ATTACHMENT 11

STORMWATER POND ASSESSMENT REPORT FOR THE PROPOSED NORTHPORT EXPANSION

PREPARED FOR NORTHPORT

AT PORT MARSDEN HIGHWAY, MARSDEN POINT

NORTHPORT STORMWATER POND ASSESSMENT REPORT

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1. Purpose

The purpose of this report is to assess the current Northport stormwater settlement treatment pond system, in terms of treatment, volumetric capacity and compliance with the existing stormwater resource consent, for both the existing port catchment and the proposed future port expansion. Recommendations to address stormwater runoff from the proposed expansion areas are also provided.

This report is intended to inform a resource consent application with the Northland Regional Council (NRC) for the expansion of the port facility.

2. Proposal

It is proposed to expand the port apron from the current 49Ha footprint to a total 67.3Ha. This includes an already consented expansion area of 4.6Ha, and a further expansion of 13.7Ha (being the current proposal). These expansions will result in an increase in stormwater runoff requiring treatment prior to discharge.

Figure A: Proposed Northport expansions

An assessment of the existing stormwater system has been undertaken to establish whether compliance with the existing resource consent (refer section below) can be maintained and verify whether adequate capacity is available within the system to provide the required treatment whilst accommodating the additional runoff from the proposed port expansions.

3. Existing Consent Conditions

A consent is held by Northport to discharge stormwater associated with the operation of the port to the Whangarei harbour, after treatment via the storage and settlement pond system – CON20090505532 (refer to Appendix B).

The discharge consent conditions are limited to water quality and treatment rather than a discharge volume or rate. However, there is an advice note under section 1.2 Pumping Hours within Schedule 1 of the application which states that *'the approximate average volume of stormwater to be discharged is assessed at 200,000 cubic metres per annum. The size of the discharge pipe and the proposed capacity of the pumps limit the pumped discharge rate to approximately 2,520 cubic metres per hour'*. It is clear that the referenced 200,000m³ per annum is incorrect, since this represents only 408 hours (17.0 days) of pumped discharge alone, at the maximum pump rate is 490m³/hr. It is recommended that the reference to total annual volume of discharge is removed noting that peak rates of discharge are principally limited by the pumping configuration and discharge pipe size.

4. Existing Northport Pond

The Northport stormwater settlement pond was constructed to provide treatment to stormwater runoff from the port prior to discharge to the Whangarei harbour. In 2016 the pond was extended to accommodate a first stage port expansion, and in 2018 baffles and two forebay bunds were installed within the pond to limit inflow "shortcutting". Refer to the Boundary Hunter Ltd survey plan for the pond layout – Appendix C.

A canal system along the perimeter of the port apron collates and directs runoff from the port to the stormwater pond. With an average depth of 1.4m and base width of 2.6m, the canal has the capacity to convey flows of up to approximately 3.8m³/s (ignoring any restrictions resulting from culverts). An inlet weir from the canal then discharges the flows into the pond via the forebays. A central bund, which has been constructed with gabion rock, splits the pond in two. Flows discharge both over and through the bund, around the baffles, and are then pumped from the second basin into a gravity pipeline to combine with discharges from another industrial land treatment pond immediately southeast of the subject pond (independent consent) before ultimately discharging to the Whangarei harbour via a diffuser at depth under Berth 1 of the berth face. Refer to Figure 01 for the overall site plan for the port and pond stormwater management - Appendix F.

The discharge from the second basin of the pond is via duty-assist pumping system. Records show the pump rates to be at 290m³/hr for the duty pump and at 490m³/hr when the standby pump is activated (i.e. both pumps running concurrently).

The gravity pipeline from the pump discharge is a 525dia which increases to a 825dia at the gravity inlet from the forebay area scruffy dome overflow, as indicated on the Northport drawing D60-30-06-01-004 dated Feb 2002 – Appendix D. The gravity line then increases further to a 1500dia at the point at which the 1200dia outlet pipe from the Marsden Maritime Holdings (MMH) quality management pond connects into the line. Refer to the Northport drawing D60-30-06-01-012 dated August 2002 – Appendix D.

There are two formalised overflows from the stormwater system. One is located in the first half of the pond, being a scruffy dome manhole riser approximately 520mm above the pond inlet weir level discharging directly to the 825dia gravity outlet pipeline bypassing the pump limitation, and the other is a 9m long spillway at the northern end of the western canal, at a level 300mm below the port apron level, which discharges directly to the harbour.

Monitoring results demonstrate that the pond currently meets the water quality requirements as detailed in Schedule 1 of the consent – CON20090505532 (Appendix B).

Water quality monitoring of the discharges (spills) from the western canal spillway have not been undertaken, although the western spillway only functions during larger events (see section 7) and discharges from the top of the canal system, thus retaining sediments in the treatment network and discharges here will be significantly after first flush flows. Furthermore, treatment is designed to be provided for higher frequency rainfall events (1/3 of 2-year ARI) which will be conveyed to the treatment pond.

5. Assessment – Treatment Capacity

The original treatment design for the port was based on Auckland TP10[1] (now replaced by GD01)[2]. As the current pond is meeting the water quality requirements of the consent it is considered appropriate to continue this design basis. It should also be noted that the current consent conditions are more stringent than the thresholds set out in the proposed Regional Plan and thus confirming the conservativeness of the design.

In accordance with Auckland TP10 the required water quality volume (WQV) for the current port apron area of 49Ha is 13,480m³. This volume is required to be provided as dead storage within the treatment network.

Survey information indicates that the available dead storage in the first half of the pond, below the level of the central bund at 3.75m CD, is 12,320m³. The dead storage available in the second half of the pond, below the pump off level of 3.10m CD, is 5,430m³. Therefore, the total dead storage available within the existing pond is 17,750m³ providing more than the required WQV for the existing port apron areas.

The proposed full expanded port footprint of 67.3Ha will require a total WQV of 18,510m³ which exceeds the dead storage volume currently available in the existing pond by 760m³. However, this additional dead storage can be provided within the base of the conveyance canals on the site at a depth of approximately 110mm (assuming a total canal length of 2640m – canals to full expanded port perimeter).

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[1] Stormwater Management Devices: Design Guidance Manual.

[2] Stormwater Management Devices in the Auckland Region.

During rainfall events up to the treatment threshold (1/3 of the 2-year – 24hour rainfall), the effectiveness of a 110mm depth of dead storage to treat flows would likely be compromised, with the increase in hydraulic gradient and the resulting velocities. Therefore, the recommendation is to install a 250mm high weir (set at 3.85m CD) within the canal which will provide an additional 2010m³ of dead storage, mitigating the effects of the increased velocities in the canal.

With the installation of the weir a total dead storage volume of 19,760m³ will be provided, 1250m³ more than required, continuing the conservative treatment design approach. This will provide a staged WQV, where removal of coarse sediments and debris is addressed within the canals, finer treatment within the first basin of the pond, and polishing within the second pond basin (pump pond).

In accordance with Auckland TP10 for WQV requirements, Hirds V4 has been utilised and climate change adjusted rainfall has not been considered. However, if additional WQV is required to address climate change this could be accommodated within the existing pond with the lifting of the pump switch levels. This could be an adaptive process as climate change manifests.

6. Model Build and Calibration

To assess the volumetric capacity of the pond for the existing port apron and the proposed future expansion, a model of the catchment, inflows and pond has been built in the HydroCAD hydrologic modelling software (refer to Appendix A for HydroCAD summary reports). This model has been calibrated against a historic rainfall event of the 24 December 2018, using available pond and canal level data and pump operating data records to establish the magnitude of initial losses and exfiltration.

The storage volumes within the pond have been established from survey information provided by Boundary Hunter Ltd, dated February 2021. Storage volumes within the canal have been estimated from survey sections of the canal and canal lengths measured from GoogleEarth aerials.

It is noted from GoogleEarth aerials that the calibration event (December 2018) is prior to the installation of a 1200dia culvert within the western canal, and during this period a portion of the southern apron was under construction with sediment ponds in place. Refer to the figure below. This has been reflected in the model calibration.

The pond pumps have been included in the model with operational stop/start levels as advised by Northport. Refer to the pond level schematic – Appendix E. Pump 1 is modelled as having a maximum pump rate of 290m³/hr and pump 1 and pump 2 having a combined maximum pump rate of 490m³/hr, as established from Northport pump data records.

The existing inlet weir, the central pond bund, and the scruffy dome overflow have all been built into the model with elevations, dimensions and lengths taken from survey information. The Inlet weir (outlet from the canal) being 10m in length and at an elevation of 3.95m CD and the central bund with a length of approximately 75m and at 3.75m CD. The scruffy dome manhole riser has a 2100dia and the rim level is set at 4.47m CD.

Figure B: GoogleEarth aerial Dec 2018

6.1. Calibration Event

The selection of the rainfall event to be used for calibration of the pond model was based on a review of pond and canal level data provided, with quality data being available for the selected event. The calibration rainfall event was selected from the period between the installation of the forebays and pond baffles in 2018 and prior to mid-2019. The rainfall event being that which occurred on the 24th of December 2018, which, while "significant", is not extreme and therefore is unlikely to distort pond behaviour.

Rainfall data was obtained from the NRC – Marsden Point rainfall gauge for the 24th of December 2018 which showed a total rainfall depth for the event of 80mm over a 24hour period (equivalent to a 2-year ARI rainfall event) and a peak intensity of 40.6mm/hr for 10 minutes (equivalent to that of a 10-year ARI rainfall event).

Calibration of the pond model for the selected event, against level data, indicated noticeable exfiltration from the pond and canal, and that discharge through the central pond bund occurs. An exfiltration rate of 20mm/hr from the pond and canal, above the static water elevation, was incorporated in the model (unlined pond in sand soils). An estimated 50ℓ/s was allowed for flows through the pond bund into the second basin (estimated from alignment of model behaviour verses data).

For the calibration event, pump record data shows a total pumped discharge from the pond of 23,932m³. The modelled discharge from the pond is calculated as 23,993m³ being within 1% of the recorded data discharge volume. The modelled peak pond elevation is 3.860m, being 60mm lower than the recorded data. The accuracy of the calibration is considered suitable for the purposes of this model's use, noting variability is likely over a range of event depths and durations.

7. Assessment – Volumetric Capacity

7.1. Current Port

Utilising the calibrated model for the current port apron of 49Ha (with the addition of the 1200dia culvert in the western canal and the seal to the southern portion of the port apron completed), the pond performance has been assessed using a Type 1A nested rainfall hyetograph methodology and site-specific current rainfall data obtained from HIRDS version 4. Refer to Figure 02 for the catchment plan for the port and stormwater pond - Appendix F.

The starting water elevations in both halves of the pond have been set at 3.30m CD and 3.10m CD, respectively. This represents the first basin at approximately half full and second basin at the pump off level. These levels are elevated from those of the recorded level data from the calibration event and are therefore considered conservative.

The model shows that the 1200dia culvert in the western canal creates a restriction on flows from the western catchment, resulting in the canal spillway operating during events in excess of a 10-year ARI event. However, the model also shows that the pond has the capacity to address the runoff generated by the current port apron area that reaches the pond (canal spillway operating) for events up to and including the 100-year ARI rainfall event and that the 825dia discharge pipe has adequate capacity to convey the peak discharge of 0.65m³/s from pumps and scruffy dome overflows. The peak pond elevation for the 100-year ARI event is shown to be at 4.59m CD being 410mm below the port apron level of 5.00m CD. For events exceeding the 20-year ARI event, the model indicates that the scruffy dome overflow will operate within the pond first basin.

For the 100-year ARI event the model shows the western canal spillway to operate with a peak discharge of 0.89m³/s and total discharge volume of 1560m³, being 1% of the total runoff volume from the expanded port apron. The modelled peak elevation in the western canal for the 100-year ARI event is 4.86m CD, being just 140mm below the port apron level.

The failure mode for the system, beyond that of the event limits discussed, has not been examined fully. However, flooding of the current port apron is unlikely for any event with a

rainfall depth of less than 350mm over 24hrs (extreme). If the pond pumps were to fail the current system (scruffy dome and western canal spillway) would be able to address a 100-year ARI event from the current port apron, with peak pond elevation at 4.62m CD (380mm below the port apron).

7.2. Full Port Expansion

To accommodate the required treatment volume in the system for the full port expansion (as discussed in section 5), the starting water level in the canals has been set at 3.85m CD. An allowance for an additional 670m of canal has been included within the model for the 67.3Ha port catchment. For current climate rainfall the model indicates that the western canal spillway operates for events in excess of the 10-year ARI event and overflows from the pond (via scruffy dome) will occur for events exceeding that of the 5-year ARI rainfall event, with the capacity of the 825dia outlet exceeded for events over that of a 20-year ARI event.

For the 100-year ARI event the model shows the western canal spillway to operate with a peak discharge of 0.89m³/s and total discharge volume of 7,710m³. The calculated peak elevation in the western canal for the 100-year ARI event is 4.860m CD; being just 140mm below the lowest points of the port apron level.

Climate change effect (allowance of an additional 20% on current Hirds V4 rainfall data) would result in both the western spillway and pond overflow (scruffy dome) operating for more frequent events. The model shows the western spillway to operate for synthetic rainfall events in excess of the 5-year ARI storm event (climate change adjusted rainfall), and the scruffy dome to operate for events in excess of the 2-year ARI storm event (climate change adjusted rainfall). The capacity of the 825dia outlet would be exceeded for events over that of a 10-year ARI event, relying on the canal spillways to discharge excess flows.

In summary, the assessment of the pond capacity confirms that the existing unmodified pond has the capacity to address the 100-year ARI event (current climate change rainfall) runoff received by the pond from the current port footprint (noting the activation of the western spillway reduces the flows conveyed to the pond), but the capacity to accommodate the additional runoff from the full proposed port expansion is limited to that generated by the 20-year ARI event for current climate rainfall, and to the 10-year ARI event for climate change adjusted rainfall (+20%) .

8. Recommendations

To provide the additional treatment volume required to address the port expansion it is recommended that a 250mm weir is constructed in the canal system, directly upstream of the pond inlet weir, to retain a volume of water in the canal.

To address the capacity requirements of the proposed expansion, the recommendation is for a second canal spillway (additional to the existing western spillway) to be installed to provide relief to the network. The recommended location would be near the eastern limit of the eastern canal, also discharging directly to the harbour.

Modelling shows that for the stormwater network (canals, pond, and overflows) to have the capacity to address the 100-year ARI rainfall event for the port expansion a 10m length of spillway will be required at 490mm below the port apron level at 4.510m CD. Based on using a Type 1A nested rainfall hyetograph methodology and current rainfall data from HIRDS version 4, the spillway will activate for events in excess of the 10-year ARI event, with the 100-year ARI peak discharge calculated at $0.56m^3/s$ and total discharge volume associated with the synthetic design storm profile of $21,420m^3$. The 100-year ARI peak elevation in the canal is calculated at approximately 380mm below the port apron level.

For the stormwater network to have the capacity to address the 100-year ARI storm event (climate change adjusted rainfall) the eastern spillway would need to be extended from 10m to 35m or lowered by 120mm. This would result in a peak discharge rate of $1.82m^3/s$ ($1.26m^3/s$ increase from current climate) and a total discharge volume of $60,630m^3$ ($39,210m^3$ increase from current climate). The lowering of the spillway will not notably increase the frequency of spills when compared to that resulting from the spillway extension. Activation of the spillway for both design conditions occurs between the modelled 2-year and 5-year (climate change adjusted rainfall) events.

It is recommended that the existing spillway (western) and any future spillway installed be modified/designed to retain oils and floatables within the port/canal network with an under-over weir setup, as presently the configuration permits loss of control of these aspects of a spill.

9. Limitation

This report has been prepared solely for the benefit of our client Northport Ltd and the Northland Regional Council in relation to the resource consent for which this report has been prepared. The comments in it are limited to the purpose stated in this report. No liability is accepted by Hawthorn Geddes engineers & architects ltd in respect of its use by any other person, and any other person who relies upon any matter contained in this report does so entirely at their own risk.

Appendix A – HydroCAD summary reports

Calibration - Dec 2018
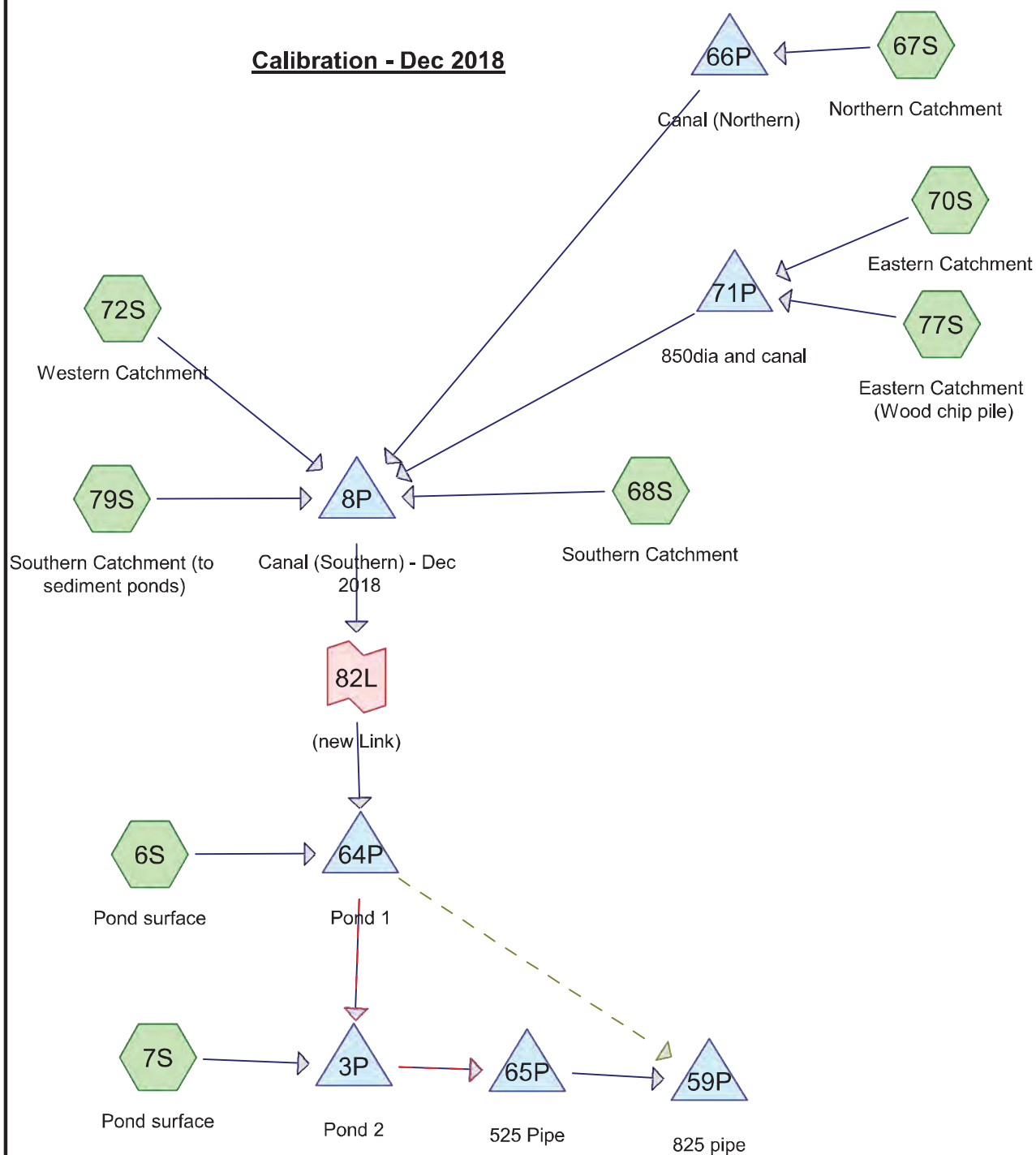
66P

Canal (Northern)

67S

Northern Catchment

70S

Eastern Catchment

71P

850dia and canal

77S

Eastern Catchment
(Wood chip pile)

72S

Western Catchment

79S

Southern Catchment (to
sediment ponds)

8P

Canal (Southern) - Dec
2018

68S

Southern Catchment

82L

(new Link)

6S

Pond surface

64P

Pond 1

7S

Pond surface

3P

Pond 2

65P

525 Pipe

59P

825 pipe

Subcat   Reach   Pond   Link

Summary for Subcatchment 6S: Pond surface

Runoff   =   0.2637 m³/s @   91.16 hrs, Volume=   2.024 Ml, Depth=   92 mm
    Routed to Pond 64P : Pond 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Northport-_24 Dec_2018_5mins Dec 2018 Rainfall=95 mm, AMC=3

	Area (m²)	CN	Adj	Description
*	22,000.0	98		
	22,000.0	98	99	Weighted Average, AMC Adjusted
	22,000.0			100.00% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
0.0					**Direct Entry,**

Subcatchment 6S: Pond surface

Hydrograph

Northport-_24 Dec_2018_5mins
Dec 2018 Rainfall=95 mm
AMC=3
Runoff Area=22,000.0 m²
Runoff Volume=2.024 Ml
Runoff Depth=92 mm
Tc=0.0 min
AMC Adjusted CN=99

0.2637 m³/s
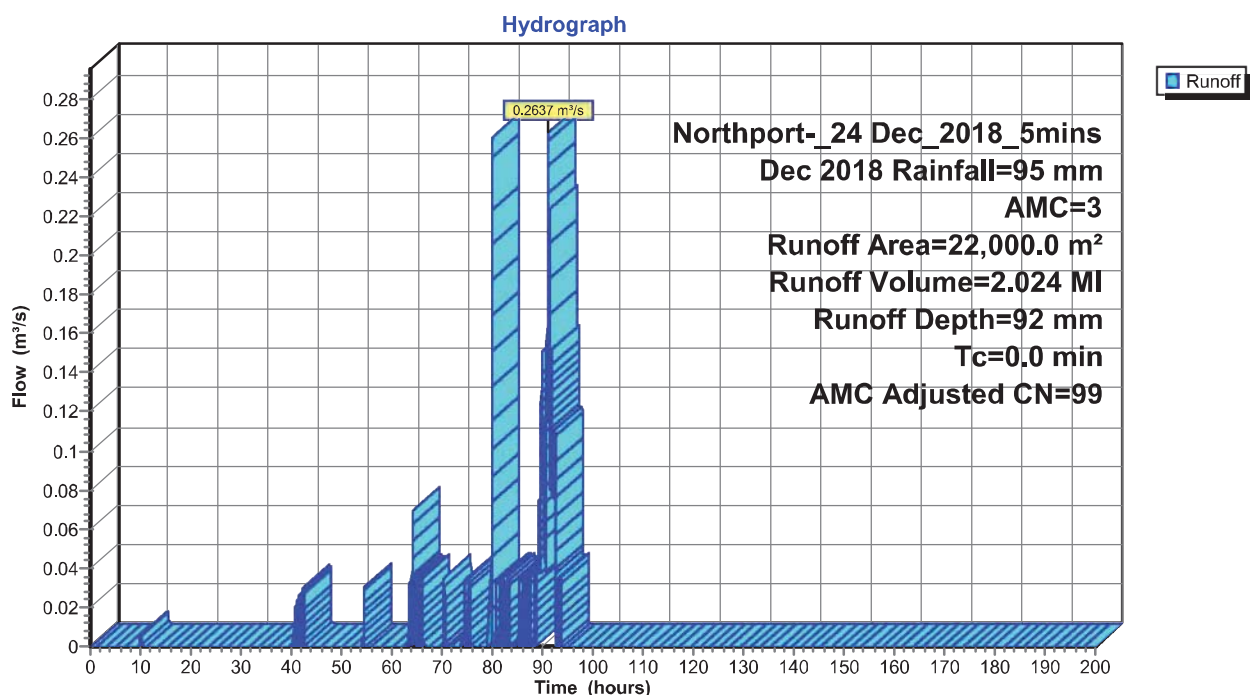
Runoff

Summary for Subcatchment 7S: Pond surface

Runoff   =   0.4195 m³/s @   91.16 hrs, Volume=   3.220 Ml, Depth=   92 mm
    Routed to Pond 3P : Pond 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Northport-_24 Dec_2018_5mins Dec 2018 Rainfall=95 mm, AMC=3

	Area (m²)	CN	Adj	Description
*	35,000.0	98		
	35,000.0	98	99	Weighted Average, AMC Adjusted
	35,000.0			100.00% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
0.0					**Direct Entry,**

Subcatchment 7S: Pond surface
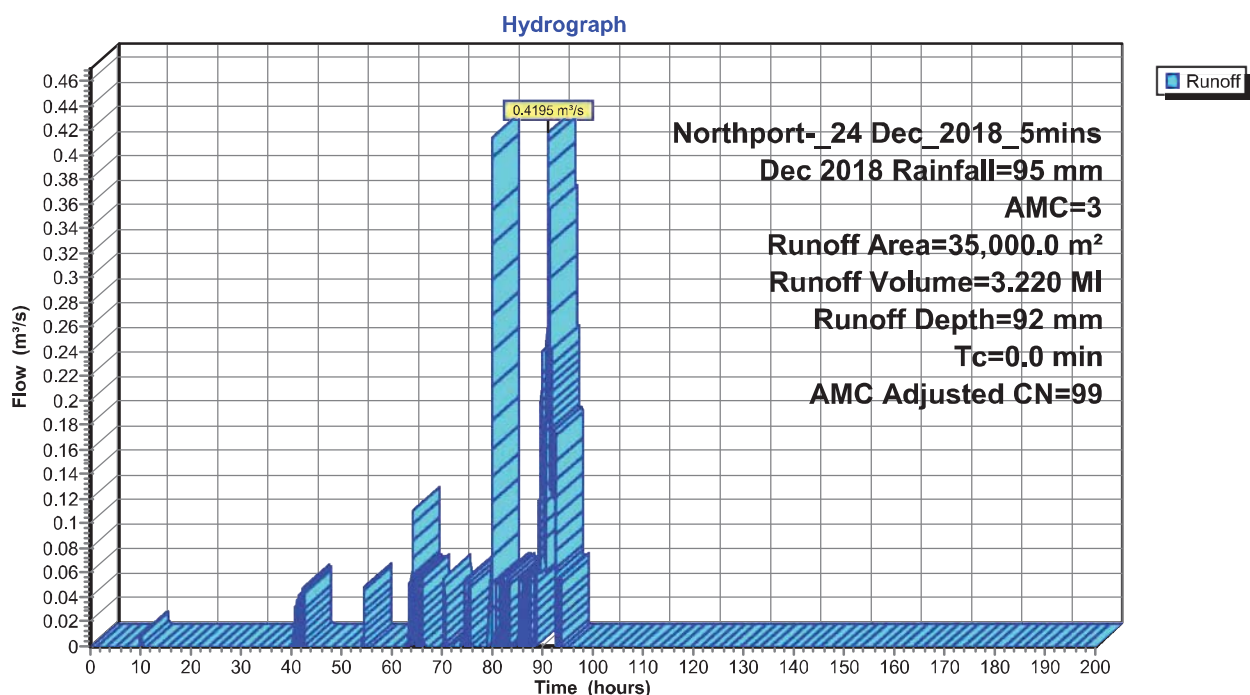
Summary for Subcatchment 67S: Northern Catchment

Runoff   =   0.5101 m³/s @ 91.56 hrs, Volume=   6.033 Ml, Depth=   86 mm
    Routed to Pond 66P : Canal (Northern)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Northport-_24 Dec_2018_5mins Dec 2018 Rainfall=95 mm, AMC=3

	Area (ha)	CN	Adj	Description
*	7.0000	92		
	7.0000	92	97	Weighted Average, AMC Adjusted
	7.0000			100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
30.0					**Direct Entry,**

Subcatchment 67S: Northern Catchment
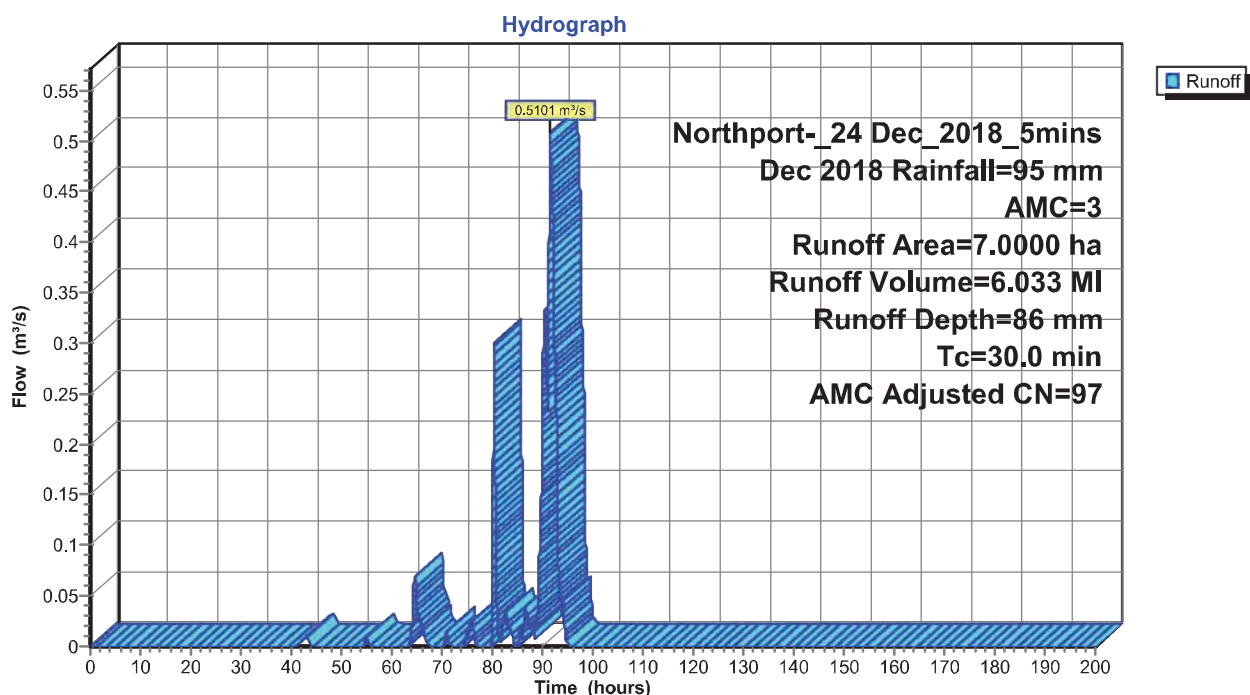
Summary for Subcatchment 68S: Southern Catchment

Runoff   =   0.6247 m³/s @ 91.56 hrs, Volume=   7.213 Ml, Depth=   83 mm
        Routed to Pond 8P : Canal (Southern) - Dec 2018

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Northport-_24 Dec_2018_5mins Dec 2018 Rainfall=95 mm, AMC=3

	Area (ha)	CN	Adj	Description
*	8.6500	90		
	8.6500	90	96	Weighted Average, AMC Adjusted
	8.6500			100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
30.0					**Direct Entry,**

Subcatchment 68S: Southern Catchment
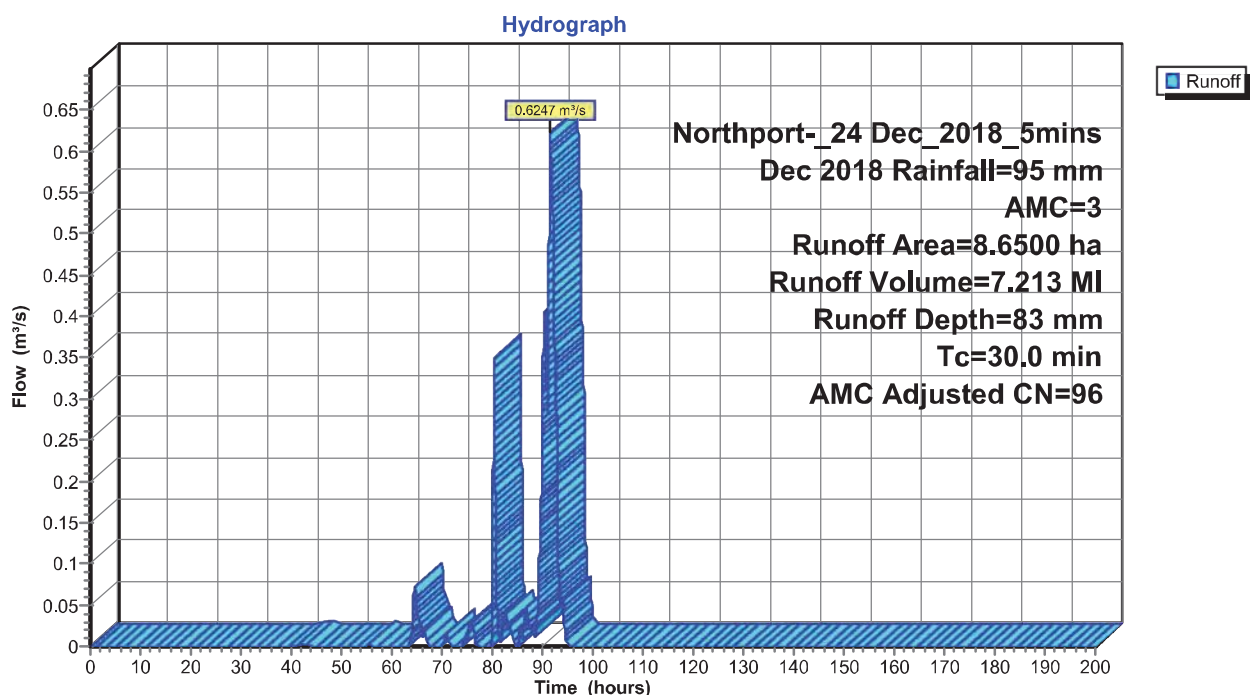
Summary for Subcatchment 70S: Eastern Catchment

Runoff   =   0.3535 m³/s @ 91.56 hrs, Volume=   4.180 Ml, Depth=   86 mm
    Routed to Pond 71P : 850dia and canal

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Northport-_24 Dec_2018_5mins Dec 2018 Rainfall=95 mm, AMC=3

	Area (ha)	CN	Adj	Description
*	4.8500	92		
	4.8500	92	97	Weighted Average, AMC Adjusted
	4.8500			100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
30.0					Direct Entry,

Subcatchment 70S: Eastern Catchment

Hydrograph

Northport-_24 Dec_2018_5mins
Dec 2018 Rainfall=95 mm
AMC=3
Runoff Area=4.8500 ha
Runoff Volume=4.180 Ml
Runoff Depth=86 mm
Tc=30.0 min
AMC Adjusted CN=97

0.3535 m³/s
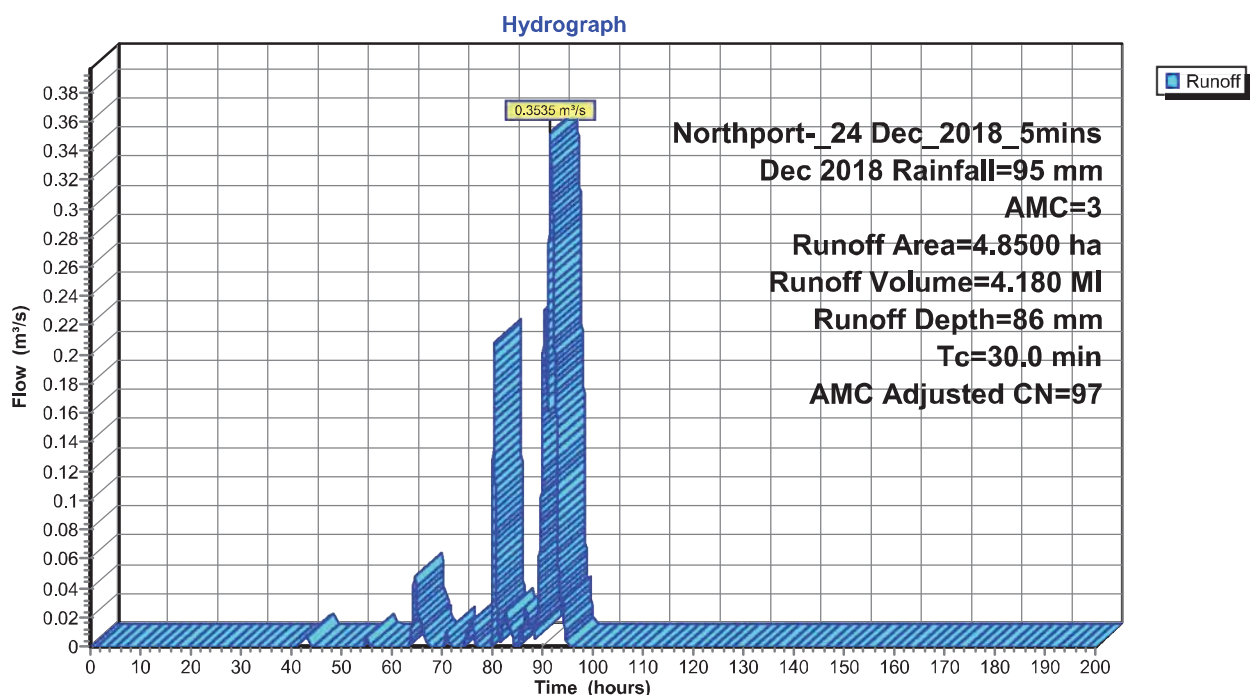
■ Runoff

Summary for Subcatchment 72S: Western Catchment

Runoff   =   1.5304 m³/s @ 91.56 hrs, Volume=   18.098 Ml, Depth=   86 mm
    Routed to Pond 8P : Canal (Southern) - Dec 2018

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Northport-_24 Dec_2018_5mins Dec 2018 Rainfall=95 mm, AMC=3

	Area (ha)	CN	Adj	Description
*	21.0000	92		
	21.0000	92	97	Weighted Average, AMC Adjusted
	21.0000			100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
30.0					**Direct Entry,**

Subcatchment 72S: Western Catchment

Hydrograph

Northport-_24 Dec_2018_5mins
Dec 2018 Rainfall=95 mm
AMC=3
Runoff Area=21.0000 ha
Runoff Volume=18.098 Ml
Runoff Depth=86 mm
Tc=30.0 min
AMC Adjusted CN=97
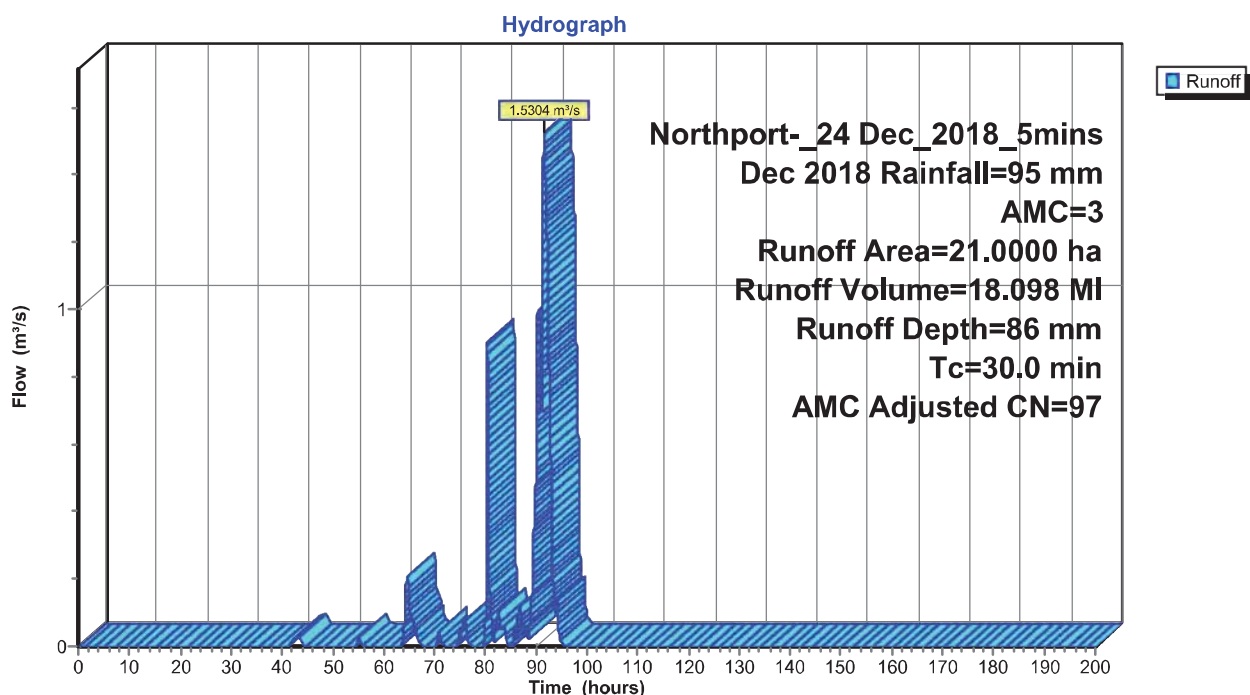
Summary for Subcatchment 77S: Eastern Catchment (Wood chip pile)

Runoff   =   0.0709 m³/s @ 91.63 hrs, Volume=   0.589 Ml, Depth=   29 mm
    Routed to Pond 71P : 850dia and canal

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Northport-_24 Dec_2018_5mins Dec 2018 Rainfall=95 mm, AMC=3

	Area (ha)	CN	Adj	Description
*	2.0000	50		
	2.0000	50	70	Weighted Average, AMC Adjusted
	2.0000			100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
30.0					**Direct Entry,**

Subcatchment 77S: Eastern Catchment (Wood chip pile)
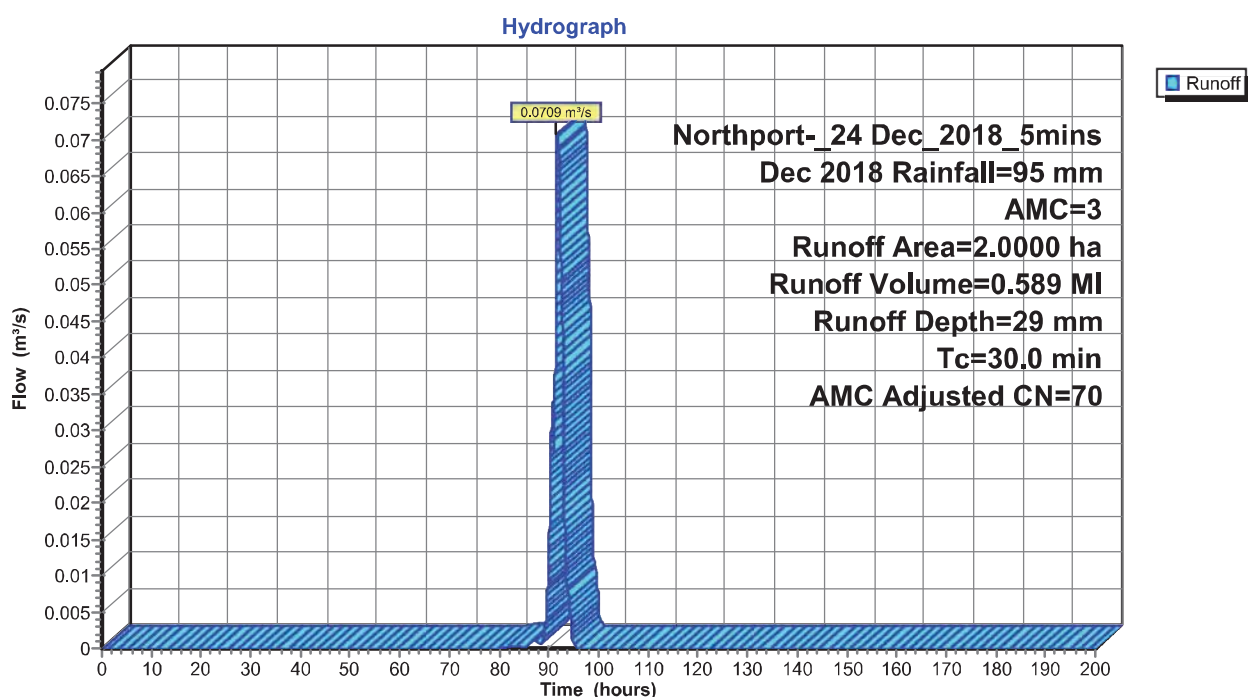
Summary for Subcatchment 79S: Southern Catchment (to sediment ponds)

Runoff   =   0.3207 m³/s @ 92.13 hrs, Volume=   3.869 Ml, Depth=   70 mm
        Routed to Pond 8P : Canal (Southern) - Dec 2018

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Northport-_24 Dec_2018_5mins Dec 2018 Rainfall=95 mm, AMC=3

	Area (ha)	CN	Adj	Description
*	5.5000	80		
	5.5000	80	91	Weighted Average, AMC Adjusted
	5.5000			100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
60.0					**Direct Entry,**

Subcatchment 79S: Southern Catchment (to sediment ponds)
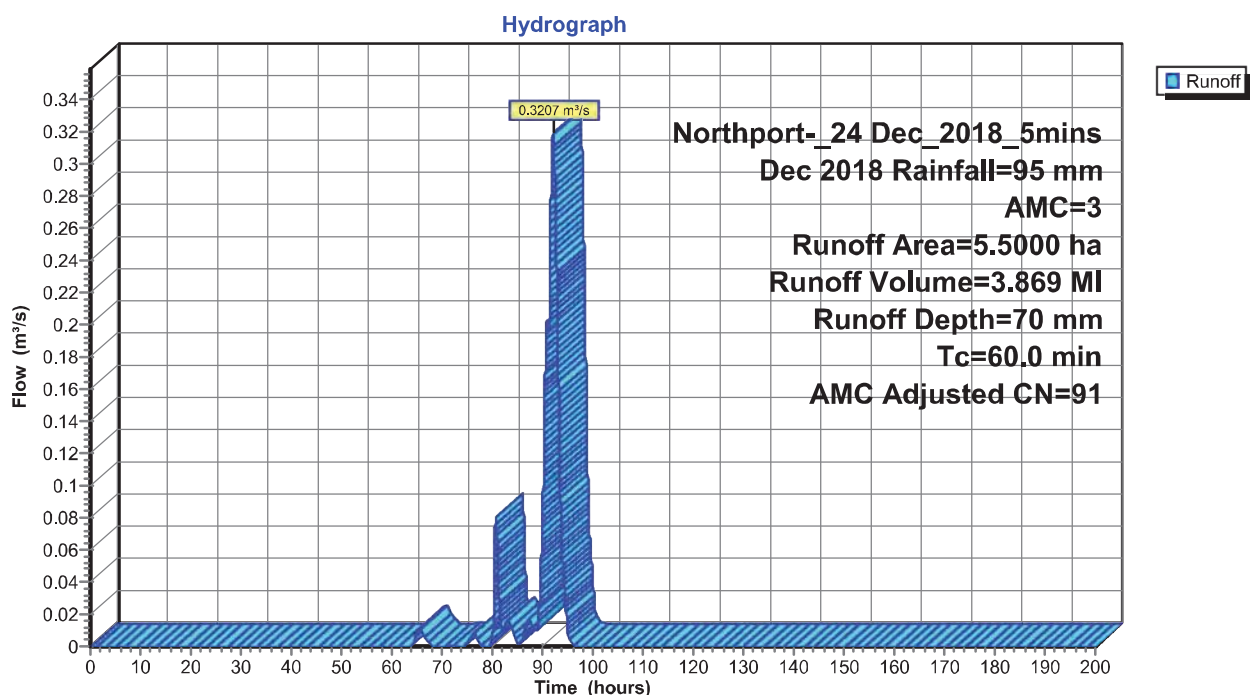
Summary for Pond 3P: Pond 2

Inflow Area =   54.7000 ha, 10.42% Impervious, Inflow Depth =   72 mm   for Dec 2018 event
Inflow   =   3.0218 m³/s @ 101.01 hrs, Volume=   39.261 Ml
Outflow   =   0.2021 m³/s @ 103.58 hrs, Volume=   38.499 Ml, Atten= 93%, Lag= 153.9 min
Discarded =   0.0660 m³/s @ 103.58 hrs, Volume=   14.506 Ml
Primary   =   0.1361 m³/s @ 103.58 hrs, Volume=   23.993 Ml
    Routed to Pond 65P : 525 Pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 2.975 m   Surf.Area= 18,242.3 m²   Storage= 2,682.7 m³
Peak Elev= 3.860 m @ 103.58 hrs   Surf.Area= 31,856.0 m²   Storage= 28,014.5 m³   (25,331.8 m³ above start)

Plug-Flow detention time= 1,580.7 min calculated for 35.814 Ml (91% of inflow)
Center-of-Mass det. time= 1,225.1 min (7,528.3 - 6,303.2)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	81,468.4 m³	**Custom Stage Data (Conic)** Listed below

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
2.600	474.5	0.0	0.0	474.5
2.800	5,907.2	537.1	537.1	5,907.3
3.000	20,004.5	2,452.2	2,989.2	20,004.8
3.200	29,205.2	4,892.0	7,881.3	29,206.2
3.400	29,965.9	5,916.9	13,798.2	29,976.6
3.600	30,727.5	6,069.2	19,867.4	30,748.2
3.800	31,631.9	6,235.7	26,103.1	31,661.2
4.000	32,382.3	6,401.3	32,504.4	32,422.2
4.200	33,112.6	6,549.4	39,053.7	33,163.7
4.400	33,844.5	6,695.6	45,749.3	33,907.0
4.600	34,590.5	6,843.4	52,592.7	34,664.5
4.800	35,339.0	6,992.8	59,585.5	35,424.6
5.000	36,095.3	7,143.3	66,728.8	36,192.7
5.200	36,849.2	7,294.3	74,023.1	36,958.6
5.400	37,605.2	7,445.3	81,468.4	37,726.9

Device	Routing	Invert	Outlet Devices (Turned on 2 times)
#1	Primary	3.240 m	**Pump - Total 290m3/hr** Discharges@4.000 m Turns Off<3.100 m 200 mm Diam. x 25.00 m Long Discharge, Hazen-Williams C= 130

  Flow (l/min)= 4,833.0 4,833.3
  Head (meters)= 10.000 0.000
 -Loss (meters)= 0.775 0.775
 =Lift (meters)=   9.225 -0.775

#2	Primary	3.440 m	**Pump - Total 490m3/hr** Discharges@4.000 m Turns Off<3.100 m 200 mm Diam. x 25.00 m Long Discharge, Hazen-Williams C= 130

  Flow (l/min)= 3,333.0 3,333.7
  Head (meters)= 10.000 0.000
 -Loss (meters)= 0.389 0.389
 =Lift (meters)=   9.611 -0.389

#3	Discarded	3.000 m	**20.00 mm/hr Exfiltration over Wetted area above 3.000 m** Excluded Wetted area = 20,004.8 m²

Discarded OutFlow Max=0.0660 m³/s @ 103.58 hrs HW=3.860 m   (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.0660 m³/s)

Primary OutFlow Max=0.1361 m³/s @ 103.58 hrs HW=3.860 m TW=4.494 m   (Dynamic Tailwater)
├─**1=Pump - Total 290m3/hr** (Pump Controls 0.0806 m³/s)
└─**2=Pump - Total 490m3/hr** (Pump Controls 0.0556 m³/s)

