. A minimum thickness of 150 mm of collapsible void form should be used.

The void form should be placed on a sand layer at least 75 mm thick (with less than 10% passing a No. 200 sieve).

4.10 Tension Loads/Uplift Forces on Piles

The piles will be subject to uplift forces due to frost heave, tensile forces due to lateral loading, overturning movement due to wind loads, etc. The piles should be designed to resist these forces. For driven steel piles, the resistance to uplift will be provided by pile self weight, applied dead loads, and uplift shaft resistance. Factors such as seasonal frost depth, adfreeze bond, soil type, heating and insulation should be taken into account while designing the piles against uplift.

The resistance to uplift may be calculated using the ultimate ULS skin friction parameters provided in **Table 3.** A resistance factor of 0.3 should be applied on ultimate geotechnical resistance ULS to obtain factored geotechnical resistance against uplift.

4.11 Lateral Load Capacity for Piles

Vertical piles are capable of resisting horizontal loading. When vertical piles are subjected to horizontal loads in addition to vertical loads, piles should be analyzed for axial loading and combined axial and lateral loading. Short term lateral loads may be imposed by construction, by seismic forces or by wind.

The lateral load capacity of piles will depend upon the pile stiffness and geotechnical engineering properties of the native soil or fill material within the upper few metres of the pile. Lateral pile analysis involves soil structure interactions and requires soil and pile stiffness properties. Until the design grades, pile type and layout have been determined it is not possible to provide detailed lateral resistance of the pile.

For pile design, the concept of subgrade reaction may be used in predicting lateral deformations of piles under lateral loading. The soil behaviour is modeled by an independent series of linear springs along the depth of the soils. Modulus of horizontal subgrade reactions represents the stiffness of the springs.

For cohesive soils (clay and clay till) k_s can be estimated using the following equation:

$k_s = 67\ c_u/D$

Where:

c_u = Undrained shear strength of the soil (kN/m^2); and
D = Pile diameter (m)

The undrained shear strengths to be used in determining the horizontal subgrade modulus (k_s) were estimated based on field SPT test results and are summarized in Table 4 below:

Table 4: Undrained Shear Strength for Cohesive Soils (testhole TH14-01)

Elevation (Soil Type)	Undrained Shear Strength, C_u (kPa)
Clay Fill (895 m to 893 m)	30
Clay (893 m to 885 m)	40
Clay (885 m to 879 m)	100
Clay Till (879 m to 877 m)	150

The soil stratigraphy was generally consistent across the site. Calculations for the coefficient of horizontal subgrade reaction along the length of the pile, used in determining lateral pile deformations will likely only include the cohesionless soil parameters described above.

4.12 Foundations for Combined Treatment Unit

4.12.1 General

The soil conditions commencing at depths of 12 to 13 m below the existing ground surface are generally not favorable for shallow footings or raft foundations due to the relatively high moisture contents (29% to 42%) and soft to firm ground conditions. Therefore, shallow footings or raft foundations are not considered feasible options without ground improvement or where the soft clay layer is removed up to a depth of 13 m below the ground surface.

Option 1: Raft Foundation

The raft foundation will be placed within the clay layer at elevation 892.26 m. The thickness of weak layer below the raft base is about 7.25 m. The estimated total settlement is 275 mm. It is estimated that 50 to 90% of the settlement will occur in 2.5 and 10 years, respectively. The estimated differential settlement is about 140 mm. Therefore, the raft foundation option without ground improvements may not be suitable due to the high expected differential settlement.

Option 2: Raft Foundation with 1 m Soil Replacement below the Raft Base

The raft foundation will be placed on a 1 m thick 40 mm minus crushed gravel layer at elevation 892.26 m. The thickness of weak layer below the raft base will be reduced to about 6.25 m. The estimated total settlement is 240 mm. It is estimated that 50 to 90% of the settlement will occur in 1.75 and 7 years, respectively. The estimated differential settlement is about 120 mm. Therefore, this option may not be suitable due to the high expected differential settlement.

Option 3: Construction of Raft Foundations after Preloading with Wick Drains

Preloading with wick drains is another option to allow for the major part of post-construction settlement to take place prior to starting construction of the tank raft foundation. Without preloading, using raft foundations for support of the tank structure may not be feasible as there is a risk of differential settlement and distress of the tank structure. The preloading will cause the settlement to occur prior to building the tanks. A triangular pattern of drains at 1.75 m spacing should be used with the 4.5 m preload fill height. The width of preload fill at the top and bottom would be 33 m and 48 m, respectively. Suitable structural fill soils could be used for the preload construction with a 600 mm thick granular drainage blanket placed at the base of preloading fill. The embedment depth of wick drains should be 13 m below the existing ground surface. The preloading fill should be maintained for 7 months. Two vibrating wire piezometers should be placed at a depth of 3.5 m below the proposed elevation of the raft base to monitor the pore water pressure dissipation. Eight settlement plates should also be placed at the existing ground surface to measure the settlement due to the preloading fill. It is estimated that 80% to 90% of the total settlement will occur in 7 months. The estimated differential settlement is less than 50 mm. Therefore, raft foundation is recommended for the support of the tank structure after preloading and completion of 80 to 90% of the total settlement. The preloading with wick drains is the most feasible and economical option compared to the pile foundation option.

Monitoring of the foundations of the existing blower house and the berms is also recommended. Six settlement markers and three vibrating wire piezometers should be placed near the blower house and berms at a depth of approximately 4 to 5 m below the proposed elevation of the foundation base to monitor the pore pressure dissipation and settlement.

The approximate cost estimates for the piling option will be $1.5 million (for one tank) and for the preloading with wick drains option will be $800,000 (for one tank). It should be noted that these costs do not include the cost of excavation for the tank and providing a 300 mm thick crushed gravel layer and the cost of raft foundation.

The other two options reviewed were not deemed feasible due to the significant time, 2 to 10 years, that will be required to achieve 50 to 90% of the total settlement. Also, the differential settlement was calculated to be 120 to 140 mm during that time. Therefore, the raft foundation after preloading with wick drains is recommended.

4.12.2 Raft Foundations

Raft foundations may be considered suitable for the support of the tank structure provided they are constructed after completion of soil improvement at the tank footprint area. It is desirable to place raft foundations within one soil type to minimize the potential for differential settlements.

Raft foundations may be designed using allowable net bearing capacity values of 70 kPa and a modulus of subgrade reaction, ks, of 7,000 to 9,000 kN/m^3 at depths of approximately 5 to 6 mBGS.

Friction between the subgrade and tank structure can be calculated as follows:

$F = \sigma v \tan (0.66 \varphi')$

where:

F = Friction between base of reservoir and subgrade
σ v = Vertical effective stress on the subgrade
φ' = Internal friction angle (use 24° for clay)

The tank will be constructed at a depth below the existing grade. It is assumed that part of the applied bearing pressure (70 kPa) will be balanced; the weight of the excavated soil and the applied foundation bearing pressure at elevation EL 892.26 m will be 50 kPa. Due to the cohesive nature of the on-site soil and fill materials, approximately 80 to 90% of the total would occur during the preloading and the remaining total settlement will be 30 to 60 mm. Differential settlements are typically half of the total settlement noted above if rafts are supported with relatively uniform subgrade soil. Differential settlements could be highly variable if the tank structure is supported on different subgrade soils.

Due to the poor ground conditions and high groundwater levels, difficulties in mobility of construction equipment and compaction of the subgrade soils are anticipated. Therefore, a 300 mm thick 40 mm minus crushed gravel layer reinforced with one layer of geo grid reinforcement BX 1200 or equivalent should be provided below the foundation base. The gravel and geo grid reinforcement layers should extend outwards at least 3.0 m from the edge of the tank foundation. The gravel layer should be placed in one layer and compacted to 98% of the SPMDD. The base of raft excavations should be thoroughly cleaned of all loosened or disturbed soil prior to pouring concrete.

Rafts should be adequately reinforced to allow the structure to settle uniformly and maintain structural integrity. Flexible connections should be provided from the structure to all connected piping to accommodate differential settlements.

4.13 Lateral Earth Pressures

The structure walls should be designed to resist lateral earth pressures in an "at-rest" condition. Lateral earth pressure on the retaining walls can be calculated using the following equation.

$P = K_o (\gamma H+q)$

where:

P	lateral earth pressure (kPa)
K	coefficient of at rest earth pressure $K_o = 0.55$ for clay and 0.5 for gravel
γ	unit weight of backfill soil (kN/m^3) - useγ' below groundwater table
γ'	unit weight of soil below groundwater table (kN/m^3) = $\gamma - \gamma_w$
γ_w	unit weight of water (9.81 kN/m^3)
H	depth below final grade (m); and
q	surcharge pressure at ground level (kPa)

Hydrostatic pressure should be included in the design of retaining walls if measures are not taken to drain the backfill behind the wall. The hydrostatic pressure (P_w, kPa) on the walls exposed to groundwater can be calculated using the following equation.

$$P_w = \gamma_w H_{wmax}$$

Where:

H_{wmax} maximum expected groundwater depth above foundation base (m)

Since the clay fill and native clay soils are frost susceptible, lateral frost forces should be expected on the retaining walls. The lateral frost forces are expected to be very high; therefore, adequate measures should be taken to reduce the lateral frost forces on the retaining wall. The lateral frost forces on the wall can be reduced by either of the following measures:

- Using a layer of free draining gravel, approximately 1 m thick, behind the wall. The free draining gravel placed behind the wall should be hydraulically connected to free draining gravel placed below the raft so that water can be discharged by gravity without developing hydrostatic pressure behind the wall. Consideration may be given to placing a weeping tile at the toe of the wall that will be hydraulically connected to the gravel behind the wall. The weeping tile (if used) should drain in the direction of natural drainage. This will reduce the lateral frost forces on the walls in the winter when the water level is at its lowest elevation and the backfill behind the wall is well drained. The free draining gravel placed behind the wall should be wrapped in non-woven filter fabric to reduce the potential for migration of fines from the native soils to the free draining gravel. A layer of compacted clay, approximately 300 mm thick, should be placed at the surface to reduce surface infiltration. The free draining gravel placed around the weeping tile should also be wrapped in non-woven geotextile to control migration of fines.

- Provide rigid insulation vertically on the wall and also at surface to reduce the development of lateral frost forces. The insulation should be at least 200 mm thick. The insulation should be applied vertically on the wall. The insulation should also be provided below the finished grade behind the retaining wall. The insulation should extend at least 2.5 m behind the wall and extend outwards from the edges of the wall on all sides. A minimum soil cover, approximately 600 mm thick, should be provided above insulation to protect it from damage.

The equation for lateral earth pressure assumes horizontal ground behind the buried wall. If the ground surface slopes away from the wall, design pressure should be re-evaluated.

Where traffic or other live loads may travel or operate near the buried structure, the horizontal pressure due to live load should be superimposed on the static earth pressure.

Backfill around buried walls should not commence before the concrete walls have reached a minimum two-thirds of their 28 day strength. Only hand operated compaction should be employed within 600 mm of the concrete walls. Caution should be used during compaction of backfill to reduce lateral loads caused by the compaction. To avoid differential lateral pressures against walls during construction the backfill should be brought up evenly around the walls. A layer of compacted clay, approximately 500 mm thick should be placed at the surface to reduce surface infiltration.

A typical gradation of the free draining gravel is provided in Table 5.

Table 5: Typical Free Draining Gravel Gradation

Sieve Size	Percent Passing
50	100
40	90 – 100
20	35 – 75
10	10 – 30
5	0 - 5

The free draining gravel placed behind the wall should be compacted to at least 95% of the SPMDD and free draining gravel placed behind the slab should be compacted to at least 100% of the SPMDD.

4.14 Buoyant Uplift

Based on groundwater observations completed on November 6, 2014 and December 11, 2014, the elevation of the groundwater table ranged from 1.49 to 3.55 mBGS (EL=896.36 m to 895.12 m).

The magnitude of hydrostatic uplift forces applied to below grade structures should be calculated, assuming that the highest groundwater table is at elevation EL = 897 m.

For design purposes, the groundwater table should be assumed at elevation EL = 897 m. Further monitoring of the groundwater table is recommended to establish stable groundwater levels. If the groundwater elevation differs from the assumed value further evaluation of the groundwater will be provided. The hydrostatic pressure may be calculated using the following equation:

$$Pw = \gamma wHw$$

Where:

Pw = Hydrostatic pressure (kPa)
γw = Unit weight of water (9.8 kN/m3)
Hw = Depth below top of water table (m)

The magnitude of buoyancy forces will impact the design of structure. Therefore, the buoyancy forces should be considered for full and empty conditions. Buoyancy forces should be considered for the headworks structure and pipelines. Buoyancy forces should be determined using the following equation:

$$U = \gamma wVs$$

Where:

U = Hydrostatic uplift force (kN)
γw = Unit weight of water (9.8 kN/m^3)
Vs = Volume of structure below the groundwater table (m^3)

Buoyant uplift forces may be resisted by the mass of the structure, or by extending the base of the foundation beyond the walls of the structure, such that the mass of the soils above the projection are used to resist uplift forces.

If an extended base is considered, uplift resistance due to the weight of the soil above the projected foundation may be determined as follows:

$Rss = AWH\gamma'$

where:

Rss = Total allowable resistance due to weight of soil (kN)
A = Perimeter of structure walls (m)
W = Width of projected base foundation beyond structure walls (m)
H = Height between top-of-foundation and ground surface (m)
γ' = Submerged unit weight of soil (kN/m³)

Uplift resistance due to shearing through the soil may be assumed to have a triangular distribution as determined by the following equation:

$Rs = (k_o\gamma' d \tan\varphi')/FS$

where:

Rs = Allowable shearing resistance (kPa)
k_o = Coefficient of earth pressure at rest (0.5)
γ' = Submerged unit weight of soil (kN/m³)
d = Depth below final ground level (m)
φ' = Friction angle of backfill (assume 20° for cohesive fill and 32° for granular fill)
FS = Factor of Safety (minimum of 2.0)

4.15 Slab-on-Grade Supported Floor Slabs

The design of floor slabs will be dependent on final site grading plans and subgrade conditions at that level. The proposed slab-on-grade may be underlain by existing fill or soft clayey soils which is not suitable for supporting of the slabs. Some settlements and cracking could result from differential settlements and consolidation of the soft soils. Consequently, we recommend that a structural floor be used for the proposed structures. The subgrade should be prepared such that any existing surficial organics or topsoil should be stripped from the site prior to placement of fill materials beneath the structural floor area. If additional imported suitable fill material is required to raise the grade of the site to design subgrade elevation, the fill should be placed in uniform lifts not exceeding 150 mm in compacted thickness and compacted to a minimum of 100% SPMDD. A 150 mm thick void form must be placed underlying the structurally supported floor slab to accommodate any heaving of the underlying soils.

4.16 Permanent Drainage

Permanent structures founded below the groundwater table should either be designed to resist the potential hydraulic uplift pressures or alternatively should have a subdrainage system below the foundations and around the perimeter walls to drain water away from the foundations.

A higher groundwater table would be expected during spring and upon melting of snow. A subdrainage system may be provided to prevent buildup of hydrostatic uplift pressures on the base of the foundation during periods of high groundwater. The recommended approach for permanent subdrainage where required is to provide a gravel drainage layer around the perimeter walls and below the base of foundation to collect water. The subgrade should be sloped to drain subsurface water towards permanent drains and sumps. The collected water should be directed to the site drainage system or to a sump for collection and discharge. A minimum thickness of 300 mm of free draining gravel with less than 5% passing sieve No. 200 should be used under the base of foundations. It is recommended that a non-woven geotextile be placed directly over the prepared subgrade and at the interface around perimeter wall drainage layer to provide separation between the subgrade and drainage gravel layer and to prevent clogging of the gravel. It is recommended that further monitoring of groundwater levels to be carried out after completion of the site grading works to measure the depth of groundwater below the finished grade.

4.17 Grading and Drainage

Excess water should be drained from the site as quickly as possible, both during and after construction. The finished grade should be laid out so that surface waters are drained away from buildings and other structures by the shortest route.

Landscaping should be designed so that surface water is prevented from ponding beside buildings. Within 2 m of the building perimeter, the landscaping should maintain a minimum grade of 5% and hard surfacing (such as asphalt or concrete) a minimum grade of 3%. Asphalt or concrete surfaced areas, outside 2 m of the building perimeter, should be provided with a minimum grade of 1% to promote runoff and minimize ponding.

4.18 Seismic Considerations

The Canadian Foundation Engineering Manual (CFEM 2006) requires that loading due to earthquake shaking should be considered as an external load in the design of civil engineering structures. The earthquake loading at any given site is related to factors such as subsoil conditions and behaviour, magnitude, duration, and frequency content of strong ground motion and the probable intensity and likelihood of occurrence of an earthquake (i.e. seismic loads).

The site soil classification was determined from the energy-corrected average standard penetration test value N_{60} of 19 in testhole TH14-03 drilled to a depth of 19.5 mBGS. The site is classified as Class D based on the SPT results and according to Table 6.1A in the Canadian Foundation Engineering Manual (CFEM, 2006).

The typical soil profile for a Class D site consists of generally stiff soil with an average standard penetration resistance (N_{60}) between 15 and 50 blows.

4.19 Review of Design and Construction

AECOM should be given the opportunity to review details of the design and specifications related to geotechnical aspects of this project prior to construction.

All recommendations presented in this report are based on the assumption that an adequate level of monitoring will be provided during construction, and that all construction will be carried out by suitably qualified contractors, experienced in foundation construction. Adequate levels of monitoring are considered to be:

- For deep foundations, full time monitoring of pile installation
- For shallow foundations, inspection of bearing surfaces
- For earthworks, full time monitoring and compaction testing.

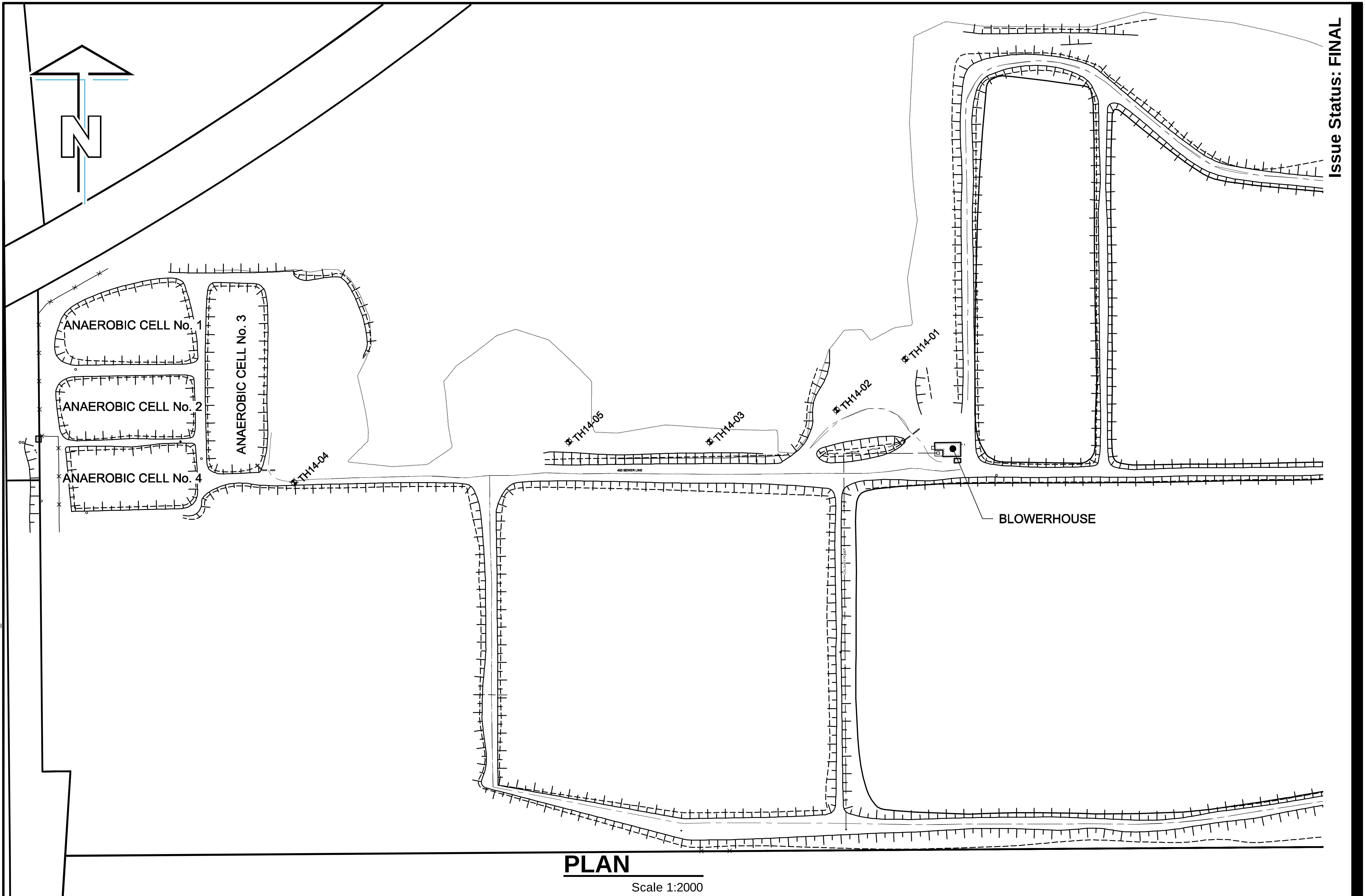
Suitably qualified persons, independent of the contractor, should carry out all such quality assurance monitoring. One of the purposes of providing an adequate level of monitoring is to verify that the recommendations provided in this report, which are based on the findings at discrete testhole locations, are relevant to other areas of the site. AECOM can provide these services upon request.

5. References

Canadian Foundation Engineering Manual (CFEM), 4th Edition, 2006.

Appendix A

Figures



PLAN

Scale 1:2000

Issue Status: FINAL

AECOM

Figure: 01

Testhole Location Plan

EDSON WASTE WATER TREATMENT FACILITY
TESTHOLE LOCATIONS
TOWN OF EDSON
Project No.: 60330572   Date: 2014-12-22

Project Management Initials: Designer: MR   Checked: FA   Approved: -   ANSI B 279.4mm x 431.8mm

Last saved by: FIERHELLERJ (2014-12-22)   Last Plotted: 2014-12-22
Filename: P:\60330572\900-WORK\910-CAD\90-ARCHIVE\SKETCHES\60330572-01-F01_R01.DWG

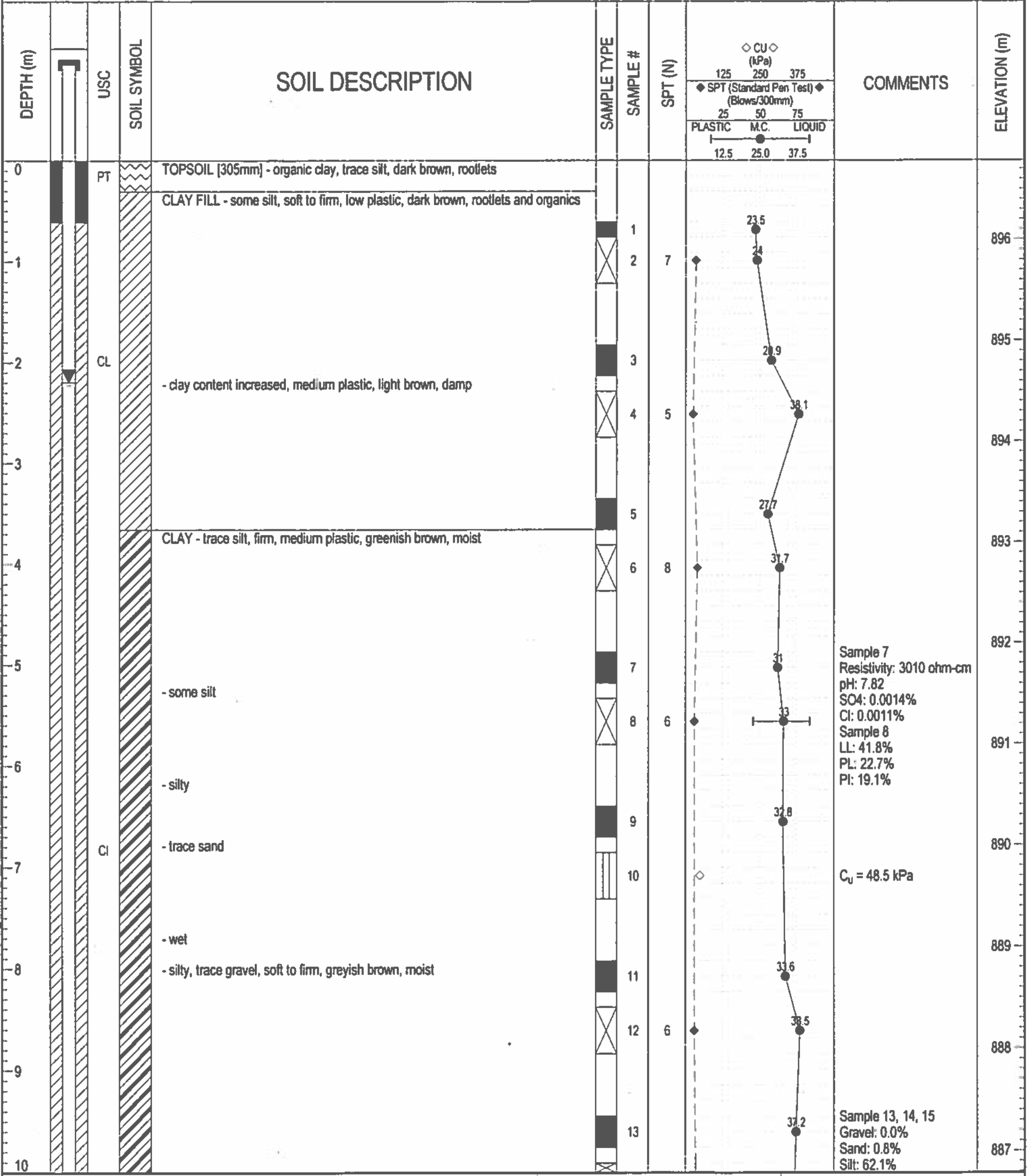
Appendix B

Testhole Logs, Explanation of Field and Laboratory Data, Modified Unified Classification System for Soils, General Statement; Normal Variability of Subsurface Conditions

PROJECT: Edson Wastewater Treatment Plant Upgrades	CLIENT: Town of Edson	TESTHOLE NO.: TH14-01
LOCATION: Pump Station	COORDINATES: UTM N 5938356 E 541244	PROJECT NO.: 60330572
CONTRACTOR: Mobile Augers	METHOD: Solid Stem	ELEVATION (m): 896.783

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ▨ NO RECOVERY ▮ CORE

BACKFILL TYPE ■ BENTONITE ☐ GRAVEL ▥ SLOUGH ☐ GROUT ▨ CUTTINGS ☐ SAND



TOPSOIL [305mm] - organic clay, trace silt, dark brown, rootlets

CLAY FILL - some silt, soft to firm, low plastic, dark brown, rootlets and organics

- clay content increased, medium plastic, light brown, damp

CLAY - trace silt, firm, medium plastic, greenish brown, moist

- some silt

- silty

- trace sand

- wet

- silty, trace gravel, soft to firm, greyish brown, moist

SAMPLE TYPE	SAMPLE #	SPT (N)	M.C.
GRAB	1		23.5
SPLIT SPOON	2	7	24
GRAB	3		28.9
SPLIT SPOON	4	5	38.1
GRAB	5		27.7
SPLIT SPOON	6	8	31.7
GRAB	7		31
SPLIT SPOON	8	6	33
GRAB	9		32.8
SHELBY TUBE	10		
GRAB	11		33.6
SPLIT SPOON	12	6	38.5
GRAB	13		37.2

COMMENTS

Sample 7
Resistivity: 3010 ohm-cm
pH: 7.82
SO4: 0.0014%
Cl: 0.0011%
Sample 8
LL: 41.8%
PL: 22.7%
PI: 19.1%

C_u = 48.5 kPa

Sample 13, 14, 15
Gravel: 0.0%
Sand: 0.8%
Silt: 62.1%

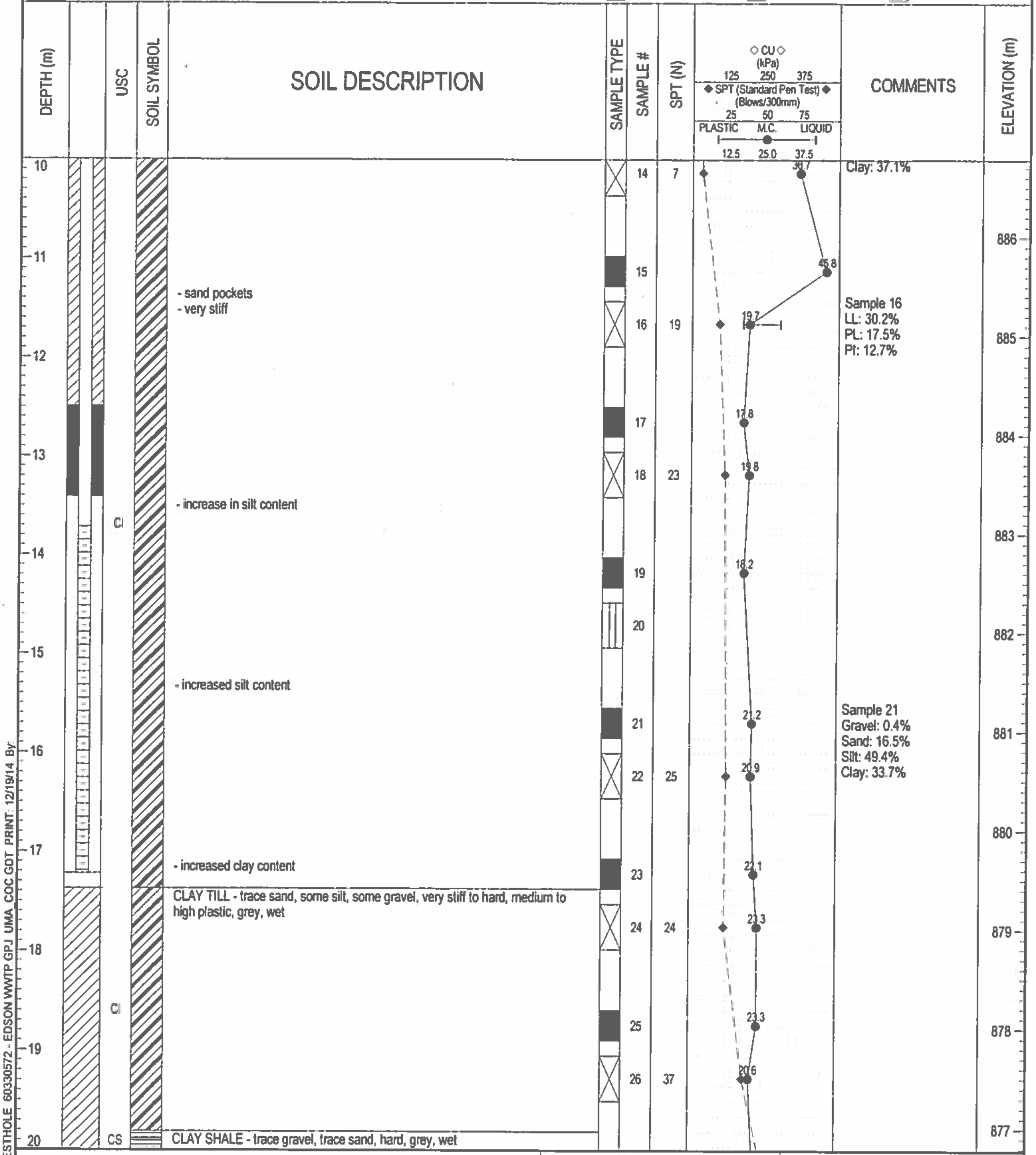
AECOM	LOGGED BY: MR	COMPLETION DEPTH: 21.03 m
	REVIEWED BY: FA	COMPLETION DATE: 10/18/2014
	PROJECT ENGINEER: A. Shirazi	Page 1 of 3

LOG OF TESTHOLE 60330572 - EDSON WWTP.GPJ UMA_COC.GDT PRINT: 12/19/14 By:

PROJECT: Edson Wastewater Treatment Plant Upgrades	CLIENT: Town of Edson	TESTHOLE NO.: **TH14-01**
LOCATION: Pump Station	COORDINATES: UTM N 5938356 E 541244	PROJECT NO.: 60330572
CONTRACTOR: Mobile Augers	METHOD: Solid Stem	ELEVATION (m): 896.783

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ▨ NO RECOVERY ▮ CORE

BACKFILL TYPE ■ BENTONITE ░ GRAVEL ▥ SLOUGH ⁘ GROUT ▨ CUTTINGS ☐ SAND



SOIL DESCRIPTION

- sand pockets
- very stiff

- increase in silt content

- increased silt content

- increased clay content

CLAY TILL - trace sand, some silt, some gravel, very stiff to hard, medium to high plastic, grey, wet

CLAY SHALE - trace gravel, trace sand, hard, grey, wet

SAMPLE #	SPT (N)	M.C.	COMMENTS
14	7	36.7	Clay: 37.1%
15		45.8	
16	19	19.7	Sample 16 LL: 30.2% PL: 17.5% PI: 12.7%
17		17.8	
18	23	19.8	
19		18.2	
20			
21		21.2	Sample 21 Gravel: 0.4% Sand: 16.5% Silt: 49.4% Clay: 33.7%
22	25	20.9	
23		21.1	
24	24	23.3	
25		23.3	
26	37	20.6	

AECOM	LOGGED BY: MR	COMPLETION DEPTH: 21.03 m
	REVIEWED BY: FA	COMPLETION DATE: 10/18/2014
	PROJECT ENGINEER: A. Shirazi	Page 2 of 3

LOG OF TESTHOLE 60330572 - EDSON WWTP.GPJ UMA_COC.GDT PRINT: 12/19/14 By:

PROJECT: Edson Wastewater Treatment Plant Upgrades	CLIENT: Town of Edson	TESTHOLE NO.: **TH14-01**
LOCATION: Pump Station	COORDINATES: UTM N 5938356 E 541244	PROJECT NO.: 60330572
CONTRACTOR: Mobile Augers	METHOD: Solid Stem	ELEVATION (m): 896.783

SAMPLE TYPE	■ GRAB	▥ SHELBY TUBE	☒ SPLIT SPOON	☰ BULK	◸ NO RECOVERY	▯ CORE
BACKFILL TYPE	■ BENTONITE	░ GRAVEL	▥ SLOUGH	⁘ GROUT	▨ CUTTINGS	☐ SAND

