

# PRELIMINARY NOISE ASSESSMENT REPORT PHASE 1B (PRE-DESIGN)

**ALEXANDRIA WATERFRONT IMPLEMENTATION**

JMT NO. 22-02065-001

**Submitted to:**

CITY OF ALEXANDRIA

**Draft, Deliberative, Pre-Decisional**



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## 1.0 EXECUTIVE SUMMARY

As the Johnson, Mirmiran and Thompson (JMT) team continues design development and refinement of the pump station associated with the City of Alexandria's Waterfront Flood Mitigation Project, the project team has conducted a preliminary analysis of the proposed noise generating facilities within the pump station. This analysis will inform the City, stakeholders, and the ongoing design development and engineering process and help determine what, if any, noise mitigation may be required or otherwise recommended to minimize impacts to stakeholders and the community from pump station operations.

Based on the JMT analysis detailed within this report, it is anticipated that the pump station will comply with the City's noise ordinance based on the architectural and engineering features and mitigating sound treatments within the facility, as needed. Considerations related to potential noise and appropriate mitigation strategies will be further evaluated and assessed as design development continues. Allowable noise levels were determined using the City of Alexandria's noise ordinance which was updated in January of 2022.

## 2.0 INTRODUCTION

A preliminary noise study was performed to understand the potential noise being generated by the pump station for the City of Alexandria's Waterfront Flood Mitigation Project. Consideration was given to the major noise generating equipment during standard operations, annual generator testing, and emergency pump station operation. The results of this study will be used to inform and determine what decisions shall be taken by the engineers, City, and stakeholders with regards to possible noise mitigation solutions during the design development and engineering process.

## 3.0 NOISE ORDINANCE

The City of Alexandria updated their noise ordinance in January 2022. The most recent iteration of the code allows for a maximum sound pressure of 75 dB(A) 10 feet from the sound generating source from 7am-11pm Monday through Sunday. Between 11pm and 7am, the maximum sound pressure is limited to 65 dB(A). It is anticipated that the team will be able to comply with the noise ordinance during full pump station operation (e.g. when rainfall or river flooding is being actively pumped) through the design and mitigating architectural and engineering solutions which will be further identified and evaluated with ongoing design development and the local development review process. Reference Figure 1 denoting the proposed location of the pump station, the generator room, rooftop HVAC equipment, and distance from the nearest building, the Old Dominion Boat Club. As shown, the distance to the nearest neighboring building is 61 feet from the pump station, well over the 10 foot sound pressure distance for the rating requirement.

