



Cross Bore Prevention A Canadian Utility Perspective

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Enbridge Gas Distribution Inc.

Paper C-1-02-1



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Enbridge Gas Distribution Inc.

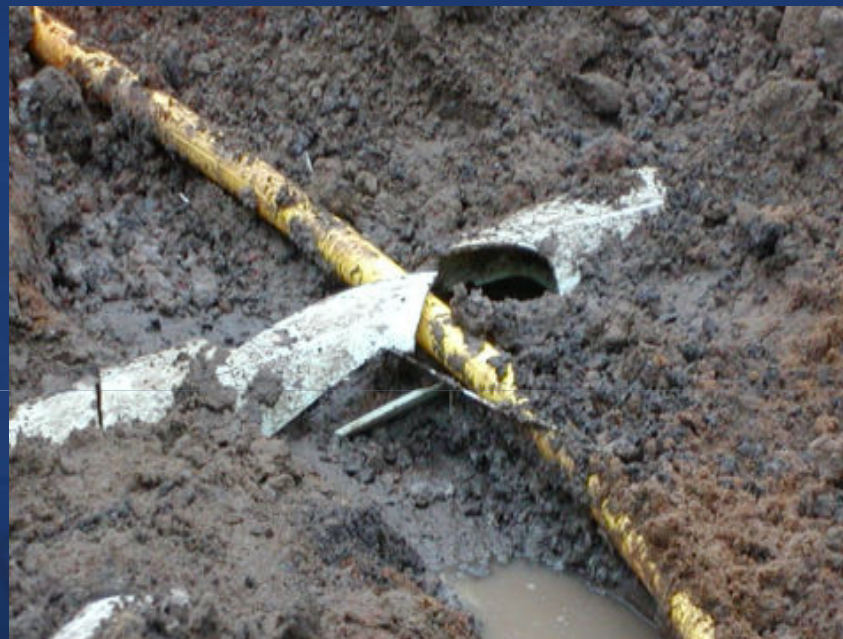
- Largest natural gas utility in Canada
- Longest-serving natural gas utility in Ontario with 162 years of history
- O/O +33,000km of transmission and distribution mains
- +1.9 million customers (+92% residential)
- Distribute about 420 BCF of natural gas per year
- Own about 97 BCF of underground gas storage facilities





Outline

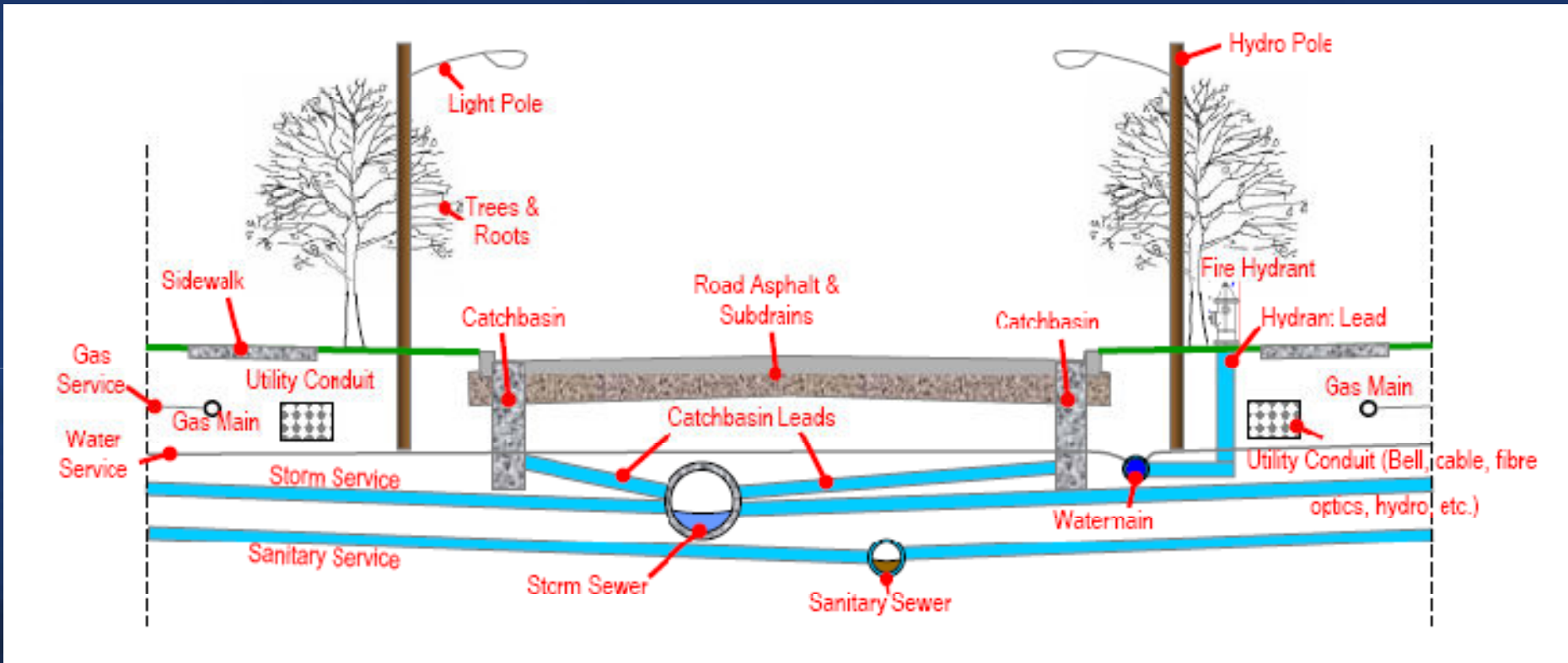
- Introduction
- Research Phase
- Construction Methods
- Cross Bore Investigations
- Awareness and Response Campaign
- Sewer Cleaning Equipment Testing
- Questions & Comments





Introduction:

What's underground? Is it where it should be?



