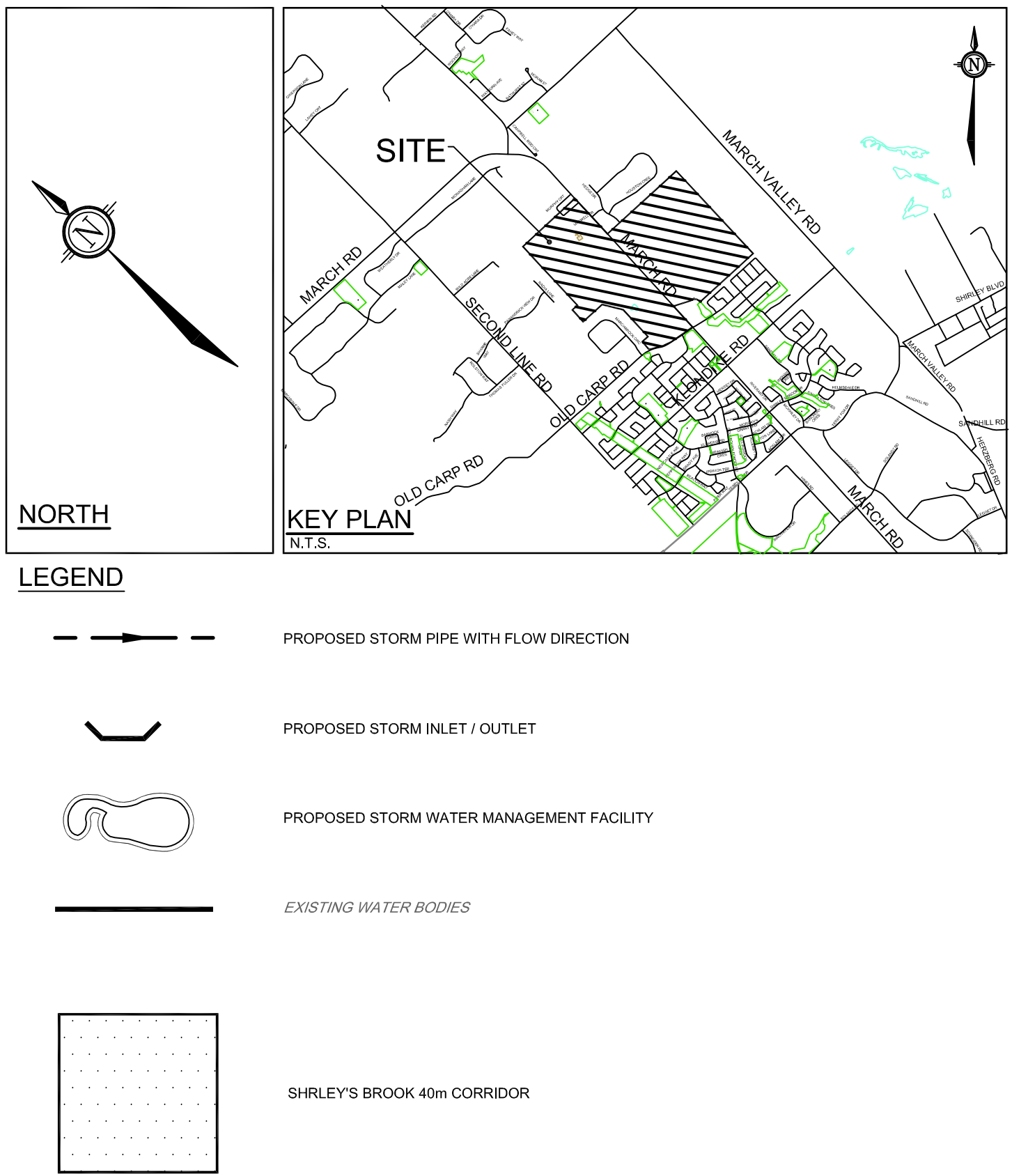
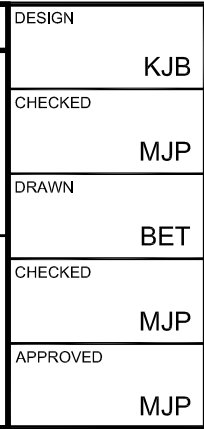


112117-P:



1.	ISSUED FOR REVIEW	02/10/14	MJP
No.	REVISION	DATE	BY



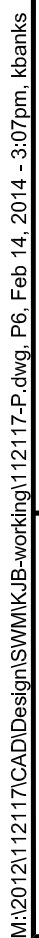
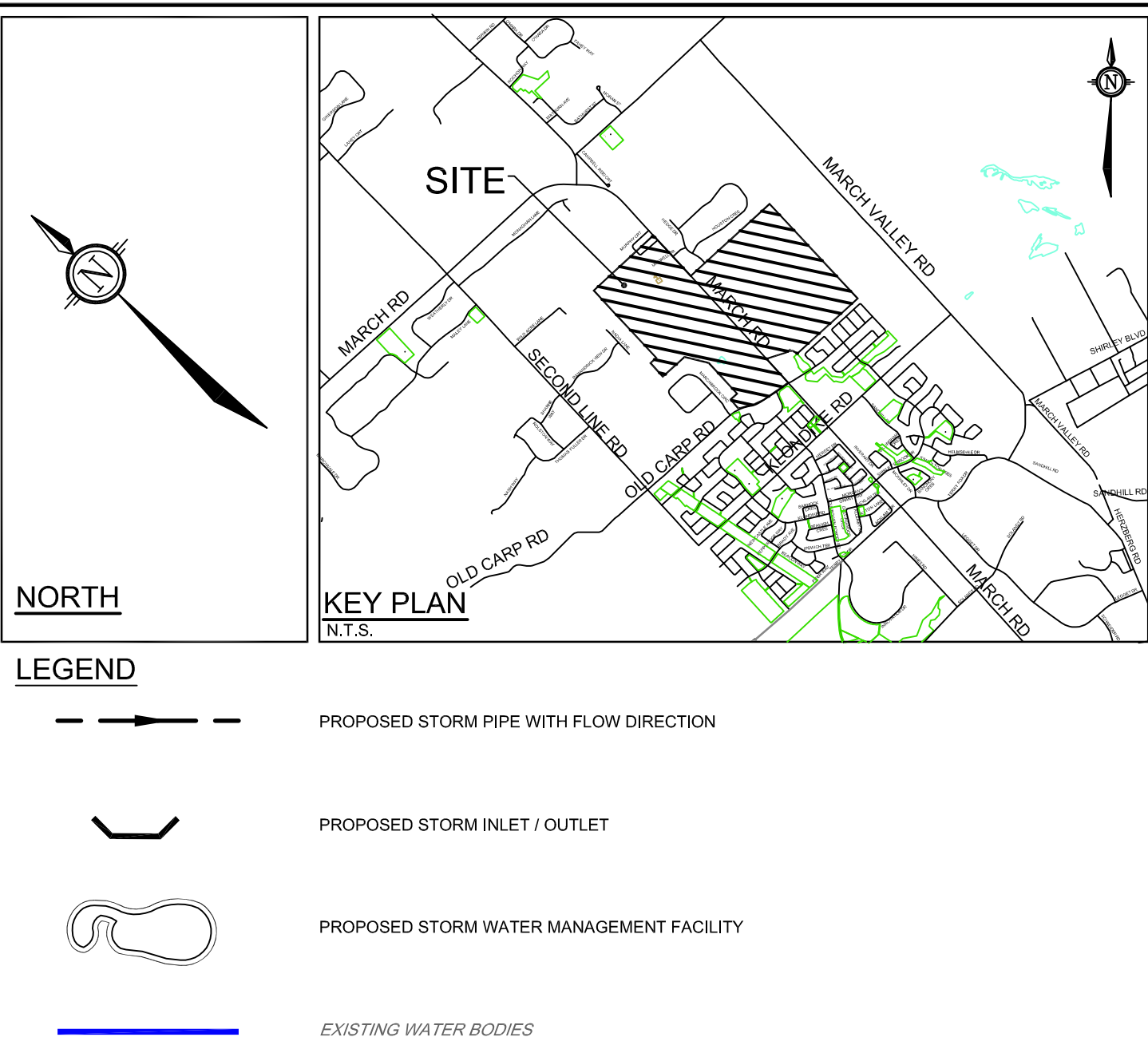
NOVATECH
ENGINEERING
CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email: novainfo@novatech-eng.com

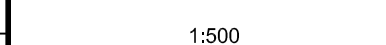
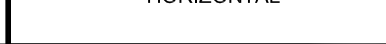
PROJECT No. 112117

REV

DRAWING No.

112117-P3



				<div style="text-align: center;"> SCALE  </div>		DESIGN KJB
				CHECKED MJP		
				DRAWN BET		
				CHECKED MJP		
1. ISSUED FOR REVIEW				02/10/14		MJP
No.	REVISION			DATE	BY	
				<div style="text-align: center;">  </div>		APPROVED MJP

DESIGN	KJB	FOR REVIEW ONLY	
CHECKED			
MJP			
DRAWN			
BET			
CHECKED			
MJP			
APPROVED			
MJP			

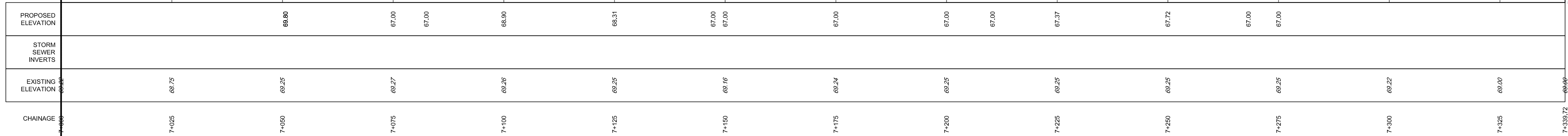
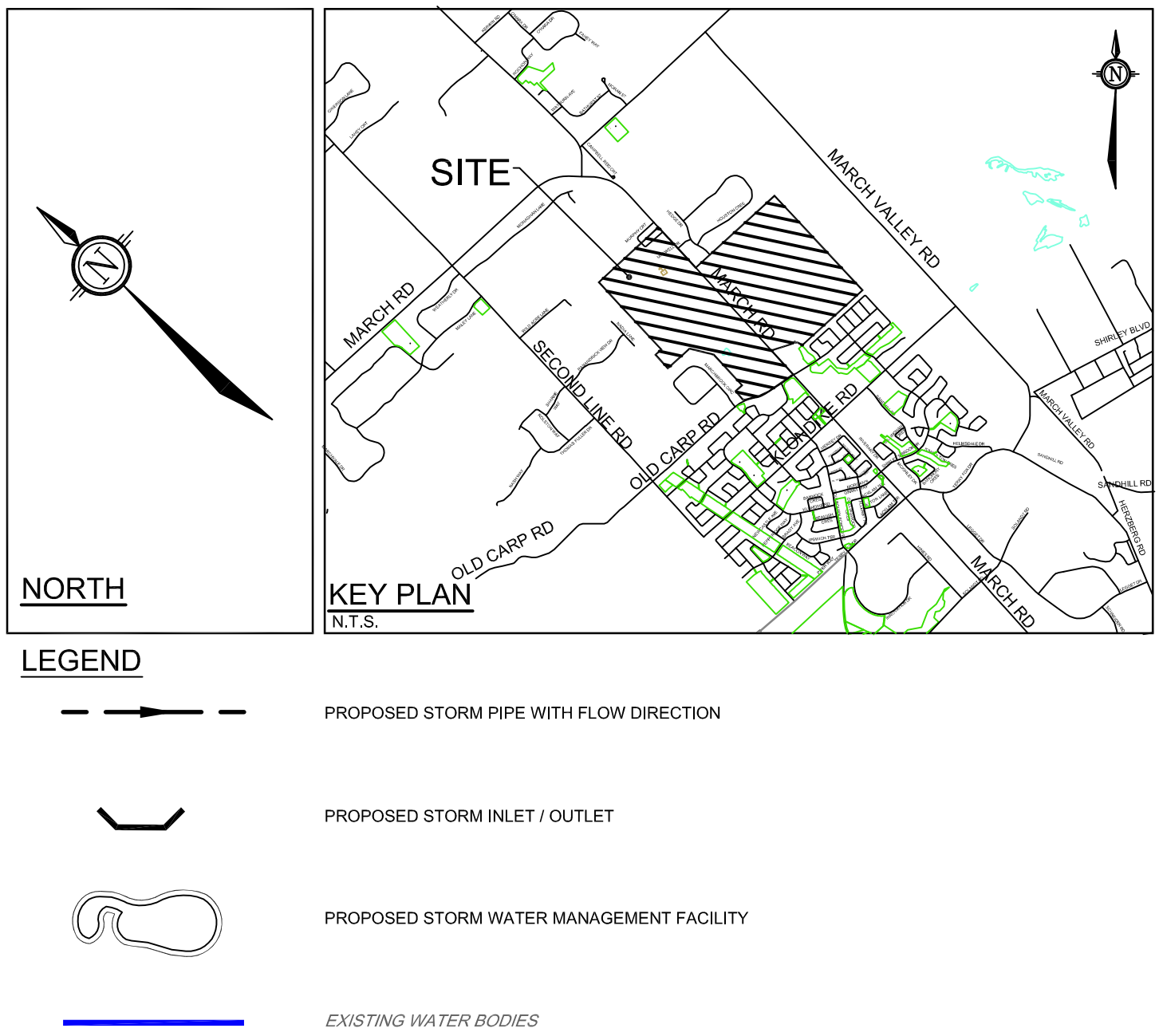
NOVATECH
ENGINEERING
CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email: novainfo@novatech-eng.com

STORM WATER MANAGEMENT FACILITY POND OPTION EAST 2d PLAN & PROFILE

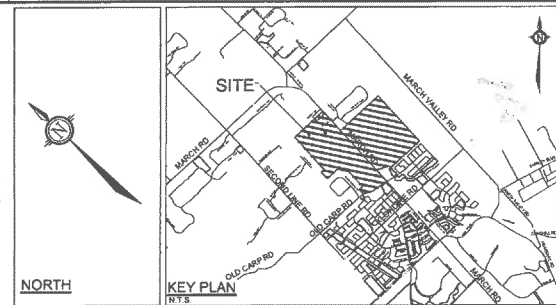
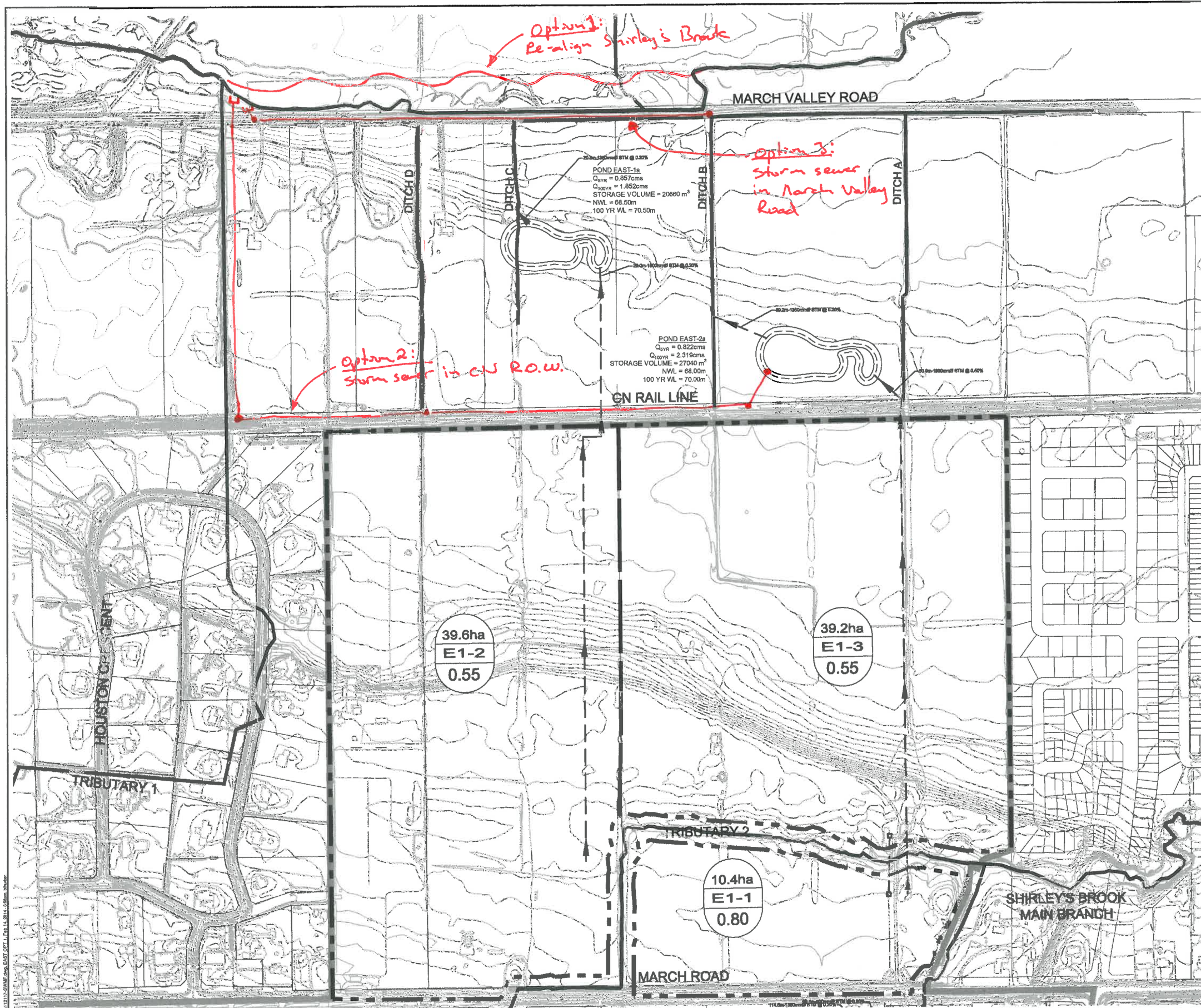
REV 1

DRAWING No.

112117-P



PROJECT No.	112117
REV	REV 1
DRAWING No.	112117-P8



- LEGEND**
- 39.2ha E1-3 0.55
 - DRAINAGE AREA (HECTARES)
 - DRAINAGE AREA ID
 - RUNOFF COEFFICIENT
 - DRAINAGE AREA BOUNDARY
 - PROPOSED STORM WATER MANAGEMENT FACILITY
 - PROPOSED STORM PIPE WITH FLOW DIRECTION
 - PROPOSED STORM INLET / OUTLET
 - PROPOSED DITCH INLET CATCH BASIN CIV STORM PIPE
 - EXISTING WATER BODIES

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS,
WATERMANS, SEWERS AND OTHER
UNDERGROUND AND OVERGROUND UTILITIES AND
STRUCTURES IS NOT NECESSARILY SHOWN ON
THE CONTRACT DRAWINGS, AND WHERE SHOWN,
THE ACCURACY OF THE POSITION OF SUCH
UTILITIES AND STRUCTURES IS NOT GUARANTEED.
BEFORE STARTING WORK, DETERMINE THE EXACT
LOCATION OF ALL SUCH UTILITIES AND
STRUCTURES AND ASSUME ALL LIABILITY FOR
DAMAGE TO THEM.

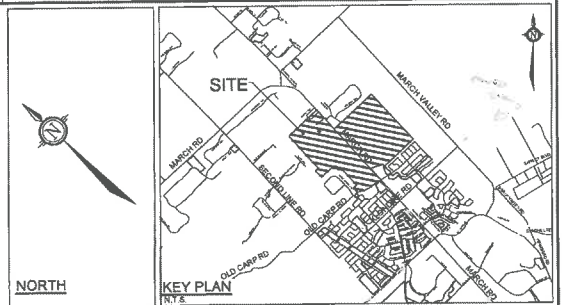
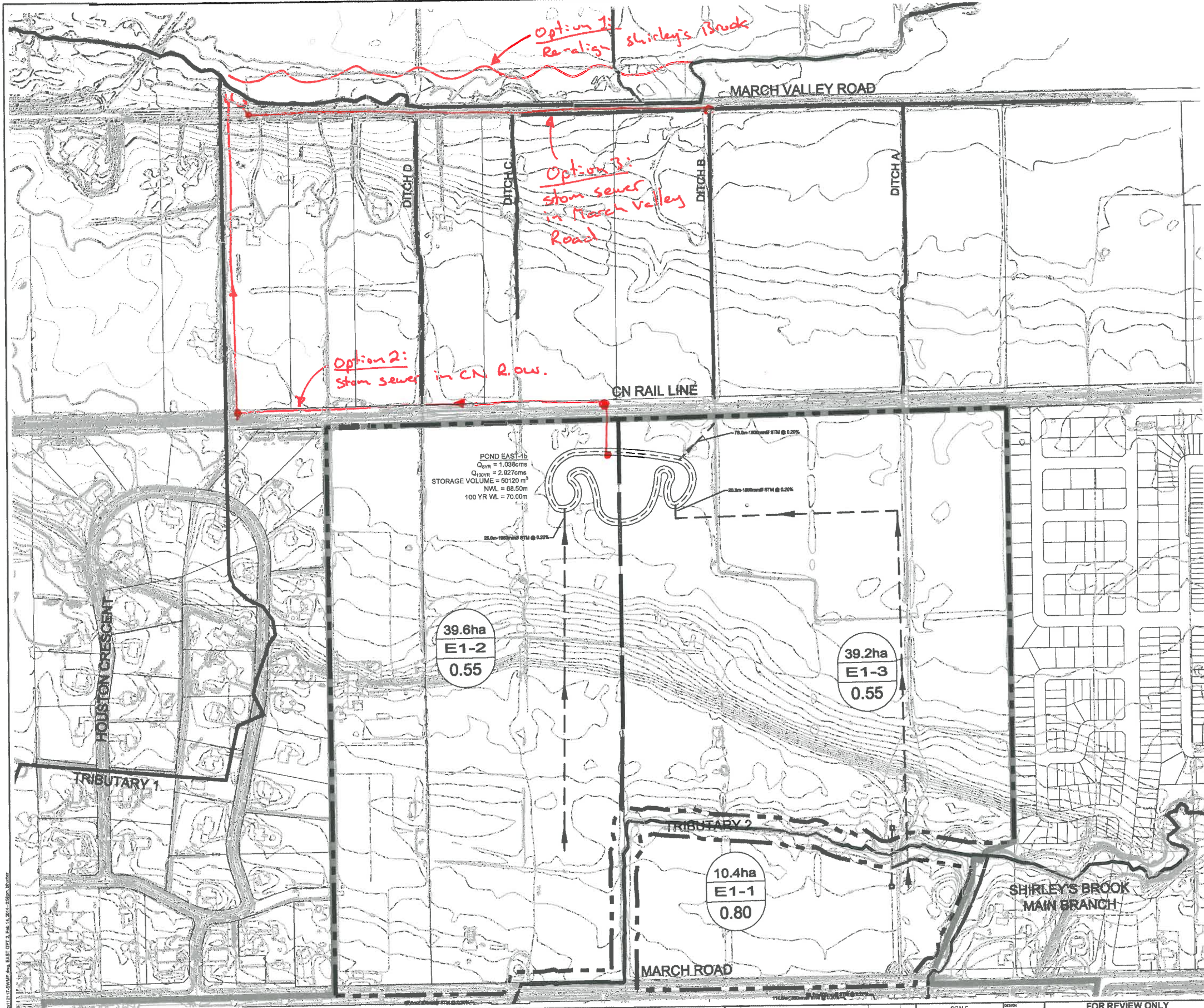
SCALE				FOR REVIEW ONLY			
1:2500				DESIGNED	KJB		
0 25 50 75 100				DRAWN	MJP		
				CHECKED	BET		
				APPROVED	MJP		
1. ISSUED FOR REVIEW							
02/10/14							
MJP							
REVISION							
DATE							
BY							

NOVATECH
ENGINEERING
CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 McNeil Courtland Drive
Ottawa, Ontario, Canada
K2M 1P4
Tel: (613) 254-9643
Fax: (613) 254-5887
Email: novatech@novatech-eng.com

LOCATION
CITY OF OTTAWA
KANATA NORTH EXPANSION STUDY

DRAWING NAME
STORM WATER MANAGEMENT
FACILITY POND OPTIONS EAST
OF MARCH ROAD 1 OF 3

PROJECT No. 112117
DRAWING No. 112117-SWMF3



- LEGEND
- 39.2ha
E1-3
0.55
 - DRAINAGE AREA (HECTARES)
 - DRAINAGE AREA ID
 - RUNOFF COEFFICIENT
 - DRAINAGE AREA BOUNDARY
 - PROPOSED STORM WATER MANAGEMENT FACILITY
 - PROPOSED STORM PIPE WITH FLOW DIRECTION
 - PROPOSED STORM INLET/OUTLET
 - PROPOSED DITCH INLET CATCH BASIN CWT STORM PIPE
 - EXISTING WATER BODIES

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS,
WATERMAINS, SEWERS AND OTHER
UNDERGROUND AND OVERGROUND UTILITIES AND
STRUCTURES IS NOT NECESSARILY SHOWN ON
THE CONTRACT DRAWINGS, AND WHERE SHOWN,
THE ACCURACY OF THE POSITION OF SUCH
UTILITIES AND STRUCTURES IS NOT GUARANTEED.
BEFORE STARTING WORK, DETERMINE THE EXACT
LOCATION OF ALL SUCH UTILITIES AND
STRUCTURES AND ASSUME ALL LIABILITY FOR
DAMAGE TO THEM.

