

**Complaint Review Committee
Request for Review**

Date: January 26, 2006
Name: Kim & Murray Empringham
Address: 12900 Kennedy Rd., Stouffville, ON, L4A 7X5
Phone #: 905-888-1235

1. Has your well been assessed by the Region's project team?
Yes.

2. Please describe your water interference problems:

Our well went dry for the first time, on June 8, 2005. The well supplied our house as well as our barn. We had 90 head of cattle in our barn which needed water. After determining that there was no problem with the pump or the pipe down the well we had to buy a truck load of water and arranged to send some of the cattle to market earlier than planned. Within a couple of weeks all of the cattle had been shipped and the barn was empty until the end of August. Once we had cattle back in the barn the well went dry again, on September 3, 2005. We were hauling 1000 gallons of water twice daily from our neighbors pond to supply the cattle in the barn. Gradually over the next week the water level started to come back up in the well, but then went dry again every time we turned the water back on to the barn to let the cattle drink. After calling the York Region Call Centre we were informed by Phil Smart of Conestoga-Rovers & Associates, that the Region would not be helping us with our water problem. After several weeks of bringing water to the cattle, with no significant improvement in sight, we had to have a new well drilled on September 23, 2005.

3. What is your preferred meeting venue and time?
Stouffville Town offices after business hours

4. Are you familiar with the CRC's mandate, scope and deliberation process?
Yes.

**Dewatering Complaint Review Committee
Additional Resident Information**

Name: Kim & Murray Empringham

Address: 12900 Kennedy Rd.
Stouffville, ON, L4A 7X5

Phone #: (905)-888-1235

Review Date:

1. Besides yourself, please list the names (and affiliations, if applicable) of the people, if any who will be speaking to the CRC on your behalf?

1. Ray Blackport – Blackport Hydrology Inc.
- 2.

2. Will you be presenting any materials to the CRC, such as reports, diagrams, figures or other information? If yes, please list and describe.

1. Inspec-Sol Letter, Response to Call Centre, Oct. 31/05
2. Rodger Boadway Ent. Ltd., Invoice, Drill New Well
3. Black Port Hydrogeology Letter and Attachments, Hydrogeologist Report
4. James Morning & Sons Ltd., Water Invoice
5. David Fockler, Well Service, Invoice

Return this form with accompanying documents to:

The Regional Municipality of York
17250 Yonge Street
Newmarket, ON, L3Y 6Z1

Mark package "Attention Clerk's Office

Re: Dewatering Complaint Review Committee"

Or if there are no attachments it may be returned by fax at 905-895-3031

Roger Boadway Ent., Ltd.**INVOICE**

Water Well Drilling / Pump Sales and Service

P.O. Box 397, 25684 Hwy. 48
 Sutton West, ON L0E 1R0
 Phone 905-722-5362, Fax 905-722-5794

DATE: Sept. 23, 2005

BILL TO:
 Murray Empringham
 12900 Kennedy Rd.
 Stouffville, ON
 L4A 7X5
 Phone 905-888-1235

FOR: Well Drilling

DESCRIPTION	QTY.	RATE	AMOUNT
8-5/8" casing installed, set and grouted in for flowing conditions			\$ 800.00
6-5/8" well drilled	83 ft.	\$42/ft.	3,486.00
6" x 3' x slot #18 S/S screen & fittings	1.00	1275.00	1,275.00
6" x 3' x slot #25 S/S screen only	1.00	540.00	540.00
Environmental package	1.00	775.00	775.00
SUBTOTAL			\$ 6,876.00
TAX RATE			7.00%
SALES TAX			481.32
OTHER			
TOTAL			\$ 7,357.32

Total accounts payable is \$10,694.45
 Thank you.

GST 699.64

Make all cheques payable to Roger Boadway Ent., Ltd.

Visa/MC, Cheques, Cash are acceptable.

Total due in 15 days. Overdue accounts subject to a service charge of 2% per month.

GST # R104599600

THANK YOU FOR YOUR BUSINESS!

Roger Boadway Ent., Ltd.*Water Well Drilling / Pump Sales and Service*

P.O. Box 397, 25684 Hwy. 48
 Sutton West, ON L0E 1R0
 Phone 905-722-5362, Fax 905-722-5794

INVOICE

DATE: Sept. 27, 2005

BILL TO:
 Murray Empringham
 12900 Kennedy Rd.
 Stouffville, ON
 L4A 7X5
 Phone 905-888-1235

FOR: Pump Sales

DESCRIPTION	QTY.	RATE	AMOUNT
Service to trench in water line, install B-10 pitless adaptor while hole was open at well for trenching, install a 10P4C02MGS-03 sub pump, Serial Nos. 05F18M, 001G05ALE, in the well with a pump setting of 50 ft. on 1" x 100 PSI plastic pipe and 14/4/8 sub wire, 1" brass insert adaptors for well pump connection, set up Stab-lock breaker for sub, set up pressure system with a Jif mount package for the electrical set up and a tank fittings package to replumb the system, installed ground clamps and ran liquid conduit pipe for the electrical, charge all material and labour to install new pump in new well and set up pressure/pumping system			3,118.81
SUBTOTAL			\$ 3,118.81
TAX RATE			7.00%
SALES TAX			218.32
OTHER			
TOTAL			\$ 3,337.13

Make all cheques payable to **Roger Boadway Ent., Ltd.**

Visa/MC, Cheques, Cash are acceptable.

Total due in 15 days. Overdue accounts subject to a service charge of 2% per month.

GST # R104599600

THANK YOU FOR YOUR BUSINESS!

October 31, 2005

Reference No. T001374-23-1482

Ms. Kim Empringham
12900 Kennedy Road
Stouffville, Ontario
L4A 7X5

Dear Ms. Empringham:

Re: Response to Call-In to the York Region Call Centre - 12900 Kennedy Road
16th Avenue Construction Activities
Markham, Ontario
File No. 1482

York Region's Manager for the 16th Avenue Trunk Sewer Construction Project, Nitti Subramaniam, asked us to follow-up with you with respect to a well issue you brought to his attention. Our records indicate that you called York Regions Call Centre on September 8th and 9th, 2005 and indicated that you were experiencing a water related issue, and reported an 'urgent' need for water.

Our company, Inspec-Sol/CRA was retained by the Region to provide an independent technical assessment of potential interference on local water wells from the 16th Avenue Trunk Sewer construction activities. The following letter has been prepared to report our findings to you, and to close this file with respect to our investigation.

We have concluded that the water conditions you reported are not the result of the construction activities. The reasons for this conclusion are detailed below. If you have other information that we could consider, please contact the undersigned directly at the telephone number listed below, or via the project call centre, and we will take action. In the absence of new information, and if you disagree with the findings, York Region has a process in place for you to pursue this matter. The process for taking this step is also detailed below.

Our records indicate that you called the Trunk Sewer Construction Project call centre service on September 8th and 9th, 2005 (File Nos. 1482 and 1485) and reported that you had experienced a loss of water with your well. A representative of Inspec-Sol/CRA contacted you, and a field technician completed an investigation of your well the same day in response to your call. The following information was obtained, based on the investigation and inspection of your well:



October 31, 2005

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Reference No. T001374-23-1459

- you have 2-inch diameter drilled well situated within a larger diameter dug/bored well;
- the depth of the drilled portion of the well is approximately 28.5 metres below the top of the concrete well casing (m BTOC), and the depth of the dug/bored portion is approximately 2.5 m BTOC;
- the dug/bored portion has an overflow pipe approximately 2 m BTOC, which is connected to an adjacent reservoir or cistern (800 gallons), and an overflow outlet is also located near the top of the concrete casing;
- the static water level at the time of the investigation was 1.96 m BTOC;
- the well reportedly flows under natural artesian conditions from the drilled portion of the well into the dug/bored portion providing storage for the water supply, and also overflows into the adjacent reservoir for additional storage; and
- the well/reservoir are equipped with jet pumps, and are used to service both your residence and barn.

You indicated the well is used to provide a water supply for up to 90 to 140 head of cattle, and that you experienced water supply shortages in June, and July 2005. You had water hauled and a water supply tank set up in order to secure the water supply for your farm.

After review, it has been determined that the nearest construction is taking place along 16th Avenue, and the main pumping station (pumping station C8) is located near the intersection of Stone Mason Drive and 16th Avenue, a distance of approximately 10 kilometres from your residence. Your well is completed in the shallow aquifer, based on the depth and construction of your well.

Inspec-Sol/CRA has reviewed the water level data collected over the last two years from over 150 monitoring wells, piezometers and private wells. The monitoring information indicates that your well is located outside the shallow aquifer area of influence for the construction activities.

As noted above, York Region has a process in place to assist you if you disagree with these findings. If that is the case, you are welcome to discuss the matter with York Region's Complaint Review Committee (CRC). The Complaint Review Committee established by York Region to review decisions made by staff relating to well performance concerns in connection with the trunk sewer project.

October 31, 2005

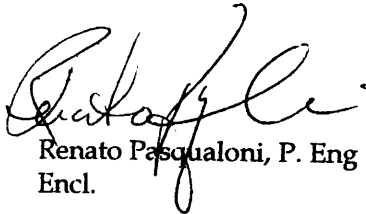
3

Reference No. T001374-23-1459

It is our understanding that you have received and reviewed the Complaint Review Committee information. To indicate a desire to participate in the Complaint Review Committee process, please complete the CRC forms and submit them to the Regional Clerks office. Also please call the call centre at 1-888-445-4418, and indicate your request to appear before the CRC.

Please feel free to contact the call centre at 1-888-445-4418, or the undersigned at Inspec-Sol/CRA if you need assistance to facilitate the CRC process, or if you have any more questions.

Yours truly,
INSPEC-SOL/CONESTOGA-ROVERS & ASSOCIATES



Renato Pasqualoni, P. Eng
Encl.

c.c. Nitti Subramaniam, York Region
A. Brown, Town of Markham

JAMES MORNING & SONS LTD.

3050 Aurora-Lloydtown Rd.
R.R. #1, Kettleby, Ontario L0G 1J0

Water Supply – Wells – Pools – Cisterns
Sand – Gravel – Top Soil – Limestone

905-727-9097

Fax 905-841-5641

SOLD TO

Empering Farm

DATE

E June 9 2005

_P.O. #

№ 27704

BN #102573656 RT

QUANTITY		PRICE
1	@ 140	140
Paid		
Larn-west		
Service Charge on N.S.F. cheques: \$15.00		
TERMS: NET 30 DAYS		
YOU PAY THIS AMOUNT ▶		140

**2* Service Charge per Month on Overdue Accounts
Not Responsible for Property Damage Past Street Line**

David Fockler Stouffville
 13454 Highway 48 Ont
 L4H 7X3
 DATE June 29 2005
 NAME Murray Empingham
 ADDRESS

SOLD BY	COD	CHARGE	ON ACCOUNT	AMOUNT FWD.
1		Lighting outflow		
2		Labour & Trip		90.00
3				
4				
5				
6				
7				
8				
9				
10				
				GST
TAX REG. NO:				PST
31				TOTAL
SIGNATURE				



24 Erb Street East
Waterloo, Ontario
N2J 1L6

Phone: 519-884-5549
Fax: 519-884-5996
blackport_hydrogeology@rogers.com

January 6, 2006

Kim and Murray Empringham,
12900 Kennedy Road,
Stouffville, Ontario
L4A 7X5

Dear Kim and Murray:

RE: Comments on the Potential Impact from the 16th Avenue Dewatering on the Empringham well

As per your request I have conducted a review and assessment of potential well interference issues with your well as related to the 16th Avenue Sewer Construction Project. The following is a brief summary of my review and interpretation of the assessment of your well and the potential impact that the dewatering of the 16th Avenue Construction project may have on your well. I have conducted an extensive review of the existing data, which is a formidable task, given the extent of data collected for the project. I have not included a detailed analysis in this letter. If you proceed with participation in the Complaint Review Committee process, I can provide more details.

A general comment regarding the review process for York Region is that it would appear that if a well being investigated is outside of "the area of influence" from pumping, as interpreted by the independent consultant Inspec-Sol, then essentially there is little review of any kind.

I will briefly outline the geologic and hydrogeologic setting, the monitoring program and interpretation to date by the project consultants and provide my comments and interpretation with respect to the problems you have encountered with your well.

Summary and Comments on the Inspec-Sol letter – October 31, 2005

In response to your calls to the York Region Call Centre on September 8th and 9th, 2005, concerning water related issues with your well, Inspec-Sol provided an independent technical assessment of potential interference from the 16th Avenue Trunk Sewer Construction activities.

Since you are familiar with the Inspec-Sol letter I will only highlight their findings relative to my review and interpretation of the existing information.

- The well is about 28.5 m below the top of casing (BTOC). The well flowed under natural conditions, until June of this year. The water level was 1.96 m below the top of casing (BTOC) at the time Inspec-Sol measured water levels on September 9th, 2005

- You indicated water shortages were experienced in June and July 2005. The well was used to supply water to 90-140 head of cattle and you had to have a water supply tank set up in order to provide sufficient water during that time.
- The nearest construction dewatering is about 10 km from your residence.
- Inspec-Sol concluded that your well is in the "shallow aquifer", based on the depth of the well.
- Water level monitoring over a large area for the last two years has established an "area of influence" from the dewatering construction activities, in the "shallow aquifer" and the "deep aquifer".
- You are located outside the interpreted area of influence in the shallow aquifer so it was concluded that you are not impacted by the dewatering activities.

I note that no other technical information was provided. There was not even a map provided showing the location of your well and the interpreted area of influence nor was there any discussion as to why your well was determined to be in the shallow aquifer. From a home owner's perspective, this makes it difficult to determine whether the conclusion is reasonable since no technical information is presented. The technical information is found on the York Region website and the files and reports are very large and extensive. It requires a considerable effort to "get up to speed" on the project, in order to assess a specific complaint.

Review of Existing Information

I have reviewed a number of the previous reports prepared by MacViro and Inspec-Sol that are available on the York Region web site. The reports are very large, upwards of 400 pages and the files are about 30 Megabytes in size. Since you just have a dial-up internet connection it will be difficult for you to download these files I have enclosed a CD with a number of the reports to aid in your understanding of the investigations. Reports have been prepared monthly and posted on the Region Website since October 2004. The reports contain information on long term monitoring, including a monthly assessment of the trends in water levels collected each month, the pumping rates and locations of pumping for the month. Based on the information collected an interpretation is provided each month with respect to the area of influence of pumping in what is interpreted to be a shallow aquifer system and a deep aquifer system. I reviewed only the relative components of the reports since there is a considerable volume of information on stream flows, discharge to streams etc that is not relevant.

In order to understand the dewatering and the potential impact of dewatering, a basic understanding of the geology and hydrogeology of the area is necessary. I will provide a general summary and comments, referring to selected figures from the monthly monitoring reports. I have attached these selected figures, however they are in black and white and some may be difficult to read. The original figures can be found on the CD I have enclosed. In some instances I have hand-marked on the figures highlighting specific information.

General Overview

- 1) **Figure 3.1** shows the general site plan and area of interest for the construction activities and monitoring areas. **Figure 3.2** shows the locations of private wells monitored.
- 2) Geologically, there are seven identified geologic units and two interpreted aquifers according to MacViro/Inspec-Sol, the project consultants. The geologic and hydrogeologic units were originally interpreted as part of the York Peel Durham (YPD) Groundwater Studies in 2003. **Figures 3.21 through 3.24** show north-south geologic cross-sections along the major roads (9th Line, Markham Road, McCowan Road and Kennedy Road respectively). The geologic units from top to bottom are:
 - Halton till – a stoney silty surficial till
 - Interstadial geologic material – a mixture of geologic material deposited during a pause in a glacial ice advance. The material consists primarily of outwash sand. It appears that your well is installed in this unit. It is noted that there are areas in Markham where this unit has eroded deeply into the underlying Newmarket till (Beatty & Associates, 2001 – Groundwater and Engineering in the Town of Markham).
 - Newmarket till – a dense sandy till with some stones and gravel. Beatty, 2001 indicated that the Newmarket till (historically referred to as Northern till) typically has a highly eroded surface and deep eroded channels are often encountered on the surface and the base of the till sheet. This is important in later discussions regarding the aquifer systems and the potential for hydraulic connection between aquifers. Of particular importance for your well is the way the geologic cross-section along Kennedy Road (Figure 3.24) has been interpreted. The cross-section shows the Interstadial unit as being “cut” into the Newmarket Till in this area. It is not known what data was used to develop the geologic cross-sections but this does indicate the potential for a hydraulic connection to between the interstadial aquifer and the underlying Thorncliffe Formation.
 - Thorncliffe Formation – a sand and gravel unit that is the main aquifer being pumped. It is a confined aquifer (discussed later) and is the primary unit of concern in the dewatering project. The Stouffville municipal wells are also located in this unit. It is noted that the Thorncliffe Formation rises in elevation moving northward and in fact in the vicinity of your well (**Figure 3.24**) the Thorncliffe Formation is very close to the interstadial aquifer where your well is located.
 - Sunnybrook till - a lower permeability till unit between the two lower aquifers.
 - Scarborough till – primarily a sandy till, coupled with the upper bedrock, is considered a lower aquifer unit. Most of the pumping is above this unit and for the purposes of your investigation, is not a factor in the assessment.

- **Bedrock – Georgian Bay shale bedrock – it is not relevant to your assessment.**
- 3) Approximately 80 monitoring wells are typically monitored on a weekly or bi-weekly basis. Water level monitoring is also conducted on a number of private wells, especially to the north of the main area of dewatering along 16th Avenue. Monitoring wells have been divided into shallow and deep monitoring wells for assessment purposes although some wells are located at intermediate depths. **Tables 3.1, 3.2 and 3.3** from the May 2005 monitoring report list the wells that are monitored. This is provided for completeness and to get an appreciation for the extent of monitoring conducted. It is noted that I have flagged some of the wells in the tables for ease of finding them when referred to in my discussion.
 - 4) Deep monitoring wells are typically found in the confined aquifer of the Thorncliffe Formation. It is described as confined because the water is confined by the geologic unit above and water levels in the aquifer rise above the top of the aquifer. Confined aquifers respond quickly to pumping as the water level will decline because the aquifer is “depressurized” when water is removed.
 - 5) The shallow monitoring wells appear to be wells which are in the shallow aquifer and measure the water table. I was unable to find exactly how the shallow aquifer was defined (i.e. depth below ground surface, specific geologic units). This will be important in my later discussion with respect to your well. Water levels do not respond as rapidly in unconfined aquifers as water levels will move up and down in direct response water entering (eg. rainfall) or leaving (eg. pumping or discharge to a stream) the aquifer.
 - 6) Based on water level monitoring over time, and taking into account historical water level monitoring, interpretations have been made with respect to the extent and magnitude of water level declines in the lower confined aquifer and the shallow aquifer. This assessment is done on a monthly basis by the project consultants and data are presented in figures and tables in each monthly report. I have reviewed a substantial amount of this information, but due to the extensive data base I focused on May through September to determine if there is anything in the data that would indicate a potential impact on the water level in your well.