DEPTH (m)		USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	◇ CU ◇ (kPa) 125 250 375 ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 25 50 75 PLASTIC M.C. LIQUID 12.5 25.0 37.5	COMMENTS	ELEVATION (m)
20	▨	CS	☰		■	27		22.4		
					☒	28	60	19.8		876
21				END OF TESTHOLE @ 21.0 mBGS - water at 12.5 mBGS upon completion - Standpipe installed to 17.2 mBGS - Water level measured at 2.18 mBGS on 6/11/2014. - Water level measured at 2.20 mBGS on 11/12/2014.						
										875
22										
										874
23										
										873
24										
										872
25										
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26										
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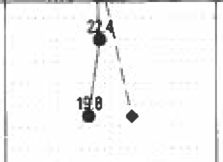
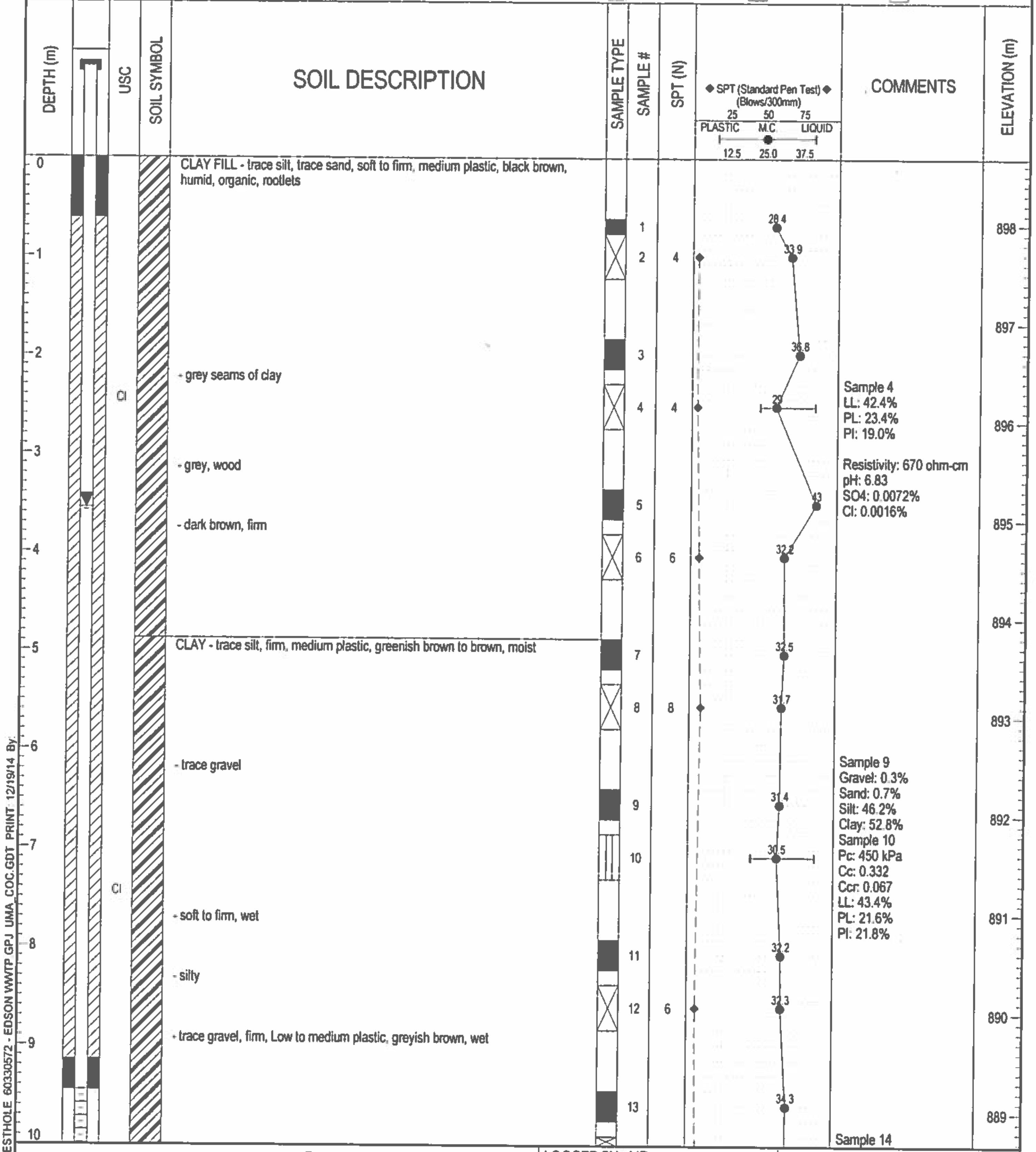
										868
29										
										867
30										



AECOM	LOGGED BY: MR	COMPLETION DEPTH: 21.03 m
	REVIEWED BY: FA	COMPLETION DATE: 10/18/2014
	PROJECT ENGINEER: A. Shirazi	

PROJECT: Edson Wastewater Treatment Plant Upgrades	CLIENT: Town of Edson	TESTHOLE NO.: **TH14-02**
LOCATION: Clarifiers	COORDINATES: UTM N 5938327 E 541205	PROJECT NO.: 60330572
CONTRACTOR: Mobile Augers	METHOD: Solid Stem	ELEVATION (m): 898.672

SAMPLE TYPE	■ GRAB	▥ SHELBY TUBE	☒ SPLIT SPOON	☰ BULK	▨ NO RECOVERY	▮ CORE
BACKFILL TYPE	■ BENTONITE	☐ GRAVEL	▥ SLOUGH	⁖ GROUT	▨ CUTTINGS	☐ SAND



CLAY FILL - trace silt, trace sand, soft to firm, medium plastic, black brown, humid, organic, rootlets

- grey seams of clay

- grey, wood

- dark brown, firm

CLAY - trace silt, firm, medium plastic, greenish brown to brown, moist

- trace gravel

- soft to firm, wet

- silty

- trace gravel, firm, Low to medium plastic, greyish brown, wet

SAMPLE #	SPT (N)	M.C.
1		28.4
2	4	33.9
3		36.8
4	4	29
5		43
6	6	32.2
7		32.5
8	8	31.7
9		31.4
10		30.5
11		32.2
12	6	32.3
13		34.3

Sample 4
LL: 42.4%
PL: 23.4%
PI: 19.0%

Resistivity: 670 ohm-cm
pH: 6.83
SO4: 0.0072%
Cl: 0.0016%

Sample 9
Gravel: 0.3%
Sand: 0.7%
Silt: 46.2%
Clay: 52.8%
Sample 10
Pc: 450 kPa
Cc: 0.332
Ccr: 0.067
LL: 43.4%
PL: 21.6%
PI: 21.8%

Sample 14

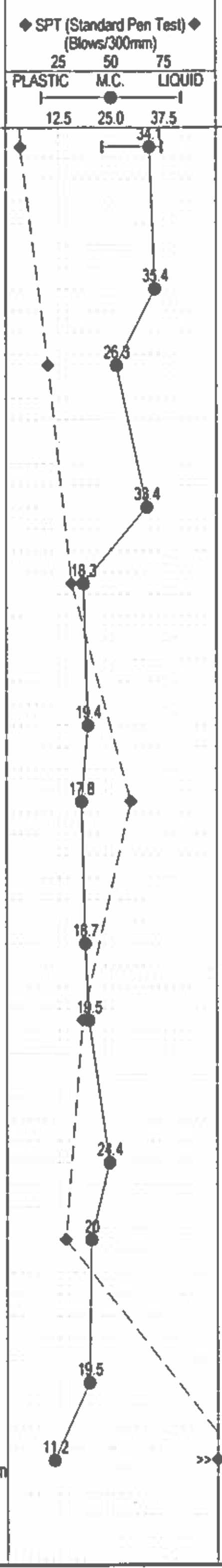
AECOM	LOGGED BY: MR	COMPLETION DEPTH: 19.51 m
	REVIEWED BY: FA	COMPLETION DATE: 10/17/2014
	PROJECT ENGINEER: A. Shirazi	Page 1 of 3

PROJECT: Edson Wastewater Treatment Plant Upgrades	CLIENT: Town of Edson	TESTHOLE NO.: TH14-02
LOCATION: Clarifiers	COORDINATES: UTM N 5938327 E 541205	PROJECT NO.: 60330572
CONTRACTOR: Mobile Augers	METHOD: Solid Stem	ELEVATION (m): 898.672

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ▨ NO RECOVERY ▯ CORE

BACKFILL TYPE ■ BENTONITE ☐ GRAVEL ▥ SLOUGH ☐ GROUT ▨ CUTTINGS ☐ SAND

DEPTH (m)	USC	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	COMMENTS
10			☒	14	7	LL: 36.9% PL: 22.9% PI: 13.9%
		- water				
11			■	15		Sample 15 Resistivity: 1270 ohm-cm pH: 7.62 SO4: 0.019% Cl: 0.0010%
		- sandy				
		- sand pockets, grey, medium grained	☒	16	20	
12		- increase in silt content, trace sand, very stiff grey				
			■	17		Sample 17 Gravel: 0.0% Sand: 15.0% Silt: 40.3% Clay: 26.3%
13			☒	18	31	
14	CI		■	19		
		- hard	☒	20	59	
15			■	21		
16		- trace cobbles and gravel, some clay	☒	22	36	
		- increase in clay content				
17			■	23		
			☒	24	28	
18		CLAY SHALE - some sand, trace gravel, sandstone interbedded				
			■	25		
19	CS		☒	26	50/ 152mm	
		END OF TESTHOLE @ 19.5 mBGS - Water at 10.67 mBGS upon completion - Water level measured at 3.31 mBGS on 6/11/2014.				
20						



ELEVATION (m): 888, 887, 886, 885, 884, 883, 882, 881, 880, 879

LOG OF TESTHOLE 60330572 - EDSON WWTP.GPJ UMA_COC.GDT PRINT: 12/19/14 By:

AECOM

LOGGED BY: MR	COMPLETION DEPTH: 19.51 m
REVIEWED BY: FA	COMPLETION DATE: 10/17/2014
PROJECT ENGINEER: A. Shirazi	

PROJECT: Edson Wastewater Treatment Plant Upgrades	CLIENT: Town of Edson	TESTHOLE NO.: **TH14-02**
LOCATION: Clarifiers	COORDINATES: UTM N 5938327 E 541205	PROJECT NO.: 60330572
CONTRACTOR: Mobile Augers	METHOD: Solid Stem	ELEVATION (m): 898.672

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ▨ NO RECOVERY ▮ CORE

BACKFILL TYPE ■ BENTONITE ☐ GRAVEL ▥ SLOUGH ⁚ GROUT ▨ CUTTINGS ☐ SAND

DEPTH (m)		USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 25 50 75 PLASTIC M.C. LIQUID 12.5 25.0 37.5	COMMENTS	ELEVATION (m)
20				- Water level measured at 3.55 mBGS on 11/12/2014.						
										878
21										
										877
22										
										876
23										
										875
24										
										874
25										
										873
26										
										872
27										
										871
28										
										870
29										
										869
30										

LOG OF TESTHOLE 60330572 - EDSON WWTP.GPJ UMA_COC.GDT PRINT: 12/19/14 By:

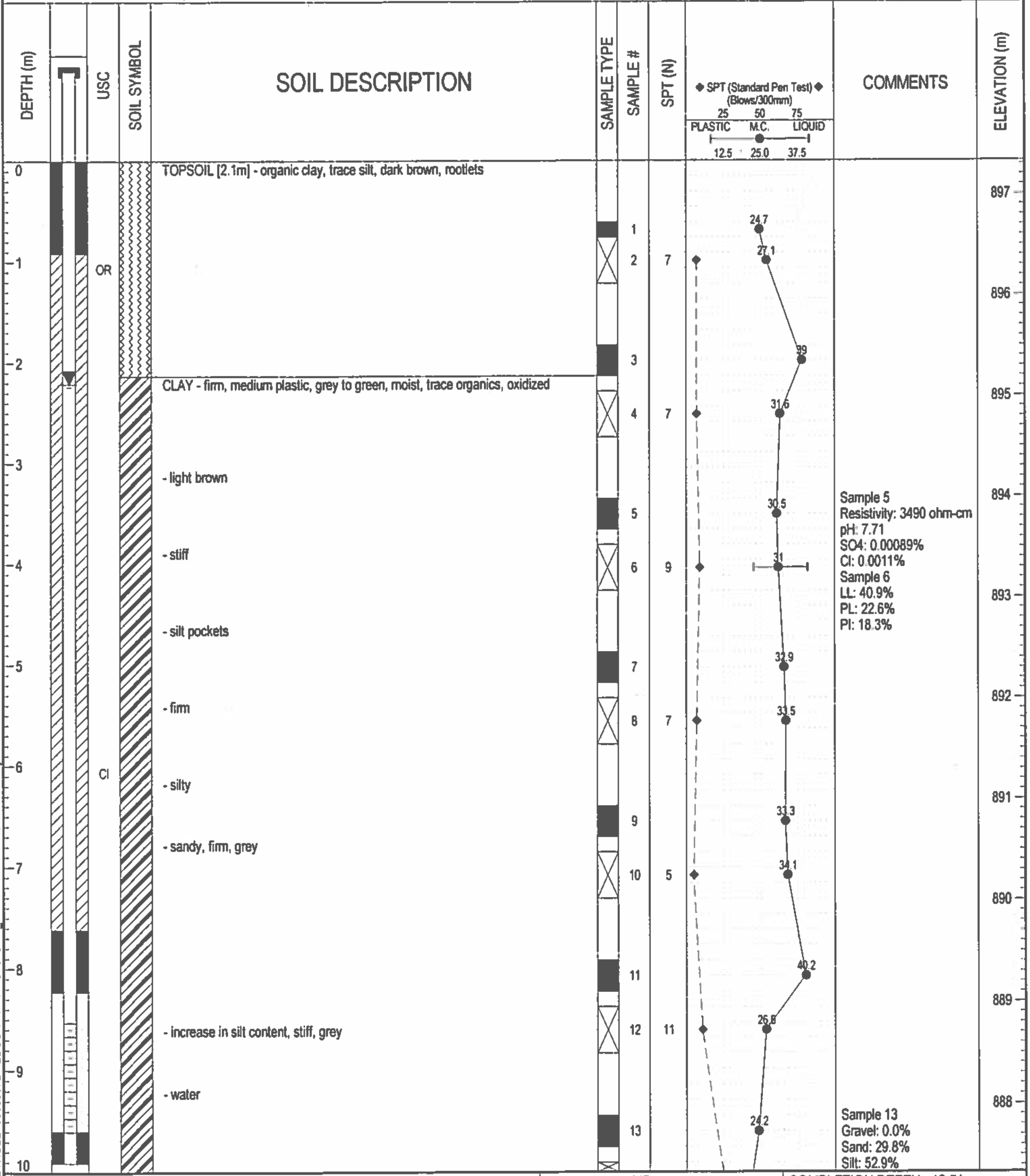
AECOM

LOGGED BY: MR	COMPLETION DEPTH: 19.51 m
REVIEWED BY: FA	COMPLETION DATE: 10/17/2014
PROJECT ENGINEER: A. Shirazi	

PROJECT: Edson Wastewater Treatment Plant Upgrades	CLIENT: Town of Edson	TESTHOLE NO.: TH14-03
LOCATION: Headworks	COORDINATES: UTM N 5938309 E 541133	PROJECT NO.: 60330572
CONTRACTOR: Mobile Augers	METHOD: Solid Stem	ELEVATION (m): 897.331

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ▨ NO RECOVERY ▮ CORE

BACKFILL TYPE ■ BENTONITE ☐ GRAVEL ▥ SLOUGH ☐ GROUT ▨ CUTTINGS ☐ SAND



SOIL DESCRIPTION

TOPSOIL [2.1m] - organic clay, trace silt, dark brown, rootlets

CLAY - firm, medium plastic, grey to green, moist, trace organics, oxidized

- light brown
- stiff
- silt pockets
- firm
- silty
- sandy, firm, grey
- increase in silt content, stiff, grey
- water

SAMPLE #	SPT (N)	M.C.
1		24.7
2	7	27.1
3		39
4	7	31.6
5		30.5
6	9	31
7		32.9
8	7	33.5
9		33.3
10	5	34.1
11		40.2
12	11	26.6
13		24.2

COMMENTS

Sample 5
Resistivity: 3490 ohm-cm
pH: 7.71
SO4: 0.00089%
Cl: 0.0011%
Sample 6
LL: 40.9%
PL: 22.6%
PI: 18.3%

Sample 13
Gravel: 0.0%
Sand: 29.8%
Silt: 52.9%

AECOM

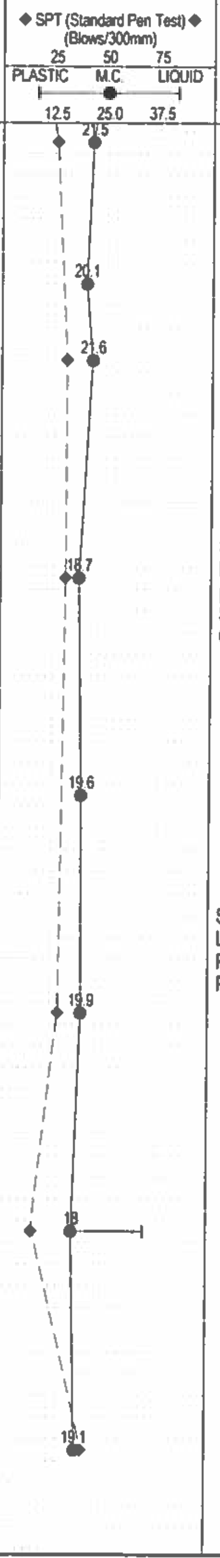
LOGGED BY: MR	COMPLETION DEPTH: 19.51 m
REVIEWED BY: FA	COMPLETION DATE: 10/16/2014
PROJECT ENGINEER: A. Shirazi	Page 1 of 3

PROJECT: Edson Wastewater Treatment Plant Upgrades	CLIENT: Town of Edson	TESTHOLE NO.: **TH14-03**
LOCATION: Headworks	COORDINATES: UTM N 5938309 E 541133	PROJECT NO.: 60330572
CONTRACTOR: Mobile Augers	METHOD: Solid Stem	ELEVATION (m): 897.331

SAMPLE TYPE: ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ▨ NO RECOVERY ▮ CORE

BACKFILL TYPE: ■ BENTONITE ☐ GRAVEL ▥ SLOUGH ☐ GROUT ▨ CUTTINGS ☐ SAND

DEPTH (m)	USC	SOIL DESCRIPTION	SAMPLE #	SPT (N)	COMMENTS	ELEVATION (m)
10	CI		14	26	Clay: 17.3%	
						887
		- silty, trace gravel				
11			15			
						886
			16	31		
12						
						885
			17			
13		- very stiff	18	31	Sample 18 Resistivity: 1010 ohm-cm pH: 7.42 SO4: 0.015% Cl: 0.00067%	
						884
14						
						883
		- cobbles encountered				
15						
	CI	CLAY TILL - trace sand, trace silt, trace gravel, medium plastic, very hard, wet, grey				882
16					Sample 21 LL: 35.0% PL: 17.8% PI: 17.2%	
			19	29		881
17						
						880
			20	17		
18						
	CS	CLAY SHALE - trace sand, hard, grey				879
19						
			21	41		878
		END OF TESTHOLE @ 19.5 mBGS - Water at 9.18 mBGS upon completion - Water level measured at 1.92 mBGS on 6/11/2014.				
20						



LOGGED BY: MR	COMPLETION DEPTH: 19.51 m
REVIEWED BY: FA	COMPLETION DATE: 10/16/2014
PROJECT ENGINEER: A. Shirazi	

PROJECT: Edson Wastewater Treatment Plant Upgrades	CLIENT: Town of Edson	TESTHOLE NO.: **TH14-03**
LOCATION: Headworks	COORDINATES: UTM N 5938309 E 541133	PROJECT NO.: 60330572
CONTRACTOR: Mobile Augers	METHOD: Solid Stem	ELEVATION (m): 897.331

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ▨ NO RECOVERY ◧ CORE

BACKFILL TYPE ■ BENTONITE ☐ GRAVEL ▥ SLOUGH ▩ GROUT ▨ CUTTINGS ☐ SAND

DEPTH (m)		USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 25 50 75 PLASTIC M.C. LIQUID 12.5 25.0 37.5	COMMENTS	ELEVATION (m)
20				- Water level measured at 2.21 mBGS on 11/12/2014.						

DEPTH (m): 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30

ELEVATION (m): 877, 876, 875, 874, 873, 872, 871, 870, 869, 868

AECOM

LOGGED BY: MR

REVIEWED BY: FA

PROJECT ENGINEER: A. Shirazi

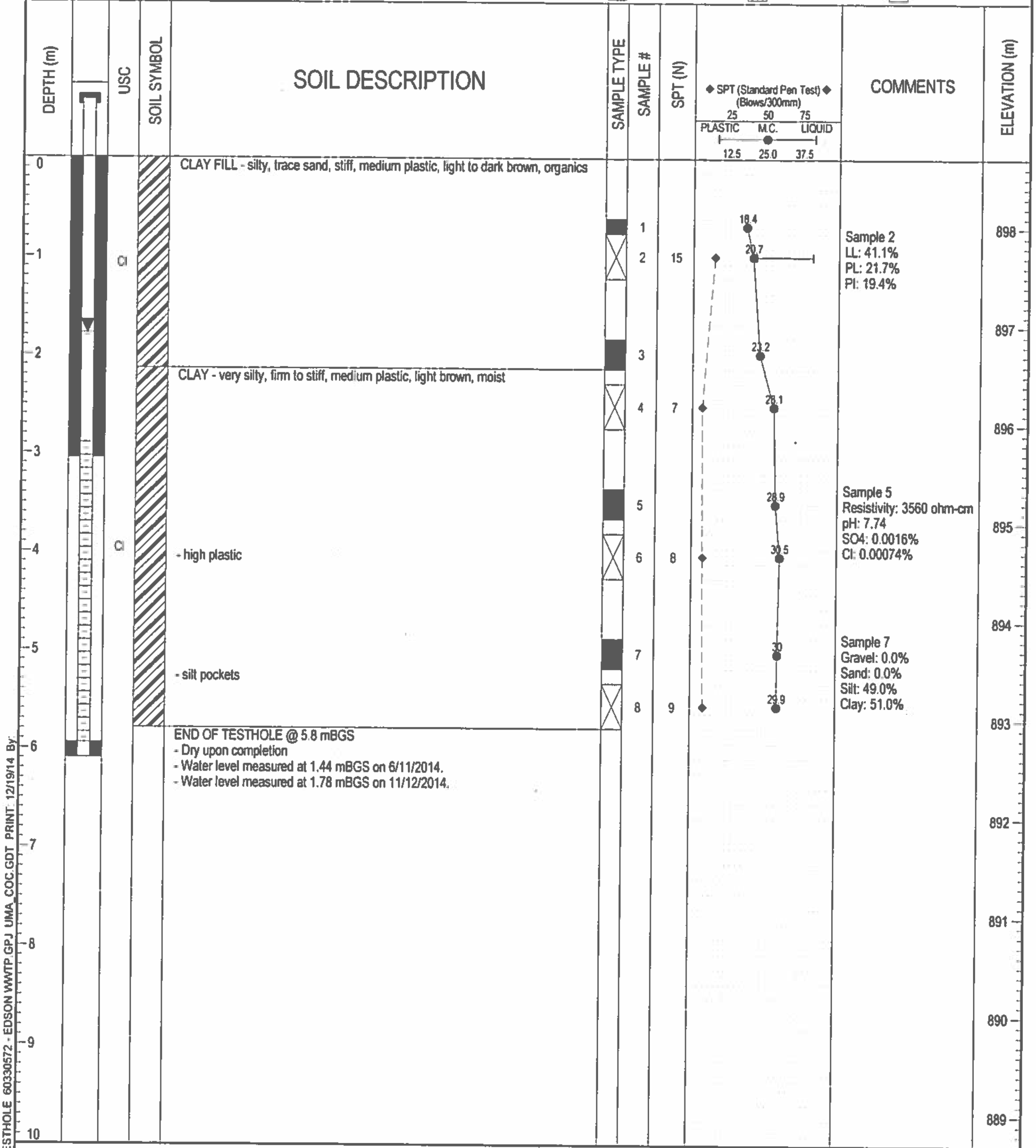
COMPLETION DEPTH: 19.51 m

COMPLETION DATE: 10/16/2014

PROJECT: Edson Wastewater Treatment Plant Upgrades	CLIENT: Town of Edson	TESTHOLE NO.: **TH14-04**
LOCATION: New Pipe	COORDINATES: UTM N 5938286 E 540897	PROJECT NO.: 60330572
CONTRACTOR: Mobile Augers	METHOD: Solid Stem	ELEVATION (m): 898.703

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ▨ NO RECOVERY ▮ CORE

BACKFILL TYPE ■ BENTONITE ⬚ GRAVEL ▥ SLOUGH ⬚ GROUT ▨ CUTTINGS ☐ SAND



SOIL DESCRIPTION

CLAY FILL - silty, trace sand, stiff, medium plastic, light to dark brown, organics

CLAY - very silty, firm to stiff, medium plastic, light brown, moist

- high plastic

- silt pockets

END OF TESTHOLE @ 5.8 mBGS
- Dry upon completion
- Water level measured at 1.44 mBGS on 6/11/2014.
- Water level measured at 1.78 mBGS on 11/12/2014.

COMMENTS

Sample 2
LL: 41.1%
PL: 21.7%
PI: 19.4%

Sample 5
Resistivity: 3560 ohm-cm
pH: 7.74
SO4: 0.0016%
Cl: 0.00074%

Sample 7
Gravel: 0.0%
Sand: 0.0%
Silt: 49.0%
Clay: 51.0%

LOG OF TESTHOLE 60330572 - EDSON WWTP.GPJ UMA_COC.GDT PRINT: 12/19/14 By:

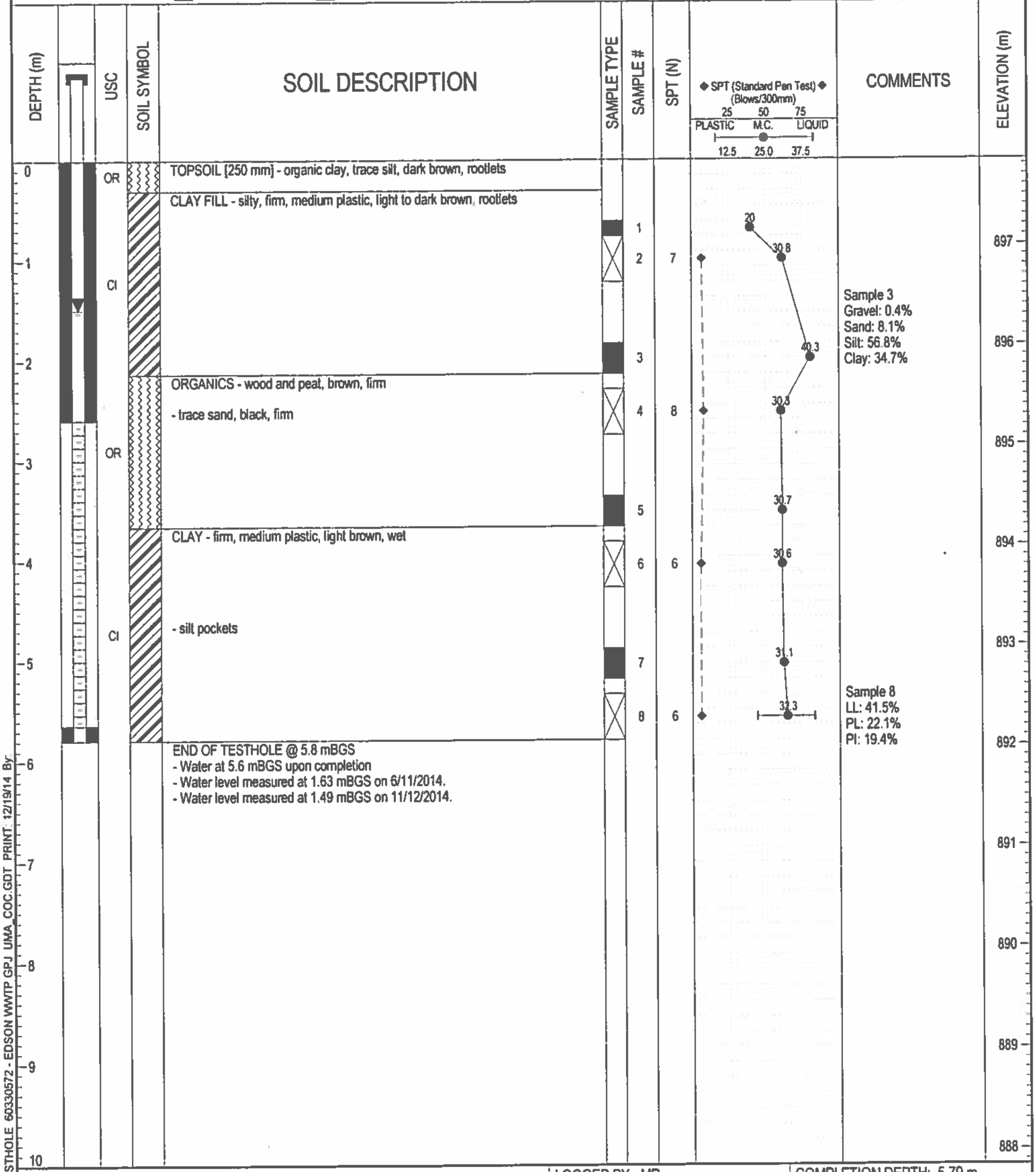
AECOM

LOGGED BY: MR	COMPLETION DEPTH: 6.10 m
REVIEWED BY: FA	COMPLETION DATE: 10/16/2014
PROJECT ENGINEER: A. Shirazi	Page 1 of 1

PROJECT: Edson Wastewater Treatment Plant Upgrades	CLIENT: Town of Edson	TESTHOLE NO.: **TH14-05**
LOCATION: New Pipe	COORDINATES: UTM N 5938309 E 541053	PROJECT NO.: 60330572
CONTRACTOR: Mobile Augers	METHOD: Solid Stem	ELEVATION (m): 897.849

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ▨ NO RECOVERY ▯ CORE

BACKFILL TYPE ■ BENTONITE ☐ GRAVEL ▥ SLOUGH ⁘ GROUT ▨ CUTTINGS ☐ SAND



TOPSOIL [250 mm] - organic clay, trace silt, dark brown, rootlets

CLAY FILL - silty, firm, medium plastic, light to dark brown, rootlets

ORGANICS - wood and peat, brown, firm

- trace sand, black, firm

CLAY - firm, medium plastic, light brown, wet

- silt pockets

END OF TESTHOLE @ 5.8 mBGS
- Water at 5.6 mBGS upon completion
- Water level measured at 1.63 mBGS on 6/11/2014.
- Water level measured at 1.49 mBGS on 11/12/2014.

Sample 3
Gravel: 0.4%
Sand: 8.1%
Silt: 56.8%
Clay: 34.7%

Sample 8
LL: 41.5%
PL: 22.1%
PI: 19.4%

LOG OF TESTHOLE 60330572 - EDSON WWTP.GPJ UMA_COC.GDT PRINT: 12/19/14 By:

AECOM

LOGGED BY: MR	COMPLETION DEPTH: 5.79 m
REVIEWED BY: FA	COMPLETION DATE: 10/16/2014
PROJECT ENGINEER: A. Shirazi	Page 1 of 1

EXPLANATION OF FIELD & LABORATORY TEST DATA

The field and laboratory test results, as shown for each hole, are described below.

1. NATURAL MOISTURE CONTENT

The relationship between the natural moisture content and depth is significant in determining the subsurface moisture conditions. The Atterberg Limits for a sample should be compared to its natural moisture content and plotted on the Plasticity Chart in order to determine the soil classification.

2. SOIL PROFILE AND DESCRIPTION

Each soil strata is classified and described noting any special conditions. The modified Unified Soil Classification (UCS) system is used. The soil profile refers to the existing ground level at the time the hole was done. Where available, the ground elevation is shown. The soil symbols used are shown in detail on the soil classification chart.

3. TESTS ON SOIL SAMPLES

Laboratory and field tests are identified by the following and are on the logs:

N - Standard Penetration Test (SPT) Blow Count. The SPT is conducted in the field to assess the in situ consistency of cohesive soils and the relative density of non-cohesive soils. The N value recorded is the number of blows from a 63.5 kg hammer dropped 760 mm which is required to drive a 51 mm split spoon sampler 300 mm into the soil.

SO_4 - Water Soluble Sulphate Content. Expressed in percent. Conducted primarily to determine requirements for the use of sulphate resistant cement. Further details on the water soluble sulphate content are given in Section 6.

γ_D - Dry Unit Weight. Usually expressed in kN/m^3.

γ_T - Total Unit Weight. Usually expressed in kN/m^3.

Q_U - Unconfined Compressive Strength. Usually expressed in kPa and may be used in determining allowable bearing capacity of the soil.

C_U - Undrained Shear Strength. Usually expressed in kPa. This value is determined by either a direct shear test or by an unconfined compression test and may also be used in determining the allowable bearing capacity of the soil.

C_{PEN} - Pocket Penetrometer Reading. Usually expressed in kPa. Estimate of the undrained shear strength as determined by a pocket penetrometer.

The following tests may also be performed on selected soil samples and the results are given on separate sheets enclosed with the logs:

- Grain Size Analysis
- Standard or Modified Proctor Compaction Test
- California Bearing Ratio Test
- Direct Shear Test
- Permeability Test
- Consolidation Test
- Triaxial Test

4. SOIL DENSITY AND CONSISTENCY

The SPT test described above may be used to estimate the consistency of cohesive soils and the density of cohesionless soils. These approximate relationships are summarized in the following tables:

Table 1 Cohesive Soils

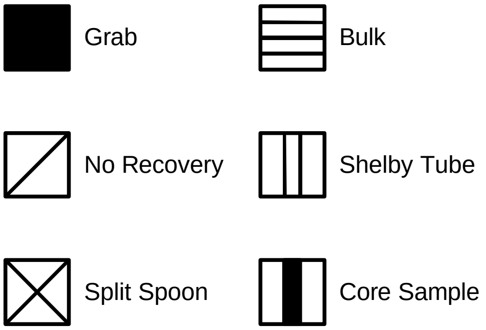
N	Consistency	C_u (kPa) approx.
0 - 1	Very Soft	<10
1 - 4	Soft	10 - 25
4 - 8	Firm	25 - 50
8 - 15	Stiff	50 - 100
15 - 30	Very Stiff	100 - 200
30 - 60	Hard	200 - 300
>60	Very Hard	>300

Table 2 Cohesionless Soils

N	Density
0 - 5	Very Loose
5 - 10	Loose
10 - 30	Compact
30 - 50	Dense
>50	Very Dense

5. SAMPLE CONDITION AND TYPE

The depth, type, and condition of samples are indicated on the logs by the following symbols:



6. WATER SOLUBLE SULPHATE CONCENTRATION

The following table, from CSA Standard A23.1-00, indicates the requirements for concrete subjected to sulphate attack based upon the percentage of water-soluble sulphate as presented on the logs. CSA Standard A23.1-00 should be read in conjunction with the table.

Table 3 Requirements For Concrete Subjected to Sulphate Attack*

Class of exposure	Degree of exposure	Water-soluble sulphate (SO_4) in soil sample, %	Sulphate (SO_4) in ground-water samples, mg/L	Minimum Specified 56 d compressive strength, MPa †	Maximum water/cementing materials ratio ‡	Air content category §	Cementing materials to be used **††
S-1	Very severe	over 2.0	over 10,000	35	0.40	2	50
S-2	Severe	0.20 - 2.0	1,500 - 10,000	32	0.45	2	50
S-3	Moderate	0.10 - 0.20	150 - 1,500	30	0.50	2	20E‡‡, 40, or 50E

* For sea water exposure see Clause 15.4

† Where supplementary cementing materials are used, the owner may also specify other test ages.

‡ See Clause 15.1.4

§ For steel trowelled interior slabs on grade, subject to sulphate attack but not freeze-thaw, air entrainment is not required.

