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May 19, 2010

File #293178

MMM Group Limited
Suite 111 - 93 Lombard Avenue
Winnipeg, Manitoba
R3B 3B1

Attention: Mr. Grantley King, P.Eng.

Dear Sir:

Re: City of Winnipeg
Valve Chamber
Bison Drive West at Kenaston Boulevard

As requested, we have undertaken a geotechnical investigation for a proposed valve chamber near the intersection of Bison Drive West at Kenaston Boulevard in south Winnipeg. The site was located near UTM coordinates 5517445.472 and 630006.550.

A single test hole was put down using a truck mounted drill provided by Subterranean (Manitoba) Ltd. The test hole was advanced using a 405 mm diameter auger to a depth of 13.41 metres. Disturbed samples were recovered from the auger cuttings and undisturbed samples were recovered in thin walled steel Shelby tube samplers. The soil profile was logged as the drilling progressed and observations were made as to any seepage or caving conditions which were encountered.

The soil profile which was encountered is illustrated on the attached test hole log. Beneath a surface covering of topsoil and silt to a depth of 1.22 metres was the usual highly plastic silty clay which extended to a depth of 12.65 metres where a glacial silt till was present and which extended to the bottom of the test hole. The silty clay was brown in colour and transitions to grey near the 4.5 metre depth. The consistency of the clay over the depths explored is stiff with undrained shear strengths in the range from 50 to 75 kPa.

It is understood that the valve chamber will have a footprint of 4.5 by 4.9 metres and will be 7.5 metres in depth.

It is recommended that the excavation required for the installation of the valve chamber should be within a temporary shoring system. The shoring may be designed on the basis of the attached earth pressure distribution shown on the attached Figure.

The walls of the valve chamber should be designed to resist lateral earth pressures that are derived on the basis of the following relationship which produces a triangular pressure distribution:

$$P = K\gamma D$$

where P = lateral earth pressure at depth D (kPa)
K = earth pressure coefficient (0.5)
γ = soil/backfill unit weight (17.28 kN/m^3)
D = depth from surface to point of calculation (m)

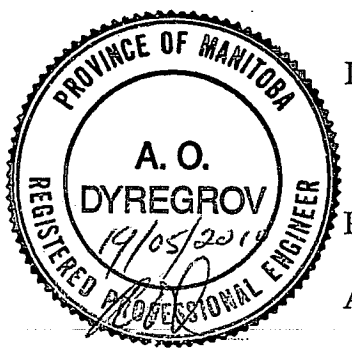
Drainage behind the walls is not anticipated and as such the soil unit weight should be reduced to its submerged (buoyant) unit weight and the water pressure should be added. The groundwater level should be assumed to be at the ground surface. An allowance for surface live loads should be included if significant load is applied within a distance from the wall equal to the height of the wall. The lateral pressure due to the live load should be presumed to be equal to 50 percent of the vertical pressure due to the live load.

The selection of backfill materials should be reviewed during the design phase and their impact on the foregoing assessed.

A major consideration for the valve chamber is the potential for uplift. The hydrostatic uplift loads acting on the base of the valve chamber should be considered with the groundwater level at the ground level. The usual method to counteract the hydrostatic uplift is to oversize the base of the valve chamber and consider the total weight of the chamber backfill vertically above the area of the extended base.

Yours truly,

DYREGROV CONSULTANTS



Per:

A.O. Dyregrov, P.Eng.

Attch.

DYREGROV CONSULTANTS	Logged/Dwn.: TJH Checked: AOD	Test Hole No. 1	Project No. 293178
PROJECT: VALVE CHAMBER , BISON DRIVE WEST at KENASTON BLVD CLIENT: MMM Group Limited		DATE OF INVEST : MAY 17, 2010 DRILL : 405 mm AUGER	

