

## Combined Sewage Storage Tunnel (CSST) at Site 5 Projected Construction Sequencing Summary As of January 27, 2017

*This table should be considered to be a living document and presents a best estimate based on the Contractor's submitted construction schedule and the project team's general experience with similar activities. Contractually, the Contractor is NOT required to adhere to this detailed schedule. The Contractor will be submitting detailed schedules and management plans prior to undertaking this work.*

Work Location	Task <sup>(1)</sup>	Start Date	End Date	Duration	Details of Work	Truck and Noise <sup>(2)</sup>
Site 5a (Stanley Park - Main Chamber and Odour Control Building Area)	IOS Locating & Phase 2 Archaeological Investigation	Mid November 2016	Early December 2016	2-3 weeks	Drill rig will be setup in Stanley Park to core down and find exact location of existing 15m-deep trunk sewer (IOS). Drill rigs used to core down are not excessively noisy. Daytime drilling expected. Little to no material trucking - just drilling crew. Access along pathway. During roughly same period, a Stage 2 archaeological investigation will take place.	Modest noise. Negligible trucking.
	Tree Clearing	Early March 2017	Mid March 2017	2-3 weeks	Activities would be limited to clearing of larger trees outside of the bird nesting season. Stumps and smaller brushes would be left on site for later removal. Tree grabbers, chainsaws, tub grinders and grinders for branches will be used at the site. There will be some noise due to grinding and from the engine of the tub grinder. Daytime work only. Trucking will include hauling felled trees and mulch off site.	Some noise from tree cutting. Modest trucking.
	Traffic Control, Hoarding/Fencing, Site Setup, Tree Protection	Early March 2017	Late March 2017	3-4 weeks	Site setup activities, including installation of the hoarding/fencing and tree protection measures. Modest trucking (fence delivery, etc) and noise.	Modest noise. Modest trucking.
	Build and Grade Temporary Access Roads & Pathways	Early March 2017	Late March 2017	3-4 weeks	Converting the pathway to truck access route (making it more robust), and constructing pathway detours for park users. Will include hauling granular material (3-4 trucks per hour for about a week) and spreading the granular material (bulldozer/grader). Additionally, there would be 3-4 empty trucks per hour leaving the site. Some multi-use temporary pathways also require paving (small pathway paving equipment - one day).	Modest noise. Heavier trucking.

Work Location	Task <sup>(2)</sup>	Start Date	End Date	Duration	Details of Work	Truck and Noise <sup>(2)</sup>
Site 5a (Stanley Park - Main Chamber and Odour Control Building Area) - continued	Construction of Secant Wall	End of March 2017	End of May 2017	8-10 weeks	Secant wall is a circular watertight enclosure around a deep excavation area (e.g. for a chamber). It is installed before removing the earth in order to mitigate affecting the groundwater table around the excavation. Activities consists of drilling vertically into soil, installing secant piles in a large circle and grouting the circumference to make the chamber area watertight. Handling of the secant piles could generate some noise. Noise Bylaw limits apply to any nighttime work. Marginal trucking for materials and some soils. A small amount of potentially contaminated soil may require disposal off-site during this phase.	Some loud noise associated with driving sheet piles. Modest trucking.
	Earth Excavation	End of May 2017	End of June 2017	3-4 weeks	Once secant walls are built, the earth inside will be removed in order to build the chambers and will be trucked off-site. Some potentially contaminated material could be encountered during the earth excavation for trucking and disposal off-site. Applies to 2 chamber locations at Site 5a (main area). Expect to generate 3-4 trucks per hour hauling excavated earth off-site. Trucks must pass through wash bay prior to exiting the site. There will also be another 3-4 empty trucks returning to the site each hour during this period.	Modest noise. Heavier trucking.
	Installation of Collar Beam	End of June 2017	Early July 2017	2-3 weeks	Shoring for deep excavations. No trucking other than bringing some material in.	Modest Noise. Negligible trucking.
	Rock Excavation	Early July 2017	Mid September 2017	8 -10 weeks	Rock excavation will involve drilling, blasting, shotcrete and bolt installation. Trucking frequency will be low as rock removal is a slow operation compared to earth removal. No rock can be handled (stored and/or removed off-site) afterhours due to Noise Bylaw limits.	Some loud noise from breaking rock. Modest trucking.
	Setup Tunnel Launch Shaft	Mid September 2017	Late November 2017	8-10 weeks	Includes pouring mud slab, hand-mining tail tunnel. Will include trucking, but low frequency due to slow progress of hand-mining 25-30m long tail tunnel to prepare for the Tunnel Boring Machine (TBM) insertion. Modest noise would include handling of excavated rock (loading trucks). No rock can be handled (stored and/or removed off-site) afterhours due to Noise Bylaw limits.	Modest noise. Modest trucking.
	Inserting and Setting up TBM	Early December 2017	Early February 2018	8-10 weeks	Delivery of TBM to site (in pieces), inserting into the launch shaft, reassembly, prepare for launch. Other than trucking in the TBM pieces and associated support equipment/materials, limited trucking and limited noise.	Modest noise. Modest trucking.

