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SYNCRONICITY DEVELOPMENT PLANNING

SERVICES SCHEME REPORT

GREENGATE EXT. 140

MOGALE CITY

MAY 2025

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ABREVIATIONS

MW – Mogale Water
MR- Mogale Roads
PRV-Pressure Reducing Valve
FH- Fire Hydrant
CH-Chainage
RHS-Right Hand Side
LHS-Left Hand Side

DOCUMENT CONTROL

Date	Revision	Name	Role	Signature
25/05/25	0	J S Coetsee	Author	

DOCUMENT CHANGE HISTORY

Date	From Version	To Version	Paragraph Reference	Change Description

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1. PROJECT BACKGROUND

1.1 Introduction

The purpose of this report is to discuss the design standards which are proposed for the design of services for the proposed Greengate Ext. 140 township to be established on a Portion 268 of the farm Rietfontein 189 IQ.

The proposed development is situated along Larsons Road. The property currently gains access via R114 (Drift Boulevard) turning south into Larsons Road and then west into the proposed Greengate Ext 140. Refer to Project Area Locality Map, Figure 1 below.

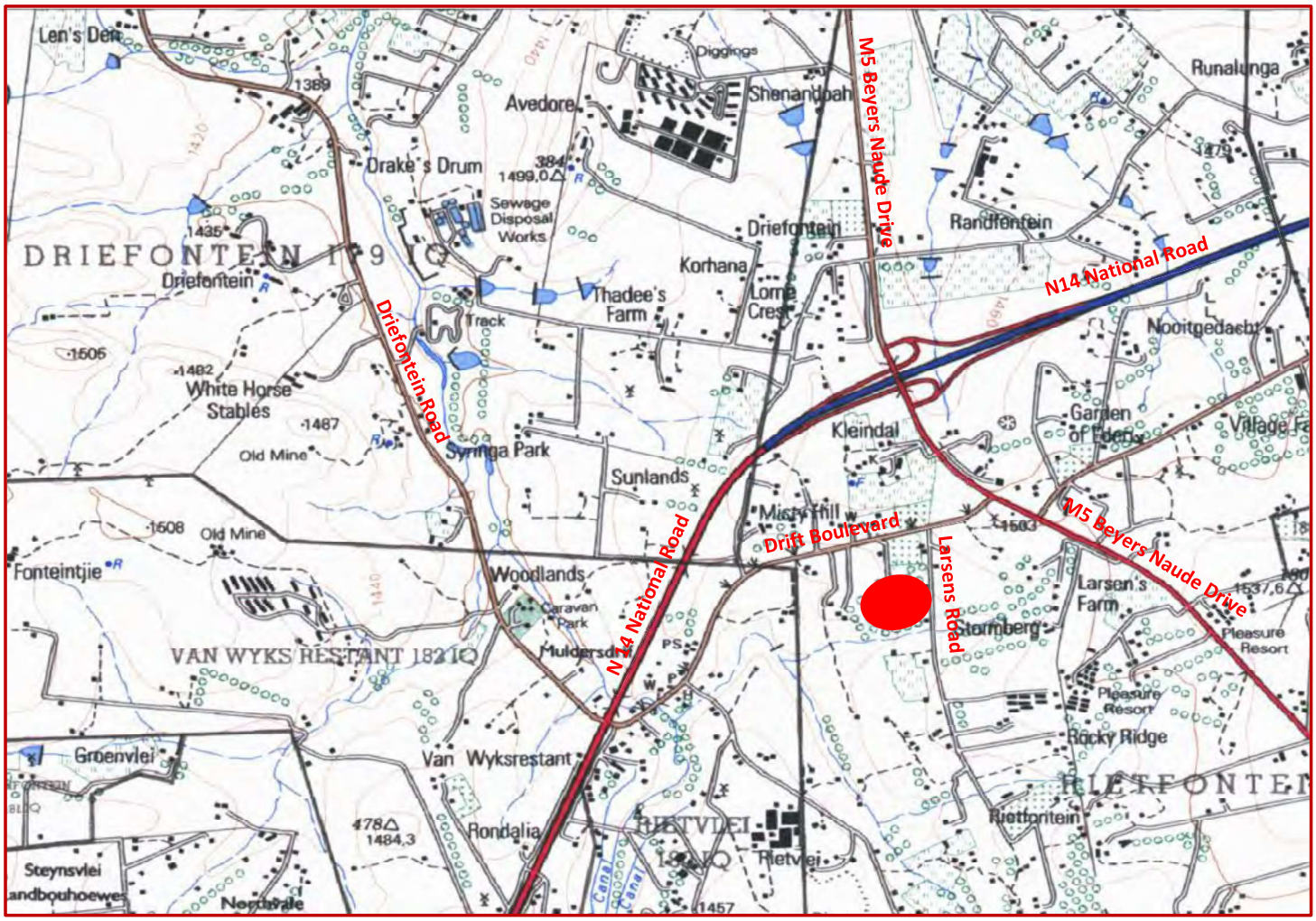

Figure 1: Project Locatlity Map

1.2 Design Criteria and Specifications

All designs will be based on standards as set out in the Guidelines for the Provision of Engineering Services for Residential Townships – 1994 and in the Guidelines for Human Settlement Planning and Design (CSIR 2000) as well as any special requirements of Mogale City Engineers Department.

The specifications to be used are the General Conditions of Contract (Sixth Edition 1990) with the project specifications in accordance with SANS1200.

1.3 Background

Portion 268 of the Farm Rietfontein 189 I.Q. currently has some dwelling houses with outbuildings. The remainder of the farm portions are currently vacant and is an un-used state.

Figure 2: Greengate Ext 115 Locatlity Map

The existing zoning of the property in terms of the Mogale City Land Use Scheme, 2022 and is described as follows: -

- Use Zone: Agricultural
- Height Zone: 2 Storeys
- Building Line: 10m Along Street Boundary
- Parking: -As per Scheme All parking to be provided on site and dust free
- Density: As per Scheme
- Coverage: As per Scheme, 10%
- Floor Area Ratio: As per Scheme, 0,2.
- Area: 8.5655 ha

Following the township establishment, the property will be sub-divided into the township Greengate Ext. 140 stands with the following proposed zonings.

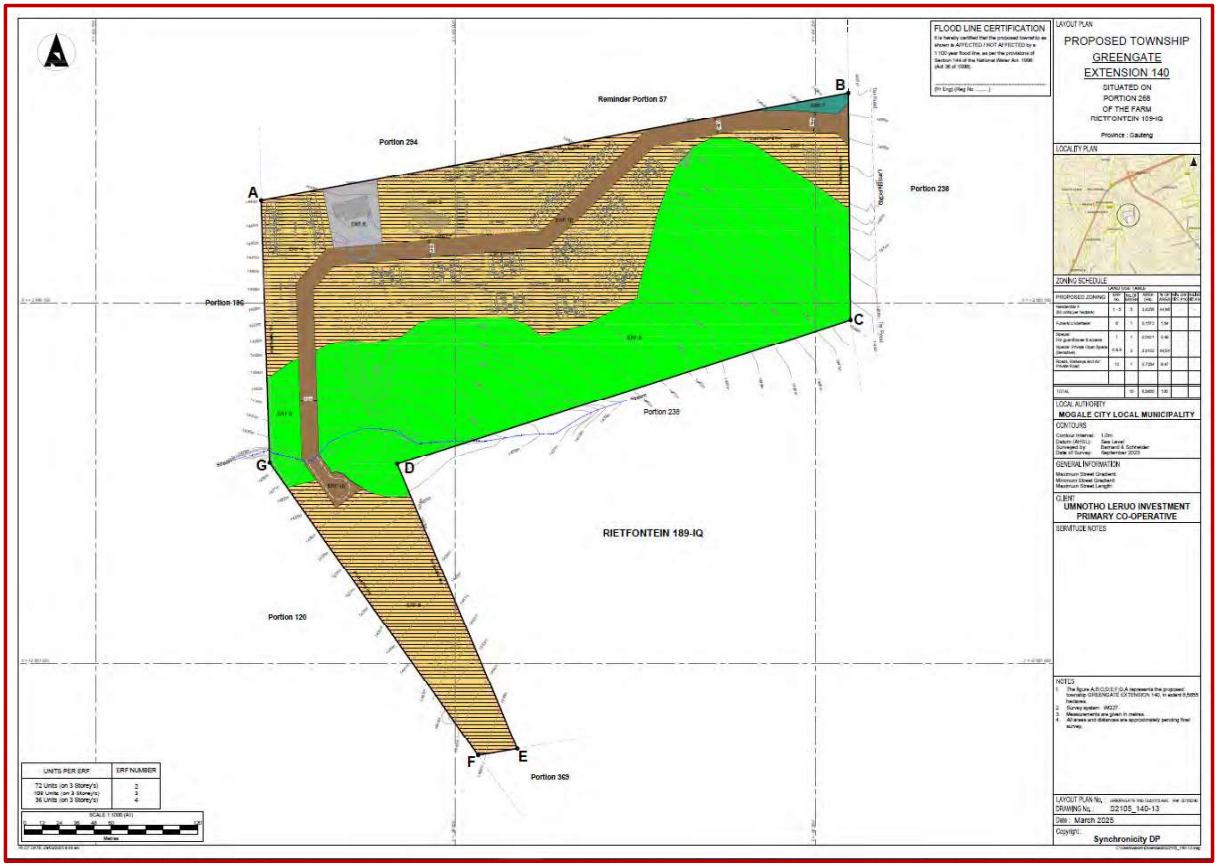

Figure 3: Proposed Township Layout Greengate Ext. 140

***Greengate Ext. 140*:**

Erven 1 to 5

- Use Zone: Residential 4 (80 Units/Hectare) (216 Units)
- Primary Rights: Dwelling units and residential buildings.
- Uses with Consent: As per Scheme
- No Rights: As per Scheme
- Density: As per Scheme - The density shall not exceed 80 units/ha units per hectare without the consent of the local authority.
- Coverage: The coverage shall not exceed 50%
- Floor Space Ratio: As per Scheme - 0,5
- Height: As per Scheme - The height of the buildings shall not exceed 3 storeys excluding architectural features.
- Parking: - As per Scheme Parking requirements may be relaxed with the consent of the local authority.
- Building Lines: As per Scheme - 5m along all street boundaries and 2m along

all other boundaries, provided that the local authority may with consent, relax any building line.

- Area: 3.8256 ha

Erf 6

- Use Zone: Funeral Undertaker
- Primary Rights: The erf shall be used for Funeral Undertaker
- Uses with Consent: As per Scheme
- No Rights: Excludes mortuary and crematorium.
- Density: N/A
- Coverage: The coverage shall not exceed 40%
- Floor Space Ratio: As per Scheme - 0,3
- Height: As per Scheme - The height of the buildings shall not exceed 3 storeys excluding architectural features.
- Parking: - As per Scheme Parking requirements may be relaxed with the consent of the local authority.
- Building Lines: As per Scheme - 5m along all boundaries and 2m along all other boundaries
- Area: 0.1572 ha

Erf 7

- Use Zone: Special (guardhouse & access)
- Primary Rights: As per Scheme
- Uses with Consent: As per Scheme
- No Rights: As per Scheme
- Density: Not Applicable
- Area: 0.0421 ha

Erf 8 & 9

- Use Zone: Private Open Space (Sensitive Area)
- Primary Rights: As per Scheme
- Uses with Consent: As per Scheme
- No Rights: As per Scheme
- Density: Not Applicable
- Area: 3.8152 ha

Erf 10

- Use Zone: Roads
- Primary Rights: As per Scheme

- Uses with Consent: As per Scheme
- No Rights: As per Scheme
- Density: Not Applicable
- Area: 0.7254 ha

2. DESCRIPTION OF SITE AND ACCESS

The proposed Greengate Ext. 140 township are to be established on a Portion 268 of the farm Rietfontein 189 IQ.

The northern boundary of the property is formed by Portion 294 and the remainder of Portion 57. The southern boundary of the property is formed by Portion 369 and 238 of Rietfontein 189-IQ. The western boundary is formed by Portion 120 and Portion 196 of the farm Rietfontein. The eastern boundary is formed by Larson Road. Refer to the figure 3 for the detailed layout.

3. EXISTING SERVICES

3.1 Roads

The proposed development is situated along Larsons Road. The property currently gains access via R114 (Drift Boulevard) turning south into Larsens Road and then west into the proposed Greengate Ext 140.

3.2 Stormwater

The existing area is currently mostly small agricultural holdings and low-density residential housing. There is no existing stormwater infrastructure in the area, with stormwater flowing overland to low lying areas and finally into the Wilgespruit river system.
Stormwater attenuation will be implemented to regulate the post development stormwater discharged into the water course crossing the property.

3.3 Water Reticulation

Data obtained from site and Mogale Water indicates existing mains (160mm Ø) within the road reserves of Larsens Road.

A new 110mm Ø bulk water line will be constructed to service Greengate Ext. 140. The new water line will be connected to the existing 160mm Ø bulk water line, situated within the Larsons Road reserve. New water connections for each stand, will be applied for, from new 110mm Ø bulk water line. This will serve as a potable water and fire mains to the township.

At this stage, the municipal water supply in the area is under severe strain, and the MCLM W&S Department will not finalise applications for township establishment until this issue is resolved.

3.4 Sewer Reticulation

No data of any bulk sewer mains could be obtained from Mogale City engineers department.
The properties in this area would connect with the Driefontein WWW (belonging to CoJ). This connection will depend on the fall of the land, but there is a connection near the intersection

Drift Boulevard Refer and Abraham Van Wyk Road. Refer to Appendix 8 "Sewer Layout Drawings".

4. SERVITUDES

4.1 Existing Servitudes

The subject property is not subject to any servitudes.

4.2 Servitudes to be Registered

A new 3m wide sewer servitude will be required for the proposed bulk sewer connection to the existing infrastructure.

5. INTERNAL SERVICES

Internal services are all those which fall within the boundaries of the proposed township. All designs will be based on standards as set out in the Guidelines for the Provision of Engineering Services for Residential Township Development 1994 and the requirements of the Guidelines for Human Settlement Planning and Design (CSIR 2000) and the requirements of the Mogale Engineers department.

5.1 Roads

Access to Greengate Ext. 140 will be provided from the N14 Highway turning south into the M5 Beyers Naude Drive and then turning west into Drift Boulevard. The property then gains access turning south into Larsons Road and then west into the proposed Greengate Ext 140. Access to Erf 5 will be from Greengate Ext 140 crossing an environmentally sensitive stream and wetland requiring the construction of a new bridge. Access to each individual stand will be provided by a new 12m road reserve as per the layout drawings.

5.1.1 Road Design Criteria

The design criteria to be used for the upgrading of the intersection with Pritchard Road are given below.

a) The geometric design norms for the roads are given in Table 1 below:

ROAD CLASSIFICATION	TRAVEL WAY WIDTH	CROSSFALL	DESIGN SPEED	MIN HORIZONTAL CURVE	VERTICAL CURVE k-VALUE	
					sag	crest
Internal Access roads	7,0	2%	40	50	15	14

Table 1: Geometric Norms

b) Proposed pavement layers given in Table 2 below.

ROAD CLASSIFICATION	SURFACING	SUBBASE	IN-SITU SELECTED	IN-SITU ROADBED
Internal Access Roads	60mm Interlocking Paving Blocks	150mm (C4) Compacted to 95% Mod AASHTO	150mm (G7) compacted to 93% Mod AASHTO	150mm In-Situ Roadbed compacted to 90% Mod AASHTO

Table 2: Proposed Pavement Layers

Cross-sectional elements

Width of proposed access street is 6m and 5m for cul-de-sacs. It is proposed that the roads have a 2% cross fall over the full width with semi-mountable kerbs.

Geometric elements

Geometric standards will adhere to the standards as specified in the Guidelines for Human Settlement Planning and Design (CSIR 2000).

The intersection with Larsens Road will adhere to the required geometric standards. No tapers are required as the layout conforms to the requirements of site triangles (i.e. 2,4m x 35m) and the intersection radii will be 9m.

5.2 Stormwater

The site is affected by a watercourse. The site has a moderate topography and slopes from the northeast to the southwest at a gradient of approximately 1:11 to 1:18 towards the watercourse/stream. Erf 5 has a moderate topography and slopes from the southeast to the northwest at a gradient of approximately 1:18 towards the watercourse/stream. It is proposed to integrate the road network with the stormwater management for the development. The proposed development is situated in the greater Mogale City area, and a MAP of 798mm was used in all the calculations.

The stormwater management will be such that the principles of progressive stormwater management will be implemented. The roads, which in turn will discharge, via grid inlets, will collect the surface run-off or open drains which will be channelled to the respective stormwater retention ponds for each erf. The retention ponds will discharging the attenuated stormwater into the watercourse/stream.

5.2.1 Stormwater Analysis

The stormwater analysis was conducted using the HydroQube design program. Stormwater calculations were carried out for the pre-development and post-development scenarios. The post development attenuated design stormwater flow for each erf, is based on the 5-year pre-development stormwater flow.

The detail catchment characteristics used in the analysis is summarized in Table 3 below.

Catchment	Catchment Area (Ha)	Overland Flow Length (m)	Slope (m/m)	Depres Storage Imperv (mm)	Depres Storage Pervious (mm)	Initial Infiltr Rate (mm)	Final Infiltr Rate (mm)	Imperv Manning n	Perv Manning n	Impervious %
Pre-Develop. E1	0.213	46	0.0652	1	3	85	10	0.02	0.20	11
Pre-Develop. E2	0.779	200	0.0400	1	3	85	10	0.02	0.20	7
Pre-Develop. E3	1.443	275	0.0545	1	3	85	10	0.02	0.20	5
Pre-Develop. E4	0.386	137	0.0803	1	3	85	10	0.02	0.20	5
Pre-Develop. E5	1.001	242	0.0578	1	3	85	10	0.02	0.20	5
Pre-Develop. E6	0.157	57	0.0926	1	3	85	10	0.02	0.20	22
Pre-Develop. E7	0.042	42	0.0455	1	3	85	10	0.02	0.20	5
Post-Develop. E1	0.213	46	0.0652	1	3	85	10	0.02	0.20	11
Post-Develop. E2	0.779	200	0.0400	1	3	85	10	0.02	0.20	75
Post-Develop. E3	1.443	275	0.0545	1	3	85	10	0.02	0.20	71
Post-Develop. E4	0.386	137	0.0803	1	3	85	10	0.02	0.20	78
Post-Develop. E5	1.001	242	0.0578	1	3	85	10	0.02	0.20	78
Post-Develop. E6	0.157	57	0.0926	1	3	85	10	0.02	0.20	22
Post-Develop. E7	0.042	42	0.0455	1	3	85	10	0.02	0.20	65

Table 3: Catchment Characteristics.

The stormwater run-off was calculated for return periods of 5, 25 and 50 years respectively. The stormwater model was set up that pipe 1 (PIPE001) represents the stormwater pipe connecting the stormwater to the existing stormwater system. The pre-development stormwater run-off is summarized in Table 4 below.

Node Id	El-Type	R.I (yrs)	Dur (min)	Pk-Inlet (m^3/s)	Pk-Outlet (m^3/s)
Erf-1	Catch	5	25	0.0000	0.054
Erf-2	Catch	5	40	0.0000	0.092
Erf-3	Catch	5	48	0.0000	0.154
Erf-4	Catch	5	32	0.0000	0.064
Erf-5	Catch	5	40	0.0000	0.118
Erf-6	Catch	5	18	0.0000	0.041
Erf-7	Catch	5	15	0.0000	0.011
Erf-1	Catch	25	25	0.0000	0.101
Erf-2	Catch	25	34	0.0000	0.181
Erf-3	Catch	25	44	0.0000	0.304
Erf-4	Catch	25	25	0.0000	0.124
Erf-5	Catch	25	34	0.0000	0.232

Erf-6	Catch	25	15	0.0000	0.077
Erf-7	Catch	25	14	0.0000	0.022
Erf-1	Catch	50	17	0.0000	0.134
Erf-2	Catch	50	38	0.0000	0.239
Erf-3	Catch	50	39	0.0000	0.406
Erf-4	Catch	50	28	0.0000	0.164
Erf-5	Catch	50	38	0.0000	0.307
Erf-6	Catch	50	18	0.0000	0.101
Erf-7	Catch	50	15	0.0000	0.029

Table 4: Pre- development Stormwater Run-off Calculations

The post-development stormwater run-off is summarized in Table 5 below.

Node Id	El-Type	R.I (yrs)	Dur (min)	Pk-Inlet (m^3/s)	Pk-Outlet (m^3/s)
Erf-1	Catch	5	25	0.0000	0.054
Erf-2	Catch	5	18	0.0000	0.194
Erf-3	Catch	5	20	0.0000	0.339
Erf-4	Catch	5	11	0.0000	0.131
Erf-5	Catch	5	15	0.0000	0.304
Erf-6	Catch	5	18	0.0000	0.041
Erf-7	Catch	5	20	0.0000	0.568
Erf-1	Catch	25	15	0.0000	0.101
Erf-2	Catch	25	14	0.0000	0.360
Erf-3	Catch	25	15	0.0000	0.631
Erf-4	Catch	25	14	0.0000	0.237
Erf-5	Catch	25	15	0.0000	0.542
Erf-6	Catch	25	15	0.0000	0.077
Erf-7	Catch	25	20	0.0000	1.060
Erf-1	Catch	50	17	0.0000	0.134
Erf-2	Catch	50	14	0.0000	0.464
Erf-3	Catch	50	16	0.0000	0.816
Erf-4	Catch	50	12	0.0000	0.307
Erf-5	Catch	50	15	0.0000	0.689
Erf-6	Catch	50	18	0.0000	0.101
Erf-7	Catch	50	20	0.0000	0.029

Table 5: Post- development Stormwater Run-off Calculations

The design stormwater for the development is based on the 5-year pre-development flow for each erf. The required storage capacity for each retention pond was calculated and is represented in Table 6 below.

