

Vibration Monitoring Plan for Remedial Action at the Former Geneva Foundry Site Geneva, New York

Site Number C835027A

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Prepared for:

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Introduction

This Vibration Monitoring Plan (VMP) for remedial action at the Former Geneva Foundry site provides for real-time monitoring of vibration during remedial construction (excavation and backfill). Remedial activities are being performed at residential and commercial property parcels affected by air deposition of lead and arsenic associated with past discharges from the Geneva Foundry in the city of Geneva, Ontario County, New York. The remedial action is being implemented in accordance with the requirements of the Record of Decision (ROD)¹ and includes removal of contaminated soils, which is expected to include excavations ranging from 6 inches (in.) to up to 36 in. below the existing ground surface.

Parcels consist primarily of residential homes and garage structures, asphalt and/or concrete driveways, sidewalks, lawn areas, trees, sheds, and gardens or landscaped areas. Residences are primarily 1- to 2-story, conventionally-framed wood structures with full basements of varying heights, constructed approximately from the early 19th century through the end of the 20th century. Typical basement/foundation walls for older structures are rubble stone masonry construction. Newer structures have concrete or masonry foundation walls. Larger commercial structures are typically slab-on-grade with footers. Where present, typical basement construction consists of concrete slab on grade with rubble stone foundation walls, estimated to range from 16 to 20 in. thick, or concrete/masonry foundation walls, estimated to range from 8 to 12 in thick. Some excavations are expected to occur immediately adjacent to structures, including houses and garages. Following excavation, backfill of the excavated areas is to be completed as quickly as possible.

Typical equipment expected to be used during excavation and backfill includes:

- 35,000-pound rubber tire or track excavator (Cat 314 or similar) with grading bucket;
- 2-cubic yard (cy) front end loader (Cat 935 or similar);
- Mini excavator;
- Track skid steer;
- 5 cy dump trailers (towed by pickup truck);
- Compaction roller (±40-inch-width); and
- Reversible plate tamper.

Vibration Monitoring

Vibration monitoring will be conducted using InstanTel Micromate vibration monitoring units (VMUs). The product information for the Micromate is included in Attachment 1. Four units will be used at each property for the duration of excavation and backfill activities. VMUs will be set up daily prior to the start of the day's construction activities. The locations of the VMUs will depend on daily activities, primarily related to the proximity of active construction activities to structures, and will vary accordingly. EEPC personnel will review

¹ New York State Department of Environmental Conservation, January 2017, "Former Geneva Foundry Site, Environmental Restoration Project, Operable Units 1,2 and 3, Geneva (C), Ontario County, Site No. B00019", prepared by the Division of Environmental Remediation, Albany, NY.

the data recorded and document the remediation activities occurring as well as the general location of activities in relation to the VMUs. The daily data reports will include a histogram with the period and details of vibration levels (peak particle velocity [PPV] in inches per second [in/sec]) and a plotted chart of PPV versus frequency (in Hertz [Hz]). The chart will include threshold criteria based on the United States Bureau of Mines (USBM) frequency-based vibration limits published in Report of Investigations (RI) No. 8507. A chart illustrating RI No. 8507 – Alternative Blasting Level Criteria is provided as Attachment 2.

In general, one VMU will be located adjacent to the structure on the subject property between the active work area and the structure. Two of the units will be located near the two nearest neighboring structures, between the active work area and the neighboring structures. One VMU may be installed along a trucking route away from the excavation area, or used to monitor an additional structure near the active work area, if needed. The locations of the VMUs may vary throughout the day as the active work area changes. Set up of the VMUs will be determined on-site to prevent outside interference/disturbance. A report for each property will be prepared summarizing the levels of the vibrations, the daily construction activities, any incidents at which the vibrations exceeded the recommended levels, and any unusual occurrences. The location of each unit will be documented daily and summarized in each Daily Observation Report.

Construction vibrations are of three different types: (1) transient or impact vibration; (2) steady-state or continuous; and (3) pseudo-steady-state vibrations². Examples of transient construction vibrations are those that occur from demolition and wrecking balls. Steady-state vibrations may be generated by vibratory pile drivers and compressors. Examples of pseudo-steady-state vibrations are those that occur from jackhammers, pavement breakers, trucks, bulldozers, and cranes.

