STORMWATER MANAGEMENT DESIGN BRIEF
SETTLERS RIDGE EAST PH3 / TOWNCENTRE PLACE

Interim Conditions

April 10, 2024

Belleville
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Belleville, ON
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1 Background

Settlers Ridge East Phase 3 (SRE) and Towncentre Place developments (Towncentre) are seeking approval to develop lands immediately west of Towncentre Drive in Belleville. SRE lands are shown in red and the Towncentre lands in blue (see Figure 1-1).

Figure 1-1: Site Location

The stormwater management facilities for Norbelle Creek are already in place. Two major dry ponds provide quantity control for all the lands which drain through Towncentre Drive and Hwy 62. The facilities were reviewed by Jewell in April 2017 and a small expansion was designed to accommodate the SRE Phases 1 and 2 lands. That expansion was constructed concurrently with Phase 1.

The premise of the 2017 work was full development of the contributing lands along with future SWM facilities (ponds 104 and 107). That work showed the stormwater management facilities would meet the design objectives. The subject lands were also included in the 2017 report and no further quantity controls were needed – quality treatment only would be required.

Within the functional servicing report for SRE and Towncentre, Jewell provided the design of the quality treatment.

2 Purpose

The purpose of this design brief is to review the effectiveness of the existing stormwater management facilities under the interim scenario that assumes:

1) No ponds 104 and 107 are installed.
2) No development will occur beyond the existing urban limit.

2.1 Hwy 62 Target Flows

The Norbelle Creek stormwater management design was initially considered in 1995 by Van Meer Limited in their Nor-Belle Subwatershed Stormwater Management Plan. They determined the existing conditions flows at Hwy 62 were 5.21cms. They completed design scenarios with storage of 1.8ha.m. and proposed a post-development peak flow rate of 3.3cms. They also explained the capacity of the culvert was 3.0cms and that the culvert would require improvements to increase the capacity.

In later years, this 3.3cms post-development peak flow was reduced to 2.8cms (GGG) and carried through to today as the maximum allowable peak flow at Hwy 62. The 2017 report demonstrates that peak flows will not exceed the target of 2.8cms at Hwy 62 and the current review confirms this in the interim conditions.

3 Modelling

The OTTHYMO model prepared in 2017 was adjusted for the interim development conditions. This includes development within the urban area only. The catchment drawing is shown in Appendix B. The urban area is identified as the dashed green line.

The proposed development is within Catchment 108b2. This has been further subdivided into E and W for east and west systems. The SRE and Towncentre catchments were modelled with 60% imperviousness. By contrast, the commercial developments were modelled using 80% imperviousness and the previous residential developments retained their assigned 45% imperviousness from the previous modelling. Catchment 108b1 (north of the pipeline) was also considered to be fully developed with 60% imperviousness. It is within the urban area and flows into Catchment 108b2 but is not the subject of the current application.

The lands within 104 and 107 catchments are undeveloped. The existing wet area for Pond 104 is included within the modelling since it is present and provides natural storage. The Pond 107 is removed.

As a refresher for the reader, Norbelle Creek flows into Cell 2 and then Cell 1 before joining with ditch flows from Towncentre Drive and Hwy 62. The creek then passes through the Hwy 62 culvert. It can be seen from the modelling that the significant work in peak flow reduction is completed by the Cell 2 which reduces peak flows to 2.94cms in the creek. Some catchments will bypass the quantity controls and this has been considered in the modelling. The reader is referred to the line diagram included within Appendix C to understand the flow pathway for each of the catchments. Within the flow diagram, catchments are shown as circles with the catchment number inside. Add points are shown as triangles and reservoirs as squares.

The model results show the peak flow for the interim development condition is **2.69cms**. This is less than what Jewell found in the full development scenario as reported in the 2017 report and is also less than the allowable peak of 2.8cms at Hwy 62. The flow summary is reported in Table 3-1. **The quantity control target is achieved in the interim development conditions.**

The updated OTTHYMO model and flow chart is included in Appendix C.

Table 3-1: 100-Yr Peak Flow Results at Hwy 62

Surface	Target Flow at Hwy 62	Provided	Satisfied
Full (2017)*	2.8m^3/s	2.73m^3/s	**Yes**
Interim (2024)**	2.8m^3/s	2.69m^3/s	**Yes**

* Norbelle Creek 2017 SWM Report, Jewell

** SWM Design Brief 2024, Jewell

4 Conclusion

The Settlers Ridge East Phase 3 and Towncentre Place developments are within Catchment 108b2 and will contribute to the existing stormwater management system for Norbelle Creek. The system is in place and has been designed to receive discharge from the current development. The target flows at Hwy 62 of 2.8cms was demonstrated to be achieved in the 2017 report that considered full development scenario.

This design brief was issued to understand the performance of the Norbelle Creek stormwater management system during the interim development conditions, which considers only development within the urban area but excludes the lands within Catchments 104 and 107.

The Norbelle Creek SWM facilities are on-line facilities and therefore perform only quantity controls. Quality controls must therefore be off-line. The Norbelle Creek plan is for quality treatment to be provided through measures such as OGS units. These have been designed for the two developments and were reported in the functional servicing study issued under separate cover.

Hydrologic modelling was carried out for the interim development conditions and Jewell found that the peak flows at Hwy 62 will be 2.69m^3/s, which is less than the allowable discharge of 2.8m^3/s. The quantity targets are satisfied.

The Norbelle Creek stormwater management will continue to function within the design targets in the interim development conditions.

Bryon Keene, P. Eng
Jewell Engineering Inc.

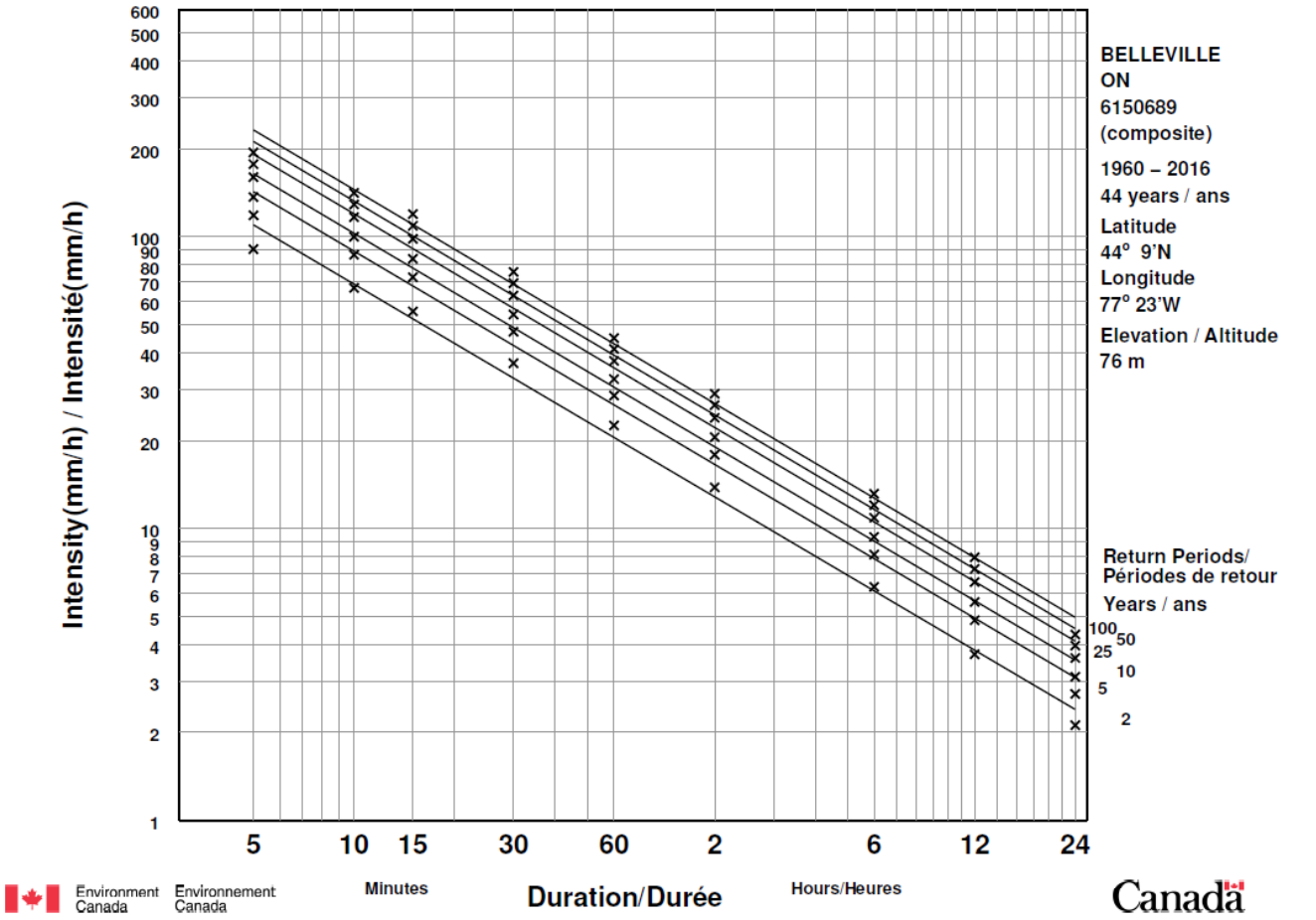
SRE PH 3 AND TOWNCENTRE SWM 2024 APR 10

APPENDIX A:
IDF CURVES – BELLEVILLE

Short Duration Rainfall Intensity–Duration–Frequency Data

2022/10/31

Données sur l'intensité, la durée et la fréquence des chutes de pluie de courte durée



