Sum Sue Report

Date: May 30, 2023 **MIL Project Number: 2023-12310**

Subject: Subsurface Utility Mapping Project for 1970 Fowler Drive, Mississauga

Dear: Starlight Developments

Enclosed please find an electronic copy of **Mark It Locates Inc** reports describing the above referenced project, including our objectives, survey procedures and methodologies, discussion of findings alone with conclusions and recommendations. All drawings associated with this project have already been delivered on a monthly basis during the course of the project. The enclosed report includes our draft drawings.

We are providing this document to supply Starlight Developments with an understanding of our process and documentation of our findings.

We are proud to have been selected by Starlight Developments to complete this assignment and trust that the information contained herein provides you with comprehensive understanding of how **Mark It Locates Inc** came to delivery of the final drawings.

Mark It Locates Inc

Sherwin Isaac
Director of Operations

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Executive Summary

Mark It Locates Inc was retained by Starlight Developments under Starlight Developments to complete a Subsurface Utility Mapping project.

The Project was part of a study for design, for 1970 Fowler Drive, Mississauga outfall project and provided a survey of current subsurface infrastructure/utility services within the project area.

The subsurface utility engineering (SUE) process as defined in ASCE CI 38-02 was followed to identify the features in this investigation. A SUE investigation at quality level D (QL-D) included records research, review and collation of all secured maps of underground infrastructure. A quality level B (QL-B) investigation was completed and the inferred position of tonable utilities were designated, accurately captured and plotted. Formal definitions of quality levels are provided in section 2.

Interpretation of all the data, resolution of discrepancies and data presentation were completed by exercising professional judgement to correlate the data from different sources and to resolve conflicting information.

The final interpreted composite utility drawings were prepared as drawing files.

The SUE survey completed by **Mark It Locates Inc** has resulted in a documented understanding of the tonable utility ownership, a detailed survey of existing surface infrastructure and the inferred spatial position of all tonable underground utilities targeted by this investigation.

1. Objective

The objective of the SUE investigation was to map horizontal locations of all tonable utilities in the requested work area. Tonable utilities are defined as those where electromagnetic radio detection can be used for their detection. Untonable utilities cannot be detected using radio detection techniques. More details are provided in section 2.2. Results of the SUE investigation were then compared with available utility records to find positional or other discrepancies.

2. Scope of Work

Two levels of SUE investigation were accomplished as followed:

2.1 SUE Quality Level D (QL-D) – Records Search

The SUE QL-D investigation consisted of a records search, review and collation of all obtainable maps of underground infrastructure. **Mark It Locates Inc** engaged utilities, municipalities and other sources to obtain available records applicable to the scope of work.

A list of all utility owners contacted is as follows:

- Bell
- Enbridge Gas
- Rogers
- Hydro
- Water
- Storm and Sanitary sewer

2.2 SUE Quality Level B (QL-B) – Subsurface Site Survey

The SUE QL-B survey consisted of geophysical site investigation utilizing conventional utility locating equipment to verify the actual (field) horizontal location of the locatable underground utilities. Technical details of the field investigation, which was preformed from Date (05/10/2023) to Date (05/17/2023), as well as issues encountered when accessing utilities, are detailed in the following sections.

2.1.1 Technical Details of Level B Investigation

Radio-detection RD7000 equipment was used for the level B investigation of tonable utilities. The equipment is an electromagnetic induction tool consisting of a transmitter and receiver unit and accessory attachments for various types of applications. The system operates at fixed radio frequencies that can be varied to suit a variety of utility locating applications.

The RD7000 transmitter can generate radio frequency signals on the target utilities in three different modes. The first and most effective mode consists of attaching a signal lead from the transmitter to a piece of exposed metallic utility hardware such as a valve, hydrant or grounded metallic covers around electrical/communications panels. A grounding cable attached to the transmitter is connected to a suitable ground point, a distance away from the transmitter and when the transmitter is energized, an electrical circuit is formed with current flowing into the target utility and returning back to the ground point. The flow of electricity generates an induced magnetic field that propagates along the target conductor (metallic utility) and the signal propagation is a function of electromagnetic properties of the electrical circuit.

The second mode utilizes an induction clamp which is a loop of 10 centimeter diameter allowing the user to apply a discrete signal, without direct electrical connections. The third mode is “induction sweeping”, which is used when no physical access to the target utility is possible. The transmitter is simply places over the anticipated location of a target utility. The magnetic field generated by the transmitter passes into the ground and interacts with the buried utility. By electromagnetic induction, a secondary induced magnetic field is generated by the target utility which is then detected by the receiver unit.

The mobile receiver is subsequently tuned to the same frequency as that for the transmitter and the SUE technician ‘sweeps’ the receiver until the maximum signal amplitude of the achieved. At the location of inferred maximum signal can be assumed that the receiver is directly above the target utility. A series of quality-control checks are routinely preformed to ensure that the target utility is being ‘located’ including “peak-null” and current measurement checks. The receiver can also be tuned to ambient magnetic fields generated around live electrical cabling (60 Hertz “power mode”) or fields created by interactions with long range very low frequency (VLF) radio sources (“radio mode”).