Node Id	El-Type	R.I (yrs)	Dur (min)	Pk-Inlet (m^3/s)	Pk-Outlet (m^3/s)	Depth/Dia Designed (m)	Flow Depth (m)	Velocity (m/s)	Storage (m^3)
Erf-1	N/A	5							N/A
Erf-2	Pond	5	60	0.194	0.047	0.450	0.074	2.75	164
Erf-3	Pond	5	58	0.339	0.121	0.450	0.123	3.35	302
Erf-4	Pond	5	47	0.131	0.045	0.450	0.045	2.88	81
Erf-5	Pond	5	58	0.304	0.085	0.450	0.094	3.49	208
Erf-6	N/A	5							N/A
Erf-7	N/A	5							N/A
Erf-1	N/A	25							N/A
Erf-2	Pond	25	59	0.360	0.089	0.450	0.106	3.08	275
Erf-3	Pond	25	59	0.631	0.164	0.450	0.146	3.67	510
Erf-4	Pond	25	49	0.237	0.060	0.450	0.080	3.15	140
Erf-5	Pond	25	59	0.542	0.114	0.450	0.109	3.81	360
Erf-6	N/A	25							N/A
Erf-7	N/A	25							N/A
Erf-1	N/A	50							N/A
Erf-2	Pond	50	60	0.464	0.122	0.450	0.125	3.38	319
Erf-3	Pond	50	60	0.816	0.189	0.450	0.157	3.82	591
Erf-4	Pond	50	36	0.307	0.157	0.450	0.130	4.11	164
Erf-5	Pond	50	60	0.689	0.129	0.450	0.116	3.94	422
Erf-6	N/A	50							N/A
Erf-7	N/A	50							N/A

Table 6: Post- development Stormwater Storage Calculations for Retention Ponds

The details for each retention pond design, will be presented with each Site Development Plan for each individual erf. Details will be provided for the internal stormwater drainage layout as well as for the detail of each outlet structure.

Erosion protection measures will be implemented, at each stormwater outlet structure, draining into the water course.

5.3 Water Supply and Reticulation

5.3.1 Water Demand Criteria

The water demand criteria used for the calculation of pipe sizes are listed in Table 6 below:

Average daily water demand: Res 3	450 ℓ / day /Unit
Average daily water demand: Funeral	600 ℓ / day /100m^2 of floor area permitted by FAR
Average daily water demand: Special	600 ℓ / day /100m^2 of floor area permitted by FAR
Peak factor	7.5
Fire flow criteria	Moderate risk 1500 ℓ / min for 4 hours duration Hydrant spacing 270 m maximum
Minimum Head at Instantaneous Peak demand	24 m
Minimum residual head	15 m
Position	In road reserves
Pipe material	> 110 mm Ø uPVC High impact Class 16 < 110 mm Ø HDPE Class 16
Minimum pipe size	75 mm diameter HDPE Class 16

Table 6: Water Demand Criteria

The detailed domestic water demand for the proposed development is calculated in Table 7 and Table 8 below.

Greengate Ext. 142:

Development Zoning		**Residential 4**	**Funeral**	**Special**	**Total**
Water Requirements	**Unit**	**Demands**	**Demands**	**Demands**	**Demands**
No of Units: Max Area	No: m^2/100	216	6.27	1.7	
Unit Demand	l/unit/day	450	600	600	
Peak Factor		7.5	7.5	7.5	
AADD	kl/d	97.2	3.8	1.0	80.8
GAADD Losses 10%	kl/d	106.9	4.1	1.1	88.9
Storage 24hrs	m3	106.9	4.1	1.1	
Peak Summer Daily Demand	kl/d	160.4	6.2	1.7	133.47
Design Peak Flow Rate	**l/s**	**13.92**	**0.54**	**0.15**	**11.58**
Connection Pipe Size	mm	110	110	110	110
Velocity	m/s	1.38	0.05	0.01	0.61

Table 7: Water Demand Calculation (Erven 1 – 7)

It can be assumed that water requirement for gardens and parks will normally take place outside of normal domestic peak times and can therefore be considered as included in the above peak demand.

Fire Requirements

The total water demand for fire-fighting is given in Table 9 below:

Fire Requirement	Unit	Demands
Risk Category		Moderate
Fire Demand	l/min	1500
Fire Flow	l/s	25.0
Connection Pipe Size	mm	90
Velocity	m/s	2.00
Minimum hydrant flow rate	**l/s**	**15**

Table 9: Fire Water Demand Criteria

Fire hydrants will be installed to the requirements of SABS Code of practice 090:1972. Based on the rational fire design conducted by the fire consultant two fire hydrants shall be required within the proposed development of erf 926. The minimum head required for fire-fighting will be 7 mWh measured at the proposed new fire hydrant within the development.

Total Requirement

Description	Unit	Min Requirement
Domestic (24mWh)	l/s	15.45
Fire Fighting Requirements (7mWh)	l/s	25

Table 10: Water Demand Summary

The water demand for the township has been calculated for three possible scenarios:

Domestic demand x Peak Factor;

Fire demand; all fire hydrants within 270 m radius discharging simultaneously;

Domestic demand x Peak Factor plus Fire demand as above.

5.3.2 New Internal Water Infrastructure

A new 110mm Ø bulk water line will be constructed to service Greengate Ext. 140. The new water line will be connected to the existing 160mm Ø bulk water line, situated within the Larsens Road-reserve. New water connections for each stand, will be applied for, from new 110mm Ø bulk water line. This will serve as a potable water and fire mains to each erf in the township.

Materials

Class 16 mPVC pipes will be used.

Valves will be resilient seal valves (RSV) on all pipe diameters. All prefabricated fittings will be Copon EP 2300 coated and lined.

5.4 Sewer Reticulation

5.4.1 General

A new 160mm Ø bulk sewer line will be constructed to service Greengate Ext. 140 as per the sewer layout drawing. Each stand will have a new connection manhole on the southwest corner of each erf.

5.4.2 Sewer Design & Demand Criteria

The design criteria for the sewerage system are listed in Table 11 below:

Description	Design Criteria
Average daily sewer demand: Res 3	400 ℓ / day /Unit
Average daily sewer demand: Funeral	550 ℓ / day /100m^2 of floor area permitted by FAR
Average daily sewer demand: Special	550 ℓ / day /100m^2 of floor area permitted by FAR
Peak factor	2, 5
Minimum grades Unit connections	1:60
110 mm Ø pipes 160 mm Ø pipes 200 mm Ø pipes	1:120 1:200 1:300
Min. velocity	0,75 m / s
Manhole spacing	80 m
Infiltration	15 %
Maximum flow depth	67 % (for peak flow)
Main lines min diameter	160 mm
Manning coefficient	= 0,012
Position	In road reserve (ϟ where possible)

Table 11: Sewer Design Criteria

The proposed sewer demand is represented in Table 12 and Table 13 below.

Development Zoning		Residential 4	Funeral	Special	Total
Sewer Demand	**Unit**	**Demands**			
No of Units: Max Area	No: m^2/100	216	6.27	1.7	
Unit/outflow/day	l/pe/day	400	500	500	
ADWF	kl/d	86.4	3.1	0.9	**90.4**
Peak Factor		**2.5**	**2.5**	**2.5**	
PDWF	kl/d	259.2	9.4	2.6	
PWWF Infiltration 15%	kl/d	298.1	10.8	2.9	
Storage 4hrs	m^3	21.6	0.8	0.2	
Inflow to Sewage Works	l/s	3.45	0.13	0.03	**3.61**

Table 12: Sewer Demand Calculation (Erven 1-7)

5.4.3 New Internal Sewer Infrastructure

A new 160mm Ø bulk sewer line will be constructed inside the road reserve to service Greengate Ext. 140 as per the sewer layout drawing. Each stand will have a new connection manhole or sewer connection.

Materials

The proposed materials to be used for the sewer reticulation are as follows:

160 mm diameter pipes - uPVC Class 34/400Kpa

Manholes- Precast concrete rings

Covers - Concrete (Heavy Duty)

6. BULK SERVICES

6.1 Water

A new 110mm Ø water line will be provided in the road reserve to service Erven 1 – 7.

The new water line will be connected to the existing 160mm Ø bulk water line, situated within the Larsens Road, road-reserve. (Detail Cost Estimate provided in Appendix 1)

6.2 Sewer

No data of any bulk sewer mains could be obtained from Mogale City engineers department.

The properties in this area would connect with the Driefontein WWW (belonging to CoJ). This connection will depend on the fall of the land, but there is a connection near the intersection Drift Boulevard Refer and Abraham Van Wyk Road. Refer to Appendix 8 "Sewer Layout

Drawing". Approximately 910m of new sewer line will have to be constructed to connect to the existing infrastructure.

The exact route for the new connection sewer line will be established during the preliminary design phase of the project. The position of the new 3m wide sewer servitude will also be established and registered.

A large portion of the construction cost will need to be offset against bulk contributions as the service will provide connection to other potential developments to the west of Greengate Ext. 140, in the future. (Detail Cost Estimate provided in Appendix 1)

6.3 Stormwater

Stormwater retention ponds will be provided on each of the large erven and the attenuated stormwater flow will drain into the natural water course. Erosion protection measures will be implemented, at each stormwater outlet structure, draining into the water course.

6.4 Roads

New road infrastructure will be provided in the form a new road providing access to all the stands.

The roads will connect directly with Larsens Road. (Detail Cost Estimate provided in Appendix 1)

6.5 Bulk Contributions

The Bulk Contributions are to be discussed with the Legal Administration Department of Mogale.

7. APPENDICES

7.1 APPENDIX 1 : COST ESTIMATE

7.2 APPENDIX 2 : WATER AND SEWER DEMAND

7.3 APPENDIX 3: PRE-DEVELOPMENT STORMWATER HYDROGRAPHS

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7.8 APPENDIX 8: SEWER LAYOUT DRAWING

APPENDIX 1: COST ESTIMATE

SERVICE	DESCRIPTION	QUANTITY UNITS (m) (m^2)	RATE	TOTAL COST
Water				
Water Pipes	110 dia Cl 16	590	990	584,100
Valves	110 Valve	8	9,790	78,320
Fire Hydrants	80mm Woodlands	7	12,440	87,080
Tie into existing water	160 dia Class 16	1	36,500	36,500
Water Total				**786,000**
Sewer				
Sewer Pipes	160 dia uPVC Cl 34	1500	980	1,470,000
Manholes	1050 mm dia	25	16,060	401,500
Tie into existing mh		1	21,900	21,900
Sewer Total				**1,893,400**
Roads				
Township Roads (Widen Exist)	Blacktop	1230	1,580	1,943,400
Internal Roads	Paving	4120	1,100	4,532,000
Bulk Earthwork	Cut & Fill	2000	140	280,000
Roads Total				**6,755,400**
River Crossing Culvert				
River Crossing Culvert	Culvert	85	18,800	1,598,000
Roads Total				**1,598,000**
Stormwater				
Stormwater Pipes	450 mm	130	2,780	361,400
	600 mm	145	3,890	564,050
Manholes & KI's		14	18,250	255,500
Inlet & Outlet Structures		6	11,680	70,080
Gabion/Reno Baskets	Provisional m3	100	2,340	234,000
Attenuation Structures	Provisional m3	1300	220	286,000
Stormwater Total				**1,771,030**
Sub Total				**11,205,830**
Contingencies	Percentage	10%		1,120,583
Sub Total				**12,326,413**
Preliminary & General	Percentage	15%		1,848,962
Total				**14,175,375**
Design Fees	Percentage	6.0%		850,522
Disbursements	Printing, Travelling & site inspections	5.0%		42,526
Sub Total				**893,049**
Total (Excl. 15% VAT)				**15,068,424**

APPENDIX 2: WATER AND SEWER DEMAND

GREENGATE EXT 140 (ERVEN 1 - 7)

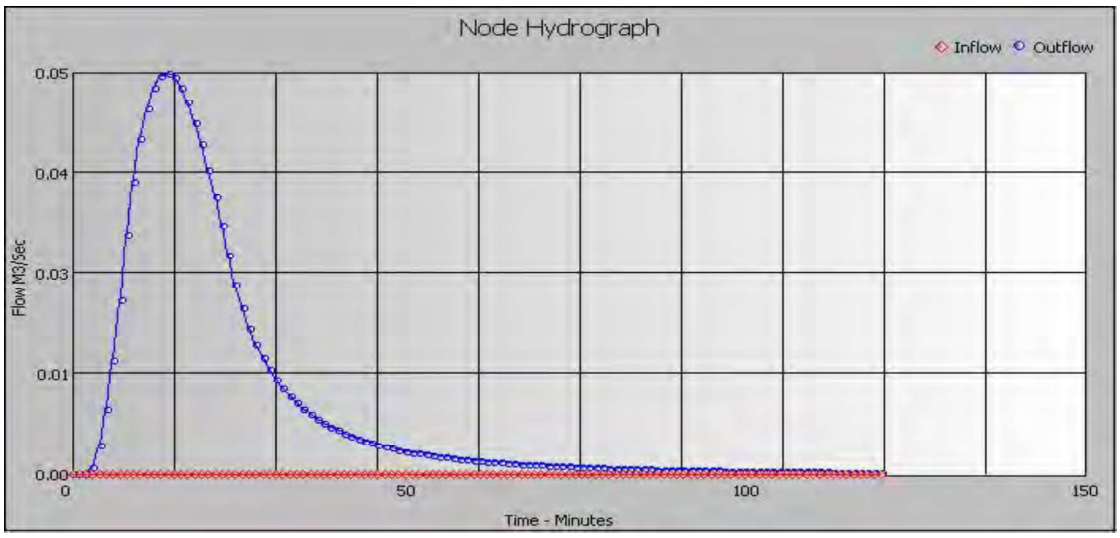
Table Of Water and Sewage Demands

Development Zoning		RES 4	FUNERAL	SPECIAL	TOTAL
Water Requirements	**Unit**	**Demands**	**Demands**	**Demands**	**Demands**
No of Units : Max Area	No : $m^2/100$	**216**	**6.27**	**1.70**	
Unit Demand	l/unit/day	**450**	**600**	**600**	
Peak Factor		**7.5**	**7.5**	**7.5**	
AADD	kl/d	97.2	3.8	1.0	102.0
GAADD Losses 10%	kl/d	106.9	4.1	1.1	112.2
Storage 24hrs	m^3	106.9	4.1	1.1	
Summer Daily Demand	kl/d	160.4	6.2	1.7	**168.3**
Design Peak Flow Rate	l/s	13.92	0.54	0.15	**14.61**
Connection Pipe Size	mm	80	80.0	80	110
Velocity	m/s	1.38	0.05	0.01	**0.77**
Fire Requirement	**Unit**	**Demands**	**Demands**	**Demands**	**Demands**
Risk Category		Moderate	Moderate	Moderate	Moderate
Fire Demand	l/min	1500	1500	1500	1500
Fire Flow	l/s	25.0	25.0	25.0	25.0
Connection Pipe Size	mm	110	110	110	110
Velocity	m/s	1.3	1.3	1.3	1.3
Storage and Combined flow	**Unit**	**Capacities and Fire demand**	**Capacities and Fire demand**	**Capacities and Fire demand**	**Capacities and Fire demand**
Fire storage (4 Hours)	m^3	360	360	360	
Total Storage	m^3	467	364	361	
Pumps SDD	l/s				
Sewage Requirements	**Unit**	**Demands**	**Demands**	**Demands**	**Demands**
No of Units	No	**216**	**6.27**	**1.70**	
Unit/outflow/day	l/pe/day	400	500	500	
Peak Factor		**2.5**	**2.5**	**2.5**	
AADD(Water)	kl/d	86.4	3.1	0.9	90.4
Summer Peak Demand (Water)	kl/d	129.6	4.7	1.3	135.6
ADWF %return 80%	kl/d	103.7	3.8	1.0	**108.5**
PDWF	kl/d	259.2	9.4	2.6	271.2
PWWF Infiltration 15%	kl/d	298.1	10.8	2.9	311.8
Storage 4hrs	m^3	21.6	0.8	0.2	
Inflow to Sewage Works	l/s	3.45	0.13	0.03	**3.61**

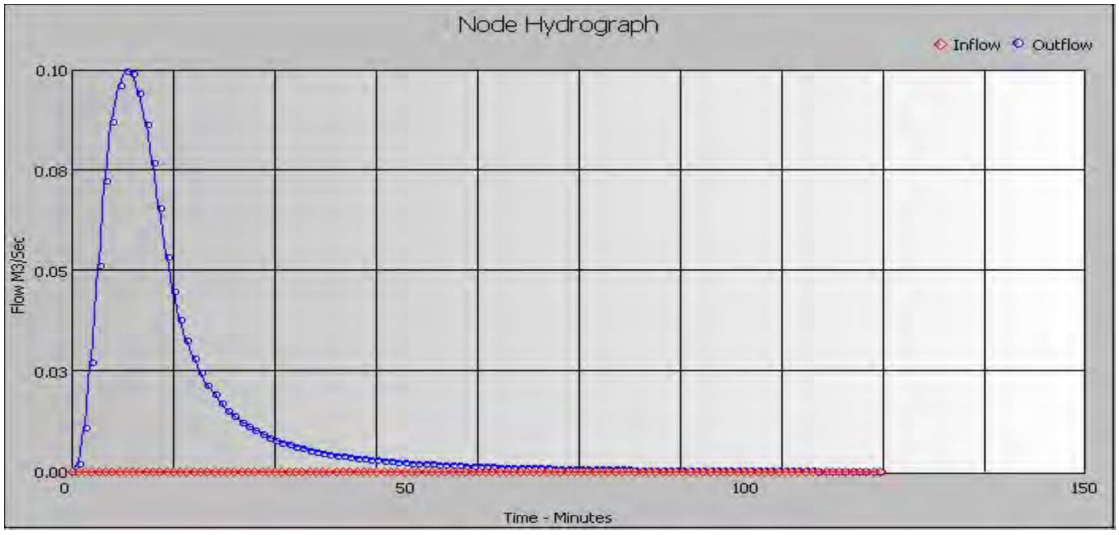
APPENDIX 3: PRE-DEVELOPMENT STORMWATER HYDROGRAPHS

APPENDIX 3:

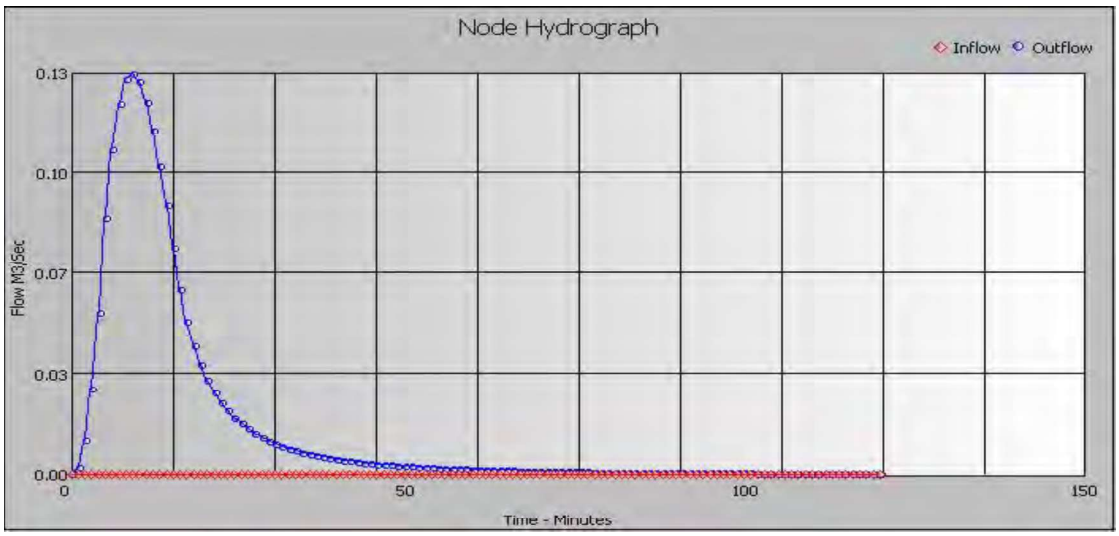
GREENGATE EXT. 140 **PRE-DEVELOPMENT: ERF 1**



5 YEAR: PRE-DEVELOPMENT



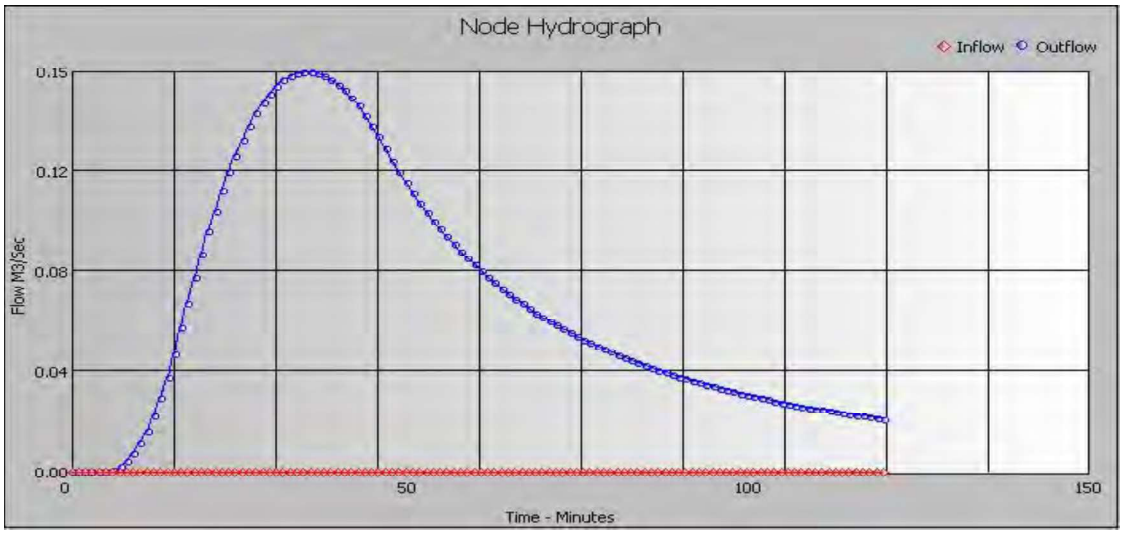
25 YEAR: PRE-DEVELOPMENT



50 YEAR: PRE-DEVELOPMENT

APPENDIX 3:

GREENGATE EXT. 140 **PRE-DEVELOPMENT: ERF 2**



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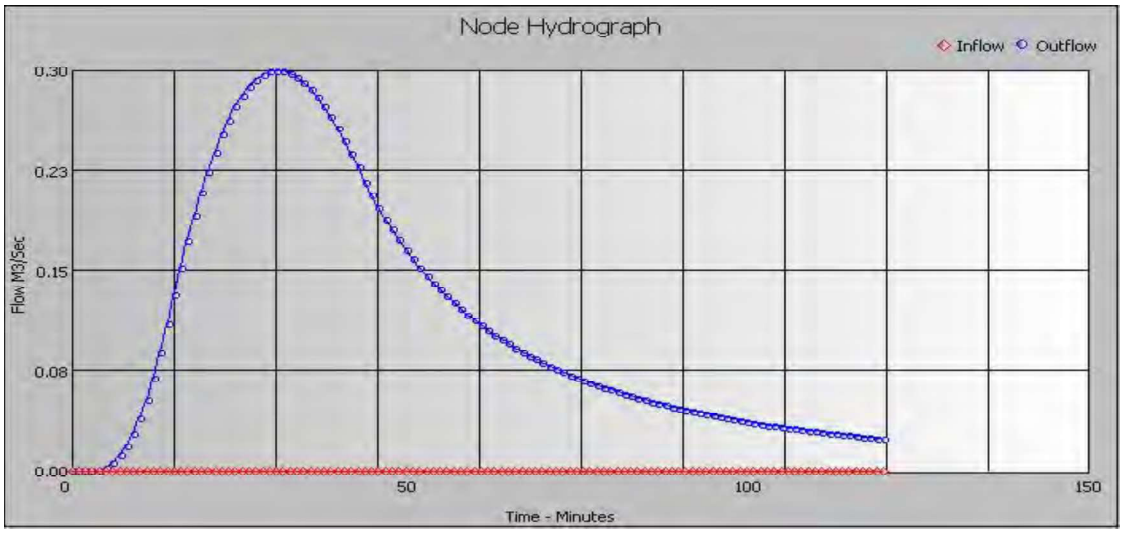

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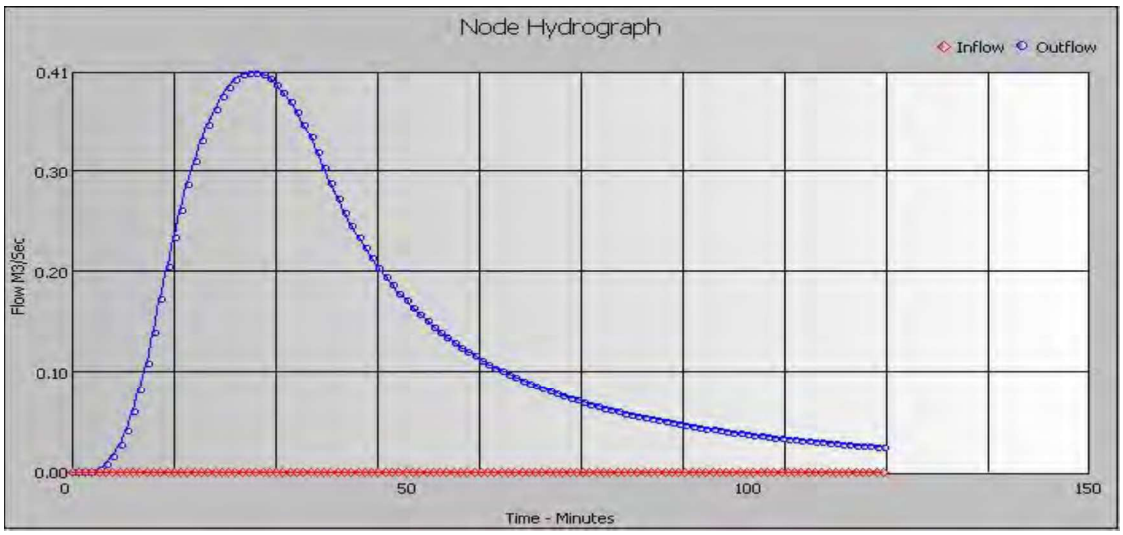

50 YEAR: PRE-DEVELOPMENT

APPENDIX 3:

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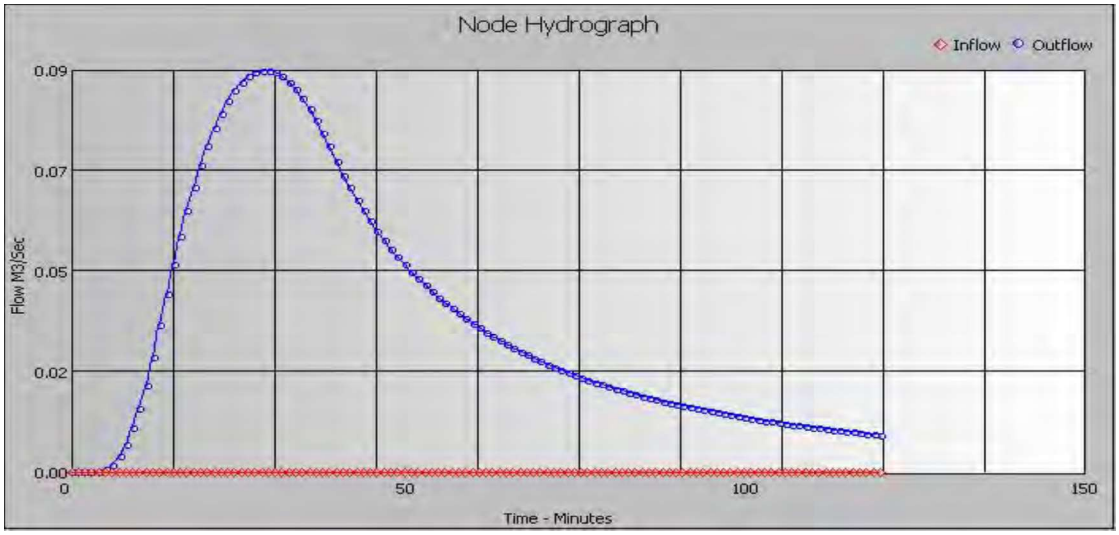
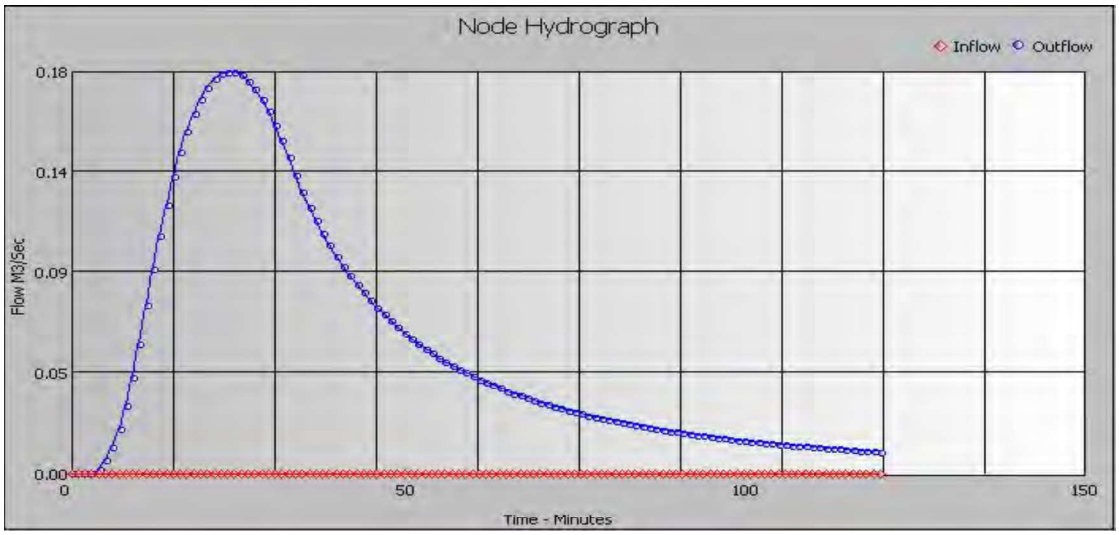


5 YEAR: PRE-DEVELOPMENT



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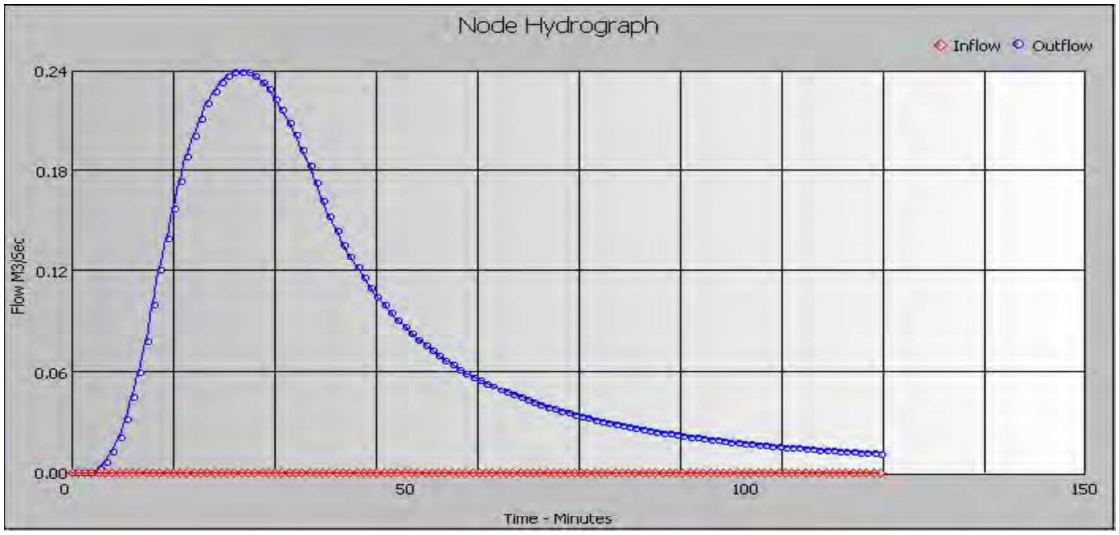
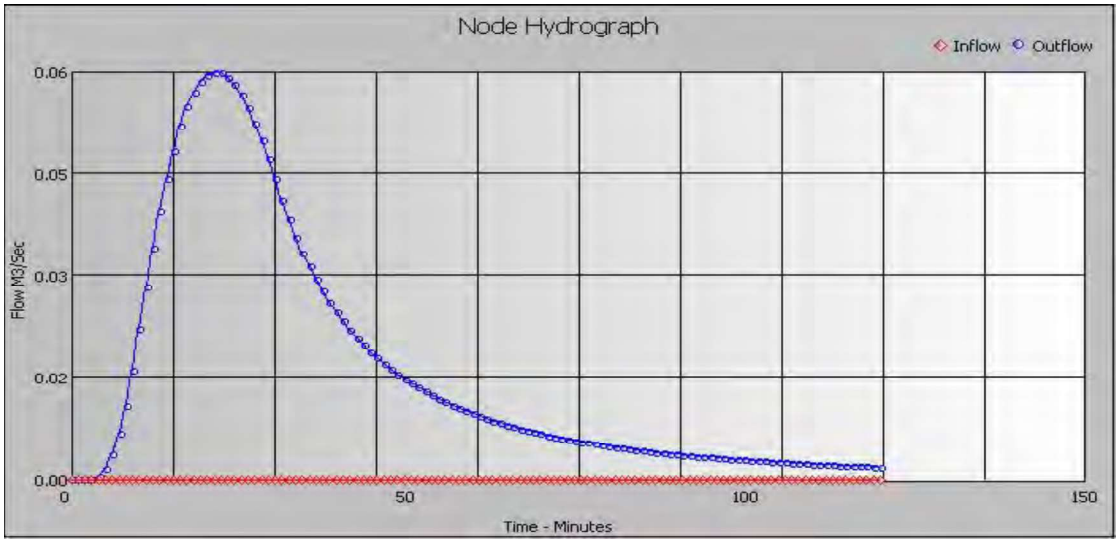


50 YEAR: PRE-DEVELOPMENT

APPENDIX 3:

GREENGATE EXT. 140 **PRE-DEVELOPMENT: ERF 4**



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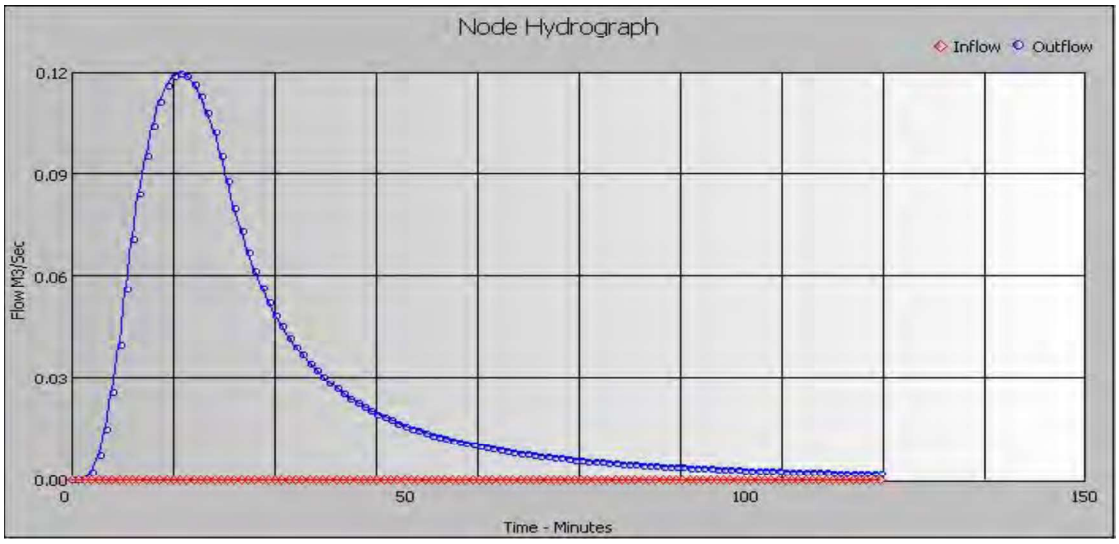

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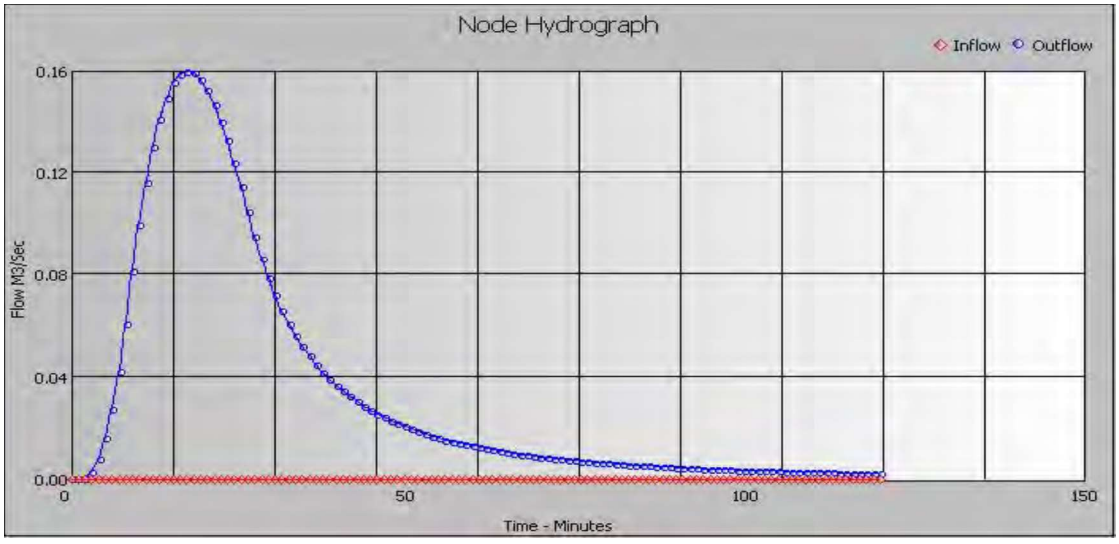
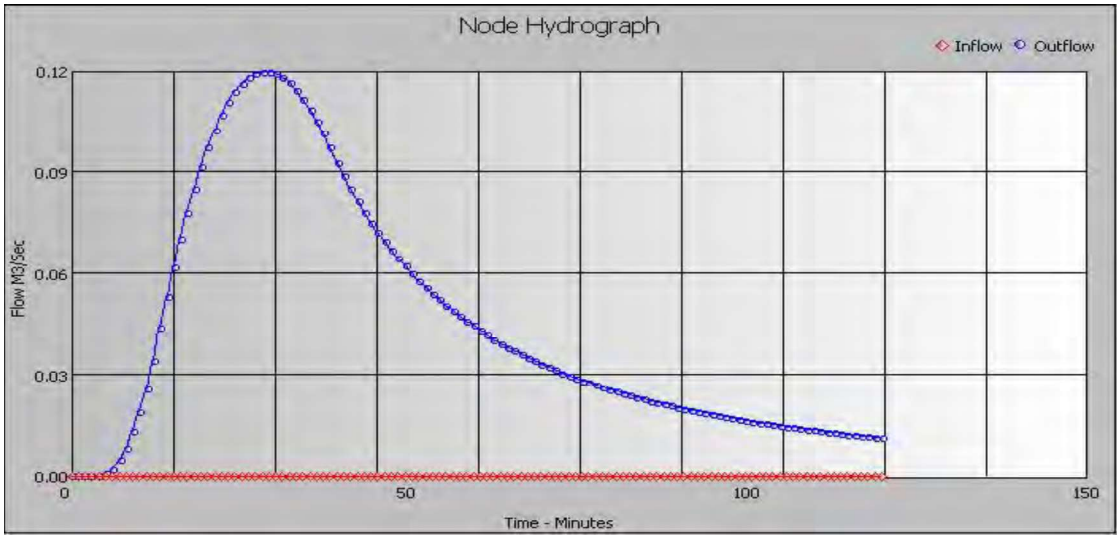


50 YEAR: PRE-DEVELOPMENT

APPENDIX 3:

GREENGATE EXT. 140 **PRE-DEVELOPMENT: ERF 5**



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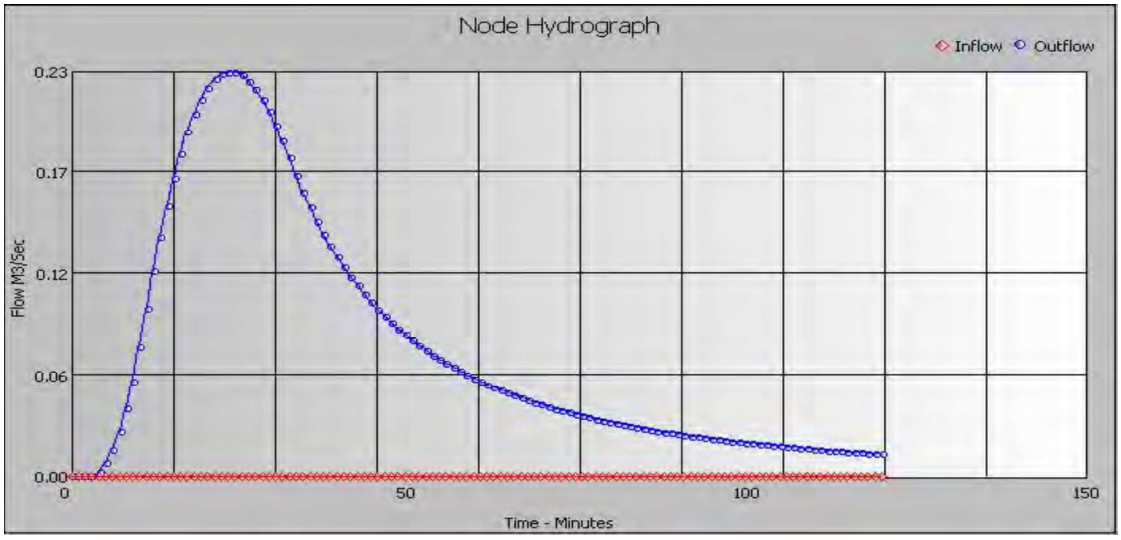
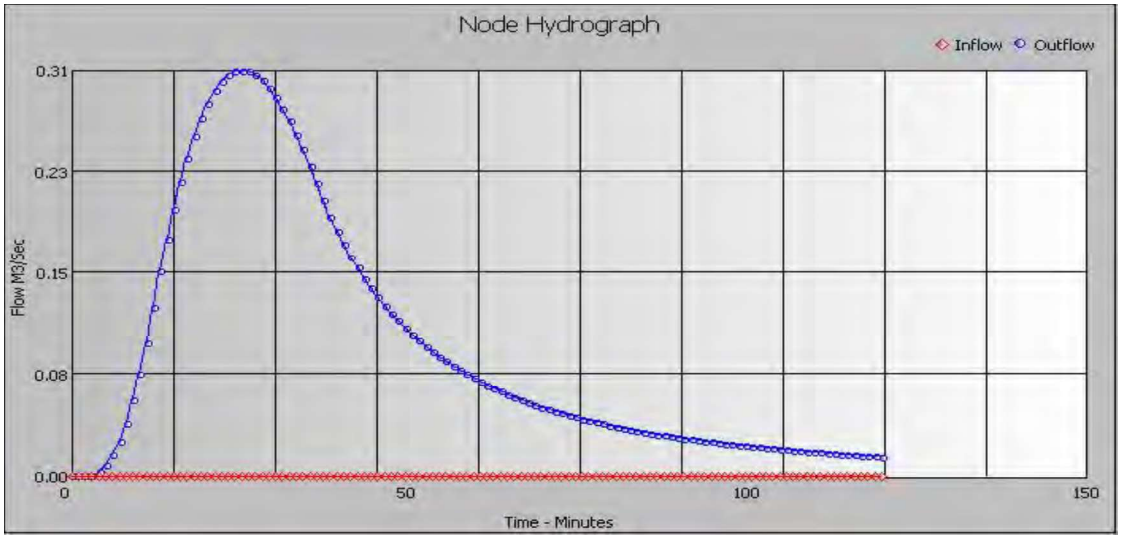