Environment and Climate Change Canada
Environnement et Changement climatique Canada

Short Duration Rainfall Intensity-Duration-Frequency Data
Données sur l'intensité, la durée et la fréquence des chutes de pluie de courte durée

Gumbel - Method of moments/Méthode des moments

2022/10/31

==========

BELLEVILLE ON 6150689
(composite)
Latitude: 44 9'N Longitude: 77 23'W Elevation/Altitude: 76 m

Years/Années : 1960 - 2016 # Years/Années : 44

==========

****

Table 1 : Annual Maximum (mm)/Maximum annuel (mm)

****

Year / Année	5 min	10 min	15 min	30 min	1 h	2 h	6 h	12 h	24 h
1960	6.3	9.1	12.4	23.4	25.4	35.1	53.8	55.1	55.9
1961	6.1	7.9	8.9	12.2	18.0	18.8	23.9	34.0	36.3
1963	12.4	19.0	23.1	28.4	30.7	31.0	31.0	31.7	44.4
1964	4.3	5.6	7.4	12.2	12.4	20.6	45.2	45.7	45.7
1966	6.3	8.9	10.4	11.9	13.2	16.0	32.8	37.8	38.1
1967	7.4	9.9	10.4	10.4	11.9	13.2	26.4	42.4	58.7
1968	7.9	11.9	13.7	18.5	21.8	27.2	43.9	57.1	57.1
1969	5.8	9.7	13.0	17.5	24.4	31.0	37.8	43.2	62.2
1971	7.4	11.4	13.0	23.9	25.1	25.4	25.7	25.7	32.5
1972	9.4	10.7	11.7	12.4	14.7	20.6	28.2	33.5	50.5
1973	7.4	10.7	11.9	18.0	21.3	21.8	37.3	45.5	48.0
1974	10.9	15.2	17.8	25.4	25.4	25.4	34.3	42.7	42.7
1977	4.8	8.1	9.9	14.7	25.1	30.2	60.5	66.0	66.0
1980	13.2	16.9	19.0	20.5	20.5	34.6	46.9	47.6	59.6
1981	-99.9	-99.9	13.3	25.5	29.4	34.6	46.2	49.2	57.4
1982	4.6	8.5	10.1	14.2	18.3	24.7	39.8	45.0	45.0
1983	6.5	8.9	10.5	18.4	22.2	30.7	39.6	39.6	50.3
1984	5.1	8.1	10.1	11.3	19.7	23.7	33.4	51.4	55.1
1985	10.5	16.2	20.0	27.0	27.4	42.3	42.3	44.5	44.5
1986	9.1	14.4	16.4	23.2	25.2	35.0	59.2	68.8	78.9
1987	4.3	6.6	9.3	14.2	24.7	37.1	39.2	39.2	39.2
1988	3.7	6.2	7.4	8.6	9.2	10.6	20.8	22.2	28.2
1989	14.5	16.7	17.9	18.4	24.2	24.2	27.7	27.7	37.7

1990	6.9	8.3	10.0	12.3	13.6	20.8	29.7	34.8	38.7
1991	8.5	13.8	18.5	18.8	32.0	32.4	32.4	32.4	32.7
1992	6.3	7.6	8.4	13.2	18.8	21.9	38.2	48.3	50.1
1993	8.2	15.8	23.6	28.3	28.3	28.3	-99.9	-99.9	69.6
1994	8.8	10.2	14.5	18.3	23.6	25.5	38.2	49.2	52.8
1995	8.0	12.9	14.9	19.3	27.5	31.5	48.5	58.5	67.3
1996	6.9	10.4	13.4	19.2	25.1	41.3	41.5	53.8	53.8
1997	10.3	16.8	20.9	25.5	42.8	50.0	56.0	56.0	56.0
1998	9.5	12.1	15.1	22.1	25.0	32.6	38.6	38.6	50.2
1999	9.6	13.1	17.9	23.2	29.4	36.9	42.8	72.7	72.7
2000	10.4	13.4	14.7	16.8	29.0	39.8	52.0	52.4	53.0
2001	7.4	10.1	11.0	11.8	16.7	17.4	21.2	31.6	39.8
2002	7.1	9.4	14.0	21.0	22.4	26.0	39.4	44.2	49.8
2003	7.6	13.5	20.1	26.2	27.0	27.0	31.1	-99.9	56.2
2004	14.4	22.1	28.8	33.3	33.3	49.0	89.9	114.4	124.5
2006	9.0	14.7	18.8	19.5	19.5	19.5	37.3	42.7	59.8
2009	6.3	10.7	14.1	20.2	21.7	30.6	36.9	52.3	68.0
2011	12.7	20.3	25.8	31.1	39.7	44.3	49.1	49.1	51.2
2012	6.2	11.3	16.1	26.0	30.0	30.8	44.4	64.6	65.4
2013	7.4	11.6	15.7	19.3	21.5	23.2	29.0	32.8	33.9
2014	7.7	12.0	14.7	16.6	18.1	26.7	34.0	42.4	63.2
2015	5.3	8.5	11.4	17.0	29.0	48.2	56.4	60.6	73.7
2016	7.0	9.8	14.7	22.9	24.4	24.6	32.2	41.6	41.6
# Yrs. Années	45	45	46	46	46	46	45	44	46
Mean Moyenne	8.0	11.8	14.7	19.4	23.7	29.2	39.9	47.0	53.4
Std. Dev. Écart-type	2.6	3.8	4.9	5.9	6.8	9.2	12.5	15.5	16.1
Skew. Dissymétrie	0.80	0.78	0.86	0.26	0.30	0.43	1.54	1.96	1.88
Kurtosis	3.48	3.43	3.72	2.61	3.95	3.11	7.71	10.31	10.23

*-99.9 Indicates Missing Data/Données manquantes

Warning: annual maximum amount greater than 100-yr return period amount
Avertissement : la quantité maximale annuelle excède la quantité pour une période de retour de 100 ans

Year/Année	Duration/Durée	Data/Données	100-yr/ans
2004	6 h	89.9	78.9
2004	12 h	114.4	95.6
2004	24 h	124.5	104.0

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Table 2a : Return Period Rainfall Amounts (mm)
Quantité de pluie (mm) par période de retour

Duration/Durée	2 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans	#Years Années
5 min	7.6	9.9	11.4	13.3	14.8	16.2	45
10 min	11.1	14.5	16.7	19.5	21.5	23.6	45
15 min	13.9	18.2	21.0	24.6	27.3	29.9	46
30 min	18.4	23.6	27.1	31.4	34.7	37.9	46
1 h	22.6	28.5	32.5	37.5	41.3	45.0	46
2 h	27.7	35.8	41.1	47.9	52.9	57.9	46
6 h	37.8	48.8	56.1	65.3	72.2	78.9	45
12 h	44.5	58.1	67.2	78.6	87.1	95.6	44
24 h	50.8	65.0	74.5	86.4	95.2	104.0	46

Table 2b :

Return Period Rainfall Rates (mm/h) - 95% Confidence limits
Intensité de la pluie (mm/h) par période de retour - Limites de confiance de 95%

Duration/Durée	2 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans	#Years Années
5 min	90.7	118.5	136.9	160.1	177.4	194.5	45
	+/- 8.4	+/- 14.2	+/- 19.2	+/- 25.9	+/- 31.0	+/- 36.1	45
10 min	66.8	86.8	100.0	116.7	129.1	141.4	45
	+/- 6.1	+/- 10.2	+/- 13.8	+/- 18.6	+/- 22.2	+/- 25.9	45
15 min	55.5	72.7	84.0	98.4	109.1	119.6	46
	+/- 5.2	+/- 8.7	+/- 11.7	+/- 15.8	+/- 18.9	+/- 22.0	46
30 min	36.9	47.3	54.2	62.9	69.3	75.8	46
	+/- 3.1	+/- 5.3	+/- 7.1	+/- 9.6	+/- 11.5	+/- 13.4	46
1 h	22.6	28.5	32.5	37.5	41.3	45.0	46
	+/- 1.8	+/- 3.0	+/- 4.1	+/- 5.5	+/- 6.6	+/- 7.7	46
2 h	13.8	17.9	20.6	24.0	26.5	29.0	46
	+/- 1.2	+/- 2.0	+/- 2.8	+/- 3.7	+/- 4.5	+/- 5.2	46
6 h	6.3	8.1	9.4	10.9	12.0	13.2	45
	+/- 0.6	+/- 0.9	+/- 1.3	+/- 1.7	+/- 2.0	+/- 2.4	45
12 h	3.7	4.8	5.6	6.6	7.3	8.0	44
	+/- 0.3	+/- 0.6	+/- 0.8	+/- 1.1	+/- 1.3	+/- 1.5	44
24 h	2.1	2.7	3.1	3.6	4.0	4.3	46
	+/- 0.2	+/- 0.3	+/- 0.4	+/- 0.5	+/- 0.7	+/- 0.8	46

Table 3 : Interpolation Equation / Équation d'interpolation: R = A*T^B

R = Interpolated Rainfall rate (mm/h)/Intensité interpolée de la pluie (mm/h)
RR = Rainfall rate (mm/h) / Intensité de la pluie (mm/h)
T = Rainfall duration (h) / Durée de la pluie (h)

