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V & J TECTONIC INC. SUBDIVISION
MASTER PLAN
STORMWATER MANAGEMENT PLAN
DEER LAKE, NL

PROJECT NUMBER: 2026005
AGUATHUNA DRAFTING AND CONSULTING COMPANY LTD. (ADC ENGINEERING)
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Document Control

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1. Executive Summary

This report summarizes the stormwater management design for the V & J Tectonic Inc. subdivision in Deer Lake, NL, and confirms that the proposed stormwater works integrate with the overall Stormwater Master Plan for phased site build-out. Hydrologic and hydraulic modelling was completed in Autodesk Storm and Sanitary Analysis (SSA) using a 24-hour future climate-adjusted design storm to evaluate pre-development and post-development runoff, size detention and outlet controls, and confirm that the controlled post-development peak discharge at the overall site outfall does not exceed the pre-development peak discharge.

- Pre-development peak flow at site outfall: **0.232 m³/s** (130.57 ha total drainage area; composite CN 45).
- Revised controlled post-development peak flow at the overall OUTFALL node: **0.220 m³/s**, which is **0.012 m³/s below** the pre-development peak flow.
- Initial construction condition: **Phase 1 + Commercial 1**.
- Phase 1 peak inflow to detention basin (DET-R-PH1): **2.108 m³/s**.
- Phase 1 peak controlled outflow via orifice outlet (Phase_1_OR): **0.124 m³/s**.
- Commercial 1 peak controlled outflow via orifice outlet (COM_1_OR): **0.080 m³/s**.
- Phase 1 maximum detention storage volume: **5,622 m³** with a maximum ponded depth of **0.99 m**.

Based on the revised modelling results, the controlled post-development discharge from the overall site does not exceed the pre-development discharge. Compliance is assessed at the overall OUTFALL node, which represents the combined downstream discharge from the modelled drainage system. The initial construction condition is expected to include Phase 1 and Commercial 1, with both areas provided with controlled outlet discharges prior to release into the downstream stormwater system. The Phase 1 and Commercial 1 outlet flows are provided as component results, while the phased detention controls and cumulative construction sequence are addressed separately in Section 7.6. Together, these results respond to the Department of Transportation and Infrastructure review comment by confirming that the stormwater controls are designed to manage interim and ultimate development conditions through a sequential downstream system. The model also includes detention basin storage and ponding; any reported flooding or ponding at detention basin storage nodes represents the intended temporary stormwater storage behaviour within the detention facilities.

Definitions

TERM	DEFINITION
CATCHMENT (DRAINAGE AREA)	The land area that contributes runoff to a defined point (e.g., a culvert crossing, pond outlet, or stream reach).
DETENTION / STORAGE	Temporary holding of runoff within a pond, swale, or floodplain area that reduces peak flows downstream.

Acronyms Table

ACRONYM	MEANING
ADC	Aguathuna Drafting and Consulting Company Ltd. (ADC Engineering)
COMM	Commercial area
DET	Detention basin
OR	Orifice outlet
PH1	Phase 1
SSA	Storm and Sanitary Analysis
R	Routing/storage node
SUB	Subbasin
UNDEV	Undeveloped area

Symbols and Units

SYMBOL / UNIT	MEANING	TYPICAL UNIT
Q	Discharge / flow rate	m ³ /s
m	metre (length)	m
mm	millimetre (length)	mm
m ³ /s	Cubic metres per second (flow rate)	m ³ /s
%	Percent (e.g., slope)	%

2. Project Background and Master Plan Context

The proposed development is planned to proceed in multiple phases in accordance with the overall Stormwater Master Plan, which establishes the ultimate drainage framework for the full build-out of the site. The Master Plan identifies a series of phased storm sewer systems, detention facilities, and controlled outlet structures intended to manage stormwater runoff in a coordinated and incremental manner while protecting downstream drainage infrastructure.

To support this approach, pre-development and post-development stormwater analyses were completed to evaluate changes in runoff characteristics resulting from development and to determine the level of flow control and detention required at each phase. The analyses confirm that post-development peak runoff rates exceed existing conditions and therefore require on-site detention and controlled release.

Phase 1 and Commercial 1 represent the initial construction condition within the overall Master Plan framework. The stormwater management systems for these areas have been designed to operate during the early stage of development while also providing the downstream stormwater controls needed to maintain compatibility with subsequent phases and commercial areas as they are connected in sequence.

3. Stormwater Master Plan Overview

The Stormwater Master Plan (see **Figure 3**) illustrates the ultimate configuration of the stormwater management system for the fully developed site. The Master Plan includes:

- Multiple phased drainage areas aligned with the planned development sequence;
- A network of storm sewer pipes conveying runoff from each phase;
- A series of detention basins and outlet control structures serving individual phases;
- A common downstream discharge corridor leading to the existing culvert and outfall system.

Each development phase is designed to provide localized stormwater control at the time of construction. Later phases are not intended to discharge independently; instead, they are to be connected only after the required downstream conveyance, detention, and outlet-control infrastructure from earlier stages is installed and operational.