Interpretation of Impact of Pumping for the 16th Avenue Sewer Construction

The interpretation of impacts of pumping for the 16th Avenue construction project is briefly described in the following bullets:

- 1) **Figure 3.10 (May 2005)** shows the extent of the interpreted estimated area of influence of pumping in May 2005. As can be seen, the interpreted magnitude of water level drawdown in the shallow aquifer does is not large away from the immediate area of construction dewatering. It is interpreted that there is less than

1.0 m drawdown south of Elgin Mills road and no measurable impact as far as 19th Avenue. I note that your well was classified as in the shallow aquifer, therefore on the basis of the estimated area of influence it was concluded by Inspec-Sol that your well could not be impacted by construction dewatering.

- 2) **Figure 3.13 (July 2005)** shows basically the same estimated area of influence as **Figure 3.10**. However, it appears a substantial drawdown has occurred in the area of the 9th Line, south of Stouffville. Although difficult to see on the **Figure 3.13**, shallow monitoring wells MW37S and MW38S, located along 9th Line, show substantial drawdown (see attached water level elevation tables for measured water levels) compared to the May values (**Figure 3.10**). The water level declined by over 6 m at MW37S between May and July, 2005. MW37S is about 9 m deep and was initially a flowing well. The elevation of the bottom of the MW37S is 236 mAMSL. It is noted that the bottom of your well is approximately 233 mAMSL. MW37S is described as being in the interstadial sand. Given that MW37S is only 9 m deep and was flowing (therefore under a confining pressure) there could be a substantial water level response extending away from this area to the northwest, toward your well, however there is very limited monitoring in this area

The area of water level decline, along 9th Line and into Stouffville was not included in the "estimated area of influence" in July 2005. **Figure 3.26 (September 2005)** however shows what is described as a "local shallow aquifer area of influence". This is apparently attributed to the 9th Line trunk sewer construction (discussed on page 3-10 of the September Monitoring report). As I indicate in my discussion below, what is occurring is the creation of an area of overlapping capture zones for the construction dewatering (both 16th Avenue and 9th Line) and the pumping of the Stouffville wells potentially increasing the overall impact on water levels outside the area of extensive monitoring.

- 3) **Figures 3.9 (May 2005), 3.11(July 2005), 3.13 (August 2005) and 3.20 (September 2005)** show the "estimated area of influence" for the Confined Aquifer (Thorncliffe Formation) for May, July, August and September respectively. As can be seen, there is a much greater drawdown in the Thorncliffe Formation confined aquifer compared to the shallow aquifer. It is noted that the title of these figures is misleading. The figures show the estimated water level drawdown in a series of contours with the 5 m contour being the last contour. The estimated area of influence is not presented the same way as it was presented for the shallow aquifer. The estimated area of influence obviously extends beyond the 5m contour however there is limited data to determine the extent of influence.
- 4) **Figure 3.9 (May 2005)** shows the estimated area of influence from the 16th Avenue sewer construction in May 2005. As can be seen the 5 m drawdown contour extends beyond Elgin Mills Road. It is noted however that wells located at 19th Avenue and beyond show a water level drawdown greater than 5 m (e.g.

Slade and Maslabey-Yates and Reilly private wells). The well with the greatest drawdown (Reilly) is in fact over 10 m. It is also noted that there is no available data on the depth of these wells. Monitoring wells located in the Stouffville area showed interpreted water level declines of almost 4 m. Also noted on **Figure 3.9 (May 2005)** is the lack of monitoring wells north of 19th Avenue and west of Stouffville to properly assess the extent of impact on water levels in the area between 19th Avenue and your property.

- 5) **Figure 3.11 (July 2005)** shows the "area of influence" for the 5 m contour extending out further to the north. Of note is the substantial increase in drawdown at MW37D located along 9th Line. The drawdown increased from 3.73 m in May to 8 m in July. It is noted that this well is located above the Thorncliffe aquifer (see the 9th Line cross-section in **Figure 3.21**). Also note that the water levels for the private wells in the 19th Avenue area are not shown on this figure, compared to the previous month.
- 6) **Figure 3.13 (August 2005)** shows a substantially altered "estimated area of influence" as the 5 m and 10 m contours now extend around the municipal wells in Stouffville. This is attributed to the combined effects of pumping from the 16th Avenue dewatering and the Stouffville well field now. What this means is that the area of influence for pumping from these two locations are overlapping and interfering with each others water taking. This will result in a rapid expansion of the overall area of influence. I have marked the interpreted area of combined influence on the figure as it was difficult to see from the photocopy. It is noted that there are no monitoring wells between what is interpreted as the combined area of influence from pumping and your well located to the northwest of this area so the extent of "area of influence can not be determined in this area.
- 7) **Figure 3.20 (September 2005)** shows essentially the same "estimated area of influence" for the 5 m contour.

Issues/Concerns with existing data and interpretation the Empringham well interference complaint

The information provided above is an attempt to present an understanding of the physical conditions throughout the overall study area, the extent of data collected, the complexity of the interpretation of the information, the interpretation of the results as presented by the project consultants and some of my highlights regarding the data or interpretation of the findings. Although I have not reviewed all of the information I believe I have a reasonable understanding of the situation. The following summarizes my assessment of your well interference complaint and the current interpretation put forth by the project consultants.

1. The interpretation that the Empringham well is a considered a shallow well and is beyond the estimated area of influence, therefore the well is not impacted by the 16th Avenue construction dewatering, is incorrect.
2. The well is 28 m deep, located in an intermediate aquifer consisting of interstadial sands. The interstadial sands are deep in the area of Kennedy and Bethesda Road and the Thorncliffe Formation (main aquifer being pumped) rises in elevation in this area creating the potential for a hydraulic connection between the two aquifer systems, either directly or through significant leakage between the geologic units. The well was a flowing well prior to this year and was therefore under considerable confining pressure.
3. There was a substantial change in the "area of influence" once the two "capture areas" from the 16th Avenue pumping and the Stouffville well field overlapped. If pumping continues at the same rate for both locations than these combined drawdown cones will have to expand and capture water from another area. For example the municipal wells at Stouffville pump a specific volume of water to meet the needs of the Town. The volume of pumping typically increases in the summer. If the area of influence of dewatering from 16th Avenue construction extends into the Stouffville municipal well "capture area" then the water "lost" for use by the Stouffville wells must be obtained from somewhere else. This means that the "area of influence" or capture area will have to expand or there will have to be increased leakage of water from the shallow aquifer or a combination of the two additional sources of water to supply the same amount of water to these wells.
4. The area of additional water could come from an expanding the area of capture or drawdown cone from northwest of area of overlapping influence from pumping. This is the general direction of groundwater flow. There is only one monitoring well beyond the area of 19th Avenue and it appears to be installed in a silt till. Based on the lack of data in this area the extent of the area of influence from combined pumping cannot be reasonably predicted but could potentially extend to your property. For example, **Figure 3.13 (August 2005)** shows an estimated drawdown of 18.57 m at MW28D, near the 10 m contour line and no other data beyond this, except the well installed in a silt till. The 10 and 5 m contours could extend as far as your property. The Interstadial sands are deep in the area of your property and the deep Thorncliffe aquifer rises in elevation in this area so there is a significant potential for a hydraulic response into the interstadial aquifer in this area.
5. It is my understanding that your well and a number of other wells in your area have experienced water level declines this year. Given that there is such limited data between the your general area (Kennedy and Bethesda intersection) and the area where there has been a significant combined influence from pumping (9th Line from Elgin Mills Road East to Stouffville) an impact from this combined pumping can not be ruled out in your area.

6. Even if your well is shallower than the pumped aquifer there is such a large drawdown in the Thorncliffe aquifer that it will induce leakage from overlying aquifers in areas where there is a reasonable hydraulic connection such as may be present in the vicinity of your well.

Conclusions

In my opinion you cannot rule out that the potential impact from the combined pumping of the 16th Avenue construction dewatering and the Stouffville municipal wells has affected the water level in your well. The altering of the capture area of the Stouffville wells, as a result of the large scale dewatering from the sewer construction, could cause a lowering of water levels in the area of the intersection of Kennedy and Bethesda roads. At present there is no apparent monitoring data to substantiate or dispute whether an impact is occurring in this area. The fact that water levels in wells in your area have been lowered since the spring would imply that an impact is occurring in your area, as a result of water taking from somewhere. A full technical assessment is required to determine the extent of the impact in this area and either rule out the combined effects of this water taking or determine whether a local source is responsible. In the absence of a full assessment, it is assumed that the combined effects of pumping from these two areas have resulted in water level declines in the aquifer in which your well is located.

I realize this review and assessment is complex so if you have any questions or require clarification please not hesitate to contact me.

Sincerely,

Blackport Hydrogeology Inc.,

Ray Blackport, M.Sc. P.Geo
Consulting Hydrogeologist

TABLE 3.1

MONITORING WELL DETAILS
16TH AVENUE TRUNK SEWER CONSTRUCTION
YORK REGION
MARKHAM, ONTARIO

Monitoring Well	Northing	Easting	Date of Installation	Ground Elevation	Reference Elevation	Depth of Well (m BGS)	Elevation of Well		Screened Interval		Screened Interval		Source ³	Status ⁴
							Top	Bottom	Top (mBGS)	Bottom (mBGS)	Top (mASL)	Bottom (mASL)		
MW2	4857624.92	641155.71	07/19/00	169.59	170.10	50.29	119.30	49.38	50.29	50.29	120.21	119.30	Scarborough	Not Monitored
MW3	4858416.34	644138.52	07/14/00	180.95	181.55	56.39	124.56	53.95	55.17	55.17	127.00	125.78	Scarborough	Weekly
MW6	4862885.07	644238.65	07/12/00	208.63	209.09	21.64	186.99	20.12	21.34	21.34	188.51	187.29	Shallow (fill)	Destroyed
MW7D	4863593.53	639752.49	07/06/00	206.15	206.80	51.20	154.95		No Data	No Data			Thorncliffe	Inaccessible
MW7S ⁵	4863250.21	638909.15	05/25/00	212.29	212.30	9.14	203.15	6.10	9.14	9.14	206.19	203.15	Shallow (sand)	Weekly
MW8	4864273.30	642184.26	07/07/00	209.95	210.65	28.04	181.91	24.69	25.60	25.60	185.26	184.35	Intermediate	Weekly
MW9 ¹	4858666.67	642088.93	07/12/00	175.59	175.59	22.86	152.73	21.95	22.86	22.86	153.64	152.73	Thorncliffe	Weekly
MW11	4862012.12	641331.34	07/19/00	181.10	181.77	33.22	147.88	32.31	33.22	33.22	148.79	147.88	Thorncliffe	Weekly
MW12	4862525.46	636900.45	07/11/00	210.81	211.35	50.60	160.21	49.38	50.60	50.60	161.43	160.21	Thorncliffe	Weekly
MW13D	4862524.29	636899.22	04/03/02	207.83	207.77	32.00	175.83		No Data	No Data			Shallow	Weekly
MW13S	4861867.10	635084.56	03/25/03	207.80	207.73	10.36	197.44						Thorncliffe	Weekly
MW14D	4861868.18	635085.29	04/05/02	205.72	205.61	33.80	171.92	3.05	6.10	6.10	202.69	199.64	Shallow (fill)	Weekly
MW14S	4860753.14	638577.62	06/11/03	205.74	205.65	6.10	199.64						Thorncliffe	Weekly
MW15D	4860751.97	638576.00	04/17/02	193.58	193.47	37.00	156.58		No Data	No Data			Shallow	Weekly
MW15S	4858777.02	636185.57	03/25/03	193.76	193.63	9.14	184.62						Thorncliffe	Weekly
MW16	4858777.02	636185.57	04/19/02	181.05	180.96	26.00	155.05						Shallow	Weekly
MW17	4865268.26	638670.80	06/18/02	218.07	217.91	20.00	198.07						Intermediate	Weekly
MW18	4864596.49	636708.22	06/28/02	231.39	231.33	43.00	188.39	36.58	39.62	39.62	187.31	184.27	Intermediate	Weekly
MW19D	4863822.64	634609.71	03/28/03	223.89	223.76	46.02	177.87	6.10	9.14	9.14	217.77	214.73	Shallow (sand)	Weekly
MW19S	4863823.67	634609.19	06/10/03	223.87	223.84	9.14	214.73						Inaccessible	Inaccessible
MW21D	4861170.78	632863.73	08/14/02	213.32	213.29	41.15	172.17		No Data	No Data			Thorncliffe	Destroyed
MW21S	4861172.59	632866.63	06/09/03	213.28	214.06	4.57	208.71	1.52	4.57	4.57	211.76	208.71	Shallow (sand)	Inaccessible
MW22	4860451.89	632110.65	07/04/02	202.29	202.29	42.00	160.30		No Data	No Data			Thorncliffe	Weekly
MW23D	4865831.60	634220.20	03/20/03	232.61	232.51	50.90	181.71	47.85	50.90	50.90	184.76	181.71	Thorncliffe	Weekly
MW23S	4865833.39	634220.05	06/10/03	232.58	232.59	5.94	226.64	2.44	5.49	5.49	230.14	227.09	Shallow (sand)	Weekly
MW24D	4865285.03	632252.24	03/27/03	240.79	240.83	39.01	201.78	35.60	38.71	38.71	205.19	202.08	Intermediate	Weekly

May 2005
well details

TABLE 3.1

MONITORING WELL DETAILS
16TH AVENUE TRUNK SEWER CONSTRUCTION
YORK REGION
MARKHAM, ONTARIO

Monitoring Well	Northing	Easting	Date of Installation	Ground Elevation	Reference Elevation	Depth of Well (m BGS)	Elevation of Well Bottom (mASL)	Screened Interval Top (mBGS)	Screened Interval Bottom (mBGS)	Screened Interval Top (mASL)	Screened Interval Bottom (mASL)	Source ³	Status ⁴
MW24S	4865281.11	632253.07	03/28/03	240.87	240.78	16.15	224.72	12.50	15.54	228.37	225.33	Shallow (sand)	Weekly
MW25	4863134.47	632687.66	04/02/03	228.12	228.14	47.55	180.57	44.50	47.55	183.62	180.57	Thorncliffe	Weekly
MW26	4864431.21	630369.47	04/11/03	236.00	235.99	57.91	178.09		No Data			Thorncliffe	Weekly
MW26S	4864431.55	630372.05	04/11/05	236.41	237.30	15.24	221.17	12.19	15.09	224.22	221.32	Shallow (till)	Weekly
MW27	4862600.88	631067.54	04/11/03	233.72	233.66	52.73	180.99	49.68	52.73	184.04	180.99	Thorncliffe	Weekly
MW28D	4867170.78	638204.27		238.10	238.12	52.25	185.87		No Data			Thorncliffe	Weekly
MW28S	4867631.63	638219.30	06/11/03	242.08	242.85	5.18	236.90	1.52	4.57	240.56	237.51	Shallow (sand)	Weekly
MW29	4860124.01	636259.05		193.26	193.31	7.35	185.96		No Data			Shallow	Weekly
MW30	4866572.60	630060.05		255.18	255.20	6.49	248.71		No Data			Shallow	Weekly
MW31	4868840.27	636116.66		249.68	249.69	6.11	243.58		No Data			Shallow	Weekly
MW32D	4867922.67	634035.59	06/12/03	252.02	251.89	60.20	191.82	53.34	59.44	198.68	192.58	Thorncliffe	Weekly
MW32S	4867924.61	634035.48	06/11/03	252.06	251.92	6.71	245.35	3.05	6.10	249.01	245.96	Shallow (till)	Weekly
MW33D	4859827.13	629115.25	07/02/03	213.03	213.80	54.25	158.78	49.68	54.25	163.35	158.78	Thorncliffe	Weekly
MW33S	4859828.47	629118.71	06/10/03	212.94	213.69	4.72	208.22	1.52	4.57	211.42	208.37	Shallow (sand)	Weekly
MW34S	4862728.48	637417.19	06/09/03	212.58	212.49	7.62	204.96	6.10	7.62	206.48	204.96	Shallow (till)	Weekly
MW35S	4864513.05	640894.90	06/25/03	221.06	222.08	7.62	213.44	3.05	7.62	218.01	213.44	Shallow (till)	Weekly
MW35D	4864514.58	640894.61	06/25/03	221.10	222.02	54.25	166.85	49.68	54.25	171.42	166.85	Thorncliffe	Weekly
MW36S	4865903.00	640623.77	07/13/03	238.20	239.16	9.14	229.06	4.57	9.14	233.63	229.06	Shallow (till)	Weekly
MW36D	4865903.78	640623.57	07/12/03	238.23	239.17	59.44	178.79	54.86	59.44	183.37	178.79	Thorncliffe	Weekly
MW37S	4867307.88	640353.49	06/16/03	245.15	245.11	9.14	236.01	4.57	9.14	240.58	236.01	Shallow (sand)	Weekly
MW37D	4867308.22	640354.15	06/16/03	245.09	244.95	35.05	210.04	28.96	35.05	216.13	210.04	Intermediate	Weekly
MW38S	4868518.43	640123.62	06/06/03	253.12	253.92	9.14	243.98	4.57	9.14	248.55	243.98	Shallow (sand)	Weekly
MW38D	4868517.72	640122.15	06/03/03	253.11	254.08	67.06	244.31	62.48	67.06	190.63	186.05	Thorncliffe	Weekly
MW39	4869113.80	638613.22	07/03/03	251.93	252.97	7.62	244.31	3.05	7.62	248.88	244.31	Shallow	Weekly
MW40S	4869823.93	640882.72	06/03/03	262.14	263.04	6.10	256.04	3.05	6.10	259.09	256.04	Thorncliffe	Weekly
MW40D	4869823.71	640883.83	06/03/03	262.11	263.09	54.86	207.25	50.29	54.86	211.82	207.25	Shallow (sand)	Weekly
MW41	4856831.41	633997.10	04/12/05	175.24	176.14	10.67	164.57	7.62	10.67	167.62	164.57	Thorncliffe	Weekly
MW42	4858775.55	636187.90	04/12/05	180.59	180.59	6.25	174.34	3.05	6.10	177.54	174.49	Shallow (till)	Weekly
MW43	4858846.18	635883.43	05/17/05	177.18	178.03	7.62	169.56	4.57	7.47	172.61	169.71	Shallow (sand)	Weekly
MW44	4860738.64	631823.92	05/11/05	201.80	202.70	6.10	195.70	3.05	5.94	198.75	195.86	Shallow (till)	Weekly
MW45	4860671.83	635278.95	05/12/05	194.99	195.82	15.24	179.75	12.19	15.09	182.80	179.90	Thorncliffe	Weekly
MW46	4861528.14	637278.32	05/13/05	208.60	209.43	12.19	196.41	9.14	12.04	199.46	196.56	Shallow (till)	Weekly
MW47	4862526.78	639194.26	05/16/05	211.45	212.33	9.14	202.31	6.10	8.99	205.35	202.46	Shallow (sand)	Weekly
MW48	4862516.64	632823.85	04/01/05	212.02	213.11	10.73	201.29	7.62	10.67	204.40	201.35	Shallow (till)	Weekly
MW49	4862882.91	641206.81	04/11/05	221.64	222.58	4.57	217.07	1.52	4.42	220.12	217.22	Shallow (sand)	Weekly