For illustrative purposes only.
Configurations vary. Courtesy of City of
Toronto Water.





Introduction: Trenchless Technologies

- Trenchless technologies permit the installation of utilities without the need for open trenching
- Various utility owners use trenchless technologies for installation of underground facilities
- Various municipalities mandated the use of trenchless technologies for many underground utility installations
- Trenchless technologies reduce:
 - installation and restoration costs
 - disruption to traffic and properties
 - environmental impact
 - customer disruption and complaints





Affiliate's Incident

- St. Lawrence Gas
- Ogdensburg, New York
- May 2004



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Where do cross bores occur? Why?

Research Phase

- Main contributing causes of having shallow clearance between sewer laterals and gas utilities

Macro Factors

- Areas with a high water table *
- Areas surrounding identified lakes *
- Areas with low drift thickness cover *
- Known areas with shallow sewer mains
- Areas where the gas line is buried deeper than usual
- Localized elevation changes (Terraced properties)
- Homes with shallow or no basements

Micro Factors

- Privately owned sewer systems
- Mobile home communities *
- Sewer laterals that exit other than the basement floor





New Construction Procedures

Solution to New Construction Installations

Education

- Construction Crews
- TT Equipment Mfg.
- Government & Agencies

Investigation

- Pre-Inspections
- Sewer Locates

Installation

- Minimum Depth Bores
- Daylight Utilities
- Camera Inspection
- Open Trench





New Construction Procedures

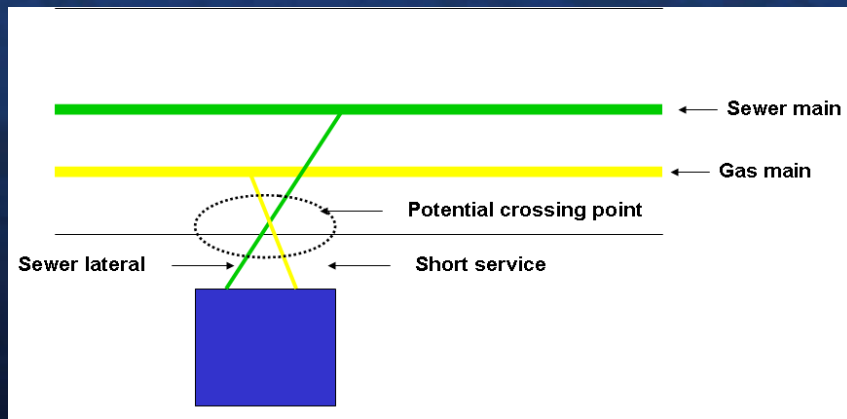
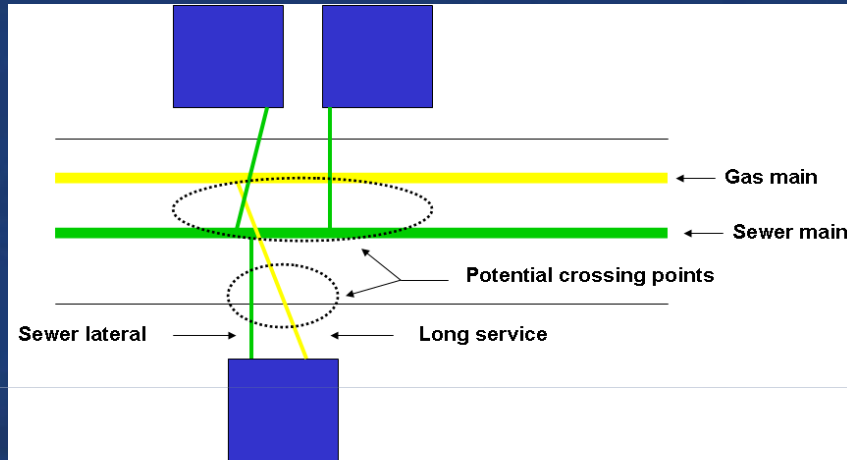
- Detailed field review of area to identify any of the main contributing factors showing a possible shallow sewer lateral.
- Municipal sewer lateral locate requested
- Private sewer lateral locates ordered



