C.C. Tatham & Associates Ltd.
Consulting Engineers

PART OF BLOCK C, REGISTERED PLAN 1233, DRAFT PLAN OF SUBDIVISION

Cumberland Beach, Township of Severn

Functional Servicing Report

prepared by:

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prepared for

1522417 Ontario Limited

October 2017

CCTA File 305820-7

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1 Introduction

C.C. Tatham & Associates Ltd. (CCTA) was retained by 1522417 Ontario Limited to prepare a Functional Servicing Report for a proposed site plan development consisting of 18 blocks of which 11 will contain a total of 42 condominium units. This development represents a second phase to the previously approved development consisting of nine residential lots and a five unit condominium block created by severances. All of the proposed condominium blocks are proposed to be zoned as medium density residential (RM1) and contain three to five Units each for a total of 42 units. This report is to present background information and design criteria for transportation, water distribution, sanitary sewer collection and stormwater management.

This report was prepared recognizing Provincial guidelines on water resources and the environment, and background reports on the development, including the following:

- The Ministry of the Environment and Climate Change (MOECC) Stormwater Management Practises Planning and Design Manual (2003);
- Michalski Nielson Associates Limited Environmental Impact Statement Bayou Park;
- Township of Severn Engineering Design Criteria (2014);
- Soil Engineers Ltd. (Soil Eng.) A Soil Investigation For Proposed Residential Development, Reference No. 1411-5001, (2015);
- Soil Engineers Ltd. (Soil Eng.) Seasonal Groundwater Level Monitoring, Reference No. 1411-5001W, (2015);
- C.C. Tatham & Associates Ltd., Shadow Creek Flood Study – Proposed Infill Lots (2015);
- C.C. Tatham & Associates Ltd., Part of Block C, Registered Plan 1233, Draft Plan of Subdivision; and
- C.C. Tatham & Associates Ltd., Traffic Impact Brief, (2017).

2 Pre-Development Conditions

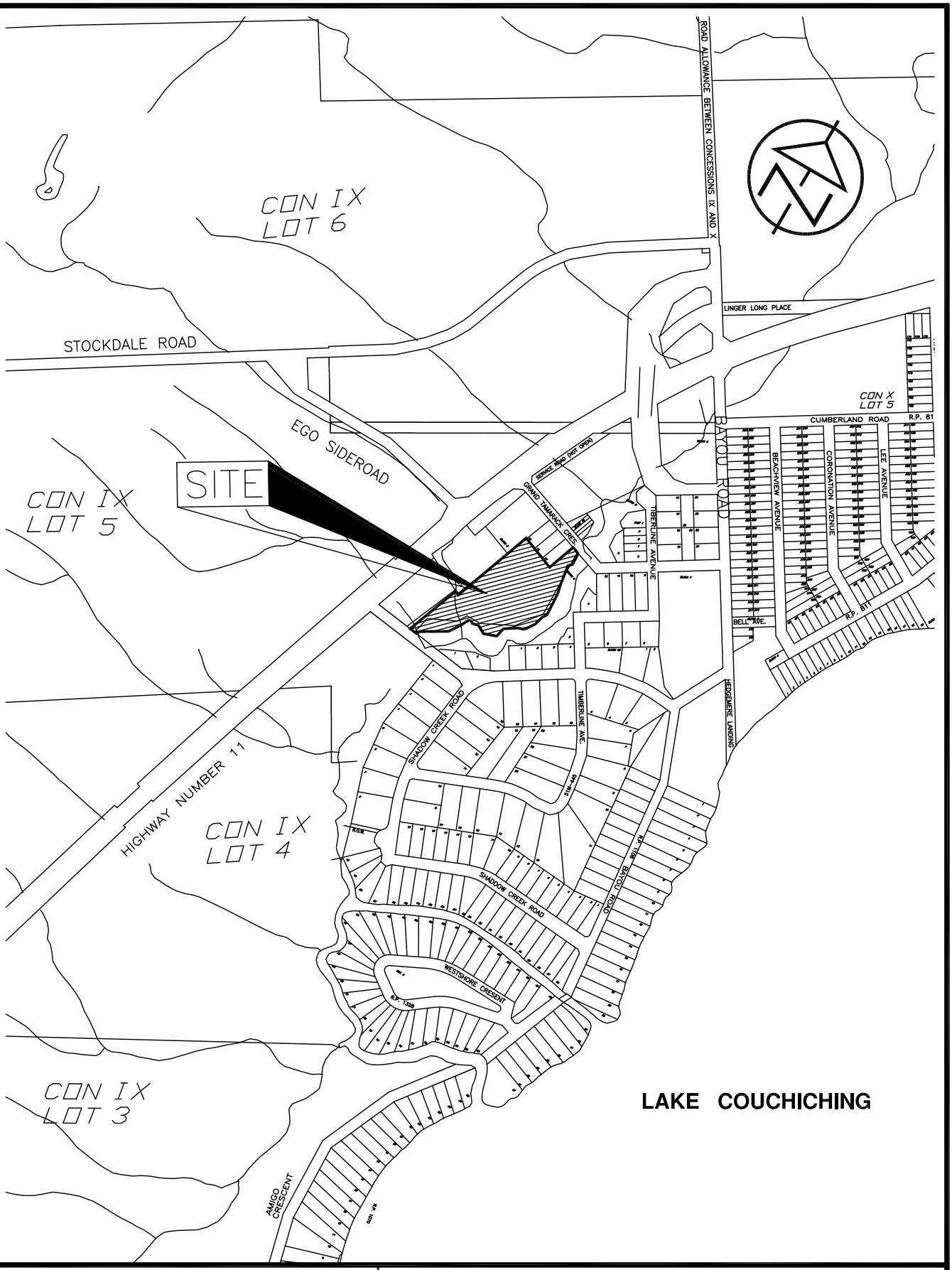
The proposed Site Plan development is south of Cumberland Beach, on Part of Block C, Registered Plan 1233, in the Township of Severn County of Simcoe. Figure 1 (Overleaf) is a key plan showing the location of this property.

The subject property consists of a single parcel on the south side of Grand Tamarack Crescent. The parcel is proposed to be developed into an 18 block site plan containing a total of 42 condominium units. The site plan is approximately 2.31 ha. (5.71 acres) in size.

Currently the property is vacant and consists mostly of a mature deciduous bush, with the exception of the previously proposed roadway which was cleared to install water and sewer. Topography of the site is generally level with approximately 1.0m of fall directing drainage from west to east toward a permanent watercourse, Shadow Creek.

Simcoe County North Soils mapping indicates the soils in the area are classified as Alliston sandy loam, which is characterized as well drained. The geotechnical investigation report for the site however, identifies layers of silty clay and sandy silt underlying the majority of the property. These oils have low permeability and are susceptible to frost and freezing potential due to their high water content and water retention properties.

The property is bound to the west by commercial lands that front Highway No. 11, existing residential houses to the north, Shadow Creek to the east and an unopened road allowance to the south. The proposed access for the site plan will be from Grand Tamarack Crescent to the south of 2617 Grand Tamarack Crescent. This site plan development is proposed to proceed in one phase.



C.C. Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie Ottawa

SITE PLAN OF PART OF BLOCK C
REGISTERED PLAN 1233
TOWNSHIP OF SEVERN
KEY PLAN

SCALE: 1:10,000	DATE: SEPT. 2017	DWG NO. 305820–FG–1

3 Servicing

3.1 Water Servicing

Potable water supply for the development will be provided by the existing 200 mm dia. watermain located in an existing servicing easement running through the centre of the site. This watermain was installed by the Township during the Westshore Water and Sewer Project (WWSP). The watermain has been adequately sized to service a development of this size, as confirmed by R.G. Robinson & Associates (RGRA), the Township of Severn's consultant for the WWSP.

3.2 Sanitary Servicing

The development is serviced by an existing 200 mm dia. sanitary main located adjacent to the watermain in the easement running through the property. This sewer was also installed during the Township of Severn WWSP. All lots will gravity feed to either the existing sewer or proposed extensions within the development.

Design sewage flows for the proposed development and sewer main sizing were originally calculated by RGRA. Per the updated calculations included in Appendix 'A', which are based upon the original RGRA calculations and most recent Township design standards, there is sufficient capacity in the sanitary sewer to convey the flow from the development.

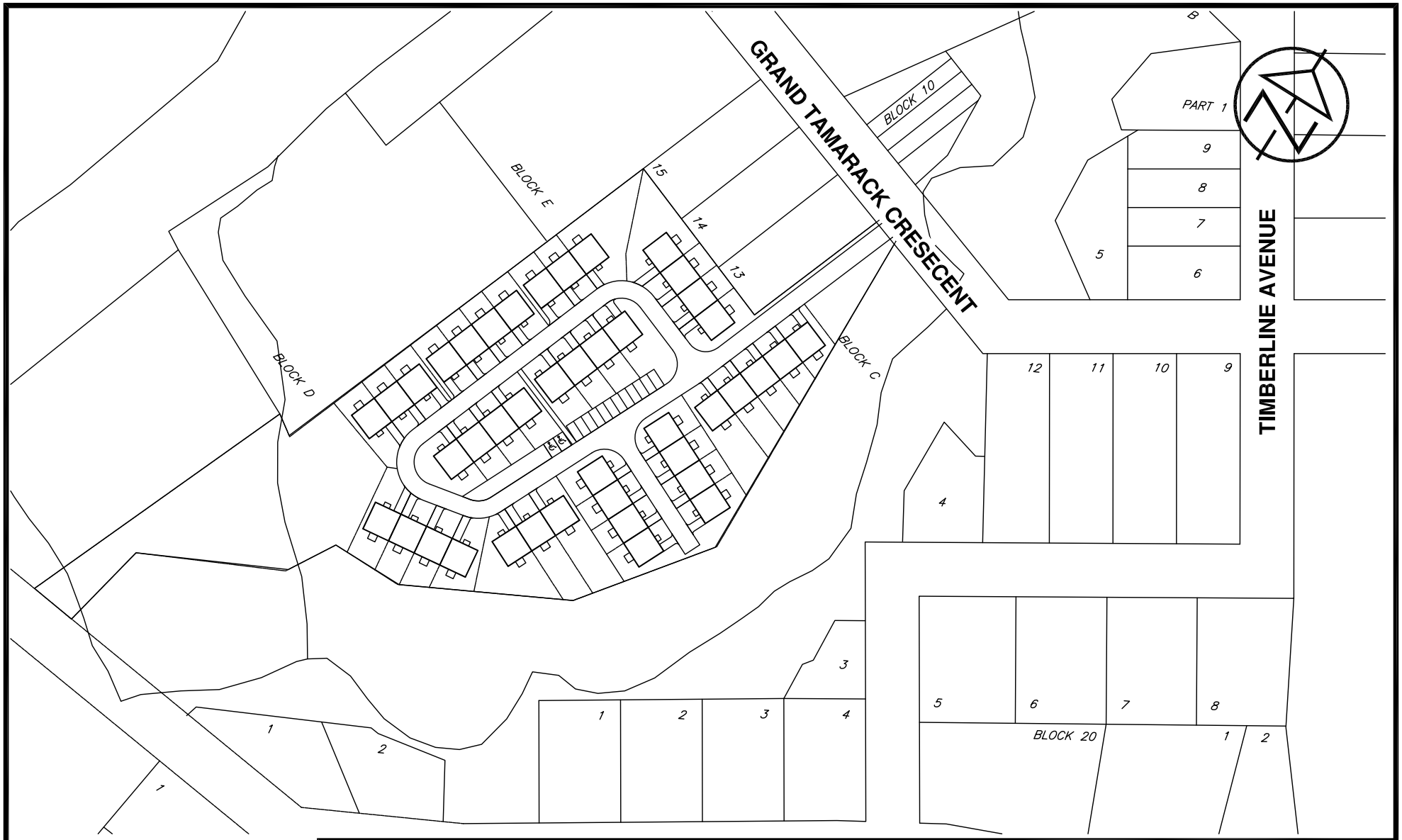
3.3 Transportation

The site plan will be serviced by one access point to Grand Tamarack Crescent. A Traffic Impact Assessment in support of the site plan has been prepared by CCTA and will be submitted under separate cover.

4 Post-Development Conditions

The development proposal is for an 18 block site plan with residential condominium blocks of three to five units each for a total of 42 units. Block 18 is to be used for stormwater management. The subdivision concept plan is shown on Figure 2 overleaf. Development of this 2.31 hectare property is proposed to take place in one phase.

The proposed roads will be constructed based upon the Township of Severn Local Residential Cross Section (STD No. 203) with reduced boulevards due to the medium density, condominium nature of the development. Roads will generally be constructed following the existing topography of the land to maintain an overall drainage pattern similar to the pre-development condition however, will include storm sewers to convey surface drainage to the proposed stormwater management facility.



C.C. Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie Ottawa

SITE PLAN OF PART OF BLOCK C
REGISTERED PLAN 1233
TOWNSHIP OF SEVERN
CONCEPT PLAN

SCALE: 1:2,000	DATE: SEPT. 2017	DWG. No. 305820-FG-2

5 Stormwater Management

5.1 Issues, Constraints and Opportunities

The proposed drainage plan is required to comply with municipal and provincial guidelines and incorporate the findings of the environmental impact studies as follows:

- Provide "Enhanced" level water quality control, to ensure the development will have no negative impacts on the water quality of downstream watercourses;
- Ensure post-development peak runoff rates will not increase from pre-development for storms up to and including the 1:100 year event, while maintaining current flow rate beyond the property boundary;
- Safe conveyance of all storm flows up to and including the Regional (Timmins) Storm event;
- Maintenance of the existing groundwater recharge/discharge relationship (water balance) as much as possible on the site.

5.2 Drainage Plan Options and Quantity/Quality Control of Stormwater Runoff

To meet current provincial and municipal guidelines, the post-development peak flows to the drainage outlet from the site must not exceed pre-development peak flows for all design storms up to the 100 year design storm event. As well, "Enhanced" level water quality control, which corresponds to 80% removal of total suspended solids, must be provided for stormwater runoff generated on site.

Typical methods of stormwater management to provide quantity and quality control of stormwater runoff are described below:

Lot Level (Source) Controls

Lot level controls include such things as roof leader soak away pits, rear yard ponding areas, reduced grading (0.5%), rear and side yard swales and other localized lot grading practices. These methods of source stormwater control are beneficial as they reduce peak flow rates and encourage localized infiltration. These controls are site specific based on soil conditions and require regular maintenance to be effective. Use of these practices is recommended and will be considered further at the final design stage.

Conveyance Controls

Conveyance controls include low-sloped grass swales, pervious pipe systems and pervious catchbasins. These systems can be very effective for reducing runoff volumes and increasing

groundwater recharge if the site soils have good drainage capability. It is proposed that grass swales be included on the site where possible.

End Of Pipe Facilities

Potential end of pipe facilities include extended detention wet ponds, dry ponds, constructed wetlands, oil/grit separators, filter strips and infiltration basins. These facilities allow stormwater to be retained and released at a rate equal to that of pre-development and are able to provide effective water quality control.

End of pipe facilities can be used effectively in conjunction with other control measures and are recommended for this development. Since the catchment area proposed for development is less than 2.0 ha, a bioretention cell is recommended for the provision of water quality and quantity controls.

5.3 Proposed Stormwater Management Plan

Referring to drawing DP-2 in Appendix 'D', the majority of drainage from post-development Catchments 201 through 203 on either side of Shadow Creek will flow overland and uncontrolled directly to Shadow Creek, as per the existing condition. Proposed development within these catchment areas consist almost exclusively of rear lot areas and rooftop drainage thus they do not require water quality control as the runoff from these surfaces will be unimpaired. Front yards from the severed lots on Timberline Crescent and Shadow Creek Road will drain towards the existing roadside ditches and outlet uncontrolled into Shadow Creek. Water quality control for the nominal driveway runoff will be treated within the roadside ditches prior to discharge into Shadow creek. Drainage from post-development catchment 206 North of Grand Tamarack Crescent will drain uncontrolled to Shadow Creek via sheet flow from rear yard areas or roadside ditches on Grand Tamarack Crescent. The external drainage area to the west of the development will be conveyed to Shadow Creek via a proposed drainage ditch which diverts the external drainage around the proposed bioretention cell.

Stormwater runoff from catchment 204, which includes the majority of the impervious areas on the site, will be directed to the proposed SWM facility at the south limit of the site via a proposed storm sewer drainage system and will discharge to Shadow Creek.

Due to grading constraints on the subject property, the proposed storm sewer has been designed at minimal grades to maintain sufficient cover over the sewer. While the storm sewer has been sized to ensure a five year storm event does not exceed 85% of the conveyance capacity, the minimal grades ensure there is also capacity for less frequent storm events. As illustrated by the preliminary design sheets in Appendix 'B', this includes full capacity for the 10 year storm event, minimal surcharge up to a maximum of 16% over pipe capacity during the 25 year storm event and minor surcharge up to a maximum of 33% over pipe capacity during the 100 year storm event. Combined with minor surface ponding areas above the storm inlets, the proposed sewer will therefore capture all surface drainage generated by storms up to and including the 100 year event on-site and convey the drainage to the

SWM facility. For storms in excess of the 100 year event, site grading has been designed to ensure an overland flow route is provided to Shadow Creek via the SWM facility or the entrance to Grand Tamarack Crescent.

The proposed SWM facility will provide additional water quantity storage volume to compensate for uncontrolled release from catchments 201 through 203 and 206. Design of the SWM facility should address the following objectives:

- Sizing of water quality control volume to achieve enhanced level protection, to provide 80% long term suspended solids removal;
- Sizing of water quantity control volume to attenuate post-development peak flow rates to pre development levels;
- The SWM facility outlet controls must consider the potential for backwater impacts caused by Shadow Creek. At a minimum, the outlet invert elevation of the SWM facility is to be higher than the 2 year flood elevation in Shadow Creek and the overflow elevation must be above the 25 year flood elevation in accordance with MOECC guidelines;
- Ensure the SWM facility can safely convey all storms up to and including the Regional Storm;
- Optimize suspended solids and heavy metal removal efficiencies by locating minor system inlets and the SWM facility outlets as far apart as possible to prevent short-circuiting;
- Consider operation and maintenance requirements and frequency and include as part of the design process;
- Recommend a post-construction monitoring program to assess stormwater quality control performance as part of the work permitting stage and in conjunction with the issuance of Certificates of Approval of approval under the Ontario Water Resources Act.

6 Water Quantity Control

6.1 Hydrologic Modelling and Input Parameters

The OTTHYMO computer model was used to model the pre and post-development hydrology of the subject property.

Drawings DP-1 and DP-2 show the pre and post-development drainage areas.

The pre-development conditions were modelled as rural drainage areas (Nashyd commands) with hydrologic input parameters based on existing land use and soil types. Pre-development input parameters are contained in Appendix 'C'.

Under the post-development condition, catchment 204 was modelled as an urban drainage area (standhyd command) to accurately account for increased site imperviousness (greater than 20%) resulting from road construction and lot development. All other post-development catchment areas were modelled as a rural cross sections since their imperviousnesses were all less than 20%. Post-development hydrologic parameters are contained in Appendix 'D'.

6.2 Results of OTTHYMO Model

Peak flows were calculated for the 4 hour Chicago and 24 hr SCS Type II Design Storms, generated using the Atmospheric Environmental Service Orillia Brain gauge weather station data. Results from the OTTHYMO model are included in Appendix 'C' and 'D' and have been summarized in Tables 1 and 2 below:

Table 1: Pre-Development Peak Flow Summary

Design Storm	Catchment 101 (4.65 ha) Hyd. 101		Catchment 102 (1.17 ha) Hyd. 102		Total Pre-Development (5.82 ha) Hyd. 103	
	CHI	SCS	CHI	SCS	CHI	SCS
25mm	0.006	-	0.002	-	0.008	-
2 year	0.014	0.019	0.005	0.008	0.018	0.026
5 year	0.029	0.036	0.011	0.014	0.039	0.048
10 year	-	0.049	-	0.019	-	0.066
25 year	0.064	0.068	0.025	0.026	0.085	0.091
50 year	-	0.084	-	0.032	-	0.112
100 year	0.100	0.101	0.038	0.039	0.134	0.135

Table 2: Post-Development Peak Flow Summary

Design Storm	Post 201+202+ 203+ 206 (uncontrolled) Hyd.224		Post 204+205 (uncontrolled) Hyd. 219		Post 204 + 205 (Controlled) Hyd.218		Total Post-Development Hyd.223	
	CHI	SCS	CHI	SCS	CHI	SCS	CHI	SCS
25mm	0.008	-	0.135	-	0.00	-	0.008 (0.008)	-
2 year	0.016	0.023	0.148	0.125	0.002	0.003	0.018 (0.018)	0.025 (0.026)
5 year	0.034	0.041	0.204	0.168	0.005	0.007	0.037 (0.039)	0.046 (0.048)
10 year	-	0.055	-	0.197	-	0.011	-	0.064 (0.066)
25 year	0.071	0.076	0.291	0.238	0.014	0.016	0.083 (0.085)	0.090 (0.091)
50 year	-	0.092	-	0.267	-	0.020	-	0.111 (0.112)
100 year	0.110	0.110	0.368	0.296	0.024	0.025	0.132 (0.134)	0.134 (0.135)

(0.120) refers to existing condition peak flow rate.

Preliminary storage-discharge data was input into the "route reservoir" command of the hydrologic model to confirm the storage volumes required to control post-development peak flows to pre-development peak flow rates. The proposed SWM facility will discharge to Shadow Creek at or above the 100-year flood elevation of 219.71 to ensure the active storage portion of the SWM facility is available for controlling peak flows generated on the site. The Shadow Creek flood elevations were modelled by CCTA and are summarized in a letter to the Township dated April 15, 2015, attached in Appendix 'E'. Specific details relating to the bioretention cell outlet structure will be determined at the final design stage.

The proposed bioretention cell illustrated on Drawing SG-1 has approximately 718 m^3 of active storage volume including an additional 405 m^3 of flood storage or 0.25 m of freeboard. The required storage volume calculated in the model was 693 m^3 during the 100 year 24 hr SCS design storm and therefore the land allocation for the SWM facility is appropriate.

7 Water Quality Control

The proposed bioretention cell has been sized to infiltrate the required enhanced level water quality storage volume generated from Catchments 204 and 205 (1.90 ha) which have a weighted imperviousness of approximately 47%. As per MOECC requirements, the larger of 28.1 m^3/ha or the 25 mm runoff volume is required for enhanced level water quality and erosion control. The 25 mm storm event runoff volume from Catchments 204 and 205 was determined to be 212 m^3, whereas 40 m^3/ha equates to 49.4 m^3. The corresponding infiltration storage required was therefore determined to be 212 m^3 whereas 255 m^3 of dead storage has been allowed for below the piped outlet invert of the bioretention cell.

The geotechnical investigation report revealed silty clay at a depth of 0.7 m in the vicinity of the proposed bioretention cell having a permeability of 10^{-7} cm/s. Due to the fact that the existing soils have very limited infiltration potential, the bioretention cell will be equipped with a minimum 0.6 m depth of permeable soil media comprised of sand, fines, and organic matter at the base of the cell and a perforated subdrain within the permeable soil media to promote infiltration and filtering of runoff. A positive outlet for the perforated subdrain to Shadow Creek will be provided.

The geotechnical investigation also identified groundwater elevations in the vicinity of the bioretention cell were approximately 1.5m below prevailing grade. While some seasonal fluctuation of the groundwater table is anticipated it will not have significant impact on the operation of the bioretention cell.

Details related to the bioretention cell and piped outlet will be provided at the final design stage.

Vegetation and plantings are an integral component to the treatment capabilities of the bioretention cell and therefore a landscape plan will be provided at the final design stage.

8 Erosion/Sediment Control Strategy During Construction

Erosion and sediment control will be implemented for all construction activities within the development site, including vegetation clearing, topsoil stripping, road construction and stockpiling of materials. The basic principles considered to minimize erosion and sedimentation and resultant negative environmental impacts include:

- Minimize disturbance activities where possible;
- Expose the smallest possible area to erosion for the shortest possible time;
- Institute erosion control measures as required immediately;
- Erection of silt fences around all construction sites;
- Confine refuelling/servicing of equipment to areas well away from the minor/major system elements;
- Implement sediment control measures before the outset of construction activities;
- Carry out regular inspections of erosion/sediment control measures and repair or maintain as necessary.

Removal of the sediment and erosion control measure should only be done after construction is completed and sediment runoff from the construction activities has stabilized.

Drawing SC-1 illustrates details and descriptions of all sediment and erosion control which will be refined during the final design process.

9 Conclusions

The proposed residential development on this site is consistent with the surrounding land use.

A Traffic Impact Assessment has been completed by C. C. Tatham & Associates Ltd. The Traffic Impact Assessment will be forwarded under separate cover.

Potable water supply for the development will be provided by the existing watermain.

Sanitary servicing for the development will be provided by the existing sanitary sewer.

The proposed stormwater management plan will satisfy the objectives originally identified as follows:

- Stormwater quantity control is provided to attenuate post-development peak flows to pre-development levels for design storms from the 2 – 100 year events;
- Stormwater quality storage requirements are based on "Enhanced" level protection;
- All storm flows will be safely conveyed from the SWM facility to the outlet.