****

Statistics/Statistiques	2 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans
Mean of RR/Moyenne de RR	33.1	43.0	49.6	57.9	64.0	70.1
Std. Dev. /Écart-type (RR)	31.6	41.3	47.7	55.8	61.9	67.8
Std. Error/Erreur-type	7.6	9.6	10.9	12.6	13.9	15.1
Coefficient (A)	20.5	26.5	30.5	35.5	39.3	43.0
Exponent/Exposant (B)	-0.676	-0.677	-0.678	-0.679	-0.679	-0.679
Mean % Error/% erreur moyenne	8.5	8.1	8.0	7.8	7.7	7.7

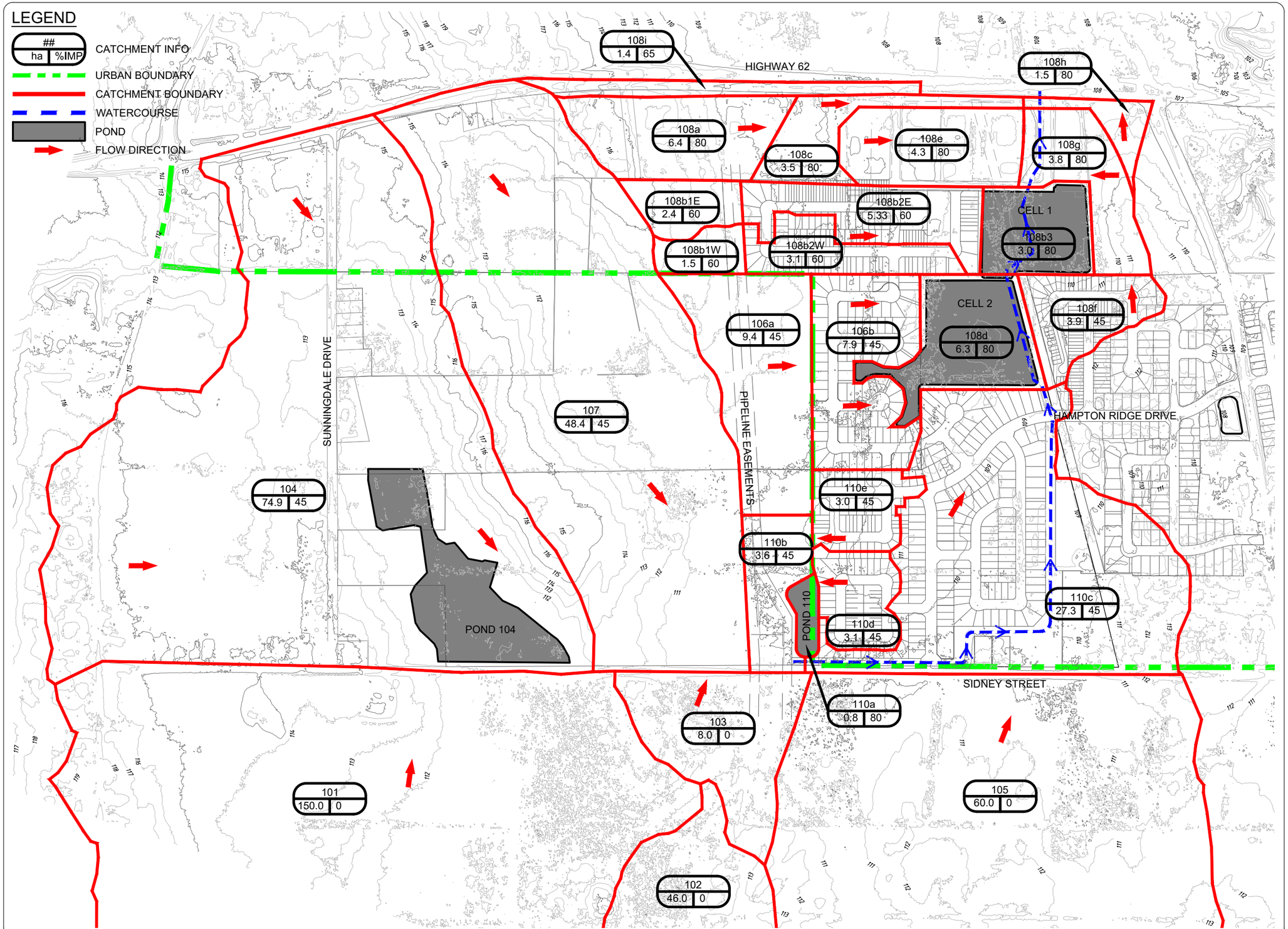
APPENDIX B:
NORBELLE CATCHMENT DRAWING

02/26/2024

F:\FTPPROJECT FILES\1 CIVIL 3D PROJECT FILES\1904502-3 - DUVANCO - SETTLERS PHASE 3\3 SHEETS\1904502 - SWM DRAINAGE PLAN

LEGEND

- ## / ha | %IMP — CATCHMENT INFO
- URBAN BOUNDARY
- CATCHMENT BOUNDARY
- WATERCOURSE
- POND
- FLOW DIRECTION



GENERAL NOTES:

- ALL INFORMATION TO BE VERIFIED ON SITE PRIOR TO COMMENCING ANY WORK. ANY DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT IMMEDIATELY.
- ALL UTILITY LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE. THE CONTRACTOR SHALL CONFIRM THE LOCATION ON SITE AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES.
- EXCLUDING THE BENCHMARK AND DESCRIPTION PROVIDED FOR THIS PROJECT, NO OTHER ELEVATIONS ARE TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.

METRIC NOTE:

- ALL DIMENSIONS SHOWN ARE IN METRES OR MILLIMETRES, UNLESS OTHERWISE NOTED.

GEOMETRIC NOTE:

- ALL SURVEY DATA SHOWN ON THIS DRAWING WAS RECORDED USING REAL-TIME KINETIC (RTK) GPS OBSERVATIONS IN REFERENCE TO UTM 18 NORTH COORDINATE SYSTEM.
- ALL ELEVATIONS ARE IN REFERENCE TO LOCAL DATUM NAD83 - GEODETIC MODEL HT2_0, UNLESS DESCRIBED OTHERWISE.

** DRAWINGS ARE NOT TO BE SCALED **

REVISIONS

NO.	DATE	DESCRIPTION	BY

JEWELL ENGINEERING

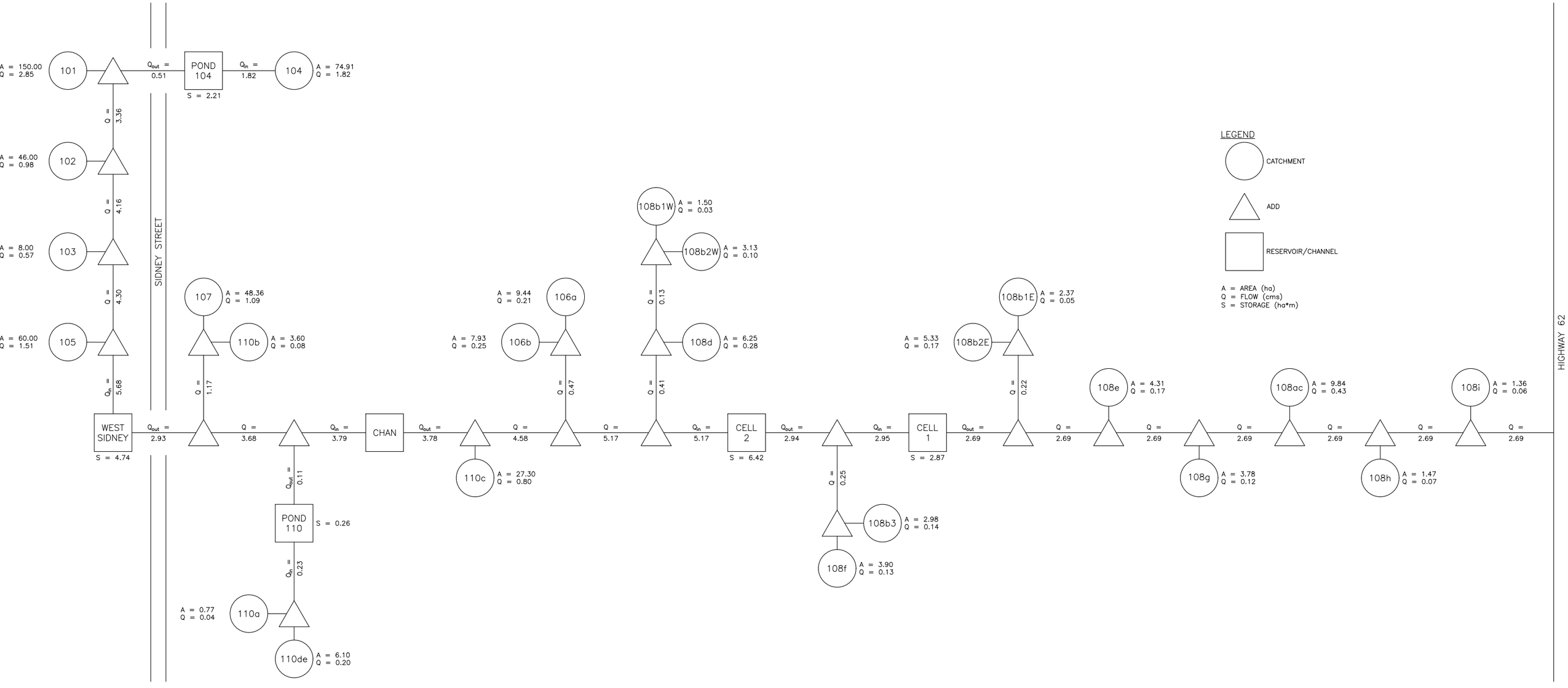
SETTLERS RIDGE EAST & TOWNCENTRE DRIVE

CITY OF BELLEVILLE

NORBELLE CATCHMENT DRAWING

DRAWN BY: JH	PROJECT NO: 190-4502	
DESIGNED BY:	DATE: February 2024	
CHECKED BY: BK	SCALE: HORIZONTAL -N/A VERTICAL -N/A	
APPROVED BY:	CONTRACT NO:	DRAWING NO: 1