The Radio-detection RD7000 equipment can accurately locate the inferred spatial positions of most metallic utilities such as plastic pipes, drain tiles, concrete sewers or vitreous clay pipe are identified using tracer wires (where available) attached to these utilities. Non-metallic utilities without tracer wires cannot be locates using Radio-detection RD7000 equipment (i.e. they are non tonable)

There are still limitations to identification of tonable utilities. Sources of the limitations are listed as follows:

- Electromagnetic interference of the device with the other electronic devices.
- Extremely deep location of utility.
- Lack of access to utilities tracer wire or tracer wire failure.

The actual position of each utility inferred from the provided maps, as well as utility records within **Mark It Locates Inc** possession was confirmed within the work area.

The inferred utility positions were marked with spray paint and/or flags on the ground surface and locations of the marks were then captured using survey grade GPS measurements. The horizontal measurements were referenced relative to MTM coordinate system, Zone 17 NAD83 (CSRS). Measurements were then positioned on the topographic base plan map provided by Starlight Developments.

2.1.2 Accessing the Utilities

A description of challenges encountered while accessing the utilities is explained:

- **Bell:** Bell utility accessible from their cabinet can be easily accessed and hooked with the Radio-detection RD7000 equipment. The main issue when accessing Bell utility is when multiple structures with breakout branch from one manhole are present. In this case, the technician needs to get into the manhole to access the utility at its source. This situation demands a confined space entry permit.
- **Hydro:** Hydro utility accessible through transformer can easily accessed and hooked with the Radio-detection RD7000 equipment. In circumstances where the utility is only accessible through manhole, confined space entry and permit are required.
- **Sewer:** Sewer utility seldom has tracer wires and so the Sonding method is used to locate the utility up to a depth of about 6 meters. The deeper the utility is, the higher the error will be in finding its location. This is due to diverging effect of magnetic field emitted by the Sonde as the field reaches the ground surface.
- **Optical Fiber:** Optical fiber with metal sheath could easily traced most of the time. In absence of metal sheath, the utilities tracer wire (where available) was used to find the utility.
- **Gas:** Discrepancy between as-built drawing and topographic map data can be an issue when locating gas utility. Moreover, lack of access to utility valves can impede the locate process.

- **Water:** Corrosion of cast iron/steel water pipe could be an issue for locating the utility as corrosion reduces conductivity of the metal, making the magnetic field emitted by the utility weak to be detected by Radio-detection RD7000. The corrosion is not an issue for plastic water pipe with tracer wire attached.
  It is worth mentioning that accuracy of utility detection using tracer wire is highly dependent on proximity of tracer wire to the utility itself.

3. Results

Results of the QL-B and QL-D investigations for the project along with additional work on 1970 Fowler Drive, Mississauga are shown in the form of CAD drawings.

Interpretation of the data, resolution of discrepancies and final presentation was completed and based on our professional judgement and recommendations are provided in section 6. The final interpreted composite utility drawings were prepared as electronic drawing files.

Where QL-B data were unavailable, QL-D data (where available) were used to fill the information gap in the composite drawings.

4. Issues

Encounter issues during field execution and data interpretation phases of SUE project are described herein:

4.1 Inconsistency Between QL-B and QL-D Data

Summary of spatial discrepancies of more than 2 meters between QL-B and QL-D investigation results for phases 1 and 2 of the project are shown on Table 1.

Table 1: List of Position Discrepancies between QL-B and QL-D Results for Phase 1

Utility	Location/Intersection	Surface	Comment
Sanitary line	Running through property	Grass	Easement, Manholes were bolted shut so no access. Line was put on CAD from QL-D Maps

4.2 QL-B Issues

As mentioned in section 3, tracing of utilities at certain areas were not possible. These areas, along with names of utilities which were not detected, are listed in Table 3. A QL-A investigation (Hydro Vacuuming Excavation) is recommended at these areas in order to obtain utility data.

Table 2: List of Utilities Not Detected During QL-B Investigation

Utility	Location/Intersection	Comment
Storm CB #3		Full of debris, could not get invert information → Must Flush
Storm CB #4		Full of water and debris, could not get invert information → Must Flush
Storm CB #5		No Hinges, could not open lid to get information.
Storm CB #6		No Hinges, could not open lid to get information.
Storm CB #7		No Hinges, could not open lid to get information.
MH #11		Bolted Shut, could not open lid to get information.
MH #12		Bolted Shut, could not open lid to get information.
MH #13		Bolted Shut, could not open lid to get information.
Sanitary	On the property	No manholes or access to locate sanitary lines to building

5. Conclusions

The following conclusions can be drawn from the information provided to Starlight Developments as part of this study:

1. This SUE investigation report described how **Mark It Locates Inc** applied the ASCE CI 38-02 guideline to establish composite utility maps within the survey area. The application of this guideline, along with the documented field notes and procedures, forms the full QL-B survey process.
2. The actual horizontal positions of the tonable utilities were determined according to SUE QL-B and are generally understood to be more accurate than the existing facility owners' drawings.
3. Due to electromagnetic interference with our utility detection devices and/or extreme depth of some utilities, QL-B investigation at certain areas was not successful as listed in Table 3.

6. Recommendations

The following is recommended to further clarify the findings of the SUE investigation:

1. In order to ascertain the extent of potential utility conflicts identified through the findings reported, it is recommended that a quality Level A (QL-A) SUE investigation (Hydro Vacuuming Excavation) be conducted to expose any potentially conflicting utility and measure its accurate location.