Note: Sample of one of the contributing causes



New Construction Procedures: Field Reviews – Service Line Installs

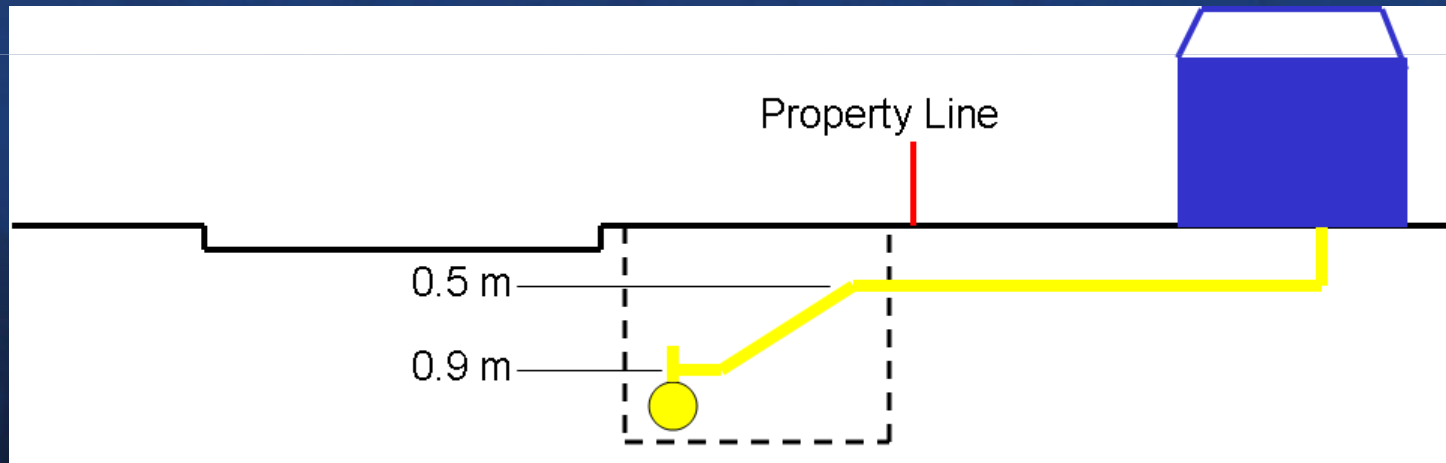


- Field reviews are set to take into consideration macro and micro factors of service install location
- Buildings on opposite side of installation address may also be at considerable risk.



New Construction Procedures: Service Only Installs

- Based on the field review if no sewer lateral locate is required because of absence of contributing factors. Service lines can be installed as long as transitioned to minimum depths.



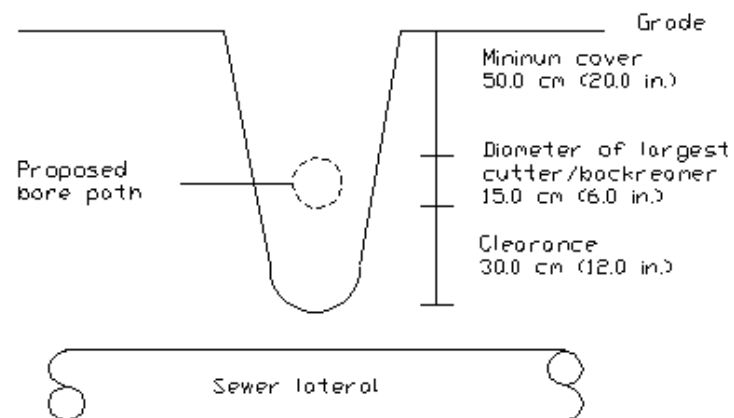


New Construction Procedures: Daylighting of Utility Crossing

- When gas line will be installed by trenchless technology and will be within 1 m (3.3 ft) of the sewer lateral in any direction. The bore path must be daylighted as illustrated.

Example Calculation of Excavation Depth (Service Installation Crossing the Sewer Lateral)

Minimum cover	= 50.0 cm (20.0 in.)
Diameter of cutter/backreamer	= 15.0 cm (6.0 in.)
Clearance factor	= <u>30.0 cm (12.0 in.)</u>
Total (minimum depth of daylight hole)	= 95.0 cm (38.0 in.)





Legacy Sewer Lateral Inspections



- Perform approximately 2000 sewer lateral investigations per year on addresses identified as having a high potential of having a cross bore





Where do cross bores occur? Why?

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Micro Factors

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- Mobile home communities *
- Sewer laterals that exit other than the basement floor





Susceptibility Assessment:

Available Factors, Evaluation and Susceptibility Calculation

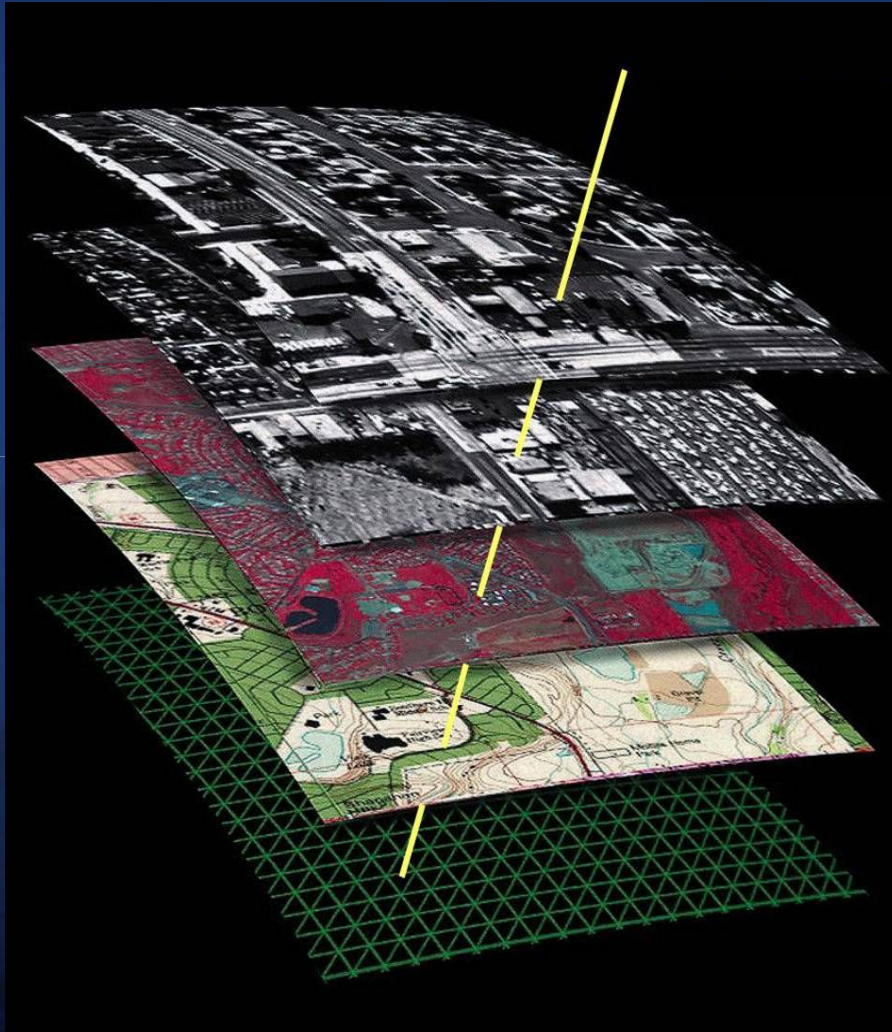
Available Factors (Data Source)	Evaluation Criterion
Elevation (Geo Surveys)	Slope Calculation (Requires site assessment)
Hydrology (Water Table)	Inverse Distance Weighted
Drift Thickness (NRCan)	Inverse Distance Weighted
Local Lake Effects (Geo Surveys)	Inverse Distance Weighted (within a 1 km buffer of identified lakes)
Mobile Home Communities (WWW)	Yes or No