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Senior Engineer, Project Manager

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Director, Manager – Orillia Office

APPENDIX A:
SANITARY SEWER DESIGN SHEET

SANITARY SEWER DESIGN SHEET

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q = average per capita daily flow = 450 L/cap.d
c = unit of commercial/institutional flow = 28.00 m^3/ha.d
ir = unit of peak extraneous residential flow = 0.23 L/ha.s
ic = unit of peak extraneous ICI flow = 0.1 L/ha.s
p = unit of population density = 2.70 ppu
Commercial Peaking Factor = 1.60

P = population
M = peaking factor (Harmon)
P = p x # units / 1000
M = $1+14/(4+P^{1/2})$, maximum of 4.0, minimum of 1.5
Q(ra) = average population flow (L/s)
Q(rp) = peak population flow (L/s)
Q(rc) = average commercial flow (L/s)
Q(rp) = peak commercial flow (L/s)
Q(i) = ic x Ac + ir x Ar = peak extraneous flow (L/s)
Q(d) = Q(rp)+Q(cp)+Q(i) = peak design flow (L/s)

Q(ra) = (P x q) / 86.4
Q(rp) = M x Q(ra)
Q(ca) = (c x a)/86.4
Q(cp) = x Q(ca)

DATE: Oct. 13, 2017
DESIGNED: JN
CHECKED:

FILE No.: 305820-7
PROJECT: West Shore Sewage System
Bayou Park Subdivision - Phase 2

SHEET No.: 1 OF 1

LOCATION			INDIVIDUAL				CUMULATIVE											SANITARY SEWER							
STREET	FROM MH	TO MH	No. RESIDENTIAL UNITS	POP	RES. AREA (ha)	COM./INST. AREA (ha)	POP	RES. AREA (ha)	COM./INST. AREA (ha)	TOTAL AREA (ha)	POPULATION FLOW, Q(ra) (L/s)	COM./INST. FLOWS, Q(ca) (L/s)	PEAKING FACTOR (M)	POPULATION FLOW, Q(rp) (L/s)	COM./INST. FLOWS, Q(cp) (L/s)	PEAK EXTRANEOUS FLOW, Q(i) (L/s)	PEAK DESIGN FLOW, Q(d) (L/s)	LENGTH (m)	PIPE SIZE DIAMETER (mm)	GRADE (%)	MANNING'S n	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	ACTUAL VELOCITY (m/s)	PERCENT FULL
Easement	50mm FM	2-10-18	0	0	2.13	3.46	0.00	2.13	3.46	5.59	0.00	1.121	4.00	0.000	1.794	0.836	2.630								
Street A	SAN MH A	SAN MH B	2	5.4	0.09		5.40	0.09	0.00	0.09	0.03	0.000	4.00	0.113	0.000	0.021	0.133	22.0	200	1.00%	0.013	32.8	1.04	0.27	0.4%
	SAN MH B	2-10-18	1	2.7	0.04		8.10	0.13	0.00	0.13	0.04	0.000	4.00	0.169	0.000	0.030	0.199	6.0	200	0.50%	0.013	23.2	0.74	0.23	0.9%
Street A	2-10-18	2-10-17	4	10.8	0.28		18.90	2.54	3.46	6.00	0.10	1.121	4.00	0.394	1.794	0.930	3.118	85.5	200	0.37%	0.013	19.9	0.63	0.44	15.6%
Street B	SAN MH C	SAN MH D	6	16.2	0.21		16.20	0.21	0.00	0.21	0.08	0.000	4.00	0.338	0.000	0.048	0.386	32.0	200	1.00%	0.013	32.8	1.04	0.36	1.2%
	SAN MH D	2-10-17	2	5.4	0.08		21.60	0.29	0.00	0.29	0.11	0.000	4.00	0.450	0.000	0.067	0.517	5.5	200	0.50%	0.013	23.2	0.74	0.30	2.2%
Street A	2-10-17	SAN MH H	1	2.7	0.09		43.20	2.92	3.46	6.38	0.23	1.121	4.00	0.900	1.794	1.018	3.712	35.0	200	0.37%	0.013	19.9	0.63	0.46	18.6%
Street A	SAN MH E	SAN MH F	17	45.9	0.62		45.90	0.62	0.00	0.62	0.24	0.000	4.00	0.956	0.000	0.143	1.099	94.0	200	1.00%	0.013	32.8	1.04	0.48	3.4%
	SAN MH F	SAN MH G	2	5.4	0.14		51.30	0.76	0.00	0.76	0.27	0.000	4.00	1.069	0.000	0.175	1.244	16.0	200	0.50%	0.013	23.2	0.74	0.39	5.4%
	SAN MH G	SAN MH H	3	8.1	0.11		59.40	0.87	0.00	0.87	0.31	0.000	4.00	1.238	0.000	0.200	1.438	33.5	200	0.50%	0.013	23.2	0.74	0.40	6.2%
Street A	SAN MH H	2-10-16	3	8.1	0.12		110.70	3.91	3.46	7.37	0.58	1.121	4.00	2.306	1.794	1.245	5.346	47.2	200	0.37%	0.013	19.9	0.63	0.51	26.8%
	2-10-16	2-10-14	1	2.7	0.12		113.40	4.03	3.46	7.49	0.59	1.121	4.00	2.363	1.794	1.273	5.429	70.5	200	0.51%	0.013	23.4	0.75	0.58	23.2%
Grand Tamarack Cres.	2-10-15	2-10-14	8	21.6	0.66	2.77	21.60	0.66	2.77	3.43	0.11	0.896	4.00	0.450	1.434	0.429	2.313	83.4	200	0.88%	0.013	30.8	0.98	0.56	7.5%
	2-10-14	2-10-13	0	0	0.13		135.00	4.83	6.23	11.05	0.70	2.017	4.00	2.813	3.228	1.732	7.773	38.0	200	2.00%	0.013	46.4	1.48	1.05	16.8%
	2-10-13	2-10-10	2	5.4	0.38		140.40	5.21	6.23	11.43	0.73	2.017	4.00	2.925	3.228	1.820	7.973	96.6	200	0.33%	0.013	18.8	0.60	0.55	42.3%
Grand Tamarack Cres.	2-10-19	2-10-10	2	5.4	0.61		5.40	0.61	0.00	0.61	0.03	0.000	4.00	0.113	0.000	0.141	0.253	81.8	200	0.85%	0.013	30.2	0.96	0.30	0.8%
Timberline Avenue	2-10-12	2-10-11	4	10.8	1.43		10.80	1.43	0.00	1.43	0.06	0.000	4.00	0.225	0.000	0.330	0.555	80.5	200	0.83%	0.013	29.9	0.95	0.37	1.9%
	2-10-11	2-10-10	4	10.8	0.51		21.60	1.95	0.00	1.95	0.11	0.000	4.00	0.450	0.000	0.448	0.898	55.0	200	0.40%	0.013	20.7	0.66	0.33	4.3%
	2-10-10	2-10-9	1	2.7	0.37		170.10	8.13	6.23	14.35	0.89	2.017	4.00	3.544	3.228	2.492	9.264	76.3	200	0.25%	0.013	16.4	0.52	0.51	56.5%
	2-10-9	2-10-8	1	2.7	0.20		172.80	8.32	6.23	14.55	0.90	2.017	4.00	3.600	3.228	2.537	9.365	24.0	200	0.31%	0.013	18.3	0.58	0.56	51.3%
	2-10-8	2-10-7	8	21.6	1.35		194.40	9.68	6.23	15.90	1.01	2.017	4.00	4.050	3.228	2.848	10.126	106.0	200	0.26%	0.013	16.7	0.53	0.53	60.6%
	2-10-7	2-10-6	0	0	0.15		194.40	9.82	6.23	16.05	1.01	2.017	4.00	4.050	3.228	2.882	10.159	21.2	200	0.19%	0.013	14.3	0.46	0.46	71.1%
	2-10-6	2-10-3	1	2.7	0.25		197.10	10.07	6.23	16.30	1.03	2.017	4.00	4.106	3.228	2.939	10.273	89.0	200	0.28%	0.013	17.4	0.55	0.55	59.2%
Shadow Creek Road	2-10-5	2-10-4	5	13.5	1.57		13.50	1.57	0.00	1.57	0.07	0.000	4.00	0.281	0.000	0.362	0.643	95.5	200	1.10%	0.013	34.4	1.09	0.43	1.9%
	2-10-4	2-10-3	7	18.9	1.50		32.40	3.08	0.00	3.08	0.17	0.000	4.00	0.675	0.000	0.708	1.383	92.0	200	0.82%	0.013	29.7	0.95	0.47	4.7%
	2-10-3	2-10-2	2	5.4	0.75		234.90	13.90	6.23	20.13	1.22	2.017	4.00	4.894	3.228	3.820	11.942	47.8	200	1.22%	0.013	36.2	1.15	0.98	33.0%
	2-10-2	2-10-1	3	8.1	0.68		243.00	14.58	6.23	20.80	1.27	2.017	4.00	5.063	3.228	3.976	12.266	79.3	200	0.97%	0.013	32.3	1.03	0.91	38.0%
	2-10-1	2-10	1	2.7	0.68		245.70	15.26	6.23	21.48	1.28	2.017	4.00	5.119	3.228	4.132	12.478			100 mmØ Forcemain					

APPENDIX B:
STORM SEWER DESIGN SHEET

C.C.Tatham & Associates Ltd.
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STORM SEWER DESIGN SHEET

Project - Bayou Park Subdivision - Phase 2
Municipality - Township of Severn
Project No. - 305820-7

Design Storm - Township of Severn (2014), 5 Year Storm
A = 29.90
B = -0.725
Tc = 10.00 minutes (min)

Mannings "n"
pvc/ concrete 0.013

Designed By - JN
Date - 13-Oct-17
Sheet - 1 of 1

Location of Section	Area	From Upstream	To Downstream	Tributary Area	Runoff Coefficient	Individual A x C	Cumulative Area	Cumulative A x C	Time of Concentration	Rainfall Intensity	Peak Flow	Manning's "n"	Slope	Diameter	Length	Full Flow Velocity	Full Flow Capacity	Actual Velocity	Time of Flow	Calculated Pipe Diameter	% Full	Time of Conc. to Next Segment
		MH #	MH #	Aa	Ca	Aa x Ca	A=Sum Aa	A x C=	Tc	i	q		S	D	L	vf	Q	va	t=L/60xva	d		tf=Tc+t
				ha			ha	Sum Aa x Ca	min	mm/hr	m3/s		%	mm	m	m/s	m3/s	m/s	min	mm	%	min
	301	DCBMH 2	CBMH 4	0.14	0.70	0.098	0.14	0.098	10.00	109.61	**0.030**	0.013	0.30%	**300**	35.0	0.75	**0.053**	0.72	0.81	242	56	10.81
	302	CBMH 4	DCBMH 6	0.24	0.70	0.168	0.38	0.266	10.81	103.58	**0.077**	0.013	0.30%	**375**	38.0	0.87	**0.096**	0.87	0.73	344	80	11.54
	303	DCBMH 6	MH 10	0.19	0.70	0.133	0.57	0.399	11.54	98.80	**0.110**	0.013	0.30%	**450**	26.5	0.98	**0.156**	0.98	0.45	394	70	11.99
	304	MH 9	MH 10	0.14	0.70	0.098	0.14	0.098	10.00	109.61	**0.030**	0.013	0.30%	**300**	47.0	0.75	**0.053**	0.72	1.09	242	56	11.09
		MH 10	DCBMH 12			0.000	0.71	0.497	11.99	96.10	**0.133**	0.013	0.30%	**450**	24.0	0.98	**0.156**	0.98	0.41	423	85	12.40
	305	DCBMH 12	DCBMH 15	0.19	0.70	0.133	0.90	0.630	12.40	93.80	**0.164**	0.013	0.30%	**525**	37.0	1.09	**0.236**	1.09	0.57	458	70	12.96
	306	DCBMH 15	MH 23	0.13	0.70	0.091	1.03	0.721	12.96	90.81	**0.182**	0.013	0.30%	**525**	36.0	1.09	**0.236**	1.09	0.55	476	77	13.51
	307	CB 16	CBMH 18	0.06	0.70	0.042	0.06	0.042	10.00	109.61	**0.013**	0.013	1.00%	**300**	24.5	1.37	**0.097**	0.89	0.46	140	13	10.46
	308	CBMH 18	CBMH 21	0.07	0.70	0.049	0.13	0.091	10.46	106.11	**0.027**	0.013	0.30%	**300**	45.5	0.75	**0.053**	0.70	1.08	232	51	11.54
	309	CB19	CBMH 21	0.08	0.70	0.056	0.08	0.056	10.00	109.61	**0.017**	0.013	1.00%	**300**	24.5	1.37	**0.097**	0.97	0.42	156	18	10.42
	310	CBMH 21	MH 23	0.13	0.70	0.091	0.34	0.238	11.54	98.78	**0.065**	0.013	0.30%	**375**	38.0	0.87	**0.096**	0.87	0.73	324	68	12.27
	311	DCB 22	MH 23	0.11	0.70	0.077	0.11	0.077	10.00	109.61	**0.023**	0.013	1.00%	**300**	10.0	1.37	**0.097**	1.05	0.16	176	24	10.16
		MH 23	MH 24			0.000	1.48	1.036	13.51	88.11	**0.254**	0.013	0.30%	**600**	8.0	1.19	**0.336**	1.19	0.11	539	75	13.63
		MH 24	HW 1			0.000	1.48	1.036	13.63	87.58	**0.252**	0.013	0.30%	**600**	6.5	1.19	**0.336**	1.19	0.09	538	75	13.72

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STORM SEWER DESIGN SHEET

Project - Bayou Park Subdivision - Phase 2
Municipality - Township of Severn
Project No. - 305820-7

Design Storm - Township of Severn (2014), 10 Year Storm
A = 34.80
B = -0.724
Tc = 10.00 minutes (min)

Mannings "n"
pvc/ concrete 0.013

Designed By - JN
Date - 13-Oct-17
Sheet - 1 of 1

Location of Section	Area	From Upstream	To Downstream	Tributary Area	Runoff Coefficient	Individual A x C	Cumulative Area	Cumulative A x C	Time of Concentration	Rainfall Intensity	Peak Flow	Manning's "n"	Slope	Diameter	Length	Full Flow Velocity	Full Flow Capacity	Actual Velocity	Time of Flow	Calculated Pipe Diameter	% Full	Time of Conc. to Next Segment
		MH #	MH #	Aa	Ca	Aa x Ca	A=Sum Aa	A x C=	Tc	i	q		S	D	L	vf	Q	va	t=L/60xva	d		tf=Tc+t
				ha			ha	Sum Aa x Ca	min	mm/hr	m3/s		%	mm	m	m/s	m3/s	m/s	min	mm	%	min
	301	DCBMH 2	CBMH 4	0.14	0.70	0.098	0.14	0.098	10.00	127.34	**0.035**	0.013	0.30%	**300**	35.0	0.75	**0.053**	0.75	0.78	256	65	10.78
	302	CBMH 4	DCBMH 6	0.24	0.70	0.168	0.38	0.266	10.78	120.61	**0.089**	0.013	0.30%	**375**	38.0	0.87	**0.096**	0.87	0.73	364	93	11.51
	303	DCBMH 6	MH 10	0.19	0.70	0.133	0.57	0.399	11.51	115.03	**0.127**	0.013	0.30%	**450**	26.5	0.98	**0.156**	0.98	0.45	417	82	11.96
	304	MH 9	MH 10	0.14	0.70	0.098	0.14	0.098	10.00	127.34	**0.035**	0.013	0.30%	**300**	47.0	0.75	**0.053**	0.75	1.05	256	65	11.05
		MH 10	DCBMH 12			0.000	0.71	0.497	11.96	111.88	**0.154**	0.013	0.30%	**450**	24.0	0.98	**0.156**	0.98	0.41	448	99	12.36
	305	DCBMH 12	DCBMH 15	0.19	0.70	0.133	0.90	0.630	12.36	109.20	**0.191**	0.013	0.30%	**525**	37.0	1.09	**0.236**	1.09	0.57	485	81	12.93
	306	DCBMH 15	MH 23	0.13	0.70	0.091	1.03	0.721	12.93	105.72	**0.212**	0.013	0.30%	**525**	36.0	1.09	**0.236**	1.09	0.55	504	90	13.48
	307	CB 16	CBMH 18	0.06	0.70	0.042	0.06	0.042	10.00	127.34	**0.015**	0.013	1.00%	**300**	24.5	1.37	**0.097**	0.93	0.44	149	15	10.44
	308	CBMH 18	CBMH 21	0.07	0.70	0.049	0.13	0.091	10.44	123.44	**0.031**	0.013	0.30%	**300**	45.5	0.75	**0.053**	0.73	1.04	246	59	11.48
	309	CB19	CBMH 21	0.08	0.70	0.056	0.08	0.056	10.00	127.34	**0.020**	0.013	1.00%	**300**	24.5	1.37	**0.097**	1.01	0.41	165	20	10.41
	310	CBMH 21	MH 23	0.13	0.70	0.091	0.34	0.238	11.48	115.23	**0.076**	0.013	0.30%	**375**	38.0	0.87	**0.096**	0.87	0.73	344	79	12.21
	311	DCB 22	MH 23	0.11	0.70	0.077	0.11	0.077	10.00	127.34	**0.027**	0.013	1.00%	**300**	10.0	1.37	**0.097**	1.10	0.15	186	28	10.15
		MH 23	MH 24			0.000	1.48	1.036	13.48	102.57	**0.295**	0.013	0.30%	**600**	8.0	1.19	**0.336**	1.19	0.11	571	88	13.59
		MH 24	HW 1			0.000	1.48	1.036	13.59	101.95	**0.293**	0.013	0.30%	**600**	6.5	1.19	**0.336**	1.19	0.09	570	87	13.69

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STORM SEWER DESIGN SHEET

Project - Bayou Park Subdivision - Phase 2
Municipality - Township of Severn
Project No. - 305820-7

Design Storm - Township of Severn (2014), 25 Year Storm
A = 40.90
B = -0.722
Tc = 10.00 minutes (min)

Mannings "n"
pvc/ concrete 0.013

Designed By - JN
Date - 13-Oct-17
Sheet - 1 of 1

Location of Section	Area	From Upstream	To Downstream	Tributary Area	Runoff Coefficient	Individual A x C	Cumulative Area	Cumulative A x C	Time of Concentration	Rainfall Intensity	Peak Flow	Manning's "n"	Slope	Diameter	Length	Full Flow Velocity	Full Flow Capacity	Actual Velocity	Time of Flow	Calculated Pipe Diameter	% Full	Time of Conc. to Next Segment
		MH #	MH #	Aa	Ca	Aa x Ca	A=Sum Aa	A x C=	Tc	i	q		S	D	L	vf	Q	va	t=L/60xva	d		tf=Tc+t
				ha			ha	Sum Aa x Ca	min	mm/hr	m3/s		%	mm	m	m/s	m3/s	m/s	min	mm	%	min
	301	DCBMH 2	CBMH 4	0.14	0.70	0.098	0.14	0.098	10.00	149.12	**0.041**	0.013	0.30%	**300**	35.0	0.75	**0.053**	0.75	0.78	271	77	10.78
	302	CBMH 4	DCBMH 6	0.24	0.70	0.168	0.38	0.266	10.78	141.27	**0.104**	0.013	0.30%	**375**	38.0	0.87	**0.096**	0.87	0.73	387	109	11.51
	303	DCBMH 6	MH 10	0.19	0.70	0.133	0.57	0.399	11.51	134.75	**0.149**	0.013	0.30%	**450**	26.5	0.98	**0.156**	0.98	0.45	442	96	11.96
	304	MH 9	MH 10	0.14	0.70	0.098	0.14	0.098	10.00	149.12	**0.041**	0.013	0.30%	**300**	47.0	0.75	**0.053**	0.75	1.05	271	77	11.05
		MH 10	DCBMH 12			0.000	0.71	0.497	11.96	131.07	**0.181**	0.013	0.30%	**450**	24.0	0.98	**0.156**	0.98	0.41	475	116	12.36
	305	DCBMH 12	DCBMH 15	0.19	0.70	0.133	0.90	0.630	12.36	127.94	**0.224**	0.013	0.30%	**525**	37.0	1.09	**0.236**	1.09	0.57	515	95	12.93
	306	DCBMH 15	MH 23	0.13	0.70	0.091	1.03	0.721	12.93	123.87	**0.248**	0.013	0.30%	**525**	36.0	1.09	**0.236**	1.09	0.55	535	105	13.48
	307	CB 16	CBMH 18	0.06	0.70	0.042	0.06	0.042	10.00	149.12	**0.017**	0.013	1.00%	**300**	24.5	1.37	**0.097**	0.97	0.42	158	18	10.42
	308	CBMH 18	CBMH 21	0.07	0.70	0.049	0.13	0.091	10.42	144.75	**0.037**	0.013	0.30%	**300**	45.5	0.75	**0.053**	0.75	1.01	261	69	11.43
	309	CB19	CBMH 21	0.08	0.70	0.056	0.08	0.056	10.00	149.12	**0.023**	0.013	1.00%	**300**	24.5	1.37	**0.097**	1.05	0.39	176	24	10.39
	310	CBMH 21	MH 23	0.13	0.70	0.091	0.34	0.238	11.43	135.38	**0.090**	0.013	0.30%	**375**	38.0	0.87	**0.096**	0.87	0.73	365	93	12.16
	311	DCB 22	MH 23	0.11	0.70	0.077	0.11	0.077	10.00	149.12	**0.032**	0.013	1.00%	**300**	10.0	1.37	**0.097**	1.14	0.15	198	33	10.15
		MH 23	MH 24			0.000	1.48	1.036	13.48	120.19	**0.346**	0.013	0.30%	**600**	8.0	1.19	**0.336**	1.19	0.11	606	103	13.59
		MH 24	HW 1			0.000	1.48	1.036	13.59	119.47	**0.344**	0.013	0.30%	**600**	6.5	1.19	**0.336**	1.19	0.09	605	102	13.69

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STORM SEWER DESIGN SHEET

Project - Bayou Park Subdivision - Phase 2
Municipality - Township of Severn
Project No. - 305820-7

Design Storm - Township of Severn (2014), 50 Year Storm
A = 45.50
B = -0.722
Tc = 10.00 minutes (min)

Mannings "n"
pvc/ concrete 0.013

Designed By - JN
Date - 13-Oct-17
Sheet - 1 of 1

Location of Section	Area	From Upstream	To Downstream	Tributary Area	Runoff Coefficient	Individual A x C	Cumulative Area	Cumulative A x C	Time of Concentration	Rainfall Intensity	Peak Flow	Manning's "n"	Slope	Diameter	Length	Full Flow Velocity	Full Flow Capacity	Actual Velocity	Time of Flow	Calculated Pipe Diameter	% Full	Time of Conc. to Next Segment
		MH #	MH #	Aa	Ca	Aa x Ca	A=Sum Aa	A x C=	Tc	i	q		S	D	L	vf	Q	va	t=L/60xva	d		tf=Tc+t
				ha			ha	Sum Aa x Ca	min	mm/hr	m3/s		%	mm	m	m/s	m3/s	m/s	min	mm	%	min
	301	DCBMH 2	CBMH 4	0.14	0.70	0.098	0.14	0.098	10.00	165.90	**0.045**	0.013	0.30%	**300**	35.0	0.75	**0.053**	0.75	0.78	282	85	10.78
	302	CBMH 4	DCBMH 6	0.24	0.70	0.168	0.38	0.266	10.78	157.16	**0.116**	0.013	0.30%	**375**	38.0	0.87	**0.096**	0.87	0.73	403	121	11.51
	303	DCBMH 6	MH 10	0.19	0.70	0.133	0.57	0.399	11.51	149.91	**0.166**	0.013	0.30%	**450**	26.5	0.98	**0.156**	0.98	0.45	460	106	11.96
	304	MH 9	MH 10	0.14	0.70	0.098	0.14	0.098	10.00	165.90	**0.045**	0.013	0.30%	**300**	47.0	0.75	**0.053**	0.75	1.05	282	85	11.05
		MH 10	DCBMH 12			0.000	0.71	0.497	11.96	145.81	**0.201**	0.013	0.30%	**450**	24.0	0.98	**0.156**	0.98	0.41	495	129	12.36
	305	DCBMH 12	DCBMH 15	0.19	0.70	0.133	0.90	0.630	12.36	142.33	**0.249**	0.013	0.30%	**525**	37.0	1.09	**0.236**	1.09	0.57	536	106	12.93
	306	DCBMH 15	MH 23	0.13	0.70	0.091	1.03	0.721	12.93	137.80	**0.276**	0.013	0.30%	**525**	36.0	1.09	**0.236**	1.09	0.55	557	117	13.48
	307	CB 16	CBMH 18	0.06	0.70	0.042	0.06	0.042	10.00	165.90	**0.019**	0.013	1.00%	**300**	24.5	1.37	**0.097**	1.00	0.41	164	20	10.41
	308	CBMH 18	CBMH 21	0.07	0.70	0.049	0.13	0.091	10.41	161.17	**0.041**	0.013	0.30%	**300**	45.5	0.75	**0.053**	0.75	1.01	272	77	11.42
	309	CB19	CBMH 21	0.08	0.70	0.056	0.08	0.056	10.00	165.90	**0.026**	0.013	1.00%	**300**	24.5	1.37	**0.097**	1.08	0.38	183	27	10.38
	310	CBMH 21	MH 23	0.13	0.70	0.091	0.34	0.238	11.42	150.72	**0.100**	0.013	0.30%	**375**	38.0	0.87	**0.096**	0.87	0.73	380	104	12.15
	311	DCB 22	MH 23	0.11	0.70	0.077	0.11	0.077	10.00	165.90	**0.035**	0.013	1.00%	**300**	10.0	1.37	**0.097**	1.18	0.14	206	37	10.14
		MH 23	MH 24			0.000	1.48	1.036	13.48	133.71	**0.385**	0.013	0.30%	**600**	8.0	1.19	**0.336**	1.19	0.11	631	114	13.59
		MH 24	HW 1			0.000	1.48	1.036	13.59	132.91	**0.382**	0.013	0.30%	**600**	6.5	1.19	**0.336**	1.19	0.09	629	114	13.69

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Web: www.cctatham.com

STORM SEWER DESIGN SHEET

Project - Bayou Park Subdivision - Phase 2
Municipality - Township of Severn
Project No. - 305820-7

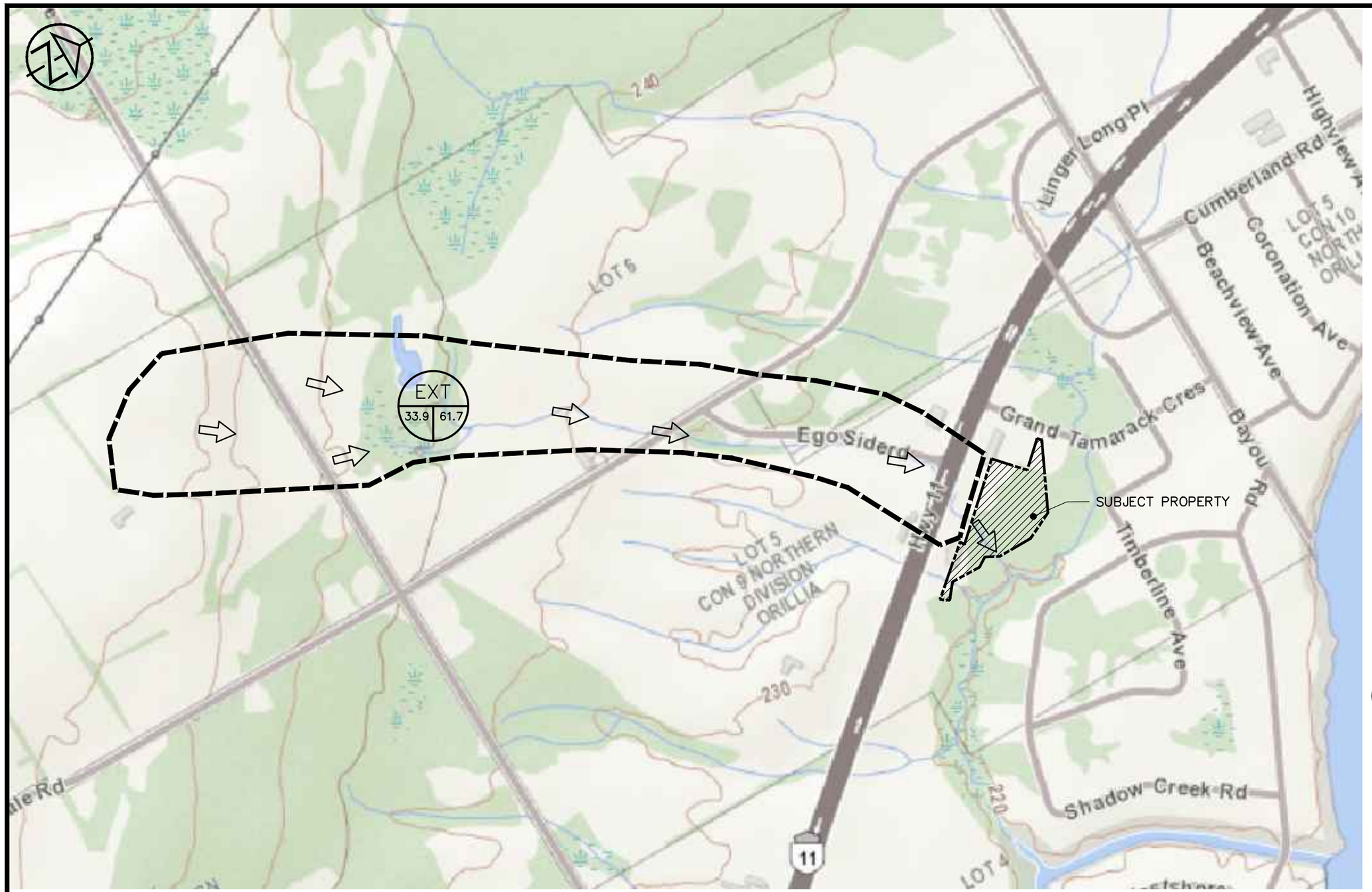
Design Storm - Township of Severn (2014), 100 Year Storm
A = 50.00
B = -0.722
Tc = 10.00 minutes (min)

