Appendix B

Contents: Geotechnical Investigation
Proposed Addition
Winakwa Community Centre
Winnipeg, Manitoba

By: Dyregrov Consultants, dated November, 2009 11 pages attached

GEOTECHNICAL INVESTIGATION

PROPOSED ADDITION

WINAKWA COMMUNITY CENTRE

WINNIPEG, MANITOBA

Prepared For

CITY OF WINNIPEG

MUNICIPAL ACCOMMODATIONS DIVISION

PLANNING, PROPERTY AND DEVELOPMENT

NOVEMBER, 2009 **Project No. 293194**

1.0 INTRODUCTION

Dyregrov Consultants were retained by the City of Winnipeg, Municipal Accommodations Division, Planning, Property and Development to provide geotechnical engineering services for a proposed addition to the Winakwa Community Centre at 980 Winakwa Road. This report describes the investigation undertaken by Dyregrov Consultants and offers comments and recommendations on the geotechnical aspects of the project. The work was authorized by Mr. Jurgen Friesen of the Municipal Accommodations Division by electronic mail of October 26, 2009.

2.0 PROPOSED DEVELOPMENT

The site is located on the south side of Winakwa Road in the Windsor Park area of the City. The extent of the existing community centre and the proposed addition is shown on Figure 1.

It is understood that the proposed addition will be located on the south side of the existing building. It will house a gymnasium and a variety of rooms (such as change and storage rooms) as well as support areas. A mezzanine level will be for mechanical equipment. There is to be no basement. The foundation service loads are anticipated to be in the order of 200 kN/m with individual column loads up to 300 kN.

The existing building was initially constructed in 1961 with additions in 1968, 1983, 1986 and 1998. The 1968, 1983 and 1986 additions were apparently founded on cast-in-place concrete friction piles. Figure 5 illustrates the additions.

3.0 FIELD AND LABORATORY INVESTIGATIONS

The test hole drilling program was undertaken on November 12, 2009. Three test holes were put down using a truck mounted drill, which is owned and operated by Subterranean Ltd., at the locations shown on Figure 1. The test holes were 460 mm in diameter. Test Hole 2 was carried to auger refusal at a depth of 17.07 metres and Test Hole 3 was stopped at 14.48 metres.

Test Hole 1 was stopped at a depth of 2.44 metres as the drilling encountered a clean sand at 2.29 metres beneath a clay fill. Despite having obtained site clearances for the underground services, the presence of the clean sand suggested that it was possibly associated with some form of underground service in the area.

The soil profile was visually classified on a continuous basis as the drilling progressed. Both disturbed and relatively undisturbed thin walled Shelby tube samples were frequently recovered. Any observed water seepage and sloughing conditions which were encountered within the test holes were noted.

The samples which were recovered were returned to our laboratory for testing. The testing consisted of the determination of soil moisture contents on all samples and undrained shear strengths and unit weights of the undisturbed samples. The results of the laboratory tests and the soil stratigraphy are included on the attached logs of Test Holes 2 to 4.

4.0 SOIL PROFILE

The generalized soil profile consists of fill, silty clay and glacial till at depth. A silt was noted in the upper part of the silty clay.

A silty clay fill was encountered in each of the test holes. It was 1.07 metres in thickness at Test Holes 2 and 3 and as noted at Test Hole 1 to the depth of the test hole.

It should be noted that the northerly part of the proposed addition site is paved with asphaltic concrete and base. The test holes were not drilled in this area.

Underlying the fill is the usual Lake Agassiz lacustrine silty clay deposit which extended to a depth of 15.85 metres at Test Hole 2. The silty clay was generally observed to be brown in its upper part and transitions to grey at depth. The silty clay is highly plastic. The consistency of the silty clay is stiff with undrained shear strengths generally in the 44 to 65 kPa range. There is a trend for the strengths to reduce with depth. The water contents are generally in the 45 to 60 percent range.