4. Phase 1 Integration with the Master Plan

Phase 1 and Commercial 1 form the initial construction condition within the overall drainage area identified in the Master Plan. Phase 1 represents the first residential sub-catchment to be developed, while Commercial 1 represents the first commercial drainage area to be developed. As shown in the Master Plan:

- Phase 1 drainage is directed to a dedicated detention basin and outlet structure specific to Phase 1.
- The Phase 1 outlet discharges to the downstream storm sewer and culvert system identified in the Master Plan as the primary discharge route for subsequent phases.
- Future phases (Phases 2 through ultimate build-out) are planned to connect downstream of the Phase 1 outlet or to parallel infrastructure, ensuring that Phase 1 flows are not adversely affected by later development.

The Phase 1 and Commercial 1 stormwater infrastructure therefore forms the initial downstream component of the ultimate system and provides controlled discharge points for the early development condition, while remaining compatible with the sequential connection of future residential phases and commercial areas.

5. Phase 1 Stormwater Management System

The Phase 1 stormwater management system has been designed in general conformance with the ultimate system shown on the Master Plan and includes:

- A storm sewer network collecting runoff from the Phase 1 serviced area;
- A dedicated detention basin providing temporary storage of post-development runoff;
- A controlled outlet structure regulating discharge from Phase 1;
- A downstream outlet pipe and culvert connection consistent with the Master Plan discharge alignment.

Pipe sizes, invert elevations, and outlet configurations have been selected to ensure compatibility with downstream infrastructure shown on the Master Plan, while also allowing for future upstream and downstream connections as development progresses.

6. Phased Stormwater Management Strategy

The phased stormwater management strategy adopted for this project ensures that:

- Each phase provides sufficient on-site detention to manage post-development runoff;
- Downstream drainage systems are protected during all stages of construction;
- Later phases are connected only after the required downstream conveyance, detention, and outlet-control infrastructure from earlier stages is installed and operational;
- The ultimate stormwater management system can be constructed incrementally without retrofitting or modification of earlier works.

Phase 1 and Commercial 1 have been designed as the initial operational stage of the stormwater management system and will remain functional as subsequent residential phases and commercial areas are connected in accordance with the Master Plan and the required downstream controls are maintained in service.

7. Hydrological Analysis and Detention Requirements

7.1 Pre-Development Conditions

Pre-development runoff conditions were modeled using **Autodesk Storm and Sanitary Analysis (SSA)** for the full contributing drainage area prior to development. The pre-development model represents existing natural conditions characterized primarily by wooded land cover with poor hydrologic condition.

Key pre-development results are summarized as follows:

- **Total Drainage Area:** 130.57 ha
- **Composite Curve Number:** 45
- **Design Storm:** 24-hour future climate-adjusted event
- **Peak Pre-Development Flow at Outfall:** 0.232 m³/s
- **Average Pre-Development Flow at Outfall:** 0.116 m³/s
- **Total Pre-Development Runoff Volume:** 0.501 hectare-m (5,009 m³)

The pre-development system does not include any detention storage and conveys runoff directly to the downstream culvert and outfall system.