TABLE 3.1

**MONITORING WELL DETAILS
16TH AVENUE TRUNK SEWER CONSTRUCTION
YORK REGION
MARKHAM, ONTARIO**

Monitoring Well	Northing	Easting	Date of Installation	Ground Elevation	Reference Elevation	Depth of Well (m BGS)	Elevation of Well (mASL)		Screened Interval (mBGS)		Screened Interval (mASL)		Source ³	Status ⁴
							Top	Bottom	Top	Bottom	Top	Bottom		
MW50	4863182.24	634766.53	04/18/05	223.61	224.51	10.67	212.94	205.10	4.57	10.36	219.04	213.25	Shallow (till)	Weekly
MW51	4863453.58	636906.62	04/15/05	215.16	215.16	10.06	205.10	199.28	7.01	9.91	208.15	205.25	Shallow (till)	Weekly
MW52	4864576.56	638798.37	05/17/05	206.90	207.72	7.62	199.28	199.28	4.57	7.47	202.33	199.43	Shallow (sand)	Weekly
MW53	4864286.70	632431.70	04/28/05	236.38	237.42	10.06	226.32	215.11	7.01	9.91	229.37	226.47	Shallow (sand)	Weekly
MW54	4864980.51	634401.39	04/04/05	229.74	230.75	14.63	215.11	216.15	4.57	10.36	225.17	219.38	Shallow (sand)	Weekly
MW55	4865611.61	636485.34	04/14/05	225.29	225.29	9.14	216.15	185.05	6.10	8.99	219.19	216.30	Shallow (sand)	Weekly
MW56	4860257.63	633281.20	04/29/05	195.11	196.03	10.06	185.05	195.17	7.01	9.91	188.10	185.20	Shallow (till)	Weekly
MW57	4859354.39	633432.71	05/10/05	206.75	207.69	11.58	195.17	174.44	8.53	11.43	198.22	195.32	Shallow (till)	Weekly
MW58	4859361.79	633431.89	05/09/05	206.44	207.35	32.00	174.44	IN PROGRESS		32.00	179.01	174.44	Till (deep)	Weekly
MW59														

Note:

- 1 - MW9 elevation surveyed using GPS
- 2 - Thorncliffe Formation elevations based on York Peel Durham Groundwater Study (2003)
- 3 - Monitoring wells considered to be in Thorncliffe Formation within 3 m of top/bottom, and based on review of well hydrograph
- 4 - (Grey) Not Monitored / Damaged beyond use
- 5 - Replacement well drilled 04/08/05
- 6 - MW41 to MW58 co-ordinates and reference elevation based on GPS survey, total station survey In Progress May 2005

TABLE 3.2

**PRIVATE WELL DETAILS
16TH AVENUE TRUNK SEWER CONSTRUCTION
MARKHAM, ONTARIO
YORK REGION**

[illegible]

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TABLE 3.3

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**PIEZOMETER DETAILS
16TH AVENUE TRUNK SEWER CONSTRUCTION
YORK REGION
MARKHAM, ONTARIO**

NUMBER	ID	Event	Easting	Northing	Ground Elevation (m AMSL)	Type	Casing Ht. (m)	Reference Elevation (m AMSL)	Well Depth ⁽¹⁾ (m BREF)	Well Depth (m AMSL)	Source
PHASE 2 AREA											
1	01-06S	BI	4860473	637155	206.12	manual					
2	01-08D	BI	4860290	636727	199.43	manual			15.20	190.9	Shallow (sand)
3	01-08B	BI	4860290	636727	199.37	manual			39.2	160.23	Thorncliffe
4	01-20B	BI	4859699	634853	179.73	manual			30.48	168.89	Shallow (sand)
5	01-26	BI	4859423	634053	182.68	manual			12.19	167.54	Shallow (sand)
6	01-28	BI	4859310	633729	198.9	manual			19.2	163.48	Shallow (sand)
7	01-29	BI	4859263	633588	207.41	manual			19.81	179.09	Shallow (sand)
8	01-30	BI	4859235	633448	210.69	manual			24.4	183.01	Shallow (sand)
9	01-43A	BI	4859399	633975	185.06	manual			47.25	163.44	Deep (till)
10	01-46A	BI	4859816	635231	179.27	manual			15.24	169.82	Shallow (sand)
									12.6	166.70	Shallow (sand)
11	01-02	M	4860720	637865	205.79	manual					
12	01-03	M	4860672	637723	207.55	manual			47.50	158.3	Thorncliffe
13	01-05	M	4860517	637285	206.72	manual			50.40	157.2	Thorncliffe
14	01-06D	M	4860473	637155	206.1	manual			48.50	158.2	Thorncliffe
15	01-07	M	4860372	636860	204.22	manual			48.40	157.7	Thorncliffe
16	01-08A	M	4860290	636727	199.43	pneumatic	Piezometer Location and Reference Elevation Survey in Progress		28.20	176.0	
17	01-09	M	4860290	636593	194.97	pneumatic			7.92	191.51	Thorncliffe
18	01-10	M	4860221	636433	193.05	pneumatic			33.5	161.47	Thorncliffe
19	01-11	M	4860145	636301	193.23	pneumatic			29	164.05	Thorncliffe
20	01-12	M	4860096	636159	192.61	pneumatic			28.96	164.27	Thorncliffe
21	01-13	M	4860048	636018	189.68	pneumatic			29.87	162.74	Thorncliffe
22	01-16	M	4859905	635587	186.72	pneumatic			19.81	169.87	Thorncliffe
23	01-17	M	4859839	635304	182.13	pneumatic			25	161.72	Thorncliffe
24	01-18	M	4859770	635090	176.31	pneumatic			18.28	163.85	Thorncliffe
25	01-19	M	4859742	634997	177.86	pneumatic			13.72	162.59	Shallow (sand)
26	01-20A	M	4859699	634853	179.73	pneumatic			15.2	162.66	Shallow (sand)
27	01-21	M	4859654	634720	180.05	pneumatic			16.31	163.42	Shallow (sand)
28	01-22	M	4859603	634599	181.32	pneumatic			15.5	164.55	Shallow (sand)
29	01-23	M	4859561	634444	180.54	pneumatic			17.83	163.49	Shallow (sand)
30	01-24	M	4859516	634332	178.49	pneumatic			17.22	163.32	Shallow (sand)
31	01-25	M	4859464	634188	179.28	pneumatic			10.06	168.43	Shallow (sand)
32	01-31	M	4859148	633314	212.43	manual			14.5	164.78	Shallow (sand)
33	01-33	M	4859003	633017	208.18	manual			49.2	163.23	Deep (till)
34	01-34	M	4858967	632907	205.65	manual			47.35	160.83	Deep (till)
35	01-35	M	4858886	632783	202.58	manual			42.98	162.67	Deep (till)
36	01-37	M	4858797	632531	203.39	manual			10.97	191.61	Shallow (sand)
37	01-39	M	4858725	632188	202.05	manual	Piezometer Location and Reference Elevation Survey in Progress		40.08	163.31	Deep (till)
38	01-40D	M	4858682	632044	197.11	manual			39.6	162.45	Deep (till)
39	01-40S	M	4858682	632044	197.1	manual			33.99	163.12	Deep (till)
40	01-42	M	4858607	631824	190.6	manual					Shallow (till)
41	01-43B	M	4859399	633975	185.06	pneumatic			29.41	161.19	Deep (till)
42	01-44	M	4859764	635043	174.92	pneumatic			22.71	162.35	Shallow (sand)
43	01-45	M	4859793	635163	177.14	pneumatic			9.4	165.52	Shallow (sand)
44	01-46	M	4859816	635231	179.27	pneumatic			19.8	157.34	Shallow (sand)
45	MW01-02-1	M	4860135	636273	193.48	pneumatic			19.2	160.07	Thorncliffe
PHASE 1 AREA											
46	01-21a	Q	641812	4860020	193.27	manual		193.27	34.22	159.1	Thorncliffe
47	01-22a	Q	641843	4859897	193.76	manual	0.75	194.51	33.82	160.7	Thorncliffe
48	98-05	Q			212.00	manual			40.0	172.0	
49	98-06	Q			210.90	manual			39.0	171.9	

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TABLE 3.3

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**PIEZOMETER DETAILS
16TH AVENUE TRUNK SEWER CONSTRUCTION
YORK REGION
MARKHAM, ONTARIO**

NUMBER	ID	Event	Easting	Northing	Ground Elevation	Type	Casing Ht.	Reference Elevation	Well Depth ⁽¹⁾	Well Depth	Source
50	98-07	Q	641380	4861988	207.65	manual	0.76	208.41	55.79	152.6	Thorncliffe
51	98-08	Q	641434	4861821	210.03	manual	0.87	210.90	49.85	161.1	Thorncliffe
52	98-09d	Q	641455	4861718	210.43	manual	0.68	211.11	53.03	158.1	Thorncliffe
53	98-09s	Q	641455	4861718	210.43	manual	0.68	211.11	45.77	165.3	Thorncliffe
54	98-10	Q	641486	4861563	208.33	manual	0.79	209.12	52.12	157.0	Thorncliffe
55	98-11	Q	641510	4861438	207.82	manual	0.10	207.92	49.73	158.2	Thorncliffe
56	98-12d	Q	641538	4861308	205.72	manual	0.78	206.50	45.50	161.0	Thorncliffe
57	98-12s	Q	641538	4861310	206.06	manual	0.90	206.96	33.18	173.8	Intermediate
58	98-13	Q	641569	4861161	205.18	manual	0.37	205.55	41.77	163.8	Intermediate
59	98-14	Q	641593	4861041	204.64	manual	0.63	205.27	32.03	173.2	Thorncliffe
60	98-15	Q	641626	4860849	204.18	manual	-0.05	204.13	45.29	158.8	Thorncliffe
61	98-18d	Q	641700	4860393	196.20	manual	0.80	197.00			
62	98-18s	Q	641699	4860397	196.06	manual	0.77	196.83	16.66	180.2	Shallow
63	98-19	Q	641729	4860261	193.46	manual	1.04	194.50	35.20	159.3	Thorncliffe
64	98-20	Q	641764	4860089	191.03	manual	0.67	191.70	24.50	167.2	Thorncliffe
65	98-20d	Q	641764	4860092	191.06	manual	0.97	192.03	38.06	154.0	Scarborough
66	98-20s	Q	641764	4860092	191.06	manual	1.07	192.13	29.39	162.7	Thorncliffe
67	98-22s	Q	641811	4859824	190.10	manual	-0.05	190.05	26.61	163.4	Thorncliffe
68	98-23	Q	641850	4859671	192.24	manual		192.24	39.62	152.6	Thorncliffe
69	98-24d	Q	641872	4859559	189.78	manual		189.78	29.65	160.1	Thorncliffe
70	98-24s	Q	641872	4859559	189.78	manual		189.78	13.50	176.3	Shallow
71	98-53	Q				manual			46.50	-46.5	
72	98-55d	Q				inaccessible					
73	98-55s	Q	639031	4861122	205.15	manual	0.70	205.85	32.95	172.9	Intermediate
74	98-56	Q	639200	4861177	202.06	manual	0.50	202.56	41.70	160.9	Thorncliffe
75	98-58	Q	639468	4861369	201.07	manual	-0.05	201.02	27.30	173.7	Thorncliffe
76	98-59s	Q	639643	4861396	198.56	manual	0.95	199.51	20.50	179.0	Intermediate
77	98-60a	Q	639723	4861424	199.55	manual	0.52	200.07	39.50	160.6	Thorncliffe
78	98-60b d	Q	639730	4861426	199.68	manual	0.74	200.42	20.30	180.1	Intermediate
79	98-60b s	Q	639730	4861426	199.68	manual	0.78	200.46	12.10	188.4	Shallow
80	98-62	Q	640026	4861535	199.06	manual	0.65	199.71	39.50	160.2	Thorncliffe
81	98-63	Q	640193	4861589	204.79	manual	0.75	205.54			
82	98-68d	Q	640851	4861817	207.92	manual	0.68	208.60	44.20	164.4	Thorncliffe
83	98-68s	Q	640851	4861817	207.92	manual	0.74	208.66	23.30	185.4	Intermediate
84	98-74	Q	638707	4861005	200.91	manual	1.05	201.96	42.40	159.6	Thorncliffe
85	98-75	Q	638853	4861058	202.37	manual	0.87	203.24	43.80	159.4	Thorncliffe

Notes:

- 1) Measured Well Depth - metres below reference
 2) Monitoring Event Q = Quarterly, and M = Monthly

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**MONITORING WELL WATER LEVEL ELEVATIONS (metres AMSL) AND DRAWDOWN (metres)
16TH AVENUE TRUNK SEWER CONSTRUCTION
YORK REGION
MARKHAM, ONTARIO**

Name	Initial Estimated Water Level ¹ m AMSL	Initial Observed Water Level ² m AMSL	May-05				Drawdown ³ (m) May-05
			6-May	12-May	18-May	26-May	
Monitoring Wells ⁽¹⁾							
MW02		160.86	160.48	160.35	160.38	160.30	0.56
MW03		165.78	164.75	164.62	164.16	163.75	2.03
MW04		184.30					
MW05		206.64					
MW06		205.55	204.59	204.39	204.28	204.47	1.08
MW07 (7D)		210.15	187.17	187.13	187.16	187.11	23.04
MW07S		210.00			210.22	210.15	-0.15
MW08		209.45	200.08	199.90	199.97	199.76	9.69
MW09		162.39	160.44	160.36	160.42	160.42	1.97
MW11		171.87	168.64	168.76	168.78	168.81	3.06
MW12		206.35	180.90	180.85	181.02	181.20	25.15
MW12-A							
MW12-B							
MW13 (13D1)		192.97	176.38	176.27	176.34	176.30	16.67
MW13 (13D2)	205	192.97					
MW13S		201.73	203.62	203.47	203.59	203.51	-1.78
MW14D	203	194.96	184.61	184.52	184.81	184.69	18.31
MW14S		202.29	202.88	202.84	202.85	202.81	-0.52
MW15 (15D)	200	185.67	173.40	173.17	173.00		27.00
MW15S		191.38	191.23	191.20	191.23		0.15
MW16		175.96	175.31	175.15	175.13	174.99	0.97
MW17		216.59		216.28	215.53	215.11	1.48
MW18		231.33	218.97	218.91	218.96	218.83	12.50
MW19D		216.20	215.81	215.73	215.85	215.50	0.70
MW19S		216.45	216.82	216.84	216.84	216.82	-0.37
MW20	204	176.67					
MW20-A		170.19	164.03	163.97	163.84		6.35
MW20-B (abandoned)		170.23			163.98		6.25
MW20-C	204	168.72	162.47	162.42			41.58
MW21D		202.29	207.15	206.59	206.65	206.13	-3.84
MW21S		210.61	211.43	211.28	211.37	211.26	-0.65
MW22		194.79	193.53	193.52	193.48	193.39	1.40
MW23D		225.67	223.64	223.22	223.40	223.18	2.49
MW23S		228.82	229.81	229.59	229.54	229.37	-0.55
MW24D		238.23	240.08	238.25	237.75	237.00	1.23
MW24S		238.95	239.70	239.43	239.71	239.25	-0.30
MW25		225.69	225.33	225.22	225.13	224.97	0.72
MW26		234.99	234.40	234.41	234.41	234.41	0.58
MW26S		234.98	235.75	235.58	235.63	235.52	-0.54
MW27		227.76	228.62	228.36	228.37	228.02	-0.26
MW28D		201.20	196.12	197.01	197.16	197.14	4.06
MW28S		240.31	241.46		241.46	241.05	-0.74
MW29		191.51		188.58	188.48	188.34	3.17
MW30		254.67	254.72	254.63	254.61	254.56	0.11
MW31		248.26	248.34	248.22	248.24	248.04	0.22
MW32D		233.95	234.48	234.47	234.53	234.39	-0.44
MW32S		249.93	250.90	250.65	250.85	250.54	-0.61
MW33D		202.34			203.12		-0.78

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**MONITORING WELL WATER LEVEL ELEVATIONS (metres AMSL) AND DRAWDOWN (metres)
16TH AVENUE TRUNK SEWER CONSTRUCTION
YORK REGION
MARKHAM, ONTARIO**

Name	Initial Estimated Water Level ¹	Initial Observed Water Level ²	May-05				Drawdown ³ (m) May-05
	m AMSL	m AMSL	6-May	12-May	18-May	26-May	
MW33S		209.26		209.71	209.68		-0.42
MW34S		208.02			208.19		-0.17
MW35S		220.38	220.17	219.82		219.72	0.66
MW35D		193.42	194.72	194.74		194.74	-1.32
MW36S		237.64	234.85	234.72	234.68	234.51	3.13
MW36D		198.45	196.66	196.69	196.62	196.62	1.83
MW37S ⁵		245.11	244.26	244.11			1.00
MW37D		243.80	240.20	240.07			3.73
MW38S		252.84	249.82	249.69	249.71	249.55	3.29
MW38D		206.18	202.37	202.46	202.41	202.49	3.69
MW39		251.21	251.40	251.37	251.31	251.24	-0.03
MW40S		261.26	261.41	261.26	261.28	261.15	0.11
MW40D		212.59	208.70	208.76	208.65	208.74	3.85
MW41		171.02	171.06	171.04	170.97		
MW42		177.77	177.83	177.56	177.43	177.23	
MW43							
MW44		199.37		199.37	199.48	199.27	
MW45							
MW46							
MW47		198.31			198.31	208.41	
MW48		208.97		208.781	208.711		
MW49		218.49	218.74	218.53	218.51	218.28	
MW50		222.38	222.63	222.35	222.47	222.08	
MW51		213.05	213.65	213.71	213.85	213.68	
MW52		201.02				201.02	
MW53		234.34		234.34	234.18	233.92	
MW54		229.42	229.57	229.46	229.46	229.38	
MW55		220.49	220.56		220.47	220.47	
MW56		193.74	193.74	193.60	193.60	193.43	
MW57		204.50		204.50	204.46	204.34	
MW58		188.85		188.85	189.07	189.17	
MW59							

Drilling in Progress

Notes

1. Initial estimated water level, based on 16th Avenue Dewatering Phase II (MacViro, 2003), and Geotechnical Data Report (DST, 2002)
2. Initial observed water level, as reported by McNally/AECON
3. Drawdown relative to initial estimated/observed water level (negative value indicates water level above initial level).
4. MW1 - Private Well not monitored
5. Initial observed water level not recorded due to flowing artesian conditions, using reference elevation
6. #N/A - Water level not measured

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TABLE 3.5

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**SELECTED PRIVATE WELL WATER LEVEL ELEVATIONS (metres AMSL) AND DRAWDOWN (metres)
16TH AVENUE TRUNK SEWER CONSTRUCTION
YORK REGION
MARKHAM, ONTARIO**