Near the surface of the silty clay, a tan silt was noted in Test Holes 2 and 3. Two layers were noted within the upper 3.05 metres in Test Hole 2 and at 1.07 metres in Test Hole 3. It was of low plasticity and described as being damp to wet.

Underlying the silty clay at a depth of 15.85 metres is a glacial silt till. It is known to be comprised of sand, gravel, cobble and boulder size materials in a silt and clay matrix. It was described as being soft and wet and had moisture contents in excess of 10 percent.

5.0 DISCUSSION AND RECOMMENDATIONS

5.1 General

Our understanding of the existing and proposed development is as outlined in the introduction of this report. It is also understood that the foundation service loads are anticipated to be in the order of 200 kN/m and up to 300 kN for individual column loads.

5.2 Foundations

The preferred foundation for the support of the proposed addition is cast-in-place concrete friction piles. The piles may be sized on the basis of an allowable shaft adhesion of 17 kPa applied to the pile circumference. The upper 2.5 metres of shaft support should be discounted due to potential soil shrinkage away from the pile as well as the depth of the fill and silt. The piles should be sized to avoid penetration of the glacial till. A minimum shaft diameter of 400 mm is recommended.

It is recommended that temporary steel sleeves be on site for use in the event that caving or seepage conditions are encountered within the borings during construction.

seepage conditions are encountered within the borings during construction.

If any of the piles might be subjected to freezing conditions, they should be a minimum of 7.6 metres in length and should contain full length reinforcement.

The piles should not be placed closer than 3 pile diameters, centre to centre. This applies to new pile groups and separations from any piles supporting the existing structure.

The usual alternative foundation for heavy loads is driven end bearing precast concrete piles. Our understanding of the project is that these piles would not be an economic alternative at this site.

5.3 Floor Slabs

It is strongly recommended that all slabs be structurally supported on a deep foundation system such as piles. The slab should be separated from the soil by a void space of at least 150 mm. A similar void should be provided beneath pile caps and grade beams. This design will avoid heave movements resulting from soil swelling in the underlying silty clay soil. This swelling and resulting heave movements are unavoidable.

If a crawlspace is provided beneath the slab, the subgrade soil should be protected with a suitable vapour barrier. As well, a perimeter drain should be placed to intercept potential drainage from the silt layers which were encountered in Test Holes 2 and 3. The drain should be placed at the toe of the excavated slopes within the crawlspace, about 300 mm below the crawlspace floor. The slopes are recommended to be at a gradient no steeper than 4 horizontal to 1 vertical.

5.4 Other

All concrete in contact with the soil should be manufactured with sulphate resistant cement and should be of high quality.

Site grading should be away from the structure at gradients of at least 2 percent.