Pond 3P: Pond 2

Inflow Area=54.7000 ha
Peak Elev=3.860 m
Storage=28,014.5 m³
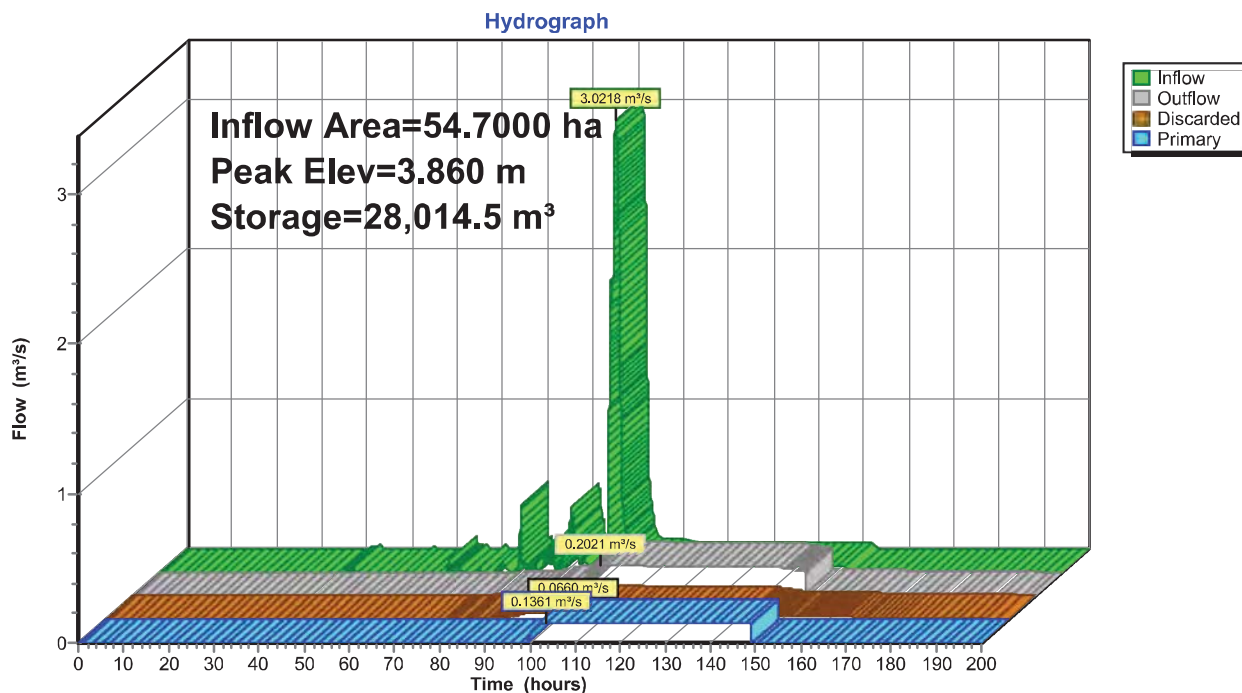
Summary for Pond 8P: Canal (Southern) - Dec 2018

Inflow Area =   49.0000 ha,   0.00% Impervious, Inflow Depth =   82 mm   for Dec 2018 event
Inflow   =   3.2728 m³/s @   91.57 hrs, Volume=   39.968 Ml
Outflow   =   3.1062 m³/s @   91.85 hrs, Volume=   39.645 Ml, Atten= 5%, Lag= 16.5 min
Discarded =   0.0244 m³/s @   91.85 hrs, Volume=   3.145 Ml
Primary   =   3.0819 m³/s @   91.85 hrs, Volume=   36.500 Ml
      Routed to Link 82L : (new Link)
Secondary =   0.0000 m³/s @   0.00 hrs, Volume=   0.000 Ml

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.663 m   Surf.Area= 0.5372 ha   Storage= 0.325 Ml
Peak Elev= 4.259 m @ 91.85 hrs   Surf.Area= 0.9458 ha   Storage= 4.743 Ml   (4.418 Ml above start)

Plug-Flow detention time= 210.8 min calculated for 39.321 Ml (98% of inflow)
Center-of-Mass det. time= 187.4 min (5,458.7 - 5,271.4)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	15.130 Ml	**2.60 mW x 1,900.00 mL x 1.50 mH 1900m canal Z=1.8**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.950 m	**10.00 m long Weir** 2 End Contraction(s)
#2	Secondary	5.000 m	**620.00 m long x 0.30 m breadth Overflow**
			Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762
			Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83
#3	Discarded	3.700 m	**20.00 mm/hr Exfiltration over Wetted area above 3.700 m**
			Excluded Wetted area = 0.5724 ha

Discarded OutFlow Max=0.0244 m³/s @ 91.85 hrs HW=4.259 m   (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.0244 m³/s)

Primary OutFlow Max=3.0818 m³/s @ 91.85 hrs HW=4.259 m TW=0.000 m   (Dynamic Tailwater)
└─**1=Weir** (Weir Controls 3.0818 m³/s @ 1.00 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.663 m   (Free Discharge)
└─**2=Overflow** (Controls 0.0000 m³/s)

Pond 8P: Canal (Southern) - Dec 2018

Hydrograph

Inflow Area=49.0000 ha
Peak Elev=4.259 m
Storage=4.743 Ml

Legend: Inflow, Outflow, Discarded, Primary, Secondary

3.2728 m³/s
3.1062 m³/s
3.0819 m³/s
0.0000 m³/s

Flow (m³/s)

Time (hours)
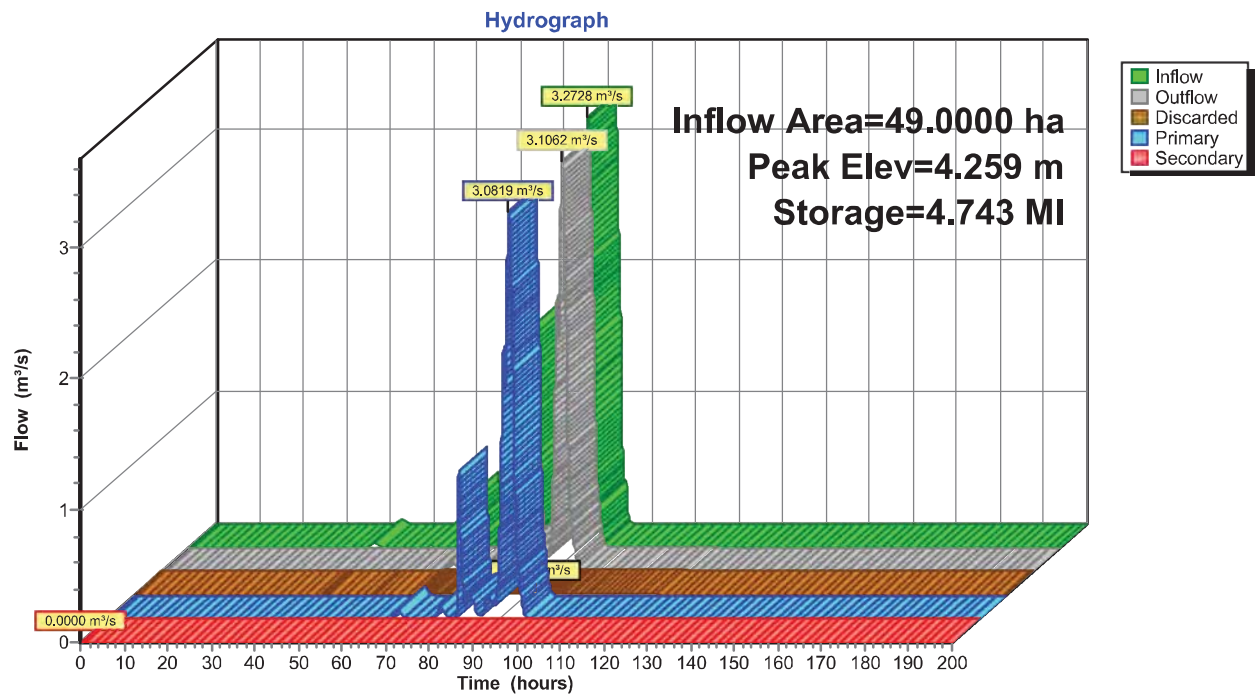
Summary for Pond 59P: 825 pipe

Inflow Area =   54.7000 ha, 10.42% Impervious, Inflow Depth =   44 mm   for Dec 2018 event
Inflow   =   0.1365 m³/s @ 100.74 hrs, Volume=   23.990 Ml
Outflow   =   0.1364 m³/s @ 100.75 hrs, Volume=   23.987 Ml, Atten= 0%, Lag= 0.6 min
Primary   =   0.1364 m³/s @ 100.75 hrs, Volume=   23.987 Ml

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 3.743 m @ 100.75 hrs   Surf.Area= 3.1 m²   Storage= 3.6 m³

Plug-Flow detention time= 0.5 min calculated for 23.987 Ml (100% of inflow)
Center-of-Mass det. time= 0.3 min (7,482.0 - 7,481.7)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	15.7 m³	**2.00 mD x 5.00 mH Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.420 m	**825 mm Round Culvert** L= 38.78 m Ke= 0.500 Inlet / Outlet Invert= 3.420 m / 3.346 m S= 0.0019 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.535 m²

Primary OutFlow Max=0.1364 m³/s @ 100.75 hrs HW=3.743 m   (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.1364 m³/s @ 1.04 m/s)

Pond 59P: 825 pipe
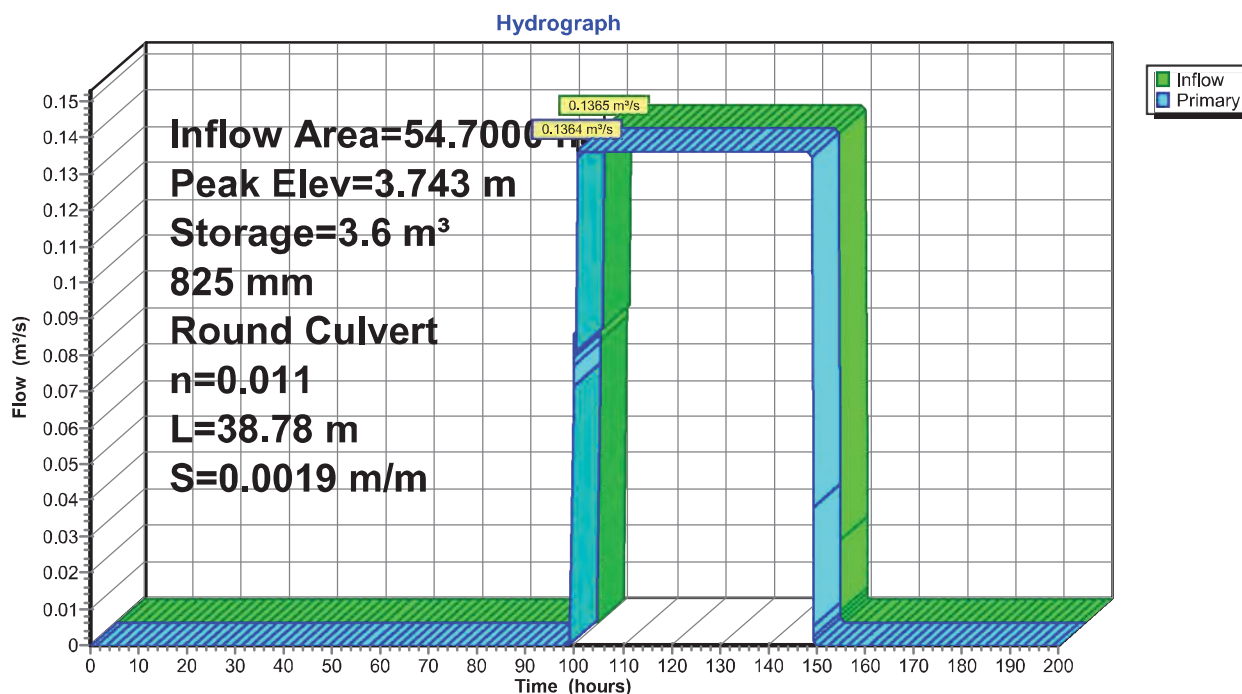
Summary for Pond 64P: Pond 1

Inflow Area =   51.2000 ha,   4.30% Impervious, Inflow Depth =   75 mm   for Dec 2018 event
Inflow   =   3.0819 m³/s @ 100.85 hrs, Volume=   38.524 Ml
Outflow   =   3.0371 m³/s @ 101.01 hrs, Volume=   38.000 Ml, Atten= 1%, Lag= 9.8 min
Discarded =   0.0157 m³/s @ 103.58 hrs, Volume=   1.959 Ml
Primary   =   2.9718 m³/s @ 101.01 hrs, Volume=   23.428 Ml
    Routed to Pond 3P : Pond 2
Secondary =   0.0500 m³/s @   75.60 hrs, Volume=   12.613 Ml
    Routed to Pond 3P : Pond 2
Tertiary   =   0.0000 m³/s @   0.00 hrs, Volume=   0.000 Ml
    Routed to Pond 59P : 825 pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.270 m   Surf.Area= 17,255.3 m²   Storage= 3,381.1 m³
Peak Elev= 3.860 m @ 103.58 hrs   Surf.Area= 20,294.7 m²   Storage= 14,522.1 m³   (11,141.0 m³ above start)

Plug-Flow detention time= 677.8 min calculated for 34.617 Ml (90% of inflow)
Center-of-Mass det. time= 547.8 min (6,432.5 - 5,884.7)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	50,024.2 m³	**Custom Stage Data (Conic)** Listed below

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
2.600	31.5	0.0	0.0	31.5
2.800	605.0	51.6	51.6	605.1
3.000	2,950.9	326.1	377.8	2,951.2
3.200	16,722.6	1,779.9	2,157.7	16,723.0
3.400	18,244.7	3,495.6	5,653.3	18,248.0
3.600	19,084.6	3,732.6	9,385.9	19,093.5
3.800	20,068.2	3,914.9	13,300.8	20,082.1
4.000	20,826.6	4,089.2	17,390.0	20,847.2
4.200	21,580.7	4,240.5	21,630.5	21,608.3
4.400	22,261.0	4,384.0	26,014.5	22,296.7
4.600	22,942.6	4,520.2	30,534.7	22,986.6
4.800	23,626.5	4,656.7	35,191.4	23,679.0
5.000	24,332.5	4,795.7	39,987.2	24,393.5
5.200	25,108.0	4,943.8	44,931.0	25,176.9
5.400	25,826.0	5,093.2	50,024.2	25,903.8

Device	Routing	Invert	Outlet Devices
#1	Primary	3.750 m	**75.00 m long x 3.00 m breadth Weir** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 Coef. (Metric) 1.37 1.41 1.49 1.48 1.48 1.48 1.47 1.46
#2	Discarded	3.300 m	**20.00 mm/hr Exfiltration over Wetted area above 3.300 m** Excluded Wetted area = 17,485.5 m²
#3	Secondary	3.300 m	**0.0500 m³/s Through bund when above 3.300 m**
#4	Tertiary	3.449 m	**825 mm Round Culvert** L= 15.00 m Ke= 0.500 Inlet / Outlet Invert= 3.449 m / 3.420 m S= 0.0019 m/m Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.535 m²
#5	Device 4	4.470 m	**2,100 mm Horiz. Scruffy dome** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0157 m³/s @ 103.58 hrs HW=3.860 m   (Free Discharge)
  ⌐—**2=Exfiltration** (Exfiltration Controls 0.0157 m³/s)

Primary OutFlow Max=2.9717 m³/s @ 101.01 hrs HW=3.843 m TW=3.536 m   (Dynamic Tailwater)
  ⌐—**1=Weir** (Weir Controls 2.9717 m³/s @ 0.42 m/s)

Secondary OutFlow Max=0.0500 m³/s @ 75.60 hrs HW=3.300 m TW=3.004 m   (Dynamic Tailwater)
  ⌐—**3=Through bund** (Exfiltration Controls 0.0500 m³/s)

Tertiary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.270 m TW=2.600 m   (Dynamic Tailwater)
  ⌐—**4=Culvert** (Controls 0.0000 m³/s)
    ⌐—**5=Scruffy dome** (Controls 0.0000 m³/s)

Pond 64P: Pond 1

Hydrograph

Inflow Area=51.200
Peak Elev=3.860 m
Storage=14,522.1

Legend:
- Inflow
- Outflow
- Discarded
- Primary
- Secondary
- Tertiary

3.0819 m³/s
3.0371 m³/s
2.9718 m³/s
0.0500 m³/s
0.0000 m³/s

Flow (m³/s)

Time (hours)
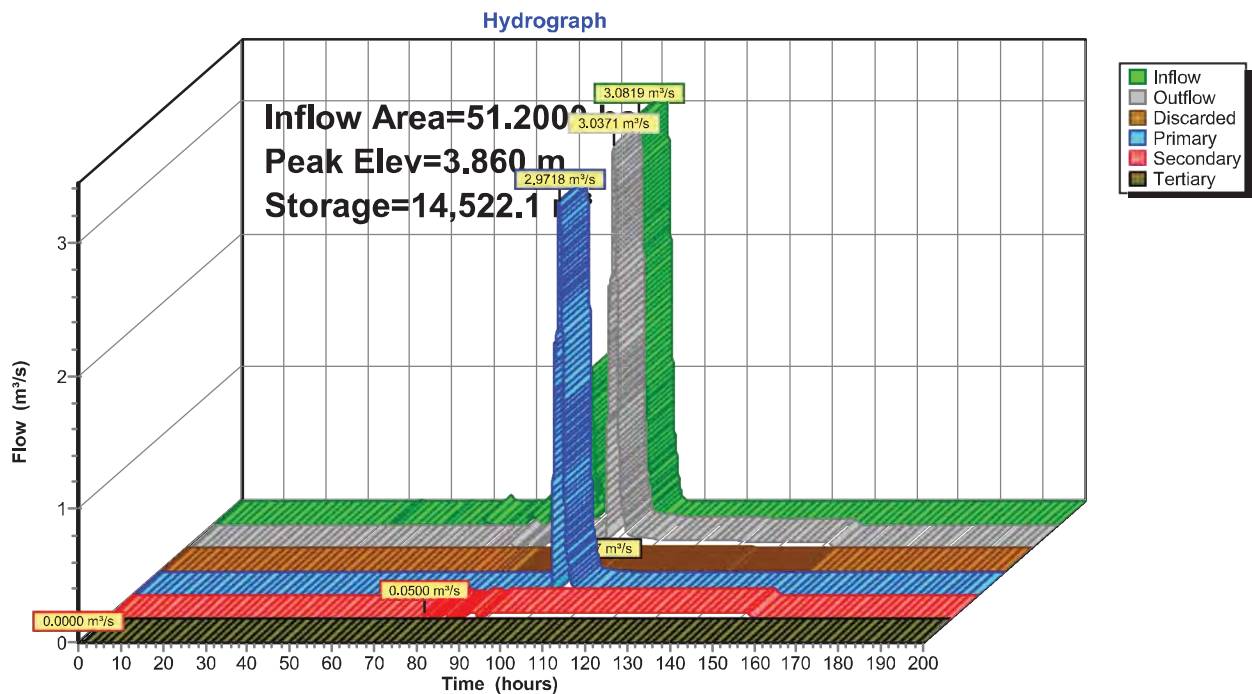
Summary for Pond 65P: 525 Pipe

Inflow Area =   54.7000 ha, 10.42% Impervious, Inflow Depth =   44 mm   for Dec 2018 event
Inflow   =   0.1361 m³/s @ 103.58 hrs, Volume=   23.993 Ml
Outflow   =   0.1365 m³/s @ 100.74 hrs, Volume=   23.990 Ml, Atten= 0%, Lag= 0.0 min
Primary   =   0.1365 m³/s @ 100.74 hrs, Volume=   23.990 Ml
        Routed to Pond 59P : 825 pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 4.496 m @ 100.74 hrs   Surf.Area= 3.1 m²   Storage= 6.0 m³

Plug-Flow detention time= 0.8 min calculated for 23.990 Ml (100% of inflow)
Center-of-Mass det. time= 0.5 min (7,481.7 - 7,481.2)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	12.6 m³	**2.00 mD x 4.00 mH Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.720 m	**525 mm Round Culvert** L= 305.76 m Ke= 0.500 Inlet / Outlet Invert= 3.720 m / 3.720 m S= 0.0000 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.216 m²

Primary OutFlow Max=0.1365 m³/s @ 100.74 hrs HW=4.496 m TW=3.742 m   (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.1365 m³/s @ 0.63 m/s)

Pond 65P: 525 Pipe

Hydrograph

Inflow Area=54.7000 ha
Peak Elev=4.496 m
Storage=6.0 m³
525 mm
Round Culvert
n=0.011
L=305.76 m
S=0.0000 m/m

0.1361 m³/s
0.1365 m³/s

Summary for Pond 66P: Canal (Northern)

Inflow Area =   7.0000 ha,   0.00% Impervious, Inflow Depth =   86 mm   for Dec 2018 event
Inflow   =   0.5101 m³/s @   91.56 hrs, Volume=   6.033 Ml
Outflow   =   0.4752 m³/s @   91.75 hrs, Volume=   6.020 Ml, Atten= 7%, Lag= 11.3 min
Primary   =   0.4752 m³/s @   91.75 hrs, Volume=   6.020 Ml
        Routed to Pond 8P : Canal (Southern) - Dec 2018
Secondary =   0.0000 m³/s @   0.00 hrs, Volume=   0.000 Ml

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.663 m   Surf.Area= 212.7 m²   Storage= 12.8 m³
Peak Elev= 4.486 m @ 91.78 hrs   Surf.Area= 452.6 m²   Storage= 285.3 m³   (272.4 m³ above start)

Plug-Flow detention time= 58.9 min calculated for 6.007 Ml (100% of inflow)
Center-of-Mass det. time= 51.4 min (5,291.6 - 5,240.2)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	621.4 m³	**2.60 mW x 75.00 mL x 1.50 mH 75m canal Z=1.8**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.600 m	**690 mm Round Culvert** L= 35.00 m Ke= 0.500 Inlet / Outlet Invert= 3.600 m / 3.600 m S= 0.0000 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.374 m²
#2	Secondary	5.000 m	**75.00 m long x 0.30 m breadth Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83

Primary OutFlow Max=0.4747 m³/s @ 91.75 hrs HW=4.485 m TW=4.256 m   (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.4747 m³/s @ 1.27 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.663 m   (Free Discharge)
└─**2=Overflow** (Controls 0.0000 m³/s)

Pond 66P: Canal (Northern)
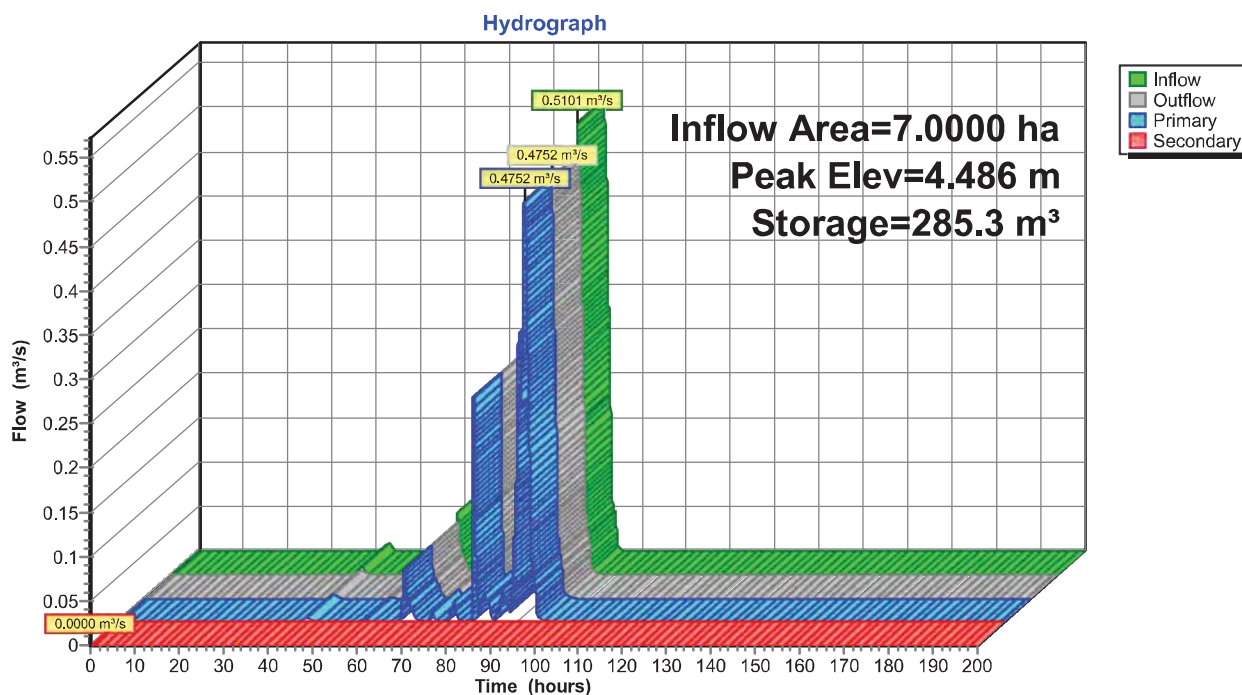
Summary for Pond 71P: 850dia and canal

Inflow Area =   6.8500 ha,   0.00% Impervious, Inflow Depth =   70 mm   for Dec 2018 event
Inflow   =   0.4241 m³/s @   91.56 hrs, Volume=   4.769 Ml
Outflow   =   0.4221 m³/s @   91.57 hrs, Volume=   4.769 Ml, Atten= 0%, Lag= 0.4 min
Primary   =   0.4221 m³/s @   91.57 hrs, Volume=   4.769 Ml
       Routed to Pond 8P : Canal (Southern) - Dec 2018

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
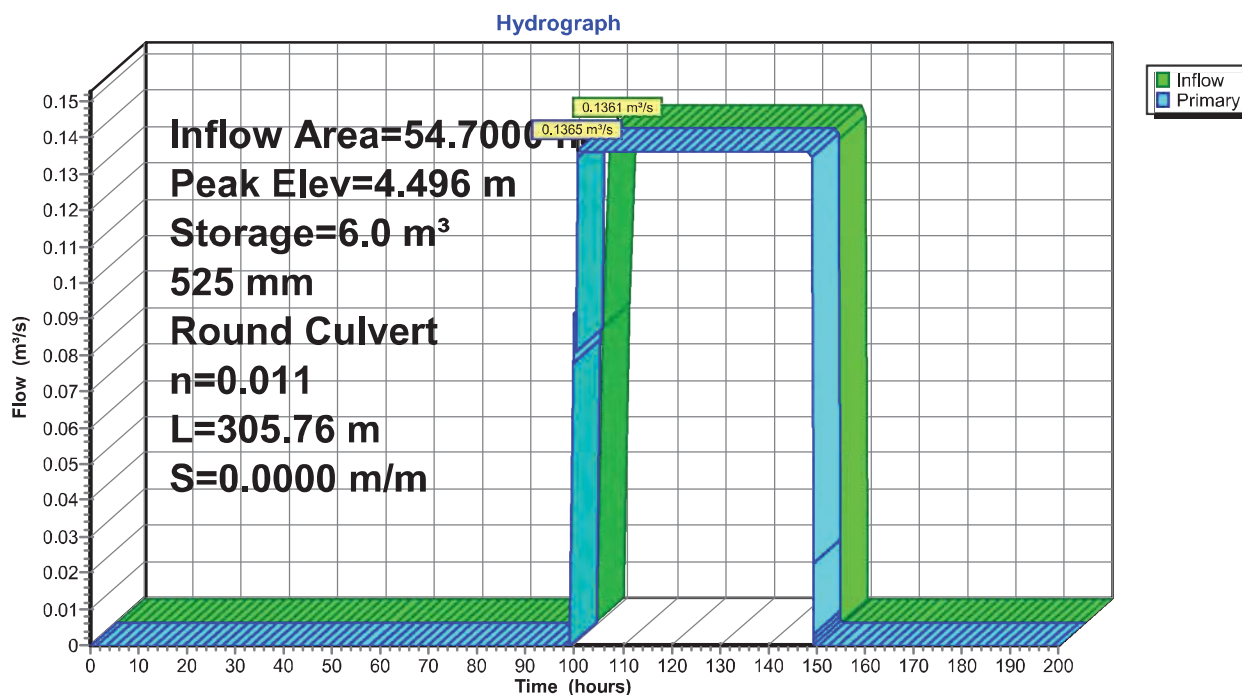Peak Elev= 4.364 m @ 91.72 hrs   Surf.Area= 49.5 m²   Storage= 18.0 m³

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.7 min (5,272.8 - 5,272.1)

Volume	Invert	Avail.Storage	Storage Description
#1	4.000 m	49.5 m³	**0.45 mW x 110.00 mL x 1.00 mH Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.600 m	**850 mm Round Culvert** L= 43.00 m Ke= 0.500 Inlet / Outlet Invert= 3.600 m / 3.600 m S= 0.0000 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.567 m²

Primary OutFlow Max=0.4186 m³/s @ 91.57 hrs HW=4.356 m TW=4.237 m   (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.4186 m³/s @ 1.04 m/s)

Pond 71P: 850dia and canal

Current Port
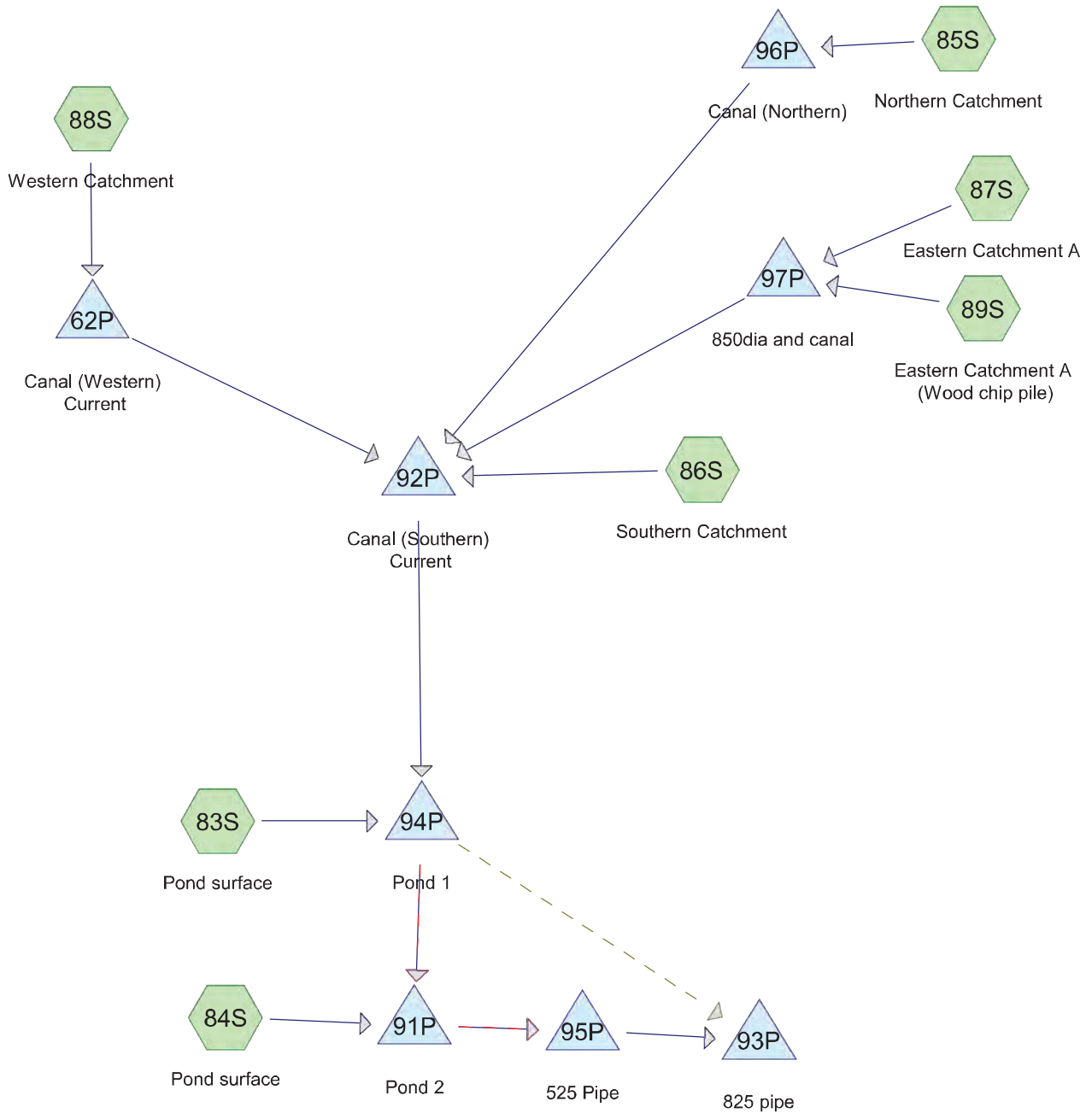
96P — Canal (Northern)

85S — Northern Catchment

88S — Western Catchment

87S — Eastern Catchment A

97P — 850dia and canal

89S — Eastern Catchment A (Wood chip pile)

62P — Canal (Western) Current

92P — Canal (Southern) Current

86S — Southern Catchment

83S — Pond surface

94P — Pond 1

84S — Pond surface

91P — Pond 2

95P — 525 Pipe

93P — 825 pipe

Subcat   Reach   Pond   Link

Summary for Pond 62P: Canal (Western) Current

Inflow Area =	226,000.0 m²,	0.00% Impervious,	Inflow Depth =	111 mm	for 5yr Type 1A event		
Inflow	=	1.5662 m³/s @	8.20 hrs,	Volume=	25,175.5 m³		
Outflow	=	1.2150 m³/s @	8.48 hrs,	Volume=	25,009.2 m³,	Atten= 22%,	Lag= 17.0 min
Discarded =		0.0116 m³/s @	8.48 hrs,	Volume=	1,003.6 m³		
Primary	=	1.2034 m³/s @	8.48 hrs,	Volume=	24,005.7 m³		

Routed to Pond 92P : Canal (Southern) Current

Secondary =	0.0000 m³/s @	0.00 hrs,	Volume=	0.0 m³		

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 4.564 m @ 8.48 hrs   Surf.Area= 3,541.3 m²   Storage= 2,431.0 m³

Plug-Flow detention time= 107.4 min calculated for 25,009.2 m³ (99% of inflow)
Center-of-Mass det. time= 102.4 min (813.7 - 711.3)

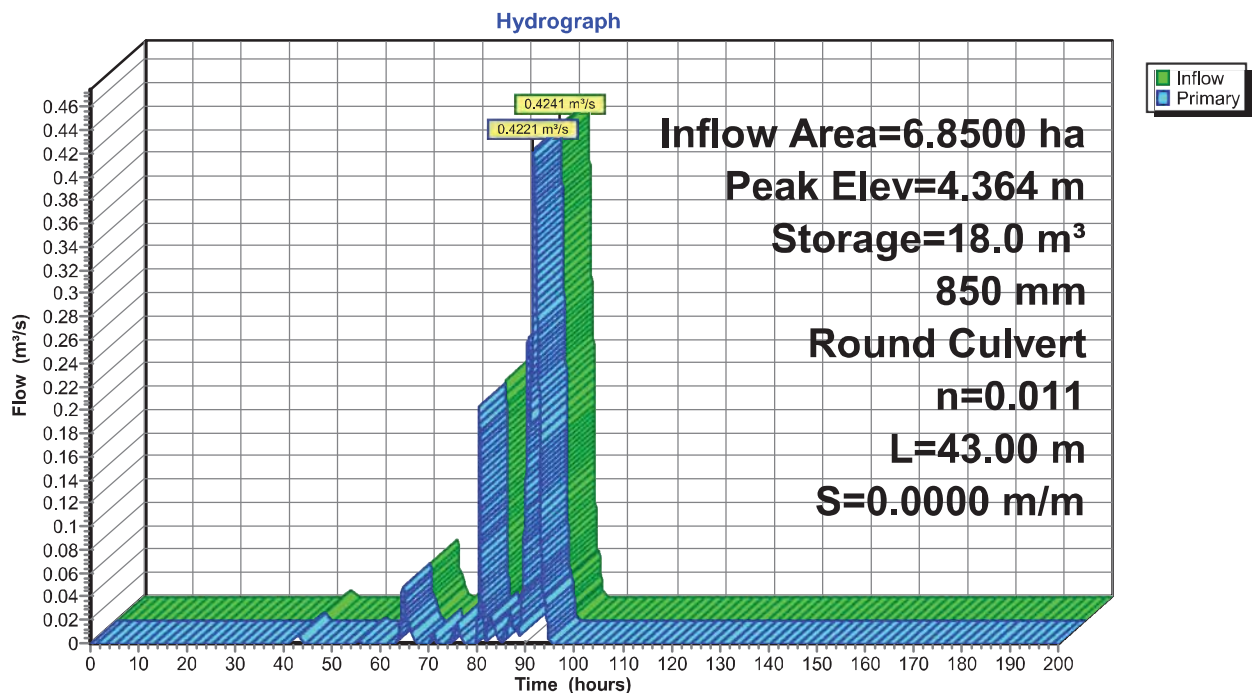| Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	4,636.1 m³	**2.60 mW x 580.00 mL x 1.50 mH 580m canal Z=1.8**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.600 m	**1,200 mm Round Culvert** L= 15.00 m RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 3.600 m / 3.600 m S= 0.0000 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.131 m²
#2	Secondary	4.700 m	**9.20 m long + 2.0 m/m SideZ x 3.00 m breadth Spilllway** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 Coef. (Metric) 1.37 1.41 1.49 1.48 1.48 1.48 1.47 1.46
#3	Secondary	5.000 m	**580.00 m long x 0.30 m breadth Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83
#4	Discarded	3.700 m	**20.00 mm/hr Exfiltration over Wetted area above 3.700 m** Excluded Wetted area = 1,748.1 m²

Discarded OutFlow Max=0.0116 m³/s @ 8.48 hrs HW=4.564 m   (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 0.0116 m³/s)

Primary OutFlow Max=1.2033 m³/s @ 8.48 hrs HW=4.564 m TW=4.224 m   (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.2033 m³/s @ 1.69 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.600 m   (Free Discharge)
├─**2=Spilllway** (Controls 0.0000 m³/s)
└─**3=Overflow** (Controls 0.0000 m³/s)

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Type IA 24-hr 5yr Type 1A Rainfall=129 mm
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Pond 62P: Canal (Western) Current

Hydrograph

Inflow Area=226,000.0 m²
Peak Elev=4.564 m
Storage=2,431.0 m³

Legend:
- Inflow
- Outflow
- Discarded
- Primary
- Secondary

1.5662 m³/s
1.2150 m³/s
1.2034 m³/s
116 m³/s
0.0000 m³/s

Flow (m³/s)

Time (hours)
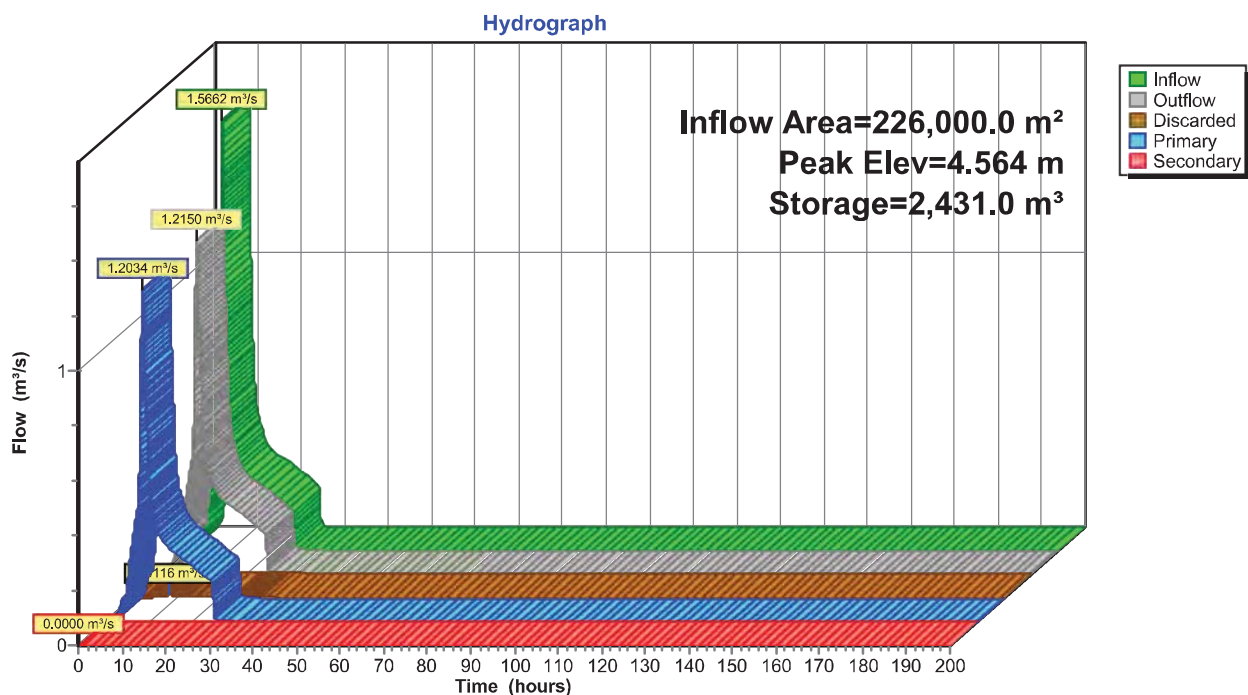
Summary for Pond 91P: Pond 2

Inflow Area = 547,000.0 m², 10.42% Impervious, Inflow Depth = 95 mm   for 5yr Type 1A event
Inflow   = 2.6050 m³/s @   8.62 hrs, Volume=   52,197.4 m³
Outflow   = 0.2054 m³/s @ 24.51 hrs, Volume=   54,609.5 m³, Atten= 92%, Lag= 953.9 min
Discarded   = 0.0693 m³/s @ 24.51 hrs, Volume=   19,462.6 m³
Primary   = 0.1361 m³/s @ 24.51 hrs, Volume=   35,146.9 m³
    Routed to Pond 95P : 525 Pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.100 m   Surf.Area= 24,604.8 m²   Storage= 5,435.2 m³
Peak Elev= 4.015 m @ 24.51 hrs   Surf.Area= 32,438.3 m²   Storage= 33,006.7 m³ (27,571.4 m³ above start)

Plug-Flow detention time= 1,919.2 min calculated for 49,170.9 m³ (94% of inflow)
Center-of-Mass det. time= 1,483.3 min (2,797.0 - 1,313.7)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	81,468.4 m³	**Custom Stage Data (Conic)** Listed below

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
2.600	474.5	0.0	0.0	474.5
2.800	5,907.2	537.1	537.1	5,907.3
3.000	20,004.5	2,452.2	2,989.2	20,004.8
3.200	29,205.2	4,892.0	7,881.3	29,206.2
3.400	29,965.9	5,916.9	13,798.2	29,976.6
3.600	30,727.5	6,069.2	19,867.4	30,748.2
3.800	31,631.9	6,235.7	26,103.1	31,661.2
4.000	32,382.3	6,401.3	32,504.4	32,422.2
4.200	33,112.6	6,549.4	39,053.7	33,163.7
4.400	33,844.5	6,695.6	45,749.3	33,907.0
4.600	34,590.5	6,843.4	52,592.7	34,664.5
4.800	35,339.0	6,992.8	59,585.5	35,424.6
5.000	36,095.3	7,143.3	66,728.8	36,192.7
5.200	36,849.2	7,294.3	74,023.1	36,958.6
5.400	37,605.2	7,445.3	81,468.4	37,726.9

Device	Routing	Invert	Outlet Devices (Turned on 2 times)
#1	Primary	3.240 m	**Pump - Total 290m3/hr**
			Discharges@4.000 m Turns Off<3.100 m
			200 mm Diam. x 25.00 m Long Discharge, Hazen-Williams C= 130

  Flow (l/min)= 4,833.0 4,833.3
  Head (meters)= 10.000 0.000
 -Loss (meters)= 0.775 0.775
 =Lift (meters)=   9.225 -0.775

Device	Routing	Invert	Outlet Devices
#2	Primary	3.440 m	**Pump - Total 490m3/hr**
			Discharges@4.000 m Turns Off<3.100 m
			200 mm Diam. x 25.00 m Long Discharge, Hazen-Williams C= 130

  Flow (l/min)= 3,333.0 3,333.7
  Head (meters)= 10.000 0.000
 -Loss (meters)= 0.389 0.389
 =Lift (meters)=   9.611 -0.389

Device	Routing	Invert	Outlet Devices
#3	Discarded	3.000 m	**20.00 mm/hr Exfiltration over Wetted area above 3.000 m**
			Excluded Wetted area = 20,004.8 m²

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Discarded OutFlow Max=0.0693 m³/s @ 24.51 hrs HW=4.015 m   (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.0693 m³/s)

Primary OutFlow Max=0.1361 m³/s @ 24.51 hrs HW=4.015 m TW=4.494 m   (Dynamic Tailwater)
├─**1=Pump - Total 290m3/hr** (Pump Controls 0.0806 m³/s)
└─**2=Pump - Total 490m3/hr** (Pump Controls 0.0556 m³/s)

Pond 91P: Pond 2

Inflow Area=547,000.0 m²
Peak Elev=4.015 m
Storage=33,006.7 m³
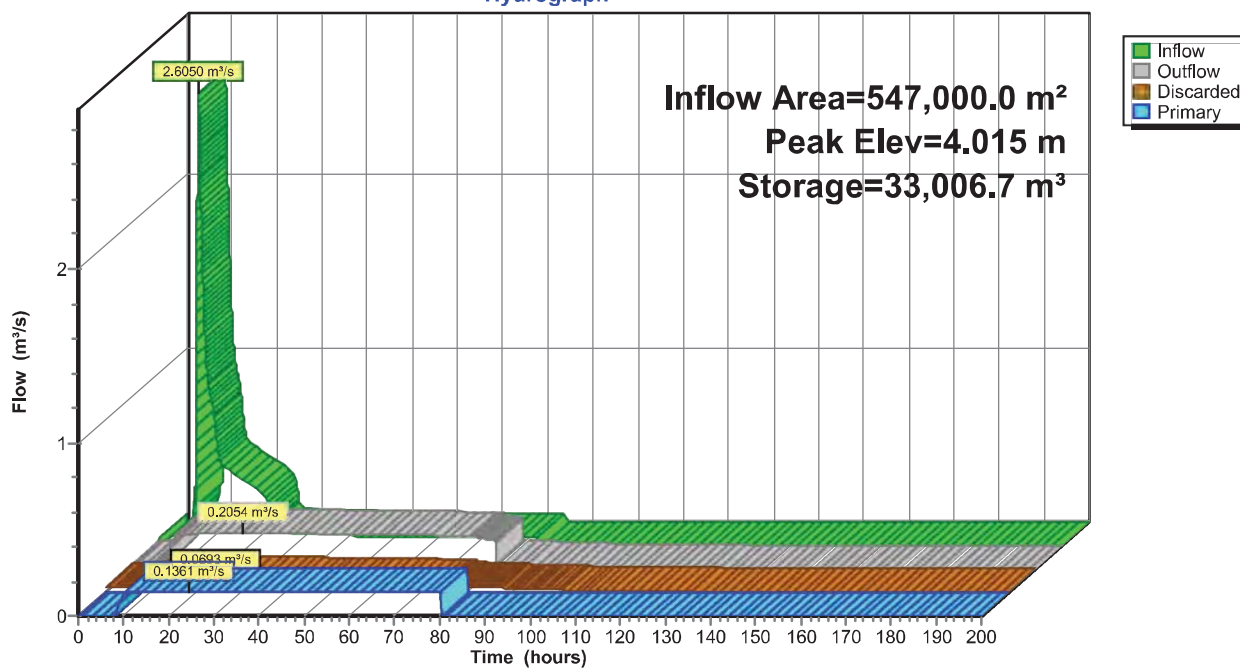
Summary for Pond 92P: Canal (Southern) Current

Inflow Area =	490,000.0 m²,	0.00% Impervious,	Inflow Depth =	104 mm	for 5yr Type 1A event	
Inflow	=	2.7081 m³/s @	8.30 hrs,	Volume=	50,833.2 m³	
Outflow	=	2.6103 m³/s @	8.43 hrs,	Volume=	50,452.5 m³,	Atten= 4%, Lag= 7.9 min
Discarded =		0.0159 m³/s @	8.43 hrs,	Volume=	2,140.9 m³	
Primary	=	2.5944 m³/s @	8.43 hrs,	Volume=	48,311.7 m³	
Routed to Pond 94P : Pond 1						
Secondary =		0.0000 m³/s @	0.00 hrs,	Volume=	0.0 m³	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 4.225 m @ 8.43 hrs   Surf.Area= 0.6390 ha   Storage= 3.066 Ml

Plug-Flow detention time= 113.5 min calculated for 50,450.0 m³ (99% of inflow)
Center-of-Mass det. time= 104.8 min (844.5 - 739.7)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	10.479 Ml	**2.60 mW x 1,315.00 mL x 1.50 mH 1315m canal Z=1.8**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.950 m	**10.00 m long Weir** 2 End Contraction(s)
#2	Secondary	5.000 m	**620.00 m long x 0.30 m breadth Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83
#3	Discarded	3.700 m	**20.00 mm/hr Exfiltration over Wetted area above 3.700 m** Excluded Wetted area = 0.3962 ha

Discarded OutFlow Max=0.0159 m³/s @ 8.43 hrs HW=4.225 m   (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.0159 m³/s)

Primary OutFlow Max=2.5943 m³/s @ 8.43 hrs HW=4.225 m TW=3.826 m   (Dynamic Tailwater)
└─**1=Weir** (Weir Controls 2.5943 m³/s @ 0.95 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.600 m   (Free Discharge)
└─**2=Overflow** (Controls 0.0000 m³/s)

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Type IA 24-hr 5yr Type 1A Rainfall=129 mm
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Pond 92P: Canal (Southern) Current

Hydrograph

Inflow Area=490,000.0 m²
Peak Elev=4.225 m
Storage=3.066 Ml

Legend:
- Inflow
- Outflow
- Discarded
- Primary
- Secondary

2.7081 m³/s
2.6103 m³/s
2.5944 m³/s
159 m³/s
0.0000 m³/s
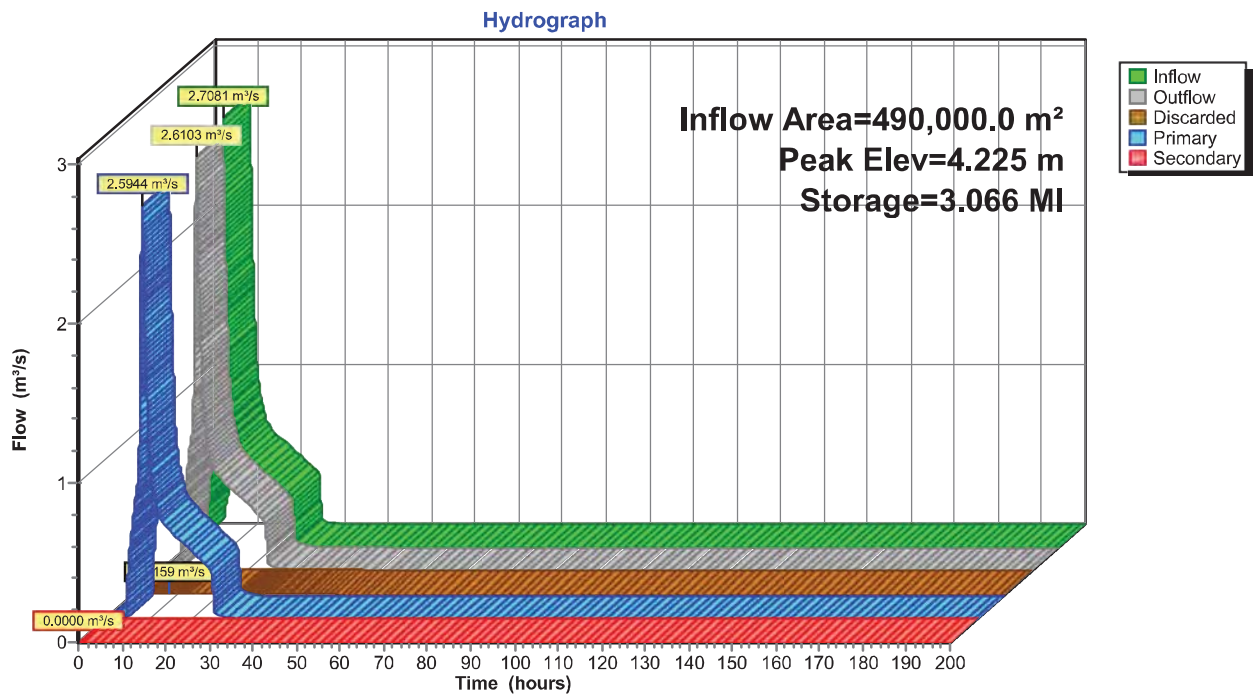
Summary for Pond 93P: 825 pipe