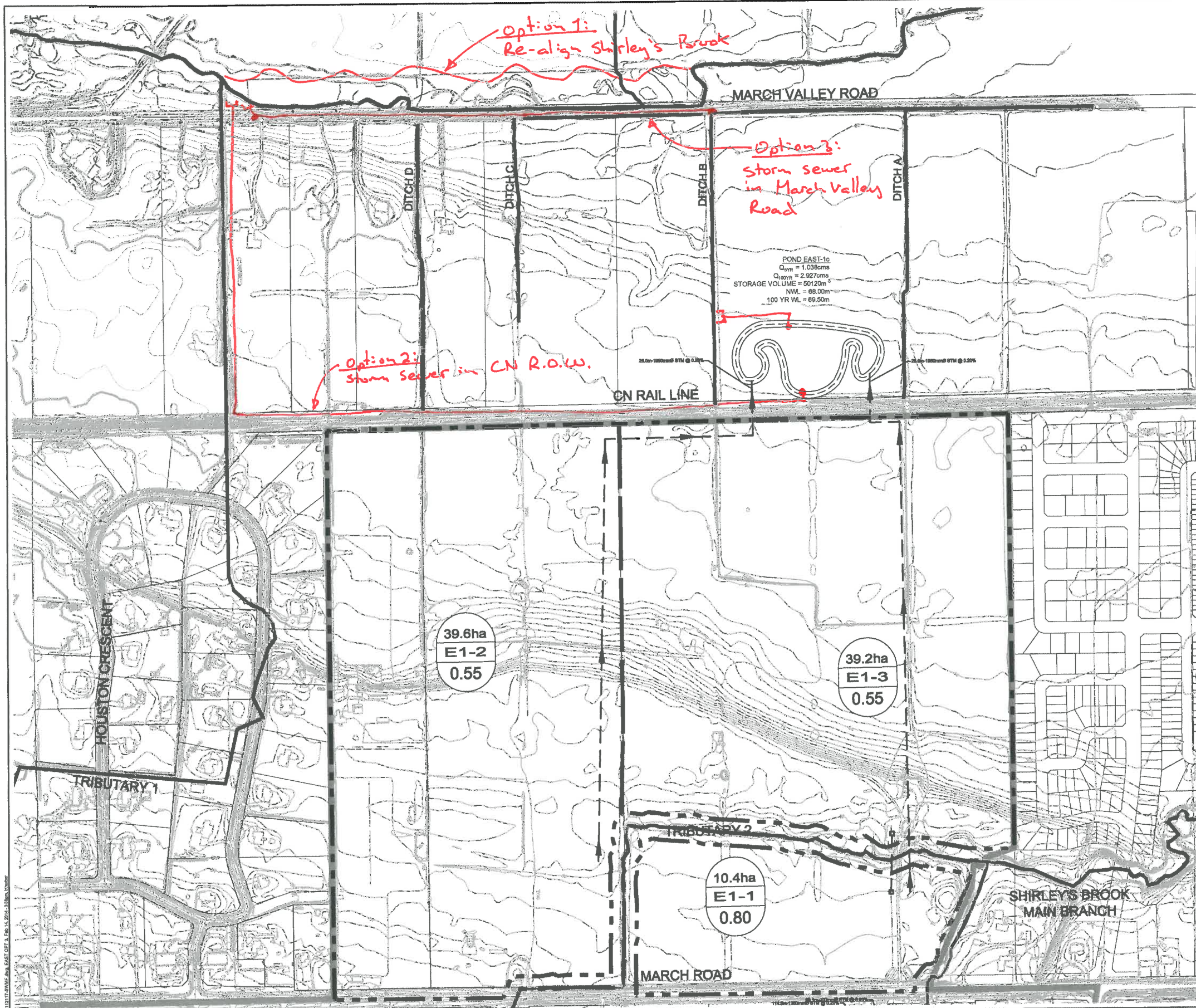
No.	REVISION	DATE	BY
1	ISSUED FOR REVIEW	02/10/14	BJP

SCALE	DESIGN
1:2500	KJB
1:2500	MJP
1:2500	BET
1:2500	MJP
1:2500	MJP

FOR REVIEW ONLY

NOVATECH
ENGINEERING
CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2H 1P5
Telephone: (613) 254-8643
Facsimile: (613) 254-5887
Email: novatech@novatech-eng.com

LOCATION
CITY OF OTTAWA
KANATA NORTH EXPANSION STUDY
DRAWING NAME
STORM WATER MANAGEMENT
FACILITY POND OPTIONS EAST
OF MARCH ROAD 2 OF 3
PROJECT NO.
112117
REV
REV 1
DRAWING NO.
112117-SWMP4



LEGEND

- 39.2ha
E1-3
0.55
- DRAINAGE AREA (HECTARES)
- DRAINAGE AREA ID
- RUNOFF COEFFICIENT
- DRAINAGE AREA BOUNDARY
- PROPOSED STORM WATER MANAGEMENT FACILITY
- PROPOSED STORM PIPE WITH FLOW DIRECTION
- PROPOSED STORM INLET/OUTLET
- PROPOSED DITCH INLET CATCH BASIN G.I.V. STORM PIPE
- EXISTING WATER BODIES

KEY PLAN

NOTE: THE POSITION OF ALL POLE LINES, CONDUITS, WATERMANS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

NOTE: THE POSITION OF ALL POLE LINES, CONDUITS, WATERMANS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

SCALE		DESIGN		FOR REVIEW ONLY	
1:2500		K.B.			
		DESIGNED	M.J.P.		
		DRAWN	BET		
		CHECKED	M.J.P.		
		APPROVED	M.J.P.		

NOVATECH
ENGINEERING
CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 McNeil Court Drive
Ottawa, Ontario, Canada
K2M 0P6
Telephone: (613) 254-9843
Facsimile: (613) 254-9847
Email: novatech@novatech-eng.com

LOCATION: CITY OF OTTAWA
KANATA NORTH EXPANSION STUDY

DRAWING NAME: STORM WATER MANAGEMENT FACILITY POND OPTIONS EAST OF MARCH ROAD 3 OF 3

PROJECT NO.: 112117
REV.: 1
DRAWING NO.: 112117-SWMF5

MEMORANDUM

DATE: MAY 21, 2014
TO: KNUEA TAC
FROM: M.PETEPiece
RE: KNUEA SWM FACILITY OPTIONS (EAST)
CC: FILE

1.0 INTRODUCTION

Stormwater quality and quantity control for the KNUEA lands east of March Road (including the March Road ROW) will be provided using one or more wet pond SWM facilities. Four alternative pond configurations have been developed for this area (refer to attached figures).

The first three options use a single SWM facility to service all of the KNUEA lands between March Road and the CN Rail Line. The fourth option uses two SWM facilities to provide separate storm outlets for the Metcalfe and Valecraft Lands.

2.0 DESIGN CONSIDERATIONS

The conceptual layouts of the pond options take the following factors into account:

SWMF Outlet

In all cases, the proposed ponds will outlet to Shirley's Brook at March Valley Road. Several alternatives for routing the outflows from the ponds to Shirley's Brook have been developed and are presented in a separate memo. The outlet alternatives are independent and compatible with all of the pond alternatives.

Sanitary Overflow

The City has indicated that the proposed sanitary trunk sewer must provide a gravity overflow to a SWM facility:

- The 100-year elevation in the SWM facility must be below the sanitary overflow elevation.
- The sanitary overflow elevation is set by the overflow at the Pumping Station.

Based on these criteria, the invert elevation for the sanitary overflow has been set at 67.40m. Consequently, the 100-year water level in the SWM facility with the sanitary overflow must be below this elevation.

Bedrock Elevation

Where possible, the facilities have been designed to be above the bedrock. For some options, the sanitary overflow requires the bottom of the pond to be below the bedrock elevation, which significantly increases the cost of excavation and will require a lining for the pond.

Storm Sewers

The storm sewers have been sized to convey the 5-year post-development peak flow from the upstream drainage area. The crossings of the CN Rail line will need to convey both minor and major system flows and have been sized for the 100-year peak flow. Outside of the urban area (east of the rail line), storm runoff will be conveyed in open channels.

For all pond options, the size and length of the storm infrastructure (sewers, culverts, open channels) required to route the flows from the limit of the development to the inlet of the pond have been accounted for in the cost estimates.

Quantity Control

The VISUAL OTTHYMO hydrologic model was used to generate pre and post-development hydrographs and evaluate storage requirements. The proposed SWM facilities have been designed to control post-development peak flows to pre-development levels for all storms up to and including the 100-year event:

- Pre-development conditions were modeled using the hydrologic parameters from the Shirley's Brook Existing Conditions Model developed by AECOMM.
- Post-development conditions were modeled using hydrologic parameters consistent with the current concept plan and conforming to the Ottawa Sewer Design Guidelines.

Quality Control

An *Enhanced* level of water quality treatment is required for all development within the Shirley's Brook subwatershed. The proposed SWM facilities have been designed to provide the recommended water quality volume (permanent pool / extended detention) listed in the MOE SWM Planning and Design Manual.

Grading

The proposed SWM facilities have been sized using 5:1 side slopes for both permanent pool and active storage.

3.0 SWM FACILITY OPTIONS (EAST)

OPTION 1A

This option provides a single SWM facility located on the Metcalfe property east of the rail line, outside the urban boundary (**Figure EAST SWM1a**). The pond is oriented perpendicular to the rail line and March Valley Road. Based on the existing ground surface, there is approximately 4.0m of fall between the east and west ends of the facility. The western portion of the facility will require approximately 2.0m of excavation below existing ground, while the eastern portion of the pond will require a berm approximately 2.0 m high.

This pond would have a tributary drainage area of approximately 95 ha and a total volume of approximately 63,000 m³. The total area of the pond block is 7.0 ha and includes provision for grading, access roads, and sediment storage.

Pros:

- Alignment minimizes the length of the inlet and outlet connections.
- Provides sanitary overflow outlet.
- Does not require excavation into bedrock.
- Facility adjacent to urban area.

Cons:

- Requires a large amount of excavation adjacent to CN Rail line.
- Requires large storm crossing at CN Rail Line (major & minor systems).

OPTION 1B

This option provides a single SWM facility located on the Metcalfe property east of the rail line, outside the urban boundary (**Figure EAST SWM1b**). The pond is oriented parallel to March Valley Road at the eastern limit of the property. Based on the existing ground surface, there is an approximate 1.0m grade difference between the east and west sides of the facility. The top of the pond will be above the existing ground and will require a perimeter berm between 1m high (west side) and 2m high (east side).

This pond would have a tributary drainage area of approximately 95 ha and a total volume of approximately 63,000 m³. The total area of the pond block is 7.0 ha and includes provision for grading, access roads, and sediment storage.

Pros:

- Location minimizes the amount of excavation required (single SWM facility).
- Provides sanitary overflow outlet.
- Does not require excavation into bedrock.

Cons:

- SWM facility not integrated into urban area.
- Requires large storm crossing at CNR Line to convey major & minor flows to pond.

M:\2012\112117\DATA\CORRESPONDENCE\MEMOS\20140520 KNEUA SWMF OPTIONS (EAST).DOCX

OPTION 1C

This option provides a single SWM facility located inside the urban boundary on the Metcalfe property (**Figure EAST SWM1c**). The pond is oriented parallel the rail line. While the existing ground elevation is relatively flat over the area of the pond, the facility will require a significant amount of excavation (approx. 6m below existing ground / 3m into bedrock) to provide sufficient depth for the required sanitary overflow.

This pond would have a tributary drainage area of approximately 95 ha and a total volume of approximately 63,000 m³. The total area of the pond block is 8.0 ha and includes provision for grading, access roads, and sediment storage.

Pros:

- Smaller storm crossing at CNR Line (controlled flows from pond).
- Provides sanitary overflow outlet.
- Pond can be integrated as a natural feature within the residential development.

Cons:

- Requires a very large amount of earth and rock excavation.
- Requires pond liner (pond bottom on bedrock).
- Requires a large land area that could otherwise be used for residential development.
- Very high construction cost.

OPTION 2

This option provides two SWM facilities outside the urban boundary. One pond is located on the Metcalfe property adjacent to March Valley Road. The second pond is located on the Valecraft property within a clearing in the existing woodlot (**Figure EAST SWM2**).

Metcalfe Pond

This pond would be the receiver for the sanitary sewer overflow. Based on the existing ground surface, there is an approximate 1.0m grade difference between the east and west sides of the facility. The top of the pond will be above the existing ground and will require a perimeter berm between 1m high (west side) and 2m high (east side).

The Metcalfe pond would have a tributary drainage area of approximately 53 ha and a total volume of approximately 33,900 m³. The total area of the pond block is 4.5 ha and includes provision for grading, access roads, and sediment storage.

Valecraft Pond

This pond is located on the Valecraft property in the open space between the north property line and the existing woodlot. The western portion of the pond would be designed as a forebay / inlet channel, with the main storage area located in the clearing between the woodlots. Based on the existing ground surface, there is a grade difference of approximately 2.5m between the east and west sides of the clearing where the main cell would be located. The eastern portion of the pond will require a berm approximately 2.5m high.



The Valecraft pond would have a tributary drainage area of approximately 42 ha and a total volume of approximately 26,500 m³. The total area of the pond block is 3.0 ha and includes provision for grading, access roads, and sediment storage.

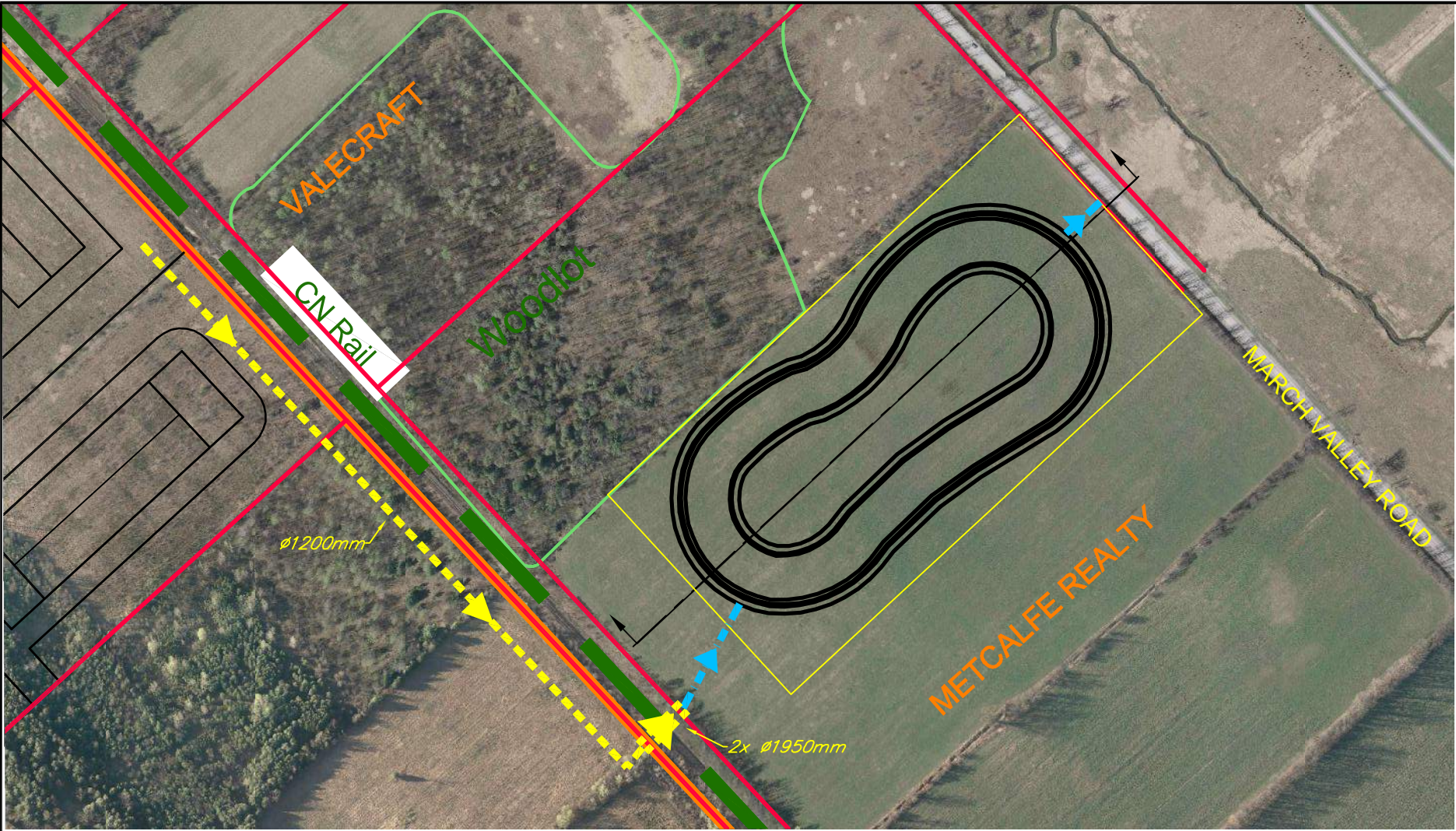
Pros:

- Provides independent SWM Facilities for the Metcalfe and Valecraft properties.
- Provides sanitary overflow outlet (Metcalfe Pond)
- Does not require excavation into bedrock.
- Lowest overall cost (combined).

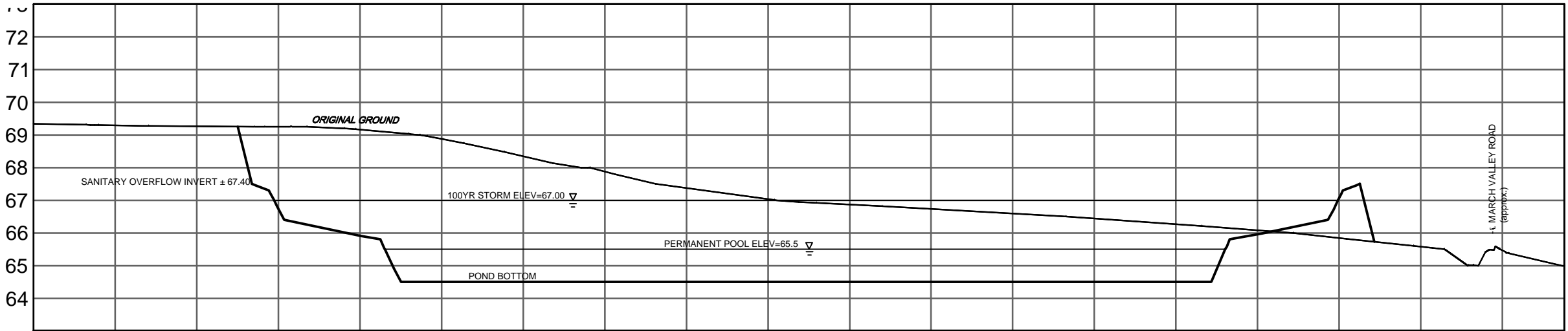
Cons:

- SWM facilities not integrated into urban area.
- Requires large storm crossings at CNR Line to convey major & minor flows to ponds.

M:\2012\112117\CAD\Design\SWM\Cost Estimate Drawings\112117-SWM-cost est - east ponds.dwg, POND 1a, May 21, 2014 - 9:05am, kbanks



- LEGEND**
- Proposed Development Area
 - Existing Property Lines
 - Woodlot Boundary
 - Pond Block Boundary
 - Storm Trunk
 - Ditching



SECTION
SCALE 1:1500

NOVATECH
ENGINEERING
CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email: novainfo@novatech-eng.com

CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION
AREA STUDY

Stormwater Facility Option #1a

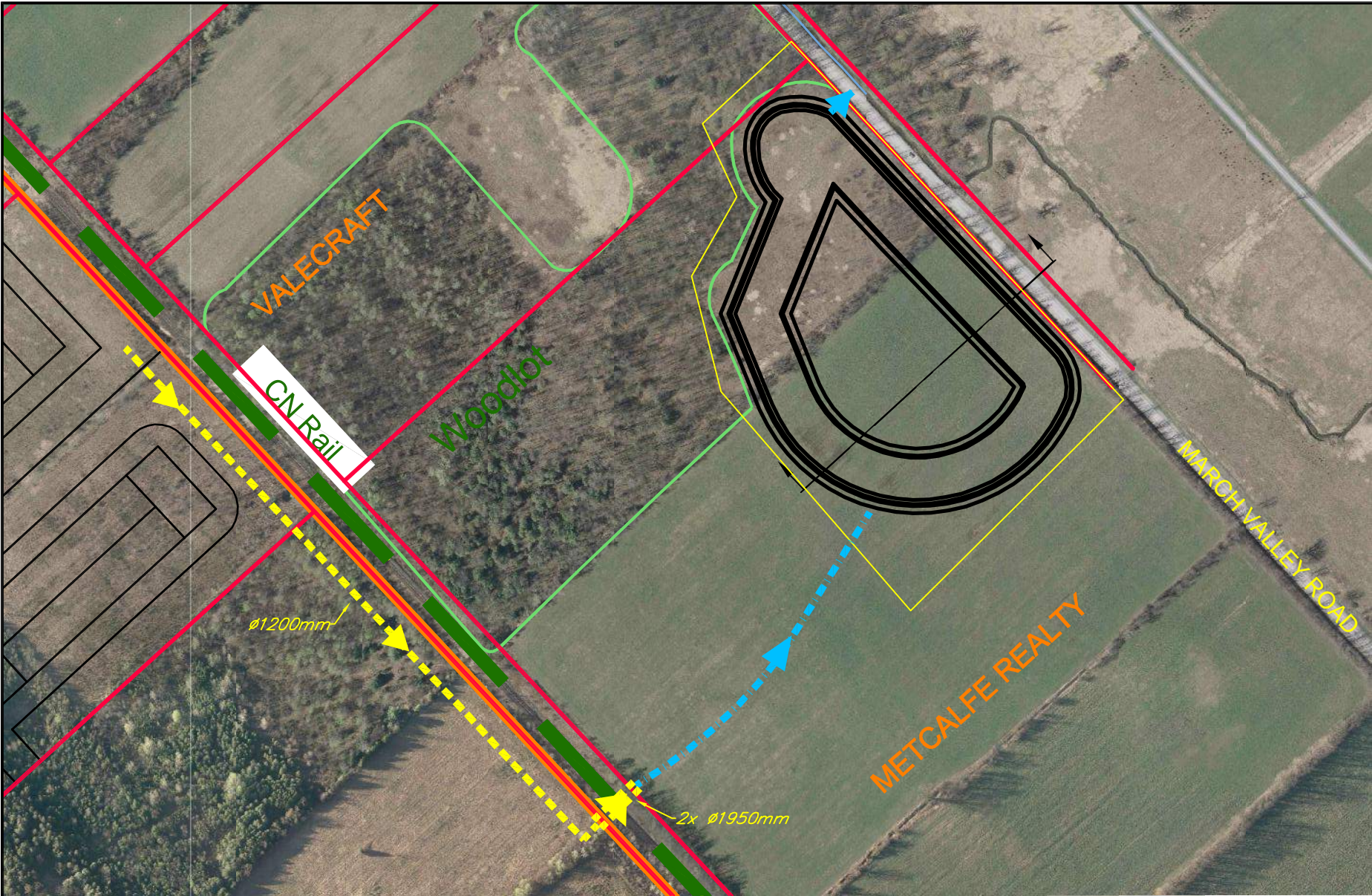
SCALE 1:4000

DATE MAY 2014

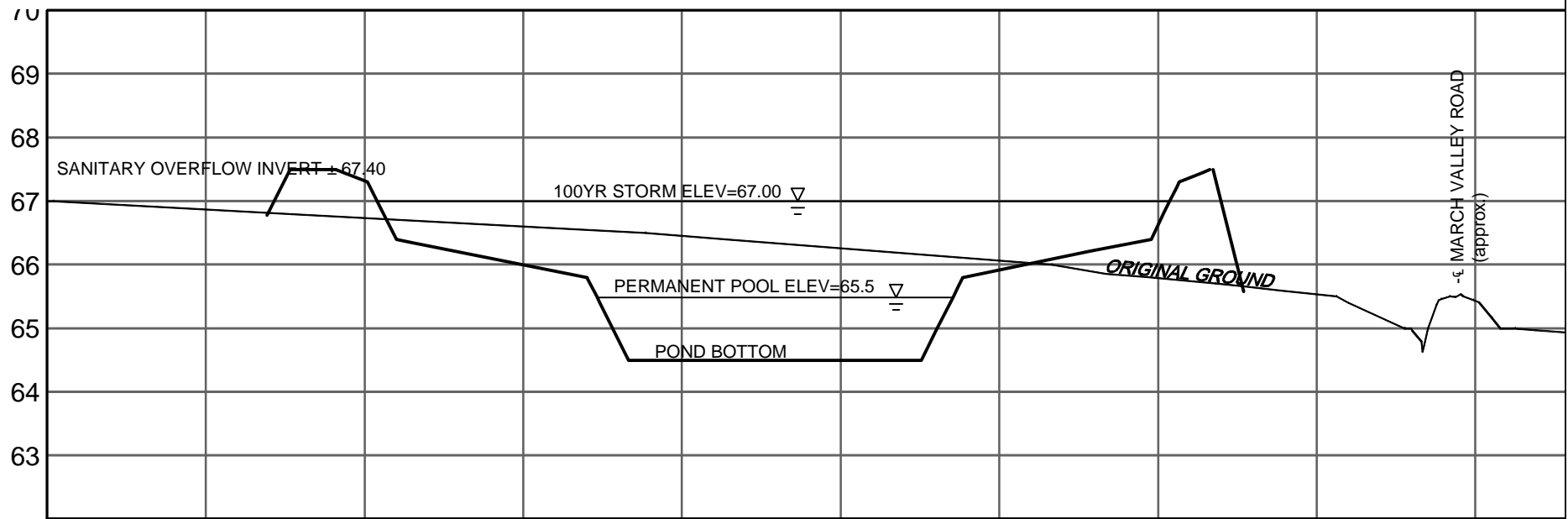
JOB 112117

FIGURE EAST SWM1a

M:\2012\112117\CAD\Design\SWM\Cost Estimate Drawings\112117-SWM-cost est - east ponds 1b NEW SHAPE.dwg, POND 1b NEW SHAPE, May 21, 2014 - 3:00pm, kbanks