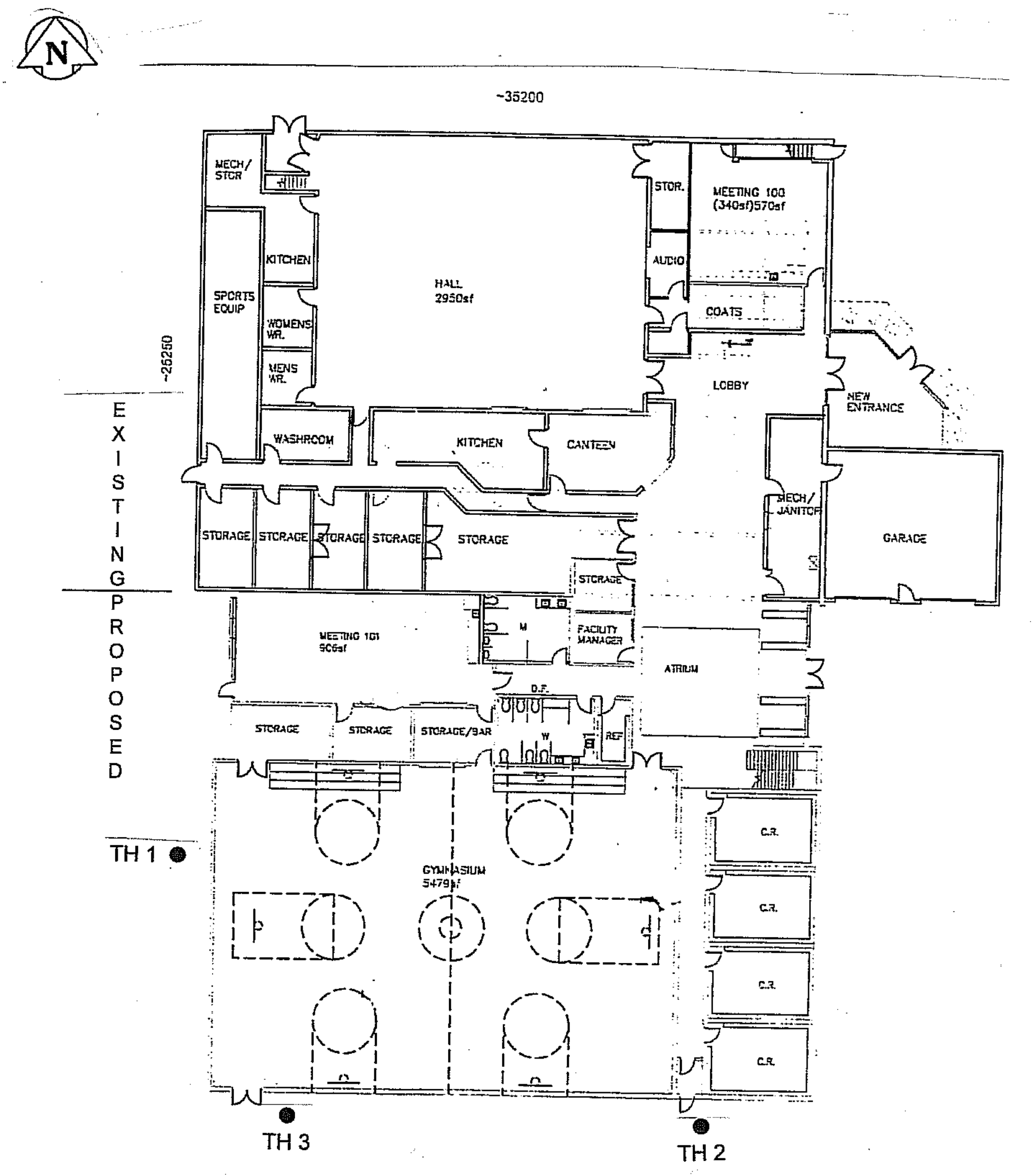
Respectfully submitted,

DYREGROV CONSULTANTS

Per: [signature]

A.O. Dyregrov, P.Eng.

PROVINCE OF MANITOBA
A. O.
DYREGROV
30/10/09
REGISTERED PROFESSIONAL ENGINEER



MAIN LEVEL

DYREGROV CONSULTANTS CONSULTING GEOTECHNICAL ENGINEERS	WINAKWA COMMUNITY CENTRE TEST HOLE LOCATION PLAN

SCALE NTS	DATE 26-11-09	MADE TJH	CHKD AOD	JOB 293194	FIGURE 1

DYREGROV CONSULTANTS	Logged/Dwn.: TJH Checked: AOD	Test Hole No. 1	Project No. 293194
PROJECT: WINAKWA COMMUNITY CENTRE, ADDITION CLIENT: CITY of WINNIPEG, MUNICIPAL ACCOMMODATIONS DEPT.		DATE OF INVEST : NOVEMBER 12, 2009 DRILL : SUBTERRANEAN, 450 mm AUGER	

