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MEMORANDUM

DATE	August 26, 2020
TO	David Breveglieri, Planner, City of Mississauga
CC	Lakeview Community Partners Limited.
SUBJECT	G.E. Booth WWTP Technical Memorandum No. 3 Evaluation of Odour Management Scenarios and Alternatives, Jacobs, dated January 8, 2020
FROM	David Scott, TMIG
PROJECT NUMBER	17201

1 Introduction

This document provides a review of the *G. E. Booth WWTP Odour Management Strategy, Technical Memorandum No. 3 Evaluation of Odour Management Scenarios and Alternatives*, dated January 8, 2020, prepared by CH2M [Jacobs] for the Region of Peel.

The methodology for liquid and odorous air sampling at the G.E. Booth WWTP was outlined in *Technical Memorandum No.1 Odour Sampling Program Protocol*, dated July 19, 2018 and the baseline status of odour management at the G.E. Booth WWTP was outlined in *Technical Memorandum No. 2, Odour Management Baseline*, dated February 12, 2019. As per TM-3, the planned next phase of the study will be a final report with a recommendation for odour monitoring strategy. However, TMIG understands that no further reports are expected to be prepared.

It must be noted that the TM-3 referenced in this document is the January 8, 2020 version of TM-3 which is an update to the August 12, 2019 version of TM -3.

TM #3 January 2020 Updates

The first version of TM-3 is dated August 12, 2019. The major updates in the January 2020 version as compared to the August 2019 version of TM-3 are:

1. Doubling of capital cost of Fujiwara primary clarifiers sludge collection mechanism.
2. Separate section on enclosing of all primary clarifiers in buildings.

2 Human Receptors and Evaluation Criteria

As part of dispersion modelling, thirty (30) human receptors were established in the vicinity of the G.E. Booth WWTP. The location of the human receptors is shown in **Figure 2-1**.

Also, odour exceedance criteria were developed based on odour concentration and frequency. Odour concentration measured in odour units (OU) and frequency measured in hours of exceedance per year, are determining factors of odour complaints. **Table 2-1 i**dentifies acceptability criteria of various odour concentrations and frequencies. For example, odour concentration of 7 to 10 OU that is detected between 10 to 50 hours per year has been determined by the Region to be acceptable. These criteria were used to evaluate acceptability of odour control alternatives developed as part of TM-3.