** See Clause 15.1.5

†† Cementing material combinations with equivalent performance may be used (see Clauses 3.2, 3.3, and 3.4)

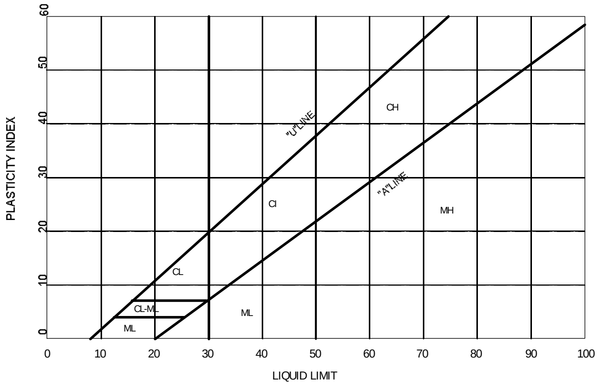
‡‡ Type 20E cement with moderate sulphate resistance (see Clause 3.1.2)

Note: Type 50E cement shall not be used in reinforced concrete exposed to both chlorides and sulphates. Refer to Clause 15.4.

7. GROUNDWATER TABLE

The groundwater table is indicated by the equilibrium level of water in a standpipe installed in a testhole or test pit. This level is generally taken at least 24 hours after installation of the standpipe. The groundwater level is subject to seasonal variations and is usually highest in the spring. The symbol on the logs indicating the groundwater level is an inverted solid triangle (▼).

MAJOR DIVISION			LOG SYMBOLS	USC	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA	
COARSE GRAINED SOILS	GRAVELS (MORE THAN HALF COARSE GRAINS LARGER THAN 4.75 mm)	CLEAN GRAVELS (LITTLE OR NO FINES)	▨	GW	WELL GRADED GRAVELS, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 4 \quad C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$	
			▨	GP	POORLY GRADED GRAVELS AND GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS	
		GRAVELS WITH FINES	▨	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	CONTENT OF FINES EXCEEDS 12%	ATTERBERG LIMITS BELOW 'A' LINE W_p LESS THAN 4
			▨	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES		ATTERBERG LIMITS ABOVE 'A' LINE W_p MORE THAN 7
	SANDS (MORE THAN HALF COARSE GRAINS SMALLER THAN 4.75 mm)	CLEAN SANDS (LITTLE OR NO FINES)	▨	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 6 \quad C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$	
			▨	SP	POORLY GRADED SANDS, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS	
		SANDS WITH FINES	▨	SM	SILTY SANDS, SAND-SILT MIXTURES	CONTENT OF FINES EXCEEDS 12%	ATTERBERG LIMITS BELOW 'A' LINE W_p LESS THAN 4
			▨	SC	CLAYEY SANDS, SAND-CLAY MIXTURES		ATTERBERG LIMITS ABOVE 'A' LINE W_p MORE THAN 7
FINE GRAINED SOILS	SILTS (BELOW 'A' LINE NEGLIGIBLE ORGANIC CONTENT)	$W_L < 50$	▨	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHT PLASTICITY	CLASSIFICATION IS BASED UPON PLASTICITY CHART (SEE BELOW)	
		$W_L > 50$	▨	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS		
	CLAYS (ABOVE 'A' LINE NEGLIGIBLE ORGANIC CONTENT)	$W_L < 30$	▨	CL	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAYS, LEAN CLAYS	WHENEVER THE NATURE OF THE FINE CONTENT HAS NOT BEEN DETERMINED, IT IS DESIGNATED BY THE LETTER 'F'. E.G. SF IS A MIXTURE OF SAND WITH SILT OR CLAY	
		$30 < W_L < 50$	▨	CI	INORGANIC CLAYS OF MEDIUM PLASTICITY, SILTY CLAYS		
		$W_L > 50$	▨	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS		
	ORGANIC SILTS & CLAYS (BELOW 'A' LINE)	$W_L < 50$	▨	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY		
		$W_L > 50$	▨	OH	ORGANIC CLAYS OF HIGH PLASTICITY		
HIGHLY ORGANIC SOILS			▨	Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOUR OR ODOUR, AND OFTEN FIBROUS TEXTURE	
BEDROCK			▨	BR	SEE REPORT DESCRIPTION		



SOIL COMPONENTS

FRACTION		SIEVE SIZE (mm)		DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS	
		PASSING	RETAINED	PERCENT	IDENTIFIER
GRAVEL	COARSE	75	19	50 - 35	AND
	FINE	19	4.75		
SAND	COARSE	4.75	2.00	35 – 20	_____Y
	MEDIUM	2.00	0.425		
	FINE	0.425	0.080	20 – 10	SOME
SILT (non-plastic) or CLAY (plastic)		0.080		10 - 1	TRACE

OVERSIZE MATERIALS

ROUNDED OR SUB-ROUNDED COBBLES 75 mm TO 200 mm BOULDERS >200 mm	ANGULAR ROCK FRAGMENTS ROCKS > 0.75 m3 IN VOLUME

NOTE :

1. BOUNDARY CLASSIFICATION POSSESSING CHARACTERISTICS OF TWO GROUPS ARE GIVEN GROUP SYMBOLS, E.G. GW-GC IS A WELL GRADED GRAVEL MIXTURE WITH CLAY BINDER BETWEEN 5% AND 12%

MODIFIED UNIFIED SOIL CLASSIFICATION SYSTEM

APRIL 2012

AECOM Canada Ltd.
General Statement; Normal Variability Of Subsurface Conditions

The scope of the investigation presented herein is limited to an investigation of the subsurface conditions as to suitability of the site for the proposed project. This report has been prepared to aid in the general evaluation of the site and to assist the design engineer in the conceptual design for the area. The description of the project presented in this report represents the understanding by the geotechnical engineer of the significant aspects of the project relevant to the design and construction of the subdivision, infrastructure and similar. In the event of any changes in the basic design or location of the structures, as outlined in this report or plan, AECOM should be given the opportunity to review the changes and to modify or reaffirm in writing the conclusions and recommendations of this report.

The analysis and recommendations represented in this report are based on the data obtained from the test holes drilled at the locations indicated on the site plans and from other information discussed herein. This report is based on the assumption that the subsurface conditions everywhere on the site are not significantly different from those encountered at the test locations. However, variations in soil conditions may exist between the test holes and, also, general groundwater levels and condition may fluctuate from time to time. The nature and extent of the variations may not become evident until construction. If subsurface conditions, different from those encountered in the test holes are observed or encountered during construction or appear to be present beneath or beyond the excavation, AECOM should be advised at once so that the conditions can be observed and reviewed and the recommendations reconsidered where necessary.

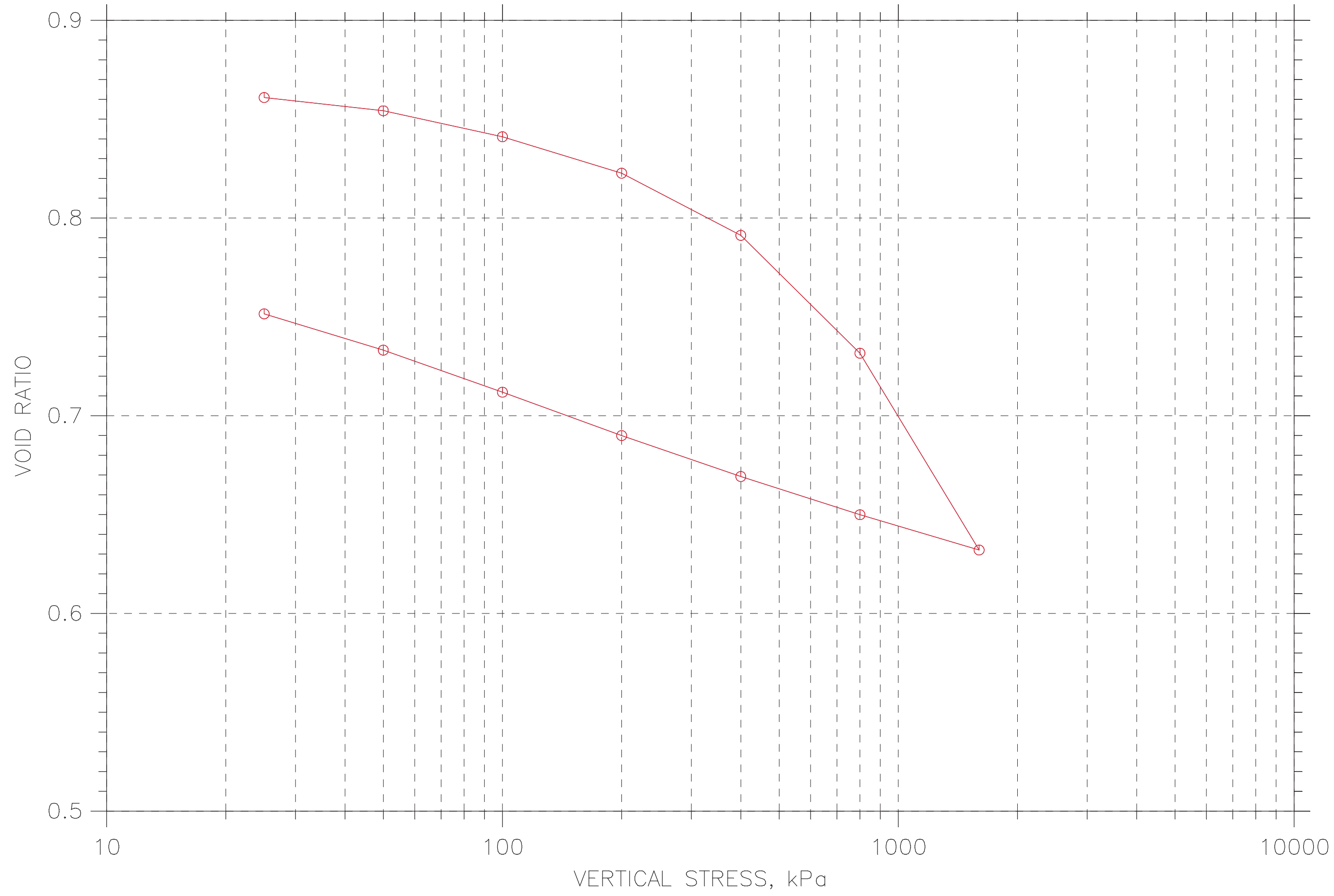
Since it is possible for conditions to vary from those identified at the test locations and from those assumed in the analysis and preparation of recommendations, a contingency fund should be included in the construction budget to allow for the possibility of variations which may result in modifications of the design and construction procedures.

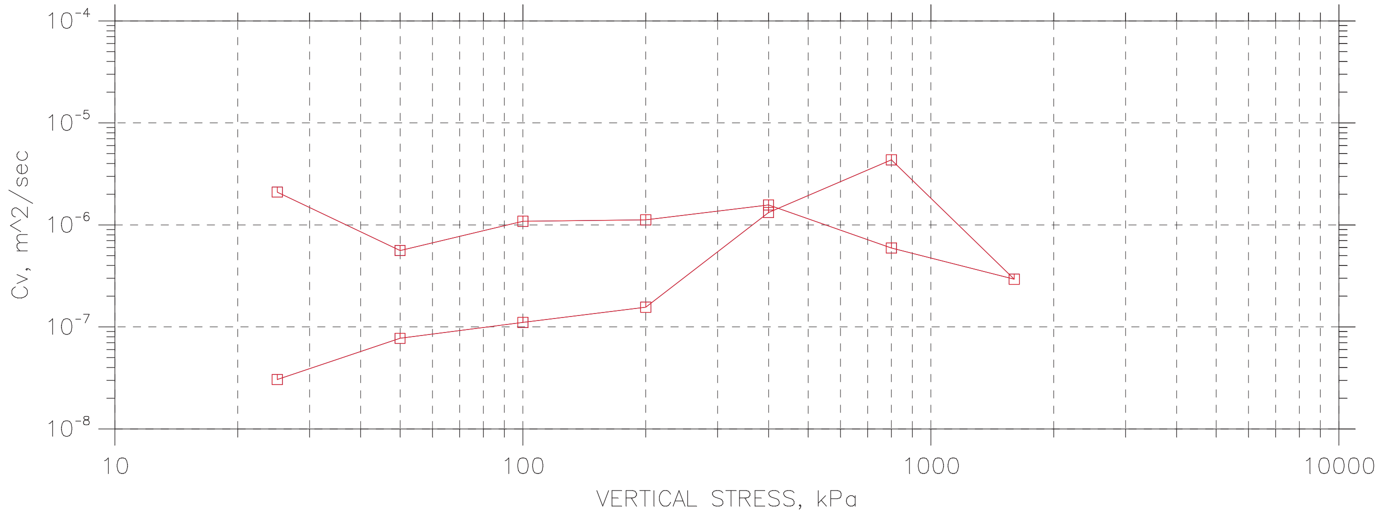
Appendix C

Laboratory Test Results

CONSOLIDATION TEST DATA

SUMMARY REPORT





Project: TOWN OF EDSON	Location: CALGARY, ALBERTA CA	Project No.: 60330572
Boring No.: TH14-02 S10	Tested By: BCM	Checked By: WPQ
Sample No.: S-10	Test Date: 11/7/14	Depth: ----
Test No.: TH1402S10	Sample Type: PRECUT	Elevation: ----
Description: SILTY CLAY TRACE F SAND - DARK BROWNISH GRAY CL		
Remarks: Pc = 450 kPa Cc = 0.332 Ccr = 0.067 TEST PERFORMED AS PER ASTM D2435		

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CONSOLIDATION TEST DATA

Project: TOWN OF EDSON
Boring No.: TH14-02 S10
Sample No.: S-10
Test No.: TH1402S10

Location: CALGARY, ALBERTA CA
Tested By: BCM
Test Date: 11/7/14
Sample Type: PRECUT

Project No.: 60330572
Checked By: WPQ
Depth: ----
Elevation: ----

Soil Description: SILTY CLAY TRACE F SAND - DARK BROWNISH GRAY CL
Remarks: Pc = 450 kPa Cc = 0.332 Ccr = 0.067 TEST PERFORMED AS PER ASTM D2435

Estimated Specific Gravity: 2.72
Initial Void Ratio: 0.87
Final Void Ratio: 0.75

Liquid Limit: ---
Plastic Limit: ---
Plasticity Index: ---

Initial Height: 25.39 mm
Specimen Diameter: 63.45 mm

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	X-17	RING	RING	X-1
Wt. Container + Wet Soil, gm	234.64	264.18	260.76	195.19
Wt. Container + Dry Soil, gm	192.1	228.52	228.52	162.74
Wt. Container, gm	44.34	111.55	111.55	45.01
Wt. Dry Soil, gm	147.76	116.97	116.97	117.73
Water Content, %	28.79	30.49	27.56	27.56
Void Ratio	---	0.87	0.75	---
Degree of Saturation, %	---	95.66	99.76	---
Dry Unit Weight, pcf	---	90.957	96.948	---

CONSOLIDATION TEST DATA

Project: TOWN OF EDSON
Boring No.: TH14-02 S10
Sample No.: S-10
Test No.: TH1402S10

Location: CALGARY, ALBERTA CA
Tested By: BCM
Test Date: 11/7/14
Sample Type: PRECUT

Project No.: 60330572
Checked By: WPQ
Depth: ----
Elevation: ----

Soil Description: SILTY CLAY TRACE F SAND - DARK BROWNISH GRAY CL
Remarks: Pc = 450 kPa Cc = 0.332 Ccr = 0.067 TEST PERFORMED AS PER ASTM D2435

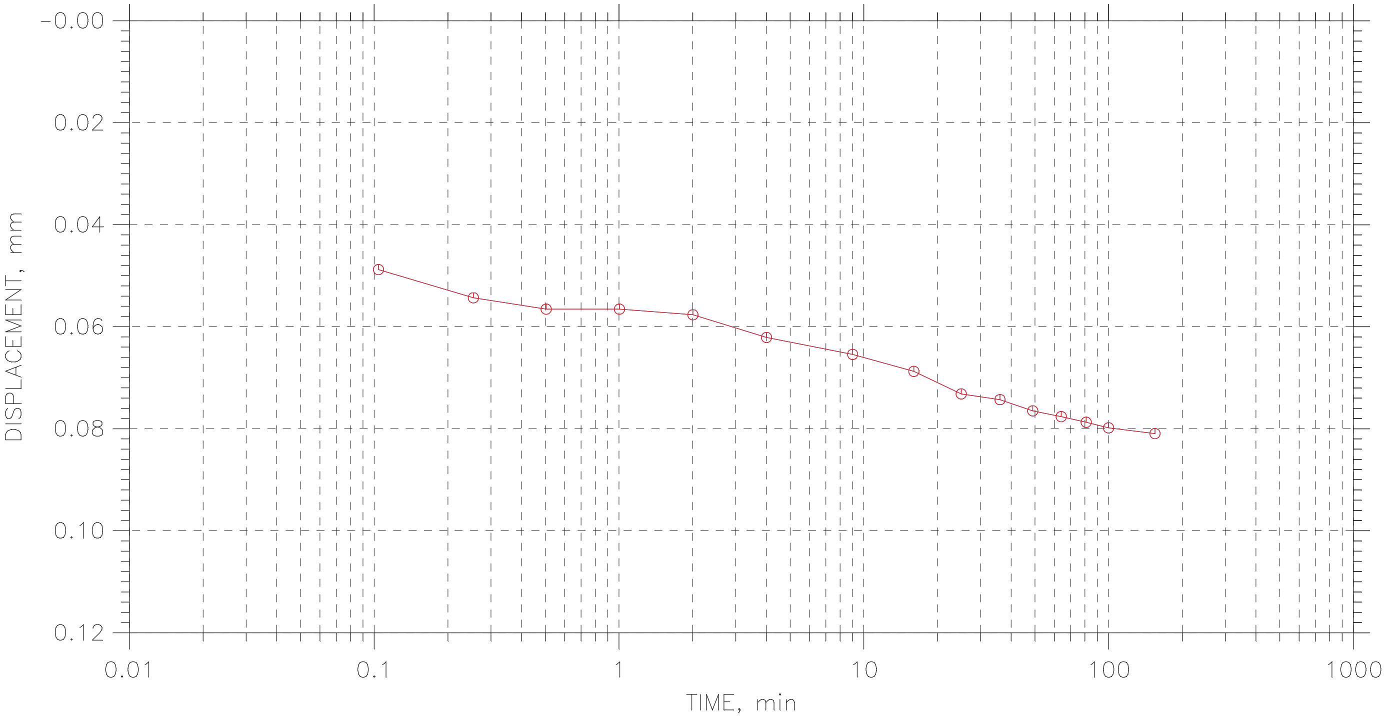
	Applied Stress kPa	Final Displacement mm	Void Ratio	Strain at End %	T50 Fitting		Coefficient of Consolidation		
					Sq.Rt. min	Log min	Sq.Rt. m^2/sec	Log m^2/sec	Ave. m^2/sec
1	25	0.08095	0.861	0.32	0.3	0.0	2.10e-006	0.00e+000	2.10e-006
2	50	0.1719	0.854	0.68	0.9	0.0	5.62e-007	0.00e+000	5.62e-007
3	100	0.3504	0.841	1.38	0.5	0.0	1.09e-006	0.00e+000	1.09e-006
4	200	0.601	0.823	2.37	0.5	0.0	1.12e-006	0.00e+000	1.12e-006
5	400	1.029	0.791	4.05	0.5	0.2	1.07e-006	2.92e-006	1.57e-006
6	800	1.84	0.732	7.25	0.9	0.7	5.05e-007	7.23e-007	5.95e-007
7	1.6e+003	3.194	0.632	12.58	2.1	0.8	2.05e-007	5.21e-007	2.94e-007
8	800	2.951	0.650	11.62	0.1	0.0	4.34e-006	0.00e+000	4.34e-006
9	400	2.688	0.669	10.59	0.5	0.1	8.68e-007	2.80e-006	1.33e-006
10	200	2.406	0.690	9.48	3.9	1.6	1.10e-007	2.68e-007	1.56e-007
11	100	2.108	0.712	8.30	3.6	4.4	1.24e-007	1.00e-007	1.11e-007
12	50	1.819	0.733	7.16	5.8	0.0	7.73e-008	0.00e+000	7.73e-008
13	25	1.569	0.751	6.18	18.0	12.3	2.56e-008	3.76e-008	3.05e-008

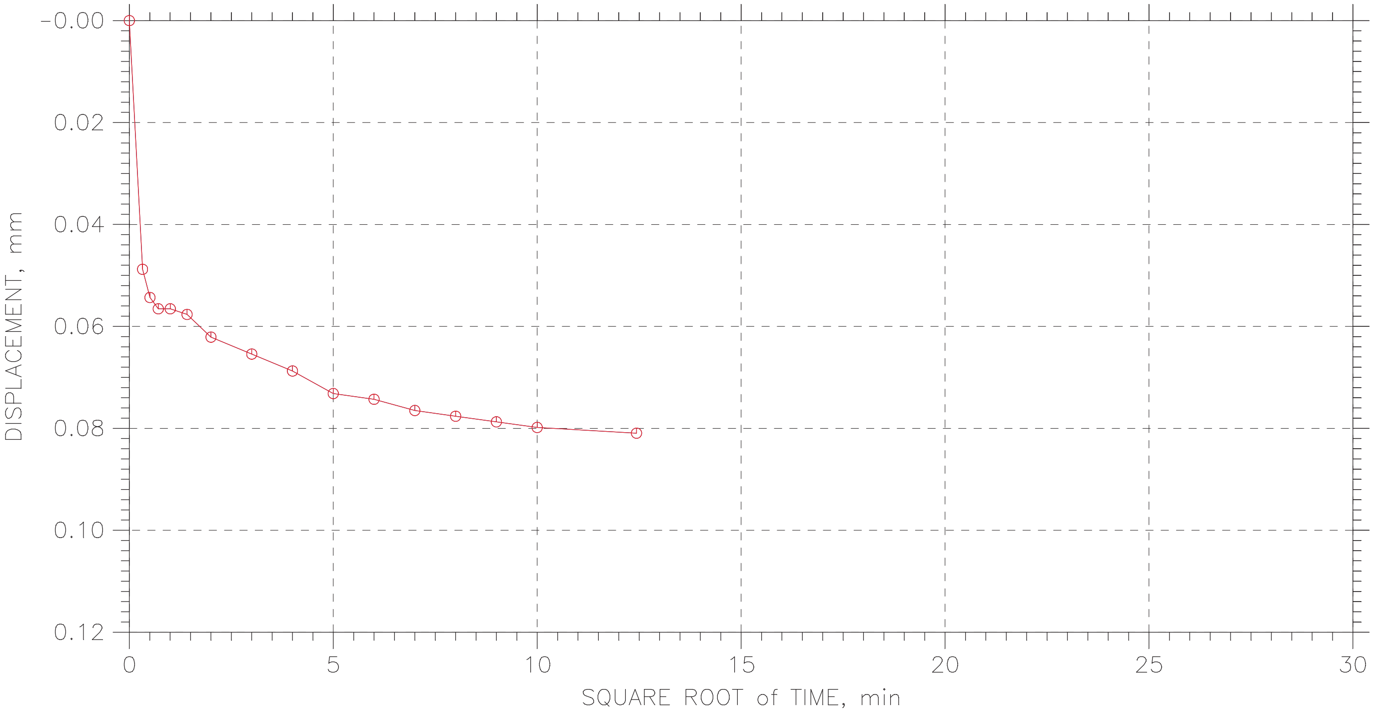
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 1 of 13

Stress: 25. kPa





AECOM

	Project: TOWN OF EDSON	Location: CALGARY, ALBERTA CA	Project No.: 60330572
	Boring No.: TH14-02 S10	Tested By: BCM	Checked By: WPQ
	Sample No.: S-10	Test Date: 11/7/14	Depth: ----
	Test No.: TH1402S10	Sample Type: PRECUT	Elevation: ----
	Description: SILTY CLAY TRACE F SAND - DARK BROWNISH GRAY CL		
	Remarks: Pc = 450 kPa Cc = 0.332 Ccr = 0.067 TEST PERFORMED AS PER ASTM D2435		

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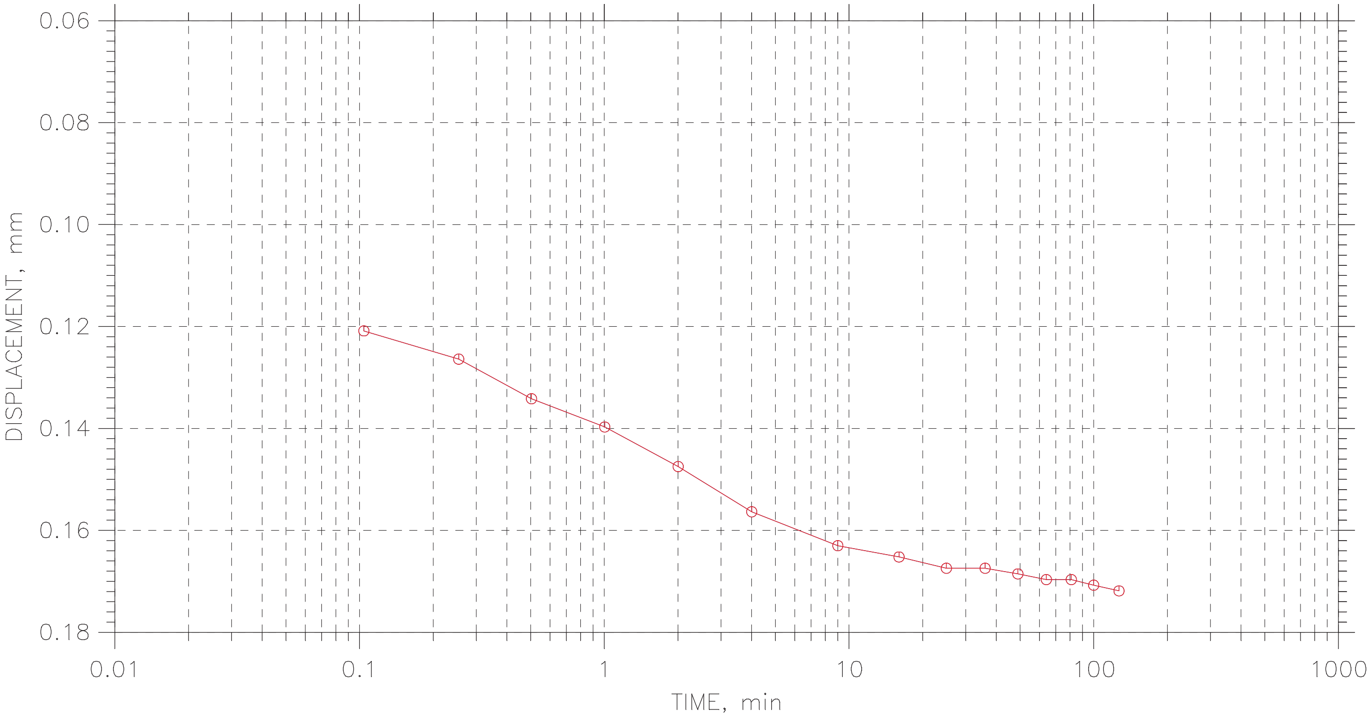
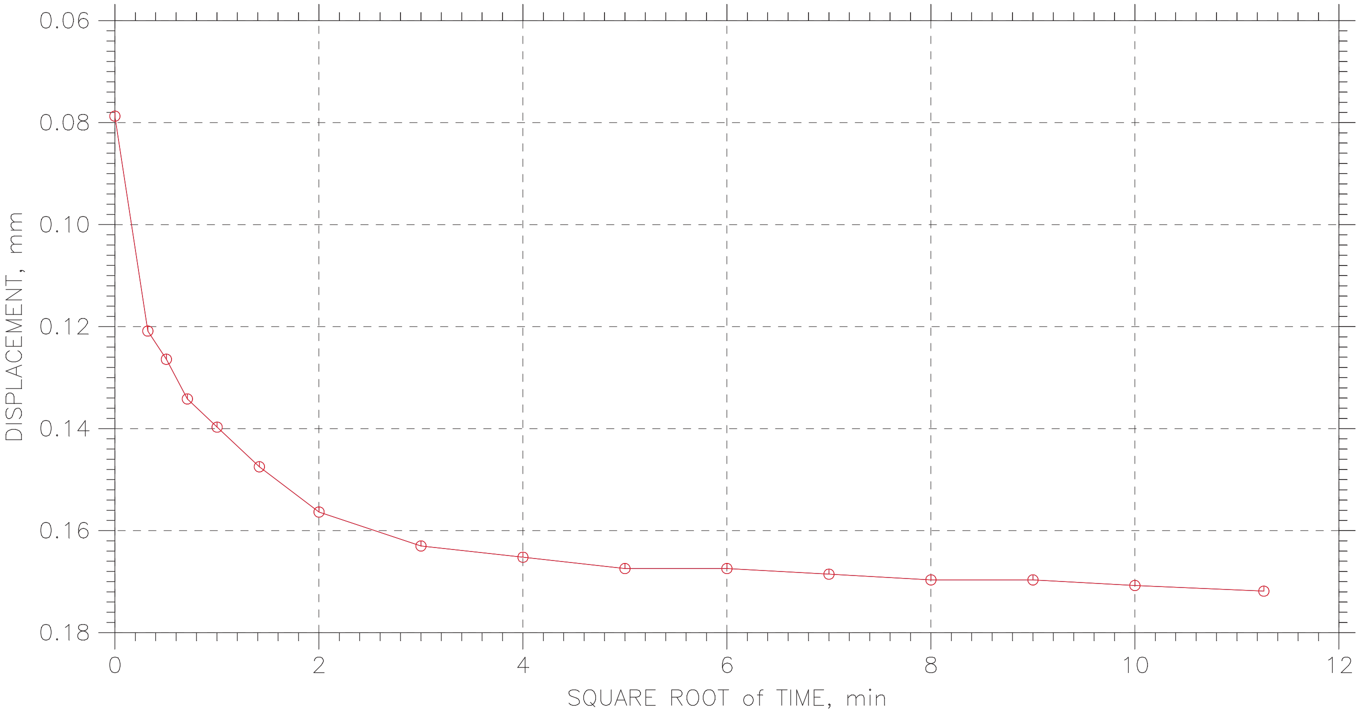
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 2 of 13

Stress: 50. kPa





AECOM

Project: TOWN OF EDSON	Location: CALGARY, ALBERTA CA	Project No.: 60330572
Boring No.: TH14-02 S10	Tested By: BCM	Checked By: WPQ
Sample No.: S-10	Test Date: 11/7/14	Depth: ----
Test No.: TH1402S10	Sample Type: PRECUT	Elevation: ----
Description: SILTY CLAY TRACE F SAND - DARK BROWNISH GRAY CL		
Remarks: Pc = 450 kPa Cc = 0.332 Ccr = 0.067 TEST PERFORMED AS PER ASTM D2435		

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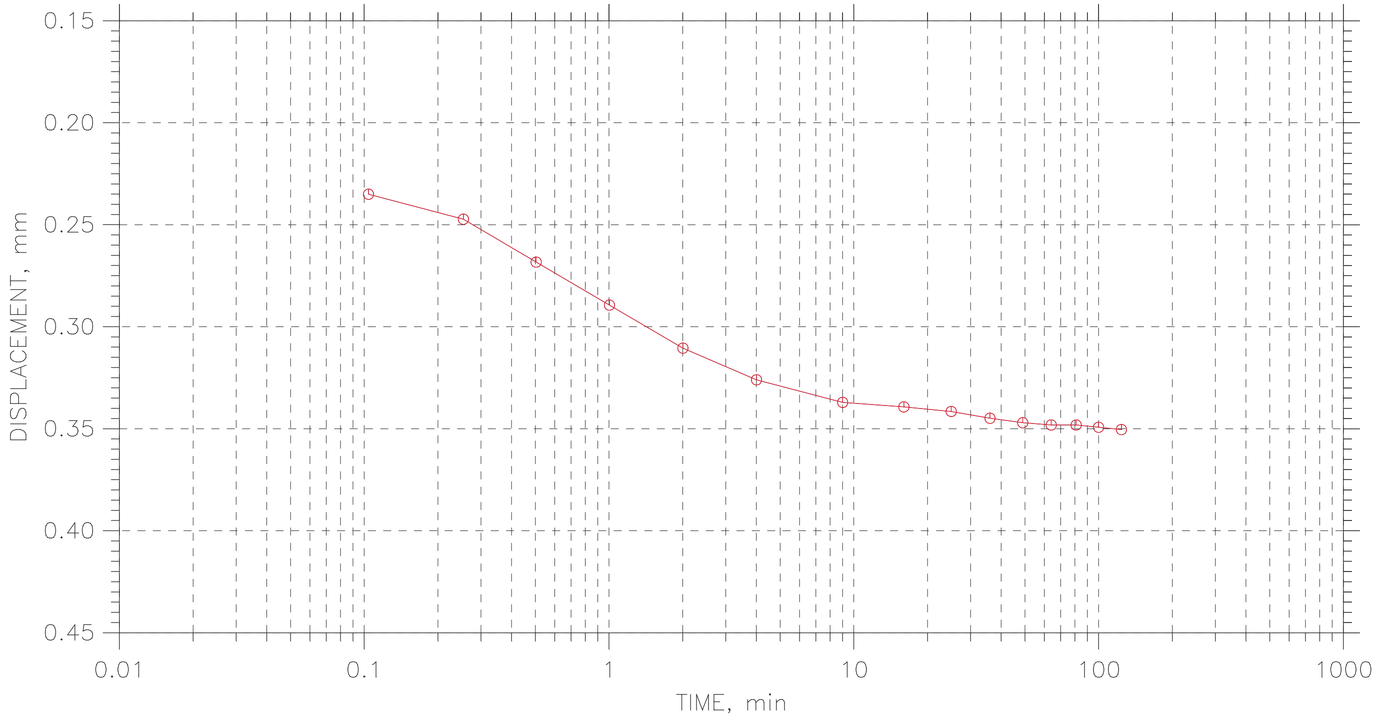
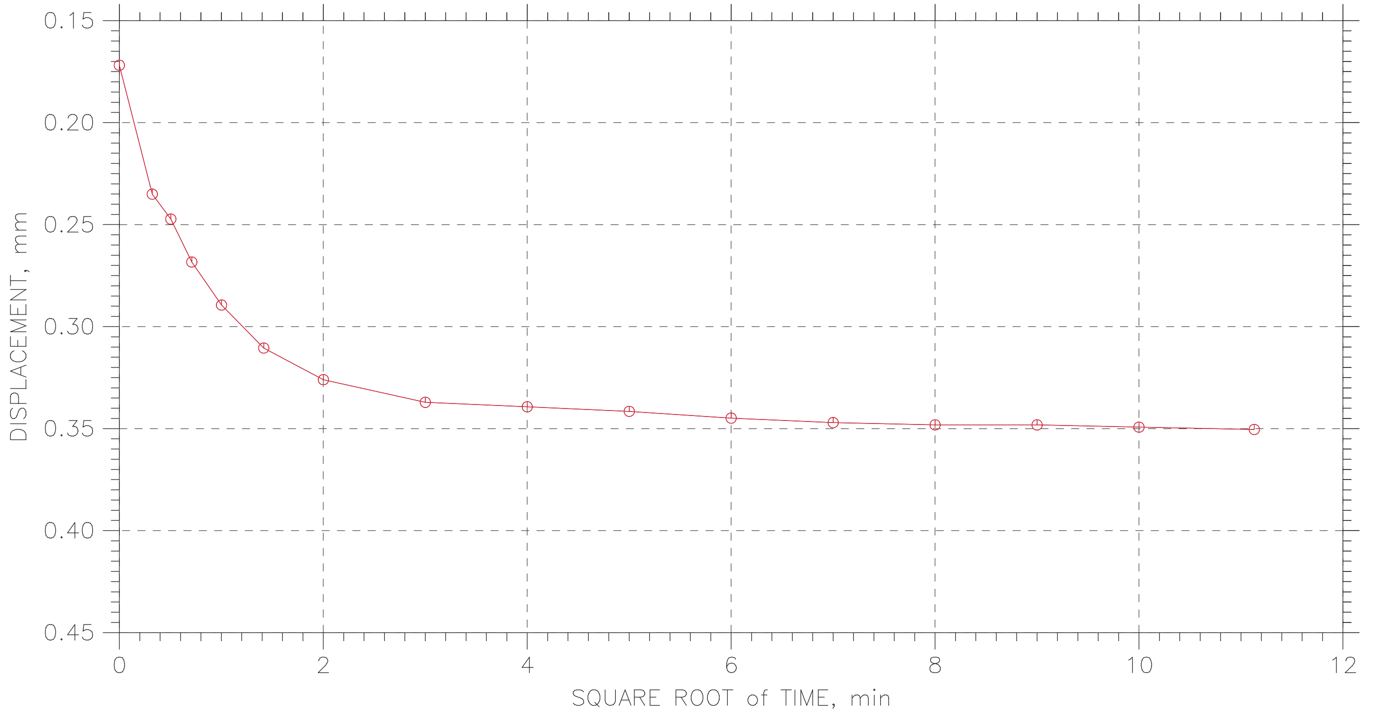
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 3 of 13