SAMPLE NO.	DEPTH (M)	ELEV. (M)	SYM	SOIL DESCRIPTION
	0.00	100.00		0.00-2.44 FILL
	0.50	99.50	X	GRASS OVER TOPSOIL OVER CLAY MATRIX, TRACE TOPSOIL (BLACK)
	1.00	99.00	X	
	1.50	98.50	X	
	2.00	98.00	X	AT 1.9 +/- SILT MIX WITH CLAY AT 2.29 SAND, CLEAN (BEDDING ?)
	2.50	97.50		
	3.00	97.00		END OF TEST HOLE AT 2.44 IN SAND
				TEST HOLE ABANDONED BECAUSE OF PROBABLE SERVICES AT 2.4 (+)
				THERE WAS NO INDICATION OF ANY BURIED SERVICE AT THIS LOCATION

MOISTURE CONTENT (%)

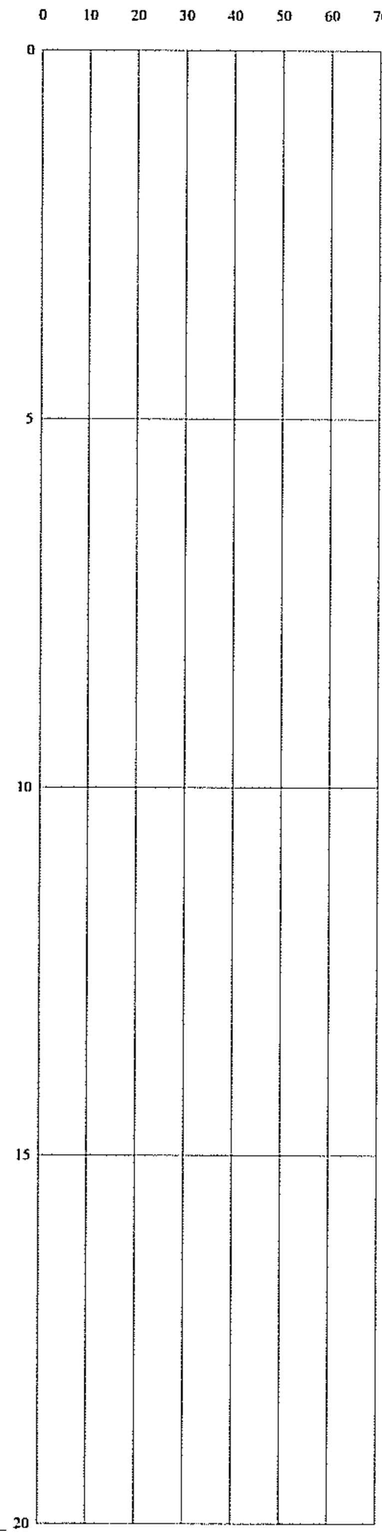


FIGURE 2

DYREGROV CONSULTANTS	Logged/Dwn.: TJH Checked: AOD	Test Hole No. 2	Project No. 293194
PROJECT: WINAKWA COMMUNITY CENTRE, ADDITION		DATE OF INVEST : NOVEMBER 12, 2009	
CLIENT: CITY of WINNIPEG, MUNICIPAL ACCOMMODATIONS DEPT.		DRILL : SUBTERRANEAN, 450 mm AUGER	