- LEGEND**
- Proposed Development Area
 - Existing Property Lines
 - Woodlot Boundary
 - Pond Block Boundary
 - Storm Trunk
 - Ditching



SECTION
SCALE 1:1000

NOVATECH
ENGINEERING
CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email: novainfo@novatech-eng.com

CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION
AREA STUDY

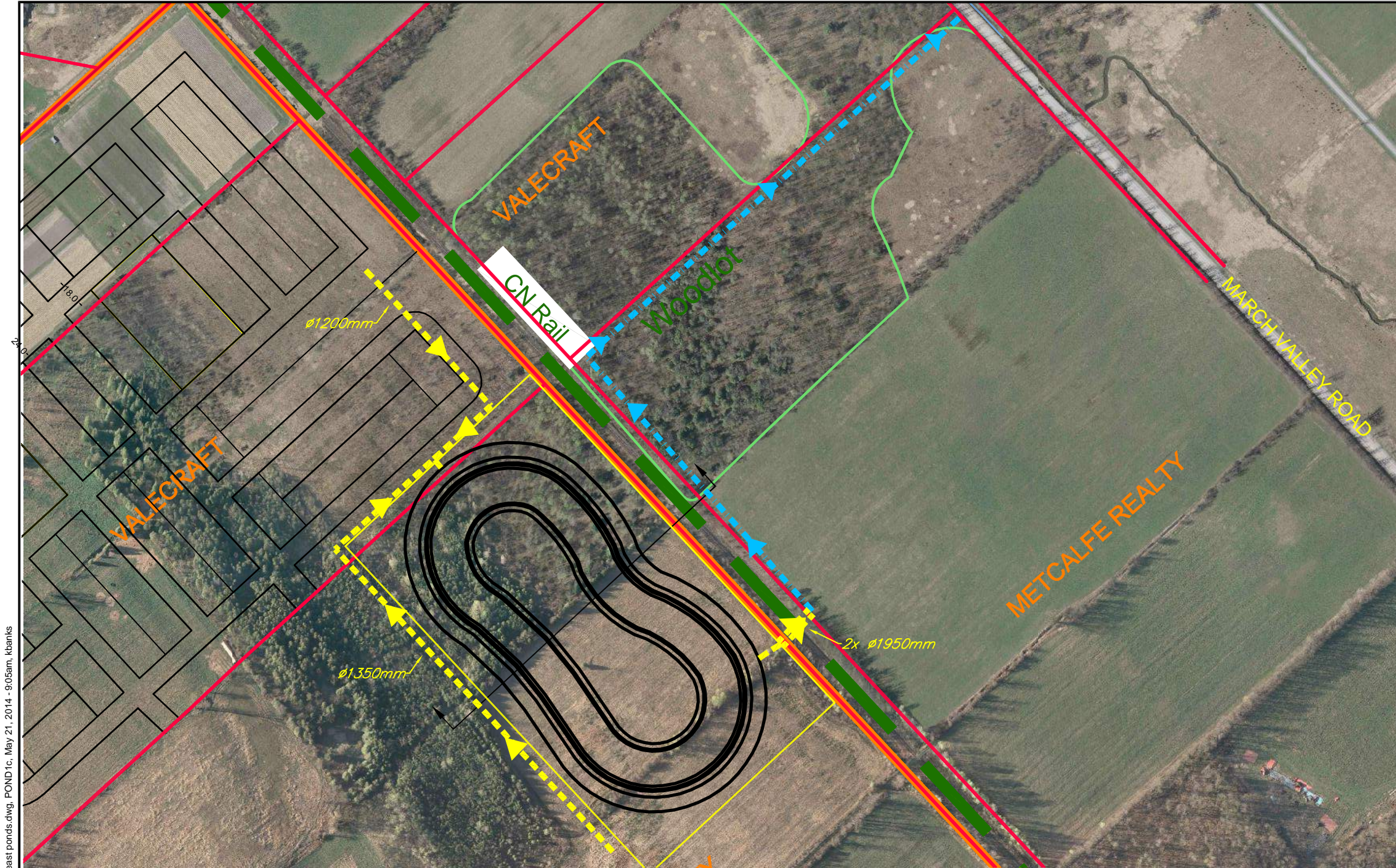
East Stormwater Facility Option #1b

SCALE 1:4000

DATE MAY 2014

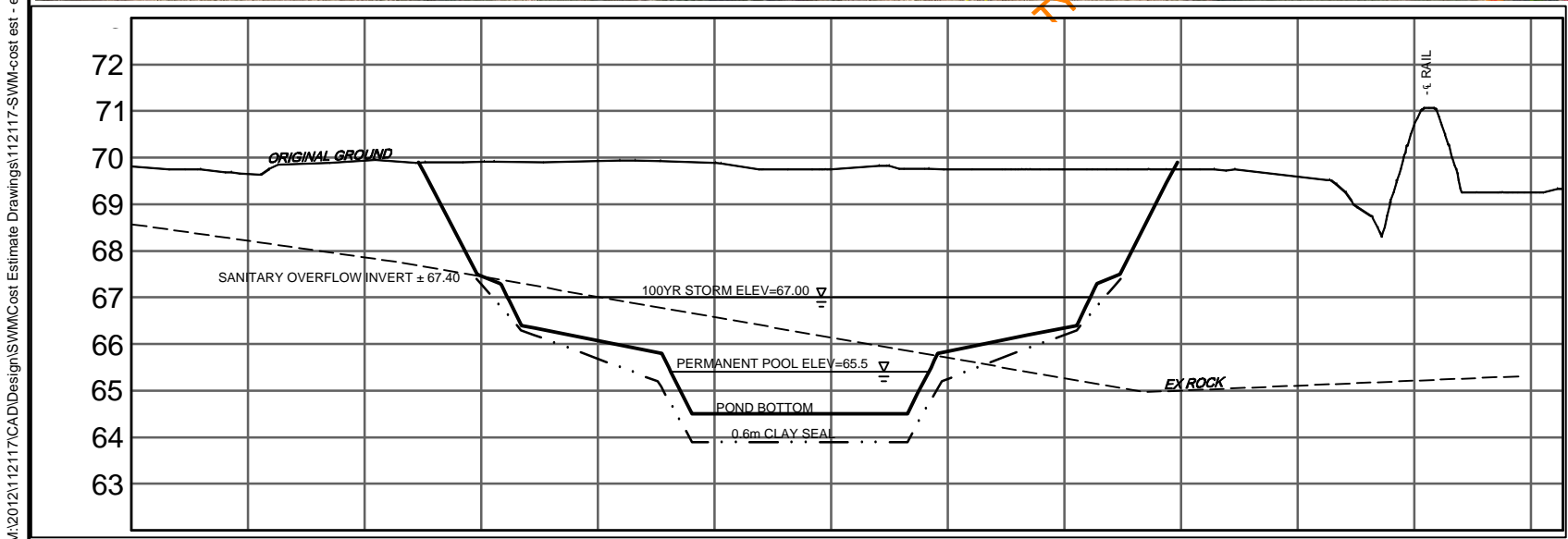
JOB 112117

FIGURE EAST SWM1b



LEGEND

- Proposed Development Area
- Existing Property Lines
- Woodlot Boundary
- Pond Block Boundary
- Storm Trunk
- Ditching



SECTION
SCALE 1:1500

NOVATECH
ENGINEERING
CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email: novainfo@novatech-eng.com

CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION
AREA STUDY

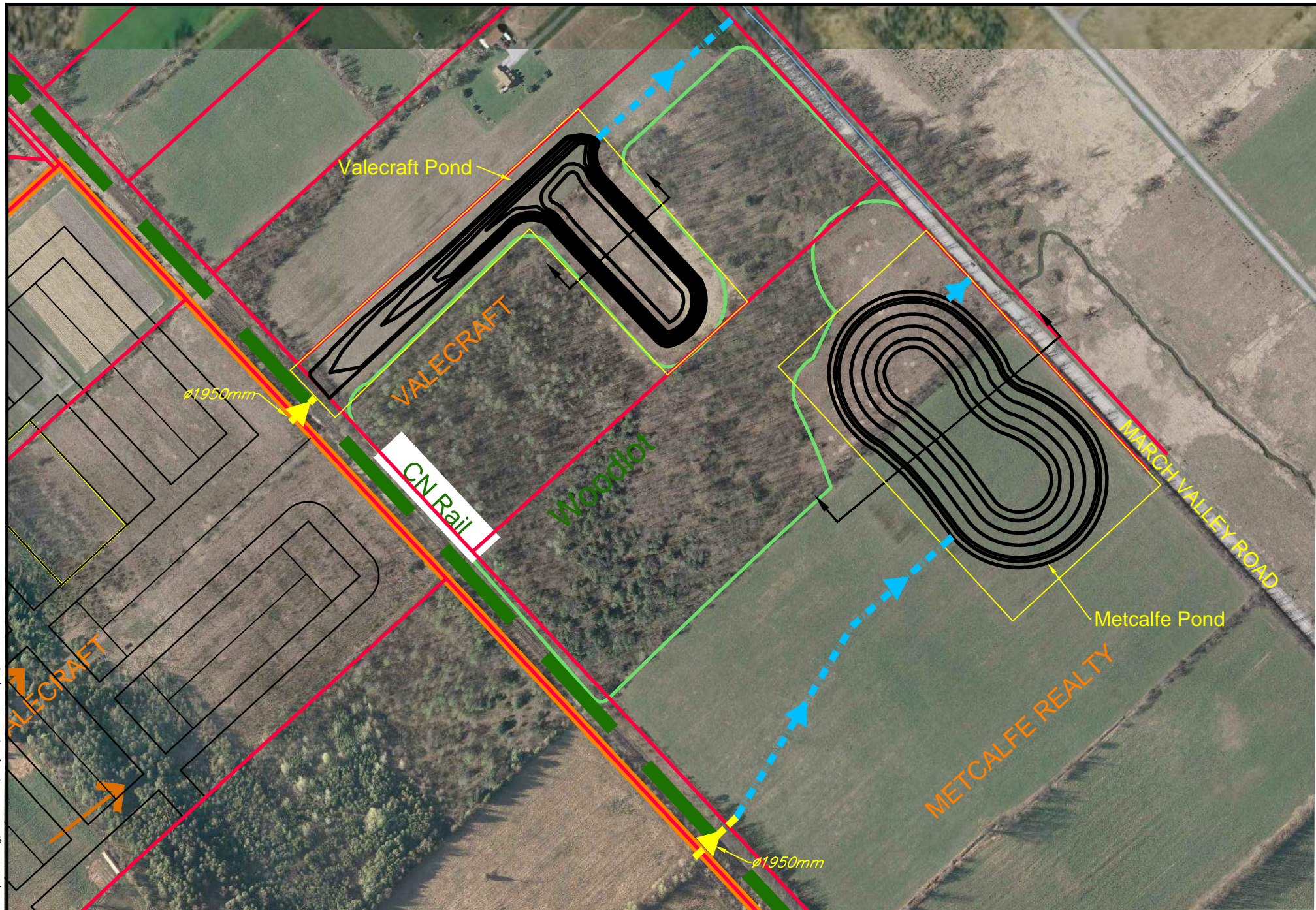
East Stormwater Facility Option #1c

SCALE 1:4000

DATE MAY 2014	JOB 112117	FIGURE EAST SWM1c
---------------	------------	-------------------

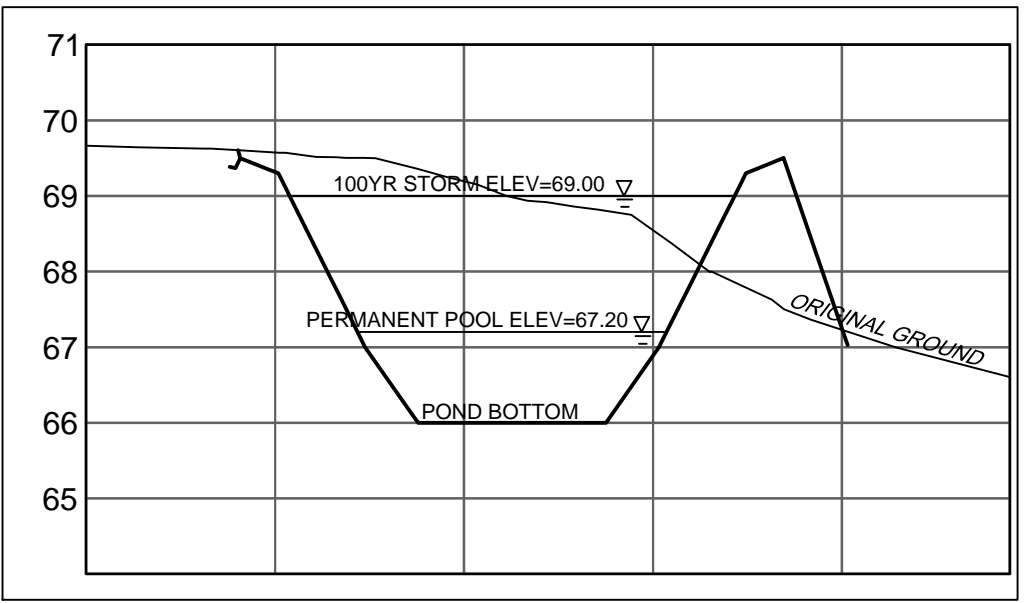
M:\2012\112117\CAD\Design\SWM\Cost Estimate Drawings\112117-SWM-cost est - east ponds.dwg, POND1c, May 21, 2014 - 9:05am, kbanks

M:\2012\112117\CAD\Design\SWM\Cost Estimate Drawings\112117-SWM-cost est - east 2 ponds.dwg, Two Ponds, May 20, 2014 - 2:52pm, kbanks

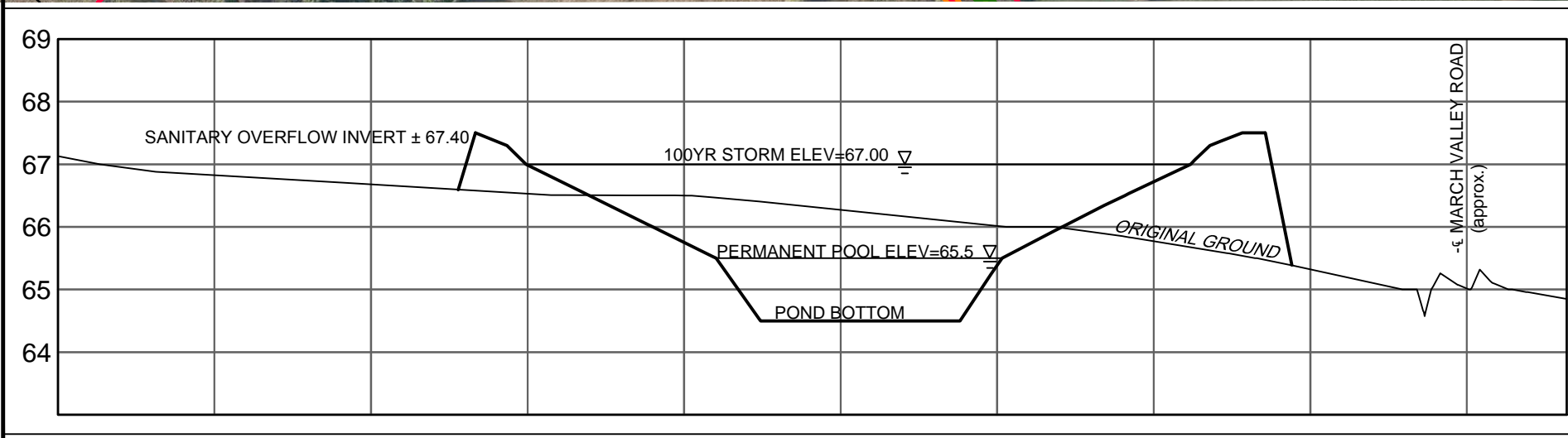


LEGEND

- Proposed Development Area
- Existing Property Lines
- Woodlot Boundary
- Pond Block Boundary
- Storm Trunk
- Ditching



VALECRAFT POND SECTION
SCALE 1:1000



METCALFE POND SECTION
SCALE 1:1000

NOVATECH
ENGINEERING
CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email: novainfo@novatech-eng.com

CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION
AREA STUDY

East Stormwater Facility Option #2

SCALE 1:4000

DATE MAY 2014	JOB 112117	FIGURE EAST SWM2
---------------	------------	------------------

Kanata North
Preliminary Stormwater Facility Cost
Metcalf & Valecraft SWMF - Option 1a

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION A - STORMWATER FACILITY (63,000m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	83,000	m³	\$10.00	\$830,000.00
	ii) Rock Excavation	0	m³	\$40.00	\$0.00
	iii) Clay Liner (0.6m Thick)	0	m²	\$9.00	\$0.00
2	Storm Trunk Pipe - 1200mm Valecraft	500	m	\$1,500.00	\$750,000.00
3	Rail Line Crossing - twin 1950mm	40	m	\$5,000.00	\$200,000.00
4	Inlet - Ditching	80	m	\$200.00	\$16,000.00
5	Inlet - Concrete Headwall	1	ea.	\$150,000.00	\$150,000.00
6	Outlet - Structure (Including Pipe)	1	ea.	\$175,000.00	\$175,000.00
7	Outlet - Ditching	30	m	\$100.00	\$3,000.00
8	Rock Check Dam	2	ea.	\$3,000.00	\$6,000.00
9	Hydro Seeding	47,800	m²	\$4.00	\$191,200.00
10	Landscaping Allowance	1	LS	\$188,000.00	\$188,000.00
11	Access Road (3m wide-asphalt)	860	m	\$205.00	\$176,300.00
TOTAL SECTION A - STORMWATER FACILITY					\$2,685,500.00

		Construction Total	\$2,685,500.00
		25% Soft Costs and Contingency	\$671,375.00
	Net Rural Land (ac)	17.3	
		Total	\$3,356,875.00

Note: DC recoverable Items are highlighted in blue

Kanata North
Preliminary Stormwater Facility Cost
Metcalfe & Valecraft SWMF - Option 1b

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION A - STORMWATER FACILITY (63,000m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	39,700	m³	\$10.00	\$397,000.00
	ii) Rock Excavation	0	m³	\$40.00	\$0.00
	iii) Clay Liner (0.6m Thick)	0	m²	\$9.00	\$0.00
2	Storm Trunk Pipe - 1200mm Valecraft	500	m	\$1,500.00	\$750,000.00
3	Rail Line Crossing - twin 1950mm	40	m	\$5,000.00	\$200,000.00
4	Inlet - Ditching	270	m	\$200.00	\$54,000.00
5	Inlet - Concrete Headwall	1	ea.	\$150,000.00	\$150,000.00
6	Outlet - Structure (Including Pipe)	1	ea.	\$175,000.00	\$175,000.00
7	Outlet - Ditching	40	m	\$100.00	\$4,000.00
8	Rock Check Dam	2	ea.	\$3,000.00	\$6,000.00
9	Hydro Seeding	47,800	m²	\$4.00	\$191,200.00
10	Landscaping Allowance	1	LS	\$188,000.00	\$188,000.00
11	Access Road (3m wide-asphalt)	860	m	\$205.00	\$176,300.00
TOTAL SECTION A - STORMWATER FACILITY					\$2,291,500.00

		Construction Total	\$2,291,500.00
		25% Soft Costs and Contingency	\$572,875.00
	Net Rural Land (ac)	17.0	
		Total	\$2,864,375.00

Note: DC recoverable Items are highlighted in blue

Kanata North
Preliminary Stormwater Facility Cost
Metcalf & Valecraft SWMF - Option 1c

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION A - STORMWATER FACILITY (63,000m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	172,600	m³	\$10.00	\$1,726,000.00
	ii) Rock Excavation	54,000	m³	\$40.00	\$2,160,000.00
	iii) Clay Liner (0.6m Thick)	18,700	m²	\$9.00	\$168,300.00
2	Clearing and Grubbing	4	ha	\$10,000.00	\$40,000.00
3	Storm Trunk Pipe - 1350mm Metcalfe	480	m	\$1,600.00	\$768,000.00
4	Storm Trunk Pipe - 1200mm Valecraft	230	m	\$1,500.00	\$345,000.00
5	Rail Line Crossing - twin 1950mm	40	m	\$5,000.00	\$200,000.00
6	Inlet - Concrete Headwall	1	ea.	\$150,000.00	\$150,000.00
7	Outlet - Structure (Including Pipe)	1	ea.	\$175,000.00	\$175,000.00
8	Outlet - Ditching	730	m	\$100.00	\$73,000.00
9	Rock Check Dam	2	ea.	\$3,000.00	\$6,000.00
10	Hydro Seeding	47,800	m²	\$4.00	\$191,200.00
11	Landscaping Allowance	1	LS	\$188,000.00	\$188,000.00
12	Access Road (3m wide-asphalt)	860	m	\$205.00	\$176,300.00
TOTAL SECTION A - STORMWATER FACILITY					\$6,366,800.00

		Construction Total	\$6,366,800.00
		25% Soft Costs and Contingency	\$1,591,700.00
	Net Urban Land (ac)	19.5	
		Total	\$7,958,500.00

Note: DC recoverable Items are highlighted in blue

Kanata North
Preliminary Stormwater Facility Cost
Metcalfe & Valecraft SWMF - Option 2

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION A - METCALFE STORMWATER FACILITY (33,900m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	32,100	m³	\$10.00	\$321,000.00
	ii) Rock Excavation	0	m³	\$40.00	\$0.00
	iii) Clay Liner (0.6m Thick)	0	m²	\$9.00	\$0.00
2	Storm Trunk Pipe - 1350mm	0	m	\$1,600.00	\$0.00
3	Inlet - Ditching	290	m	\$200.00	\$58,000.00
4	Inlet - Concrete Headwall	1	ea.	\$84,000.00	\$84,000.00
5	Outlet - Structure (Including Pipe)	1	ea.	\$98,000.00	\$98,000.00
6	Outlet - Ditching	25	m	\$100.00	\$2,500.00
7	Rail Line Crossing - 1950mm	40	m	\$2,500.00	\$100,000.00
8	Rock Check Dam	2	ea.	\$3,000.00	\$6,000.00
9	Hydro Seeding	3,100	m²	\$4.00	\$12,400.00
10	Landscaping Allowance	1	LS	\$105,000.00	\$105,000.00
11	Access Road (3m wide-asphalt)	670	m	\$205.00	\$137,350.00
TOTAL SECTION A - STORMWATER FACILITY					\$924,250.00

Construction Total		\$924,250.00
25% Soft Costs and Contingency		\$231,062.50
Net Rural Land (ac) at	10.9	
Subtotal (Metcalfe)		\$1,155,312.50

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION B - VALECRAFT STORMWATER FACILITY (26,500m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	30,000	m³	\$10.00	\$300,000.00
	ii) Rock Excavation	0	m³	\$40.00	\$0.00
	iii) Clay Liner (0.6m Thick)	0	m²	\$9.00	\$0.00
2	Storm Trunk Pipe - 1200mm	0	m	\$1,500.00	\$0.00
3	Inlet - Ditching	0	m	\$200.00	\$0.00
4	Inlet - Concrete Headwall	1	ea.	\$60,000.00	\$60,000.00
5	Outlet - Structure (Including Pipe)	1	ea.	\$70,000.00	\$70,000.00
6	Outlet - Ditching	150	m	\$100.00	\$15,000.00
7	Rail Line Crossing - 1950mm	40	m	\$2,500.00	\$100,000.00
8	Rock Check Dam	2	ea.	\$3,000.00	\$6,000.00
9	Hydro Seeding	9,600	m²	\$4.00	\$38,400.00
10	Landscaping Allowance	1	LS	\$75,000.00	\$75,000.00
11	Access Road (3m wide-asphalt)	620	m	\$205.00	\$127,100.00
TOTAL SECTION A - STORMWATER FACILITY					\$791,500.00

Construction Total		\$791,500.00
25% Soft Costs and Contingency		\$197,875.00
Net Rural Land (ac) at	7.2	
Subtotal (Metcalfe)		\$989,375.00

Total		\$2,144,687.50
--------------	--	-----------------------

Note: DC recoverable Items are highlighted in blue

MEMORANDUM

DATE: MAY 21, 2014
TO: KNUEA TAC
FROM: M.PETEPiece
RE: KNUEA STORM OUTLET TO SHIRLEY'S BROOK AT MARCH VALLEY ROAD
CC: FILE

Shirley's Brook will serve as the storm outlet for the KNUEA lands east of March Road. The reach of Shirley's Brook adjacent to the Valecraft / Metcalfe properties is located within the March Valley Road right-of-way. The roadway embankment along this reach is steep and prone to washout during periods of high flow, and has been reinforced with gabion baskets and riprap. Further downstream, the watercourse resumes a more natural flow path outside of the right-of-way and flows northeast through the DND lands towards Shirley's Bay and the Ottawa River.