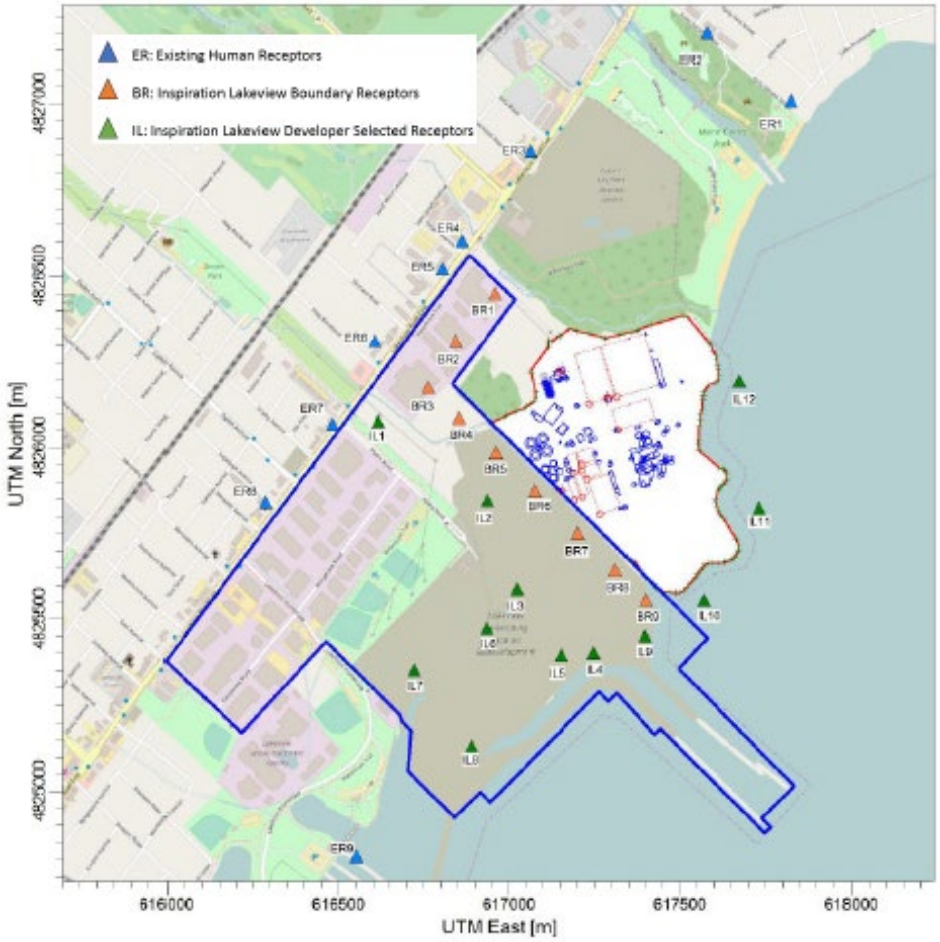


FIGURE 2-1: LOCATION OF HUMAN RECEPTORS (FIGURE 3-1, JACOBS TM-3, JANUARY 8, 2020)

TABLE 2-1: ODOUR ACCEPTABILITY CRITERIA (TABLE 3-1, JACOBS TM-3, JANUARY 8, 2020)

Hours Exceedance per Year (Frequency)	Odour Concentration (Odour Units)				
	3-5	7-10	20	50	100
Intensity	Very Weak	Weak	Distinct	Strong	Very Strong
0 – 10 h (fewer than 99.9% of hours)	Acceptable	Acceptable	Acceptable	Somewhat Acceptable	Unacceptable
10 – 50 h (fewer than 99.5% of hours)	Acceptable	Acceptable	Somewhat Acceptable	Unacceptable	Highly Unacceptable
50 – 100 h (fewer than 99% of hours)	Acceptable	Somewhat Acceptable	Unacceptable	Highly Unacceptable	Highly Unacceptable
More than 100 h	Somewhat Acceptable	Unacceptable	Highly Unacceptable	Highly Unacceptable	Highly Unacceptable

3 Existing Baseline Scenario and Short-Term Alternatives

Existing Baseline Scenario, as defined by TM-3, is based on existing G.E. Booth WWTP rated capacity of 434 ML/d.

Jacobs TM-2 reports that currently, odour collection and treatment is not provided for the existing Plant 1 primary clarifier effluent weirs which has an equivalent odour emission rate of approximately 40,000 OU/s.

New Plant 1 primary clarifiers are proposed to be constructed complete with covered effluent weirs and launders and the odorous air is to be treated by a new bio-trickling filter system. Until the new Plant 1 is in operation and the existing Plant 1 is de-comissioned, TM-3 proposes an interim alternative consisting of the following components at a five-year life-cycle cost of $484,000:

1. Cover existing Plant 1 primary clarifier effluent weirs (310 m^2).
2. Fill spare Plant 1 and 2 GAC odour control unit with media (0.15 m^3).
3. Upgrade Plant 1 and 2 odour control fan (to 9,100 m^3/hr) and upgrade ducting.

TM-3 concludes that by covering the existing Plant 1 primary clarifier effluent weirs and treating the collected odorous air, the odour impacts to human receptors at the proposed Lakeview Village Development (LVD) can be "*greatly reduced*" and that all receptors are anticipated to experience acceptable and somewhat acceptable odour intensities and/or frequencies except two (2) areas located immediately west of the Plant 1 and 2 GAC unit which would experience unacceptable odour levels. **Figure 3-1** demonstrates modelling results based on existing baseline and short-term odour improvements alternative described above.

Figure 3-1 (b) and **Figure 3-1 (d)** show the impact to human receptors with red triangles representing Highly Unacceptable, yellow triangles representing Unacceptable, purple triangles representing Somewhat Acceptable, and green triangles representing Acceptable odour impacts.

Comparing **Figure 3-1 (d)** to **Figure 3-1 (b)**, it is evident that the interim odour mitigation works will significantly improve the odour impacts within Lakeview Village with the incidences of Unacceptable and Somewhat Acceptable odour impacts being limited to an area located east of Hydro Road and north of Street B.

Region staff were given the approval to proceed with the implementation of the interim odour works at Regional Council on July 23, 2020. Regional staff have proceeded, as a result, with the design and implementation of these works. These works are anticipated to be in operation in early 2021.

Given that these works are of an interim nature only and that they serve to provide improved air quality in the vicinity of the Lakeview Discover Centre, currently under construction adjacent to Lakeshore Road, LCPL has committed to cover the capital cost of this interim solution.