APPENDIX C:
OTTHYMO MODELLING


LEGEND
CATCHMENT
ADD
RESERVOIR/CHANNEL
A = AREA (ha)
Q = FLOW (cms)
S = STORAGE (ha*m)
SIDNEY STREET
HIGHWAY 62
101
A = 150.00
Q = 2.85
POND 104
S = 2.21
104
A = 74.91
Q = 1.82
102
A = 46.00
Q = 0.98
103
A = 8.00
Q = 0.57
105
A = 60.00
Q = 1.51
107
A = 48.36
Q = 1.09
110b
A = 3.60
Q = 0.08
WEST SIDNEY
S = 4.74
CHAN
POND 110
S = 0.26
110a
A = 0.77
Q = 0.04
110de
A = 6.10
Q = 0.20
110c
A = 27.30
Q = 0.80
106a
A = 9.44
Q = 0.21
106b
A = 7.93
Q = 0.25
108b1W
A = 1.50
Q = 0.03
108b2W
A = 3.13
Q = 0.10
108d
A = 6.25
Q = 0.28
108u
Q = 0.28
CELL 2
S = 6.42
108b3
A = 2.98
Q = 0.14
108f
A = 3.90
Q = 0.13
108b1E
A = 2.37
Q = 0.05
108b2E
A = 5.33
Q = 0.17
CELL 1
S = 2.87
108e
A = 4.31
Q = 0.17
108g
A = 3.78
Q = 0.12
108ac
A = 9.84
Q = 0.43
108h
A = 1.47
Q = 0.07
108i
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Q = 2.69
Q = 2.69

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==============================================================================

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       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO    __________01640
```

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```
  Input   filename: nbellv10.dat
  Output  filename: nbellv10.out
  Summary filename: nbellv10.sum



DATE: 04-10-2024                        TIME: 16:24:44


COMMENTS: _____________________________________________________________

------------------------------------------------------------------------------
*
  ****************************
  ** SIMULATION NUMBER:   1 **
  ****************************

*
*                    Settlers Ridge and Barkema - Nor-Belle Creek
*                    Lots 1, 2 and 3, Conc. 3 and 4, Thurlow Township
*                    Belleville Rainfall using Nor-Belle Creek MDP, 2011
*                    and Ainley SWM Implementation Report, April 2013
*
*                    100Yr Event based on Ainley SWMHYMO
*                    2024 Feb 23
*                    Bryon Keene, P.Eng., Jewell Engineering
*
*                    To Support SRE Phase 3 and Towncentre Drive
*                    Developments
*
*                    NBELLE model is conversion of Settlers SWMHYMO model and
*                    represents fully developed conditions with the expanded
*                    pond on Barkema Lands - Note: the full Settlers pond did
*                    not get constructed.
*
*                    NBELLEV1 model is altered to determine how much storage
*                    in Cell 2 is required solely due to spill containment.
*
*                    NBELLEV2 model is altered to allow full development of
```

```
*                   catchments 110, 106a, 106b,and 108b1.
*                   The Settlers pond is enlarged with the addition of
*                   0.4ha*m storage on Barkema lands.
*
*                   NBELLEV3 model considers how basins 104 and 107 will be
*                   developed. 104 will have reduced outflow at Sidney St.
*                   107 will have a combined quantity/quality pond.
*
*                   NBELLEV5 was developed to consider the expansion of Cell 2
*                   eastward (north of Cell 1).  The purpose of this model is
*                   to check to see if the 100YR WSEL of Pond 2 can be lowered
*                   from 109.45m closer to 109m.  This would help to improve
*                   the flow capacity in the channel.
*
*                   NBELLEV6 places pond 107 north of pipeline near Sidney st.
*                   Catchments are adjusted.  Uses the expanded Cell 2 per V5
*                   108b is now directed into Cell 2.  108d becomes Cell 1.
*
*                   NBELLEV7 Catchment 108b is routed to Cell 1
*
*                   NBELLEV8 Combining Cell 1 & 2 into Master Cell 2. Includes
*                   North expansion into Barkema. Area for Cell 1 is reduced to
*                   allow for bypass channel. Rough area calculation. STORAGE
*                   DISCHARGE TABLE EXCEEDED.
*
*                   NBELLEV9 Add Pond 110. Catchment 110 area split into
*                   110a,b,c,d,e. Master Cell used for Nor-Belle Pond.
*
*                   NBELLV10 Reviews impact of Phase 3 of SRE and Towncentre
*                   Drive developments.  The model considers no development
*                   outside of the urban area.
*
*                  length solved from A=1.5(L)^2
*
*********************************************************************
*                    100 Year Storm
*********************************************************************
*                          Post-Development Flow

--------------------
|    READ STORM    |    Filename: 12AES100.STM
| Ptotal= 81.52 mm |    Comments: 12 Hr AES from XCG NorBelle
--------------------
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                1.00     .00 |  4.00   16.30 |  7.00    6.52 | 10.00     .00
                2.00   10.60 |  5.00   12.23 |  8.00    2.45 | 11.00     .00
                3.00   21.19 |  6.00   11.41 |  9.00     .82 | 12.00     .00

---------------------------------------------------------------------------

*CHICAGO STORM       IUNITS=2 TD=6.0 HRS R=0.333 STD=5 MIN ICASE =2
```

```
*                     (TIME, INTENSITY)= 5,91.6 10,66.5 15,54.4 30,35.9
*                     60,22.1 120,13.5 360,6.3 720,3.7 1440,2.1 END=-1
*                    Basin 104 Sunningdale Area
*CALIB STANDHYD       ID=1 HYD=104 DT=5 MIN DA=74.91HA
*                     XIMP=.35 TIMP=.45 DWF=0.0 LOSS=2 CN=81
*                     DPSP=2.5 SLPP=5.0 LGP=35 MNP=.25 SCP=0 DPSI=0.6
*                     SLPI=0.6 LGI=1300 MNI=.013 SCI=0
*                     -1
*
*                    Basin 104 Assumed in natural state
--------------------
| CALIB            |
| NASHYD    (0104) |   Area    (ha)=  74.91   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=  11.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .60

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.

     Unit Hyd Qpeak  (cms)=   4.77

     PEAK FLOW       (cms)=   1.82 (i)
     TIME TO PEAK    (hrs)=   4.50
     RUNOFF VOLUME    (mm)=  39.30
     TOTAL RAINFALL   (mm)=  81.52
     RUNOFF COEFFICIENT   =    .48

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                    Route Basin 104 through natural storage east of Sidney
--------------------
| RESERVOIR (2000) |
| IN= 1---> OUT= 9 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .000       .000    |    1.200      6.245
                           .400      1.725    |    1.600      9.787
                           .800      3.554    |    1.750     10.930

                                    AREA     QPEAK     TPEAK       R.V.
                                    (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 1 (0104)         74.91      1.82      4.50      39.30
     OUTFLOW: ID= 9 (2000)         74.91       .51      8.33      39.24

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 27.79
                   TIME SHIFT OF PEAK FLOW         (min)=230.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  2.21

--------------------------------------------------------------------------------
*                    Basin 104 Routing altered to cut outflow in half
*ROUTE RESERVOIR     ID=9 NHYD=2000 IDIN=1 DT=5 MIN
*                    DISCHARGE   STORAGE
```

```
*                    0           0
*                    .2          1.725
*                    .3          3.554
*                    0.4         6.245
*                    0.6         9.787
*                    1.0        10.93
*                     -1
*                   Save Hydrograph from Basin 104 Outflow
--------------------
| SAVE HYD  (2000) |   AREA       (ha)=  74.91
| ID= 9   PCYC=*** |   QPEAK     (cms)=    .51 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   8.33
--------------------   VOLUME      (mm)=  39.24
  Filename: 104CONT.hyd
  Comments: 100-Yr Peak Flow Basin 104

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Basin 101 Huntingwood to Sidney - No Development
--------------------
| CALIB            |
| NASHYD    (0101) |   Area    (ha)= 150.00   Curve Number   (CN)= 79.0
|ID= 2 DT= 5.0 min |   Ia      (mm)=  11.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.70

     Unit Hyd Qpeak  (cms)=   3.37

     PEAK FLOW       (cms)=   2.85 (i)
     TIME TO PEAK    (hrs)=   6.83
     RUNOFF VOLUME    (mm)=  35.95
     TOTAL RAINFALL   (mm)=  81.52
     RUNOFF COEFFICIENT   =    .44

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (1001) |
|   9 +  2 =  7    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 9 (2000):    74.91      .51     8.33    39.24
        + ID2= 2 (0101):   150.00     2.85     6.83    35.95
          ================================================
          ID = 7 (1001):   224.91     3.31     6.92    37.04

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Basin 102 Trillium to Sidney - No Development
--------------------
```

```
| CALIB            |
| NASHYD    (0102) |   Area    (ha)=  46.00   Curve Number   (CN)= 78.0
|ID= 3 DT= 5.0 min |   Ia      (mm)=  11.10   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=    .70

     Unit Hyd Qpeak  (cms)=   2.51

     PEAK FLOW       (cms)=    .98 (i)
     TIME TO PEAK    (hrs)=   6.08
     RUNOFF VOLUME    (mm)=  34.90
     TOTAL RAINFALL   (mm)=  81.52
     RUNOFF COEFFICIENT   =    .43

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------
| ADD HYD   (1002) |
|   7 +  3 =  6    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 7 (1001):   224.91     3.31     6.92    37.04
        + ID2= 3 (0102):    46.00      .98     6.08    34.90
          ================================================
          ID = 6 (1002):   270.91     4.16     6.50    36.68

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
*                   Basin 103 Small area west of Sidney - No Development
--------------------
| CALIB            |
| NASHYD    (0103) |   Area    (ha)=   8.00   Curve Number   (CN)= 74.0
|ID= 4 DT= 5.0 min |   Ia      (mm)=  11.10   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=    .60

     Unit Hyd Qpeak  (cms)=    .51

     PEAK FLOW       (cms)=    .15 (i)
     TIME TO PEAK    (hrs)=   6.08
     RUNOFF VOLUME    (mm)=  31.04
     TOTAL RAINFALL   (mm)=  81.52
     RUNOFF COEFFICIENT   =    .38

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------
| ADD HYD   (1003) |
|   6 +  4 =  9    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
```