Vibration limits will follow USBM criteria. The “Z-curve” or “Siskind curve” is the information most often cited, which was published in 1980 and based on an extensive study conducted in 1970. The graph shows the limits recommended by the USBM to preclude cosmetic damage to plaster and drywall, the most fragile building materials, when comparing ground velocity with its associated frequency. If the vibration limits do not exceed the curve, damage is not likely, based on the USBM studies. The criterion curve set forth by USBM is included in Attachment 2.

The USBM criteria range from about 0.2 in/sec at a frequency of 1 Hz to 2.0 in/sec at frequencies greater than 30 Hz. To be conservative, if consistent vibration levels are observed higher than the 0.2 in/sec, EEEPC will request that the remedial contractor halt construction activities and identify the source of the vibration. If remedial activities appear to be the cause of the high vibration levels, EEEPC will consult with the remedial contractor on control of ground vibrations before remedial operations resume.

² Wiss, John F. 1981. “Construction Vibrations: State-of-the-Art.” *Journal of the Geotechnical Engineering Division, Proceedings of the American Society of Civil Engineers*. Vol. 107, No. GT2: 167-181.

Minimate Plus™

Advanced Vibration and Overpressure Monitor

Range of Applications:

- Blast-monitoring for compliance
- Near-field blast analysis
- Pile driving
- Construction activity
- Demolition activity
- Heavy Transportation
- Bridge monitoring
- Structural analysis
- Underwater blast monitoring
- 4 or 8 channel data acquisition
- Remote monitoring - Auto Call Home™
- Structural monitoring - Flex™

When we asked what you wanted in a vibration monitor, you said “Everything.” So, we designed the **Instantel® Minimate Plus™** vibration and overpressure monitor. Ever since, it has become a favourite of contractors, consultants, engineers and blasters, because it offers unrivalled features and versatility in a rugged and easy-to-use package.

Versatile

Use the **Minimate Plus** monitor with an **Instantel Standard Triaxial Geophone** (ISEE or DIN version) and an overpressure microphone (Linear or A Weight) to provide a rugged, reliable compliance monitoring system. Add the **Instantel 8-Channel** option and a single monitor may be used with two triaxial geophones and two microphones.

For more demanding monitoring applications, the **Instantel Blastware® Advanced Module** software provides the capability to monitor a broad selection of vibration and overpressure sensors, as well as sensors for structural and environmental measurements. Monitor vibration, ambient environmental conditions, and the movement of structural cracks, all at the same time, all using the same **Minimate Plus** monitor.

Intelligent

For remote installations, the **Instantel Auto Call Home™** feature will automatically transfer event files from field to office as they are recorded using a variety of wired or wireless modems. From there, the **Blastware Mail** feature of the **Blastware** software automatically distributes files or summary information to multiple e-mail or text messaging addresses.

Easy to use

Even with all of these features, the **Minimate Plus** system is still easy for anyone to use. A high-contrast LCD, eight-key tactile keypad, coupled with simple menu-driven operations, provides complete control and confidence.

Minimate Plus - everything you need and more.



Key Features

- **Instantel Histogram Combo™** mode allows capture of full waveform records while recording in histogram mode.
- **Auto Call Home** feature automates remote monitoring applications.
- Sample rates from 1,024 to 16,000 S/s, per channel with up to 65,000 S/s available on a single channel.
- Available **Instantel 8-channel** option allows for two standard geophones and two microphones to be operated from one **Minimate Plus** monitor.
- Non-volatile memory with standard 300-event storage capacity (optional 1,500-event capacity).
- Records waveform events up to 100 seconds long with standard setup, or up to 500 seconds with advanced setup.
- Continuous monitoring means zero dead time, even while the unit is processing.
- Any channel can be matched to a wide variety of sensors - geophones, accelerometers, or hydrophones.