Stress: 100. kPa





AECOM	Project: TOWN OF EDSON	Location: CALGARY, ALBERTA CA	Project No.: 60330572
	Boring No.: TH14-02 S10	Tested By: BCM	Checked By: WPQ
	Sample No.: S-10	Test Date: 11/7/14	Depth: ----
	Test No.: TH1402S10	Sample Type: PRECUT	Elevation: ----
	Description: SILTY CLAY TRACE F SAND - DARK BROWNISH GRAY CL		
	Remarks: Pc = 450 kPa Cc = 0.332 Ccr = 0.067 TEST PERFORMED AS PER ASTM D2435		

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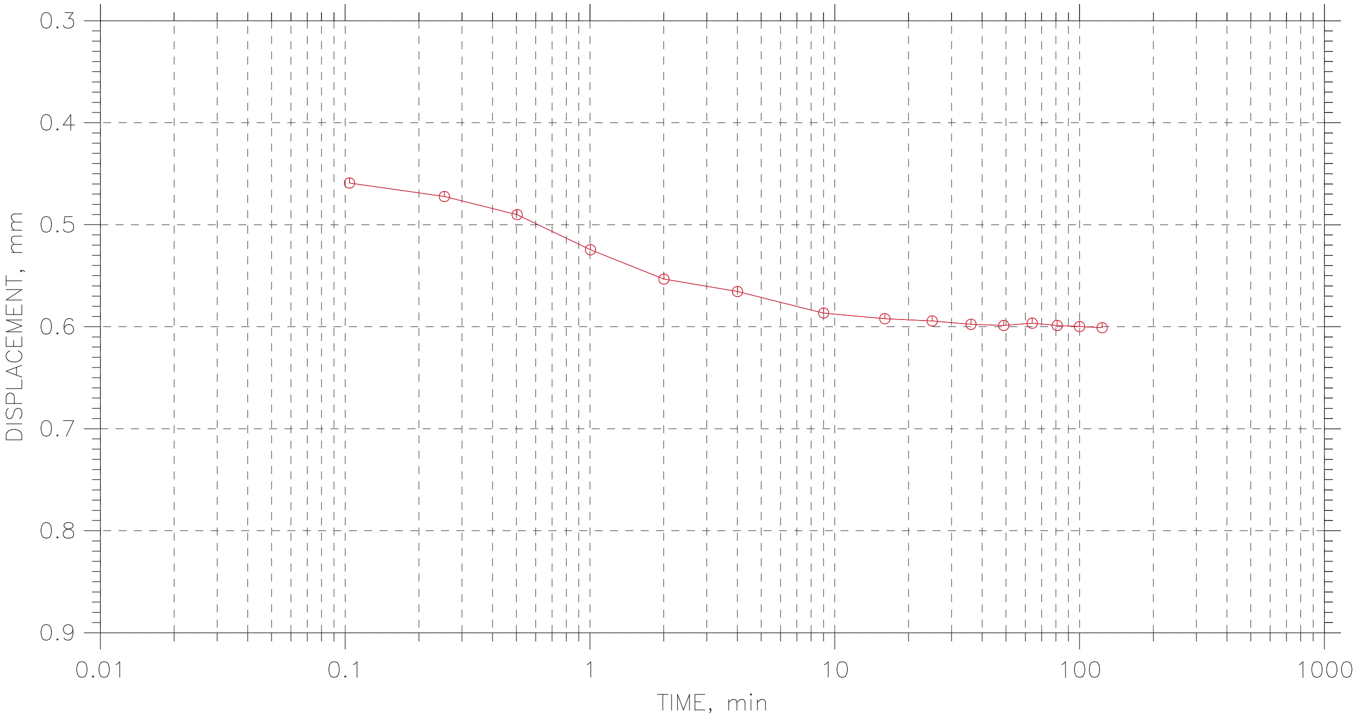
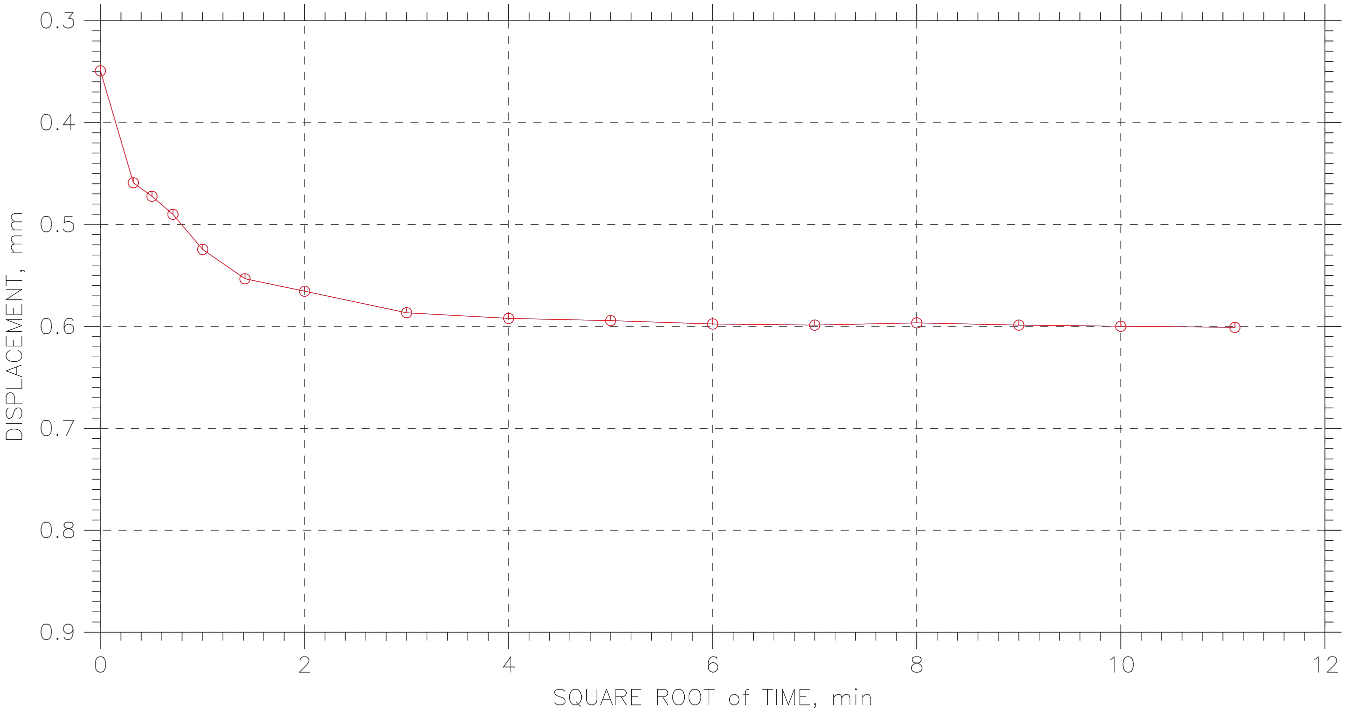
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 4 of 13

Stress: 200. kPa





AECOM	Project: TOWN OF EDSON	Location: CALGARY, ALBERTA CA	Project No.: 60330572
	Boring No.: TH14-02 S10	Tested By: BCM	Checked By: WPQ
	Sample No.: S-10	Test Date: 11/7/14	Depth: ----
	Test No.: TH1402S10	Sample Type: PRECUT	Elevation: ----
	Description: SILTY CLAY TRACE F SAND - DARK BROWNISH GRAY CL		
	Remarks: Pc = 450 kPa Cc = 0.332 Ccr = 0.067 TEST PERFORMED AS PER ASTM D2435		

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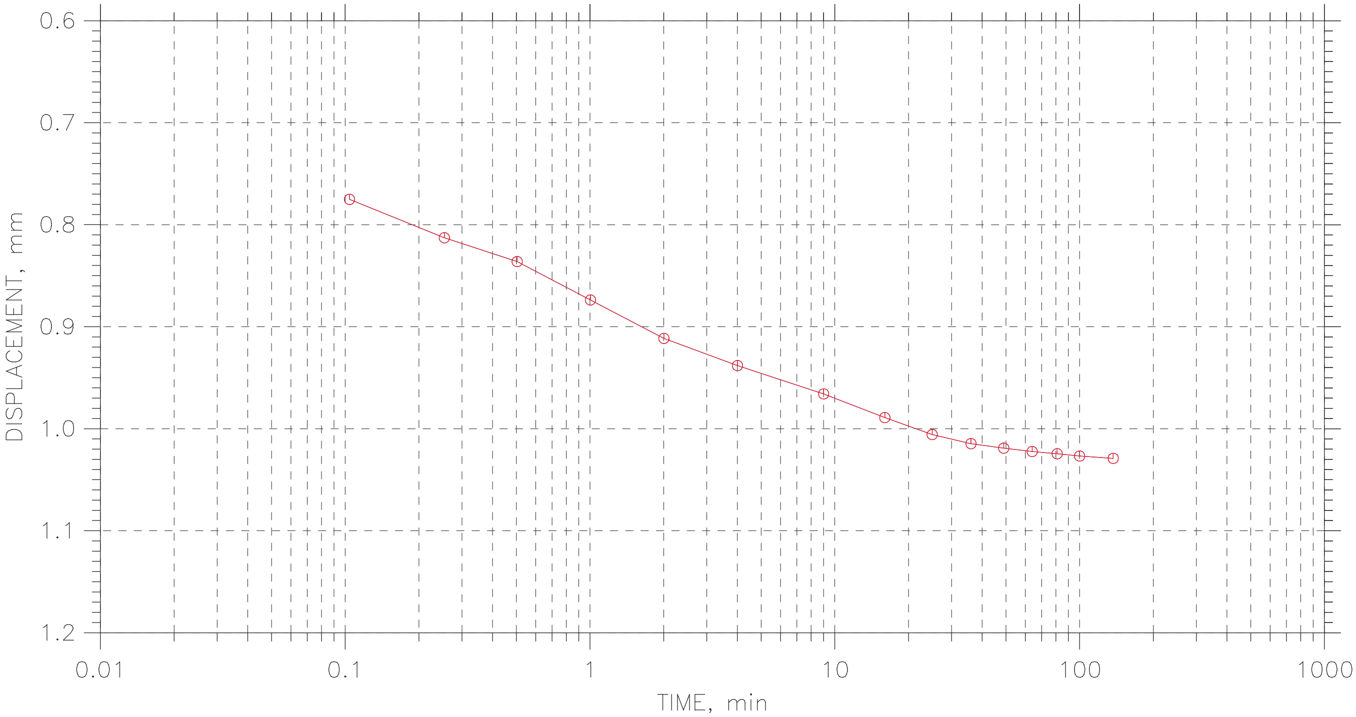
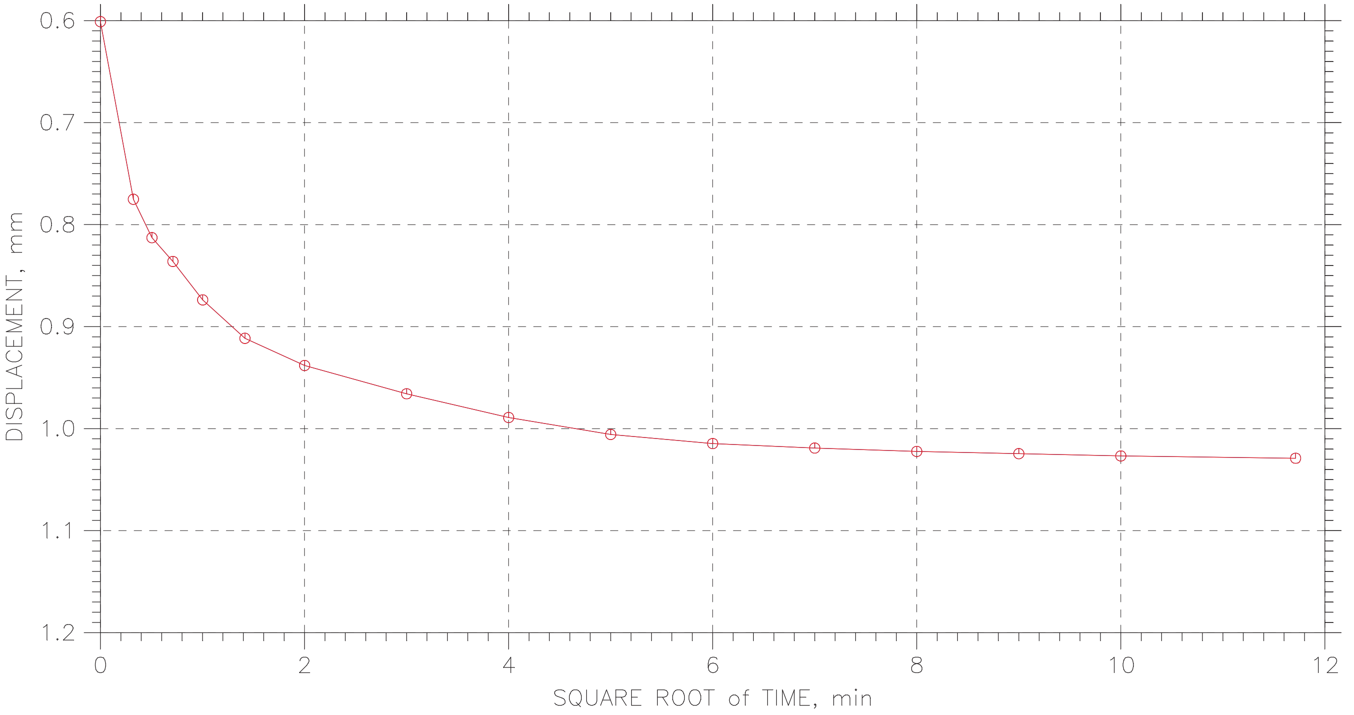
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 5 of 13

Stress: 400. kPa





AECOM	Project: TOWN OF EDSON	Location: CALGARY, ALBERTA CA	Project No.: 60330572
	Boring No.: TH14-02 S10	Tested By: BCM	Checked By: WPQ
	Sample No.: S-10	Test Date: 11/7/14	Depth: ----
	Test No.: TH1402S10	Sample Type: PRECUT	Elevation: ----
	Description: SILTY CLAY TRACE F SAND - DARK BROWNISH GRAY CL		
	Remarks: Pc = 450 kPa Cc = 0.332 Ccr = 0.067 TEST PERFORMED AS PER ASTM D2435		

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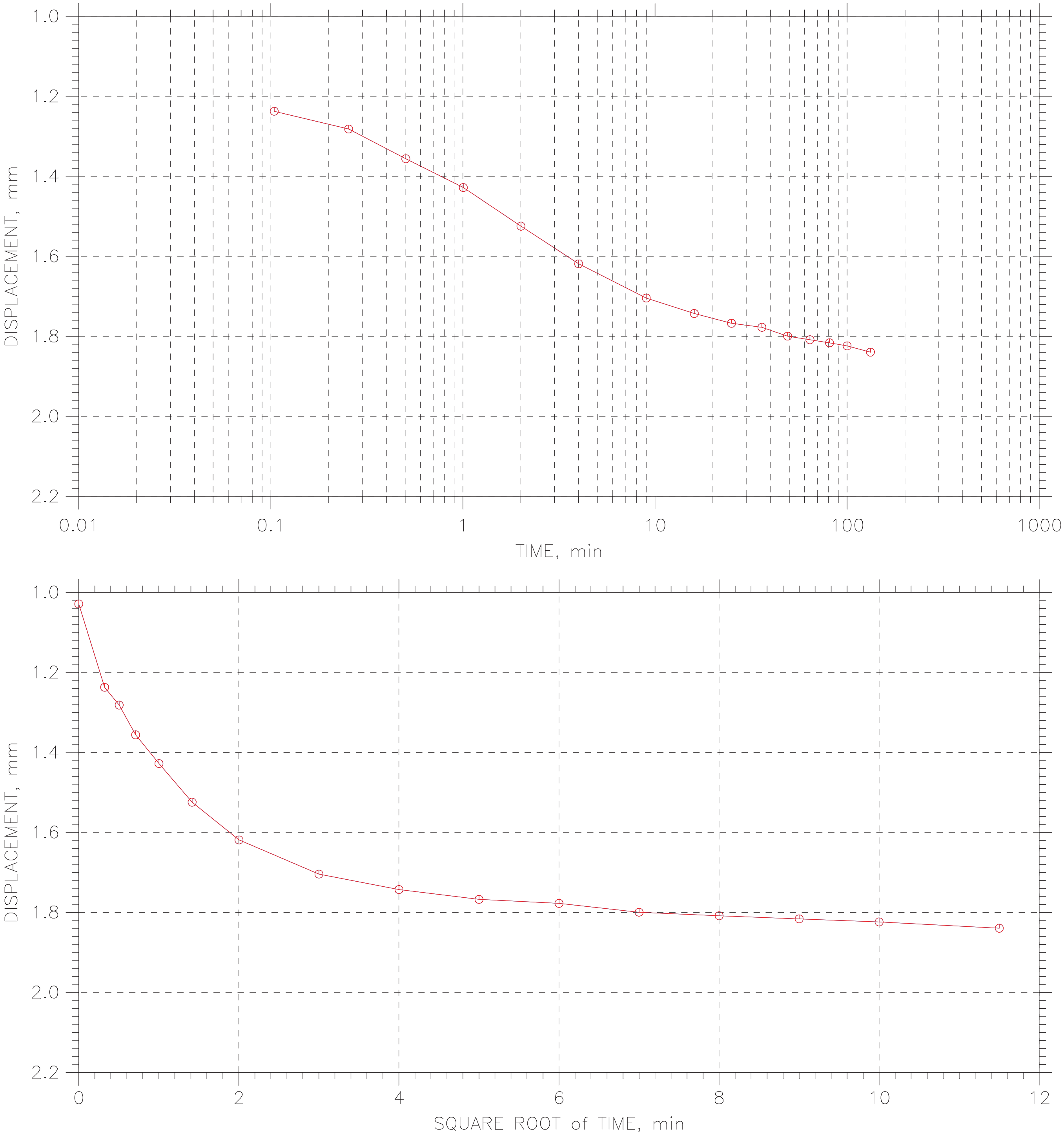
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 6 of 13

Stress: 800. kPa



AECOM	Project: TOWN OF EDSON	Location: CALGARY, ALBERTA CA	Project No.: 60330572
	Boring No.: TH14-02 S10	Tested By: BCM	Checked By: WPQ
	Sample No.: S-10	Test Date: 11/7/14	Depth: ----
	Test No.: TH1402S10	Sample Type: PRECUT	Elevation: ----
	Description: SILTY CLAY TRACE F SAND - DARK BROWNISH GRAY CL		
	Remarks: Pc = 450 kPa Cc = 0.332 Ccr = 0.067 TEST PERFORMED AS PER ASTM D2435		

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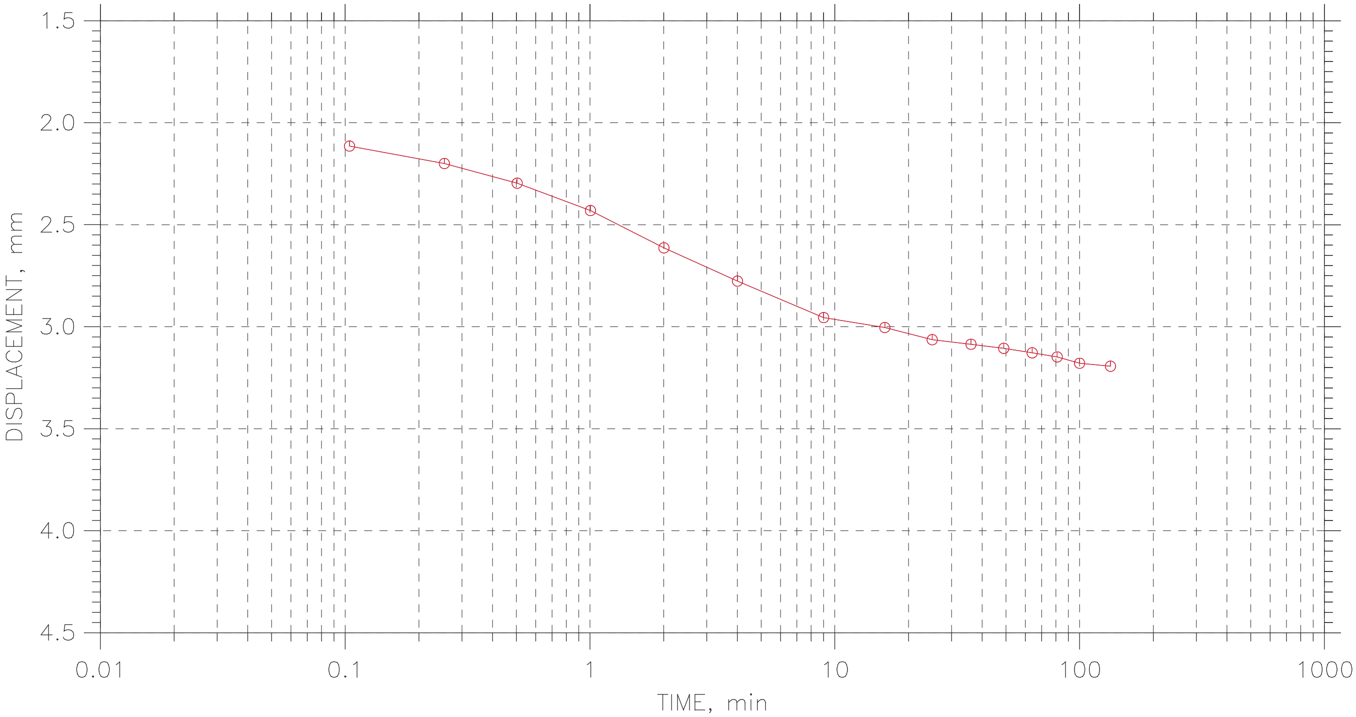
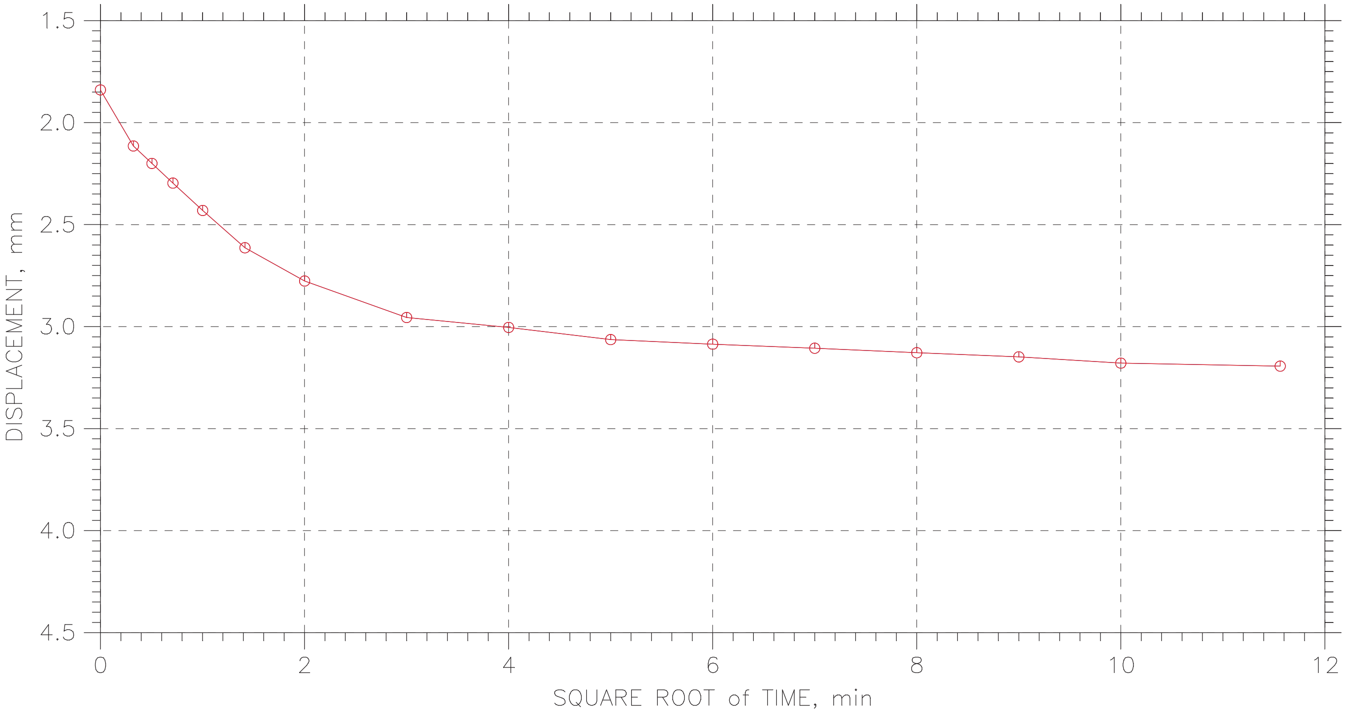
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 7 of 13

Stress: 1600. kPa





AECOM	Project: TOWN OF EDSON	Location: CALGARY, ALBERTA CA	Project No.: 60330572
	Boring No.: TH14-02 S10	Tested By: BCM	Checked By: WPQ
	Sample No.: S-10	Test Date: 11/7/14	Depth: ----
	Test No.: TH1402S10	Sample Type: PRECUT	Elevation: ----
	Description: SILTY CLAY TRACE F SAND - DARK BROWNISH GRAY CL		
	Remarks: Pc = 450 kPa Cc = 0.332 Ccr = 0.067 TEST PERFORMED AS PER ASTM D2435		

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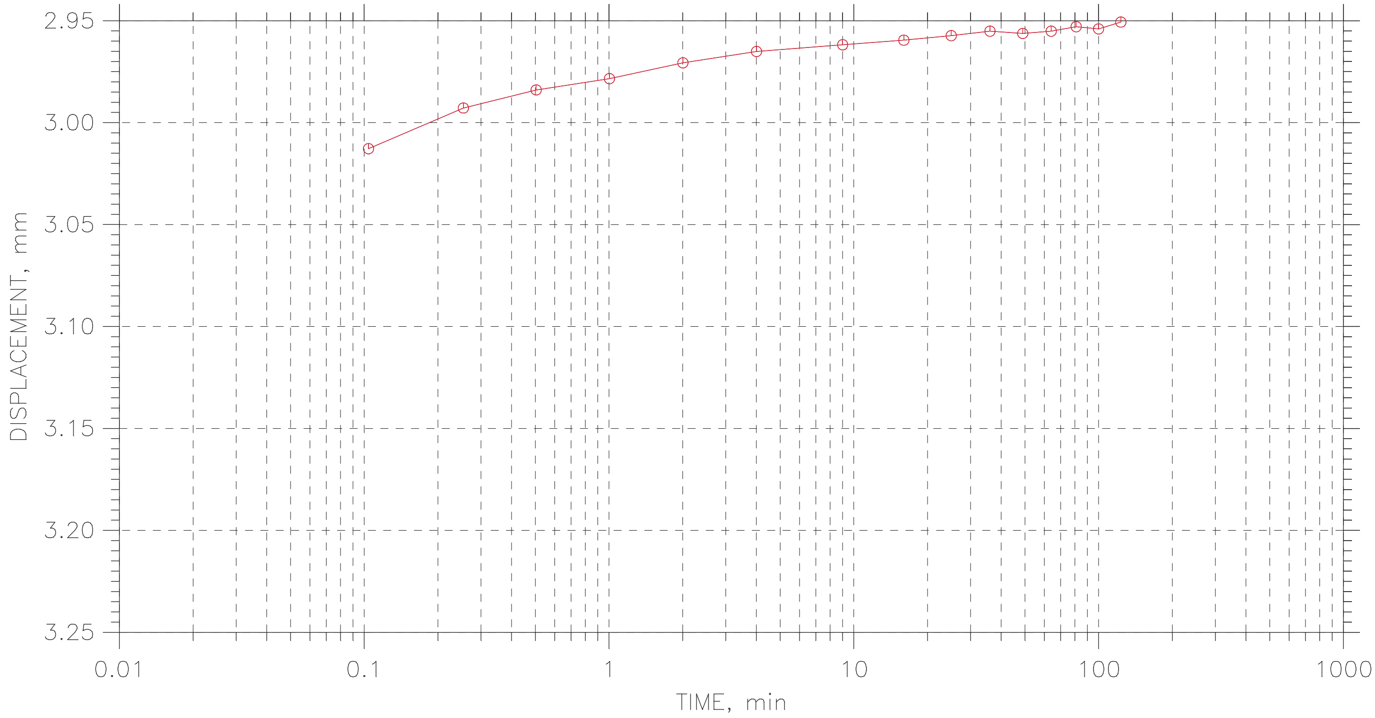
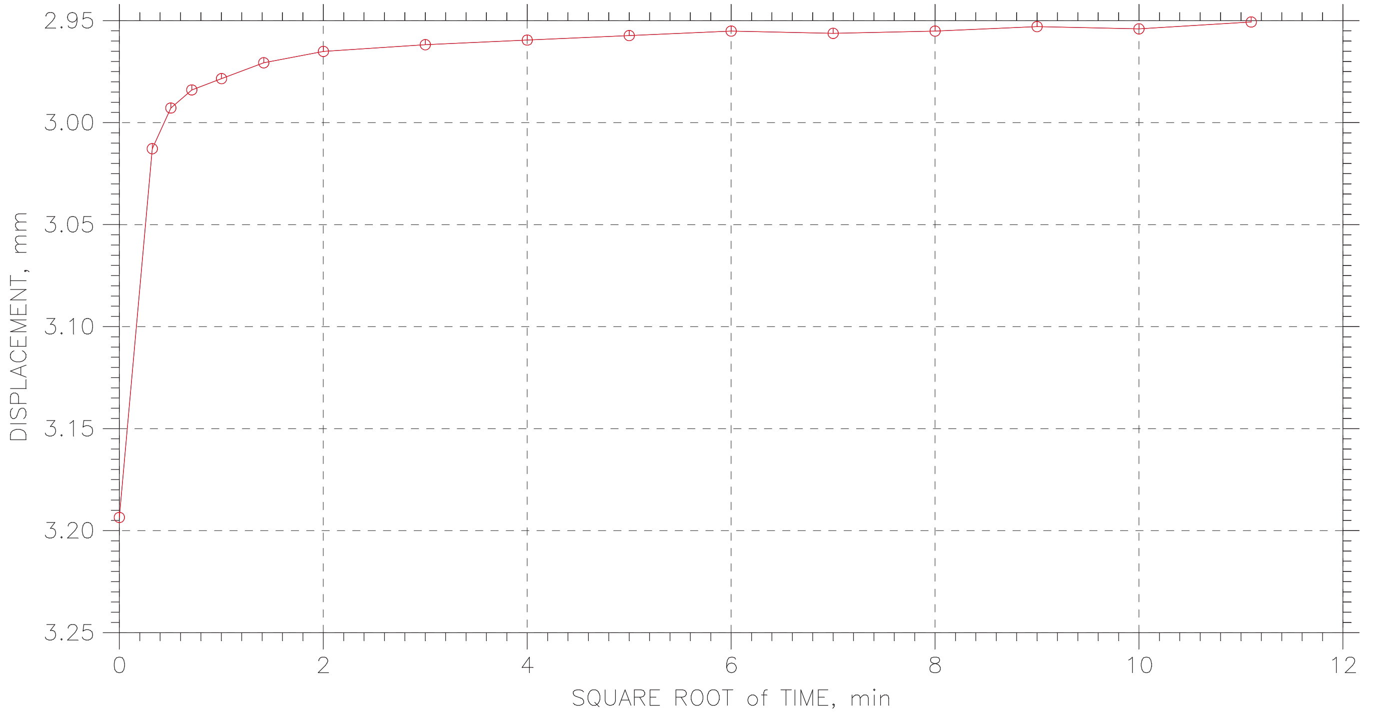
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 8 of 13

Stress: 800. kPa





AECOM	Project: TOWN OF EDSON	Location: CALGARY, ALBERTA CA	Project No.: 60330572
	Boring No.: TH14-02 S10	Tested By: BCM	Checked By: WPQ
	Sample No.: S-10	Test Date: 11/7/14	Depth: ----
	Test No.: TH1402S10	Sample Type: PRECUT	Elevation: ----
	Description: SILTY CLAY TRACE F SAND - DARK BROWNISH GRAY CL		
	Remarks: Pc = 450 kPa Cc = 0.332 Ccr = 0.067 TEST PERFORMED AS PER ASTM D2435		