Name	Address	Easting	Northing	Initial Observed Water Level (m AMSL)	Observed Water Levels (m AMSL)				Observed/ Estimated Drawdown (metres) May-05
					3-May-05	10-May-05	18-May-05	27-May-05	
<u>Reesor Road</u>									
Pearse	9318	643229	4862644	213.00					
<u>Major MacKenzie Dr. ⁽¹⁾</u>									
Flea Mkt. New	5058	636555	4862429	180.46		175.64		175.68	4.78
Markham Missionary	5438	637447	4862835	200.09	174.97				25.12
Carter-New	5601	638066	4862903	178.49		174.47			4.02
Ammar-New	5646	638037	4862989	182.78	179.71				3.07
Benczik	5899	638811	4863174	205.72			179.82		25.90
Angus Glen South	4289	634698	4861831	195.19		189.37		189.49	5.70
<u>16th Avenue</u>									
Baker	4404	635131	4859891	181.19		169.26	169.20	169.20	11.99
Beckett - 4672 ⁽¹⁾	4672	635802	4860271	189.65		178.83	178.83	178.83	10.82
York Downs PW3	4134	634035	4860464	183.60		183.07		183.05	0.55
York Downs PW4	4134	633915	4860643	184.57		183.31		185.17	-0.60
York Downs PW5	4134	634895	4860253	179.29				177.13	2.16
<u>McCowan Ave.</u>									
Robbins ⁽¹⁾	9704	637185	4861703	202.26			171.77		30.49
Frocione-new	10192	636933	4863111	180.82			177.14		(3.68)
Markovits-New	10228	636914	4863154	180.67			177.40		(3.27)
Smith-New	10292	636901	4863318	181.15			177.95		(3.2)
Slade	11640	636190	4866931	222.15			214.70		7.45
Lewis	10982	636383	4865123	197.03			189.89		7.14
Markham Fair	10801	637054	4865017	195.18			187.21		7.97
<u>Kennedy Road ⁽¹⁾</u>									
West	9346	635357	4860132	184.73		175.26	175.09	175.09	9.64
Rutnam	9392	635301	4860260	175.63		174.49	174.40	174.40	1.23
Beckett	9451	635556	4860495	189.20					
Angus Glen North	10060	633320	4862168	209.94				209.40	0.54
<u>Hwy 48</u>									
Cooper-New ⁽¹⁾	10044	639005	4863380	187.54			183.44		(4.10)
Winstanley ⁽¹⁾	10386	638811	4864268	200.11			187.65		12.46
Seaver-New	10451	638936	4864521	190.90			188.30		(2.60)
Nielson-New	10666	638602	4864952	191.74			188.47		(3.27)
<u>Elgin Mills ⁽¹⁾</u>									
Hoover	6097	638936	4865410	197.92			188.35		9.57

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**SELECTED PRIVATE WELL WATER LEVEL ELEVATIONS (metres AMSL) AND DRAWDOWN (metres)
16TH AVENUE TRUNK SEWER CONSTRUCTION
YORK REGION
MARKHAM, ONTARIO**

<u>Name</u>	<u>Address</u>	<u>Easting</u>	<u>Northing</u>	<u>Initial Observed Water Level (m AMSL)</u>	<u>Observed Water Levels (m AMSL)</u>				<u>Observed/ Estimated Drawdown (metres) May-05</u>
					<u>3-May-05</u>	<u>10-May-05</u>	<u>18-May-05</u>	<u>27-May-05</u>	
<u>19th Avenue</u> ⁽¹⁾									
Brangers	5467	636878	4866571	205.27			200.88		4.39
Plashkes	5809	637675	4867067	205.68					
Maslabey-Yates	4934	635275	4866282	222.83			216.08		6.76
<u>Dixon's Hill Road</u> ⁽¹⁾									
Reilly	111	638304	4867420	206.93			196.42		10.51
<u>Mill Race Court</u>									
Magee-New		638499	4867259	203.22			199.31		(3.91)
<u>Glenbourne Park Drive</u>									
Embrey (KISS)	5	633305	4860311	187.45					
Donahue	19	633379	4860565	189.77	187.04	186.68	186.68		0.77
Gamoff	37	633429	4860940	193.92	189.07	188.68	188.68		1.09
Cribari	15	633405	4860489	187.97					
Humfrey	4	633373	4860121	185.31	187.27	187.36	187.36		0.61
Casados	25	633441	4860671	186.60	185.17	184.77	184.77		0.54
Morton	31	633453	4860830	191.58	187.2	187.06	187.06		-0.46
					192.25	192.17	192.17		-0.59

Notes:

1) Initial Water Level as recorded by McNally/AECON

2) (brackets) - indicate well installed subsequent to the Phase 1 and Phase 2 construction dewatering

N/A - not measured

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TABLE 3.6

**PIEZOMETER WATER LEVEL ELEVATIONS (m amsl) AND DRAWDOWN (metres)
16TH AVENUE TRUNK SEWER CONSTRUCTION
YORK REGION
MARKHAM, ONTARIO**

NUMBER	ID	Event	Easting	Northing	Ground Elevation (m AMSL)	Well Depth (m bref)	Initial Observed Water Level (DST, 2002) (summer 2001)	Water Level Elevation (May 2005) (m AMSL)	Total Observed Drawdown (metres)	Source
1	01-06S	BI	4860474	637156	206.12	15.20	195.56	195.61	0.05	Shallow (sand)
2	01-08D	BI	4860290	636727	199.43	39.2	197.63	174.03	-23.60	Thorncliffe
3	01-08B	BI	4860290	636727	199.37	30.48	197.60	193.58	-4.02	Shallow (sand)
	01-15	BI			188.38		171.58	171.58	0.00	
	01-16	BI			186.72		186.10	166.72	-19.38	
4	01-20B	BI	4859699	634853	179.73	12.19	174.30	174.39	0.09	Shallow (sand)
5	01-26	BI	4859422	634053	182.68	19.2	181.50	181.74	0.24	Shallow (sand)
6	01-28	BI	4859310	633729	198.9	19.81	194.00	188.89	-5.11	Shallow (sand)
7	01-29	BI	4859263	633587	207.41	24.4	184.10	184.16	0.06	Shallow (sand)
8	01-30	BI	4859234	633447	210.69	47.25	185.90	186.61	0.71	Deep (till)
9	01-43A	BI	4859399	633975	185.06	15.24	182.50	182.81	0.31	Shallow (sand)
10	01-46A	BI	4859816	635231	179.27	12.6	182.70			Shallow (sand)
	98-101	M	4860387	637017	207.93		173.80	173.78	-0.02	
	01-01	M			202.9		202.90	168.15	-34.75	
11	01-02	M	4860720	637865	205.79	47.50	199.90	170.73	-29.17	Thorncliffe
12	01-03*	M	4860672	637723	207.55	50.40	206.80	167.67	-39.13	Thorncliffe
13	01-05	M	4860517	637285	206.72	48.50	201.50	171.01	-30.49	Thorncliffe
14	01-06D	M	4860473	637155	206.12	48.40	204.31	204.14	-0.17	Thorncliffe
15	01-07	M	4860372	636860	204.22	28.20	201.00	204.12	3.12	
16	01-08A	M	4860290	636727	199.43	7.92	195.03	174.13	-20.90	Thorncliffe
17	01-09	M	4860290	636593	194.97	33.5	179.47	174.27	-5.20	Thorncliffe
18	01-10	M	4860221	636433	193.05	29	197.40	174.55	-22.85	Thorncliffe
19	01-11	M	4860145	636301	193.23	28.96	196.20	171.23	-24.97	Thorncliffe
20	01-12	M	4860096	636159	192.61	29.87	196.40	172.11	-24.29	Thorncliffe
21	01-13	M	4860048	636018	189.68	19.81	191.40	178.48	-12.92	Thorncliffe
22	01-16	M	4859905	635587	186.72	25	186.10	166.72	-19.38	Thorncliffe
23	01-17	M	4859839	635304	182.13	18.28	185.80	167.43	-18.37	Thorncliffe
24	01-18	M	4859770	635090	176.31	13.72	175.40	174.11	-1.29	Shallow (sand)
25	01-19	M	4859742	634997	177.86	15.2	175.80	174.66	-1.14	Shallow (sand)
26	01-20A	M	4859699	634853	179.73	16.31	175.40	173.93	-1.47	Shallow (sand)
27	01-21	M	4859654	634720	180.05	15.5	176.40	175.75	-0.65	Shallow (sand)
28	01-22	M	4859603	634599	181.32	17.83	176.00			Shallow (sand)
29	01-23	M	4859561	634444	180.54	17.22	177.90	176.24	-1.66	Shallow (sand)
30	01-24	M	4859516	634332	178.49	10.06	177.50	176.19	-1.31	Shallow (sand)
31	01-25	M	4859464	634188	179.28	14.5	180.50	177.58	-2.92	Shallow (sand)
32	01-31	M	4859148	633314	212.43	49.2	186.00			Deep (till)
33	01-33	M	4859003	633017	208.18	47.35	192.40	207.87	15.47	Deep (till)
34	01-34	M	4858967	632907	205.65	42.98	197.30			Deep (till)
35	01-35	M	4858886	632783	202.58	10.97	191.40	194.21	2.81	Shallow (sand)
	01-35A	M								
36	01-37	M	4858797	632531	203.39	40.08	190.20	190.62	0.42	Deep (till)
37	01-39	M	4858725	632188	202.05	39.6	190.20	190.57	0.37	Deep (till)
38	01-40D	M	4858682	632044	197.11	33.99	192.64	193.04	0.40	Deep (till)
39	01-40S	M	4858682	632044	197.1		193.94	193.91	-0.03	Shallow (till)
40	01-42	M	4858607	631824	194.33	29.41	190.70	190.95	0.25	Deep (till)
41	01-43B	M	4859399	633975	185.06	22.71	181.30	183.26	1.96	Shallow (sand)
42	01-44	M	4859764	635043	174.92	9.4	174.20			Shallow (sand)
43	01-45	M	4859793	635163	177.14	19.8	173.40	172.74	-0.66	Shallow (sand)
44	01-46	M	4859816	635231	179.27	19.2	182.70			Shallow (sand)
45	MW01-02-1	M	4860135	636273	193.48		175.78	175.78	0.00	Thorncliffe

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**MONITORING WELL WATER LEVEL ELEVATIONS (m AMSL) AND DRAWDOWN (metres)
16TH AVENUE TRUNK SEWER CONSTRUCTION
YORK REGION
MARKHAM, ONTARIO**

Name	Initial Estimated Water Level ¹	Initial Observed Water Level ²	Jul-05				Drawdown ^{3,4} (metres) Jul-05
	m AMSL	m AMSL	5-Jul	13-Jul	20-Jul	26-Jul	
<u>Monitoring Wells ¹</u>							
<u>DEEP WELLS</u>							
<i>Till (deep)</i>							
MW58D		188.85	188.97	188.85	188.85	188.85	0.00
<i>Intermediate</i>							
MW04		184.30					
MW05		206.64					
MW08		209.45	198.94		198.70		
MW18		231.33	218.38	218.18		218.13	-10.75
MW19D		216.20	212.30	211.17	211.57	212.40	-13.20
MW24D		238.23	236.43				(-3.80)
MW37D		243.80	236.45	235.80	236.19		(-2.04)
<i>Thorncliffe</i>							
MW07 (7D)							-8.00
MW09		210.15	186.67	186.67	186.50	186.47	
MW11		162.39	160.02		159.84		-23.68
MW12		171.87	168.72		168.58		-2.55
MW12-A		206.35	181.41				-3.29
MW12-B							-24.94
MW13 (13D)	205	192.97					
MW14D	203	194.96				175.87	-29.13
MW15 (15D)	200	185.67	184.17			183.07	-19.93
MW16		175.96	172.54	172.40		172.45	-27.55
MW20		176.67	173.68			173.64	-2.32
MW20-A	204	170.19					
MW20-B (abandoned)		170.23					
MW20-C	204	168.72					
MW21D		202.29					
MW22		194.79	203.66	201.30		201.77	(-0.52)
MW23D		225.67	190.14	189.65		188.65	(-6.14)
MW25		225.69	221.39	221.06			(-4.61)
MW26		234.99	222.31	221.33		221.87	(-3.82)
MW27		227.76	233.91	233.61	233.49	233.31	(-1.68)
MW28D		201.20	225.39	224.54	225.10	224.39	(-3.37)
MW32D		234.07	196.63		196.46		-4.74
MW33D		202.34	233.65		233.31		(-0.76)
MW35D		193.42	202.38	201.99			(-0.35)
MW36D		198.45	194.42	194.85	194.20		-0.78
MW38D		206.18	196.10	195.97	195.98		-2.47
MW40D		212.59	202.35	202.29	202.29		-3.89
MW45		182.92	208.58	208.47	208.44		-4.15
<i>Scarborough</i>							
MW02			182.91	182.76	182.68	182.69	(0.23)
MW03		160.86	159.67		159.51		-1.35
		165.78	162.47		162.20		-3.58

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TABLE 3.4

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**MONITORING WELL WATER LEVEL ELEVATIONS (m AMSL) AND DRAWDOWN (metres)
16TH AVENUE TRUNK SEWER CONSTRUCTION
YORK REGION
MARKHAM, ONTARIO**

Name	Initial Estimated Water Level ¹	Initial Observed Water Level ²	Jul-05				Drawdown ^{3,4} (metres) Jul-05
	m AMSL	m AMSL	5-Jul	13-Jul	20-Jul	26-Jul	
SHALLOW WELLS							
<i>Shallow - Sand</i>							
MW07S		209.84	209.49				
MW28S		240.31	240.64		240.24		(-0.35)
MW47		205.25	204.58	204.46	204.37	204.32	(-0.07)
MW52		204.97	205.71	204.52	204.49	204.46	(-0.93)
<i>Shallow (sand) - Interstitial</i>							
MW19S		216.43	216.57	216.50	216.23		(-0.20)
MW21S		210.73	210.94	210.69		210.51	(-0.22)
MW23S		228.86	228.90	228.70			(-0.16)
MW24S		238.95	238.21		237.95		(-1.00)
MW33S		209.26	209.31	209.12			(-0.14)
✕ MW37S ⁵		245.11	237.90	237.77			-7.34
MW38S		252.84	249.08	248.98	249.15		-3.69
MW40S		261.26	260.81	260.71	260.89		(-0.37)
MW42		178.17				176.08	(-2.09)
MW43		179.56	176.64	176.22	176.17	176.01	(-3.55)
MW49		218.49	217.85	217.63	217.56	217.50	(-0.99)
MW53		233.57	232.42	232.14	232.09	232.01	(-1.56)
MW54		230.64	230.12	229.91	229.79	229.72	(-0.92)
MW55		219.31	218.69	218.36	218.29	218.22	(-1.09)
MW59		172.39				171.38	(-1.01)
<i>Shallow (Till) - Halton/Newmarket</i>							
MW06		205.55	202.18		202.13		(-3.42)
MW14S		202.27	202.47			202.48	(0.21)
MW17		216.59	215.13		214.93		(-1.66)
MW26S		234.98	234.14	233.85	233.96	233.71	(-1.27)
MW29		191.51	188.96	187.82	188.82	187.77	-3.74
MW32S		250.06	250.02		250.04		(-0.02)
MW34S		208.63	208.36			208.08	(-0.55)
MW35S		220.38	219.18	219.00	218.86		-1.52
MW36S		237.64	235.17	235.11	235.07		-2.57
MW41		171.02	170.56	170.37	170.35	170.30	(-0.72)
MW44		203.73	203.37	203.19	203.13	203.05	(-0.68)
MW46		199.58	199.47		199.22	199.22	(-0.36)
MW48		208.78	208.25	207.97	207.90	207.79	(-0.99)
MW50		221.46	220.21	219.89	219.80	219.69	(-1.77)
MW51		214.77	215.04			214.66	(-0.11)
MW56		196.72	195.83	195.55	195.47	195.36	(-1.36)
MW57		204.20	203.62	203.38	203.30	203.25	(-0.95)
<i>Shallow - Unknown</i>							
MW13S		201.73					
MW15S		191.38	191.26	190.77		190.76	(-0.62)
MW30		254.67	254.33		254.37		(-0.30)
MW31		248.26	247.61		247.62		(-0.64)
MW39		251.21	251.05	250.94	250.98		(-0.23)

Notes

1. Initial estimated water level, based on 16th Avenue Dewatering Phase II (MacViro, 2003), and Geotechnical Data Report (DST, 2002)
2. Initial observed water level, as reported by McNally/AECON, and as observed on completion (MW41 to MW59)
3. () Brackets indicate possible seasonal fluctuation, longterm trend required to verify drawdown - hydrographs referenced
4. Drawdown relative to initial estimated/observed water level (positive value indicates water level above initial level).
- ✕ 5. Initial observed water level not recorded due to flowing artesian conditions, using reference elevation
6. MW1 - Private Well not monitored
7. #N/A - Water level not measured

2/23/2005

TABLE 3

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**MONITORING WELL WATER LEVEL ELEVATIONS (metres AMSL) AND DRAWDOWN (metres)
16TH AVENUE TRUNK SEWER CONSTRUCTION
YORK REGION
MARKHAM, ONTARIO**

Name	Initial Estimated Water Level ¹ m AMSL	Initial Observed Water Level ² m AMSL	8-Oct-04	13-Oct-04	<u>Oct-04</u> 20-Oct-04	26-Oct-04	Drawdown ³ (m) Oct-04
Monitoring Wells ⁽¹⁾							
MW02		160.86		160.00		159.95	0.91
MW03		165.78		163.24		163.35	2.43
MW04		184.30					
MW05		206.64					
MW06		205.55		203.24		202.78	2.77
MW07 (7D)		210.15	186.13	185.93		186.26	23.89
MW07S		210.00					
MW08		209.45	198.87	198.89		198.81	10.64
MW09		162.39				159.79	2.60
MW11		171.87		167.90		167.75	4.12
MW12		206.35					
MW12-A							
MW12-B							
MW13 (13D)	205	192.97		176.45		176.37	28.63
MW13S		201.73		202.09		201.74	-0.01
MW14D	203	194.96		183.48		182.62	20.38
MW14S		202.29		202.71		202.69	-0.02
MW15 (15D)	200	185.67		175.90		175.28	24.72
MW15S		191.38		190.81		190.82	0.56
MW16		175.96		174.83		174.75	1.21
MW17		216.59	214.83			214.71	1.88
MW18		231.33		219.20		219.03	12.30
MW19D		216.20		214.16		214.95	1.25
MW19S		216.45		216.64		216.60	-0.15
MW20	204	176.67		165.77		164.70	38.63
MW20-A		170.19		164.89			5.49
MW20-B (abandoned)		170.23					
MW20-C	204	168.72		163.36		163.15	40.85
MW21D		202.29		202.99		202.98	-0.69
MW21S		210.61		210.61		210.50	0.11
MW22		194.79		190.85		190.92	3.87
MW23D		225.67					
MW23S		228.82		229.24		229.14	-0.32
MW24D		238.23		236.26		236.29	1.94
MW24S		238.95		238.23		238.09	0.86
MW25		225.69				224.14	1.55
MW26		234.99		233.84		233.91	1.08
MW27		227.76		227.06		227.51	0.25
MW28D		201.20	196.99	197.16	197.02	196.63	4.57
MW28S		240.31	240.27	240.12	240.02	239.95	0.36
MW29		191.51		189.50		189.41	2.10
MW30		254.67		254.26		254.24	0.43
MW31		248.26		247.67		247.57	0.69
MW32D		233.95		233.89		233.85	0.10
MW32S		249.93		249.89		249.87	0.06
MW33D		202.34		202.41		202.56	-0.22
MW33S		209.26		209.10		209.04	0.22
MW34S		208.02					
MW35S		220.38	219.97	218.84	218.44	218.41	1.97
MW35D		193.42	193.63	193.72	193.70	193.70	-0.28
MW36S		237.64	237.58	237.56	237.50	237.51	0.13
MW36D		198.45	196.20	196.29	196.24	196.29	2.16
MW37S							
MW37D		243.80	240.78	240.66	240.63	240.40	3.40
MW38S		252.84	252.33	252.32	252.37	252.37	0.47
MW38D		206.18	202.55	202.77	202.60	202.49	3.69
MW39		251.21	250.96	250.98	250.97	250.98	0.23
MW40S		261.26	260.84	261.83	260.76	260.87	0.39
MW40D		212.59	208.81	208.96	208.79	208.76	3.83

