



# TRANSMITTAL – 978-12-29

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WE ARE SENDING YOU THE FOLLOWING:

STREET NAME	DESCRIPTION
Microtunneling	Noise Bylaw Exemption for Microtunneling Operation

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**D2023-33**

**Bowmanville Zone 1 Feedermain**

**Proposal for 24 Hour Tunnelling  
Operations**

Document Information		Prepared by	
Revision	Reason for Revision	Initials	Date
000	Initial Release of Document	VW	14/12/2023

## Introduction

The purpose of this document is to highlight the significant advantages associated with 24 hour microtunneling operations and make a case for by-law exemption based on these facts.

The tunnelling operations are scheduled to commence on January 10<sup>th</sup> 2024 and continue for 1 month. **We would like to work 24 hours per day 5 days per week from Monday January 15<sup>th</sup> 2024 for 3 weeks to Friday February 9<sup>th</sup> 2024.**

## Microtunneling Advantages

Open-cut methods are typically used to install subsurface utilities. However, the disruptions associated with open-cut methods are often unacceptable due to nuisance and disruption associated with the large dig required. Microtunneling is a digging technique that combines the pipe jacking method into a remotely controlled, guided way of construction. Because of its extensive techniques, the overall process avoids the need to have open trenches for pipe laying ensuring there's less disruption to the rest of the community.

Microtunnelling (also known as slurry pipejacking) is preferred method of pipe installation on this project (as opposed to open cut methods) for a number of reasons including,

- Ability to install product pipe directly in the ground at great depths
- Reduced environmental impact.
  - Microtunneling technology allows product pipe to be installed under sensitive areas with minimal or no effect above ground.
  - Microtunneling ensure quantities of both incoming and outgoing materials are reduced significantly. Not only is this less harsh on the surrounding environment (reduced need for trucking for example), but it boosts the safety benefits for the workers too.
- Reduced project timeline. Microtunneling is an efficient pipe installation system. Erritt expects to install 30m of pipe per shift at peak output. Huge savings in time are apparent especially when we couple this output with a massive reduction in the areas which requires costly and disruptive reinstatement.

### 3.0 Microtunnelling – Short Overview of Process

Micro tunnelling (also known as slurry pipejacking) is not a new method. It is preformed extensively across the world with rapid expansion every year. Herrenknecht tunnelling equipment, manufactured in Germany, now provide robust machines to overcome difficult ground conditions. The tunnelling equipment for this contract essentially comprises of the AVN 1500 tunnel boring machine (TBM), the control container, the jacking frame, the separation and water circuit equipment, and the various ancillary equipment such as hydraulics and bentonite lubrication system.

- The AVN 1500 TBM has the advantage of being a closed face method of construction which significantly reduces the risk of losing the face stability. The TBM uses slurry pressure in conjunction with the jacking force to maintain tunnel face stability and prevent over excavation. The slurry pressures will be constantly monitored during the drive by both the tunnel operator and the engineering staff to ensure that the slurry pressure is meeting the in situ stresses acting on the face of the tunnel boring machine and therefore, preventing over excavation and the possibility of frac out. This method also has the advantage of the operator being above ground at the launch pit. A simple schematic diagram can be seen in Figure 1 and a description of the various tunnelling plant can be found in the following.
- The Herrenknecht – AVN – standard range covers all the components for unmanned pipe jacking. These components are optimally designed for use together and enable safe and efficient tunnelling, whether under groundwater or not, without any accompanying action such as groundwater level lowering, provision of compressed air or freezing. The compact construction and silent operation of these systems makes them ideally suited for use in heavily built up areas.