Inflow Area =		547,000.0 m²,	10.42% Impervious,	Inflow Depth =	64 mm for 5yr Type 1A event
Inflow	=	0.1365 m³/s @	9.23 hrs,	Volume=	35,143.4 m³
Outflow	=	0.1364 m³/s @	9.24 hrs,	Volume=	35,140.8 m³, Atten= 0%, Lag= 0.6 min
Primary	=	0.1364 m³/s @	9.24 hrs,	Volume=	35,140.8 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 3.733 m @ 9.24 hrs   Surf.Area= 3.1 m²   Storage= 3.6 m³

Plug-Flow detention time= 0.4 min calculated for 35,139.1 m³ (100% of inflow)
Center-of-Mass det. time= 0.3 min (2,678.2 - 2,677.9)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	15.7 m³	**2.00 mD x 5.00 mH Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.420 m	**900 mm Round Culvert** L= 38.78 m Ke= 0.500
			Inlet / Outlet Invert= 3.420 m / 3.346 m S= 0.0019 m/m Cc= 0.900
			n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.636 m²

Primary OutFlow Max=0.1364 m³/s @ 9.24 hrs HW=3.733 m   (Free Discharge)
└─1=Culvert (Barrel Controls 0.1364 m³/s @ 1.03 m/s)

Pond 93P: 825 pipe

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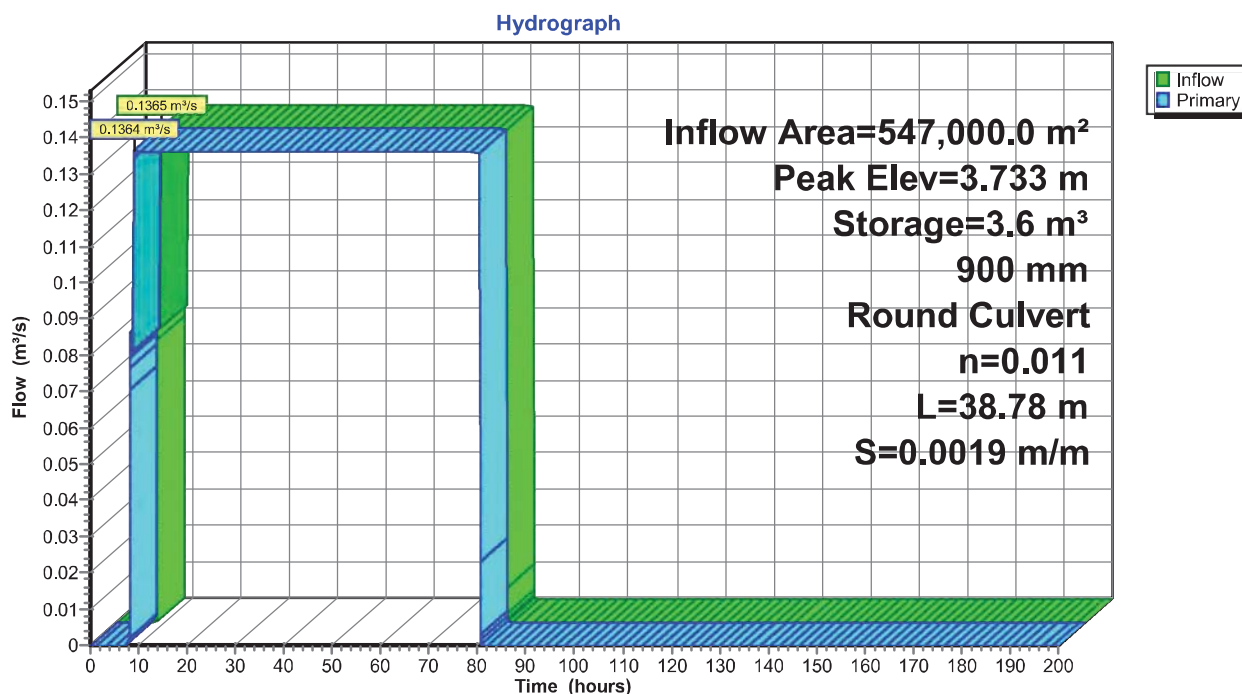
Summary for Pond 94P: Pond 1

Inflow Area =   512,000.0 m²,   4.30% Impervious, Inflow Depth =   100 mm   for 5yr Type 1A event
Inflow   =   2.6611 m³/s @   8.43 hrs, Volume=   51,017.3 m³
Outflow   =   2.5123 m³/s @   8.62 hrs, Volume=   51,018.5 m³, Atten= 6%, Lag= 11.7 min
Discarded =   0.0190 m³/s @   24.52 hrs, Volume=   3,125.5 m³
Primary   =   2.4472 m³/s @   8.62 hrs, Volume=   33,350.6 m³
     Routed to Pond 91P : Pond 2
Secondary =   0.0500 m³/s @   0.00 hrs, Volume=   14,542.5 m³
     Routed to Pond 91P : Pond 2
Tertiary   =   0.0000 m³/s @   0.00 hrs, Volume=   0.0 m³
     Routed to Pond 93P : 825 pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.300 m   Surf.Area= 17,483.7 m²   Storage= 3,905.5 m³
Peak Elev= 4.015 m @ 24.52 hrs   Surf.Area= 20,884.4 m²   Storage= 17,715.2 m³   (13,809.8 m³ above start)

Plug-Flow detention time= 797.4 min calculated for 47,113.1 m³ (92% of inflow)
Center-of-Mass det. time= 663.9 min (1,419.9 - 756.0)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	50,024.2 m³	**Custom Stage Data (Conic)** Listed below

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
2.600	31.5	0.0	0.0	31.5
2.800	605.0	51.6	51.6	605.1
3.000	2,950.9	326.1	377.8	2,951.2
3.200	16,722.6	1,779.9	2,157.7	16,723.0
3.400	18,244.7	3,495.6	5,653.3	18,248.0
3.600	19,084.6	3,732.6	9,385.9	19,093.5
3.800	20,068.2	3,914.9	13,300.8	20,082.1
4.000	20,826.6	4,089.2	17,390.0	20,847.2
4.200	21,580.7	4,240.5	21,630.5	21,608.3
4.400	22,261.0	4,384.0	26,014.5	22,296.7
4.600	22,942.6	4,520.2	30,534.7	22,986.6
4.800	23,626.5	4,656.7	35,191.4	23,679.0
5.000	24,332.5	4,795.7	39,987.2	24,393.5
5.200	25,108.0	4,943.8	44,931.0	25,176.9
5.400	25,826.0	5,093.2	50,024.2	25,903.8

Device	Routing	Invert	Outlet Devices
#1	Primary	3.750 m	**75.00 m long x 3.00 m breadth Weir** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 Coef. (Metric) 1.37 1.41 1.49 1.48 1.48 1.48 1.47 1.46
#2	Discarded	3.300 m	**20.00 mm/hr Exfiltration over Wetted area above 3.300 m** Excluded Wetted area = 17,485.5 m²
#3	Secondary	3.300 m	**0.0500 m³/s Through bund when above 3.300 m**
#4	Tertiary	3.449 m	**825 mm Round Culvert** L= 15.00 m Ke= 0.500 Inlet / Outlet Invert= 3.449 m / 3.420 m S= 0.0019 m/m Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.535 m²
#5	Device 4	4.470 m	**2,100 mm Horiz. Scruffy dome** C= 0.600 Limited to weir flow at low heads

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Discarded OutFlow Max=0.0190 m³/s @ 24.52 hrs HW=4.015 m   (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.0190 m³/s)

Primary OutFlow Max=2.4471 m³/s @ 8.62 hrs HW=3.832 m TW=3.288 m   (Dynamic Tailwater)
↑—**1=Weir** (Weir Controls 2.4471 m³/s @ 0.40 m/s)

Secondary OutFlow Max=0.0500 m³/s @ 0.00 hrs HW=3.300 m TW=3.100 m   (Dynamic Tailwater)
↑—**3=Through bund** (Exfiltration Controls 0.0500 m³/s)

Tertiary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.300 m TW=2.600 m   (Dynamic Tailwater)
↑—**4=Culvert** (Controls 0.0000 m³/s)
  ↑—**5=Scruffy dome** (Controls 0.0000 m³/s)

Pond 94P: Pond 1

Hydrograph

Inflow Area=512,000.0 m²
Peak Elev=4.015 m
Storage=17,715.2 m³

Legend: Inflow, Outflow, Discarded, Primary, Secondary, Tertiary

2.6611 m³/s
2.5123 m³/s
2.4472 m³/s
0 m³/s
0.0500 m³/s
0.0000 m³/s

Flow (m³/s) vs Time (hours)
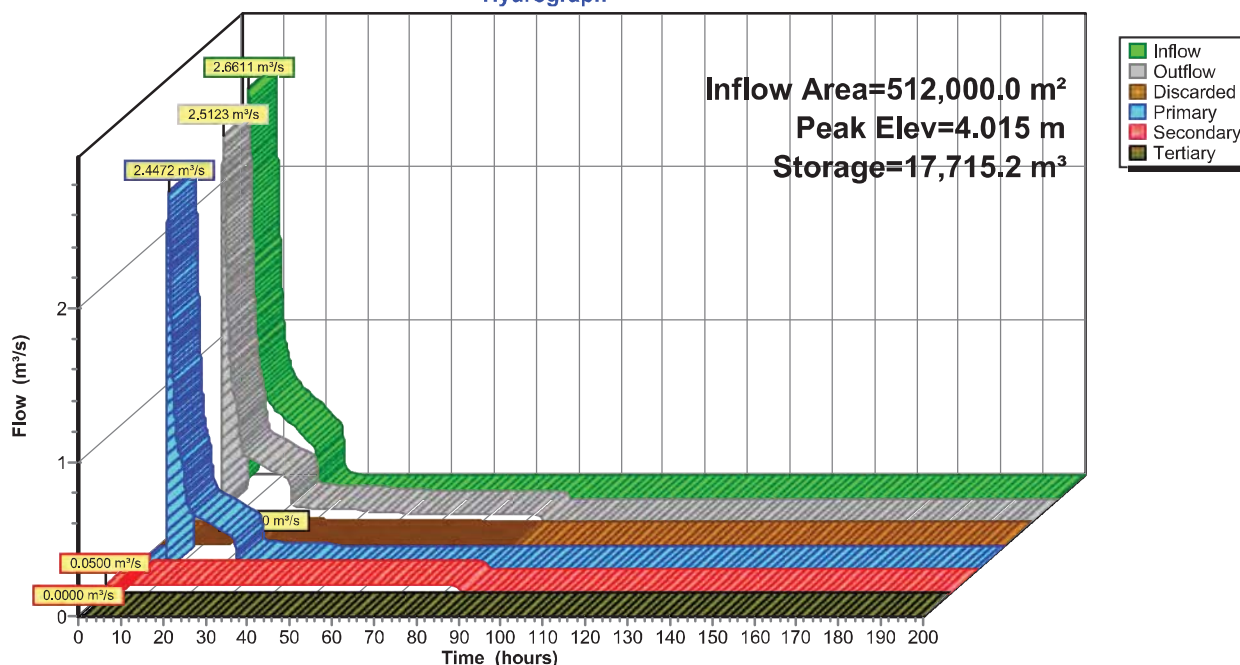
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Type IA 24-hr 5yr Type 1A Rainfall=129 mm
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Summary for Pond 96P: Canal (Northern)

Inflow Area =	70,000.0 m²,	0.00% Impervious,	Inflow Depth = 111 mm for 5yr Type 1A event
Inflow =	0.4851 m³/s @	8.20 hrs,	Volume= 7,797.7 m³
Outflow =	0.4510 m³/s @	8.30 hrs,	Volume= 7,776.0 m³, Atten= 7%, Lag= 6.2 min
Primary =	0.4510 m³/s @	8.30 hrs,	Volume= 7,776.0 m³

Routed to Pond 92P : Canal (Southern) Current

Secondary =	0.0000 m³/s @	0.00 hrs,	Volume= 0.0 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 4.426 m @ 8.34 hrs   Surf.Area= 434.5 m²   Storage= 258.6 m³

Plug-Flow detention time= 42.8 min calculated for 7,775.6 m³ (100% of inflow)
Center-of-Mass det. time= 41.1 min (752.4 - 711.3)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	621.4 m³	**2.60 mW x 75.00 mL x 1.50 mH 75m canal Z=1.8**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.600 m	**690 mm Round Culvert** L= 35.00 m Ke= 0.500 Inlet / Outlet Invert= 3.600 m / 3.600 m S= 0.0000 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.374 m²
#2	Secondary	5.000 m	**75.00 m long x 0.30 m breadth Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83

Primary OutFlow Max=0.4497 m³/s @ 8.30 hrs HW=4.423 m TW=4.219 m   (Dynamic Tailwater)
└—**1=Culvert** (Inlet Controls 0.4497 m³/s @ 1.20 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.600 m   (Free Discharge)
└—**2=Overflow** (Controls 0.0000 m³/s)

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Type IA 24-hr 5yr Type 1A Rainfall=129 mm
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Pond 96P: Canal (Northern)

Hydrograph

Inflow Area=70,000.0 m²
Peak Elev=4.426 m
Storage=258.6 m³

Legend: Inflow, Outflow, Primary, Secondary

0.4851 m³/s
0.4510 m³/s
0.4510 m³/s
0.0000 m³/s

Summary for Pond 62P: Canal (Western) Current

Inflow Area =   226,000.0 m²,   0.00% Impervious, Inflow Depth =   134 mm   for 10yr Type 1A event
Inflow   =   1.8783 m³/s @   8.20 hrs, Volume=   30,315.2 m³
Outflow   =   1.4465 m³/s @   8.49 hrs, Volume=   30,146.8 m³, Atten= 23%, Lag= 17.3 min
Discarded =   0.0130 m³/s @   8.49 hrs, Volume=   1,324.4 m³
Primary   =   1.4335 m³/s @   8.49 hrs, Volume=   28,822.4 m³
     Routed to Pond 92P : Canal (Southern) Current
Secondary =   0.0000 m³/s @   0.00 hrs, Volume=   0.0 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
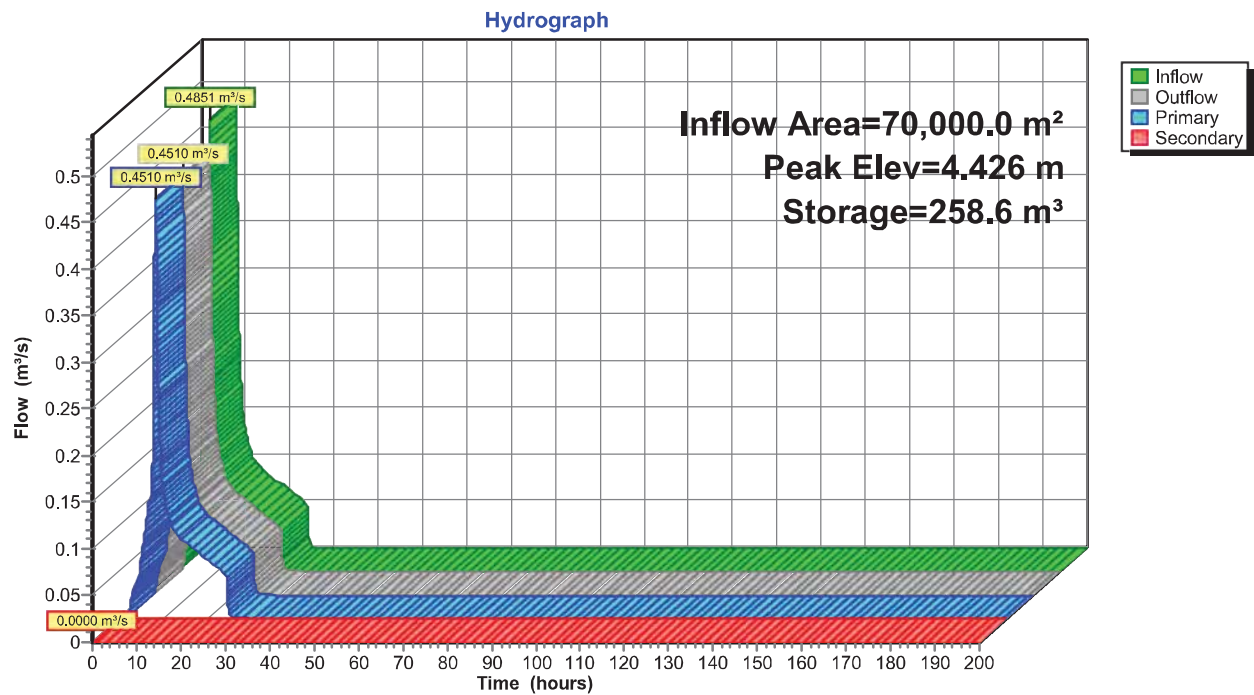Peak Elev= 4.669 m @ 8.49 hrs   Surf.Area= 3,764.6 m²   Storage= 2,815.3 m³

Plug-Flow detention time= 118.1 min calculated for 30,145.3 m³ (99% of inflow)
Center-of-Mass det. time= 114.3 min (818.9 - 704.6)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	4,636.1 m³	**2.60 mW x 580.00 mL x 1.50 mH 580m canal Z=1.8**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.600 m	**1,200 mm Round Culvert** L= 15.00 m RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 3.600 m / 3.600 m S= 0.0000 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.131 m²
#2	Secondary	4.700 m	**9.20 m long + 2.0 m/m SideZ x 3.00 m breadth Spilllway** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 Coef. (Metric) 1.37 1.41 1.49 1.48 1.48 1.48 1.47 1.46
#3	Secondary	5.000 m	**580.00 m long x 0.30 m breadth Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83
#4	Discarded	3.700 m	**20.00 mm/hr Exfiltration over Wetted area above 3.700 m** Excluded Wetted area = 1,748.1 m²

Discarded OutFlow Max=0.0130 m³/s @ 8.49 hrs HW=4.669 m   (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 0.0130 m³/s)

Primary OutFlow Max=1.4334 m³/s @ 8.49 hrs HW=4.669 m TW=4.260 m   (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.4334 m³/s @ 1.79 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.600 m   (Free Discharge)
├─**2=Spilllway** (Controls 0.0000 m³/s)
└─**3=Overflow** (Controls 0.0000 m³/s)

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Type IA 24-hr 10yr Type 1A Rainfall=152 mm
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Pond 62P: Canal (Western) Current

Hydrograph

Inflow Area=226,000.0 m²
Peak Elev=4.669 m
Storage=2,815.3 m³

Legend:
- Inflow
- Outflow
- Discarded
- Primary
- Secondary

1.8783 m³/s
1.4465 m³/s
1.4335 m³/s
130 m³
0.0000 m³/s

Flow (m³/s)

Time (hours)
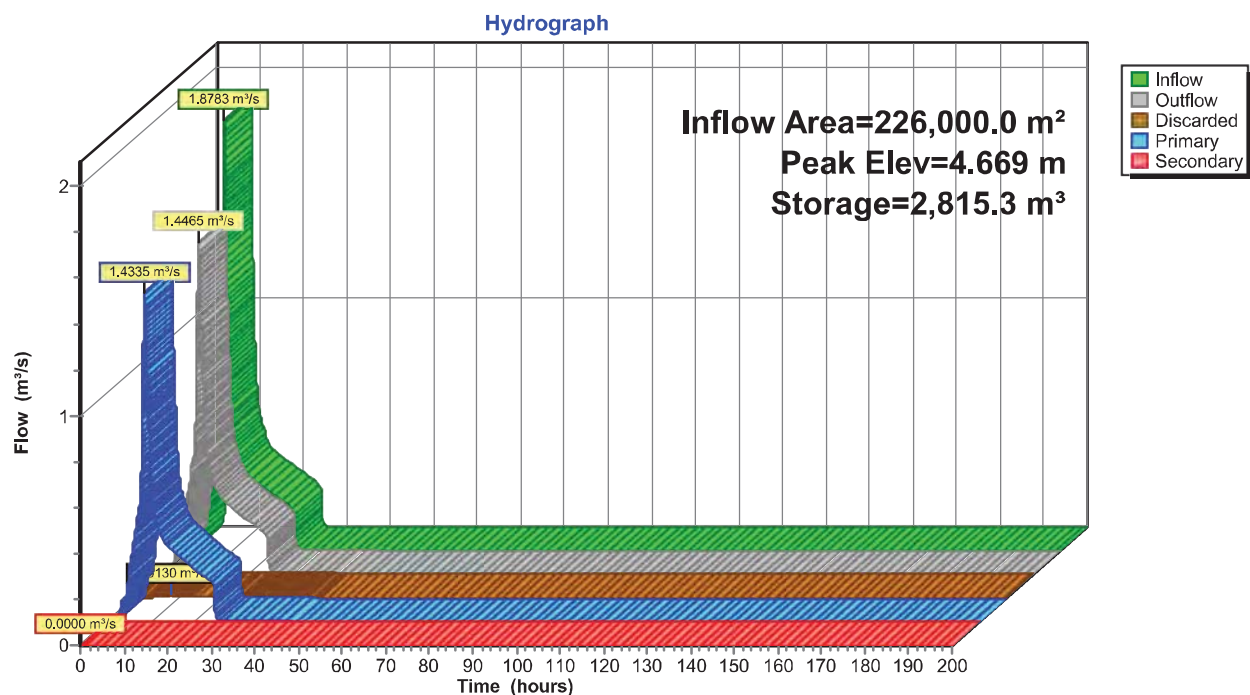
Summary for Pond 91P: Pond 2

Inflow Area =   547,000.0 m², 10.42% Impervious, Inflow Depth =   114 mm   for 10yr Type 1A event
Inflow   =   3.2335 m³/s @   8.55 hrs, Volume=   62,184.7 m³
Outflow   =   0.2092 m³/s @   24.40 hrs, Volume=   64,575.7 m³, Atten= 94%, Lag= 951.0 min
Discarded =   0.0731 m³/s @   24.40 hrs, Volume=   22,969.5 m³
Primary   =   0.1361 m³/s @   24.40 hrs, Volume=   41,606.2 m³
        Routed to Pond 95P : 525 Pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.100 m   Surf.Area= 24,604.8 m²   Storage= 5,435.2 m³
Peak Elev= 4.197 m @ 24.40 hrs   Surf.Area= 33,103.2 m²   Storage= 38,969.2 m³   (33,534.0 m³ above start)

Plug-Flow detention time= 2,151.2 min calculated for 59,136.6 m³ (95% of inflow)
Center-of-Mass det. time= 1,720.3 min (3,137.9 - 1,417.6)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	81,468.4 m³	**Custom Stage Data (Conic)** Listed below

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
2.600	474.5	0.0	0.0	474.5
2.800	5,907.2	537.1	537.1	5,907.3
3.000	20,004.5	2,452.2	2,989.2	20,004.8
3.200	29,205.2	4,892.0	7,881.3	29,206.2
3.400	29,965.9	5,916.9	13,798.2	29,976.6
3.600	30,727.5	6,069.2	19,867.4	30,748.2
3.800	31,631.9	6,235.7	26,103.1	31,661.2
4.000	32,382.3	6,401.3	32,504.4	32,422.2
4.200	33,112.6	6,549.4	39,053.7	33,163.7
4.400	33,844.5	6,695.6	45,749.3	33,907.0
4.600	34,590.5	6,843.4	52,592.7	34,664.5
4.800	35,339.0	6,992.8	59,585.5	35,424.6
5.000	36,095.3	7,143.3	66,728.8	36,192.7
5.200	36,849.2	7,294.3	74,023.1	36,958.6
5.400	37,605.2	7,445.3	81,468.4	37,726.9

Device	Routing	Invert	Outlet Devices (Turned on 2 times)
#1	Primary	3.240 m	**Pump - Total 290m3/hr** Discharges@4.000 m Turns Off<3.100 m 200 mm Diam. x 25.00 m Long Discharge, Hazen-Williams C= 130 Flow (l/min)= 4,833.0 4,833.3 Head (meters)= 10.000 0.000 -Loss (meters)= 0.775 0.775 =Lift (meters)= 9.225 -0.775
#2	Primary	3.440 m	**Pump - Total 490m3/hr** Discharges@4.000 m Turns Off<3.100 m 200 mm Diam. x 25.00 m Long Discharge, Hazen-Williams C= 130 Flow (l/min)= 3,333.0 3,333.7 Head (meters)= 10.000 0.000 -Loss (meters)= 0.389 0.389 =Lift (meters)= 9.611 -0.389
#3	Discarded	3.000 m	**20.00 mm/hr Exfiltration over Wetted area above 3.000 m** Excluded Wetted area = 20,004.8 m²

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Discarded OutFlow Max=0.0731 m³/s @ 24.40 hrs HW=4.197 m   (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.0731 m³/s)

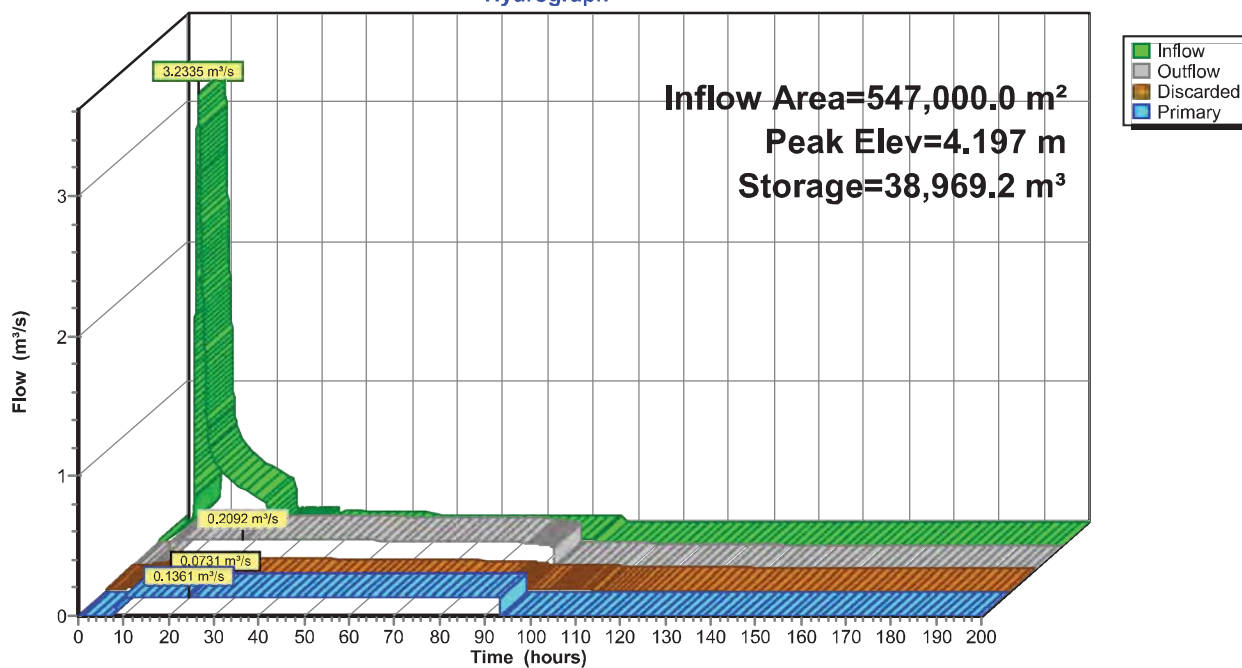**Primary OutFlow** Max=0.1361 m³/s @ 24.40 hrs HW=4.197 m TW=4.494 m   (Dynamic Tailwater)
├─**1=Pump - Total 290m3/hr** (Pump Controls 0.0806 m³/s)
└─**2=Pump - Total 490m3/hr** (Pump Controls 0.0556 m³/s)

Pond 91P: Pond 2

Hydrograph

Inflow Area=547,000.0 m²
Peak Elev=4.197 m
Storage=38,969.2 m³

Legend: Inflow, Outflow, Discarded, Primary

3.2335 m³/s
0.2092 m³/s
0.0731 m³/s
0.1361 m³/s

Summary for Pond 92P: Canal (Southern) Current

Inflow Area =   490,000.0 m²,   0.00% Impervious, Inflow Depth =   125 mm   for 10yr Type 1A event
Inflow   =   3.2446 m³/s @   8.30 hrs, Volume=   61,382.8 m³
Outflow   =   3.1347 m³/s @   8.43 hrs, Volume=   60,996.2 m³, Atten= 3%, Lag= 7.8 min
Discarded =   0.0170 m³/s @   8.43 hrs, Volume=   2,839.4 m³
Primary   =   3.1177 m³/s @   8.43 hrs, Volume=   58,156.9 m³
    Routed to Pond 94P : Pond 1
Secondary =   0.0000 m³/s @   0.00 hrs, Volume=   0.0 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 4.261 m @ 8.43 hrs   Surf.Area= 0.6561 ha   Storage= 3.299 Ml

Plug-Flow detention time= 128.5 min calculated for 60,993.2 m³ (99% of inflow)
Center-of-Mass det. time= 117.5 min (851.4 - 733.9)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	10.479 Ml	**2.60 mW x 1,315.00 mL x 1.50 mH 1315m canal Z=1.8**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.950 m	**10.00 m long Weir** 2 End Contraction(s)
#2	Secondary	5.000 m	**620.00 m long x 0.30 m breadth Overflow**
			Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762
			Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83
#3	Discarded	3.700 m	**20.00 mm/hr Exfiltration over Wetted area above 3.700 m**
			Excluded Wetted area = 0.3962 ha

Discarded OutFlow Max=0.0170 m³/s @ 8.43 hrs HW=4.261 m   (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.0170 m³/s)

Primary OutFlow Max=3.1176 m³/s @ 8.43 hrs HW=4.261 m TW=3.843 m   (Dynamic Tailwater)
└─**1=Weir** (Weir Controls 3.1176 m³/s @ 1.01 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.600 m   (Free Discharge)
└─**2=Overflow** (Controls 0.0000 m³/s)

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Pond 92P: Canal (Southern) Current

Hydrograph

Inflow Area=490,000.0 m²
Peak Elev=4.261 m
Storage=3.299 Ml

Legend:
- Inflow
- Outflow
- Discarded
- Primary
- Secondary

3.2446 m³/s
3.1347 m³/s
3.1177 m³/s
170 m³/s
0.0000 m³/s

Flow (m³/s) vs Time (hours)

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Summary for Pond 93P: 825 pipe

Inflow Area =   547,000.0 m², 10.42% Impervious, Inflow Depth =   76 mm   for 10yr Type 1A event
Inflow   =   0.1365 m³/s @   8.69 hrs, Volume=   41,602.7 m³
Outflow   =   0.1364 m³/s @   8.70 hrs, Volume=   41,600.1 m³, Atten= 0%, Lag= 0.6 min
Primary   =   0.1364 m³/s @   8.70 hrs, Volume=   41,600.1 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
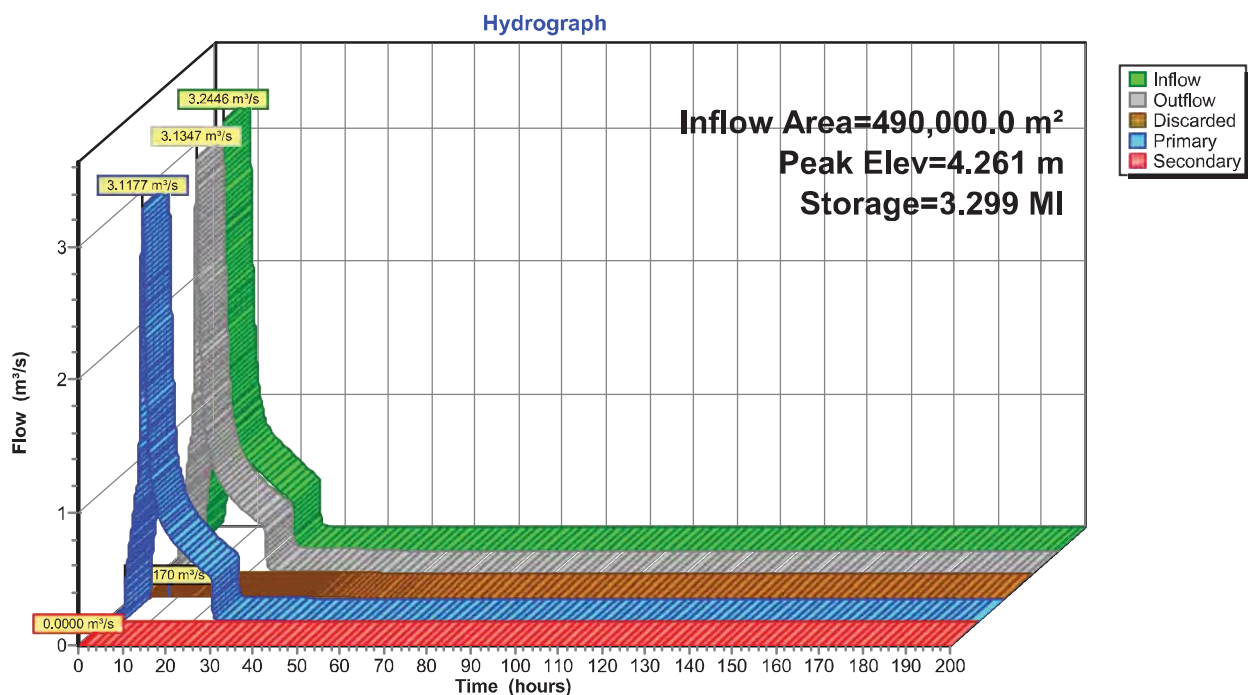Peak Elev= 3.733 m @ 8.70 hrs   Surf.Area= 3.1 m²   Storage= 3.6 m³

Plug-Flow detention time= 0.4 min calculated for 41,598.0 m³ (100% of inflow)
Center-of-Mass det. time= 0.3 min (3,046.6 - 3,046.3)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	15.7 m³	**2.00 mD x 5.00 mH Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.420 m	**900 mm Round Culvert** L= 38.78 m Ke= 0.500
			Inlet / Outlet Invert= 3.420 m / 3.346 m S= 0.0019 m/m Cc= 0.900
			n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.636 m²

Primary OutFlow Max=0.1364 m³/s @ 8.70 hrs HW=3.733 m   (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.1364 m³/s @ 1.03 m/s)

Pond 93P: 825 pipe
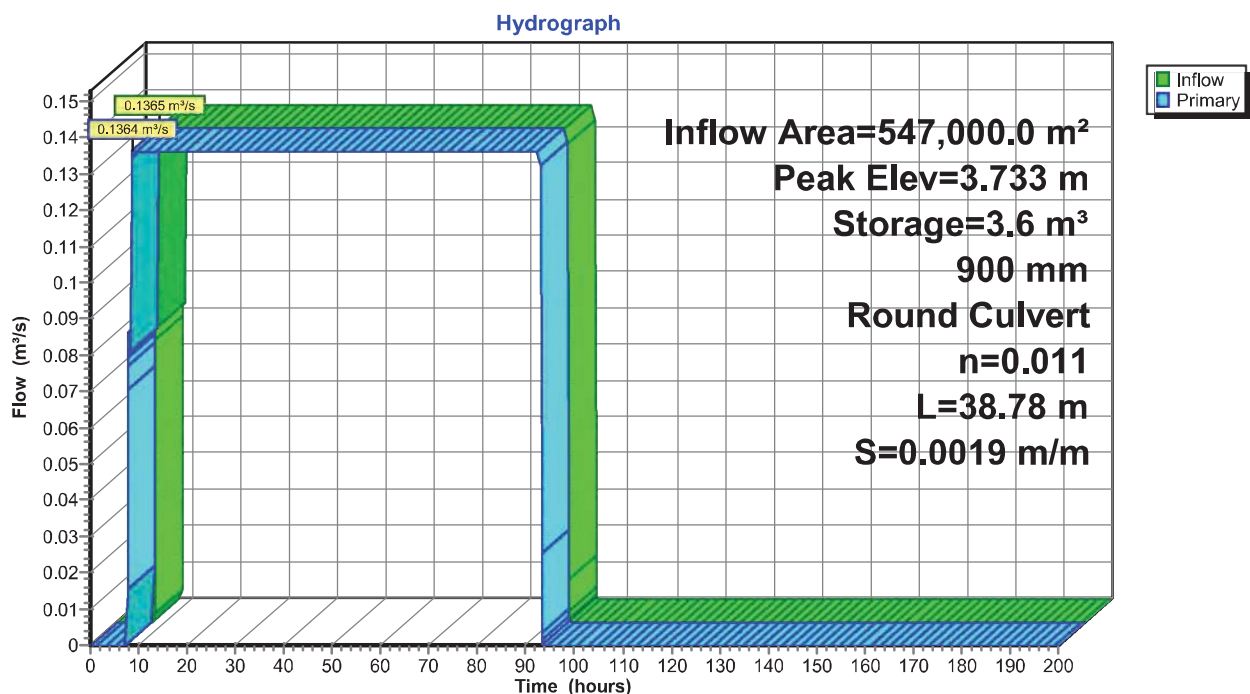
Summary for Pond 94P: Pond 1

Inflow Area =   512,000.0 m²,   4.30% Impervious, Inflow Depth =   120 mm   for 10yr Type 1A event
Inflow   =   3.1965 m³/s @   8.42 hrs, Volume=   61,367.8 m³
Outflow   =   3.1161 m³/s @   8.56 hrs, Volume=   61,361.4 m³, Atten= 3%, Lag= 7.9 min
Discarded =   0.0229 m³/s @ 24.41 hrs, Volume=   4,285.0 m³
Primary   =   3.0507 m³/s @   8.56 hrs, Volume=   40,146.6 m³
     Routed to Pond 91P : Pond 2
Secondary =   0.0500 m³/s @   0.00 hrs, Volume=   16,929.8 m³
     Routed to Pond 91P : Pond 2
Tertiary   =   0.0000 m³/s @   0.00 hrs, Volume=   0.0 m³
     Routed to Pond 93P : 825 pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.300 m   Surf.Area= 17,483.7 m²   Storage= 3,905.5 m³
Peak Elev= 4.197 m @ 24.41 hrs   Surf.Area= 21,571.0 m²   Storage= 21,575.8 m³   (17,670.3 m³ above start)

Plug-Flow detention time= 929.8 min calculated for 57,456.0 m³ (94% of inflow)
Center-of-Mass det. time= 798.5 min (1,549.5 - 751.0)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	50,024.2 m³	**Custom Stage Data (Conic)** Listed below

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
2.600	31.5	0.0	0.0	31.5
2.800	605.0	51.6	51.6	605.1
3.000	2,950.9	326.1	377.8	2,951.2
3.200	16,722.6	1,779.9	2,157.7	16,723.0
3.400	18,244.7	3,495.6	5,653.3	18,248.0
3.600	19,084.6	3,732.6	9,385.9	19,093.5
3.800	20,068.2	3,914.9	13,300.8	20,082.1
4.000	20,826.6	4,089.2	17,390.0	20,847.2
4.200	21,580.7	4,240.5	21,630.5	21,608.3
4.400	22,261.0	4,384.0	26,014.5	22,296.7
4.600	22,942.6	4,520.2	30,534.7	22,986.6
4.800	23,626.5	4,656.7	35,191.4	23,679.0
5.000	24,332.5	4,795.7	39,987.2	24,393.5
5.200	25,108.0	4,943.8	44,931.0	25,176.9
5.400	25,826.0	5,093.2	50,024.2	25,903.8

Device	Routing	Invert	Outlet Devices
#1	Primary	3.750 m	**75.00 m long x 3.00 m breadth Weir** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 Coef. (Metric) 1.37 1.41 1.49 1.48 1.48 1.48 1.47 1.46
#2	Discarded	3.300 m	**20.00 mm/hr Exfiltration over Wetted area above 3.300 m** Excluded Wetted area = 17,485.5 m²
#3	Secondary	3.300 m	**0.0500 m³/s Through bund when above 3.300 m**
#4	Tertiary	3.449 m	**825 mm Round Culvert** L= 15.00 m Ke= 0.500 Inlet / Outlet Invert= 3.449 m / 3.420 m S= 0.0019 m/m Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.535 m²
#5	Device 4	4.470 m	**2,100 mm Horiz. Scruffy dome** C= 0.600 Limited to weir flow at low heads

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Discarded OutFlow Max=0.0229 m³/s @ 24.41 hrs HW=4.197 m   (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.0229 m³/s)

Primary OutFlow Max=3.0505 m³/s @ 8.56 hrs HW=3.845 m TW=3.400 m   (Dynamic Tailwater)
└─**1=Weir** (Weir Controls 3.0505 m³/s @ 0.43 m/s)

Secondary OutFlow Max=0.0500 m³/s @ 0.00 hrs HW=3.300 m TW=3.100 m   (Dynamic Tailwater)
└─**3=Through bund** (Exfiltration Controls 0.0500 m³/s)

Tertiary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.300 m TW=2.600 m   (Dynamic Tailwater)
└─**4=Culvert** (Controls 0.0000 m³/s)
  └─**5=Scruffy dome** (Controls 0.0000 m³/s)

Pond 94P: Pond 1

Hydrograph

Inflow Area=512,000.0 m²
Peak Elev=4.197 m
Storage=21,575.8 m³

Legend: Inflow, Outflow, Discarded, Primary, Secondary, Tertiary

3.1965 m³/s
3.1161 m³/s
3.0507 m³/s
0.0500 m³/s
0.0000 m³/s

Flow (m³/s) vs Time (hours)
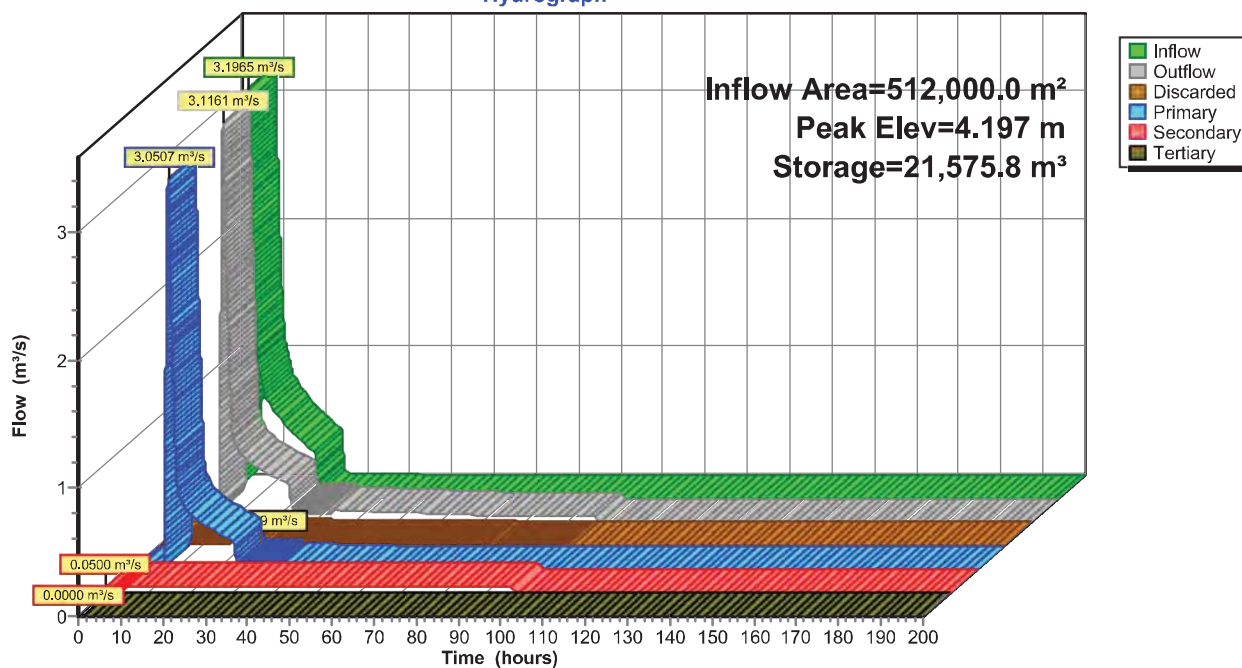
Summary for Pond 96P: Canal (Northern)

Inflow Area =   70,000.0 m²,   0.00% Impervious, Inflow Depth =   134 mm   for 10yr Type 1A event
Inflow   =   0.5818 m³/s @   8.20 hrs, Volume=   9,389.7 m³
Outflow   =   0.5326 m³/s @   8.32 hrs, Volume=   9,367.6 m³, Atten= 8%, Lag= 7.5 min
Primary   =   0.5326 m³/s @   8.32 hrs, Volume=   9,367.6 m³
     Routed to Pond 92P : Canal (Southern) Current
Secondary =   0.0000 m³/s @   0.00 hrs, Volume=   0.0 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 4.544 m @ 8.35 hrs   Surf.Area= 470.2 m²   Storage= 312.1 m³

Plug-Flow detention time= 47.5 min calculated for 9,367.1 m³ (100% of inflow)
Center-of-Mass det. time= 46.1 min (750.8 - 704.6)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	621.4 m³	**2.60 mW x 75.00 mL x 1.50 mH 75m canal Z=1.8**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.600 m	**690 mm Round Culvert** L= 35.00 m Ke= 0.500
			Inlet / Outlet Invert= 3.600 m / 3.600 m S= 0.0000 m/m Cc= 0.900
			n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.374 m²
#2	Secondary	5.000 m	**75.00 m long x 0.30 m breadth Overflow**
			Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762
			Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83

Primary OutFlow Max=0.5316 m³/s @ 8.32 hrs HW=4.542 m TW=4.256 m   (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.5316 m³/s @ 1.42 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.600 m   (Free Discharge)
└─**2=Overflow** (Controls 0.0000 m³/s)

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Pond 96P: Canal (Northern)

Hydrograph

Inflow Area=70,000.0 m²
Peak Elev=4.544 m
Storage=312.1 m³

Legend:
- Inflow
- Outflow
- Primary
- Secondary

0.5818 m³/s
0.5326 m³/s
0.5326 m³/s
0.0000 m³/s

Summary for Pond 62P: Canal (Western) Current

Inflow Area =   226,000.0 m²,   0.00% Impervious, Inflow Depth =   158 mm   for 20yr Type 1A event
Inflow   =   2.2021 m³/s @   8.20 hrs, Volume=   35,693.5 m³
Outflow   =   1.8077 m³/s @   8.44 hrs, Volume=   35,522.1 m³, Atten= 18%, Lag= 14.5 min
Discarded =   0.0142 m³/s @   8.44 hrs, Volume=   1,771.6 m³
Primary   =   1.6264 m³/s @   8.44 hrs, Volume=   33,584.9 m³
    Routed to Pond 92P : Canal (Southern) Current
Secondary =   0.1672 m³/s @   8.44 hrs, Volume=   165.5 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
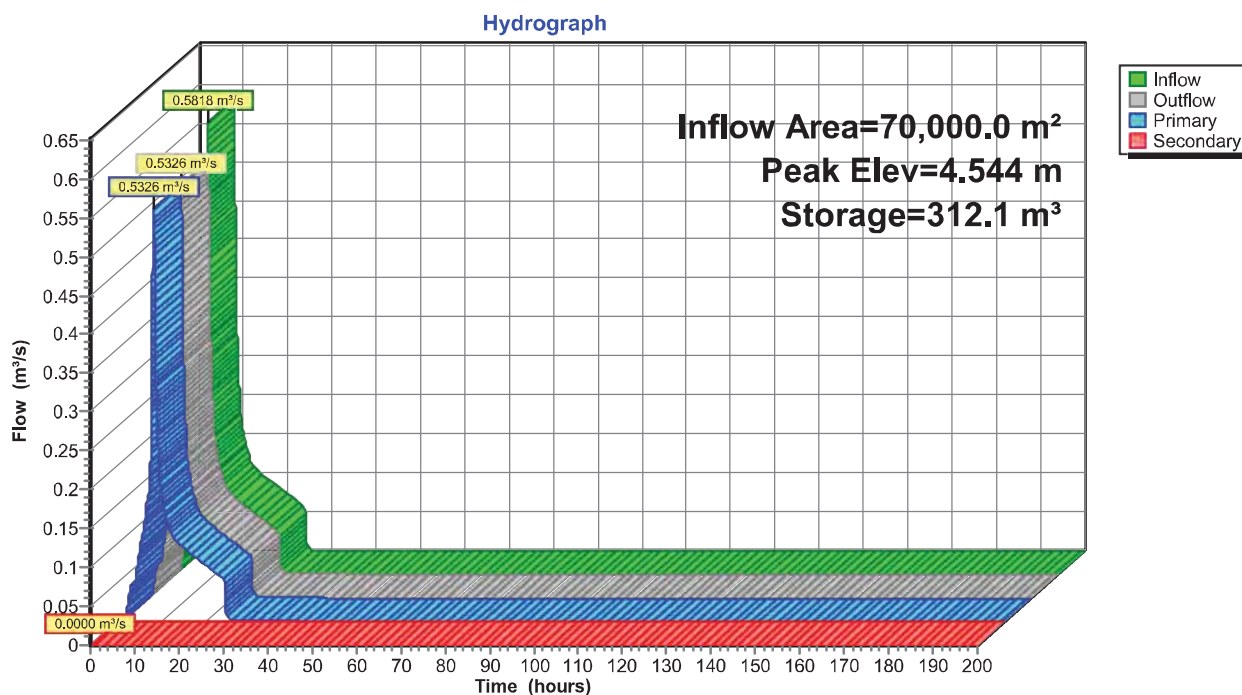Peak Elev= 4.756 m @ 8.44 hrs   Surf.Area= 3,949.2 m²   Storage= 3,150.0 m³

Plug-Flow detention time= 137.8 min calculated for 35,520.3 m³ (100% of inflow)
Center-of-Mass det. time= 134.6 min (833.8 - 699.2)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	4,636.1 m³	**2.60 mW x 580.00 mL x 1.50 mH 580m canal Z=1.8**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.600 m	**1,200 mm Round Culvert** L= 15.00 m RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 3.600 m / 3.600 m S= 0.0000 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.131 m²
#2	Secondary	4.700 m	**9.20 m long + 2.0 m/m SideZ x 3.00 m breadth Spilllway** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 Coef. (Metric) 1.37 1.41 1.49 1.48 1.48 1.48 1.47 1.46
#3	Secondary	5.000 m	**580.00 m long x 0.30 m breadth Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83
#4	Discarded	3.700 m	**20.00 mm/hr Exfiltration over Wetted area above 3.700 m** Excluded Wetted area = 1,748.1 m²