- Factors were evaluated for each centroid and entered into a susceptibility equation to provide a risk number from 1 to 10





Integration of Data Sources



Post 1970 customer lot centroids

Susceptibility Score of available macro factors

All customer lot centroids

All building lot centroids

GIS spatial data

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Sewer Lateral Inspection Program: Susceptibility Assessment Validation

- CCTV inspections of 2000 sewer laterals, annually
 - Addresses prioritized by susceptibility assessment
 - Sample sizes statistically distributed
 - Sample addresses randomly selected
- Lateral from main method of inspection
 - Chose streets with a range of addresses incorporating all levels of risk scoring





Sewer Lateral Inspection Program: Enhancements

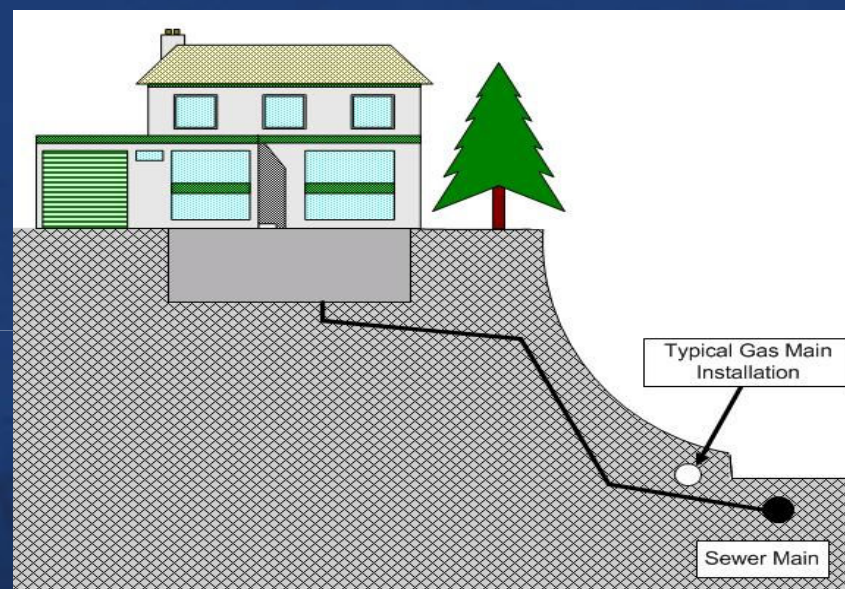
- Inclusion of new data sets in the susceptibility assessment to incorporate micro factors:
 - Municipal Property Assessors
 - Crawl spaces
 - Shallow basements
 - No basements
 - Use of sewer plan profiles (As-laid)s
 - Sewer and road elevations compared to treatment plant
- Increased resolution of the elevation data sets required
- Better targeting of high risk areas
- Increased SL contractor resources





Sewer Lateral Inspection Program: Susceptibility Assessment Validation Findings

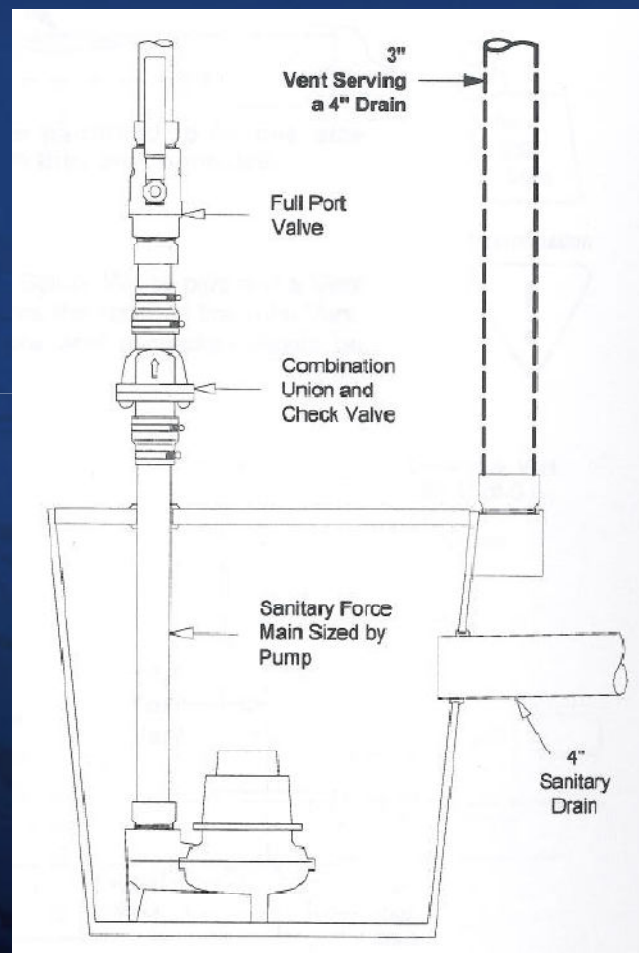
- Cross bores found
 - Gas utilities
 - Water utilities
- Micro factors can have a dominating effect over macro factors
- Susceptibility factors and calculation errors





