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September 11, 2009

File #293171

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

Attention: Mr. Grantley King, P.Eng.
Project Engineer, Structures

Dear Sir:

Re: City of Winnipeg
Outfall Chamber
Waterford and Lombard

As requested, we have undertaken a geotechnical investigation for the replacement of an outfall chamber near the intersection of Waterfront Drive and Lombard Avenue. The site of the proposed replacement is at the location of the "existing manhole" as identified on the attached MMM Group Drawing SK - 01. The test hole which was drilled is on the top of the Flood Protection Dyke adjacent to the manhole.

The single test hole was put down using a track mounted drill provided by Paddock Drilling of Brandon, Manitoba. The test hole was advanced using a continuous 125 mm solid stem auger to a depth of 12.2 metres. Disturbed samples were recovered from the auger cuttings and attempts to recover undisturbed samples in thin walled Shelby tube samplers were unsuccessful. Several Standard Penetration Tests were successful. A standpipe piezometer was installed in the test hole with a sand pack between depths of 4.9 and 12.2 metres.

The soil profile which was encountered in the test hole is illustrated on the attached test hole log. The upper 5.2 metres consisted of fill which was variable in constituents, the upper portion consisting of a well compacted silty, sandy clay. At a depth of 2.9 metres was a thin layer of sand, gravel and cinders. This was underlain with clay which contained some sand and gravel and at deeper depths some layers of organics and silts. At the bottom of the fill, the soil had a "smokey" odor which could perhaps relate to some burned deleterious materials close to the test hole. Below the fill were stratified layers of silts and clays, and some sandy layers and traces of organics. These materials are believed to be alluvial deposits. These materials were described as being wet. Four days after the installation of the standpipe piezometer, the groundwater level was at a depth of 5.6 metres below grade.

It is understood that the outfall chamber will have a footprint of 4.6 by 3.15 metres and will have its bearing at a depth of 7.12 metres. This will put the base below the depth at which the groundwater was recorded in the piezometer on September 4, 2009.

It is recommended that the excavation required for the installation of the outfall chamber should be within a temporary shoring system. The shoring may be designed on the basis of the attached earth pressure distribution shown on Figure 3. Seepage will likely be encountered when undertaking the excavation and should be controlled. There is also the potential for bottom instability which should be recognized and designed against.

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

$$P = K \gamma D$$

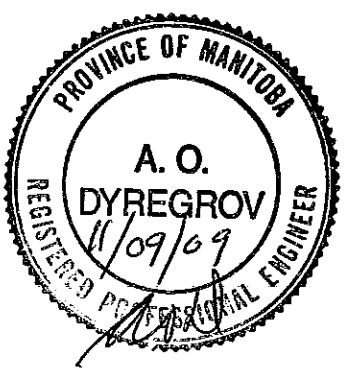
where P = lateral earth pressure at depth D (kPa)
K = earth pressure coefficient (0.5)
γ = soil/backfill unit weight (17.28 kN/m^3)
D = depth from surface to point of pressure calculation (m)

Drainage behind the walls is not anticipated and as such the soil unit weight should be reduced to its submerged (buoyant) weight and the water pressure should be added. The groundwater level should be assumed to be at a depth of 2.0 metres below finished grade or the spring flood level of the adjacent Red River. 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 equal to 50 percent of the vertical pressure due to the live load.

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

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

The location of the outfall chamber is within the primary flood protection dyke. The impact of the construction of the outfall chamber will have no consequential impact on the stability of the bank of the Red River at the proposed location. It is presumed that the stability of the river bank and the flood protection dyke is satisfactory and will have no detrimental impact on the outfall chamber. In view of this, I would be in support of an application for a City of Winnipeg Waterways Permit for the construction of the outfall chamber as proposed.