Post-development runoff from the KNUEA will be controlled to pre-development levels, but the volume of water will increase. The reach of Shirley's Brook within the March Valley Road right-of-way is at the downstream end of a large urban watershed and the additional flow contribution from the KNUEA lands will be relatively small. However, it is recognized that any increase in runoff could potentially lead to more frequent washouts of the roadway embankment.

To address this issue, three alternatives for the KNUEA storm outlet at March Valley Road have been developed:

1. The roadside ditch on the west side of March Valley Road can be re-graded to provide a storm outlet to Shirley's Brook further downstream where the watercourse leaves the right-of-way.
2. Improvements can be made to Shirley's Brook within the March Valley Road right-of-way to stabilize the banks and improve the channel morphology.
3. The reach of Shirley's Brook within the right-of-way can be re-located.

Option 1: Re-grade the roadside ditch on the east side of March Valley Road

The east side of March Valley Road does not currently have a well defined roadside ditch. Runoff from the agricultural fields and wooded areas to the east flow overland to the right-of-way, then outlet to Shirley's Brook through a pair of CSP culvert crossing March Valley Road near the northeast corner of the Valecraft property.

The existing cross-culverts would be removed and the ditch would be re-graded to convey runoff further north to a new culvert that would outlet to Shirley's Brook just downstream of where it leaves the March Valley Road ROW. The proposed scope of work associated with this option is shown on **Figure OPT 1**.

Pros:

- Provides a storm outlet for the KNUEA lands downstream of the reach of Shirley's Brook within the March Valley Road ROW.

Cons:

- Requires removal of existing trees in and adjacent to the right-of-way.
- Proposed ditch would be very flat (approximately 0.15% grade).
- Requires work at private entrance not owned by the developers (larger culvert, ditch re-grading).
- May require grading work outside the right-of-way limits on property not owned by the developers.
- While this option will ensure no adverse impacts to Shirley's Brook, it does not address existing operational issues.

Option 2: Improvements to Shirley's Brook within March Valley Road ROW

Parish Geomorphic have indicated that improvements could be made to Shirley's Brook to improve the stability of the banks and channel along the March Valley Road ROW. The storm outlet(s) for the KNUEA lands would discharge to the existing watercourse in the locations shown on **Figure OPT 2**. This option would require a permit from MVCA (alterations to watercourses).

Pros:

- Provides a storm outlet to Shirley's Brook for the KNUEA lands.
- The required work would be limited to the March Valley Road right-of-way.
- Proposed improvements should reduce the frequency of maintenance and repair to the road embankment.

Cons:

- Would require removal of some existing trees on the east bank of Shirley's Brook.
- May not fully address ongoing maintenance and operational issues, as the extent and type of improvements would be limited by the space available within the right-of-way.

Option 3: Relocate Shirley's Brook outside of March Valley Road ROW

The construction of March Valley Road required the re-alignment of Shirley's Brook resulting in a straightened channel that runs parallel to the right-of-way for approximately 450m. There is an opportunity to relocate this reach of the watercourse outside of the right-of-way using natural channel design techniques.

The proposed channel would be located on federal lands (DND gun range) managed by NCC. The storm outlet(s) for the KNU EA lands would discharge to the re-aligned watercourse in the locations shown on **Figure OPT 3**. This option would require a permit from MVCA (alterations to watercourses).

Pros:

- Provides a storm outlet to Shirley's Brook for the KNU EA lands.
- The proposed work would significantly improve this reach of Shirley's Brook.
- The March Valley Road right-of-way could be re-designed with a much smaller ditch, providing the opportunity for future improvements to the road (widening, etc) within the existing right-of-way.
- The proposed alignment would run through an open area and would require minimal removal of existing trees.

Cons:

- Requires approval from NCC / DND.
- Longest timeline for approvals and co-ordination.

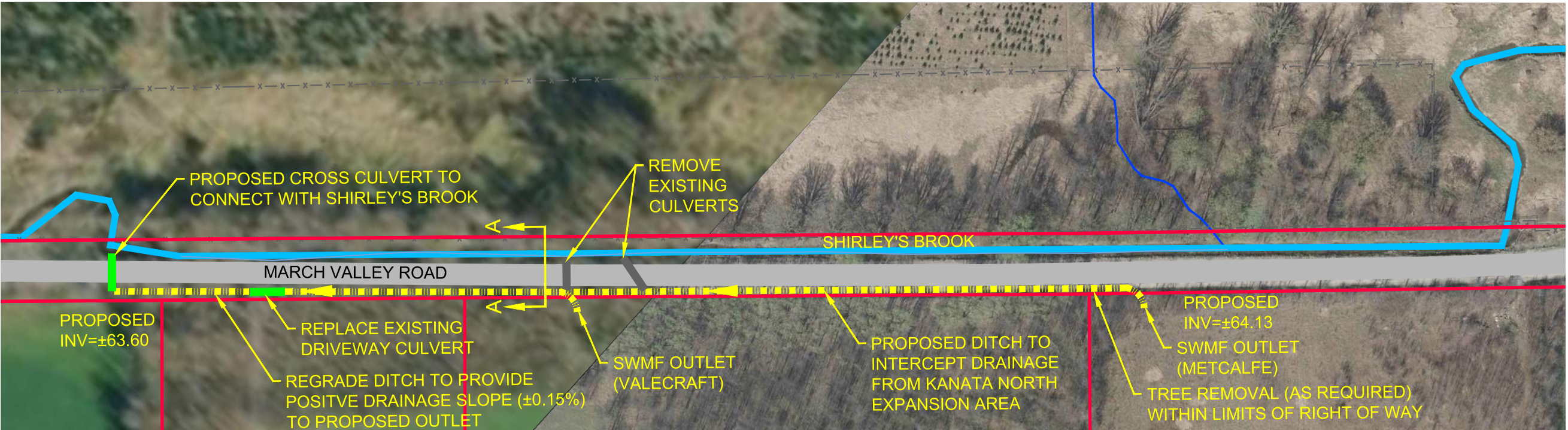
Conclusions and Recommendations

Option 1 (re-grade existing ditch) is not recommended. While this option is the least expensive, there are a number of design issues that would need to be addressed: There are a significant number of trees located in or near the right-of-way that would need to be removed. The proposed ditch would likely have standing water due to the flat grade of the ditch and the proximity to the water table. A new culvert would need to be installed under the driveway to the north of the Valecraft property. This driveway is in a low, wet area with no clearly defined ditch and it may be necessary to remove trees and place fill outside of the right-of-way.

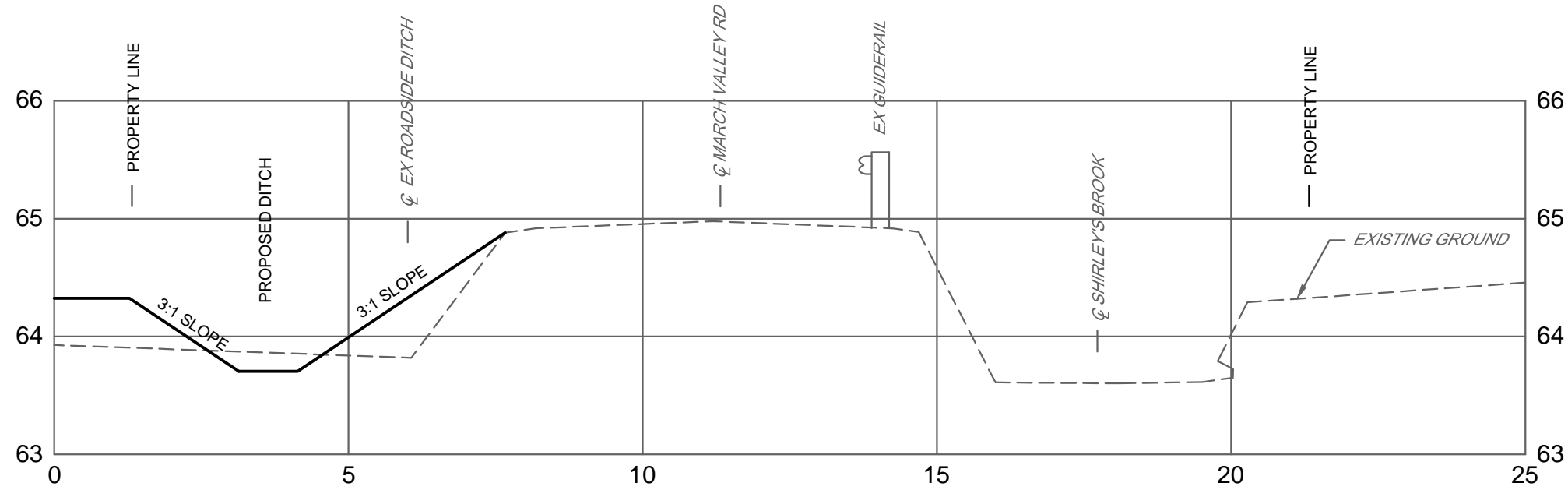
Option 2 (channel stabilization) is viable, but the opportunities for channel improvement will be limited by the space available within the right-of-way. Channel stabilization techniques will ensure that the increase in runoff from the KNU EA lands will not increase the probability of bank failure and/or washouts, but there will still be some risk as the channel will still be located within the right-of-way.

Option 3 (channel relocation) is the preferred option from a technical perspective and represents the best long-term solution, but is contingent on obtaining approval from NCC. The estimated cost of the proposed works is comparable to Option 2, and there may be opportunity for cost-sharing between the City, the NCC, and the developer that could offset the total cost. This option also opens up the opportunity for future improvements to March Valley Road by relocating Shirley's Brook outside the right-of-way.

M:\2012\112117\DATA\CORRESPONDENCE\MEMOS\20140521 KNU EA OUTLET OPTIONS (EAST).DOCX



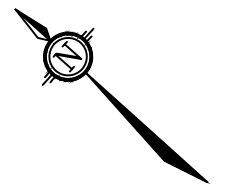
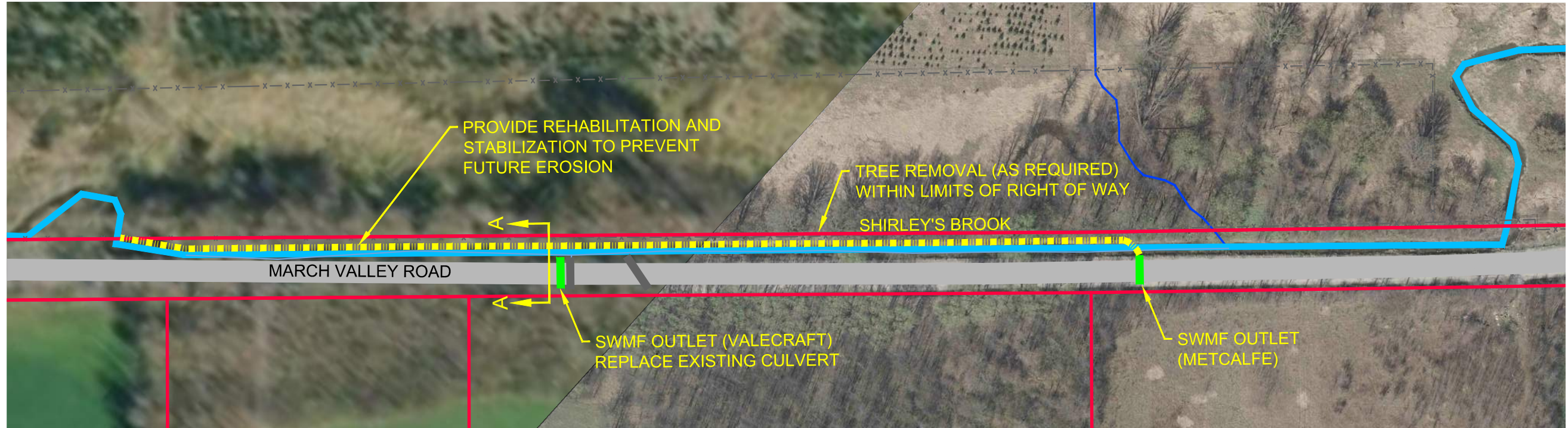
PLAN
SCALE 1:1500



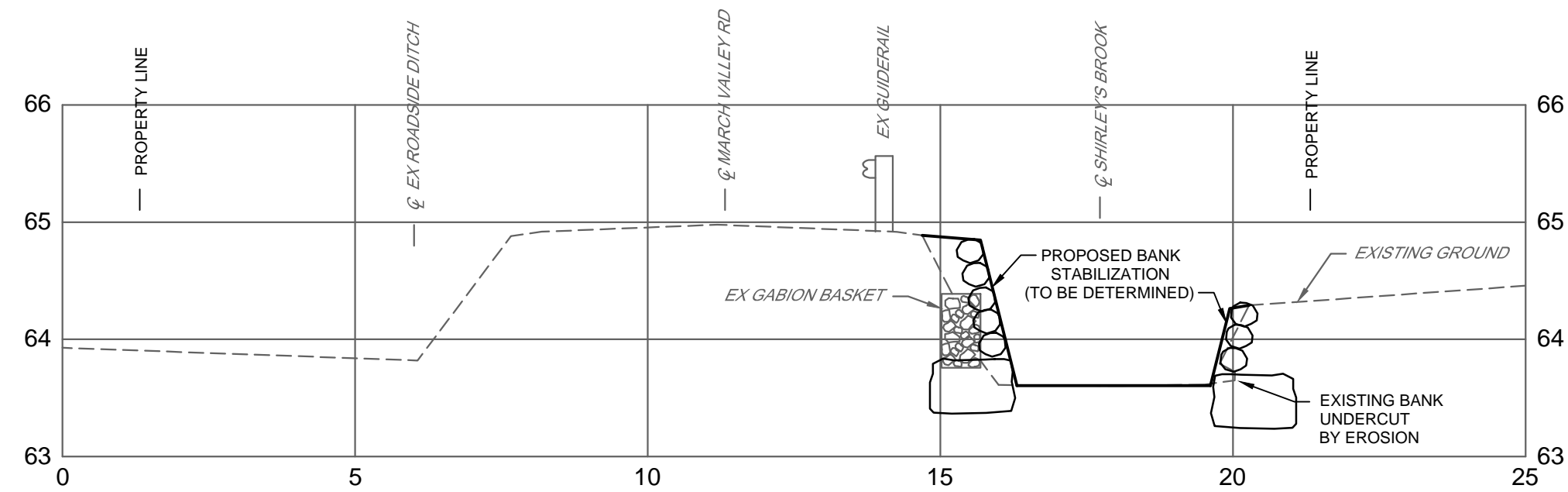
SECTION A-A
SCALE H 1:100
V 1:50

NOVATECH ENGINEERING CONSULTANTS LTD. <small>ENGINEERS & PLANNERS</small> Suite 200, 240 Michael Cowpland Drive Ottawa, Ontario, Canada K2M 1P6 Telephone: (613) 254-9643 Facsimile: (613) 254-5867 Email: novainfo@novatech-eng.com		CITY OF OTTAWA KANATA NORTH URBAN EXPANSION AREA STUDY	
		EAST STORM OUTLET OPTION 1	
SCALE		AS NOTED	
DATE	JOB	FIGURE	
MAY 2014	112117	OPT 1	

M:\2012\112117\CAD\Design\SWMS\SWM Facility & Outlet Plans\112117 - MARCH VALLEY OPT 1-3.dwg, OPT 1, May 21, 2014 - 2:38pm, lcolbran



PLAN
SCALE 1:1500

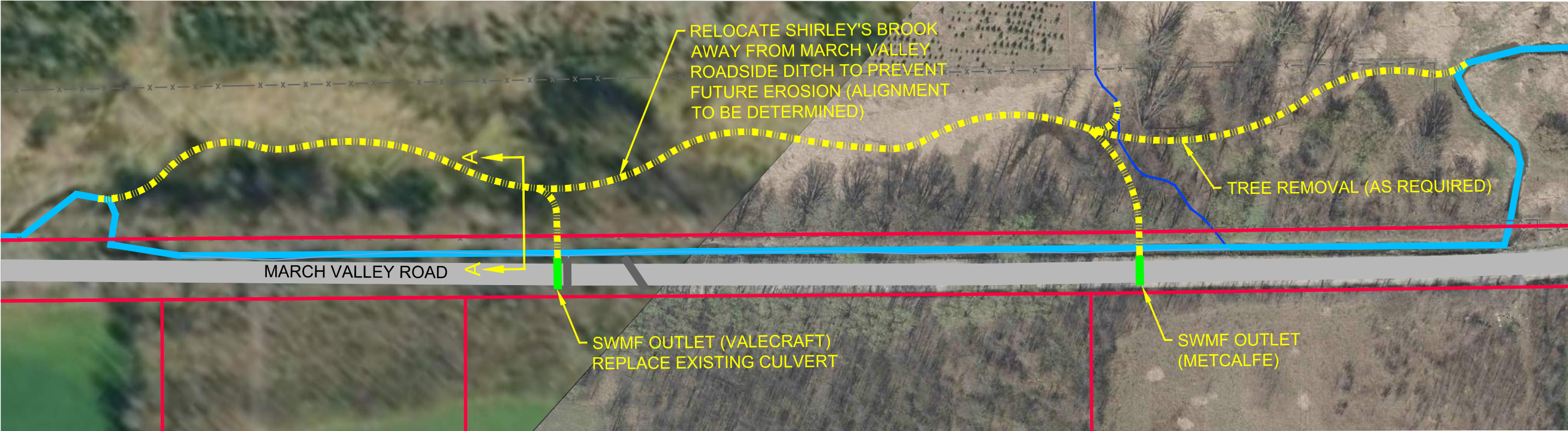


SECTION A-A
SCALE H 1:100
V 1:50

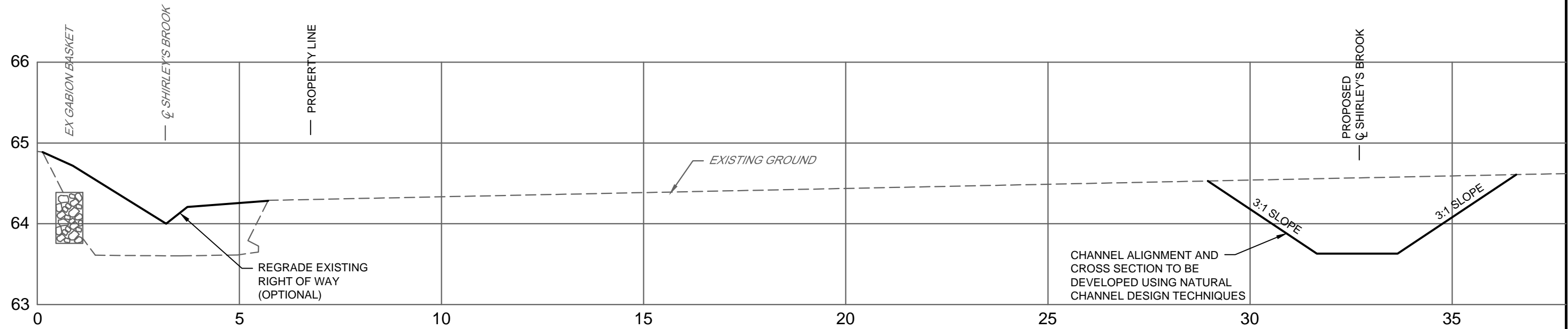
NOVATECH
ENGINEERING
CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email: novainfo@novatech-eng.com

CITY OF OTTAWA KANATA NORTH URBAN EXPANSION AREA STUDY		
EAST STORM OUTLET OPTION 2		
SCALE AS NOTED		
DATE MAY 2014	JOB 112117	FIGURE OPT 2

M:\2012\112117\CAD\Design\SWMS\SWM Facility & Outlet Plans\112117 - MARCH VALLEY OPT 1-3.dwg, OPT 2, May 21, 2014 - 2:38pm, lcolbran



PLAN
SCALE 1:1500



SECTION A-A
SCALE H 1:100
V 1:50

NOVATECH
ENGINEERING
CONSULTANTS LTD.

ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2M 1P6

Telephone (613) 254-9643
Facsimile (613) 254-5867
Email: novainfo@novatech-eng.com

CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION
AREA STUDY

EAST STORM OUTLET
OPTION 3

SCALE AS NOTED

DATE MAY 2014 JOB 112117 FIGURE OPT 3

Kanata North
Preliminary Stormwater Outlet Cost
Option 1

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION A - STORMWATER OUTLET					
1	Traffic Control	1	LS	\$10,000.00	\$10,000.00
2	Erosion and Sediment Control				
	i) Temporary Check Dams	5	ea.	\$500.00	\$2,500.00
	ii) Silt Fence	1	LS	\$10,000.00	\$10,000.00
3	March Valley West Roadside Ditch Remediation				
	i) Reshaping roadside ditch & erosion blanket	460	m	\$300.00	\$138,000.00
4	Driveway Culvert removal and reinstatement	1	ea.	\$5,000.00	\$5,000.00
5	Road Crossing Culvert remove and resintatement	2	ea.	\$6,000.00	\$12,000.00
6	New Road Crossing Culvert	1	ea.	\$12,000.00	\$12,000.00
7	Tree Removal	1	LS	\$5,000.00	\$5,000.00
TOTAL SECTION A - STORMWATER OUTLET					\$194,500.00

Construction Total	\$194,500.00
25% Soft Costs and Contingency	\$48,625.00
Total	\$243,125.00

Note: DC recoverable Items are highlighted in blue

Kanata North
Preliminary Stormwater Outlet Cost
Option 2

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION A - STORMWATER OUTLET					
1	Traffic Control	1	LS	\$10,000.00	\$10,000.00
2	Erosion and Sediment Control				
	i) Temporary Check Dams	5	ea.	\$500.00	\$2,500.00
	ii) Silt Fence	1	LS	\$10,000.00	\$10,000.00
3	Shirley's Brook Remediation				
	i) Green wall system with tie backs & live staking	460	m	\$850.00	\$391,000.00
4	Road Crossing Culvert remove and resintatement	1	ea.	\$12,000.00	\$12,000.00
5	New Road Crossing Culvert	1	ea.	\$12,000.00	\$12,000.00
6	Tree Removal	1	LS	\$5,000.00	\$5,000.00
TOTAL SECTION A - STORMWATER OUTLET					\$442,500.00

Construction Total	\$442,500.00
25% Soft Costs and Contingency	\$110,625.00
Total	\$553,125.00

Note: DC recoverable Items are highlighted in blue

Kanata North
Preliminary Stormwater Outlet Cost
Option 3

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION A - STORMWATER OUTLET					
1	Traffic Control	1	LS	\$10,000.00	\$10,000.00
2	Erosion and Sediment Control				
	i) Temporary Check Dams	7	ea.	\$500.00	\$3,500.00
	ii) Silt Fence	1	LS	\$12,000.00	\$12,000.00
3	Excavate New Natural Channel for Shirley's Brook				
	i) Excavate, erosion blanket, live staking	560	m	\$650.00	\$364,000.00
4	Road Crossing Culvert remove and resintatement	1	ea.	\$12,000.00	\$12,000.00
5	New Road Crossing Culvert	1	ea.	\$12,000.00	\$12,000.00
6	Tree Removal	1	LS	\$5,000.00	\$5,000.00
TOTAL SECTION A - STORMWATER OUTLET					\$418,500.00

SECTION B - MARCH VALLEY ROADSIDE DITCH IMPROVEMENTS					
7	March Valley East Roadside Ditch Remediation				
	i) Backfill, reshape, erosion blanket	460	m	\$300.00	\$138,000.00
TOTAL SECTION B - MARCH VALLEY ROADSIDE DITCH IMPROVEMENTS					\$138,000.00

Construction Total	\$556,500.00
25% Soft Costs and Contingency	\$139,125.00
Total	\$695,625.00

Note: DC recoverable Items are highlighted in blue

MEMORANDUM

DATE: JUNE 4, 2014
TO: KNUEA TAC
FROM: M.PETEPiece
RE: KNUEA STORMWATER MANAGEMENT (WEST)
CC: FILE

1.0 INTRODUCTION

The information provided in this memo presents the recommended stormwater management strategy for the Kanata North Urban Expansion Area (KNUEA) west of March Road. Stormwater quality and quantity control for this portion of the study area is proposed to be provided using a combination of wet pond SWM facilities and on-site controls. The recommended stormwater management strategy was developed based on the following design considerations.