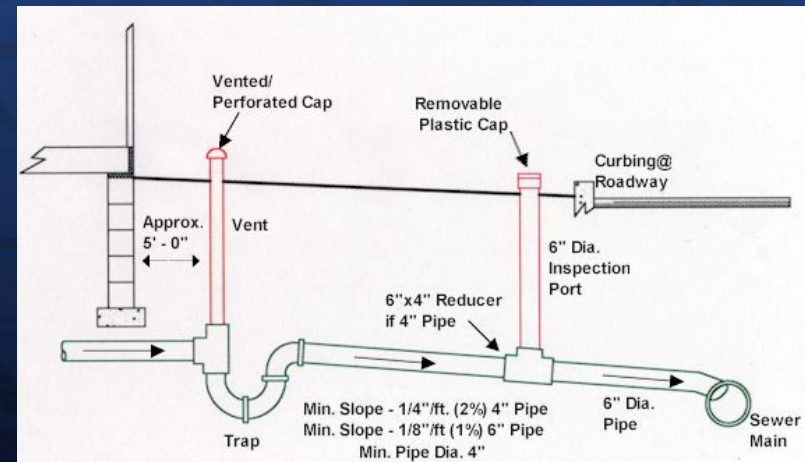
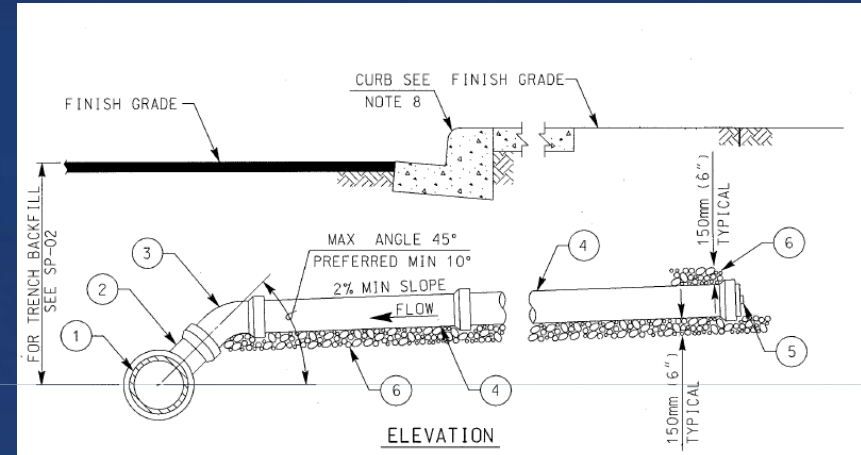
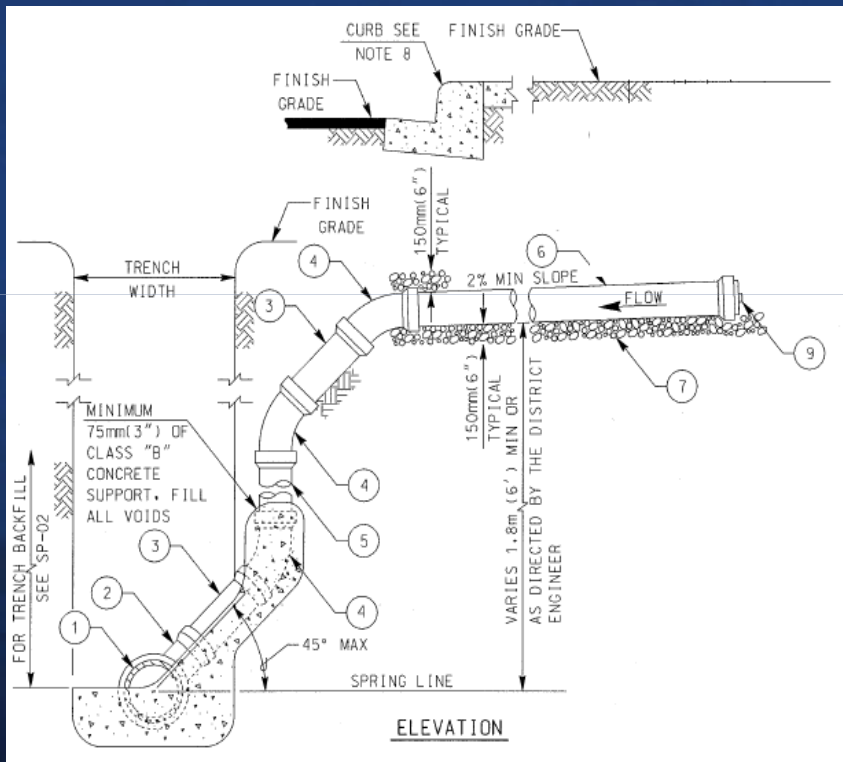
Sewer Lateral Inspection Program: Challenges

- Difficult customers / property owners
- Sewer contractor resources
- Access to municipal sewer mains and fire hydrants
- Locate equipment and sewer main size
- Sewage ejector/grinder pumps
- Sewer lateral blockages
- Sewer lateral piping configurations