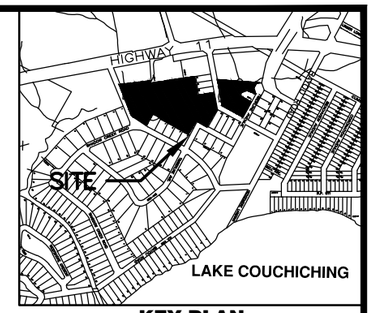
Mannings "n"
pvc/ concrete 0.013

Designed By - JN
Date - 13-Oct-17
Sheet - 1 of 1

Location of Section	Area	From Upstream	To Downstream	Tributary Area	Runoff Coefficient	Individual A x C	Cumulative Area	Cumulative A x C	Time of Concentration	Rainfall Intensity	Peak Flow	Manning's "n"	Slope	Diameter	Length	Full Flow Velocity	Full Flow Capacity	Actual Velocity	Time of Flow	Calculated Pipe Diameter	% Full	Time of Conc. to Next Segment
		MH #	MH #	Aa	Ca	Aa x Ca	A=Sum Aa	A x C=	Tc	i	q		S	D	L	vf	Q	va	t=L/60xva	d		tf=Tc+t
				ha			ha	Sum Aa x Ca	min	mm/hr	m3/s		%	mm	m	m/s	m3/s	m/s	min	mm	%	min
	301	DCBMH 2	CBMH 4	0.14	0.70	0.098	0.14	0.098	10.00	182.30	**0.050**	0.013	0.30%	**300**	35.0	0.75	**0.053**	0.75	0.78	293	94	10.78
	302	CBMH 4	DCBMH 6	0.24	0.70	0.168	0.38	0.266	10.78	172.70	**0.128**	0.013	0.30%	**375**	38.0	0.87	**0.096**	0.87	0.73	417	133	11.51
	303	DCBMH 6	MH 10	0.19	0.70	0.133	0.57	0.399	11.51	164.73	**0.183**	0.013	0.30%	**450**	26.5	0.98	**0.156**	0.98	0.45	477	117	11.96
	304	MH 9	MH 10	0.14	0.70	0.098	0.14	0.098	10.00	182.30	**0.050**	0.013	0.30%	**300**	47.0	0.75	**0.053**	0.75	1.05	293	94	11.05
		MH 10	DCBMH 12			0.000	0.71	0.497	11.96	160.24	**0.221**	0.013	0.30%	**450**	24.0	0.98	**0.156**	0.98	0.41	513	142	12.36
	305	DCBMH 12	DCBMH 15	0.19	0.70	0.133	0.90	0.630	12.36	156.41	**0.274**	0.013	0.30%	**525**	37.0	1.09	**0.236**	1.09	0.57	555	116	12.93
	306	DCBMH 15	MH 23	0.13	0.70	0.091	1.03	0.721	12.93	151.43	**0.303**	0.013	0.30%	**525**	36.0	1.09	**0.236**	1.09	0.55	577	129	13.48
	307	CB 16	CBMH 18	0.06	0.70	0.042	0.06	0.042	10.00	182.30	**0.021**	0.013	1.00%	**300**	24.5	1.37	**0.097**	1.03	0.40	170	22	10.40
	308	CBMH 18	CBMH 21	0.07	0.70	0.049	0.13	0.091	10.40	177.23	**0.045**	0.013	0.30%	**300**	45.5	0.75	**0.053**	0.75	1.01	282	85	11.41
	309	CB19	CBMH 21	0.08	0.70	0.056	0.08	0.056	10.00	182.30	**0.028**	0.013	1.00%	**300**	24.5	1.37	**0.097**	1.11	0.37	189	29	10.37
	310	CBMH 21	MH 23	0.13	0.70	0.091	0.34	0.238	11.41	165.74	**0.110**	0.013	0.30%	**375**	38.0	0.87	**0.096**	0.87	0.73	394	114	12.14
	311	DCB 22	MH 23	0.11	0.70	0.077	0.11	0.077	10.00	182.30	**0.039**	0.013	1.00%	**300**	10.0	1.37	**0.097**	1.21	0.14	213	40	10.14
		MH 23	MH 24			0.000	1.48	1.036	13.48	146.93	**0.423**	0.013	0.30%	**600**	8.0	1.19	**0.336**	1.19	0.11	654	126	13.59
		MH 24	HW 1			0.000	1.48	1.036	13.59	146.05	**0.420**	0.013	0.30%	**600**	6.5	1.19	**0.336**	1.19	0.09	652	125	13.69

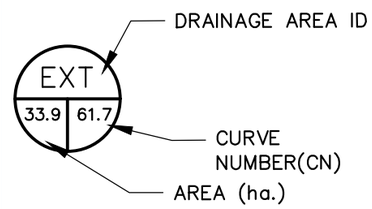
APPENDIX C:
PRE-DEVELOPMENT HYDROLOGIC MODEL





KEY PLAN

LEGEND



CONTRACT DRAWINGS

CONTRACTOR MUST VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR SAME. ANY DISCREPANCIES MUST BE REPORTED TO THE ENGINEER BEFORE COMMENCING WORK. DRAWINGS ARE NOT TO BE SCALED.

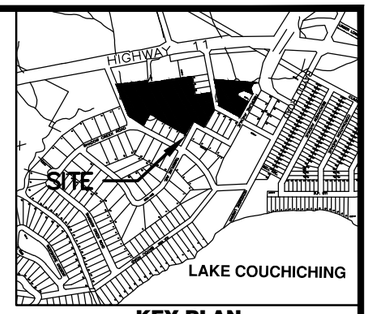
BACKGROUND IMAGE AND CONTOURS FROM ONLINE COUNTY OF SIMCOE GIS MAPPING.

C.C. Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie Ottawa

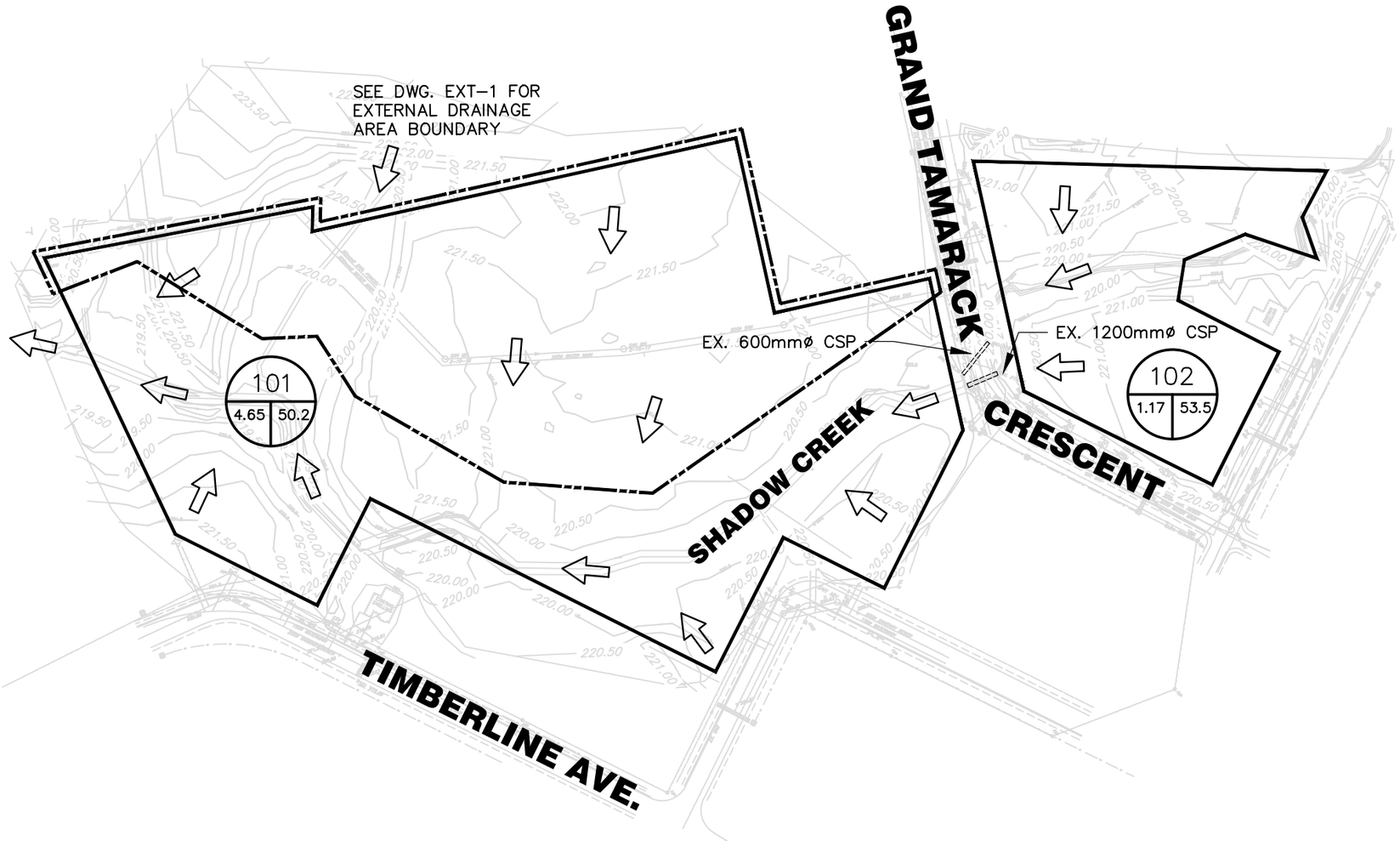
BAYOU PARK SUBDIVISION
TOWNSHIP OF SEVERN
EXTERNAL DRAINAGE PLAN

DWG. No. **EXT-1**

SCALE: 1:5000	DRAWN: HY	DATE: OCT, 2017	JOB NO. 305820



KEY PLAN



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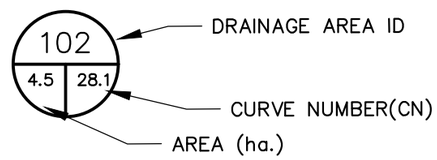


CONTRACT DRAWINGS

CONTRACTOR MUST VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR SAME. ANY DISCREPANCIES MUST BE REPORTED TO THE ENGINEER BEFORE COMMENCING WORK. DRAWINGS ARE NOT TO BE SCALED.

C.C. Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie Ottawa

BAYOU PARK SUBDIVISION
TOWNSHIP OF SEVERN
EXISTING DRAINAGE PLAN

DWG. No. **DP-1**

SCALE: 1:2000	DRAWN: HY	DATE: SEPT, 2017	JOB NO. 305820

CUMBERLAND BEACH
FILE No 305820

Area #. **EXT** **Area =** **33.90 ha**

Weighted Curve Number

Soil Series Symbol	Hydrologic Soil Group	Soil Texture	Land Use		Forest			Cultivated			Impervious areas			Wetlands			Average CN
			Area (ha)	Percent	Area	%	CN	Area	%	CN	Area	%	CN	Area	%	CN	
Tis	A	Sand Loam	33.90	100.0%	5.09	15.0%	39.0	23.39	69.0%	66.0	4.07	12.0%	98.0	1.36	4.0%	50.0	65.2
					Avg. =	15.0%		Avg. =	69.0%		Avg. =	12.0%		Avg. =	4.0%		
								Total Avg. =	100.0%								
	Total Area =		33.90														**Avg. = 65.2**

Note: Land cover generated from ontario flow assessment toll GIS.

Time of Concentration
(Bransby-Williams Method)

-suggested to use when runoff coefficient is greater than or equal to 0.40

Path	=	Watercourse
Hmax (m)	=	285
Hmin (m)	=	223
L (m)	=	1704
Slope	=	3.6%
Time of conc.	=	52.74 min
Time of conc.	=	0.88 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.59 hours

Initial Abstraction

Land Cover Values

Impervious	=	2 mm
Pervious		
Pasture		5 mm
Meadow		8 mm
Forest		10 mm
Wetlands		16 mm

IA = (Forest x 10mm)+(Pasture x 8mm)+(Impervious x 2mm)+(Wetlands x 16mm)

IA = 5.83 mm

Time of Concentration
(Airport Method)

-suggested to use when runoff coefficient is less than 0.40

Path	=	Watercourse
Hmax (m)	=	285.0
Hmin (m)	=	223.0
L (m)	=	1704.0
Slope	=	3.6%

	Sand Loam
Cultivated	0.22
Woodland	0.08
Impervious	0.40
Wetland	0.05

Runoff Coefficient	=	0.21
Time of conc.	=	77.54 min
Time of conc.	=	1.29 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.86 hours

CUMBERLAND BEACH
FILE No 305820

Area #. 101 **Area =** 4.65 **ha**

Weighted Curve Number

Soil Series Symbol	Hydrologic Soil Group	Soil Texture	Land Use		Forest			Pasture			Impervious areas			Wetlands			Average CN
			Area (ha)	Percent	Area	%	CN	Area	%	CN	Area	%	CN	Area	%	CN	
Ans	AB	Sand Loam	4.65	100.0%	3.72	80.0%	48.0	0.93	20.0%	59.0	0.00	0.0%	98.0	0.00	0.0%	50.0	50.2
					Avg. =	80.0%	Avg. =	20.0%		Avg. =	0.0%		Avg. =	0.0%			
							Total Avg. =	100.0%									
	Total Area =		4.65														**Avg. = 50.2**

Time of Concentration
(Bransby-Williams Method)

-suggested to use when runoff coefficient is greater than or equal to 0.40

Path	=	Watercourse
Hmax (m)	=	222
Hmin (m)	=	219
L (m)	=	375
Slope	=	0.8%
Time of conc.	=	19.17 min
Time of conc.	=	0.32 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.21 hours

Initial Abstraction

Land Cover Values

Impervious	=	2 mm
Pervious		
Pasture		5 mm
Meadow		8 mm
Forest		10 mm
Wetlands		16 mm

IA = (Forest x 10mm)+(Pasture x 8mm)+(Impervious x 2mm)+(Wetlands x 16mm)

IA = 9.00 mm

Time of Concentration
(Airport Method)

-suggested to use when runoff coefficient is less than 0.40

Path	=	Watercourse
Hmax (m)	=	222.0
Hmin (m)	=	219.0
L (m)	=	375.0
Slope	=	0.8%

	Sand Loam
Pasture	0.10
Woodland	0.08
Impervious	0.90
Wetland	0.05

Runoff Coefficient	=	0.08
Time of conc.	=	69.09 min
Time of conc.	=	1.15 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.77 hours

CUMBERLAND BEACH
FILE No 305820

Area #. 102 **Area =** 1.17 **ha**

Weighted Curve Number

Soil Series Symbol	Hydrologic Soil Group	Soil Texture	Land Use		Forest			Pasture			Impervious areas			Wetlands			Average CN
			Area (ha)	Percent	Area	%	CN	Area	%	CN	Area	%	CN	Area	%	CN	
Ans	AB	Sand Loam	1.17	100.0%	0.59	50.0%	48.0	0.59	50.0%	59.0	0.00	0.0%	98.0	0.00	0.0%	50.0	53.5
				Avg. =	50.0%		Avg. =	50.0%		Avg. =	0.0%		Avg. =	0.0%			
							Total Avg. =	100.0%									
	Total Area =		1.17														**Avg. = 53.5**

Time of Concentration
(Bransby-Williams Method)

-suggested to use when runoff coefficient is greater than or equal to 0.40

Path	=	Watercourse
Hmax (m)	=	221.5
Hmin (m)	=	220
L (m)	=	170
Slope	=	0.9%
Time of conc.	=	9.78 min
Time of conc.	=	0.16 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.11 hours

Initial Abstraction

Land Cover Values

Impervious	=	2 mm
Pervious		
Pasture		7 mm
Meadow		8 mm
Forest		10 mm
Wetlands		16 mm

IA = (Forest x 10mm)+(Pasture x 8mm)+(Impervious x 2mm)+(Wetlands x 16mm)

IA = 8.50 mm

Time of Concentration
(Airport Method)

-suggested to use when runoff coefficient is less than 0.40

Path	=	Watercourse
Hmax (m)	=	221.5
Hmin (m)	=	220.0
L (m)	=	170.0
Slope	=	0.9%

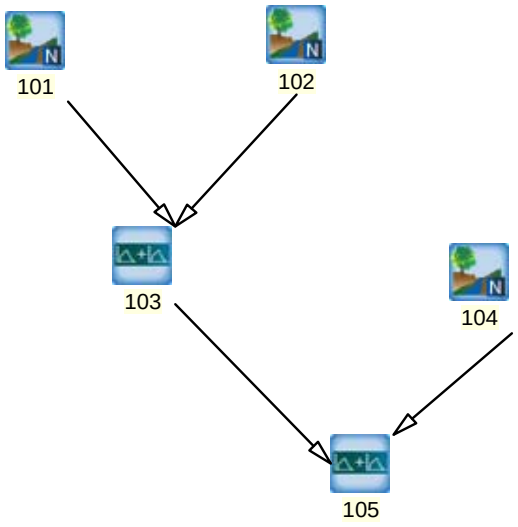
	Sand Loam
Pasture	0.10
Woodland	0.08
Impervious	0.90
Wetland	0.05

Runoff Coefficient	=	0.09
Time of conc.	=	44.76 min
Time of conc.	=	0.75 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.50 hours

C.C. Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie Ottawa

Project:	Bayou Park Subdivision
Date:	Oct-2017
File No.:	305820
Designed By:	HY
Checked By:	JA
Subject:	Hydrologic Model Schematic