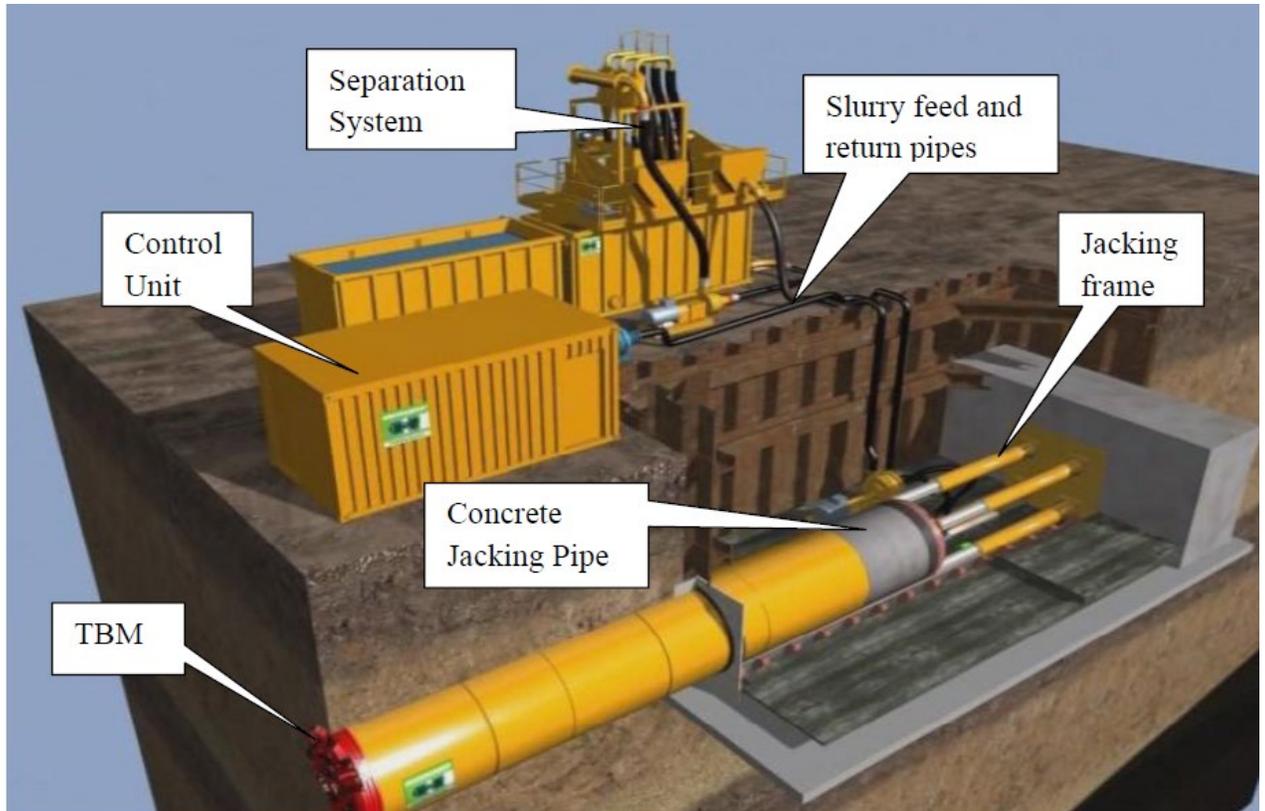


Figure 1: Schematic diagram of tunnelling equipment

- The Herrenknecht Microtunnelling systems consist of four main components: AVN Microtunnelling machine, control container including guidance system, jacking frame and slurry pumps, settlement tank including water circuit and separation units. Additionally, Bentonite pumps and high-pressure water jet pumps can become part of the system depending on requirements.
- The CONTROL CONTAINER is the heart and brain of the entire system. In its back section, it houses the hydraulic power pack and electric distribution panels for powering all of the equipment supplied with the system. The power pack consists of powerful and separate pumps for the jacking frame and cutting head. The pumps are mounted on top and around a generous hydraulic oil tank and ample oil cooler. The main and sub-distribution panels supply the entire control station, operator panel, laser and guidance

system and variable speed slurry pumps. In its front section, separated by a sound insulated wall, is the operator's control station for remote operation of the microtunnelling machine. The controls include all functions required for operation of equipment.