Minimate Plus™

General Specifications

Minimate Plus

Channels	Microphone and Triaxial Geophone or 4 independent user-configurable channels (two Microphones and two Triaxial Geophones or 8 independent channels with optional 8-channel upgrade)
Vibration Monitoring (with Standard Triaxial Geophone)	
Range	Up to 254 mm/s (10 in/s)
Resolution	0.127 mm/s (0.005 in/s) or 0.0159 mm/s (0.000625 in/s) with built-in preamp
Accuracy (ISEE / DIN)	+/- 5% or 0.5 mm/s (0.02 in/s), whichever is larger, between 4 and 125 Hz / DIN 45669-1 standard
Transducer Density	2.13 g/cc (133 lbs/ft ³)
Frequency Range (ISEE / DIN)	2 to 250 Hz, within zero to -3 dB of an ideal flat response / 1 to 315 Hz
Maximum Cable Length (ISEE / DIN)	75 m (250 ft) / 1,000 m (3,280 ft)
Air Overpressure Monitoring	
Weighting Scales	Linear or A-weight
Linear Range	88 to 148 dB (500 Pa (0.072 PSI) Peak)
Linear Resolution	0.25 Pa (0.0000363 PSI)
Linear Accuracy	+/- 10% or +/- 1 dB, whichever is larger, between 4 and 125 Hz
Linear Frequency Response	2 to 250 Hz between -3 dB roll off points
A-weight Range	50 to 110 dBA
A-weight Resolution	0.1 dBA

Waveform Recording

Record Modes	Manual, Single-shot, Continuous
Seismic Trigger	0.125 to 254 mm/s (0.005 to 10 in/s)
Acoustic Triggers	
Linear	100 to 148 dB
A-weight	55 to 110 dBA
Sample Rate	1,024 to 16,384 S/s per channel (independent of record time), up to 65,536 S/s in single-channel mode with advanced software (max 8,192 S/s per channel for 8 channels)
Record Stop Mode	Fixed record time, Instantel® AutoRecord™ record stop mode
Record Time	1 to 100 seconds (programmable in one-second steps) or 500 seconds plus 0.25 seconds pre-trigger
AutoRecord Time	Auto window programmable from 1 to 9 seconds, plus a 0.25 second pre-trigger. Event is recorded until activity remains below trigger level for duration of auto window, or until available memory is filled. Recording uninterrupted by event processing - no dead time
Cycle Time	
Storage Capacity	
Full Waveform Events	300 one-second events at 1,024 S/s sample rate (1,500 event capacity with optional memory upgrade)
Event Summaries	1,750 (8,750 event capacity with optional memory upgrade)

Histogram Recording

Record Modes	Histogram and Instantel Histogram Combo™ (monitor captures triggered waveforms while recording in Histogram mode)
Recording Interval	2, 5 or 15 seconds; 1, 5 or 15 minutes
Storage Capacity	46,656 intervals - 3 days at 5-second intervals or 102 days at 15-minute intervals (with memory upgrade - 15 days at 5-second intervals or 540 days at 15-minute intervals)

Physical Specifications

Dimensions	81 x 91 x 160 mm (3.2 x 3.6 x 6.3 in)
Weight	1.4 kg (3 lbs)
Battery	Rechargeable 6 V sealed gel cell - capacity for 210 hours of continuous monitoring
User Interface	8-key keypad with domed tactile keys
Display	4-line x 20-character, high-contrast, backlit LCD
PC Interface	RS-232
Auxiliary Inputs and Outputs	External Trigger, Remote Alarm, coordinate download from GPS
Environmental	
LCD Operating Temperature	-10 to 50°C (14 to 122°F)
Electronics Operating Temperature	-20 to 60°C (-4 to 140°F)
Remote Communications	Compatible with Telephone, GSM, Cellular, RF, Satellite, Short-haul modems and Ethernet® device servers. Automatically transfers events when they occur through the Instantel Auto Call Home™ feature.
Additional Features	Monitor start/stop timer

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714B0052 Rev 07 - Product Specifications are Subject to Change

The World's Most Trusted Vibration Monitors



Micromate®

Introducing the new Instantel® Micromate® Vibration and Overpressure Monitor.