2.0 DESIGN CONSIDERATIONS

March Road

March Road is an arterial roadway that bisects the KNUEA community. It was determined that stormwater management for the KNUEA lands west of March Road should be provided on the west side of March Road for the following reasons:

- Changes to existing drainage patterns should be minimized.
- Major system flows cannot be conveyed overland across an arterial roadway.
- Overland flows must be directed to a SWM facility for quantity control.

Shirley's Brook Northwest Branch

The Northwest Branch of Shirley's Brook is comprised of two main tributaries that divide the KNUEA lands west of March Road into three storm drainage areas. Due to topographic constraints, it is not possible to service all of the lands west of March Road using a single SWM facility and independent stormwater management will be required for each of the three areas.

SWMF Outlet

To minimize changes to existing drainage patterns, the SWM facilities should outlet to Northwest Branch tributaries upstream of March Road. The operating levels in the ponds will be dictated by the water levels in the tributaries at the outlet from the ponds.

Bedrock Elevation

The design of the facilities should minimize the extent of bedrock excavation as much as possible. The depth to bedrock is relatively shallow in this area, so some bedrock excavation will be required.

Quantity Control

The VISUAL OTTHYMO hydrologic model was used to generate pre and post-development hydrographs and evaluate storage requirements. The proposed SWM facilities have been designed to control post-development peak flows to the allowed release rates, as dictated by the City of Ottawa for all storms up to and including the 100-year event:

- Pre-development conditions were modeled using the hydrologic parameters from the Shirley's Brook Existing Conditions Model developed by AECOMM.
- Post-development conditions were modeled using hydrologic parameters consistent with the current concept plan and conforming to the Ottawa Sewer Design Guidelines.

A flow monitoring program has been initiated to provide additional data on flows in the Northwest Branch of Shirley's Brook. The flow monitoring data will be reviewed and, if warranted, the SWM facility sizes will be revised based on the results of the monitoring program.

Quality Control

An *Enhanced* level of water quality treatment is required for all development within the Shirley's Brook subwatershed. The proposed SWM facilities have been designed to provide the recommended water quality volume (permanent pool / extended detention) listed in the MOE SWM Planning and Design Manual.

Grading

The proposed SWM facilities have been sized using 7:1 side slopes for the permanent pool and 5:1 side slopes for the active storage.

3.0 SWM FACILITIES (WEST)

The recommended SWM strategy proposes two end-of-pipe stormwater management wet ponds to provide water quality and quantity control for the majority of the KNUEA lands west of March Road. The locations of the proposed SWM facilities are shown on **Figure WEST SWMF**.

On-site controls are proposed for the southernmost portion of the area. This area is relatively small (6.12 ha) and the proposed land uses (school, hi-density residential) are compatible with on-site stormwater management.

SWMF West 1 (Junic / Multivesco)

This option provides a single SWM facility located on the Junic / Multivesco property between the re-aligned stream corridor for the northwest tributary and the proposed roadway (**Figure WEST SWMF 1**). The pond is oriented perpendicular March Road. Based on the existing ground surface, there is approximately 4.0m of fall between the east and west ends of the facility. The western portion of the facility will require approximately 2.0m of excavation below existing ground, while the eastern portion of the pond will require a berm approximately 2.0m high.

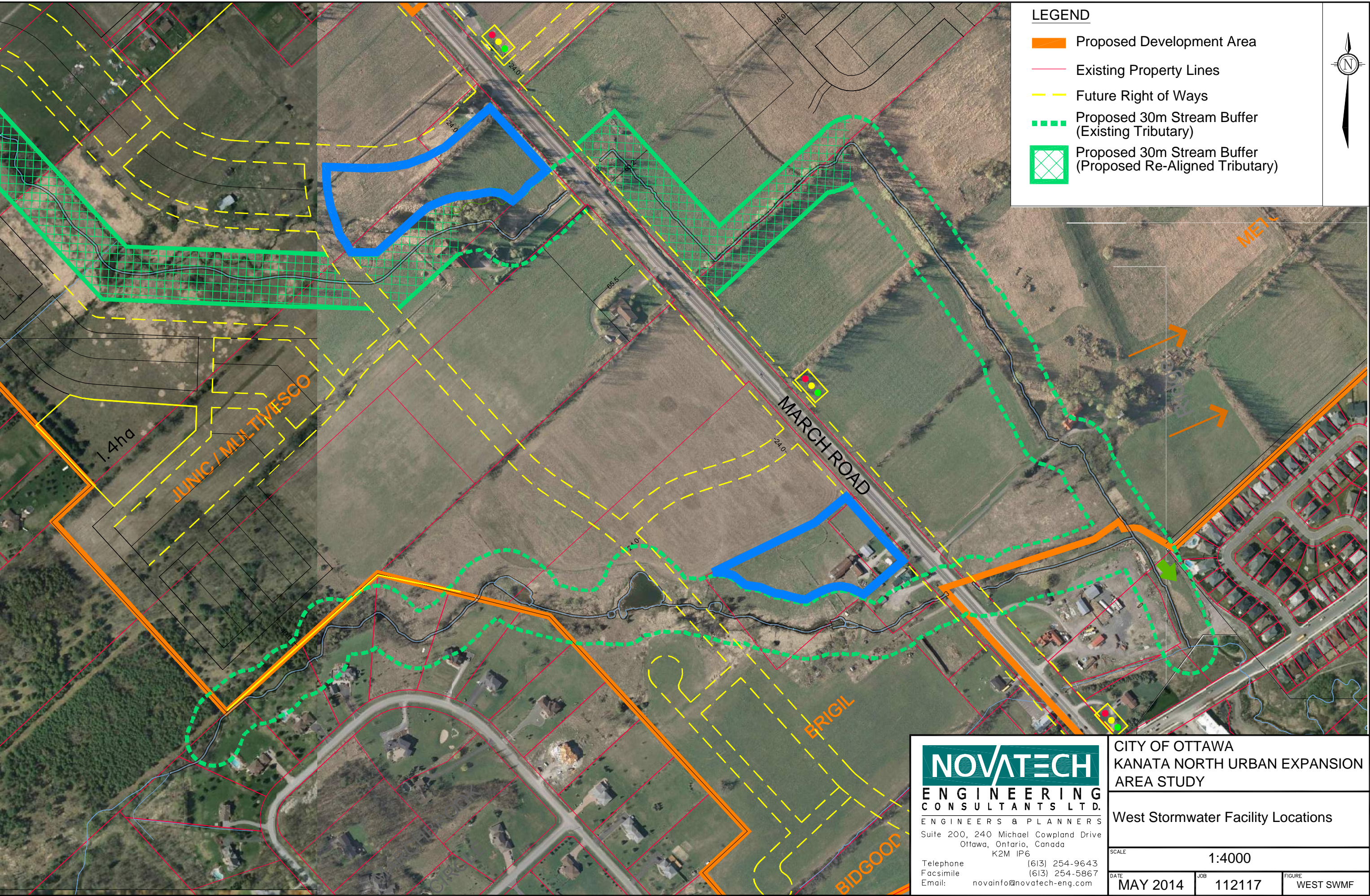
This pond would have a tributary drainage area of approximately 47 ha and a total volume of approximately 31,000 m³. The total area of the pond block is approximately 5.1 ha and includes provision for grading, access roads, and sediment storage.

SWMF West 2 (Brigil)

This option provides a single SWM facility located on the Brigil property next to the southwest tributary, and perpendicular to March Road (**Figure West SWMF 2**). Based on the existing ground surface, there is approximately 1.0m of fall between the east and west ends of the facility. The western portion of the facility will not require any additional excavation below existing ground, while the eastern portion of the pond will require a berm approximately 1.0 m high.

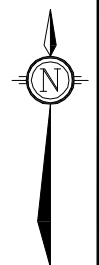
This pond would have a tributary drainage area of approximately 26 ha and a total volume of approximately 18,500 m³. The total area of the pond block is approximately 4.0 ha and includes provision for grading, access roads, and sediment storage.

M:\2012\11217\CAD\Design\SWM\Cost Estimate Drawings\11217-SWM-Overall Pond Layout.dwg, Pond Layout (West), May 27, 2014 - 4:31pm, kbanks



LEGEND

- Proposed Development Area
- Existing Property Lines
- Future Right of Ways
- Proposed 30m Stream Buffer (Existing Tributary)
- Proposed 30m Stream Buffer (Proposed Re-Aligned Tributary)



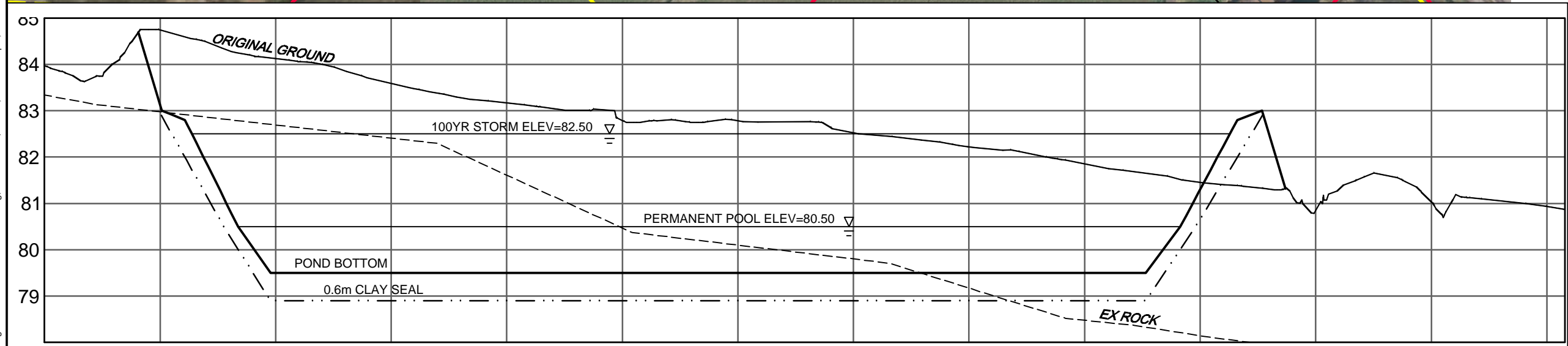
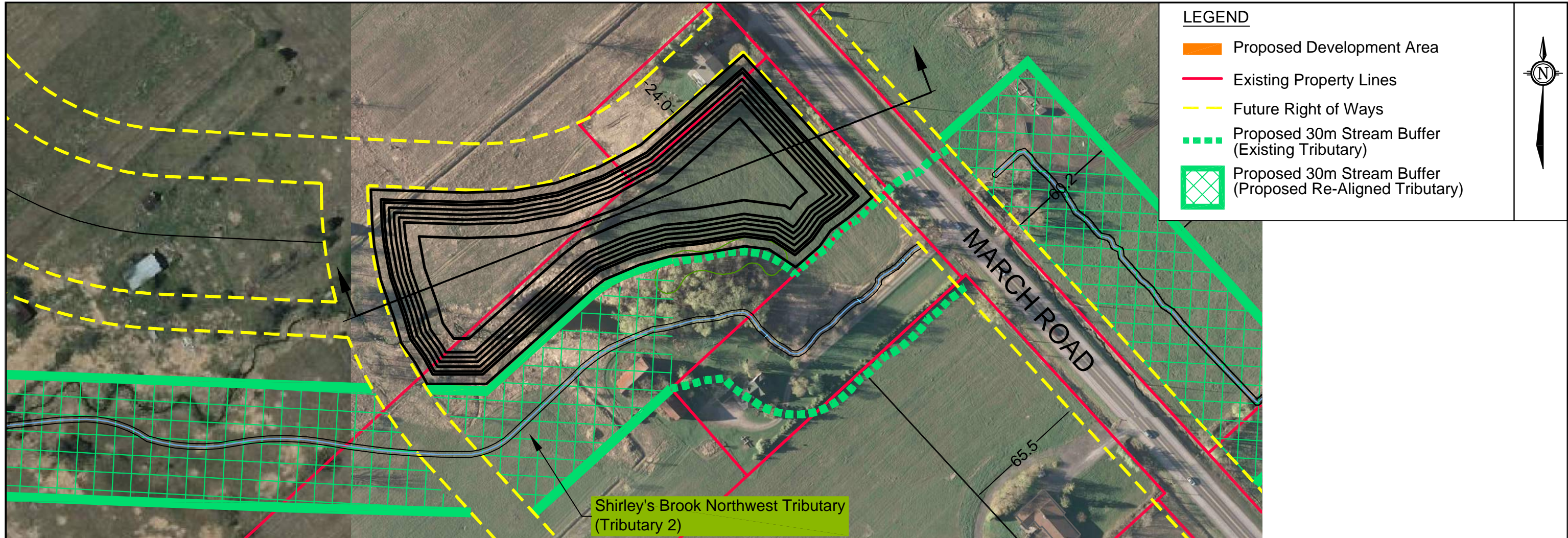
NOVATECH
ENGINEERING
CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email: novainfo@novatech-eng.com

CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION
AREA STUDY

West Stormwater Facility Locations

SCALE	1:4000		
DATE	MAY 2014	JOB	112117
FIGURE	WEST SWMF		

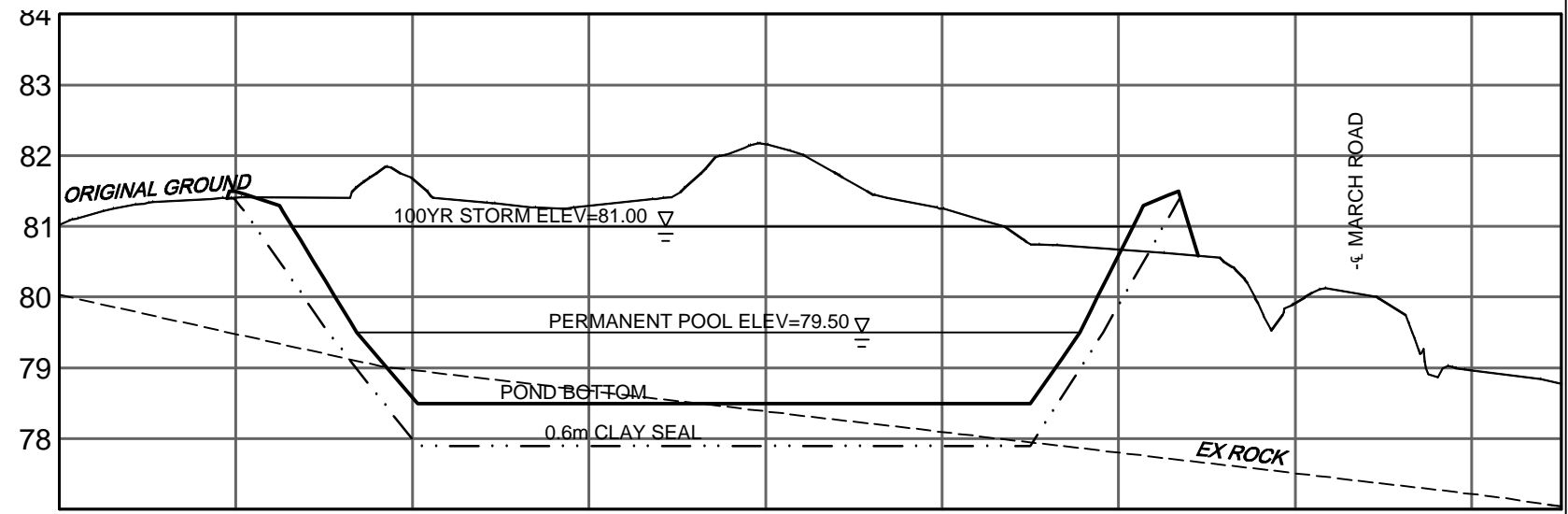
M:\2012\112117\CAD\Design\SWM\Cost Estimate Drawings\112117-SWM-cost est-JM.dwg, JM1 - ONLY, Jun 04, 2014 - 1:43pm, kbanks



SECTION
SCALE 1:1000

NOVATECH ENGINEERING CONSULTANTS LTD. ENGINEERS & PLANNERS Suite 200, 240 Michael Cowpland Drive Ottawa, Ontario, Canada K2M 1P6 Telephone (613) 254-9643 Facsimile (613) 254-5867 Email: novainfo@novatech-eng.com		CITY OF OTTAWA KANATA NORTH URBAN EXPANSION AREA STUDY	
		Junic / Multivesco Stormwater Facility	
SCALE		1:2000	
DATE	JOB	FIGURE	
MAY 2014	112117	WEST SWMF 1	

M:\2012\112117\CAD\Design\SWM\Cost Estimate Drawings\112117-SWM-cost est-BRIGIL.dwg, Brigi 1 - ONLY, Jun 04, 2014 - 10:43am, kbanks



NOVATECH
ENGINEERING
CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email: novainfo@novatech-eng.com

CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION
AREA STUDY

Brigil Stormwater Facility

SCALE 1:2000

DATE MAY 2014

JOB 112117

FIGURE WEST SWMF 2

Kanata North
Preliminary Stormwater Facility Cost
Junic/Multivesco SWMF

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION A - STORMWATER FACILITY (31,000m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	26,700	m³	\$10.00	\$267,000.00
	ii) Rock Excavation	18,700	m³	\$40.00	\$748,000.00
	iii) Clay Liner (0.6m Thick)	10,500	m²	\$9.00	\$94,500.00
2	Inlet - Concrete Headwall	1.0	ea.	\$81,000.00	\$81,000.00
3	Outlet - Structure (Including Pipe)	1.0	ea.	\$94,000.00	\$94,000.00
4	Rock Check Dam	1.0	ea.	\$3,000.00	\$3,000.00
5	Hydro Seeding	19,000	m²	\$4.00	\$76,000.00
6	Landscaping Allowance	1.0	LS	\$101,000.00	\$101,000.00
7	Access Road (3m wide-asphalt)	670	m	\$205.00	\$137,350.00
TOTAL SECTION A - STORMWATER FACILITY					\$1,601,850.00

		Construction Total	\$1,601,850.00
		25% Soft Costs and Contingency	\$400,462.50
Net Urban Land (ac) at \$200,000/ac		5.1	\$1,020,000.00
		Total	\$3,022,312.50

Note: DC recoverable Items are highlighted in blue

Kanata North
Preliminary Stormwater Facility Cost
Brigil SWMF

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION A - STORMWATER FACILITY (18,500m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	20,900	m³	\$10.00	\$209,000.00
	ii) Rock Excavation	9,200	m³	\$40.00	\$368,000.00
	iii) Clay Liner (0.6m Thick)	8,200	m²	\$9.00	\$73,800.00
2	Inlet - Concrete Headwall	1.0	ea.	\$48,000.00	\$48,000.00
3	Outlet - Structure (Including Pipe)	1.0	ea.	\$56,000.00	\$56,000.00
4	Rock Check Dam	1.0	ea.	\$3,000.00	\$3,000.00
5	Hydro Seeding	13,200	m²	\$4.00	\$52,800.00
6	Landscaping Allowance	1.0	LS	\$60,000.00	\$60,000.00
7	Access Road (3m wide-asphalt)	500	m	\$205.00	\$102,500.00
TOTAL SECTION A - STORMWATER FACILITY					\$973,100.00

			Construction Total	\$973,100.00
			25% Soft Costs and Contingency	\$243,275.00
Net Urban Land (ac) at \$200,000/ac			4.0	\$800,000.00
			Total	\$2,016,375.00

Note: DC recoverable Items are highlighted in blue

MEMORANDUM

DATE: OCTOBER 3, 2014
TO: KNUEA TAC
FROM: M.PETEPiece
RE: KNUEA SWM FACILITY OPTIONS (EAST)
CC: FILE

1.0 INTRODUCTION

Stormwater quality and quantity control for the KNUEA lands east of March Road (including the March Road ROW) will be provided using one or more wet pond SWM facilities. Four alternative pond configurations have been developed for this area (refer to attached figures).

The first three options use a single SWM facility to service all of the KNUEA lands between March Road and the CN Rail Line. The fourth option uses two SWM facilities to provide separate storm outlets for the Metcalfe and Valecraft Lands.

2.0 DESIGN CONSIDERATIONS

The conceptual layouts of the pond options take the following factors into account:

SWMF Outlet

In all cases, the proposed ponds will outlet to Shirley's Brook at March Valley Road. Several alternatives for routing the outflows from the ponds to Shirley's Brook have been developed and are presented in a separate memo. The outlet alternatives are independent and compatible with all of the pond alternatives.

Sanitary Overflow

The City has indicated that the proposed sanitary trunk sewer must provide a gravity overflow to a SWM facility:

- The 100-year elevation in the SWM facility must be below the sanitary overflow elevation.
- The sanitary overflow elevation is set by the overflow at the Pumping Station.

Based on these criteria, the invert elevation for the sanitary overflow has been set at 67.40m. Consequently, the 100-year water level in the SWM facility with the sanitary overflow must be below this elevation.

Bedrock Elevation

Where possible, the facilities have been designed to be above the bedrock. For some options, the sanitary overflow requires the bottom of the pond to be below the bedrock elevation, which significantly increases the cost of excavation and will require a lining for the pond.

Drawing **112117-TPSWMF** outlines the proposed pond locations, along with test pit data as provided by Paterson Group (see attached memo). Bedrock elevations have been interpolated from the provided data to estimate the quantity of rock excavation, if any, will be required for each of the pond options.

Storm Sewers

The storm sewers have been sized to convey the 5-year post-development peak flow from the upstream drainage area. The crossings of the CN Rail line will need to convey both minor and major system flows and have been sized for the 100-year peak flow. Outside of the urban area (east of the rail line), storm runoff will be conveyed in open channels.

For all pond options, the size and length of the storm infrastructure (sewers, culverts, open channels) required to route the flows from the limit of the development to the inlet of the pond have been accounted for in the cost estimates.

Quantity Control

The VISUAL OTTHYMO hydrologic model was used to generate pre and post-development hydrographs and evaluate storage requirements. The proposed SWM facilities have been designed to control post-development peak flows to pre-development levels for all storms up to and including the 100-year event:

- Pre-development conditions were modeled using the hydrologic parameters from the Shirley's Brook Existing Conditions Model developed by AECOMM.
- Post-development conditions were modeled using hydrologic parameters consistent with the current concept plan and conforming to the Ottawa Sewer Design Guidelines.

Quality Control

An *Enhanced* level of water quality treatment is required for all development within the Shirley's Brook subwatershed. The proposed SWM facilities have been designed to provide the recommended water quality volume (permanent pool / extended detention) listed in the MOE SWM Planning and Design Manual.

Grading

The proposed SWM facilities have been sized using 5:1 side slopes for both permanent pool and active storage.

3.0 SWM FACILITY OPTIONS (EAST)

OPTION 1A

This option provides a single SWM facility located on the Metcalfe property east of the rail line, outside the urban boundary (**Figure EAST SWM1a**). The pond is oriented perpendicular to the rail line and March Valley Road. Based on the existing ground surface, there is approximately 4.0m of fall between the east and west ends of the facility. The western portion of the facility will require approximately 2.0m of excavation below existing ground, while the eastern portion of the pond will require a berm approximately 2.0 m high.

This pond would have a tributary drainage area of approximately 95 ha and a total volume of approximately 63,000 m³. The total area of the pond block is 7.0 ha and includes provision for grading, access roads, and sediment storage.

Pros:

- Alignment minimizes the length of the inlet and outlet connections.
- Provides sanitary overflow outlet.
- Requires very little bedrock excavation.
- Facility adjacent to urban area.

Cons:

- Requires a large amount of excavation adjacent to CN Rail line.
- Requires large storm crossing at CN Rail Line (major & minor systems).

OPTION 1B

This option provides a single SWM facility located on the Metcalfe property east of the rail line, outside the urban boundary (**Figure EAST SWM1b**). The pond is oriented parallel to March Valley Road at the eastern limit of the property. Based on the existing ground surface, there is an approximate 1.0m grade difference between the east and west sides of the facility. The top of the pond will be above the existing ground and will require a perimeter berm between 1m high (west side) and 2m high (east side).

This pond would have a tributary drainage area of approximately 95 ha and a total volume of approximately 63,000 m³. The total area of the pond block is 7.0 ha and includes provision for grading, access roads, and sediment storage.

Pros:

- Location minimizes the amount of excavation required (single SWM facility).
- Provides sanitary overflow outlet.
- Does not require excavation into bedrock.

Cons:

- SWM facility not integrated into urban area.
- Requires large storm crossing at CNR Line to convey major & minor flows to pond.

M:\2012\112117\DATA\CORRESPONDENCE\MEMOS\2014\003 KNEUA SWMF OPTIONS (EAST).DOCX

OPTION 1C

This option provides a single SWM facility located inside the urban boundary on the Metcalfe property (**Figure EAST SWM1c**). The pond is oriented parallel the rail line. While the existing ground elevation is relatively flat over the area of the pond, the facility will require a significant amount of excavation (approx. 6m below existing ground / 3m into bedrock) to provide sufficient depth for the required sanitary overflow.

This pond would have a tributary drainage area of approximately 95 ha and a total volume of approximately 63,000 m³. The total area of the pond block is 8.0 ha and includes provision for grading, access roads, and sediment storage.