Existing Baseline

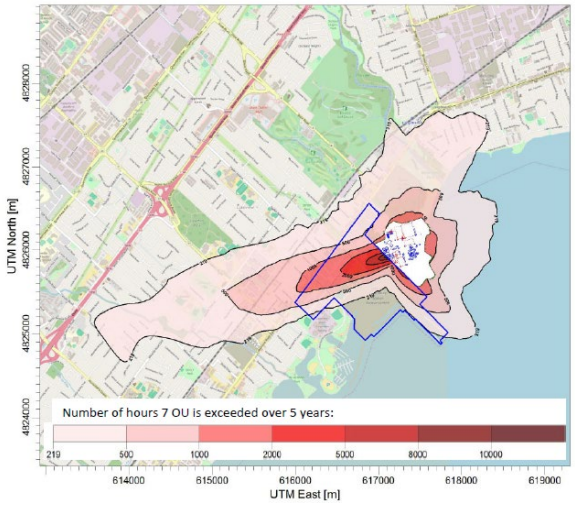


Figure 3-1 (a): Existing Baseline-Number of Hours 7 OU is Exceeded over 5 years.

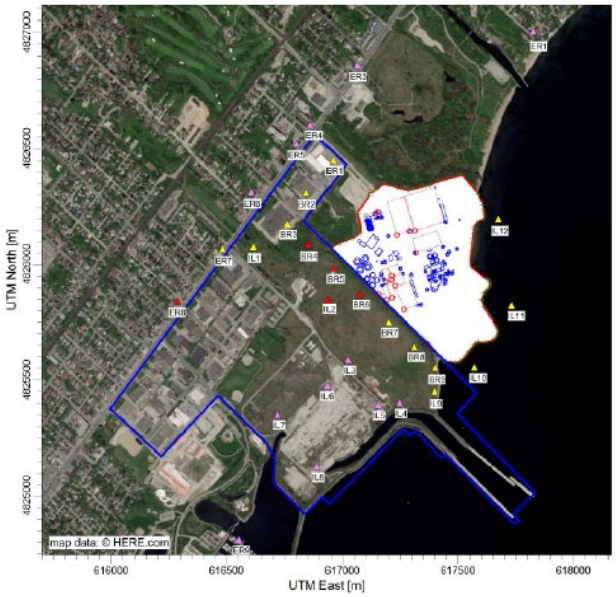


Figure 3-1 (b): Existing Baseline -Predicted Odour Impacts.

Existing Baseline with Interim Odour Control Mitigation

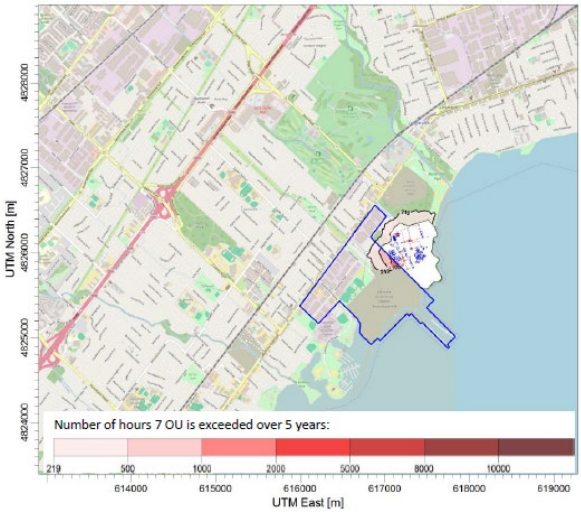


Figure 3-1 (c): Existing Baseline with Interim Odour Control Mitigation -Number of Hours 7 OU is Exceeded over 5 years.

Figure 3-1 (d): Existing Baseline with Interim Odour Mitigation -Predicted Odour Impacts.

FIGURE 3-1: EXISTING BASELINE AND INTERIM ODOUR MITIGATION IMPACT (FIGURES 5-2, 5-3 & 5-4, JACOBS TM-3, JANUARY 8, 2020)

4 Future Baseline Scenario and Long-Term Alternatives

Future Baseline Scenario, as defined by TM-3, is based on increase of G.E. Booth WWTP rated capacity to 600 ML/d from the existing 434 ML/d.

Based on modelling results, the future baseline scenario was developed for the number of hours that exceed the threshold of 7 OU in 5 years; the result is represented in **Figure 4-1**.