Bayou Park Subdivision
Existing Hydrologic Model Schematic



Nashyd		Route Pipe		Duhyd	
Standhyd		Route Channel		Diverthyd	
Addhyd		Route Reservoir			

```
================================================================================================================


      V    V   I    SSSSS  U   U    A    L
      V    V   I    SS     U   U   A A   L
       V  V    I     SS    U   U  AAAAA  L
       V  V    I      SS   U   U  A   A  L
        VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO

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                  *****  S U M M A R Y   O U T P U T  *****


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  Output  filename: C:\Users\jash\Desktop\Project Files\305820 - Cumberland Beach (Van Amerlsvoort)\FSR - October 2017
\Revised materials rec
  Summary filename: C:\Users\jash\Desktop\Project Files\305820 - Cumberland Beach (Van Amerlsvoort)\FSR - October 2017
\Revised materials rec


DATE: 10/17/2017                          TIME: 3:01:34 PM

USER:


COMMENTS: _____________________________________________________


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

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM                 6.0
      [ Ptot= 24.97 mm ]
      fname : C:\Users\jash\Desktop\Project Files\305820 - Cumberland Beach (Van Amerlsvoort)\FSR - October 2017\R
      remark: 25 mm 4-hr Chicago storm
*
  **  CALIB NASHYD       0104  1  5.0   33.90     .10  3.00   2.37  .09    .000
      [CN=65.2         ]
      [ N = 3.0:Tp  .86]
*
  **  CALIB NASHYD       0101  1  5.0    4.65     .01  3.00    .95  .04    .000
      [CN=50.2         ]
      [ N = 3.0:Tp  .77]
*
  **  CALIB NASHYD       0102  1  5.0    1.17     .00  2.58   1.14  .05    .000
      [CN=53.5         ]
      [ N = 3.0:Tp  .50]
*
      ADD [0101 + 0102]  0103  3  5.0    5.82     .01  2.83    .99  n/a    .000
*
      ADD [0104 + 0103]  0105  3  5.0   39.72     .11  3.00   2.17  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   2 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM                12.0
      [ Ptot= 33.30 mm ]
      fname : C:\Users\jash\Desktop\Project Files\305820 - Cumberland Beach (Van Amerlsvoort)\FSR - October 2017\R
      remark: * Orillia Chicago 2 Year, 4 Hour Storm
*
  **  CALIB NASHYD       0104  1  5.0   33.90     .21  3.00   4.63  .14    .000
      [CN=65.2         ]
      [ N = 3.0:Tp  .86]
*
  **  CALIB NASHYD       0101  1  5.0    4.65     .01  3.00   2.14  .06    .000
      [CN=50.2         ]
      [ N = 3.0:Tp  .77]
*
  **  CALIB NASHYD       0102  1  5.0    1.17     .01  2.58   2.50  .08    .000
      [CN=53.5         ]
      [ N = 3.0:Tp  .50]
*
      ADD [0101 + 0102]  0103  3  5.0    5.82     .02  2.83   2.21  n/a    .000
*
      ADD [0104 + 0103]  0105  3  5.0   39.72     .22  3.00   4.27  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   3 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM                12.0
      [ Ptot= 44.71 mm ]
      fname : C:\Users\jash\Desktop\Project Files\305820 - Cumberland Beach (Van Amerlsvoort)\FSR - October 2017\R
      remark: * Orillia Chicago 5 Year, 4 Hour Storm
*
  **  CALIB NASHYD       0104  1  5.0   33.90     .39  3.00   8.67  .19    .000
      [CN=65.2         ]
      [ N = 3.0:Tp  .86]
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  **  CALIB NASHYD       0101  1  5.0    4.65     .03  2.92   4.43  .10    .000
      [CN=50.2         ]
      [ N = 3.0:Tp  .77]
*
  **  CALIB NASHYD       0102  1  5.0    1.17     .01  2.58   5.10  .11    .000
      [CN=53.5         ]
      [ N = 3.0:Tp  .50]
*
      ADD [0101 + 0102]  0103  3  5.0    5.82     .04  2.83   4.57  n/a    .000
*
      ADD [0104 + 0103]  0105  3  5.0   39.72     .43  3.00   8.07  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   4 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM                12.0
      [ Ptot= 63.42 mm ]
      fname : C:\Users\jash\Desktop\Project Files\305820 - Cumberland Beach (Van Amerlsvoort)\FSR - October 2017\R
      remark: *Orillia Chicago 25 Year, 4 Hour Storm
*
  **  CALIB NASHYD       0104  1  5.0   33.90     .77  3.00  17.17  .27    .000
      [CN=65.2         ]
      [ N = 3.0:Tp  .86]
*
  **  CALIB NASHYD       0101  1  5.0    4.65     .06  2.92   9.67  .15    .000
      [CN=50.2         ]
      [ N = 3.0:Tp  .77]
*
  **  CALIB NASHYD       0102  1  5.0    1.17     .02  2.58  10.94  .17    .000
      [CN=53.5         ]
      [ N = 3.0:Tp  .50]
*
      ADD [0101 + 0102]  0103  3  5.0    5.82     .09  2.75   9.92  n/a    .000
*
      ADD [0104 + 0103]  0105  3  5.0   39.72     .86  2.92  16.11  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   5 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM                12.0
      [ Ptot= 78.51 mm ]
      fname : C:\Users\jash\Desktop\Project Files\305820 - Cumberland Beach (Van Amerlsvoort)\FSR - October 2017\R
      remark: *Orillia Chicago 100 Year, 4 Hour Storm
*
  **  CALIB NASHYD       0104  1  5.0   33.90    1.15  2.92  25.37  .32    .000
      [CN=65.2         ]
      [ N = 3.0:Tp  .86]
*
  **  CALIB NASHYD       0101  1  5.0    4.65     .10  2.92  15.03  .19    .000
      [CN=50.2         ]
      [ N = 3.0:Tp  .77]
```

```
*
 **  CALIB NASHYD       0102  1  5.0    1.17     .04  2.50  16.85  .21    .000
     [CN=53.5         ]
     [ N = 3.0:Tp  .50]
*
     ADD [0101 + 0102]  0103  3  5.0    5.82     .13  2.75  15.40  n/a    .000
*
     ADD [0104 + 0103]  0105  3  5.0   39.72    1.28  2.92  23.90  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   6 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

     START @   .00 hrs
     ---------------------
     READ STORM                12.0
     [ Ptot=193.00 mm ]
     fname : C:\Users\jash\Desktop\Project Files\305820 - Cumberland Beach (Van Amerlsvoort)\FSR - October 2017\R
     remark: TIMMINS REGIONAL 12 HOUR DURATION STORM
*
 **  CALIB NASHYD       0104  1  5.0   33.90    1.87  7.58 108.55  .56    .000
     [CN=65.2         ]
     [ N = 3.0:Tp  .86]
*
 **  CALIB NASHYD       0101  1  5.0    4.65     .19  7.50  77.65  .40    .000
     [CN=50.2         ]
     [ N = 3.0:Tp  .77]
*
 **  CALIB NASHYD       0102  1  5.0    1.17     .06  7.17  83.99  .44    .000
     [CN=53.5         ]
     [ N = 3.0:Tp  .50]
*
     ADD [0101 + 0102]  0103  3  5.0    5.82     .24  7.42  78.93  n/a    .000
*
     ADD [0104 + 0103]  0105  3  5.0   39.72    2.11  7.58 104.21  n/a    .000
*
 FINISH

================================================================================================================
```

```
================================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO

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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 2.2.4\voin.dat
  Output  filename: C:\Users\jash\Desktop\Project Files\305820 - Cumberland Beach (Van Amerlsvoort)\FSR - October 2017
\Revised materials rec
  Summary filename: C:\Users\jash\Desktop\Project Files\305820 - Cumberland Beach (Van Amerlsvoort)\FSR - October 2017
\Revised materials rec


DATE: 10/17/2017                          TIME: 3:03:56 PM

USER:


COMMENTS: _____________________________________________________


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

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      MASS STORM                 5.0
      [ Ptot= 46.51 mm ]
*
  **  CALIB NASHYD       0102  1  5.0    1.17     .01 12.33   5.57  .12    .000
      [CN=53.5         ]
      [ N = 3.0:Tp  .50]
*
  **  CALIB NASHYD       0101  1  5.0    4.65     .02 12.67   4.85  .10    .000
      [CN=50.2         ]
      [ N = 3.0:Tp  .77]
*
  **  CALIB NASHYD       0104  1  5.0   33.90     .27 12.67   9.37  .20    .000
      [CN=65.2         ]
      [ N = 3.0:Tp  .86]
*
      ADD [0102 + 0101]  0103  3  5.0    5.82     .03 12.50   4.99  n/a    .000
*
      ADD [0103 + 0104]  0105  3  5.0   39.72     .29 12.67   8.73  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   2 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      MASS STORM                 5.0
      [ Ptot= 60.36 mm ]
*
  **  CALIB NASHYD       0102  1  5.0    1.17     .01 12.25   9.84  .16    .000
      [CN=53.5         ]
      [ N = 3.0:Tp  .50]
*
  **  CALIB NASHYD       0101  1  5.0    4.65     .04 12.58   8.68  .14    .000
      [CN=50.2         ]
      [ N = 3.0:Tp  .77]
*
  **  CALIB NASHYD       0104  1  5.0   33.90     .46 12.67  15.61  .26    .000
      [CN=65.2         ]
      [ N = 3.0:Tp  .86]
*
      ADD [0102 + 0101]  0103  3  5.0    5.82     .05 12.50   8.91  n/a    .000
*
      ADD [0103 + 0104]  0105  3  5.0   39.72     .50 12.67  14.63  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   3 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      MASS STORM                 5.0
      [ Ptot= 69.52 mm ]
*
  **  CALIB NASHYD       0102  1  5.0    1.17     .02 12.25  13.19  .19    .000
      [CN=53.5         ]
      [ N = 3.0:Tp  .50]
*
  **  CALIB NASHYD       0101  1  5.0    4.65     .05 12.58  11.70  .17    .000
      [CN=50.2         ]
      [ N = 3.0:Tp  .77]
*
  **  CALIB NASHYD       0104  1  5.0   33.90     .60 12.67  20.32  .29    .000
      [CN=65.2         ]
      [ N = 3.0:Tp  .86]
*
      ADD [0102 + 0101]  0103  3  5.0    5.82     .07 12.50  12.00  n/a    .000
*
      ADD [0103 + 0104]  0105  3  5.0   39.72     .66 12.67  19.10  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   4 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      MASS STORM                 5.0
      [ Ptot= 81.07 mm ]
*
  **  CALIB NASHYD       0102  1  5.0    1.17     .03 12.25  17.92  .22    .000
      [CN=53.5         ]
      [ N = 3.0:Tp  .50]
*
  **  CALIB NASHYD       0101  1  5.0    4.65     .07 12.58  16.00  .20    .000
      [CN=50.2         ]
      [ N = 3.0:Tp  .77]
*
  **  CALIB NASHYD       0104  1  5.0   33.90     .80 12.67  26.81  .33    .000
      [CN=65.2         ]
      [ N = 3.0:Tp  .86]
*
      ADD [0102 + 0101]  0103  3  5.0    5.82     .09 12.50  16.38  n/a    .000
*
      ADD [0103 + 0104]  0105  3  5.0   39.72     .89 12.67  25.28  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   5 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      MASS STORM                 5.0
      [ Ptot= 89.74 mm ]
*
  **  CALIB NASHYD       0102  1  5.0    1.17     .03 12.25  21.81  .24    .000
      [CN=53.5         ]
      [ N = 3.0:Tp  .50]
*
  **  CALIB NASHYD       0101  1  5.0    4.65     .08 12.58  19.55  .22    .000
      [CN=50.2         ]
      [ N = 3.0:Tp  .77]
*
  **  CALIB NASHYD       0104  1  5.0   33.90     .96 12.67  32.02  .36    .000
      [CN=65.2         ]
      [ N = 3.0:Tp  .86]
*
      ADD [0102 + 0101]  0103  3  5.0    5.82     .11 12.50  20.01  n/a    .000
*
      ADD [0103 + 0104]  0105  3  5.0   39.72    1.07 12.67  30.26  n/a    .000
*
  ****************************
```
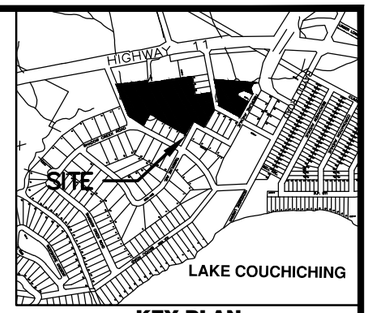
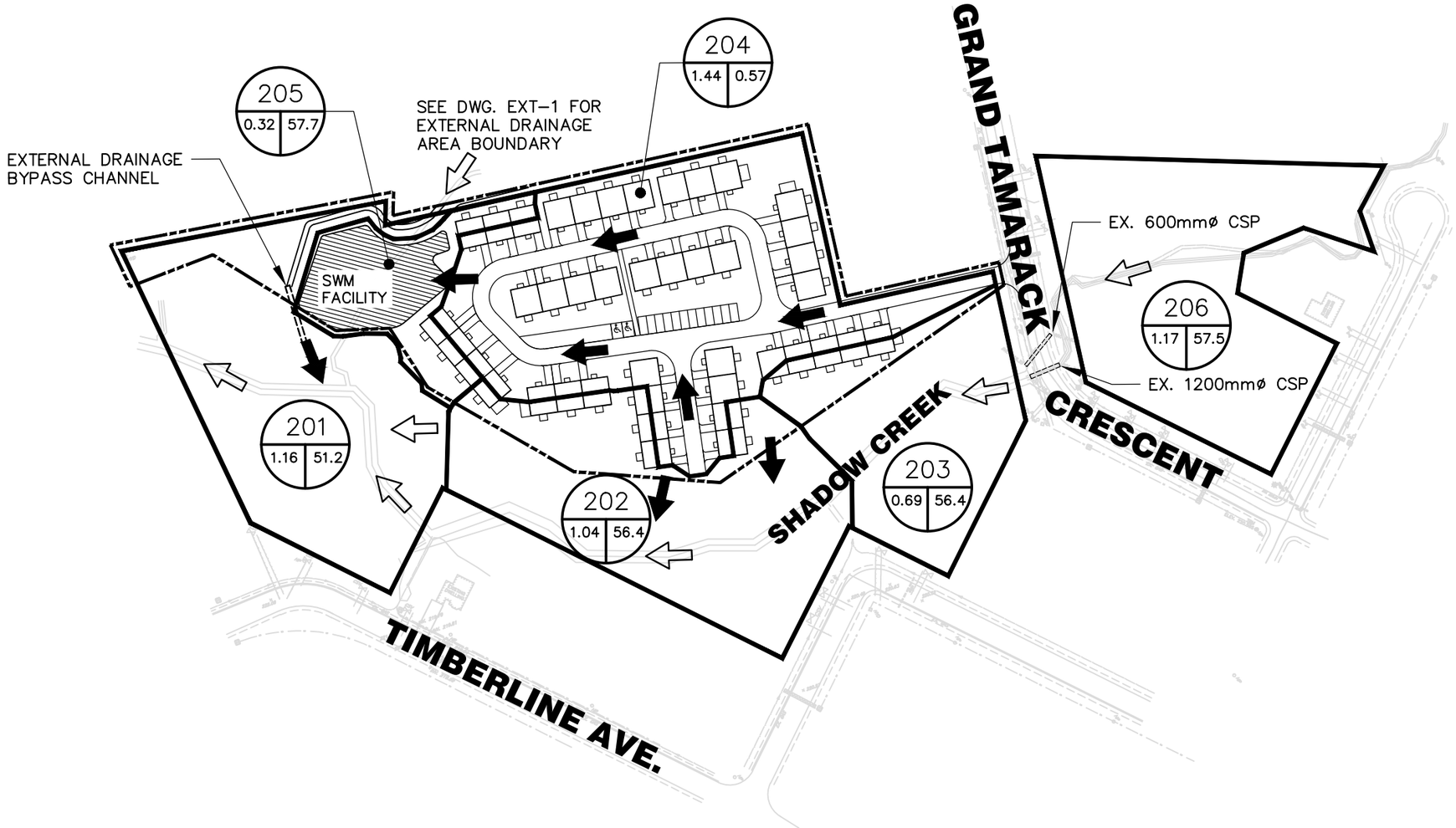

```
 ** SIMULATION NUMBER:   6 **
 ****************************

 W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

     START @   .00 hrs
     --------------------
     MASS STORM                   5.0
     [ Ptot= 98.31 mm ]
*
  **  CALIB NASHYD       0102  1  5.0    1.17     .04 12.25  25.92  .26    .000
     [CN=53.5         ]
     [ N = 3.0:Tp  .50]
*
  **  CALIB NASHYD       0101  1  5.0    4.65     .10 12.58  23.32  .24    .000
     [CN=50.2         ]
     [ N = 3.0:Tp  .77]
*
  **  CALIB NASHYD       0104  1  5.0   33.90    1.13 12.67  37.44  .38    .000
     [CN=65.2         ]
     [ N = 3.0:Tp  .86]
*
     ADD [0102 + 0101]  0103  3  5.0    5.82     .13 12.50  23.85  n/a    .000
*
     ADD [0103 + 0104]  0105  3  5.0   39.72    1.25 12.67  35.44  n/a    .000
*
 FINISH

================================================================================================
```

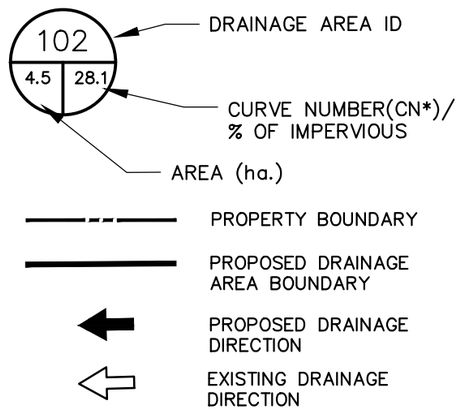
APPENDIX D:
POST-DEVELOPMENT HYDROLOGIC MODEL



KEY PLAN



LEGEND



CONTRACT DRAWINGS

CONTRACTOR MUST VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR SAME. ANY DISCREPANCIES MUST BE REPORTED TO THE ENGINEER BEFORE COMMENCING WORK. DRAWINGS ARE NOT TO BE SCALED.

C.C. Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie Ottawa

BAYOU PARK SUBDIVISION
TOWNSHIP OF SEVERN
PROPOSED DRAINAGE PLAN

DWG. No. **DP-2**

SCALE: 1:2000	DRAWN: HY	DATE: SEPT, 2017	JOB NO. 305820

CUMBERLAND BEACH
FILE No 305820

Area #. 201 **Area =** 1.16 **ha**

Weighted Curve Number

Soil Series Symbol	Hydrologic Soil Group	Soil Texture	Land Use		Forest			Lawn			Impervious areas			Wetlands			Average CN
			Area (ha)	Percent	Area	%	CN	Area	%	CN	Area	%	CN	Area	%	CN	
Ans	AB	Sand Loam	1.16	100.0%	0.95	82.0%	48.0	0.17	15.0%	59.0	0.03	3.0%	98.0	0.00	0.0%	50.0	51.2
					Avg. =	82.0%	Avg. =	15.0%		Avg. =	3.0%		Avg. =	0.0%			
							Total Avg. =	100.0%									
	Total Area =		1.16														**Avg. = 51.2**

Time of Concentration
(Bransby-Williams Method)

-suggested to use when runoff coefficient is greater than or equal to 0.40

Path	=	Watercourse
Hmax (m)	=	219.18
Hmin (m)	=	218.79
L (m)	=	145
Slope	=	0.3%
Time of conc.	=	10.59 min
Time of conc.	=	0.18 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.12 hours

Initial Abstraction

Land Cover Values

Impervious = 2 mm

Pervious

Lawns	5 mm
Meadow	8 mm
Forest	10 mm
Wetlands	16 mm

IA = (Forest x 10mm)+(Pasture x 8mm)+(Impervious x 2mm)+(Wetlands x 16mm)

IA = 9.01 mm

Time of Concentration
(Airport Method)

-suggested to use when runoff coefficient is less than 0.40

Path	=	Watercourse
Hmax (m)	=	219.2
Hmin (m)	=	218.8
L (m)	=	145.0
Slope	=	0.3%

	Sand Loam
Lawn	0.10
Woodland	0.08
Impervious	0.90
Wetland	0.05

Runoff Coefficient	=	0.11
Time of conc.	=	60.35 min
Time of conc.	=	1.01 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.67 hours

CUMBERLAND BEACH
FILE No 305820

Area #. 202 **Area =** 1.04 **ha**

Weighted Curve Number

Soil Series Symbol	Hydrologic Soil Group	Soil Texture	Land Use		Forest			Lawn			Impervious areas			Wetlands			Average CN
			Area (ha)	Percent	Area	%	CN	Area	%	CN	Area	%	CN	Area	%	CN	
Ans	AB	Sand Loam	1.04	100.0%	0.65	62.5%	48.0	0.28	26.5%	59.0	0.11	11.0%	98.0	0.00	0.0%	50.0	56.4
				Avg. =	62.5%	Avg. =		26.5%	Avg. =		11.0%	Avg. =		0.0%			
						Total Avg. =		100.0%									
	Total Area =		1.04														**Avg. = 56.4**

Time of Concentration
(Bransby-Williams Method)

-suggested to use when runoff coefficient is greater than or equal to 0.40

Path	=	Watercourse
Hmax (m)	=	219.36
Hmin (m)	=	219.18
L (m)	=	180
Slope	=	0.1%
Time of conc.	=	16.20 min
Time of conc.	=	0.27 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.18 hours

Initial Abstraction

Land Cover Values

Impervious = 2 mm

Pervious

Lawns	5 mm
Meadow	8 mm
Forest	10 mm
Wetlands	16 mm

IA = (Forest x 10mm)+(Pasture x 8mm)+(Impervious x 2mm)+(Wetlands x 16mm)

IA = 7.80 mm

Time of Concentration
(Airport Method)

-suggested to use when runoff coefficient is less than 0.40

Path	=	Watercourse
Hmax (m)	=	219.4
Hmin (m)	=	219.2
L (m)	=	180.0
Slope	=	0.1%

	Sand Loam
Lawn	0.10
Woodland	0.08
Impervious	0.90
Wetland	0.05

Runoff Coefficient	=	0.18
Time of conc.	=	87.12 min
Time of conc.	=	1.45 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.97 hours

CUMBERLAND BEACH
FILE No 305820

Area #. 203 **Area =** 0.69 **ha**

Weighted Curve Number

Soil Series Symbol	Hydrologic Soil Group	Soil Texture	Land Use		Forest			Lawn			Impervious areas			Wetlands			Average CN
			Area (ha)	Percent	Area	%	CN	Area	%	CN	Area	%	CN	Area	%	CN	
Ans	AB	Sand Loam	0.69	100.0%	0.44	64.0%	48.0	0.17	24.5%	59.0	0.08	11.5%	98.0	0.00	0.0%	50.0	56.4
					Avg. =	64.0%	Avg. =	24.5%		Avg. =	11.5%		Avg. =	0.0%			
							Total Avg. =	100.0%									
	Total Area =		0.69														**Avg. = 56.4**

Time of Concentration
(Bransby-Williams Method)

-suggested to use when runoff coefficient is greater than or equal to 0.40

Path	=	Watercourse
Hmax (m)	=	219.41
Hmin (m)	=	219.36
L (m)	=	84
Slope	=	0.1%
Time of conc.	=	8.74 min
Time of conc.	=	0.15 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.10 hours

Initial Abstraction

Land Cover Values

Impervious	=	2 mm
Pervious		
Lawns		5 mm
Meadow		8 mm
Forest		10 mm
Wetlands		16 mm

IA = (Forest x 10mm)+(Pasture x 8mm)+(Impervious x 2mm)+(Wetlands x 16mm)

IA = 7.86 mm

Time of Concentration
(Airport Method)

-suggested to use when runoff coefficient is less than 0.40

Path	=	Watercourse
Hmax (m)	=	219.4
Hmin (m)	=	219.4
L (m)	=	84.0
Slope	=	0.1%

Lawn	0.10
Woodland	0.08
Impervious	0.90
Wetland	0.05

Runoff Coefficient	=	0.18
Time of conc.	=	70.46 min
Time of conc.	=	1.17 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.78 hours

CUMBERLAND BEACH
FILE No 305820

Area #. 204 **Area =** 1.44 **ha**

Weighted Curve Number

Soil Series Symbol	Hydrologic Soil Group	Soil Texture	Land Use		Forest			Lawn			Impervious areas			Wetlands			Average CN
			Area (ha)	Percent	Area	%	CN	Area	%	CN	Area	%	CN	Area	%	CN	
Ans	AB	Sand Loam	1.44	100.0%	0.00	0.0%	48.0	0.62	43.0%	59.0	0.82	57.0%	98.0	0.00	0.0%	50.0	81.2
				Avg. =	0.0%		Avg. =	43.0%		Avg. =	57.0%		Avg. =	0.0%			
							Total Avg. =	100.0%									
	Total Area =		1.44													**Avg. =**	**81.2**

note: Impervious area based on road + parking area +walk way +Drive way +house on site plan drawing

Road	0.29	ha
parking lot	0.03	ha
Walk way	0.01	ha
house	0.4	ha
Drive way	0.09	ha
Total	0.82	ha

CUMBERLAND BEACH
FILE No 305820

Area #. 205 **Area =** 0.32 **ha**

Weighted Curve Number

Soil Series Symbol	Hydrologic Soil Group	Soil Texture	Land Use		Forest			Lawn			Impervious areas			Wetlands			Average CN
			Area (ha)	Percent	Area	%	CN	Area	%	CN	Area	%	CN	Area	%	CN	
Ans	AB	Sand Loam	0.32	100.0%	0.00	0.0%	48.0	0.12	38.0%	59.0	0.03	9.0%	98.0	0.17	53.0%	50.0	57.7
					Avg. =	0.0%	Avg. =	38.0%		Avg. =	9.0%		Avg. =	53.0%			
							Total Avg. =	100.0%									
	Total Area =		0.32														**Avg. = 57.7**

Time of Concentration
(Bransby-Williams Method)

-suggested to use when runoff coefficient is greater than or equal to 0.40

Path	=	Watercourse
Hmax (m)	=	220.85
Hmin (m)	=	220
L (m)	=	98
Slope	=	0.9%
Time of conc.	=	6.44 min
Time of conc.	=	0.11 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.07 hours

Initial Abstraction

Land Cover Values

Impervious = 2 mm

Pervious

Lawns	5 mm
Meadow	8 mm
Forest	10 mm
Wetlands	16 mm

IA = (Forest x 10mm)+(Pasture x 8mm)+(Impervious x 2mm)+(Wetlands x 16mm)

IA = 10.56 mm

Time of Concentration
(Airport Method)

-suggested to use when runoff coefficient is less than 0.40

Path	=	Watercourse
Hmax (m)	=	220.9
Hmin (m)	=	220.0
L (m)	=	98.0
Slope	=	0.9%

Lawn	0.10
Woodland	0.08
Impervious	0.90
Wetland	0.05

Runoff Coefficient	=	0.15
Time of conc.	=	32.30 min
Time of conc.	=	0.54 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.36 hours

CUMBERLAND BEACH
FILE No 305820

Area #. 206 **Area =** 1.17 **ha**

Weighted Curve Number

Soil Series Symbol	Hydrologic Soil Group	Soil Texture	Land Use Area (ha)	Land Use Percent	Forest Area	Forest %	Forest CN	Lawn Area	Lawn %	Lawn CN	Impervious areas Area	Impervious areas %	Impervious areas CN	Wetlands Area	Wetlands %	Wetlands CN	Average CN
Ans	AB	Sand Loam	1.17	100.0%	0.49	42.0%	48.0	0.59	50.0%	59.0	0.09	8.0%	98.0	0.00	0.0%	50.0	57.5
					Avg. =	42.0%		Avg. =	50.0%		Avg. =	8.0%		Avg. =	0.0%		
							Total Avg. =	100.0%									
	Total Area =		1.17														**Avg. = 57.5**

Time of Concentration
(Bransby-Williams Method)

-suggested to use when runoff coefficient is greater than or equal to 0.40

Path	=	Watercourse
Hmax (m)	=	221.5
Hmin (m)	=	220
L (m)	=	170
Slope	=	0.9%
Time of conc.	=	9.78 min
Time of conc.	=	0.16 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.11 hours

Initial Abstraction

Land Cover Values

Impervious = 2 mm

Pervious

Lawns	5 mm
Meadow	8 mm
Forest	10 mm
Wetlands	16 mm

IA = (Forest x 10mm)+(Pasture x 8mm)+(Impervious x 2mm)+(Wetlands x 16mm)

IA = 6.86 mm

Time of Concentration
(Airport Method)

-suggested to use when runoff coefficient is less than 0.40

Path	=	Watercourse
Hmax (m)	=	221.5
Hmin (m)	=	220.0
L (m)	=	170.0
Slope	=	0.9%

Lawn	0.10
Woodland	0.08
Impervious	0.90
Wetland	0.05

Runoff Coefficient	=	0.16
Time of conc.	=	41.85 min
Time of conc.	=	0.70 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.47 hours

C.C. Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie Ottawa

Project :	Bayou Park Subdivision
File No.	305820
Date:	Oct-17
Designed By:	HY
Checked By:	JA
Subject:	Bioretention Cell Stage-Volume Table

BIORETENTION CELL STAGE- VOLUME TABLE

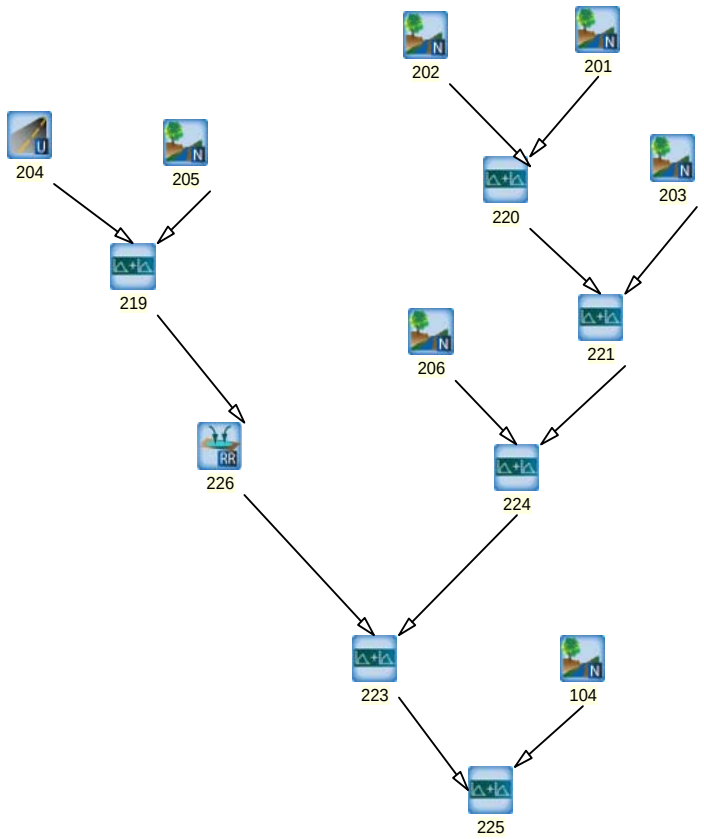
Elevation	Depth	Increasing Area	Accum Area	Volume	Accum. Dead Volume	Accum. Active Volume	Accum. Total
(m)	(m)	(m^2)	(m^2)	(m^3)	(m^3)	(m^3)	(m^3)
219.46	0.00	0.00	938.58	0.0	0.0	0.00	0.0
219.51	0.05	32.10	970.68	47.7	47.7	0.00	47.7
219.56	0.10	32.64	1003.32	49.3	97.1	0.00	97.1
219.61	0.15	33.18	1036.50	51.0	148.1	0.00	148.1
219.66	0.20	33.72	1070.22	52.7	200.7	0.00	200.7
219.71	0.25	34.26	1104.47	54.4	255.1	0.00	255.1
219.76	0.30	34.80	1139.27	56.1	255.1	56.1	311.2
219.81	0.35	35.34	1174.61	57.8	255.1	113.9	369.0
219.86	0.40	35.88	1210.49	59.6	255.1	173.6	428.7
219.91	0.45	36.42	1246.90	61.4	255.1	235.0	490.1
219.96	0.50	36.96	1283.86	63.3	255.1	298.3	553.4
220.01	0.55	37.50	1321.36	65.1	255.1	363.4	618.5
220.06	0.60	38.04	1359.39	67.0	255.1	430.4	685.5
220.11	0.65	38.58	1397.97	68.9	255.1	499.3	754.4
220.16	0.70	39.12	1437.08	70.9	255.1	570.2	825.3
220.21	0.75	39.65	1476.74	72.8	255.1	643.1	898.2
220.26	0.80	40.19	1516.93	74.8	255.1	717.9	973.0
220.31	0.85	40.73	1557.67	76.9	255.1	794.8	1049.9
220.36	0.90	41.27	1598.94	78.9	255.1	873.7	1128.8
220.41	0.95	41.81	1640.75	81.0	255.1	954.7	1209.8
220.46	1.00	42.35	1683.11	83.1	255.1	1037.8	1292.9
220.51	1.05	42.89	1726.00	85.2	255.1	1123.0	1378.1

Active storage volume required during 100- yr storm as determined by VO2 hydrologic model: 693 m^3

C.C. Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie Ottawa

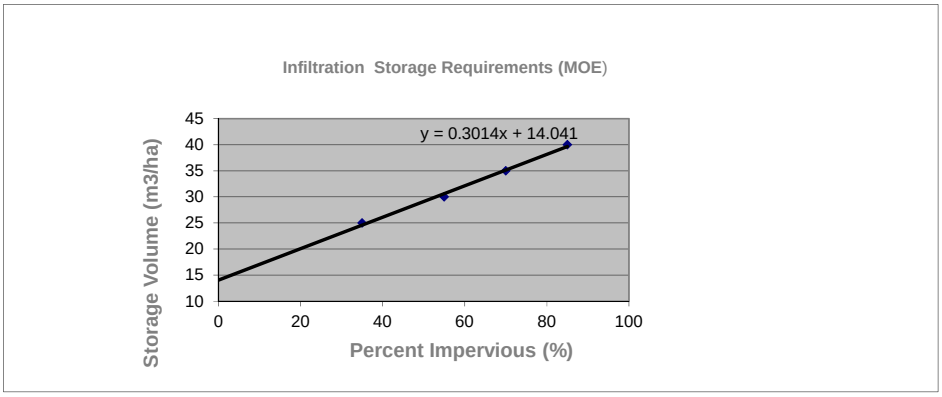
Project:	Bayou Park Subdivision
Date:	Oct-2017
File No.:	305820
Designed By:	HY
Checked By:	JA
Subject:	Hydrologic Model Schematic

Bayou Park Subdivision
Proposed Hydrologic Model Schematic



Nashyd		Route Pipe		Duhyd	
Standhyd		Route Channel		Diverthyd	
Addhyd		Route Reservoir			

C.C.Tatham & Associates Ltd. Consulting Engineers Collingwood Bracebridge Orillia Barrie	Project:	Cumberland Beach	Date:	Oct-17
	File No.:	305820	Designed By:	JA
	Subject:	Ext. Det. Cell Water Quality Calculations	Checked By:	JA