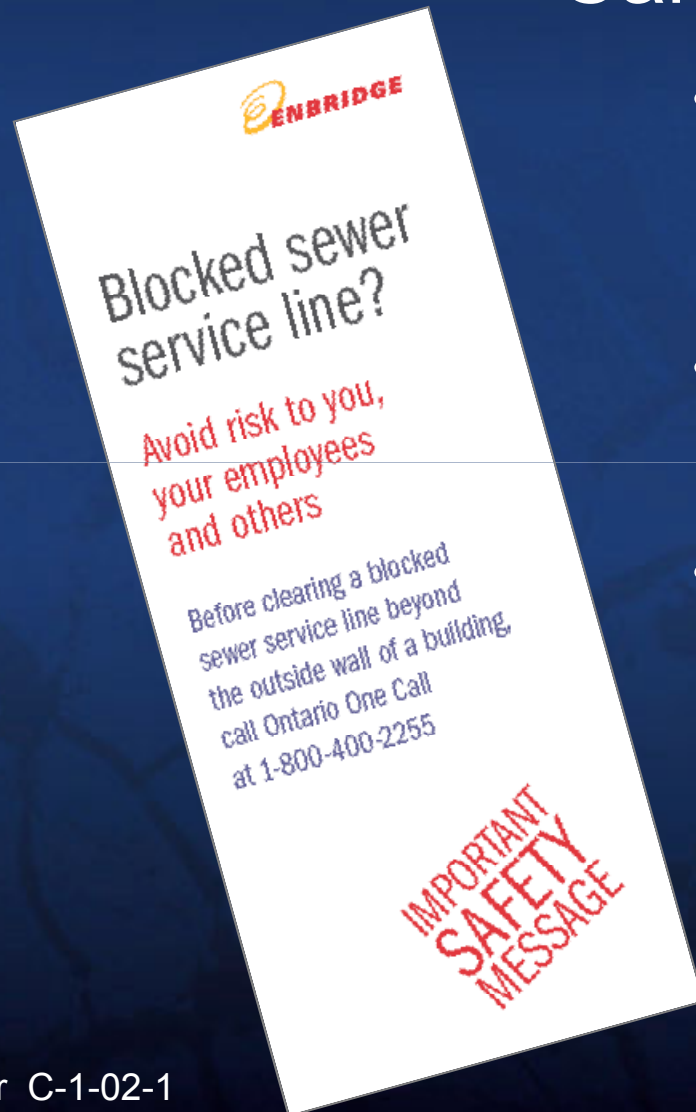


Types of Sewer Service Connections





Awareness and Response Campaign



- Enbridge Gas Distribution is launching a campaign to raise awareness about the potential safety issue.
- Started the roll out in Niagara Region and will move across our franchise within 2010.
- Campaign will be rolled out first with the plumbing community and municipal sewer operators then general public.





Awareness and Response Campaign

Calling for a NG Sewer Safety Inspection

- Before clearing a blocked sewer service line beyond the outside wall of a building, call Ontario One Call.

Ontario One Call 1-800-400-2255

- Available 24 hours a day, 7 days a week
- There is no charge for a Natural Gas Sewer Safety Inspection
- When you call you will need to provide the following information
 - Your contact information
 - Job site location (including nearest major intersection)
 - Will there be access to the inside of the building?
 - What time is preferred?
 - Do you require an onsite meeting?





Awareness and Response Campaign

Natural Gas Sewer Safety Inspection

What to expect during a natural gas sewer safety inspection.

- The EGD Representative will arrive onsite and identify themselves.
- They will perform a series of records checks to identify if building is a risk.
- If building has any risk associated to it, the EGD Representative will locate the gas lines and sewer service line. The sewer service line inspection may or may not include a video inspection.
- The EGD representative will provide the requestor a copy of the natural gas sewer safety inspection report with either an Inspection Passed or Danger Do Not Proceed sticker on the report.