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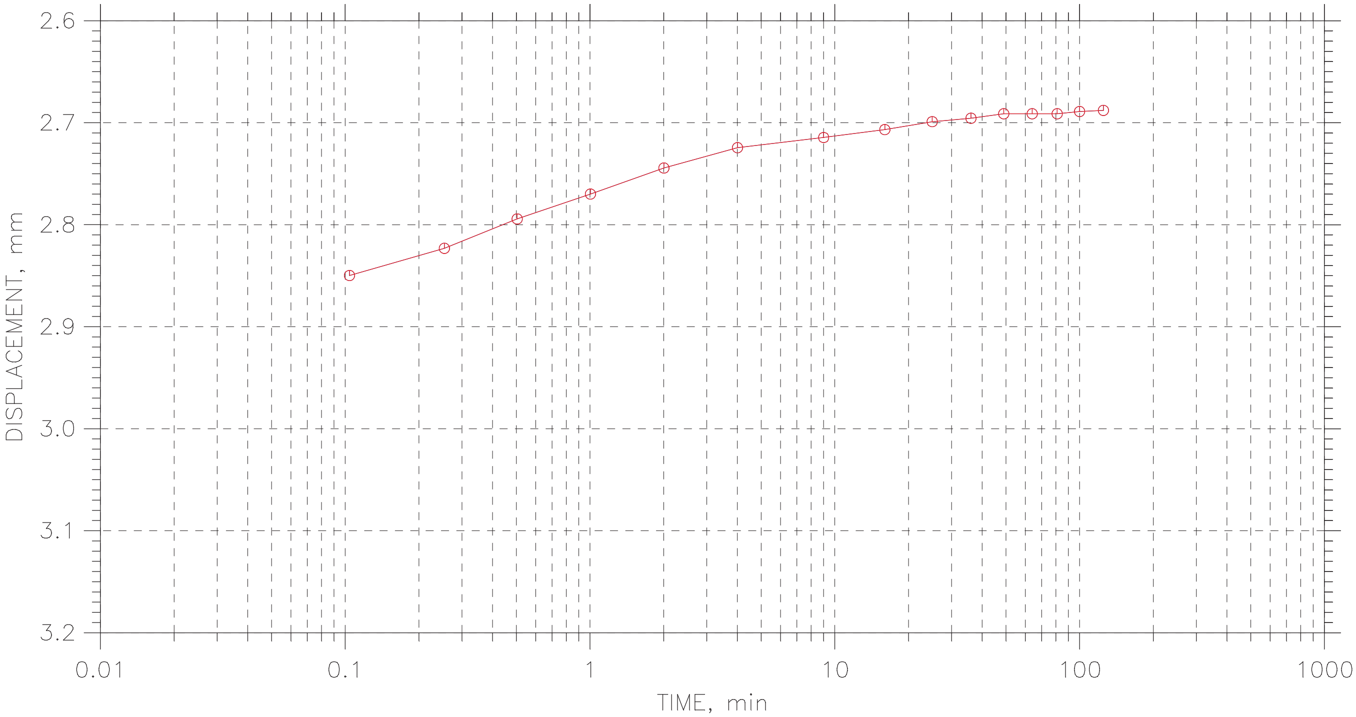
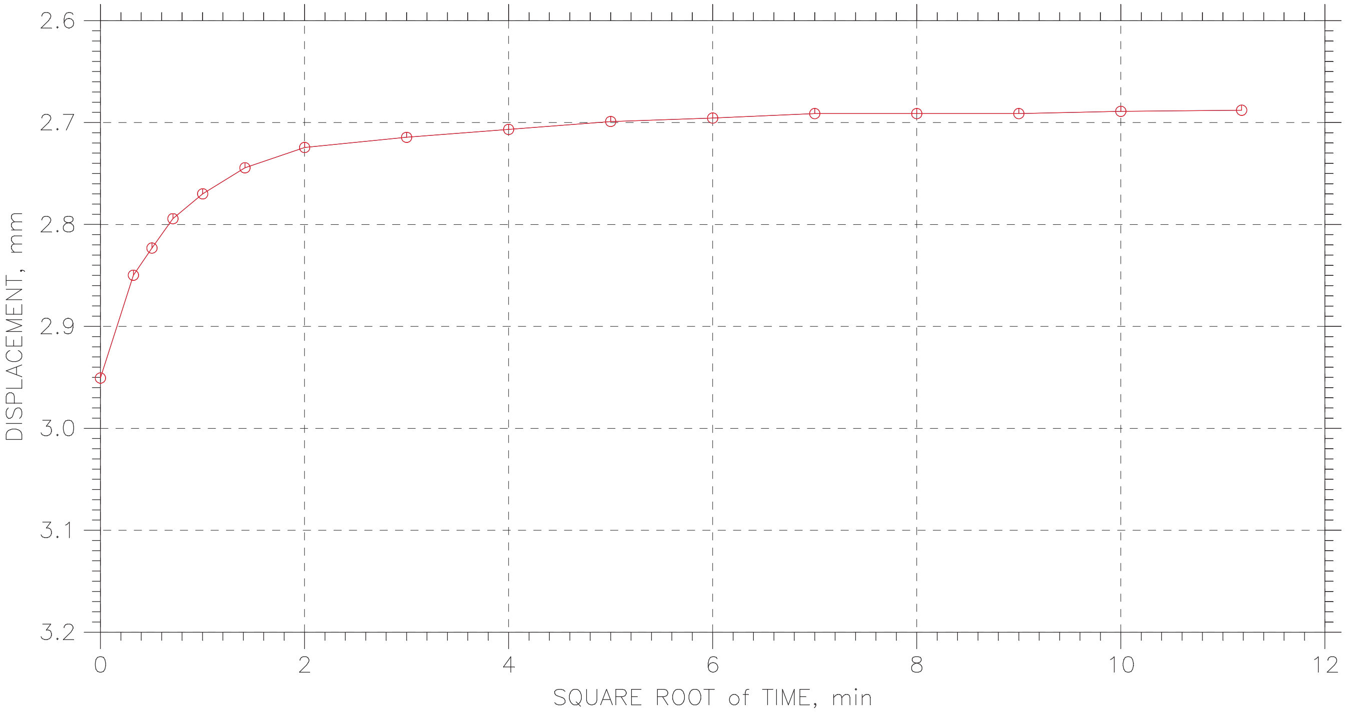
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 9 of 13

Stress: 400. kPa





AECOM	Project: TOWN OF EDSON	Location: CALGARY, ALBERTA CA	Project No.: 60330572
	Boring No.: TH14-02 S10	Tested By: BCM	Checked By: WPQ
	Sample No.: S-10	Test Date: 11/7/14	Depth: ----
	Test No.: TH1402S10	Sample Type: PRECUT	Elevation: ----
	Description: SILTY CLAY TRACE F SAND - DARK BROWNISH GRAY CL		
	Remarks: Pc = 450 kPa Cc = 0.332 Ccr = 0.067 TEST PERFORMED AS PER ASTM D2435		

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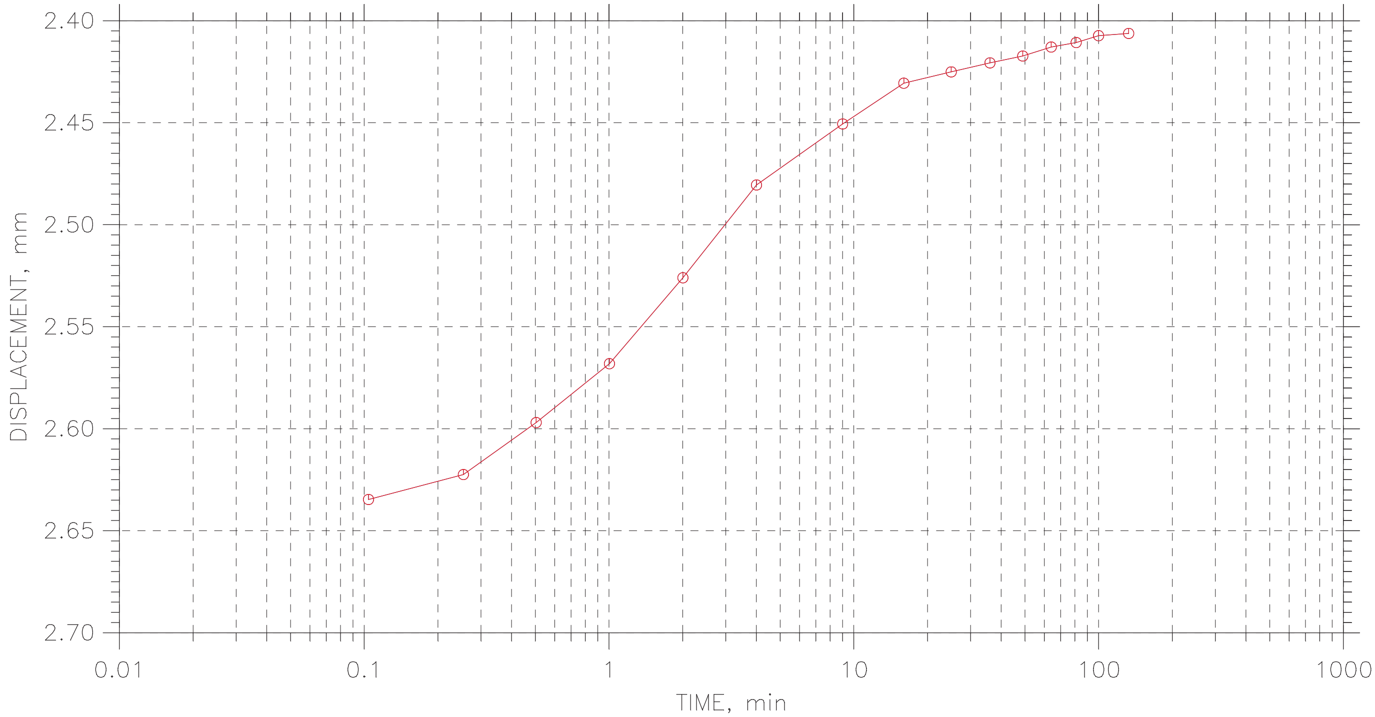
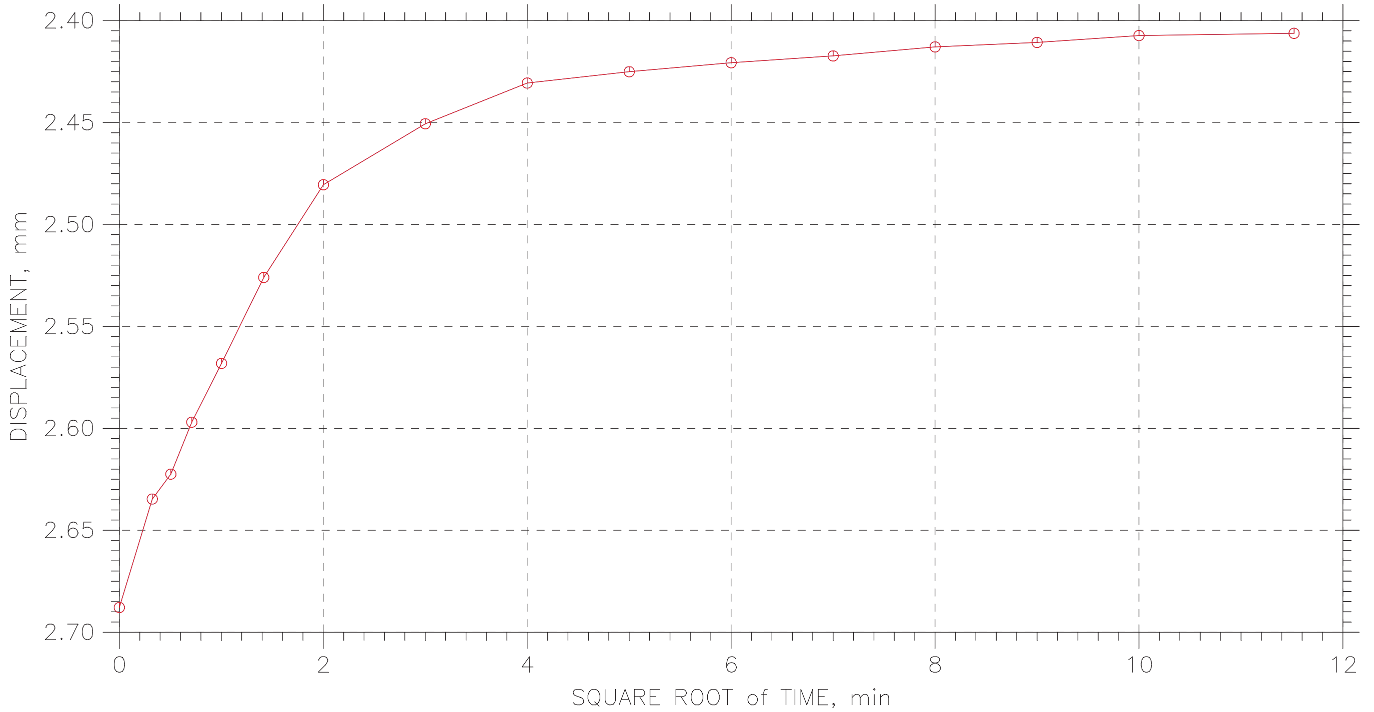
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 10 of 13

Stress: 200. kPa





AECOM

Project: TOWN OF EDSON	Location: CALGARY, ALBERTA CA	Project No.: 60330572
Boring No.: TH14-02 S10	Tested By: BCM	Checked By: WPQ
Sample No.: S-10	Test Date: 11/7/14	Depth: ----
Test No.: TH1402S10	Sample Type: PRECUT	Elevation: ----

Description: SILTY CLAY TRACE F SAND - DARK BROWNISH GRAY CL

Remarks: Pc = 450 kPa Cc = 0.332 Ccr = 0.067 TEST PERFORMED AS PER ASTM D2435

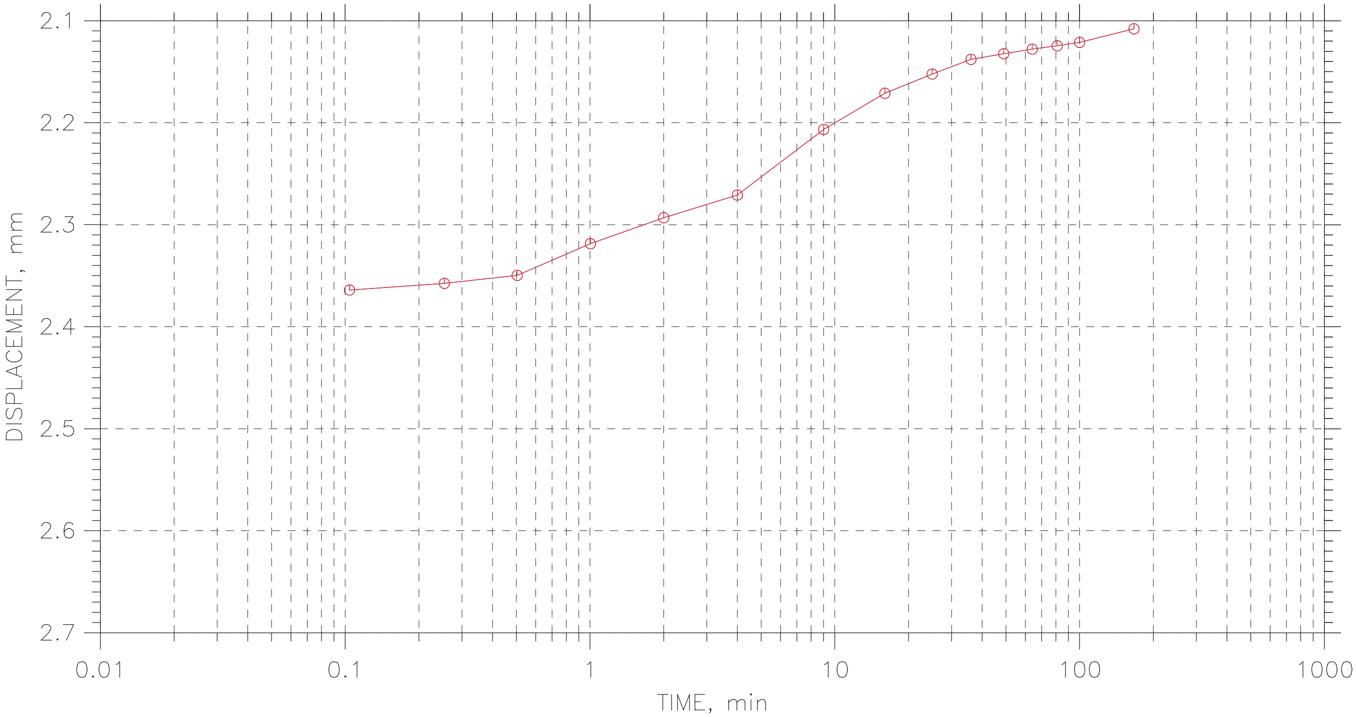
Tue, 11-NOV-2014 09:37:34

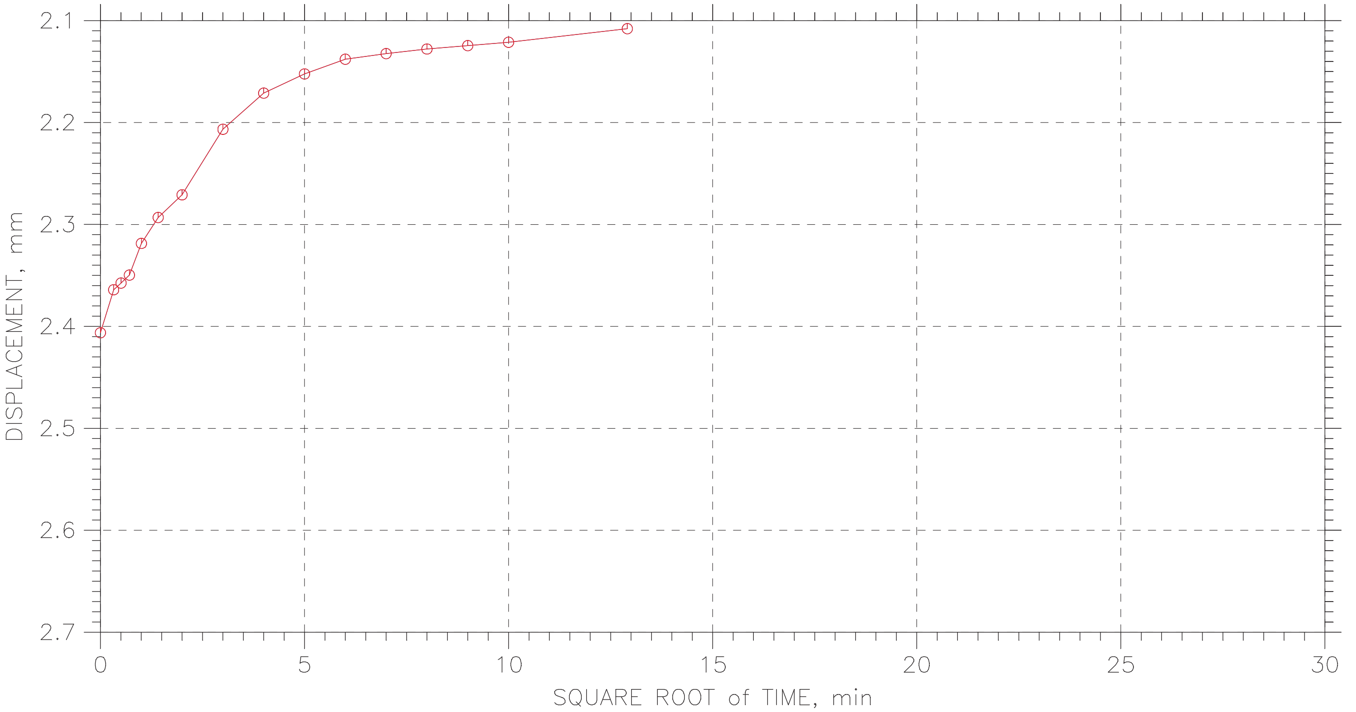
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 11 of 13

Stress: 100. kPa





AECOM

Project: TOWN OF EDSON	Location: CALGARY, ALBERTA CA	Project No.: 60330572
Boring No.: TH14-02 S10	Tested By: BCM	Checked By: WPQ
Sample No.: S-10	Test Date: 11/7/14	Depth: ----
Test No.: TH1402S10	Sample Type: PRECUT	Elevation: ----
Description: SILTY CLAY TRACE F SAND - DARK BROWNISH GRAY CL		
Remarks: Pc = 450 kPa Cc = 0.332 Ccr = 0.067 TEST PERFORMED AS PER ASTM D2435		

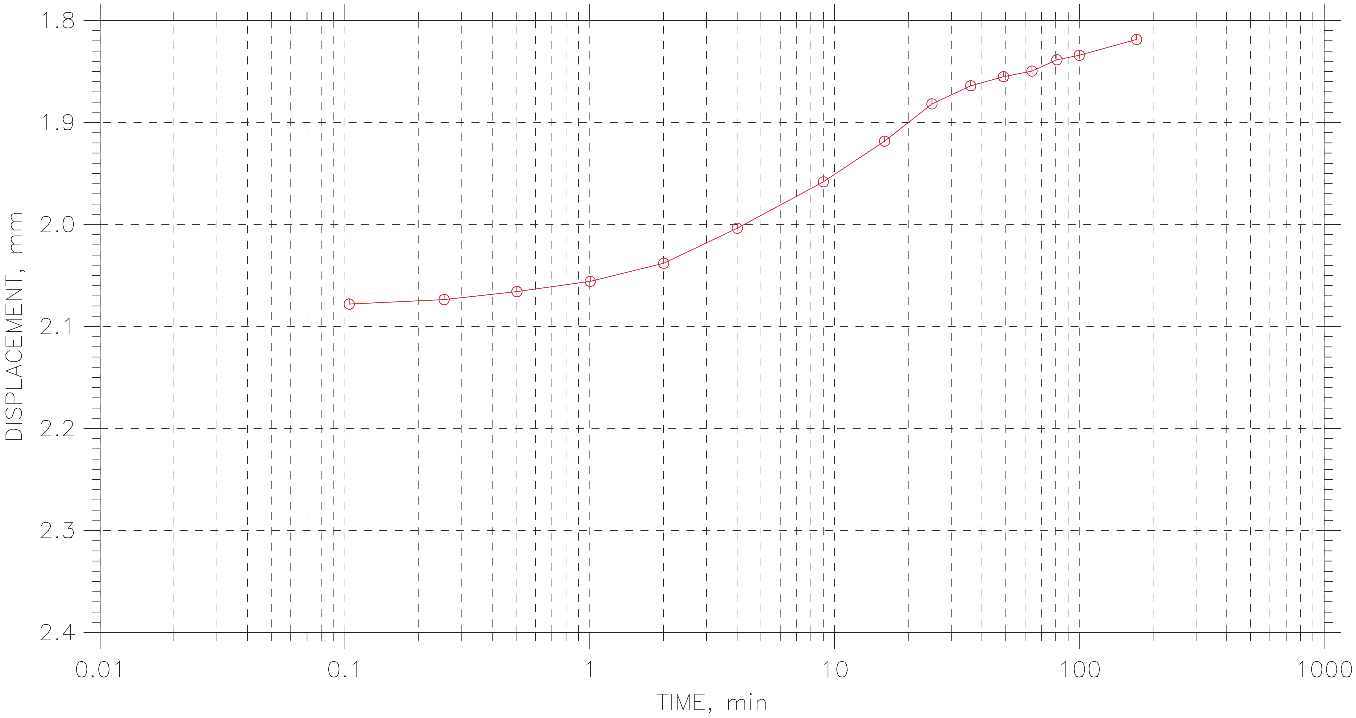
Tue, 11-NOV-2014 09:37:34

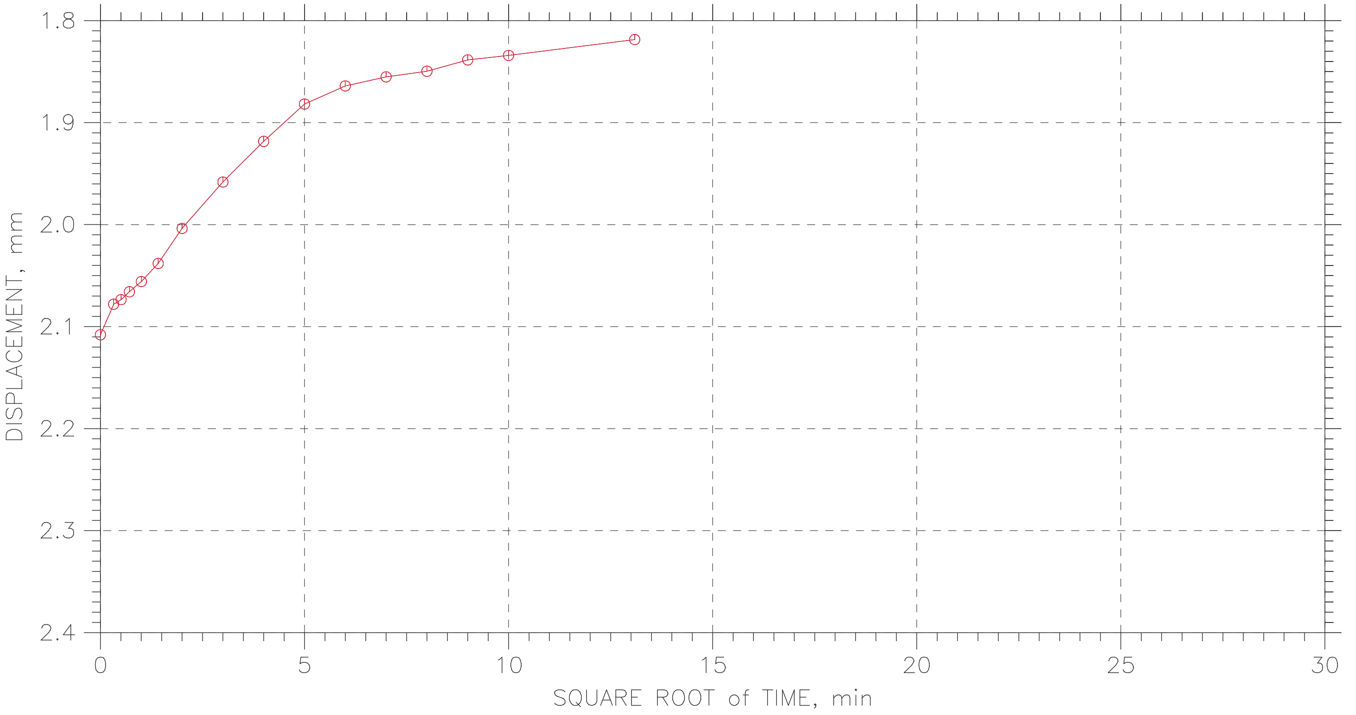
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 12 of 13

Stress: 50. kPa





AECOM	Project: TOWN OF EDSON	Location: CALGARY, ALBERTA CA	Project No.: 60330572
	Boring No.: TH14-02 S10	Tested By: BCM	Checked By: WPQ
	Sample No.: S-10	Test Date: 11/7/14	Depth: ----
	Test No.: TH1402S10	Sample Type: PRECUT	Elevation: ----
	Description: SILTY CLAY TRACE F SAND - DARK BROWNISH GRAY CL		
	Remarks: Pc = 450 kPa Cc = 0.332 Ccr = 0.067 TEST PERFORMED AS PER ASTM D2435		

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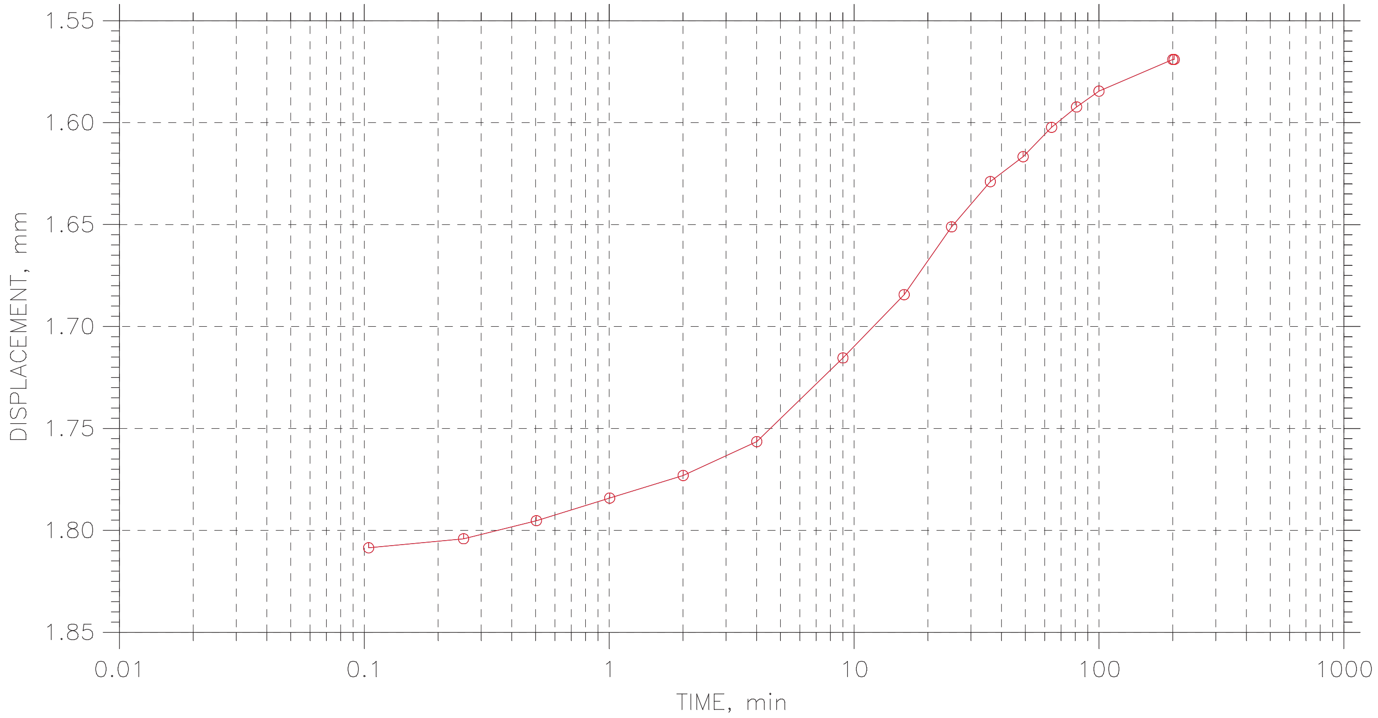
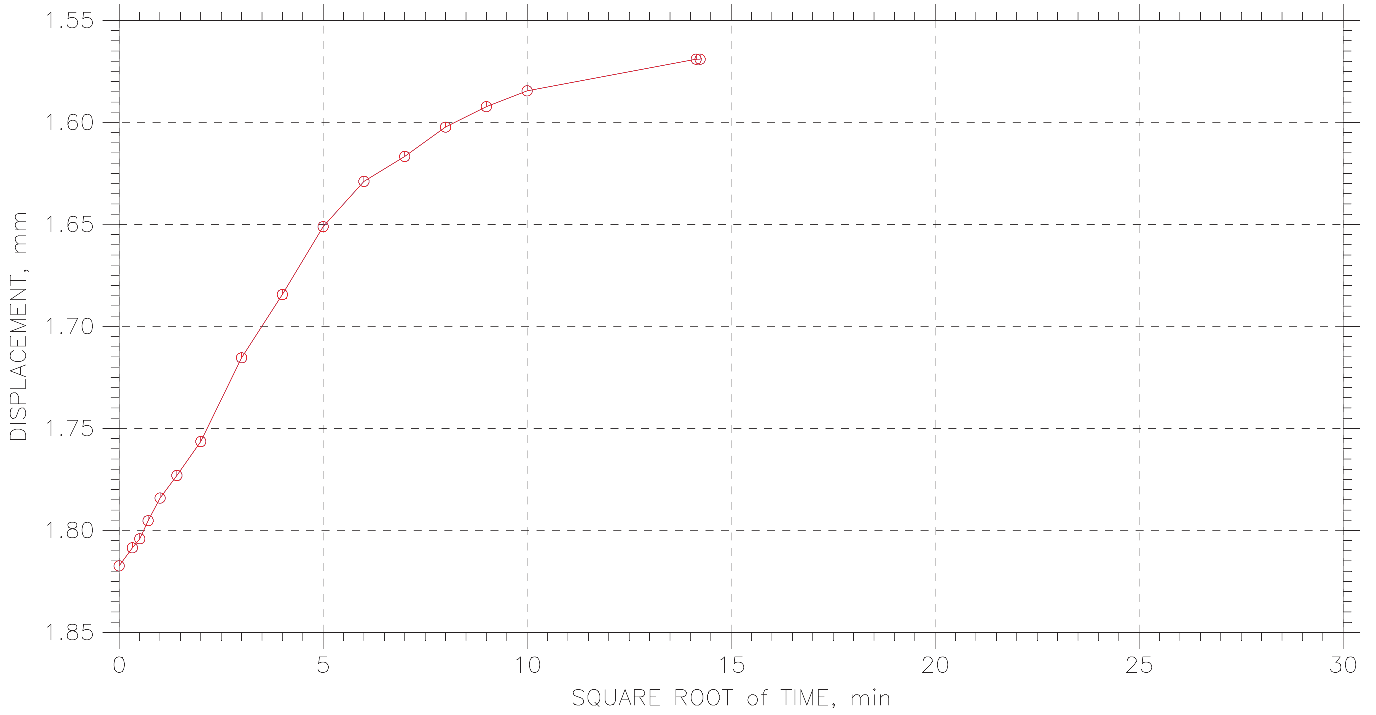
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 13 of 13

Stress: 25. kPa





AECOM	Project: TOWN OF EDSON	Location: CALGARY, ALBERTA CA	Project No.: 60330572
	Boring No.: TH14-02 S10	Tested By: BCM	Checked By: WPQ
	Sample No.: S-10	Test Date: 11/7/14	Depth: ----
	Test No.: TH1402S10	Sample Type: PRECUT	Elevation: ----
	Description: SILTY CLAY TRACE F SAND - DARK BROWNISH GRAY CL		
	Remarks: Pc = 450 kPa Cc = 0.332 Ccr = 0.067 TEST PERFORMED AS PER ASTM D2435		

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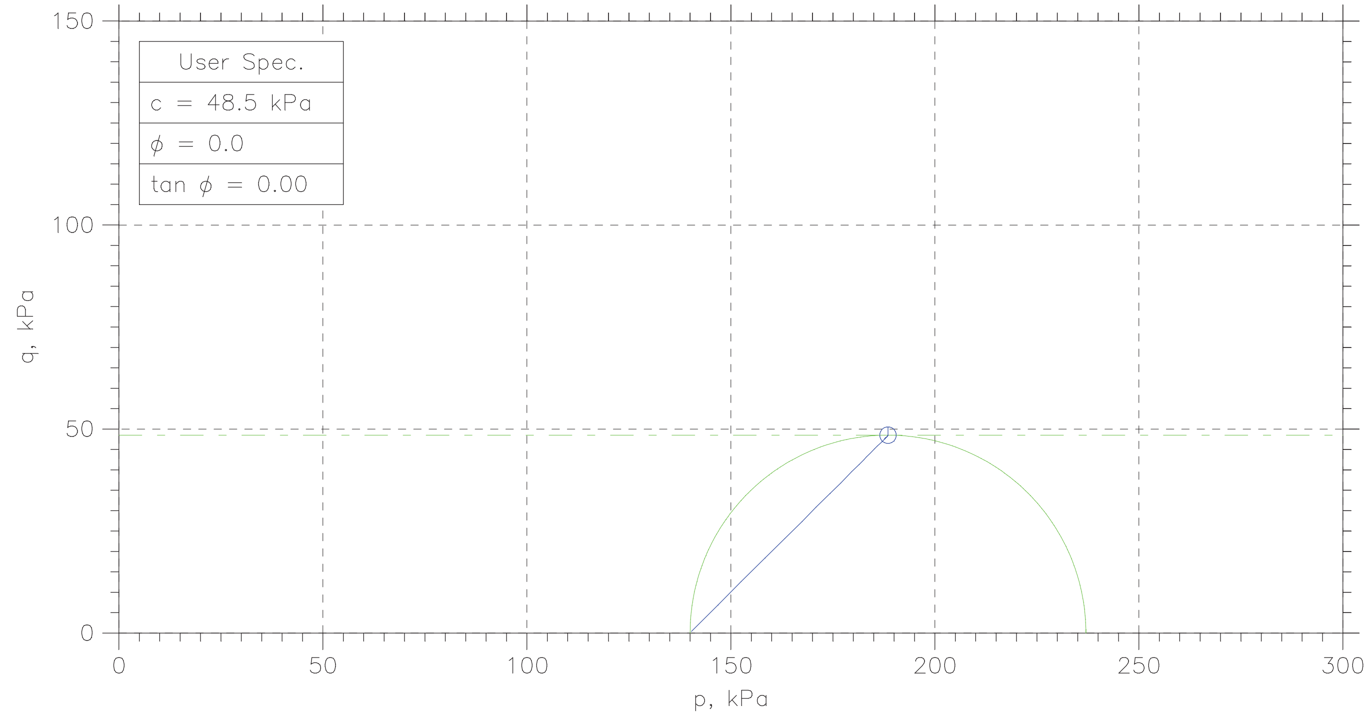
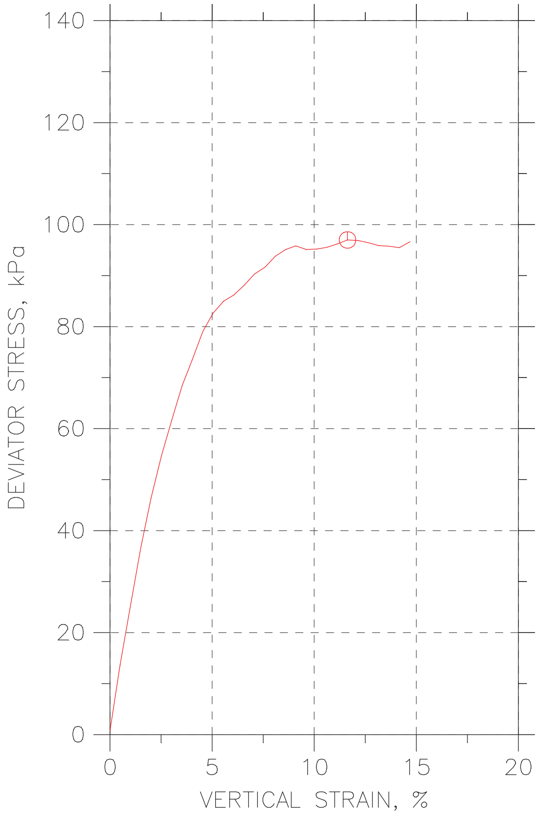
UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D2850