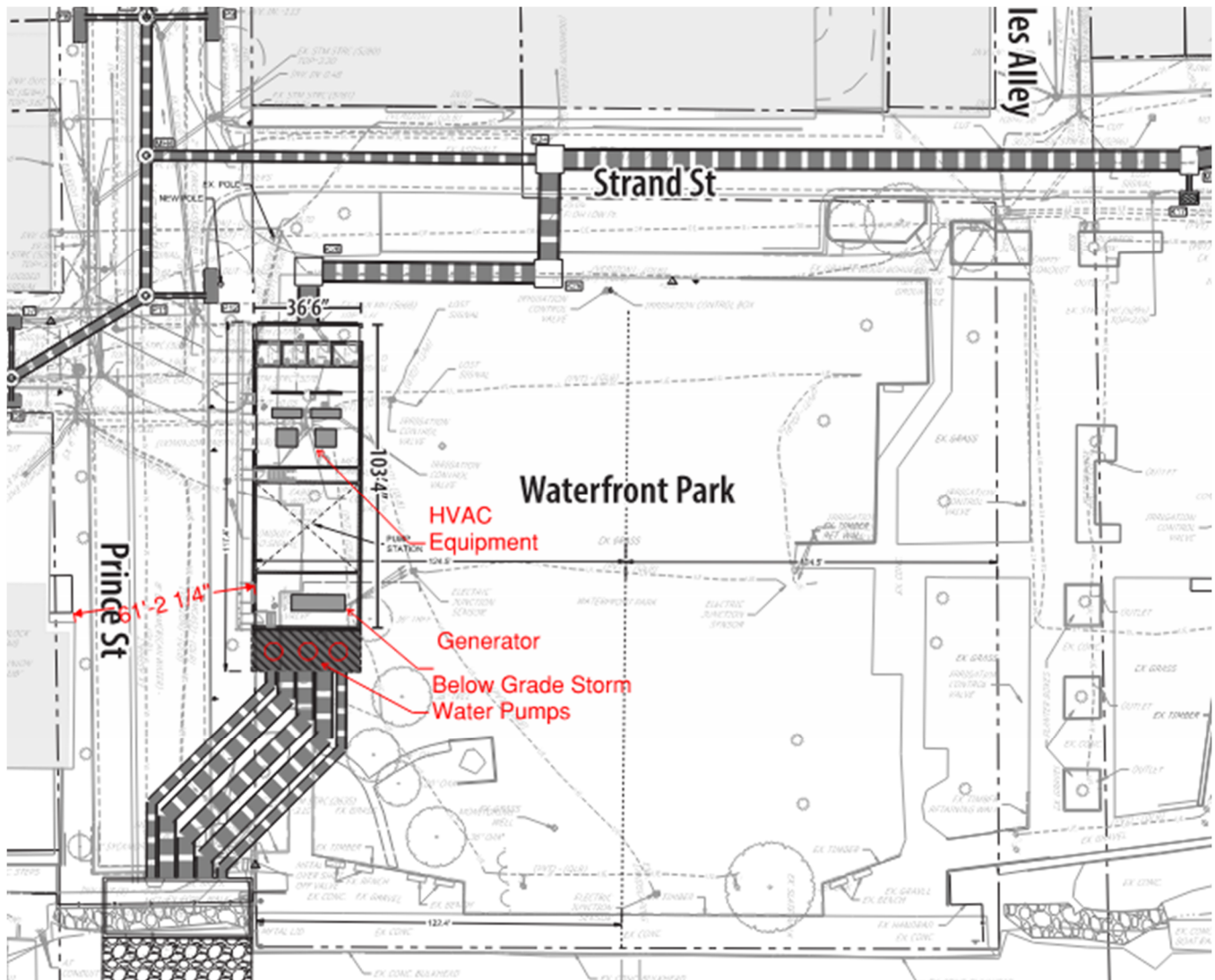


Figure 1: Proposed Pump Station Location

## 4.0 STORM WATER PUMPS

There are a total of five storm water pumps housed in the pumping station: three (3) 750 horsepower pumps and two (2) 100 horsepower pumps. One of the 750 horsepower pumps is for redundancy only and is not considered to be operational simultaneously with the other two. In terms of noise, the worst-case pumping scenario under generator operation occurs when the two-750 horsepower pumps operate at 100% capacity simultaneously. Per the manufacturer's certified noise testing report, a single 750 horsepower pump will generate a sound pressure of 80.1 dB measured 1 meter from the top of the pump assembly. The combined sound pressure of two pumps running simultaneously is 83.1 dB.

The stormwater pumping chamber is below grade and encased in a concrete wet well which will contain and attenuate a majority of the noise generated from the pumps. The pump motors are accessible via 1/4" steel plating covering the access hatches. 1/4" steel is rated for a minimum 20 dB sound pressure reduction from transmission loss. The maximum noise possible from the pumping system will be 63.1 dB(A) 10 feet

from the pump access hatches. This sound pressure will be compliant with the reduced nighttime noise ordinance of the city of Alexandria.

Note: The full octave band noise data for the pump was unavailable from the manufacturer. The manufacturer provided overall sound pressure data at a distance of 1 meter. A more accurate calculation could be performed if the engineer is provided sound power data in each of the 8 octave bands. With the limited information provided, the engineer used a conservative calculation approach. The values used for developing the noise calculation are very conservative and the actual installed values will likely be lower than the calculated values. More accurate calculations can be performed if the manufacturer can provide the sound pressure or sound power for each octave band.