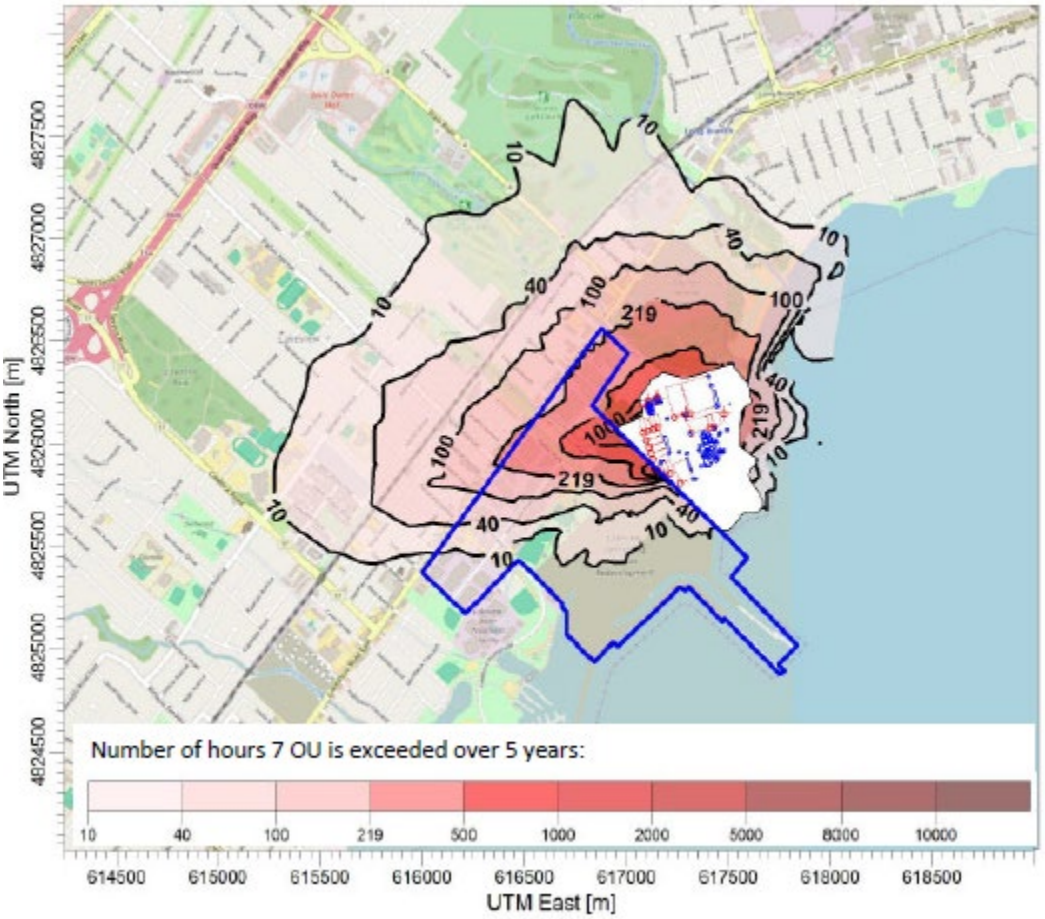


FIGURE 4-1: FUTURE BASELINE SCENARIO (FIGURE 5-5, JACOBS TM-3, JANUARY 8, 2020)

Five (5) long-term odour control alternatives were developed and presented in TM-3. For each alternative, summary of proposed measure(s), capital cost, operations and maintenance cost, and impact on human receptors at LVD are presented below:

0. The Baseline (existing odour control system) has an annual O&M cost of $474,000. Of the thirty (30) LVD areas studied under TM-3, the existing odour control systems reduces odours to a degree that eighteen (18) areas would have “Acceptable” odour levels, nine (9) areas would have “Somewhat Acceptable” odour levels and three (3) areas would have “Unacceptable” odour levels.
1. Alternative 1: Increasing the stack height of the future inlet sewer/Headworks odour control system to 15 m from 12 m at a capital cost of $4,800 and an annual O&M cost of $474,000. Of the thirty (30) LVD areas studied under TM-3, this alternative would reduce odours to a degree that nineteen (19) areas would have “Acceptable” odour levels, eight (8) areas would have “Somewhat Acceptable” odour levels and three (3) areas would have “Unacceptable” odour levels.
2. Alternative 2: ALTERNATIVE 1 + expanding the existing Headworks GAC capacity and polishing biotrickling filter exhaust at a capital cost of $1,696,800 and an annual O&M cost of $637,500. Of the thirty (30) LVD areas studied under TM-3, this alternative would reduce odours to a degree that twenty (20) areas would have “Acceptable” odour levels, seven (7) areas would have “Somewhat Acceptable” odour levels and three (3) areas would have “Unacceptable” odour levels.
3. Alternative 3: ALTERNATIVE 2 + installing covers on Plant 1 primary clarifiers and collecting and treating odorous air with new biotrickling filter at a capital cost of $17,137,100 and an annual O&M cost of $608,500. Of the thirty (30) LVD areas studied under TM-3, this alternative would reduce odours to a degree that twenty-five (25) areas would have “Acceptable” odour levels, three (3) areas would have “Somewhat Acceptable” odour levels and two (2) areas would have “Unacceptable” odour levels.
4. Alternative 4: ALTERNATIVE 3 + installing covers on Plant 2 primary clarifiers and collecting and treating odorous air with new biotrickling filters (would involve replacing travelling bridge mechanisms with Fujiwara systems) at a capital cost of $35,317,800 and an annual O&M cost of $639,700. Of the thirty (30) LVD areas studied under TM-3, this alternative would reduce odours to a degree that twenty-seven (27) areas would have “Acceptable” odour levels, two (2) areas would have “Somewhat Acceptable” odour levels and one (1) area would have “Unacceptable” odour levels.
5. Alternative 5: ALTERNATIVE 4 + installing covers on Plant 3 primary clarifiers and collecting and treating odorous air with new biotrickling filters (would involve replacing travelling bridge mechanisms with Fujiwara systems) at a capital cost of $94,003,700 and an annual O&M cost of $538,100. Of the thirty (30) LVD areas studied under TM-3, this alternative would reduce odours to a degree that 29 areas would have “Acceptable” odour levels, 1 area would have “Somewhat Acceptable” odour levels and 0 areas would have “Unacceptable” odour levels.