Discarded OutFlow Max=0.0142 m³/s @ 8.44 hrs HW=4.756 m   (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 0.0142 m³/s)

Primary OutFlow Max=1.6264 m³/s @ 8.44 hrs HW=4.756 m TW=4.296 m   (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.6264 m³/s @ 1.86 m/s)

Secondary OutFlow Max=0.1671 m³/s @ 8.44 hrs HW=4.756 m   (Free Discharge)
├─**2=Spilllway** (Weir Controls 0.1671 m³/s @ 0.32 m/s)
└─**3=Overflow** (Controls 0.0000 m³/s)
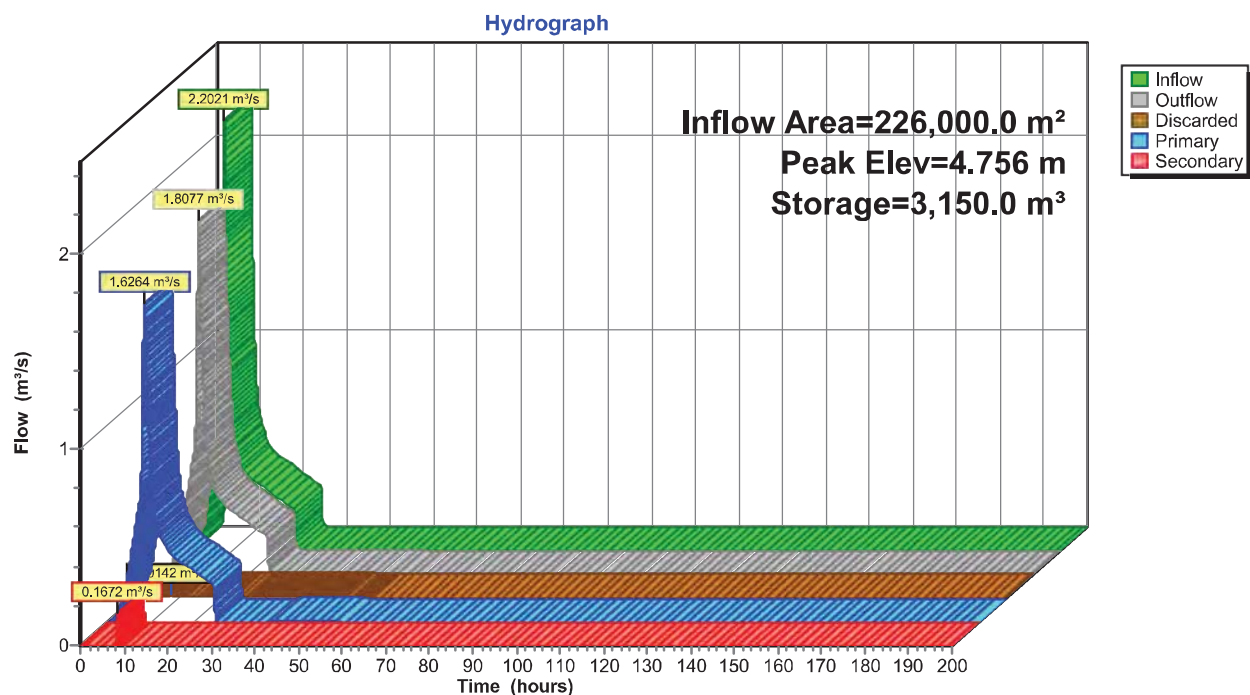
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Pond 62P: Canal (Western) Current

Hydrograph

Inflow Area=226,000.0 m²
Peak Elev=4.756 m
Storage=3,150.0 m³

Legend:
- Inflow
- Outflow
- Discarded
- Primary
- Secondary

2.2021 m³/s
1.8077 m³/s
1.6264 m³/s
0.1672 m³/s

Flow (m³/s)

Time (hours)

Summary for Pond 91P: Pond 2

Inflow Area = 547,000.0 m², 10.42% Impervious, Inflow Depth = 132 mm   for 20yr Type 1A event
Inflow   = 3.7930 m³/s @   8.53 hrs, Volume=   72,039.8 m³
Outflow   = 0.2128 m³/s @ 24.40 hrs, Volume=   74,397.8 m³, Atten= 94%, Lag= 952.5 min
Discarded   = 0.0767 m³/s @ 24.40 hrs, Volume=   26,524.3 m³
Primary   = 0.1361 m³/s @ 24.40 hrs, Volume=   47,873.5 m³
   Routed to Pond 95P : 525 Pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.100 m   Surf.Area= 24,604.8 m²   Storage= 5,435.2 m³
Peak Elev= 4.376 m @ 24.40 hrs   Surf.Area= 33,755.5 m²   Storage= 44,934.7 m³   (39,499.5 m³ above start)

Plug-Flow detention time= 2,370.3 min calculated for 68,958.2 m³ (96% of inflow)
Center-of-Mass det. time= 1,943.0 min (3,471.7 - 1,528.7)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	81,468.4 m³	**Custom Stage Data (Conic)** Listed below

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
2.600	474.5	0.0	0.0	474.5
2.800	5,907.2	537.1	537.1	5,907.3
3.000	20,004.5	2,452.2	2,989.2	20,004.8
3.200	29,205.2	4,892.0	7,881.3	29,206.2
3.400	29,965.9	5,916.9	13,798.2	29,976.6
3.600	30,727.5	6,069.2	19,867.4	30,748.2
3.800	31,631.9	6,235.7	26,103.1	31,661.2
4.000	32,382.3	6,401.3	32,504.4	32,422.2
4.200	33,112.6	6,549.4	39,053.7	33,163.7
4.400	33,844.5	6,695.6	45,749.3	33,907.0
4.600	34,590.5	6,843.4	52,592.7	34,664.5
4.800	35,339.0	6,992.8	59,585.5	35,424.6
5.000	36,095.3	7,143.3	66,728.8	36,192.7
5.200	36,849.2	7,294.3	74,023.1	36,958.6
5.400	37,605.2	7,445.3	81,468.4	37,726.9

Device	Routing	Invert	Outlet Devices (Turned on 2 times)
#1	Primary	3.240 m	**Pump - Total 290m3/hr** Discharges@4.000 m Turns Off<3.100 m 200 mm Diam. x 25.00 m Long Discharge, Hazen-Williams C= 130

      Flow (l/min)= 4,833.0 4,833.3
      Head (meters)= 10.000 0.000
    -Loss (meters)= 0.775 0.775
    =Lift (meters)=   9.225 -0.775

Device	Routing	Invert	Outlet Devices
#2	Primary	3.440 m	**Pump - Total 490m3/hr** Discharges@4.000 m Turns Off<3.100 m 200 mm Diam. x 25.00 m Long Discharge, Hazen-Williams C= 130

      Flow (l/min)= 3,333.0 3,333.7
      Head (meters)= 10.000 0.000
    -Loss (meters)= 0.389 0.389
    =Lift (meters)=   9.611 -0.389

Device	Routing	Invert	Outlet Devices
#3	Discarded	3.000 m	**20.00 mm/hr Exfiltration over Wetted area above 3.000 m** Excluded Wetted area = 20,004.8 m²

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Discarded OutFlow Max=0.0767 m³/s @ 24.40 hrs HW=4.376 m   (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.0767 m³/s)

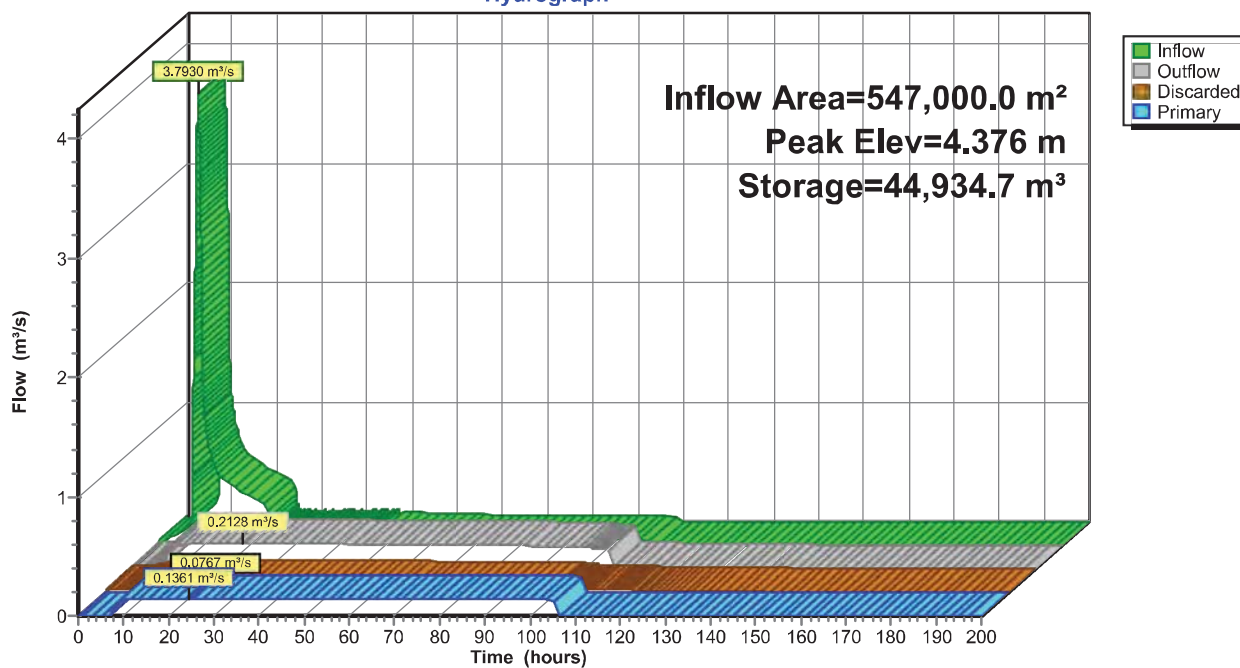**Primary OutFlow** Max=0.1361 m³/s @ 24.40 hrs HW=4.376 m TW=4.494 m   (Dynamic Tailwater)
├─**1=Pump - Total 290m3/hr** (Pump Controls 0.0806 m³/s)
└─**2=Pump - Total 490m3/hr** (Pump Controls 0.0556 m³/s)

Pond 91P: Pond 2

Hydrograph

Inflow Area=547,000.0 m²
Peak Elev=4.376 m
Storage=44,934.7 m³

Summary for Pond 92P: Canal (Southern) Current

Inflow Area =		490,000.0 m²,	0.00% Impervious,	Inflow Depth = 147 mm	for 20yr Type 1A event
Inflow	=	3.7949 m³/s @	8.30 hrs,	Volume=	72,182.2 m³
Outflow	=	3.6654 m³/s @	8.42 hrs,	Volume=	71,787.5 m³, Atten= 3%, Lag= 7.1 min
Discarded =		0.0204 m³/s @	24.40 hrs,	Volume=	3,832.8 m³
Primary	=	3.6474 m³/s @	8.42 hrs,	Volume=	67,954.8 m³
	Routed to Pond 94P : Pond 1				
Secondary =		0.0000 m³/s @	0.00 hrs,	Volume=	0.0 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 4.376 m @ 24.40 hrs   Surf.Area= 0.7107 ha   Storage= 4.082 Ml

Plug-Flow detention time= 154.5 min calculated for 71,787.5 m³ (99% of inflow)
Center-of-Mass det. time= 140.6 min (873.3 - 732.7)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	10.479 Ml	**2.60 mW x 1,315.00 mL x 1.50 mH 1315m canal Z=1.8**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.950 m	**10.00 m long Weir** 2 End Contraction(s)
#2	Secondary	5.000 m	**620.00 m long x 0.30 m breadth Overflow**
			Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762
			Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83
#3	Discarded	3.700 m	**20.00 mm/hr Exfiltration over Wetted area above 3.700 m**
			Excluded Wetted area = 0.3962 ha

Discarded OutFlow Max=0.0204 m³/s @ 24.40 hrs HW=4.376 m (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.0204 m³/s)

Primary OutFlow Max=3.6473 m³/s @ 8.42 hrs HW=4.296 m TW=3.854 m (Dynamic Tailwater)
└─**1=Weir** (Weir Controls 3.6473 m³/s @ 1.06 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.600 m (Free Discharge)
└─**2=Overflow** (Controls 0.0000 m³/s)

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Pond 92P: Canal (Southern) Current

Hydrograph

Inflow Area=490,000.0 m²
Peak Elev=4.376 m
Storage=4.082 Ml

Legend:
- Inflow
- Outflow
- Discarded
- Primary
- Secondary

3.7949 m³/s
3.6654 m³/s
3.6474 m³/s
0.0000 m³/s
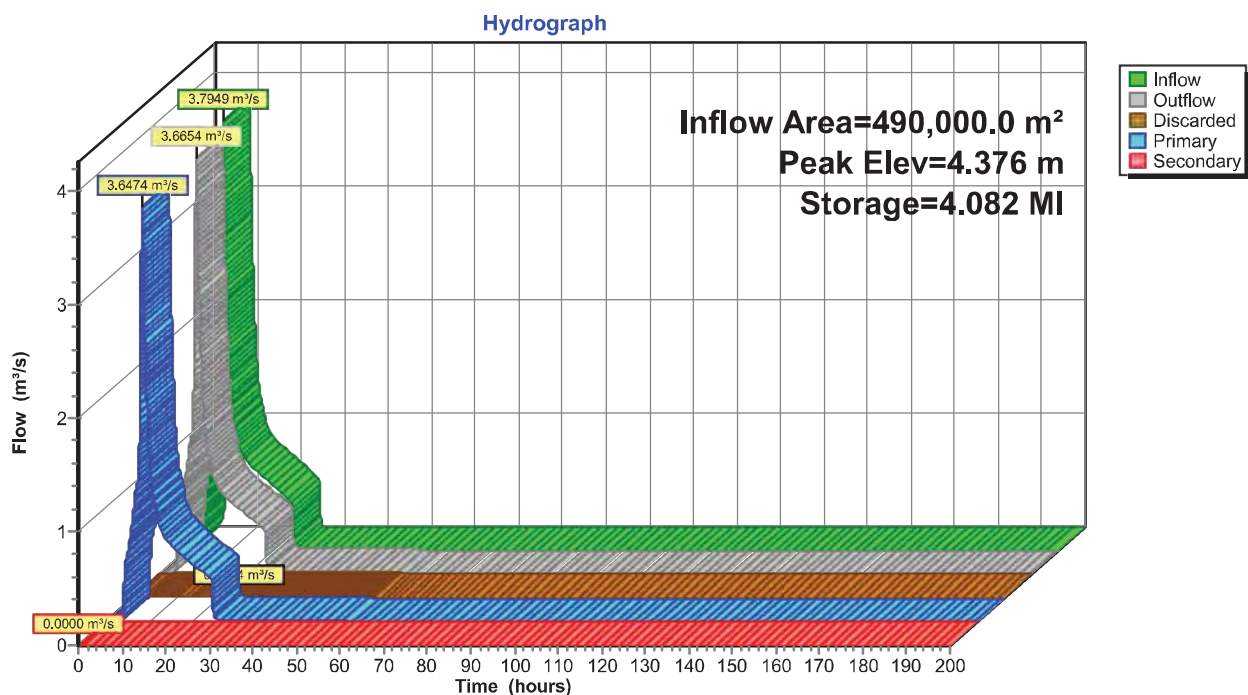
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Summary for Pond 93P: 825 pipe

Inflow Area =   547,000.0 m², 10.42% Impervious, Inflow Depth =   88 mm   for 20yr Type 1A event
Inflow   =   0.1365 m³/s @   8.35 hrs, Volume=   47,869.9 m³
Outflow   =   0.1364 m³/s @   8.36 hrs, Volume=   47,867.4 m³, Atten= 0%, Lag= 0.6 min
Primary   =   0.1364 m³/s @   8.36 hrs, Volume=   47,867.4 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 3.733 m @ 8.36 hrs   Surf.Area= 3.1 m²   Storage= 3.6 m³

Plug-Flow detention time= 0.4 min calculated for 47,865.0 m³ (100% of inflow)
Center-of-Mass det. time= 0.3 min (3,406.7 - 3,406.4)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	15.7 m³	**2.00 mD x 5.00 mH Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.420 m	**900 mm Round Culvert** L= 38.78 m Ke= 0.500 Inlet / Outlet Invert= 3.420 m / 3.346 m S= 0.0019 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.636 m²

Primary OutFlow Max=0.1364 m³/s @ 8.36 hrs HW=3.733 m   (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.1364 m³/s @ 1.03 m/s)

Pond 93P: 825 pipe

Hydrograph

Inflow Area=547,000.0 m²
Peak Elev=3.733 m
Storage=3.6 m³
900 mm
Round Culvert
n=0.011
L=38.78 m
S=0.0019 m/m

Legend: ■ Inflow ■ Primary

0.1365 m³/s
0.1364 m³/s

Flow (m³/s) axis: 0 to 0.15
Time (hours) axis: 0 to 200

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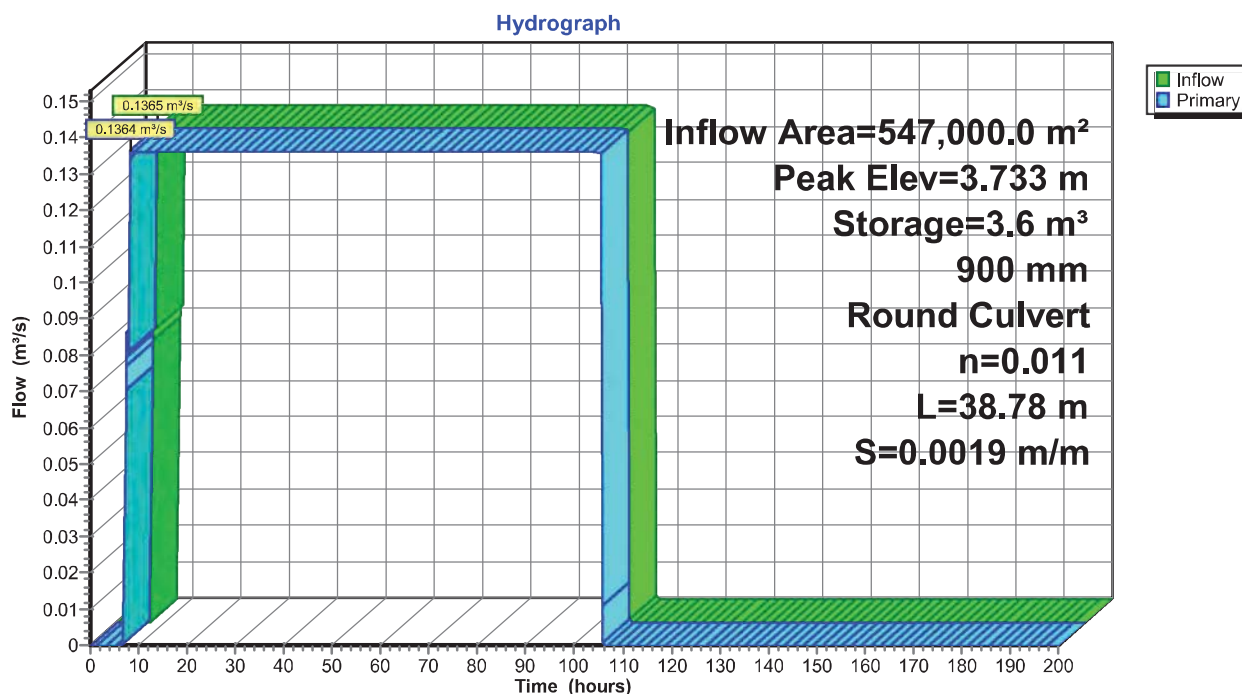
Summary for Pond 94P: Pond 1

Inflow Area =	512,000.0 m²,	4.30% Impervious,	Inflow Depth =	140 mm	for 20yr Type 1A event	
Inflow =	3.7400 m³/s @	8.41 hrs,	Volume=	71,693.2 m³		
Outflow =	3.6526 m³/s @	8.53 hrs,	Volume=	71,669.3 m³,	Atten= 2%,	Lag= 7.4 min
Discarded =	0.0263 m³/s @	24.41 hrs,	Volume=	5,577.0 m³		
Primary =	3.5870 m³/s @	8.53 hrs,	Volume=	46,852.3 m³		

Routed to Pond 91P : Pond 2

Secondary =	0.0500 m³/s @	0.00 hrs,	Volume=	19,240.0 m³	

Routed to Pond 91P : Pond 2

Tertiary =	0.0000 m³/s @	0.00 hrs,	Volume=	0.0 m³	

Routed to Pond 93P : 825 pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.300 m   Surf.Area= 17,483.7 m²   Storage= 3,905.5 m³
Peak Elev= 4.376 m @ 24.41 hrs   Surf.Area= 22,178.2 m²   Storage= 25,481.2 m³   (21,575.7 m³ above start)

Plug-Flow detention time= 1,069.6 min calculated for 67,763.8 m³ (95% of inflow)
Center-of-Mass det. time= 932.3 min (1,688.3 - 756.0)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	50,024.2 m³	**Custom Stage Data (Conic)** Listed below

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
2.600	31.5	0.0	0.0	31.5
2.800	605.0	51.6	51.6	605.1
3.000	2,950.9	326.1	377.8	2,951.2
3.200	16,722.6	1,779.9	2,157.7	16,723.0
3.400	18,244.7	3,495.6	5,653.3	18,248.0
3.600	19,084.6	3,732.6	9,385.9	19,093.5
3.800	20,068.2	3,914.9	13,300.8	20,082.1
4.000	20,826.6	4,089.2	17,390.0	20,847.2
4.200	21,580.7	4,240.5	21,630.5	21,608.3
4.400	22,261.0	4,384.0	26,014.5	22,296.7
4.600	22,942.6	4,520.2	30,534.7	22,986.6
4.800	23,626.5	4,656.7	35,191.4	23,679.0
5.000	24,332.5	4,795.7	39,987.2	24,393.5
5.200	25,108.0	4,943.8	44,931.0	25,176.9
5.400	25,826.0	5,093.2	50,024.2	25,903.8

Device	Routing	Invert	Outlet Devices
#1	Primary	3.750 m	**75.00 m long x 3.00 m breadth Weir** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 Coef. (Metric) 1.37 1.41 1.49 1.48 1.48 1.48 1.47 1.46
#2	Discarded	3.300 m	**20.00 mm/hr Exfiltration over Wetted area above 3.300 m** Excluded Wetted area = 17,485.5 m²
#3	Secondary	3.300 m	**0.0500 m³/s Through bund when above 3.300 m**
#4	Tertiary	3.449 m	**825 mm Round Culvert** L= 15.00 m Ke= 0.500 Inlet / Outlet Invert= 3.449 m / 3.420 m S= 0.0019 m/m Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.535 m²
#5	Device 4	4.470 m	**2,100 mm Horiz. Scruffy dome** C= 0.600 Limited to weir flow at low heads

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Discarded OutFlow Max=0.0263 m³/s @ 24.41 hrs HW=4.376 m   (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.0263 m³/s)

Primary OutFlow Max=3.5868 m³/s @ 8.53 hrs HW=3.855 m TW=3.527 m   (Dynamic Tailwater)
└─**1=Weir** (Weir Controls 3.5868 m³/s @ 0.45 m/s)

Secondary OutFlow Max=0.0500 m³/s @ 0.00 hrs HW=3.300 m TW=3.100 m   (Dynamic Tailwater)
└─**3=Through bund** (Exfiltration Controls 0.0500 m³/s)

Tertiary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.300 m TW=2.600 m   (Dynamic Tailwater)
└─**4=Culvert** (Controls 0.0000 m³/s)
  └─**5=Scruffy dome** (Controls 0.0000 m³/s)

Pond 94P: Pond 1

Hydrograph

Inflow Area=512,000.0 m²
Peak Elev=4.376 m
Storage=25,481.2 m³

Legend: Inflow, Outflow, Discarded, Primary, Secondary, Tertiary

3.7400 m³/s
3.6526 m³/s
3.5870 m³/s
0.0500 m³/s
0.0000 m³/s
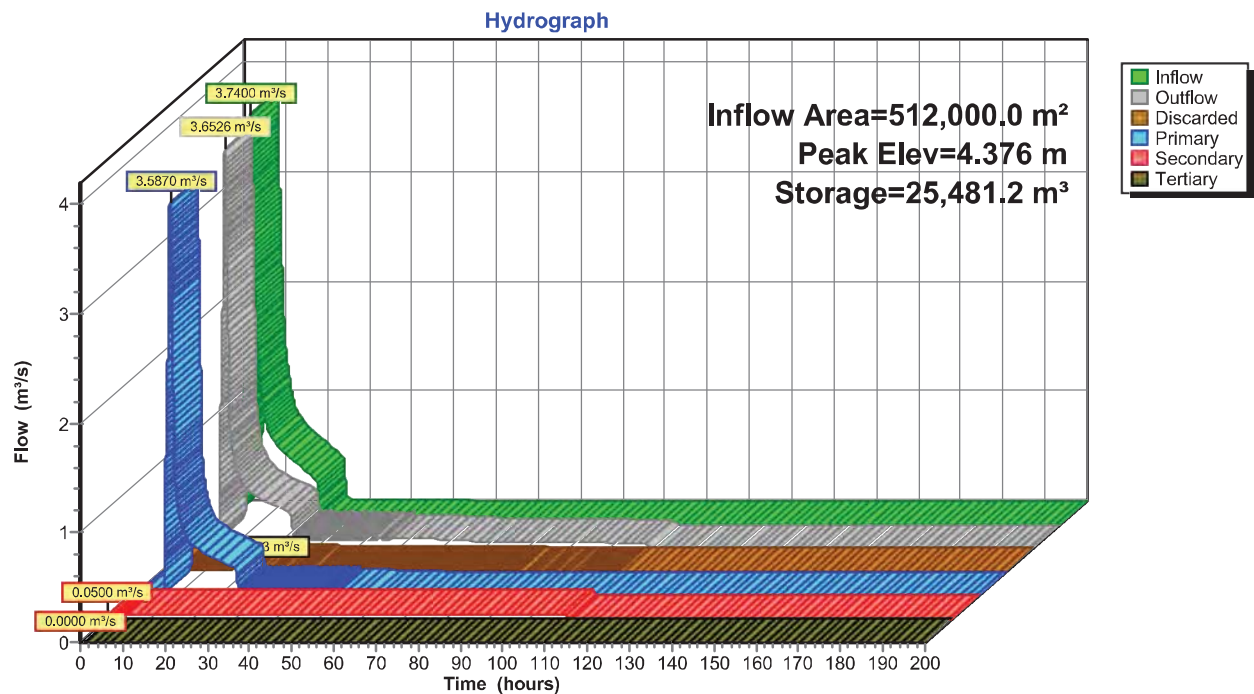
Summary for Pond 96P: Canal (Northern)

Inflow Area =	70,000.0 m²,	0.00% Impervious,	Inflow Depth =	158 mm	for 20yr Type 1A event
Inflow	=	0.6821 m³/s @	8.20 hrs, Volume=	11,055.5 m³	
Outflow	=	0.6142 m³/s @	8.35 hrs, Volume=	11,032.9 m³,	Atten= 10%, Lag= 8.9 min
Primary	=	0.6142 m³/s @	8.35 hrs, Volume=	11,032.9 m³	
		Routed to Pond 92P : Canal (Southern) Current			
Secondary =	0.0000 m³/s @	0.00 hrs, Volume=	0.0 m³		

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 4.675 m @ 8.37 hrs   Surf.Area= 510.3 m²   Storage= 376.5 m³

Plug-Flow detention time= 56.0 min calculated for 11,032.4 m³ (100% of inflow)
Center-of-Mass det. time= 54.9 min (754.2 - 699.2)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	621.4 m³	**2.60 mW x 75.00 mL x 1.50 mH 75m canal Z=1.8**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.600 m	**690 mm Round Culvert** L= 35.00 m Ke= 0.500 Inlet / Outlet Invert= 3.600 m / 3.600 m S= 0.0000 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.374 m²
#2	Secondary	5.000 m	**75.00 m long x 0.30 m breadth Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83

Primary OutFlow Max=0.6135 m³/s @ 8.35 hrs HW=4.674 m TW=4.293 m   (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.6135 m³/s @ 1.64 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.600 m   (Free Discharge)
└─**2=Overflow** (Controls 0.0000 m³/s)

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Pond 96P: Canal (Northern)

Hydrograph

Inflow Area=70,000.0 m²
Peak Elev=4.675 m
Storage=376.5 m³

Legend:
- Inflow
- Outflow
- Primary
- Secondary

0.6821 m³/s
0.6142 m³/s
0.6142 m³/s
0.0000 m³/s

Flow (m³/s)

Time (hours)
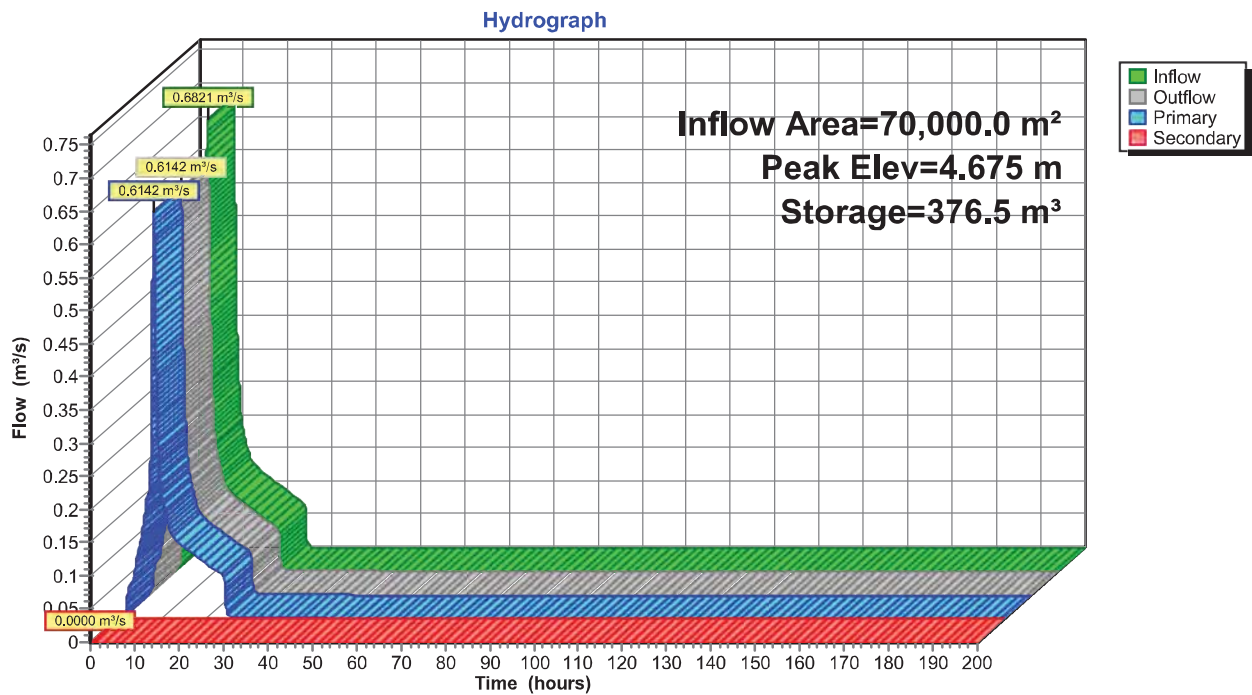
Summary for Pond 62P: Canal (Western) Current

Inflow Area =   226,000.0 m²,   0.00% Impervious, Inflow Depth =   190 mm   for 50yr Type 1A event
Inflow   =   2.6316 m³/s @   8.20 hrs, Volume=   42,879.9 m³
Outflow   =   2.3560 m³/s @   8.37 hrs, Volume=   42,705.1 m³, Atten= 10%, Lag= 10.4 min
Discarded =   0.0151 m³/s @   8.37 hrs, Volume=   2,289.5 m³
Primary   =   1.7740 m³/s @   8.37 hrs, Volume=   39,567.6 m³
     Routed to Pond 92P : Canal (Southern) Current
Secondary =   0.5669 m³/s @   8.37 hrs, Volume=   847.9 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 4.822 m @ 8.37 hrs   Surf.Area= 4,091.0 m²   Storage= 3,417.9 m³

Plug-Flow detention time= 154.0 min calculated for 42,702.9 m³ (100% of inflow)
Center-of-Mass det. time= 151.3 min (845.0 - 693.7)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	4,636.1 m³	**2.60 mW x 580.00 mL x 1.50 mH 580m canal Z=1.8**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.600 m	**1,200 mm Round Culvert** L= 15.00 m RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 3.600 m / 3.600 m S= 0.0000 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.131 m²
#2	Secondary	4.700 m	**9.20 m long + 2.0 m/m SideZ x 3.00 m breadth Spilllway** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 Coef. (Metric) 1.37 1.41 1.49 1.48 1.48 1.48 1.47 1.46
#3	Secondary	5.000 m	**580.00 m long x 0.30 m breadth Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83
#4	Discarded	3.700 m	**20.00 mm/hr Exfiltration over Wetted area above 3.700 m** Excluded Wetted area = 1,748.1 m²

Discarded OutFlow Max=0.0151 m³/s @ 8.37 hrs HW=4.822 m   (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 0.0151 m³/s)

Primary OutFlow Max=1.7740 m³/s @ 8.37 hrs HW=4.822 m TW=4.334 m   (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.7740 m³/s @ 1.91 m/s)

Secondary OutFlow Max=0.5668 m³/s @ 8.37 hrs HW=4.822 m   (Free Discharge)
├─**2=Spilllway** (Weir Controls 0.5668 m³/s @ 0.49 m/s)
└─**3=Overflow** (Controls 0.0000 m³/s)

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Pond 62P: Canal (Western) Current
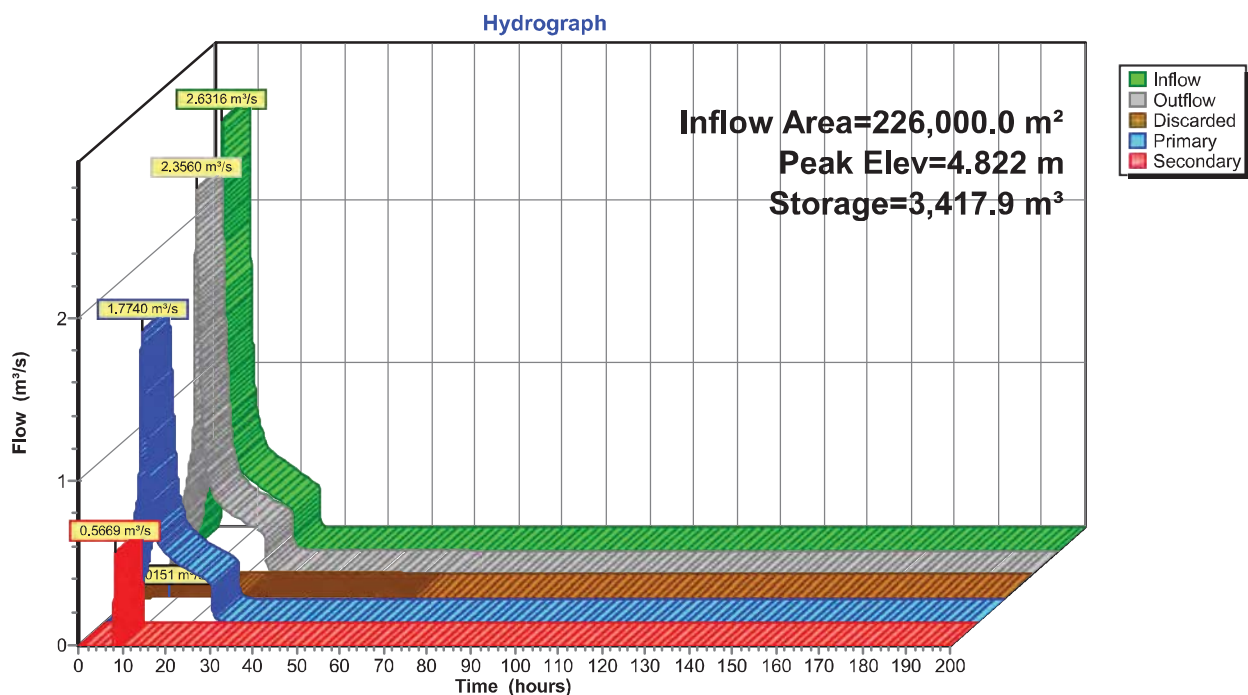
Summary for Pond 91P: Pond 2

Inflow Area =   547,000.0 m², 10.42% Impervious, Inflow Depth =   148 mm   for 50yr Type 1A event
Inflow   =   4.4525 m³/s @   8.51 hrs, Volume=   80,815.8 m³
Outflow   =   0.2165 m³/s @   24.00 hrs, Volume=   83,130.3 m³, Atten= 95%, Lag= 929.2 min
Discarded   =   0.0804 m³/s @   24.00 hrs, Volume=   29,777.4 m³
Primary   =   0.1361 m³/s @   24.00 hrs, Volume=   53,352.9 m³
     Routed to Pond 95P : 525 Pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.100 m   Surf.Area= 24,604.8 m² Storage= 5,435.2 m³
Peak Elev= 4.551 m @ 24.00 hrs   Surf.Area= 34,406.2 m² Storage= 50,902.2 m³   (45,466.9 m³ above start)

Plug-Flow detention time= 2,574.9 min calculated for 77,694.1 m³ (96% of inflow)
Center-of-Mass det. time= 2,149.1 min (3,750.6 - 1,601.5)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	81,468.4 m³	**Custom Stage Data (Conic)** Listed below

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
2.600	474.5	0.0	0.0	474.5
2.800	5,907.2	537.1	537.1	5,907.3
3.000	20,004.5	2,452.2	2,989.2	20,004.8
3.200	29,205.2	4,892.0	7,881.3	29,206.2
3.400	29,965.9	5,916.9	13,798.2	29,976.6
3.600	30,727.5	6,069.2	19,867.4	30,748.2
3.800	31,631.9	6,235.7	26,103.1	31,661.2
4.000	32,382.3	6,401.3	32,504.4	32,422.2
4.200	33,112.6	6,549.4	39,053.7	33,163.7
4.400	33,844.5	6,695.6	45,749.3	33,907.0
4.600	34,590.5	6,843.4	52,592.7	34,664.5
4.800	35,339.0	6,992.8	59,585.5	35,424.6
5.000	36,095.3	7,143.3	66,728.8	36,192.7
5.200	36,849.2	7,294.3	74,023.1	36,958.6
5.400	37,605.2	7,445.3	81,468.4	37,726.9

Device	Routing	Invert	Outlet Devices (Turned on 2 times)
#1	Primary	3.240 m	**Pump - Total 290m3/hr** Discharges@4.000 m Turns Off<3.100 m 200 mm Diam. x 25.00 m Long Discharge, Hazen-Williams C= 130 Flow (l/min)= 4,833.0 4,833.3 Head (meters)= 10.000 0.000 -Loss (meters)= 0.775 0.775 =Lift (meters)= 9.225 -0.775
#2	Primary	3.440 m	**Pump - Total 490m3/hr** Discharges@4.000 m Turns Off<3.100 m 200 mm Diam. x 25.00 m Long Discharge, Hazen-Williams C= 130 Flow (l/min)= 3,333.0 3,333.7 Head (meters)= 10.000 0.000 -Loss (meters)= 0.389 0.389 =Lift (meters)= 9.611 -0.389
#3	Discarded	3.000 m	**20.00 mm/hr Exfiltration over Wetted area above 3.000 m** Excluded Wetted area = 20,004.8 m²

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Discarded OutFlow Max=0.0804 m³/s @ 24.00 hrs HW=4.551 m   (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.0804 m³/s)

Primary OutFlow Max=0.1361 m³/s @ 24.00 hrs HW=4.551 m TW=4.494 m   (Dynamic Tailwater)
├─**1=Pump - Total 290m3/hr** (Pump Controls 0.0806 m³/s)
└─**2=Pump - Total 490m3/hr** (Pump Controls 0.0556 m³/s)

Pond 91P: Pond 2

Hydrograph

Inflow Area=547,000.0 m²
Peak Elev=4.551 m
Storage=50,902.2 m³

Legend: Inflow, Outflow, Discarded, Primary

4.4525 m³/s
0.2165 m³/s
0.0804 m³/s
0.1361 m³/s

Flow (m³/s) vs Time (hours)

Summary for Pond 92P: Canal (Southern) Current

Inflow Area =   490,000.0 m²,   0.00% Impervious, Inflow Depth =   176 mm   for 50yr Type 1A event
Inflow   =   4.4409 m³/s @   8.27 hrs, Volume=   86,278.8 m³
Outflow   =   4.2883 m³/s @   8.39 hrs, Volume=   85,874.5 m³, Atten= 3%, Lag= 7.3 min
Discarded =   0.0257 m³/s @   24.02 hrs, Volume=   4,985.7 m³
Primary   =   4.2691 m³/s @   8.39 hrs, Volume=   80,888.8 m³
     Routed to Pond 94P : Pond 1
Secondary =   0.0000 m³/s @   0.00 hrs, Volume=   0.0 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 4.551 m @ 24.02 hrs   Surf.Area= 0.7941 ha   Storage= 5.399 Ml

Plug-Flow detention time= 174.9 min calculated for 85,870.2 m³ (100% of inflow)
Center-of-Mass det. time= 160.6 min (893.4 - 732.8)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	10.479 Ml	**2.60 mW x 1,315.00 mL x 1.50 mH 1315m canal Z=1.8**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.950 m	**10.00 m long Weir** 2 End Contraction(s)
#2	Secondary	5.000 m	**620.00 m long x 0.30 m breadth Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83
#3	Discarded	3.700 m	**20.00 mm/hr Exfiltration over Wetted area above 3.700 m** Excluded Wetted area = 0.3962 ha

Discarded OutFlow Max=0.0257 m³/s @ 24.02 hrs HW=4.551 m   (Free Discharge)
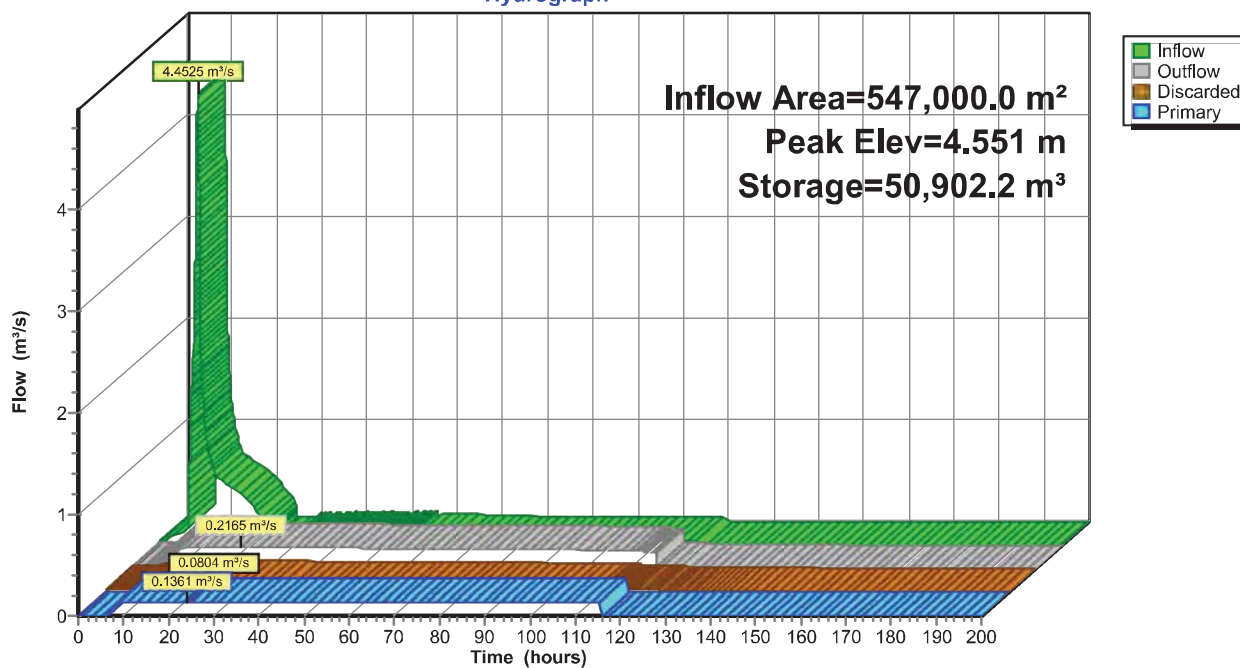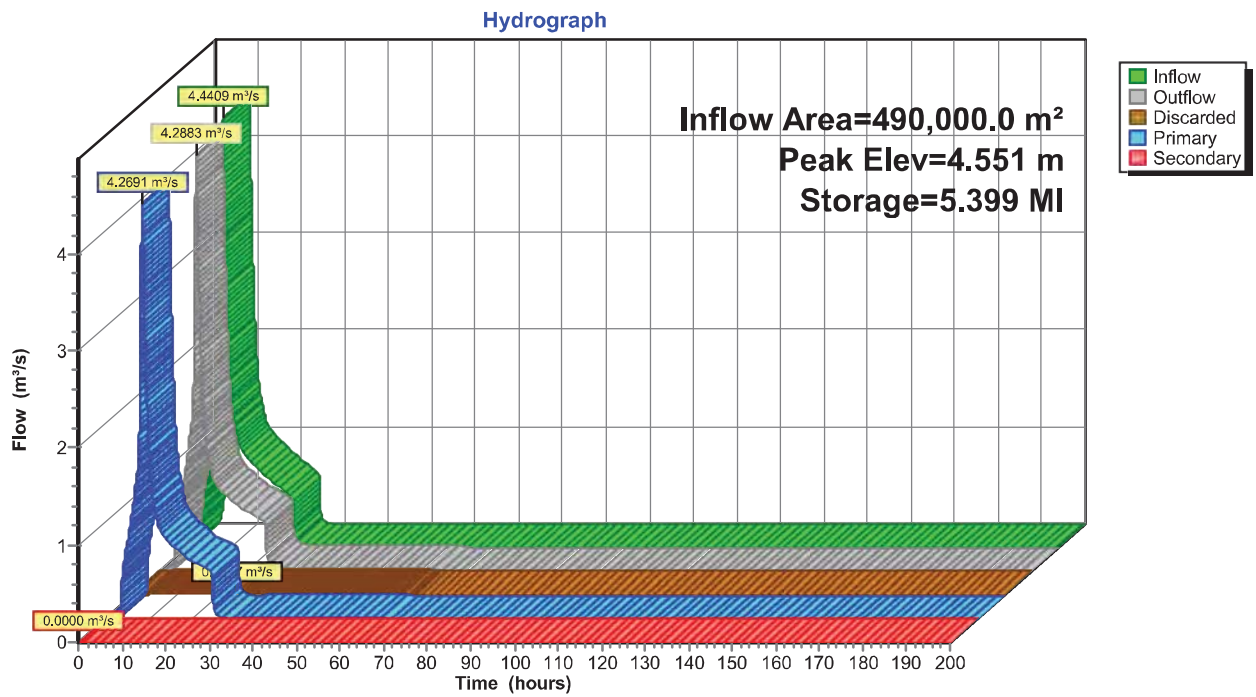└─**3=Exfiltration** (Exfiltration Controls 0.0257 m³/s)

Primary OutFlow Max=4.2690 m³/s @ 8.39 hrs HW=4.334 m TW=3.865 m   (Dynamic Tailwater)
└─**1=Weir** (Weir Controls 4.2690 m³/s @ 1.12 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.600 m   (Free Discharge)
└─**2=Overflow** (Controls 0.0000 m³/s)

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Pond 92P: Canal (Southern) Current

Hydrograph

Inflow Area=490,000.0 m²
Peak Elev=4.551 m
Storage=5.399 Ml

Legend:
- Inflow
- Outflow
- Discarded
- Primary
- Secondary

4.4409 m³/s
4.2883 m³/s
4.2691 m³/s
0.____ m³/s
0.0000 m³/s

Flow (m³/s)

Time (hours)

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Summary for Pond 93P: 825 pipe

Inflow Area =   547,000.0 m², 10.42% Impervious, Inflow Depth =   106 mm   for 50yr Type 1A event
Inflow   =   0.4088 m³/s @   24.01 hrs, Volume=   58,024.6 m³
Outflow   =   0.4088 m³/s @   24.01 hrs, Volume=   58,022.1 m³, Atten= 0%, Lag= 0.0 min
Primary   =   0.4088 m³/s @   24.01 hrs, Volume=   58,022.1 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 3.986 m @ 24.01 hrs   Surf.Area= 3.1 m²   Storage= 4.4 m³

Plug-Flow detention time= 0.5 min calculated for 58,022.1 m³ (100% of inflow)
Center-of-Mass det. time= 0.3 min (3,522.9 - 3,522.7)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	15.7 m³	**2.00 mD x 5.00 mH Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.420 m	**900 mm Round Culvert** L= 38.78 m Ke= 0.500 Inlet / Outlet Invert= 3.420 m / 3.346 m S= 0.0019 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.636 m²

Primary OutFlow Max=0.4088 m³/s @ 24.01 hrs HW=3.986 m   (Free Discharge)
└─1=Culvert (Barrel Controls 0.4088 m³/s @ 1.38 m/s)

Pond 93P: 825 pipe
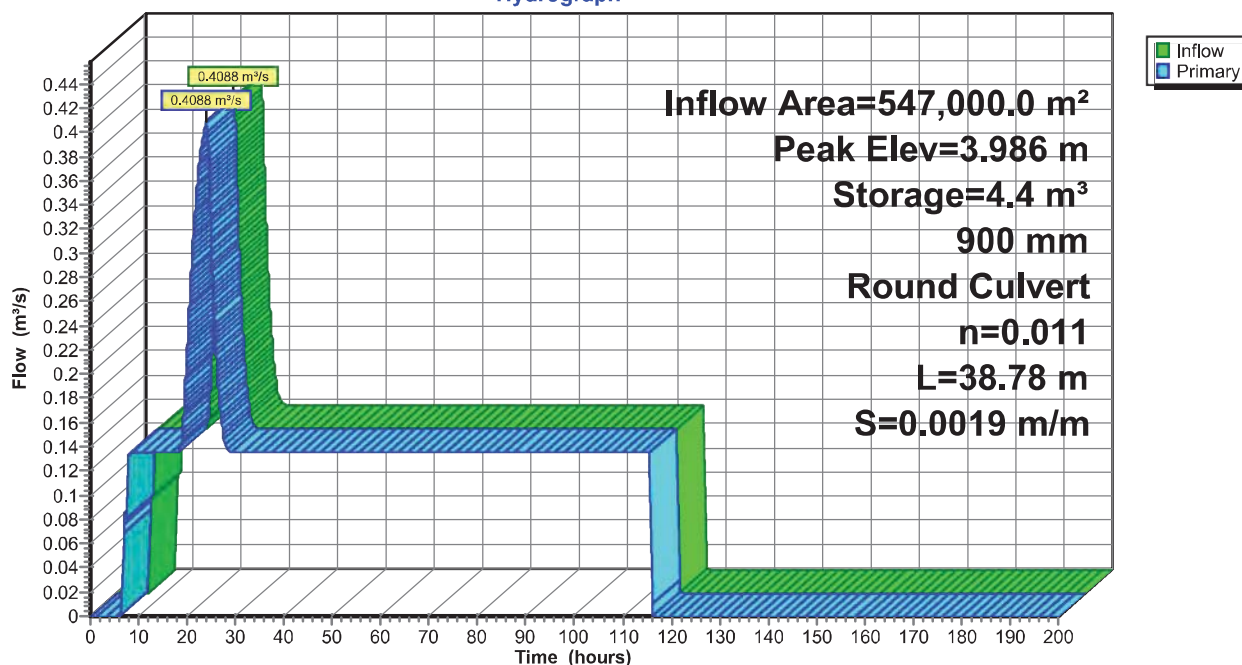
Summary for Pond 94P: Pond 1