Notes

1. Initial estimated water level, based on 16th Avenue Dewatering Phase II (MacViro, 2003), and Geotechnical Data Report (DST, 2002)
2. Initial observed water level, as reported by McNally/AECON
3. Drawdown relative to initial estimated/observed water level (negative value indicates water level above initial level).
4. MW1 - Private Well not monitored
5. #N/A - Water level not measured

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TABLE 3.4
DEEP MONITORING WELL WATER LEVEL ELEVATIONS (m AMSL) AND DRAWDOWN (metres)
16TH AVENUE TRUNK SEWER CONSTRUCTION
YORK REGION
MARKHAM, ONTARIO

Name	Initial Observed Water Level ¹ m AMSL	1-Sep-05	9-Sep-05	14-Sep-05	22-Sep-05	29-Sep-05	Observed Water Level Change ² (metres) Sep-05	Estimated Water Level Change ³ (metres)	Longterm Trend ⁴	Observed Longterm Water Level Change ⁵ (metres)	Normalized Longterm Water Level Change ⁶ (metres)	Normalized Longterm Trend ⁷	Estimated Drawdown ⁸ (metres)
Monitoring Wells													
DEEP WELLS													
Full Depth													
MV30D	188.85	188.85	188.81	188.80	188.80	188.92	0.07						N/A
Intermediate													
MV104	184.30												
MV105	206.64												
MV108	209.45												
MV118	231.33		197.60	196.30				-11.15					-11.2
MV190	216.20	214.25	218.63	218.40	218.39			-12.94					-12.9
MV240	238.23		214.32	214.33	214.64	214.76		-1.66					-1.5
MV27D	243.80	235.53	235.48			235.26		-2.97					-3.0
Shallow													
MV107 (7D)	210.15		186.30	186.23	186.22	186.33		-23.93					-23.9
MV109	162.39			158.95				-2.06					-2.1
MV111	171.87												
MV122	206.35		181.75					-24.60					-24.6
Shallow (13D)													
MV113 (13D)	192.97												
MV140	194.96		183.91	184.00	184.01			-10.95					8.0
MV15 (15D)	185.67		173.77	172.65				-13.02					-15.4
MV16	175.96		173.66	173.41	173.38			-2.58					-27.3
MV20	176.67												-2.6
MV20-A	170.19												
MV20-B (abandoned)	170.23												
MV20-C	168.72												
MV21D	202.29		202.79	202.60	203.02	203.69		1.40					
MV22	194.79												
MV23D	225.67		222.31	222.93	223.29			-3.36					-2.8
MV25	225.69		223.04	223.09	223.29			-2.65					-2.3
MV26	224.99		223.07	223.66	226.12	233.10		-1.89					-3.7
MV27	227.76		223.53	225.66	226.12			-1.12					-2.6
MV28D	201.20		196.39			196.54		-4.66					-1.1
MV32D	234.07		233.21			233.54		-0.86					-2.5
MV33D	202.34		202.71	203.21	203.58			-0.72					-10.5
MV33D	193.42		194.12	194.12	194.10			0.68					-4.3
MV36D	198.45		195.74	195.81	195.76			-2.69					-12.1
MV38D	206.18		200.18	201.96	201.97			-4.26					-20.4
MV400	214.59		207.99	208.06	208.07			-4.32					-17.5
MV45	182.92		182.55	182.48	182.55			-0.37					-15.9
													(-4.6)

NOT APPLICABLE - NO SEASONAL WATER
LEVEL CHANGE OBSERVED

decreasing -0.6
stable -2.3
decreasing -2.4
decreasing -1.3
decreasing -0.7
decreasing -1.4

NOT APPLICABLE - NO SEASONAL WATER
LEVEL CHANGE OBSERVED

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TABLE 34
DEEP MONITORING WELL WATER LEVEL ELEVATIONS (m AMSL) AND DRAWDOWN (metres)
16TH AVENUE TRUNK SEWER CONSTRUCTION
YORK REGION
MARKHAM, ONTARIO

Name	Initial Observed Water Level ¹ m AMSL	1-Sep-05	9-Sep-05	14-Sep-05	22-Sep-05	29-Sep-05	Observed Water Level Change ² (metres) Sep-05	Initial Estimated Water Level ¹¹ m AMSL	Estimated Water Level Change ³ (metres)	Longterm Trend ⁴ (metres)	Observed Longterm Water Level Change ⁵ (metres)	Normalized Longterm Water Level Change ⁶ (metres)	Normalized Longterm Trend ⁷ (metres)	Estimated Drawdown ¹⁰ (metres)
Monitoring Wells														
Scourbrough														
MTV02	160.86						159.70							
MTV03	165.78						163.00							
							-1.16							-1.2
							-2.78							-2.8

**NOT APPLICABLE - NO SEASONAL WATER
LEVEL CHANGE OBSERVED**

- Notes**
1. Initial observed water level, as reported by McNally/AECOM, and as observed on completion.
 2. Change in water level relative to Initial Observed Water Level (positive value indicates water level above initial level).
 3. Initial water level estimated based on YTD Groundwater Studies 2005.
 4. Initial estimated water level, based on 16th Avenue Dewatering Phase II (MacVitt, 2003).
 5. Change in water level relative to Initial Estimated Water Level.
 6. Longterm trend of observed water levels (see Normalized Hydrograph).
 7. Longterm change in water level, based on trend line (see Normalized Hydrograph).
 8. Longterm trend accounting for seasonal variations, based on normalized trend line (see Normalized Hydrograph).
 9. Longterm trend in water level, based on normalized trend line (see Normalized Hydrograph).
 10. Estimated drawdown, based on observed water level change, estimated water level change, and on longterm trend and normalized trend for deep wells exhibiting seasonal water level changes (see Normalized Hydrographs). Drawdown of less than a half metre or increased water levels are designated as 0 m drawdown.
 11. #N/A - Water level not measured.
 12. NE - Not estimated - the Initial Observed Water Level is considered reliable based on confirmed data and/or longterm monitoring, and is used to calculate drawdown.
 13. N/A - Not Applicable.
 14. () Brackets indicate short term record or anomalous data requiring verification, data not utilized.
 15. m AMSL - metres Above Mean Sea Level.

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TABLE 3.5
SHALLOW MONITORING WELL WATER LEVEL ELEVATIONS (m AMSL) AND DRAWDOWN (metres)
16TH AVENUE TRUNK SEWER CONSTRUCTION
YORK REGION
MARKHAM, ONTARIO

Name	Initial Observed Water Level ¹ m AMSL	1-Sep-05	9-Sep-05	14-Sep-05	22-Sep-05	29-Sep-05	Observed Water Level Change ² (metres) Sep-05	Longterm Trend ³	Observed Longterm Water Level Change ⁴ (metres)	Normalized Longterm Trend ⁵	Normalized Longterm Water Level Change ⁶ (metres)	Estimated Drawdown ⁷ (metres)
Monitoring Wells												
SHALLOW WELLS												
Shallow - Sand												
MIV075	209.84		239.73	208.92	209.05	209.24	-0.60	stable	0.0	stable	0.0	0.0
MIV285	240.31					239.76	-0.56	decreasing	-0.6	stable	0.0	0.0
MIV47	205.25	205.21	204.86	204.66	205.03	205.42	-0.17	stable	0.0	increasing	2.7	0.0
MIV52	204.97	204.42	204.35	204.33	204.33	204.36	-0.61	decreasing	-0.9	increasing	2.4	0.0
MIV135	201.73							increasing	2.4	increasing	1.8	0.0
MIV155	191.38		191.08		190.94		-0.44	stable	0.0	increasing	1.5	0.0
MIV30	254.67		254.14			254.26	-0.41	stable	0.0	increasing	1.2	0.0
MIV31	248.26		247.19				-1.07	stable	0.0	increasing	0.6	0.0
MIV39	251.21	250.48	250.44	250.76	250.93		-0.28	stable	0.0	increasing	1.2	0.0
Shallow (sand) - Interstitial												
MIV195	216.43	216.42	216.35	210.46	216.32	216.32	-0.11	stable	0.0	increasing	0.9	0.0
MIV215	210.73		210.58		210.60	211.10	0.37	stable	0.0	stable	0.0	0.0
MIV235	228.86		228.61				-0.26	stable	0.0	stable	0.0	0.0
MIV245	238.95		237.73			237.88	-1.07	stable	0.0	stable	0.0	0.0
MIV335	209.26							stable	0.0	stable	0.0	0.0
MIV375	245.11	239.47	239.90	240.23	240.81		-4.30	decreasing	-6.5	decreasing	-5.0	-5.0
MIV405	252.84	248.52	248.82	248.69	248.95		-3.89	decreasing	-4.3	decreasing	-3.9	-3.9
MIV405	261.26	260.64	260.69	260.63	258.78		-2.48	decreasing	-0.7	stable	0.0	0.0
MIV42	178.17		175.89	175.67	175.61		-2.56	decreasing	-3.00	decreasing	-0.99	-0.99
MIV43	179.56				176.64		-2.92	decreasing	-1.6	stable	0.0	0.0
MIV49	218.49	217.44	217.38	217.38	217.45	217.56	-0.93	decreasing	-1.4	increasing	0.6	0.0
MIV53	233.57	232.03	231.86	231.87	231.96	232.03	-1.54	decreasing	-1.6	stable	0.0	0.0
MIV54	230.64	229.60	229.52	229.39	229.36	229.42	-1.22	decreasing	-1.5	stable	0.0	0.0
MIV55	219.31	218.07	218.01	217.99	217.95	218.03	-1.28	decreasing	-1.7	stable	0.0	0.0
MIV59	172.39		173.74	173.92	174.01		1.62	increasing	2.5	increasing	1.7	0.0
Shallow (Till) - Halton/Newmarket												
MIV06	205.55		202.29	201.81			-3.74	decreasing	-0.8	decreasing	-1.5	-1.5
MIV145	202.27		202.63	202.50	202.50		0.23	stable	0.0	increasing	0.7	0.0
MIV17	216.59	213.29	214.37	214.11		213.97	-2.62	stable	0.0	stable	0.0	0.0
MIV265	234.98	233.87	233.80	233.62	233.88	233.99	-0.99	decreasing	-1.5	stable	0.0	0.0
MIV29	191.51	187.98		187.96	188.06		-3.45	decreasing	0.0	decreasing	-3.2	-3.2
MIV325	250.06		250.08		250.57		0.51	stable	0.0	stable	0.0	0.0
MIV345	208.63		208.01	207.95	207.97	207.99	-0.64	decreasing	-0.8	stable	0.0	0.0
MIV355	220.38	217.93	217.93	217.82	217.84		-2.54	decreasing	-2.5	decreasing	-1.8	-1.8
MIV365	237.64	234.86	235.08	234.98	235.14		-2.50	decreasing	-3.3	decreasing	-3.3	-3.3
MIV41	171.02	170.29			170.15		-0.87	decreasing	-1.2	increasing	0.9	0.0
MIV44	203.73	203.45		203.22	203.27	203.67	-0.06	decreasing	-0.5	increasing	1.3	0.0
MIV46	199.58	199.27	199.25	199.21	199.31	199.34	-0.25	stable	0.0	increasing	1.0	0.0
MIV48	208.78	207.47	207.34	207.27	207.18	207.18	-1.60	decreasing	-1.7	stable	0.0	0.0
MIV50	221.46	220.10	219.81		219.95	220.75	-0.71	decreasing	-1.8	stable	0.0	0.0

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TABLE 3.5
SHALLOW MONITORING WELL WATER LEVEL ELEVATIONS (m AMSL) AND DRAWDOWN (metres)
16TH AVENUE TRUNK SEWER CONSTRUCTION
YORK REGION
MARKHAM, ONTARIO

Name	Initial Observed Water Level ¹ m AMSL	Sep-05				Observed Longterm Water Level Change ⁴ (metres)	Longterm Trend ⁵	Normalized Longterm Trend ⁵	Normalized Longterm Water Level Change ⁶ (metres)	Estimated Drawdown ⁷ (metres)
		1-Sep-05	9-Sep-05	14-Sep-05	22-Sep-05	29-Sep-05				
Monitoring Wells										
M1V51	214.77	214.77	214.73	214.57	214.58	214.88				
M1V56	196.72	195.52	195.44	195.45	195.50	195.76	decreasing	increasing	1.3	0.0
M1V57	204.20	203.27	203.19	203.11	203.13	202.52	decreasing	stable	0.0	0.0
							decreasing	increasing	0.5	0.0

Notes

1. Initial observed water level, as reported by McNally/AECOM, and as observed on completion.
2. Change in water level relative to Initial Observed Water Level (positive values indicate water level above initial level.
3. Longterm trend of observed water levels (see Normalized Hydrograph).
4. Longterm change in water level, based on trend line (see Normalized Hydrograph).
5. Longterm trend accounting for seasonal variations, based on normalized trend line (see Normalized Hydrograph).
6. Longterm change in water level, based on normalized trend line (see Normalized Hydrograph).
7. Estimated drawdown, based on longterm trend and normalized trend (see Normalized Hydrograph).
Drawdown of less than a half metre or increased water levels are designated as 0 m drawdown
8. #N/A - Not measured
9. () Brackets indicate longer term trend required to verify drawdown.

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TABLE 3.6
DEEP PIEZOMETER WATER LEVEL ELEVATIONS (m AMSL) AND DRAWDOWN (metres)
16TH AVENUE TRUNK SEWER CONSTRUCTION
YORK REGION
MARKHAM, ONTARIO

ID	Event	Easting	Northing	Ground Elevation (m AMSL)	Well Depth (m bref)	Initial Observed Water Level ¹ (DST, 2002)	Water Level Elevation (SEPT 2005) (m AMSL)	Estimated Drawdown ² (metres)	Source
DEEP PIEZOMETERS									
Deep (till) - Newmarket									
01-30	W	4859234	633447	210.69	47.25	185.90			
01-31	W	4859148	633314	212.43	49.20	186.00			Deep (till) - Newmarket
01-33	W	4859003	633017	208.18	47.35	192.40			Deep (till) - Newmarket
01-34	W	4858967	632907	205.65	42.98	197.30			Deep (till) - Newmarket
01-37	W	4858797	632531	203.39	40.08	190.20			Deep (till) - Newmarket
01-39	W	4858725	632188	202.05	39.60	190.20			Deep (till) - Newmarket
01-40D	W	4858682	632044	197.11	33.99	192.64			Deep (till) - Newmarket
01-42	W	4858607	631824	194.33	29.41	190.70			Deep (till) - Newmarket
Thorncliffe									
01-01	W			202.90	47.30	202.90			Thorncliffe
01-02	W	4860720	637865	205.79	47.50	199.90			Thorncliffe
01-03	W	4860673	637733	207.59	50.40	206.80			Thorncliffe
01-05	W	4860517	637285	206.72	48.50	201.50	167.30	-34.20	Thorncliffe
01-06D	W	4860473	637155	206.12	48.40	204.31	203.79	(-0.52)	Thorncliffe
01-08D	W	4860290	636727	199.43	39.20	197.63	171.63	-26.00	Thorncliffe
01-08B	W	4860290	636727	199.43	7.92	195.03	171.83	-23.20	Thorncliffe
01-09	BI	4860290	636593	194.97	33.50	194.97	172.27	-22.70	Thorncliffe
01-10	BI	4860221	636433	193.05	29.00	197.40	172.45	-24.95	Thorncliffe
01-11	BI	4860145	636301	193.23	28.96	196.20	168.93	-27.27	Thorncliffe
01-12	BI	4860096	636159	192.61	29.87	196.40	170.21	-26.19	Thorncliffe
01-13	BI	4860048	636018	189.68	19.81	191.40	176.78	-14.62	Thorncliffe
01-16	BI	4859905	635587	186.72	25.00	186.10	164.82	-21.28	Thorncliffe
01-17	BI	4859839	635304	182.13	18.28	185.80	165.03	-20.77	Thorncliffe
01-46	BI	4859816	635231	179.27	19.20	182.70			Thorncliffe
98-101	W	4860387	637016	206.12	39.65	173.80	170.29	(-3.51)	Thorncliffe
MW01-02-1	BI	4860135	636273	193.48	18.70	175.78	175.68	(-0.10)	Thorncliffe

Note:

1. Initial observed waer level based on 16th Avenue Geotechnical Data (DST, 2002).
2. Drawdown relative to Initial Observed Water Level.
3. () Brackets indicate short term record, data not utilized.
4. #N/A - not measured.
5. mAMSL - metres Above Mean Sea Level.