MOE Water Quality Storage Volumes

Table 3.1 Values

% imp	storage (m^3/ha)
35	25
55	30
70	35
85	40

Ext. Det. Cell Water Quality MOE Storage Calculation

Catchment imperviousness:	47%	
Storage volume:	28.1	m^3/ha
Contributing area:	1.76	ha
Required Water Quality Storage Volume	49.4	m^3
25 mm Storm Runoff Volume:	212.4	m^3
Water quality storage provided:	241.0	m^3

Bioretention Cell Drawdown Time

Avg. Bottom Area:	939.00	m^2
Maximum pondind depth:	0.25	m
Hydraulic Conductivity, k	0.0000001	cm/s
	0.000000001	m/s
Maximum drawdown time:	71293.3	hrs

(therefore a perforated subdrain is recommended in the bioretention cell soil media to promote infiltration and filtering of runoff to a positive outlet)

```
================================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO

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                    *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 2.2.4\voin.dat
  Output  filename: C:\Users\jash\Desktop\Project Files\305820 - Cumberland Beach (Van Amerlsvoort)\FSR - October 2017
\Revised SWM Materials
  Summary filename: C:\Users\jash\Desktop\Project Files\305820 - Cumberland Beach (Van Amerlsvoort)\FSR - October 2017
\Revised SWM Materials


DATE: 10/17/2017                          TIME: 4:19:35 PM

USER:


COMMENTS: _____________________________________________________


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

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM                6.0
      [ Ptot= 24.97 mm ]
      fname : C:\Users\jash\Desktop\Project Files\305820 - Cumberland Beach (Van Amerlsvoort)\FSR - October 2017\R
      remark: 25 mm 4-hr Chicago storm
*
  **  CALIB NASHYD       0104  1  5.0   33.90     .10  3.00   2.37  .09    .000
      [CN=65.2         ]
      [ N = 3.0:Tp  .86]
*
  **  CALIB NASHYD       0203  1  5.0     .69     .00  2.92   1.37  .05    .000
      [CN=56.4         ]
      [ N = 3.0:Tp  .78]
*
  **  CALIB NASHYD       0202  1  5.0    1.04     .00  3.17   1.38  .06    .000
      [CN=56.4         ]
      [ N = 3.0:Tp  .97]
*
  **  CALIB NASHYD       0201  1  5.0    1.16     .00  2.83    .99  .04    .000
      [CN=51.2         ]
      [ N = 3.0:Tp  .67]
*
  **  CALIB NASHYD       0206  1  5.0    1.17     .00  2.50   1.59  .06    .000
      [CN=57.5         ]
      [ N = 3.0:Tp  .47]
*
  *   CALIB STANDHYD     0204  1  5.0    1.44     .13  1.92  14.52  .58    .000
      [I%=57.0:S%= 2.00]
*
  *   CALIB NASHYD       0205  1  5.0     .32     .00  2.42   1.03  .04    .000
      [CN=57.7         ]
      [ N = 3.0:Tp  .36]
*
      ADD [0202 + 0201]  0220  3  5.0    2.20     .00  3.00   1.17  n/a    .000
*
      ADD [0204 + 0205]  0219  3  5.0    1.76     .13  1.92  12.07  n/a    .000
*
      ADD [0203 + 0220]  0221  3  5.0    2.89     .00  3.00   1.22  n/a    .000
*
      RESRVR [ 2 : 0219] 0218  1  5.0    1.76     .00  5.42    .00  n/a    .000
      {ST=   .02 ha.m }
*
      ADD [0221 + 0206]  0224  3  5.0    4.06     .01  2.75   1.32  n/a    .000
*
      ADD [0224 + 0218]  0223  3  5.0    5.82     .01  2.75    .92  n/a    .000
*
      ADD [0104 + 0223]  0225  3  5.0   39.72     .11  3.00   2.16  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   2 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM               12.0
      [ Ptot= 33.30 mm ]
      fname : C:\Users\jash\Desktop\Project Files\305820 - Cumberland Beach (Van Amerlsvoort)\FSR - October 2017\R
      remark: * Orillia Chicago 2 Year, 4 Hour Storm
*
  **  CALIB NASHYD       0104  1  5.0   33.90     .21  3.00   4.63  .14    .000
      [CN=65.2         ]
      [ N = 3.0:Tp  .86]
*
  **  CALIB NASHYD       0203  1  5.0     .69     .00  3.00   2.92  .09    .000
      [CN=56.4         ]
      [ N = 3.0:Tp  .78]
*
  **  CALIB NASHYD       0202  1  5.0    1.04     .00  3.17   2.93  .09    .000
      [CN=56.4         ]
      [ N = 3.0:Tp  .97]
*
  **  CALIB NASHYD       0201  1  5.0    1.16     .00  2.83   2.22  .07    .000
      [CN=51.2         ]
      [ N = 3.0:Tp  .67]
*
  **  CALIB NASHYD       0206  1  5.0    1.17     .01  2.50   3.25  .10    .000
      [CN=57.5         ]
      [ N = 3.0:Tp  .47]
*
  *   CALIB STANDHYD     0204  1  5.0    1.44     .15  2.00  20.08  .60    .000
      [I%=57.0:S%= 2.00]
*
  *   CALIB NASHYD       0205  1  5.0     .32     .00  2.42   2.47  .07    .000
      [CN=57.7         ]
      [ N = 3.0:Tp  .36]
*
      ADD [0202 + 0201]  0220  3  5.0    2.20     .01  3.00   2.55  n/a    .000
*
      ADD [0204 + 0205]  0219  3  5.0    1.76     .15  2.00  16.88  n/a    .000
*
      ADD [0203 + 0220]  0221  3  5.0    2.89     .01  3.00   2.64  n/a    .000
*
      RESRVR [ 2 : 0219] 0218  1  5.0    1.76     .00  4.08   4.31  n/a    .000
      {ST=   .03 ha.m }
*
      ADD [0221 + 0206]  0224  3  5.0    4.06     .02  2.75   2.82  n/a    .000
*
      ADD [0224 + 0218]  0223  3  5.0    5.82     .02  2.75   3.27  n/a    .000
*
      ADD [0104 + 0223]  0225  3  5.0   39.72     .22  3.00   4.43  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   3 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM               12.0
      [ Ptot= 44.71 mm ]
      fname : C:\Users\jash\Desktop\Project Files\305820 - Cumberland Beach (Van Amerlsvoort)\FSR - October 2017\R
      remark: * Orillia Chicago 5 Year, 4 Hour Storm
*
  **  CALIB NASHYD       0104  1  5.0   33.90     .39  3.00   8.67  .19    .000
      [CN=65.2         ]
      [ N = 3.0:Tp  .86]
*
  **  CALIB NASHYD       0203  1  5.0     .69     .01  2.92   5.82  .13    .000
      [CN=56.4         ]
      [ N = 3.0:Tp  .78]
*
  **  CALIB NASHYD       0202  1  5.0    1.04     .01  3.17   5.84  .13    .000
      [CN=56.4         ]
      [ N = 3.0:Tp  .97]
*
  **  CALIB NASHYD       0201  1  5.0    1.16     .01  2.83   4.59  .10    .000
      [CN=51.2         ]
      [ N = 3.0:Tp  .67]
```

```
*
  **  CALIB NASHYD       0206  1  5.0    1.17     .01  2.50   6.34  .14    .000
      [CN=57.5         ]
      [ N = 3.0:Tp  .47]
*
  *   CALIB STANDHYD     0204  1  5.0    1.44     .20  2.00  28.05  .63    .000
      [I%=57.0:S%= 2.00]
*
  *   CALIB NASHYD       0205  1  5.0     .32     .00  2.42   5.29  .12    .000
      [CN=57.7         ]
      [ N = 3.0:Tp  .36]
*
      ADD [0202 + 0201]  0220  3  5.0    2.20     .02  2.92   5.18  n/a    .000
*
      ADD [0204 + 0205]  0219  3  5.0    1.76     .20  2.00  23.91  n/a    .000
*
      ADD [0203 + 0220]  0221  3  5.0    2.89     .02  2.92   5.33  n/a    .000
*
      RESRVR [ 2 : 0219] 0218  1  5.0    1.76     .00  4.08  11.34  n/a    .000
      {ST=   .04 ha.m }
*
      ADD [0221 + 0206]  0224  3  5.0    4.06     .03  2.75   5.62  n/a    .000
*
      ADD [0224 + 0218]  0223  3  5.0    5.82     .04  2.75   7.35  n/a    .000
*
      ADD [0104 + 0223]  0225  3  5.0   39.72     .42  3.00   8.47  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   4 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM                12.0
      [ Ptot= 63.42 mm ]
      fname : C:\Users\jash\Desktop\Project Files\305820 - Cumberland Beach (Van Amerlsvoort)\FSR - October 2017\R
      remark: *Orillia Chicago 25 Year, 4 Hour Storm
*
  **  CALIB NASHYD       0104  1  5.0   33.90     .77  3.00  17.17  .27    .000
      [CN=65.2         ]
      [ N = 3.0:Tp  .86]
*
  **  CALIB NASHYD       0203  1  5.0     .69     .01  2.92  12.25  .19    .000
      [CN=56.4         ]
      [ N = 3.0:Tp  .78]
*
  **  CALIB NASHYD       0202  1  5.0    1.04     .02  3.17  12.28  .19    .000
      [CN=56.4         ]
      [ N = 3.0:Tp  .97]
*
  **  CALIB NASHYD       0201  1  5.0    1.16     .02  2.75   9.99  .16    .000
      [CN=51.2         ]
      [ N = 3.0:Tp  .67]
*
  **  CALIB NASHYD       0206  1  5.0    1.17     .03  2.50  13.08  .21    .000
      [CN=57.5         ]
      [ N = 3.0:Tp  .47]
*
  *   CALIB STANDHYD     0204  1  5.0    1.44     .29  2.00  41.82  .66    .000
      [I%=57.0:S%= 2.00]
*
  *   CALIB NASHYD       0205  1  5.0     .32     .01  2.42  11.68  .18    .000
      [CN=57.7         ]
      [ N = 3.0:Tp  .36]
*
      ADD [0202 + 0201]  0220  3  5.0    2.20     .03  2.92  11.07  n/a    .000
*
      ADD [0204 + 0205]  0219  3  5.0    1.76     .29  2.00  36.34  n/a    .000
*
      ADD [0203 + 0220]  0221  3  5.0    2.89     .04  2.92  11.35  n/a    .000
*
      RESRVR [ 2 : 0219] 0218  1  5.0    1.76     .01  3.75  23.77  n/a    .000
      {ST=   .05 ha.m }
*
      ADD [0221 + 0206]  0224  3  5.0    4.06     .07  2.67  11.85  n/a    .000
*
      ADD [0224 + 0218]  0223  3  5.0    5.82     .08  2.75  15.46  n/a    .000
*
      ADD [0104 + 0223]  0225  3  5.0   39.72     .85  2.92  16.92  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   5 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM                12.0
      [ Ptot= 78.51 mm ]
      fname : C:\Users\jash\Desktop\Project Files\305820 - Cumberland Beach (Van Amerlsvoort)\FSR - October 2017\R
      remark: *Orillia Chicago 100 Year, 4 Hour Storm
*
  **  CALIB NASHYD       0104  1  5.0   33.90    1.15  2.92  25.37  .32    .000
      [CN=65.2         ]
      [ N = 3.0:Tp  .86]
*
  **  CALIB NASHYD       0203  1  5.0     .69     .02  2.92  18.69  .24    .000
      [CN=56.4         ]
      [ N = 3.0:Tp  .78]
*
  **  CALIB NASHYD       0202  1  5.0    1.04     .02  3.08  18.72  .24    .000
      [CN=56.4         ]
      [ N = 3.0:Tp  .97]
*
  **  CALIB NASHYD       0201  1  5.0    1.16     .03  2.75  15.50  .20    .000
      [CN=51.2         ]
      [ N = 3.0:Tp  .67]
*
  **  CALIB NASHYD       0206  1  5.0    1.17     .05  2.50  19.77  .25    .000
      [CN=57.5         ]
      [ N = 3.0:Tp  .47]
*
  *   CALIB STANDHYD     0204  1  5.0    1.44     .36  2.00  53.47  .68    .000
      [I%=57.0:S%= 2.00]
*
  *   CALIB NASHYD       0205  1  5.0     .32     .01  2.33  18.16  .23    .000
      [CN=57.7         ]
      [ N = 3.0:Tp  .36]
*
      ADD [0202 + 0201]  0220  3  5.0    2.20     .05  2.92  17.02  n/a    .000
*
      ADD [0204 + 0205]  0219  3  5.0    1.76     .37  2.00  47.05  n/a    .000
*
      ADD [0203 + 0220]  0221  3  5.0    2.89     .07  2.92  17.42  n/a    .000
*
      RESRVR [ 2 : 0219] 0218  1  5.0    1.76     .02  3.33  34.48  n/a    .000
      {ST=   .07 ha.m }
*
      ADD [0221 + 0206]  0224  3  5.0    4.06     .11  2.67  18.10  n/a    .000
*
      ADD [0224 + 0218]  0223  3  5.0    5.82     .13  2.75  23.05  n/a    .000
*
      ADD [0104 + 0223]  0225  3  5.0   39.72    1.28  2.92  25.03  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   6 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      READ STORM                12.0
      [ Ptot=193.00 mm ]
      fname : C:\Users\jash\Desktop\Project Files\305820 - Cumberland Beach (Van Amerlsvoort)\FSR - October 2017\R
      remark: TIMMINS REGIONAL 12 HOUR DURATION STORM
*
  **  CALIB NASHYD       0104  1  5.0   33.90    1.87  7.58 108.55  .56    .000
      [CN=65.2         ]
      [ N = 3.0:Tp  .86]
*
  **  CALIB NASHYD       0203  1  5.0     .69     .03  7.50  89.85  .47    .000
      [CN=56.4         ]
      [ N = 3.0:Tp  .78]
*
  **  CALIB NASHYD       0202  1  5.0    1.04     .04  7.83  89.89  .47    .000
      [CN=56.4         ]
      [ N = 3.0:Tp  .97]
*
  **  CALIB NASHYD       0201  1  5.0    1.16     .05  7.42  79.45  .41    .000
      [CN=51.2         ]
      [ N = 3.0:Tp  .67]
*
  **  CALIB NASHYD       0206  1  5.0    1.17     .07  7.17  92.63  .48    .000
      [CN=57.5         ]
      [ N = 3.0:Tp  .47]
*
  *   CALIB STANDHYD     0204  1  5.0    1.44     .14  7.00 151.13  .78    .000
      [I%=57.0:S%= 2.00]
*
  *   CALIB NASHYD       0205  1  5.0     .32     .02  7.08  90.27  .47    .000
      [CN=57.7         ]
```

```
     [ N = 3.0:Tp  .36]
*
      ADD [0202 + 0201]  0220  3  5.0    2.20     .09  7.50  84.39  n/a    .000
*
      ADD [0204 + 0205]  0219  3  5.0    1.76     .16  7.00 140.06  n/a    .000
*
      ADD [0203 + 0220]  0221  3  5.0    2.89     .13  7.50  85.69  n/a    .000
*
      RESRVR [ 2 : 0219] 0218  1  5.0    1.76     .06  9.50 127.49  n/a    .000
      {ST=   .13 ha.m }
*
      ADD [0221 + 0206]  0224  3  5.0    4.06     .19  7.33  87.69  n/a    .000
*
      ADD [0224 + 0218]  0223  3  5.0    5.82     .24  7.33  99.73  n/a    .000
*
      ADD [0104 + 0223]  0225  3  5.0   39.72    2.10  7.58 107.25  n/a    .000
*
 FINISH

================================================================================================================
```

```
================================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO

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                    *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 2.2.4\voin.dat
  Output  filename: C:\Users\jash\Desktop\Project Files\305820 - Cumberland Beach (Van Amerlsvoort)\FSR - October 2017
\Revised SWM Materials
  Summary filename: C:\Users\jash\Desktop\Project Files\305820 - Cumberland Beach (Van Amerlsvoort)\FSR - October 2017
\Revised SWM Materials


DATE: 10/17/2017                          TIME: 4:22:20 PM

USER:


COMMENTS: _____________________________________________________


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

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      MASS STORM                 5.0
      [ Ptot= 46.51 mm ]
*
  **  CALIB NASHYD       0205  1  5.0     .32     .00 12.08   5.80  .12    .000
      [CN=57.7         ]
      [ N = 3.0:Tp  .36]
*
  *   CALIB STANDHYD     0204  1  5.0    1.44     .12 11.75  29.30  .63    .000
      [I%=57.0:S%= 2.00]
*
  *   CALIB NASHYD       0206  1  5.0    1.17     .01 12.25   6.89  .15    .000
      [CN=57.5         ]
      [ N = 3.0:Tp  .47]
*
  *   CALIB NASHYD       0201  1  5.0    1.16     .01 12.50   5.02  .11    .000
      [CN=51.2         ]
      [ N = 3.0:Tp  .67]
*
  *   CALIB NASHYD       0202  1  5.0    1.04     .00 12.83   6.36  .14    .000
      [CN=56.4         ]
      [ N = 3.0:Tp  .97]
*
  *   CALIB NASHYD       0203  1  5.0     .69     .00 12.67   6.34  .14    .000
      [CN=56.4         ]
      [ N = 3.0:Tp  .78]
*
  *   CALIB NASHYD       0104  1  5.0   33.90     .27 12.67   9.37  .20    .000
      [CN=65.2         ]
      [ N = 3.0:Tp  .86]
*
      ADD [0205 + 0204]  0219  3  5.0    1.76     .13 11.75  25.03  n/a    .000
*
      ADD [0201 + 0202]  0220  3  5.0    2.20     .01 12.67   5.65  n/a    .000
*
      ADD [0220 + 0203]  0221  3  5.0    2.89     .01 12.67   5.82  n/a    .000
*
      RESRVR [ 2 : 0219] 0226  1  5.0    1.76     .00 15.92  12.46  n/a    .000
      {ST=   .03 ha.m }
*
      ADD [0206 + 0221]  0224  3  5.0    4.06     .02 12.42   6.13  n/a    .000
*
      ADD [0226 + 0224]  0223  3  5.0    5.82     .03 12.50   8.04  n/a    .000
*
      ADD [0223 + 0104]  0225  3  5.0   39.72     .29 12.67   9.18  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   2 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      MASS STORM                 5.0
      [ Ptot= 60.36 mm ]
*
  **  CALIB NASHYD       0205  1  5.0     .32     .01 12.08  10.48  .17    .000
      [CN=57.7         ]
      [ N = 3.0:Tp  .36]
*
  *   CALIB STANDHYD     0204  1  5.0    1.44     .17 11.75  39.46  .65    .000
      [I%=57.0:S%= 2.00]
*
  *   CALIB NASHYD       0206  1  5.0    1.17     .02 12.25  11.82  .20    .000
      [CN=57.5         ]
      [ N = 3.0:Tp  .47]
*
  *   CALIB NASHYD       0201  1  5.0    1.16     .01 12.50   8.97  .15    .000
      [CN=51.2         ]
      [ N = 3.0:Tp  .67]
*
  *   CALIB NASHYD       0202  1  5.0    1.04     .01 12.83  11.07  .18    .000
      [CN=56.4         ]
      [ N = 3.0:Tp  .97]
*
  *   CALIB NASHYD       0203  1  5.0     .69     .01 12.58  11.05  .18    .000
      [CN=56.4         ]
      [ N = 3.0:Tp  .78]
*
  *   CALIB NASHYD       0104  1  5.0   33.90     .46 12.67  15.61  .26    .000
      [CN=65.2         ]
      [ N = 3.0:Tp  .86]
*
      ADD [0205 + 0204]  0219  3  5.0    1.76     .17 11.75  34.19  n/a    .000
*
      ADD [0201 + 0202]  0220  3  5.0    2.20     .02 12.58   9.96  n/a    .000
*
      ADD [0220 + 0203]  0221  3  5.0    2.89     .03 12.58  10.22  n/a    .000
*
      RESRVR [ 2 : 0219] 0226  1  5.0    1.76     .01 13.92  21.62  n/a    .000
      {ST=   .04 ha.m }
*
      ADD [0206 + 0221]  0224  3  5.0    4.06     .04 12.42  10.68  n/a    .000
*
      ADD [0226 + 0224]  0223  3  5.0    5.82     .05 12.42  13.99  n/a    .000
*
      ADD [0223 + 0104]  0225  3  5.0   39.72     .50 12.67  15.37  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   3 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      MASS STORM                 5.0
      [ Ptot= 69.52 mm ]
*
  **  CALIB NASHYD       0205  1  5.0     .32     .01 12.08  14.14  .20    .000
      [CN=57.7         ]
      [ N = 3.0:Tp  .36]
*
  *   CALIB STANDHYD     0204  1  5.0    1.44     .19 11.75  46.42  .67    .000
      [I%=57.0:S%= 2.00]
*
  *   CALIB NASHYD       0206  1  5.0    1.17     .02 12.25  15.63  .23    .000
      [CN=57.5         ]
      [ N = 3.0:Tp  .47]
*
  *   CALIB NASHYD       0201  1  5.0    1.16     .01 12.50  12.08  .17    .000
      [CN=51.2         ]
      [ N = 3.0:Tp  .67]
*
  *   CALIB NASHYD       0202  1  5.0    1.04     .01 12.83  14.73  .21    .000
      [CN=56.4         ]
      [ N = 3.0:Tp  .97]
*
  *   CALIB NASHYD       0203  1  5.0     .69     .01 12.58  14.70  .21    .000
      [CN=56.4         ]
```
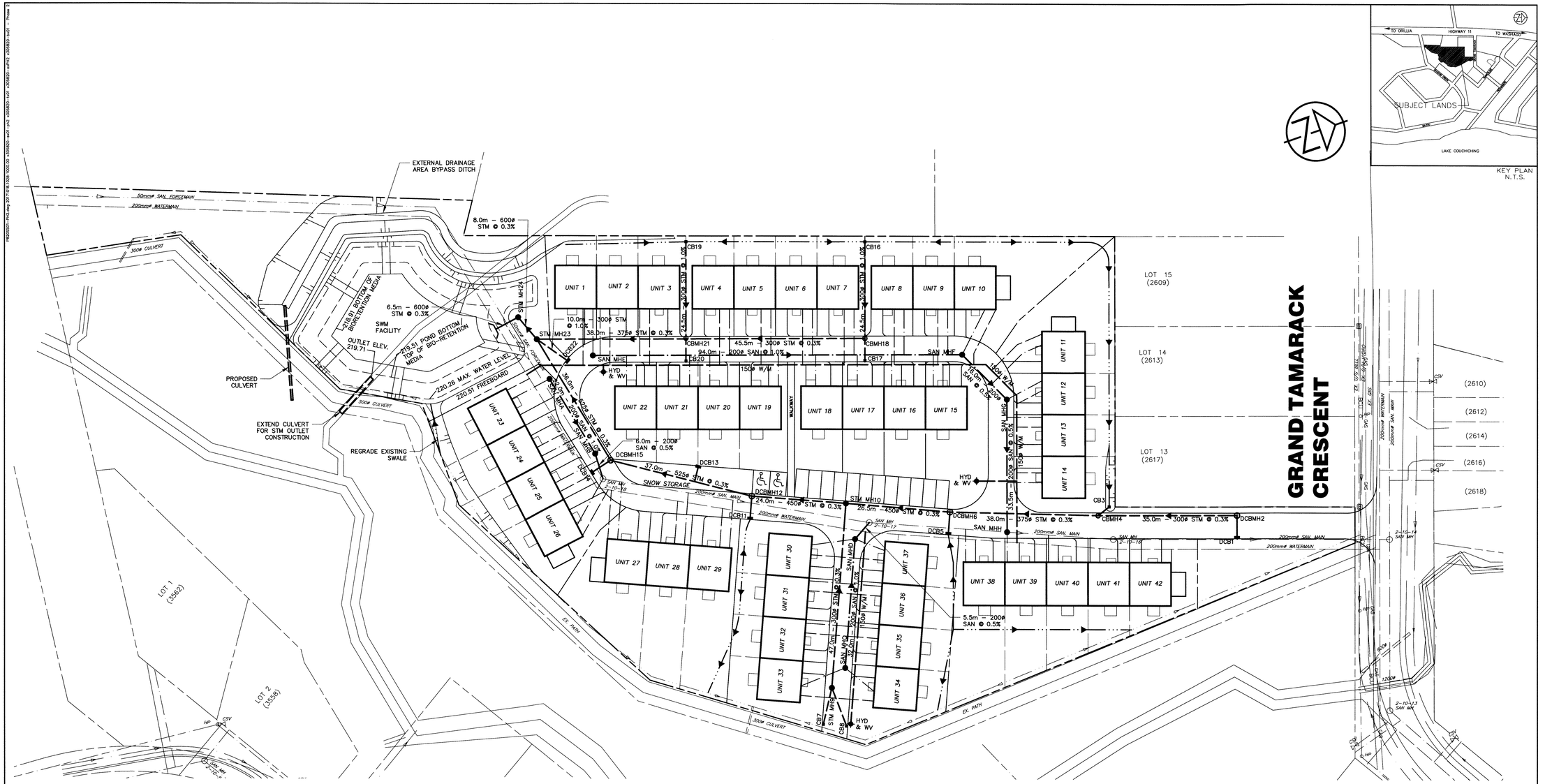

```
     [ N = 3.0:Tp  .78]
*
  *   CALIB NASHYD       0104  1  5.0   33.90     .60 12.67  20.32  .29    .000
      [CN=65.2         ]
      [ N = 3.0:Tp  .86]
*
      ADD [0205 + 0204]  0219  3  5.0    1.76     .20 11.75  40.55  n/a    .000
*
      ADD [0201 + 0202]  0220  3  5.0    2.20     .03 12.58  13.33  n/a    .000
*
      ADD [0220 + 0203]  0221  3  5.0    2.89     .03 12.58  13.66  n/a    .000
*
      RESRVR [ 2 : 0219] 0226  1  5.0    1.76     .01 13.58  27.99  n/a    .000
      {ST=   .05 ha.m }
*
      ADD [0206 + 0221]  0224  3  5.0    4.06     .06 12.42  14.23  n/a    .000
*
      ADD [0226 + 0224]  0223  3  5.0    5.82     .06 12.42  18.39  n/a    .000
*
      ADD [0223 + 0104]  0225  3  5.0   39.72     .66 12.67  20.04  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   4 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      MASS STORM                  5.0
      [ Ptot= 81.07 mm ]
*
  **  CALIB NASHYD       0205  1  5.0     .32     .01 12.08  19.32  .24    .000
      [CN=57.7         ]
      [ N = 3.0:Tp  .36]
*
  *   CALIB STANDHYD     0204  1  5.0    1.44     .23 11.75  55.42  .68    .000
      [I%=57.0:S%= 2.00]
*
  *   CALIB NASHYD       0206  1  5.0    1.17     .03 12.25  20.96  .26    .000
      [CN=57.5         ]
      [ N = 3.0:Tp  .47]
*
  *   CALIB NASHYD       0201  1  5.0    1.16     .02 12.50  16.50  .20    .000
      [CN=51.2         ]
      [ N = 3.0:Tp  .67]
*
  *   CALIB NASHYD       0202  1  5.0    1.04     .02 12.83  19.87  .25    .000
      [CN=56.4         ]
      [ N = 3.0:Tp  .97]
*
  *   CALIB NASHYD       0203  1  5.0     .69     .01 12.58  19.84  .25    .000
      [CN=56.4         ]
      [ N = 3.0:Tp  .78]
*
  *   CALIB NASHYD       0104  1  5.0   33.90     .80 12.67  26.81  .33    .000
      [CN=65.2         ]
      [ N = 3.0:Tp  .86]
*
      ADD [0205 + 0204]  0219  3  5.0    1.76     .24 11.75  48.86  n/a    .000
*
      ADD [0201 + 0202]  0220  3  5.0    2.20     .03 12.58  18.09  n/a    .000
*
      ADD [0220 + 0203]  0221  3  5.0    2.89     .05 12.58  18.51  n/a    .000
*
      RESRVR [ 2 : 0219] 0226  1  5.0    1.76     .02 13.25  36.29  n/a    .000
      {ST=   .06 ha.m }
*
      ADD [0206 + 0221]  0224  3  5.0    4.06     .08 12.42  19.22  n/a    .000
*
      ADD [0226 + 0224]  0223  3  5.0    5.82     .09 12.42  24.38  n/a    .000
*
      ADD [0223 + 0104]  0225  3  5.0   39.72     .88 12.67  26.45  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   5 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      MASS STORM                  5.0
      [ Ptot= 89.74 mm ]
*
  **  CALIB NASHYD       0205  1  5.0     .32     .01 12.08  23.57  .26    .000
      [CN=57.7         ]
```

```
     [ N = 3.0:Tp  .36]
*
  *   CALIB STANDHYD     0204  1  5.0    1.44     .26 11.75  62.32  .70    .000
      [I%=57.0:S%= 2.00]
*
  *   CALIB NASHYD       0206  1  5.0    1.17     .04 12.25  25.31  .28    .000
      [CN=57.5         ]
      [ N = 3.0:Tp  .47]
*
  *   CALIB NASHYD       0201  1  5.0    1.16     .02 12.50  20.15  .22    .000
      [CN=51.2         ]
      [ N = 3.0:Tp  .67]
*
  *   CALIB NASHYD       0202  1  5.0    1.04     .02 12.83  24.08  .27    .000
      [CN=56.4         ]
      [ N = 3.0:Tp  .97]
*
  *   CALIB NASHYD       0203  1  5.0     .69     .02 12.58  24.05  .27    .000
      [CN=56.4         ]
      [ N = 3.0:Tp  .78]
*
  *   CALIB NASHYD       0104  1  5.0   33.90     .96 12.67  32.02  .36    .000
      [CN=65.2         ]
      [ N = 3.0:Tp  .86]
*
      ADD [0205 + 0204]  0219  3  5.0    1.76     .27 11.75  55.28  n/a    .000
*
      ADD [0201 + 0202]  0220  3  5.0    2.20     .04 12.58  22.01  n/a    .000
*
      ADD [0220 + 0203]  0221  3  5.0    2.89     .06 12.58  22.50  n/a    .000
*
      RESRVR [ 2 : 0219] 0226  1  5.0    1.76     .02 13.00  42.71  n/a    .000
      {ST=   .06 ha.m }
*
      ADD [0206 + 0221]  0224  3  5.0    4.06     .09 12.42  23.31  n/a    .000
*
      ADD [0226 + 0224]  0223  3  5.0    5.82     .11 12.42  29.17  n/a    .000
*
      ADD [0223 + 0104]  0225  3  5.0   39.72    1.06 12.67  31.61  n/a    .000
*
  ****************************
  ** SIMULATION NUMBER:   6 **
  ****************************

  W/E COMMAND             HYD ID   DT    AREA   Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha     cms   hrs     mm          cms

      START @   .00 hrs
      --------------------
      MASS STORM                  5.0
      [ Ptot= 98.31 mm ]
*
  **  CALIB NASHYD       0205  1  5.0     .32     .01 12.08  28.04  .29    .000
      [CN=57.7         ]
      [ N = 3.0:Tp  .36]
*
  *   CALIB STANDHYD     0204  1  5.0    1.44     .29 11.75  69.25  .71    .000
      [I%=57.0:S%= 2.00]
*
  *   CALIB NASHYD       0206  1  5.0    1.17     .05 12.25  29.87  .30    .000
      [CN=57.5         ]
      [ N = 3.0:Tp  .47]
*
  *   CALIB NASHYD       0201  1  5.0    1.16     .03 12.50  24.02  .24    .000
      [CN=51.2         ]
      [ N = 3.0:Tp  .67]
*
  *   CALIB NASHYD       0202  1  5.0    1.04     .02 12.83  28.50  .29    .000
      [CN=56.4         ]
      [ N = 3.0:Tp  .97]
*
  *   CALIB NASHYD       0203  1  5.0     .69     .02 12.58  28.47  .29    .000
      [CN=56.4         ]
      [ N = 3.0:Tp  .78]
*
  *   CALIB NASHYD       0104  1  5.0   33.90    1.13 12.67  37.44  .38    .000
      [CN=65.2         ]
      [ N = 3.0:Tp  .86]
*
      ADD [0205 + 0204]  0219  3  5.0    1.76     .30 11.75  61.76  n/a    .000
*
      ADD [0201 + 0202]  0220  3  5.0    2.20     .05 12.58  26.14  n/a    .000
*
      ADD [0220 + 0203]  0221  3  5.0    2.89     .07 12.58  26.69  n/a    .000
*
      RESRVR [ 2 : 0219] 0226  1  5.0    1.76     .02 12.92  49.19  n/a    .000
      {ST=   .07 ha.m }
*
      ADD [0206 + 0221]  0224  3  5.0    4.06     .11 12.42  27.61  n/a    .000
```

```
*
      ADD [0226 + 0224]  0223  3  5.0    5.82     .13 12.42  34.14  n/a    .000
*
      ADD [0223 + 0104]  0225  3  5.0   39.72    1.25 12.67  36.95  n/a    .000
*
 FINISH
 ================================================================================================
```