Inflow Area =   512,000.0 m²,   4.30% Impervious, Inflow Depth =   167 mm   for 50yr Type 1A event
Inflow   =   4.3823 m³/s @   8.38 hrs, Volume=   85,330.7 m³
Outflow   =   4.2818 m³/s @   8.49 hrs, Volume=   85,292.4 m³, Atten= 2%, Lag= 6.7 min
Discarded =   0.0296 m³/s @   24.01 hrs, Volume=   6,868.0 m³
Primary   =   4.2160 m³/s @   8.49 hrs, Volume=   52,509.7 m³
     Routed to Pond 91P : Pond 2
Secondary =   0.0500 m³/s @   0.00 hrs, Volume=   21,239.4 m³
     Routed to Pond 91P : Pond 2
Tertiary   =   0.2727 m³/s @   24.01 hrs, Volume=   4,675.3 m³
     Routed to Pond 93P : 825 pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.300 m   Surf.Area= 17,483.7 m²   Storage= 3,905.5 m³
Peak Elev= 4.551 m @ 24.01 hrs   Surf.Area= 22,774.2 m²   Storage= 29,418.1 m³ (25,512.6 m³ above start)

Plug-Flow detention time= 1,139.9 min calculated for 81,382.8 m³ (95% of inflow)
Center-of-Mass det. time= 1,004.4 min (1,768.9 - 764.5)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	50,024.2 m³	**Custom Stage Data (Conic)** Listed below

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
2.600	31.5	0.0	0.0	31.5
2.800	605.0	51.6	51.6	605.1
3.000	2,950.9	326.1	377.8	2,951.2
3.200	16,722.6	1,779.9	2,157.7	16,723.0
3.400	18,244.7	3,495.6	5,653.3	18,248.0
3.600	19,084.6	3,732.6	9,385.9	19,093.5
3.800	20,068.2	3,914.9	13,300.8	20,082.1
4.000	20,826.6	4,089.2	17,390.0	20,847.2
4.200	21,580.7	4,240.5	21,630.5	21,608.3
4.400	22,261.0	4,384.0	26,014.5	22,296.7
4.600	22,942.6	4,520.2	30,534.7	22,986.6
4.800	23,626.5	4,656.7	35,191.4	23,679.0
5.000	24,332.5	4,795.7	39,987.2	24,393.5
5.200	25,108.0	4,943.8	44,931.0	25,176.9
5.400	25,826.0	5,093.2	50,024.2	25,903.8

Device	Routing	Invert	Outlet Devices
#1	Primary	3.750 m	**75.00 m long x 3.00 m breadth Weir** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 Coef. (Metric) 1.37 1.41 1.49 1.48 1.48 1.48 1.47 1.46
#2	Discarded	3.300 m	**20.00 mm/hr Exfiltration over Wetted area above 3.300 m** Excluded Wetted area = 17,485.5 m²
#3	Secondary	3.300 m	**0.0500 m³/s Through bund when above 3.300 m**
#4	Tertiary	3.449 m	**825 mm Round Culvert** L= 15.00 m Ke= 0.500 Inlet / Outlet Invert= 3.449 m / 3.420 m S= 0.0019 m/m Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.535 m²
#5	Device 4	4.470 m	**2,100 mm Horiz. Scruffy dome** C= 0.600 Limited to weir flow at low heads

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Discarded OutFlow Max=0.0296 m³/s @ 24.01 hrs HW=4.551 m   (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.0296 m³/s)

Primary OutFlow Max=4.2157 m³/s @ 8.49 hrs HW=3.867 m TW=3.684 m   (Dynamic Tailwater)
└─**1=Weir** (Weir Controls 4.2157 m³/s @ 0.48 m/s)

Secondary OutFlow Max=0.0500 m³/s @ 0.00 hrs HW=3.300 m TW=3.100 m   (Dynamic Tailwater)
└─**3=Through bund** (Exfiltration Controls 0.0500 m³/s)

Tertiary OutFlow Max=0.2727 m³/s @ 24.01 hrs HW=4.551 m TW=3.986 m   (Dynamic Tailwater)
└─**4=Culvert** (Passes 0.2727 m³/s of 0.9919 m³/s potential flow)
  └─**5=Scruffy dome** (Weir Controls 0.2727 m³/s @ 0.51 m/s)

Pond 94P: Pond 1

Hydrograph
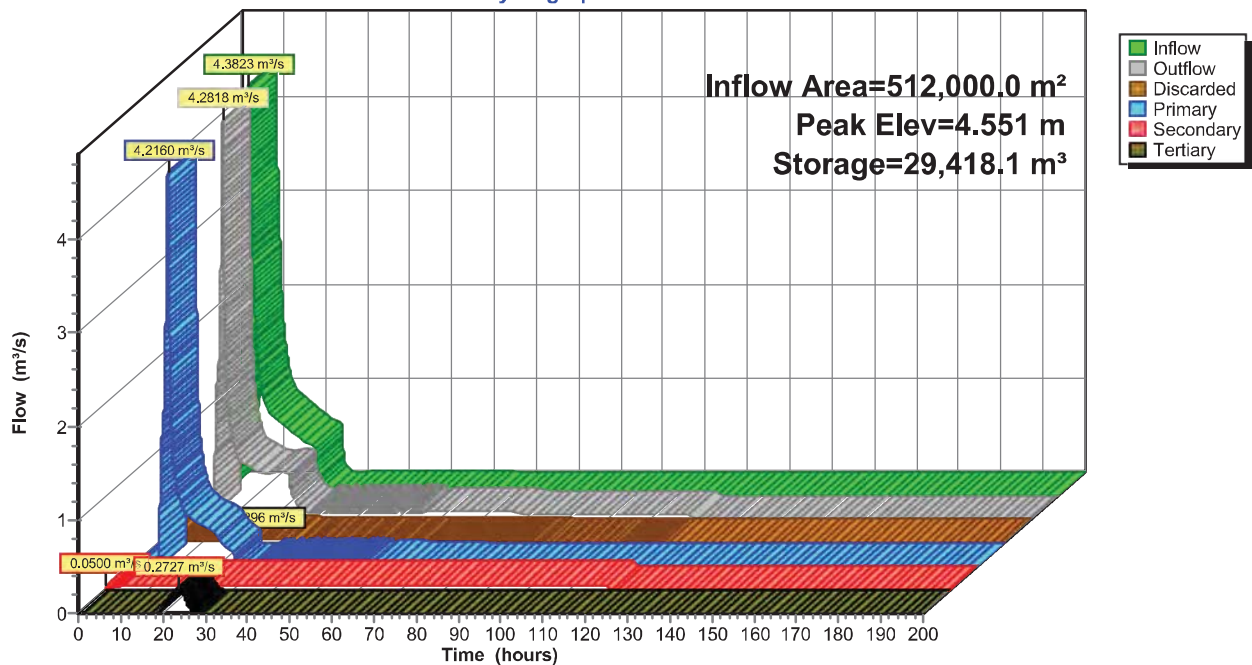
Inflow Area=512,000.0 m²
Peak Elev=4.551 m
Storage=29,418.1 m³

Legend:
- Inflow
- Outflow
- Discarded
- Primary
- Secondary
- Tertiary

4.3823 m³/s
4.2818 m³/s
4.2160 m³/s
0.0500 m³/s 0.2727 m³/s

Flow (m³/s) vs Time (hours)

Summary for Pond 96P: Canal (Northern)

Inflow Area =   70,000.0 m²,   0.00% Impervious, Inflow Depth =   190 mm   for 50yr Type 1A event
Inflow   =   0.8151 m³/s @   8.20 hrs, Volume=   13,281.4 m³
Outflow   =   0.7195 m³/s @   8.38 hrs, Volume=   13,258.3 m³, Atten= 12%, Lag= 10.8 min
Primary   =   0.7195 m³/s @   8.38 hrs, Volume=   13,258.3 m³
          Routed to Pond 92P : Canal (Southern) Current
Secondary =   0.0000 m³/s @   0.00 hrs, Volume=   0.0 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 4.858 m @ 8.38 hrs   Surf.Area= 567.0 m²   Storage= 475.0 m³

Plug-Flow detention time= 63.9 min calculated for 13,258.3 m³ (100% of inflow)
Center-of-Mass det. time= 62.6 min (756.2 - 693.7)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	621.4 m³	**2.60 mW x 75.00 mL x 1.50 mH 75m canal Z=1.8**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.600 m	**690 mm Round Culvert** L= 35.00 m Ke= 0.500 Inlet / Outlet Invert= 3.600 m / 3.600 m S= 0.0000 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.374 m²
#2	Secondary	5.000 m	**75.00 m long x 0.30 m breadth Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83

Primary OutFlow Max=0.7193 m³/s @ 8.38 hrs HW=4.858 m TW=4.334 m   (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.7193 m³/s @ 1.92 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.600 m   (Free Discharge)
└─**2=Overflow** (Controls 0.0000 m³/s)

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Pond 96P: Canal (Northern)

Hydrograph

Inflow Area=70,000.0 m²
Peak Elev=4.858 m
Storage=475.0 m³

Legend:
- Inflow
- Outflow
- Primary
- Secondary

0.8151 m³/s
0.7195 m³/s
0.7195 m³/s
0.0000 m³/s

Flow (m³/s)

Time (hours)
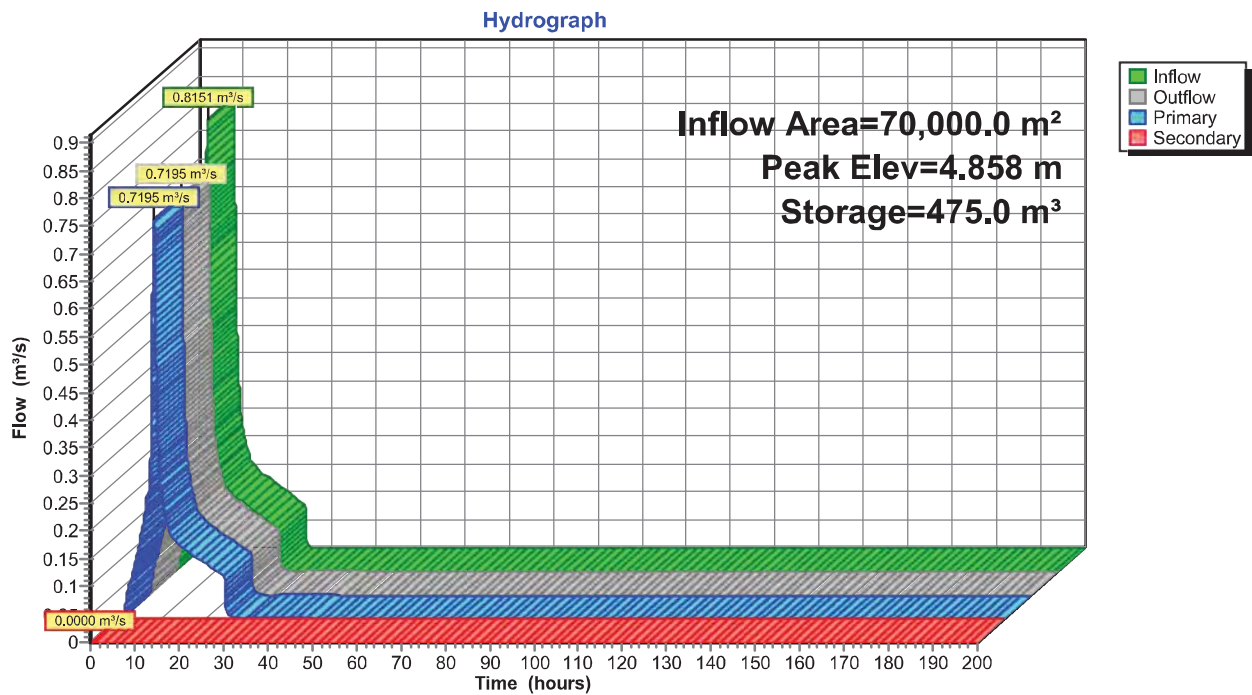
Summary for Pond 62P: Canal (Western) Current

Inflow Area =   226,000.0 m²,   0.00% Impervious, Inflow Depth =   215 mm   for 100yr Type 1A event
Inflow   =   2.9656 m³/s @   8.20 hrs, Volume=   48,502.6 m³
Outflow   =   2.7578 m³/s @   8.33 hrs, Volume=   48,327.2 m³, Atten= 7%, Lag= 8.1 min
Discarded =   0.0156 m³/s @   8.33 hrs, Volume=   2,424.2 m³
Primary   =   1.8570 m³/s @   8.33 hrs, Volume=   44,346.1 m³
    Routed to Pond 92P : Canal (Southern) Current
Secondary =   0.8852 m³/s @   8.33 hrs, Volume=   1,557.0 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 4.860 m @ 8.33 hrs   Surf.Area= 4,171.7 m²   Storage= 3,574.4 m³

Plug-Flow detention time= 146.2 min calculated for 48,324.8 m³ (100% of inflow)
Center-of-Mass det. time= 143.9 min (834.1 - 690.2)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	4,636.1 m³	**2.60 mW x 580.00 mL x 1.50 mH 580m canal Z=1.8**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.600 m	**1,200 mm Round Culvert** L= 15.00 m RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 3.600 m / 3.600 m S= 0.0000 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.131 m²
#2	Secondary	4.700 m	**9.20 m long + 2.0 m/m SideZ x 3.00 m breadth Spilllway** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 Coef. (Metric) 1.37 1.41 1.49 1.48 1.48 1.48 1.47 1.46
#3	Secondary	5.000 m	**580.00 m long x 0.30 m breadth Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83
#4	Discarded	3.700 m	**20.00 mm/hr Exfiltration over Wetted area above 3.700 m** Excluded Wetted area = 1,748.1 m²

Discarded OutFlow Max=0.0156 m³/s @ 8.33 hrs HW=4.860 m   (Free Discharge)
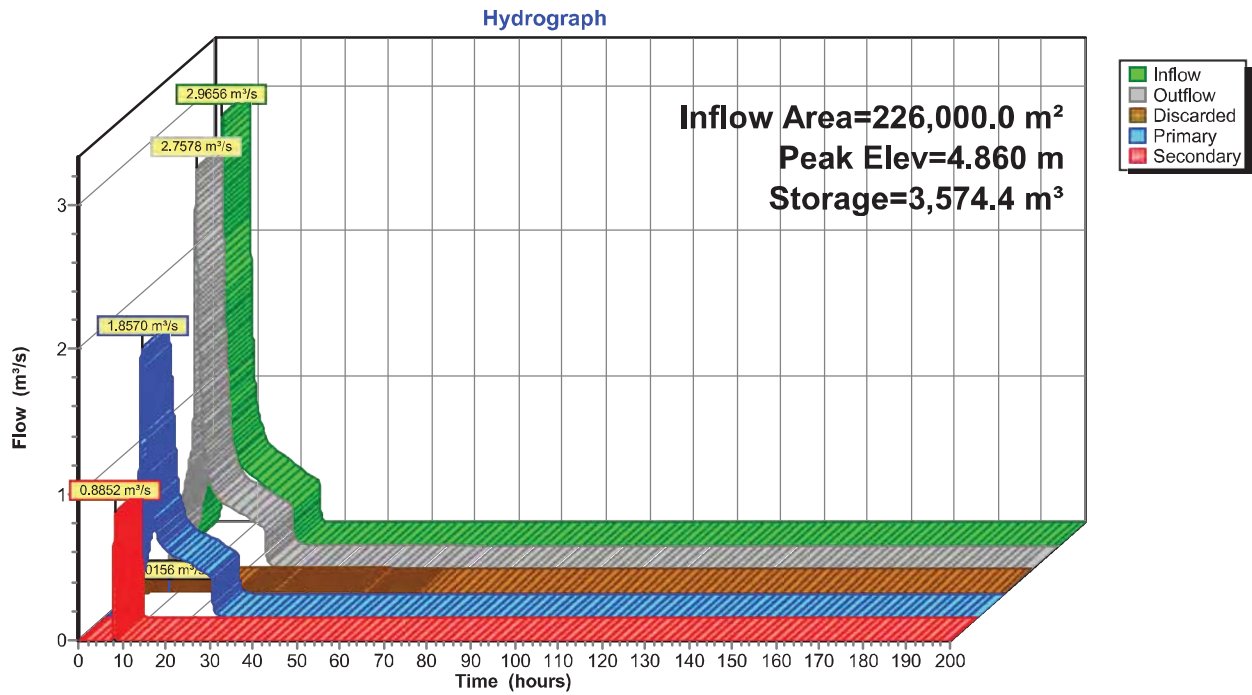└─**4=Exfiltration** (Exfiltration Controls 0.0156 m³/s)

Primary OutFlow Max=1.8569 m³/s @ 8.33 hrs HW=4.860 m TW=4.359 m   (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.8569 m³/s @ 1.94 m/s)

Secondary OutFlow Max=0.8850 m³/s @ 8.33 hrs HW=4.860 m   (Free Discharge)
├─**2=Spilllway** (Weir Controls 0.8850 m³/s @ 0.58 m/s)
└─**3=Overflow** (Controls 0.0000 m³/s)

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Pond 62P: Canal (Western) Current

Hydrograph

Inflow Area=226,000.0 m²
Peak Elev=4.860 m
Storage=3,574.4 m³

Legend: Inflow, Outflow, Discarded, Primary, Secondary

Flow (m³/s)

2.9656 m³/s
2.7578 m³/s
1.8570 m³/s
0.8852 m³/s
0156 m³/s

Time (hours)

Summary for Pond 91P: Pond 2

Inflow Area =   547,000.0 m², 10.42% Impervious, Inflow Depth =   150 mm   for 100yr Type 1A event
Inflow   =   4.8349 m³/s @   8.38 hrs, Volume=   82,293.3 m³
Outflow   =   0.2174 m³/s @   21.57 hrs, Volume=   84,600.5 m³, Atten= 96%, Lag= 791.1 min
Discarded   =   0.0813 m³/s @   21.57 hrs, Volume=   30,360.8 m³
Primary   =   0.1361 m³/s @   21.57 hrs, Volume=   54,239.7 m³
      Routed to Pond 95P : 525 Pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.100 m   Surf.Area= 24,604.8 m² Storage= 5,435.2 m³
Peak Elev= 4.594 m @ 21.57 hrs   Surf.Area= 34,567.2 m² Storage= 52,378.5 m³   (46,943.2 m³ above start)

Plug-Flow detention time= 2,630.5 min calculated for 79,160.4 m³ (96% of inflow)
Center-of-Mass det. time= 2,204.8 min (3,776.3 - 1,571.6)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	81,468.4 m³	**Custom Stage Data (Conic)** Listed below

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
2.600	474.5	0.0	0.0	474.5
2.800	5,907.2	537.1	537.1	5,907.3
3.000	20,004.5	2,452.2	2,989.2	20,004.8
3.200	29,205.2	4,892.0	7,881.3	29,206.2
3.400	29,965.9	5,916.9	13,798.2	29,976.6
3.600	30,727.5	6,069.2	19,867.4	30,748.2
3.800	31,631.9	6,235.7	26,103.1	31,661.2
4.000	32,382.3	6,401.3	32,504.4	32,422.2
4.200	33,112.6	6,549.4	39,053.7	33,163.7
4.400	33,844.5	6,695.6	45,749.3	33,907.0
4.600	34,590.5	6,843.4	52,592.7	34,664.5
4.800	35,339.0	6,992.8	59,585.5	35,424.6
5.000	36,095.3	7,143.3	66,728.8	36,192.7
5.200	36,849.2	7,294.3	74,023.1	36,958.6
5.400	37,605.2	7,445.3	81,468.4	37,726.9

Device	Routing	Invert	Outlet Devices (Turned on 2 times)
#1	Primary	3.240 m	**Pump - Total 290m3/hr** Discharges@4.000 m Turns Off<3.100 m 200 mm Diam. x 25.00 m Long Discharge, Hazen-Williams C= 130

  Flow (l/min)= 4,833.0 4,833.3
  Head (meters)= 10.000 0.000
 -Loss (meters)= 0.775 0.775
 =Lift (meters)=   9.225 -0.775

#2	Primary	3.440 m	**Pump - Total 490m3/hr** Discharges@4.000 m Turns Off<3.100 m 200 mm Diam. x 25.00 m Long Discharge, Hazen-Williams C= 130

  Flow (l/min)= 3,333.0 3,333.7
  Head (meters)= 10.000 0.000
 -Loss (meters)= 0.389 0.389
 =Lift (meters)=   9.611 -0.389

#3	Discarded	3.000 m	**20.00 mm/hr Exfiltration over Wetted area above 3.000 m** Excluded Wetted area = 20,004.8 m²

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Discarded OutFlow Max=0.0813 m³/s @ 21.57 hrs HW=4.594 m   (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.0813 m³/s)

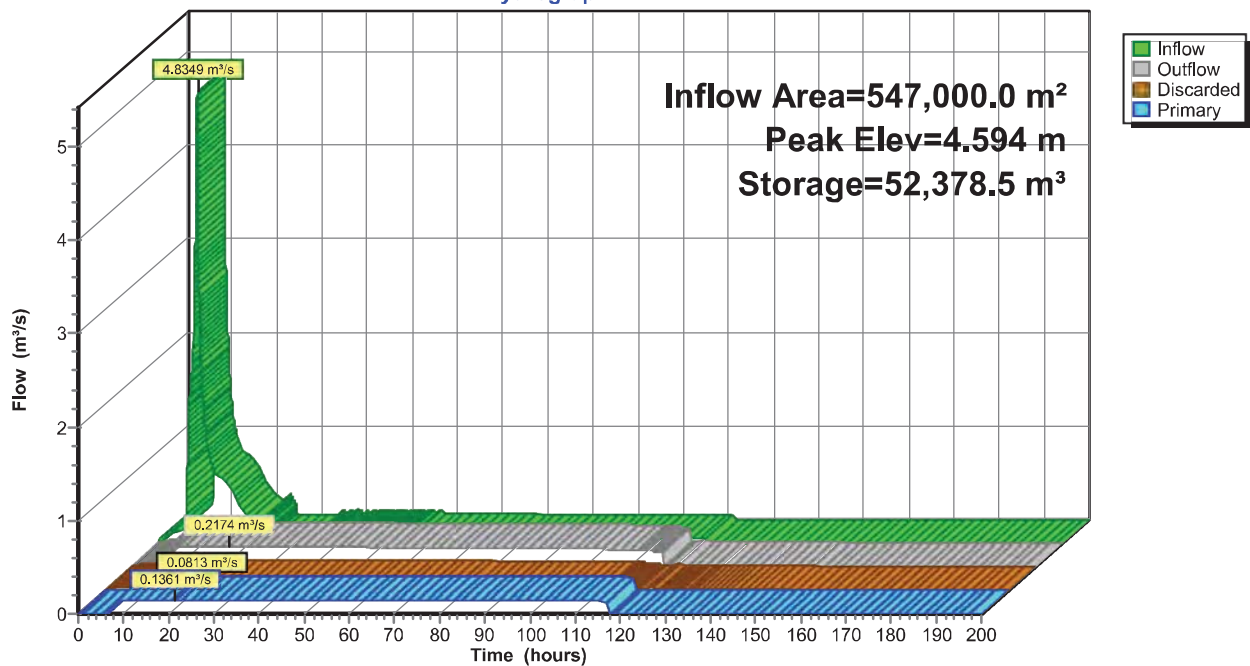**Primary OutFlow** Max=0.1361 m³/s @ 21.57 hrs HW=4.594 m TW=4.494 m   (Dynamic Tailwater)
├─**1=Pump - Total 290m3/hr** (Pump Controls 0.0806 m³/s)
└─**2=Pump - Total 490m3/hr** (Pump Controls 0.0556 m³/s)

Pond 91P: Pond 2

Hydrograph

Inflow Area=547,000.0 m²
Peak Elev=4.594 m
Storage=52,378.5 m³

Legend: Inflow, Outflow, Discarded, Primary

4.8349 m³/s
0.2174 m³/s
0.0813 m³/s
0.1361 m³/s

Summary for Pond 92P: Canal (Southern) Current

Inflow Area =   490,000.0 m², 0.00% Impervious, Inflow Depth =   199 mm   for 100yr Type 1A event
Inflow   =   4.8918 m³/s @   8.25 hrs, Volume=   97,433.6 m³
Outflow   =   4.7294 m³/s @   8.37 hrs, Volume=   97,027.4 m³, Atten= 3%, Lag= 7.5 min
Discarded   =   0.0270 m³/s @   21.56 hrs, Volume=   5,278.1 m³
Primary   =   4.7095 m³/s @   8.37 hrs, Volume=   91,749.4 m³
       Routed to Pond 94P : Pond 1
Secondary =   0.0000 m³/s @   0.00 hrs, Volume=   0.0 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 4.594 m @ 21.56 hrs   Surf.Area= 0.8148 ha   Storage= 5.748 Ml

Plug-Flow detention time= 166.4 min calculated for 97,027.4 m³ (100% of inflow)
Center-of-Mass det. time= 153.0 min (883.7 - 730.7)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	10.479 Ml	**2.60 mW x 1,315.00 mL x 1.50 mH 1315m canal Z=1.8**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.950 m	**10.00 m long Weir** 2 End Contraction(s)
#2	Secondary	5.000 m	**620.00 m long x 0.30 m breadth Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83
#3	Discarded	3.700 m	**20.00 mm/hr Exfiltration over Wetted area above 3.700 m** Excluded Wetted area = 0.3962 ha

Discarded OutFlow Max=0.0270 m³/s @ 21.56 hrs HW=4.594 m   (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.0270 m³/s)

Primary OutFlow Max=4.7092 m³/s @ 8.37 hrs HW=4.360 m TW=3.873 m   (Dynamic Tailwater)
└─**1=Weir** (Weir Controls 4.7092 m³/s @ 1.16 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.600 m   (Free Discharge)
└─**2=Overflow** (Controls 0.0000 m³/s)

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Type IA 24-hr 100yr Type 1A Rainfall=233 mm
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Pond 92P: Canal (Southern) Current

Hydrograph

Inflow Area=490,000.0 m²
Peak Elev=4.594 m
Storage=5.748 Ml

Legend:
- Inflow
- Outflow
- Discarded
- Primary
- Secondary

4.8918 m³/s
4.7294 m³/s
4.7095 m³/s
0.0000 m³/s
0.0000 m³/s
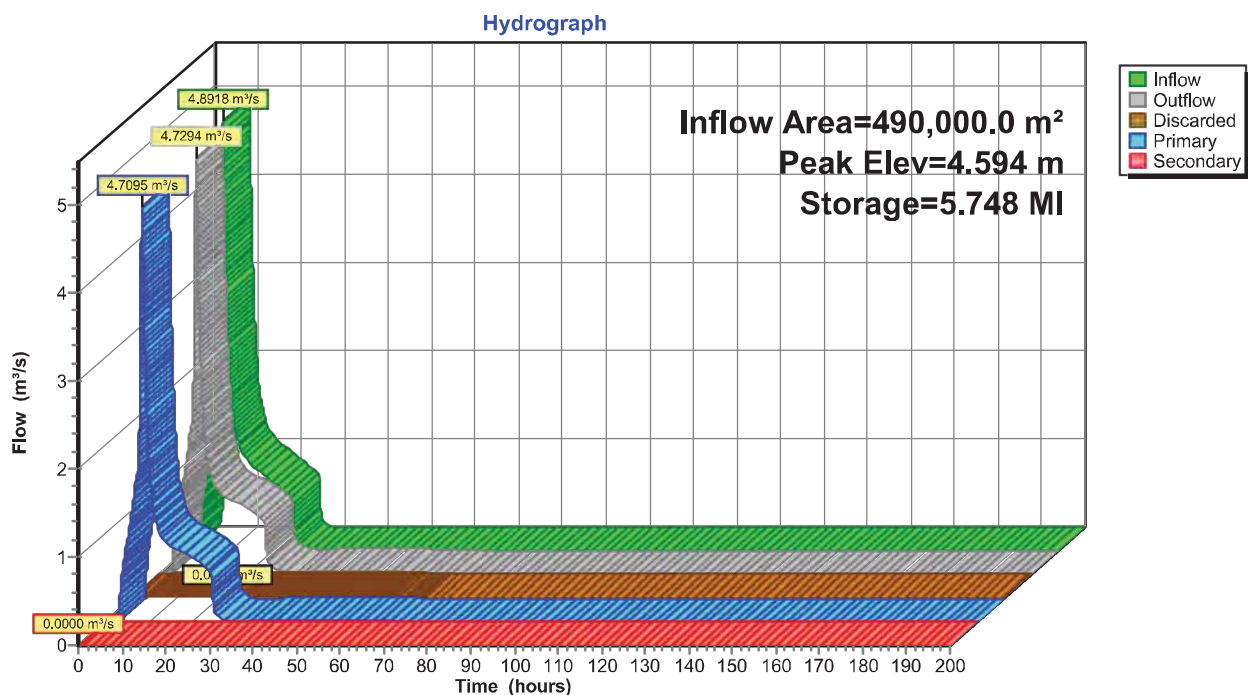
Summary for Pond 93P: 825 pipe

Inflow Area =   547,000.0 m², 10.42% Impervious, Inflow Depth =   127 mm   for 100yr Type 1A event
Inflow   =   0.6549 m³/s @   21.58 hrs, Volume=   69,440.1 m³
Outflow   =   0.6549 m³/s @   21.58 hrs, Volume=   69,437.5 m³, Atten= 0%, Lag= 0.0 min
Primary   =   0.6549 m³/s @   21.58 hrs, Volume=   69,437.5 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 4.167 m @ 21.58 hrs   Surf.Area= 3.1 m²   Storage= 4.9 m³

Plug-Flow detention time= 0.4 min calculated for 69,434.0 m³ (100% of inflow)
Center-of-Mass det. time= 0.2 min (3,201.9 - 3,201.7)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	15.7 m³	**2.00 mD x 5.00 mH Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.420 m	**900 mm Round Culvert** L= 38.78 m Ke= 0.500 Inlet / Outlet Invert= 3.420 m / 3.346 m S= 0.0019 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.636 m²

Primary OutFlow Max=0.6549 m³/s @ 21.58 hrs HW=4.167 m   (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.6549 m³/s @ 1.57 m/s)

Pond 93P: 825 pipe

Hydrograph

Inflow Area=547,000.0 m²
Peak Elev=4.167 m
Storage=4.9 m³
900 mm
Round Culvert
n=0.011
L=38.78 m
S=0.0019 m/m
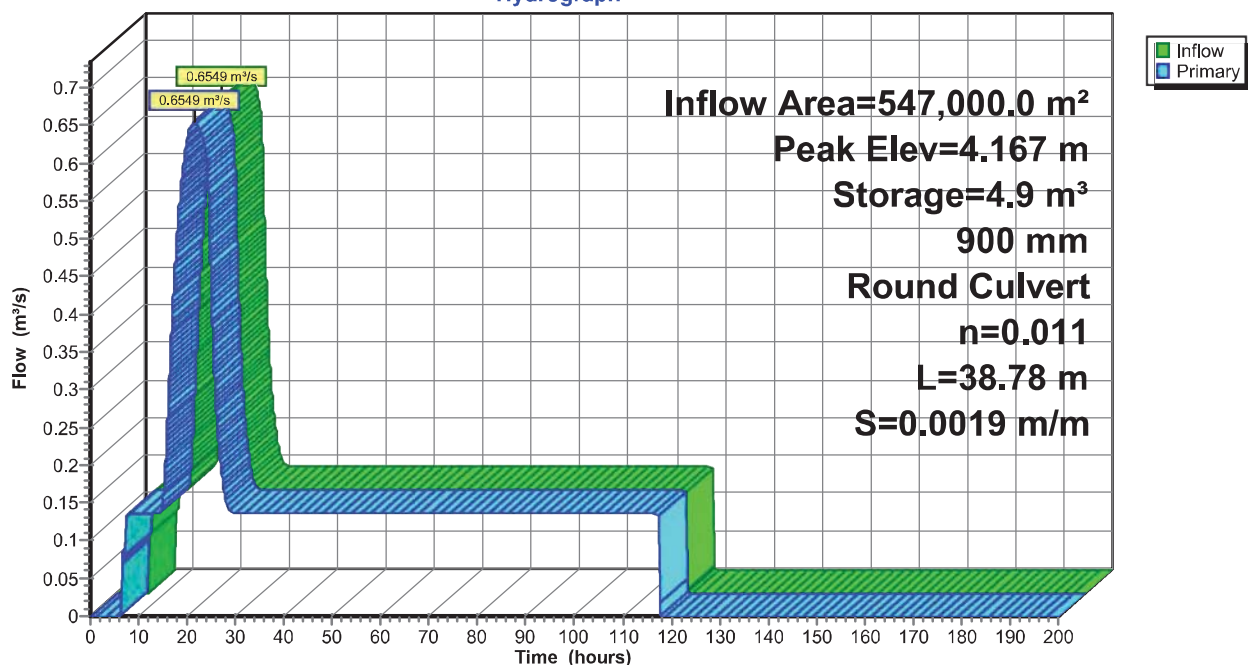
Summary for Pond 94P: Pond 1

Inflow Area = 512,000.0 m², 4.30% Impervious, Inflow Depth = 189 mm for 100yr Type 1A event
Inflow = 4.8386 m³/s @ 8.37 hrs, Volume= 96,741.0 m³
Outflow = 4.6483 m³/s @ 8.38 hrs, Volume= 96,699.7 m³, Atten= 4%, Lag= 1.0 min
Discarded = 0.0304 m³/s @ 21.58 hrs, Volume= 7,143.8 m³
Primary = 4.5823 m³/s @ 8.38 hrs, Volume= 52,803.9 m³
    Routed to Pond 91P : Pond 2
Secondary = 0.0500 m³/s @ 0.00 hrs, Volume= 21,548.1 m³
    Routed to Pond 91P : Pond 2
Tertiary = 0.5188 m³/s @ 21.58 hrs, Volume= 15,203.8 m³
    Routed to Pond 93P : 825 pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.300 m   Surf.Area= 17,483.7 m²   Storage= 3,905.5 m³
Peak Elev= 4.594 m @ 21.58 hrs   Surf.Area= 22,921.3 m²   Storage= 30,393.2 m³   (26,487.8 m³ above start)

Plug-Flow detention time= 1,049.5 min calculated for 92,789.6 m³ (96% of inflow)
Center-of-Mass det. time= 931.1 min (1,695.7 - 764.7)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	50,024.2 m³	**Custom Stage Data (Conic)** Listed below

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
2.600	31.5	0.0	0.0	31.5
2.800	605.0	51.6	51.6	605.1
3.000	2,950.9	326.1	377.8	2,951.2
3.200	16,722.6	1,779.9	2,157.7	16,723.0
3.400	18,244.7	3,495.6	5,653.3	18,248.0
3.600	19,084.6	3,732.6	9,385.9	19,093.5
3.800	20,068.2	3,914.9	13,300.8	20,082.1
4.000	20,826.6	4,089.2	17,390.0	20,847.2
4.200	21,580.7	4,240.5	21,630.5	21,608.3
4.400	22,261.0	4,384.0	26,014.5	22,296.7
4.600	22,942.6	4,520.2	30,534.7	22,986.6
4.800	23,626.5	4,656.7	35,191.4	23,679.0
5.000	24,332.5	4,795.7	39,987.2	24,393.5
5.200	25,108.0	4,943.8	44,931.0	25,176.9
5.400	25,826.0	5,093.2	50,024.2	25,903.8

Device	Routing	Invert	Outlet Devices
#1	Primary	3.750 m	**75.00 m long x 3.00 m breadth Weir** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 Coef. (Metric) 1.37 1.41 1.49 1.48 1.48 1.48 1.47 1.46
#2	Discarded	3.300 m	**20.00 mm/hr Exfiltration over Wetted area above 3.300 m** Excluded Wetted area = 17,485.5 m²
#3	Secondary	3.300 m	**0.0500 m³/s Through bund when above 3.300 m**
#4	Tertiary	3.449 m	**825 mm Round Culvert** L= 15.00 m Ke= 0.500 Inlet / Outlet Invert= 3.449 m / 3.420 m S= 0.0019 m/m Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.535 m²
#5	Device 4	4.470 m	**2,100 mm Horiz. Scruffy dome** C= 0.600 Limited to weir flow at low heads

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Discarded OutFlow Max=0.0304 m³/s @ 21.58 hrs HW=4.594 m   (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.0304 m³/s)

Primary OutFlow Max=4.5540 m³/s @ 8.38 hrs HW=3.873 m TW=3.760 m   (Dynamic Tailwater)
└─**1=Weir** (Weir Controls 4.5540 m³/s @ 0.49 m/s)

Secondary OutFlow Max=0.0500 m³/s @ 0.00 hrs HW=3.300 m TW=3.100 m   (Dynamic Tailwater)
└─**3=Through bund** (Exfiltration Controls 0.0500 m³/s)

Tertiary OutFlow Max=0.5188 m³/s @ 21.58 hrs HW=4.594 m TW=4.167 m   (Dynamic Tailwater)
└─**4=Culvert** (Passes 0.5188 m³/s of 0.9276 m³/s potential flow)
  └─**5=Scruffy dome** (Weir Controls 0.5188 m³/s @ 0.64 m/s)

Pond 94P: Pond 1

Hydrograph
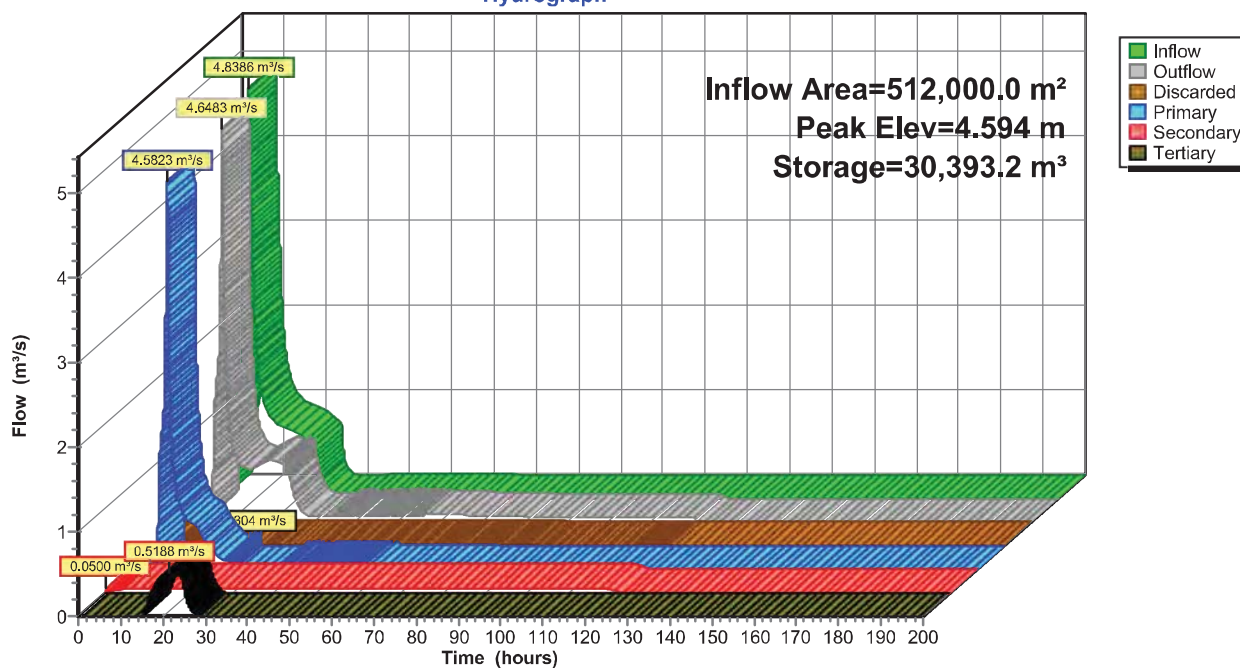
Inflow Area=512,000.0 m²
Peak Elev=4.594 m
Storage=30,393.2 m³

Legend: Inflow, Outflow, Discarded, Primary, Secondary, Tertiary

4.8386 m³/s
4.6483 m³/s
4.5823 m³/s
.0304 m³/s
0.5188 m³/s
0.0500 m³/s

Flow (m³/s) — vertical axis
Time (hours) — horizontal axis

Summary for Pond 96P: Canal (Northern)

Inflow Area =	70,000.0 m²,	0.00% Impervious,	Inflow Depth =	215 mm	for 100yr Type 1A event	
Inflow	=	0.9186 m³/s @	8.20 hrs,	Volume=	15,022.9 m³	
Outflow	=	0.8135 m³/s @	8.38 hrs,	Volume=	14,999.8 m³,	Atten= 11%, Lag= 10.9 min
Primary	=	0.7966 m³/s @	8.38 hrs,	Volume=	14,997.5 m³	

Routed to Pond 92P : Canal (Southern) Current

Secondary =	0.0169 m³/s @	8.38 hrs,	Volume=	2.3 m³	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 5.003 m @ 8.38 hrs   Surf.Area= 612.4 m²   Storage= 560.4 m³

Plug-Flow detention time= 61.1 min calculated for 14,999.8 m³ (100% of inflow)
Center-of-Mass det. time= 59.9 min (750.1 - 690.2)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	621.4 m³	**2.60 mW x 75.00 mL x 1.50 mH 75m canal Z=1.8**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.600 m	**690 mm Round Culvert** L= 35.00 m Ke= 0.500 Inlet / Outlet Invert= 3.600 m / 3.600 m S= 0.0000 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.374 m²
#2	Secondary	5.000 m	**75.00 m long x 0.30 m breadth Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83

Primary OutFlow Max=0.7966 m³/s @ 8.38 hrs HW=5.003 m TW=4.360 m   (Dynamic Tailwater)
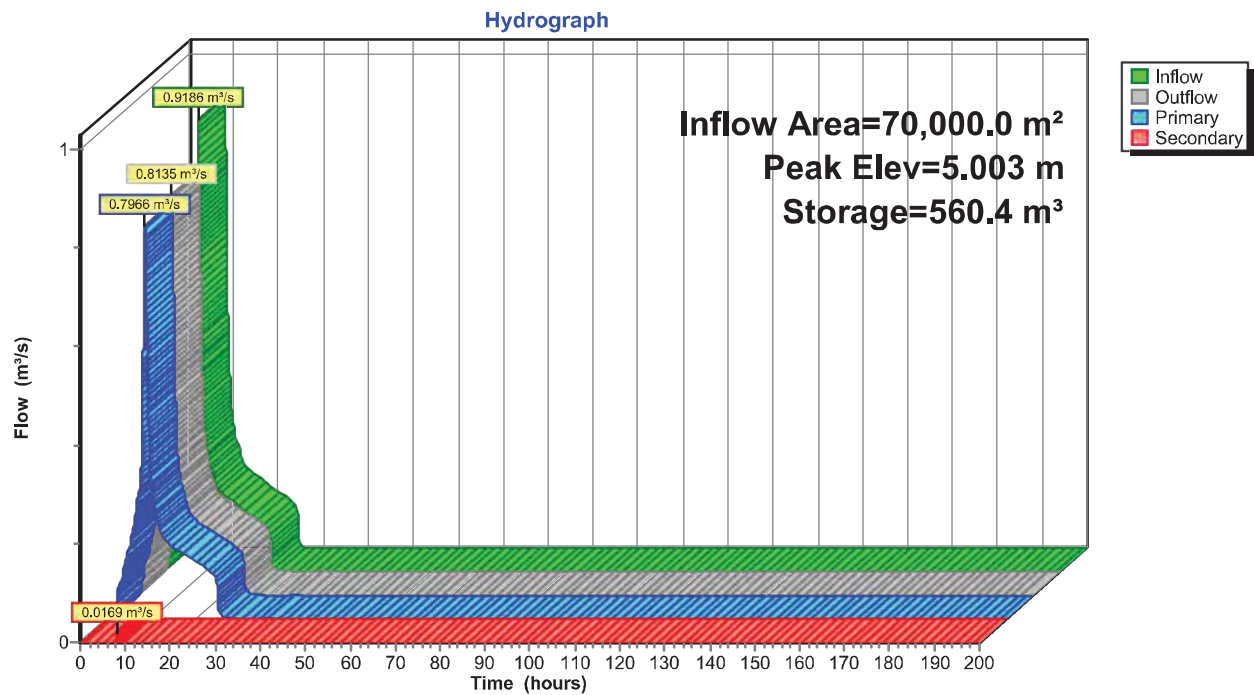└─**1=Culvert** (Inlet Controls 0.7966 m³/s @ 2.13 m/s)

Secondary OutFlow Max=0.0168 m³/s @ 8.38 hrs HW=5.003 m   (Free Discharge)
└─**2=Overflow** (Weir Controls 0.0168 m³/s @ 0.08 m/s)

Pond 96P: Canal (Northern)

Hydrograph

Inflow Area=70,000.0 m²
Peak Elev=5.003 m
Storage=560.4 m³

Legend:
- Inflow
- Outflow
- Primary
- Secondary

0.9186 m³/s
0.8135 m³/s
0.7966 m³/s
0.0169 m³/s

Flow (m³/s)

Time (hours)

Full expansion 67.3Ha

Full expansion 67.3Ha routing diagram with the following nodes:

- **120S** — Western Catchment
- **114S** — Eastern Expansion Catchment
- **128P** — Canal (Northern)
- **117S** — Northern Catchment
- **119S** — Eastern Catchment A
- **129P** — 850dia and canal
- **121S** — Eastern Catchment A (Wood chip pile)
- **118S** — Southern Catchment
- **130P** — Canal - western
- **124P** — Canal - eastern canal expansion
- **115S** — Pond surface
- **126P** — Pond 1
- **116S** — Pond surface
- **123P** — Pond 2
- **127P** — 525 Pipe
- **125P** — 825 pipe

Legend:
- Subcat (hexagon)
- Reach (rectangle)
- Pond (triangle)
- Link (arrow/chevron)

Summary for Pond 124P: Canal - eastern canal expansion

Inflow Area =   673,000.0 m²,   0.00% Impervious, Inflow Depth =   106 mm   for 5yr Type 1A event
Inflow   =   3.9622 m³/s @   8.25 hrs, Volume=   71,417.5 m³
Outflow   =   3.6806 m³/s @   8.43 hrs, Volume=   71,389.2 m³, Atten= 7%, Lag= 10.9 min
Discarded   =   0.0214 m³/s @   24.39 hrs, Volume=   3,174.3 m³
Primary   =   3.6603 m³/s @   8.43 hrs, Volume=   68,215.0 m³
     Routed to Pond 126P : Pond 1
Secondary =   0.0000 m³/s @   0.00 hrs, Volume=   0.0 m³
Tertiary   =   0.0000 m³/s @   0.00 hrs, Volume=   0.0 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.850 m   Surf.Area= 6,950.7 m²   Storage= 1,513.9 m³
Peak Elev= 4.319 m @ 24.39 hrs   Surf.Area= 10,310.6 m²   Storage= 5,559.3 m³   (4,045.4 m³ above start)

Plug-Flow detention time= 163.2 min calculated for 69,871.8 m³ (98% of inflow)
Center-of-Mass det. time= 124.1 min (861.1 - 737.0)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	15,805.9 m³	**2.60 mW x 1,985.00 mL x 1.50 mH 1985m canal Z=1.8**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.950 m	**10.00 m long Weir** 2 End Contraction(s)
#2	Secondary	5.000 m	**620.00 m long x 0.30 m breadth Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83
#3	Discarded	3.850 m	**20.00 mm/hr Exfiltration over Wetted area above 3.850 m** Excluded Wetted area = 7,208.3 m²
#4	Tertiary	4.510 m	**10.00 m long + 2.0 m/m SideZ x 1.00 m breadth Proposed Spillway Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 0.914 1.067 1.219 1.372 1.524 1.676 Coef. (Metric) 1.34 1.42 1.48 1.48 1.47 1.46 1.46 1.48 1.48 1.50 1.54 1.58 1.61 1.65 1.76 1.79 1.83

Discarded OutFlow Max=0.0214 m³/s @ 24.39 hrs HW=4.319 m   (Free Discharge)
└—**3=Exfiltration** (Exfiltration Controls 0.0214 m³/s)

Primary OutFlow Max=3.6601 m³/s @ 8.43 hrs HW=4.297 m TW=3.853 m   (Dynamic Tailwater)
└—**1=Weir** (Weir Controls 3.6601 m³/s @ 1.06 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.850 m   (Free Discharge)
└—**2=Overflow** (Controls 0.0000 m³/s)

Tertiary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.850 m   (Free Discharge)
└—**4=Proposed Spillway Overflow** (Controls 0.0000 m³/s)

Pond 124P: Canal - eastern canal expansion

Hydrograph

Inflow Area=673,000.0 m²
Peak Elev=4.319 m
Storage=5,559.3 m³

Legend:
- Inflow
- Outflow
- Discarded
- Primary
- Secondary
- Tertiary

Labeled values: 3.9622 m³/s, 3.6806 m³/s, 3.6603 m³/s, 4 m³/s, 0.0000 m³/s, 0.0000 m³/s

Flow (m³/s) vs Time (hours)

Summary for Pond 126P: Pond 1

Inflow Area =   695,000.0 m²,   3.17% Impervious, Inflow Depth =   102 mm   for 5yr Type 1A event
Inflow   =   3.7269 m³/s @   8.43 hrs, Volume=   70,920.6 m³
Outflow   =   3.6394 m³/s @   8.55 hrs, Volume=   70,909.9 m³, Atten= 2%, Lag= 7.3 min
Discarded =   0.0252 m³/s @   24.41 hrs, Volume=   5,275.5 m³
Primary   =   3.5738 m³/s @   8.55 hrs, Volume=   46,890.9 m³
       Routed to Pond 123P : Pond 2
Secondary =   0.0500 m³/s @   3.28 hrs, Volume=   18,743.5 m³
       Routed to Pond 123P : Pond 2
Tertiary   =   0.0000 m³/s @   0.00 hrs, Volume=   0.0 m³
       Routed to Pond 125P : 825 pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.300 m   Surf.Area= 17,483.6 m²   Storage= 3,905.5 m³
Peak Elev= 4.319 m @ 24.41 hrs   Surf.Area= 21,984.1 m²   Storage= 24,230.1 m³   (20,324.6 m³ above start)

Plug-Flow detention time= 1,026.9 min calculated for 67,004.5 m³ (94% of inflow)
Center-of-Mass det. time= 880.0 min (1,659.1 - 779.1)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	50,024.2 m³	**Custom Stage Data (Conic)** Listed below

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
2.600	31.5	0.0	0.0	31.5
2.800	605.0	51.6	51.6	605.1
3.000	2,950.9	326.1	377.8	2,951.2
3.200	16,722.6	1,779.9	2,157.7	16,723.0
3.400	18,244.7	3,495.6	5,653.3	18,248.0
3.600	19,084.6	3,732.6	9,385.9	19,093.5
3.800	20,068.2	3,914.9	13,300.8	20,082.1
4.000	20,826.6	4,089.2	17,390.0	20,847.2
4.200	21,580.7	4,240.5	21,630.5	21,608.3
4.400	22,261.0	4,384.0	26,014.5	22,296.7
4.600	22,942.6	4,520.2	30,534.7	22,986.6
4.800	23,626.5	4,656.7	35,191.4	23,679.0
5.000	24,332.5	4,795.7	39,987.2	24,393.5
5.200	25,108.0	4,943.8	44,931.0	25,176.9
5.400	25,826.0	5,093.2	50,024.2	25,903.8