TABLE 3.7
SHALLOW PIEZOMETER WATER LEVEL ELEVATIONS (m AMSL) AND DRAWDOWN (metres)
16TH AVENUE TRUNK SEWER CONSTRUCTION
YORK REGION
MARKHAM, ONTARIO

ID	Event	East	West	Ground Elevation (m AMSL)	Well Depth (m)	Initial Observed Water Level ¹ (DST, 2002)	Water Level Elevation (SEPT 2005) (m AMSL)	Observed Water Level Change ² (metres) (Sept 05)	Longterm Trend ³	Observed Longterm Water Level Change ⁴ (metres)	Normalized Longterm Trend ⁵	Normalized Longterm Water Level Change ⁶ (metres)	Estimated Drawdown ⁷ (metres)	Source
SHALLOW PIEZOMETERS														
<i>Shallow (fill) - Halton/Newmarket</i>														
01-07	W	4860372	636860	204.22	28.20	201.00	195.40	-0.16	increasing	3.7	increasing	2.8	0.0	Shallow (fill) - Halton/Newmarket
01-40S	W	4858482	632044	197.10	33.99	193.94	193.27	-3.13	stable	0.0	stable	0.0	0.0	Shallow (fill) - Halton/Newmarket
<i>Shallow (sand) - Interstadial</i>														
01-06S	W	4860474	637156	206.12	15.20	195.56	195.40	-0.16	stable	0.0	increasing	0.7	0.0	Shallow (sand) - Interstadial
01-08A	BI	4860290	636727	199.37	30.48	196.40	193.27	-3.13	decreasing	-4.7	decreasing	-4.9	-4.9	Shallow (sand) - Interstadial
01-18	BI	4859770	635090	176.31	13.72	173.20	170.61	-2.59	decreasing	-3.6	decreasing	-3.2	-3.2	Shallow (sand) - Interstadial
01-19	BI	4859742	634997	177.86	13.20	173.90	171.26	-2.64	decreasing	-2.6	decreasing	-2.4	-2.4	Shallow (sand) - Interstadial
01-20A	BI	4859699	634853	179.73	16.31	173.30	172.93	-0.37	decreasing	-1.7	decreasing	-1.6	-1.6	Shallow (sand) - Interstadial
01-20B	W	4859699	634853	179.73	12.19	174.30	171.13	-3.17	decreasing	-0.8	decreasing	-0.7	-0.7	Shallow (sand) - Interstadial
01-21	BI	4859634	634720	180.05	15.50	174.70	174.85	0.15	decreasing	-1.2	decreasing	-0.9	-0.9	Shallow (sand) - Interstadial
01-22	BI	4859603	634599	181.32	17.83	176.00	175.34	-0.56	decreasing	-0.9	stable	0.0	0.0	Shallow (sand) - Interstadial
01-23	BI	4859561	634444	180.54	17.22	175.90	174.69	-0.71	decreasing	-2.1	decreasing	-2.0	-2.0	Shallow (sand) - Interstadial
01-24	BI	4859516	634332	178.49	10.06	175.40	176.18	0.71	decreasing	-1.7	decreasing	-1.5	-1.5	Shallow (sand) - Interstadial
01-25	BI	4859464	634188	179.28	14.50	176.70	180.38	3.68	decreasing	-3.0	decreasing	-2.7	-2.7	Shallow (sand) - Interstadial
01-26	W	4859422	634053	182.68	19.20	181.50	187.75	6.25	stable	0.0	stable	0.0	0.0	Shallow (sand) - Interstadial
01-28	W	4859310	633729	198.90	19.81	190.20	187.75	-2.45	decreasing	-5.0	decreasing	-5.0	-5.0	Shallow (sand) - Interstadial
01-29	W	4859263	633587	207.41	24.40	184.10	183.85	-0.25	stable	0.0	stable	0.0	0.0	Shallow (sand) - Interstadial
01-35	W	4858866	632783	202.58	10.97	191.40	182.06	-0.44	increasing	3.0	increasing	2.8	0.0	Shallow (sand) - Interstadial
01-43A	W	4859399	633975	185.06	15.24	182.50	182.06	-0.44	stable	0.0	increasing	0.5	0.0	Shallow (sand) - Interstadial
01-43B	BI	4859399	633975	185.06	22.71	181.30	181.30	0.00	increasing	1.5	increasing	2.0	0.0	Shallow (sand) - Interstadial
01-44	BI	4859764	635043	174.92	9.40	171.40	170.22	-1.18	decreasing	-2.6	decreasing	-1.8	-1.8	Shallow (sand) - Interstadial
01-45	BI	4859793	635163	177.14	19.80	173.40	171.74	-1.66	decreasing	-1.2	decreasing	-0.6	-0.6	Shallow (sand) - Interstadial
01-46A	W	4859816	635231	179.27	12.60	182.70			stable	0.0	increasing	0.5	0.0	Shallow (sand) - Interstadial

Note:

1. Initial observed water level based on 16th Avenue Geotechnical Data (DST, 2002) low water level prior to Phase 2 Construction.
2. Change in water level relative to Initial Observed Water Level (positive value indicates water level above initial level).
3. Longterm trend of observed water level (see Normalized Hydrograph).
4. Longterm change in water level, based on trend line (see Normalized Hydrograph).
5. Longterm trend accounting for seasonal variations, based on normalized trend line (see Normalized Hydrograph).
6. Longterm change in water level, based on normalized trend line (see Normalized Hydrograph).
7. Estimated drawdown, based on longterm trend and normalized trend.
8. #N/A - Not measured.
9. () Brackets indicate short record and/or data requires verification, data not utilized.
10. mAMSL - metres Above Mean Sea Level.

TABLE 3.8

STREAM PIEZOMETER WATER LEVEL ELEVATIONS (mAMS), AND WATER LEVEL CHANGES (metres)
16TH AVENUE TRUNK SEWER CONSTRUCTION
YORK REGION
MARKHAM, ONTARIO

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Piezometer	Easting	Northing	Elevation (mAMS)	Initial Water Elevation	Date	Water Elevations (mAMS), ¹				Water Level Change (m) ²	Trend	Correlated Shallow Monitoring Well ³	Trend ⁴
						July 7, 2005	July 21, 2005	August, 2005	September, 2005				
AC2-MS-D	631694	4858094	192.952	189.577	8-Nov-04	192.01	192.01	192.32		2.74	increasing	P01-35, 40	stable
AC3-MS-D	632218	4858248	188.576	185.5	8-Nov-04	187.68	187.04	187.67	187.71	2.21	increasing	P01-35, 40	stable
Bea1-MS-S	628978	4858427	202.762	200.049	8-Nov-04	200.60	200.63	200.71	200.81	0.76	increasing		
Bea2-MS-D	630134	4857535	190.493	187.083	8-Nov-04	188.17		188.30	188.39	1.30	increasing		
Bea3-MS-D	632263	4856238	181.767	180.135	8-Nov-04	179.83		180.06	180.29	0.15	stable		
Ber1-MS-D	630943	4864660	236.246	235.151	8-Nov-04	235.13	235.12	234.90	235.10	-0.05	stable	MW265	stable
Ber2-MS-S	631468	4862758	219.649	218.669	25-Jan-05	218.31	218.33	218.55	218.70	0.03	stable	MW49	increasing
Ber4-MS-S	633129	4861184	204.182	201.364	18-Jan-05	202.01	201.94	201.74	201.76	0.39	stable	MW215	stable
Ber5-MS-S	632285	4860234	199.135	195.85	11-Nov-04	Damaged		196.82	196.81	-0.04	stable	MW56	stable
Ber6-MS-D	634098	4859494	178.348	174.032	11-Nov-04	175.87	175.93	175.98	176.02	1.99	increasing	P01-44, 43A	decreasing
Ber7-MS-D	634349	4859274	176.283	175.565	11-Nov-05	175.50	175.49	175.59	175.38	-0.19	stable	P01-44, 43A	decreasing
Ber11-MS-S	634447	4864702	221.772	221.674	8-Nov-04	221.54	221.35	221.60	221.63	-0.05	stable	MW54	stable
Ber2-MS-S	633714	4863414	207.558	204.837	19-Nov-04	205.38	205.40	205.47	205.56	0.73	increasing	MW195	increasing
Ber3-MS-S	634659	4861824	194.833	192.441	22-Dec-04	192.31	192.19	192.19	192.21	-0.23	stable	MW145	increasing
Ber4-MS-D	634683	4861718	193.708	190.158	11-Nov-04	190.90	190.93	191.07	191.19	1.03	increasing	MW145	stable
Ber6-MS-D	635057	4859831	176.445	174.168	11-Nov-04	174.12	174.14	172.98	172.61	-1.56	decreasing	P01-18, 19, 20	decreasing
Ber7-MS-D	635062	4859600	174.92	173.284	11-Nov-04	173.22	173.23	172.84	172.17	-1.11	decreasing	P01-18, 19, 20	decreasing
Ber8-MS-D	635610	4858797	171.542	169.49	11-Nov-04	169.57	169.59	169.48	169.54	0.04	stable	MW42	decreasing
Ber9-MS-S	635686	4858744	170.37	169.438	11-Nov-05	169.40	169.40	169.36	169.38	-0.06	stable	MW42	decreasing
EKCI-MS-D	636582	4860285	192.34	190.752	29-Nov-04	190.46	190.44	190.65	190.73	-0.03	stable		
EK2-MS-D	636485	4860198	190.42	188.413	19-Jan-05	188.18	188.22	188.79	188.77	0.35	stable	P01-08A	decreasing
EK3-MS-D	636766	4858546	167.796	166.851	11-Nov-04	166.75	166.95	167.15	167.40	0.55	stable	MW42	decreasing
LRC2-MS-D	637898	4865075	209.299	206.146	9-Nov-04	206.32		206.52	206.59	0.45	stable	MW52	increasing
LRC4-MS-D	643238	4863208	196.053	195.699	30-Mar-05	195.69	195.61	195.18	195.23	-0.47	stable		
LRC5-MS-S	644372	4860766	186.288	185.187	13-Dec-04	184.90	184.91	184.91	184.98	-0.21	stable		
MJC2-MS-D	636582	4860285											
MJC3-MS-D	637898	4865075	173.104	173.104	11-Nov-04	173.15	173.18	173.02	172.91	-0.19	stable		
RC1-MS-D	635498	4864163	222.47	218.353	30-Dec-04	219.78	219.84	221.26	220.38	2.03	increasing	MW195	increasing
RC2-MS-S	636749	4862395	207.094	203.622	30-Dec-04	204.56	204.57	204.67	204.75	1.13	increasing	MW345	stable
RC3-MS-D	637445	4861719	203.74	203.365	11-Nov-04	203.52	203.47	203.34	203.26	-0.11	stable	MW46	stable
RC5-MS-D	638602	4860773	192.23	191.048	25-Nov-04	190.97	191.00	191.08	191.19	0.14	stable	MW155, 01-065	increasing
RC7-MS-D	635571	4864079	222.857	218.295	20-Dec-04	218.89	218.90	218.68	218.76	0.46	stable	MW195	increasing
RC8-MS-D	639237	4860152	185.529	184.257	25-Jan-05	183.82	183.83	183.92	183.90	-0.35	stable		
RR1-MS-S	629440	4861999	224.83	222.126	8-Nov-04	221.83	221.87	221.95	222.03	-0.10	stable		
RR2-MS-S	629279	4859926	201.109	198.414	19-Nov-04	199.00	198.70	198.78	198.83	0.42	stable	MW33	stable
RR3-MS-S	631737	4857882	185.609	183.169	8-Nov-04	184.62	184.86	185.11	185.19	2.02	increasing		
RR4-MS-D	635967	4857508	169.319	168.849	11-Nov-04	169.32	169.60	169.59	169.57	0.73	increasing		

Note:

- 1 - mAMS - meters above mean sea level.
- 2 - Change in water level relative to initial observed water level.
- 3 - Closest shallow monitoring well screened at similar elevation as stream piezometer.
- 4 - Trend based on shallow monitoring well Normalized Longterm Trend (see Normalized Hydrographs).

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TABLE 3.9

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**SELECTED PRIVATE WELL WATER LEVEL ELEVATIONS (m AMSL) AND DRAWDOWN (metres) - DEEP
16TH AVENUE TRUNK SEWER CONSTRUCTION
YORK REGION
MARKHAM, ONTARIO**

Name	Address	Easting	Northing	Initial Observed Water Level (m AMSL) ⁽¹⁾	Observed Water Levels (m AMSL)				Observed / Estimated Water Level Change (metres) Sep-05
					07-Sep-05	15-Sep-05	23-Sep-05	29-Sep-05	
<u>Reesor Road</u>									
Pearse	9318	643229	4862644	213.00			197.86		-15.14
<u>Major MacKenzie Dr.</u>									
Flea Mkt. New	5058	636555	4862429	192.01	175.12		175.33		-16.68
Markham Missionary	5438	637447	4862835	200.09			174.17		-25.92
Carter-New	5601	638066	4862903	178.49			174.75		(-3.74)
Amnar-New	5646	638037	4862989	182.78			178.92		(-3.86)
Benczik	5899	638811	4863174	205.72			179.17		-26.55
Angus Glen South	4289	634698	4861831	195.19	188.95		189.02		-6.17
<u>16th Avenue</u>									
Baker	4404	635131	4859891	181.19	167.50	167.41	167.29	167.26	-13.93
Beckett - 4672	4672	635802	4860271	189.65	177.73	177.62	177.60	177.62	-12.03
York Downs PW3	4134	634035	4860464	183.60					
York Downs PW4	4134	633915	4860643	184.57					
York Downs PW5	4134	634895	4860253	179.29					
<u>McCowan Ave.</u>									
Robbins	9704	637185	4861703	202.26					
Frocione-new	10192	636933	4863111	180.82			176.42		(-4.40)
Markovits-New	10228	636914	4863154	180.67			176.69		(-3.98)
Smith-New	10292	636901	4863318	181.15			177.27		(-3.88)
Slade	11640	636190	4866931	222.15			213.57		-8.58
Lewis	10982	636383	4865123	197.03			189.13		-7.90
Markham Fair	10801	637054	4865017	195.18			186.73		-8.45
<u>Kennedy Road</u>									
West	9346	635357	4860132	184.73	173.41	173.32	173.18	173.20	-11.53
Rutnam	9392	635301	4860260	175.63	173.07	173.01	172.87	172.89	-2.74
Beckett	9451	635556	4860495	189.20					
Angus Glen North	10060	633320	4862168	209.94	209.38		209.52		-0.42
Green Acres Day Camp	11123	634664	4864977	225.00			218.39		-6.61
<u>Hwy 48</u>									
Cooper-New	10044	639005	4863380	187.54			182.73		-4.81
Winstanley	10386	638811	4864268	200.11			186.15		-13.96
Seaver-New	10451	638936	4864521	190.90			186.30		-4.60
Nielson-New	10666	638602	4864952	191.74					
<u>Elgin Mills</u>									
Hoover	6097	638936	4865410	197.92			187.57		-10.35

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TABLE 3.9

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**SELECTED PRIVATE WELL WATER LEVEL ELEVATIONS (m AMSL) AND DRAWDOWN (metres) - DEEP
16TH AVENUE TRUNK SEWER CONSTRUCTION
YORK REGION
MARKHAM, ONTARIO**

Name	Address	Easting	Northing	Initial Observed Water Level (m AMSL) ⁽¹⁾	Observed Water Levels (m AMSL)				Observed/ Estimated Water Level Change (metres) Sep-05
					07-Sep-05	15-Sep-05	23-Sep-05	29-Sep-05	
<u>19th Avenue</u>									
Brangers	5467	636878	4866571	205.27			199.67		-5.60
Plashkes	5809	637675	4867067	205.68			198.85		-6.83
Maslabey-Yates	4934	635275	4866282	222.83					
<u>Dickson Hill Road</u>									
Reilly	111	638304	4867420	206.93			196.02		-10.91
<u>Mill Race Court</u>									
Magee-New		638499	4867259	203.22			198.89		-4.33
<u>Glenbourne Park Drive</u>									
Embrey (KISS)	5	633305	4860311	184.35 ⁽²⁾	181.78	182.15	182.68	183.30	-1.05
Donahue	19	633379	4860565	187.92 ⁽²⁾			184.72	185.26	-2.66
Garnoff	37	633429	4860940	193.92					
Cribari	15	633405	4860489	184.08 ⁽²⁾	181.8				-2.28
Humfrey	4	633373	4860121	183.77 ⁽²⁾	173.67		183.92		0.15
Casados	25	633441	4860671	186.60					
Morton	31	633453	4860830	191.58	189.10		189.24		-2.34
<u>Cachet Parkway</u>									
Williams	9	633103	4860858	184.54 ⁽²⁾	182.407		180.98		-3.56
Montisano	35	632776	4860487	182.52 ⁽²⁾	179.29		179.85		-2.67
Hrga	52	632360	4860361	186.04 ⁽²⁾					
<u>Warden Avenue</u>									
Angus Glen Farm	10565	632923	4862826	218.90 ⁽²⁾	218.099		218.28		-0.62
Brock	10620	632637	4862874	223.60 ⁽²⁾	222.719		223.49		-0.11

Notes:

1. Initial Water Level as recorded by McNally/AECON
2. Initial Water Level based on comparative seasonal level prior to construction dewatering
3. () Brackets indicate short term record, data not utilized
4. #N/A - not measured

TABLE 3.10

SELECTED PRIVATE WELL WATER LEVEL ELEVATIONS (m AMSL) AND DRAWDOWN (metres) - SHALLOW
16TH AVENUE TRUNK SEWER CONSTRUCTION
YORK REGION
MARKHAM, ONTARIO