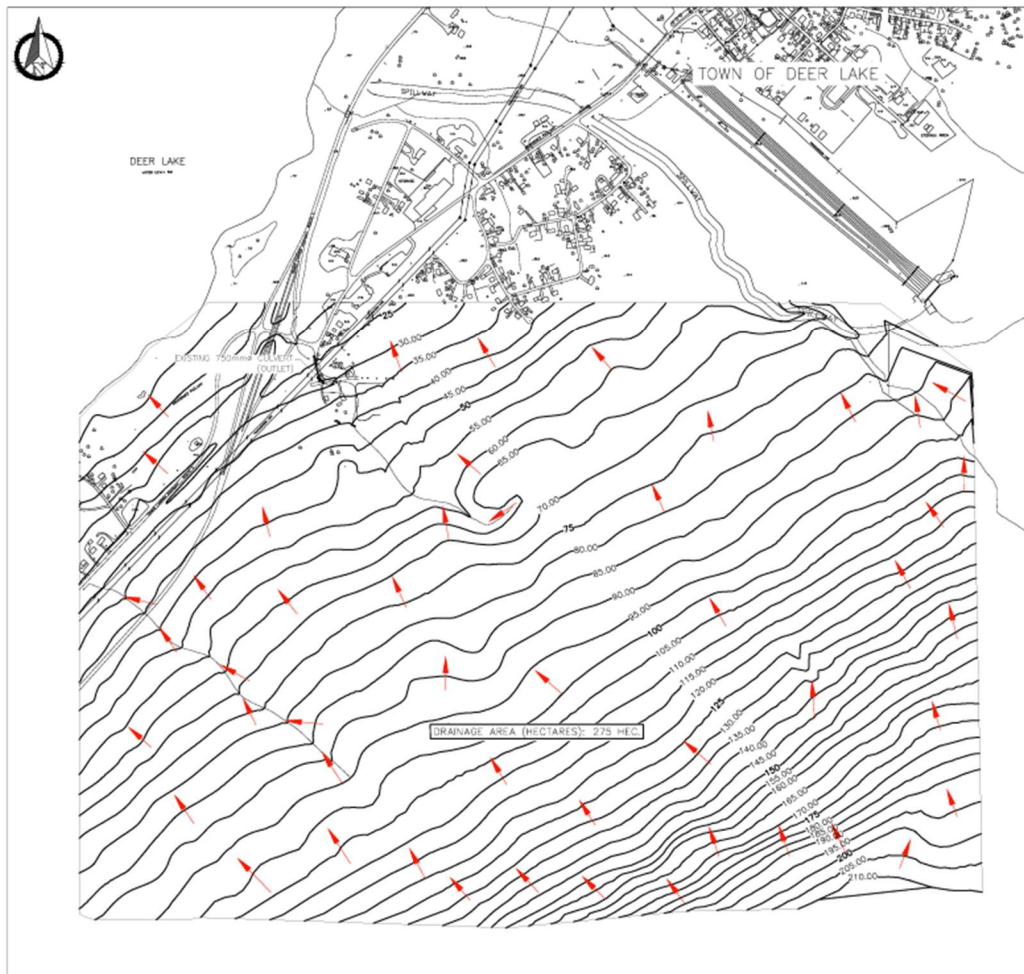


Figure 1 - Pre-Development Drainage Area

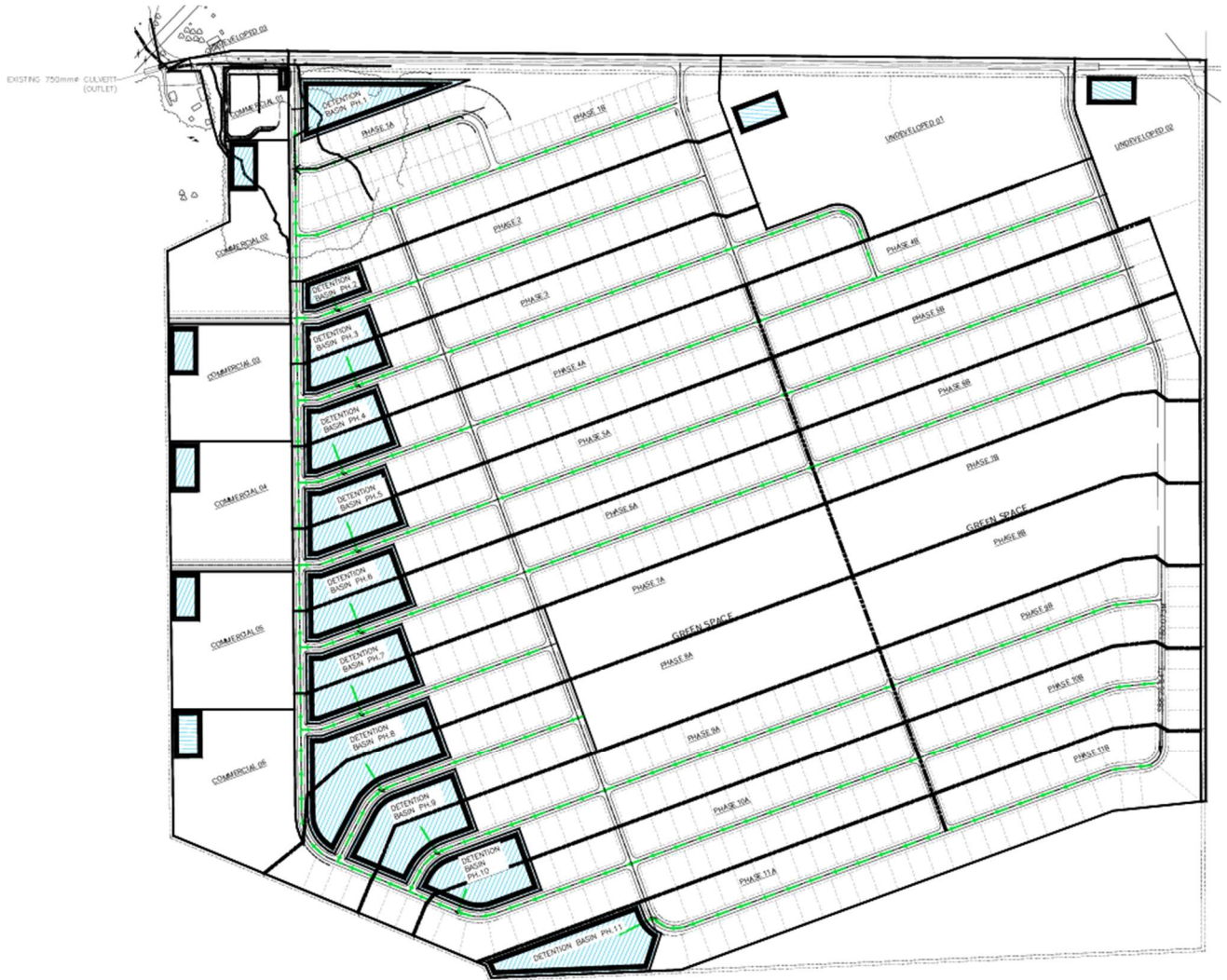


Figure 2 - Post-Development Phases

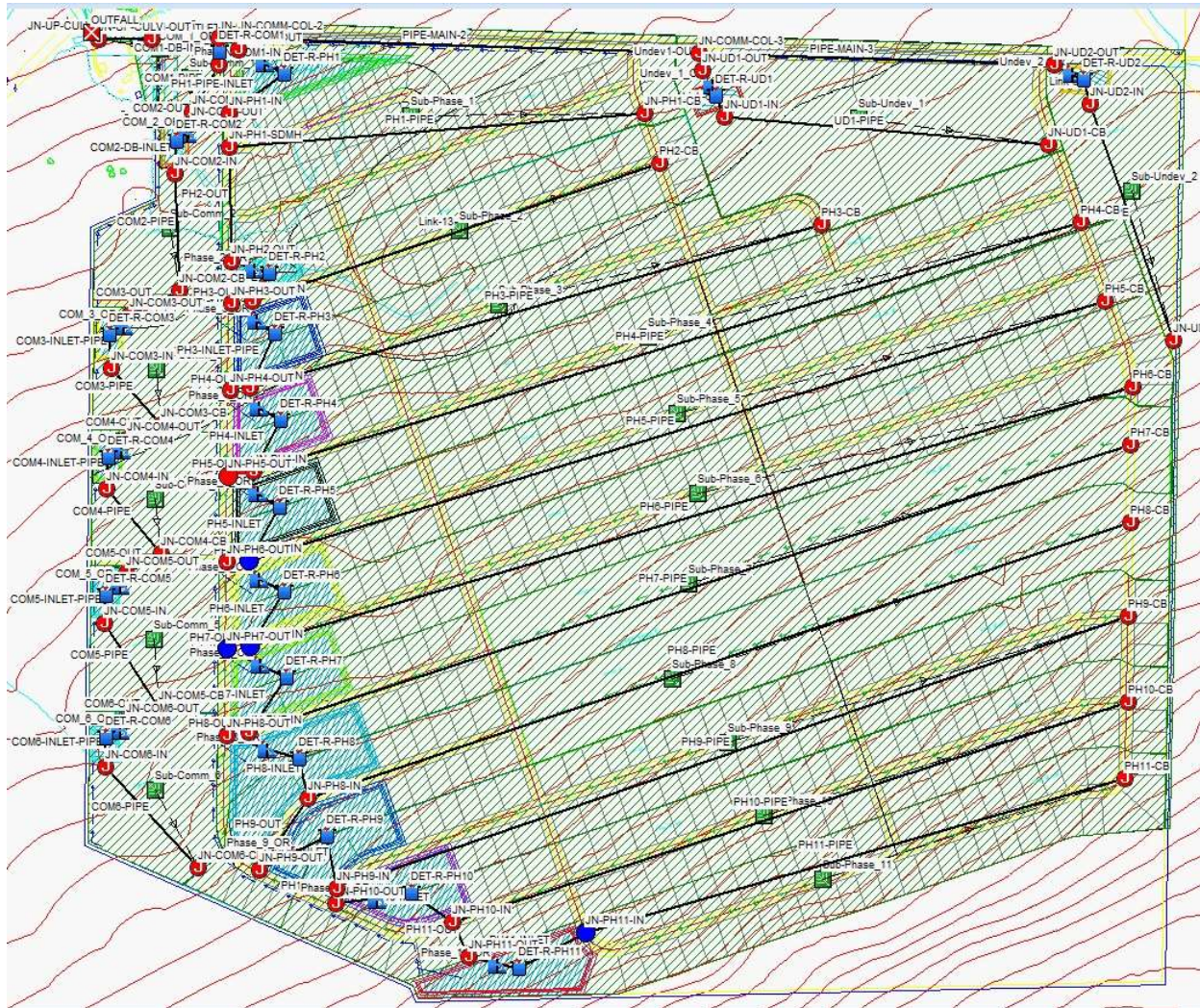


Figure 3 - Post-Development Stormwater Master Plan – Revised SSA Hydrologic Model (All Phases)

7.2 Post-Development Conditions

Post-development conditions were evaluated using an integrated SSA model incorporating the proposed storm sewer network, detention basins, outlet control structures, and downstream outfall system in accordance with the Stormwater Master Plan (see Figure 3). The revised post-development model includes 23 subbasins representing commercial areas, phased development areas, the Phase 1 detention area, and undeveloped catchments across the overall drainage system.

The revised controlled post-development model demonstrates that the peak discharge at the overall OUTFALL node is $0.220 \text{ m}^3/\text{s}$, which is less than the pre-development peak discharge of $0.232 \text{ m}^3/\text{s}$. Therefore, the revised model addresses the review requirement that the post-development peak flow rate for the overall development not exceed the overall pre-development peak flow rate.

Model element identifiers and abbreviations used in the SSA analyses are defined in the Acronyms Table.

As summarized in Table 7-1, the revised model separates the Phase 1 drainage into Phase 1A, Phase 1A Road, Phase 1B, and the Phase 1 detention area. The modeled subbasins range in area from 0.44 ha to 11.84 ha, with weighted curve numbers ranging from 39.00 to 89.00 and times of concentration ranging from 00:10:00 to 00:19:37. Peak runoff rates vary by land use, drainage area, and basin characteristics. Overall, the results confirm that post-development runoff responses vary materially across the site and support the use of phased detention storage and controlled outlet structures throughout the Master Plan area.