- The JACKING FRAME is of a unique space saving design. Due to its three-stage ratchet system it builds competitively short. For instance, a total stroke of 3 m requires only a cylinder stroke of 1 m. The operation starts with the (red) push block being pulled back almost to the very end of the jacking frame. Here the first set of ratchets catch the push block. Once the cylinders are fully extended, the rams are pulled back while the push block stays in place. Now, the second set of ratchets catch the push block, and a new stroke can commence. This process is repeated one more time until the entire length of pipe is installed in the ground and a new section of pipe is lowered into the jacking frame by an excavator.
- The AVN Microtunnelling machine or CUTTING HEAD is the workhorse of the system. Pushed by the jacking frame and the installed pipes respectively, it excavates the soil with one of its various cutting wheels driven by powerful hydraulic motors. One of the key features of Herrenknecht Microtunnelling machines are its fast adaptation to different ground conditions. Different cutting wheels that fit the same cutting head are available for sand, clay, gravel, solid rock and mixed face conditions and can be interchanged within the hour. For this contract, a mixed head has been selected, due to the possibility of dealing with cobbles and boulders.
- The excavated material enters from the face of the cutting wheel into the crusher chamber lying behind. In there, all particles including boulders are crushed down into smaller pieces between the powerful crusher bars. During this process, water is pumped into the crusher chamber through various selectable openings inside the crusher cone, forming a slurry that can be pumped to the surface.
- The cutting head in itself is articulated by hydraulic steering cylinders inside, allowing the machine to be controlled in line and grade. Therefore, a laser target is mounted inside the

machine. A laser guidance systems known as the VL70 provides guidance information from this target to the control container via the “37 pin” control cable.

- The SLURRY SYSTEM or WATER CIRCUIT basically starts inside the crusher chamber of the cutting head. After the slurry is formed, it is pumped out by a frequency controlled slurry pump located in the tunnel and the shaft. Then, the slurry pump inside the launch pit pumps the slurry to the control container on the surface. In there the slurry passes through a flow meter allowing the operator to monitor the amount of slurry taken out of the ground in order to avoid loss of ground water or over excavation. After passing the flow meter, the slurry enters the separation system. A series of screens, hydro cyclones, and centrifuge separate all solids in suspension and deposit them into a muck holding area for removal by truck. The solid-free water that remains in the tanks overflows into the next compartment from where it is re-used and pumped down the shaft by the feed pump, through the tunnel, to the cutting head and its crusher chamber again. As well, the feed water is monitored by a flow meter giving the operator all the information needed for successful slurry removal.

#### **4.0 Requirement for Exemption to By-Law**

Exemption to the by-law is required under two headings, technical requirements for efficient and safe microtunneling and practical aspects associated with constructability and minimisation of disruption.

- Technical requirements – Lubrication of pipe jacks has been found to be extremely effective in reducing jacking resistances during construction of pipe jacked tunnels. To obtain maximum benefit and ensure practically achievable jacking forces lubrication of the space between jacking pipe and excavated ground “the overcut” (about 25mm all round in case of AVN1500 Machine) must be maintained at all times during construction phase. Lubrication of the tunnel is achieved with the utilisation of a thick bentonite slurry pumped continuously into tunnel overcut as the tunnel progresses. The designers have designed

tunnels of drive length up to 600m on this project and thus continuous mining is required 24 hours a day 5 days a week in order to complete the project.

Lubrication is carried out by Erritt Construction on all microtunnels regardless of diameter or tunnel length; from experience we know that it is the most important parameter for successful tunnelling. The following ground conditions require constant lubrication due to likelihood of lubrication washout/filtration into ground and/or settlement of annular overcut space around jacking pipe,

- In unstable ground, such as soft clays, cohesionless soils or highly fractured rock.
- Excavations occurring in any ground below the water table.
- Sandy or gravelly soil, in this case primary function is to prevent collapse of the ground onto the pipes.

The tunnel being constructed as part of this project will encounter one or all of the above mentioned technical challenges and therefore constant lubrication as part of a 24 hour tunnelling operation is imperative for efficient and safe completion of sections.

It has been repeatedly observed by Erritt Construction on numerous projects that when tunnel production (forward) movement stops for any extended period increased jacking forces are observed.