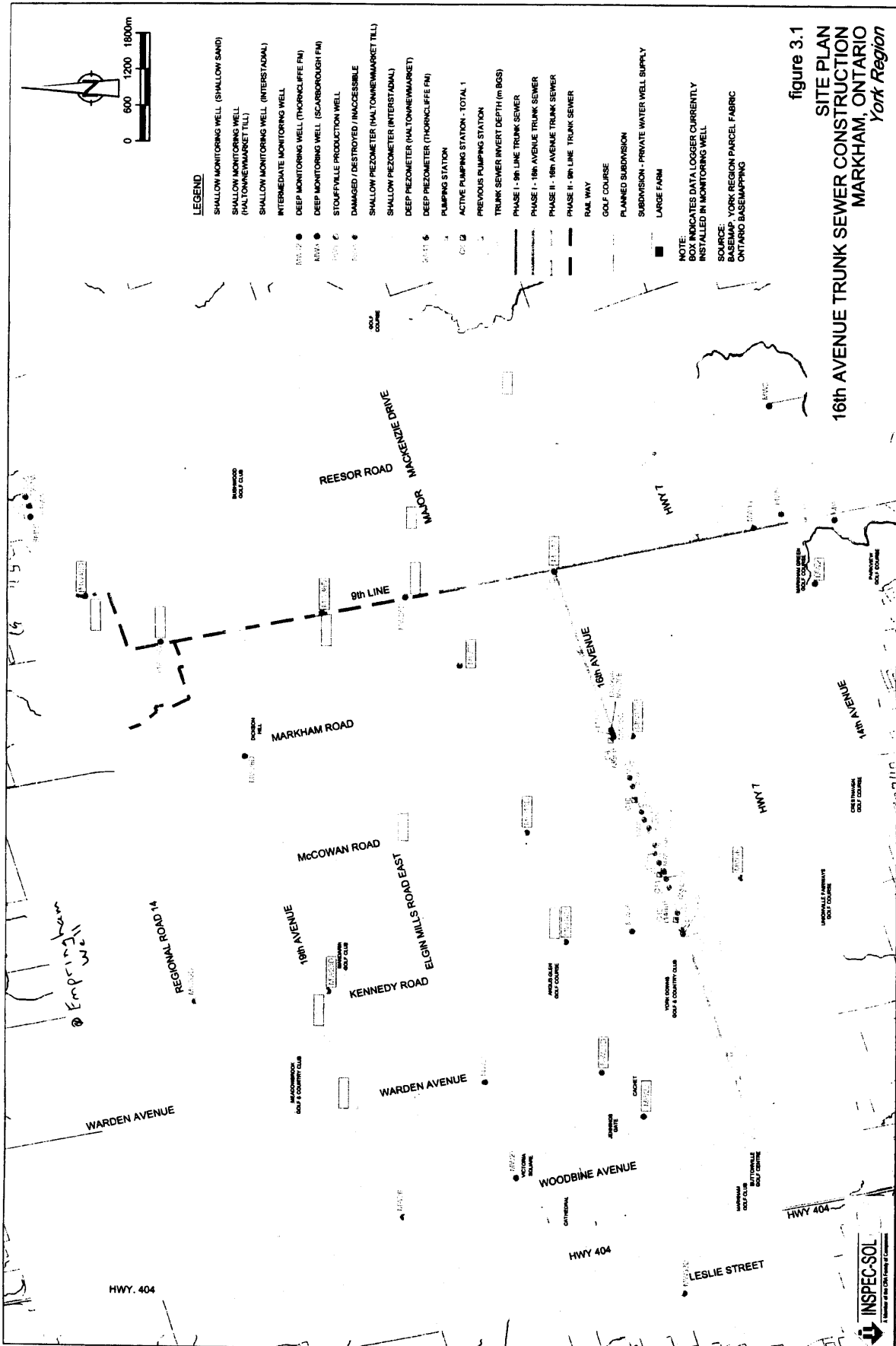
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Private Well	Address	Easting	Northing	Well Type	Reference Elevation	Well Depth (m BGS)	Well Depth (m AMSL)	Water Level Elevation (m AMSL)	Sep-05	Well Condition	Longterm Trend ¹	Observed Longterm Water Level Change ² (metres)	Normalized Longterm Trend ³	Observed Longterm Water Level Change ² (metres)	Estimated Drawdown ⁴ (metres)
Hex 7															
Burkholder	6881	642176	4859905	dug/bored	194.5	15.2	179.2	189.42 (Feb. 2005)		Recovery	stable	0	stable	0	0
Drudge	6921	642283	4859923	dug/bored	194.5			187.94 (Feb. 2005)		Recovery	decreasing	-1	decreasing	-1	(-1)
Williams	7082	643725	4860495	dug/bored	200.1			197.1		Recovery	stable	0	stable	0	0
Recent Road															
Whitlam	9683	643194	4863709	dug/bored	203.8			200.88 (August 2004)		Recovery		NOT APPLICABLE - DRY WELL			0
16th Avenue															
Beckett	5616	638008	4860963	dug/bored	199.4	7.5	191.9	192.2 (Dec. 2003)		Dry (Abandoned)		NOT APPLICABLE - DRY WELL			>-5
Christie	7006			dug/bored	211.0	13.0	198.0	218.49 (Jun. 2004)		Dry (Water Deliveries)		NOT APPLICABLE - DRY WELL			>-5
Creighton	7149	642077	4862099	dug/bored	212.0			<196.9 (Oct. 2000)		Dry (Abandoned)		NOT APPLICABLE - DRY WELL			>-5
Major Mackenzie Drive															
Ferguson (old)	5078	636625	4862463	dug/bored	207.5	7.0	200.5	200.6		Dry		NOT APPLICABLE - DRY WELL			>-3
Carter (old)	5601			dug/bored	215.0	10.0	205.0	<205.2 (April 2003)		Dry (Abandoned)		NOT APPLICABLE - DRY WELL			>-4
Davey (old)	5616	637985	4862990	dug/bored	215.6	9.8	205.8	<206.27 (Sept. 2004)		Dry		NOT APPLICABLE - DRY WELL			>-4
Amner (old)	5646	638030	4862962	dug/bored	216.2	8.6	207.6	<212.96 (Oct. 2004)		Dry		NOT APPLICABLE - DRY WELL			>-3.5
Marengur	6080			dug/bored	210.0	6.0	204.0	<205 (April 2003)		Dry (Abandoned)		NOT APPLICABLE - DRY WELL			>-2.5
Hex 48															
Reesor (old)	10224			dug/bored	203.2	9.8	193.4	<193.2 (April 2003)		Dry		NOT APPLICABLE - DRY WELL			undetermined
Seaver (old)	10451	638880	4864513	dug/bored	209.6	6.2	203.4	<203.5		Dry		NOT APPLICABLE - DRY WELL			undetermined
Layoria (old)	10579	638791	4864095	dug/bored	213.5	5.2	208.3	208.8		Recovery / Surface Water		NOT APPLICABLE - DRY WELL			undetermined
Nelson (old)	10666	638599	4864051	dug/bored	213.1	7.0	206.1	207.9		Recovery / Surface Water		NOT APPLICABLE - DRY WELL			undetermined
Kearney Road															
IPS	9693	635395	4861040	dug/bored	200.8	8.2	192.6	195.4		Recovery / Surface Water	stable	Increasing	0.5		-2

Notes

1. Longterm trend of observed water levels (see Normalized Hydrograph)
2. Longterm change in water level, based on trend line (see Normalized Hydrograph)
3. Longterm trend accounting for seasonal variations, based on normalized trend line (see Normalized Hydrograph)
4. Longterm change in water level, based on normalized trend line (see Normalized Hydrograph)
5. Estimated drawdown, based on longterm trend and normalized trend
6. Drawdown of less than a half metre or increased water levels are designated as 0 m drawdown

Brackets indicate data requires verification.



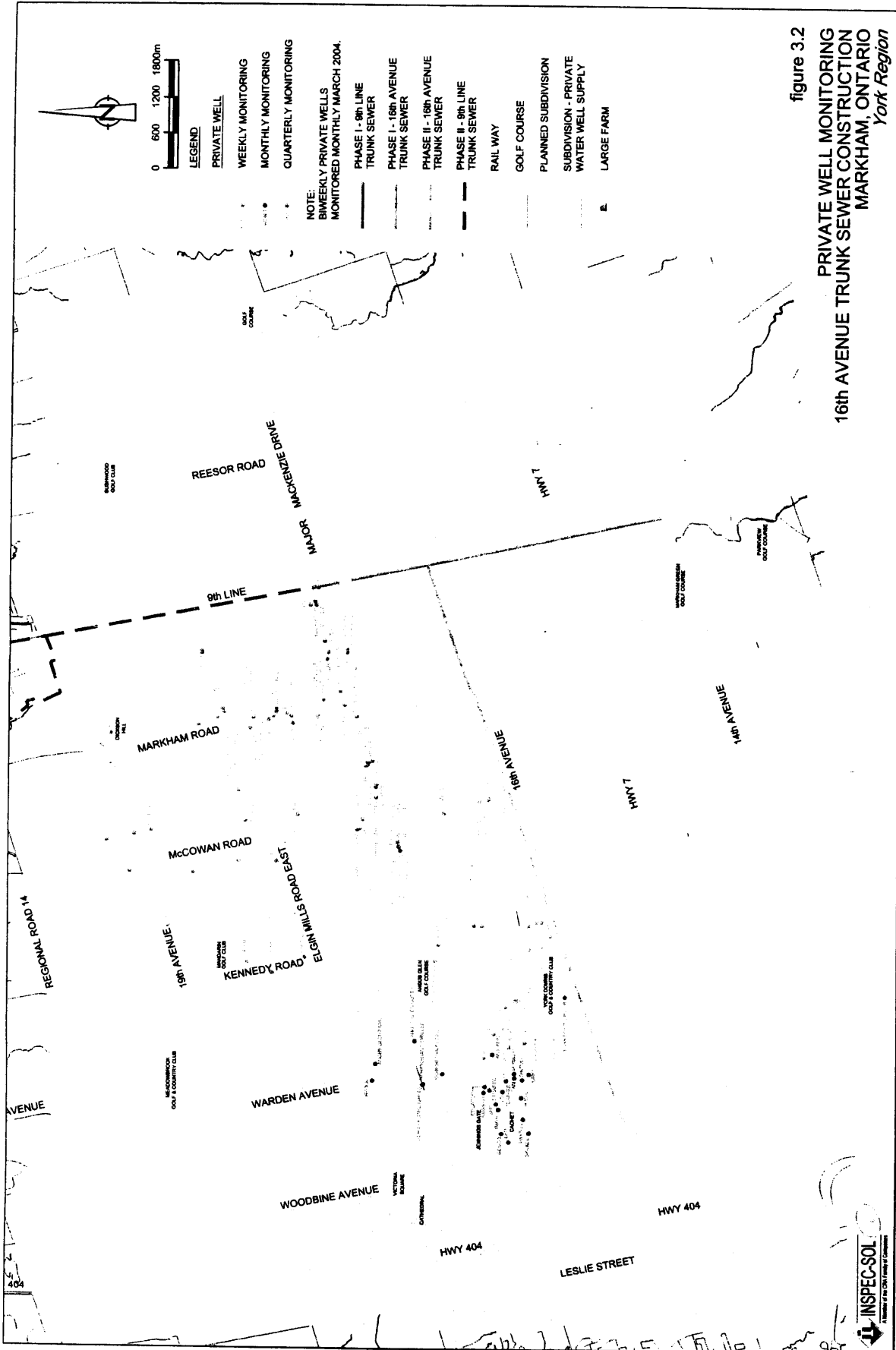
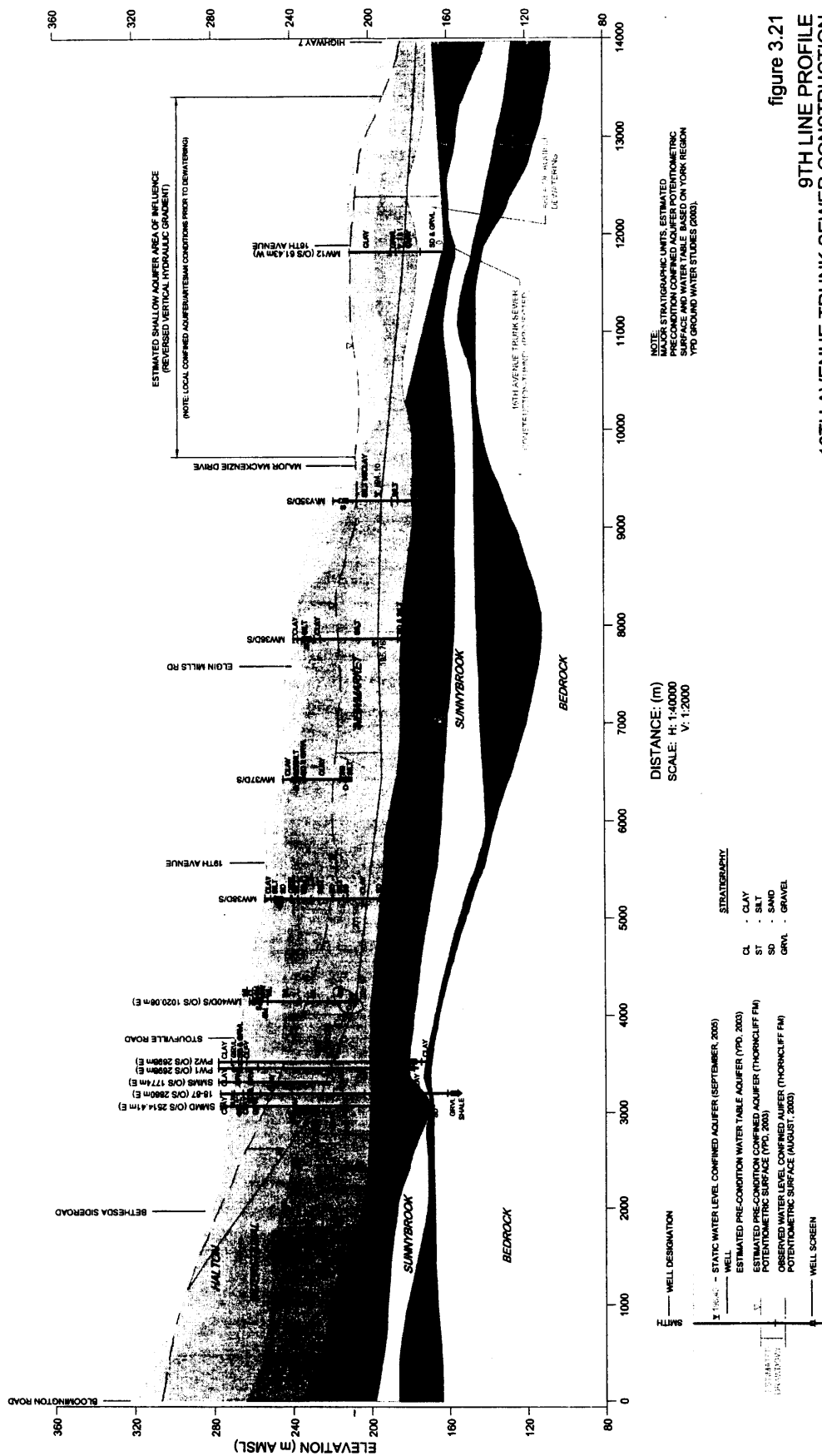
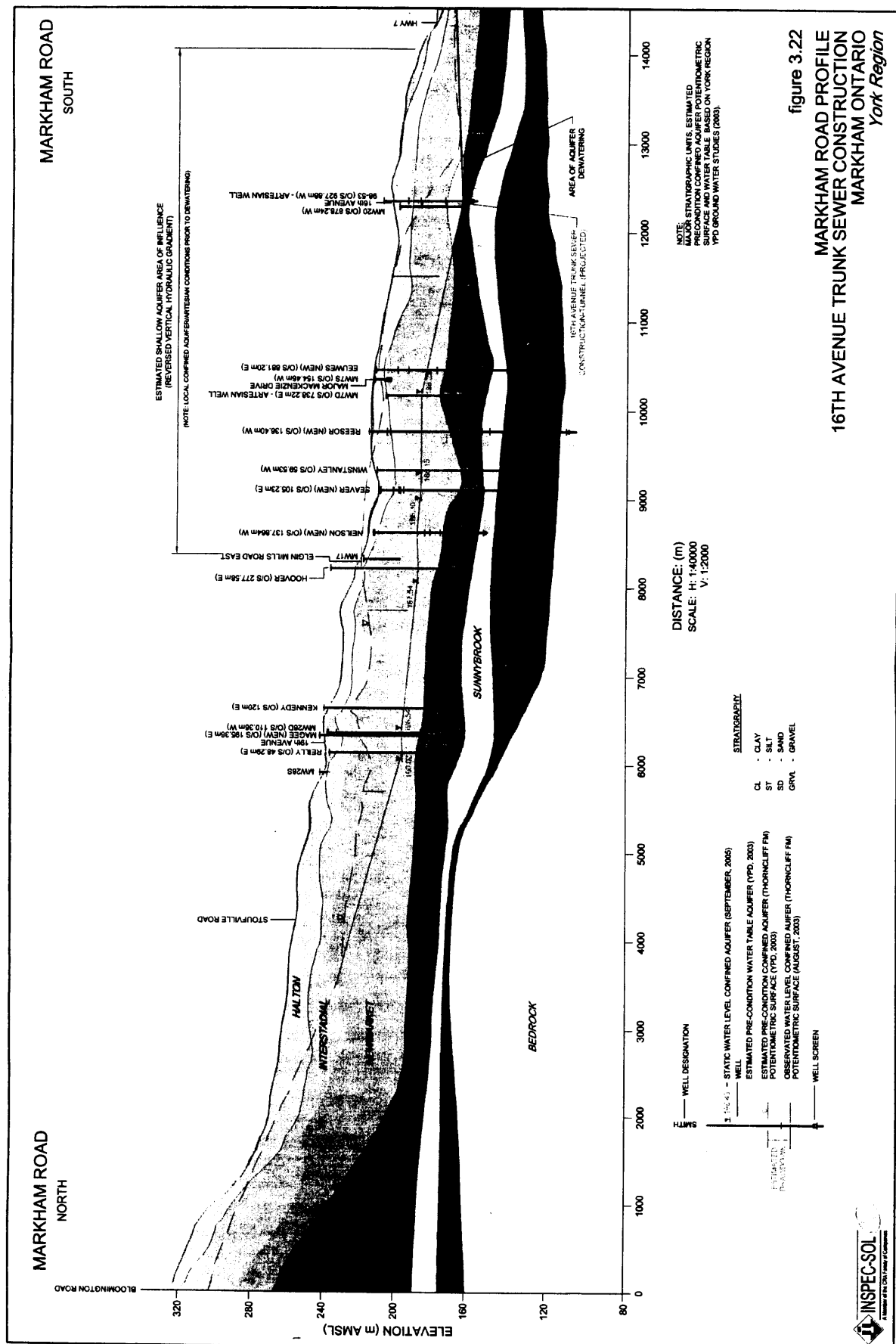


figure 3.2
 PRIVATE WELL MONITORING
 16th AVENUE TRUNK SEWER CONSTRUCTION
 MARKHAM, ONTARIO
 York Region



16TH AVENUE TRUNK SEWER CONSTRUCTION
MARKHAM ONTARIO
York Region



McCOWAN ROAD
SOUTH

McCOWAN ROAD
NORTH

ESTIMATED SHALLOW AQUIFER AREA OF INFLUENCE
(REVERSED VERTICAL HYDRAULIC GRADIENT)

(NOTE: LOCAL CONFINED AQUIFER/UNSATURATED CONDITIONS PRIOR TO DRAINAGE)

10th AVENUE TRUNK SEWER
CONSTRUCTION TUNNEL
PROJECTED

AREA OF AQUIFER
DEWATERING

10th AVENUE TRUNK SEWER
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10th AVENUE TRUNK SEWER
CONSTRUCTION TUNNEL
PROJECTED

DISTANCE: (m)
SCALE: H: 1:40000
V: 1:2000

STRATIGRAPHY

- CL - CLAY
- ST - SILT
- SO - SAND
- GRA - GRAVEL

WELL DESIGNATION

10th AVENUE TRUNK SEWER
CONSTRUCTION TUNNEL
PROJECTED

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CONSTRUCTION TUNNEL
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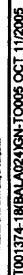
10th AVENUE TRUNK SEWER
CONSTRUCTION TUNNEL
PROJECTED

10th AVENUE TRUNK SEWER
CONSTRUCTION TUNNEL
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10th AVENUE TRUNK SEWER
CONSTRUCTION TUNNEL
PROJECTED