Symbol		⏀			
Sample No.		S-10			
Test No.		140 kPa			
Depth		----			
Initial	Diameter, mm	71.89			
	Height, mm	152.4			
	Water Content, %	26.4			
	Dry Density, kN/m^3	15.49			
	Saturation, %	99.4			
	Void Ratio	0.722			
Before Shear	Water Content, %	26.4			
	Dry Density, kN/m^3	15.49			
	Saturation*, %	99.4			
	Void Ratio	0.722			
	Back Press., kPa	.0			
Ver. Eff. Cons. Stress, kPa		139.8			
Shear Strength, kPa		48.5			
Strain at Failure, %		11.6			
Strain Rate, %/min		1			
B-Value		---			
Estimated Specific Gravity		2.72			
Liquid Limit		---			
Plastic Limit		---			

AECOM

Project: TOWN OF EDSON
Location: CALGARY, ALBERTA CANADA
Project No.: 60330572
Boring No.: TH14-01 S10
Sample Type: PRECUT

Description: SILTY CLAY TRACE F SAND - DARK BROWNISH GRAY CL
Remarks: FAILURE CRITERIA = MAXIMUM DEVIATOR STRESS. TEST PERFORM AS PER ASTM D2850

TRIAXIAL TEST

Project: TOWN OF EDSON
Boring No.: TH14-01 S10
Sample No.: S-10
Test No.: 140 kPa

Location: CALGARY, ALBERTA CANADA
Tested By: BCM
Test Date: 11/8/14
Sample Type: PRECUT

Project No.: 60330572
Checked By: WPQ
Depth: ----
Elevation: ----

Soil Description: SILTY CLAY TRACE F SAND - DARK BROWNISH GRAY CL
Remarks: FAILURE CRITERIA = MAXIMUM DEVIATOR STRESS. TEST PERFORM AS PER ASTM D2850

Specimen Height: 152.37 mm
Specimen Area: 4059.07 mm^2
Specimen Volume: 618241.94 mm^3

Piston Area: 130.97 mm^2
Piston Friction: 0.00 kN
Piston Weight: 0.00 kN

Filter Strip Correction: 0.00 kPa
Membrane Correction: 0.00 kN/mm
Correction Type: Uniform

Liquid Limit: ---

Plastic Limit: ---

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Volumetric Strain %	Corrected Area mm^2	Deviator Load kN	Deviator Stress kPa	Pore Pressure kPa	Horizontal Stress kPa	Vertical Stress kPa
1	0	0	0	4083.7	0.0030193	0.73935	0	139.95	140.69
2	0.49945	0.49543	0	4104.2	0.056038	13.654	0	140	153.66
3	0.9989	0.99397	0	4124.9	0.10357	25.108	0	139.89	165
4	1.4984	1.5104	0	4146.7	0.15246	36.766	0	139.95	176.71
5	1.9978	2.0097	0	4167.9	0.19307	46.323	0	140.06	186.38
6	2.4973	2.5152	0	4189.6	0.22887	54.628	0	140.12	194.74
7	2.9967	3.0239	0	4211.7	0.25988	61.703	0	140	201.71
8	3.5006	3.5302	0	4234	0.28948	68.372	0	140.06	208.43
9	4	4.028	0	4256	0.31288	73.515	0	140.17	213.69
10	4.4995	4.5444	0	4279.2	0.33838	79.075	0	140.06	219.14
11	4.9989	5.0453	0	4301.9	0.35558	82.658	0	140.12	222.77
12	5.4984	5.5477	0	4324.9	0.36729	84.926	0	140.12	225.04
13	5.9978	6.0618	0	4348.7	0.37487	86.204	0	140.06	226.27
14	6.4973	6.5681	0	4372.4	0.3852	88.098	0	140.12	228.21
15	6.9967	7.0682	0	4396	0.39691	90.289	0	140.06	230.35
16	7.5006	7.5901	0	4421	0.40517	91.648	0	140.06	231.71
17	8	8.0948	0	4445.4	0.41687	93.775	0	140.17	233.95
18	8.4995	8.5942	0	4469.8	0.42514	95.113	0	140.12	235.23
19	8.9989	9.0974	0	4494.7	0.43065	95.814	0	140.06	235.87
20	9.4984	9.6068	0	4520.2	0.42997	95.122	0	140.06	235.18
21	9.9978	10.117	0	4546	0.43271	95.185	0	140.17	235.36
22	10.497	10.621	0	4571.7	0.43686	95.557	0	140	235.56
23	10.997	11.12	0	4597.6	0.44235	96.213	0	140.17	236.39
24	11.501	11.633	0	4624.4	0.44857	97.001	0	140	237.01
25	12	12.141	0	4651.3	0.45062	96.881	0	140.12	237
26	12.5	12.644	0	4678.2	0.45131	96.47	0	140.12	236.59
27	12.999	13.163	0	4706.3	0.45131	95.894	0	140.12	236.01
28	13.498	13.664	0	4733.8	0.45337	95.774	0	140.12	235.89
29	13.998	14.171	0	4761.9	0.45475	95.497	0	140.12	235.61
30	14.497	14.686	0	4790.8	0.46301	96.646	0	140.12	236.76

Your Project #: 60330572 TASK 08
Site Location: TOWN OF EDSON-WWTP
Your C.O.C. #: A066604

Attention:RICHARD DAGG

AECOM
200 - 6807 RAILWAY STREET SE
CALGARY, AB
CANADA T2H2V6

Report Date: 2014/11/10
Report #: R1680261
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B499814
Received: 2014/11/03, 12:12

Sample Matrix: Soil
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Resistivity	6	N/A	2014/11/05		
Conductivity @25C (Soluble)	6	2014/11/05	2014/11/05	AB SOP-00033 / AB SOP-00004	Carter 2nd ed 15.3 m
pH @25C (Soluble)	6	2014/11/05	2014/11/05	AB SOP-00033 / AB SOP-00006	Carter 2nd ed 16.2 m
Soluble Paste	6	2014/11/05	2014/11/05	AB SOP-00033	Carter 2nd ed 15.2 m
Soluble Ions Calculation	6	N/A	2014/11/05		CALCULATION

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Carmen McKay, Project Manager
Email: CMcKay@maxxam.ca
Phone# (403)219-3683
==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total Cover Pages : 1

Maxxam Job #: B499814
Report Date: 2014/11/10

AECOM
Client Project #: 60330572 TASK 08
Site Location: TOWN OF EDSON-WWTP
Sampler Initials: CK

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		LA7690		LA7691		LA7692		
Sampling Date		2014/11/03 12:12		2014/11/03 12:12		2014/11/03 12:12		
COC Number		A066604		A066604		A066604		
	Units	**EDSON TH14-01 #7**	**RDL**	**EDSON TH14-02 #4**	**RDL**	**EDSON TH14-02 #15**	**RDL**	**QC Batch**
Calculated Parameters								
Resistivity @ 25° C	ohm-cm	3010	5	670	5	1270	5	7705135
Calculated Chloride (Cl)	%	0.0011 (1)	0.00036	0.0016 (1)	0.00033	0.0010 (1)	0.00032	7704340
Calculated Sulphate (SO4)	%	0.0014 (2)	0.00036	0.0072 (2)	0.00033	0.019 (2)	0.00032	7704340
Soluble Parameters								
Soluble Conductivity	dS/m	0.33	0.020	1.5	0.020	0.79	0.020	7708635
Soluble pH	pH	7.82	N/A	6.83	N/A	7.62	N/A	7708257
Saturation %	%	71	N/A	66	N/A	64	N/A	7706517

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Soluble Chloride (Cl)
(2) Soluble Sulphate (SO4)

Maxxam ID		LA7693		LA7694		LA7695		
Sampling Date		2014/11/03 12:12		2014/11/03 12:12		2014/11/03 12:12		
COC Number		A066604		A066604		A066604		
	Units	**EDSON TH14-03 #5**	**RDL**	**EDSON TH14-03 #18**	**RDL**	**EDSON TH14-04 #5**	**RDL**	**QC Batch**
Calculated Parameters								
Resistivity @ 25° C	ohm-cm	3490	5	1010	5	3560	5	7705135
Calculated Chloride (Cl)	%	0.0011 (1)	0.00037	0.00067 (1)	0.00022	0.00074 (1)	0.00035	7704340
Calculated Sulphate (SO4)	%	0.00089 (2)	0.00037	0.015 (2)	0.00022	0.0016 (2)	0.00035	7704340
Soluble Parameters								
Soluble Conductivity	dS/m	0.29	0.020	0.99	0.020	0.28	0.020	7708635
Soluble pH	pH	7.71	N/A	7.42	N/A	7.74	N/A	7708257
Saturation %	%	73	N/A	44	N/A	69	N/A	7706517

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Soluble Chloride (Cl)
(2) Soluble Sulphate (SO4)

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		LA7695		
Sampling Date		2014/11/03 12:12		
COC Number		A066604		
	Units	**EDSON TH14-04 #5 Lab-Dup**	**RDL**	**QC Batch**
Soluble Parameters				
Soluble Conductivity	dS/m	0.28	0.020	7708635
Soluble pH	pH	7.75	N/A	7708257
Saturation %	%	70	N/A	7706517

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	17.7°C

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
7706517	AAE	QC Standard	Saturation %	2014/11/05		104	%	75 - 125
7706517	AAE	RPD [LA7695-01]	Saturation %	2014/11/05	0.66		%	12
7708257	BL7	QC Standard	Soluble pH	2014/11/05		99	%	98 - 102
7708257	BL7	Spiked Blank	Soluble pH	2014/11/05		101	%	97 - 103
7708257	BL7	RPD [LA7695-01]	Soluble pH	2014/11/05	0.13		%	N/A
7708635	BL7	QC Standard	Soluble Conductivity	2014/11/05		105	%	75 - 125
7708635	BL7	Spiked Blank	Soluble Conductivity	2014/11/05		100	%	90 - 110
7708635	BL7	Method Blank	Soluble Conductivity	2014/11/05	<0.020		dS/m	
7708635	BL7	RPD [LA7695-01]	Soluble Conductivity	2014/11/05	0.53		%	35

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Maxxam Job #: B499814
Report Date: 2014/11/10

AECOM
Client Project #: 60330572 TASK 08
Site Location: TOWN OF EDSON-WWTP
Sampler Initials: CK

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Peng Liang

Peng Liang, Analyst II

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam

Calgary: 4000 19st St. NE, T2E 6P8. Ph: (403) 291-3077, Fax: (403) 735-2240, Toll free: (800) 386-7247
Edmonton: 9331 - 48 Street, T6B 2R4. Ph: (780) 577-7100, Fax: (780) 450-4187, Toll free: (877) 465-8889
www.maxxamanalytics.com

Chain of Custody A066604

042

Page: 1 of 1

	Invoice To: C/O Report Address ☐	Report To: Same as Invoice ☐	Report Distribution (E-Mail):
Company:	AECOM	richard.dagg@aecom.com	muhammad.raja@aecom.com
Contact:	Kevin Woodall		
Address:	200-6807 Railway St. S.E.		
	Prov: AB PC: T2H 2V6	Prov: PC:	
Contact #s:	Ph: 403.254.3301 Cell:	Ph: Cell:	

REGULATORY GUIDELINES:
- ☐ AT1
- ☐ CCME
- ☐ Regulated Drinking Water
- ☐ Other:

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.

PO #:
Project # / Name: Town of Edson-WWTP 60330572 ~~task~~ 08
Site Location:
Quote #:
Sampled By:

SERVICE REQUESTED:
☐ **RUSH** (Contact lab to reserve)
Date Required:
☒ REGULAR (5 to 7 Days)

See reverse for package specifics

					SOIL									WATER							Other Analysis		
	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	BTEX F1-F4	Sieve (75 micron)	Regulated Metals (CCME / AT1)	Salinity 4	Assessment ICP Metals	Basic Class II Landfill	SO4	pH	Resistivity	☐BTEX F1 ☐VOCs	☐BTEX F1-F2 ☐BTEX F1-F4	☐ Routine Water ☐ Turb ☐ F	☐ TOC ☐ DOC	Regulated Metals (CCME / AT1) Total	Dissolved	Mercury ☐ Total ☐ Dissolved		HOLD - Do not Analyze	# of Containers Submitted
1	Edson TH14-01 #7	—	—	—							X	X	X										
2	TH14-02 #4	—	—	—							X	X	X										
3	TH14-02 #15	—	—	—							X	X	X										
4	TH14-03 #5	—	—	—							X	X	X										
5	TH 14-03 #18	—	—	—							X	X	X										
6	TH 14-04 #5	—	—	—							X	X	X										
7																							
8																							
9																							
10																							
11																							
12																							

Please indicate Filtered, Preserved or Both (F, P, F/P) → F/P

03-Nov-14 12:12
Carmen McKay
B499814
JB
NB6 INS-0008

Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):
Chris Keeley	14/11/03	
Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):

Special Instructions: Note all samples are oven dried

# of Jars Used & Not Submitted

LAB USE ONLY

Received By:	Date:	Time:	Maxxam Job #:		
DAVID THIEDEMANN	2014/11/03	12:12	Custody Seal	Temperature	Ice
Lab Comments:			No	18,18,17	No

ATTERBERG LIMITS

AECOM

CLIENT : City of Edson
PROJECT : Edson WWTP
JOB No. : 60330572.08
LOCATION :
SAMPLE: 8
BOREHOLE: TH14-01
DEPTH :
DATE : November 4, 2014
TECHNICIAN : CK

LIQUID LIMIT

Trial No.	1					
Number of Blows	21					
Container Number						
Wt. Sample (wet+tare)(g)	38.91					
Wt. Sample (dry+tare)(g)	30.87					
Wt. Tare (g)	12.07					
Wt. Dry Soil (g)	18.8					
Wt. Water (g)	8.0					
Water Content (%)	42.8%					

AVERAGE VALUES

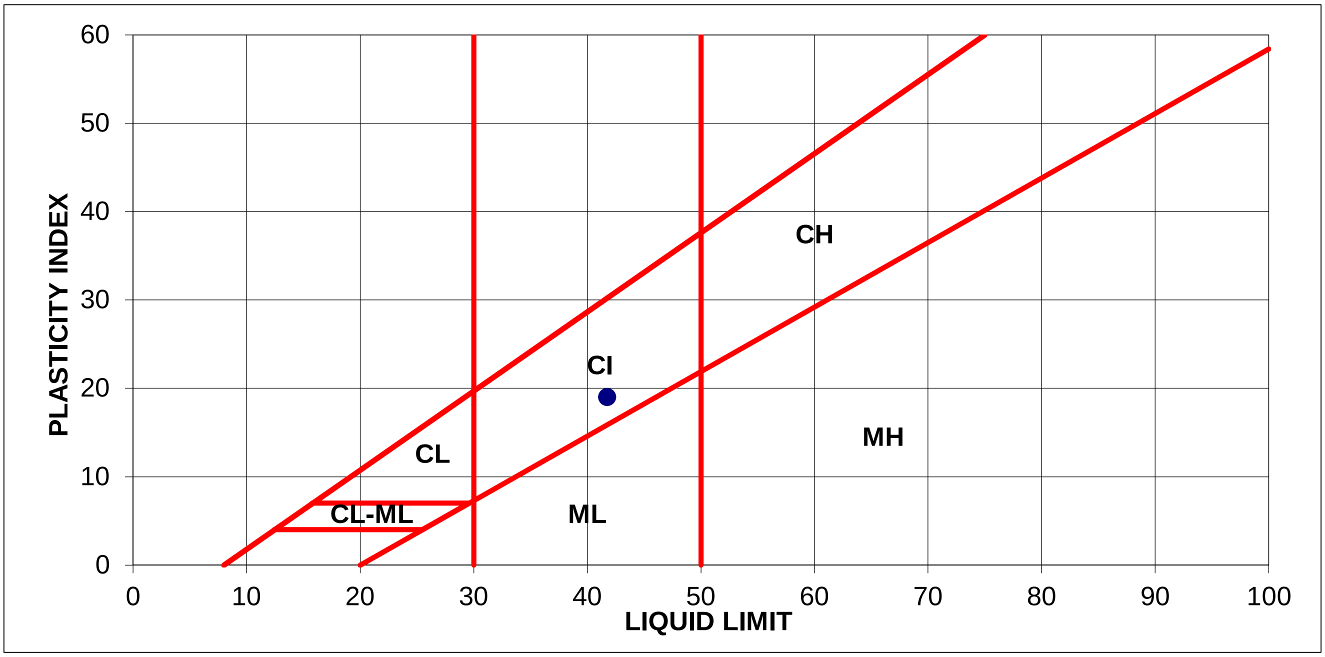
Liquid Limit	41.8
Plastic Limit	22.7
Plasticity Index	19.0

SAMPLE DESCRIPTION

Classification: **CI**

PLASTIC LIMIT

Trial No.	1		
Container Number			
Wt. Sample (wet+tare)(g)	30.23		
Wt. Sample (dry+tare)(g)	27.67		
Wt. Tare (g)	16.40		
Wt. Dry Soil (g)	11.3		
Wt. Water (g)	2.6		
Water Content (%)	22.7%		



FORM: Edson 14-01#8 Att.xlsx
DATE: 11/5/2014

ATTERBERG LIMITS

AECOM

CLIENT : City of Edson
PROJECT : Edson WWTP
JOB No. : 60330572.08
LOCATION : SAMPLE: 16
BOREHOLE: TH14-01 DEPTH :
DATE : November 4, 2014 TECHNICIAN : CK

LIQUID LIMIT

Trial No.	1					
Number of Blows	27					
Container Number						
Wt. Sample (wet+tare)(g)	44.64					
Wt. Sample (dry+tare)(g)	37.13					
Wt. Tare (g)	12.03					
Wt. Dry Soil (g)	25.1					
Wt. Water (g)	7.5					
Water Content (%)	29.9%					

AVERAGE VALUES

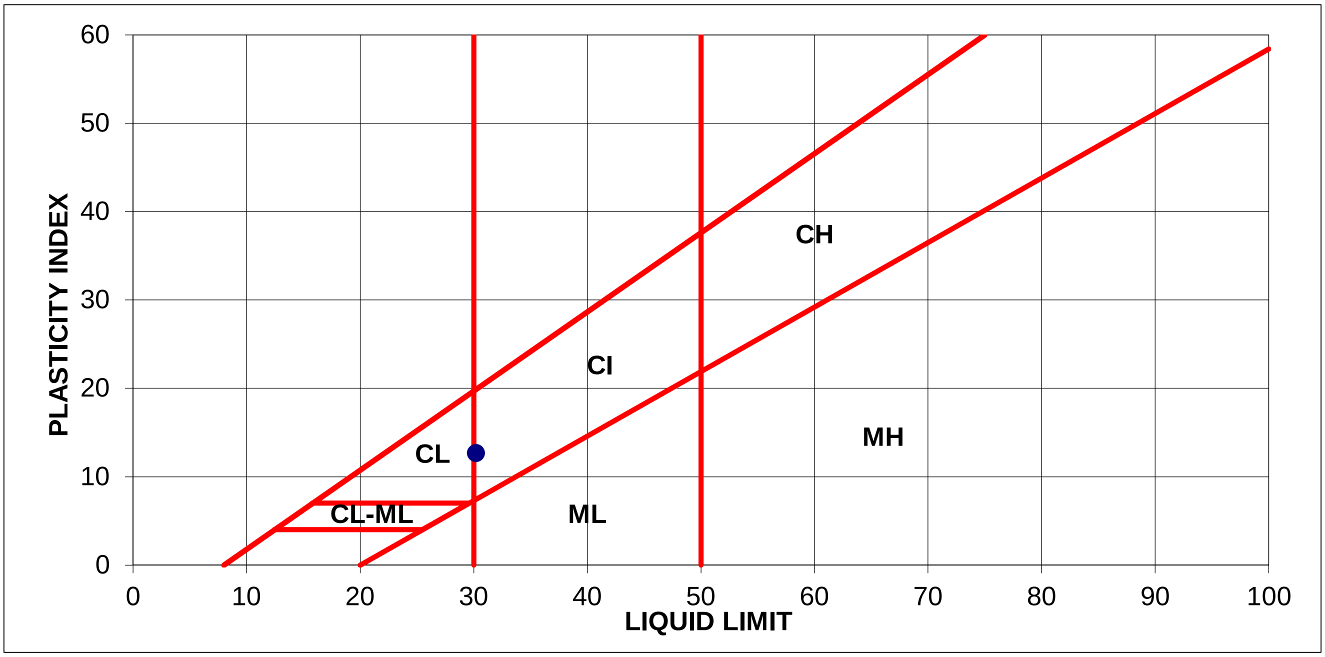
Liquid Limit	30.2
Plastic Limit	17.5
Plasticity Index	12.7

SAMPLE DESCRIPTION

Classification: **CI-CL**

PLASTIC LIMIT

Trial No.	1		
Container Number			
Wt. Sample (wet+tare)(g)	30.93		
Wt. Sample (dry+tare)(g)	28.72		
Wt. Tare (g)	16.10		
Wt. Dry Soil (g)	12.6		
Wt. Water (g)	2.2		
Water Content (%)	17.5%		



FORM: Edson 14-01#16 Att.xlsx
DATE: 11/5/2014

ATTERBERG LIMITS

CLIENT : City of Edson
PROJECT : Edson WWTP
JOB No. : 60330572.08
LOCATION :
SAMPLE: 4
BOREHOLE: TH14-02
DEPTH :
DATE : November 4, 2014
TECHNICIAN : CK

LIQUID LIMIT

Trial No.	1					
Number of Blows	24					
Container Number						
Wt. Sample (wet+tare)(g)	39.83					
Wt. Sample (dry+tare)(g)	31.44					
Wt. Tare (g)	11.77					
Wt. Dry Soil (g)	19.7					
Wt. Water (g)	8.4					
Water Content (%)	42.7%					

AVERAGE VALUES

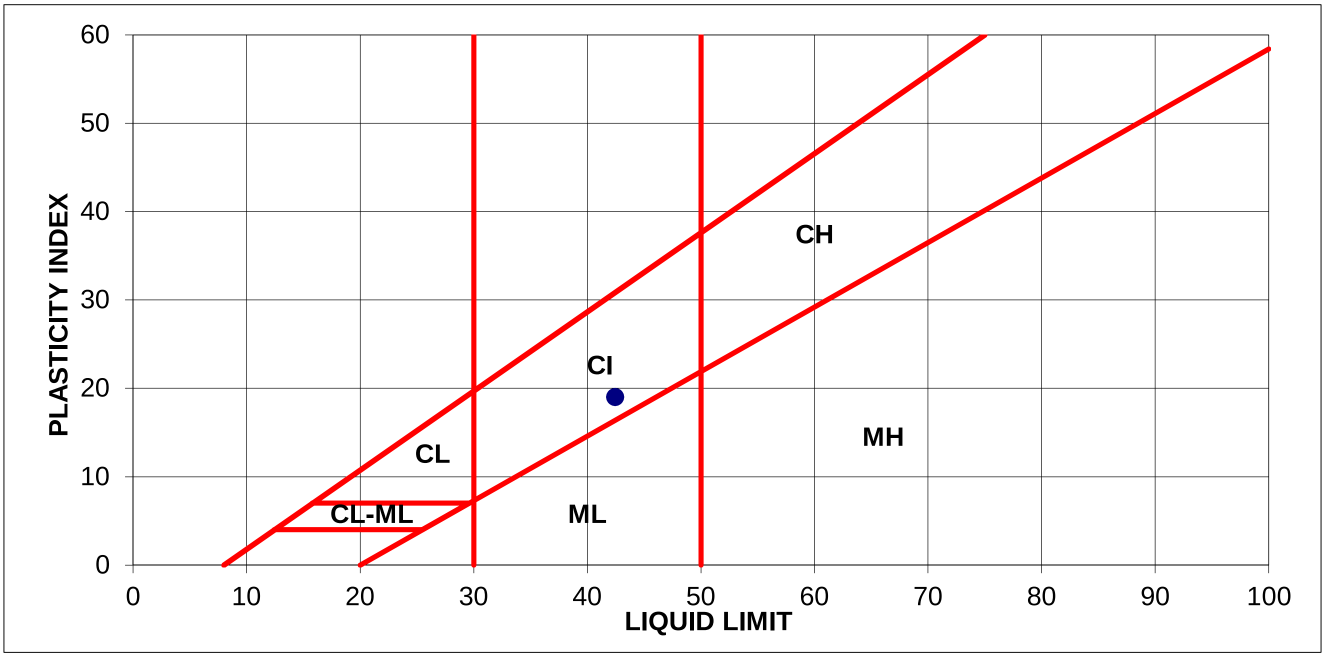
Liquid Limit	42.4
Plastic Limit	23.4
Plasticity Index	19.0

SAMPLE DESCRIPTION

Classification: **CI**

PLASTIC LIMIT

Trial No.	1		
Container Number			
Wt. Sample (wet+tare)(g)	31.24		
Wt. Sample (dry+tare)(g)	28.41		
Wt. Tare (g)	16.32		
Wt. Dry Soil (g)	12.1		
Wt. Water (g)	2.8		
Water Content (%)	23.4%		



FORM: Edson 14-02#4 Att.xlsx
DATE: 11/5/2014

ATTERBERG LIMITS

CLIENT :	City of Edson		
PROJECT :	Edson WWTP		
JOB No. :	60330572.08		
LOCATION :		SAMPLE:	10
BOREHOLE:	TH14-02	DEPTH :	
DATE :	November 6, 2014	TECHNICIAN :	GU

LIQUID LIMIT

Trial No.	1					
Number of Blows	23					
Container Number						
Wt. Sample (wet+tare)(g)	47.01					
Wt. Sample (dry+tare)(g)	37.66					
Wt. Tare (g)	16.33					
Wt. Dry Soil (g)	21.3					
Wt. Water (g)	9.4					
Water Content (%)	43.8%					

AVERAGE VALUES

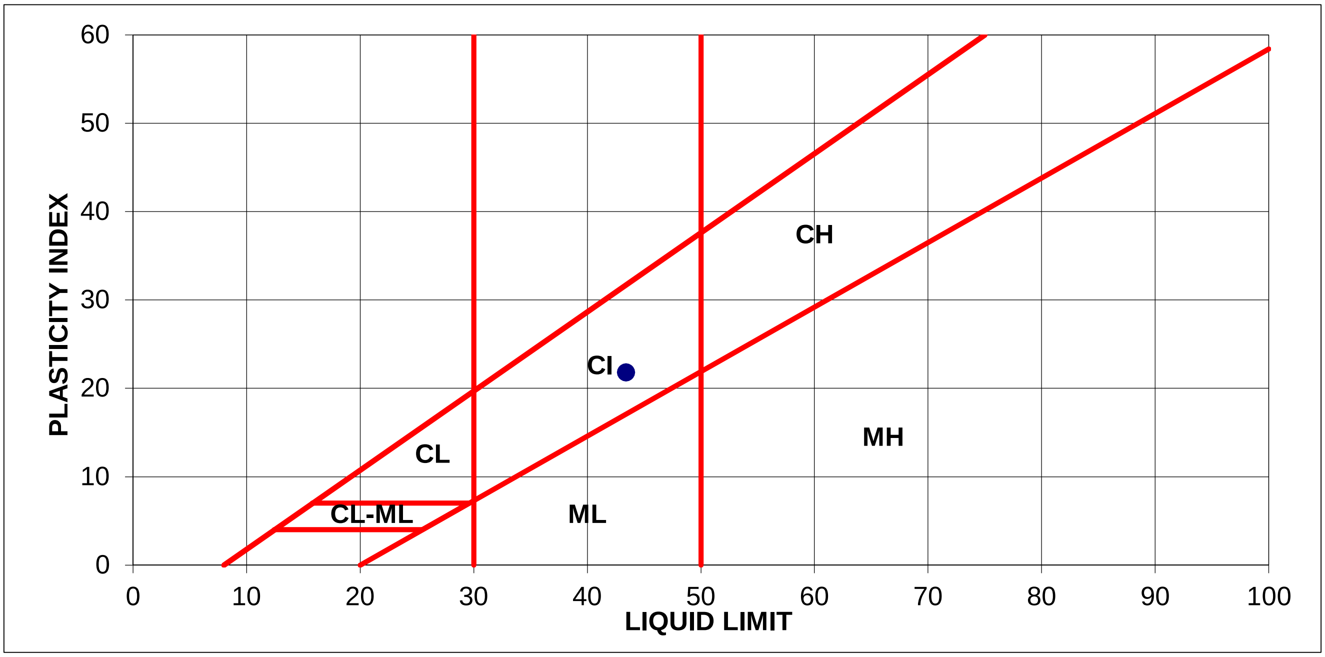
Liquid Limit	43.4
Plastic Limit	21.6
Plasticity Index	21.8

SAMPLE DESCRIPTION

Classification: **CI**

PLASTIC LIMIT

Trial No.	1		
Container Number			
Wt. Sample (wet+tare)(g)	27.93		
Wt. Sample (dry+tare)(g)	25.02		
Wt. Tare (g)	11.54		
Wt. Dry Soil (g)	13.5		
Wt. Water (g)	2.9		
Water Content (%)	21.6%		



FORM: Edson 14-02#10 Att.xlsx
DATE: 11/7/2014

ATTERBERG LIMITS

CLIENT :	City of Edson		
PROJECT :	Edson WWTP		
JOB No. :	60330572.08		
LOCATION :		SAMPLE:	14
BOREHOLE:	TH14-02	DEPTH :	
DATE :	November 4, 2014	TECHNICIAN :	CK

LIQUID LIMIT

Trial No.	1					
Number of Blows	23					
Container Number						
Wt. Sample (wet+tare)(g)	42.65					
Wt. Sample (dry+tare)(g)	34.31					
Wt. Tare (g)	11.91					
Wt. Dry Soil (g)	22.4					
Wt. Water (g)	8.3					
Water Content (%)	37.2%					

AVERAGE VALUES

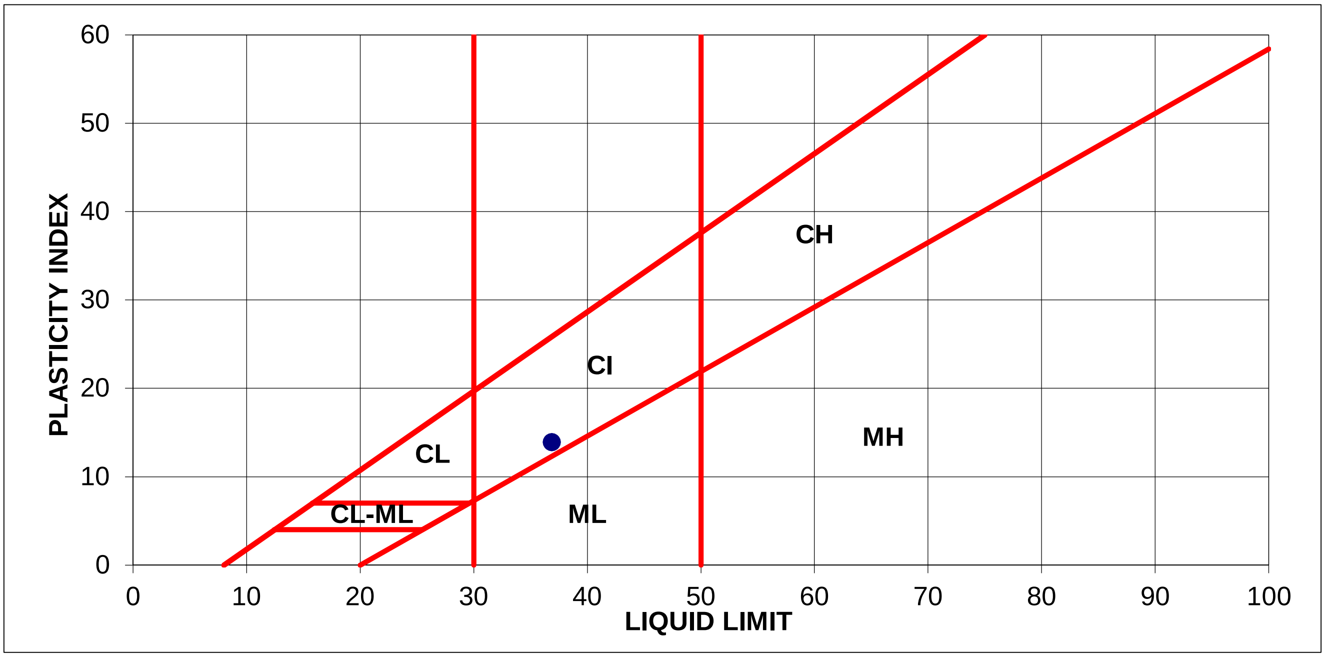
Liquid Limit	36.9
Plastic Limit	22.9
Plasticity Index	13.9

SAMPLE DESCRIPTION

Classification: **CI**

PLASTIC LIMIT

Trial No.	1		
Container Number			
Wt. Sample (wet+tare)(g)	27.35		
Wt. Sample (dry+tare)(g)	24.86		
Wt. Tare (g)	14.01		
Wt. Dry Soil (g)	10.9		
Wt. Water (g)	2.5		
Water Content (%)	22.9%		



ATTERBERG LIMITS

CLIENT :	City of Edson		
PROJECT :	Edson WWTP		
JOB No. :	60330572.08		
LOCATION :		SAMPLE:	6
BOREHOLE:	TH14-03	DEPTH :	
DATE :	November 4, 2014	TECHNICIAN :	CK

LIQUID LIMIT

Trial No.	1					
Number of Blows	22					
Container Number						
Wt. Sample (wet+tare)(g)	42.51					
Wt. Sample (dry+tare)(g)	33.49					
Wt. Tare (g)	11.76					
Wt. Dry Soil (g)	21.7					
Wt. Water (g)	9.0					
Water Content (%)	41.5%					