Figure 4-2 shows modelling result for alternatives 4 and 5 for Plant 1 and Plant 2 odour control upgrades (to be completed in 2026) and Plant 3 odour control upgrades (to be completed in 2027) respectively.

Figure 4-2 (b) and **Figure 4-2 (d)** show the impact to human receptors with yellow triangles representing Unacceptable, purple triangles representing Somewhat Acceptable, and green triangles representing Acceptable odour impacts.

Figure 4-2 (b) shows Alternative 4 (Plant 1 and Plant 2 odour mitigation works) will further improve the odour impacts within Lakeview Village with the incidences of Unacceptable and Somewhat Acceptable impacts being limited to two receptors within an area located east of Haig (Street I) and north of Street B.

Figure 4-2 (d) shows Alternative 5 (Plant 3 odour mitigation works) will further improve the odour impacts within Lakeview Village with all receptors within Lakeview Village development having acceptable odour levels and no areas of the proposed Lakeview Village development are hence to be impacted by odours from G.E. Booth WWTP.

Note: The “odour contours” shown on Figures 4-2(a) and 4-2(c) are derived from the receptor data and provide an interpolation of this data. Figures 4-2(b) and 4-2(d) provide a better comparison and hence are used in our discussion above.

Alternative 4 – Plants 1 and 2 Ultimate Odour Upgrades

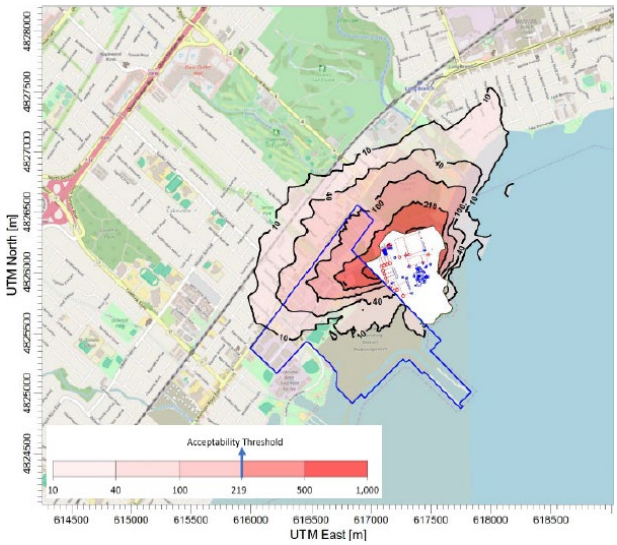


Figure 4-2 (a): Alternative 4-Number of Hours 7 OU is Exceeded over 5 years.

Figure 4-2 (b): Alternative 4-Predicted Odour Impacts.

Alternative 5 – Plant 1, 2 and 3 Ultimate Odour Upgrades

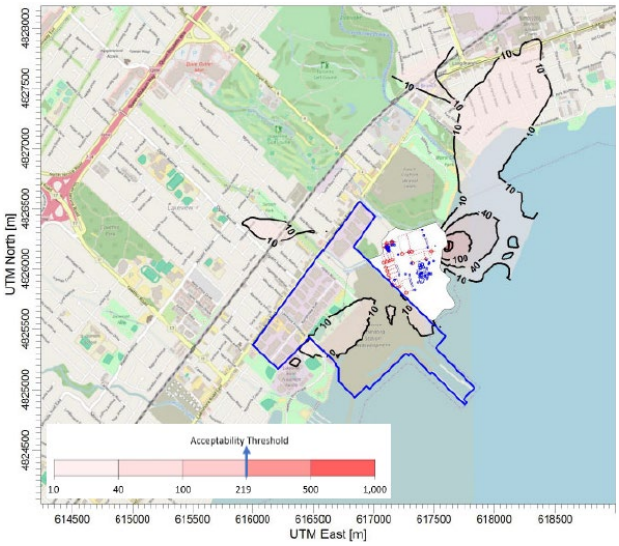


Figure 4-2 (c): Alternative 5-Number of Hours 7 OU is Exceeded over 5 years.