## 5.0 EMERGENCY POWER GENERATOR

The 3.5kW generator has an overall sound rating of 99 dB(A). The generator will be housed within the pump station with walls made of 6-inch blocks. The main source of noise transmission out of the pump station from the generator will be through the acoustic louver. The octave band noise data from the generator is presented in Figure 2 below.

				Sound Pressure Levels, dB(A)								
Load	Distance, m (ft)	Open Unit, Isolated Exhaust	Measurement Clock Position	Octave Band Center Frequency (Hz)								Overall Level
				63	125	250	500	1000	2000	4000	8000	
100% Load	7 (23)		3:00	76.6	87.1	88.4	86.8	86.3	87.5	85.6	83.5	95.2
			1:30	79.9	82.5	91.4	88.6	91.6	90.2	87.5	82.9	97.5
			12:00-Engine	80.1	87.1	89.3	92.7	94.5	88.8	85.8	79.1	98.7
			10:30	77.3	83.9	90.9	91.0	90.2	89.8	87.0	84.5	97.5
			9:00	81.5	85.7	87.1	88.6	86.9	89.9	88.7	86.6	96.5
			7:30	84.0	83.9	89.8	87.3	87.2	88.8	84.2	81.8	95.7
			6:00-Alternator	79.0	82.0	92.0	84.6	84.5	84.0	80.5	76.0	94.5
		4:30	73.9	80.7	90.8	88.3	88.0	90.6	88.7	84.6	96.8	
		8-pos. log avg.	80.0	84.7	90.2	89.1	89.8	89.1	86.6	83.3	96.7	

Figure 2: Sound pressure data for generator

The emergency generator operations will require the generator to be cycled once per month for up to one hour. During the monthly cycle, the generator will be operated with little to no load. On an annual cycle the generator should undergo a load bank test during which time it will be run at 100% capacity.

During the annual load bank test, at 100% capacity the generator will produce an overall sound pressure of 76.7 dB(A) 10 feet from the acoustic louver. The 76.7 dB(A) sound pressure exceeds the maximum allowable daytime value identified in the City of Alexandria noise ordinance. Since this work is considered preventive maintenance for the building and not standard operating conditions, the work is qualified for an exemption to the noise ordinance as long as the work occurs between 7am-6pm Monday through Friday. If the City chooses to mitigate the noise, sound dampening materials may be applied to the walls of the generator room to reduce the sound pressure by a minimum of 3 dB(A) in order to make the building compliant. A 3 dB(A) reduction represents a 50% reduction in the sound pressure from the noise source.

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## **6.0 HVAC EQUIPMENT**

The outdoor portion of the HVAC unit has a sound power rating of 88.5 dB(A) under full load operation. With the installed conditions the sound pressure 10 feet from the HVAC equipment will be 70.81 dB(A). This maximum sound pressure value will occur only during daytime operations. During nighttime operations, the HVAC equipment will operate at part load and will be in compliance with the 65 dB(A) noise ordinance.

## **7.0 COMBINATIONS OF NOISE GENERATING SOURCES**

During standard daytime pump station operations, the HVAC equipment and the pumps may operate at full capacity. In this condition, the total sound pressure will be 71.5 dB(A). If the generator is added, the total sound pressure is 75.7 dB(A). This condition with all of the noise generating sources operating simultaneously at full load would occur only during a power failure in the municipal power grid, following a heavy rain, and during a 1% ambient heat condition. The probability of these conditions occurring simultaneously is low and the engineer does not recommend additional acoustic treatments to accommodate this occurrence. This occurrence can also be interpreted as an emergency operation for the public good and qualifies for an exemption from the noise ordinance.

## **8.0 CONCLUSION**

The equipment to be utilized within the pump station at this conceptual stage has been analyzed for compliance with the City of Alexandria noise ordinance. The noise study has revealed that sound treatments will be required for the generator room to mitigate the noise produced by the generator when it is operating at 100% load. The remainder of the noise-generating equipment will be in compliance with the noise ordinance without enhanced acoustical treatments.