Pros:

- Smaller storm crossing at CNR Line (controlled flows from pond).
- Provides sanitary overflow outlet.
- Pond can be integrated as a natural feature within the residential development.

Cons:

- Requires a very large amount of earth and rock excavation.
- Requires pond liner (pond bottom on bedrock).
- Requires a large land area that could otherwise be used for residential development.
- Very high construction cost.

OPTION 2

This option provides two SWM facilities outside the urban boundary. One pond is located on the Metcalfe property adjacent to March Valley Road. The second pond is located on the Valecraft property within a clearing in the existing woodlot (**Figure EAST SWM2**).

Metcalfe Pond

This pond would be the receiver for the sanitary sewer overflow. Based on the existing ground surface, there is an approximate 1.0m grade difference between the east and west sides of the facility. The top of the pond will be above the existing ground and will require a perimeter berm between 1m high (west side) and 2m high (east side).

The Metcalfe pond would have a tributary drainage area of approximately 53 ha and a total volume of approximately 33,900 m³. The total area of the pond block is 4.5 ha and includes provision for grading, access roads, and sediment storage.

Valecraft Pond

This pond is located on the Valecraft property in the open space between the north property line and the existing woodlot. The western portion of the pond would be designed as a forebay / inlet channel, with the main storage area located in the clearing between the woodlots. Based on the existing ground surface, there is a grade difference of approximately 2.5m between the east and west sides of the clearing where the main cell would be located. The eastern portion of the pond will require a berm approximately 2.5m high.



The Valecraft pond would have a tributary drainage area of approximately 42 ha and a total volume of approximately 26,500 m³. The total area of the pond block is 3.0 ha and includes provision for grading, access roads, and sediment storage.

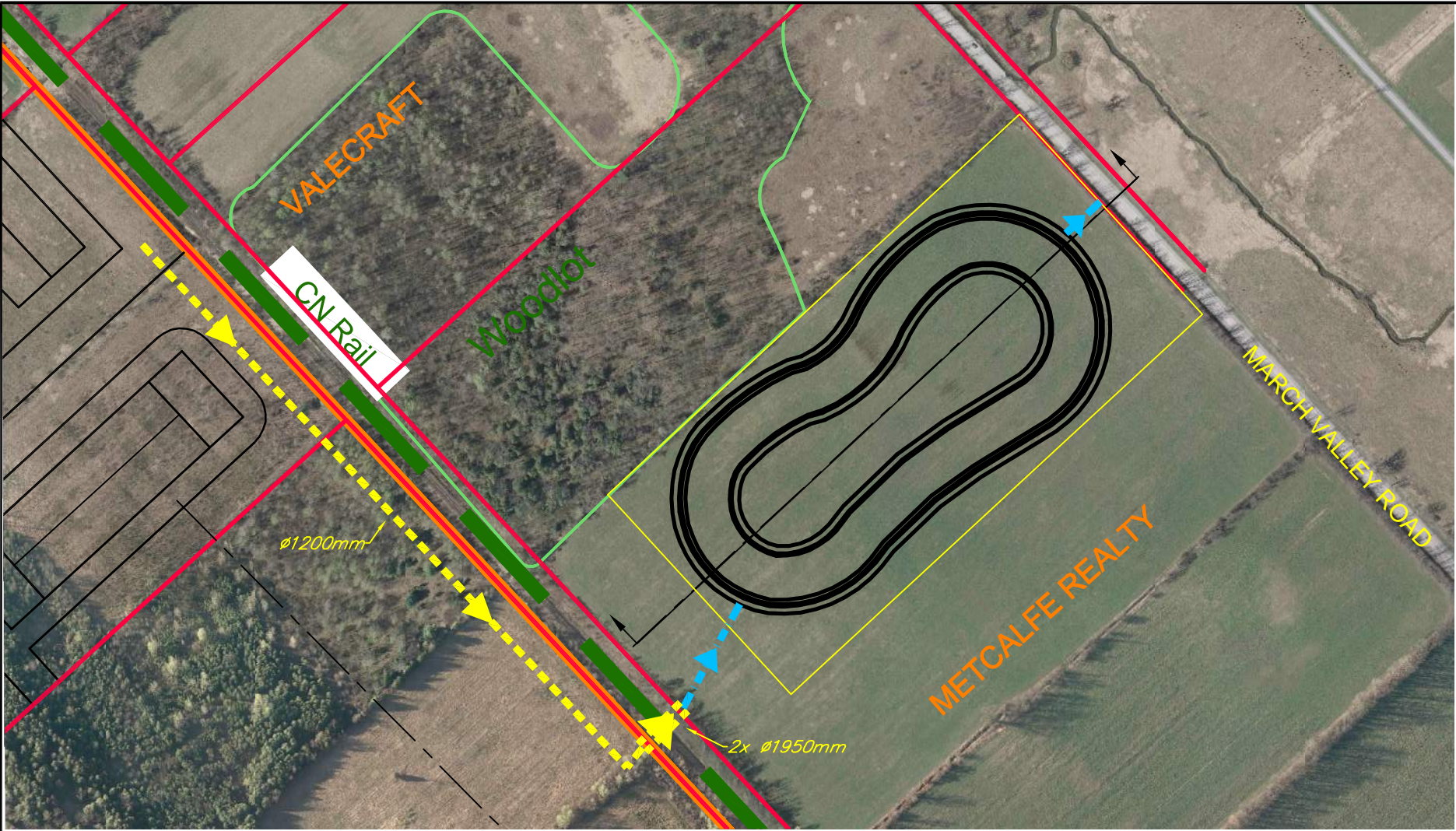
Pros:

- Provides independent SWM Facilities for the Metcalfe and Valecraft properties.
- Provides sanitary overflow outlet (Metcalfe Pond)
- Does not require excavation into bedrock.
- Lowest overall cost (combined).

Cons:

- SWM facilities not integrated into urban area.
- Requires large storm crossings at CNR Line to convey major & minor flows to ponds.

M:\2012\112117\CAD\Design\SWM\Cost Estimate Drawings\112117-SWM-cost est - east ponds.dwg, POND 1a, Oct 03, 2014 - 1:10pm, kbanks



LEGEND

Proposed Development Area

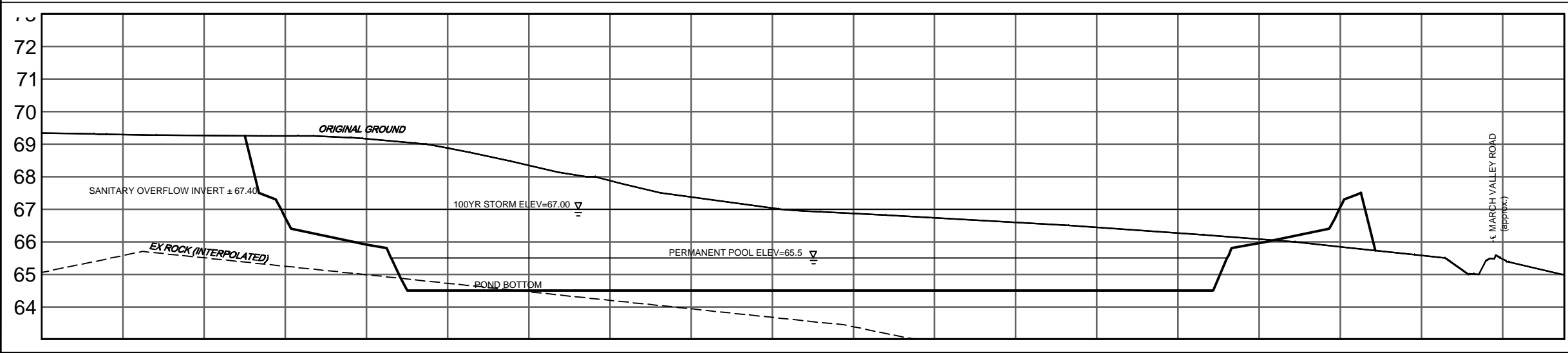
Existing Property Lines

Woodlot Boundary

Pond Block Boundary

Storm Trunk

Ditching



SECTION
SCALE 1:1500

NOVATECH

Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION
AREA STUDY

Stormwater Facility Option #1a

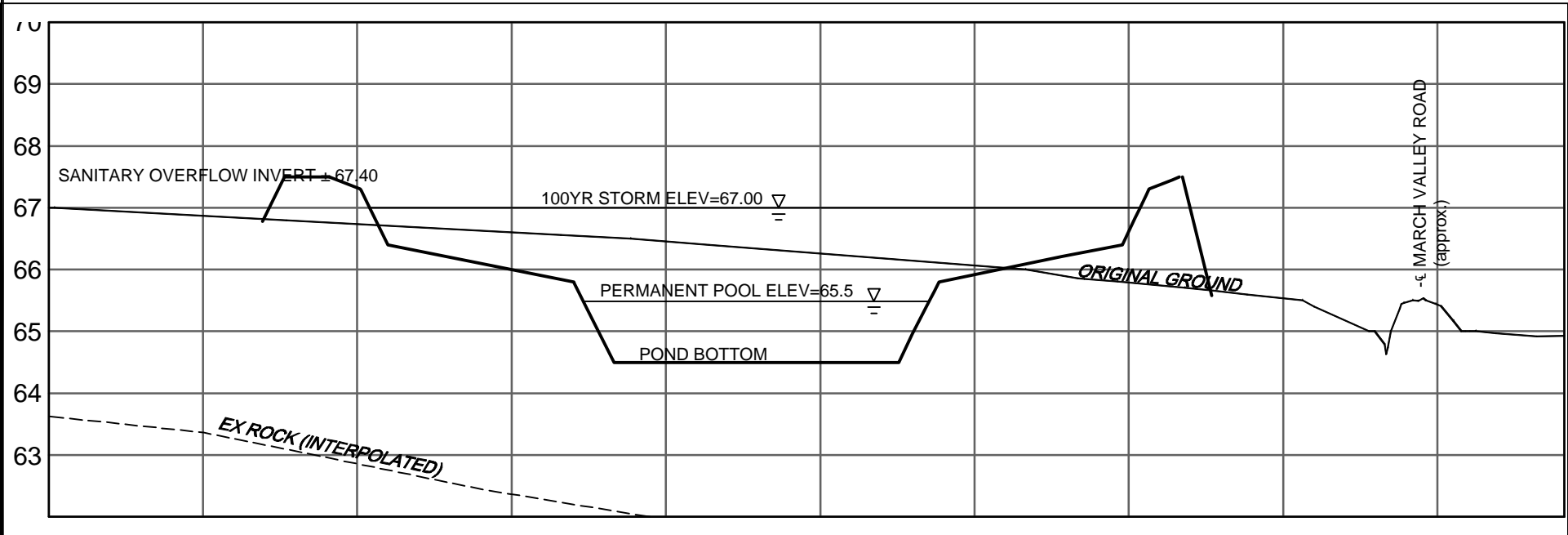
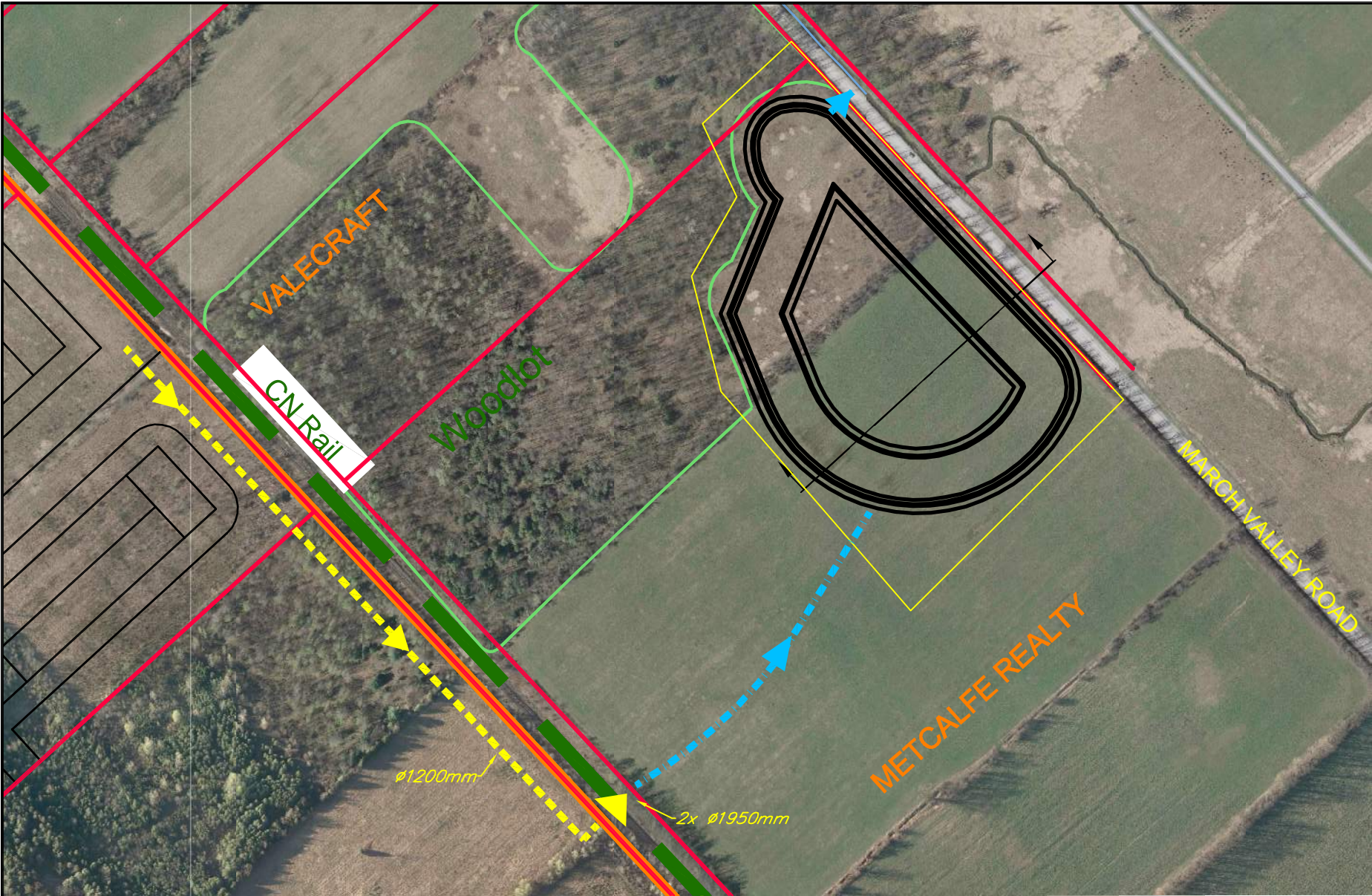
SCALE 1:4000

DATE OCT 2014

JOB 112117

FIGURE EAST SWM1a

M:\2012\112117\CAD\Design\SWM\Cost Estimate Drawings\112117-SWM-cost est - east ponds 1b NEW SHAPE.dwg, POND 1b NEW SHAPE, Oct 02, 2014 - 3:54pm, kblanks



SECTION
SCALE 1:1000

LEGEND

- Proposed Development Area
- Existing Property Lines
- Woodlot Boundary
- Pond Block Boundary
- Storm Trunk
- Ditching



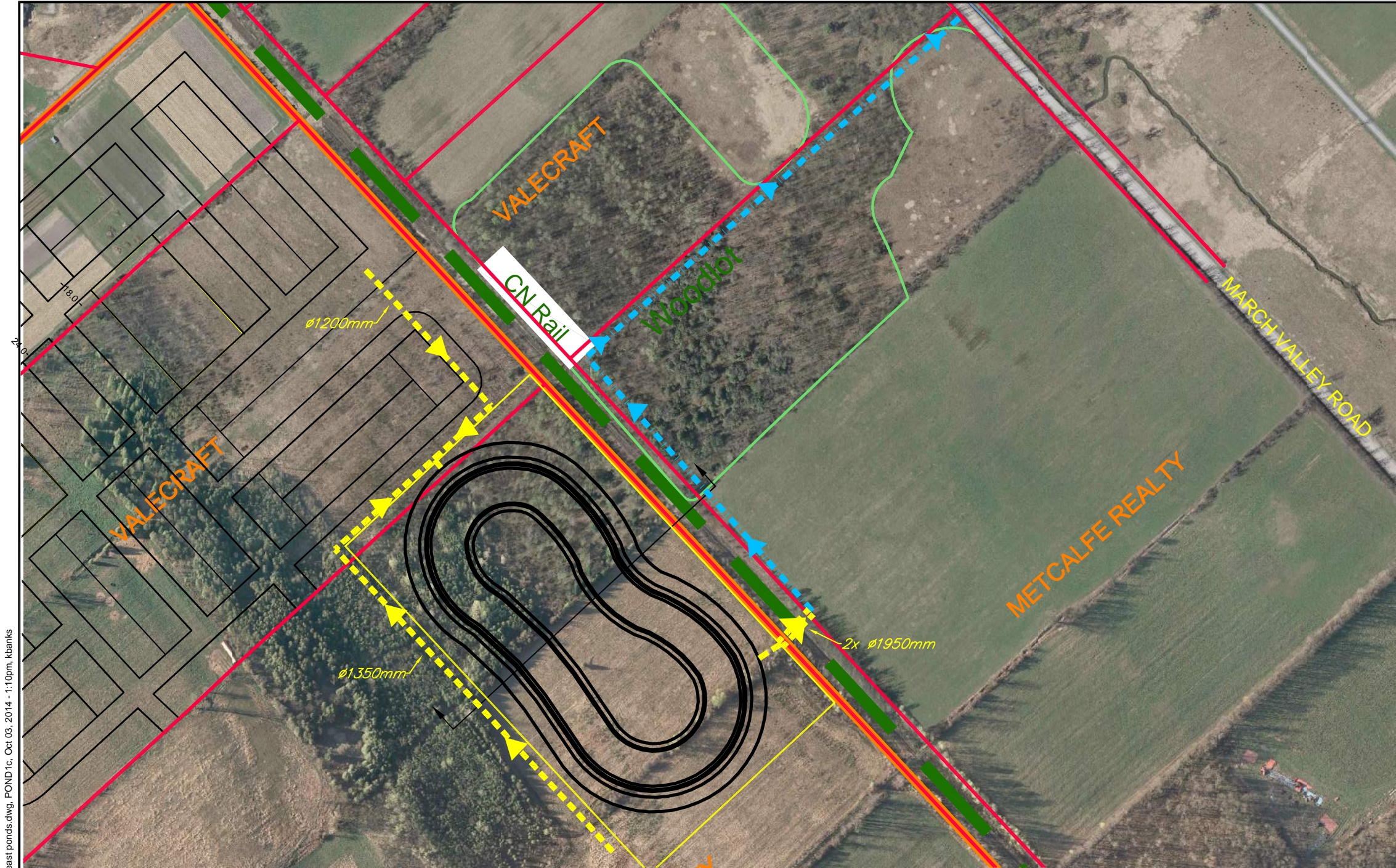
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6

Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION
AREA STUDY

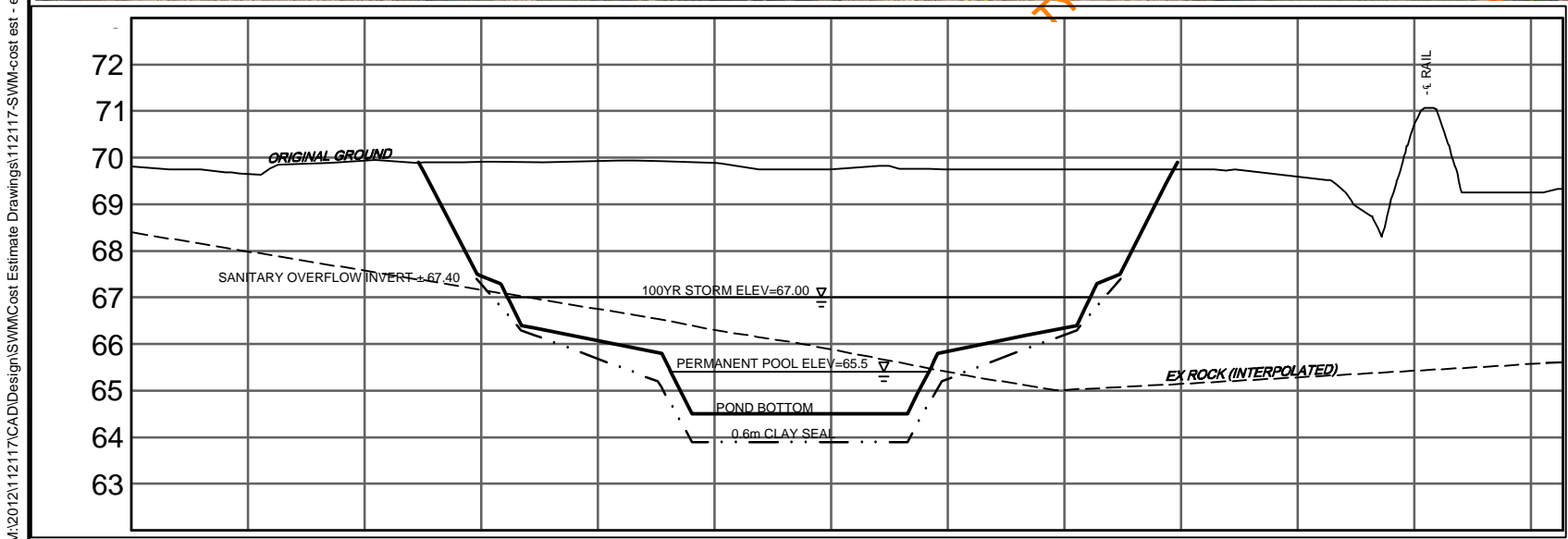
East Stormwater Facility Option #1b

SCALE		1:4000	
DATE	JOB	FIGURE	
OCT 2014	112117	EAST SWM1b	



LEGEND

- Proposed Development Area
- Existing Property Lines
- Woodlot Boundary
- Pond Block Boundary
- Storm Trunk
- Ditching



SECTION
SCALE 1:1500

Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

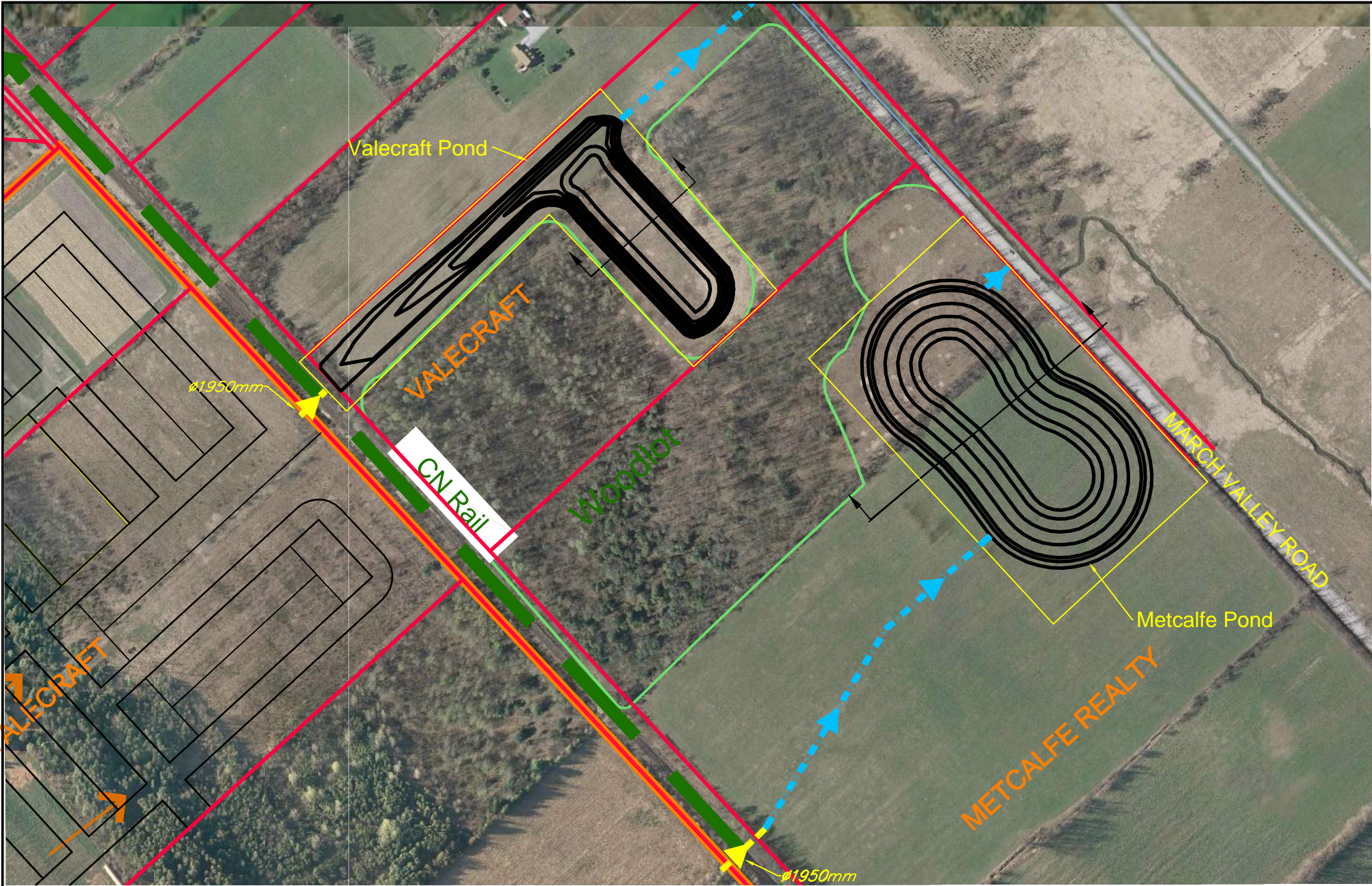
CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION
AREA STUDY