Awareness and Response Campaign

Natural Gas Sewer Safety Inspection Report

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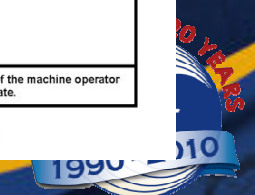
ABC LOCATE Co. Ltd.		Primary Locate Sheet NOT VALID FOR EXCAVATION* TO BE USED FOR SEWER LINE CLEARING ONLY			Request # 123456789
Tel: 416-123-4567	Fax: 416-123-4568	Toll Free: 1-800-123-4567	Email: g.smith@locates.com		
Utilities <input type="checkbox"/> Telecom <input checked="" type="checkbox"/> Gas <input type="checkbox"/> Hydro <input type="checkbox"/> Street Lighting Located <input type="checkbox"/> <input type="checkbox"/>	Revised Work Date (mm/dd/yyyy): 10/10/2009	Work Date (mm/dd/yyyy): 10/10/2009	Request Type Status <input type="checkbox"/> Homeowner <input checked="" type="checkbox"/> Contractor		
Requested By: John Doe	Company (if applicable): Plumber's Plumber	Tel: 416-145-2543	Fax/email: 416-133-3344		
Appt. Date(mm/dd/yyyy):	Received Date(mm/dd/yyyy): 10/10/2009	Locate Address: 234 Somewhere Street			
Type of Work: SEWER BLOCKAGE		City: Toronto			
Caller's Remarks: Clearing sewer blockage in sewer lateral.					
Telecom	Gas	Hydro	Street Lighting		
Mark <input type="checkbox"/> Clear <input type="checkbox"/>	Mark <input type="checkbox"/> Clear <input type="checkbox"/>	Mark <input type="checkbox"/> Clear <input type="checkbox"/>	Mark <input type="checkbox"/> Clear <input type="checkbox"/>	Mark <input type="checkbox"/> Clear <input type="checkbox"/>	Mark <input type="checkbox"/> Clear <input type="checkbox"/>
SEWER CLEARING WORK MUST NOT EXTEND OUTSIDE THE LOCATED AREA WITHOUT OBTAINING A FURTHER LOCATE					
Records Reference:		<input type="checkbox"/> Third Party Notification			
<input type="checkbox"/> Map	<input type="checkbox"/> Network X #				
<input type="checkbox"/> Byers	<input checked="" type="checkbox"/> Datapak				
Field Notes					
Other:		DPT Remarks:			
Method of Field Marking: <input checked="" type="checkbox"/> Paint <input type="checkbox"/> Stakes <input checked="" type="checkbox"/> Flags <input type="checkbox"/> Offset Flags <input type="checkbox"/> Other (Telecom=Orange, Gas=Yellow, Hydro=Red)					
Caution: Locates are VOID after 30 days. See Important Information on reverse side.					
Caution: Any changes to location or nature of work requires a new locate. Sewer clearing work must not extend outside the Located Area without a new locate. Privately owned services, including sewer service lines, within the located area have not been located - check with the service/property owner.					
For all Locate requests, including remarks, contact Ontario One Call at 1-800-400-2255 or www.on1call.com					
Locator Name: G. Smith	Start Time: 13:45	<input type="checkbox"/> Mark & Fax <input checked="" type="checkbox"/> Left on Site <input type="checkbox"/> Emailed			
ID #: 1234	End Time: 15:00	Located Received by: Print:			
Date (mm/dd/yyyy): 10/10/2009	Total Hours: 1.25	Signature:			
A copy of this Primary Locate Sheet and Auxiliary Locate Sheet(s) must be on site and in the hands of the machine operator during work operations. If sketch and markings do not coincide, the requestor must obtain a new locate.					

November 2009 Yellow – Office White – Requestor

Page 1 of 2

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Utilities <input type="checkbox"/> Telecom <input checked="" type="checkbox"/> Gas <input type="checkbox"/> Hydro <input type="checkbox"/> Street Lighting Located <input type="checkbox"/> <input type="checkbox"/>	Revised Work Date (mm/dd/yyyy): 10/10/2009	Work Date (mm/dd/yyyy): 10/10/2009	Request Type Status <input type="checkbox"/> Homeowner <input checked="" type="checkbox"/> Contractor		
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Findings from Initial Program Roll-out

- Participation higher than anticipated and higher than original Ontario One-Call Program. This is probably due to the large focus on health and safety of the worker.
- Highly competitive nature of sewer drain cleaning, is causing private companies to use a “wait and see” approach.
- Municipalities are eager to assist and derive solutions to eliminate hazards.





Awareness & Response Campaign

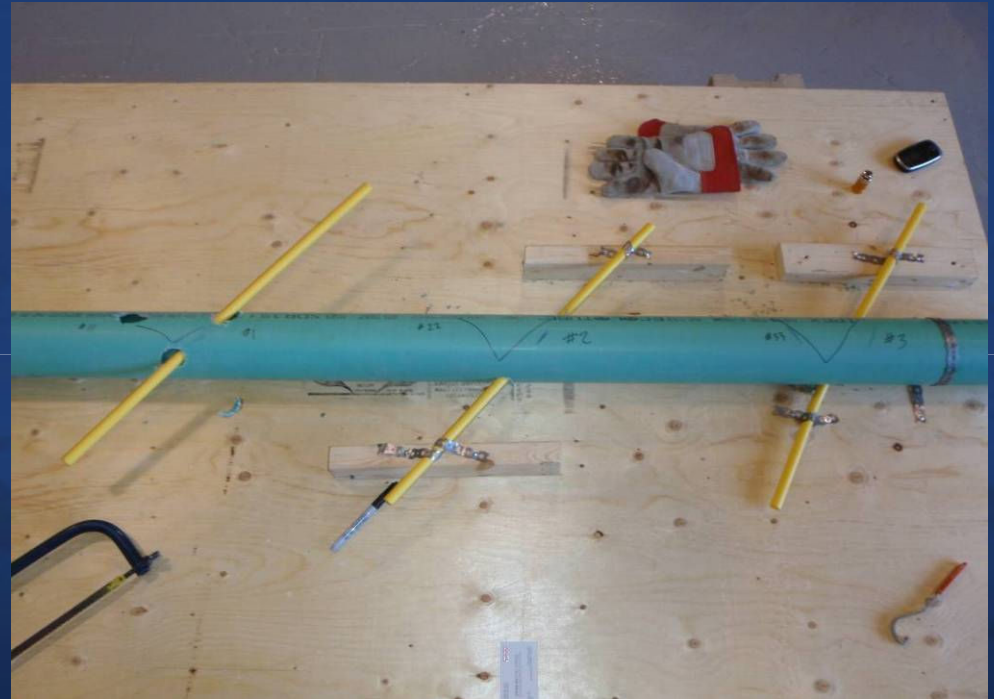
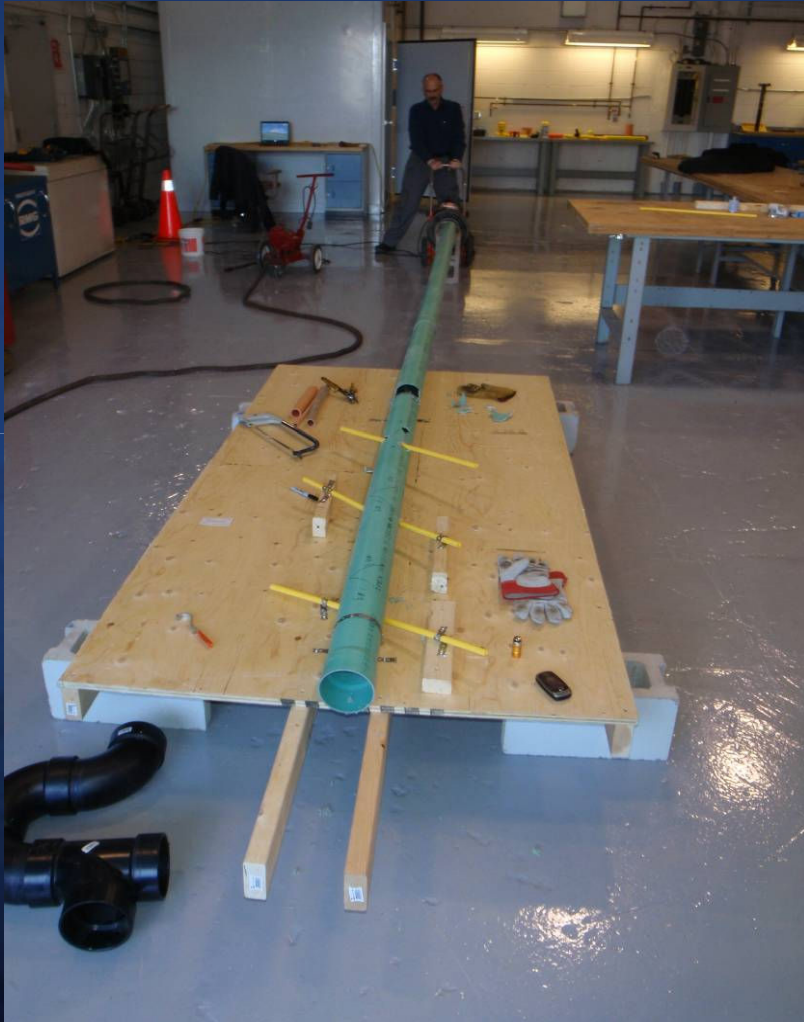
Next Steps