SAMPLE NO.	DEPTH (M)	ELEV. (M)	SYM	SOIL DESCRIPTION	
	0.00	100.00		0.00-1.07 FILL GRASS OVER TOPSOIL OVER CLAY MATRIX WITH SOME GRAVEL AND TRACE TOPSOIL	
	0.50	99.50			
	1.00	99.00		1.07-1.68 CLAY BROWN, STIFF, SILTY, HIGH PLASTIC	
	1.50	98.50			
	2.00	98.00		1.68-2.13 SILT TAN, DAMP	
	2.50	97.50		2.13-2.44 CLAY, SAME AS ABOVE 2.44-3.05SILT TAN, DAMP TO WET,	
	3.00	97.00		3.05-15.85 CLAY BROWN, SILTY, STIFF, HIGH PLASTIC TRACE SILT INCLUSIONS, FINELY LAYERED	
	3.50	96.50			
	4.00	96.00			
	4.50	95.50			Qu-66.5 kPa Pp-79.0 kPa Tv-81.4 kPa W -17.23 KN/M
	5.00	95.00			
	5.50	94.50			
	6.00	94.00			
	6.50	93.50		GREY AT +/- 6.7	
	7.00	93.00			
	7.50	92.50			
	8.00	92.00		GREY, SILTY, STIFF, HIGH PLASTIC TRACE SILT, SAND AND FINE GRAVEL INCLUSIONS	Qu-51.4 kPa Pp-64.6 kPa Tv-62.2 kPa W -17.28 KN/M
	8.50	91.50			
	9.00	91.00			
	9.50	90.50		ODD SMALL BOULDER IN CLAY MATRIX	
	10.00	90.00			
	10.50	89.50			
	11.00	89.00		SAME	Qu-42.8 kPa Pp-55.0 kPa Tv-47.8 kPa W -17.3 KN/M
	11.50	88.50			
	12.00	88.00			
	12.50	87.50			
	13.00	87.00			
	13.50	86.50			
	14.00	86.00			
	14.50	85.50			
	15.00	85.00			
	15.50	84.50			
	16.00	84.00		15.85-17.07 GLACIAL SILT TILL SILT MATRIX WITH SAND AND GRAVEL SOFT, WET, MORE DENSE AT 17.0, DRIER	
	16.50	83.50			
	17.00	83.00			
	17.50	82.50		END OF TEST HOLE AT 17.07 AT AUGER REFUSAL	
	18.00	82.00			

MOISTURE CONTENT (%)

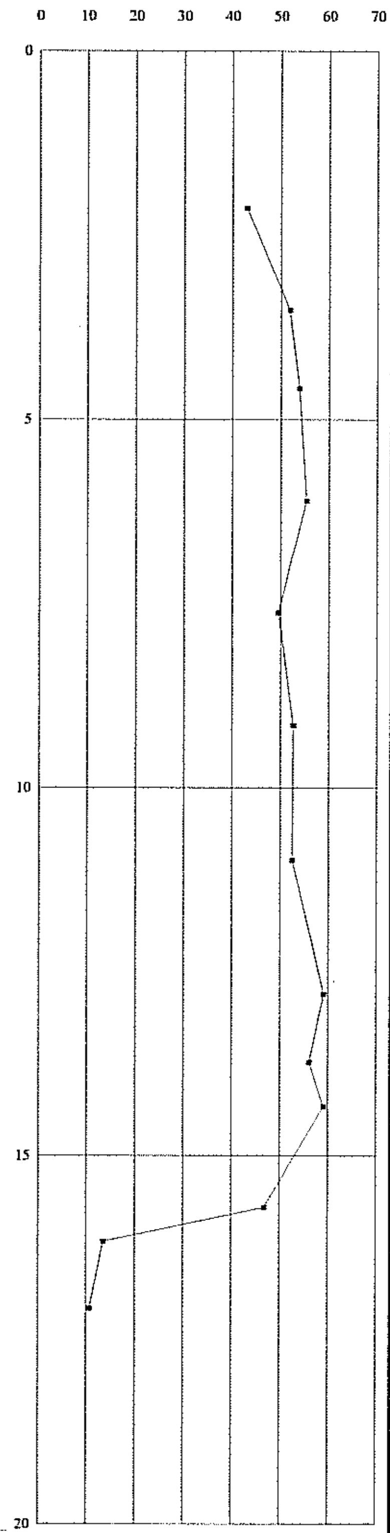


FIGURE 3

DYREGROV CONSULTANTS	Logged/Dwn.: TJH Checked: AOD	Test Hole No. 3	Project No. 293194
PROJECT: WINAKWA COMMUNITY CENTRE, ADDITION CLIENT: CITY of WINNIPEG, MUNICIPAL ACCOMMODATIONS DEPT.		DATE OF INVEST : NOVEMBER 12, 2009 DRILL : SUBTERRANEAN, 450 mm AUGER	