Device	Routing	Invert	Outlet Devices
#1	Primary	3.750 m	**75.00 m long x 3.00 m breadth Weir** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 Coef. (Metric) 1.37 1.41 1.49 1.48 1.48 1.48 1.47 1.46
#2	Discarded	3.300 m	**20.00 mm/hr Exfiltration over Wetted area above 3.300 m** Excluded Wetted area = 17,485.5 m²
#3	Secondary	3.300 m	**0.0500 m³/s Through bund when above 3.300 m**
#4	Tertiary	3.449 m	**825 mm Round Culvert** L= 15.00 m Ke= 0.500 Inlet / Outlet Invert= 3.449 m / 3.420 m S= 0.0019 m/m Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.535 m²
#5	Device 4	4.470 m	**2,100 mm Horiz. Scruffy dome** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0252 m³/s @ 24.41 hrs HW=4.319 m   (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.0252 m³/s)

Primary OutFlow Max=3.5737 m³/s @ 8.55 hrs HW=3.855 m TW=3.476 m   (Dynamic Tailwater)
└─**1=Weir** (Weir Controls 3.5737 m³/s @ 0.45 m/s)

Secondary OutFlow Max=0.0500 m³/s @ 3.28 hrs HW=3.300 m TW=3.105 m   (Dynamic Tailwater)
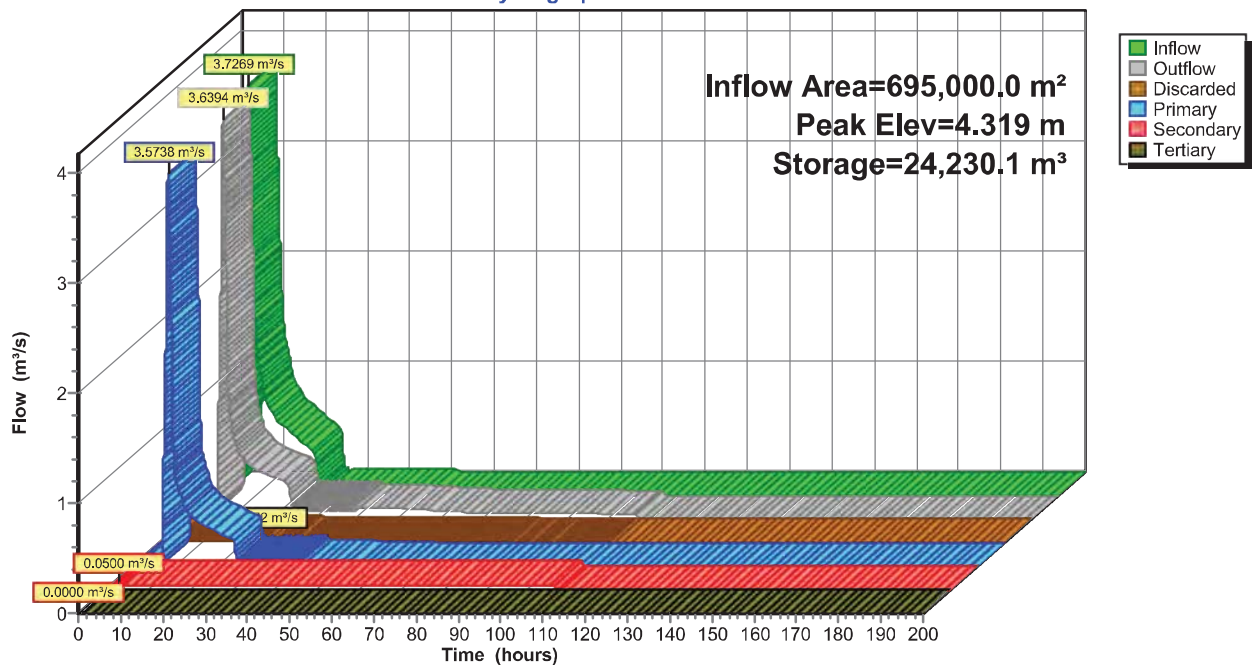└─**3=Through bund** (Exfiltration Controls 0.0500 m³/s)

Tertiary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.300 m TW=2.600 m   (Dynamic Tailwater)
└─**4=Culvert** (Controls 0.0000 m³/s)
  └─**5=Scruffy dome** (Controls 0.0000 m³/s)

Pond 126P: Pond 1

Hydrograph

Inflow Area=695,000.0 m²
Peak Elev=4.319 m
Storage=24,230.1 m³

Legend: Inflow, Outflow, Discarded, Primary, Secondary, Tertiary

Summary for Pond 124P: Canal - eastern canal expansion

Inflow Area =   673,000.0 m²,   0.00% Impervious, Inflow Depth =   128 mm   for 10yr Type 1A event
Inflow   =   4.7361 m³/s @   8.25 hrs, Volume=   85,947.9 m³
Outflow   =   4.4204 m³/s @   8.43 hrs, Volume=   85,909.2 m³, Atten= 7%, Lag= 10.5 min
Discarded =   0.0305 m³/s @   24.31 hrs, Volume=   4,859.9 m³
Primary   =   4.3980 m³/s @   8.43 hrs, Volume=   81,049.3 m³
     Routed to Pond 126P : Pond 1
Secondary =   0.0000 m³/s @   0.00 hrs, Volume=   0.0 m³
Tertiary   =   0.0000 m³/s @   0.00 hrs, Volume=   0.0 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.850 m   Surf.Area= 6,950.7 m²   Storage= 1,513.9 m³
Peak Elev= 4.519 m @ 24.31 hrs   Surf.Area= 11,747.5 m²   Storage= 7,767.6 m³   (6,253.6 m³ above start)

Plug-Flow detention time= 211.2 min calculated for 84,391.1 m³ (98% of inflow)
Center-of-Mass det. time= 168.3 min (906.4 - 738.1)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	15,805.9 m³	**2.60 mW x 1,985.00 mL x 1.50 mH 1985m canal Z=1.8**

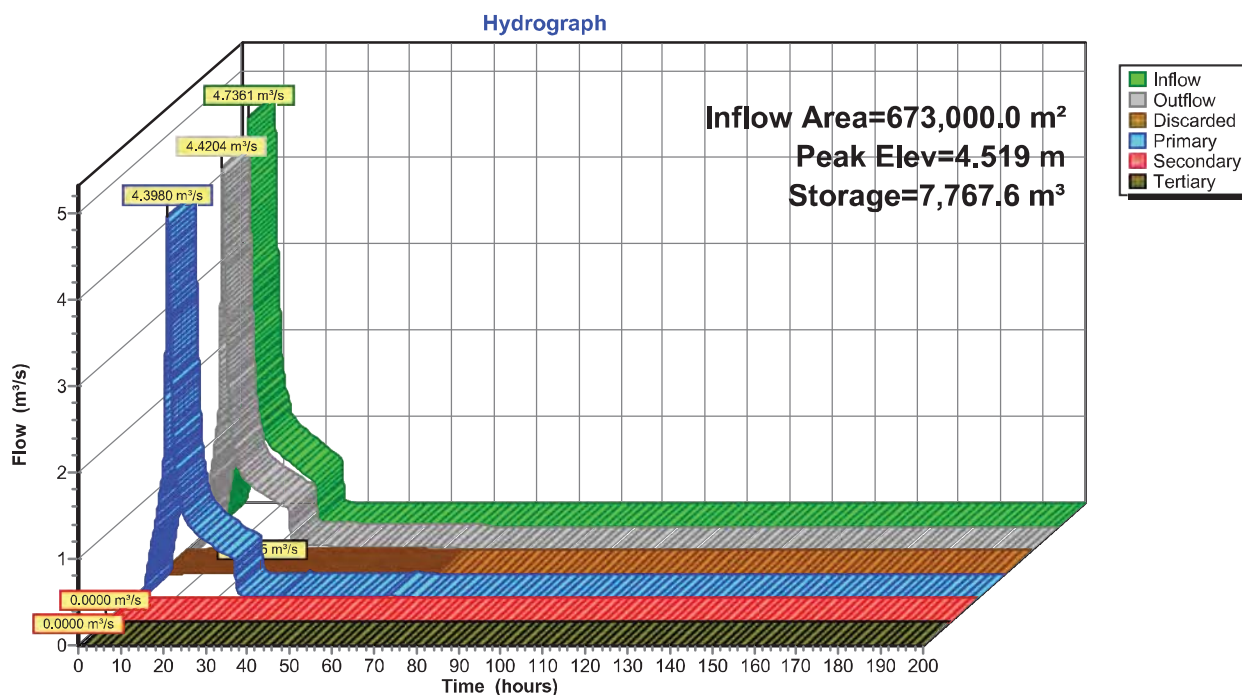| Device	Routing	Invert	Outlet Devices
#1	Primary	3.950 m	**10.00 m long Weir** 2 End Contraction(s)
#2	Secondary	5.000 m	**620.00 m long x 0.30 m breadth Overflow**
			Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427
			0.488 0.549 0.610 0.762
			Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83
			1.82 1.83
#3	Discarded	3.850 m	**20.00 mm/hr Exfiltration over Wetted area above 3.850 m**
			Excluded Wetted area = 7,208.3 m²
#4	Tertiary	4.510 m	**10.00 m long + 2.0 m/m SideZ x 1.00 m breadth Proposed Spillway Overflow**
			Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427
			0.488 0.549 0.610 0.762 0.914 1.067 1.219 1.372 1.524
			1.676
			Coef. (Metric) 1.34 1.42 1.48 1.48 1.47 1.46 1.46 1.48 1.48
			1.50 1.54 1.58 1.61 1.65 1.76 1.79 1.83

Discarded OutFlow Max=0.0305 m³/s @ 24.31 hrs HW=4.519 m   (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.0305 m³/s)

Primary OutFlow Max=4.3979 m³/s @ 8.43 hrs HW=4.342 m TW=3.867 m   (Dynamic Tailwater)
└─**1=Weir** (Weir Controls 4.3979 m³/s @ 1.13 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.850 m   (Free Discharge)
└─**2=Overflow** (Controls 0.0000 m³/s)

Tertiary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.850 m   (Free Discharge)
└─**4=Proposed Spillway Overflow** (Controls 0.0000 m³/s)

Pond 124P: Canal - eastern canal expansion

Hydrograph

Inflow Area=673,000.0 m²
Peak Elev=4.519 m
Storage=7,767.6 m³

Legend:
- Inflow
- Outflow
- Discarded
- Primary
- Secondary
- Tertiary

4.7361 m³/s
4.4204 m³/s
4.3980 m³/s
0.0000 m³/s
0.0000 m³/s

Flow (m³/s)

Time (hours)

Summary for Pond 126P: Pond 1

Inflow Area =	695,000.0 m²,	3.17% Impervious,	Inflow Depth =	121 mm	for 10yr Type 1A event	
Inflow =	4.4770 m³/s @	8.42 hrs,	Volume=	84,260.2 m³		
Outflow =	4.3857 m³/s @	8.54 hrs,	Volume=	84,214.2 m³,	Atten= 2%,	Lag= 6.8 min
Discarded =	0.0290 m³/s @	24.32 hrs,	Volume=	6,847.2 m³		
Primary =	4.3198 m³/s @	8.54 hrs,	Volume=	54,680.4 m³		

Routed to Pond 123P : Pond 2

Secondary =	0.0500 m³/s @	2.91 hrs,	Volume=	21,298.5 m³

Routed to Pond 123P : Pond 2

Tertiary =	0.1286 m³/s @	24.32 hrs,	Volume=	1,388.1 m³

Routed to Pond 125P : 825 pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.300 m   Surf.Area= 17,483.6 m²   Storage= 3,905.5 m³
Peak Elev= 4.519 m @ 24.32 hrs   Surf.Area= 22,666.0 m²   Storage= 28,700.2 m³   (24,794.8 m³ above start)

Plug-Flow detention time= 1,173.7 min calculated for 80,304.7 m³ (95% of inflow)
Center-of-Mass det. time= 1,008.5 min (1,810.5 - 802.0)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	50,024.2 m³	**Custom Stage Data (Conic)** Listed below

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
2.600	31.5	0.0	0.0	31.5
2.800	605.0	51.6	51.6	605.1
3.000	2,950.9	326.1	377.8	2,951.2
3.200	16,722.6	1,779.9	2,157.7	16,723.0
3.400	18,244.7	3,495.6	5,653.3	18,248.0
3.600	19,084.6	3,732.6	9,385.9	19,093.5
3.800	20,068.2	3,914.9	13,300.8	20,082.1
4.000	20,826.6	4,089.2	17,390.0	20,847.2
4.200	21,580.7	4,240.5	21,630.5	21,608.3
4.400	22,261.0	4,384.0	26,014.5	22,296.7
4.600	22,942.6	4,520.2	30,534.7	22,986.6
4.800	23,626.5	4,656.7	35,191.4	23,679.0
5.000	24,332.5	4,795.7	39,987.2	24,393.5
5.200	25,108.0	4,943.8	44,931.0	25,176.9
5.400	25,826.0	5,093.2	50,024.2	25,903.8

Device	Routing	Invert	Outlet Devices
#1	Primary	3.750 m	**75.00 m long x 3.00 m breadth Weir** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 Coef. (Metric) 1.37 1.41 1.49 1.48 1.48 1.48 1.47 1.46
#2	Discarded	3.300 m	**20.00 mm/hr Exfiltration over Wetted area above 3.300 m** Excluded Wetted area = 17,485.5 m²
#3	Secondary	3.300 m	**0.0500 m³/s Through bund when above 3.300 m**
#4	Tertiary	3.449 m	**825 mm Round Culvert** L= 15.00 m Ke= 0.500 Inlet / Outlet Invert= 3.449 m / 3.420 m S= 0.0019 m/m Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.535 m²
#5	Device 4	4.470 m	**2,100 mm Horiz. Scruffy dome** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0290 m³/s @ 24.32 hrs HW=4.519 m (Free Discharge)
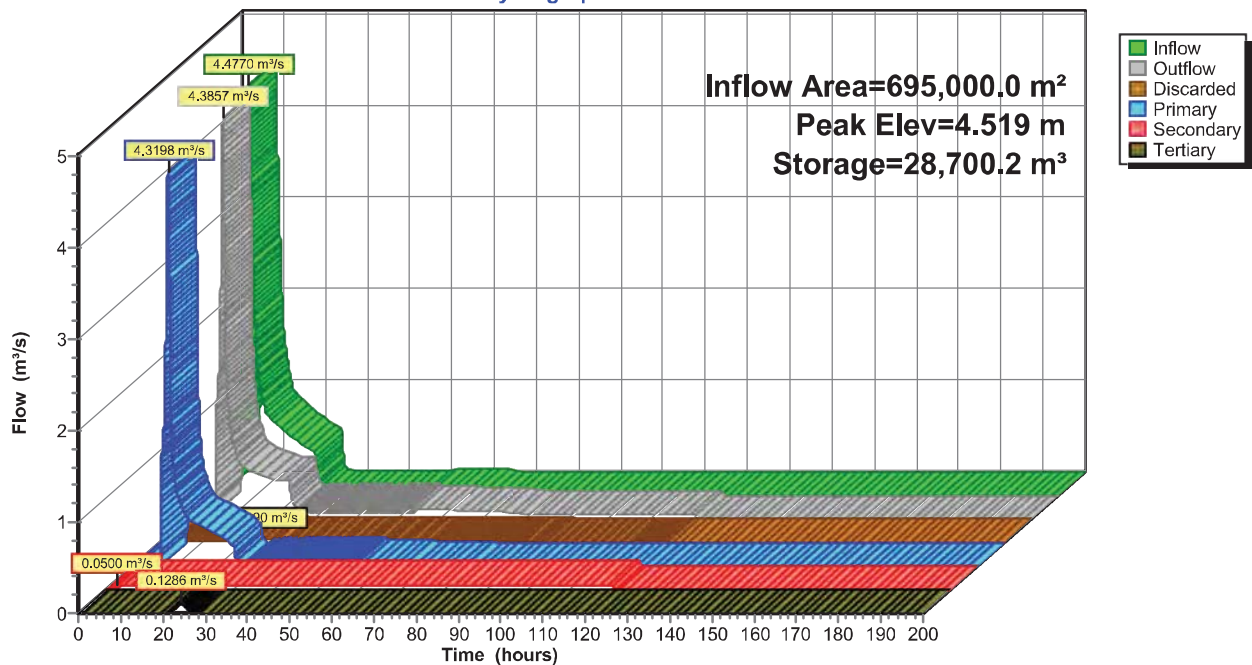└─**2=Exfiltration** (Exfiltration Controls 0.0290 m³/s)

Primary OutFlow Max=4.3196 m³/s @ 8.54 hrs HW=3.869 m TW=3.640 m (Dynamic Tailwater)
└─**1=Weir** (Weir Controls 4.3196 m³/s @ 0.49 m/s)

Secondary OutFlow Max=0.0500 m³/s @ 2.91 hrs HW=3.300 m TW=3.107 m (Dynamic Tailwater)
└─**3=Through bund** (Exfiltration Controls 0.0500 m³/s)

Tertiary OutFlow Max=0.1286 m³/s @ 24.32 hrs HW=4.519 m TW=3.881 m (Dynamic Tailwater)
└─**4=Culvert** (Passes 0.1286 m³/s of 0.9783 m³/s potential flow)
  └─**5=Scruffy dome** (Weir Controls 0.1286 m³/s @ 0.40 m/s)

Pond 126P: Pond 1

Hydrograph

Inflow Area=695,000.0 m²
Peak Elev=4.519 m
Storage=28,700.2 m³

Legend: Inflow, Outflow, Discarded, Primary, Secondary, Tertiary

4.4770 m³/s
4.3857 m³/s
4.3198 m³/s
0.0500 m³/s
0.1286 m³/s

Summary for Pond 130P: Canal - western

Inflow Area =   226,000.0 m²,   0.00% Impervious, Inflow Depth =   134 mm   for 10yr Type 1A event
Inflow   =   1.8783 m³/s @   8.20 hrs, Volume=   30,315.2 m³
Outflow   =   1.4597 m³/s @   8.48 hrs, Volume=   30,305.4 m³, Atten= 22%, Lag= 16.9 min
Discarded =   0.0111 m³/s @   8.48 hrs, Volume=   1,485.7 m³
Primary   =   1.4486 m³/s @   8.48 hrs, Volume=   28,819.7 m³
     Routed to Pond 124P : Canal - eastern canal expansion
Secondary =   0.0000 m³/s @   0.00 hrs, Volume=   0.0 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.850 m   Surf.Area= 2,033.1 m²   Storage= 442.6 m³
Peak Elev= 4.676 m @ 8.48 hrs   Surf.Area= 3,779.1 m²   Storage= 2,841.0 m³ (2,398.4 m³ above start)

Plug-Flow detention time= 168.0 min calculated for 29,861.3 m³ (99% of inflow)
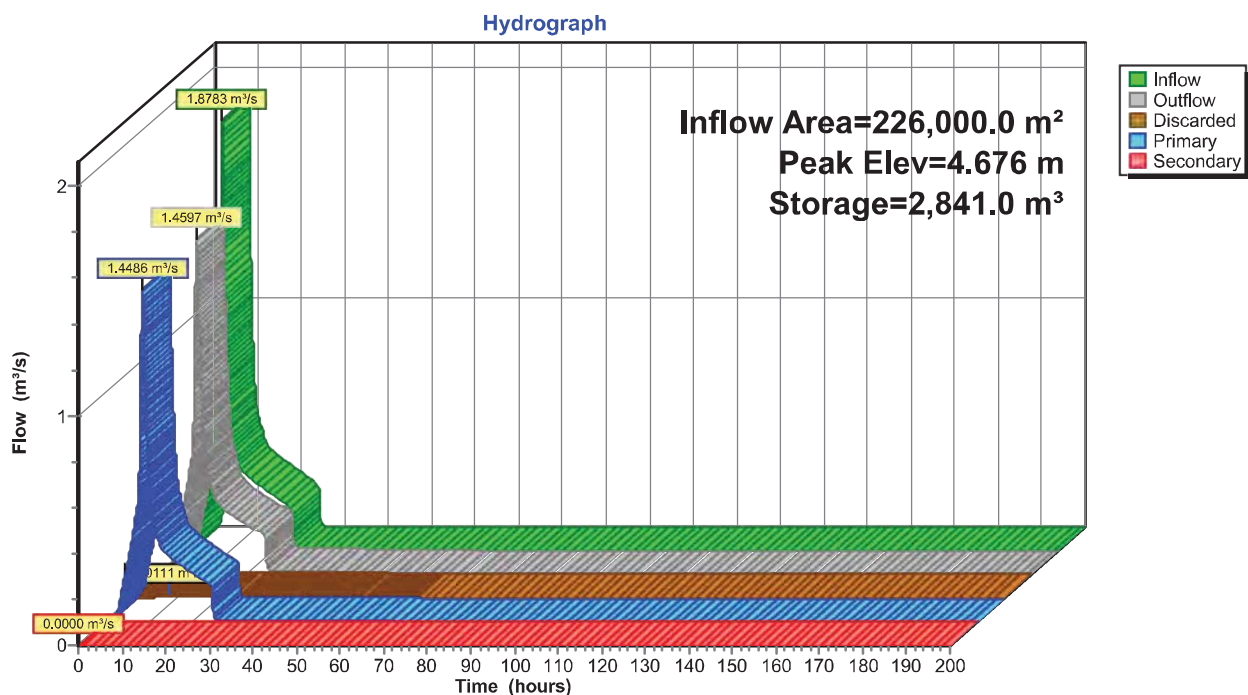Center-of-Mass det. time= 147.3 min (851.9 - 704.6)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	4,636.1 m³	**2.60 mW x 580.00 mL x 1.50 mH 580m canal Z=1.8**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.600 m	**1,200 mm Round Culvert** L= 15.00 m RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 3.600 m / 3.600 m S= 0.0000 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.131 m²
#2	Secondary	4.700 m	**9.20 m long + 2.0 m/m SideZ x 3.00 m breadth Spilllway** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 Coef. (Metric) 1.37 1.41 1.49 1.48 1.48 1.48 1.47 1.46
#3	Secondary	5.000 m	**580.00 m long x 0.30 m breadth Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83
#4	Discarded	3.850 m	**20.00 mm/hr Exfiltration over Wetted area above 3.850 m** Excluded Wetted area = 2,108.8 m²

Discarded OutFlow Max=0.0111 m³/s @ 8.48 hrs HW=4.676 m   (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 0.0111 m³/s)

Primary OutFlow Max=1.4486 m³/s @ 8.48 hrs HW=4.676 m TW=4.340 m   (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.4486 m³/s @ 1.79 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.850 m   (Free Discharge)
├─**2=Spilllway** (Controls 0.0000 m³/s)
└─**3=Overflow** (Controls 0.0000 m³/s)

Pond 130P: Canal - western

Hydrograph

Inflow Area=226,000.0 m²
Peak Elev=4.676 m
Storage=2,841.0 m³

Legend:
- Inflow
- Outflow
- Discarded
- Primary
- Secondary

1.8783 m³/s
1.4597 m³/s
1.4486 m³/s
0111 m³/s
0.0000 m³/s

Flow (m³/s)

Time (hours)

Summary for Pond 124P: Canal - eastern canal expansion

Inflow Area =	673,000.0 m²,	0.00% Impervious,	Inflow Depth =	151 mm	for 20yr Type 1A event
Inflow =	5.5381 m³/s @	8.25 hrs,	Volume=	101,332.8 m³	
Outflow =	5.1743 m³/s @	8.42 hrs,	Volume=	101,291.6 m³,	Atten= 7%, Lag= 10.1 min
Discarded =	0.0338 m³/s @	21.97 hrs,	Volume=	5,515.8 m³	
Primary =	5.1499 m³/s @	8.42 hrs,	Volume=	95,775.9 m³	
	Routed to Pond 126P : Pond 1				
Secondary =	0.0000 m³/s @	0.00 hrs,	Volume=	0.0 m³	
Tertiary =	0.0000 m³/s @	0.00 hrs,	Volume=	0.0 m³	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.850 m   Surf.Area= 6,950.7 m²   Storage= 1,513.9 m³
Peak Elev= 4.591 m @ 21.97 hrs   Surf.Area= 12,262.4 m²   Storage= 8,628.4 m³   (7,114.5 m³ above start)

Plug-Flow detention time= 205.3 min calculated for 99,777.7 m³ (98% of inflow)
Center-of-Mass det. time= 166.5 min (900.7 - 734.3)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	15,805.9 m³	**2.60 mW x 1,985.00 mL x 1.50 mH 1985m canal Z=1.8**

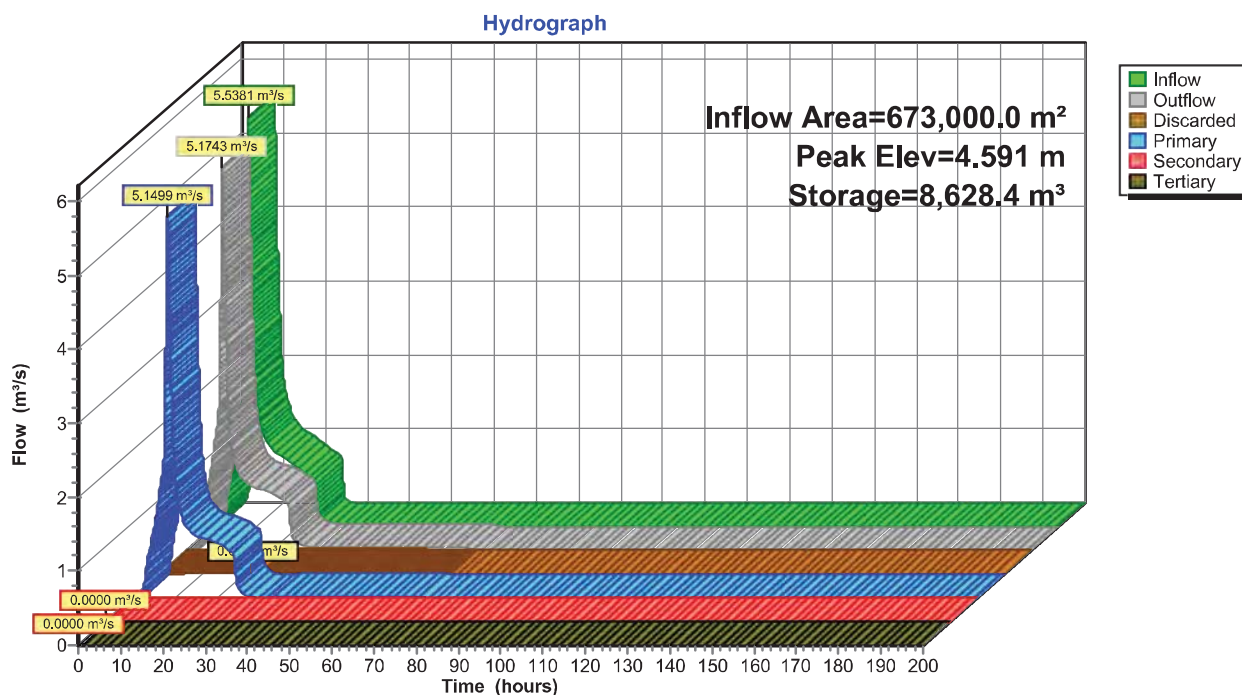| Device	Routing	Invert	Outlet Devices
#1	Primary	3.950 m	**10.00 m long Weir** 2 End Contraction(s)
#2	Secondary	5.000 m	**620.00 m long x 0.30 m breadth Overflow**
			Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762
			Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83
#3	Discarded	3.850 m	**20.00 mm/hr Exfiltration over Wetted area above 3.850 m**
			Excluded Wetted area = 7,208.3 m²
#4	Tertiary	4.510 m	**10.00 m long + 2.0 m/m SideZ x 1.00 m breadth Proposed Spillway Overflow**
			Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 0.914 1.067 1.219 1.372 1.524 1.676
			Coef. (Metric) 1.34 1.42 1.48 1.48 1.47 1.46 1.46 1.48 1.48 1.50 1.54 1.58 1.61 1.65 1.76 1.79 1.83

Discarded OutFlow Max=0.0338 m³/s @ 21.97 hrs HW=4.591 m   (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.0338 m³/s)

Primary OutFlow Max=5.1497 m³/s @ 8.42 hrs HW=4.386 m TW=3.880 m   (Dynamic Tailwater)
└─**1=Weir** (Weir Controls 5.1497 m³/s @ 1.19 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.850 m   (Free Discharge)
└─**2=Overflow** (Controls 0.0000 m³/s)

Tertiary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.850 m   (Free Discharge)
└─**4=Proposed Spillway Overflow** (Controls 0.0000 m³/s)

Pond 124P: Canal - eastern canal expansion

Hydrograph

Inflow Area=673,000.0 m²
Peak Elev=4.591 m
Storage=8,628.4 m³

Legend:
- Inflow
- Outflow
- Discarded
- Primary
- Secondary
- Tertiary

5.5381 m³/s
5.1743 m³/s
5.1499 m³/s
0.0000 m³/s
0.0000 m³/s

Flow (m³/s)

Time (hours)

Summary for Pond 125P: 825 pipe

Inflow Area =   730,000.0 m²,   7.81% Impervious, Inflow Depth =   95 mm   for 20yr Type 1A event
Inflow   =   0.6327 m³/s @   21.98 hrs, Volume=   69,557.6 m³
Outflow   =   0.6327 m³/s @   21.99 hrs, Volume=   69,555.0 m³, Atten= 0%, Lag= 0.1 min
Primary   =   0.6327 m³/s @   21.99 hrs, Volume=   69,555.0 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 4.192 m @ 21.99 hrs   Surf.Area= 3.1 m²   Storage= 5.0 m³
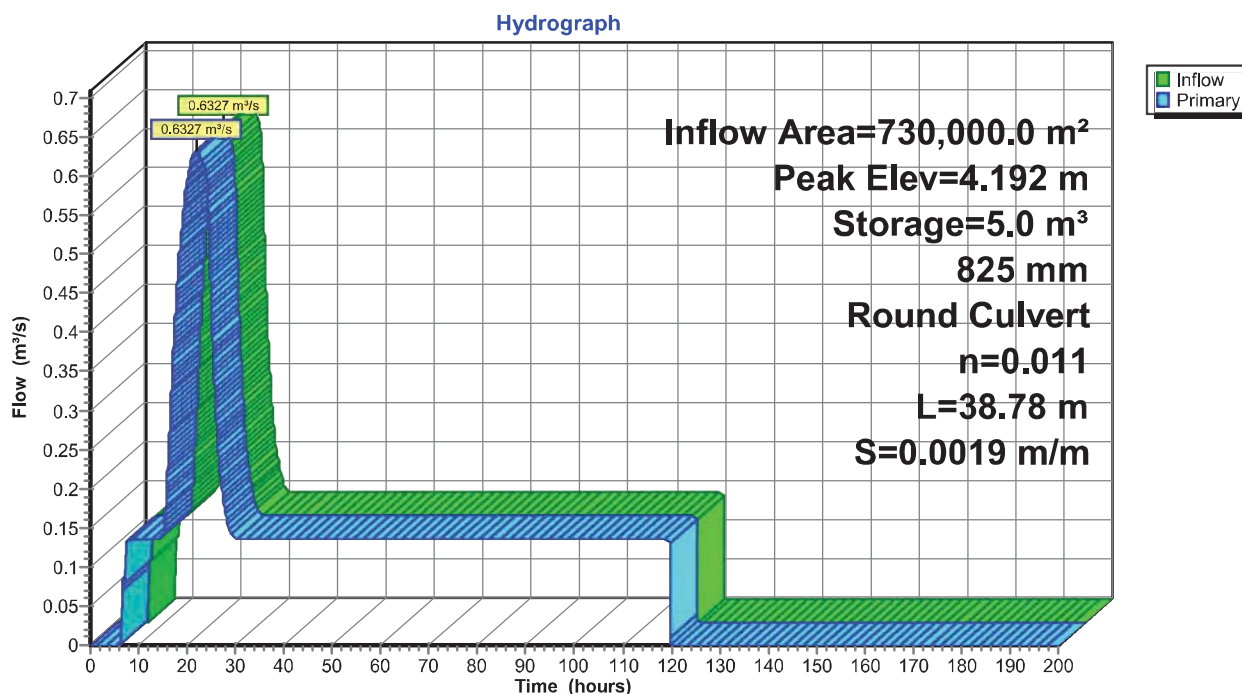
Plug-Flow detention time= 0.4 min calculated for 69,551.5 m³ (100% of inflow)
Center-of-Mass det. time= 0.2 min (3,288.6 - 3,288.4)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	15.7 m³	**2.00 mD x 5.00 mH Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.420 m	**825 mm Round Culvert** L= 38.78 m Ke= 0.500 Inlet / Outlet Invert= 3.420 m / 3.346 m S= 0.0019 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.535 m²

Primary OutFlow Max=0.6327 m³/s @ 21.99 hrs HW=4.192 m   (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.6327 m³/s @ 1.58 m/s)

Pond 125P: 825 pipe

Hydrograph

Inflow Area=730,000.0 m²
Peak Elev=4.192 m
Storage=5.0 m³
825 mm
Round Culvert
n=0.011
L=38.78 m
S=0.0019 m/m

Summary for Pond 130P: Canal - western

Inflow Area =   226,000.0 m²,   0.00% Impervious, Inflow Depth =   158 mm   for 20yr Type 1A event
Inflow   =   2.2021 m³/s @   8.20 hrs, Volume=   35,693.5 m³
Outflow   =   1.8283 m³/s @   8.43 hrs, Volume=   35,683.0 m³, Atten= 17%, Lag= 14.0 min
Discarded =   0.0122 m³/s @   8.43 hrs, Volume=   1,683.9 m³
Primary   =   1.6337 m³/s @   8.43 hrs, Volume=   33,812.3 m³
     Routed to Pond 124P : Canal - eastern canal expansion
Secondary =   0.1824 m³/s @   8.43 hrs, Volume=   186.8 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.850 m   Surf.Area= 2,033.1 m²   Storage= 442.6 m³
Peak Elev= 4.759 m @ 8.43 hrs   Surf.Area= 3,956.2 m²   Storage= 3,163.1 m³   (2,720.5 m³ above start)

Plug-Flow detention time= 163.4 min calculated for 35,238.6 m³ (99% of inflow)
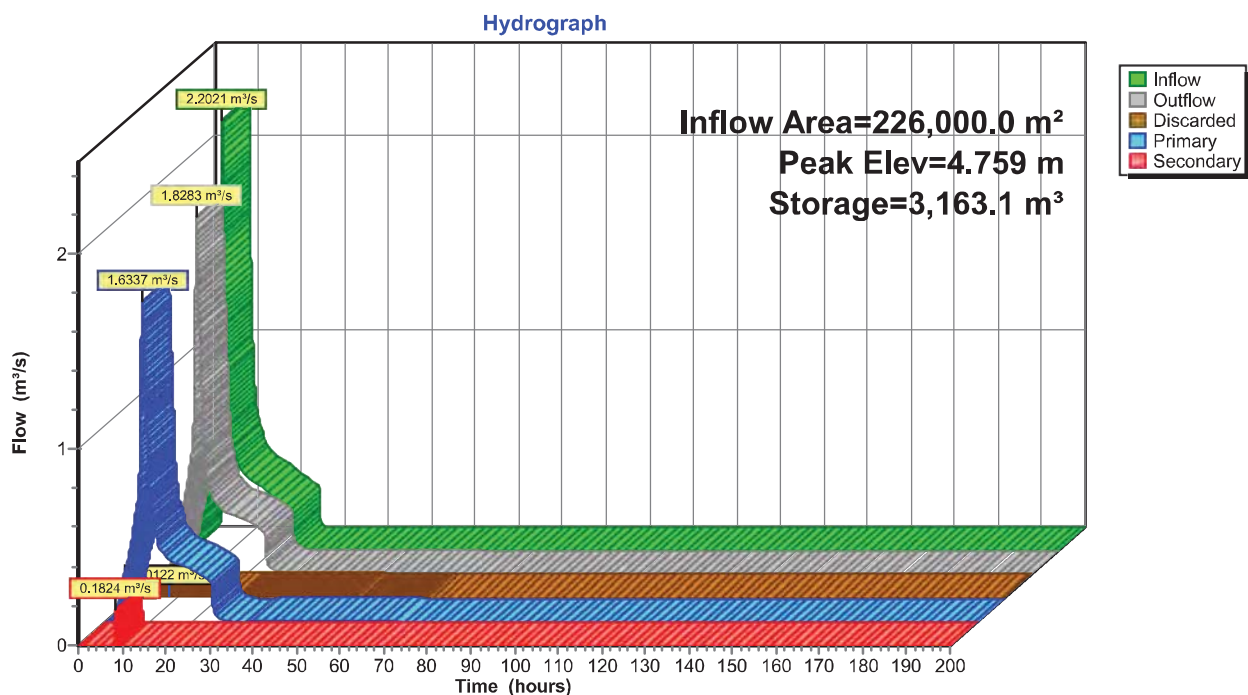Center-of-Mass det. time= 145.6 min (844.9 - 699.2)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	4,636.1 m³	**2.60 mW x 580.00 mL x 1.50 mH 580m canal Z=1.8**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.600 m	**1,200 mm Round Culvert** L= 15.00 m RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 3.600 m / 3.600 m S= 0.0000 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.131 m²
#2	Secondary	4.700 m	**9.20 m long + 2.0 m/m SideZ x 3.00 m breadth Spilllway** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 Coef. (Metric) 1.37 1.41 1.49 1.48 1.48 1.48 1.47 1.46
#3	Secondary	5.000 m	**580.00 m long x 0.30 m breadth Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83
#4	Discarded	3.850 m	**20.00 mm/hr Exfiltration over Wetted area above 3.850 m** Excluded Wetted area = 2,108.8 m²

Discarded OutFlow Max=0.0122 m³/s @ 8.43 hrs HW=4.759 m   (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 0.0122 m³/s)

Primary OutFlow Max=1.6337 m³/s @ 8.43 hrs HW=4.759 m TW=4.386 m   (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.6337 m³/s @ 1.86 m/s)

Secondary OutFlow Max=0.1823 m³/s @ 8.43 hrs HW=4.759 m   (Free Discharge)
├─**2=Spilllway** (Weir Controls 0.1823 m³/s @ 0.33 m/s)
└─**3=Overflow** (Controls 0.0000 m³/s)

Pond 130P: Canal - western

Hydrograph

Inflow Area=226,000.0 m²
Peak Elev=4.759 m
Storage=3,163.1 m³

Legend:
- Inflow
- Outflow
- Discarded
- Primary
- Secondary

2.2021 m³/s
1.8283 m³/s
1.6337 m³/s
0.1824 m³/s
0122 m³/s

Summary for Pond 125P: 825 pipe

Inflow Area =   730,000.0 m²,   7.81% Impervious, Inflow Depth =   122 mm   for 50yr Type 1A event
Inflow   =   1.4372 m³/s @   21.96 hrs, Volume=   88,847.0 m³
Outflow   =   1.4630 m³/s @   21.94 hrs, Volume=   88,844.4 m³, Atten= 0%, Lag= 0.0 min
Primary   =   1.4630 m³/s @   21.94 hrs, Volume=   88,844.4 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 5.032 m @ 21.94 hrs   Surf.Area= 3.1 m²   Storage= 7.6 m³

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.2 min (2,947.5 - 2,947.3)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	15.7 m³	**2.00 mD x 5.00 mH Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.420 m	**825 mm Round Culvert** L= 38.78 m Ke= 0.500 Inlet / Outlet Invert= 3.420 m / 3.346 m S= 0.0019 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.535 m²

Primary OutFlow Max=1.4341 m³/s @ 21.94 hrs HW=4.998 m   (Free Discharge)
└─**1=Culvert** (Barrel Controls 1.4341 m³/s @ 2.68 m/s)

Pond 125P: 825 pipe
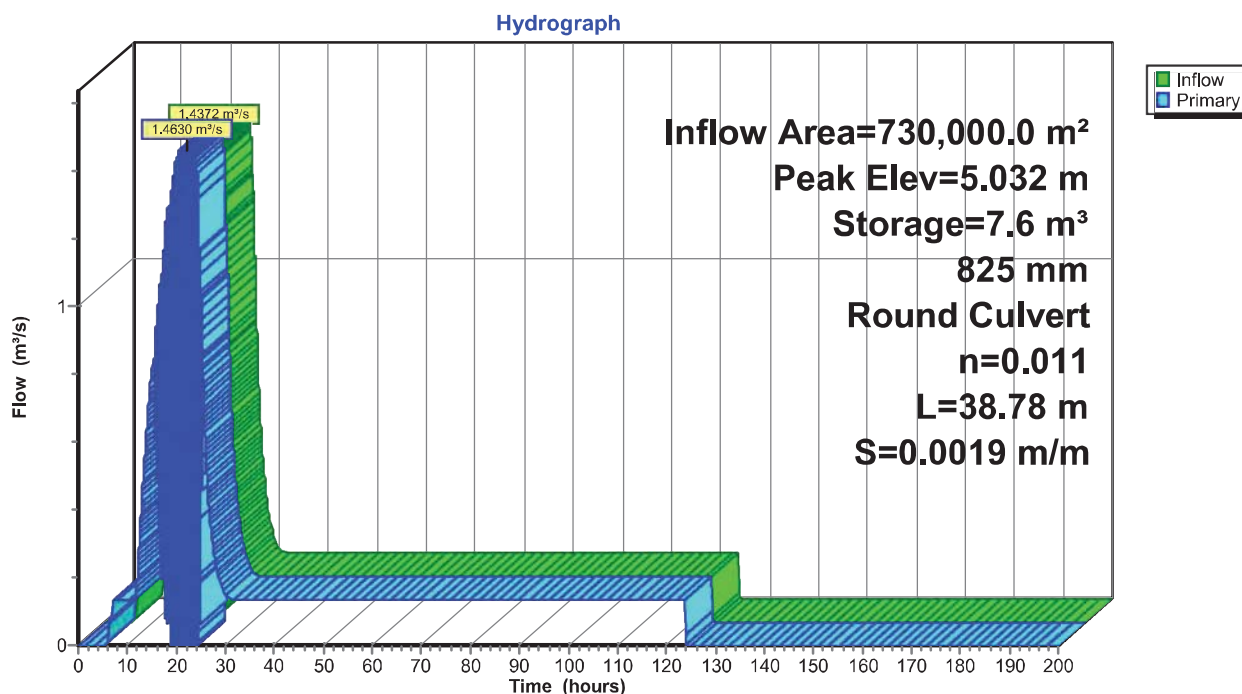
Summary for Pond 130P: Canal - western

Inflow Area =   226,000.0 m²,   0.00% Impervious, Inflow Depth =   215 mm   for 100yr Type 1A event
Inflow   =   2.9656 m³/s @   8.20 hrs, Volume=   48,502.6 m³
Outflow   =   2.7630 m³/s @   8.33 hrs, Volume=   48,490.5 m³, Atten= 7%, Lag= 8.0 min
Discarded =   0.0136 m³/s @   8.33 hrs, Volume=   2,052.7 m³
Primary   =   1.8583 m³/s @   8.33 hrs, Volume=   38,770.3 m³
     Routed to Pond 124P : Canal - eastern canal expansion
Secondary =   0.8910 m³/s @   8.33 hrs, Volume=   7,667.4 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.850 m   Surf.Area= 2,033.1 m²   Storage= 442.6 m³
Peak Elev= 4.861 m @ 8.33 hrs   Surf.Area= 4,173.0 m²   Storage= 3,577.0 m³   (3,134.4 m³ above start)

Plug-Flow detention time= 149.3 min calculated for 48,045.4 m³ (99% of inflow)
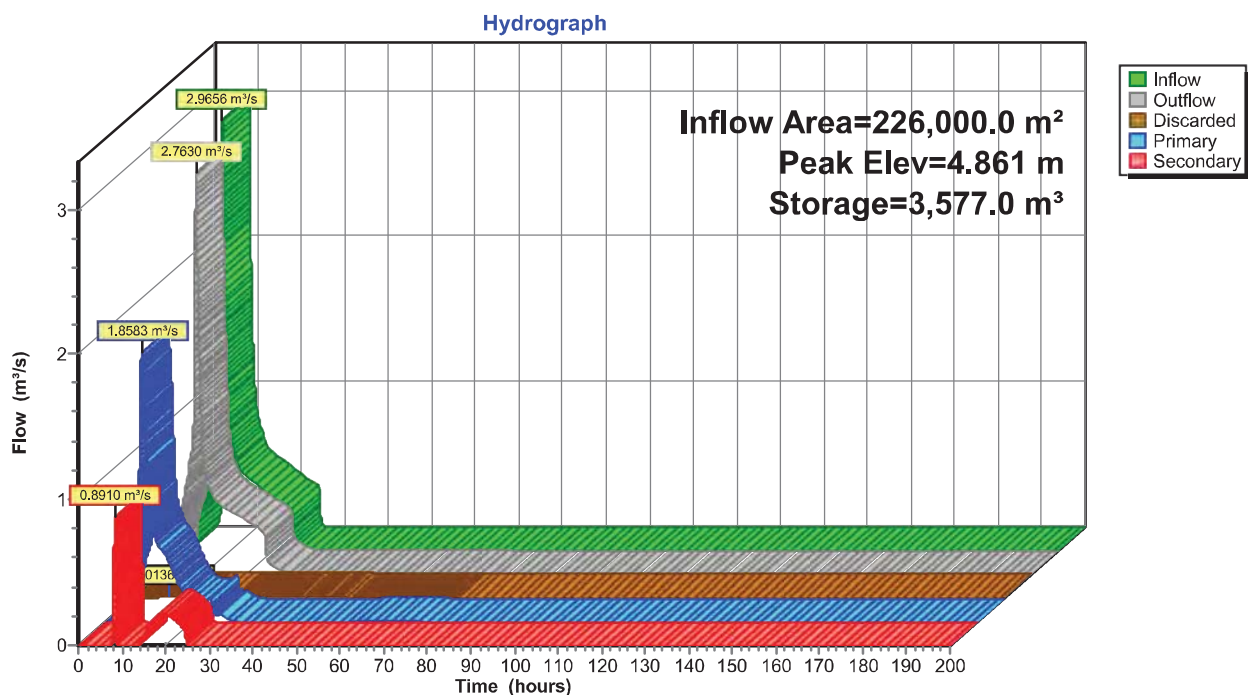Center-of-Mass det. time= 136.2 min (826.4 - 690.2)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	4,636.1 m³	**2.60 mW x 580.00 mL x 1.50 mH 580m canal Z=1.8**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.600 m	**1,200 mm Round Culvert** L= 15.00 m RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 3.600 m / 3.600 m S= 0.0000 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.131 m²
#2	Secondary	4.700 m	**9.20 m long + 2.0 m/m SideZ x 3.00 m breadth Spilllway** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 Coef. (Metric) 1.37 1.41 1.49 1.48 1.48 1.48 1.47 1.46
#3	Secondary	5.000 m	**580.00 m long x 0.30 m breadth Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83
#4	Discarded	3.850 m	**20.00 mm/hr Exfiltration over Wetted area above 3.850 m** Excluded Wetted area = 2,108.8 m²

Discarded OutFlow Max=0.0136 m³/s @ 8.33 hrs HW=4.861 m   (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 0.0136 m³/s)

Primary OutFlow Max=1.8583 m³/s @ 8.33 hrs HW=4.861 m TW=4.471 m   (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.8583 m³/s @ 1.94 m/s)

Secondary OutFlow Max=0.8909 m³/s @ 8.33 hrs HW=4.861 m   (Free Discharge)
├─**2=Spilllway** (Weir Controls 0.8909 m³/s @ 0.58 m/s)
└─**3=Overflow** (Controls 0.0000 m³/s)

Pond 130P: Canal - western

Hydrograph

Inflow Area=226,000.0 m²
Peak Elev=4.861 m
Storage=3,577.0 m³

Legend:
- Inflow
- Outflow
- Discarded
- Primary
- Secondary

Values labeled on chart:
- 2.9656 m³/s
- 2.7630 m³/s
- 1.8583 m³/s
- 0.8910 m³/s
- 0136

Axes:
- Flow (m³/s)
- Time (hours): 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (mm)	AMC
1	5yr Type 1A	Type IA 24-hr		Default	24.00	1	129	2
2	10yr Type 1A	Type IA 24-hr		Default	24.00	1	152	2
3	20yr Type 1A	Type IA 24-hr		Default	24.00	1	176	2
4	100yr Type 1A	Type IA 24-hr		Default	24.00	1	233	2

Summary for Pond 124P: Canal - eastern canal expansion

Inflow Area =   673,000.0 m²,   0.00% Impervious, Inflow Depth =   106 mm   for 5yr Type 1A event
Inflow   =   3.9622 m³/s @   8.25 hrs, Volume=   71,417.5 m³
Outflow   =   3.6806 m³/s @   8.43 hrs, Volume=   71,389.2 m³, Atten= 7%, Lag= 10.9 min
Discarded   =   0.0214 m³/s @   24.39 hrs, Volume=   3,174.3 m³
Primary   =   3.6603 m³/s @   8.43 hrs, Volume=   68,215.0 m³
    Routed to Pond 126P : Pond 1
Secondary   =   0.0000 m³/s @   0.00 hrs, Volume=   0.0 m³
Tertiary   =   0.0000 m³/s @   0.00 hrs, Volume=   0.0 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.850 m   Surf.Area= 6,950.7 m²   Storage= 1,513.9 m³
Peak Elev= 4.319 m @ 24.39 hrs   Surf.Area= 10,310.6 m²   Storage= 5,559.3 m³   (4,045.4 m³ above start)

Plug-Flow detention time= 163.2 min calculated for 69,871.8 m³ (98% of inflow)
Center-of-Mass det. time= 124.1 min (861.1 - 737.0)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	15,805.9 m³	**2.60 mW x 1,985.00 mL x 1.50 mH 1985m canal Z=1.8**