Figure 4-2 (d): Alternative 5-Predicted Odour Impacts.

FIGURE 4-2: ALTERNATIVE 4 AND ALTERNATIVE 5 NUMBER OF HOURS OF EXCEEDING 7 OU THRESHOLD OVER 5 YEARS AND ULTIMATE ODOUR MITIGATION IMPACTS (FIGURES 6-11, 6-12 & 6-13 JACOBS TM-3, JANUARY 8, 2020)

Summary of costs, and impact at human receptors in the vicinity of the G.E. Booth WWTP, associated with these scenarios are provided in **Table 4-1**.

TABLE 4-1: SUMMARY OF ALTERNATIVES, CAPITAL, O&M COSTS AND IMPACT ON HUMAN RECEPTORS.

Alternative	Capital Cost (including mark-ups)	Annual O&M Cost	Impact at Human Receptors (30 Areas Under Study)
0. Baseline (existing system)	$0	$474,000	Acceptable: 18 Somewhat Acceptable: 9 Unacceptable: 3
1. Increase stack height of Future Baseline inlet sewer/Headworks biotrickling filter from 12m to 15m	$4,800	$474,000	Acceptable: 19 Somewhat Acceptable: 8 Unacceptable: 3
2. Alternative 1 plus expand existing Headworks GAC polishing capacity.	$1,696,800	$637,500	Acceptable: 20 Somewhat Acceptable: 7 Unacceptable: 3
3. Alternative 2 plus install covers on Plant 1 primary clarifiers and collect and treat odorous air with new biotrickling filter.	$17,137,100 ($54,665,900)*	$608,500 ($685,500)*	Acceptable: 25 Somewhat Acceptable: 3 Unacceptable: 2
4. Alternative 3 plus install covers on Plant 2 primary clarifiers and collect and treat odorous air with new biotrickling filter (replace travelling bridge mechanisms with Fujiwara systems).	$35,317,800 ($91,101,600)*	$639,700 ($681,500)*	Acceptable: 27 Somewhat Acceptable: 2 Unacceptable: 1
5. Alternative 4 plus install covers on Plant 3 primary clarifiers and collect and treat odorous air with new biotrickling filter (replace travelling bridge mechanisms with Fujiwara systems).	$94,003,700 ($216,635,500)*	$538,100 ($667,700)*	Acceptable: 29 Somewhat Acceptable: 1 Unacceptable: 0

* Includes cost to cover and enclose primary clarifiers in buildings.

5 Region's Staff Report to the Council

The Region prepared and submitted a report for the July 23, 2020 Council meeting entitled *Lakeview Village Community –Ultimate Odour Control Strategy at G.E. Booth Wastewater Treatment Plant, City of Mississauga, Ward 1*.

In summary, the report indicates:

- Capital budget of $190M to cover and construct buildings around Plants 1, 2 and 3 primary clarifiers and upgrade and expand odour control treatment system.
  - $180.5M to be funded through region-wide development charge.