SAMPLE NO.	DEPTH (M)	ELEV. (M)	SYM	SOIL DESCRIPTION	
	0.00	100.00		0.00-1.07 FILL GRASS OVER TOPSOIL OVER CLAY MATRIX WITH SOME GRAVEL AND TRACE TOPSOIL	
	0.50	99.50			
	1.00	99.00		1.07-1.37 SILT TAN, DAMP	
	1.50	98.50		1.37-14.48 CLAY BROWN, SILTY, STIFF, HIGH PLASTIC	
	2.00	98.00			
	2.50	97.50			
	3.00	97.00			
	3.50	96.50			
	4.00	96.00			
	4.50	95.50			
	5.00	95.00			
	5.50	94.50			
	6.00	94.00		SAME, TRACE SULPHATES, TRACE SILT INCLUSIONS, MOTTLED	Qu-47.2 kPa Pp-71.8 kPa Tv-63.2 kPa W -17.14 KN/M
	6.50	93.50			
	7.00	93.00		GREY AT +/- 6.7	
	7.50	92.50			
	8.00	92.00			
	8.50	91.50			
	9.00	91.00			
	9.50	90.50			
	10.00	90.00			
	10.50	89.50			
	11.00	89.00			
	11.50	88.50			
	12.00	88.00		GREY, SILTY, STIFF, TRACE (+) SILT SAND AND FINE GRAVEL INCLUSIONS	Qu-26.6 kPa Pp-57.4 kPa Tv-47.8 kPa W -16.82 KN/M
	12.50	87.50			
	13.00	87.00			
	13.50	86.50			
	14.00	86.00			
	14.50	85.50			
	15.00	85.00		END OF TEST HOLE AT 14.48 IN GREY CLAY MATRIX	

MOISTURE CONTENT (%)