- USB Connectivity for downloading events and to connect to external devices such as powered USB Hubs, Modems, Memory sticks, Printers or a GPS.
- Download Events without a PC: Simply connect a USB memory stick, select and save Events
- Touch Screen: Large, high resolution color graphics touch screen
- Easy to read and navigate menu structure
- Context Sensitive Icons: Icons are only shown if they are relevant to what you are doing
- Short Cut Icons: Fast, one touch access to the most commonly used features
- Context Sensitive Help at your fingertips
- Integrated Keypad: Large 10-key interface with dedicated function keys
- Remote Access: Use Instantel's Auto Call Home program for easy, remote access to your monitor and data
- Field Printing: Optional field printing with a supported Instantel USB printer
- Variable Sample Rates: 1024, 2048, and 4096 samples per second (S/s) for each channel
- Zero dead time between recorded events
- Full Waveform Event capacity with the standard memory, store up to 1000 events of one second duration at sample rates up to 2048 S/s.
- Battery Life: 10 days of monitoring (15 day option available)
- Record Modes: Waveform, Waveform Manual, Histogram and Histogram Combo Record Modes
- Monitor Scheduler: Assign different setup files, scheduled self checks, scheduled Auto Call Home times and when to start and stop monitoring
- Full Waveform Event Analysis: Time of the event, trigger source, peak particle velocity (PPV) for each vibration channel, peak air overpressure, zero crossing (ZC) frequencies, peak vector sum (PVS), maximum acceleration, maximum displacement and more, all available on the unit in the field
- Personal and Job Specific Information: Save multiple operator names and configuration files on the unit
- Rugged Design: Field rugged and durable design with a fully sealed top panel, non-corrosive connectors, and sealed electronics to enhance water resistance
- Optional Protective Boot: The optional boot provides added protection as well as increased flexibility for mounting your Micromate unit.
- National Frequency Analysis Standards: Supports numerous Compliance Reports – select the desired standard for inclusion on the hard copy field reports
- Full PC Compatibility: Archive, print, perform analysis and post process with the Blastware software module
- Optional Auxiliary I/O Connector: This factory installed option allows for the connection and operation of the Instantel Remote Alarm and or External Trigger Cable.
- Optional Remote Alarm (optional Auxiliary I/O required): The Remote Alarm allows the Micromate to control two external devices such as sounder or strobe lights.
- Optional External Trigger Cable (optional Auxiliary I/O required): Use the optional external trigger cable connected to the auxiliary I/O connector to trigger the unit at the same time as an event occurs
- Optional GPS: Connect the compatible Magellan Explorist 310, Global Positioning System (GPS), to the Micromate to download and include the vibration source and sensor location coordinates on event reports or to synchronize the Micromate's internal clock with the GPS system.



Micromate Specifications

Range of Applications

- Blast monitoring for compliance
- Near-field blast monitoring
- Pile driving monitoring
- Environmental monitoring
- Heavy transportation monitoring

- Tunnel and subway monitoring
- Bridge monitoring
- Remote access monitoring
- Dynamic compaction activity
- Construction activity
- Demolition activity
- Structural monitoring and analysis

Minimate Pro6	Minimate Pro4	Micromate
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Micromate Highlights

Key Features	Hand-held USB interface for high-speed data transfers and connection to InstanTel compatible modem, printer and memory sticks Touch screen with context sensitive icons Auto Call Home™ remote monitoring function 10 day battery life (15 day optional) Rugged design (optional protective boot and cover)
4 Channels	Microphone and Triaxial Geophone
Memory	Store 1000 Events
Record Modes	Waveform, Waveform Manual Histogram and InstanTel® Histogram Combo
Available Sample Rates	1,024, 2,048, 4,096 KHz S/s per channel (independent of record time)
Unit Dimensions	101.6 x 135.1 x 44.5 mm (4.15 x 5.32 x 1.75 in)
Unit Weight	0.5 kg (1.1 lbs)
User Interface	10 domed tactile keys, colour touch screen, and full display keyboard with dedicated icons for common functions
Product Rank	Mid-range



[Visit Micromate
Micromate Specification Sheet](#)

RI 8507 Alternate blasting level criteria