- Practical requirements – 24 hour working will reduce total construction times significantly for both the tunnelling phase and overall project. This gives the following advantages:
  - Areas of public space, in this case the road closure, can be returned for public use / traffic in a much quicker fashion. This reduces nuisance to local resident and businesses
  - Tunnelling operations require relatively large items of plant which may be an eye sore – aesthetic aspects of each location can be returned to high standards in a quicker period of time
  - Winter working conditions, due to the timing of the project a large section of works are to be completed in the winter conditions. 24 hr tunnelling allows continuous

mining during the winter without the need to shut down and drain all slurry lines at end of each day. Daily winterising and warming of equipment in a stop start environment has a negative effect on production and increases risk of equipment failure.

## 5.0 Summary of Noise producing Equipment

In comparison with alternative construction activities such as open digging microtunneling is a relatively quiet undertaking. Activities being undertaken at night can be further rigged and managed in order to provide the lowest disruption to local resident's / business's. A summary of noise producing equipment required as a minimum for night works are summarised below,

- Kobelco 110T Crane – used to “drop” concrete jacking pipes into shaft. Crane will be specially rigged and operated at low engine power in order to reduce noise levels. Notably “tracking” movements of machine will be avoided save in extreme situations. Prior to shift starting crew will organise a stock of pipes within easy reach of crane.
- 700 Kva Generator – This is a new generator (<1.5 years old, with low operating hours), which is purpose manufactured for sound attenuation, generator is housed within “modular acoustic enclosure”. Unit produces maximum 65 dBA at 15m.
- Herrenknecht HSP300 Separation Plant – Primary noise is from scalplings (small pebbles and balls of soil) falling onto spoil heap. Panel type sound barrier can be constructed to combat this if required. The plant itself emits low noise levels and will be tarped or enclosed to further reduce noise levels
- Tunnelling Equipment – Tunneling equipment consists of pumps, tunnel machine and control container. Hydraulic motors in control container are shielded by acoustic enclosure and are electrically driven by the generator; this renders them effectively silent to outside. Tunnel machine will be operating underground and is effectively silent. Pumps typically produce negligible sound levels.

- Bentonite Pump – Hydraulically powered, engine and pumps are housed within 20' shipping container. With doors closed this unit emits no more noise than the generator. Day shift will mix enough Bentointe for night shift – eliminating need to open door.

## 6.0 Noise Reduction and Minimisation of Nuisance to Residents

We note that the site is in an industrial area and there are no residents within 185m of the tunnelling site location. The resident is across of Highway 2 and thus the noise will not travel this far and thus there is no impact to residents. However the following controls will still be put in place by Erritt Construction to minimise nuisance noise during period of exemption,

- All equipment will be fully serviced prior to start of project, mechanical team to ensure following;
  - Noise suppressions systems fitted where possible,
  - Mechanical systems operating to peak standards in particular exhaust systems,
  - All panels, covers and enclosures to be tightly fitting and in peak condition; in particular latches and locking mechanisms to be fully operationally, and
  - Equipment to be regularly lubricated where applicable.
- Construction crew and site management to be briefed fully on details of this document and requirements for quiet running.
- Operator of excavators in particular are to be briefed on operational requirements as detailed above – No tracking movements of excavators to occur whatsoever save in emergency situations. Management plan to be in place to facilitate this.
- Engagement with potentially affected persons / businesses by contractor prior to work taking place. Contact details for Erritt management (available 24 hours a day) to be provided to any affected parties as well as local law enforcement. Erritt aim to resolve any disturbances (however unlikely) as quickly as possible by intervention of management directly wherever possible
- No spoil removal (trucking) after 7pm
- No deliveries to take place between 7pm and 7am

- Lighting will be designed and situated in such a manner as to limit “light pollution” to negligible levels. Specifically, we will focus lighting directly where it is needed and limit height of lighting stands.
- The construction site is in an industrial area with no residents within 185m of the launch site



## 7.0 Conclusion

We hope you find this report sufficiently detailed and accurate and that you will see fit to grant Erritt Construction Ltd an exemption to noise regulation by-law for the period of tunnelling works. If you have any questions please do not hesitate to contact me.

Regards,

Vincent Walshe

Director

Erritt Construction Ltd.