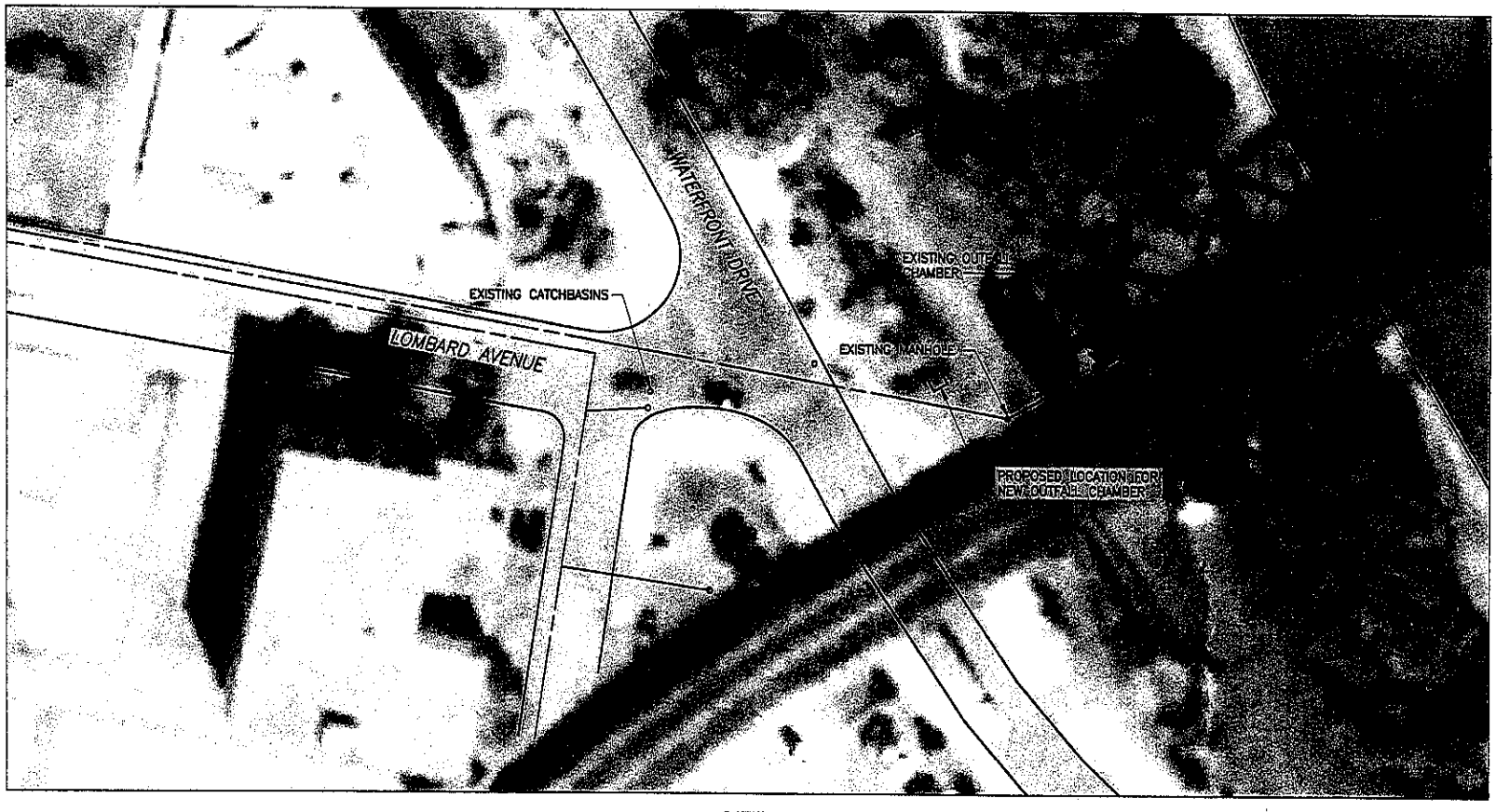


Yours truly,

DYREGROV CONSULTANTS

Per: A O Dyregrov

A.O. Dyregrov, P.Eng.



SITE PLAN
1:500

NOTE:
These design documents are prepared solely for the use by the party with whom the design professional has entered into a contract and there are no representations of any kind made by the design professional to any party with whom the design professional has not entered into a contract.

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CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
OUTFALL CHAMBER AT WATERFRONT AND LOMARD
SITE PLAN

SCALE:	DATE:	DWG. No.
NTS	09.08.04	SK-01

Aug 05, 2009 - 9:14am
\\wgdata\users\LeikennanC\My MMM\Waterfront Lombard Outfall Chamber.dwg -tab:SK-1 Site Plan

DYREGROV CONSULTANTS	Logged/Dwn.: TJH Checked: AOD	Test Hole No. 1	Project No. 293171
PROJECT: WATERFRONT DRIVE & LOMBARD AVE, GATE VALVE CLIENT: MMM		DATE OF INVEST : AUGUST 31, 2009 DRILL : PADDOCK 125 mm AUGER	

SAMPLE NO.	DEPTH (M)	ELEV. (M)	SYM	SOIL DESCRIPTION
	0.00	100.00		0.00-0.08 TOPSOIL & GRASS
	0.50	99.50		0.08-5.20 FILL
	1.00	99.00		CLAY MATRIX WITH SAND, SILT, WELL COMPACTED, (DYKE)
	1.50	98.50		
	2.00	98.00		AT 2.9 SMALL LAYER BLACKISH CLAY, SOME SAND AND GRAVEL, CINDERS,
	2.50	97.50		
	3.00	97.00		CLAY WITH SAND AND GRAVEL
	3.50	96.50		
	4.00	96.00		
	4.50	95.50		LAYER ORGANICS, SAND AND GRAVEL, ODD SHALE TYPE STONES, SILTY LAYERS
	5.00	95.00		LIGHT TO DARK GREY, 'SMOKEY ODOUR'
	5.50	94.50		5.20-12.20 ALLUVIAL SILTS AND CLAYS
	6.00	94.00		SILTS AND CLAYS, SOME SAND,
	6.50	93.50		TRACE ORGANIC INCLUSIONS FEW SAND LAYERS, WET
	7.00	93.00		
	7.50	92.50		
	8.00	92.00		AT 8.0 A TREE ROOT WAS ENCOUNTERED
	8.50	91.50		
	9.00	91.00		WET
	9.50	90.50		
	10.00	90.00		
	10.50	89.50		
	11.00	89.00		
	11.50	88.50		
	12.00	88.00		
	12.50	87.50		END OF TEST HOLE AT 12.20 IN ALLUVIAL SILTS AND CLAYS
	13.00	87.00		
				INSTALLED STAND PIPE AT 12.2 WITH SAND FROM 4.9 TO 12.20 FLUSH COVERING INSTALLED GROUNDWATER LEVEL AT 6.67 ON 04/09/09