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Site 5a (Stanley Park - Main Chamber and Odour Control Building Area) - continued	East-West Tunnel (EWT) Tunneling	Early February 2018	Early December 2018	40-45 weeks (10 months)	TBM progressing along EWT. Spoils (crushed stones - gravel) being extracted from launch shaft and being trucked away. Tunneling 20-22 hours per day, but trucking limited to normal working hours of 12-14 hours (between 7:00AM and 10:00PM). Noise Bylaw limits apply to afterhours activities. Estimate that tunnel spoils will be hauled away at 3 trucks per hour as the tunnel progresses approximately 20 m per day. Another 3 empty trucks will be arriving to the site each hour to be loaded. Tunneling will also require, on average, 3 trucks per day delivering parts for the tunnel lining.	Modest noise. Heavier trucking.
	Construction of Large Chambers (once tunneling complete)	Mid December 2018	Mid September 2019	35-40 weeks (9 months)	Construction of chambers includes the following components: micro piles installation, structure floor, walls and roof construction, ventilation duct, installation of gates, ladders and steps, and backfill. Materials and concrete being delivered to site as required.	Modest noise. Modest trucking.
	Construction of Odour Control Building	Mid March 2017	Mid January 2018	40-45 weeks (10 months)	Typical building construction with material and equipment being delivered to site as required.	Modest noise. Modest trucking.
	Grading and Landscaping	Mid March 2019	Mid September 2019	25-28 weeks (6 months)	Will include hauling away granular material installed as a base for driving vehicles within the staging area and hauling in new topsoil for landscaping. This will be followed by bringing in and installing numerous trees throughout the park. It's estimated that hauling away the granular material would take approximately 2-3 weeks and result in approximately 2-3 trucks per hour during this two to three week period. It is likely that hauling in new topsoil could generate similar trucking at its peak, but would happen later in this period.	Modest noise. Heavier trucking.
Site 5b (Stanley Park - Closer to Queen Victoria Access)	MicroTunnel Launch Shaft Setup, Shoring Installation	Early March 2017	Mid/Late March 2017	2-3 weeks	This is for the diversion sewer that will divert overflows away from Ottawa River and into the CSST. There will be a sewer installed by tunneling between Stanley Park and the intersection of River Lane / Queen Victoria. Activities for this phase include installing shoring into the soil to prepare for excavation of the hole.	Some loud noise associated with driving sheet piles. Modest trucking.