Table 7-1: Post-development subbasin hydrologic parameters and peak runoff

Subbasin ID	Area (ha)	Flow Length (m)	Average Slope (%)	Weighted CN	Time of Concentration (hh:mm:ss)	Peak Runoff (m ³ /s)
Sub-Comm_1	0.70	105.00	2.00	89.00	00:10:00	0.19
Sub-Comm_2	2.49	193.00	2.00	89.00	00:10:00	0.67
Sub-Comm_3	2.16	170.00	2.00	89.00	00:10:00	0.58
Sub-Comm_4	2.39	178.00	2.00	89.00	00:10:00	0.64
Sub-Comm_5	2.54	195.00	2.00	89.00	00:10:00	0.68
Sub-Comm_6	2.72	193.00	2.00	89.00	00:10:00	0.73
Sub-Phase_1	10.34	500.00	4.00	80.10	00:10:00	2.05
Sub-Phase_2	5.62	532.00	2.52	79.61	00:10:00	1.10
Sub-Phase_3	6.50	630.00	1.58	79.66	00:10:00	1.27
Sub-Phase_4	10.11	956.00	1.50	79.40	00:19:20	1.57
Sub-Phase_5	10.93	956.00	1.65	79.20	00:18:39	1.72
Sub-Phase_6	11.33	1034.00	1.69	70.83	00:19:37	1.17
Sub-Phase_7	11.84	1034.00	2.78	46.75	00:16:12	0.06
Sub-Phase_8	11.84	1034.00	3.32	47.02	00:15:07	0.06
Sub-Phase_9	10.43	1009.00	3.65	64.77	00:14:19	0.86
Sub-Phase_10	9.51	912.00	4.24	64.87	00:12:30	0.83
Sub-Phase_11	7.90	760.00	4.26	63.79	00:10:51	0.67
Sub-Undev_1	7.75	415.00	4.50	52.16	00:10:00	0.20
Sub-Undev_2	3.86	500.00	8.30	49.38	00:10:00	0.06
Sub-Undev_3	0.44	144.00	4.50	57.19	00:10:00	0.02

7.3.2 Controlled Outflow

Discharge from the Phase 1 detention basin is controlled by an orifice outlet (Phase_1_OR) discharging to the downstream storm sewer system. The associated Phase 1 hydrologic model, basin conveyance path, and conveyance profiles from the basin and inlet piping toward the outlet culvert and back to the basin are provided for reference (see Figures 4 through 7).

- **Peak Controlled Outflow from Phase 1 Basin: 0.124 m³/s**
- **Time of Peak Outflow: 19:56**

This represents a substantial reduction from the uncontrolled Phase 1 basin inflow. This value is reported as the controlled discharge from the Phase 1 detention basin only; compliance with the overall pre-development discharge criterion is assessed separately at the overall OUTFALL node.

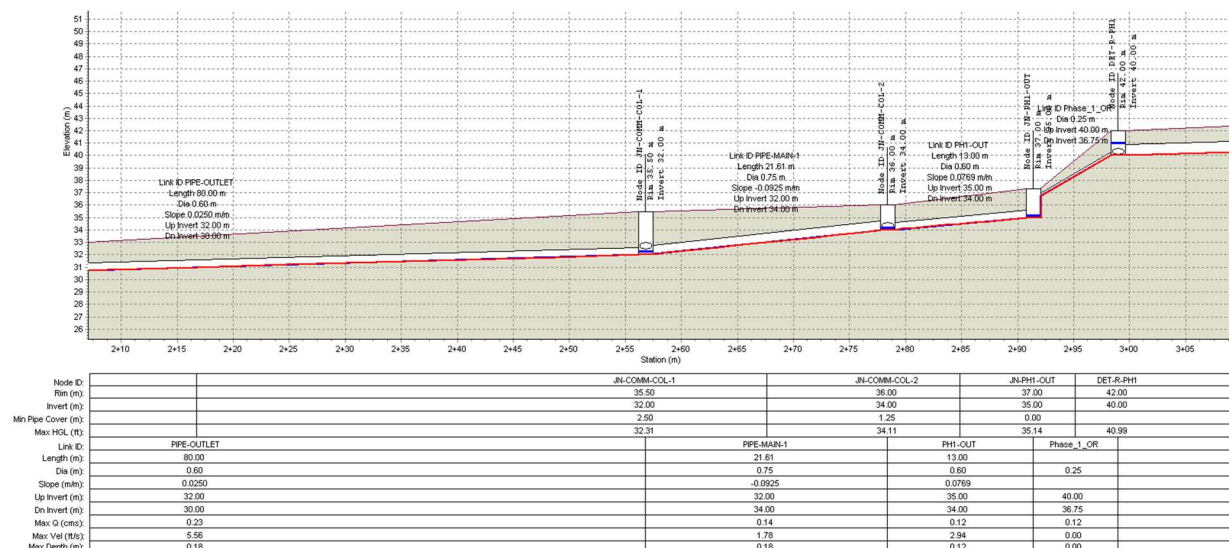


Figure 6 - Phase 1 Conveyance Profile: Detention Basin (DET-R-PH1) and Basin Inlet Piping heading toward the Outlet Culvert