ID1= 6 (1002):	270.91	4.16	6.50	36.68
+ ID2= 4 (0103):	8.00	.15	6.08	31.04
ID = 9 (1003):	278.91	4.30	6.42	36.52

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---

* Basin 105 Southwest of Sidney - No Development

CALIB			
NASHYD (0105)	Area (ha)= 60.00	Curve Number (CN)= 83.0	
ID= 5 DT= 5.0 min	Ia (mm)= 11.10	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= .60		

Unit Hyd Qpeak (cms)= 3.82

PEAK FLOW (cms)= 1.51 (i)
TIME TO PEAK (hrs)= 4.42
RUNOFF VOLUME (mm)= 40.50
TOTAL RAINFALL (mm)= 81.52
RUNOFF COEFFICIENT = .50

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (1004)
9 + 5 = 1

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 9 (1003):	278.91	4.30	6.42	36.52
+ ID2= 5 (0105):	60.00	1.51	4.42	40.50
ID = 1 (1004):	338.91	5.68	6.25	37.22

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---

* Route Basins 101, 102, 103, 104, 105
* through natural storage east of Sidney

RESERVOIR (2001)
IN= 1---> OUT= 9
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
.000	.000	1.950	1.824
.050	.007	2.660	3.571
.180	.123	3.230	6.043
1.180	.882	.000	.000

	AREA	QPEAK	TPEAK	R.V.

```
                                (ha)      (cms)      (hrs)        (mm)
     INFLOW : ID= 1 (1004)    338.91      5.68       6.25       37.22
     OUTFLOW: ID= 9 (2001)    338.91      2.93       8.75       37.22

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 51.55
                   TIME SHIFT OF PEAK FLOW         (min)=150.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  4.74

--------------------------------------------------------------------------------
*                   Save Hydrograph at Sidney St
--------------------
| SAVE HYD  (2001) |   AREA       (ha)= 338.91
| ID= 9   PCYC=*** |   QPEAK     (cms)=   2.93 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   8.75
--------------------   VOLUME      (mm)=  37.22
  Filename: SID.hyd
  Comments: 100-Yr Peak Flow at Sidney st

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Sidney Street Crossing - Route flows to Cell 2
*                   Since Ainley considered storage in the channel for Cell 2
*                   the channel routing is about 400m, dist to pond is 1190m
*
*                   Basin 107 from Hwy 62, Barkema and Central Settlers
*                   Undeveloped
--------------------
| CALIB            |
| NASHYD    (0107) |   Area    (ha)=  48.36   Curve Number   (CN)= 80.0
|ID= 7 DT= 5.0 min |   Ia      (mm)=  11.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .70

     Unit Hyd Qpeak  (cms)=   2.64

     PEAK FLOW       (cms)=   1.09 (i)
     TIME TO PEAK    (hrs)=   6.00
     RUNOFF VOLUME    (mm)=  37.03
     TOTAL RAINFALL   (mm)=  81.52
     RUNOFF COEFFICIENT   =    .45

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*CALIB STANDHYD      ID=7 HYD=107 DT=5 MIN DA=48.36HA
*                    XIMP=.35 TIMP=.45 DWF=0.0 LOSS=2 CN=80
*                    DPSP=2.5 SLPP=5.0 LGP=568 MNP=.25 SCP=0 DPSI=0.6
*                    SLPI=0.6 LGI=568 MNI=.013 SCI=0
*                    -1
*                   Proposed combined facility in Settlers for Basin 107
*                   Orifice = 0.20m, Weir = 0.5m @ 110.7m, Spill at 111.5
*                   NOT USED FOR NBELLv10
```

```
*ROUTE RESERVOIR     ID=8 NHYD=2002 IDIN=7 DT=5 MIN
*                    DISCHARGE   STORAGE
*                    0           0
*                    0.0044       0.1625
*                    0.0264       0.3280
*                    0.0653       0.4966
*                    0.1214       0.6682
*                    0.1858       0.8429
*                    0.2545       1.0207
*                    0.3249       1.2016
*                    0.3948       1.3857
*                    0.4626       1.5729
*                    0.5269       1.7633
*                    0.6918       1.9569
*                    0.9383       2.1538
*                    1.2347       2.3538
*                     -1
*                   Basin 110b Area between Pond 107 and Pond 110. Flows into
*                   channel directly. Undeveloped
--------------------
| CALIB            |
| NASHYD    (1102) |   Area    (ha)=   3.60   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=  11.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .40

     Unit Hyd Qpeak  (cms)=    .34

     PEAK FLOW       (cms)=    .08 (i)
     TIME TO PEAK    (hrs)=   4.17
     RUNOFF VOLUME    (mm)=  35.92
     TOTAL RAINFALL   (mm)=  81.52
     RUNOFF COEFFICIENT   =    .44

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*CALIB STANDHYD      ID=1 HYD=1102 DT=5 MIN DA=3.6HA
*                    XIMP=.35 TIMP=.45 DWF=0.0 LOSS=2 CN=79
*                    DPSP=2.5 SLPP=5.0 LGP=35 MNP=.25 SCP=0 DPSI=0.6
*                    SLPI=0.6 LGI=155 MNI=.013 SCI=0
*                    -1

--------------------
| ADD HYD   (1006) |
|   9 +  1 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 9 (2001):   338.91     2.93     8.75    37.22
        + ID2= 1 (1102):     3.60      .08     4.17    35.92
          ================================================
          ID = 2 (1006):   342.51     2.94     8.67    37.21

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
--------------------
| ADD HYD   (1006) |
|   2 +  7 =  8    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 2 (1006):    342.51     2.94     8.67    37.21
        + ID2= 7 (0107):     48.36     1.09     6.00    37.03
          ================================================
          ID = 8 (1006):    390.87     3.68     6.58    37.19

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
*                   Basins 110d and 110e Catchment area for Pond 110.
*                   110d = 3.07ha, 110e = 3.05ha - Both Developed
--------------------
| CALIB            |
| STANDHYD  (1104) |   Area    (ha)=   6.10
|ID= 3 DT= 5.0 min |   Total Imp(%)=  45.00   Dir. Conn.(%)=  35.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.74         3.35
     Dep. Storage     (mm)=        .60         2.50
     Average Slope     (%)=        .60         5.00
     Length            (m)=     202.00       202.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      21.19        12.75
               over (min)        10.00        35.00
     Storage Coeff.  (min)=       8.45 (ii)   40.74 (ii)
     Unit Hyd. Tpeak (min)=      10.00        45.00
     Unit Hyd. peak  (cms)=        .12          .03
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .13          .11          .20 (iii)
     TIME TO PEAK    (hrs)=       3.33         4.83         4.33
     RUNOFF VOLUME    (mm)=      80.92        46.18        58.30
     TOTAL RAINFALL   (mm)=      81.52        81.52        81.52
     RUNOFF COEFFICIENT   =        .99          .57          .72


       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  79.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
*                   Basin 110a Self Area of Pond 110.
--------------------
| CALIB            |
```

```
| STANDHYD  (1101) |   Area    (ha)=    .77
|ID= 4 DT= 5.0 min |   Total Imp(%)=  80.00   Dir. Conn.(%)=  60.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .62          .15
     Dep. Storage     (mm)=        .60         2.50
     Average Slope     (%)=        .60         5.00
     Length            (m)=      72.00        72.00
     Mannings n             =     .013         .250

     Max.eff.Inten.(mm/hr)=      21.19        30.02
               over (min)        10.00        10.00
     Storage Coeff.  (min)=       4.55 (ii)   13.69 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .23          .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .03          .01          .04 (iii)
     TIME TO PEAK    (hrs)=       3.17         3.33         3.25
     RUNOFF VOLUME    (mm)=      80.92        56.51        71.05
     TOTAL RAINFALL   (mm)=      81.52        81.52        81.52
     RUNOFF COEFFICIENT   =        .99          .69          .87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  79.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (1007) |
|   3 +  4 =  5    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)      (mm)
          ID1= 3 (1104):     6.10      .20     4.33    58.30
        + ID2= 4 (1101):      .77      .04     3.25    71.05
          ================================================
          ID = 5 (1007):     6.87      .23     4.25    59.75

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Inflow to Pond 110
--------------------
| SAVE HYD  (1007) |   AREA       (ha)=   6.87
| ID= 5   PCYC=138 |   QPEAK     (cms)=    .23 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   4.25
--------------------   VOLUME     (mm)=  59.75
  Filename: p110in.hyd
  Comments: 100-Yr Peak inflow to Pond 110
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

---

* Pond 110 with contributing area and self area.

RESERVOIR (2003)
IN= 5---> OUT= 6
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
.000	.000	.088	.220
.005	.033	.111	.261
.008	.068	.208	.304
.010	.104	.369	.348
.017	.141	.571	.394
.056	.180	.000	.000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 5 (1007)	6.87	.23	4.25	59.75
OUTFLOW: ID= 6 (2003)	6.87	.11	7.42	58.91

PEAK FLOW REDUCTION [Qout/Qin](%)= 48.42
TIME SHIFT OF PEAK FLOW (min)=190.00
MAXIMUM STORAGE USED (ha.m.)= .26

---

* Outflow from Pond 110

SAVE HYD (2003)	AREA (ha)= 6.87
ID= 6 PCYC=950	QPEAK (cms)= .11 (i)
DT= 5.0 min	TPEAK (hrs)= 7.42
	VOLUME (mm)= 58.91

Filename: p110out.hyd
Comments: 100-Yr Peak outflow from Pond 110

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

---

* Sum the flow from west of Sidney St with outflows from 110 pond
* and Basin 107 and 110b

ADD HYD (1008)
8 + 6 = 7

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 8 (1006):	390.87	3.68	6.58	37.19
+ ID2= 6 (2003):	6.87	.11	7.42	58.91
ID = 7 (1008):	397.74	3.79	6.58	37.56

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
--------------------------------------------------------------------------------
*                   Sidney Street Crossing - Route flows to Cell 2
*                   Since Ainley considered storage in the channel for Cell 2
*                   the channel routing is about 400m, dist to pond is 1190m
--------------------
| ROUTE CHN (3000) |
| IN= 7---> OUT= 8 |     Routing time step (min)'=  5.00
--------------------

               SECTION No    =*****    No. of Segments  =   3
               Channel Slp % =  .20    Floodplain Slp % = .20

               <--------- CROSS SECTION DATA ---------->
               Distance      Elevation       Manning
                    .00        109.80         .0500
                   2.00        109.07         .0500
                   5.50        109.07     .0500 / .0300  Main Channel
                   6.00        108.57         .0300      Main Channel
                   9.00        108.57         .0300      Main Channel
                   9.50        109.07     .0300 / .0500  Main Channel
                  13.00        109.07         .0500
                  15.00        109.80         .0500


               Valley Sections =   1
               Channel Length  =  400.0
               Channel Slope % =   .200

      <---------------------- TRAVEL TIME TABLE ----------------------->
       DEPTH     ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)       (m)     (cu.m.)      (cms)        (m/s)      (min)
        .06    108.64    .766E+02        .0          .23       29.10
        .12    108.70    .156E+03        .1          .36       18.75
        .19    108.76    .239E+03        .3          .46       14.61
        .25    108.82    .325E+03        .4          .54       12.30
        .31    108.89    .414E+03        .6          .62       10.80
        .37    108.95    .506E+03        .9          .69        9.73
        .44    109.01    .602E+03       1.1          .75        8.92
        .50    109.07    .700E+03       1.4          .80        8.29
        .57    109.14    .995E+03       1.8          .74        8.98
        .63    109.21    .130E+04       2.4          .74        9.02
        .70    109.27    .161E+04       3.1          .76        8.81
        .76    109.34    .194E+04       3.8          .78        8.52
        .83    109.40    .227E+04       4.6          .81        8.20
        .90    109.47    .261E+04       5.5          .85        7.89
        .96    109.54    .296E+04       6.5          .88        7.59
       1.03    109.60    .333E+04       7.6          .91        7.32
       1.09    109.67    .370E+04       8.7          .94        7.07
       1.16    109.73    .408E+04       9.9          .97        6.84
       1.23    109.80    .447E+04      11.2         1.01        6.63
```