East Stormwater Facility Option #1c

SCALE	1:4000	
DATE	OCT 2014	JOB 112117
FIGURE	EAST SWM1c	

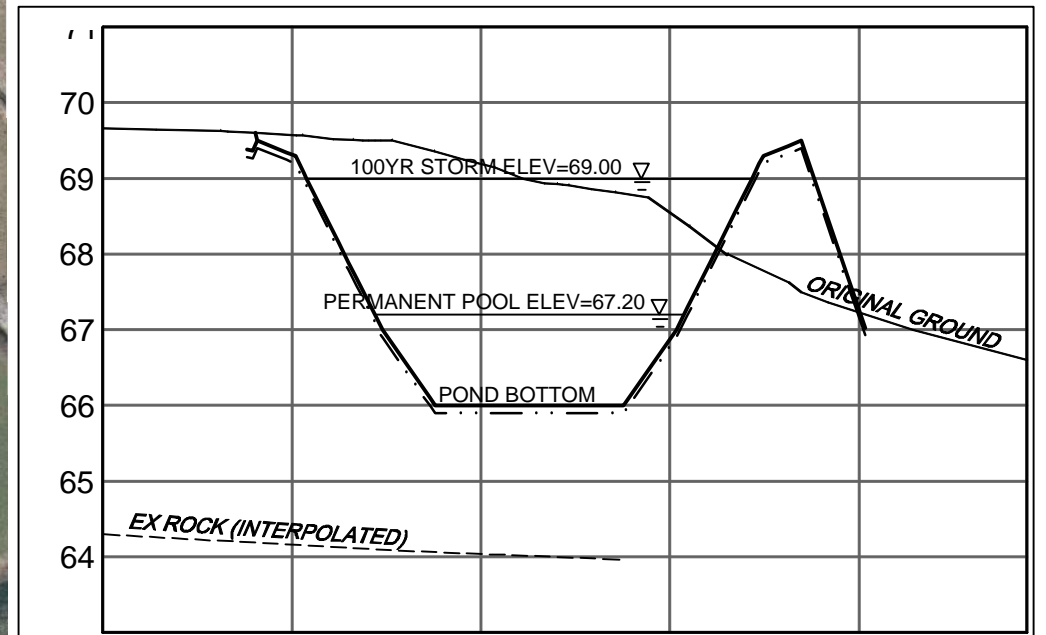
M:\2012\112117\CAD\Design\SWM\Cost Estimate Drawings\112117-SWM-cost est - east ponds.dwg, POND1c, Oct 03, 2014 - 1:10pm, kblanks

M:\2012\112117\CAD\Design\SWM\Cost Estimate Drawings\112117-SWM-cost est - east 2 ponds.dwg, Two Ponds, Oct 02, 2014 - 3:50pm, kbanks



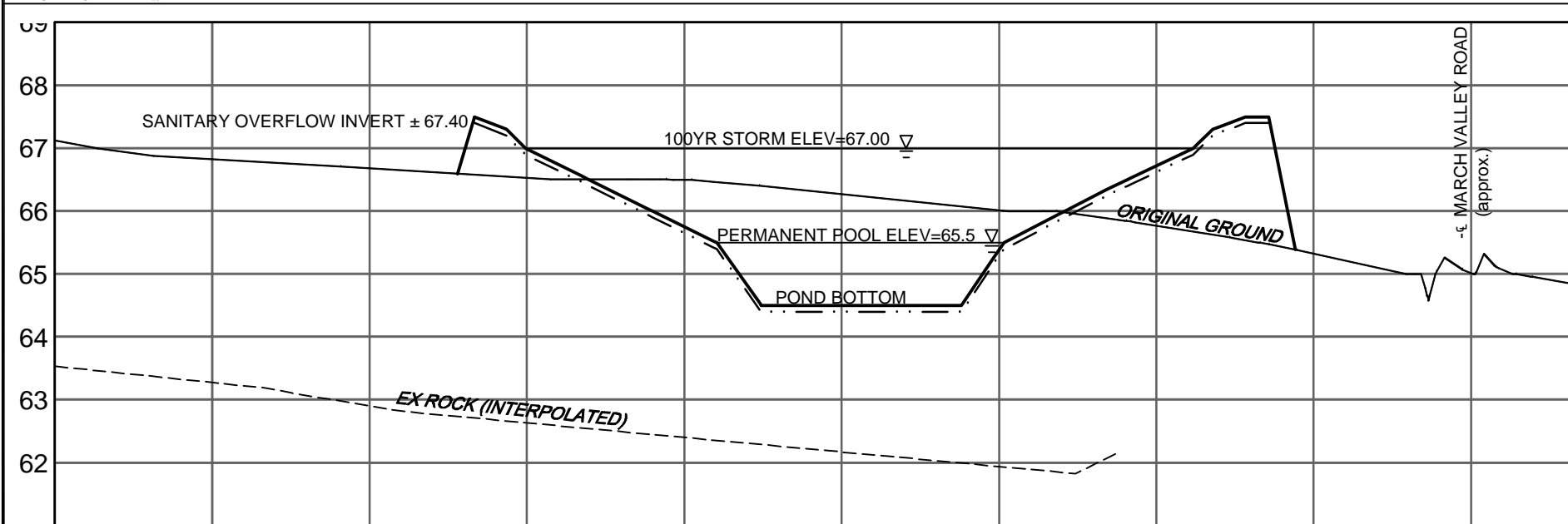
LEGEND

- Proposed Development Area
- Existing Property Lines
- Woodlot Boundary
- Pond Block Boundary
- Storm Trunk
- Ditching



VALECRAFT POND SECTION

SCALE 1:1000



METCALFE POND SECTION

SCALE 1:1000

NOVATECH

Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6

Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION
AREA STUDY

East Stormwater Facility Option #2

SCALE 1:4000

DATE OCT 2014 JOB 112117

FIGURE EAST SWM2

SHT11X17.DWG - 279mmX432mm

Kanata North
Preliminary Stormwater Facility Cost
Metcalf & Valecraft SWMF - Option 1a

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION A - STORMWATER FACILITY (63,000m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	82,500	m³	\$10.00	\$825,000.00
	ii) Rock Excavation	500	m³	\$40.00	\$20,000.00
	iii) Clay Liner (0.6m Thick)	4,600	m²	\$9.00	\$41,400.00
2	Storm Trunk Pipe - 1200mm Valecraft	500	m	\$1,500.00	\$750,000.00
3	Rail Line Crossing - twin 1950mm	40	m	\$5,000.00	\$200,000.00
4	Inlet - Ditching	80	m	\$200.00	\$16,000.00
5	Inlet - Concrete Headwall	1	ea.	\$150,000.00	\$150,000.00
6	Outlet - Structure (Including Pipe)	1	ea.	\$175,000.00	\$175,000.00
7	Outlet - Ditching	30	m	\$100.00	\$3,000.00
8	Rock Check Dam	2	ea.	\$3,000.00	\$6,000.00
9	Hydro Seeding	47,800	m²	\$4.00	\$191,200.00
10	Landscaping Allowance	1	LS	\$188,000.00	\$188,000.00
11	Access Road (3m wide-asphalt)	860	m	\$205.00	\$176,300.00
TOTAL SECTION A - STORMWATER FACILITY					\$2,741,900.00

		Construction Total	\$2,741,900.00
		25% Soft Costs and Contingency	\$685,475.00
	Net Rural Land (ac)	17.3	
		Total	\$3,427,375.00

Note: DC recoverable Items are highlighted in blue

Kanata North
Preliminary Stormwater Facility Cost
Metcalfe & Valecraft SWMF - Option 1b

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION A - STORMWATER FACILITY (63,000m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	39,700	m³	\$10.00	\$397,000.00
	ii) Rock Excavation	0	m³	\$40.00	\$0.00
	iii) Clay Liner (0.6m Thick)	0	m²	\$9.00	\$0.00
2	Storm Trunk Pipe - 1200mm Valecraft	500	m	\$1,500.00	\$750,000.00
3	Rail Line Crossing - twin 1950mm	40	m	\$5,000.00	\$200,000.00
4	Inlet - Ditching	270	m	\$200.00	\$54,000.00
5	Inlet - Concrete Headwall	1	ea.	\$150,000.00	\$150,000.00
6	Outlet - Structure (Including Pipe)	1	ea.	\$175,000.00	\$175,000.00
7	Outlet - Ditching	40	m	\$100.00	\$4,000.00
8	Rock Check Dam	2	ea.	\$3,000.00	\$6,000.00
9	Hydro Seeding	47,800	m²	\$4.00	\$191,200.00
10	Landscaping Allowance	1	LS	\$188,000.00	\$188,000.00
11	Access Road (3m wide-asphalt)	860	m	\$205.00	\$176,300.00
TOTAL SECTION A - STORMWATER FACILITY					\$2,291,500.00

		Construction Total	\$2,291,500.00
		25% Soft Costs and Contingency	\$572,875.00
	Net Rural Land (ac)	17.0	
		Total	\$2,864,375.00

Note: DC recoverable Items are highlighted in blue

Kanata North
Preliminary Stormwater Facility Cost
Metcalf & Valecraft SWMF - Option 1c

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION A - STORMWATER FACILITY (63,000m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	172,600	m³	\$10.00	\$1,726,000.00
	ii) Rock Excavation	54,500	m³	\$40.00	\$2,180,000.00
	iii) Clay Liner (0.6m Thick)	21,000	m²	\$9.00	\$189,000.00
2	Clearing and Grubbing	4	ha	\$10,000.00	\$40,000.00
3	Storm Trunk Pipe - 1350mm Metcalfe	480	m	\$1,600.00	\$768,000.00
4	Storm Trunk Pipe - 1200mm Valecraft	230	m	\$1,500.00	\$345,000.00
5	Rail Line Crossing - twin 1950mm	40	m	\$5,000.00	\$200,000.00
6	Inlet - Concrete Headwall	1	ea.	\$150,000.00	\$150,000.00
7	Outlet - Structure (Including Pipe)	1	ea.	\$175,000.00	\$175,000.00
8	Outlet - Ditching	730	m	\$100.00	\$73,000.00
9	Rock Check Dam	2	ea.	\$3,000.00	\$6,000.00
10	Hydro Seeding	47,800	m²	\$4.00	\$191,200.00
11	Landscaping Allowance	1	LS	\$188,000.00	\$188,000.00
12	Access Road (3m wide-asphalt)	860	m	\$205.00	\$176,300.00
TOTAL SECTION A - STORMWATER FACILITY					\$6,407,500.00

		Construction Total	\$6,407,500.00
		25% Soft Costs and Contingency	\$1,601,875.00
	Net Urban Land (ac)	19.5	
		Total	\$8,009,375.00

Note: DC recoverable Items are highlighted in blue

Kanata North
Preliminary Stormwater Facility Cost
Metcalfe & Valecraft SWMF - Option 2

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION A - METCALFE STORMWATER FACILITY (33,900m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	32,100	m³	\$10.00	\$321,000.00
	ii) Rock Excavation	0	m³	\$40.00	\$0.00
	iii) Clay Liner (0.6m Thick)	0	m²	\$9.00	\$0.00
2	Storm Trunk Pipe - 1350mm	0	m	\$1,600.00	\$0.00
3	Inlet - Ditching	290	m	\$200.00	\$58,000.00
4	Inlet - Concrete Headwall	1	ea.	\$84,000.00	\$84,000.00
5	Outlet - Structure (Including Pipe)	1	ea.	\$98,000.00	\$98,000.00
6	Outlet - Ditching	25	m	\$100.00	\$2,500.00
7	Rail Line Crossing - 1950mm	40	m	\$2,500.00	\$100,000.00
8	Rock Check Dam	2	ea.	\$3,000.00	\$6,000.00
9	Hydro Seeding	3,100	m²	\$4.00	\$12,400.00
10	Landscaping Allowance	1	LS	\$105,000.00	\$105,000.00
11	Access Road (3m wide-asphalt)	670	m	\$205.00	\$137,350.00
TOTAL SECTION A - STORMWATER FACILITY					\$924,250.00

Construction Total		\$924,250.00
25% Soft Costs and Contingency		\$231,062.50
Net Rural Land (ac) at	10.9	
Subtotal (Metcalfe)		\$1,155,312.50

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION B - VALECRAFT STORMWATER FACILITY (26,500m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	30,000	m³	\$10.00	\$300,000.00
	ii) Rock Excavation	0	m³	\$40.00	\$0.00
	iii) Clay Liner (0.6m Thick)	0	m²	\$9.00	\$0.00
2	Storm Trunk Pipe - 1200mm	0	m	\$1,500.00	\$0.00
3	Inlet - Ditching	0	m	\$200.00	\$0.00
4	Inlet - Concrete Headwall	1	ea.	\$60,000.00	\$60,000.00
5	Outlet - Structure (Including Pipe)	1	ea.	\$70,000.00	\$70,000.00
6	Outlet - Ditching	150	m	\$100.00	\$15,000.00
7	Rail Line Crossing - 1950mm	40	m	\$2,500.00	\$100,000.00
8	Rock Check Dam	2	ea.	\$3,000.00	\$6,000.00
9	Hydro Seeding	9,600	m²	\$4.00	\$38,400.00
10	Landscaping Allowance	1	LS	\$75,000.00	\$75,000.00
11	Access Road (3m wide-asphalt)	620	m	\$205.00	\$127,100.00
TOTAL SECTION A - STORMWATER FACILITY					\$791,500.00

Construction Total		\$791,500.00
25% Soft Costs and Contingency		\$197,875.00
Net Rural Land (ac) at	7.2	
Subtotal (Metcalfe)		\$989,375.00

Total		\$2,144,687.50
--------------	--	-----------------------

Note: DC recoverable Items are highlighted in blue

MEMORANDUM

DATE: OCTOBER 23, 2014
TO: KNUEA TAC
FROM: M.PETEPiece
RE: ADDITIONAL SWM FACILITY OPTIONS – EAST (OPTIONS 3 AND 4)
CC: FILE

1.0 INTRODUCTION

This memo has been prepared in response to comments provided by the City on the previously circulated SWM facility options memorandum (October 3, 2014) for the KNUEA lands on the east side of March Road. This memo presented four alternative SWM facility locations (Options 1A, 1B, 1C and 2).

The SWM Facility options outlined in the October 3 memorandum were presented and discussed at the Kanata North EMP TAC meeting on October 10, 2014. Based on feedback provided by the City at this meeting TAC meeting, two new options have been developed (Options 3 and 4).

2.0 DESIGN CONSIDERATIONS

The additional pond options take the following factors into account:

Urban Boundary

The City has indicated that ponds located outside the urban area should be situated adjacent to the urban boundary, and should have a pathway system to provide connectivity with the community.

Woodlot S20

The previously circulated SWM facility options were located either partially within or adjacent to Woodlot S20. The two new options presented in this memo (Options 3 and 4) have the ponds located outside of Woodlot S20.

SWMF Outlet

The proposed ponds will outlet to Shirley's Brook at March Valley Road. Several alternatives for routing the outflows from the ponds to Shirley's Brook have been developed and are presented in a separate memo. The outlet alternatives are independent and compatible with all of the pond alternatives.

Sanitary Overflow

The City has indicated that the proposed sanitary trunk sewer must provide a gravity overflow to a SWM facility:

- The 100-year elevation in the SWM facility must be below the sanitary overflow elevation.
- The sanitary overflow elevation is set by the overflow at the Pumping Station.

Based on these criteria, the invert elevation for the sanitary overflow has been set at 67.40m. Consequently, the 100-year water level in the SWM facility with the sanitary overflow must be below this elevation.

Storm Sewers

The storm sewers will be sized to convey the 5-year post-development peak flow from the upstream drainage area. The crossings of the CN Rail line will need to convey both minor and major system flows and have been sized for the 100-year peak flow. Outside of the urban area (east of the rail line), storm runoff will be conveyed in open channels.

For all pond options, the size and length of the storm infrastructure (sewers, culverts, open channels) required to route the flows from the limit of the development to the inlet of the pond have been accounted for in the cost estimates.

Quantity Control

The VISUAL OTTHYMO hydrologic model was used to generate pre and post-development hydrographs and evaluate storage requirements. The proposed SWM facilities have been designed to control post-development peak flows to pre-development levels for all storms up to and including the 100-year event:

- Pre-development conditions were modeled using the hydrologic parameters from the Shirley's Brook Existing Conditions Model developed by AECOMM.
- Post-development conditions were modeled using hydrologic parameters consistent with the current concept plan and conforming to the Ottawa Sewer Design Guidelines.

Quality Control

An *Enhanced* level of water quality treatment is required for all development within the Shirley's Brook subwatershed. The proposed SWM facilities have been designed to provide the recommended water quality volume (permanent pool / extended detention) listed in the MOE SWM Planning and Design Manual.

Grading

For conceptual design purposes, the proposed SWM facilities have been sized assuming 5:1 side slopes for both permanent pool and active storage.

3.0 SWM FACILITY OPTIONS (EAST)

Drawing **112117-TPSWMF** shows the location of all the SWM facility options (east and west) for the KNUEA development, along with test pit data as provided by Paterson Group. The bedrock surface profiles shown on the plan and profile drawings for each option have been interpolated from the geotechnical data.

OPTION 3

This option provides a single SWM facility located outside the urban boundary on the Metcalfe property east of the rail line (**Figure EAST SWM3**). The western end of the pond is adjacent to the CN rail line, and the pond block has been set back 30m from the southern boundary of woodlot S20. There is approximately 3.5m of fall between the east and west ends of the facility.

The required excavation depth has been established based on providing a sanitary overflow above the 100-year elevation in the pond. The western portion of the facility will require approximately 2.0m of excavation below existing ground, while the eastern portion of the pond will require a berm approximately 1.5 m high. The berm would be constructed from the excavated material.

This pond would have a tributary drainage area of approximately 95 ha and a total volume of approximately 63,000 m³. The total area of the pond block is 7.0 ha and includes provision for grading, access roads, sediment management, and pathway connections to the proposed development.

Pros:

- Alignment minimizes the length of the inlet and outlet connections.
- Provides sanitary overflow outlet.
- Requires little bedrock excavation.
- Adjacent to urban area.

Cons:

- Requires a large amount of excavation adjacent to CN Rail line.
- Requires large storm crossing of CN Rail line to route major & minor drainage to pond.

OPTION 4

This option provides a single SWM facility located inside the urban boundary on the Metcalfe property (**Figure EAST SWM4**). The pond is oriented parallel the rail line in the southeast corner of the KNUEA development area. The existing ground elevation is relatively flat over the area of the proposed pond block (approximately 69.5m).

Option 4 will require a significant amount of excavation (approx. 6m below existing ground) to provide a sanitary overflow above the 100-year elevation in the pond.

This pond would have a tributary drainage area of approximately 95 ha and a total volume of approximately 63,000 m³. The total area of the pond block is 8.0 ha and includes provision for grading, access roads, and sediment storage.

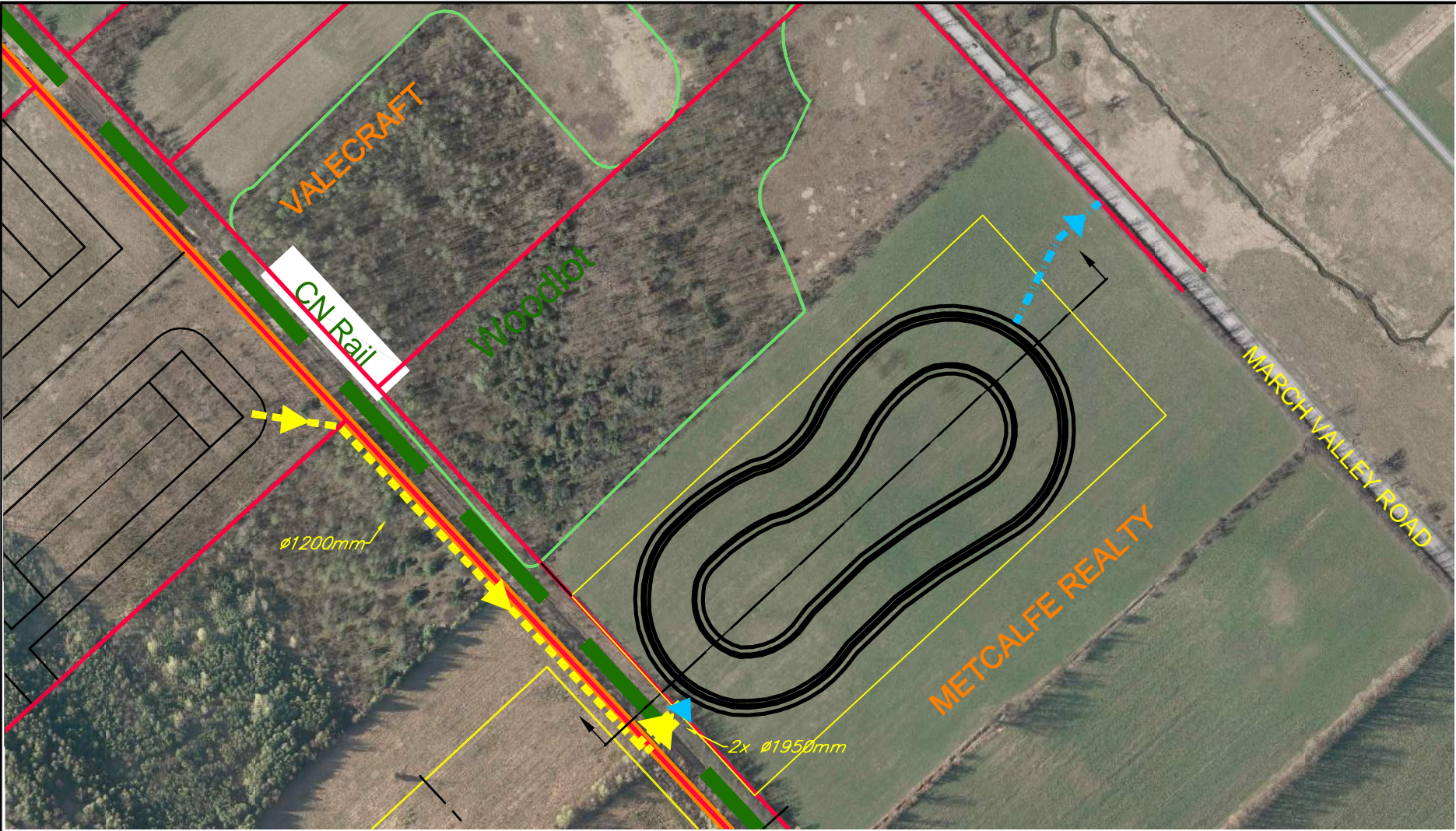
Pros:

- Requires smaller storm crossing of CN Rail line (controlled outflows from pond).
- Provides sanitary overflow outlet.
- Pond can be integrated as a natural feature within the residential development.

Cons:

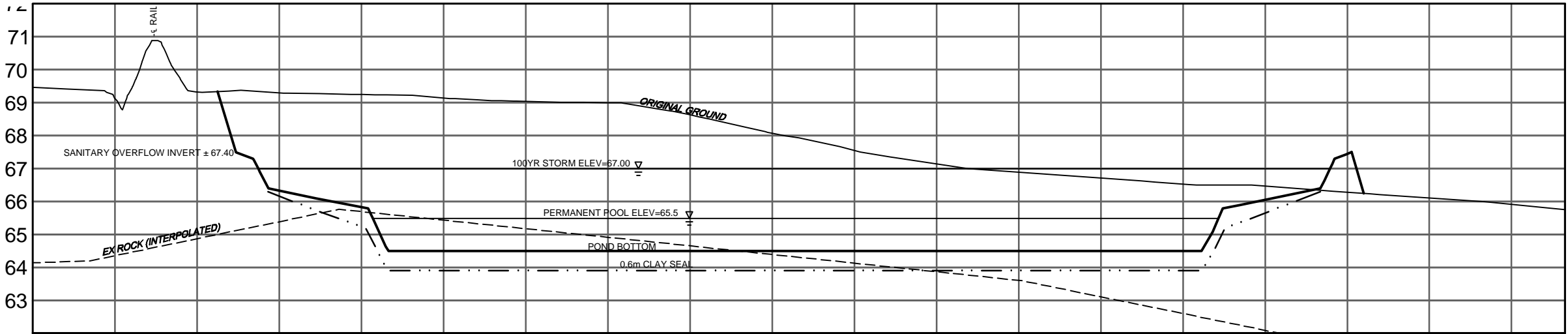
- Requires a very large amount of earth and rock excavation.
- Requires pond liner (pond bottom on bedrock).
- Requires a large land area that could otherwise be used for residential development.
- Very high construction cost.