LEGEND

CONTRACT DRAWINGS

CONTRACTOR MUST VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR SAME. ANY DISCREPANCIES MUST BE REPORTED TO THE ENGINEER BEFORE COMMENCING WORK. DRAWINGS ARE NOT TO BE SCALED.

TBM INFORMATION

NAIL IN HP ON SOUTH SIDE OF GRAND TAMARACK CRESCENT AT INTERSECTION OF GRAND TAMARACK CRESCENT AND TIMBERLINE AVENUE. ELEVATION 220.595.

CONTRACT DRAWINGS

LEGAL SURVEY INFORMATION AND UNIT LAYOUT DIMENSIONS SHOWN ON THIS PLAN FROM SITE PLAN BY C.T. STRONGMAN SURVEYING LTD. O.L.S. DRAWING R-251, REVISION DATE JULY 5, 2017. INFORMATION MAY NOT BE FINAL AND IS NOT GUARANTEED.

NO.	REVISIONS	DATE	INITIAL

APPROVED

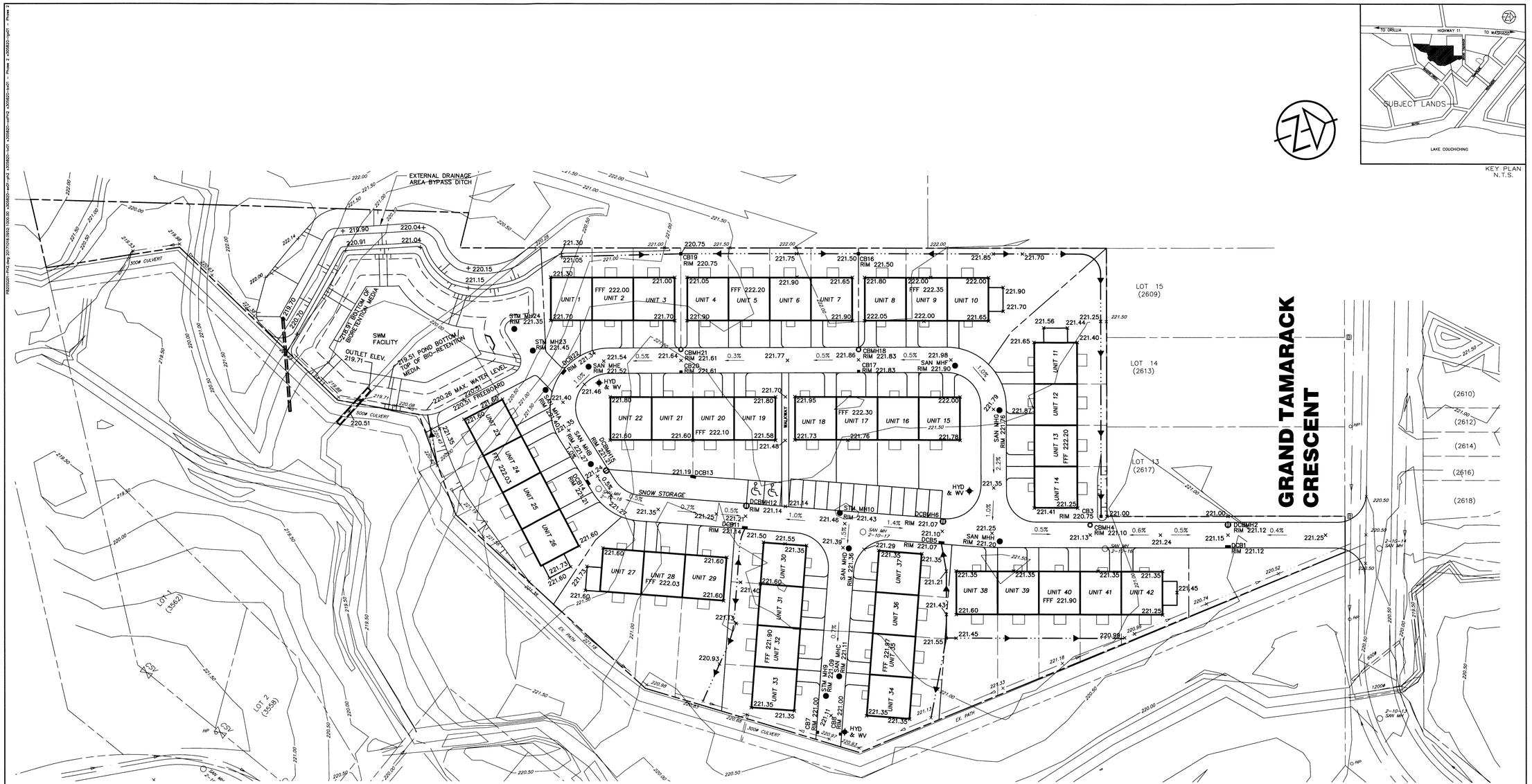
LICENSED PROFESSIONAL ENGINEER
J. A. NEMIS
100181826
Oct. 18, 2017
PROVINCE OF ONTARIO

SITE PLAN OF PART OF BLOCK C REGISTERED PLAN 1233 PHASE 2 TOWNSHIP OF SEVERN

PRELIMINARY SITE SERVICING PLAN

C.C. Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie Ottawa

SCALE: 1:500		JOB NO.	305820-7
DESIGN: JN	CHECKED: TCC	DWG.	SS-1
DRAWN: SMM	DATE: SEPT. 2017		



KEY PLAN
N.T.S.

LEGEND

CONTRACT DRAWINGS

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TBM INFORMATION

NAIL IN HP ON SOUTH SIDE OF GRAND TAMARACK CRESCENT AT INTERSECTION OF GRAND TAMARACK CRESCENT AND TIMBERLINE AVENUE. ELEVATION 220.595.

CONTRACT DRAWINGS

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NO.	REVISIONS	DATE	INITIAL

APPROVED

LICENSED PROFESSIONAL ENGINEER
J. A. NEMISZ
100181826
Oct. 18, 2017
PROVINCE OF ONTARIO

SITE PLAN OF PART OF BLOCK C REGISTERED PLAN 1233 PHASE 2 TOWNSHIP OF SEVERN

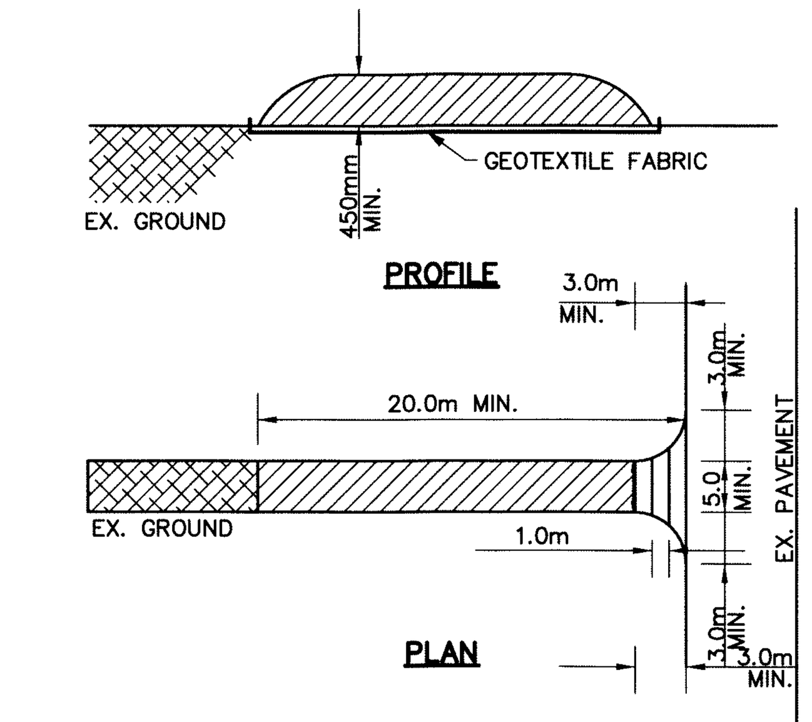
PRELIMINARY SITE GRADING PLAN

C.C. Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie Ottawa

SCALE: 1:500		JOB NO.	305820-7
DESIGN: JN	CHECKED: TCC	DWG.	SG-1
DRAWN: SMM	DATE: SEPT. 2017		

NOTES

A) POND SHALL BE CONSTRUCTED PRIOR TO ROAD CONSTRUCTION AND GRADING WORK ONSITE.
B) CONTRACTOR TO INSTALL AND MAINTAIN ROCK CHECK DAMS AND SILT FENCE AT LOCATIONS SHOWN OR AS DIRECTED BY THE ENGINEER.
C) CONSTRUCT AND MAINTAIN CONSTRUCTION ENTRANCES AS SHOWN.
D) CONTRACTOR TO ARRANGE PRE-CONSTRUCTION MEETING WITH ENGINEER AFTER PLACING ALL SILTATION CONTROL WORKS.
E) SILTATION CONTROL WORKS TO BE INSPECTED AFTER EACH RAINFALL AND REPAIRED AS REQUIRED.
F) ALL SILT FENCE MUST BE INSTALLED PRIOR TO CONSTRUCTION TO OPSD 219.110.
G) ALL SEDIMENT CONTROL WORKS MUST BE CLEANED AND MAINTAINED AFTER EACH MAJOR STORM EVENT OR AS DEEMED NECESSARY BY THE ENGINEER.
H) THE CONTRACTOR WILL INSPECT THE SEDIMENT AND EROSION CONTROL MEASURES WEEKLY AND AFTER EACH MAJOR STORM EVENT. THE CONTRACTOR WILL COMPLETE CORRECTIVE ACTIONS REQUIRED AS SOON AS DEFICIENCIES ARE NOTED. THE CONTRACTOR MAINTAINS ULTIMATE RESPONSIBILITY TO ENSURE PROPER SEDIMENT AND EROSION CONTROL MEASURES ARE IMPLEMENTED AND MAINTAINED. ALL DEFICIENCIES AND CORRECTIVE MEASURES WILL BE DOCUMENTED IN A WEEKLY INSPECTION REPORT PREPARED BY THE CONTRACTOR.
I) IF CONSTRUCTION IS INTERRUPTED AND/OR INACTIVITY EXCEEDS 30 DAYS, THEN STOCKPILED, STRIPPED OR EXPOSED AREAS MUST BE STABILIZED BY HYDROSEEDING AND ANY OTHER APPROPRIATE GEOTEXTILE MATERIAL, IF REQUIRED.
J) REMOVAL OF ALL SILT FENCES AND ROCK CHECK DAMS AT THE END OF CONSTRUCTION TO BE APPROVED BY THE ENGINEER AFTER THE SITE HAS STABILIZED.
K) ALL ROCK CHECK DAMS TO OPSD 219.210.
L) ALL CONSTRUCTION VEHICLES TO ACCESS THE SITE USING THE DESIGNATED CONSTRUCTION ENTRANCES.
M) TEMPORARY DRAINAGE SWALES SHOULD BE CONSTRUCTED WITHIN THE R.O.W.'S TO CONVEY STORMWATER.
N) STOCKPILES TO BE LOCATED AWAY FROM R.O.W.'S AND DRAINAGE COURSES.



STONE SIZE – THE STONE PAD SHALL BE A MIN. 450mm THICK. USE 50ømm STONE OR RECLAIMED CONCRETE EQUIVALENT FOR FIRST 10m FROM ADJACENT ROAD & 150mmø STONE FOR REMAINDER OF STONE PAD.

LENGTH – AS REQUIRED BUT NOT LESS THAN 20m.

WIDTH – 5m MIN. BUT NOT LESS THAN THE WIDTH AT POINTS WHERE INGRESS AND EGRESS OCCURS.

GEOTEXTILE FABRIC (TERRAFIX 270R OR EQUAL) WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING STONE.

SURFACE WATER – ALL SURFACE WATER FLOWING OR DIRECTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE.

MAINTENANCE – THE CONTRACTOR SHALL MAINTAIN THE ENTRANCE IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT-OF-WAY. THIS MAY REQUIRE PERIODIC DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHT-OF-WAY MUST BE REMOVED IMMEDIATELY BY THE CONTRACTOR. UPON OBSERVATION OF CONTINUOUS MUD TRACKING ONTO ADJACENT STREETS, THE STONE MAT IS TO BE FULLY REPLACED.

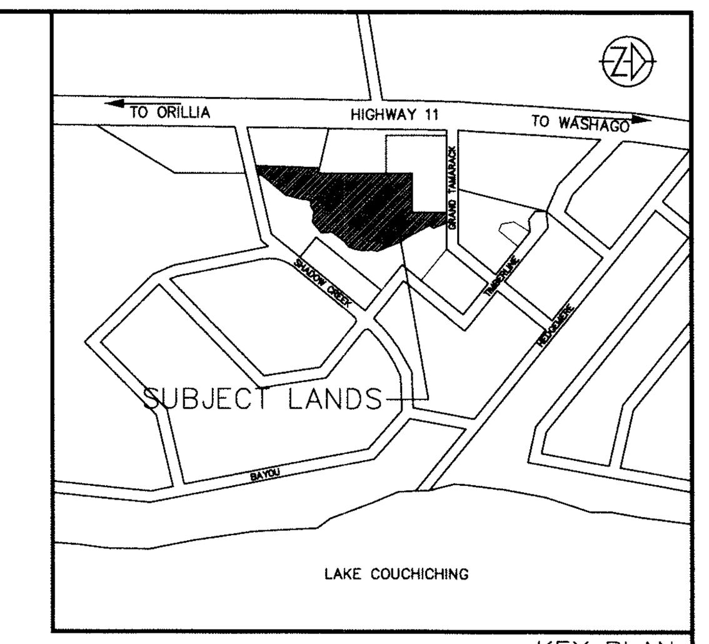
WASHING – WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.

INSPECTION AND REQUIRED MAINTENANCE AFTER EACH RAIN SHALL BE PROVIDED BY THE CONTRACTOR.

STONE MUD MAT DETAIL
SCALE: NTS

LEGEND

- SILT FENCE
- RCD – ROCK FLOW CHECK DAM PER OPSD 219.210
- STONE MUD MAT
- CATCHBASIN/CATCHBASIN MAINTENACE HOLE FILTER



KEY PLAN
N.T.S.

LEGEND

CONTRACT DRAWINGS

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TBM INFORMATION

NAIL IN HP ON SOUTH SIDE OF GRAND TAMARACK CRESCENT AT INTERSECTION OF GRAND TAMARACK CRESCENT AND TIMBERLINE AVENUE. ELEVATION 220.595.

CONTRACT DRAWINGS

LEGAL SURVEY INFORMATION AND UNIT LAYOUT DIMENSIONS SHOWN ON THIS PLAN FROM SITE PLAN BY C.T. STRONGMAN SURVEYING LTD. O.L.S. DRAWING R-251, REVISION DATE JULY 5, 2017. INFORMATION MAY NOT BE FINAL AND IS NOT GUARANTEED.

NO.	REVISIONS	DATE	INITIAL

APPROVED

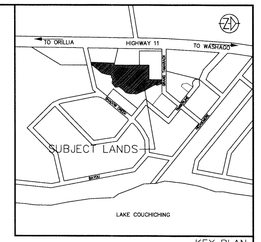
LICENSED PROFESSIONAL ENGINEER
J. A. NEMISZ
100181826
Oct. 18, 2017
305820-7
PROVINCE OF ONTARIO

SITE PLAN OF PART OF BLOCK C
REGISTERED PLAN 1233
PHASE 2
TOWNSHIP OF SEVERN

PRELIMINARY SILTATION AND EROSION CONTROL PLAN

C.C. Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie Ottawa

SCALE: 1:500		JOB NO. 305820-7
DESIGN: JN	CHECKED: TCC	DWG. SC-1
DRAWN: SMM	DATE: SEPT. 2017	



KEY PLAN
N.T.S.

GRAND TAMARACK CRESCENT

LOT 15 (2609)
LOT 14 (2613)
LOT 13 (2617)
LOT 1 (3562)
LOT 2 (3558)
(2610)
(2612)
(2614)
(2616)
(2618)

UNIT 10
UNIT 11
UNIT 12
UNIT 13
UNIT 14
UNIT 15
UNIT 16
UNIT 17
UNIT 18
UNIT 19
UNIT 20
UNIT 21
UNIT 22
UNIT 23
UNIT 24
UNIT 25
UNIT 26
UNIT 27
UNIT 28
UNIT 29
UNIT 30
UNIT 31
UNIT 32
UNIT 33
UNIT 34
UNIT 35
UNIT 36
UNIT 37
UNIT 38
UNIT 39
UNIT 40
UNIT 41
UNIT 42
UNIT 43

301 0.14 0.70
302 0.24 0.70
303 0.19 0.70
304 0.14 0.70
305 0.19 0.70
306 0.13 0.70
307 0.06 0.70
308 0.07 0.70
309 0.08 0.70
310 0.13 0.70
311 0.11 0.70

CB1
CB3
CB16
CB17
CB18
CB19
CB20
CBMH2
CBMH4
CBMH18
CBMH21
DCB1
DCB5
DCB11
DCB13
DCB14
DCBMH2
DCBMH6
DCBMH12
DCBMH15
STM MH10
STM MH22
STM MH23
STM MH24
WALKWAY
SNOW STORAGE
EX. PATH
HP
O HP
221.50
222.14
222.00

LEGEND

STORM DRAINAGE AREA BOUNDARY

301 0.14 0.70
DRAINAGE AREA LABEL
RUNOFF COEFFICIENT
AREA IN ha.

LEGEND

CONTRACT DRAWINGS

CONTRACTOR MUST VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR SAME. ANY DISCREPANCIES MUST BE REPORTED TO THE ENGINEER BEFORE COMMENCING WORK. DRAWINGS ARE NOT TO BE SCALED.

TBM INFORMATION

NAIL IN HP ON SOUTH SIDE OF GRAND TAMARACK CRESCENT AT INTERSECTION OF GRAND TAMARACK CRESCENT AND TIMBERLINE AVENUE. ELEVATION 220.595.

CONTRACT DRAWINGS

LEGAL SURVEY INFORMATION AND UNIT LAYOUT DIMENSIONS SHOWN ON THIS PLAN FROM SITE PLAN BY C.T. STRONGMAN SURVEYING LTD. O.L.S. DRAWING R-251, REVISION DATE JULY 5, 2017. INFORMATION MAY NOT BE FINAL AND IS NOT GUARANTEED.

NO.	REVISIONS	DATE	INITIAL

APPROVED

LICENSED PROFESSIONAL ENGINEER
I. A. NEMISZ
100181826
Oct. 16, 2017
PROVINCE OF ONTARIO

SITE PLAN OF PART OF BLOCK C
REGISTERED PLAN 1233
PHASE 2
TOWNSHIP OF SEVERN

PRELIMINARY STORM SEWER DRAINAGE PLAN

C.C. Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie Ottawa

SCALE: 1:500		JOB NO.	305820-7
DESIGN: JN	CHECKED: TCC	DWG.	**STM-1**
DRAWN: SMM	DATE: SEPT. 2017		

KEY PLAN
N.T.S.

LEGEND

- SANITARY DRAINAGE AREA BOUNDARY
- SANITARY SEWER/DIRECTION OF FLOW
- SANITARY SERVICE
- C — CATCHMENT AREA LABLE
- 0.28 | 10.8 — POPULATION *
- DRAINAGE AREA (ha.)

* 2.7 PEOPLE PER UNIT

LEGEND

CONTRACT DRAWINGS

CONTRACTOR MUST VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR SAME. ANY DISCREPANCIES MUST BE REPORTED TO THE ENGINEER BEFORE COMMENCING WORK. DRAWINGS ARE NOT TO BE SCALED.

TBM INFORMATION

NAIL IN HP ON SOUTH SIDE OF GRAND TAMARACK CRESCENT AT INTERSECTION OF GRAND TAMARACK CRESCENT AND TIMBERLINE AVENUE. ELEVATION 220.595.

CONTRACT DRAWINGS

LEGAL SURVEY INFORMATION AND UNIT LAYOUT DIMENSIONS SHOWN ON THIS PLAN FROM SITE PLAN BY C.T. STRONGMAN SURVEYING LTD. O.L.S. DRAWING R-251, REVISION DATE JULY 5, 2017. INFORMATION MAY NOT BE FINAL AND IS NOT GUARANTEED.