		<---- hydrograph ---->			<--- channel --->	
	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 7 (1008)	397.74	3.79	6.58	37.56	.76	.78
OUTFLOW: ID= 8 (3000)	397.74	3.78	6.67	37.56	.76	.78

---

* Basin 110c Area east of Sidney, Thurlow Dr
* (This basin includes former 106b. Basins 110abde removed)

CALIB	
STANDHYD (1103)	Area (ha)= 27.30
ID= 1 DT= 5.0 min	Total Imp(%)= 45.00 Dir. Conn.(%)= 35.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	12.28	15.01	
Dep. Storage	(mm)=	.60	2.50	
Average Slope	(%)=	.60	5.00	
Length	(m)=	427.00	427.00	
Mannings n	=	.013	.250	
Max.eff.Inten.	(mm/hr)=	21.19	12.35	
over	(min)	15.00	55.00	
Storage Coeff.	(min)=	13.23 (ii)	64.48 (ii)	
Unit Hyd. Tpeak	(min)=	15.00	65.00	
Unit Hyd. peak	(cms)=	.08	.02	
				TOTALS
PEAK FLOW	(cms)=	.56	.44	.80 (iii)
TIME TO PEAK	(hrs)=	3.50	6.50	4.58
RUNOFF VOLUME	(mm)=	80.92	46.18	58.32
TOTAL RAINFALL	(mm)=	81.52	81.52	81.52
RUNOFF COEFFICIENT	=	.99	.57	.72

(i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
CN* = 79.0 Ia = Dep. Storage (Above)
(ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (1009)				
8 + 1 = 2	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 8 (3000):	397.74	3.78	6.67	37.56
+ ID2= 1 (1103):	27.30	.80	4.58	58.32
ID = 2 (1009):	425.04	4.50	6.58	38.89

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---

* Basin 106a North of SRE Phases 1 & 2 - Undeveloped

CALIB					
NASHYD (1061)	Area (ha)=	9.44	Curve Number (CN)=	79.0
ID= 3 DT= 5.0 min	Ia (mm)=	11.10	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	.50		

Unit Hyd Qpeak (cms)= .72

PEAK FLOW (cms)= .21 (i)
TIME TO PEAK (hrs)= 4.33
RUNOFF VOLUME (mm)= 35.93
TOTAL RAINFALL (mm)= 81.52
RUNOFF COEFFICIENT = .44

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

---

*CALIB STANDHYD ID=3 HYD=106 DT=5 MIN DA=9.44HA
* XIMP=.35 TIMP=.45 DWF=0.0 LOSS=2 CN=79
* DPSP=2.5 SLPP=5.0 LGP=251 MNP=.25 SCP=0 DPSI=0.6
* SLPI=0.6 LGI=251 MNI=.013 SCI=0
* -1
* SRE Phases 1 & 2 (Basin 106b)

CALIB					
STANDHYD (0106)	Area (ha)=	7.93		
ID= 4 DT= 5.0 min	Total Imp(%)=	45.00	Dir. Conn.(%)=	35.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	3.57	4.36	
Dep. Storage	(mm)=	.60	2.50	
Average Slope	(%)=	.60	5.00	
Length	(m)=	230.00	230.00	
Mannings n	=	.013	.250	
Max.eff.Inten.	(mm/hr)=	21.19	12.75	
over	(min)	10.00	35.00	
Storage Coeff.	(min)=	9.13 (ii)	44.04 (ii)	
Unit Hyd. Tpeak	(min)=	10.00	45.00	
Unit Hyd. peak	(cms)=	.12	.03	
				TOTALS
PEAK FLOW	(cms)=	.16	.14	.25 (iii)
TIME TO PEAK	(hrs)=	3.33	4.83	4.33
RUNOFF VOLUME	(mm)=	80.92	46.18	58.31
TOTAL RAINFALL	(mm)=	81.52	81.52	81.52
RUNOFF COEFFICIENT	=	.99	.57	.72

(i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
CN* = 79.0 Ia = Dep. Storage (Above)
(ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (1010)		AREA	QPEAK	TPEAK	R.V.
3 + 4 = 5		(ha)	(cms)	(hrs)	(mm)
	ID1= 3 (1061):	9.44	.21	4.33	35.93
	+ ID2= 4 (0106):	7.93	.25	4.33	58.31
	ID = 5 (1010):	17.37	.47	4.33	46.15

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (1010)		AREA	QPEAK	TPEAK	R.V.
2 + 5 = 6		(ha)	(cms)	(hrs)	(mm)
	ID1= 2 (1009):	425.04	4.50	6.58	38.89
	+ ID2= 5 (1010):	17.37	.47	4.33	46.15
	ID = 6 (1010):	442.41	4.88	6.42	39.18

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---

* SRE - Phase 3 and Towncentre Drive Developments
* 108b1 is north of the pipelines and remains undeveloped
* but, it is picked up into the stormsewers within 108b2.
* Two inlets are provided. West inlet will contribute to the
* Cell 2. East inlet will bypass.
*
* 108b2 is Phase 3 of SRE and Towncentre Drive
* West portion of 108b2 will contribute to Cell 2
* Settlers Pond. East portion will bypass both Cells.
* Introduce 108b1W and 108b2W for west portions to Cell 2
* 108b1E and 108b2E for east portions that bypass
* Basin 108b1W Area = 1.5ha to Cell 2 (undeveloped)

CALIB					
NASHYD (1081)	Area	(ha)= 1.50	Curve Number	(CN)= 77.0	
ID= 1 DT= 5.0 min	Ia	(mm)= 11.10	# of Linear Res.	(N)= 3.00	
	U.H. Tp(hrs)=	.30			