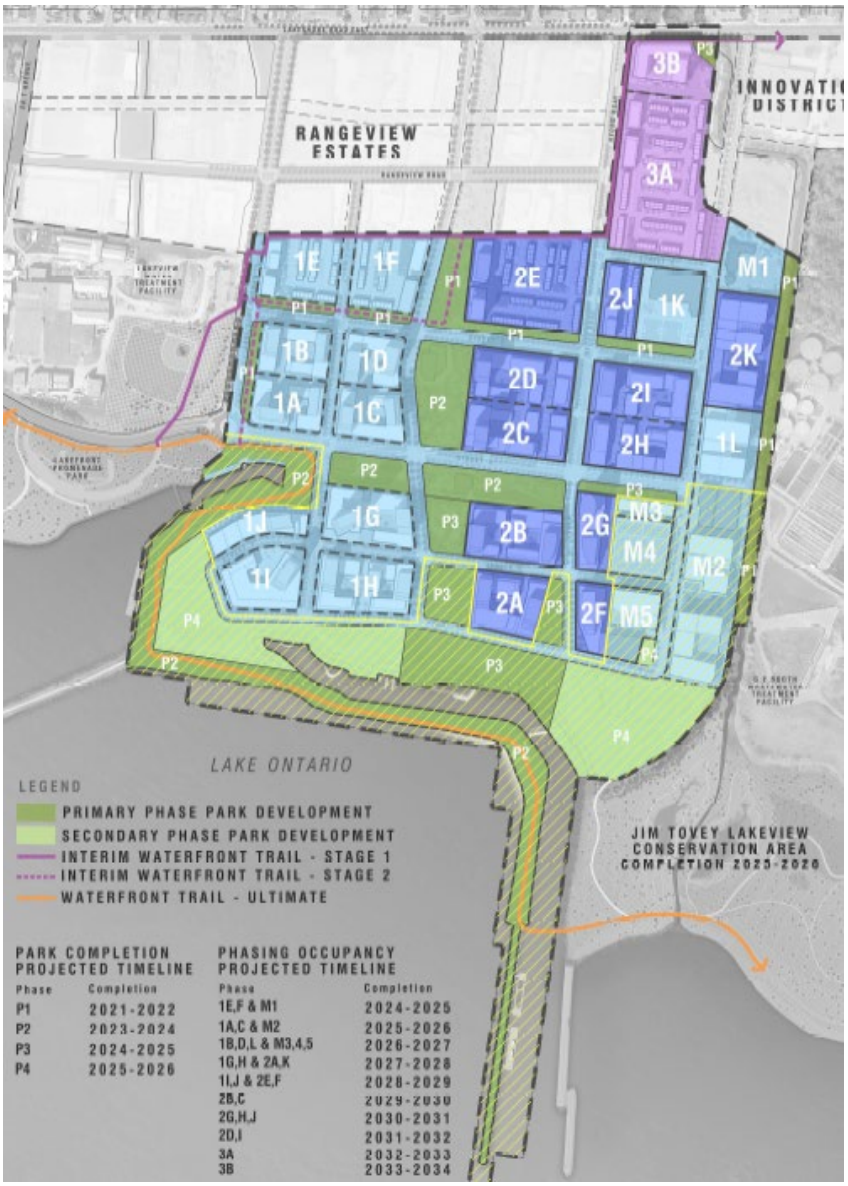
    - $9.5 million to be funded through wastewater rates.
- Advance $5M from 2024 to 2020 capital budget to modify existing design and construction contracts.
- Half of the odour mitigation program to be completed by 2026. If this is not met it would significantly impact LV development schedule.

Region staff were given the approval to proceed with the implementation of the ultimate odour works (Alternative 5) at Regional Council on July 23, 2020. Regional staff have proceeded, as a result, with the design and implementation of these works.

As noted in the staff report, the first stage of these works (Plant 1 and Plant 2) are anticipated to be in operation in 2026 and the second stage of these works (Plant 3) are anticipated to be in operation in 2027.

6 Development Phasing

Development of the Lakeview Village lands is anticipated to build-out primarily in a west to east direction. The following figure and tables provide a summary of the anticipated phasing, occupancy timing, and odour impacts:


RANGEVIEW ESTATES
LAKE ONTARIO
JIM TOVEY LAKEVIEW CONSERVATION AREA
COMPLETION 2025-2026
LEGEND
PRIMARY PHASE PARK DEVELOPMENT
SECONDARY PHASE PARK DEVELOPMENT
INTERIM WATERFRONT TRAIL - STAGE 1
INTERIM WATERFRONT TRAIL - STAGE 2
WATERFRONT TRAIL - ULTIMATE
PARK COMPLETION PROJECTED TIMELINE
Phase Completion
P1 2021-2022
P2 2023-2024
P3 2024-2025
P4 2025-2026
PHASING OCCUPANCY PROJECTED TIMELINE
Phase Completion
1E,F & M1 2024-2025
1A,C & M2 2025-2026
1B,D,L & M3,4,5 2026-2027
1G,H & 2A,K 2027-2028
1I,J & 2E,F 2028-2029
2B,C 2029-2030
2G,H,J 2030-2031
2D,I 2031-2032
3A 2032-2033
3B 2033-2034