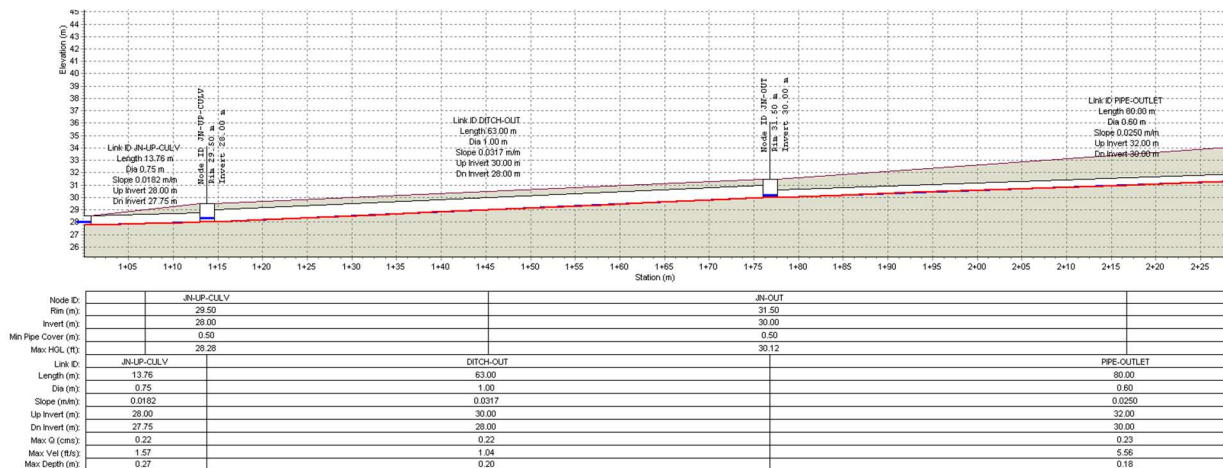


Figure 3 - Phase 1 Conveyance Profiles: Outlet Culvert to Detention Basin (DET-R-PH1)

7.4 Phase 1 Detention Storage Requirements

The Phase 1 detention basin provides temporary storage to attenuate post-development runoff to acceptable discharge rates.

Based on the SSA **Storage Node Summary** for **DET-R-PH1**, the following detention volumes were determined:

- **Maximum Stored Volume:** $5.622 \times 10^3 \text{ m}^3$ (5,622 m³)
- **Average Stored Volume During Event:** $4.762 \times 10^3 \text{ m}^3$
- **Maximum Ponded Depth:** 0.99 m
- **Time of Maximum Storage:** 19:56

The detention volume provided within the Phase 1 basin is sufficient to temporarily store excess runoff generated during the design storm and release flows at a controlled rate. Reported ponding or flooding at detention basin storage nodes is expected and represents intentional use of the detention storage volume during the design storm event.

7.5 Downstream Outfall Comparison

A comparison of the pre-development and revised controlled post-development model results at the overall site outfall is provided below. The compliance point for addressing the Department of Transportation and Infrastructure review comment is the overall **OUTFALL** node, which represents the combined downstream discharge from the modeled development area. Individual detention basin outlet flows, including Phase_1_OR, are component flows and are not used on their own to demonstrate overall site compliance.

Table 7-2: Comparison of pre-development and post-development model results

Condition / Model Result	Reporting Location	Peak Flow (m ³ /s)
Pre-development baseline	Site outfall	0.232
Revised controlled post-development model	OUTFALL node	0.220
Difference below pre-development peak	OUTFALL node	0.012
Initial construction component discharges for reference only	Phase_1_OR / COM_1_OR	0.124 / 0.080

Note: The “Initial construction component discharges” row reports the peak controlled outlet discharges from the Phase 1 and Commercial 1 detention facilities only. These values are provided to document the operation of the initial construction outlet controls and are not the compliance point for the overall development. Overall compliance is assessed at the OUTFALL node, where the revised controlled post-development peak flow is 0.220 m³/s.

As shown in Table 7-2, the revised controlled post-development peak flow at the overall OUTFALL node is 0.220 m³/s, which is less than the pre-development peak flow of 0.232 m³/s. The revised model therefore demonstrates that the overall controlled post-development peak discharge does not exceed the overall pre-development peak discharge. This directly addresses the Department of Transportation and Infrastructure comment regarding the overall development discharge rate.

7.6 Interim Phase Compliance

The phased stormwater system is sequential and hydraulically integrated. Later residential and commercial phases are not intended to be constructed or discharged independently of the downstream stormwater controls constructed in earlier phases. For example, drainage from subsequent residential phases is conveyed through downstream stormwater infrastructure associated with previously constructed phases, and subsequent commercial areas are similarly dependent on the downstream commercial stormwater controls. As such, isolated single-phase simulations for later phases would not represent realistic interim construction conditions.

The appropriate interim assessment is therefore based on the actual cumulative construction sequence, beginning with Phase 1 + Commercial 1 and progressing through subsequent phases and commercial areas as the required downstream conveyance, detention, and outlet-control infrastructure is installed. A phase or commercial area is not intended to contribute developed runoff to the downstream drainage system until the required downstream controls serving that area are in place and operational. The revised SSA model confirms that the fully routed post-development condition, including the phase and commercial detention facilities and downstream conveyance system, produces a peak flow of 0.220 m³/s at the OUTFALL node, which is less than the pre-development peak flow criterion of 0.232 m³/s.

The values summarized in Table 7-3 are presented to clarify how the cumulative construction sequence is supported by the revised SSA model. The value outside the brackets is the routed full-model OUTFALL peak discharge, while the bracketed values identify the controlled component discharges from the active phase and commercial detention facilities associated with each cumulative construction condition. These component discharges demonstrate that runoff from each contributing area is controlled before entering the downstream system; however, they are not directly additive because individual outlet hydrographs peak at different times and are routed through the downstream stormwater network before reaching the OUTFALL node. The governing comparison remains the routed peak discharge at the OUTFALL node.