AVERAGE VALUES

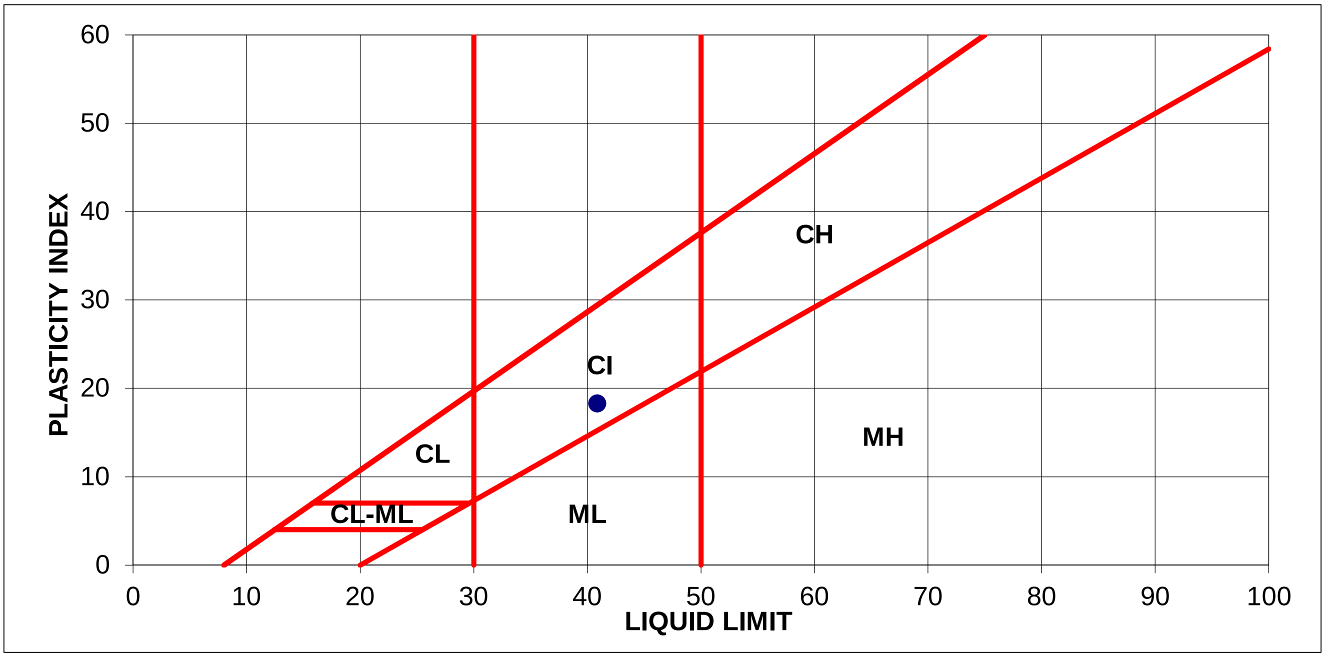
Liquid Limit	40.9
Plastic Limit	22.6
Plasticity Index	18.3

SAMPLE DESCRIPTION

Classification: **CI**

PLASTIC LIMIT

Trial No.	1		
Container Number			
Wt. Sample (wet+tare)(g)	28.75		
Wt. Sample (dry+tare)(g)	26.41		
Wt. Tare (g)	16.05		
Wt. Dry Soil (g)	10.4		
Wt. Water (g)	2.3		
Water Content (%)	22.6%		



FORM: Edson 14-03#6 Att.xlsx
DATE: 11/5/2014

ATTERBERG LIMITS

AECOM

CLIENT : City of Edson
PROJECT : Edson WWTP
JOB No. : 60330572.08
LOCATION :
SAMPLE: 21
BOREHOLE: TH14-03
DEPTH :
DATE : November 4, 2014
TECHNICIAN : CK

LIQUID LIMIT

Trial No.	1					
Number of Blows	25					
Container Number						
Wt. Sample (wet+tare)(g)	41.32					
Wt. Sample (dry+tare)(g)	33.72					
Wt. Tare (g)	11.98					
Wt. Dry Soil (g)	21.7					
Wt. Water (g)	7.6					
Water Content (%)	35.0%					

AVERAGE VALUES

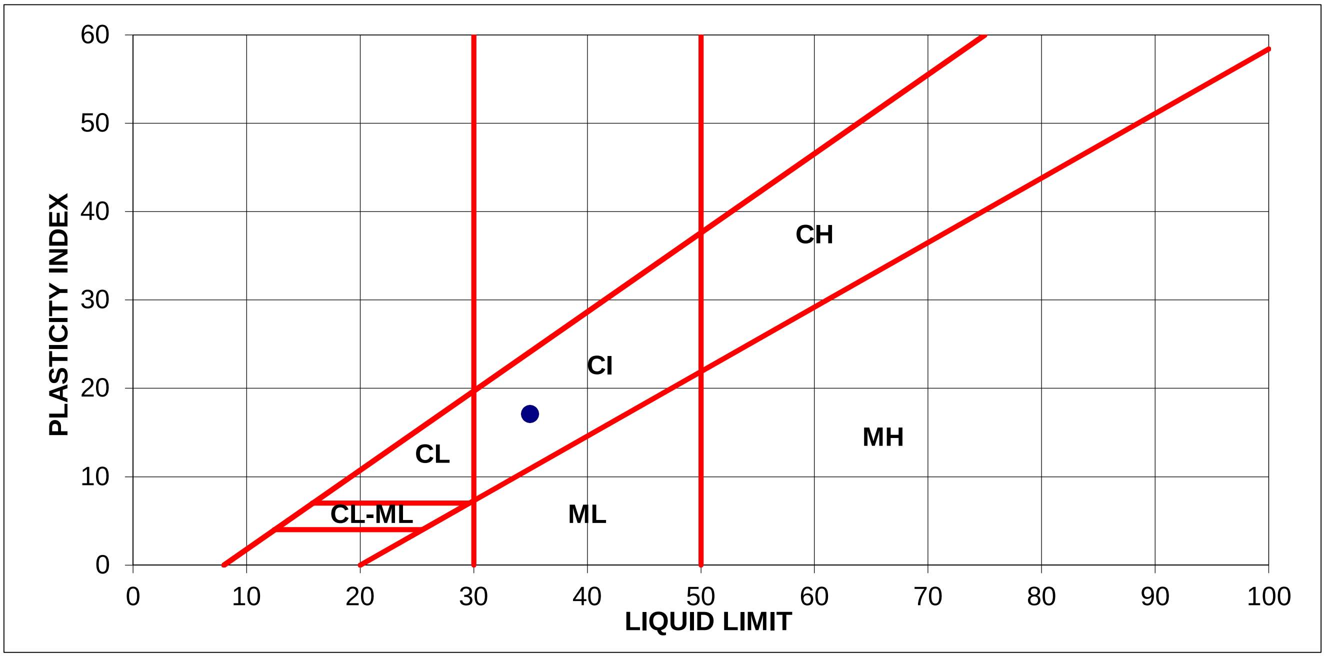
Liquid Limit	35.0
Plastic Limit	17.8
Plasticity Index	17.1

SAMPLE DESCRIPTION

Classification: **CI**

PLASTIC LIMIT

Trial No.	1		
Container Number			
Wt. Sample (wet+tare)(g)	31.36		
Wt. Sample (dry+tare)(g)	28.99		
Wt. Tare (g)	15.71		
Wt. Dry Soil (g)	13.3		
Wt. Water (g)	2.4		
Water Content (%)	17.8%		



FORM: Edson 14-03#21 Att.xlsx
DATE: 11/5/2014

ATTERBERG LIMITS

AECOM

CLIENT : City of Edson
PROJECT : Edson WWTP
JOB No. : 60330572.08
LOCATION :
SAMPLE: 2
BOREHOLE: TH14-04
DEPTH :
DATE : November 4, 2014
TECHNICIAN : CK

LIQUID LIMIT

Trial No.	1					
Number of Blows	27					
Container Number						
Wt. Sample (wet+tare)(g)	40.03					
Wt. Sample (dry+tare)(g)	31.82					
Wt. Tare (g)	11.70					
Wt. Dry Soil (g)	20.1					
Wt. Water (g)	8.2					
Water Content (%)	40.8%					

AVERAGE VALUES

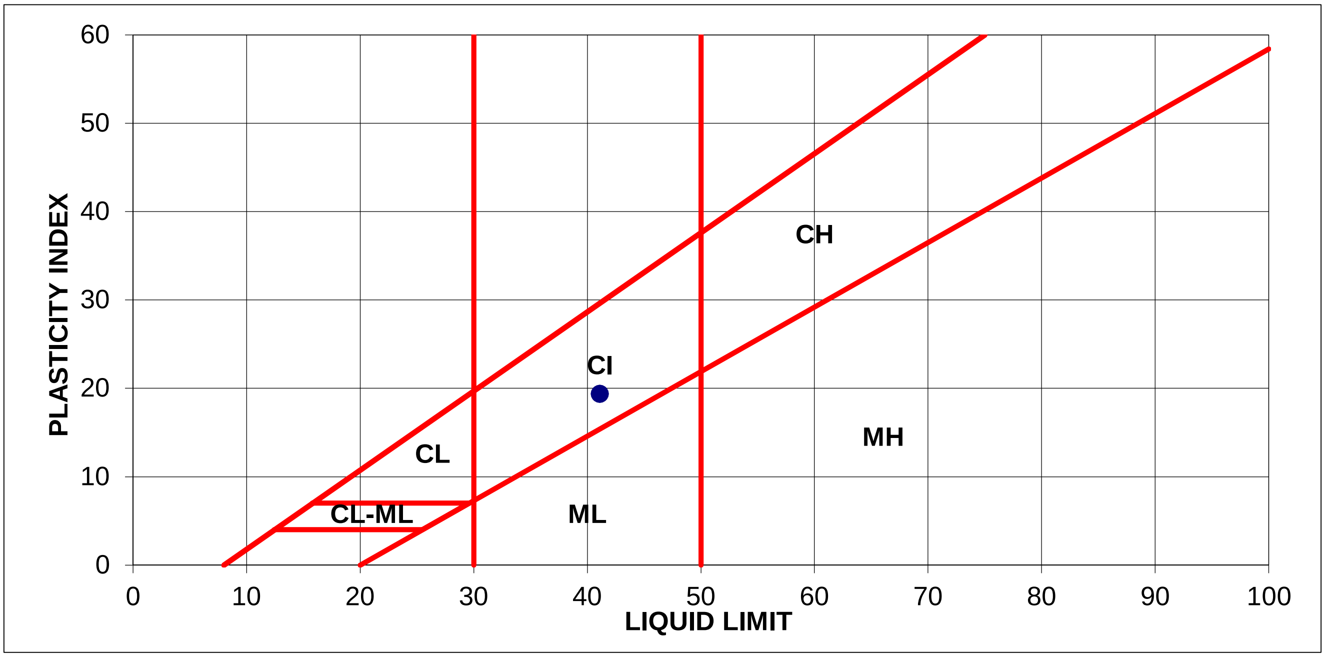
Liquid Limit	41.1
Plastic Limit	21.7
Plasticity Index	19.4

SAMPLE DESCRIPTION

Classification: **CI**

PLASTIC LIMIT

Trial No.	1		
Container Number			
Wt. Sample (wet+tare)(g)	30.71		
Wt. Sample (dry+tare)(g)	28.09		
Wt. Tare (g)	16.03		
Wt. Dry Soil (g)	12.1		
Wt. Water (g)	2.6		
Water Content (%)	21.7%		



FORM: Edson 14-04#2 Att.xlsx
DATE: 11/5/2014

ATTERBERG LIMITS

CLIENT : City of Edson
PROJECT : Edson WWTP
JOB No. : 60330572.08
LOCATION :
SAMPLE: 8
BOREHOLE: TH14-05
DEPTH :
DATE : November 4, 2014
TECHNICIAN : CK

LIQUID LIMIT

Trial No.	1					
Number of Blows	23					
Container Number						
Wt. Sample (wet+tare)(g)	41.76					
Wt. Sample (dry+tare)(g)	32.83					
Wt. Tare (g)	11.55					
Wt. Dry Soil (g)	21.3					
Wt. Water (g)	8.9					
Water Content (%)	42.0%					

AVERAGE VALUES

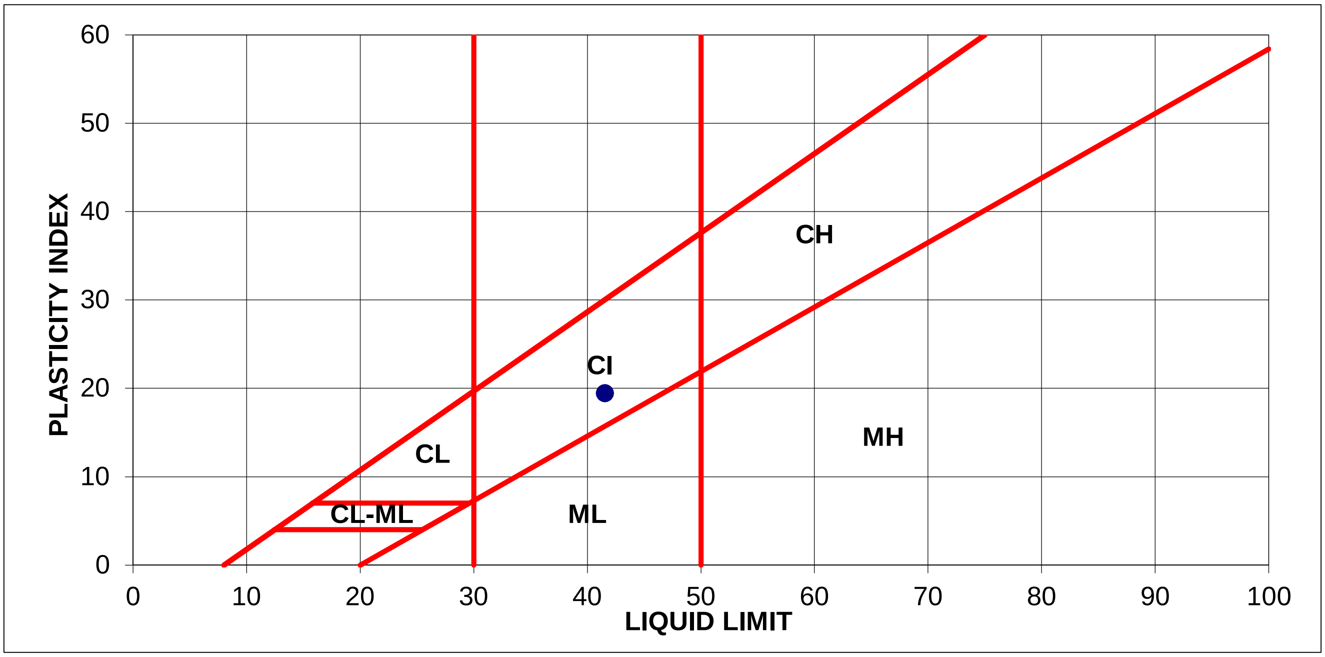
Liquid Limit	41.5
Plastic Limit	22.1
Plasticity Index	19.4

SAMPLE DESCRIPTION

Classification: **CI**

PLASTIC LIMIT

Trial No.	1		
Container Number			
Wt. Sample (wet+tare)(g)	29.70		
Wt. Sample (dry+tare)(g)	27.28		
Wt. Tare (g)	16.33		
Wt. Dry Soil (g)	11.0		
Wt. Water (g)	2.4		
Water Content (%)	22.1%		



FORM: Edson 14-05#8 Att.xlsx
DATE: 11/5/2014

GRAIN SIZE ANALYSIS

CLIENT : Town of Edson
PROJECT : Edson WWTP
JOB No. : 60330572.08
LOCATION :
TESTHOLE: 14-01
DATE : 4-Nov-14
SAMPLE: #13,14 & 15 Combined
DEPTH : Various
TECHNICIAN : GU

TOTAL DRY WEIGHT OF SAMPLE		SIEVE NO. (µm)	SIZE OF OPENING		WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT FINER THAN	REMARKS
			APPROX. INCHES	mm				
Before Washing		150,000	6	150.0		0%	100%	
Wet + Tare		75,000	3	75.0		0%	100%	
Dry+Tare	370.8	50,000	2	50.0		0%	100%	
Tare	100.0	40,000	1 1/2	40.0		0%	100%	
Wt. Dry	270.8	25,000	1	25.0		0%	100%	
Moisture Content		20,000	3/4	20.0		0%	100%	
Wet + Tare		16,000	5/8	16.0		0%	100%	
Dry+Tare		12,500	1/2	12.5		0%	100%	
Tare		10,000	3/8	10.0		0%	100%	
MC (%)		5,000	0.185	5.0	0.4	0%	99.9%	
	Passing							
After Washing		2,000	0.0937	2.0	0.5	0%	99.8%	
Wt. Dry+Tare		1,250	0.0469	1.25	0.5	0%	99.8%	
Tare		630	0.0234	0.63	0.5	0%	99.8%	
Wt. Dry		315	0.0116	0.315	1.0	0%	99.6%	
Tare No.		160	0.0059	0.160	1.6	1%	99.4%	
		75	0.00295	0.075	2.1	1%	99.2%	
		PAN						

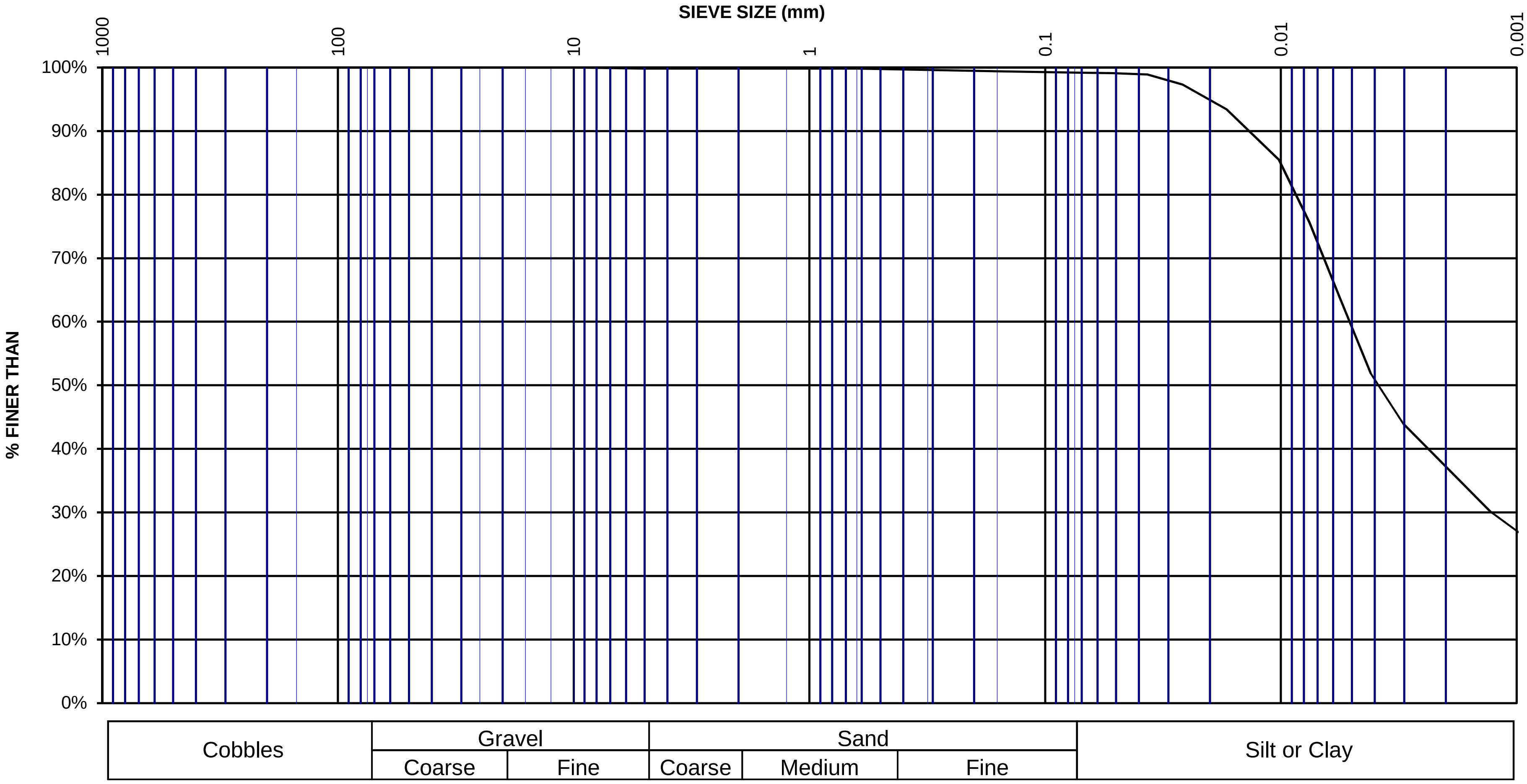
HYDROMETER DATA		READING	TIME (min)	DIAMETER (mm)	TEMP. (°C)	CORR. READING	PERCENT FINER THAN	REMARKS
Wt Dry+Tare	370.8	55	0.5	0.052	19	50	99.1%	
Wt Tare	100.0	55	1	0.037	19	50	98.9%	
Wt Dry	270.8	54	2	0.026	19	49	97.3%	
Sample Size :	50	52	5	0.017	19	47	93.4%	
Wt Retained 2 mm:	0.5	48	15	0.010	19	43	85.5%	
% Passing 2 mm:	99.8%	43	30	0.008	19	38	75.6%	
Specific Gravity :	2.70	37	60	0.006	19	32	63.7%	
Hydrometer No.:	43-9856	31	120	0.004	19	26	51.9%	
Solution (g/L) :	40	27	240	0.003	19	22	44.0%	
		20	1440	0.001	19	15	30.1%	
		18	2880	0.001	19	13	26.2%	

FORM: Edson Hydro 14-01 #13,14&15.xls
DATE: 11/6/2014

GRAIN SIZE ANALYSIS

AECOM

CLIENT :	Town of Edson		
PROJECT :	Edson WWTP		
JOB No. :	60330572.08		
LOCATION :		SAMPLE:	#13,14 & 15 Combined
TESTHOLE:	14-01	DEPTH :	Various
DATE :	4-Nov-14	TECHNICIAN :	GU



FORM: Edson Hydro 14-01 #13,14&15.xls
DATE: 11/6/2014

GRAIN SIZE ANALYSIS

AECOM

CLIENT : Town of Edson
PROJECT : Edson WWTP
JOB No. : 60330572.08
LOCATION :
SAMPLE: 21
TESTHOLE: 14-01
DEPTH :
DATE : 3-Nov-2014
TECHNICIAN : GU

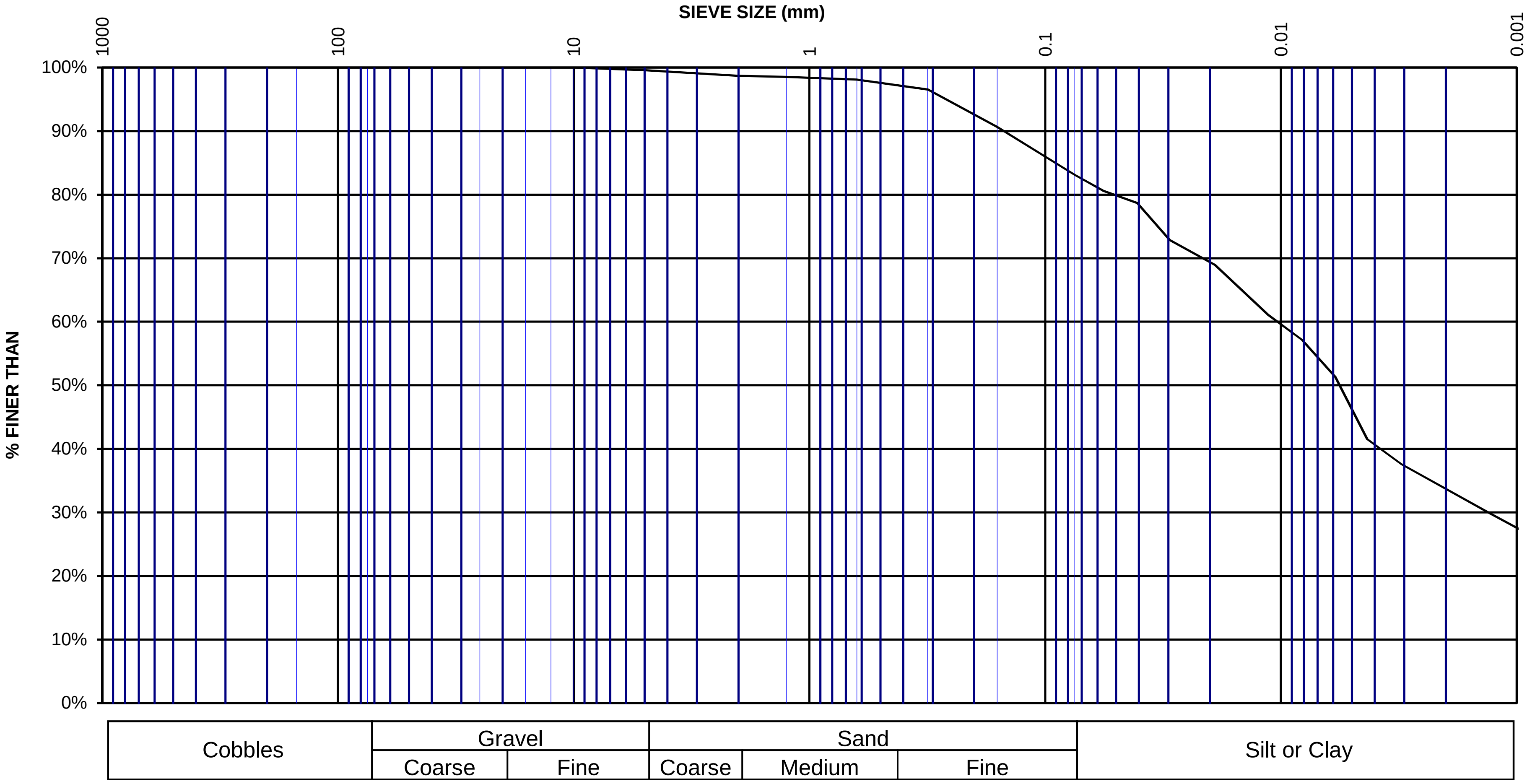
TOTAL DRY WEIGHT OF SAMPLE		SIEVE NO. (μm)	SIZE OF OPENING		WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT FINER THAN	REMARKS
			APPROX. INCHES	mm				
Before Washing		150,000	6	150.0		0%	100%	
Wet + Tare		75,000	3	75.0		0%	100%	
Dry+Tare	518.0	50,000	2	50.0		0%	100%	
Tare	100.0	40,000	1 1/2	40.0		0%	100%	
Wt. Dry	418.0	25,000	1	25.0		0%	100%	
Moisture Content		20,000	3/4	20.0		0%	100%	
Wet + Tare		16,000	5/8	16.0		0%	100%	
Dry+Tare		12,500	1/2	12.5		0%	100%	
Tare		10,000	3/8	10.0		0%	100%	
MC (%)		5,000	0.185	5.0	1.7	0%	99.6%	
	Passing							
After Washing		2,000	0.0937	2.0	5.4	1%	98.7%	
Wt. Dry+Tare		1,250	0.0469	1.25	6.2	1%	98.5%	
Tare		630	0.0234	0.63	7.9	2%	98.1%	
Wt. Dry		315	0.0116	0.315	14.5	3%	96.5%	
Tare No.		160	0.0059	0.160	39.2	9%	90.6%	
		75	0.00295	0.075	70.6	17%	83.1%	
		PAN						

HYDROMETER DATA		READING	TIME (min)	DIAMETER (mm)	TEMP. (°C)	CORR. READING	PERCENT FINER THAN	REMARKS
Wt Dry+Tare	518.0	46	0.5	0.057	19	41	80.6%	
Wt Tare	100.0	45	1	0.041	19	40	78.7%	
Wt Dry	418.0	42	2	0.030	19	37	72.8%	
Sample Size :	50	40	5	0.019	19	35	68.9%	
Wt Retained 2 mm:	5.4	36	15	0.011	19	31	61.1%	
% Passing 2 mm:	98.7%	34	30	0.008	19	29	57.2%	
Specific Gravity :	2.70	31	60	0.006	19	26	51.3%	
Hydrometer No.:	43-9856	26	120	0.004	19	21	41.5%	
Solution (g/L) :	40	24	240	0.003	19	19	37.6%	
		20	1440	0.001	19	15	29.8%	
		19	2880	0.001	19	14	26.9%	

FORM: Edson Hydro 14-01 #21.xls
DATE: 11/5/2014

GRAIN SIZE ANALYSIS

CLIENT :	Town of Edson		
PROJECT :	Edson WWTP		
JOB No. :	60330572.08		
LOCATION :		SAMPLE:	21
TESTHOLE:	14-01	DEPTH :	
DATE :	3-Nov-2014	TECHNICIAN :	GU



FORM: Edson Hydro 14-01 #21.xls
DATE: 11/5/2014

GRAIN SIZE ANALYSIS

AECOM

CLIENT :	Town of Edson		
PROJECT :	Edson WWTP		
JOB No. :	60330572.08		
LOCATION :		SAMPLE:	9
TESTHOLE:	14-02	DEPTH :	
DATE :	3-Nov-2014	TECHNICIAN :	GU

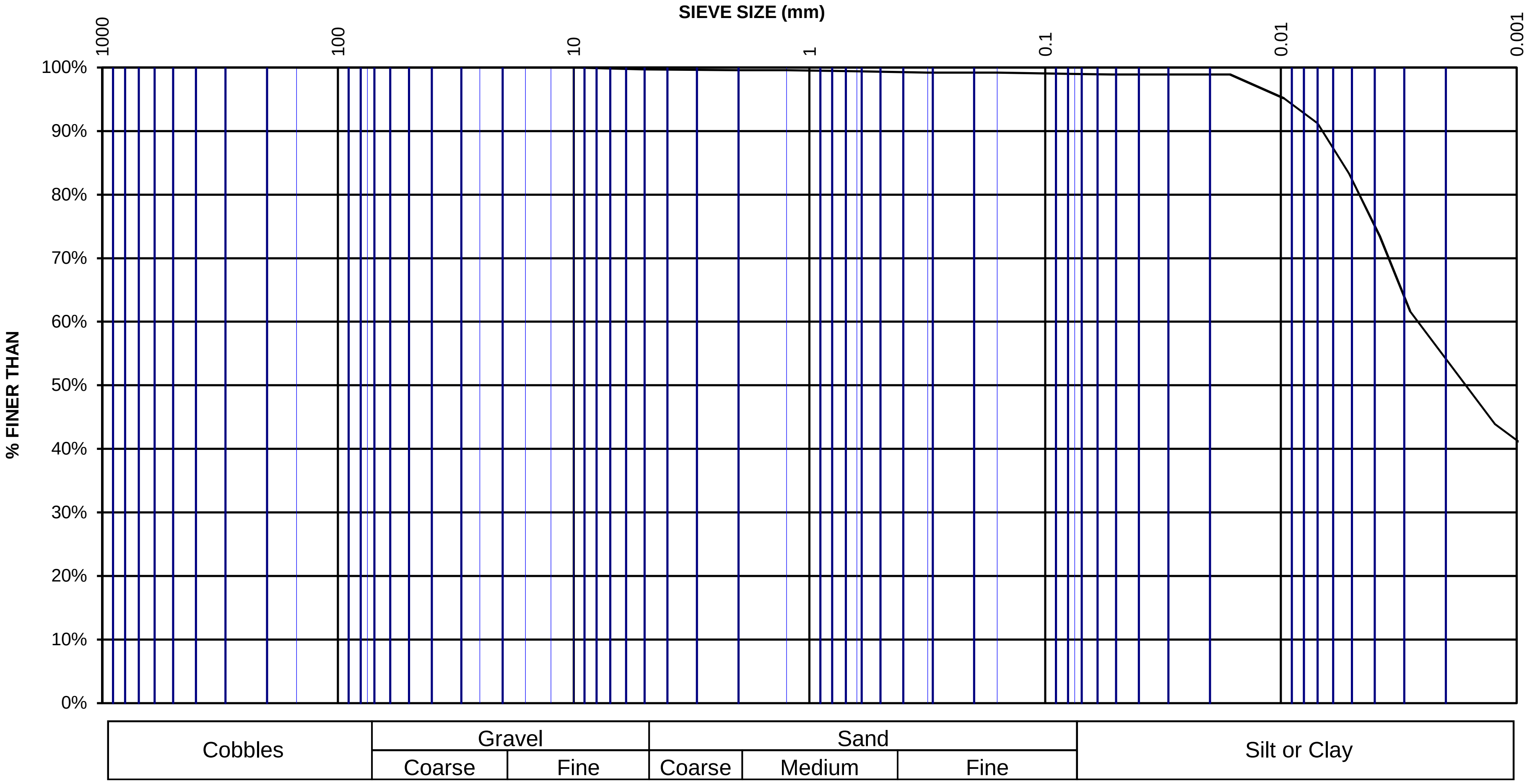
TOTAL DRY WEIGHT OF SAMPLE		SIEVE NO. (μm)	SIZE OF OPENING		WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT FINER THAN	REMARKS
			APPROX. INCHES	mm				
Before Washing		150,000	6	150.0		0%	100%	
Wet + Tare		75,000	3	75.0		0%	100%	
Dry+Tare	491.9	50,000	2	50.0		0%	100%	
Tare	100.0	40,000	1 1/2	40.0		0%	100%	
Wt. Dry	391.9	25,000	1	25.0		0%	100%	
Moisture Content		20,000	3/4	20.0		0%	100%	
Wet + Tare		16,000	5/8	16.0		0%	100%	
Dry+Tare		12,500	1/2	12.5		0%	100%	
Tare		10,000	3/8	10.0		0%	100%	
MC (%)		5,000	0.185	5.0	1.2	0%	99.7%	
	Passing							
After Washing		2,000	0.0937	2.0	1.6	0%	99.6%	
Wt. Dry+Tare		1,250	0.0469	1.25	1.6	0%	99.6%	
Tare		630	0.0234	0.63	2.4	1%	99.4%	
Wt. Dry		315	0.0116	0.315	3.2	1%	99.2%	
Tare No.		160	0.0059	0.160	3.2	1%	99.2%	
		75	0.00295	0.075	3.9	1%	99.0%	
		PAN						

HYDROMETER DATA		READING	TIME (min)	DIAMETER (mm)	TEMP. (°C)	CORR. READING	PERCENT FINER THAN	REMARKS
Wt Dry+Tare	491.9	55	0.5	0.052	19	50	98.9%	
Wt Tare	100.0	55	1	0.037	19	50	98.9%	
Wt Dry	391.9	55	2	0.026	19	50	98.9%	
Sample Size :	50	55	5	0.016	19	50	98.9%	
Wt Retained 2 mm:	1.6	53	15	0.010	19	48	95.1%	
% Passing 2 mm:	99.6%	51	30	0.007	19	46	91.2%	
Specific Gravity :	2.70	47	60	0.005	19	42	83.3%	
Hydrometer No.:	43-9856	42	120	0.004	19	37	73.5%	
Solution (g/L) :	40	36	240	0.003	19	31	61.6%	
		27	1440	0.001	19	22	43.9%	
		25	2880	0.001	19	20	39.9%	