SAMPLE NO.	DEPTH (M)	ELEV. (M)	SYM	SOIL DESCRIPTION	
	0.00	100.00		0.00-0.15 TOPSOIL	
	0.50	99.50		0.15-0.25 CLAY, SILTY STIFF	
	1.00	99.00		0.25-1.22 SILT TAN, DAMP TO MOIST, TRACE OF SLOUGHING	
	1.50	98.50		1.22-12.65 CLAY BROWN, STIFF, SILTY, HIGH PLASTIC LAYERED,	
	2.00	98.00			
	2.50	97.50			Qu-29.5 kPa Pp-71.8 kPa Tv-60.3 kPa W -16.87 KN/M
	3.00	97.00			
	3.50	96.50			
	4.00	96.00			
	4.50	95.50		BROWN, STIFF, HIGH PLASTIC, TRACE SILT , SAND AND FINE GRAVEL	Qu-53.2 kPa Pp-67.0 kPa
	5.00	95.00		INCLUSIONS, FINELY LAYERED SILT AND CLAY	Tv-55.5 kPa W -16.68 KN/M
	5.50	94.50			
	6.00	94.00			
	6.50	93.50		SAME, GREY	Qu-49.7 kPa Pp-57.4 kPa
	7.00	93.00			Tv-47.8 kPa W -17.41 KN/M
	7.50	92.50			
	8.00	92.00			
	8.50	91.50			Qu-57.6 kPa Pp-52.6 kPa
	9.00	91.00			Tv-53.6 kPa W -16.79 KN/M
	9.50	90.50			
	10.00	90.00			
	10.50	89.50			
	11.00	89.00			
	11.50	88.50			Qu-47.8 kPa Pp-47.8 kPa
	12.00	88.00			Tv-46.9 kPa W -16.91 KN/M
	12.50	87.50			
	13.00	87.00		12.65-13.41 GLACIAL SILT TILL SILT MATRIX WITH SAND AND GRAVEL FEW COBBLES AND BOULDERS, DAMP	
	13.50	86.50			
	14.00	86.00		END OF TEST HOLE AT 13.41 IN GLACIAL SILT TILL	
	14.50	85.50			
				TEST HOLE LOCATED TO EAST OF PROPOSED LOCATION AND ON THE SOUTH SIDE OF CADBORO ROAD. THERE IS A SMALL DITCH DRAIN TO THE WEST OF THE TEST HOLE	

MOISTURE CONTENT (%)

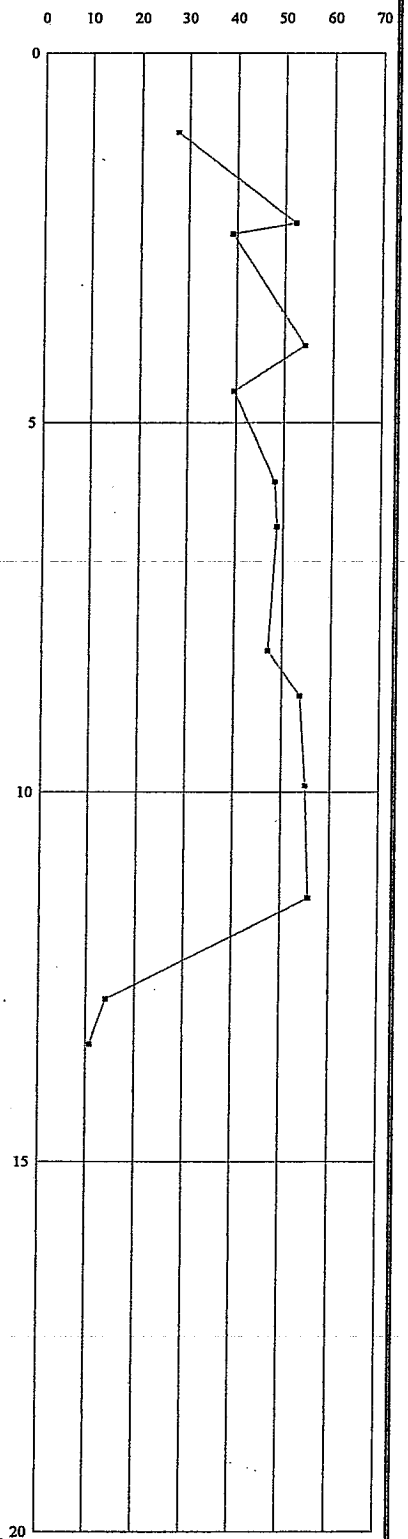


FIGURE 2