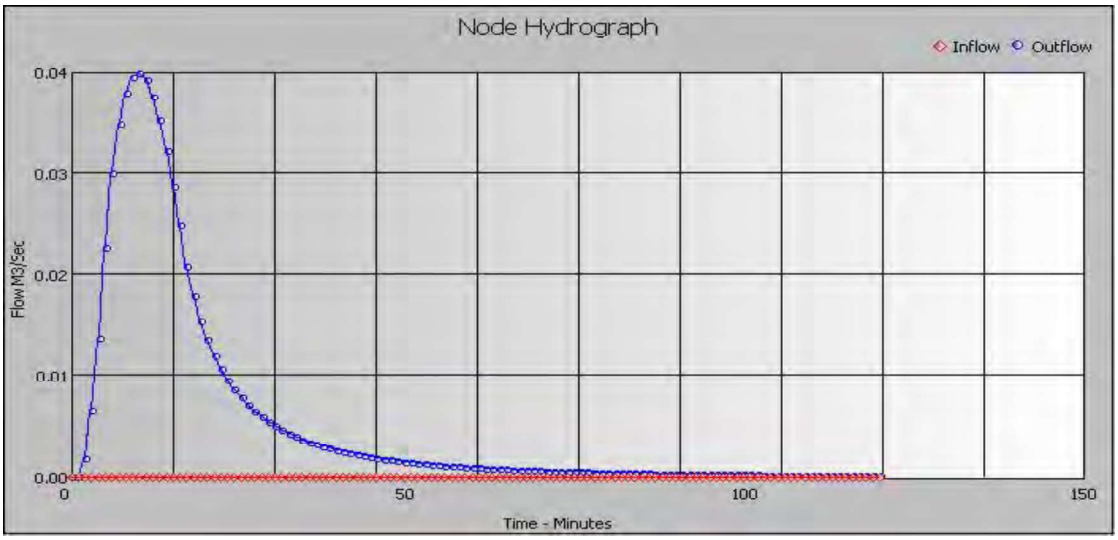
25 YEAR: PRE-DEVELOPMENT



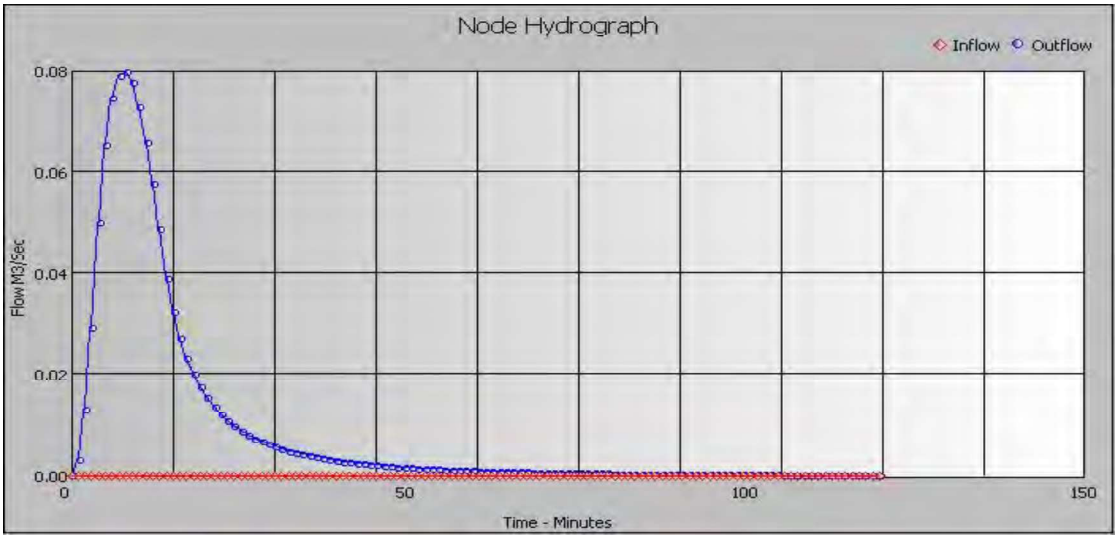
50 YEAR: PRE-DEVELOPMENT

APPENDIX 3:

GREENGATE EXT. 140 **PRE-DEVELOPMENT: ERF 6**



5 YEAR: PRE-DEVELOPMENT



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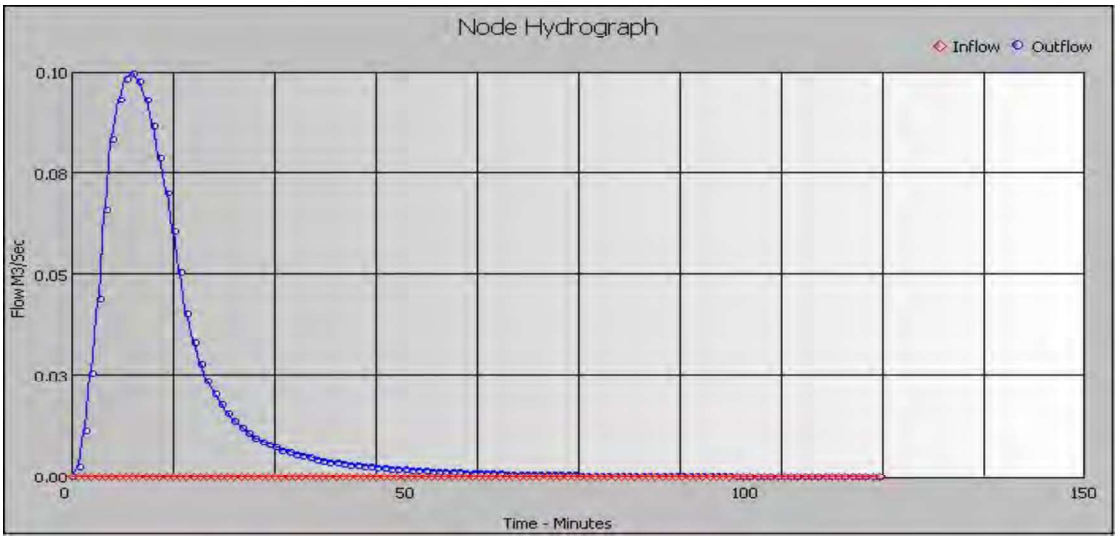
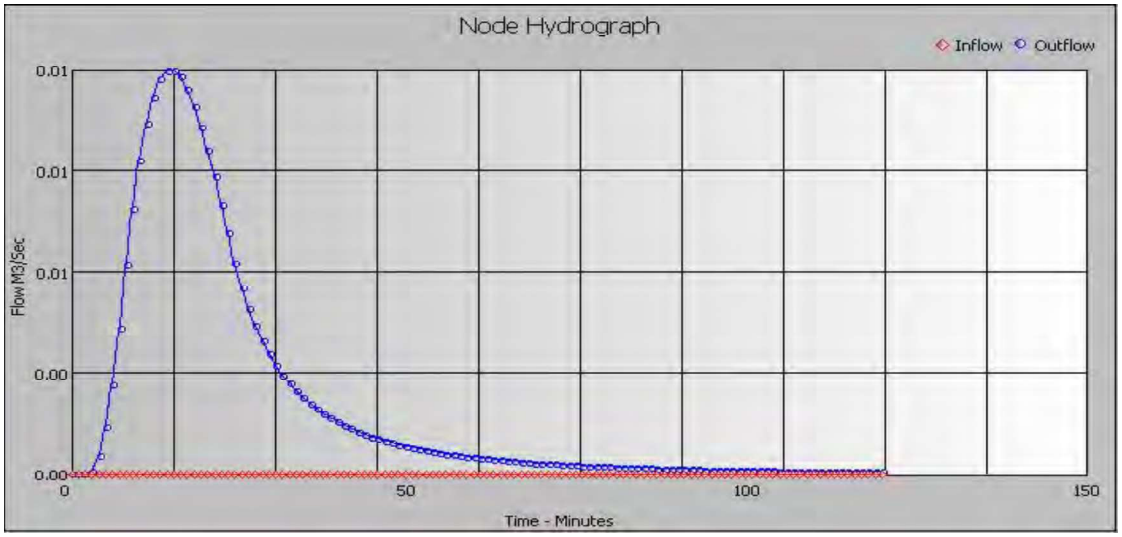


50 YEAR: PRE-DEVELOPMENT

APPENDIX 3:

GREENGATE EXT. 140 **PRE-DEVELOPMENT: ERF 7**



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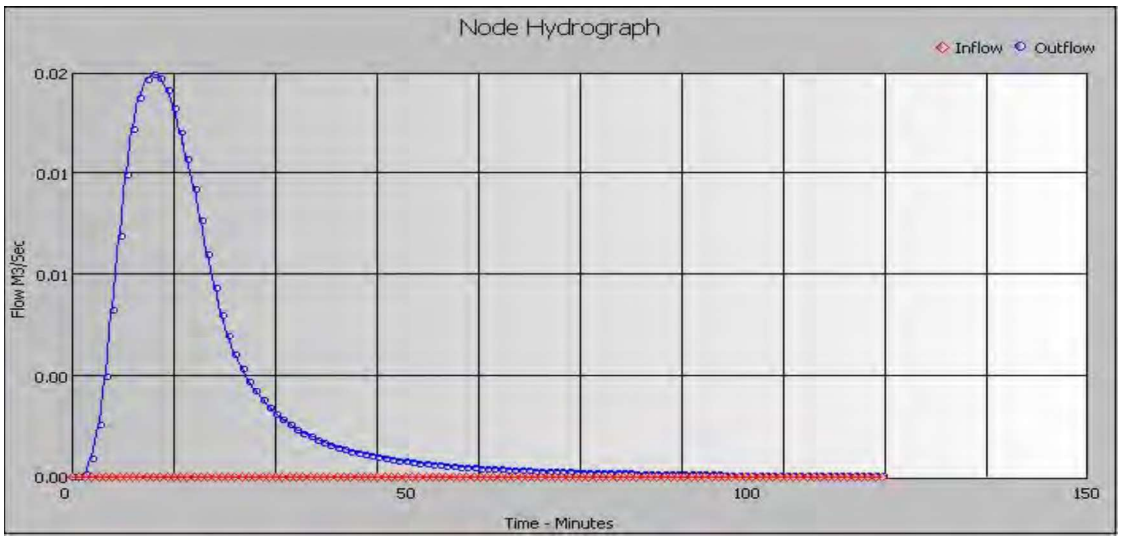

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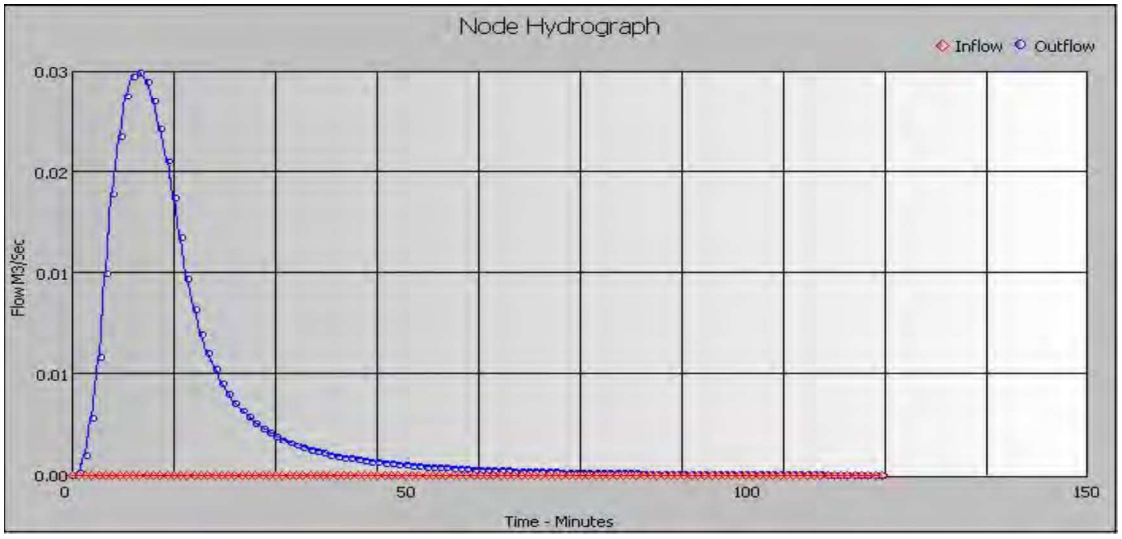
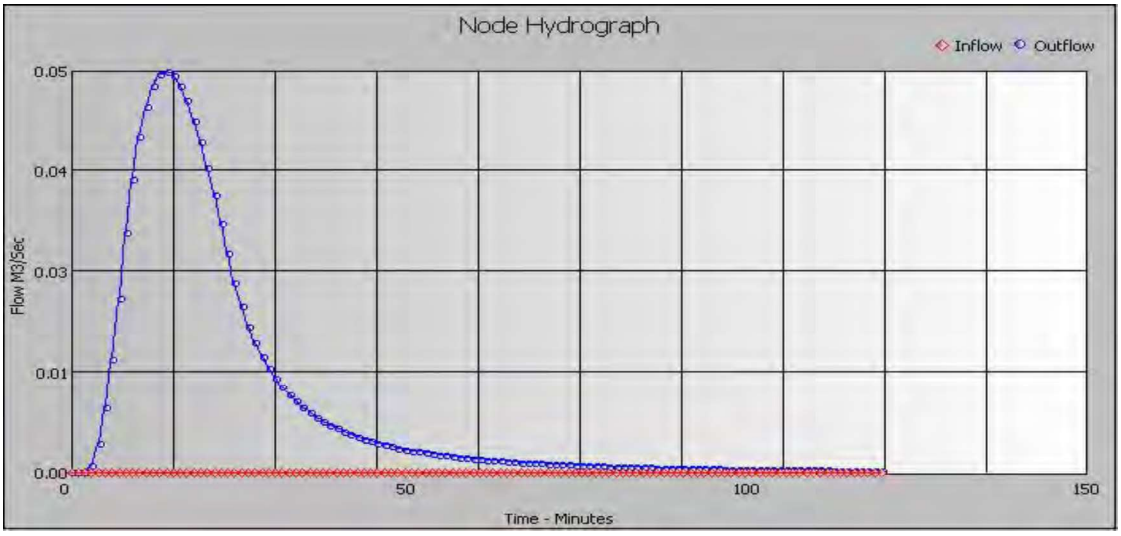


50 YEAR: PRE-DEVELOPMENT

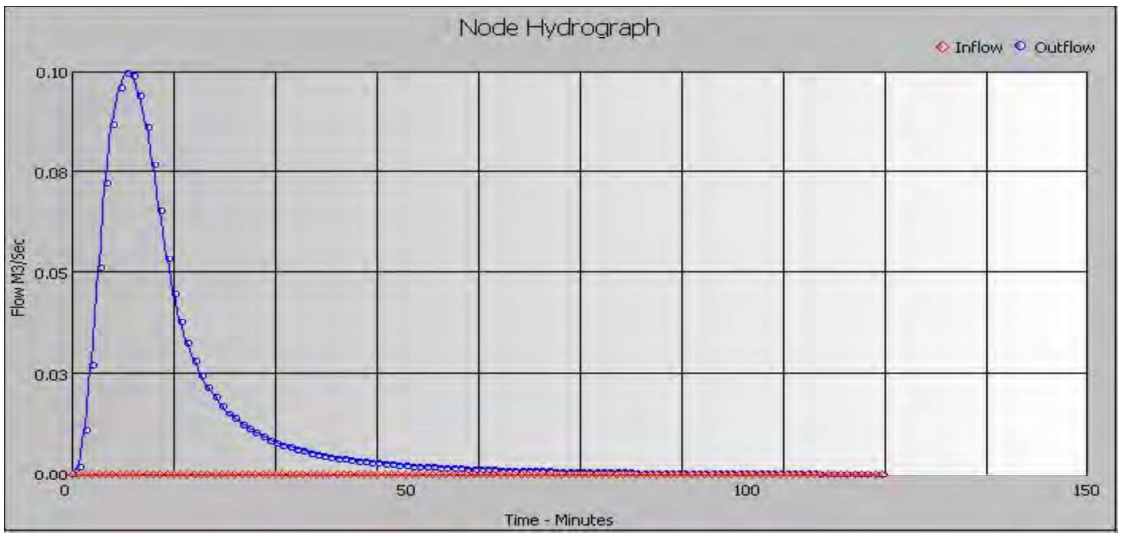
APPENDIX 4: POST-DEVELOPMENT STORMWATER HYDROGRAPHS

APPENDIX 4:

GREENGATE EXT. 140 **POST-DEVELOPMENT: ERF 1**



5 YEAR: POST-DEVELOPMENT



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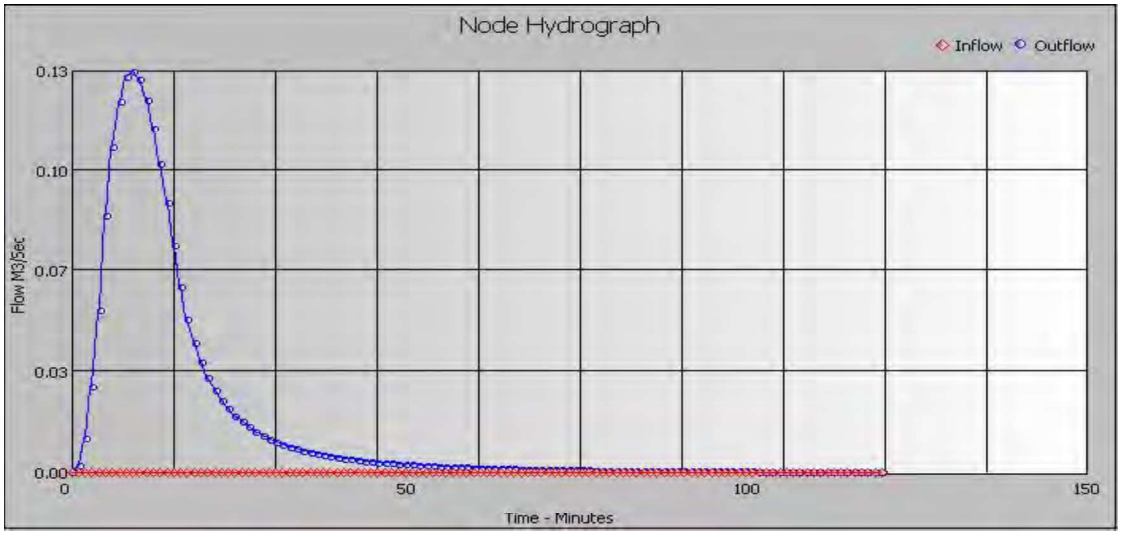
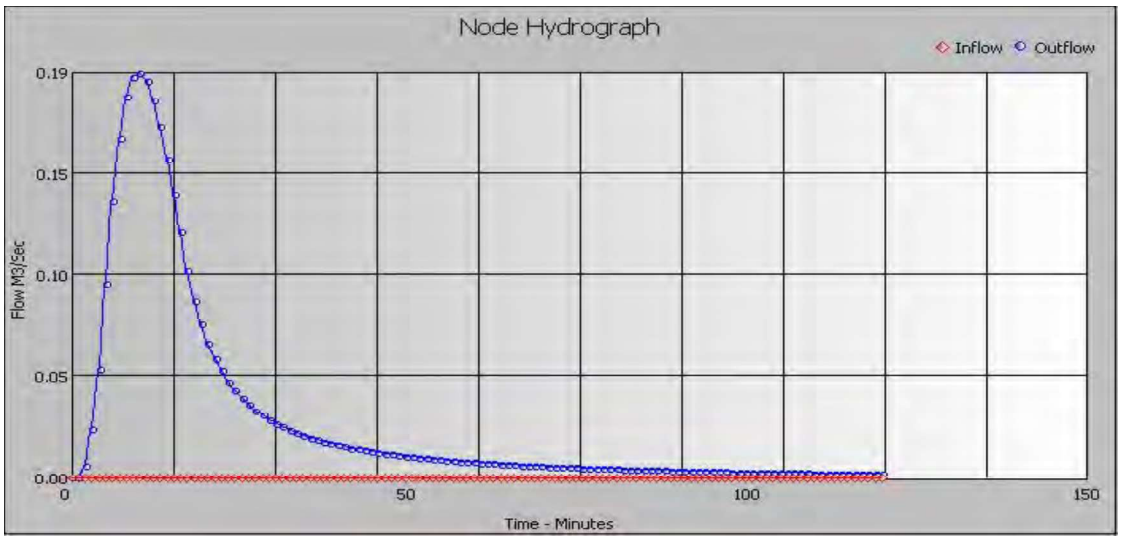