Unit Hyd Qpeak (cms)= .19

```
     PEAK FLOW       (cms)=    .03 (i)
     TIME TO PEAK    (hrs)=   4.08
     RUNOFF VOLUME    (mm)=  33.83
     TOTAL RAINFALL   (mm)=  81.52
     RUNOFF COEFFICIENT   =    .42

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Basin 108b2W Area = 3.13ha to Cell 2 (developed)
--------------------
| CALIB            |
| STANDHYD  (1082) |   Area    (ha)=   3.13
|ID= 2 DT= 5.0 min |   Total Imp(%)=  45.00   Dir. Conn.(%)=  35.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.41         1.72
     Dep. Storage     (mm)=        .60         2.50
     Average Slope     (%)=        .60         5.00
     Length            (m)=     144.00       144.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      21.19        12.20
               over (min)        10.00        30.00
     Storage Coeff.  (min)=       6.89 (ii)   33.72 (ii)
     Unit Hyd. Tpeak (min)=       5.00        35.00
     Unit Hyd. peak  (cms)=        .18          .03
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .06          .05          .10 (iii)
     TIME TO PEAK    (hrs)=       3.42         4.67         4.42
     RUNOFF VOLUME    (mm)=      80.92        43.91        56.80
     TOTAL RAINFALL   (mm)=      81.52        81.52        81.52
     RUNOFF COEFFICIENT   =        .99          .54          .70


       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  77.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Basin 108d Settlers pond (Cell 2)
--------------------
| CALIB            |
| STANDHYD  (1084) |   Area    (ha)=   6.25
|ID= 3 DT= 5.0 min |   Total Imp(%)=  80.00   Dir. Conn.(%)=  60.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.00         1.25
     Dep. Storage     (mm)=        .60         2.50
```

Average Slope	(%)=	.60		5.00		
Length	(m)=	204.00		204.00		
Mannings n	=	.013		.250		
Max.eff.Inten.	(mm/hr)=	21.19		27.45		
over	(min)	10.00		25.00		
Storage Coeff.	(min)=	8.50	(ii)	32.40	(ii)	
Unit Hyd. Tpeak	(min)=	10.00		35.00		
Unit Hyd. peak	(cms)=	.12		.03		
					TOTALS	
PEAK FLOW	(cms)=	.22		.08	.28	(iii)
TIME TO PEAK	(hrs)=	3.33		4.50	3.33	
RUNOFF VOLUME	(mm)=	80.92		54.51	70.32	
TOTAL RAINFALL	(mm)=	81.52		81.52	81.52	
RUNOFF COEFFICIENT	=	.99		.67	.86	

(i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
CN* = 77.0 Ia = Dep. Storage (Above)
(ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (1010)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 4		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (1081):	1.50	.03	4.08	33.83
+	ID2= 2 (1082):	3.13	.10	4.42	56.80
	ID = 4 (1010):	4.63	.13	4.42	49.38

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (1011)		AREA	QPEAK	TPEAK	R.V.
3 + 4 = 5		(ha)	(cms)	(hrs)	(mm)
	ID1= 3 (1084):	6.25	.28	3.33	70.32
+	ID2= 4 (1010):	4.63	.13	4.42	49.38
	ID = 5 (1011):	10.88	.41	3.33	61.42

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
| ADD HYD   (1011) |
|   5 +  6 =  7    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 5 (1011):    10.88      .41     3.33    61.42
        + ID2= 6 (1010):   442.41     4.88     6.42    39.18
          ================================================
          ID = 7 (1011):   453.29     5.17     6.33    39.71

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Inflow to Settlers Pond (Cell 2)
--------------------
| SAVE HYD  (1011) |   AREA       (ha)= 453.29
| ID= 7   PCYC=*** |   QPEAK     (cms)=   5.17 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   6.33
--------------------   VOLUME     (mm)=  39.71
  Filename: Cell2in.hyd
  Comments: 100-Yr Peak inflow to Cell 2

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Route through Settlers (Cell 2)
*                   Pond revised for Dec 23 2016 Concept Barkema Pond
--------------------
| RESERVOIR (2002) |
| IN= 7---> OUT= 9 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .000        .000   |    1.275      3.533
                           .031        .568   |    1.531      3.969
                           .117       1.068   |    1.745      4.413
                           .241       1.448   |    2.065      4.862
                           .387       1.852   |    2.334      5.319
                           .540       2.263   |    2.599      5.782
                           .766       2.679   |    2.857      6.251
                          1.027       3.103   |    3.102      6.727

                                    AREA     QPEAK     TPEAK       R.V.
                                    (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 7 (1011)    453.29      5.17      6.33      39.71
     OUTFLOW: ID= 9 (2002)    453.29      2.94     10.75      38.69

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 56.99
                    TIME SHIFT OF PEAK FLOW         (min)=265.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  6.42

--------------------------------------------------------------------------------
*                   Outflow from Settlers Pond
--------------------
| SAVE HYD  (2002) |   AREA       (ha)= 453.29
```

| ID= 9 PCYC=*** | QPEAK (cms)= 2.94 (i)
| DT= 5.0 min | TPEAK (hrs)= 10.75
VOLUME (mm)= 38.69
Filename: Cell2out.hyd
Comments: 100-Yr Peak outflow from Cell 2

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

---

* Basin 108f Portion of 108 to Nor-Belle pond (Cell 1)

| CALIB | Area (ha)= 3.90
| STANDHYD (1086) | Total Imp(%)= 45.00 Dir. Conn.(%)= 35.00
|ID= 2 DT= 5.0 min |

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.76	2.14	
Dep. Storage	(mm)=	.60	2.50	
Average Slope	(%)=	.60	5.00	
Length	(m)=	161.00	161.00	
Mannings n	=	.013	.250	
Max.eff.Inten.	(mm/hr)=	21.19	12.20	
over	(min)	10.00	30.00	
Storage Coeff.	(min)=	7.37 (ii)	36.05 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	40.00	
Unit Hyd. peak	(cms)=	.17	.03	
				TOTALS
PEAK FLOW	(cms)=	.08	.07	.13 (iii)
TIME TO PEAK	(hrs)=	3.42	4.75	4.42
RUNOFF VOLUME	(mm)=	80.92	43.91	56.81
TOTAL RAINFALL	(mm)=	81.52	81.52	81.52
RUNOFF COEFFICIENT	=	.99	.54	.70

(i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
CN* = 77.0 Ia = Dep. Storage (Above)
(ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

---

* Basin 108b3 Norbelle Pond (Cell)

| CALIB | Area (ha)= 2.98
| STANDHYD (1084) | Total Imp(%)= 80.00 Dir. Conn.(%)= 60.00
|ID= 3 DT= 5.0 min |

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.38	.60
Dep. Storage	(mm)=	.60	2.50
Average Slope	(%)=	.60	5.00

Length	(m)=	141.00	141.00	
Mannings n	=	.013	.250	
Max.eff.Inten.	(mm/hr)=	21.19	27.88	
over	(min)	10.00	20.00	
Storage Coeff.	(min)=	6.81 (ii)	25.84 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	30.00	
Unit Hyd. peak	(cms)=	.18	.04	
				TOTALS
PEAK FLOW	(cms)=	.11	.04	.14 (iii)
TIME TO PEAK	(hrs)=	3.33	4.42	3.33
RUNOFF VOLUME	(mm)=	80.92	54.51	70.30
TOTAL RAINFALL	(mm)=	81.52	81.52	81.52
RUNOFF COEFFICIENT	=	.99	.67	.86

(i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
CN* = 77.0 Ia = Dep. Storage (Above)
(ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (1010)		AREA	QPEAK	TPEAK	R.V.
2 + 3 = 4		(ha)	(cms)	(hrs)	(mm)
	ID1= 2 (1086):	3.90	.13	4.42	56.81
+	ID2= 3 (1084):	2.98	.14	3.33	70.30
	ID = 4 (1010):	6.88	.25	3.33	62.68

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (1010)		AREA	QPEAK	TPEAK	R.V.
9 + 4 = 1		(ha)	(cms)	(hrs)	(mm)
	ID1= 9 (2002):	453.29	2.94	10.75	38.69
+	ID2= 4 (1010):	6.88	.25	3.33	62.68
	ID = 1 (1010):	460.17	2.95	10.67	39.05

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

SAVE HYD (1010)	AREA (ha)= 460.17
ID= 1 PCYC=***	QPEAK (cms)= 2.95 (i)

DT= 5.0 min	TPEAK (hrs)= 10.67
	VOLUME (mm)= 39.05

Filename: norin.hyd
Comments: 100-Yr Peak inflow to Cell 1

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

---

* Route through Nor-Belle Pond (Cell 1)

RESERVOIR (2003)
IN= 1---> OUT= 9
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
.000	.000	.985	.763
.005	.018	1.132	1.014
.063	.045	1.264	1.323
.174	.072	1.374	1.849
.322	.123	1.880	2.210
.488	.175	2.363	2.568
.659	.342	3.141	3.292
.826	.546	3.348	3.656

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 1 (1010)	460.17	2.95	10.67	39.05
OUTFLOW: ID= 9 (2003)	460.17	2.69	14.25	38.99

PEAK FLOW REDUCTION [Qout/Qin](%)= 91.36
TIME SHIFT OF PEAK FLOW (min)=215.00
MAXIMUM STORAGE USED (ha.m.)= 2.87

---

* Outflow from Nor-Belle Pond

SAVE HYD (2003)	AREA (ha)= 460.17
ID= 9 PCYC=***	QPEAK (cms)= 2.69 (i)
DT= 5.0 min	TPEAK (hrs)= 14.25
	VOLUME (mm)= 38.99

Filename: norout.hyd
Comments: 100-Yr Peak outflow from Cell 1

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

---

* Portion of SRE Ph 3 and Towncentre Drive bypassing
* Basin 108b1E Area = 2.37ha Bypasses (undeveloped)

CALIB	
NASHYD (1081)	Area (ha)= 2.37 Curve Number (CN)= 77.0
ID= 1 DT= 5.0 min	Ia (mm)= 11.10 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= .30