- Testing of sewer clearing equipment, to determine safe clearing equipment or methods
- Development of standard maintenance procedures with municipalities that can be used to safely clear blocked sewer laterals
- Electronic clearing of areas vis-à-vis:
 - Date comparison of last video inspection to gas work
 - Date of install of NG lines
 - Joint trench installations





Sewer Cleaning Equipment Testing Testing Rig



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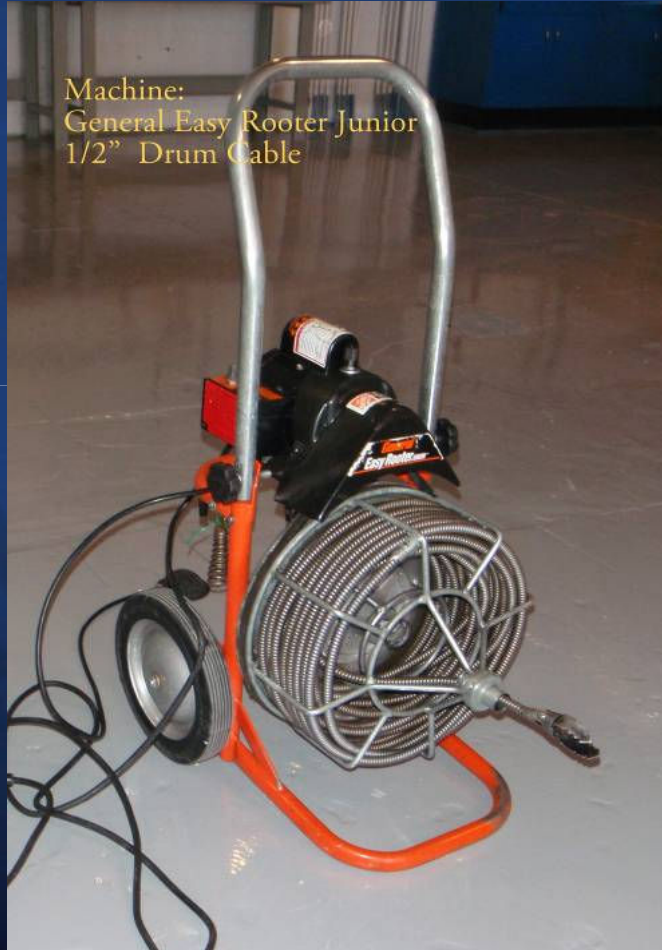


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Sewer Cleaning Equipment Testing

General Easy Rooter Junior





Sewer Cleaning Equipment Testing

Electric Eel Model B





Sewer Cleaning Equipment Testing

Electric Eel Model B – 10 Min. Test

- Equipment representative of that used by municipal/commercial operators
- Spear head tool attached
- 1 Cycle in and out
- 10 minute duration





Sewer Cleaning Equipment Testing

Electric Eel Model B – Destructive Test

- 3” Rotary Hole Blade
- Typical commercial equipment used to clear tree roots from sewer service lateral
- 5 sec duration





Sewer Cleaning Equipment Testing Electric Eel Model B – Destructive Test



Machine:
Electric Eel Model B
1-1/4" Sectional Cable

Cutter:
3in. Rotary Saw Blade

Duration:
Less than 5 seconds





Questions & Comments

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