50 YEAR: POST-DEVELOPMENT

APPENDIX 4:

GREENGATE EXT. 140 **POST-DEVELOPMENT: ERF 2**



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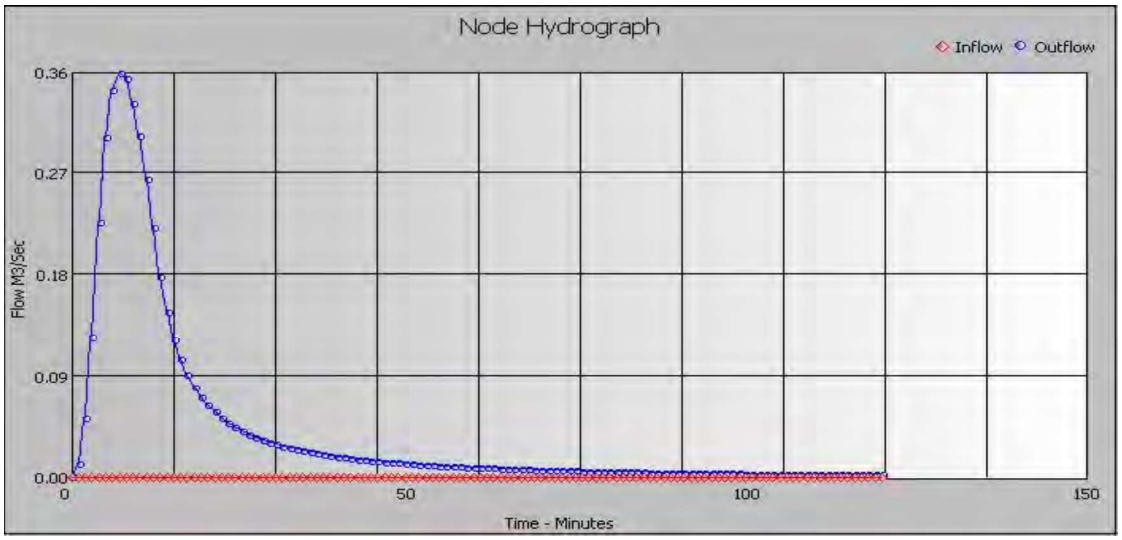

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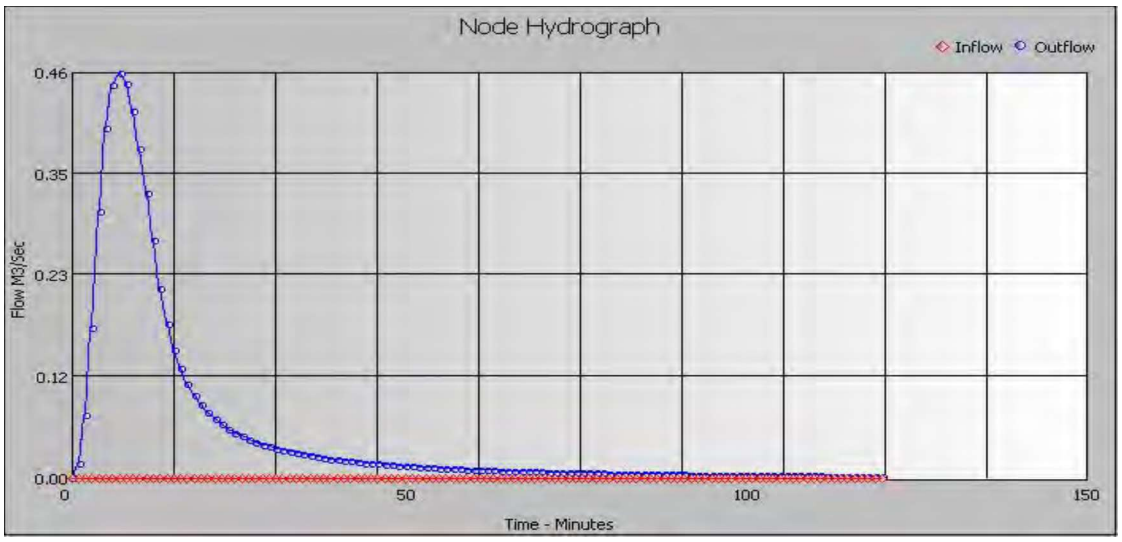
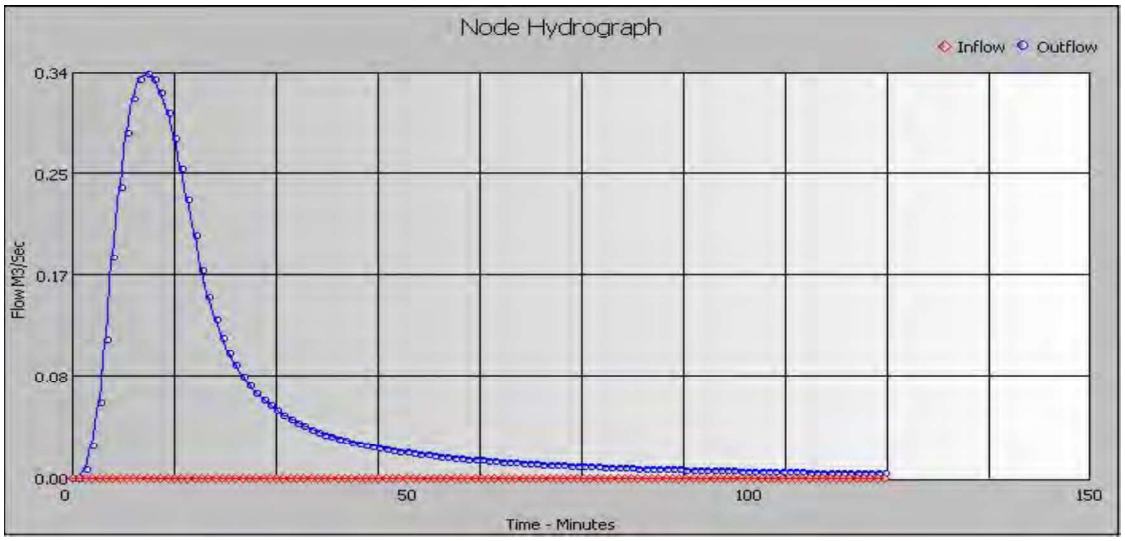


50 YEAR: POST-DEVELOPMENT

APPENDIX 4:

GREENGATE EXT. 140 **POST-DEVELOPMENT: ERF 3**



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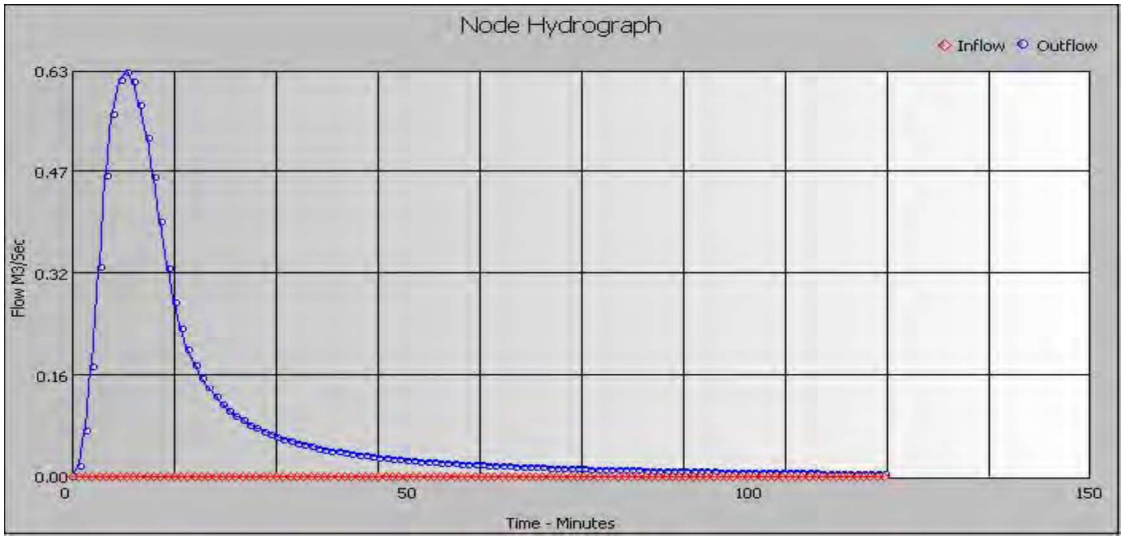

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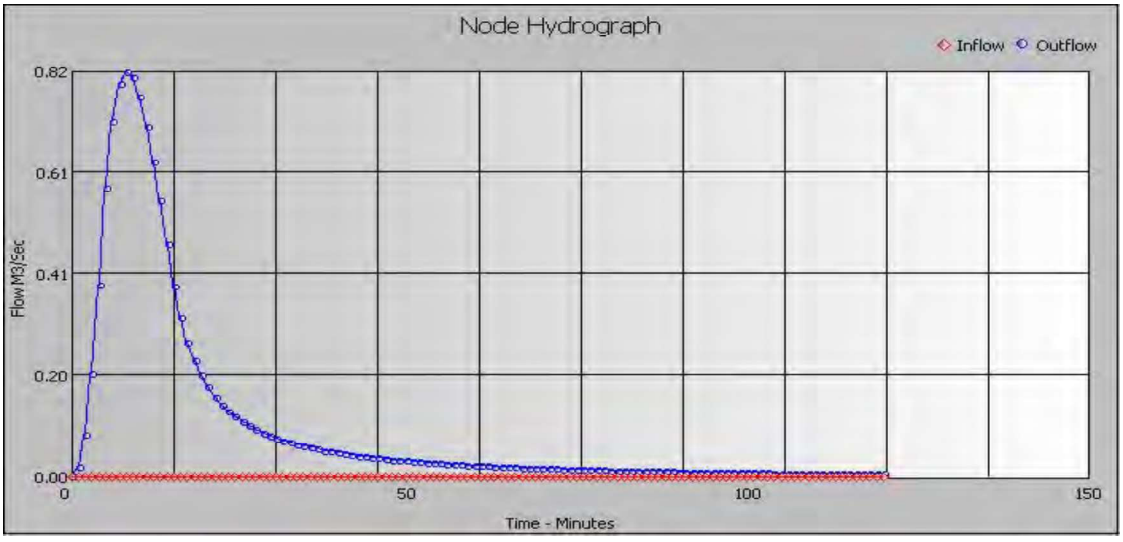
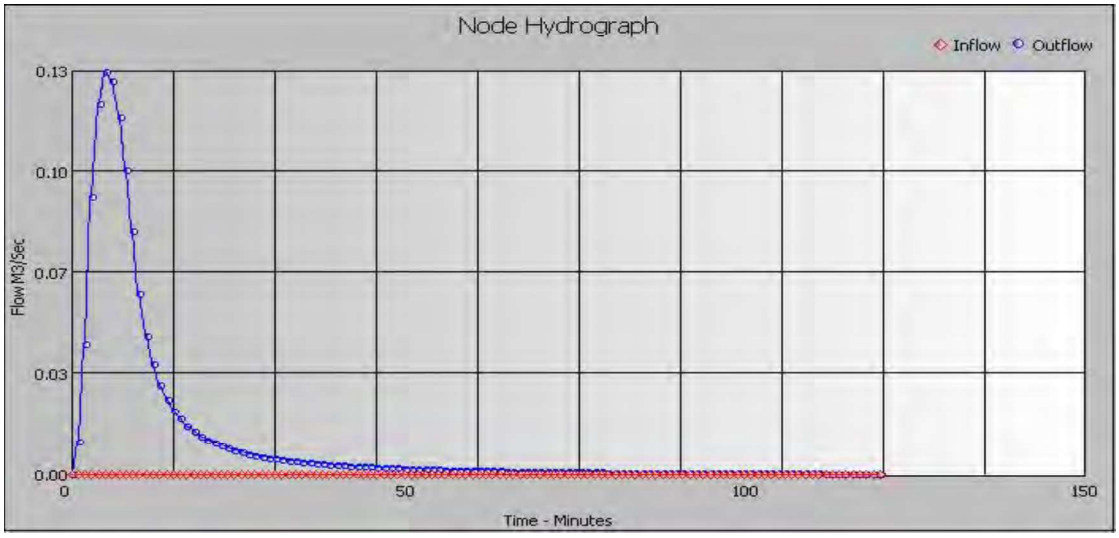


50 YEAR: POST-DEVELOPMENT

APPENDIX 4:

GREENGATE EXT. 140 **POST-DEVELOPMENT: ERF 4**



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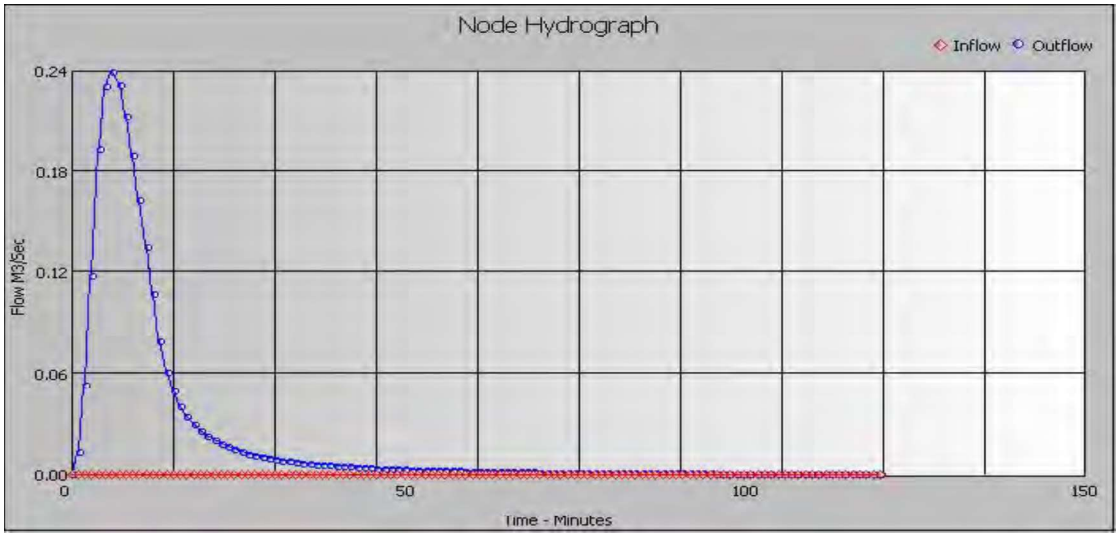

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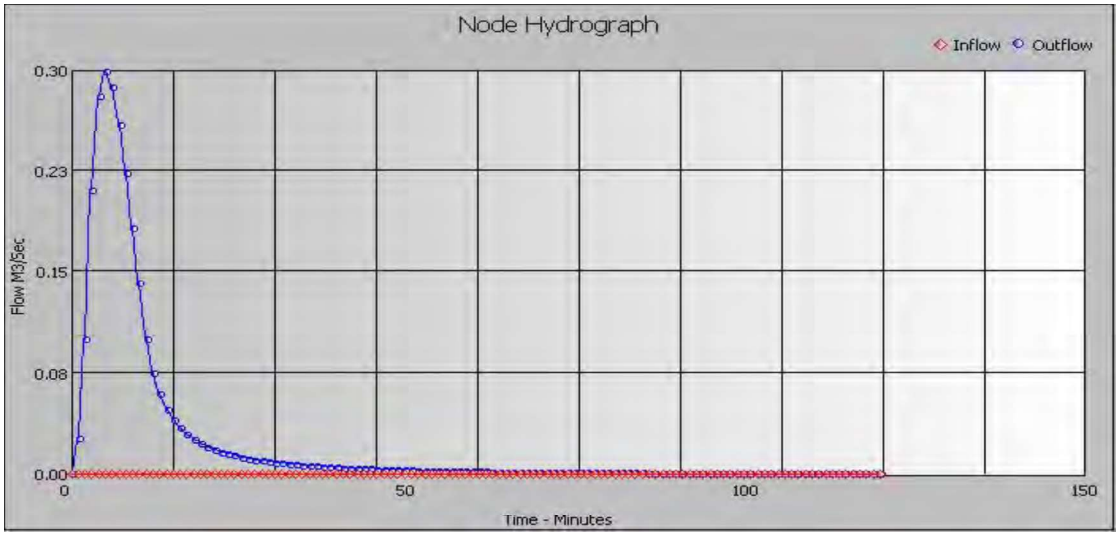
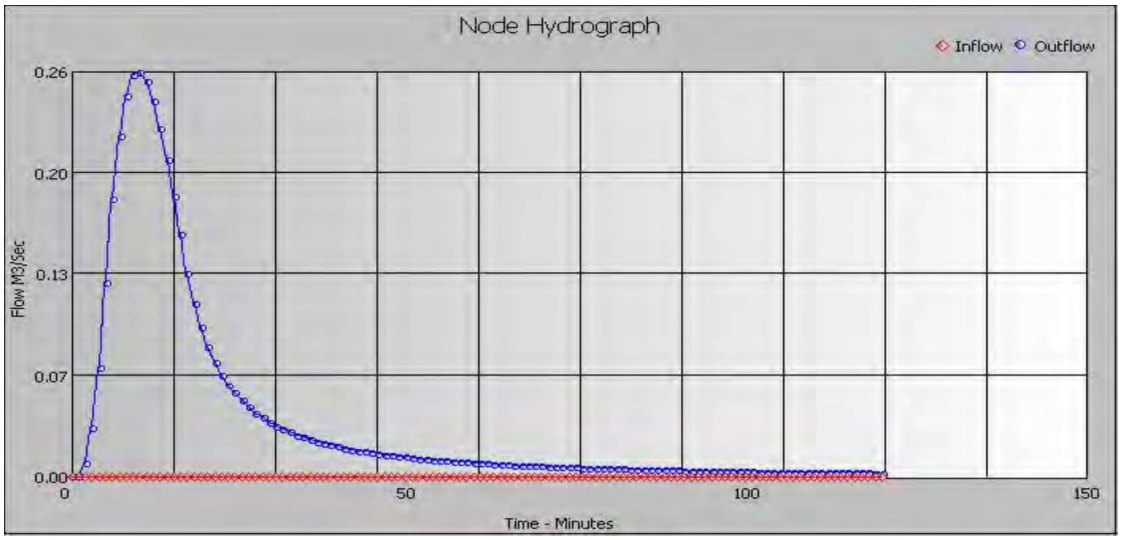


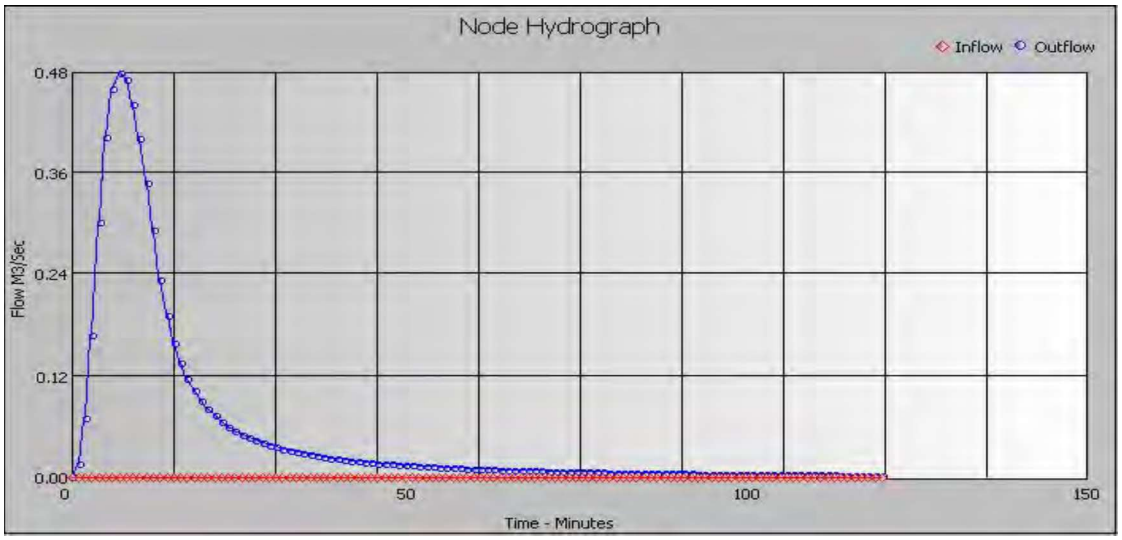
50 YEAR: POST-DEVELOPMENT

APPENDIX 4:

GREENGATE EXT. 140 **POST-DEVELOPMENT: ERF 5**



5 YEAR: POST-DEVELOPMENT



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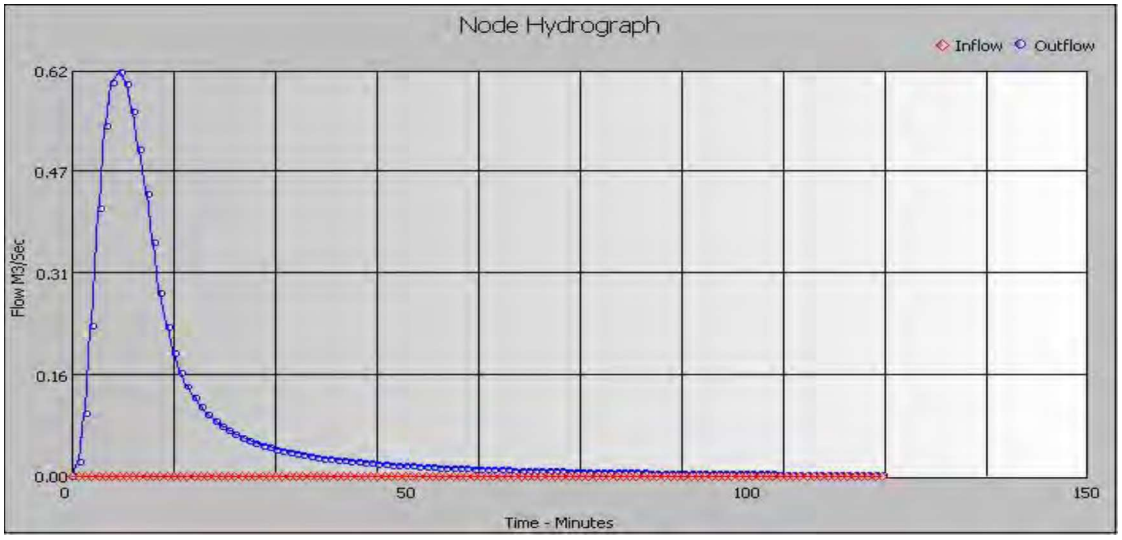
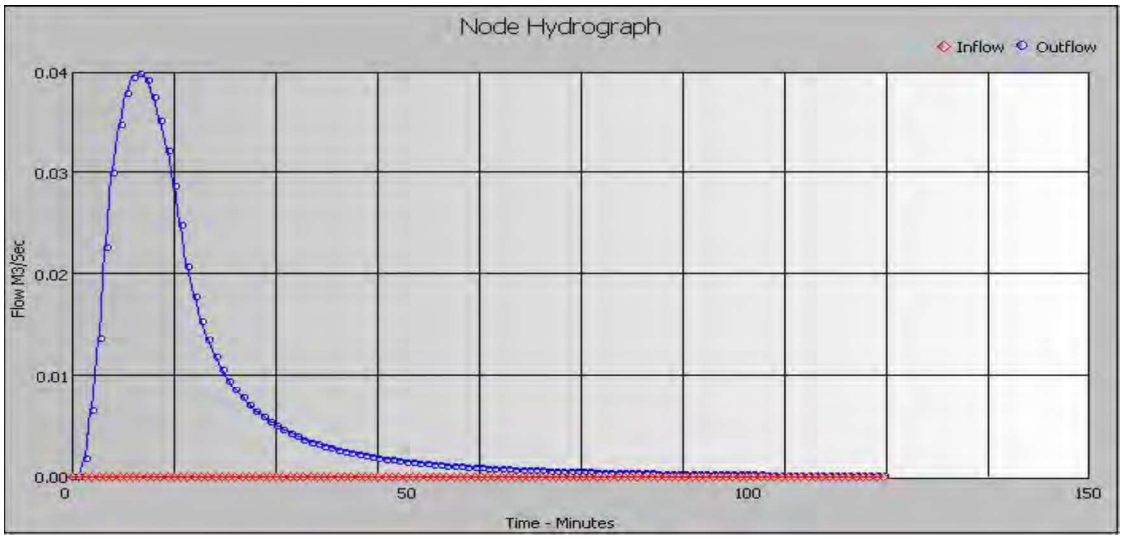


50 YEAR: POST-DEVELOPMENT

APPENDIX 4:

GREENGATE EXT. 140 **POST-DEVELOPMENT: ERF 6**



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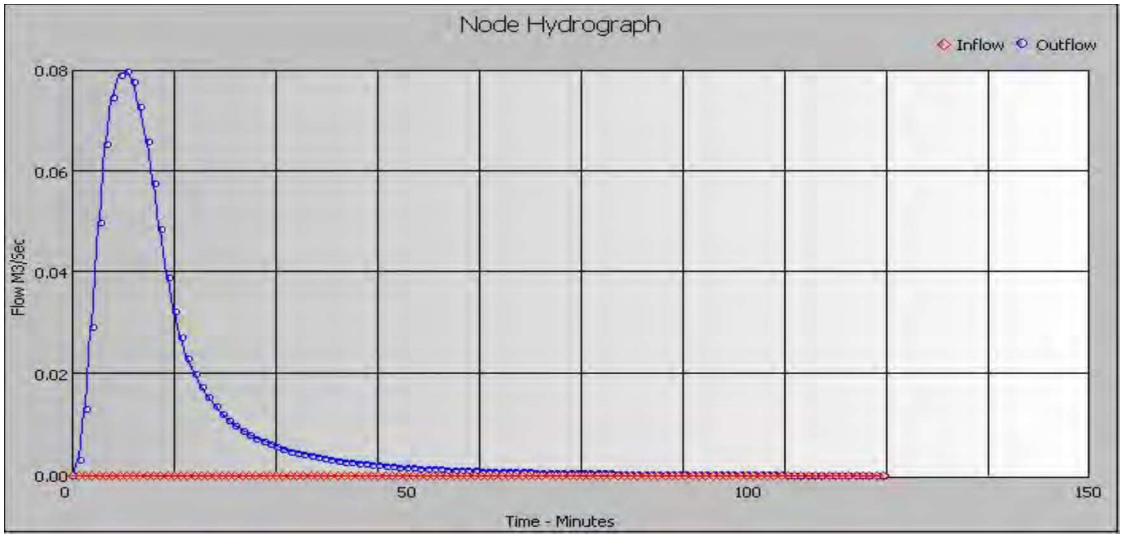

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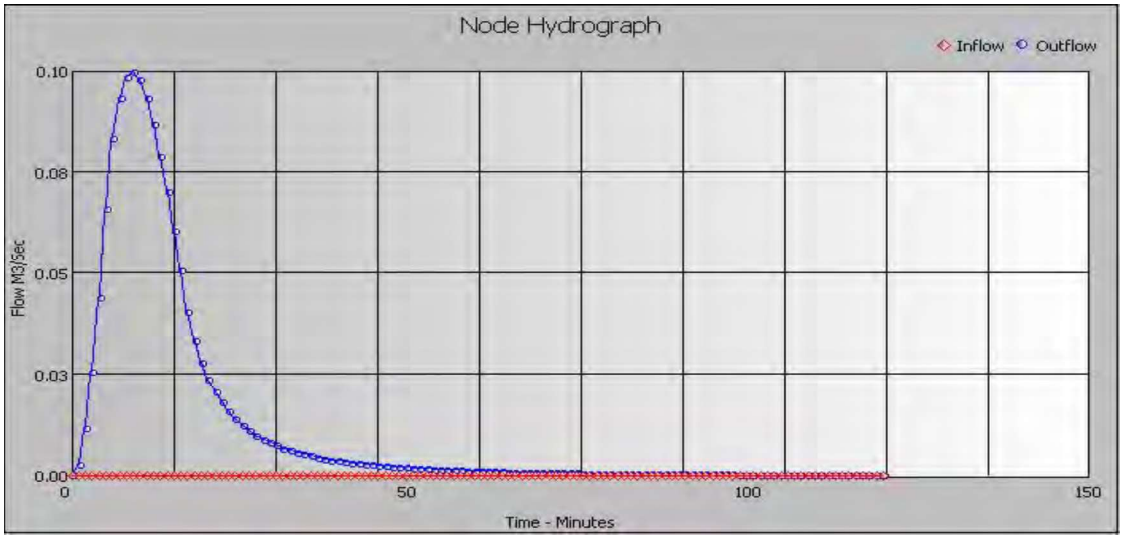
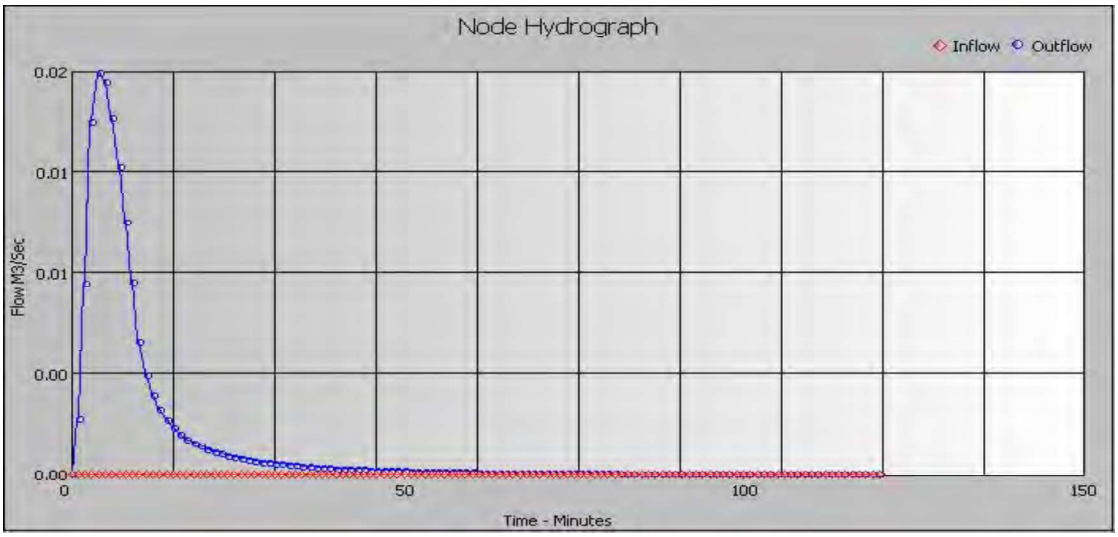


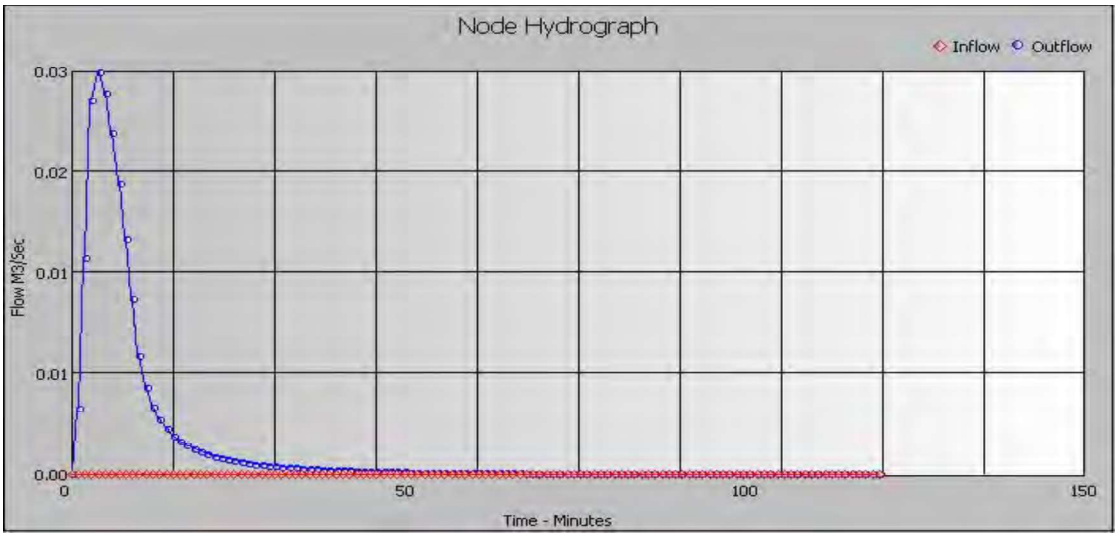
50 YEAR: POST-DEVELOPMENT

APPENDIX 4:

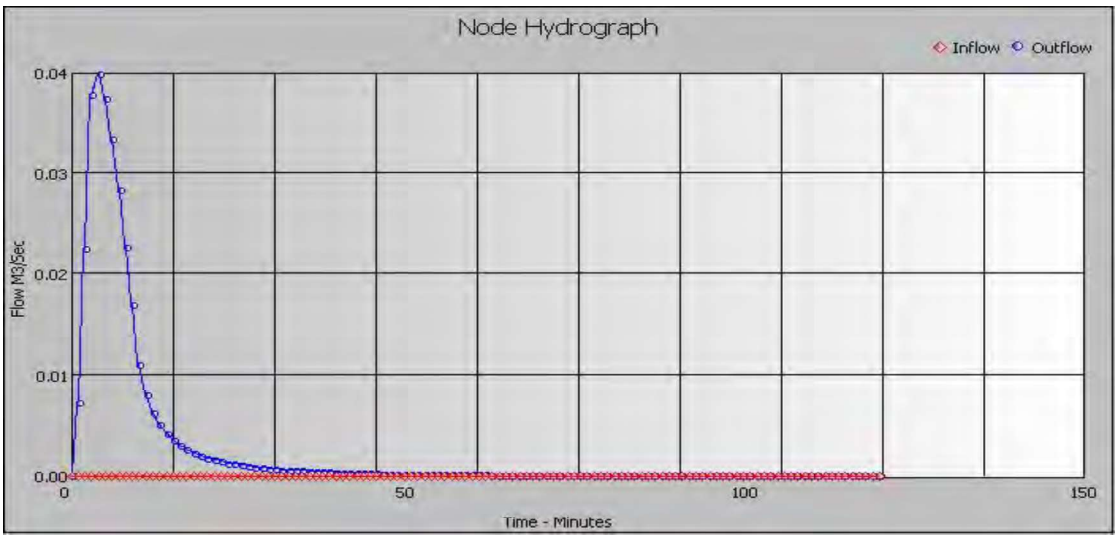
GREENGATE EXT. 140 **POST-DEVELOPMENT: ERF 7**



5 YEAR: POST-DEVELOPMENT



25 YEAR: POST-DEVELOPMENT

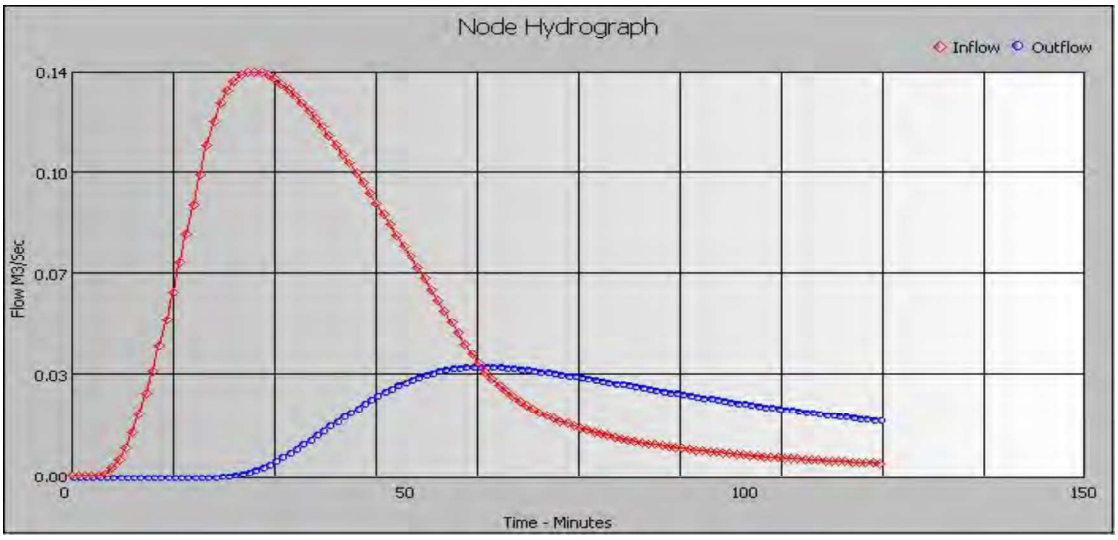


50 YEAR: POST-DEVELOPMENT

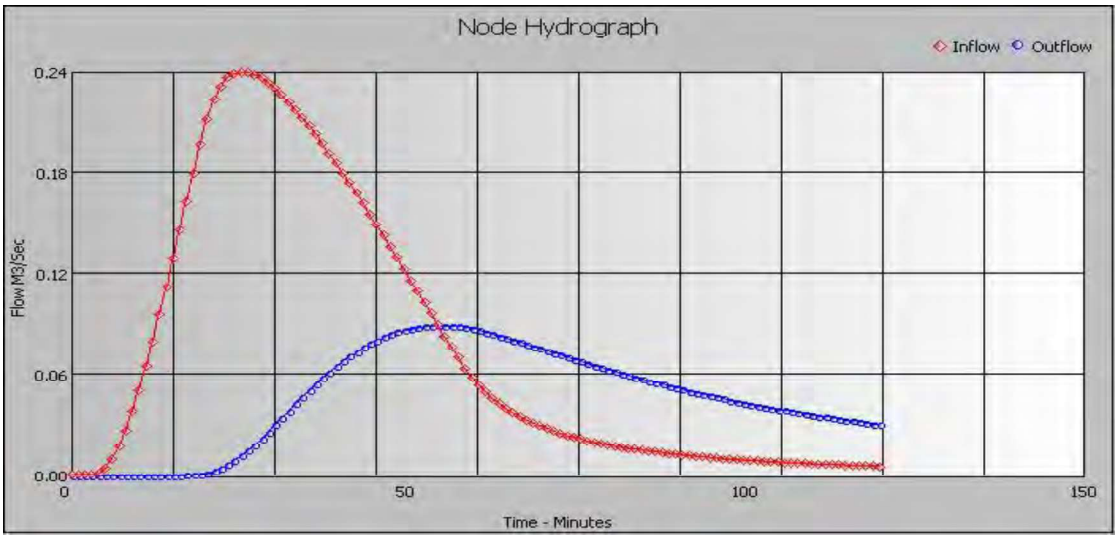
APPENDIX 5: POST-DEVELOPMENT STORMWATER RETENTION POND HYDROGRAPHS

APPENDIX 5:

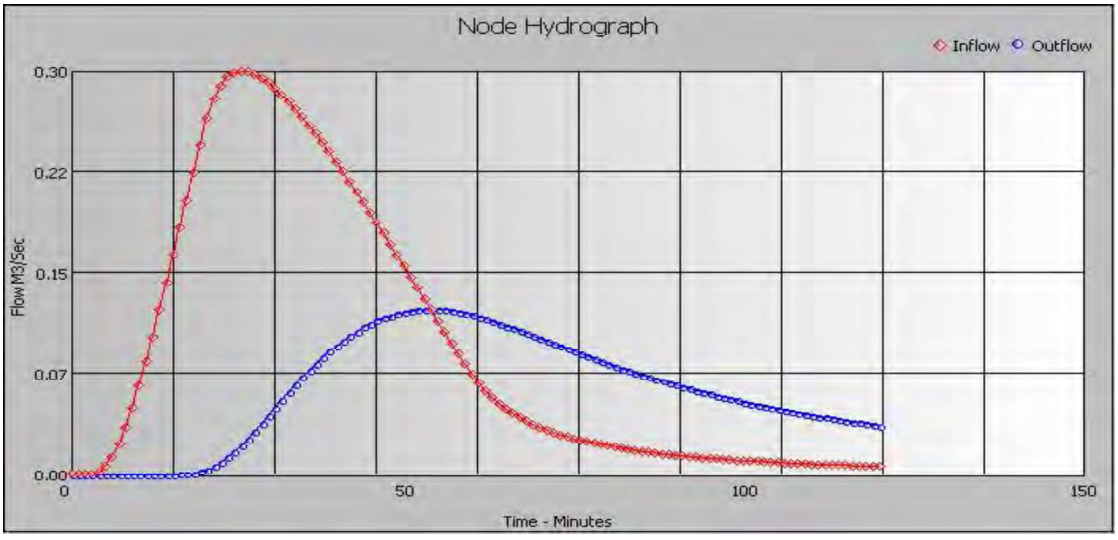
GREENGATE EXT. 140 **POST-DEVELOPMENT- RETENTION POND : ERF 2**



5 YEAR: POST-DEVELOPMENT



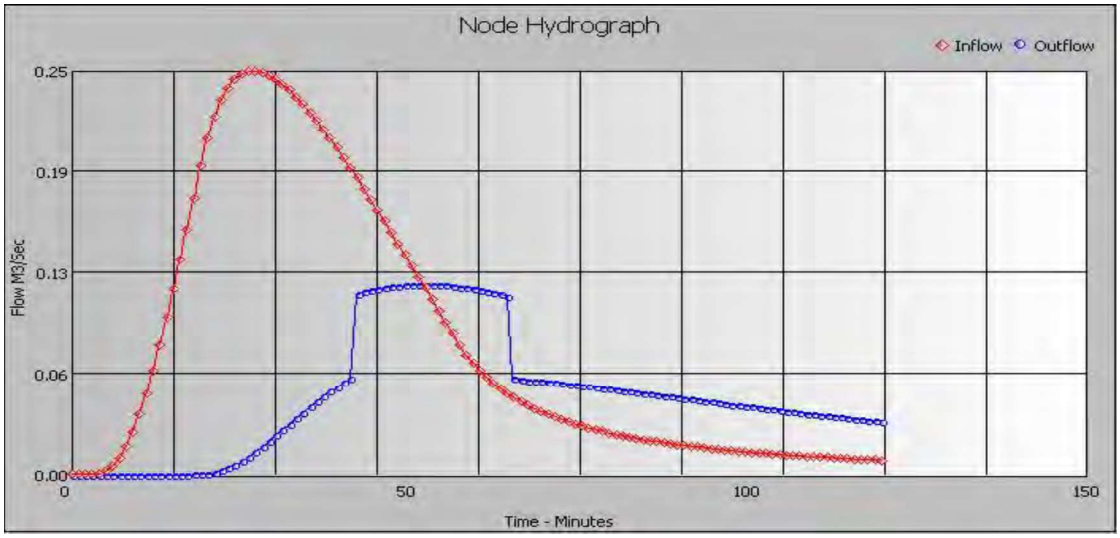
25 YEAR: POST-DEVELOPMENT



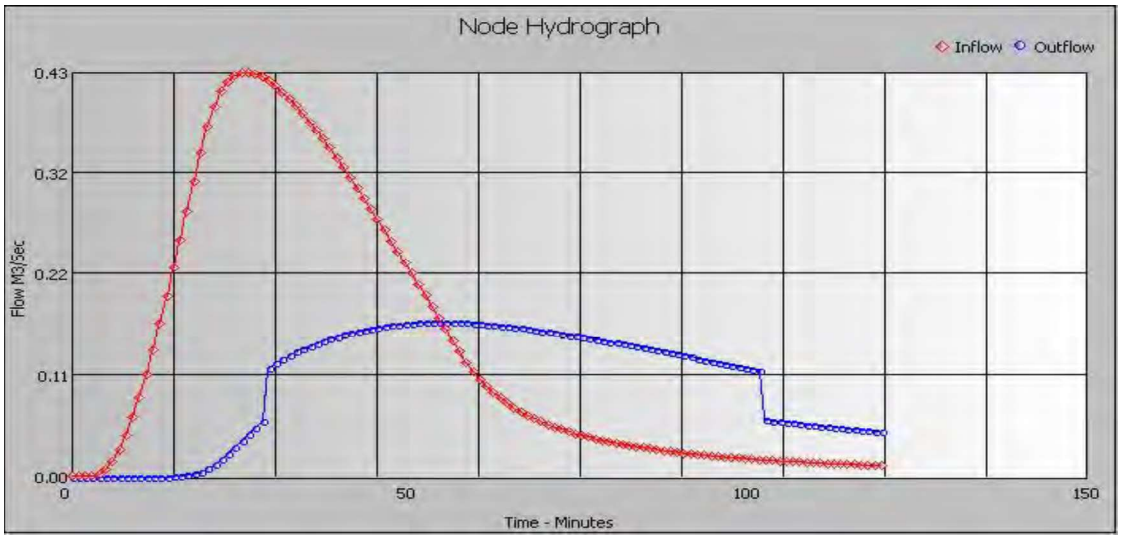
50 YEAR: POST-DEVELOPMENT

APPENDIX 5:

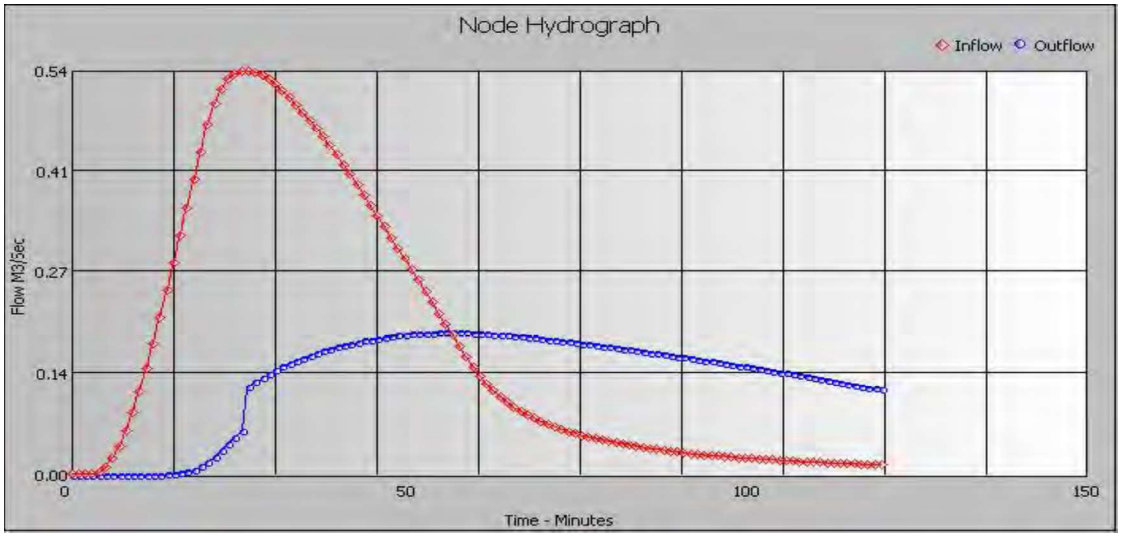
GREENGATE EXT. 140 **POST-DEVELOPMENT- RETENTION POND: ERF 3**



5 YEAR: POST-DEVELOPMENT



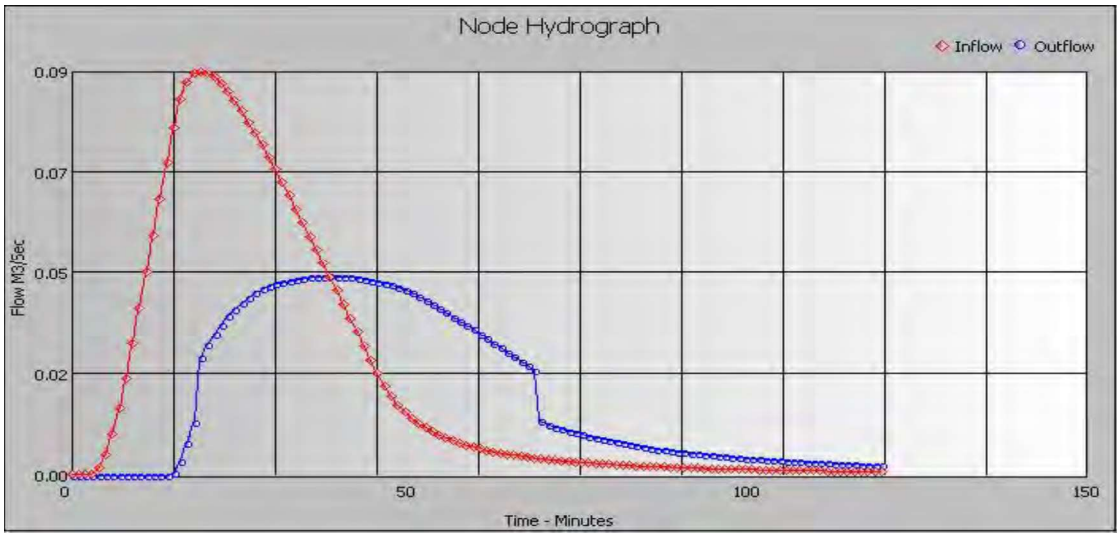
25 YEAR: POST-DEVELOPMENT



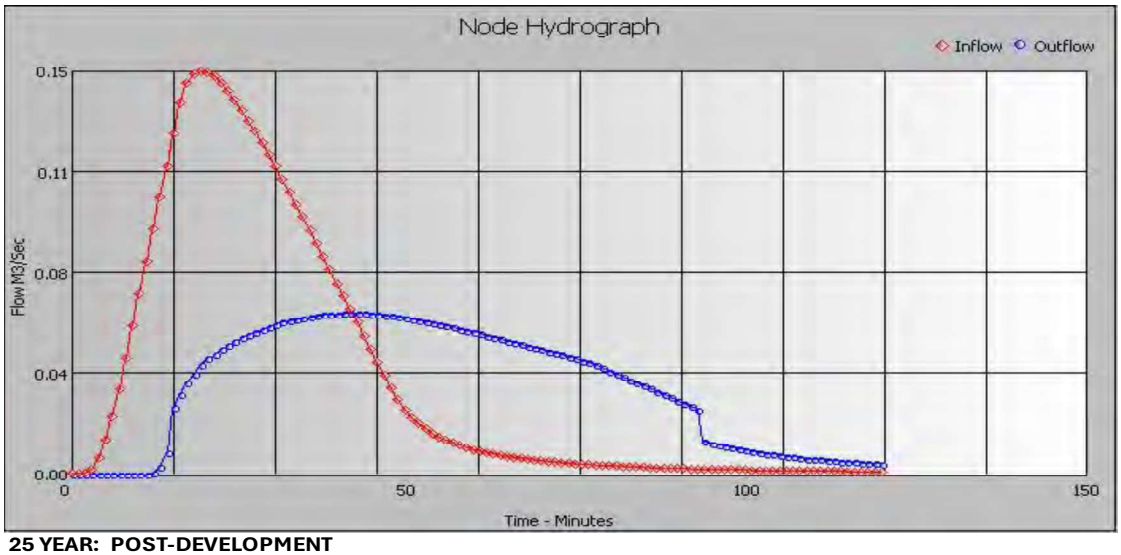
50 YEAR: POST-DEVELOPMENT

APPENDIX 5:

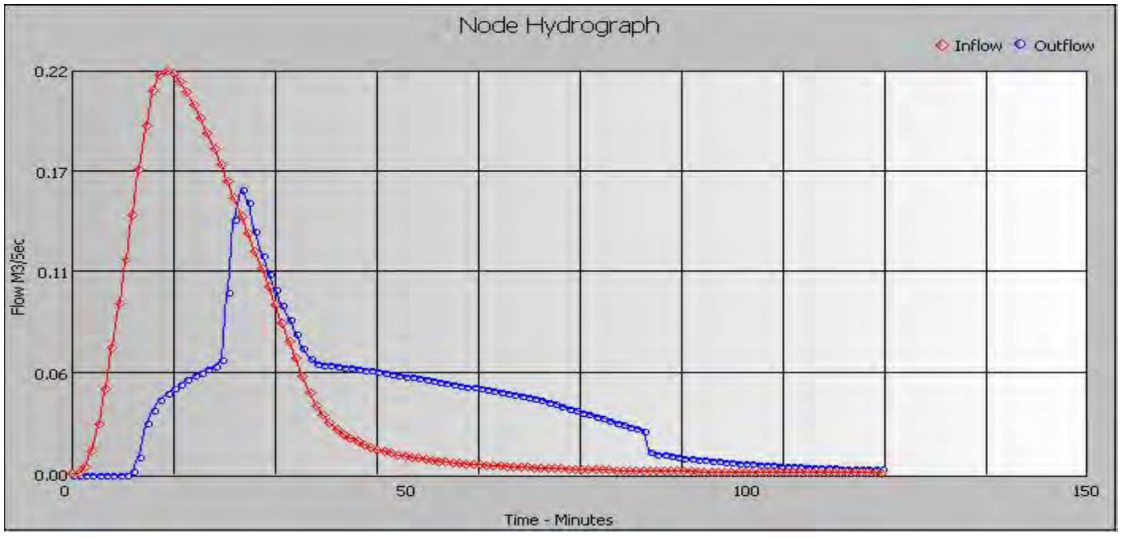
GREENGATE EXT. 140 **POST-DEVELOPMENT- RETENTION POND: ERF 4**



5 YEAR: POST-DEVELOPMENT



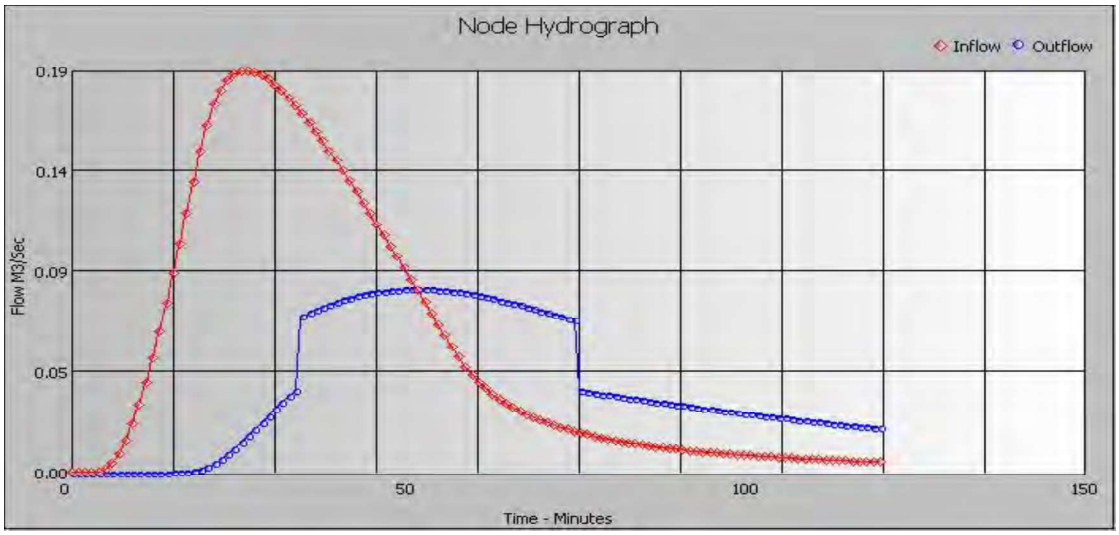
25 YEAR: POST-DEVELOPMENT



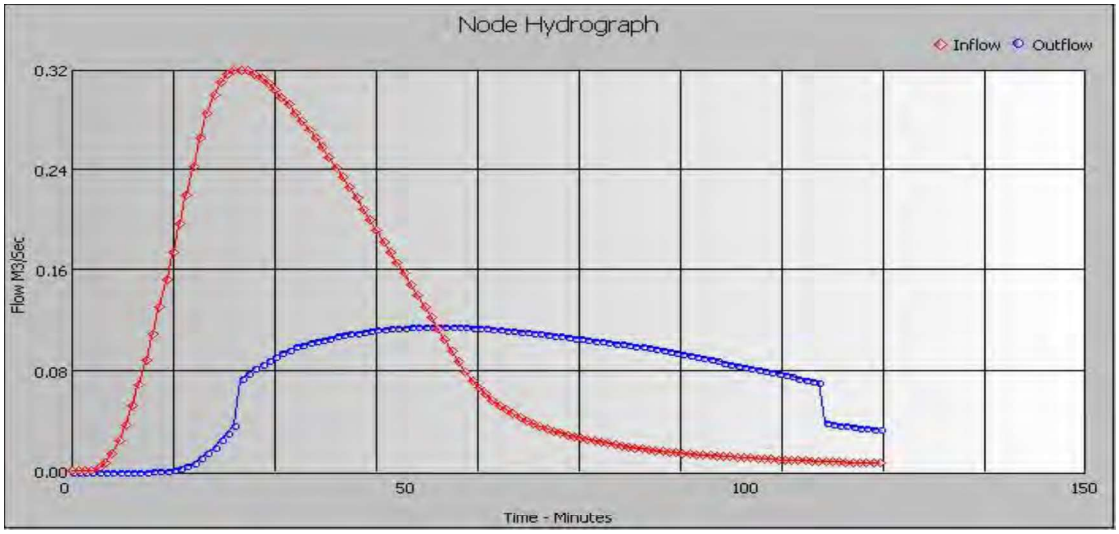
50 YEAR: POST-DEVELOPMENT

APPENDIX 5:

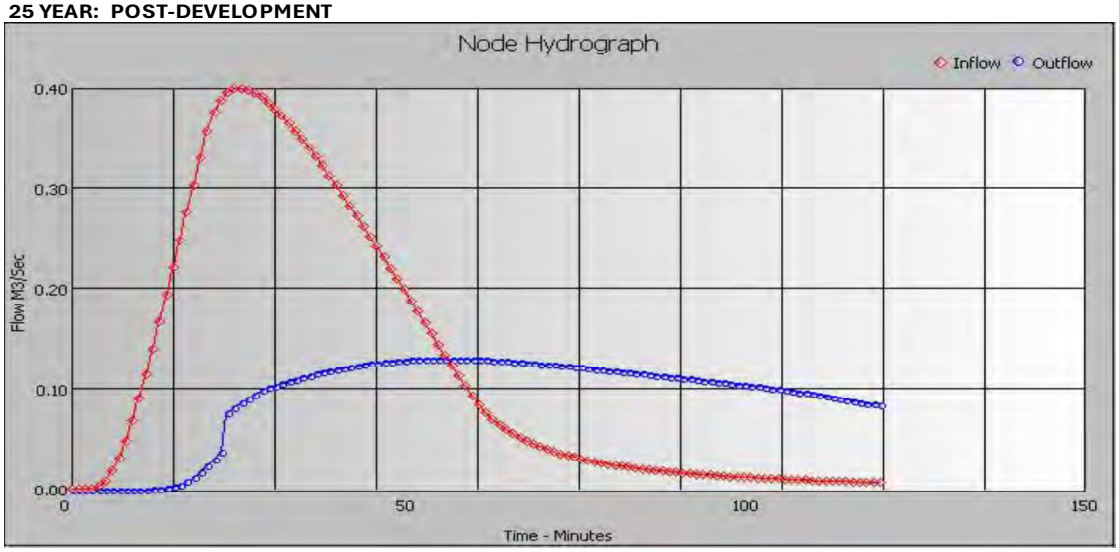
GREENGATE EXT. 140 **POST-DEVELOPMENT-RETENTION POND: ERF 5**



5 YEAR: POST-DEVELOPMENT



25 YEAR: POST-DEVELOPMENT

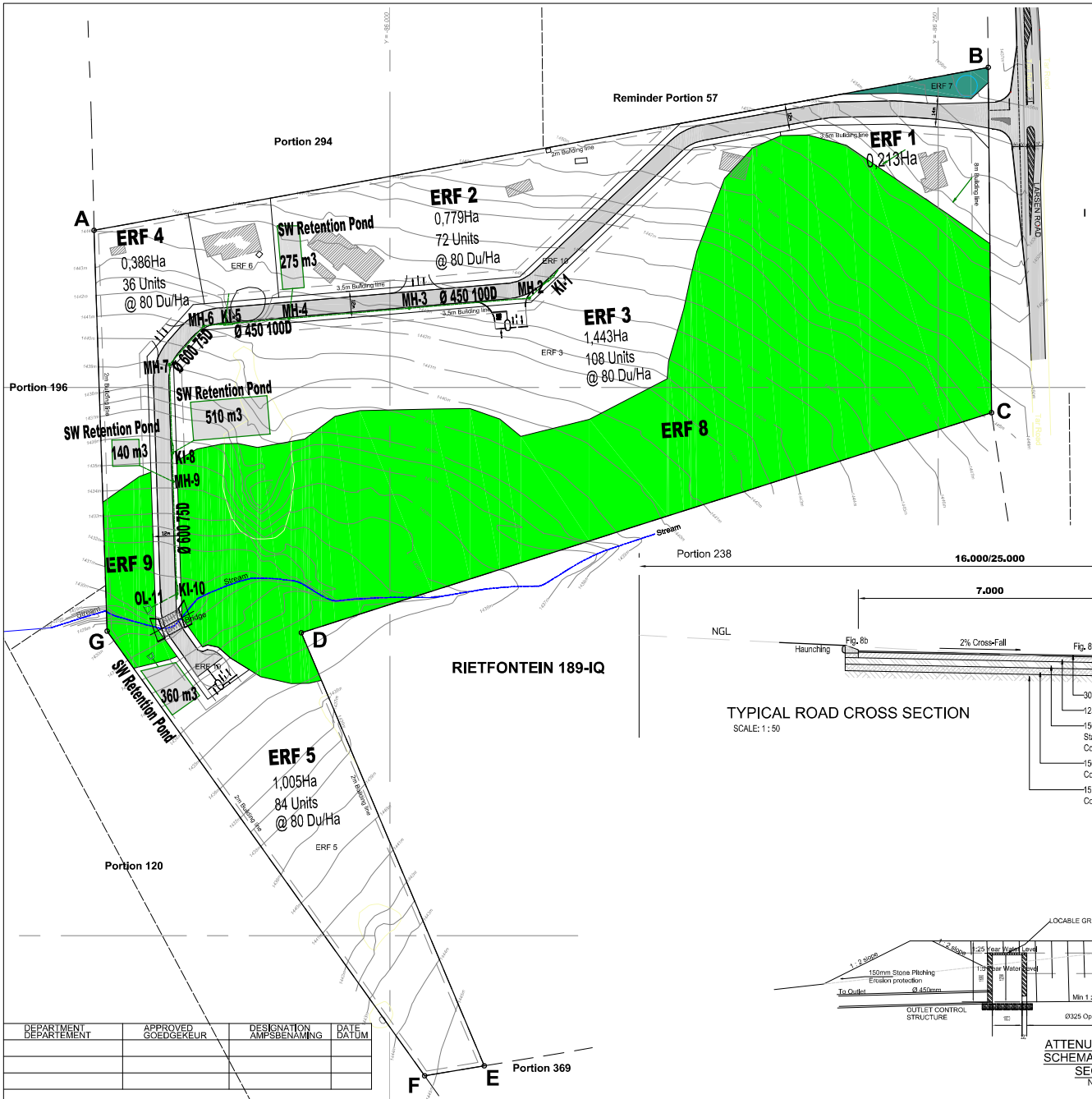


50 YEAR: POST-DEVELOPMENT

APPENDIX 6: ROADS & STORMWATER LAYOUT DRAWING

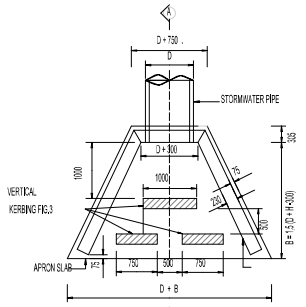
APPENDIX 7: WATER LAYOUT DRAWING

APPENDIX 8: SEWER LAYOUT DRAWINGS

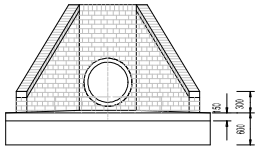


ERF	AREA	RETURN PERIOD	5 YEAR	25 YEAR	ATTENUATION VOLUME
ERF 1	0,215HA	PRE-DEVELOPMENT	0,054m3/sek	0,101m3/sek	
		POST-DEVELOPMENT	0,054m3/sek	0,101m3/sek	N/A
ERF 2	0,778HA	PRE-DEVELOPMENT	0,200m3/sek	0,191m3/sek	
		POST-DEVELOPMENT	0,196m3/sek	0,362m3/sek	375m3
ERF 3	1,443HA	PRE-DEVELOPMENT	0,154m3/sek	0,304m3/sek	
		POST-DEVELOPMENT	0,258m3/sek	0,491m3/sek	510m3
ERF 4	0,386HA	PRE-DEVELOPMENT	0,064m3/sek	0,124m3/sek	
		POST-DEVELOPMENT	0,101m3/sek	0,237m3/sek	140m3
ERF 5	1,005HA	PRE-DEVELOPMENT	0,119m3/sek	0,226m3/sek	
		POST-DEVELOPMENT	0,260m3/sek	0,493m3/sek	360m3
ERF 6	0,157HA	PRE-DEVELOPMENT	0,041m3/sek	0,077m3/sek	
		POST-DEVELOPMENT	0,041m3/sek	0,077m3/sek	N/A
ERF 7	0,241HA	PRE-DEVELOPMENT	0,211m3/sek	0,002m3/sek	
		POST-DEVELOPMENT	0,211m3/sek	0,202m3/sek	N/A