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Site 5b (Stanley Park - Closer to Queen Victoria Access) - continued	Earth Excavation	Mid March 2017	Late March 2017	1 week	Once shoring is installed, the earth material will be excavated and trucked away (maybe 3 trucks per hour for 3-4 days - small volume). The same frequency of empty trucks would also return to the site. Note that some potentially contaminated material could be encountered during the earth excavation for trucking and disposal off-site.	Modest Noise. Heavier trucking (very short duration) when moving soil.
	Rock Excavation	Late March 2017	Late April 2017	3-4 weeks	Rock excavation will involve drilling, blasting, shotcrete and bolt installation, as well as trucking away excavated rock. Trucking frequency will be low as rock removal is a slow operation compared to earth removal. No rock can be handled (stored and/or removed off-site) afterhours due to noise limit bylaws.	Some loud noise from breaking rock. Modest trucking.
	Micro-Tunneling of Diversion Sewer (5b to EWT Outlet Chamber - main shaft)	Early October 2017	Late November 2017	8 weeks	Includes installation of tunneling equipment, plus 2-3 weeks of pilot hole tunneling, 5-6 weeks of back reaming along that pilot hole, and finishing the grouting. The reaming operation (which consists of enlarging the smaller pilot hole to the size required for the sewer) is expected to produce the most trucking as it generates spoils (crushed rock) to be hauled away. Could fill one or two trucks per hour at its peak for that 5-6 week period.	Modest noise. Modest trucking.
	Installation of 3 m Pre-Cast Shaft	Late November 2017	Early February 2018	8-10 weeks	Activities include installing the precast chamber sections, benching and grouting, backfilling, removal of shoring, etc. Small chamber - modest trucking. Similar to installing a big sewer manhole with more parging/grouting and a large gate and related equipment on the inside.	Modest noise. Modest trucking.
	Grading around this shaft 5b	Mid February 2018	End of February 2018	2-3 weeks	Rough grading. Final landscaping is included as part of the landscaping activity described for Site 5a.	Modest noise. Heavier trucking.
Site 5c (Rideau River Collector - Overflow Diversion Chamber - At intersection of River Lane & Queen Victoria) <sup>(3)</sup>	Utility Relocation	Mid-February 2017	Early-March 2017	2-3 weeks	Relocation of communication lines by the utility companies from above-ground to underground.	Modest noise. Modest trucking.

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Site 5c (Rideau River Collector - Overflow Diversion Chamber - At intersection of River Lane & Queen Victoria) <sup>(3)</sup> - continued	Traffic Control, Hoarding/Fencing, Site Setup, Utility Relocation and Temporary Sewer Bypass	Early March 2017	Early May 2017	8 weeks	Site setup activities, including installation of the fencing and relocation of utilities and sewers as required. Modest noise and trucking (delivery of fences/piping, hauling away of some material excavated for these relocations, etc).	Modest noise. Modest trucking.
	Shoring	Early May 2017	Late May 2017	2-4 weeks	Includes driving shoring piles into the soil down to the rock elevation and line grouting to permit excavation of soils inside the shored area while supporting the surrounding areas. Installing the shoring will generate some noise - limited to daytime. Modest trucking - limited to hauling shoring material and perhaps some small volume of soils may be hauled away.	Some noise (relatively modest) due to excavating equipment and soil moving. Modest trucking.
	Earth Excavation	Late May 2017	Late May 2017	1-2 weeks	Once shoring is installed, the earth material will be excavated and trucked away (maybe 2-3 trucks per hour - small volume). The same frequency of empty trucks would also return to the site.	Modest noise. Heavier trucking.
	Rock Excavation	Late May 2017	Late July 2017	8 weeks	Rock excavation will involve drilling, blasting, hoe-ramming, shotcrete and bolt installation, as well as trucking away excavated rock. Trucking frequency will be low as rock removal is a slow operation compared to earth removal.	Loud noise resulting from hoe-ramming and rock handling. Modest trucking.
	Micro-Tunneling of Diversion Sewer (5b to River Lane)	Early August 2017	Early October 2017	8-10 weeks	Includes installation of tunneling equipment, pilot hole tunneling, back reaming along that pilot hole, and finishing the grouting. The back reaming operation (which consists of enlarging the smaller pilot hole to the size required for the sewer) is expected to produce the most trucking as it generates spoils (crushed rock) to be hauled away, and will last approximately 5-6 weeks. For this section of the diversion tunnel, it is proposed by the contractor that these reaming spoils be extracted from the shaft located that the intersection of River Lane / Queen Victoria - to be confirmed. Could fill four trucks per day at its peak.	Some modest noise associated with motor for auger. Modest trucking.