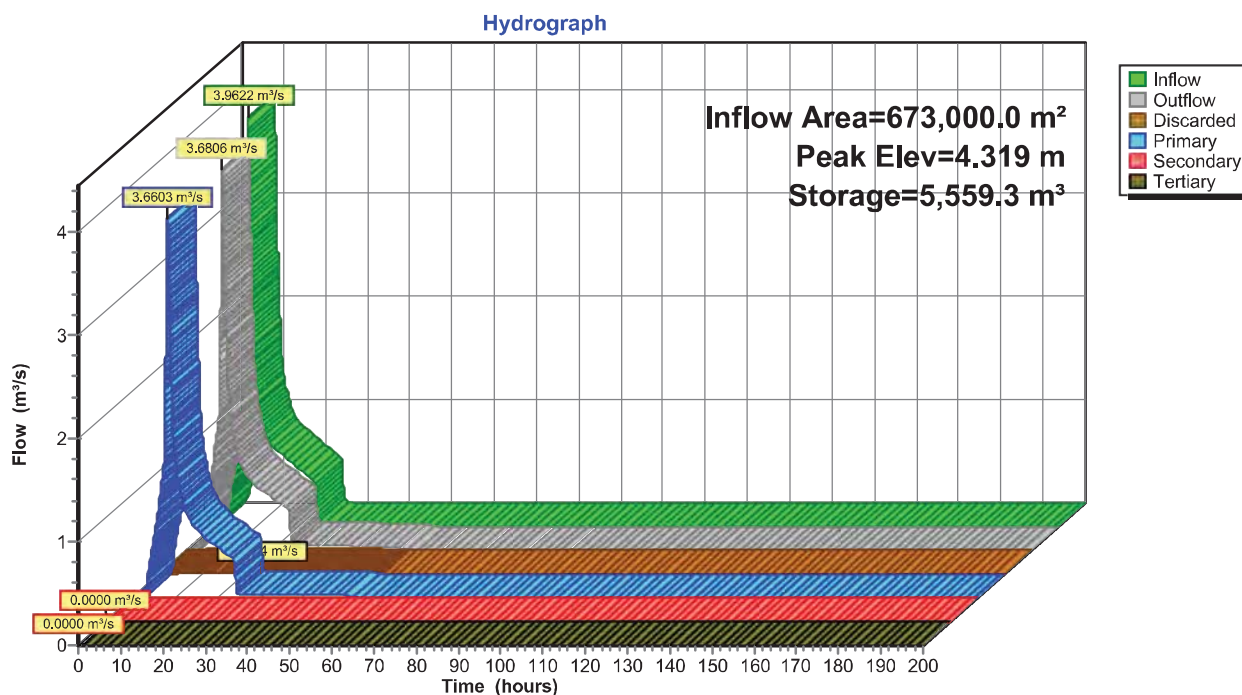| Device	Routing	Invert	Outlet Devices
#1	Primary	3.950 m	**10.00 m long Weir** 2 End Contraction(s)
#2	Secondary	5.000 m	**620.00 m long x 0.30 m breadth Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83
#3	Discarded	3.850 m	**20.00 mm/hr Exfiltration over Wetted area above 3.850 m** Excluded Wetted area = 7,208.3 m²
#4	Tertiary	4.510 m	**10.00 m long + 2.0 m/m SideZ x 1.00 m breadth Proposed Spillway Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 0.914 1.067 1.219 1.372 1.524 1.676 Coef. (Metric) 1.34 1.42 1.48 1.48 1.47 1.46 1.46 1.48 1.48 1.50 1.54 1.58 1.61 1.65 1.76 1.79 1.83

Discarded OutFlow Max=0.0214 m³/s @ 24.39 hrs HW=4.319 m   (Free Discharge)
└─3=Exfiltration (Exfiltration Controls 0.0214 m³/s)

Primary OutFlow Max=3.6601 m³/s @ 8.43 hrs HW=4.297 m TW=3.853 m   (Dynamic Tailwater)
└─1=Weir (Weir Controls 3.6601 m³/s @ 1.06 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.850 m   (Free Discharge)
└─2=Overflow (Controls 0.0000 m³/s)

Tertiary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.850 m   (Free Discharge)
└─4=Proposed Spillway Overflow (Controls 0.0000 m³/s)

Pond 124P: Canal - eastern canal expansion

Hydrograph

Inflow Area=673,000.0 m²
Peak Elev=4.319 m
Storage=5,559.3 m³

Legend:
- Inflow
- Outflow
- Discarded
- Primary
- Secondary
- Tertiary

3.9622 m³/s
3.6806 m³/s
3.6603 m³/s
4 m³/s
0.0000 m³/s
0.0000 m³/s

Flow (m³/s) vs Time (hours)

Summary for Pond 125P: 825 pipe

Inflow Area = 730,000.0 m², 7.81% Impervious, Inflow Depth = 64 mm for 5yr Type 1A event
Inflow   = 0.1365 m³/s @   8.49 hrs, Volume=   46,588.3 m³
Outflow   = 0.1364 m³/s @   8.50 hrs, Volume=   46,585.7 m³, Atten= 0%, Lag= 0.6 min
Primary   = 0.1364 m³/s @   8.50 hrs, Volume=   46,585.7 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
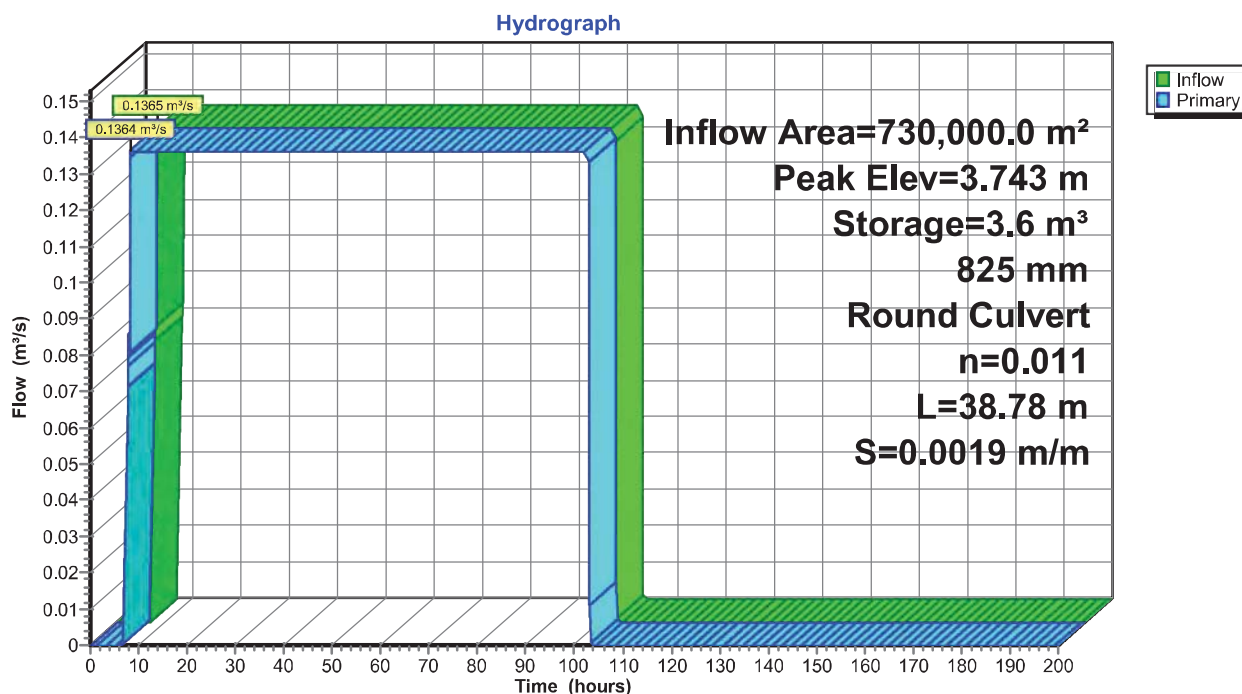Peak Elev= 3.743 m @ 8.50 hrs   Surf.Area= 3.1 m²   Storage= 3.6 m³

Plug-Flow detention time= 0.4 min calculated for 46,583.4 m³ (100% of inflow)
Center-of-Mass det. time= 0.3 min (3,338.8 - 3,338.5)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	15.7 m³	**2.00 mD x 5.00 mH Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.420 m	**825 mm Round Culvert** L= 38.78 m Ke= 0.500
			Inlet / Outlet Invert= 3.420 m / 3.346 m S= 0.0019 m/m Cc= 0.900
			n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.535 m²

Primary OutFlow Max=0.1364 m³/s @ 8.50 hrs HW=3.743 m   (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.1364 m³/s @ 1.04 m/s)

Pond 125P: 825 pipe

Hydrograph

Inflow Area=730,000.0 m²
Peak Elev=3.743 m
Storage=3.6 m³
825 mm
Round Culvert
n=0.011
L=38.78 m
S=0.0019 m/m

Summary for Pond 126P: Pond 1

Inflow Area =   695,000.0 m²,   3.17% Impervious, Inflow Depth =   102 mm   for 5yr Type 1A event
Inflow   =   3.7269 m³/s @   8.43 hrs, Volume=   70,920.6 m³
Outflow   =   3.6394 m³/s @   8.55 hrs, Volume=   70,909.9 m³, Atten= 2%, Lag= 7.3 min
Discarded =   0.0252 m³/s @   24.41 hrs, Volume=   5,275.5 m³
Primary   =   3.5738 m³/s @   8.55 hrs, Volume=   46,890.9 m³
    Routed to Pond 123P : Pond 2
Secondary =   0.0500 m³/s @   3.28 hrs, Volume=   18,743.5 m³
    Routed to Pond 123P : Pond 2
Tertiary   =   0.0000 m³/s @   0.00 hrs, Volume=   0.0 m³
    Routed to Pond 125P : 825 pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.300 m   Surf.Area= 17,483.6 m²   Storage= 3,905.5 m³
Peak Elev= 4.319 m @ 24.41 hrs   Surf.Area= 21,984.1 m²   Storage= 24,230.1 m³   (20,324.6 m³ above start)

Plug-Flow detention time= 1,026.9 min calculated for 67,004.5 m³ (94% of inflow)
Center-of-Mass det. time= 880.0 min (1,659.1 - 779.1)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	50,024.2 m³	**Custom Stage Data (Conic)** Listed below

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
2.600	31.5	0.0	0.0	31.5
2.800	605.0	51.6	51.6	605.1
3.000	2,950.9	326.1	377.8	2,951.2
3.200	16,722.6	1,779.9	2,157.7	16,723.0
3.400	18,244.7	3,495.6	5,653.3	18,248.0
3.600	19,084.6	3,732.6	9,385.9	19,093.5
3.800	20,068.2	3,914.9	13,300.8	20,082.1
4.000	20,826.6	4,089.2	17,390.0	20,847.2
4.200	21,580.7	4,240.5	21,630.5	21,608.3
4.400	22,261.0	4,384.0	26,014.5	22,296.7
4.600	22,942.6	4,520.2	30,534.7	22,986.6
4.800	23,626.5	4,656.7	35,191.4	23,679.0
5.000	24,332.5	4,795.7	39,987.2	24,393.5
5.200	25,108.0	4,943.8	44,931.0	25,176.9
5.400	25,826.0	5,093.2	50,024.2	25,903.8

Device	Routing	Invert	Outlet Devices
#1	Primary	3.750 m	**75.00 m long x 3.00 m breadth Weir** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 Coef. (Metric) 1.37 1.41 1.49 1.48 1.48 1.48 1.47 1.46
#2	Discarded	3.300 m	**20.00 mm/hr Exfiltration over Wetted area above 3.300 m** Excluded Wetted area = 17,485.5 m²
#3	Secondary	3.300 m	**0.0500 m³/s Through bund when above 3.300 m**
#4	Tertiary	3.449 m	**825 mm Round Culvert** L= 15.00 m Ke= 0.500 Inlet / Outlet Invert= 3.449 m / 3.420 m S= 0.0019 m/m Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.535 m²
#5	Device 4	4.470 m	**2,100 mm Horiz. Scruffy dome** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0252 m³/s @ 24.41 hrs HW=4.319 m (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.0252 m³/s)

Primary OutFlow Max=3.5737 m³/s @ 8.55 hrs HW=3.855 m TW=3.476 m (Dynamic Tailwater)
└─**1=Weir** (Weir Controls 3.5737 m³/s @ 0.45 m/s)

Secondary OutFlow Max=0.0500 m³/s @ 3.28 hrs HW=3.300 m TW=3.105 m (Dynamic Tailwater)
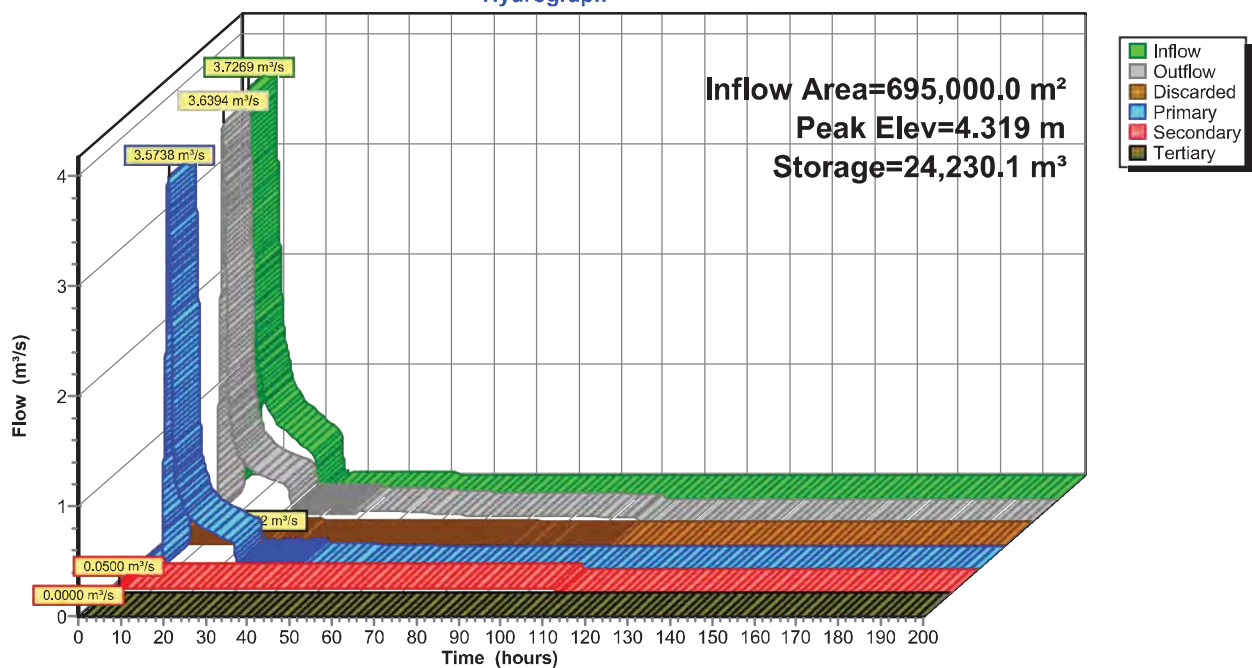└─**3=Through bund** (Exfiltration Controls 0.0500 m³/s)

Tertiary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.300 m TW=2.600 m (Dynamic Tailwater)
└─**4=Culvert** (Controls 0.0000 m³/s)
  └─**5=Scruffy dome** (Controls 0.0000 m³/s)

Pond 126P: Pond 1

Hydrograph

Inflow Area=695,000.0 m²
Peak Elev=4.319 m
Storage=24,230.1 m³

Legend: Inflow, Outflow, Discarded, Primary, Secondary, Tertiary

Summary for Pond 124P: Canal - eastern canal expansion

Inflow Area =		673,000.0 m²,	0.00% Impervious,	Inflow Depth =	128 mm	for 10yr Type 1A event	
Inflow	=	4.7361 m³/s @	8.25 hrs,	Volume=	85,948.6 m³		
Outflow	=	4.4204 m³/s @	8.43 hrs,	Volume=	85,910.0 m³,	Atten= 7%,	Lag= 10.5 min
Discarded =		0.0305 m³/s @	24.30 hrs,	Volume=	4,857.5 m³		
Primary	=	4.3980 m³/s @	8.43 hrs,	Volume=	81,018.2 m³		

Routed to Pond 126P : Pond 1

Secondary =		0.0000 m³/s @	0.00 hrs,	Volume=	0.0 m³	
Tertiary	=	0.0109 m³/s @	24.30 hrs,	Volume=	34.2 m³	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.850 m   Surf.Area= 6,950.7 m²   Storage= 1,513.9 m³
Peak Elev= 4.519 m @ 24.30 hrs   Surf.Area= 11,745.6 m²   Storage= 7,764.4 m³   (6,250.5 m³ above start)

Plug-Flow detention time= 211.6 min calculated for 84,396.0 m³ (98% of inflow)
Center-of-Mass det. time= 168.2 min (906.3 - 738.1)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	15,805.9 m³	**2.60 mW x 1,985.00 mL x 1.50 mH 1985m canal Z=1.8**

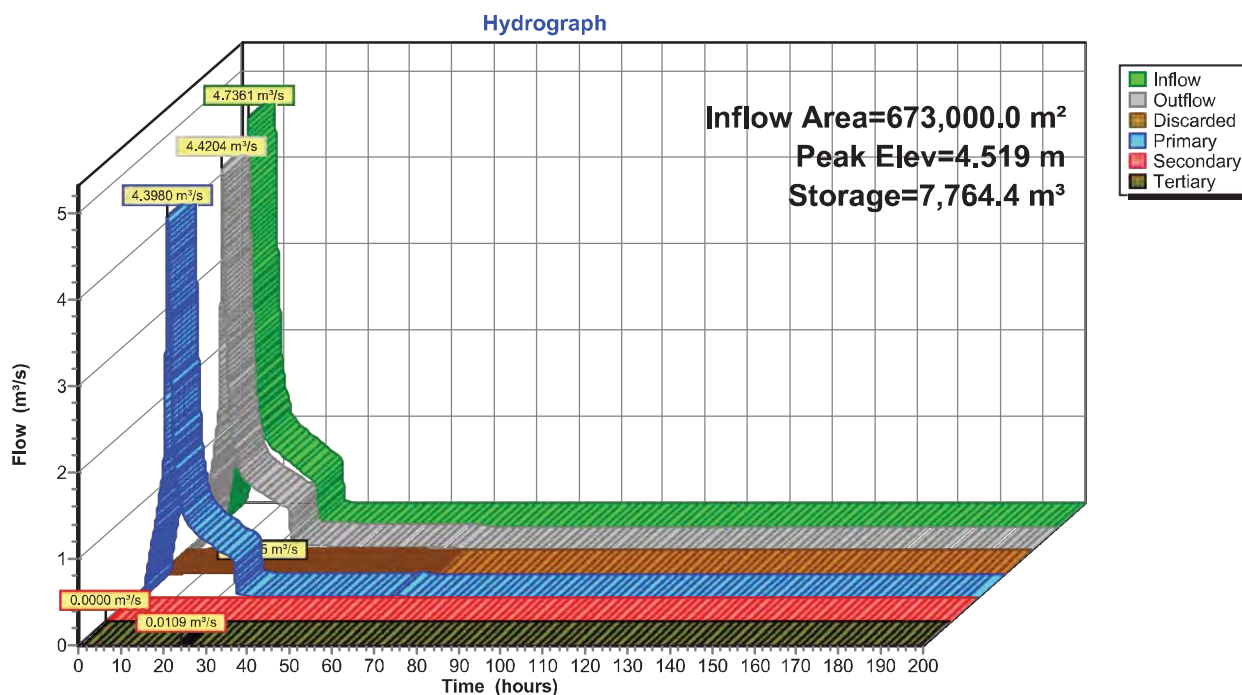| Device	Routing	Invert	Outlet Devices
#1	Primary	3.950 m	**10.00 m long Weir** 2 End Contraction(s)
#2	Secondary	5.000 m	**620.00 m long x 0.30 m breadth Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83
#3	Discarded	3.850 m	**20.00 mm/hr Exfiltration over Wetted area above 3.850 m** Excluded Wetted area = 7,208.3 m²
#4	Tertiary	4.510 m	**10.00 m long + 2.0 m/m SideZ x 1.00 m breadth Proposed Spillway Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 0.914 1.067 1.219 1.372 1.524 1.676 Coef. (Metric) 1.34 1.42 1.48 1.48 1.47 1.46 1.46 1.48 1.48 1.50 1.54 1.58 1.61 1.65 1.76 1.79 1.83

Discarded OutFlow Max=0.0305 m³/s @ 24.30 hrs HW=4.519 m   (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.0305 m³/s)

Primary OutFlow Max=4.3979 m³/s @ 8.43 hrs HW=4.342 m TW=3.867 m   (Dynamic Tailwater)
└─**1=Weir** (Weir Controls 4.3979 m³/s @ 1.13 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.850 m   (Free Discharge)
└─**2=Overflow** (Controls 0.0000 m³/s)

Tertiary OutFlow Max=0.0109 m³/s @ 24.30 hrs HW=4.519 m   (Free Discharge)
└─**4=Proposed Spillway Overflow** (Weir Controls 0.0109 m³/s @ 0.12 m/s)

Pond 124P: Canal - eastern canal expansion

Hydrograph

Inflow Area=673,000.0 m²
Peak Elev=4.519 m
Storage=7,764.4 m³

Legend:
- Inflow
- Outflow
- Discarded
- Primary
- Secondary
- Tertiary

Flow (m³/s)

Time (hours)

4.7361 m³/s
4.4204 m³/s
4.3980 m³/s
0.0000 m³/s
0.0109 m³/s

Summary for Pond 125P: 825 pipe

Inflow Area =   730,000.0 m², 7.81% Impervious, Inflow Depth =   75 mm   for 10yr Type 1A event
Inflow   =   0.2637 m³/s @ 24.31 hrs, Volume=   54,958.1 m³
Outflow   =   0.2637 m³/s @ 24.31 hrs, Volume=   54,955.5 m³, Atten= 0%, Lag= 0.0 min
Primary   =   0.2637 m³/s @ 24.31 hrs, Volume=   54,955.5 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 3.880 m @ 24.31 hrs   Surf.Area= 3.1 m²   Storage= 4.0 m³

Plug-Flow detention time= 0.4 min calculated for 54,952.8 m³ (100% of inflow)
Center-of-Mass det. time= 0.3 min (3,680.0 - 3,679.7)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	15.7 m³	**2.00 mD x 5.00 mH Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.420 m	**825 mm Round Culvert** L= 38.78 m Ke= 0.500 Inlet / Outlet Invert= 3.420 m / 3.346 m S= 0.0019 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.535 m²

Primary OutFlow Max=0.2637 m³/s @ 24.31 hrs HW=3.880 m   (Free Discharge)
└—**1=Culvert** (Barrel Controls 0.2637 m³/s @ 1.25 m/s)

Pond 125P: 825 pipe
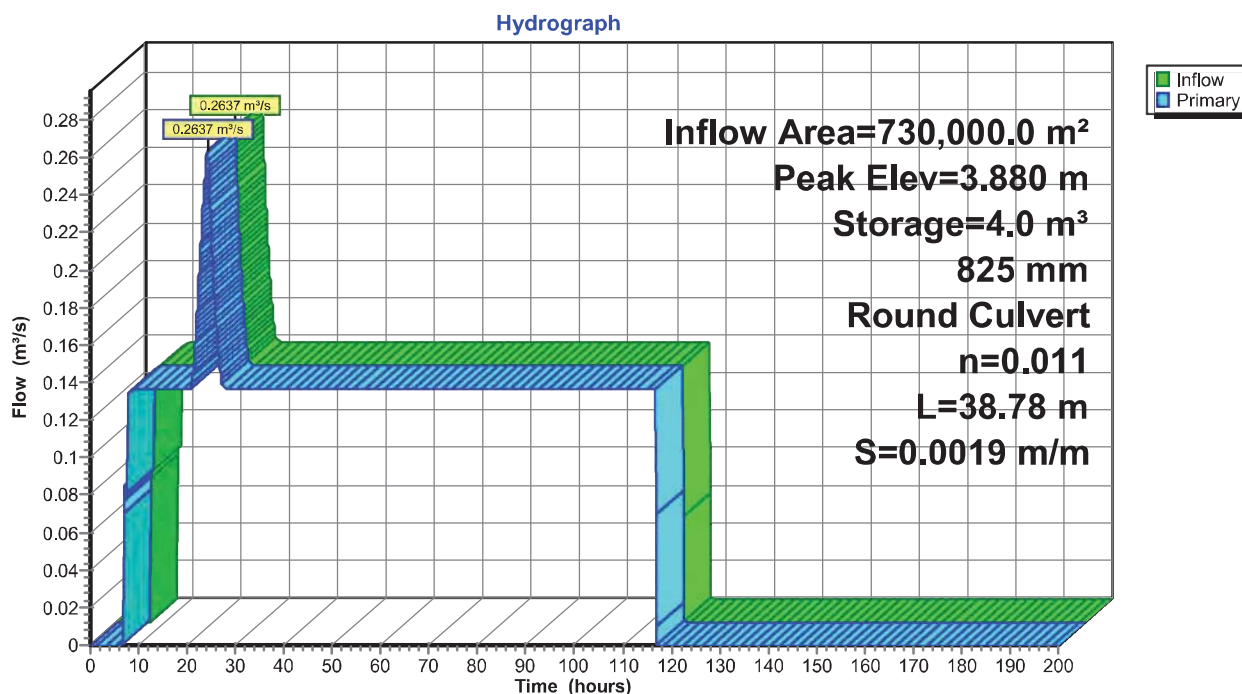
Summary for Pond 126P: Pond 1

Inflow Area =   695,000.0 m²,   3.17% Impervious, Inflow Depth =   121 mm   for 10yr Type 1A event
Inflow   =   4.4770 m³/s @   8.42 hrs, Volume=   84,229.2 m³
Outflow   =   4.3857 m³/s @   8.54 hrs, Volume=   84,182.7 m³, Atten= 2%, Lag= 6.8 min
Discarded =   0.0290 m³/s @ 24.31 hrs, Volume=   6,844.9 m³
Primary   =   4.3198 m³/s @   8.54 hrs, Volume=   54,667.3 m³
     Routed to Pond 123P : Pond 2
Secondary =   0.0500 m³/s @   2.91 hrs, Volume=   21,294.2 m³
     Routed to Pond 123P : Pond 2
Tertiary   =   0.1276 m³/s @ 24.31 hrs, Volume=   1,376.4 m³
     Routed to Pond 125P : 825 pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.300 m   Surf.Area= 17,483.6 m²   Storage= 3,905.5 m³
Peak Elev= 4.519 m @ 24.31 hrs   Surf.Area= 22,665.1 m²   Storage= 28,694.2 m³ (24,788.7 m³ above start)

Plug-Flow detention time= 1,173.7 min calculated for 80,273.2 m³ (95% of inflow)
Center-of-Mass det. time= 1,008.4 min (1,810.2 - 801.7)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	50,024.2 m³	**Custom Stage Data (Conic)** Listed below

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
2.600	31.5	0.0	0.0	31.5
2.800	605.0	51.6	51.6	605.1
3.000	2,950.9	326.1	377.8	2,951.2
3.200	16,722.6	1,779.9	2,157.7	16,723.0
3.400	18,244.7	3,495.6	5,653.3	18,248.0
3.600	19,084.6	3,732.6	9,385.9	19,093.5
3.800	20,068.2	3,914.9	13,300.8	20,082.1
4.000	20,826.6	4,089.2	17,390.0	20,847.2
4.200	21,580.7	4,240.5	21,630.5	21,608.3
4.400	22,261.0	4,384.0	26,014.5	22,296.7
4.600	22,942.6	4,520.2	30,534.7	22,986.6
4.800	23,626.5	4,656.7	35,191.4	23,679.0
5.000	24,332.5	4,795.7	39,987.2	24,393.5
5.200	25,108.0	4,943.8	44,931.0	25,176.9
5.400	25,826.0	5,093.2	50,024.2	25,903.8

Device	Routing	Invert	Outlet Devices
#1	Primary	3.750 m	**75.00 m long x 3.00 m breadth Weir** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 Coef. (Metric) 1.37 1.41 1.49 1.48 1.48 1.48 1.47 1.46
#2	Discarded	3.300 m	**20.00 mm/hr Exfiltration over Wetted area above 3.300 m** Excluded Wetted area = 17,485.5 m²
#3	Secondary	3.300 m	**0.0500 m³/s Through bund when above 3.300 m**
#4	Tertiary	3.449 m	**825 mm Round Culvert** L= 15.00 m Ke= 0.500 Inlet / Outlet Invert= 3.449 m / 3.420 m S= 0.0019 m/m Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.535 m²
#5	Device 4	4.470 m	**2,100 mm Horiz. Scruffy dome** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0290 m³/s @ 24.31 hrs HW=4.519 m (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.0290 m³/s)

Primary OutFlow Max=4.3196 m³/s @ 8.54 hrs HW=3.869 m TW=3.640 m (Dynamic Tailwater)
└─**1=Weir** (Weir Controls 4.3196 m³/s @ 0.49 m/s)

Secondary OutFlow Max=0.0500 m³/s @ 2.91 hrs HW=3.300 m TW=3.107 m (Dynamic Tailwater)
└─**3=Through bund** (Exfiltration Controls 0.0500 m³/s)

Tertiary OutFlow Max=0.1276 m³/s @ 24.31 hrs HW=4.519 m TW=3.880 m (Dynamic Tailwater)
└─**4=Culvert** (Passes 0.1276 m³/s of 0.9782 m³/s potential flow)
  └─**5=Scruffy dome** (Weir Controls 0.1276 m³/s @ 0.40 m/s)

Pond 126P: Pond 1
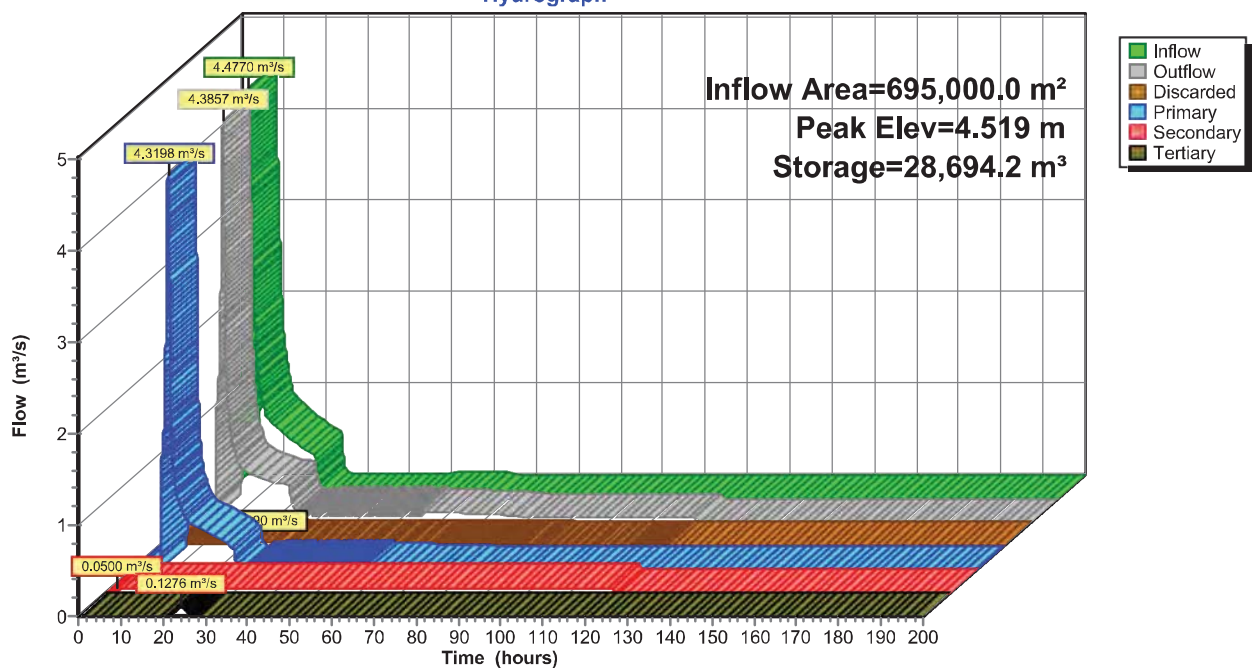
Summary for Pond 124P: Canal - eastern canal expansion

Inflow Area =   673,000.0 m²,   0.00% Impervious, Inflow Depth =   151 mm   for 20yr Type 1A event
Inflow   =   5.5381 m³/s @   8.25 hrs, Volume=   101,376.4 m³
Outflow   =   5.1743 m³/s @   8.42 hrs, Volume=   101,336.2 m³, Atten= 7%, Lag= 10.1 min
Discarded   =   0.0328 m³/s @   20.65 hrs, Volume=   5,368.4 m³
Primary   =   5.1499 m³/s @   8.42 hrs, Volume=   91,245.9 m³
     Routed to Pond 126P : Pond 1
Secondary   =   0.0000 m³/s @   0.00 hrs, Volume=   0.0 m³
Tertiary   =   0.1959 m³/s @   20.65 hrs, Volume=   4,722.0 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.850 m   Surf.Area= 6,950.7 m²   Storage= 1,513.9 m³
Peak Elev= 4.569 m @ 20.65 hrs   Surf.Area= 12,109.6 m²   Storage= 8,369.1 m³   (6,855.2 m³ above start)

Plug-Flow detention time= 199.3 min calculated for 99,822.3 m³ (98% of inflow)
Center-of-Mass det. time= 161.3 min (894.9 - 733.6)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	15,805.9 m³	**2.60 mW x 1,985.00 mL x 1.50 mH 1985m canal Z=1.8**

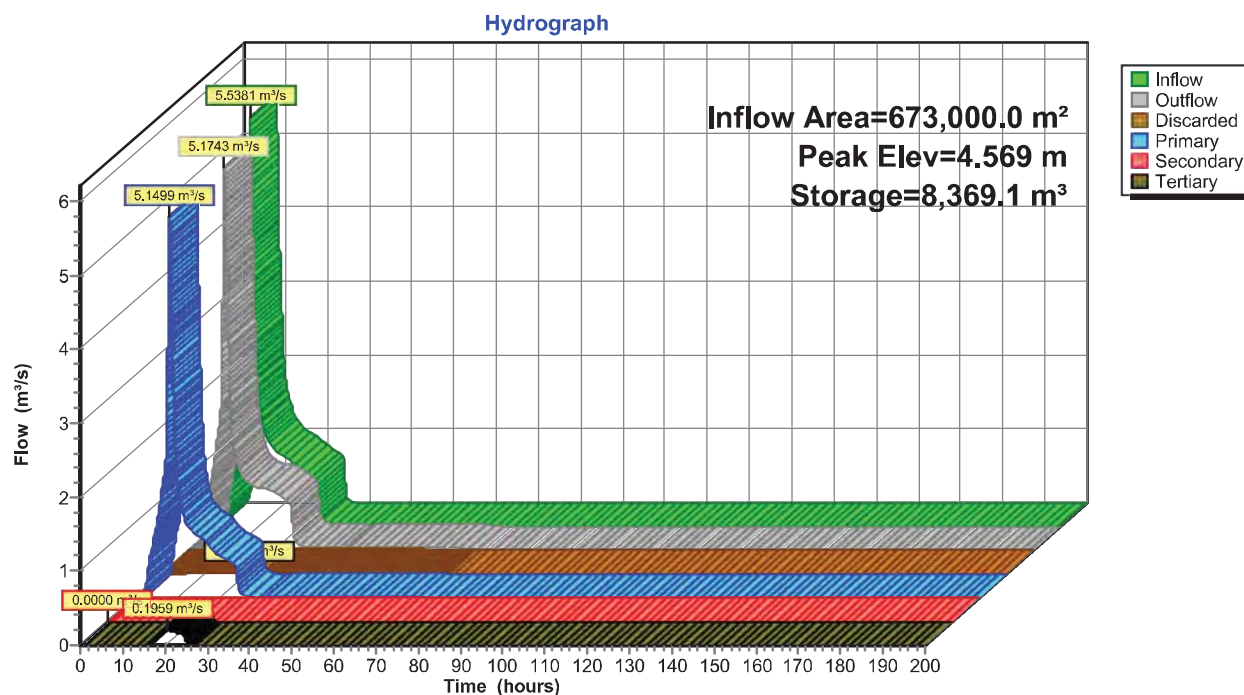| Device	Routing	Invert	Outlet Devices
#1	Primary	3.950 m	**10.00 m long Weir** 2 End Contraction(s)
#2	Secondary	5.000 m	**620.00 m long x 0.30 m breadth Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83
#3	Discarded	3.850 m	**20.00 mm/hr Exfiltration over Wetted area above 3.850 m** Excluded Wetted area = 7,208.3 m²
#4	Tertiary	4.510 m	**10.00 m long + 2.0 m/m SideZ x 1.00 m breadth Proposed Spillway Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 0.914 1.067 1.219 1.372 1.524 1.676 Coef. (Metric) 1.34 1.42 1.48 1.48 1.47 1.46 1.46 1.48 1.48 1.50 1.54 1.58 1.61 1.65 1.76 1.79 1.83

Discarded OutFlow Max=0.0328 m³/s @ 20.65 hrs HW=4.569 m   (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.0328 m³/s)

Primary OutFlow Max=5.1497 m³/s @ 8.42 hrs HW=4.386 m TW=3.880 m   (Dynamic Tailwater)
└─**1=Weir** (Weir Controls 5.1497 m³/s @ 1.19 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.850 m   (Free Discharge)
└─**2=Overflow** (Controls 0.0000 m³/s)

Tertiary OutFlow Max=0.1959 m³/s @ 20.65 hrs HW=4.569 m   (Free Discharge)
└─**4=Proposed Spillway Overflow** (Weir Controls 0.1959 m³/s @ 0.33 m/s)

Pond 124P: Canal - eastern canal expansion

Hydrograph

Inflow Area=673,000.0 m²
Peak Elev=4.569 m
Storage=8,369.1 m³

Legend:
- Inflow
- Outflow
- Discarded
- Primary
- Secondary
- Tertiary

5.5381 m³/s
5.1743 m³/s
5.1499 m³/s
0.0000 m³/s
0.1959 m³/s

Flow (m³/s)

Time (hours)

Summary for Pond 125P: 825 pipe

Inflow Area =	730,000.0 m²,	7.81% Impervious,	Inflow Depth =	90 mm	for 20yr Type 1A event
Inflow	=	0.5079 m³/s @	20.67 hrs,	Volume=	65,505.3 m³
Outflow	=	0.5079 m³/s @	20.67 hrs,	Volume=	65,502.7 m³, Atten= 0%, Lag= 0.1 min
Primary	=	0.5079 m³/s @	20.67 hrs,	Volume=	65,502.7 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 4.091 m @ 20.67 hrs Surf.Area= 3.1 m² Storage= 4.7 m³

Plug-Flow detention time= 0.4 min calculated for 65,499.5 m³ (100% of inflow)
Center-of-Mass det. time= 0.2 min (3,357.0 - 3,356.7)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	15.7 m³	**2.00 mD x 5.00 mH Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.420 m	**825 mm Round Culvert** L= 38.78 m Ke= 0.500 Inlet / Outlet Invert= 3.420 m / 3.346 m S= 0.0019 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.535 m²

Primary OutFlow Max=0.5079 m³/s @ 20.67 hrs HW=4.091 m (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.5079 m³/s @ 1.49 m/s)

Pond 125P: 825 pipe

Hydrograph — Inflow Area=730,000.0 m² Peak Elev=4.091 m Storage=4.7 m³ 825 mm Round Culvert n=0.011 L=38.78 m S=0.0019 m/m
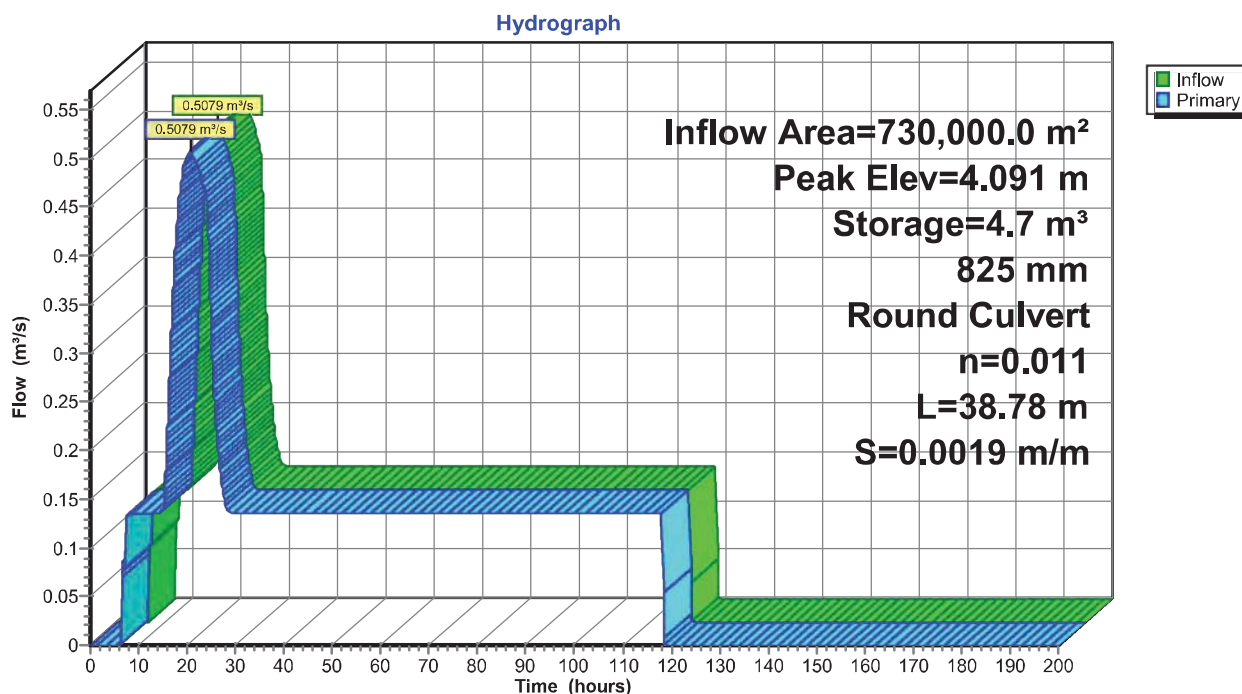
Summary for Pond 126P: Pond 1

Inflow Area =   695,000.0 m²,   3.17% Impervious, Inflow Depth =   137 mm   for 20yr Type 1A event
Inflow   =   5.2425 m³/s @   8.41 hrs, Volume=   94,984.3 m³
Outflow   =   5.0746 m³/s @   8.44 hrs, Volume=   94,940.6 m³, Atten= 3%, Lag= 1.4 min
Discarded =   0.0300 m³/s @   20.67 hrs, Volume=   7,188.9 m³
Primary   =   5.0085 m³/s @   8.44 hrs, Volume=   55,239.5 m³
     Routed to Pond 123P : Pond 2
Secondary =   0.0500 m³/s @   2.62 hrs, Volume=   21,646.7 m³
     Routed to Pond 123P : Pond 2
Tertiary   =   0.3717 m³/s @   20.67 hrs, Volume=   10,865.5 m³
     Routed to Pond 125P : 825 pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.300 m   Surf.Area= 17,483.6 m²   Storage= 3,905.5 m³
Peak Elev= 4.569 m @ 20.67 hrs   Surf.Area= 22,837.2 m²   Storage= 29,836.0 m³   (25,930.5 m³ above start)

Plug-Flow detention time= 1,100.8 min calculated for 91,035.2 m³ (96% of inflow)
Center-of-Mass det. time= 952.1 min (1,729.7 - 777.7)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	50,024.2 m³	**Custom Stage Data (Conic)** Listed below

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
2.600	31.5	0.0	0.0	31.5
2.800	605.0	51.6	51.6	605.1
3.000	2,950.9	326.1	377.8	2,951.2
3.200	16,722.6	1,779.9	2,157.7	16,723.0
3.400	18,244.7	3,495.6	5,653.3	18,248.0
3.600	19,084.6	3,732.6	9,385.9	19,093.5
3.800	20,068.2	3,914.9	13,300.8	20,082.1
4.000	20,826.6	4,089.2	17,390.0	20,847.2
4.200	21,580.7	4,240.5	21,630.5	21,608.3
4.400	22,261.0	4,384.0	26,014.5	22,296.7
4.600	22,942.6	4,520.2	30,534.7	22,986.6
4.800	23,626.5	4,656.7	35,191.4	23,679.0
5.000	24,332.5	4,795.7	39,987.2	24,393.5
5.200	25,108.0	4,943.8	44,931.0	25,176.9
5.400	25,826.0	5,093.2	50,024.2	25,903.8

Device	Routing	Invert	Outlet Devices
#1	Primary	3.750 m	**75.00 m long x 3.00 m breadth Weir** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 Coef. (Metric) 1.37 1.41 1.49 1.48 1.48 1.48 1.47 1.46
#2	Discarded	3.300 m	**20.00 mm/hr Exfiltration over Wetted area above 3.300 m** Excluded Wetted area = 17,485.5 m²
#3	Secondary	3.300 m	**0.0500 m³/s Through bund when above 3.300 m**
#4	Tertiary	3.449 m	**825 mm Round Culvert** L= 15.00 m Ke= 0.500 Inlet / Outlet Invert= 3.449 m / 3.420 m S= 0.0019 m/m Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.535 m²
#5	Device 4	4.470 m	**2,100 mm Horiz. Scruffy dome** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0300 m³/s @ 20.67 hrs HW=4.569 m   (Free Discharge)
└─2=**Exfiltration** (Exfiltration Controls 0.0300 m³/s)

Primary OutFlow Max=4.9814 m³/s @ 8.44 hrs HW=3.880 m TW=3.759 m   (Dynamic Tailwater)
└─1=**Weir** (Weir Controls 4.9814 m³/s @ 0.51 m/s)

Secondary OutFlow Max=0.0500 m³/s @ 2.62 hrs HW=3.300 m TW=3.108 m   (Dynamic Tailwater)
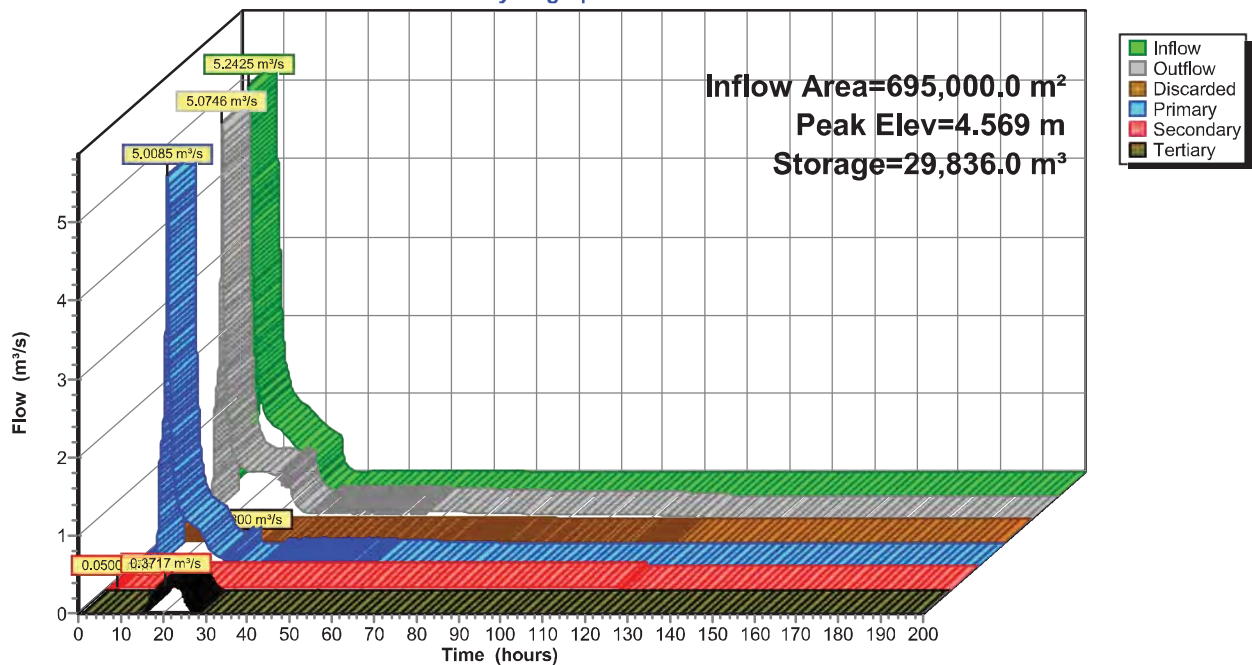└─3=**Through bund** (Exfiltration Controls 0.0500 m³/s)

Tertiary OutFlow Max=0.3717 m³/s @ 20.67 hrs HW=4.569 m TW=4.091 m   (Dynamic Tailwater)
└─4=**Culvert** (Passes 0.3717 m³/s of 0.9819 m³/s potential flow)
  └─5=**Scruffy dome** (Weir Controls 0.3717 m³/s @ 0.57 m/s)

Pond 126P: Pond 1

Summary for Pond 124P: Canal - eastern canal expansion

Inflow Area =   673,000.0 m²,   0.00% Impervious, Inflow Depth =   204 mm   for 100yr Type 1A event
Inflow   =   7.2637 m³/s @   8.23 hrs, Volume=   137,419.8 m³
Outflow   =   6.6652 m³/s @   8.36 hrs, Volume=   137,378.9 m³, Atten= 8%, Lag= 7.7 min
Discarded =   0.0353 m³/s @   14.50 hrs, Volume=   5,846.3 m³
Primary   =   6.6367 m³/s @   8.36 hrs, Volume=   110,114.0 m³
      Routed to Pond 126P : Pond 1
Secondary =   0.0000 m³/s @   0.00 hrs, Volume=   0.0 m³
Tertiary   =   0.5634 m³/s @   14.50 hrs, Volume=   21,418.7 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.850 m   Surf.Area= 6,950.7 m²   Storage= 1,513.9 m³
Peak Elev= 4.625 m @ 14.50 hrs   Surf.Area= 12,511.6 m²   Storage= 9,058.3 m³   (7,544.3 m³ above start)

Plug-Flow detention time= 160.9 min calculated for 135,865.0 m³ (99% of inflow)
Center-of-Mass det. time= 132.6 min (855.6 - 723.0)

Volume	Invert	Avail.Storage	Storage Description
#1	3.600 m	15,805.9 m³	**2.60 mW x 1,985.00 mL x 1.50 mH 1985m canal Z=1.8**

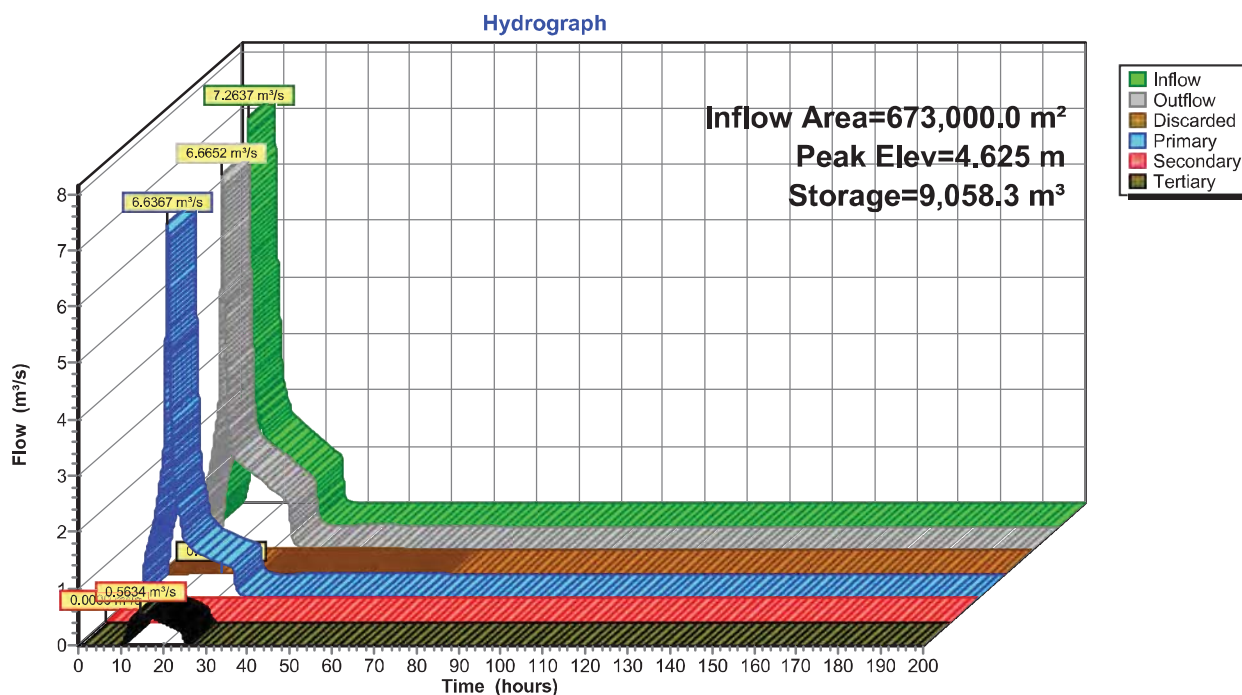| Device	Routing	Invert	Outlet Devices
#1	Primary	3.950 m	**10.00 m long Weir** 2 End Contraction(s)
#2	Secondary	5.000 m	**620.00 m long x 0.30 m breadth Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 Coef. (Metric) 1.49 1.50 1.52 1.58 1.65 1.70 1.77 1.81 1.83 1.82 1.83
#3	Discarded	3.850 m	**20.00 mm/hr Exfiltration over Wetted area above 3.850 m** Excluded Wetted area = 7,208.3 m²
#4	Tertiary	4.510 m	**10.00 m long + 2.0 m/m SideZ x 1.00 m breadth Proposed Spillway Overflow** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 0.549 0.610 0.762 0.914 1.067 1.219 1.372 1.524 1.676 Coef. (Metric) 1.34 1.42 1.48 1.48 1.47 1.46 1.46 1.48 1.48 1.50 1.54 1.58 1.61 1.65 1.76 1.79 1.83