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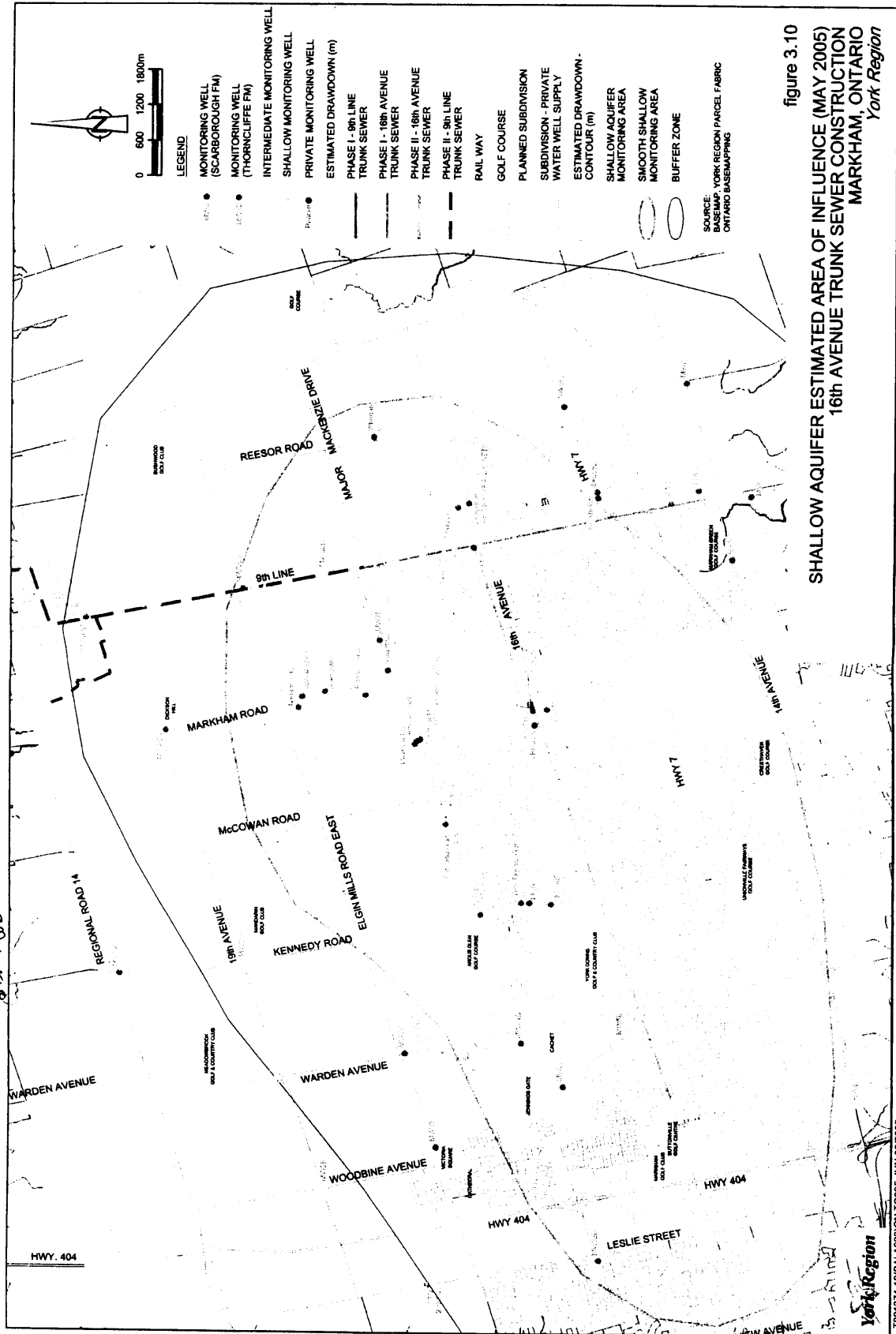
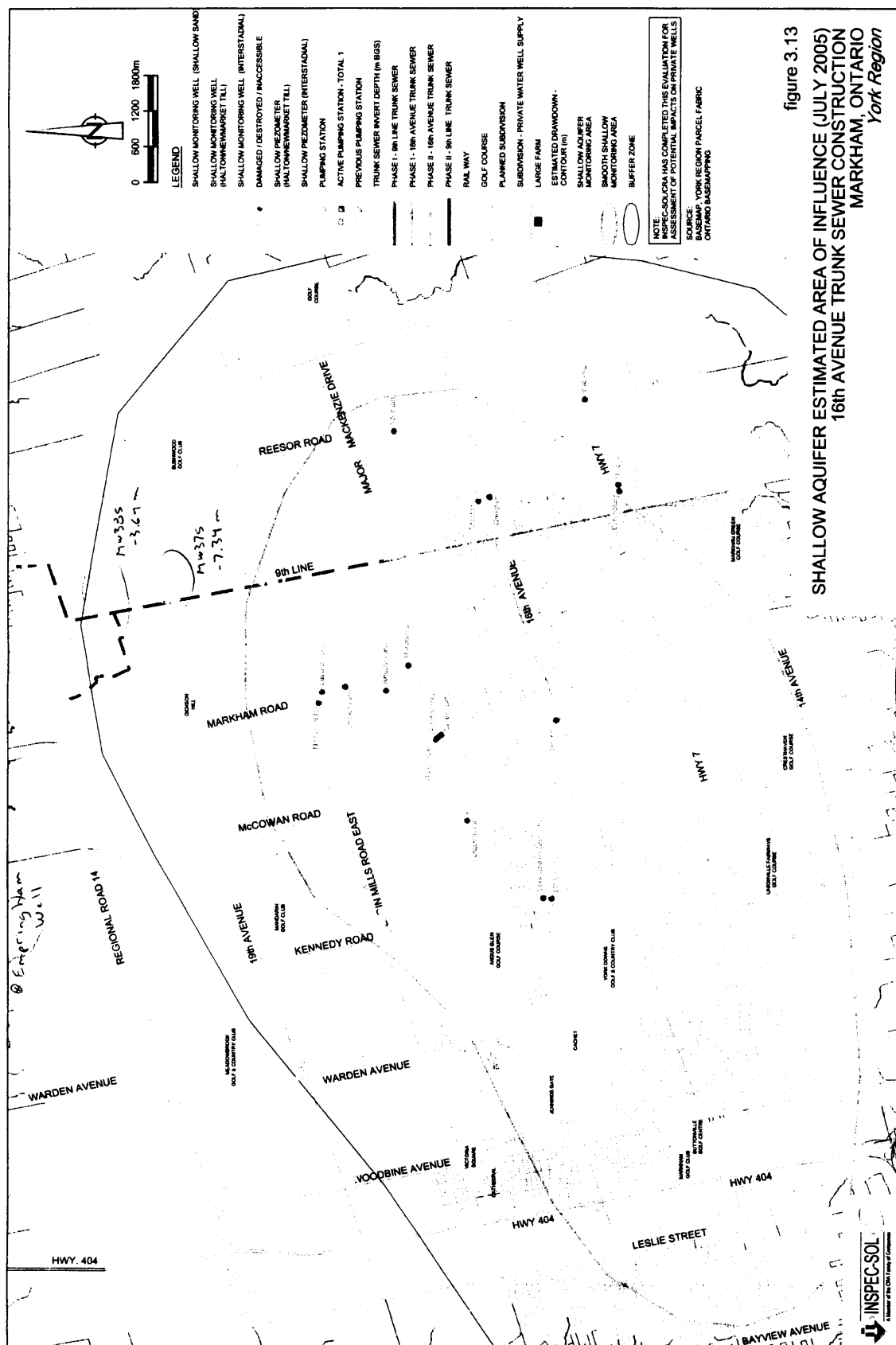


figure 3.10
SHALLOW AQUIFER ESTIMATED AREA OF INFLUENCE (MAY 2005)
16th AVENUE TRUNK SEWER CONSTRUCTION
MARKHAM, ONTARIO
York Region





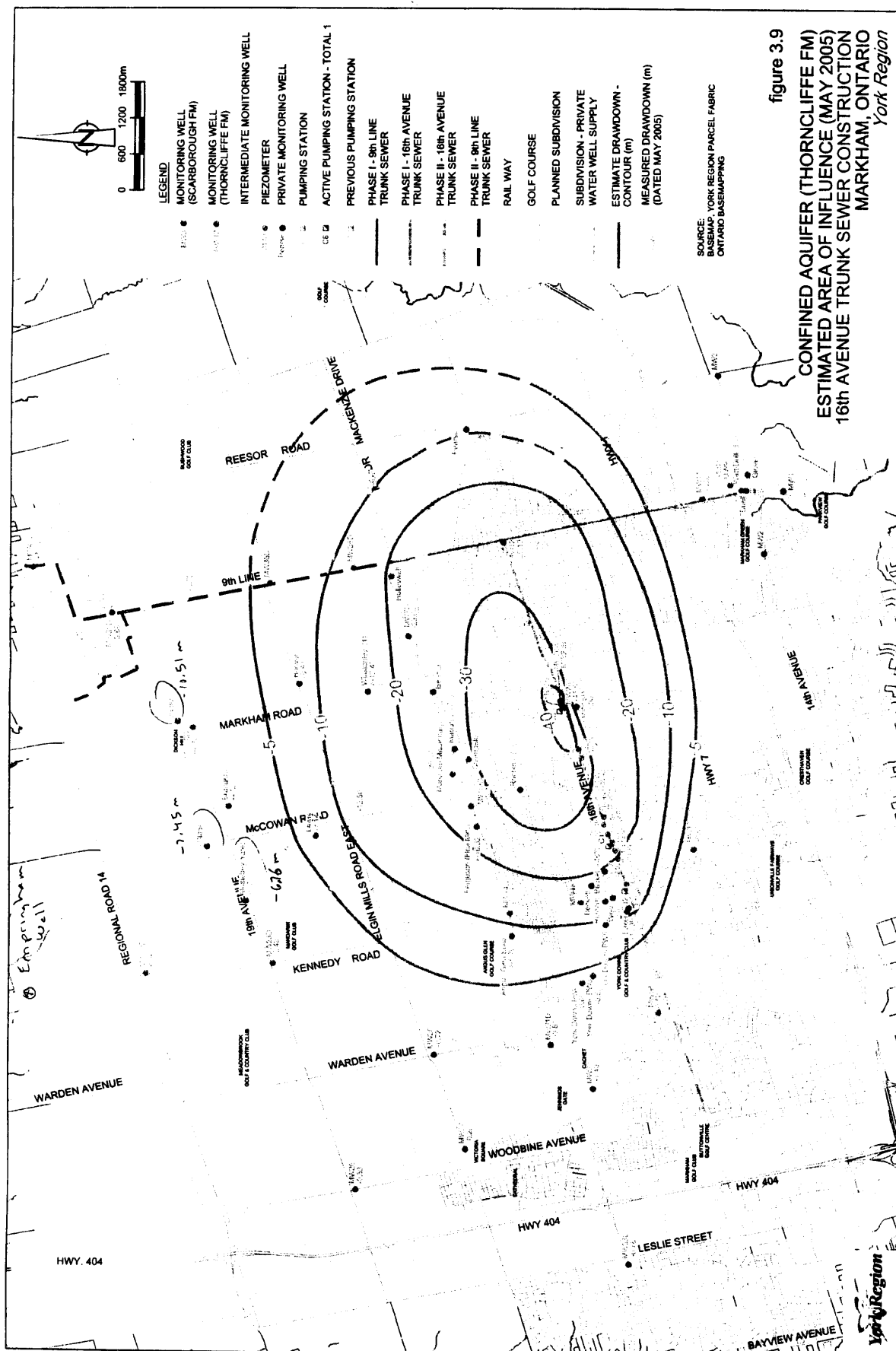
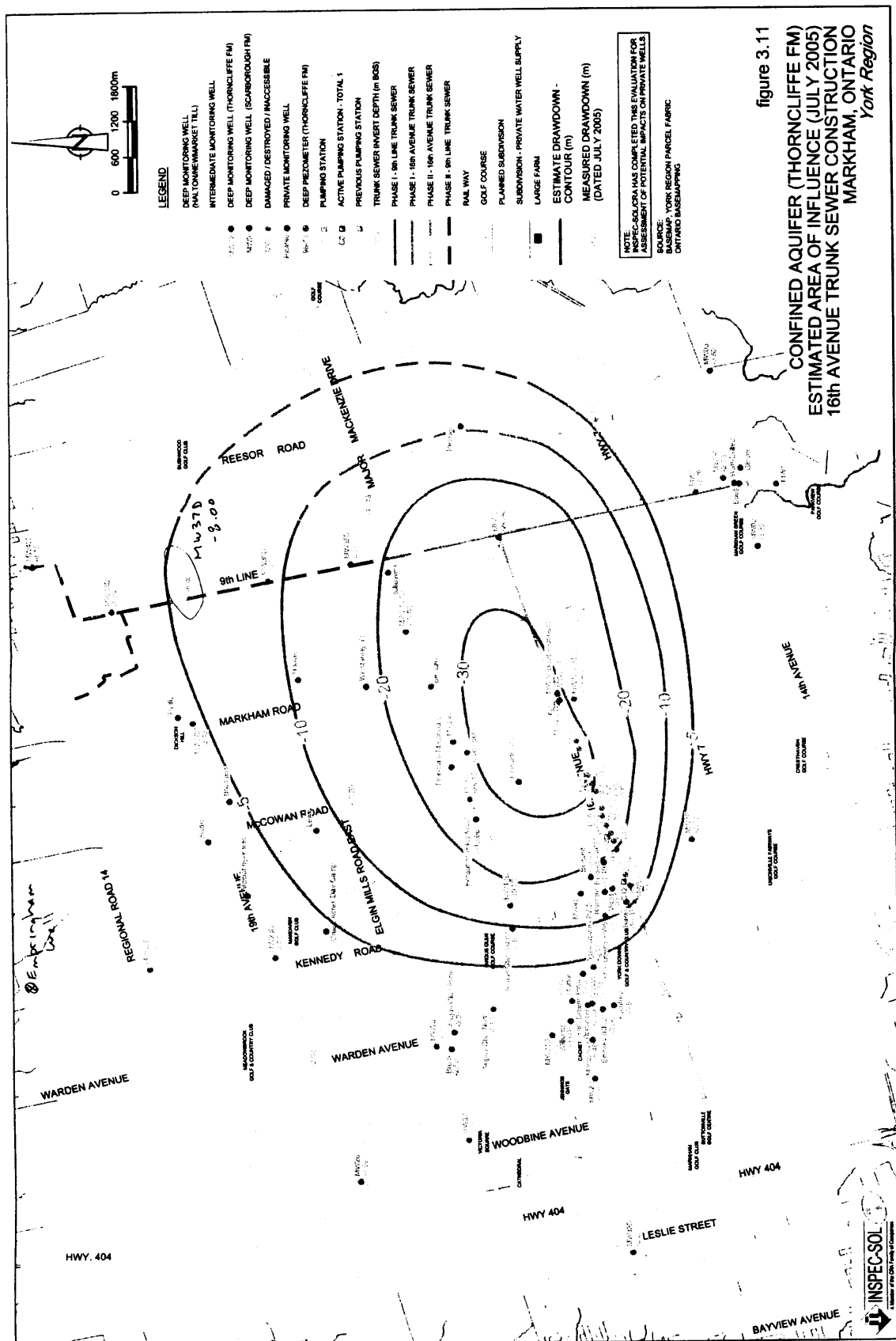
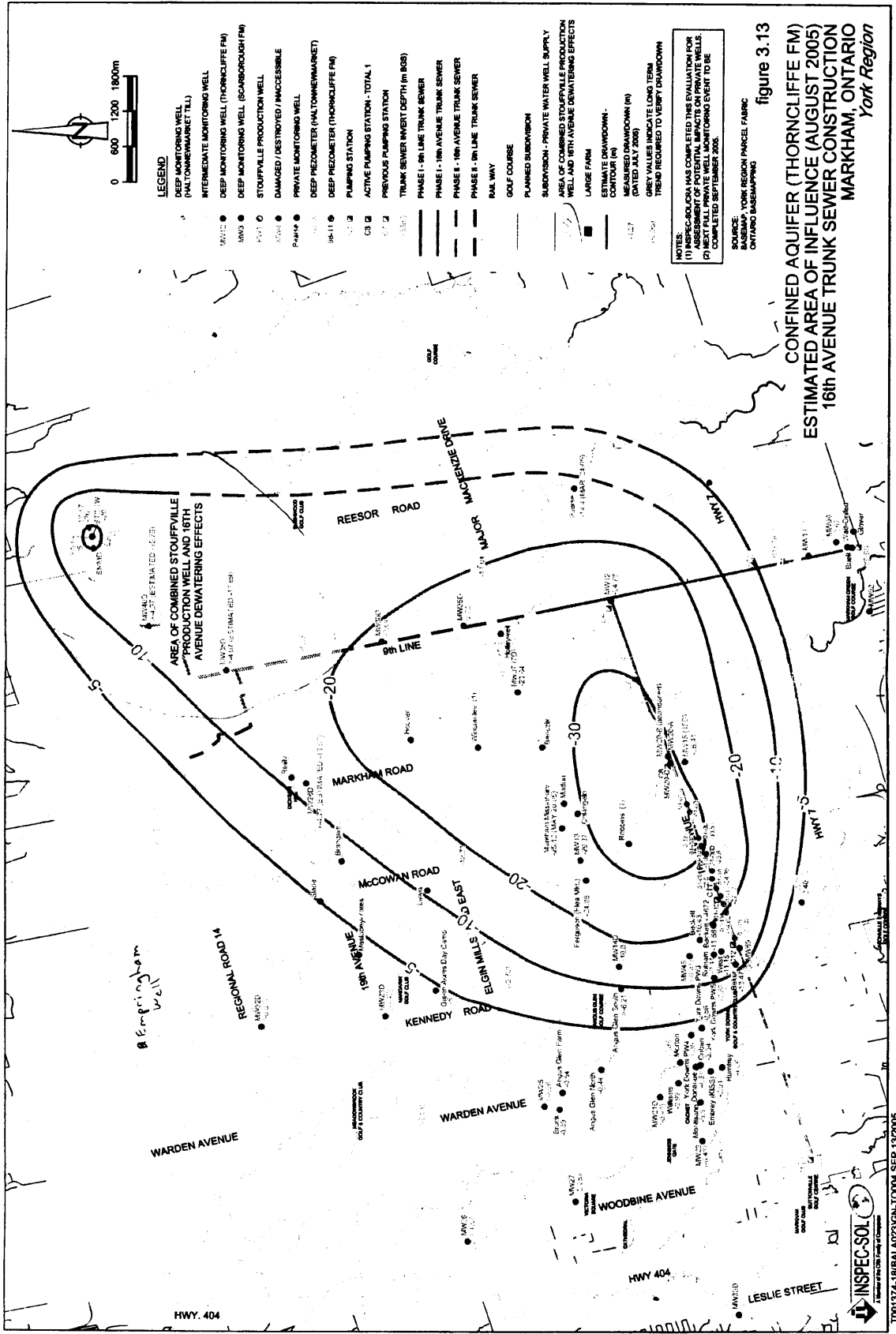


figure 3.9
 CONFINED AQUIFER (THORNCLIFFE FM)
 ESTIMATED AREA OF INFLUENCE (MAY 2005)
 16th AVENUE TRUNK SEWER CONSTRUCTION
 MARKHAM, ONTARIO
 York Region





T001374-18(BAJA023)GN-T0004 SEP-13/2005