FORM: Edson Hydro 14-02 #9.xls
DATE: 11/5/2014

GRAIN SIZE ANALYSIS

CLIENT :	Town of Edson		
PROJECT :	Edson WWTP		
JOB No. :	60330572.08		
LOCATION :		SAMPLE:	9
TESTHOLE:	14-02	DEPTH :	
DATE :	3-Nov-2014	TECHNICIAN :	GU



FORM: Edson Hydro 14-02 #9.xls
DATE: 11/5/2014

GRAIN SIZE ANALYSIS

CLIENT :	Town of Edson		
PROJECT :	Edson WWTP		
JOB No. :	60330572.08		
LOCATION :		SAMPLE:	17
TESTHOLE:	14-02	DEPTH :	
DATE :	4-Nov-14	TECHNICIAN :	GU

TOTAL DRY WEIGHT OF SAMPLE		SIEVE NO. (μm)	SIZE OF OPENING		WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT FINER THAN	REMARKS
			APPROX. INCHES	mm				
Before Washing		150,000	6	150.0		0%	100%	
Wet + Tare		75,000	3	75.0		0%	100%	
Dry+Tare	505.9	50,000	2	50.0		0%	100%	
Tare	100.0	40,000	1 1/2	40.0		0%	100%	
Wt. Dry	405.9	25,000	1	25.0		0%	100%	
Moisture Content		20,000	3/4	20.0		0%	100%	
Wet + Tare		16,000	5/8	16.0		0%	100%	
Dry+Tare		12,500	1/2	12.5		0%	100%	
Tare		10,000	3/8	10.0		0%	100%	
MC (%)		5,000	0.185	5.0		0%	100%	
	Passing							
After Washing		2,000	0.0937	2.0	0.1	0%	100.0%	
Wt. Dry+Tare		1,250	0.0469	1.25	0.9	0%	99.8%	
Tare		630	0.0234	0.63	1.7	0%	99.6%	
Wt. Dry		315	0.0116	0.315	6.6	2%	98.4%	
Tare No.		160	0.0059	0.160	32.6	8%	92.0%	
		75	0.00295	0.075	61.0	15%	85.0%	
		PAN						

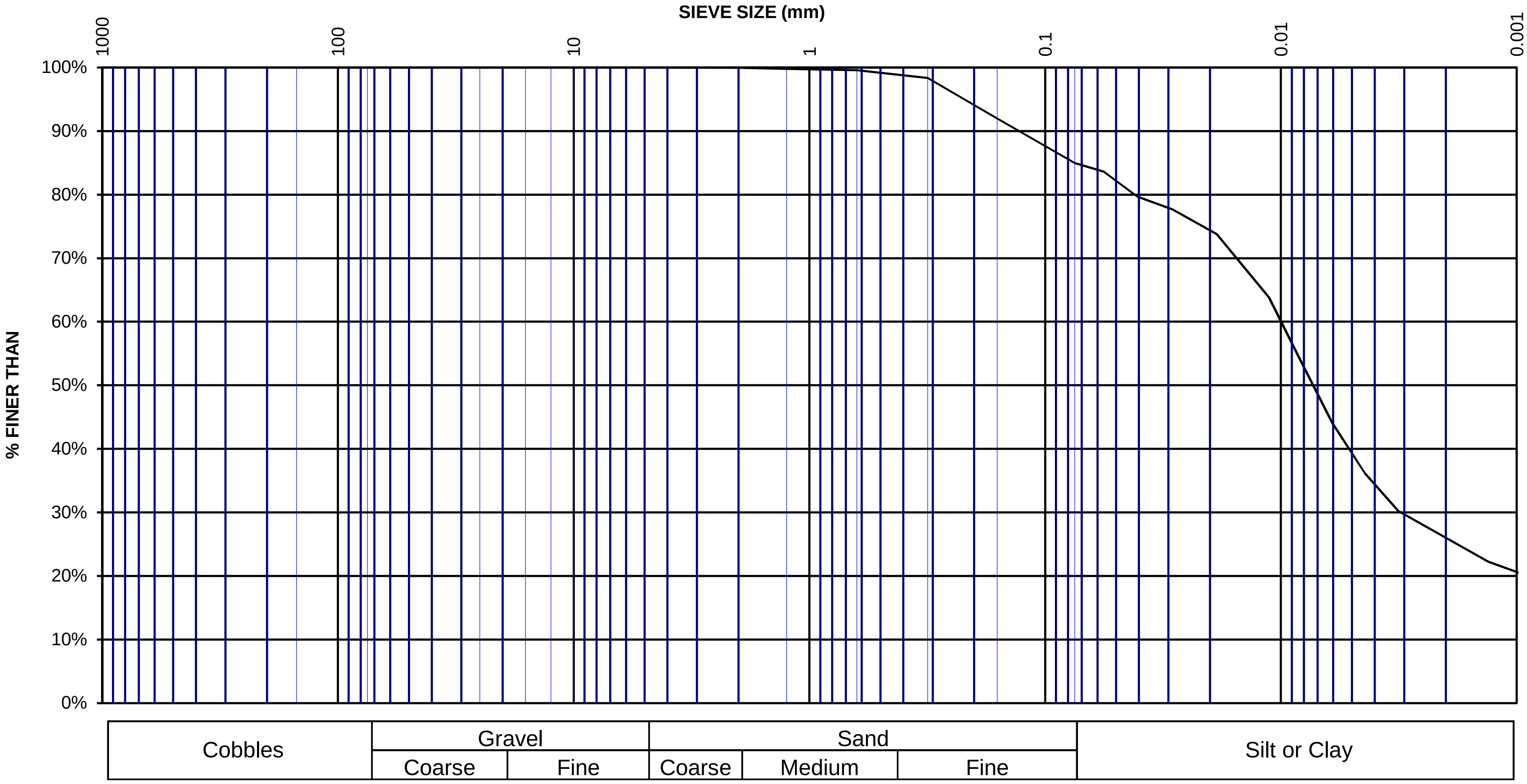
HYDROMETER DATA		READING	TIME (min)	DIAMETER (mm)	TEMP. (°C)	CORR. READING	PERCENT FINER THAN	REMARKS
Wt Dry+Tare	505.9	47	0.5	0.056	19	42	83.6%	
Wt Tare	100.0	45	1	0.041	19	40	79.7%	
Wt Dry	405.9	44	2	0.029	19	39	77.7%	
Sample Size :	50	42	5	0.019	19	37	73.7%	
Wt Retained 2 mm:	0.1	37	15	0.011	19	32	63.8%	
% Passing 2 mm:	100.0%	32	30	0.008	19	27	53.9%	
Specific Gravity :	2.70	27	60	0.006	19	22	44.0%	
Hydrometer No.:	43-9856	23	120	0.004	19	18	36.1%	
Solution (g/L) :	40	20	240	0.003	19	15	30.2%	
		16	1440	0.001	19	11	22.3%	
		15	2880	0.001	19	10	20.3%	

FORM: Edson Hydro 14-02 #17.xls
DATE: 11/6/2014

GRAIN SIZE ANALYSIS

AECOM

CLIENT :	Town of Edson		
PROJECT :	Edson WWTP		
JOB No. :	60330572.08		
LOCATION :		SAMPLE:	17
TESTHOLE:	14-02	DEPTH :	
DATE :	4-Nov-14	TECHNICIAN :	GU



FORM: Edson Hydro 14-02 #17.xls
DATE: 11/6/2014

GRAIN SIZE ANALYSIS

AECOM

CLIENT :	Town of Edson		
PROJECT :	Edson WWTP		
JOB No. :	60330572.08		
LOCATION :		SAMPLE:	#13,14,15 &16 Combined
TESTHOLE:	14-03	DEPTH :	Various
DATE :	3-Nov-2014	TECHNICIAN :	GU

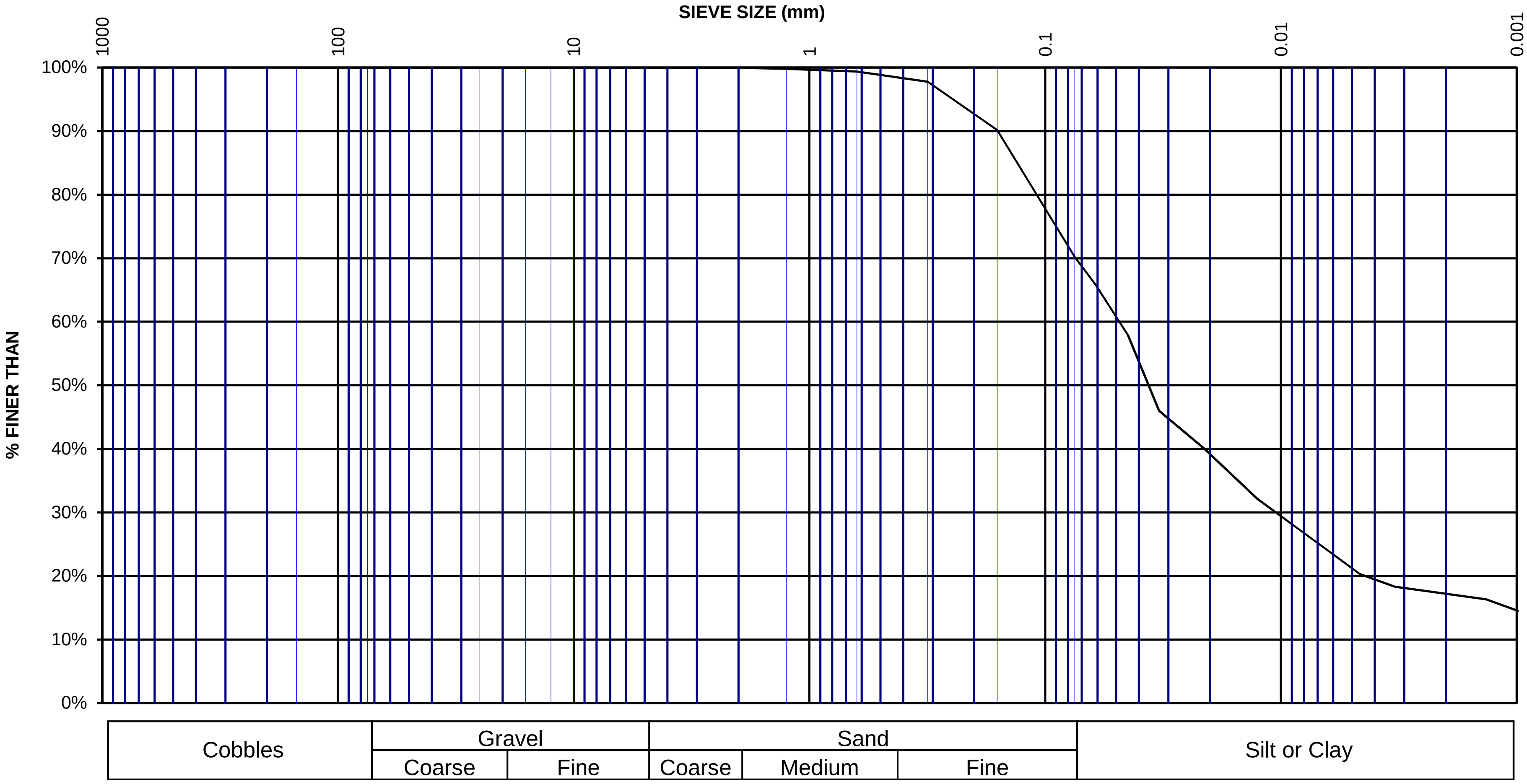
TOTAL DRY WEIGHT OF SAMPLE		SIEVE NO. (µm)	SIZE OF OPENING		WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT FINER THAN	REMARKS
			APPROX. INCHES	mm				
Before Washing		150,000	6	150.0		0%	100%	
Wet + Tare		75,000	3	75.0		0%	100%	
Dry+Tare	474.6	50,000	2	50.0		0%	100%	
Tare	100.0	40,000	1 1/2	40.0		0%	100%	
Wt. Dry	374.6	25,000	1	25.0		0%	100%	
Moisture Content		20,000	3/4	20.0		0%	100%	
Wet + Tare		16,000	5/8	16.0		0%	100%	
Dry+Tare		12,500	1/2	12.5		0%	100%	
Tare		10,000	3/8	10.0		0%	100%	
MC (%)		5,000	0.185	5.0		0%	100%	
	Passing							
After Washing		2,000	0.0937	2.0	0.1	0%	100.0%	
Wt. Dry+Tare		1,250	0.0469	1.25	0.8	0%	99.8%	
Tare		630	0.0234	0.63	2.3	1%	99.4%	
Wt. Dry		315	0.0116	0.315	8.3	2%	97.8%	
Tare No.		160	0.0059	0.160	36.8	10%	90.2%	
		75	0.00295	0.075	111.7	30%	70.2%	
		PAN						

HYDROMETER DATA		READING	TIME (min)	DIAMETER (mm)	TEMP. (°C)	CORR. READING	PERCENT FINER THAN	REMARKS
Wt Dry+Tare	474.6	38	0.5	0.061	19	33	65.8%	
Wt Tare	100.0	34	1	0.045	19	29	57.9%	
Wt Dry	374.6	28	2	0.033	19	23	46.0%	
Sample Size :	50	25	5	0.021	19	20	40.1%	
Wt Retained 2 mm:	0.1	21	15	0.013	19	16	32.2%	
% Passing 2 mm:	100.0%	19	30	0.009	19	14	28.2%	
Specific Gravity :	2.70	17	60	0.006	19	12	24.2%	
Hydrometer No.:	43-9856	15	120	0.005	19	10	20.3%	
Solution (g/L) :	40	14	240	0.003	19	9	18.3%	
		13	1440	0.001	19	8	16.3%	
		12	2880	0.001	19	7	14.4%	

FORM: Edson Hydro 14-03 #13to16.xls
DATE: 11/5/2014

GRAIN SIZE ANALYSIS

CLIENT :	Town of Edson		
PROJECT :	Edson WWTP		
JOB No. :	60330572.08		
LOCATION :		SAMPLE:	#13,14,15 &16 Combined
TESTHOLE:	14-03	DEPTH :	Various
DATE :	3-Nov-2014	TECHNICIAN :	GU



FORM: Edson Hydro 14-03 #13to16.xls
DATE: 11/5/2014

GRAIN SIZE ANALYSIS

CLIENT :	Town of Edson		
PROJECT :	Edson WWTP		
JOB No. :	60330572.08		
LOCATION :		SAMPLE:	7
TESTHOLE:	14-04	DEPTH :	
DATE :	3-Nov-2014	TECHNICIAN :	GU

TOTAL DRY WEIGHT OF SAMPLE		SIEVE NO. (µm)	SIZE OF OPENING		WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT FINER THAN	REMARKS
			APPROX. INCHES	mm				
Before Washing		150,000	6	150.0		0%	100%	
Wet + Tare		75,000	3	75.0		0%	100%	
Dry+Tare	473.3	50,000	2	50.0		0%	100%	
Tare	100.0	40,000	1 1/2	40.0		0%	100%	
Wt. Dry	373.3	25,000	1	25.0		0%	100%	
Moisture Content		20,000	3/4	20.0		0%	100%	
Wet + Tare		16,000	5/8	16.0		0%	100%	
Dry+Tare		12,500	1/2	12.5		0%	100%	
Tare		10,000	3/8	10.0		0%	100%	
MC (%)		5,000	0.185	5.0		0%	100%	
	Passing							
After Washing		2,000	0.0937	2.0		0%	100%	
Wt. Dry+Tare		1,250	0.0469	1.25	0.0	0%	100.0%	
Tare		630	0.0234	0.63	0.0	0%	100.0%	
Wt. Dry		315	0.0116	0.315	0.0	0%	100.0%	
Tare No.		160	0.0059	0.160	0.0	0%	100.0%	
		75	0.00295	0.075	0.0	0%	100.0%	
		PAN						

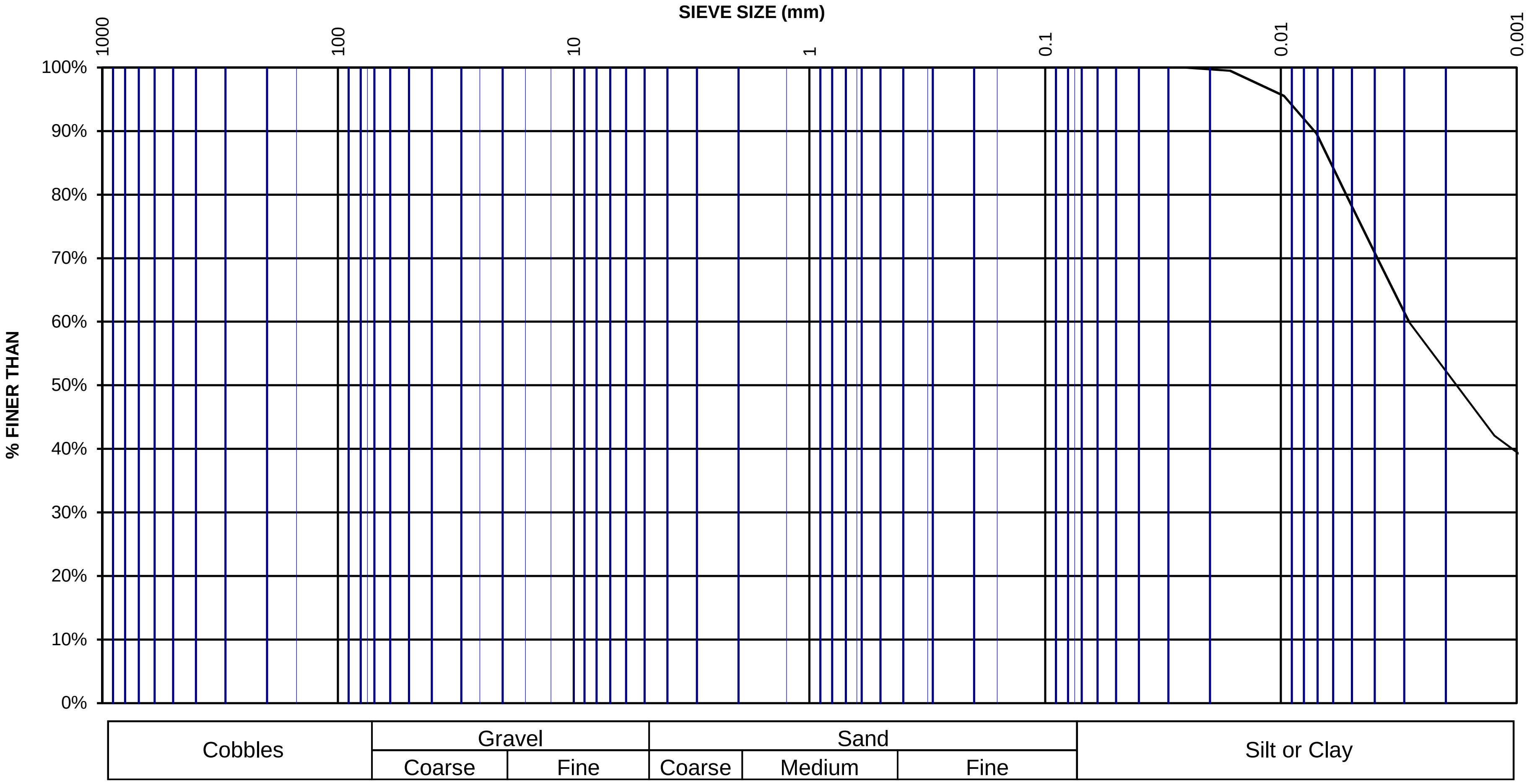
HYDROMETER DATA		READING	TIME (min)	DIAMETER (mm)	TEMP. (°C)	CORR. READING	PERCENT FINER THAN	REMARKS
Wt Dry+Tare	473.3	55	0.5	0.052	19	51	100.0%	
Wt Tare	100.0	55	1	0.037	19	51	100.0%	
Wt Dry	373.3	55	2	0.026	19	51	100.0%	
Sample Size :	50	55	5	0.016	19	50	99.5%	
Wt Retained 2 mm:	0	53	15	0.010	19	48	95.5%	
% Passing 2 mm:	100.0%	50	30	0.007	19	45	89.6%	
Specific Gravity :	2.70	45	60	0.005	19	40	79.7%	
Hydrometer No.:	43-9856	40	120	0.004	19	35	69.8%	
Solution (g/L) :	40	35	240	0.003	19	30	59.9%	
		26	1440	0.001	19	21	42.1%	
		24	2880	0.001	19	19	38.1%	

FORM: Edson Hydro 14-04 #7.xls
DATE: 11/5/2014

GRAIN SIZE ANALYSIS

AECOM

CLIENT :	Town of Edson		
PROJECT :	Edson WWTP		
JOB No. :	60330572.08		
LOCATION :		SAMPLE:	7
TESTHOLE:	14-04	DEPTH :	
DATE :	3-Nov-2014	TECHNICIAN :	GU



FORM: Edson Hydro 14-04 #7.xls
DATE: 11/5/2014

GRAIN SIZE ANALYSIS

CLIENT : Town of Edson
PROJECT : Edson WWTP
JOB No. : 60330572.08
LOCATION :
TESTHOLE: 14-05
DATE : 3-Nov-2014

SAMPLE: 3
DEPTH :
TECHNICIAN : GU

TOTAL DRY WEIGHT OF SAMPLE		SIEVE NO. (µm)	SIZE OF OPENING		WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT FINER THAN	REMARKS
			APPROX. INCHES	mm				
<u>Before Washing</u>		150,000	6	150.0		0%	100%	
Wet + Tare		75,000	3	75.0		0%	100%	
Dry+Tare	403.1	50,000	2	50.0		0%	100%	
Tare	100.0	40,000	1 1/2	40.0		0%	100%	
Wt. Dry	303.1	25,000	1	25.0		0%	100%	
<u>Moisture Content</u>		20,000	3/4	20.0		0%	100%	
Wet + Tare		16,000	5/8	16.0		0%	100%	
Dry+Tare		12,500	1/2	12.5		0%	100%	
Tare		10,000	3/8	10.0		0%	100%	
MC (%)		5,000	0.185	5.0	1.2	0%	99.6%	
	Passing							
<u>After Washing</u>		2,000	0.0937	2.0	3.5	1%	98.8%	
Wt. Dry+Tare		1,250	0.0469	1.25	5.3	2%	98.3%	
Tare		630	0.0234	0.63	9.5	3%	96.9%	
Wt. Dry		315	0.0116	0.315	12.5	4%	95.9%	
Tare No.		160	0.0059	0.160	16.1	5%	94.7%	
		75	0.00295	0.075	25.7	8%	91.5%	
		PAN						

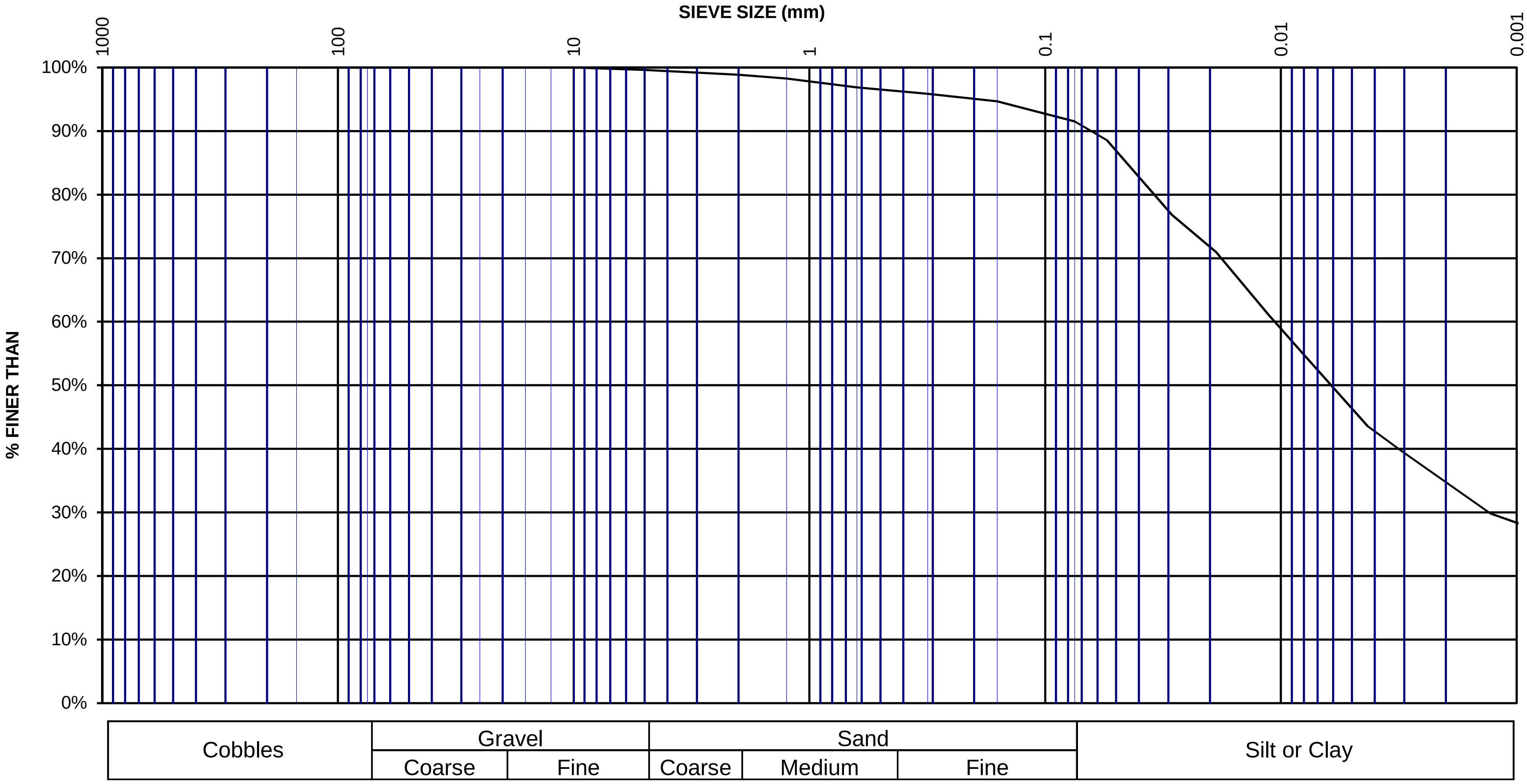
HYDROMETER DATA		READING	TIME (min)	DIAMETER (mm)	TEMP. (°C)	CORR. READING	PERCENT FINER THAN	REMARKS
Wt Dry+Tare	403.1	50	0.5	0.055	19	45	88.6%	
Wt Tare	100.0	47	1	0.040	19	42	82.7%	
Wt Dry	303.1	44	2	0.029	19	39	76.8%	
Sample Size :	50	41	5	0.019	19	36	70.9%	
Wt Retained 2 mm:	3.5	36	15	0.011	19	31	61.2%	
% Passing 2 mm:	98.8%	33	30	0.008	19	28	55.3%	
Specific Gravity :	2.70	30	60	0.006	19	25	49.4%	
Hydrometer No.:	43-9856	27	120	0.004	19	22	43.5%	
Solution (g/L) :	40	25	240	0.003	19	20	39.6%	
		20	1440	0.001	19	15	29.8%	
		19	2880	0.001	19	14	27.9%	

FORM: Edson Hydro 14-05 #3.xls
DATE: 11/5/2014

GRAIN SIZE ANALYSIS

AECOM

CLIENT :	Town of Edson		
PROJECT :	Edson WWTP		
JOB No. :	60330572.08		
LOCATION :		SAMPLE:	3
TESTHOLE:	14-05	DEPTH :	
DATE :	3-Nov-2014	TECHNICIAN :	GU



FORM: Edson Hydro 14-05 #3.xls
DATE: 11/5/2014

WATER CONTENT

CLIENT: Town of Edson

PROJECT: Edson - WWTP

JOB No.: 60330572 - 08

DATE : November 3, 2014 TECHNICAN : CK

HOLE No.	14-01							
DEPTH								
SAMPLE No.	1	2	3	4	5	6	7	8
TARE No.								
WT. SAMPLE WET + TARE	506.9	277.7	600.3	307.0	525.7	394.7	525.7	423.5
WT. SAMPLE DRY + TARE	412.9	226.5	468.6	226.0	414.5	302.9	404.5	321.8
WT. TARE	13.6	13.6	13.6	13.5	13.6	13.6	13.5	13.5
WATER CONTENT W%	**23.5%**	**24.0%**	**28.9%**	**38.1%**	**27.7%**	**31.7%**	**31.0%**	**33.0%**

HOLE No.	14-01							
DEPTH								
SAMPLE No.	9	11	12	13	14	15	16	17
TARE No.								
WT. SAMPLE WET + TARE	597.7	588.8	480.6	471.2	495.5	437.9	384.1	481.6
WT. SAMPLE DRY + TARE	453.4	444.1	350.8	347	366.0	304.7	323.1	410.9
WT. TARE	13.6	13.6	13.6	13.5	13.6	13.6	13.5	13.5
WATER CONTENT W%	**32.8%**	**33.6%**	**38.5%**	**37.2%**	**36.7%**	**45.8%**	**19.7%**	**17.8%**

HOLE No.	14-01							
DEPTH								
SAMPLE No.	18	19	21	22	23	24	25	26
TARE No.								
WT. SAMPLE WET + TARE	403.1	529.4	520.3	416.2	535.0	430.9	468.5	438.5
WT. SAMPLE DRY + TARE	338.8	450.0	431.8	346.7	440.7	352.0	382.4	365.8
WT. TARE	13.6	13.6	13.6	13.5	13.6	13.6	13.5	13.5
WATER CONTENT W%	**19.8%**	**18.2%**	**21.2%**	**20.9%**	**22.1%**	**23.3%**	**23.3%**	**20.6%**

HOLE No.	14-01		14-02					
DEPTH								
SAMPLE No.	27	28	1	2	3	4	5	6
TARE No.								
WT. SAMPLE WET + TARE	539.6	482.2	312.4	186.1	454.3	272.5	339.3	273.8
WT. SAMPLE DRY + TARE	443.3	404.9	246.4	142.4	335.8	214.3	241.4	210.4
WT. TARE	13.6	13.6	13.6	13.5	13.6	13.6	13.5	13.5
WATER CONTENT W%	**22.4%**	**19.8%**	**28.4%**	**33.9%**	**36.8%**	**29.0%**	**43.0%**	**32.2%**

FORM : Edson Moistures.xls
DATE: 11/5/2014

WATER CONTENT

AECOM

CLIENT: Town of Edson

PROJECT: Edson - WWTP

JOB No.: 60330572 - 08

DATE : November 3, 2014 TECHNICAN : CK

HOLE No.	14-02							
DEPTH								
SAMPLE No.	7	8	9	11	12	13	14	15
TARE No.								
WT. SAMPLE WET + TARE	499.7	348.3	530.9	453.2	611.8	551.8	561.6	571.5
WT. SAMPLE DRY + TARE	380.4	267.7	407.3	346.0	465.8	414.3	422.2	425.5
WT. TARE	13.6	13.6	13.6	13.5	13.6	13.6	13.5	13.5
WATER CONTENT W%	**32.5%**	**31.7%**	**31.4%**	**32.2%**	**32.3%**	**34.3%**	**34.1%**	**35.4%**

HOLE No.	14-02							
DEPTH								
SAMPLE No.	16	17	18	19	20	21	22	23
TARE No.								
WT. SAMPLE WET + TARE	453.7	555.6	372.1	588.5	448.2	572.0	346.1	459.4
WT. SAMPLE DRY + TARE	362.1	419.8	316.7	494.9	382.4	484.1	291.9	371.9
WT. TARE	13.6	13.6	13.6	13.5	13.6	13.6	13.5	13.5
WATER CONTENT W%	**26.3%**	**33.4%**	**18.3%**	**19.4%**	**17.8%**	**18.7%**	**19.5%**	**24.4%**

HOLE No.	14-02			14-03				
DEPTH								
SAMPLE No.	24	25	26	1	2	3	4	5
TARE No.								
WT. SAMPLE WET + TARE	355.5	520.3	311.8	461.6	328.3	499.1	402.5	498.7
WT. SAMPLE DRY + TARE	298.5	437.6	281.8	372.8	261.2	363.0	309.0	385.3
WT. TARE	13.6	13.6	13.6	13.5	13.6	13.6	13.5	13.5
WATER CONTENT W%	**20.0%**	**19.5%**	**11.2%**	**24.7%**	**27.1%**	**39.0%**	**31.6%**	**30.5%**

HOLE No.	14-03							
DEPTH								
SAMPLE No.	6	7	8	9	10	11	12	13
TARE No.								
WT. SAMPLE WET + TARE	395.6	496.2	368.2	534.6	515.8	492.8	421.8	532.4
WT. SAMPLE DRY + TARE	305.3	376.8	279.2	404.3	388.0	355.5	335.5	431.2
WT. TARE	13.6	13.6	13.6	13.5	13.6	13.6	13.5	13.5
WATER CONTENT W%	**31.0%**	**32.9%**	**33.5%**	**33.3%**	**34.1%**	**40.2%**	**26.8%**	**24.2%**

FORM : Edson Moistures.xls
DATE: 11/5/2014

WATER CONTENT

AECOM

CLIENT: Town of Edson

PROJECT: Edson - WWTP

JOB No.: 60330572 - 08

DATE : November 3, 2014 TECHNICAN : CK

HOLE No.	14-03							14-04
DEPTH								
SAMPLE No.	14	15	16	18	19	20	21	1
TARE No.								
WT. SAMPLE WET + TARE	419.0	589.6	309.5	325.7	136.3	447.4	360.8	479.7
WT. SAMPLE DRY + TARE	347.2	493.1	256.9	276.6	115.9	381.1	305.2	407.1
WT. TARE	13.6	13.6	13.6	13.5	13.6	13.6	13.5	13.5
WATER CONTENT W%	**21.5%**	**20.1%**	**21.6%**	**18.7%**	**19.9%**	**18.0%**	**19.1%**	**18.4%**

HOLE No.	14-04							14-05
DEPTH								
SAMPLE No.	2	3	4	5	6	7	8	1
TARE No.								
WT. SAMPLE WET + TARE	335.3	474.1	346.6	542.7	352.4	504.4	396.2	510.6
WT. SAMPLE DRY + TARE	280.2	387.4	273.6	424.0	273.3	391.1	308.0	427.7
WT. TARE	13.6	13.6	13.6	13.5	13.6	13.6	13.5	13.5
WATER CONTENT W%	**20.7%**	**23.2%**	**28.1%**	**28.9%**	**30.5%**	**30.0%**	**29.9%**	**20.0%**

HOLE No.	14-05							
DEPTH								
SAMPLE No.	2	3	4	5	6	7	8	
TARE No.								
WT. SAMPLE WET + TARE	246.5	437.3	350.4	532.5	417.3	650.6	509.9	
WT. SAMPLE DRY + TARE	191.7	315.7	272.1	410.5	322.7	499.4	388.7	
WT. TARE	13.6	13.6	13.6	13.5	13.6	13.6	13.5	
WATER CONTENT W%	**30.8%**	**40.3%**	**30.3%**	**30.7%**	**30.6%**	**31.1%**	**32.3%**	

HOLE No.	14-01	14-02	14-01	14-03				
DEPTH	47.5	22.5	22.5	47.5				
SAMPLE No.	20	10	10					
TARE No.								
WT. SAMPLE WET + TARE	347.8	412.3	359.9	495.4				
WT. SAMPLE DRY + TARE	285.2	316.7	269.5	416.4				
WT. TARE	13.3	14.0	14.1	13.4				
WATER CONTENT W%	**23.0%**	**31.6%**	**35.4%**	**19.6%**				

FORM : Edson Moistures.xls
DATE: 11/5/2014