Table 7-3: Cumulative Phased Controlled Outlet Discharge Summary

Cumulative Construction Condition	Active Controlled Outlets	Controlled OUTFALL Peak with Component Outlet Discharges (m ³ /s)	Interim Compliance Context
Pre-development baseline	Site outfall	0.232	Pre-development benchmark for comparison at the OUTFALL node.
Phase 1 + Commercial 1	Phase_1_OR; COM_1_OR	0.220 (Phase 1: 0.124; Commercial 1: 0.080)	Initial residential and commercial controls active prior to discharge to the downstream system.
Phases 1-2 + Commercial 1-2	Phase_1_OR; Phase_2_OR; COM_1_OR; COM_2_OR	0.220 (P1: 0.124; P2: 0.152; C1: 0.080; C2: 0.078)	Phase 2 and Commercial 2 discharge only after the downstream Phase 1 and Commercial 1 controls are available.
Phases 1-3 + Commercial 1-3	Phase_1_OR through Phase_3_OR; COM_1_OR through COM_3_OR	0.220 (P1: 0.124; P2: 0.152; P3: 0.052; C1: 0.080; C2: 0.078; C3: 0.076)	Cumulative construction condition with earlier downstream controls in place.
Phases 1-4 + Commercial 1-4	Phase_1_OR through Phase_4_OR; COM_1_OR through COM_4_OR	0.220 (P1: 0.124; P2: 0.152; P3: 0.052; P4: 0.046; C1: 0.080; C2: 0.078; C3: 0.076; C4: 0.074)	Cumulative construction condition with all contributing controls installed before discharge.
Phases 1-5 + Commercial 1-5	Phase_1_OR through Phase_5_OR; COM_1_OR through COM_5_OR	0.220 (P1: 0.124; P2: 0.152; P3: 0.052; P4: 0.046; P5: 0.035; C1: 0.080; C2: 0.078; C3: 0.076; C4: 0.074; C5: 0.069)	Cumulative construction condition routed through the constructed downstream system.
Phases 1-6 + Commercial 1-6	Phase_1_OR through Phase_6_OR; COM_1_OR through COM_6_OR	0.220 (P1: 0.124; P2: 0.152; P3: 0.052; P4: 0.046; P5: 0.035; P6: 0.023; C1: 0.080; C2: 0.078; C3: 0.076; C4: 0.074; C5: 0.069; C6: 0.059)	Full commercial sequence active with residential phases constructed through Phase 6.

Cumulative Construction Condition	Active Controlled Outlets	Controlled OUTFALL Peak with Component Outlet Discharges (m ³ /s)	Interim Compliance Context
Phases 1-7 + Commercial 1-6	Phase_1_OR through Phase_7_OR; COM_1_OR through COM_6_OR	0.220 (P1: 0.124; P2: 0.152; P3: 0.052; P4: 0.046; P5: 0.035; P6: 0.023; P7: 0.084; C1: 0.080; C2: 0.078; C3: 0.076; C4: 0.074; C5: 0.069; C6: 0.059)	Subsequent residential phases continue to discharge through the constructed downstream controls.
Phases 1-8 + Commercial 1-6	Phase_1_OR through Phase_8_OR; COM_1_OR through COM_6_OR	0.220 (P1: 0.124; P2: 0.152; P3: 0.052; P4: 0.046; P5: 0.035; P6: 0.023; P7: 0.084; P8: 0.002; C1: 0.080; C2: 0.078; C3: 0.076; C4: 0.074; C5: 0.069; C6: 0.059)	Cumulative construction condition routed through the downstream stormwater network.
Phases 1-9 + Commercial 1-6	Phase_1_OR through Phase_9_OR; COM_1_OR through COM_6_OR	0.220 (P1: 0.124; P2: 0.152; P3: 0.052; P4: 0.046; P5: 0.035; P6: 0.023; P7: 0.084; P8: 0.002; P9: 0.010; C1: 0.080; C2: 0.078; C3: 0.076; C4: 0.074; C5: 0.069; C6: 0.059)	Cumulative construction condition routed through the downstream stormwater network.
Phases 1-10 + Commercial 1-6	Phase_1_OR through Phase_10_OR; COM_1_OR through COM_6_OR	0.220 (P1: 0.124; P2: 0.152; P3: 0.052; P4: 0.046; P5: 0.035; P6: 0.023; P7: 0.084; P8: 0.002; P9: 0.010; P10: 0.011; C1: 0.080; C2: 0.078; C3: 0.076; C4: 0.074; C5: 0.069; C6: 0.059)	Cumulative construction condition routed through the downstream stormwater network.
Phases 1-11 + Commercial 1-6	All phase and commercial controlled outlets; OUTFALL node	0.220 (P1: 0.124; P2: 0.152; P3: 0.052; P4: 0.046; P5: 0.035; P6: 0.023; P7: 0.084; P8: 0.002; P9: 0.010; P10: 0.011; P11: 0.007; C1: 0.080; C2: 0.078; C3: 0.076; C4: 0.074; C5: 0.069; C6: 0.059)	Fully routed post-development model complies with the 0.232 m ³ /s pre-development criterion.

Note: The controlled OUTFALL peak shown outside the brackets is the routed full-model peak discharge from the revised SSA model at the overall OUTFALL node. The bracketed values identify the individual controlled component discharges from the active phase and commercial detention facilities that feed the downstream system at each cumulative construction condition. These component discharges show the controlled release from each phase or commercial area into the downstream or previously constructed stormwater system; they are not directly additive because each outlet hydrograph peaks at a different time and is routed through downstream conveyance and detention before contributing to the OUTFALL hydrograph. For construction, each contributing phase or commercial area is to proceed only after the required downstream conveyance, detention, and outlet-control infrastructure needed to serve that contributing area has been installed and is operational.