MOISTURE CONTENT (%)

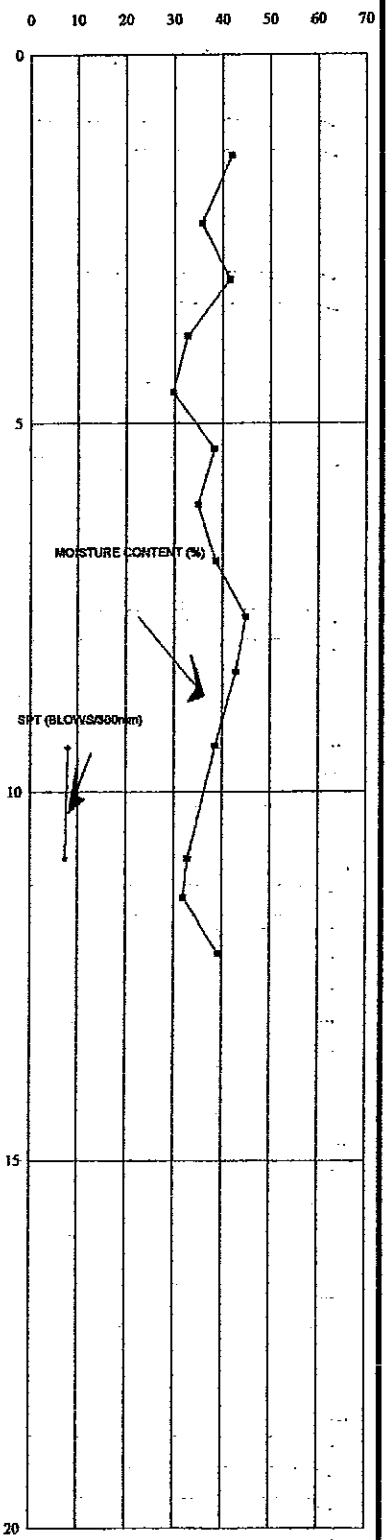
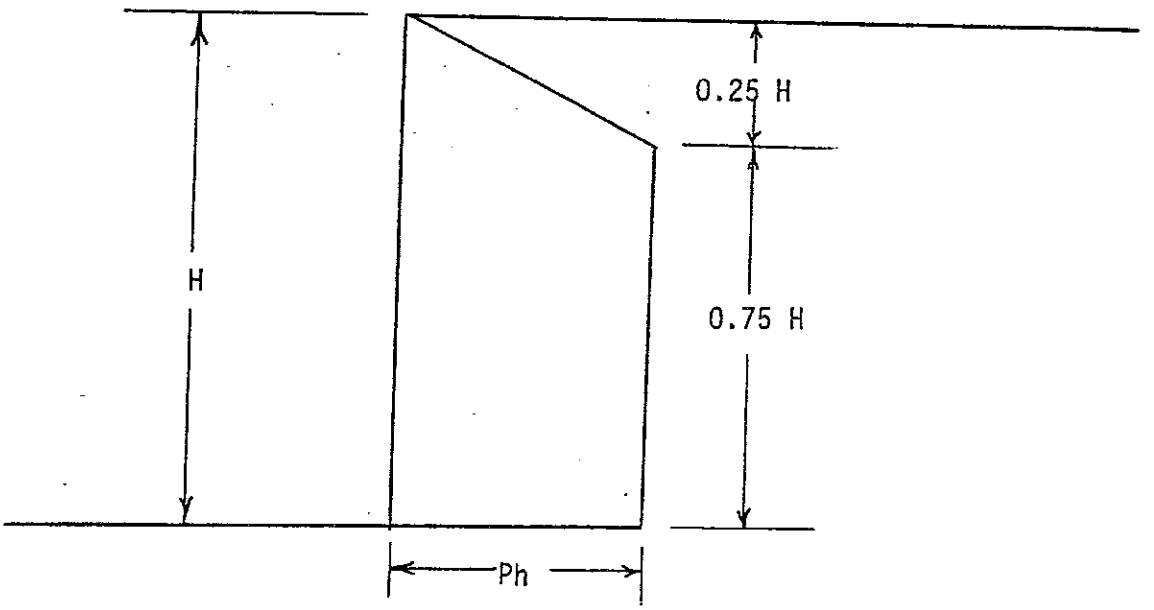


FIGURE 2



$Ph = 0.4\gamma H$

Where: Ph = Lateral earth pressure on shoring (kPa)

γ = Soil unit weigth (17.28 kN/M³)

H = Wall height (M)

Note: Add surface load surcharge where applicable

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OUTFALL GATE CHAMBER
WATERFRONT & LOMBARD
CITY OF WINNIPEG

SCALE	DATE	MADE	CHKD	JOB	FIGURE 3