NO.	REVISIONS	DATE	INITIAL

APPROVED

LICENSED PROFESSIONAL ENGINEER
J. A. NEMISZ
100181826
Oct. 12, 2017
305820-7
PROVINCE OF ONTARIO

SITE PLAN OF PART OF BLOCK C REGISTERED PLAN 1233 PHASE 2 TOWNSHIP OF SEVERN

PRELIMINARY OVERALL SANITARY PLAN

C.C. Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie Ottawa

SCALE: 1:500		JOB NO.	305820-7
DESIGN: JN	CHECKED: TCC	DWG.	**SAN-1**
DRAWN: SMM	DATE: SEPT. 2017		

APPENDIX E:
SHADOW CREEK FLOOD ELEVATIONS

C.C. Tatham & Associates Ltd.
Consulting Engineers

Collingwood Bracebridge Orillia Barrie

50 Andrew Street South, Suite 100
Orillia, Ontario L3V 7T5
Tel: (705) 325-1753
Fax: (705) 325-7420
Email: info@cctatham.com
Web: www.cctatham.com

April 15, 2015

via Hand Delivery
CCTA File 305820

Andrew Fyfe
Director of Planning & Development
Township of Severn
1024 Hurlwood Lane
Orillia, ON L3V 6J3

Re: Shadow Creek Flood Study – Proposed Infill Lots
Part of Block B and C, Registered Plan 1233, Township of Severn

Dear Andrew:

C.C. Tatham & Associates Ltd. (CCTA) has been retained by 1522417 Ontario Ltd. to conduct a natural hazards assessment in support of a draft plan of subdivision that is bisected by Shadow Creek. Following an update to the Draft Plan and the acquisition of additional topographic information, we revisited our Shadow Creek Flood Study (December 22, 2008, revised October 22, 2014) to confirm the validity of our previous findings. Upon the request of the Ministry of Transportation (MTO) and the Township, we have prepared this report to verify any impacts to the flood elevations in the Shadow Creek watercourse which may result following the development of the ten proposed infill lots.

The proposed development is located in the community of Cumberland Beach, Township of Severn both north and south of Grand Tamarack Crescent, between Highway 11 and Timberline Avenue. The site is legally described as Block B and Part of Block C, Registered Plan 1233, Township of Severn.

The subject site is currently vacant and the proposal is for 9 residential lots and 1 townhouse block created by severance with additional lands owned by the applicant subject to future development opportunity. The purpose of our initial study was to determine the extent of natural hazards in the vicinity of the site. As a result of this study, minor lot grading measures had been proposed to protect the development from the potential flood hazard, while not causing an increase in flooding to upstream or downstream properties. The purpose of this study is to verify if the ten proposed infill lots will have an impact on flooding within the watercourse following their development.

Floodplain Assessment

Through previous discussions with the County of Simcoe and Township of Severn, a two zone floodplain concept was developed which would allow for grading within the flood fringe identified as the lands between the high water levels of the 100 year storm and the Regional (Timmins) storm. Application of the two zone concept is only allowable provided the following conditions are met:

- proposed property limits do not include areas within the 100 year storm floodplain;
- no grading works occur below the 100 year storm floodplain elevation and;
- proposed structures are flood proofed against the Regional storm event.

An assessment of the existing flood conditions in the area was completed through a detailed topographic survey and the development of a HEC-RAS hydraulic model to predict the floodplain characteristics in the vicinity of the site. Through the use of an OTTHYMO hydrologic model, 100 year and Regional flood flows under current and future post-development conditions were determined for the subject section of Shadow Creek. Flood flows from more frequent storm events were also considered to assess any impacts to water surface elevations at the northern property limit of the subject lands which corresponds with the MTO's Bayou Road overpass. The resulting flows are summarized in Table 1 below and copies of the OTTHYMO model outputs are included in Appendix A.

Table 1: Shadow Creek Flood Flow Rates

	25 mm Storm (m^3/s)	5 Year Storm (m^3/s)	25 Year Storm (m^3/s)	100 Year Storm (m^3/s)	Regional Storm (m^3/s)
Current	0.17	0.72	1.50	1.91	8.80
Post-Development	0.18	0.72	1.50	1.92	8.84

Since the completion of our previous study, the location and alignment of some cross-sections in the HEC-RAS model have been adjusted to provide a better illustration of the impacts of the 100 year and Regional floodplains on the proposed infill lots. The location of the cross-sections, 100 year flood limits and Regional flood limits are depicted on drawing No. FP-2. The high water elevations for all calculated storm events under current conditions are summarized in Table 2.

The 100 year and Regional floodplains resulting from the localized filling and increased flow rates following development of the infill lots are depicted on drawing No. FP-3. The high water elevations for all calculated storm events for the post-development condition are summarized in Table 3.

To ensure a conservative estimation of the flood limits and flood proofing elevations for the proposed structures, the flows calculated in the OTTHYMO model were applied in full at the upstream limit of the subject lands in the HEC-RAS model. Minimum elevations for openings on all of the proposed structures will include 0.3 m of freeboard above the Regional flood elevation calculated at the nearest upstream cross-section.

Table 2: Shadow Creek - Current Flood Elevations

Cross Section	Floodplain Elevation (m)				
	25 mm	5 Year	25 Year	100 Year	Regional
1000	220.07	220.20	220.37	220.50	221.10
891	219.89	220.07	220.33	220.48	221.07
860	219.82	220.02	220.32	220.47	221.07
836	219.69	220.00	220.32	220.47	221.07
821	219.67	219.98	220.29	220.44	221.07
807	219.64	219.89	220.06	220.12	220.48
792	219.64	219.88	220.07	220.14	220.67
753	219.63	219.88	220.06	220.14	220.66
686	219.63	219.88	220.06	220.13	220.65
637	219.62	219.87	220.05	220.12	220.64
575	219.58	219.78	219.90	219.94	220.41
525	219.39	219.57	219.70	219.76	220.22
499	219.37	219.54	219.66	219.71	220.10
457	219.32	219.49	219.61	219.66	220.00
395	218.98	219.14	219.27	219.30	219.54

Table 3: Shadow Creek – Post-Development Flood Elevations

Cross Section	Floodplain Elevation (m)				
	25 mm	5 Year	25 Year	100 Year	Regional
1000	220.08	220.20	220.37	220.50	221.10
891	219.90	220.07	220.33	220.48	221.08
860	219.83	220.02	220.32	220.48	221.07
836	219.69	220.00	220.32	220.48	221.07
821	219.67	219.98	220.29	220.44	221.07
807	219.65	219.89	220.06	220.13	220.48
792	219.64	219.88	220.07	220.14	220.67
753	219.64	219.88	220.06	220.14	220.66
686	219.64	219.88	220.06	220.13	220.65
637	219.63	219.87	220.05	220.13	220.64
575	219.59	219.78	219.90	219.94	220.41
525	219.40	219.57	219.70	219.76	220.22
499	219.37	219.54	219.66	219.71	220.10
457	219.33	219.49	219.61	219.66	220.00
395	218.99	219.14	219.27	219.30	219.54

The flood elevation at the upstream property limit in the post-development condition increased by 0.01 m during the 25 mm storm event compared to current conditions. No change in elevation at the upstream property limit is observed during the 5 year, 25 year, 100 year and Regional storm events. We therefore anticipate the impact on upstream landowners following the development of the proposed infill lots will be negligible.

Cross-sections and summary output data from the HEC-RAS model are included in Appendix B.

Proposed Filling

As indicated above, some filling will be required to protect the developed portion of Lots 3, 4, 5 and Block 10 as shown on Drawing FP-3. It should be noted the filling will occur completely outside of the

environmental setback defined in the Environmental Impact Statement prepared by Michalski Neilson and Associates Ltd and the 100 year flood limits as determined by this study.

It should also be noted the property immediately north of Block 10 will not be developed, due to the extent of the flood hazard across this property. It was determined that protecting this property against the Regional Flood would require a significant amount of fill and that it was preferable to maintain flood storage in this area.

Summary

Based on the above analysis we can confirm that the proposed development can be protected from the flood hazard, without causing adverse impacts on upstream or downstream landowners.

If you have any questions or concerns regarding this analysis please do not hesitate to contact the undersigned.

Yours truly,
C.C. Tatham & Associates Ltd.

Joshua Nemisz, B.A.Sc., P.Eng.
Intermediate Engineer – Project Manager
TC:JN:ha

Tim Collingwood, B.A.Sc., P.Eng.
Director, Manager – Orillia Branch

copy: G.VanAmelsvoort, Owner (Letter only via email gerryvanam@hotmail.com)
G. Lucas, Lucas & Associates (Letter only via email gjlucas@rogers.com)

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APPENDIX A:
OTTHYMO MODELLING RESULTS

CUMBERLAND BEACH
FILE No 305820

Area #. 99 **Area =** 25.00 ha

Weighted Curve Number

Soil Series Symbol	Hydrologic Soil Group	Soil Texture	Land Use Area (ha)	Land Use Percent	Forest Area	Forest %	Forest CN	Pasture Area	Pasture %	Pasture CN	Impervious areas Area	Impervious areas %	Impervious areas CN	Wetlands Area	Wetlands %	Wetlands CN	Average CN
Tls	A	Sand Loam	15.00	60.0%	4.80	32.0%	39.0	9.00	60.0%	49.0	1.20	8.0%	98.0	0.00	0.0%	50.0	49.7
Lvs	C	Clay Loam or Clay	7.50	30.0%	2.40	32.0%	73.0	4.50	60.0%	79.0	0.60	8.0%	98.0	0.00	0.0%	50.0	78.6
Ans	AB	Sand Loam	2.50	10.0%	0.80	32.0%	48.0	1.50	60.0%	59.0	0.20	8.0%	98.0	0.00	0.0%	50.0	58.6
				Avg. =	32.0%		Avg. =	60.0%		Avg. =	8.0%		Avg. =	0.0%			
							Total Avg. =	100.0%									
	Total Area =		25.00														Avg. = 59.3

Time of Concentration
(Bransby-Williams Method)

-suggested to use when runoff coefficient is greater than or equal to 0.40

Path	=	Watercourse
Hmax (m)	=	245
Hmin (m)	=	225
L (m)	=	1090
Slope	=	1.8%
Time of conc.	=	39.88 min
Time of conc.	=	0.66 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.44 hours

Initial Abstraction

Land Cover Values

Impervious	=	2 mm
Pervious		
Pasture		7 mm
Meadow		8 mm
Forest		10 mm
Wetlands		16 mm

IA = (Forest x 10mm)+(Pasture x 8mm)+(Impervious x 2mm)+(Wetlands x 16mm)

IA = 7.56 mm

Time of Concentration
(SCS Upland Method)

Path	=	Watercourse			
Hmax (m)	=	245.0			
Hmin (m)	=	225.0			
L (m)	=	1090.0			
Slope	=	1.8%			
		Woodland	Pasture	Impervious	Wetlands
Velocity(m/s)	=	0.21	0.29	0.83	0.62
Time of conc.	=	59.25 min			
Time of conc.	=	0.99 hrs			
Time to peak	=	2/3 of tc			
Time to peak	=	0.66 hours			

Time of Concentration
(Airport Method)

-suggested to use when runoff coefficient is less than 0.40

Path	=	Watercourse
Hmax (m)	=	245.0
Hmin (m)	=	225.0
L (m)	=	1090.0
Slope	=	1.8%

	Sand Loam
Pasture	0.10
Woodland	0.08
Impervious	0.40
Wetland	0.05

Runoff Coefficient	=	0.09
Time of conc.	=	89.18 min
Time of conc.	=	1.49 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.99 hours

CUMBERLAND BEACH
FILE No 305820

Area #. 100 **Area =** 351.00 ha

Weighted Curve Number

Soil Series Symbol	Hydrologic Soil Group	Soil Texture	Land Use		Forest			Pasture			Impervious areas			Wetlands			Average CN
			Area (ha)	Percent	Area	%	CN	Area	%	CN	Area	%	CN	Area	%	CN	
Tls	A	Sand Loam	210.60	60.0%	67.39	32.0%	39.0	126.36	60.0%	49.0	16.85	8.0%	98.0	0.00	0.0%	50.0	49.7
Lvs	C	Clay Loam or Clay	105.30	30.0%	33.70	32.0%	73.0	63.18	60.0%	79.0	8.42	8.0%	98.0	0.00	0.0%	50.0	78.6
Ans	AB	Sand Loam	35.10	10.0%	11.23	32.0%	48.0	21.06	60.0%	59.0	2.81	8.0%	98.0	0.00	0.0%	50.0	58.6
					Avg. =	32.0%	Avg. =	60.0%		Avg. =	8.0%		Avg. =	0.0%			
							Total Avg. =	100.0%									
Total Area =			351.00														Avg. = 59.3

Time of Concentration
(Bransby-Williams Method)

-suggested to use when runoff coefficient is greater than or equal to 0.40

Path	=	Watercourse
Hmax (m)	=	230
Hmin (m)	=	225
L (m)	=	2560
Slope	=	0.2%
Time of conc.	=	112.57 min
Time of conc.	=	1.88 hrs
Time to peak	=	2/3 of tc
Time to peak	=	1.25 hours

Initial Abstraction

Land Cover Values

Impervious	=	2 mm
Pervious		
Pasture		7 mm
Meadow		8 mm
Forest		10 mm
Wetlands		16 mm

IA = (Forest x 10mm)+(Pasture x 8mm)+(Impervious x 2mm)+(Wetlands x 16mm)

IA = 7.56 mm

Time of Concentration
(SCS Upland Method)

Path	=	Watercourse			
Hmax (m)	=	230.0			
Hmin (m)	=	225.0			
L (m)	=	2560.0			
Slope	=	0.2%			
		Woodland	Pasture	Impervious	Wetlands
Velocity(m/s)	=	0.07	0.09	0.27	0.20
Time of conc.	=	426.50 min			
Time of conc.	=	7.11 hrs			
Time to peak	=	2/3 of tc			
Time to peak	=	4.74 hours			

Time of Concentration
(Airport Method)

-suggested to use when runoff coefficient is less than 0.40

Path	=	Watercourse
Hmax (m)	=	230.0
Hmin (m)	=	225.0
L (m)	=	2560.0
Slope	=	0.2%

	Sand Loam
Pasture	0.10
Woodland	0.08
Impervious	0.40
Wetland	0.05

Runoff Coefficient	=	0.09
Time of conc.	=	288.38 min
Time of conc.	=	4.81 hrs
Time to peak	=	2/3 of tc
Time to peak	=	3.20 hours

CUMBERLAND BEACH
FILE No 305820

Area #. 101 **Area = 3.49 ha**

Weighted Curve Number

Soil Series Symbol	Hydrologic Soil Group	Soil Texture	Land Use Area (ha)	Land Use Percent	Forest Area	Forest %	Forest CN	Pasture Area	Pasture %	Pasture CN	Impervious areas Area	Impervious areas %	Impervious areas CN	Wetlands Area	Wetlands %	Wetlands CN	Average CN
Ans	AB	Sand Loam	3.49	100.0%	2.79	80.0%	48.0	0.70	20.0%	59.0	0.00	0.0%	98.0	0.00	0.0%	50.0	50.2
					Avg. =	80.0%	Avg. =	20.0%		Avg. =	0.0%		Avg. =	0.0%			
							Total Avg. =	100.0%									
	Total Area =		3.49														Avg. = 50.2

Time of Concentration
(Bransby-Williams Method)

-suggested to use when runoff coefficient is greater than or equal to 0.40

Path	=	Watercourse
Hmax (m)	=	222.2
Hmin (m)	=	219
L (m)	=	248
Slope	=	1.3%
Time of conc.	=	11.86 min
Time of conc.	=	0.20 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.13 hours

Initial Abstraction

Land Cover Values

Impervious	=	2 mm
Pervious		
Pasture		5 mm
Meadow		8 mm
Forest		10 mm
Wetlands		16 mm

IA = (Forest x 10mm)+(Pasture x 8mm)+(Impervious x 2mm)+(Wetlands x 16mm)

IA = 7.40 mm

Time of Concentration
(SCS Upland Method)

Path	=	Watercourse			
Hmax (m)	=	222.2			
Hmin (m)	=	219.0			
L (m)	=	248.0			
Slope	=	1.3%			
		Woodland	Pasture	Impervious	Wetlands
Velocity(m/s)	=	0.17	0.24	0.70	0.52
Time of conc.	=	22.04 min			
Time of conc.	=	0.37 hrs			
Time to peak	=	2/3 of tc			
Time to peak	=	0.24 hours			

Time of Concentration
(Airport Method)

-suggested to use when runoff coefficient is less than 0.40

Path	=	Watercourse
Hmax (m)	=	222.2
Hmin (m)	=	219.0
L (m)	=	248.0
Slope	=	1.3%

	Sand Loam
Pasture	0.10
Woodland	0.08
Impervious	0.40
Wetland	0.05

Runoff Coefficient	=	0.08
Time of conc.	=	47.91 min
Time of conc.	=	0.80 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.53 hours

CUMBERLAND BEACH
FILE No 305820

Area #. 201 **Area =** 1.46 ha

Weighted Curve Number

Soil Series Symbol	Hydrologic Soil Group	Soil Texture	Land Use Area (ha)	Land Use Percent	Forest Area	Forest %	Forest CN	Lawn Area	Lawn %	Lawn CN	Impervious areas Area	Impervious areas %	Impervious areas CN	Wetlands Area	Wetlands %	Wetlands CN	Average CN
Ans	AB	Sand Loam	1.46	100.0%	0.58	40.0%	48.0	0.77	53.0%	59.0	0.10	7.0%	98.0	0.00	0.0%	50.0	57.3
					Avg. =	40.0%	Avg. =	53.0%		Avg. =	7.0%		Avg. =	0.0%			
							Total Avg. =	100.0%									
Total Area =			1.46														Avg. = 57.3

Time of Concentration
(Bransby-Williams Method)

-suggested to use when runoff coefficient is greater than or equal to 0.40

Path	=	Watercourse
Hmax (m)	=	220
Hmin (m)	=	219
L (m)	=	220
Slope	=	0.5%
Time of conc.	=	14.14 min
Time of conc.	=	0.24 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.16 hours

Initial Abstraction

Land Cover Values

Impervious	=	2 mm
Pervious		
Lawns		5 mm
Meadow		8 mm
Forest		10 mm
Wetlands		16 mm

IA = (Forest x 10mm)+(Pasture x 8mm)+(Impervious x 2mm)+(Wetlands x 16mm)

IA = 5.99 mm

Time of Concentration
(SCS Upland Method)

Path	=	Watercourse			
Hmax (m)	=	220.0			
Hmin (m)	=	219.0			
L (m)	=	220.0			
Slope	=	0.5%			
		Woodland	Pasture	Impervious	Wetlands
Velocity(m/s)	=	0.10	0.14	0.41	0.31
Time of conc.	=	25.01 min			
Time of conc.	=	0.42 hrs			
Time to peak	=	2/3 of tc			
Time to peak	=	0.28 hours			

Time of Concentration
(Airport Method)

-suggested to use when runoff coefficient is less than 0.40

Path	=	Watercourse
Hmax (m)	=	220.0
Hmin (m)	=	219.0
L (m)	=	220.0
Slope	=	0.5%

	#REF!
Lawn	0.10
Woodland	0.08
Impervious	0.40
Wetland	0.05

Runoff Coefficient	=	0.08
Time of conc.	=	64.08 min
Time of conc.	=	1.07 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.71 hours

CUMBERLAND BEACH
FILE No 305820

Area #. 202 **Area =** 0.26 ha

Weighted Curve Number

Soil Series Symbol	Hydrologic Soil Group	Soil Texture	Land Use Area (ha)	Land Use Percent	Forest Area	Forest %	Forest CN	Lawn Area	Lawn %	Lawn CN	Impervious areas Area	Impervious areas %	Impervious areas CN	Wetlands Area	Wetlands %	Wetlands CN	Average CN
Ans	AB	Sand Loam	0.26	100.0%	0.00	0.0%	48.0	0.16	60.0%	59.0	0.10	40.0%	98.0	0.00	0.0%	50.0	74.6
					Avg. =	0.0%	Avg. =	60.0%		Avg. =	40.0%		Avg. =	0.0%			
							Total Avg. =	100.0%									
	Total Area =		0.26														Avg. = 74.6

Time of Concentration
(Bransby-Williams Method)

-suggested to use when runoff coefficient is greater than or equal to 0.40

Path	=	Watercourse
Hmax (m)	=	221.9
Hmin (m)	=	220.5
L (m)	=	94
Slope	=	1.5%
Time of conc.	=	5.66 min
Time of conc.	=	0.09 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.06 hours

Initial Abstraction

Land Cover Values

Impervious = 2 mm

Pervious

Lawns	5 mm
Meadow	8 mm
Forest	10 mm
Wetlands	16 mm

IA = (Forest x 10mm)+(Pasture x 8mm)+(Impervious x 2mm)+(Wetlands x 16mm)

IA = 3.80 mm

Time of Concentration
(SCS Upland Method)

Path	=	Watercourse			
Hmax (m)	=	221.9			
Hmin (m)	=	220.5			
L (m)	=	94.0			
Slope	=	1.5%			
		Woodland	Pasture	Impervious	Wetlands
Velocity(m/s)	=	0.19	0.26	0.75	0.56
Time of conc.	=	3.44 min			
Time of conc.	=	0.06 hrs			
Time to peak	=	2/3 of tc			
Time to peak	=	0.04 hours			

Time of Concentration
(Airport Method)

-suggested to use when runoff coefficient is less than 0.40

Path	=	Watercourse
Hmax (m)	=	221.9
Hmin (m)	=	220.5
L (m)	=	94.0
Slope	=	1.5%

	#REF!
Lawn	0.10
Woodland	0.08
Impervious	0.40
Wetland	0.05

Runoff Coefficient = 0.22

Time of conc.	=	24.36 min
Time of conc.	=	0.41 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.27 hours

CUMBERLAND BEACH
FILE No 305820

Area #. 203 **Area = 1.77 ha**

Weighted Curve Number

Soil Series Symbol	Hydrologic Soil Group	Soil Texture	Land Use Area (ha)	Land Use Percent	Forest Area	Forest %	Forest CN	Lawn Area	Lawn %	Lawn CN	Impervious areas Area	Impervious areas %	Impervious areas CN	Wetlands Area	Wetlands %	Wetlands CN	Average CN
Ans	AB	Sand Loam	1.77	100.0%	0.35	20.0%	48.0	0.99	56.0%	59.0	0.42	24.0%	98.0	0.00	0.0%	50.0	66.2
					Avg. =	20.0%		Avg. =	56.0%		Avg. =	24.0%		Avg. =	0.0%		
							Total Avg. =	100.0%									
Total Area =			1.77														Avg. = 66.2

Time of Concentration
(Bransby-Williams Method)

suggested to use when runoff coefficient is greater than or equal to 0.40

Path	=	Watercourse
Hmax (m)	=	221.9
Hmin (m)	=	220
L (m)	=	158
Slope	=	1.2%
Time of conc.	=	8.20 min
Time of conc.	=	0.14 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.09 hours

Initial Abstraction

Land Cover Values

Impervious	=	2 mm
Pervious		
Lawns		5 mm
Meadow		8 mm
Forest		10 mm
Wetlands		16 mm

IA = (Forest x 10mm)+(Pasture x 8mm)+(Impervious x 2mm)+(Wetlands x 16mm)

IA = 4.88 mm

Time of Concentration
(SCS Upland Method)

Path	=	Watercourse			
Hmax (m)	=	221.9			
Hmin (m)	=	220.0			
L (m)	=	158.0			
Slope	=	1.2%			
		Woodland	Pasture	Impervious	Wetlands
Velocity(m/s)	=	0.17	0.23	0.67	0.50
Time of conc.	=	8.07 min			
Time of conc.	=	0.13 hrs			
Time to peak	=	2/3 of tc			
Time to peak	=	0.09 hours			

Time of Concentration
(Airport Method)

suggested to use when runoff coefficient is less than 0.40

Path	=	Watercourse
Hmax (m)	=	221.9
Hmin (m)	=	220.0
L (m)	=	158.0
Slope	=	1.2%

Lawn	0.10
Woodland	0.08
Impervious	0.40
Wetland	0.05

Runoff Coefficient	=	0.15
Time of conc.	=	36.53 min
Time of conc.	=	0.61 hrs
Time to peak	=	2/3 of tc
Time to peak	=	0.41 hours

```
=================================================================================
========================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM, Version 2.0
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O   Licensed To: C.C. Tatham &
Associates Ltd.
        OOO     T      T    H   H    Y    M   M   OOO                  VO2-0110

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                    *****  D E T A I L E D   O U T P U T *****

  Input   filename: C:\Program Files\Visual OTTHYMO v2.0\voin.dat

  Output  filename: C:\MYDOCU~1\305820~1\CUMBER~1\Pre-development.out

  Summary filename: C:\MYDOCU~1\305820~1\CUMBER~1\Pre-development.sum


DATE: 05/04/2007                                TIME: 4:45:49 PM

USER:


COMMENTS: _____________________________________________________________

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


--------------------
|    READ STORM    |    Filename: C:\My Documents\STORMS\
|                  |              Owen Sound\CHIC25MM.4HR
| Ptotal= 24.97 mm |    Comments: 25 mm 4-hr Chicago storm
--------------------
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .10    1.29 |  1.10    2.81 |  2.10   13.05 |  3.10    2.04
                 .20    1.36 |  1.20    3.22 |  2.20    8.44 |  3.20    1.89
                 .30    1.44 |  1.30    3.77 |  2.30    6.21 |  3.30    1.76
                 .40    1.53 |  1.40    4.55 |  2.40    4.91 |  3.40    1.65
                 .50    1.63 |  1.50    5.77 |  2.50    4.06 |  3.50    1.55
                 .60    1.75 |  1.60    7.86 |  2.60    3.47 |  3.60    1.46
                 .70    1.89 |  1.70   12.27 |  2.70    3.03 |  3.70    1.39
                 .80    2.06 |  1.80   26.17 |  2.80    2.70 |  3.80    1.32
```

.90	2.26	1.90	72.58	2.90	2.43	3.90	1.26
1.00	2.50	2.00	26.96	3.00	2.22	4.00	1.20

CALIB NASHYD (0099) ID= 1 DT= 5.0 min	Area (ha)= 25.00	Curve Number (CN)= 59.3
	Ia (mm)= 7.60	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= .66	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.083	1.29	1.083	2.81	2.083	13.05	3.08	2.04
.167	1.35	1.167	3.14	2.167	9.36	3.17	1.92
.250	1.41	1.250	3.55	2.250	7.10	3.25	1.81
.333	1.48	1.333	4.08	2.333	5.69	3.33	1.72
.417	1.55	1.417	4.79	2.417	4.74	3.42	1.63
.500	1.63	1.500	5.77	2.500	4.06	3.50	1.55
.583	1.75	1.583	7.86	2.583	3.47	3.58	1.46
.667	1.86	1.667	11.39	2.667	3.12	3.67	1.40
.750	1.99	1.750	20.61	2.750	2.83	3.75	1.35
.833	2.14	1.833	44.73	2.833	2.59	3.83	1.30
.917	2.31	1.917	63.46	2.917	2.39	3.92	1.25
1.000	2.50	2.000	26.96	3.000	2.22	4.00	1.20

Unit Hyd Qpeak (cms)= 1.447

PEAK FLOW (cms)= .060 (i)
TIME TO PEAK (hrs)= 2.750
RUNOFF VOLUME (mm)= 1.574
TOTAL RAINFALL (mm)= 24.971
RUNOFF COEFFICIENT = .063

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

CALIB NASHYD (0100) ID= 1 DT= 5.0 min	Area (ha)= 351.00	Curve Number (CN)= 59.3
	Ia (mm)= 7.60	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 4.70	