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Site 5c (Rideau River Collector - Overflow Diversion Chamber - At intersection of River Lane & Queen Victoria) <sup>(3)</sup> - continued	Construction of Chambers (once micro-tunneling complete)	Early October 2017	Early February 2018	16-18 weeks (4 months)	Construction of chambers includes the following components: structure floor, walls and roof construction, installation of weir, ladders and steps, demolition of section of existing overflow sewer, new connections, backfill and removal of shoring. Materials and concrete being delivered to site as required. This phase includes backfill around the chamber, estimated to generate 3-4 trucks per hour hauling backfill material to the site and the same frequency of empty trucks leaving the site - over a period of approximately 1-2 weeks in late January / early February. Other trucking would include concrete trucks during the pours	Modest noise. Heavier trucking during backfill (1-2 weeks), modest otherwise.
	Grading and Rough Reinstatement	Early February 2018	Early March 2018	4 weeks	Grading of the surface, base-coat paving, curbs, sidewalks, rough grading of landscaped areas to prepare for sodding later in the spring (since weather will not permit sodding at this time). Opening of the intersection. Heavier trucking will be during delivery of granular material for road construction (3-4 trucks per hour for a week or so).	Modest noise. Heavier trucking for 1-2 weeks, otherwise modest.
	Post-Construction Final Reinstatement	Early May 2018	Mid May 2018	1-2 weeks	Once weather is warmer, application of final layer of pavement and placement of sod and plantings. No long-term roadway impact as top-lift pavement is expected to be completed in a single day.	Modest noise. Heavier trucking for 2 days of paving.

**Important Notes:**

1. The activities list is not intended to be an exhaustive list. The City reserves the right to order the Contractor to cease the use of non-conforming equipment or to correct non-conforming procedures or to cease the nighttime construction activities at no cost to the City in the event that noise thresholds are exceeded.

2. Normal (a.k.a. daytime) working hours as defined in the city's Zoning Bylaw is 7:00AM-10:00PM. Outside of these hours (i.e. 10:00PM-7:00AM) is referred to as "afterhours". The Contract Documents stipulate that the following activities will not be permitted afterhours:

- Backing-up construction equipment and vehicles (due to backup alarm)
- Deliveries, including loading/unloading material or excavated muck into trucks
- Operation of equipment, motors and power tools without noise dampening
- Handling sheet piling
- Tree removal, cutting or grinding
- Significant grading operations requiring earth-moving equipment

The Contract Documents further stipulate that a noise monitoring program will be implemented by the Contractor to assess conformance to the stipulated limits. The noise monitoring program will be approved by the Contract Administrator prior to implementation. Exceedances will be reported to the Contract Administrator within 24 hours with a solution to prevent future exceedances.

The column for noise trucking is intended to be a high-level relative comparison. A noisy activity is the label used for activities that include breaking rock, banging steel, etc; other activities are considered to generate modest noise (relative to breaking rock and banging steel). Similarly, heavy trucking is the label used for activities generating 3 to 4 trucks per hour; other activities are considered to generate modest trucking (considerably less than 3-4 trucks per hour).

3. All work at Site 5c (River Lane / Queen Victoria) is limited to daytime activities. No work is currently permitted at this site afterhours (10:00pm to 7:00am). The Contractor may submit a special request for a specific task that is impractical to be completed during daytime, but it would need to be submitted for review and approval by the project team and the Councillor as it is not currently permitted.