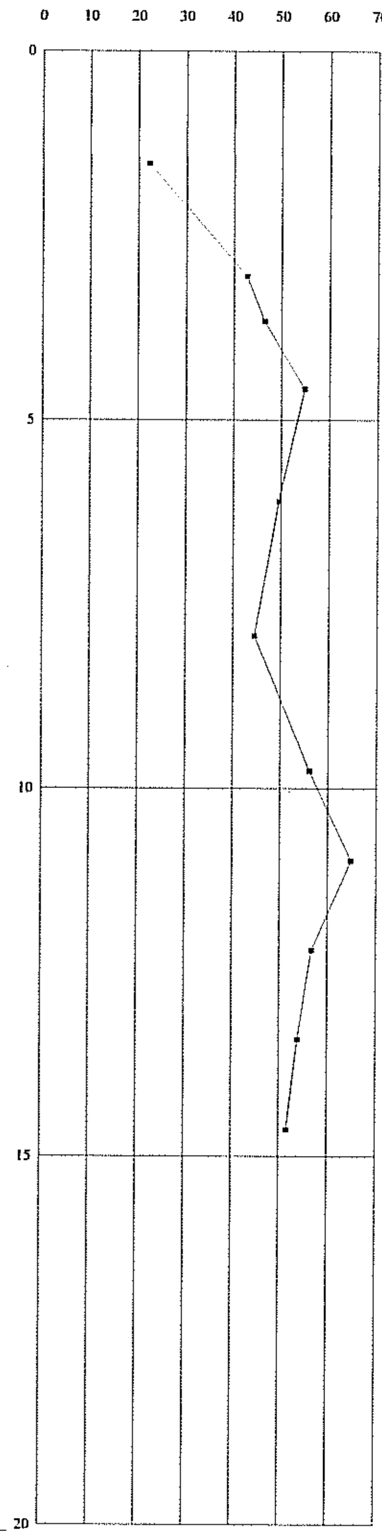
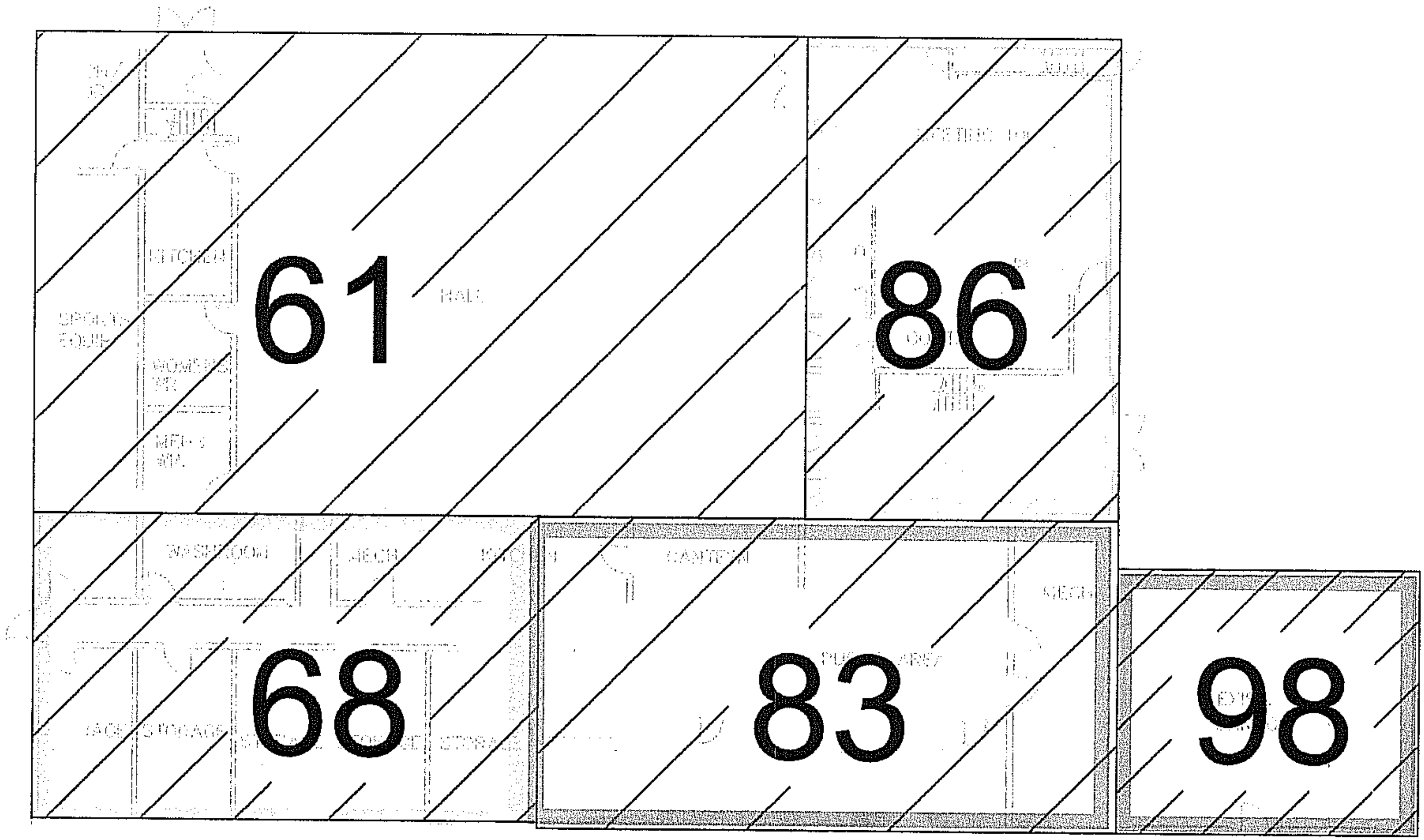


FIGURE 4



DYREGROV CONSULTANTS CONSULTING GEOTECHNICAL ENGINEERS						WINAKWA COMMUNITY CENTRE CONSTRUCTION ADDITION (YRS)					
SCALE	NTS	DATE	30-11-09	MADE	TJH	CHKD	AOD	JOB	293194	FIGURE	5