8. Phase 1 Infrastructure Summary Tables

Table 8-1: Phase 1 Storm Sewer Pipes (preliminary)

Pipe ID	Diameter (mm)	Length (m)	Slope (%)
PH1-PIPE	600	40.0	4.50
PH1-PIPE-INLET	900	78.0	2.56
PH1-PIPE-SD	900	39.0	7.69
PH1-OUT	600	13.0	7.69
PIPE-OUTLET	600	80	2.50

Table 8-2: Phase 1 Detention and Outlet Control

Component	Value
Detention Basin ID	DET-R-PH1
Maximum Storage Volume	5,622 m ³
Maximum Ponded Depth	0.99 m
Outlet Type	Orifice
Orifice ID	Phase_1_OR
Peak Outflow	0.124 m ³ /s

9. Phase-by-Phase Detention Storage Summary

Table 9-1 summarizes the detention storage volumes and controlled discharge rates provided for each phase or drainage area in the revised post-development stormwater analysis. Each phase includes a dedicated detention facility with an outlet control structure sized to attenuate post-development runoff before discharge to the downstream system. The phase outlet values are component results used to document individual detention basin performance and support the cumulative construction sequence summarized in Table 7-3. As shown in Table 7-3, the individual controlled outlet discharges from each active phase and commercial area are routed through the downstream stormwater network, while overall compliance with the pre-development peak discharge criterion is demonstrated at the overall OUTFALL node, where the revised controlled post-development peak flow is 0.220 m³/s compared to the pre-development peak flow of 0.232 m³/s.

Table 9-1: Phase-by-Phase Detention Storage Summary

Phase / Area	Detention Basin ID	Maximum Storage Volume (m ³)	Average Storage Volume (m ³)	Maximum Ponded Depth (m)	Peak Controlled Outflow (m ³ /s)
Commercial 1	DET-R-COM1	197	127	0.74	0.105
Commercial 2	DET-R-COM2	1,642	1,336	0.94	0.078
Commercial 3	DET-R-COM3	1,554	1,264	0.88	0.076
Commercial 4	DET-R-COM4	1,489	1,275	0.84	0.074
Commercial 5	DET-R-COM5	1,340	1,058	0.75	0.069
Commercial 6	DET-R-COM6	1,040	562	0.57	0.059
Phase 1	DET-R-PH1	5,622	4,762	0.99	0.124
Phase 2	DET-R-PH2	3,366	2,706	1.71	0.146
Phase 3	DET-R-PH3	8,040	7,327	1.29	0.053
Phase 4	DET-R-PH4	6,953	6,008	0.99	0.046
Phase 5	DET-R-PH5	4,863	3,833	0.62	0.035
Phase 6	DET-R-PH6	2,551	1,940	0.30	0.023
Phase 7	DET-R-PH7	679	430	0.08	0.084
Phase 8	DET-R-PH8	978	499	0.07	0.002
Phase 9	DET-R-PH9	2,698	1,899	0.26	0.010
Phase 10	DET-R-PH10	2,265	1,653	0.29	0.011
Phase 11	DET-R-PH11	1,359	962	0.15	0.007
Undeveloped Area 1	DET-R-UD1	297	231	0.16	0.018
Undeveloped Area 2	DET-R-UD2	234	159	0.04	0.002

10. Engineering Conclusion

Based on the completed pre-development and revised post-development hydrologic and hydraulic analyses, including review of the phased detention controls and the hydraulically routed downstream system, the proposed stormwater management system provides detention, controlled discharge, and downstream flow attenuation for the development. The revised controlled post-development model results show a peak flow of 0.220 m³/s at the overall OUTFALL node, compared to the modeled pre-development peak flow of 0.232 m³/s. The post-development peak discharge is therefore 0.012 m³/s lower than the pre-development peak discharge, demonstrating that the fully routed controlled post-development discharge does not exceed the pre-development discharge.

The stormwater management system is intended to be constructed and operated in a sequential manner, beginning with Phase 1 + Commercial 1 as the initial construction condition. Later residential phases and commercial areas are not intended to discharge developed runoff independently of the downstream controls constructed in earlier stages; therefore, the meaningful interim condition is the cumulative construction condition in which the necessary downstream conveyance, detention, and outlet-control infrastructure is in place before each contributing area becomes active. The Phase 1 detention basin provides 5,622 m³ of temporary storage, attenuating a peak inflow of 2.108 m³/s to a peak controlled discharge of 0.124 m³/s

through the Phase_1_OR orifice outlet. Commercial 1 provides a peak controlled discharge of 0.080 m³/s through the COM_1_OR orifice outlet. The component outlet discharges summarized in Table 7-3 document the controlled release from each active residential and commercial detention facility into the downstream system, while the overall routed OUTFALL peak remains below the pre-development criterion. Reported ponding or flooding at detention basin storage nodes is expected and represents intentional detention storage during the design storm event. In summary, provided that the downstream conveyance, detention, and outlet controls required for each contributing phase or commercial area are installed prior to or concurrent with that contributing area, the revised phased stormwater management strategy addresses the requirement to protect downstream infrastructure during interim construction stages while maintaining an overall controlled OUTFALL peak below pre-development conditions.

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