Discarded OutFlow Max=0.0353 m³/s @ 14.50 hrs HW=4.625 m   (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.0353 m³/s)

Primary OutFlow Max=6.6241 m³/s @ 8.36 hrs HW=4.473 m TW=4.026 m   (Dynamic Tailwater)
└─**1=Weir** (Weir Controls 6.6241 m³/s @ 1.28 m/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=3.850 m   (Free Discharge)
└─**2=Overflow** (Controls 0.0000 m³/s)

Tertiary OutFlow Max=0.5634 m³/s @ 14.50 hrs HW=4.625 m   (Free Discharge)
└─**4=Proposed Spillway Overflow** (Weir Controls 0.5634 m³/s @ 0.48 m/s)

Pond 124P: Canal - eastern canal expansion

Hydrograph

Inflow Area=673,000.0 m²
Peak Elev=4.625 m
Storage=9,058.3 m³

Legend:
- Inflow
- Outflow
- Discarded
- Primary
- Secondary
- Tertiary

7.2637 m³/s
6.6652 m³/s
6.6367 m³/s
0.5634 m³/s
0.0000 m³/s

Flow (m³/s)

Time (hours)

Summary for Pond 125P: 825 pipe

Inflow Area = 730,000.0 m², 7.81% Impervious, Inflow Depth = 119 mm   for 100yr Type 1A event
Inflow   =   0.8683 m³/s @   14.53 hrs, Volume=   86,731.2 m³
Outflow   =   0.8691 m³/s @   14.63 hrs, Volume=   86,728.6 m³, Atten= 0%, Lag= 5.9 min
Primary   =   0.8691 m³/s @   14.63 hrs, Volume=   86,728.6 m³

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Peak Elev= 4.399 m @ 14.63 hrs   Surf.Area= 3.1 m²   Storage= 5.7 m³

Plug-Flow detention time= 0.3 min calculated for 86,724.2 m³ (100% of inflow)
Center-of-Mass det. time= 0.2 min (2,799.0 - 2,798.8)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	15.7 m³	**2.00 mD x 5.00 mH Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	3.420 m	**825 mm Round Culvert** L= 38.78 m Ke= 0.500 Inlet / Outlet Invert= 3.420 m / 3.346 m S= 0.0019 m/m Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.535 m²

Primary OutFlow Max=0.8645 m³/s @ 14.63 hrs HW=4.395 m   (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.8645 m³/s @ 1.73 m/s)

Pond 125P: 825 pipe

Hydrograph

Inflow Area=730,000.0 m²
Peak Elev=4.399 m
Storage=5.7 m³
825 mm
Round Culvert
n=0.011
L=38.78 m
S=0.0019 m/m
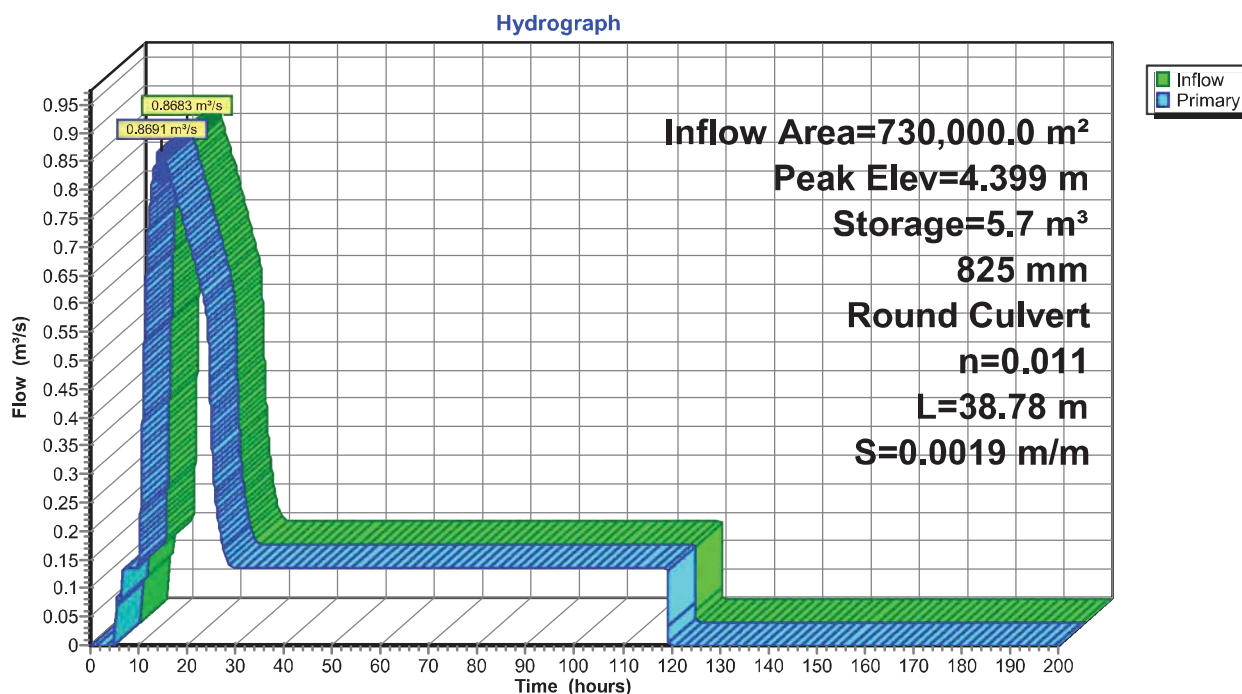
Summary for Pond 126P: Pond 1

Inflow Area =   695,000.0 m²,   3.17% Impervious, Inflow Depth =   166 mm   for 100yr Type 1A event
Inflow   =   6.7678 m³/s @   8.35 hrs, Volume=   115,105.6 m³
Outflow   =   4.2153 m³/s @   8.30 hrs, Volume=   115,041.3 m³, Atten= 38%, Lag= 0.0 min
Discarded =   0.0310 m³/s @   14.53 hrs, Volume=   7,486.5 m³
Primary   =   4.1466 m³/s @   8.30 hrs, Volume=   54,500.8 m³
    Routed to Pond 123P : Pond 2
Secondary =   0.0500 m³/s @   2.16 hrs, Volume=   21,898.5 m³
    Routed to Pond 123P : Pond 2
Tertiary   =   0.7249 m³/s @   14.53 hrs, Volume=   31,155.5 m³
    Routed to Pond 125P : 825 pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs
Starting Elev= 3.300 m   Surf.Area= 17,483.6 m²   Storage= 3,905.5 m³
Peak Elev= 4.625 m @ 14.53 hrs   Surf.Area= 23,026.9 m²   Storage= 31,108.8 m³   (27,203.3 m³ above start)

Plug-Flow detention time= 948.9 min calculated for 111,130.3 m³ (97% of inflow)
Center-of-Mass det. time= 828.1 min (1,562.1 - 734.0)

Volume	Invert	Avail.Storage	Storage Description
#1	2.600 m	50,024.2 m³	**Custom Stage Data (Conic)** Listed below

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
2.600	31.5	0.0	0.0	31.5
2.800	605.0	51.6	51.6	605.1
3.000	2,950.9	326.1	377.8	2,951.2
3.200	16,722.6	1,779.9	2,157.7	16,723.0
3.400	18,244.7	3,495.6	5,653.3	18,248.0
3.600	19,084.6	3,732.6	9,385.9	19,093.5
3.800	20,068.2	3,914.9	13,300.8	20,082.1
4.000	20,826.6	4,089.2	17,390.0	20,847.2
4.200	21,580.7	4,240.5	21,630.5	21,608.3
4.400	22,261.0	4,384.0	26,014.5	22,296.7
4.600	22,942.6	4,520.2	30,534.7	22,986.6
4.800	23,626.5	4,656.7	35,191.4	23,679.0
5.000	24,332.5	4,795.7	39,987.2	24,393.5
5.200	25,108.0	4,943.8	44,931.0	25,176.9
5.400	25,826.0	5,093.2	50,024.2	25,903.8

Device	Routing	Invert	Outlet Devices
#1	Primary	3.750 m	**75.00 m long x 3.00 m breadth Weir** Head (meters) 0.061 0.122 0.183 0.244 0.305 0.366 0.427 0.488 Coef. (Metric) 1.37 1.41 1.49 1.48 1.48 1.48 1.47 1.46
#2	Discarded	3.300 m	**20.00 mm/hr Exfiltration over Wetted area above 3.300 m** Excluded Wetted area = 17,485.5 m²
#3	Secondary	3.300 m	**0.0500 m³/s Through bund when above 3.300 m**
#4	Tertiary	3.449 m	**825 mm Round Culvert** L= 15.00 m Ke= 0.500 Inlet / Outlet Invert= 3.449 m / 3.420 m S= 0.0019 m/m Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.535 m²
#5	Device 4	4.470 m	**2,100 mm Horiz. Scruffy dome** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0310 m³/s @ 14.53 hrs HW=4.625 m   (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.0310 m³/s)
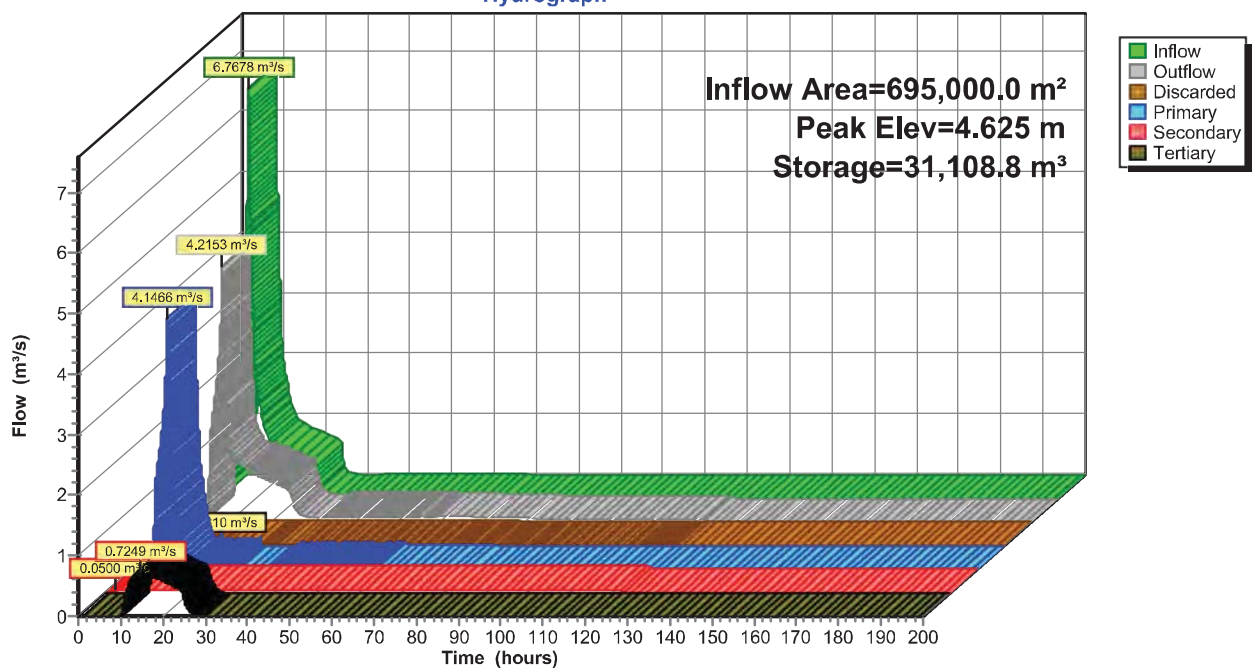
Primary OutFlow Max=2.7906 m³/s @ 8.30 hrs HW=3.999 m TW=3.997 m   (Dynamic Tailwater)
└─**1=Weir** (Weir Controls 2.7906 m³/s @ 0.15 m/s)

Secondary OutFlow Max=0.0500 m³/s @ 2.16 hrs HW=3.300 m TW=3.111 m   (Dynamic Tailwater)
└─**3=Through bund** (Exfiltration Controls 0.0500 m³/s)

Tertiary OutFlow Max=0.6935 m³/s @ 14.53 hrs HW=4.625 m TW=4.386 m   (Dynamic Tailwater)
└─**4=Culvert** (Inlet Controls 0.6935 m³/s @ 1.30 m/s)
  └─**5=Scruffy dome** (Passes 0.6935 m³/s of 0.7249 m³/s potential flow)

Pond 126P: Pond 1

Hydrograph

Inflow Area=695,000.0 m²
Peak Elev=4.625 m
Storage=31,108.8 m³

Legend: Inflow, Outflow, Discarded, Primary, Secondary, Tertiary

6.7678 m³/s
4.2153 m³/s
4.1466 m³/s
10 m³/s
0.7249 m³/s
0.0500 m³/s

Flow (m³/s) — Time (hours)

Appendix B – Consent CON20090505532 – Schedule 1

SCHEDULE 1

MONITORING PROGRAMME – RESOURCE CONSENT CON20090505532

The Consent Holder shall undertake the monitoring as follows:

1 WATER QUALITY OF DISCHARGES FROM THE STORMWATER SETTLEMENT AND STORAGE POND SYSTEM

1.1 Routine Water Monitoring for Discharges from the stormwater settlement and storage pond to Whangarei Harbour

The stormwater system and discharges shall be monitored in accordance with Table 1 attached below

If any of the following determinands in the stormwater being discharged to the coastal marine area exceed the Action Values specified in Table A, the Consent Holder will notify the NRC within two weeks of receiving the sample result and investigate the source of the contaminant and advise the NRC as to the findings of the investigation and any management response.

Table A

Determinands	Action values: Concentration in milligrams per cubic metre
Total Aluminium	5
Total copper	13
Total lead	44
Total zinc	150
PAHs	
– Acenaphthene	58
– Anthracene	0.1
– Benzo(α)anthracene	0.18
– Benzo(α)pyrene	0.1
– Fluoranthene	10
– Fluorene	30
– Napthalene	500
– Phenanthrene	6
– Pyrene	0.25

Note: ANZECC for PAH, 99% protection level as recommended in Section 8.3.7.7 and also CEQG (Canadian aquatic guidelines). For aluminium, ANZECC 8.3.7 Marine guidelines recommend 0.5 mg/m as an indicative low reliability figure.

Values in Table A are intended to act as an early warning to identify if concentrations are increasing relative to previously documented monitoring values/trends and warrant investigation notwithstanding that they may be well below levels of environmental concern taking into account mixing and dilution.

TABLE 1: SCHEMATIC MONITORING DIAGRAM –

Location	Sampling Frequency	Parameters	Criteria	Notes
Point of discharge from treatment pond system	First discharge per season, and two other discharge events each year			Advise NRC when ponds reach design discharge level for the first time each year prior to discharge occurring
	Three samples spaced evenly over each day (operational hours) until discharge has ceased. First sample to be taken as close as possible to when discharge first occurs.	TSS, VSS, NTU and pH	TSS as in Condition 5(b)	T and DO are considered not useful in this situation as they will reflect conditions intrinsic to the wetland and in any event cannot have any influence on water quality in this particular marine receiving environment.
	Taken with first sample from first discharge event only.	Al, Cu, Pb, Zn, PAH, and resin acids. Total N and Total P to be included if fertiliser products have been stored on site in the previous season.	**Action values** see table A in 1.1 above. Resin acids, Total N and P concentrations will be assessed against available previous literature and concentrations to determine potential for adverse effects. All parameters to be assessed for any increasing trends over time.	If the resin acid results for the first discharge of the season are below any applicable ANZECC effect threshold after theoretical mixing, resin acids need not be further analysed in that season.
	One-off under existing regime	WETT (Toxicity Testing)	As specified in point 1.3 below	One further WETT will be undertaken under the present port conditions. The need for any further WETT will be considered only if new port operations introduce new contaminant(s) into the stormwater.
Pond Influent	To be done with *"First discharge per season"* referred to above	T, pH, DO, TSS, Cu, Pb, Zn, resin acids, phenols, PAH, VSS	Trend data only, no compliance limits.	Test to be used as an indication of pond effectiveness under different conditions eg size of storm, contributing area

Stormwater Canals, western/eastern arms	One off	*Sediment samples:* Cu, Pb, Zn, PAH *Water:* Winter months *(when ponding in canals following rainfall)* pH, Cu, Pb, Zn, resin acids, phenols, PAH	Trend data only but reference to ANZECC ISQG values to assess pollution status. Trend data only. No compliance limits	Samples to be taken at: Join of arms, 100m upstream on eastern arm, 100m upstream on western arm Test to be used to determine any disposal issues for sediment Both sediment and water samples to be representative based on 3 sub-samples from different points of each arm composited for analytical purposes
Groundwater				All results from the water quality and sediment quality monitoring will be reviewed after 5 years of exercise of this consent for the purpose of determining if groundwater quality is at risk.

Abbreviations

ANZECC	The Australian and New Zealand Environment and Conservation Council
T	Temperature
DO	Dissolved oxygen (both g/m³ and % saturation)
TSS	Total Suspended Solids
Total N	Total Nitrogen
Total P	Total Phosphorus
FC	Faecal Coliforms
Cu	Copper
Pb	Lead
Zn	Zinc
PAH	Polycyclic aromatic hydrocarbon
WETT	Whole Effluent Toxicity Test
VSS	Volatile Suspended Solids
NTU	Nephelometric Turbidity Unit

1.2 Pumping Hours

The Consent Holder shall measure the pumping hours, the date, the time, and the quantity of water when the discharge to Whangarei Harbour occurs.

Advice Note: *The application states that the approximately average volume of stormwater to be discharged is assessed at 200,000 cubic metres per annum. The size of the discharge pipe and the proposed capacity of the pumps limit the pumped discharge rate to approximately 2,520 cubic metres per hour.*

1.3 Wett Method

The WETT method for toxicity analyses shall be undertaken on not less than three representative marine species, including at least one algae, one invertebrate, and one fish. The choice of toxicity test species, dilutions, test endpoints to be measured, and "toxicity effect" shall be submitted to the Council for approval at least twenty working days prior to stormwater sampling. For each of the three [3] toxicity tests the EC_{25} (the concentration of stormwater estimated to produce a toxic effect in 25% of the test organisms) shall be greater than the equivalent of a 200-fold dilution of the stormwater. The dilution water used for toxicity tests shall be an uncontaminated sample of Whangarei Harbour water, collected on an incoming tide at the harbour entrance, at a point agreed to by the Council. There shall be no significant toxicity after a 200-fold dilution of the stormwater. For the purposes of this condition "significant toxicity" is defined as no more than a 25% toxic effect measured in the most sensitive test species used. Testing of the samples shall be carried out in accordance with the methodology outlined in the NIWA document entitled "Standard Methods for Whole Effluent Toxicity Testing: Development and Application" dated November 1998.

1.4 The pH and TSS results taken in accordance with Table 1 will be recorded in an ongoing spreadsheet a copy of which shall be forwarded to the Council Monitoring Manager as required by Condition 2 below. Any results recorded which do not achieve the criteria included in Condition 5 shall be reported to the Council Monitoring Manager together with an explanation within seven days of their receipt by Northport.

2 REPORTING

2.1 The Consent Holder shall forward to the Council Monitoring Manager by 31 August each year an annual report for the previous period 1 July to 30 June detailing the results of the monitoring required by Section 1 of this monitoring programme and an assessment of compliance with the conditions of consent.

3 REVIEW

The Regional Council, in conjunction with the Consent Holder, may undertake a review of the monitoring programme every two years. The review will take into account the Consent Holders monitoring results, any monitoring undertaken by the Regional Council and the level of development within the catchment areas. The Consent Holder shall meet the reasonable costs of any such review.

4   FIELD MEASUREMENTS, RECORDS, SAMPLE COLLECTION, SAMPLE TRANSPORT, DETECTION LIMITS, AND LABORATORY REQUIREMENTS

4.1   Records

A record of rainfall conditions preceding and during sampling shall be kept. This record shall be based on a nearby rainfall recording site agreed by the Council.

4.2   Sample Collection

All samples collected as part of this monitoring programme shall be collected using standard methods and approved containers.

4.3   Sample Transport

All samples collected as part of this monitoring programme shall be transported in accordance with standard procedures and under chain of custody to the laboratory.

4.4   Detection Limits

The detection limits for the analysis of metals in sediment and water samples collected shall be equivalent to, or better than, those specified below:
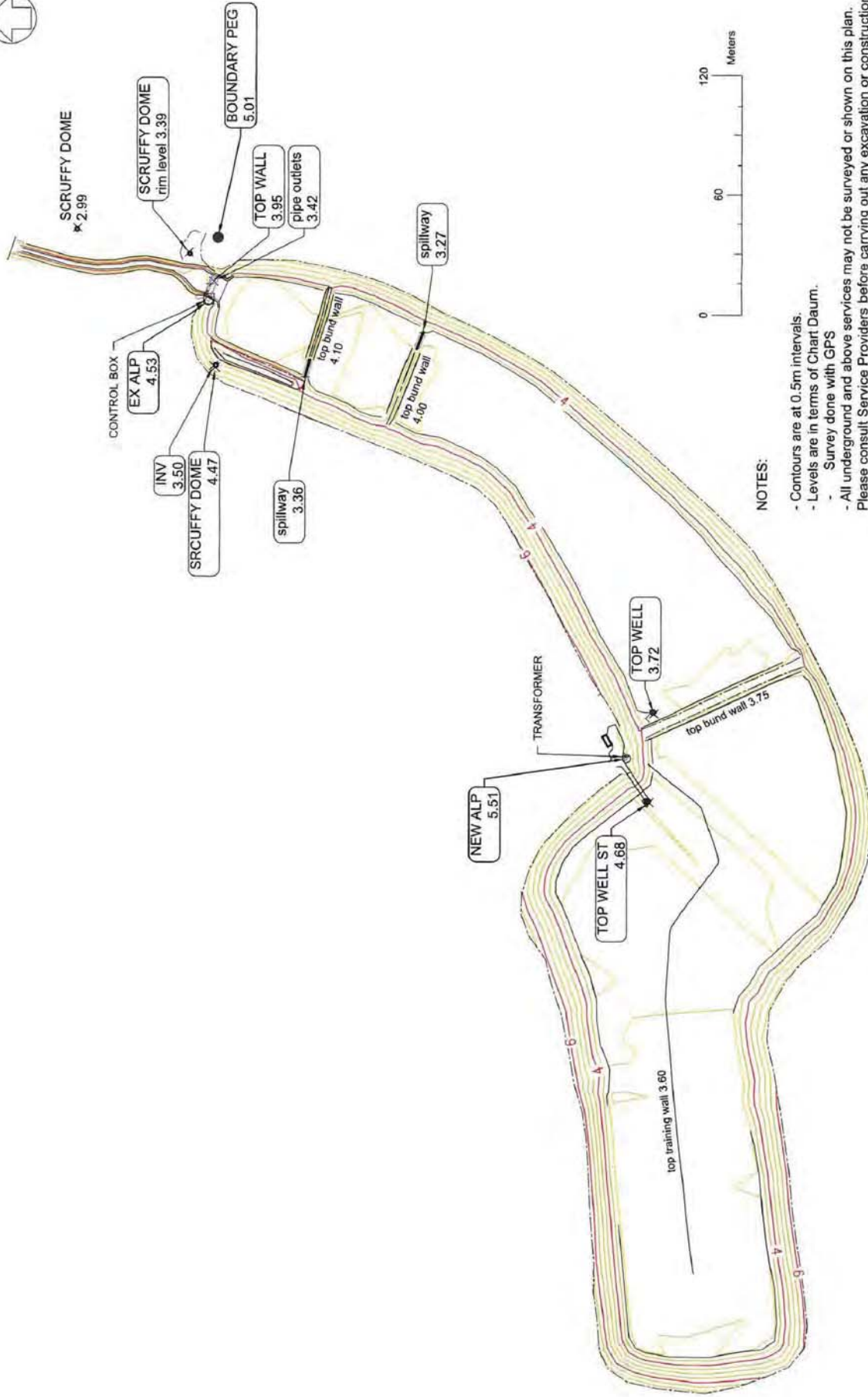
Metal	Sediment samples (milligrams per kilogram)	Water samples (milligrams per cubic metre)
total copper	2	1.0
total lead	0.4	0.2
total zinc	4	2.0
total arsenic	2	N/A
total cadmium	0.1	N/A
total chromium	2	N/A

4.5   Laboratory Requirements

All samples collected as part of this monitoring programme shall be analysed at a laboratory with registered quality assurance procedures (see definition below), and all analyses shall be conducted using standard methods.

Registered quality assurance procedures are procedures that ensure that the laboratory meets good management practices and would include registrations such as ISO 9000, ISO Guide 25, and Ministry of Health Accreditation.

Appendix C – Survey Plan

SCRUFFY DOME
× 2.99

SCRUFFY DOME
rim level 3.39

BOUNDARY PEG
5.01

TOP WALL
3.95

pipe outlets
3.42

CONTROL BOX

EX ALP
4.53

INV
3.50

SRCUFFY DOME
4.47

spillway
3.36

spillway
3.27

top bund wall
4.10

top bund wall
4.00

spillway
3.27

TRANSFORMER

TOP WELL
3.72

top bund wall 3.75

NEW ALP
5.51

TOP WELL ST
4.68

top training wall 3.60

NOTES:

- Contours are at 0.5m intervals.
- Levels are in terms of Chart Daum.
-     Survey done with GPS
- All underground and above services may not be surveyed or shown on this plan.
Please consult Service Providers before carrying out any excavation or construction.
- Boundary Hunter Ltd accepts no responsibility for services omitted by this survey.

Meters

0   60   120

Prepared for:
Northport

Northport Stormwater Pond
Existing Contour Survey

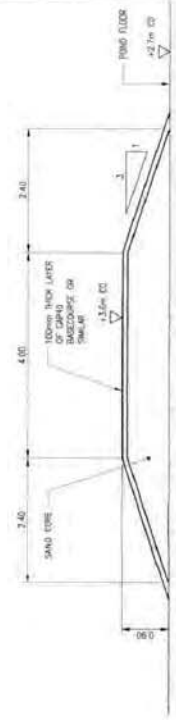| Surveyed: BM | Checked. B Smith |
| Date: 12/02/21 | Scale: 1:2000 @ A3 |

Sheet:
1 of 1

Ref: 8934

Appendix D – Northport Stormwater Pond Plan and Detail

NORTHPORT

NORTHPORT DEVELOPMENT

PROPOSED STORMWATER SETTLING & RETENTION BASINS

PLAN & DETAIL

Northport

P.O BOX 848
WHANGAREI, NEW ZEALAND
TEL 09 432 8740, FAX 09 432 8743
EMAIL bruce@northportcorp.co.nz

B. PRESTON

D60-30-06-01-004   0

1:1000(A1)
1:2000(A3)   FEB 2002

ORIGINAL SIZE A1
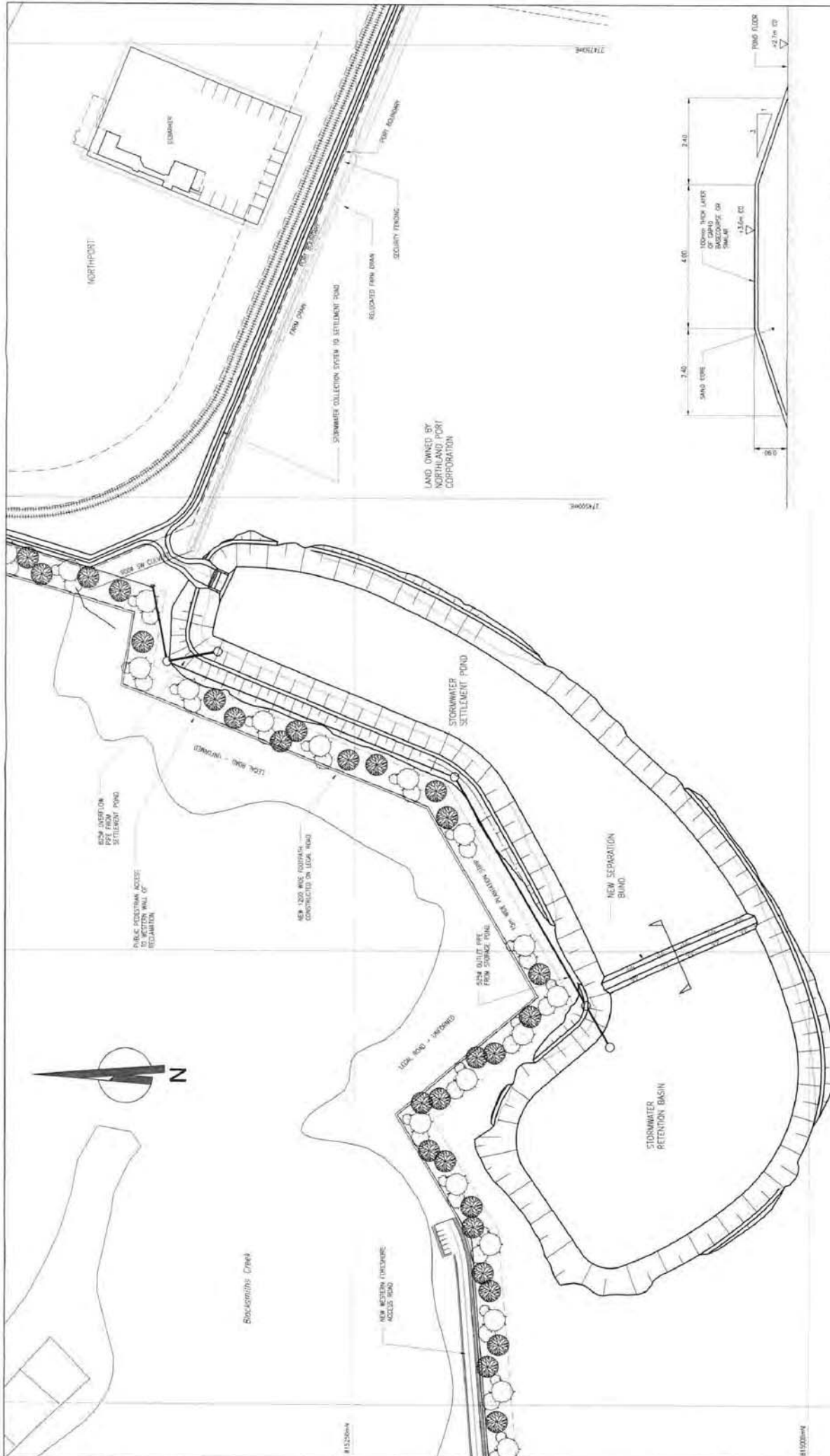
SEPARATION BUND TYPICAL CROSS SECTION
1:50(A1)
1:100(A3)

POND FLOOR   +2.7m CD

160mm THICK LAYER
OF GAP40
BASECOURSE OR
SIMILAR   +3.6m CD

SAND CORE

2.40   4.00   2.40

0.60

NOTE:
-COORDINATES ARE IN TERMS OF
GEODETIC DATUM 1949 Mt EDEN CIRCUIT.
-LEVELS ARE IN TERMS OF CHART DATUM

N

Blacksmiths Creek

STORMWATER
RETENTION BASIN

STORMWATER
SETTLEMENT POND

NEW SEPARATION
BUND

LEGAL ROAD - UNFORMED

NEW 1200 WIDE FOOTPATH
CONSTRUCTED ON LEGAL ROAD

825ø OUTLET PIPE
FROM STORAGE POND

825ø DIVERSION
PIPE FROM
SETTLEMENT POND

PUBLIC PEDESTRIAN ACCESS
TO WESTERN WALL OF
RECLAMATION

NEW WESTERN (CHEDDARS)
ACCESS ROAD

900 DIA CULVERT

LEGAL ROAD - UNFORMED

STORMWATER COLLECTION SYSTEM TO SETTLEMENT POND

RELOCATED FARM DRAIN

SECURITY FENCING

FARM DRAIN

PORT BOUNDARY

LAND OWNED BY
NORTHLAND PORT
CORPORATION

1745000mE

1742500mE

6132500mN

6130000mN

ISSUE   DATE   DETAIL   APPRVD   BY

0   5.3.02   ISSUED   DETAIL   BMP

PLAN

ELEVATION

MANHOLE 'E' DETAILS
1:25(A1)
1:50(A3)

SCHEDULE OF COORDINATES

45° BEND	8160185.37mN	2745798.1mE
CENTRE OF MANHOLE E.	8160135.51mN	2745827.18mE

LOCALITY PLAN
1:125(A1)
1:250(A3)

STANDARD PRECAST MANHOLE LID 150 THICK

2400 ID CONCRETE MH RISER - CLASS X

1200 DIA SW OVERFLOW PIPE FROM NPC INDUSTRIAL LAND DEVELOPMENT. INVERT LEVEL, AT ENTRANCE TO MANHOLE +1.50 CD

1500 DIA SW OVERFLOW PIPE TO WHARF. INVERT LEVEL, AT EXIT FROM MANHOLE +1.50 CD

825 DIA SW OVERFLOW PIPE FROM FROM NORTHPORT SW POND. INVERT LEVEL, AT ENTRANCE TO MANHOLE +2.17 CD

HAUNCHING TO SUIT PORTION

2600x2400 PRECAST MANHOLE BASE REINFORCED WITH D250-150 EACH WAY. 100 COVER TO BOTTOM

+1.50 CD (PIPE INVERTS)

LAND BOLLARD

45° BEND

SW CHANNEL SPILLWAY

SW COLLECTION CHANNEL

MANHOLE 'E' (2500 ID)

MANHOLE (1800 DIA)

825 DIA SW OVERFLOW PIPE FROM PORT

1200 DIA SW OVERFLOW PIPE FROM SUBDIVISION

NOTE:
- COORDINATES ARE IN TERMS OF GEODETIC DATUM 1949, Mt EDEN CIRCUIT.
- LEVELS ARE IN TERMS OF CHART DATUM.

N

ISSUE	DATE	DETAILS	DRWN	APPRVD
0	20.8.02	ISSUED FOR PRICING	BMP	

Appendix E – Pond Levels Schematic

NORTHPORT STORMWATER PUMP LEVELS

TOP OF DECK = RL 5.50m

BOTTOM OF BEARER = RL 5.23m

MINIMUM PORT DATUM = RL 5.00m

TOP OF PUMP RAIL = RL 4.77m

TOP OF INLET WEIR = RL 4.00m

HIGH LEVEL ALARM = RL 3.64m

BASE OF PERIMETER CANALS = RL 3.50m

START STANDBY PUMP = RL 3.44m

START DUTY PUMP = RL 3.24m

STOP BOTH PUMPS = RL 3.10m

BASE OF POND = RL 2.70m

1.59m

1.79m

1.99m

2.13m

Appendix F – Figure 01 – Overall Site Plan & Figure – 02 Catchment Plan

Proposed Expansion

Eastern canal

Eastern Consented

Northern canal

Slot Drain

Canal System

Existing Port

Port Marsden Highway

Eastern canal

Inlet Weir

First Basin

Location of western spillway

1200mmØ Culvert

Western canal

825mmØ Overflow pipe from settlement pond

Scruffy Dome

Forebay Bunds

525mmØ Outlet pipe from storage pond

Pump Station

Central Bund

Second Basin

Baffle

400 m

N

SITE PLAN
SCALE - 1:5000

Hawthorn Geddes
engineers & architects ltd

7 Selwyn Avenue
Whangarei 0110
Phone: 09 438 7139
Unit 21a, The Grange
Warkworth 0910
Phone: 09 283 3428
www.hawthorngeddes.co.nz
hg@hges.co.nz

CLIENT NORTHPORT LTD
PROJECT FUTURE DEVELOPMENT
PORT MARSDEN HIGHWAY, MARSDEN POINT
DRAWING OVERALL SITE PLAN

SCALE @ A3   1:5000
PROJECT No. 12377
FIGURE No. 01   REV. R1

690mmØ Culvert

Proposed
Expansion
13.7 Ha
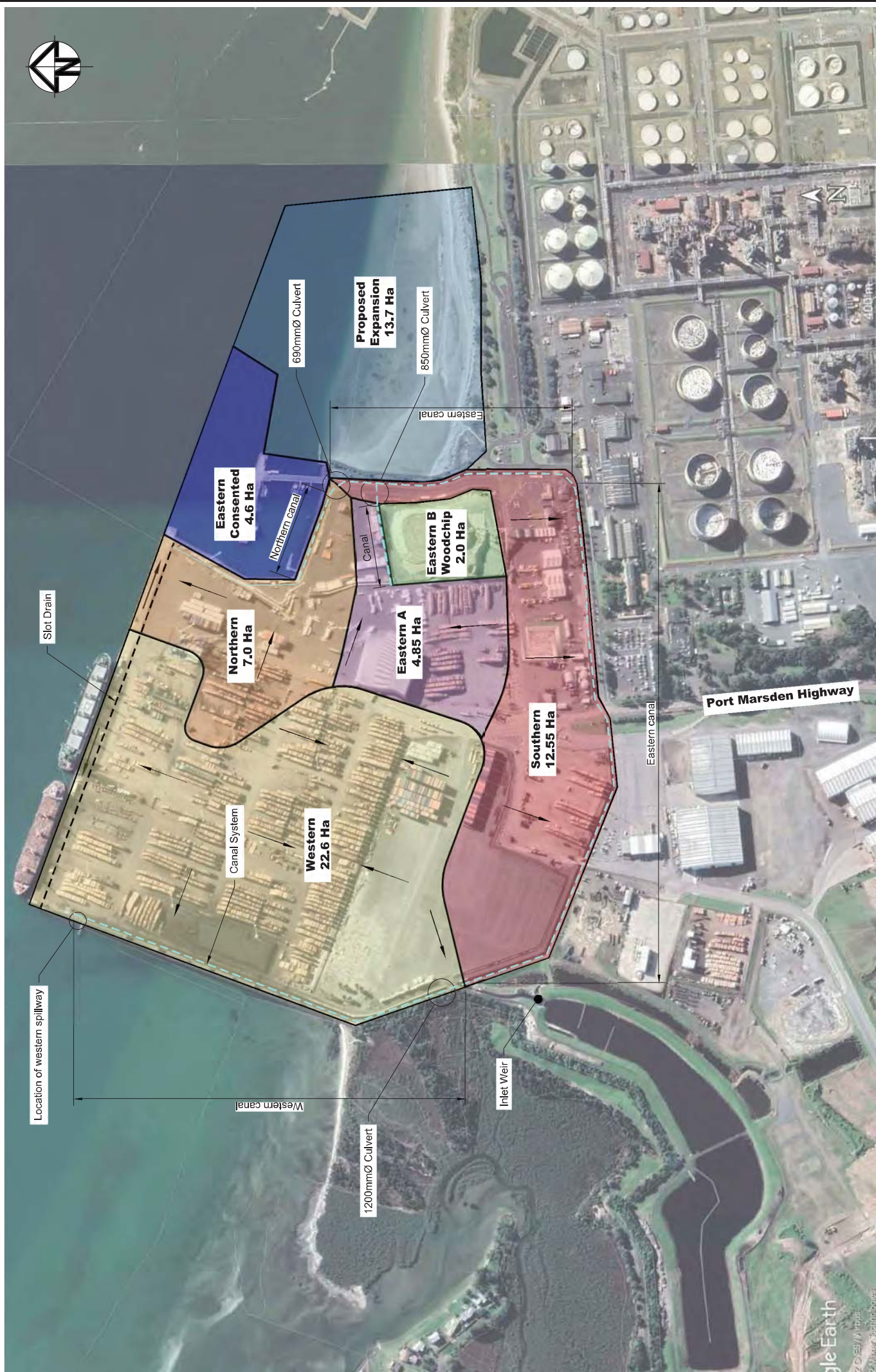
850mmØ Culvert

Eastern canal

Eastern
Consented
4.6 Ha

Northern canal

Canal

Eastern B
Woodchip
2.0 Ha

Slot Drain

Northern
7.0 Ha

Eastern A
4.85 Ha

Southern
12.55 Ha

Eastern canal

Port Marsden Highway

Canal System

Western
22.6 Ha

Location of western spillway

Western canal

1200mmØ Culvert

Inlet Weir

SITE PLAN
SCALE - 1:5000

CLIENT   **NORTHPORT LTD**

PROJECT   **FUTURE DEVELOPMENT**
          PORT MARSDEN HIGHWAY, MARSDEN POINT

DRAWING   **CATCHMENT PLAN**

Hawthorn Geddes
engineers & architects ltd

Unit 21a, The Grange
Warkworth 0910
Phone: 09 283 3428
www.hawthorngeddes.co.nz

7 Selwyn Avenue
Whangarei 0110
Phone: 09 438 7139
hg@hgks.co.nz

SCALE @ A3   1:5000
PROJECT No. **12377**
FIGURE No.   REV.
02   **R1**

ATTACHMENT 12

8 February 2022

Greg Blomfield
Terminal Facilities Manager
Northport Limited
PO Box 44
RUAKAKA 0151

Dear Greg

RESPONSE TO SECTION 92(1) (RMA) INFORMATION REQUEST IN REGARD TO RESOURCE CONSENT APPLICATION APP-005055.38.01 AND LU2200107

1.0 Introduction

In November 2022, Northport Ltd (Northport) applied to Northland Regional Council (NRC) and Whangārei District Council (WDC) for resource consent for discharges to air from its proposed expansion of the existing Northport berth length and associated operations towards the east. On 19 December 2022 NRC and WDC sought additional information pursuant to s.92(1) of the Resource Management Act 1991 (RMA). Northport has subsequently engaged Pattle Delamore Partners Limited (PDP) to prepare the response to this information request.

2.0 Responses

Responses are provided below to each of the points raised in the s.92(1) (RMA) information request.

2.1 Question 48

> 48. Section 3.11.5 of the AEE refers to the construction of an additional beach/roosting area to the west of the current port. The AQIA has not assessed the potential air quality effect of this construction and without the AQMP, it is unclear whether dust management plans have been provided or are proposed for this component of the proposal.
>
> Please provide an assessment of the potential dust effects of the construction and ongoing maintenance of the bird roosting area and confirm whether dust management procedures will be applied to this construction.
>
> Reason: The AQMP is considered a key aspect of the mitigation of potential air quality effects and should address the entire proposal.

Additional roosting habitat for Variable Oystercatcher and NZ Dotterel has been proposed in the inter-tidal area to the west of the existing port. This habitat is proposed to be constructed prior to the proposed reclamation for the Port so that it is ready ahead of any habitat loss associated with the reclamation. It is designed to be completely or mostly formed from sand and have a reasonable area above mean high water springs.

2

GREG BLOMFIELD - RESPONSE TO SECTION 92(1) (RMA) INFORMATION REQUEST IN REGARD TO RESOURCE CONSENT APPLICATION APP-005055.38.01 AND LU2200107

The proposed roost will be constructed from sand transported to the area at high tides with shallow draft barges which will be unloaded and shaped with hydraulic excavators. It is predicted that at least 40 barge loads will be required and take 1-3 months to complete. The mitigation measures will be outlined in the Construction Environmental Management Plan (CEMP) and will include that construction will occur during a period of low wind speeds (winds less than 5 metres per second (m/s)).

A FIDOL assessment of the proposed roost is set out as part of this s92 response. The proposed roost location and representative sensitive receptors are provided in Figure 1. Not all of the sensitive receptors have been identified due to practical purposes, but the selected locations will provide a representation of the surrounding environment. Table 1 provides the details of the identified sensitive receptors.

Figure 1: Proposed Roost Location and Identified Sensitive Receptors

Table 1: Sensitive Receptors				
Receptor Name	**Address**	**Receptor Type**	**Distance from the proposed Roost (m)**	**Direction relative to the Roost**
R1	38 Albany Road	Residential	350	SSW
R2	26 Albany Road	Residential	300	SW
R3	134 Marsden Bay Drive	Residential	580	WSW

pdp

3

GREG BLOMFIELD - RESPONSE TO SECTION 92(1) (RMA) INFORMATION REQUEST IN REGARD TO RESOURCE
CONSENT APPLICATION APP-005055.38.01 AND LU2200107

Frequency

The nearest receptors are located in the southwestern hemisphere from the proposed roost. This means that a wind from the northeastern hemisphere is required for the sensitive receptors to be downwind. As mentioned in the AQIA, winds above 5 m/s are considered to be able to transport dust. This would occur between 2.8 and 3.4 percent of the time. Based on guidance form the Institute of Air Management[1] this percentage of winds is classified as infrequent.

Furthermore, the frequency of winds will be further reduced as the sensitive receptors will need to be downwind during the time material is being deposited, this is proposed to be 40 occasions over a period of one to three months. However, as the sand deposited would be wet it is unlikely to cause nuisance dust effects during this process and once the material is deposited and is only likely to cause nuisance effects if it is disturbed when dry. Construction will occur with a variety of mitigation measures in place (to be outlined in the CEMP) which will occur that work is to be undertaken during periods of low wind speeds.

Post construction the frequency of nuisance dust towards the sensitive receptors will be limited to periods of time where the roost has been toped-up with additional sand. This is predicted to be infrequent and will be outlined in the monitoring and top-up plan that is to be established.

Intensity

The nearest receptors are located more than 300 m away from the proposed roost and based on the information provided in Figure 3 of the AQIA, marine sediments are unlikely to be transported more than 250 m. With the mitigation measures presented in Section 5.1.6.5 of the AEE, the intensity is considered to be low.

Post construction, the intensity of nuisance dust from the roost is predicted to be less than the nuisance dust that would be experienced from the beach. This is due to the distance between the sensitive receptors, beach, and proposed roost. Overall, the intensity is considered to be negligible.

Duration

PDP considers that the duration that nuisance effects could be observed to be short as effects will be limited to the construction of the roost which is predicted to take between one and three months. Furthermore, the activity that has the highest likelihood of producing nuisance dust is unloading (if the material is dry) and shaping the sand using hydraulic excavators and this will be limited to periods with good wind conditions (less than 5 m/s) and therefore the overall duration that nuisance effects can occur will be short.

As with the frequency, post construction the duration of nuisance dust will be limited to periods of time where additional material has been laid. This is predicted to be short in duration.

Offensiveness

PDP considers that dust emissions associated with the proposed roost are unlikely to be present in such quantities that they result in any off-site offensive or objectionable effects. This is based on the duration for construction to occur, the frequency of suitable meteorological conditions, the distance between the roost and sensitive receptors and the mitigation measures that will be implemented.

Post construction, PDP considers that any nuisance dust from the proposed roost will not be considered offensive or objectionable. This is due to the nature of the surrounding area, where the beach is more likely to result in nuisance dust effects at the sensitive receptors.

---

[1] Institute of Air Quality Management, *Guidance on the Assessment of Mineral Dust Impacts for Planning,* 2016

4

GREG BLOMFIELD - RESPONSE TO SECTION 92(1) (RMA) INFORMATION REQUEST IN REGARD TO RESOURCE CONSENT APPLICATION APP-005055.38.01 AND LU2200107

Location

The proposed roost is located a sufficient distance from sensitive receptors and beyond the distance dust associated with the construction is predicted to travel. Therefore, the location is deemed to be appropriate from an air quality perspective.

FIDOL Conclusion

Overall, it is considered that any nuisance dust effects associated with the proposed roost will be less than minor. Dust effects have the greatest potential to occur during constriction and this is limited to a period of one to three months and approximately 40 barge movements.

Post construction of the roost, nuisance dust effects are unlikely to result in adverse effects at any of the sensitive receptors due to the size and location of the roost. Erosion will occur over time with ongoing top-ups however these are likely to be intermittent and not result in any offensive or objectionable nuisance dust effects.

2.2   Question 49

49. *Please provide further detail on what meteorological monitoring will be used for air quality management. If the existing monitoring stations are proposed to be used for this purpose, then further detail to confirm the appropriateness of this monitoring data should be provided.*

Reason: The control measures under Section 6 (Dust) states that real-time weather data will be available for the site from Northport's meteorological monitoring stations and implies this information will be used to manage air quality. However, the AQIA states several meteorological monitoring stations that Northport own are located on "very high on port structures or near buildings and therefore have been considered to not accurately reflect the meteorological conditions of the proposed expansion".

There are a number of meteorological monitors in the vicinity of Northport. While none of the meteorological stations is where the proposed reclamation will be undertaken, there are monitoring stations that will provide suitable data to determine what conditions are occurring onsite. These monitoring stations were not considered appropriate to assess the meteorological conditions for the entire site in the AQIA due to their height and the location of the monitoring stations. However, from a dust assessment perspective there are monitoring stations that are deemed to be suitable. The parameters that should be used will primarily be wind direction, wind speed and rainfall. Temperature, relative humidity, and barometric pressure will also be recorded and are less subject to change across the site. For the work being undertaken to the east of the Northport (the proposed expansion), the information recorded from the Tug Jetty should be used. As the location of this monitor is subject to change as it could be moved during construction, PDP proposes that if this monitor was to move it would be moved to a suitable location to record the meteorological conditions for the proposed expansion.

During the construction of the proposed roost, Berth 2 and Portland should be considered with the information not recorded at those two stations being provided from either Marsden Pt Lead or the Admin Building. These monitoring stations are not ideal in terms of location however due to the height of the monitors; it is likely to overpredict the frequency of high wind speeds, providing some conservatism as work will not be undertaken during high wind speeds. As multiple monitoring stations are being proposed to be considered this will result in a range of conditions that could be experienced, therefore the most conservative values should be used (i.e. highest wind speed).

5

GREG BLOMFIELD - RESPONSE TO SECTION 92(1) (RMA) INFORMATION REQUEST IN REGARD TO RESOURCE CONSENT APPLICATION APP-005055.38.01 AND LU2200107

3.0   Closure

If you have any questions, please feel free to contact the undersigned.

Yours faithfully

PATTLE DELAMORE PARTNERS LIMITED

Prepared by

Tara Hutchins

Air Quality Scientist

Reviewed by

Jonathan Harland

Service Leader – Air Quality

Approved by

Andrew Curtis

Technical Director – Air Quality