M:\2012\112117\CAD\Design\SWM\Cost Estimate Drawings\112117-SWM-cost est - east ponds-2.dwg, POND 3, Oct 22, 2014 - 4:25pm, kbanks



LEGEND

- Proposed Development Area
- Existing Property Lines
- Woodlot Boundary
- Pond Block Boundary
- Storm Trunk
- Ditching



SECTION
SCALE 1:1500

NOVATECH

Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6

Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION
AREA STUDY

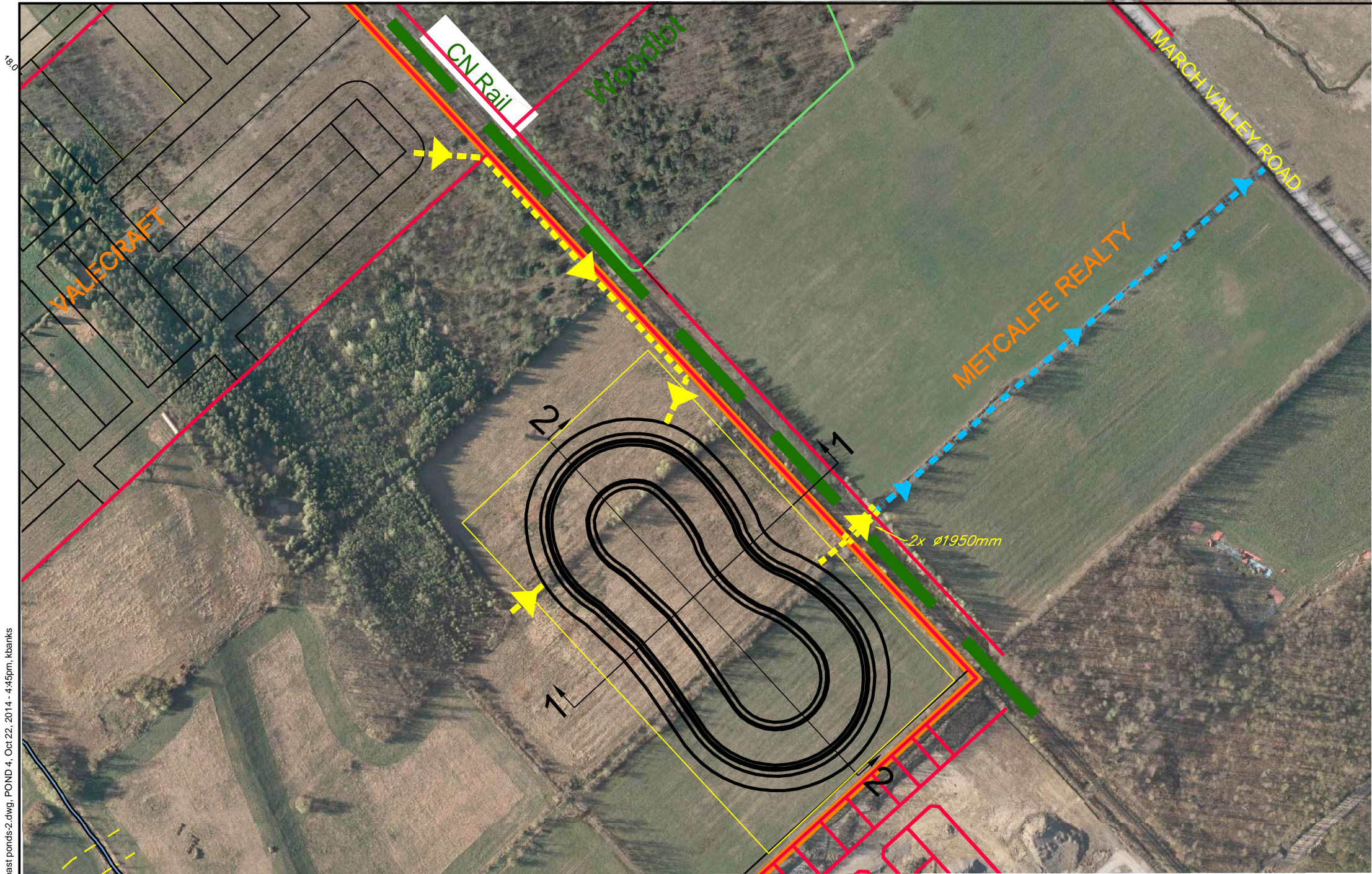
Stormwater Facility Option #3

SCALE 1:4000

DATE OCT 2014

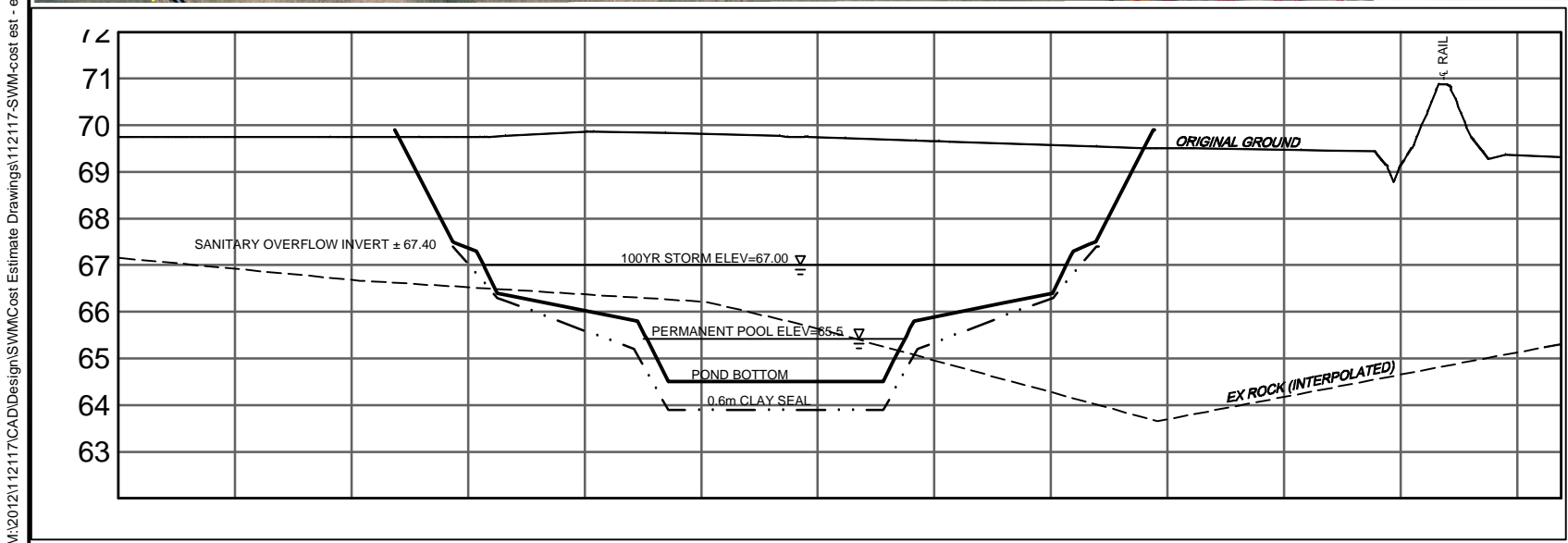
JOB 112117

FIGURE EAST SWM3



LEGEND

- Proposed Development Area
- Existing Property Lines
- Woodlot Boundary
- Pond Block Boundary
- Storm Trunk
- Ditching



SECTION 1-1
SCALE 1:1500

Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION
AREA STUDY

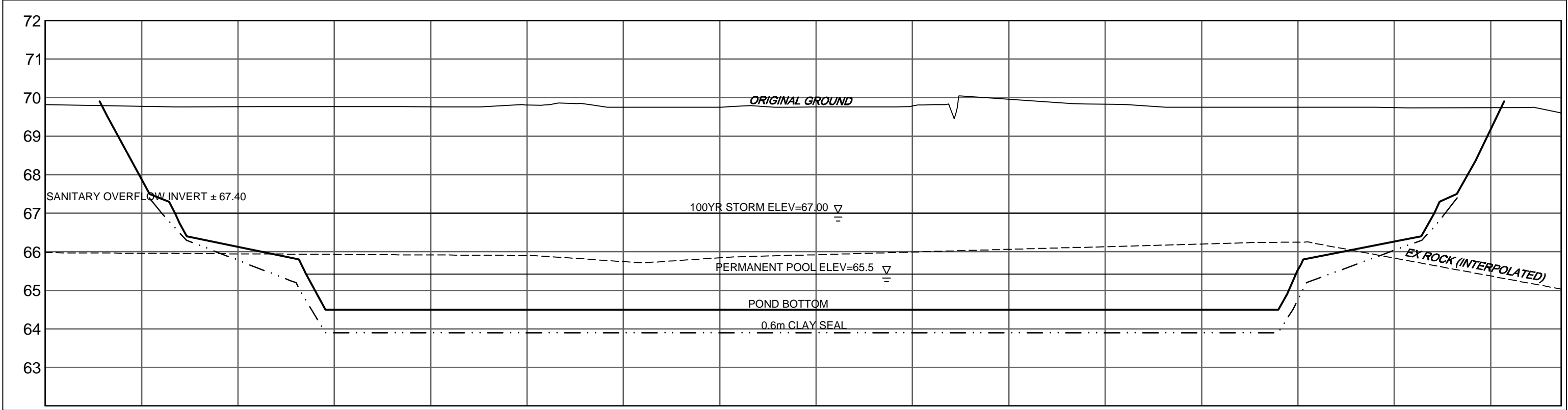
East Stormwater Facility Option #4

SCALE 1:4000

DATE OCT 2014	JOB 112117	FIGURE EAST SWM4
---------------	------------	------------------

M:\2012\11 12117\CAD\Design\SWM\Cost Estimate Drawings\112117-SWM-cost est - east ponds-2.dwg, POND 4, Oct 22, 2014 - 4:45pm, kbanks

M:\2012\112117\CAD\Design\SWM\Cost Estimate Drawings\112117-SWM-cost est - east ponds-2.dwg, POND 4 (2), Oct 22, 2014 - 4:22pm, kbanks



SECTION 2-2
SCALE 1:1000



Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6

Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

CITY OF OTTAWA
KANATA NORTH URBAN EXPANSION
AREA STUDY

East Stormwater Facility Option #4
SECTION 2-2

SCALE 1:1000		FIGURE EAST SWM4 S2-2
DATE OCT 2014	JOB 112117	

Kanata North
Preliminary Stormwater Facility Cost
Metcalfe & Valecraft SWMF - Option 3

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION A - STORMWATER FACILITY (63,000m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	113,000	m³	\$10.00	\$1,130,000.00
	ii) Rock Excavation	9050	m³	\$40.00	\$362,000.00
	iii) Clay Liner (0.6m Thick)	18,600	m²	\$9.00	\$167,400.00
2	Storm Trunk Pipe - 1200mm Valecraft	360	m	\$1,500.00	\$540,000.00
3	Rail Line Crossing - twin 1950mm	40	m	\$5,000.00	\$200,000.00
4	Inlet - Ditching	15	m	\$200.00	\$3,000.00
5	Inlet - Concrete Headwall	1	ea.	\$150,000.00	\$150,000.00
6	Outlet - Structure (Including Pipe)	1	ea.	\$175,000.00	\$175,000.00
7	Outlet - Ditching	100	m	\$100.00	\$10,000.00
8	Rock Check Dam	2	ea.	\$3,000.00	\$6,000.00
9	Hydro Seeding	47,800	m²	\$4.00	\$191,200.00
10	Landscaping Allowance	1	LS	\$188,000.00	\$188,000.00
11	Access Road (3m wide-asphalt)	860	m	\$205.00	\$176,300.00
TOTAL SECTION A - STORMWATER FACILITY					\$3,298,900.00

		Construction Total	\$3,298,900.00
		25% Soft Costs and Contingency	\$824,725.00
	Net Rural Land (ac)	17.3	
		Total	\$4,123,625.00

Kanata North
Preliminary Stormwater Facility Cost
Metcalfe & Valecraft SWMF - Option 4

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
SECTION A - STORMWATER FACILITY (63,000m³)					
1	Earthworks				
	i) Earth Excavation (incl Topsoil Stripping)	183,000	m³	\$10.00	\$1,830,000.00
	ii) Rock Excavation	40,500	m³	\$40.00	\$1,620,000.00
	iii) Clay Liner (0.6m Thick)	21,000	m²	\$9.00	\$189,000.00
2	Clearing and Grubbing	4	ha	\$10,000.00	\$40,000.00
3	Storm Trunk Pipe - 1350mm Metcalfe	40	m	\$1,600.00	\$64,000.00
4	Storm Trunk Pipe - 1200mm Valecraft	360	m	\$1,500.00	\$540,000.00
5	Rail Line Crossing - twin 1950mm	40	m	\$5,000.00	\$200,000.00
6	Inlet - Concrete Headwall	1	ea.	\$150,000.00	\$150,000.00
7	Outlet - Structure (Including Pipe)	1	ea.	\$175,000.00	\$175,000.00
8	Outlet - Ditching	440	m	\$100.00	\$44,000.00
9	Rock Check Dam	2	ea.	\$3,000.00	\$6,000.00
10	Hydro Seeding	47,800	m²	\$4.00	\$191,200.00
11	Landscaping Allowance	1	LS	\$188,000.00	\$188,000.00
12	Access Road (3m wide-asphalt)	860	m	\$205.00	\$176,300.00
TOTAL SECTION A - STORMWATER FACILITY					\$5,413,500.00

		Construction Total	\$5,413,500.00
		25% Soft Costs and Contingency	\$1,353,375.00
	Net Urban Land (ac)	19.5	
		Total	\$6,766,875.00

MEMORANDUM

DATE: NOVEMBER 11, 2014
TO: KNUEA TAC
FROM: M.PETEPiece / K.AULD
RE: KANATA NORTH SWM FACILITY OPTIONS – EAST OF MARCH ROAD
FILE NO.: 112117
CC: FILE

1.0 INTRODUCTION

This memorandum provides a consolidated summary and evaluation of the previously circulated SWM facility location alternatives for the KNUEA lands on the east side of March Road. This document combines the SWMF options presented in the two previously circulated memos:

- 1) Novatech Memo - KNUEA SWM Facility Options (East) (October 3, 2014)
- 2) Novatech Memo – Additional SWM Facility Options (East) (October 23, 2014)

2.0 DESIGN CONSIDERATIONS

The SWM facility alternatives for the KNUEA lands east of March Road have been developed and evaluated based on the following design factors:

Connectivity

The City has indicated that SWM facilities should be integrated into the community. Ponds located outside the urban area should provide connectivity to the community through the use of pathways or other linkages.

Storm Drainage

The size and length of the storm infrastructure (sewers, culverts, open channels) required to convey storm runoff to the ponds have been accounted for in the cost estimates:

- Storm drainage within the urban area will be provided using storm sewers sized to convey the uncontrolled 5-year post-development peak flow.
- Storm drainage outside the urban area (east of the rail line) will be conveyed in open channels.
- Storm crossings of the CN Rail are to have sufficient capacity to convey the 100-year peak flow, and may consist of either combined or separate major and minor system crossings.

SWM Facility Outlet

The proposed ponds will outlet to Shirley's Brook at March Valley Road. Several alternatives for routing the outflows from the ponds to Shirley's Brook have been developed and are presented in a separate memo:

- The outlets to Shirley's Brook should be designed to minimize adverse impacts (primarily erosion).
- Outlets placed further north along March Valley Road will reduce the extent of improvements required to mitigate erosion in Shirley's Brook where the watercourse is immediately adjacent to the road.

Storm / Sanitary Trunk Sewers

The location and elevation of the storm and sanitary trunk sewers have been reviewed for each proposed SWMF alternative to determine any potential conflicts with pipe crossings. In some instances, the operating levels of the proposed SWM facilities have been adjusted (from the previous submissions) to accommodate the required crossings.

Sanitary Overflow

A sanitary overflow will be required on the proposed trunk sewer servicing the KNUEA lands east of March Road to ensure the HGL elevation is below the underside of footings of the proposed residential units. The City has indicated that, where possible, sanitary overflows are to be routed to SWM facilities. City design standards for overflows are currently in development. The following sanitary overflow criteria have been applied to the KNUEA lands:

- Sanitary overflows are to operate by gravity and be directed to a SWM facility.
- The sanitary overflow must be above the 100-year elevation in the SWM facility.
- The HGL elevation in the sanitary trunk is based on the overflow elevation at the Pumping Station.

Based on these criteria, the invert elevation for the sanitary overflow has been set at 67.40m. Consequently, the 100-year water level in the SWM facility must be below this elevation.

Geotechnical / Rock Elevation

Where possible, the facilities have been designed to be above the bedrock. For some options, the sanitary overflow requires the bottom of the pond to be below the bedrock elevation, which significantly increases the cost of excavation and will likely require a lining for the pond.

Drawing **112117-TPSWMF** outlines the proposed pond locations, along with test pit data as provided by Paterson Group (see attached memo). Bedrock elevations have been interpolated from the provided data to estimate the quantity of rock excavation, if any, will be required for each of the pond options.

Quantity Control

The proposed SWM facilities have been designed to control post-development peak flows to pre-development levels for all storms up to and including the 100-year event. Runoff hydrographs and storage requirements were evaluated using VISUAL OTTHYMO.

- Pre-development conditions were modeled using the hydrologic parameters from the Shirley's Brook Existing Conditions Model developed by AECOMM.
- Post-development conditions were modeled using hydrologic parameters consistent with the current concept plan and conforming to the Ottawa Sewer Design Guidelines.

Quality Control

The proposed SWM facilities have been designed to provide an *Enhanced* level of water quality treatment for the proposed development, based on the recommended water quality volumes (permanent pool / extended detention) listed in the MOE SWM Planning and Design Manual.

3.0 SWM FACILITY OPTIONS (EAST)

An evaluation matrix (attached) has been prepared to provide an overview and comparison of the various options based on the design considerations listed in Section 2.0.

Five SWM facility options have been developed for the KNUEA lands east of March Road. Drawing **112117-TPSWMF** shows the location(s) of each option, along with test pit data as provided by Paterson Group. The bedrock surface profiles shown on the plan and profile drawings for each option have been interpolated from the geotechnical data.

OPTION 1

This option consists of two wet pond SWM facilities located outside the urban boundary (refer to **Figure EAST SWM1**).

Metcalfe Pond

One pond would be located on the Metcalfe property adjacent to March Valley Road, south of Woodlot S23. The Metcalfe pond would have a tributary drainage area of approximately 53 ha and a total volume of approximately 33,900 m³. The total area of the pond block would be approximately 4.5 ha and includes provision for grading, access roads, pathway linkages, and sediment management. The permanent pool elevation has been set at 65.00m, which is roughly equal to the 2-year water level in Shirley's Brook at the outlet of the pond.

Valecraft Pond

One pond would be located on the Valecraft property in the open space between the north property line and the existing woodlot. The inlet to the pond would run parallel to Woodlot S23, while the main area located in the clearing as shown on the attached figure. The Valecraft pond would have a tributary drainage area of approximately 42 ha and a total volume of approximately 26,500 m³. The total area of the pond block would be approximately 3.0 ha and includes provision for grading, access roads, pathway linkages, and sediment management.

Design Considerations

The proposed ponds would be connected to the KNUEA lands using a pathway system. The required setbacks from Woodlot S23 would be established by the environmental studies. Two separate SWM facilities would increase servicing flexibility and reduce the required size of the trunk sewers. The Metcalfe pond would serve as the outlet for the proposed sanitary overflow. Each pond would have a total depth of approximately 3.0m and are expected to be above the underlying bedrock.

Two separate crossings of the CN Rail line would be required (major and minor systems). Having two major system outlets will reduce the potential for major system drainage issues that could result from directing all runoff from the lands east of March Road towards a single outlet.

OPTION 2

This option consists of a single wet pond SWM facility located outside the urban boundary (refer to **Figure EAST SWM2**).

The pond would be located on the Metcalfe property east of the CN rail line, south of Woodlot S23. The inlet to the pond would be adjacent to the CN rail corridor. The pond would have a tributary drainage area of approximately 95 ha and a total volume of approximately 63,000 m³. The total area of the pond block is approximately 7.0 ha and includes provision for grading, access roads, pathway linkages, and sediment management. The permanent pool elevation has been set at 65.00m, which is roughly equal to the 2-year water level in Shirley's Brook at the outlet of the pond.

Design Considerations

The operating levels in the SWM facility would be dictated by the elevation of the required sanitary overflow, which is to be above the 100-year elevation in the pond. As a result, the required excavation depth adjacent to the CN rail line is relatively deep (approximately 5.5m) and will be below the bedrock.

The pond would be connected to the KNUEA lands using a pathway system. The required setback from Woodlot S23 would be established by the environmental studies. A servicing corridor parallel to the CN rail line will be required to connect the Valecraft lands to the pond and will need to be designed to carry both the major and minor system flows.

OPTION 3

This option consists of a single wet pond SWM facility located outside the urban boundary (refer to **Figure EAST SWM3**).

The pond would be located on the Metcalfe property east of the rail line, adjacent to March Valley Road and south of woodlot S23. The pond would have a tributary drainage area of approximately 95 ha and a total volume of approximately 63,000 m³. The total area of the pond block is 5.5 ha and includes provision for grading, access roads, pathway linkages, and sediment management. The permanent pool elevation has been set at 65.00m, which is roughly equal to the 2-year water level in Shirley's Brook at the outlet of the pond.

Design Considerations

The operating levels in the SWM facility would be dictated by the elevation of the required sanitary overflow, which is to be above the 100-year elevation in the pond. The existing ground elevation in the vicinity of March Valley Road is low enough to minimize the requirement for additional excavation to provide the required sanitary overflow.

The proposed location adjacent to March Valley Road minimizes the amount of excavation required, resulting in a smaller footprint for the pond block due to the shallower pond depth. This pond would be above the underlying bedrock and should not require any rock excavation.

The pond would be connected to the KNU EA lands using a pathway system. The required setback from Woodlot S23 would be established by the environmental studies. A servicing corridor parallel to the CN rail line will be required to connect the Valecraft lands to the pond and will need to be designed to carry both the major and minor system flows. A drainage channel would be required to convey the major and minor system flows from the CN rail line to the pond.

OPTION 4

This option consists of a single wet pond SWM facility located inside the urban boundary (refer to **Figure EAST SWM4**).

The pond would be located on the Metcalfe property adjacent to the CN Rail line, in the southeast corner of the KNU EA lands. The pond would have a tributary drainage area of approximately 95 ha and a total volume of approximately 63,000 m³. The total area of the pond block is 8.0 ha and includes provision for grading, access roads, pathway linkages, and sediment management. The permanent pool elevation has been set at 65.50m.

Design Considerations

The operating levels in the SWM facility would be dictated by the elevation of the required sanitary overflow, which is to be above the 100-year elevation in the pond. As a result, the required excavation depth is approximately 6.0m below existing ground and will require rock excavation.

With the pond bottom below the bedrock surface, a clay or synthetic lining would likely be required to ensure the pond bottom is adequately sealed. This could potentially create issues with uplift of the lining material if the pond is below the surrounding groundwater table.

A servicing corridor parallel to the CN rail line will be required to connect the Valecraft lands to the pond and will need to be designed to carry both the major and minor system flows.

The pond location could result in design challenges related to the depth and velocity of overland flow in the right-of-ways as the major system flow paths converge as they approach the pond. The storm trunk sewers could be oversized to compensate, but this would increase both the capital and life-cycle cost of the infrastructure and potentially create crossing conflicts with the sanitary sewers.

This location represents a relatively inefficient use of land due to the additional area associated with the depth of excavation. The depth of the pond also creates challenges in designing the pond as an amenity or feature within the development.

M:\2012\112117\DATA\CORRESPONDENCE\MEMOS\2014\028 KNU EA SWMF OPTIONS (EAST-ALL).DOCX

OPTION 5

This option consists of a single wet pond SWM facility located inside the urban boundary (refer to **Figure EAST SWM5**).

The pond would be located at the northern limit of the Metcalfe property and adjacent to the the CN Rail line. The pond would have a tributary drainage area of approximately 95 ha and a total volume of approximately 63,000 m³. The total area of the pond block is 8.0 ha and includes provision for grading, access roads, pathway linkages, and sediment management. The permanent pool elevation has been set at 65.50m.

Design Considerations

The operating levels in the SWM facility would be dictated by the elevation of the required sanitary overflow, which is to be above the 100-year elevation in the pond. The required excavation depth is approximately 6.0m below existing ground).The depth to bedrock elevation becomes shallower along the northern limit of the Metcalfe property, resulting in the highest rock excavation requirements of all the options.

With the pond bottom below the bedrock surface, a clay or synthetic lining would likely be required to ensure the pond bottom is adequately sealed. This could potentially create issues with uplift of the lining material if the pond is below the surrounding groundwater table.

Overland flow routing to this pond would be less challenging than Option 4, and the location provides greater servicing flexibility for the Valecraft Property.

This location represents a relatively inefficient use of land due to the additional area associated with the depth of excavation. The depth of the pond also creates challenges in designing the pond as an amenity or feature within the development.