```
     Unit Hyd Qpeak  (cms)=    .30

     PEAK FLOW       (cms)=    .05 (i)
     TIME TO PEAK    (hrs)=   4.08
     RUNOFF VOLUME    (mm)=  33.85
     TOTAL RAINFALL   (mm)=  81.52
     RUNOFF COEFFICIENT   =    .42

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Basin 108b2E Area = 5.33ha Bypasses (developed)
--------------------
| CALIB            |
| STANDHYD  (1082) |   Area    (ha)=   5.33
|ID= 2 DT= 5.0 min |   Total Imp(%)=  45.00   Dir. Conn.(%)=  35.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.40         2.93
     Dep. Storage     (mm)=        .60         2.50
     Average Slope     (%)=        .60         5.00
     Length            (m)=     189.00       189.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      21.19        12.10
               over (min)        10.00        35.00
     Storage Coeff.  (min)=       8.12 (ii)   39.79 (ii)
     Unit Hyd. Tpeak (min)=      10.00        40.00
     Unit Hyd. peak  (cms)=        .13          .03
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .11          .09          .17 (iii)
     TIME TO PEAK    (hrs)=       3.25         4.67         4.25
     RUNOFF VOLUME    (mm)=      80.92        43.91        56.82
     TOTAL RAINFALL   (mm)=      81.52        81.52        81.52
     RUNOFF COEFFICIENT   =        .99          .54          .70


       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  77.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (1012) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (1081):     2.37      .05     4.08    33.85
        + ID2= 2 (1082):     5.33      .17     4.25    56.82
```

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          ================================================
          ID = 3 (1012):     7.70      .22     4.25    49.76

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (1012) |
|   3 +  9 =  4    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (1012):     7.70      .22     4.25    49.76
        + ID2= 9 (2003):   460.17     2.69    14.25    38.99
          ================================================
          ID = 4 (1012):   467.87     2.69    14.25    39.17

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Basin 108e Portion of 108 uncontrolled (80% imp)
--------------------
| CALIB            |
| STANDHYD  (1084) |   Area    (ha)=   4.31
|ID= 2 DT= 5.0 min |   Total Imp(%)=  80.00   Dir. Conn.(%)=  60.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.45          .86
     Dep. Storage     (mm)=        .60         2.50
     Average Slope     (%)=        .60         5.00
     Length            (m)=    1700.00       170.00
     Mannings n             =      .013         .250

     Max.eff.Inten.(mm/hr)=      21.19        26.77
               over (min)        30.00        25.00
     Storage Coeff.  (min)=      30.32 (ii)   51.96 (ii)
     Unit Hyd. Tpeak (min)=      30.00        55.00
     Unit Hyd. peak  (cms)=        .04          .02
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .14          .05          .17 (iii)
     TIME TO PEAK    (hrs)=       4.33         5.75         4.50
     RUNOFF VOLUME    (mm)=      80.92        53.53        69.89
     TOTAL RAINFALL   (mm)=      81.52        81.52        81.52
     RUNOFF COEFFICIENT   =        .99          .66          .86


       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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*                   Basin 108g Portion of 108 uncontrolled (80% imp)
--------------------
| CALIB            |
| STANDHYD  (1085) |   Area    (ha)=   3.78
|ID= 3 DT= 5.0 min |   Total Imp(%)=  80.00   Dir. Conn.(%)=  60.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.02          .76
     Dep. Storage     (mm)=        .60         2.50
     Average Slope     (%)=        .60         5.00
     Length            (m)=     159.00       159.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      21.19        26.77
               over (min)        10.00        25.00
     Storage Coeff.  (min)=       7.32 (ii)   28.10 (ii)
     Unit Hyd. Tpeak (min)=       5.00        30.00
     Unit Hyd. peak  (cms)=        .17          .04
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .13          .05           .17 (iii)
     TIME TO PEAK    (hrs)=       3.42         4.50          3.42
     RUNOFF VOLUME    (mm)=      80.92        53.53         69.92
     TOTAL RAINFALL   (mm)=      81.52        81.52         81.52
     RUNOFF COEFFICIENT   =        .99          .66           .86


       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (1012) |
|   2 +  3 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 2 (1084):     4.31      .17     4.50    69.89
        + ID2= 3 (1085):     3.78      .17     3.42    69.92
          ==============================================
          ID = 1 (1012):     8.09      .32     4.42    69.94

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (1013) |
|   1 +  4 =  5    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (1012):     8.09      .32     4.42    69.94
```

+ ID2= 4 (1012):	467.87	2.69	14.25	39.17
ID = 5 (1013):	475.96	2.69	14.25	39.69

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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* Basins 108a and 108c, Portion of 108 uncontrolled
* 108a = 6.37ha at 80% imp
* 108c = 3.47ha at 80% imp

CALIB				
STANDHYD (1086)	Area (ha)= 9.84			
ID= 1 DT= 5.0 min	Total Imp(%)= 80.00		Dir. Conn.(%)= 60.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	7.87	1.97	
Dep. Storage	(mm)=	.60	2.50	
Average Slope	(%)=	.60	5.00	
Length	(m)=	256.00	256.00	
Mannings n	=	.013	.250	
Max.eff.Inten.	(mm/hr)=	21.19	26.31	
over	(min)	10.00	30.00	
Storage Coeff.	(min)=	9.74 (ii)	37.59 (ii)	
Unit Hyd. Tpeak	(min)=	10.00	40.00	
Unit Hyd. peak	(cms)=	.11	.03	
			TOTALS	
PEAK FLOW	(cms)=	.35	.13	.43 (iii)
TIME TO PEAK	(hrs)=	3.42	4.67	3.42
RUNOFF VOLUME	(mm)=	80.92	53.53	69.94
TOTAL RAINFALL	(mm)=	81.52	81.52	81.52
RUNOFF COEFFICIENT	=	.99	.66	.86

(i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (1014)				
1 + 5 = 2	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (1086):	9.84	.43	3.42	69.94
+ ID2= 5 (1013):	475.96	2.69	14.25	39.69
ID = 2 (1014):	485.80	2.69	14.25	40.30

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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* Basin 108h Portion of 108 uncontrolled (80% imp)

CALIB					
STANDHYD (1087)	Area (ha)=	1.47			
ID= 3 DT= 5.0 min	Total Imp(%)=	80.00	Dir. Conn.(%)=	60.00	
		IMPERVIOUS	PERVIOUS (i)		
Surface Area	(ha)=	1.18	.29		
Dep. Storage	(mm)=	.60	2.50		
Average Slope	(%)=	.60	5.00		
Length	(m)=	125.00	35.00		
Mannings n	=	.013	.250		
Max.eff.Inten.	(mm/hr)=	21.19	28.00		
over	(min)	10.00	10.00		
Storage Coeff.	(min)=	6.33 (ii)	12.26 (ii)		
Unit Hyd. Tpeak	(min)=	5.00	15.00		
Unit Hyd. peak	(cms)=	.19	.09		
				TOTALS	
PEAK FLOW	(cms)=	.05	.02	.07 (iii)	
TIME TO PEAK	(hrs)=	3.33	3.42	3.33	
RUNOFF VOLUME	(mm)=	80.92	53.53	69.92	
TOTAL RAINFALL	(mm)=	81.52	81.52	81.52	
RUNOFF COEFFICIENT	=	.99	.66	.86	

(i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)

(ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (1015)				
2 + 3 = 1	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 2 (1014):	485.80	2.69	14.25	40.30
+ ID2= 3 (1087):	1.47	.07	3.33	69.92
ID = 1 (1015):	487.27	2.69	14.25	40.40

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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* Basin 108i Portion of 108 uncontrolled (65% imp)

CALIB

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| STANDHYD  (1087) |   Area    (ha)=   1.36
|ID= 2 DT= 5.0 min |   Total Imp(%)=  65.00   Dir. Conn.(%)=  45.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .88          .48
     Dep. Storage     (mm)=        .60         2.50
     Average Slope     (%)=        .60         5.00
     Length            (m)=      95.00        95.00
     Mannings n             =     .013         .250

     Max.eff.Inten.(mm/hr)=      21.19        18.90
               over (min)        10.00        20.00
     Storage Coeff.  (min)=       5.37 (ii)   22.91 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=        .21          .05
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .04          .02          .06 (iii)
     TIME TO PEAK    (hrs)=       3.25         4.33         3.25
     RUNOFF VOLUME    (mm)=      80.92        48.78        63.13
     TOTAL RAINFALL   (mm)=      81.52        81.52        81.52
     RUNOFF COEFFICIENT   =        .99          .60          .77


       (i) CN PROCEDURE SELECTED FOR RAINFALL LOSSES:
            CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (1016) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (1015):   487.27     2.69    14.25    40.40
        + ID2= 2 (1087):     1.36      .06     3.25    63.13
          ================================================
          ID = 3 (1016):   488.63     2.69    14.25    40.46

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| SAVE HYD  (1016) |   AREA       (ha)= 488.63
| ID= 3   PCYC=*** |   QPEAK     (cms)=   2.69 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=  14.25
--------------------   VOLUME     (mm)=  40.46
  Filename: NBel100.TXT
  Comments: Peak Outflow

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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FINISH

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