STORMWATER RUNOFF CALCULATIONS

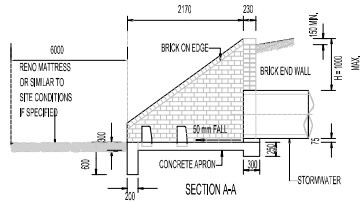


TYPICAL OUTLET STRUCTURE



TYPICAL ROAD CROSS SECTION
SCALE: 1 : 50

ATTENUATION DAM
SCHEMATIC CROSS
SECTION
NTS



DEPARTMENT DEPARTEMENT	APPROVED GOEDGEKEUR	DESIGNATION AMPSBENAMING	DATE DATUM

CONSULTING ENGINEERS - RAADGEWENDE INGENIEURS

OFFICE:
P O Box 7296
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Republic of South Africa
Tel: +27 82 807-0055
E Mail: kcbus@inventas.co.za

SURVEYED - OPGEMEET	--
DESIGNED - ONTWERP	J S COETSEE
DRAWN - GETEKEN	J SCHOEMAN
CHECKED - NAGESIEN	J S COETSEE
SERVICES CHECKED	
DIENSLEIDINGS NAGESIEN	
GEOTECHNICAL INVESTIGATION	
GEOTEGNIESE ONDERSOEK	
SERVITUDES	
SERWITUTE	
APPROVED	
GOEDGEKEUR	

PRIVATE DRAWING No
PRIVAAT TEKENING Nr

APPROVED
GOEDGEKEUR
Pr. Eng. No.
Pr. Ing. Nr.
DATE -DATUM

MOGALE CITY

GREENGATE EXT 140
ROAD & STORMWATER LAYOUT & DETAILS

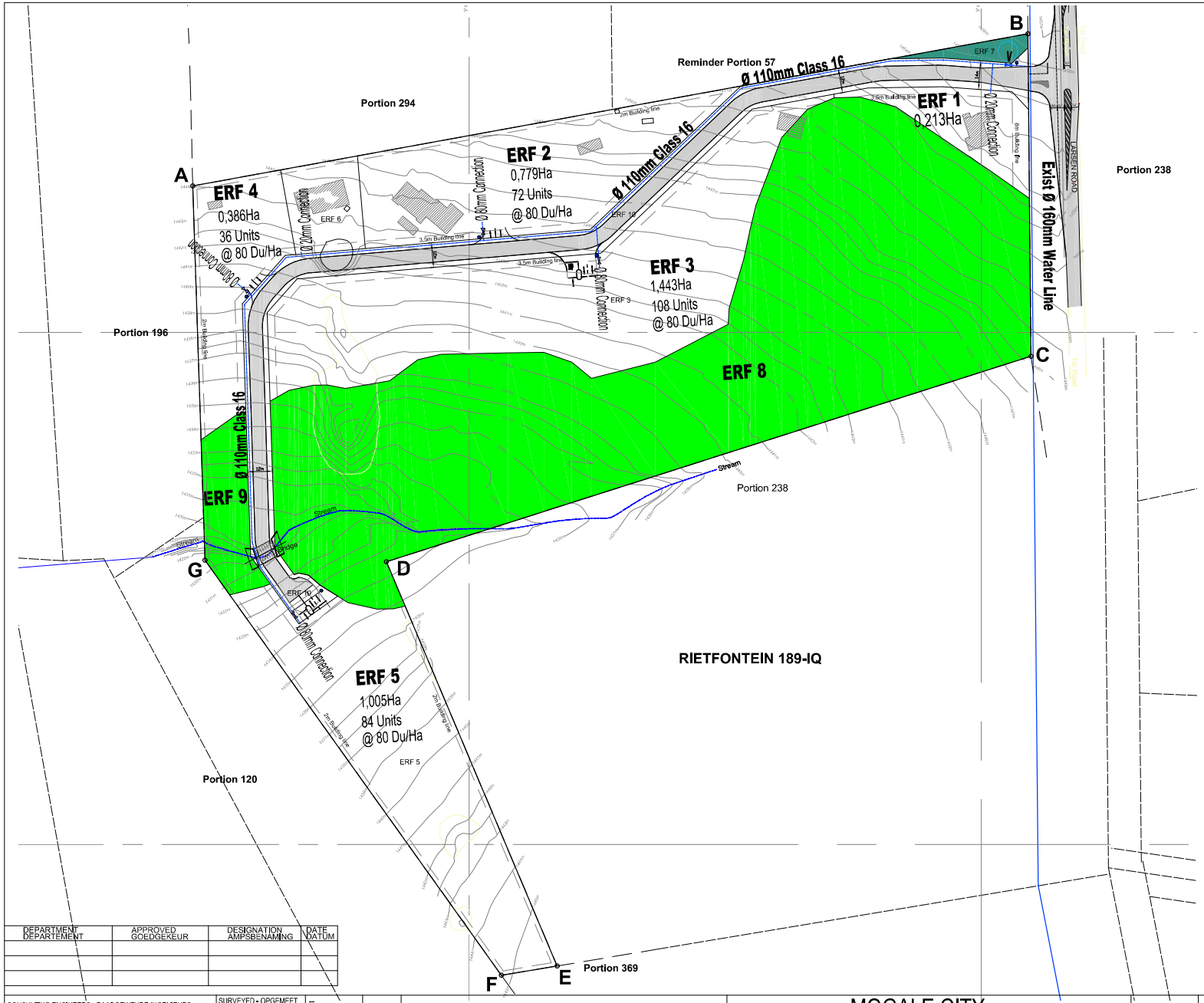
DESIGN MANAGER
BESTUURDER ONTWERP
J S COETSEE
(Pr. Eng. 950005)
DATE DATUM

SCALE SKAAL
1:1000
Jan 2025

AMENDMENTS - WYSIGINGS | APPROVED GOEDGEKEUR | DATE DATUM

DRAWING No.
TEKENING Nr.
2024-45-GREENGATE-X140-SW-01

FILE No
LEER Nr



1) GENERAL NOTES

1.2. The New Customer Manager at the Mogale Water Department Office must be notified before any construction works related to the installation of water or sewer may be commence.

1.3. All construction work shall comply with the relevant SABS 1200 Specification and Mogale Water Department specific requirements.

1.4. All materials used in installing water and sewer mains shall comply with the relevant SABS Specification and with the minimum requirements of Mogale Water Department.

1.5. The position and depth of all existing services on the site and off the site where affected by the works shall be confirmed prior to any construction work on the installation of water of sewer mains being commenced.

1.6. Only Mogale Water Department staff shall carry out tie-in connections to existing water and sewer manholes and mains. Note that a minimum of 2 weeks notice shall be given to Mogale Water Department staff to attend site inspections, meeting and any other necessary on site liaison.

2. SPECIFIC SEWER REQUIREMENTS

2.1. For standard details refer to Mogale Water Department standard drawings DWG 5, 6, & 7.

2.2. All materials shall comply with the relevant SABS Specification and with the requirements of Mogale Water Department.

2.3. Anchoring of Sewer mains:

2.3.1. Grade:- between 1:10 and 1:6 : Anchor blocks shall be installed at intervals not exceeding 12 meters

2.3.2. Grade: - steeper than 1: 6 : Sewer main shall be encased for the entire section where the grade is steeper than 1: 6.

2.4. No trees or shrubs shall be planted within 2 meters of any sewer main.

2.5. Sewer manholes are to be spaced a maximum distance of 80 meters.

LEGEND:

EXISTING SEWER

PROPOSED SEWER 160 uPVC CLASS 34 OR 400 SOLID WALL HEAVY DUTY

1m FROM CADASTRAL BOUNDARY

ALL CHANNELING TO BE VITREOUS CLAY

3. SPECIFIC WATER REQUIREMENTS

3.1. For standard details refer to Mogale Water Department standard drawings DWG 1, 2, 3, & 4.

3.2. Protection of fittings and mains:

3.2.1. Steel mains: Copon lined and suitably wrapped per specification.

3.2.2. Steel fittings: Copon coated internally and suitably wrapped per specification.

3.2.3. Galvanised fittings: suitably wrapped per specification.

3.3. All valve and below ground hydrant chambers to be watertight.

3.4. Position of across the road erf connections to be marked by a W cut into the kerbstone.

3.5. The contractor shall not operate any water valve or other fittings without the permission of Mogale Water Department.

3.6. Cover to water mains:

Description	Minimum (mm)	Maximum (mm)
Gravel Road	1000	1500
Tarred roads and traffic areas	800	1500
Pedestrian areas and other areas no used by vehicular traffic	600	1500

3.7. All water mains are to be installed at 2 meters from erf boundaries unless otherwise shown on the drawing.

3.8. Any anchor blocks constructed are to properly shuttered and cast against undisturbed ground. Any over excavation is to be filled with mass concrete.

EXISTING WATER

PROPOSED WATER 110 mPVC CLASS 16

FIRE HYDRANT

AIR VALVE

VALVE

SCOUR VALVE

DOUBLE HOUSE CONNECTION

SINGLE HOUSE CONNECTION

DEPARTMENT DEPARTEMENT	APPROVED GOEDGEKEUR	DESIGNATION AMPSBENAMING	DATE DATUM

CONSULTING ENGINEERS - RAADGEWENDE INGENIEURS

OFFICE:
850 Lisbon Ave,
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PRIVATE DRAWING No
PRIVAAT TEKENING Nr

APPROVED
GOEDGEKEUR
Pr. Eng. No.
Pr. Ing. Nr.
DATE -DATUM

SURVEYED - OPGEMEET	--
DESIGNED - ONTWERP	J S COETSEE
DRAWN - GETEKEN	J SCHOEMAN
CHECKED - NAGESIEN	J S COETSEE
SERVICES CHECKED DIENSLEIDINGS NAGESIEN	
GEOTECHNICAL INVESTIGATION GEOTEGNIESE ONDERSOEK	
SERVITUDES SERWITUTE	
APPROVED GOEDGEKEUR	

MOGALE CITY

GREENGATE EXT 140
WATER LAYOUT & DETAILS

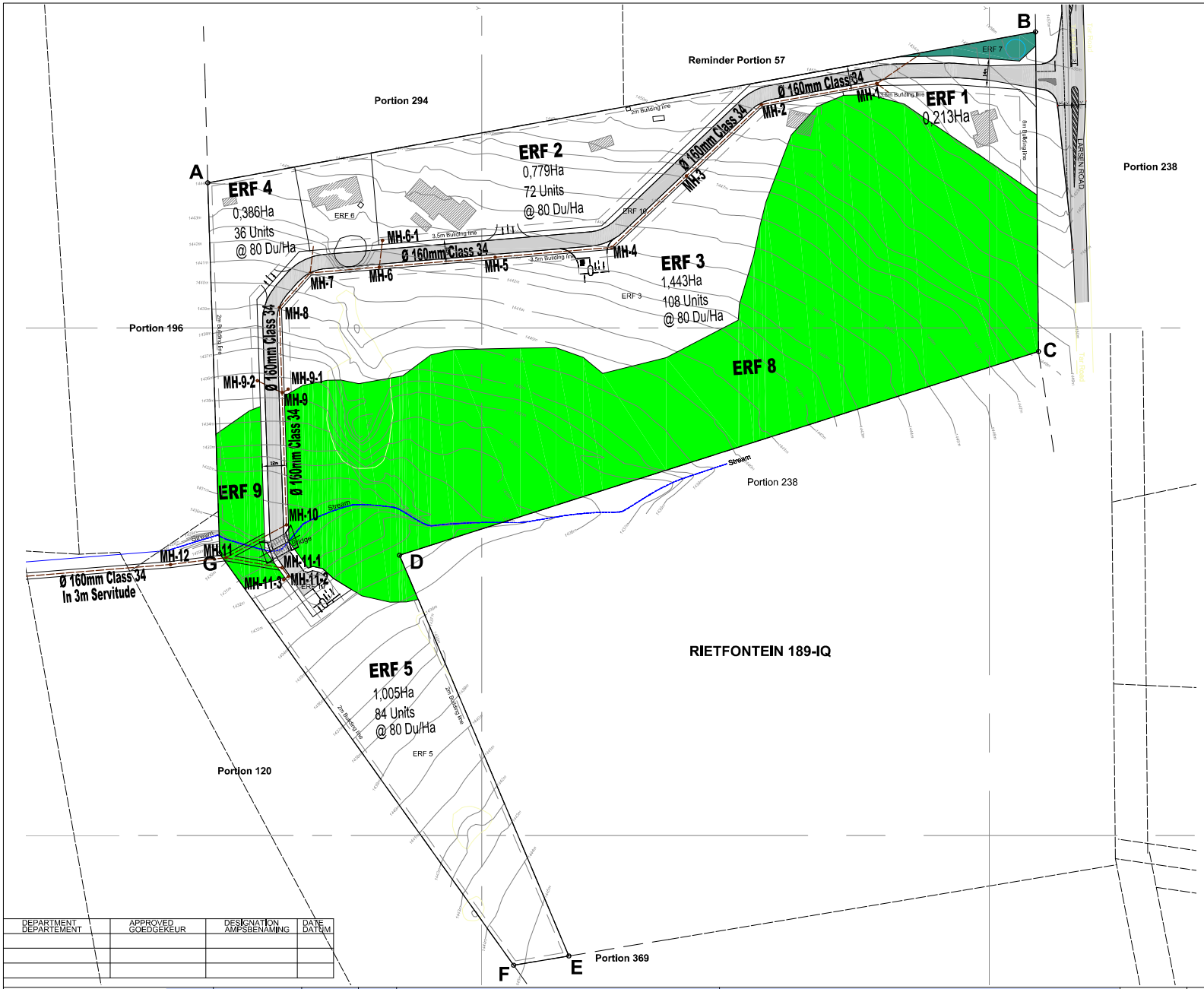
DESIGN MANAGER
BESTUURDER ONTWERP
JS COETSEE
Pr.Eng. 950005
DATE DATUM May 2025

SCALE SKAAL 1:1000

AMENDMENTS - WYSIGINGS	APPROVED GOEDGEKEUR	DATE DATUM

DRAWING No.
TEKENING Nr.
2024-45-GREENGATE-X140-W-01

FILE No
LêER Nr.



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AIR VALVE

VALVE

SCOUR VALVE

DOUBLE HOUSE CONNECTION

SINGLE HOUSE CONNECTION

DEPARTMENT DEPARTEMENT	APPROVED GOEDGEKEUR	DESIGNATION AMPSBENAMING	DATE DATUM

CONSULTING ENGINEERS - RAADGEWENDE INGENIEURS

OFFICE:
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PRIVATE DRAWING No
PRIVAAT TEKENING Nr

APPROVED
GOEDGEKEUR
Pr. Eng. No.
Pr. Ing. Nr.
DATE - DATUM

SURVEYED - OPGEMEET	--
DESIGNED - ONTWERP	J S COETSEE
DRAWN - GETEKEN	J SCHOEMAN
CHECKED - NAGESIEN	J S COETSEE
SERVICES CHECKED DIENSLEIDINGS NAGESIEN	
GEOTECHNICAL INVESTIGATION GEOTEGNIESE ONDERSOEK	
SERVITUDES SERWITUTE	
APPROVED GOEDGEKEUR	

MOGALE CITY

GREENGATE EXT 140
SEWER LAYOUT & DETAILS

DESIGN MANAGER
BESTUURDER ONTWERP
J S COETSEE
(Pr. Eng. 950005)
DATE DATUM

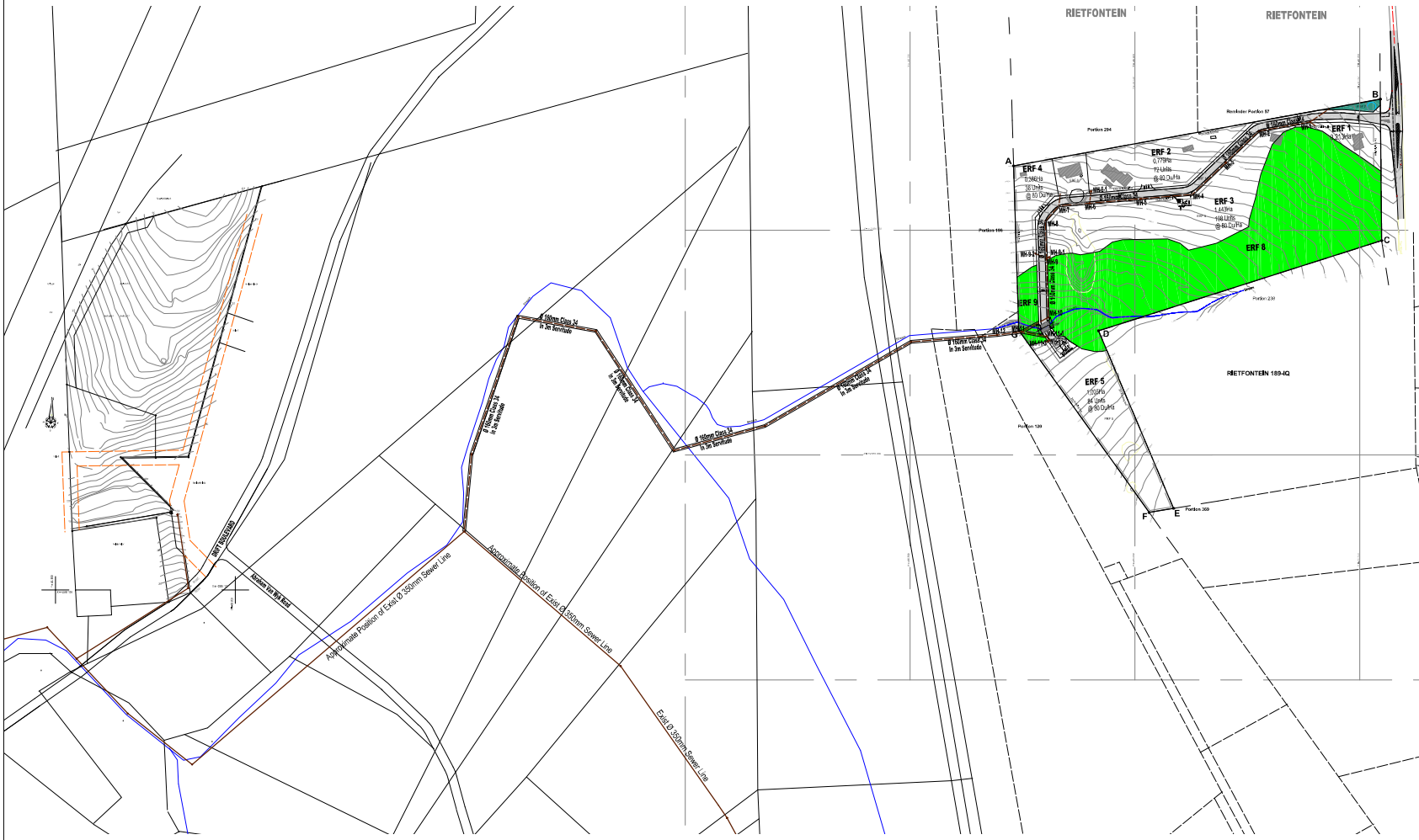
SCALE SKAAL
1:1000

Jan 2025

AMENDMENTS - WYSIGINGS | APPROVED GOEDGEKEUR | DATE DATUM

DRAWING No.
TEKENING Nr.
2025-45-GREENGATE-X140-SE-01

FILE No.
LEER Nr



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PROPOSED WATER 110 mPVC CLASS 16

FIRE HYDRANT

AIR VALVE

VALVE

SCOUR VALVE

DOUBLE HOUSE CONNECTION

SINGLE HOUSE CONNECTION

DEPARTMENT DEPARTEMENT	APPROVED GOEDGEKEUR	DESIGNATION AMPSBENAMING	DATE DATUM

CONSULTING ENGINEERS - RAADGEWENDE INGENIEURS

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SURVEYED - OPGEMEET	--
DESIGNED - ONTWERP	J S COETSEE
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SERVITUDES	
SERWITUTE	
APPROVED	
GOEDGEKEUR	

PRIVATE DRAWING No
PRIVAAT TEKENING Nr

APPROVED
GOEDGEKEUR
Pr. Eng. No.
Pr. Ing. Nr.
DATE - DATUM

MOGALE CITY

GREENGATE EXT 140
BULK SEWER LAYOUT

DESIGN MANAGER
BESTUURDER ONTWERP
J S COETSEE
(Pr. Eng. 950005)

DATE DATUM: Jan 2025

SCALE SKAAL: 1:2500

AMENDMENTS - WYSIGINGS	APPROVED GOEDGEKEUR	DATE DATUM

DRAWING No.
TEKENING Nr.
202-45-GREENGATE-X140 SE-02

FILE No.
LEER Nr