Residential Phasing

Phase	Location	Occupancy	Impact from Odour
Phases 1E & 1F	West of Street F (Ogden), north of Street B	2024-2025	No impact provided interim odour mitigation works are in operation (2021)
Phases 1A & 1C	West of Street F (Ogden), north of Street A	2025-2026	No impact provided interim odour mitigation works are in operation (2021)
Phases 1B & 1D	West of Street F (Ogden), north of Street A	2026-2027	No impact provided interim odour mitigation works are in operation (2021)
Phases 1G, 1H, 2A	West of Hydro Road, south of Street A	2027-2028	No impact provided interim odour mitigation works are in operation (2021)
Phases 1I, 1J, 2E, 2F	Scattered	2028-2029	No impact provided interim odour mitigation works are in operation (2021)
Phases 2B & 2C	West of Hydro Road	2029-2030	No impact provided interim odour mitigation works are in operation (2021)
Phases 2G & 2H	East of Hydro Road, north and south of Street A	2030-2031	No impact provided interim odour mitigation works are in operation (2021)
Phases 2J	Between Hydro and Haig and north of Street B	2030-2031	No impact provided Stage 1 of Ultimate Mitigation are in operation (2026)
Phases 2D & 2I	South of Street B, east and west of Hydro Road	2031-2032	No impact provided interim odour mitigation works are in operation (2021)
Phases 3A	Between Hydro and Haig, north of Street F	2032-2033	No impact provided interim odour mitigation works are in operation (2021)
Phases 3B	Between Hydro and Haig, north of Street F	2033-2034	No impact provided interim odour mitigation works are in operation (2021)

Non-Residential Phasing

Phase	Location	Occupancy	Impact from Odour
Phases M1	East of Street I (Haig) Park Depot lands	2024-2025	No impact, especially when Stage 2 of Ultimate Mitigation are in operation (2027)
Phases M2	East of Street I (Haig) and Innovation District on future City lands	2025-2026	No impact, especially when interim odour mitigation works are in operation (2021)

Phases 1L	East of Street I (Haig) North of Street A	2026-2027	No impact, especially when Stage 1 of Ultimate Mitigation are in operation (2026)
Phases 1K	School Block west of Street I (Haig)	2027-2028	No impact provided Stage 1 of Ultimate Mitigation are in operation (2026)
Phases M3-M5	West of Haig, south of Street A on future City owned lands	2026-2028	No impact, especially when interim odour mitigation works are in operation (2021)
Phases 2K	East of Haig, opposite Street B	2027-2028	No impact, especially when Stage 2 of Ultimate Mitigation are in operation (2027)

7 Conclusion

Based on the above summary, it is evident from the Region's analysis that:

1. Proposed interim odour mitigation works will reduce the impacts of odour from the G.E. Booth WWTP (ie based on current plant capacity, prior to Plant 1 replacement and plant capacity expansion), with an area of Unacceptable odour levels limited to an area comprising Phase 2J, 1K, 1L, 2K, and M1. This interim mitigation work is anticipated to be completed in 2021.
2. Proposed ultimate odour mitigation works at the new Plant 1 and existing Plant 2 will further reduce odour impacts resulting in Unacceptable odour levels limited to an area comprising Phase 2K and M1. This stage of mitigation works is anticipated to be completed in 2026
3. Proposed ultimate odour mitigation works at the existing Plant 3 will further reduce odour impacts resulting in acceptable odour levels throughout the Lakeview Village development. This stage of mitigation works is anticipated to be completed in 2027.

It is anticipated that appropriate draft plan conditions may be identified directing the applicant to demonstrate that the appropriate odour mitigation measures are in place, on a block by block basis, prior to site plan approval of that block.

References

1. *G. E. BOOTH WWTP ODOUR MANAGEMENT STRATEGY, Technical Memorandum No. 1 Odour Sampling Program*, Prepared for Region of Peel, July 19, 2018, CH2M 245 Consumers Road, Toronto, Ontario M2J 1R3
2. *G. E. BOOTH WWTP ODOUR MANAGEMENT STRATEGY, Technical Memorandum No. 2 Odour Management Baseline*, Prepared for Region of Peel, February 12, 2019, CH2M 245 Consumers Road, Toronto, Ontario M2J 1R3
3. *G. E. BOOTH WWTP ODOUR MANAGEMENT STRATEGY, Technical Memorandum No. 3 Evaluation of Odour Management Scenarios and Alternatives*, Prepared for Region of Peel, August 12, 2019, CH2M 245 Consumers Road, Toronto, Ontario M2J 1R3
4. *G. E. BOOTH WWTP ODOUR MANAGEMENT STRATEGY, Technical Memorandum No. 3 Evaluation of Odour Management Scenarios and Alternatives*, Prepared for Region of Peel, January 8, 2020, CH2M 245 Consumers Road, Toronto, Ontario M2J 1R3
5. *Lakeview Village Community – Ultimate Odour Control Strategy at G.E. Booth Wastewater Treatment Plant, City of Mississauga, Ward 1*, Andrew Farr, Interim Commissioner of Public Works, Stephen Van Ofwegen, Commissioner of Finance and Chief Financial Officer, Submitted for Regional Council Meeting of 2020-07-23.