Unit Hyd Qpeak (cms)= 2.852

PEAK FLOW (cms)= .174 (i)
TIME TO PEAK (hrs)= 7.083
RUNOFF VOLUME (mm)= 1.574
TOTAL RAINFALL (mm)= 24.971
RUNOFF COEFFICIENT = .063

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

CALIB NASHYD (0101) ID= 1 DT= 5.0 min	Area (ha)= 3.49	Curve Number (CN)= 50.2
	Ia (mm)= 7.40	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= .53	

```
     Unit Hyd Qpeak  (cms)=     .252

     PEAK FLOW       (cms)=     .007 (i)
     TIME TO PEAK    (hrs)=    2.583
     RUNOFF VOLUME    (mm)=    1.145
     TOTAL RAINFALL   (mm)=   24.971
     RUNOFF COEFFICIENT    =     .046

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

```
--------------------
| ADD HYD   (0102) |
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
          ID1= 1 (0100):    351.00      .174      7.08      1.57
        + ID2= 2 (0101):      3.49      .007      2.58      1.15
          ==========================================================
          ID = 3 (0102):    354.49      .174      7.08      1.57

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

```
  ******************************
  ** SIMULATION NUMBER:   2 **
  ******************************


--------------------
|    READ STORM    |    Filename: C:\My Documents\STORMS\Orillia\orchi5-4.stm
| Ptotal= 44.71 mm |    Comments: * Orillia Chicago 5 Year, 4 Hour Storm
--------------------
                TIME     RAIN |  TIME     RAIN |  TIME     RAIN |  TIME     RAIN
                 hrs    mm/hr |   hrs    mm/hr |   hrs    mm/hr |   hrs    mm/hr
                 .20     2.54 |  1.20     5.58 |  2.20    25.38 |  3.20     3.73
                 .40     2.83 |  1.40     7.51 |  2.40    11.60 |  3.40     3.22
                 .60     3.22 |  1.60    11.60 |  2.60     7.51 |  3.60     2.83
                 .80     3.73 |  1.80    25.38 |  2.80     5.58 |  3.80     2.54
                1.00     4.46 |  2.00    87.57 |  3.00     4.46 |  4.00     2.30
```

```
--------------------
| CALIB            |
| NASHYD    (0099) |    Area     (ha)=  25.00   Curve Number    (CN)= 59.3
|ID= 1 DT= 5.0 min |    Ia       (mm)=   7.60   # of Linear Res.(N)= 3.00
--------------------    U.H. Tp(hrs)=    .66

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

                              ---- TRANSFORMED HYETOGRAPH ----
               TIME     RAIN |  TIME     RAIN |  TIME     RAIN |  TIME     RAIN
                hrs    mm/hr |   hrs    mm/hr |   hrs    mm/hr |   hrs    mm/hr
               .083     2.54 | 1.083     5.58 | 2.083    25.38 |  3.08     3.73
               .167     2.54 | 1.167     5.58 | 2.167    25.38 |  3.17     3.73
               .250     2.71 | 1.250     6.74 | 2.250    17.11 |  3.25     3.42
               .333     2.83 | 1.333     7.51 | 2.333    11.60 |  3.33     3.22
               .417     2.91 | 1.417     8.33 | 2.417    10.78 |  3.42     3.14
               .500     3.22 | 1.500    11.60 | 2.500     7.51 |  3.50     2.83
               .583     3.22 | 1.583    11.60 | 2.583     7.51 |  3.58     2.83
```

.667	3.63	1.667	22.62	2.667	5.97	3.67	2.60
.750	3.73	1.750	25.38	2.750	5.58	3.75	2.54
.833	4.02	1.833	50.26	2.833	5.13	3.83	2.44
.917	4.46	1.917	87.57	2.917	4.46	3.92	2.30
1.000	4.46	2.000	87.57	3.000	4.46	4.00	2.30

Unit Hyd Qpeak (cms)= 1.447

PEAK FLOW (cms)= .259 (i)
TIME TO PEAK (hrs)= 2.750
RUNOFF VOLUME (mm)= 6.514
TOTAL RAINFALL (mm)= 44.714
RUNOFF COEFFICIENT = .146

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

CALIB NASHYD (0100) ID= 1 DT= 5.0 min			
	Area (ha)= 351.00	Curve Number (CN)= 59.3	
	Ia (mm)= 7.60	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 4.70		

Unit Hyd Qpeak (cms)= 2.852

PEAK FLOW (cms)= .721 (i)
TIME TO PEAK (hrs)= 7.000
RUNOFF VOLUME (mm)= 6.514
TOTAL RAINFALL (mm)= 44.714
RUNOFF COEFFICIENT = .146

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

CALIB NASHYD (0101) ID= 1 DT= 5.0 min			
	Area (ha)= 3.49	Curve Number (CN)= 50.2	
	Ia (mm)= 7.40	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= .53		

Unit Hyd Qpeak (cms)= .252

PEAK FLOW (cms)= .031 (i)
TIME TO PEAK (hrs)= 2.583
RUNOFF VOLUME (mm)= 4.812
TOTAL RAINFALL (mm)= 44.714
RUNOFF COEFFICIENT = .108

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

ADD HYD (0102)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0100):	351.00	.721	7.00	6.51
+ ID2= 2 (0101):	3.49	.031	2.58	4.81
ID = 3 (0102):	354.49	.721	7.00	6.50

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
  ****************************
  ** SIMULATION NUMBER:   3 **
  ****************************


--------------------
|    READ STORM    |    Filename: C:\My Documents\STORMS\Orillia\orchi25.stm
| Ptotal= 63.42 mm |    Comments: *Orillia Chicago 25 Year, 4 Hour Storm
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.20	3.72	1.20	8.17	2.20	36.46	3.20	5.47
.40	4.15	1.40	10.98	2.40	16.89	3.40	4.72
.60	4.72	1.60	16.89	2.60	10.98	3.60	4.15
.80	5.47	1.80	36.46	2.80	8.17	3.80	3.72
1.00	6.54	2.00	119.55	3.00	6.54	4.00	3.37

```
--------------------
| CALIB            |
| NASHYD   (0099)  |    Area     (ha)=  25.00   Curve Number    (CN)= 59.3
|ID= 1 DT= 5.0 min |    Ia       (mm)=   7.60   # of Linear Res.(N)= 3.00
--------------------    U.H. Tp(hrs)=    .66

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.083	3.72	1.083	8.17	2.083	36.46	3.08	5.47
.167	3.72	1.167	8.17	2.167	36.46	3.17	5.47
.250	3.98	1.250	9.86	2.250	24.72	3.25	5.02
.333	4.15	1.333	10.98	2.333	16.89	3.33	4.72
.417	4.26	1.417	12.16	2.417	15.71	3.42	4.61
.500	4.72	1.500	16.89	2.500	10.98	3.50	4.15
.583	4.72	1.583	16.89	2.583	10.98	3.58	4.15
.667	5.32	1.667	32.55	2.667	8.73	3.67	3.81
.750	5.47	1.750	36.46	2.750	8.17	3.75	3.72
.833	5.90	1.833	69.70	2.833	7.52	3.83	3.58
.917	6.54	1.917	119.55	2.917	6.54	3.92	3.37
1.000	6.54	2.000	119.55	3.000	6.54	4.00	3.37

```
     Unit Hyd Qpeak  (cms)=   1.447

     PEAK FLOW       (cms)=    .541 (i)
     TIME TO PEAK    (hrs)=   2.750
     RUNOFF VOLUME    (mm)=  13.540
     TOTAL RAINFALL   (mm)=  63.424
     RUNOFF COEFFICIENT   =    .213

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

--------------------
| CALIB            |
| NASHYD   (0100)  |    Area     (ha)= 351.00   Curve Number    (CN)= 59.3
|ID= 1 DT= 5.0 min |    Ia       (mm)=   7.60   # of Linear Res.(N)= 3.00
--------------------    U.H. Tp(hrs)=   4.70

     Unit Hyd Qpeak  (cms)=   2.852
```

```
      PEAK FLOW        (cms)=    1.498 (i)
      TIME TO PEAK     (hrs)=    7.000
      RUNOFF VOLUME     (mm)=   13.540
      TOTAL RAINFALL    (mm)=   63.424
      RUNOFF COEFFICIENT   =     .213

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0101)   |    Area     (ha)=    3.49   Curve Number    (CN)= 50.2
|ID= 1 DT= 5.0 min   |    Ia       (mm)=    7.40   # of Linear Res.(N)= 3.00
--------------------    U.H. Tp(hrs)=     .53

      Unit Hyd Qpeak   (cms)=     .252

      PEAK FLOW        (cms)=     .066 (i)
      TIME TO PEAK     (hrs)=    2.583
      RUNOFF VOLUME     (mm)=   10.190
      TOTAL RAINFALL    (mm)=   63.424
      RUNOFF COEFFICIENT   =     .161

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

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

--------------------
| ADD HYD   (0102) |
|   1 +  2 =  3    |                AREA     QPEAK     TPEAK      R.V.
--------------------                (ha)     (cms)     (hrs)      (mm)
          ID1= 1 (0100):    351.00    1.498      7.00     13.54
        + ID2= 2 (0101):      3.49     .066      2.58     10.19
          ================================================
          ID = 3 (0102):    354.49    1.498      7.00     13.51

      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
  ******************************
  ** SIMULATION NUMBER:   4 **
  ******************************


--------------------
|    READ STORM    |     Filename: C:\My Documents\STORMS\Orillia\oschi100.stm
| Ptotal= 71.77 mm |     Comments: OWEN SOUND 100 YEAR 4 HOUR DURATION CHIC
--------------------
                TIME     RAIN |  TIME     RAIN |  TIME     RAIN |  TIME     RAIN
                 hrs    mm/hr |   hrs    mm/hr |   hrs    mm/hr |   hrs    mm/hr
                 .10     3.08 |  1.10     7.44 |  2.10    40.41 |  3.10     5.16
                 .20     3.27 |  1.20     8.67 |  2.20    25.38 |  3.20     4.73
                 .30     3.49 |  1.30    10.36 |  2.30    18.12 |  3.30     4.37
                 .40     3.73 |  1.40    12.83 |  2.40    13.95 |  3.40     4.05
                 .50     4.02 |  1.50    16.70 |  2.50    11.28 |  3.50     3.79
                 .60     4.35 |  1.60    23.51 |  2.60     9.44 |  3.60     3.55
                 .70     4.75 |  1.70    37.88 |  2.70     8.10 |  3.70     3.35
                 .80     5.22 |  1.80    81.47 |  2.80     7.09 |  3.80     3.16
                 .90     5.80 |  1.90   206.92 |  2.90     6.31 |  3.90     3.00
                1.00     6.52 |  2.00    83.92 |  3.00     5.67 |  4.00     2.85

--------------------------------------------------------------------------------
```

```
--------------------
| CALIB            |
| NASHYD    (0099) |   Area    (ha)=  25.00   Curve Number   (CN)= 59.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.60   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .66

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

                              ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .083    3.08 | 1.083    7.44 | 2.083   40.41 | 3.08    5.16
                .167    3.23 | 1.167    8.42 | 2.167   28.39 | 3.17    4.82
                .250    3.40 | 1.250    9.68 | 2.250   21.02 | 3.25    4.51
                .333    3.59 | 1.333   11.35 | 2.333   16.45 | 3.33    4.24
                .417    3.79 | 1.417   13.60 | 2.417   13.42 | 3.42    4.00
                .500    4.02 | 1.500   16.70 | 2.500   11.28 | 3.50    3.79
                .583    4.35 | 1.583   23.51 | 2.583    9.44 | 3.58    3.55
                .667    4.67 | 1.667   35.01 | 2.667    8.37 | 3.67    3.39
                .750    5.03 | 1.750   64.03 | 2.750    7.49 | 3.75    3.24
                .833    5.45 | 1.833  131.65 | 2.833    6.78 | 3.83    3.10
                .917    5.94 | 1.917  182.32 | 2.917    6.18 | 3.92    2.97
               1.000    6.52 | 2.000   83.92 | 3.000    5.67 | 4.00    2.85

     Unit Hyd Qpeak  (cms)=   1.447

     PEAK FLOW       (cms)=    .731 (i)
     TIME TO PEAK    (hrs)=   2.667
     RUNOFF VOLUME    (mm)=  17.265
     TOTAL RAINFALL   (mm)=  71.769
     RUNOFF COEFFICIENT   =    .241

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0100) |   Area    (ha)= 351.00   Curve Number   (CN)= 59.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.60   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   4.70

     Unit Hyd Qpeak  (cms)=   2.852

     PEAK FLOW       (cms)=   1.913 (i)
     TIME TO PEAK    (hrs)=   6.917
     RUNOFF VOLUME    (mm)=  17.265
     TOTAL RAINFALL   (mm)=  71.769
     RUNOFF COEFFICIENT   =    .241

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0101) |   Area    (ha)=   3.49   Curve Number   (CN)= 50.2
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .53

     Unit Hyd Qpeak  (cms)=    .252

     PEAK FLOW       (cms)=    .091 (i)
```

TIME TO PEAK (hrs)= 2.500
RUNOFF VOLUME (mm)= 13.097
TOTAL RAINFALL (mm)= 71.769
RUNOFF COEFFICIENT = .182

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

| ADD HYD (0102) |
| 1 + 2 = 3 |

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0100):	351.00	1.913	6.92	17.26
+ ID2= 2 (0101):	3.49	.091	2.50	13.10
ID = 3 (0102):	354.49	1.913	6.92	17.22

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

****
** SIMULATION NUMBER: 5 **
****

| READ STORM |
| Ptotal=193.00 mm |

Filename: C:\My Documents\STORMS\Owen Sound\TIMMINS.12
Comments: TIMMINS REGIONAL 12 HOUR DURATION STORM

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.20	15.00	3.20	3.00	6.20	43.00	9.20	13.00
.40	15.00	3.40	3.00	6.40	43.00	9.40	13.00
.60	15.00	3.60	3.00	6.60	43.00	9.60	13.00
.80	15.00	3.80	3.00	6.80	43.00	9.80	13.00
1.00	15.00	4.00	3.00	7.00	43.00	10.00	13.00
1.20	20.00	4.20	5.00	7.20	20.00	10.20	13.00
1.40	20.00	4.40	5.00	7.40	20.00	10.40	13.00
1.60	20.00	4.60	5.00	7.60	20.00	10.60	13.00
1.80	20.00	4.80	5.00	7.80	20.00	10.80	13.00
2.00	20.00	5.00	5.00	8.00	20.00	11.00	13.00
2.20	10.00	5.20	20.00	8.20	23.00	11.20	8.00
2.40	10.00	5.40	20.00	8.40	23.00	11.40	8.00
2.60	10.00	5.60	20.00	8.60	23.00	11.60	8.00
2.80	10.00	5.80	20.00	8.80	23.00	11.80	8.00
3.00	10.00	6.00	20.00	9.00	23.00	12.00	8.00

| CALIB |
| NASHYD (0099) |
| ID= 1 DT= 5.0 min |

Area (ha)= 25.00 Curve Number (CN)= 59.3
Ia (mm)= 7.60 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .66

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00

.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Unit Hyd Qpeak (cms)= 1.447

PEAK FLOW (cms)= 1.342 (i)
TIME TO PEAK (hrs)= 7.333
RUNOFF VOLUME (mm)= 95.551
TOTAL RAINFALL (mm)= 193.000
RUNOFF COEFFICIENT = .495

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

CALIB NASHYD (0100) ID= 1 DT= 5.0 min	Area (ha)= 351.00	Curve Number (CN)= 59.3
	Ia (mm)= 7.60	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 4.70	

Unit Hyd Qpeak (cms)= 2.852

PEAK FLOW (cms)= 8.794 (i)
TIME TO PEAK (hrs)= 13.167
RUNOFF VOLUME (mm)= 95.552
TOTAL RAINFALL (mm)= 193.000
RUNOFF COEFFICIENT = .495

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

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--------------------
| CALIB            |
| NASHYD    (0101) |   Area     (ha)=   3.49   Curve Number    (CN)= 50.2
|ID= 1 DT= 5.0 min |   Ia       (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .53

     Unit Hyd Qpeak  (cms)=     .252

     PEAK FLOW       (cms)=     .164 (i)
     TIME TO PEAK    (hrs)=    7.250
     RUNOFF VOLUME    (mm)=   78.720
     TOTAL RAINFALL   (mm)= 193.000
     RUNOFF COEFFICIENT   =     .408

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

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--------------------
| ADD HYD   (0102) |
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
          ID1= 1 (0100):    351.00    8.794     13.17     95.55
        + ID2= 2 (0101):      3.49     .164      7.25     78.72
          ================================================
          ID = 3 (0102):    354.49    8.803     13.17     95.39

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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 FINISH
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       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM, Version 2.0
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O   Licensed To: C.C. Tatham &
Associates Ltd.
        OOO     T      T    H   H    Y    M   M   OOO                  VO2-0110

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                    *****  D E T A I L E D   O U T P U T *****

  Input   filename: C:\Program Files\Visual OTTHYMO v2.0\voin.dat

  Output  filename: C:\MYDOCU~1\305820~1\CUMBER~1\Post-development.out

  Summary filename: C:\MYDOCU~1\305820~1\CUMBER~1\Post-development.sum


DATE: 05/04/2007                                TIME: 4:46:48 PM

USER:


COMMENTS: _____________________________________________________________

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


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|    READ STORM    |    Filename: C:\My Documents\STORMS\
|                  |              Owen Sound\CHIC25MM.4HR
| Ptotal= 24.97 mm |    Comments: 25 mm 4-hr Chicago storm
--------------------
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .10    1.29 |  1.10    2.81 |  2.10   13.05 |  3.10    2.04
                 .20    1.36 |  1.20    3.22 |  2.20    8.44 |  3.20    1.89
                 .30    1.44 |  1.30    3.77 |  2.30    6.21 |  3.30    1.76
                 .40    1.53 |  1.40    4.55 |  2.40    4.91 |  3.40    1.65
                 .50    1.63 |  1.50    5.77 |  2.50    4.06 |  3.50    1.55
                 .60    1.75 |  1.60    7.86 |  2.60    3.47 |  3.60    1.46
                 .70    1.89 |  1.70   12.27 |  2.70    3.03 |  3.70    1.39
                 .80    2.06 |  1.80   26.17 |  2.80    2.70 |  3.80    1.32
```

.90	2.26	1.90	72.58	2.90	2.43	3.90	1.26
1.00	2.50	2.00	26.96	3.00	2.22	4.00	1.20

CALIB NASHYD (0202)	Area (ha)= .26	Curve Number (CN)= 75.6
ID= 1 DT= 5.0 min	Ia (mm)= 3.80	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= .27	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.083	1.29	1.083	2.81	2.083	13.05	3.08	2.04
.167	1.35	1.167	3.14	2.167	9.36	3.17	1.92
.250	1.41	1.250	3.55	2.250	7.10	3.25	1.81
.333	1.48	1.333	4.08	2.333	5.69	3.33	1.72
.417	1.55	1.417	4.79	2.417	4.74	3.42	1.63
.500	1.63	1.500	5.77	2.500	4.06	3.50	1.55
.583	1.75	1.583	7.86	2.583	3.47	3.58	1.46
.667	1.86	1.667	11.39	2.667	3.12	3.67	1.40
.750	1.99	1.750	20.61	2.750	2.83	3.75	1.35
.833	2.14	1.833	44.73	2.833	2.59	3.83	1.30
.917	2.31	1.917	63.46	2.917	2.39	3.92	1.25
1.000	2.50	2.000	26.96	3.000	2.22	4.00	1.20

Unit Hyd Qpeak (cms)= .037

PEAK FLOW (cms)= .003 (i)
TIME TO PEAK (hrs)= 2.167
RUNOFF VOLUME (mm)= 4.340
TOTAL RAINFALL (mm)= 24.971
RUNOFF COEFFICIENT = .174

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

CALIB NASHYD (0201)	Area (ha)= 1.46	Curve Number (CN)= 57.3
ID= 1 DT= 5.0 min	Ia (mm)= 6.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= .71	

Unit Hyd Qpeak (cms)= .079

PEAK FLOW (cms)= .004 (i)
TIME TO PEAK (hrs)= 2.833
RUNOFF VOLUME (mm)= 1.727
TOTAL RAINFALL (mm)= 24.971
RUNOFF COEFFICIENT = .069

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

CALIB NASHYD (0203)	Area (ha)= 1.77	Curve Number (CN)= 66.2
ID= 1 DT= 5.0 min	Ia (mm)= 4.80	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= .40	

```
     Unit Hyd Qpeak  (cms)=     .169

     PEAK FLOW       (cms)=     .011 (i)
     TIME TO PEAK    (hrs)=    2.333
     RUNOFF VOLUME    (mm)=    2.714
     TOTAL RAINFALL   (mm)=   24.971
     RUNOFF COEFFICIENT   =     .109

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

RESERVOIR (0400) IN= 2---> OUT= 1 DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	.0000	.0000	.0200	.0210
	.0010	.0050	.0210	.0280
	.0100	.0120	.0000	.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0203)	1.77	.01	2.33	2.71
OUTFLOW: ID= 1 (0400)	1.77	.00	4.50	2.00

PEAK FLOW REDUCTION [Qout/Qin](%)= 7.74
TIME SHIFT OF PEAK FLOW (min)=130.00
MAXIMUM STORAGE USED (ha.m.)= .0042

ADD HYD (0401) 1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0201):	1.46	.004	2.83	1.73
+ ID2= 2 (0400):	1.77	.001	4.50	2.00
ID = 3 (0401):	3.23	.004	2.83	1.88

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0402) 1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0202):	.26	.003	2.17	4.34
+ ID2= 2 (0401):	3.23	.004	2.83	1.88
ID = 3 (0402):	3.49	.006	2.42	2.06

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB NASHYD (0100) ID= 1 DT= 5.0 min				
	Area (ha)=	351.00	Curve Number (CN)=	59.3
	Ia (mm)=	7.60	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	4.70		

Unit Hyd Qpeak (cms)= 2.852

PEAK FLOW (cms)= .174 (i)
TIME TO PEAK (hrs)= 7.083
RUNOFF VOLUME (mm)= 1.574
TOTAL RAINFALL (mm)= 24.971
RUNOFF COEFFICIENT = .063

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

| ADD HYD (0403) |
| 1 + 2 = 3 |

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0402):	3.49	.006	2.42	2.06
+ ID2= 2 (0100):	351.00	.174	7.08	1.57
ID = 3 (0403):	354.49	.175	7.08	1.58

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

****
** SIMULATION NUMBER: 2 **
****

| READ STORM |
| Ptotal= 44.71 mm |

Filename: C:\My Documents\STORMS\Orillia\orchi5-4.stm
Comments: * Orillia Chicago 5 Year, 4 Hour Storm

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.20	2.54	1.20	5.58	2.20	25.38	3.20	3.73
.40	2.83	1.40	7.51	2.40	11.60	3.40	3.22
.60	3.22	1.60	11.60	2.60	7.51	3.60	2.83
.80	3.73	1.80	25.38	2.80	5.58	3.80	2.54
1.00	4.46	2.00	87.57	3.00	4.46	4.00	2.30

| CALIB |
| NASHYD (0202) |
|ID= 1 DT= 5.0 min |

Area (ha)= .26 Curve Number (CN)= 75.6
Ia (mm)= 3.80 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .27

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.083	2.54	1.083	5.58	2.083	25.38	3.08	3.73
.167	2.54	1.167	5.58	2.167	25.38	3.17	3.73
.250	2.71	1.250	6.74	2.250	17.11	3.25	3.42
.333	2.83	1.333	7.51	2.333	11.60	3.33	3.22
.417	2.91	1.417	8.33	2.417	10.78	3.42	3.14
.500	3.22	1.500	11.60	2.500	7.51	3.50	2.83
.583	3.22	1.583	11.60	2.583	7.51	3.58	2.83
.667	3.63	1.667	22.62	2.667	5.97	3.67	2.60

.750	3.73	1.750	25.38	2.750	5.58	3.75	2.54
.833	4.02	1.833	50.26	2.833	5.13	3.83	2.44
.917	4.46	1.917	87.57	2.917	4.46	3.92	2.30
1.000	4.46	2.000	87.57	3.000	4.46	4.00	2.30

Unit Hyd Qpeak (cms)= .037

PEAK FLOW (cms)= .011 (i)
TIME TO PEAK (hrs)= 2.250
RUNOFF VOLUME (mm)= 13.611
TOTAL RAINFALL (mm)= 44.714
RUNOFF COEFFICIENT = .304

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

CALIB NASHYD (0201) ID= 1 DT= 5.0 min	Area (ha)= 1.46	Curve Number (CN)= 57.3
	Ia (mm)= 6.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= .71	

Unit Hyd Qpeak (cms)= .079

PEAK FLOW (cms)= .015 (i)
TIME TO PEAK (hrs)= 2.833
RUNOFF VOLUME (mm)= 6.573
TOTAL RAINFALL (mm)= 44.714
RUNOFF COEFFICIENT = .147

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

CALIB NASHYD (0203) ID= 1 DT= 5.0 min	Area (ha)= 1.77	Curve Number (CN)= 66.2
	Ia (mm)= 4.80	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= .40	

Unit Hyd Qpeak (cms)= .169

PEAK FLOW (cms)= .038 (i)
TIME TO PEAK (hrs)= 2.417
RUNOFF VOLUME (mm)= 9.392
TOTAL RAINFALL (mm)= 44.714
RUNOFF COEFFICIENT = .210

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

RESERVOIR (0400)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
.0000	.0000	.0200	.0210
.0010	.0050	.0210	.0280
.0100	.0120	.0000	.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0203)	1.77	.04	2.42	9.39
OUTFLOW: ID= 1 (0400)	1.77	.01	3.58	8.68

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                    PEAK    FLOW    REDUCTION [Qout/Qin](%)= 24.05
                    TIME SHIFT OF PEAK FLOW             (min)= 70.00
                    MAXIMUM  STORAGE   USED           (ha.m.)=  .0114

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--------------------
| ADD HYD   (0401) |
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
          ID1= 1 (0201):      1.46      .015      2.83      6.57
        + ID2= 2 (0400):      1.77      .009      3.58      8.68
          ================================================
          ID = 3 (0401):      3.23      .022      3.00      7.73

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0402) |
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
          ID1= 1 (0202):       .26      .011      2.25     13.61
        + ID2= 2 (0401):      3.23      .022      3.00      7.73
          ================================================
          ID = 3 (0402):      3.49      .025      2.83      8.16

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0100) |   Area     (ha)= 351.00   Curve Number    (CN)= 59.3
|ID= 1 DT= 5.0 min |   Ia       (mm)=   7.60   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   4.70

     Unit Hyd Qpeak  (cms)=   2.852

     PEAK FLOW       (cms)=    .721 (i)
     TIME TO PEAK    (hrs)=   7.000
     RUNOFF VOLUME    (mm)=   6.514
     TOTAL RAINFALL   (mm)=  44.714
     RUNOFF COEFFICIENT   =    .146

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

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--------------------
| ADD HYD   (0403) |
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
          ID1= 1 (0402):      3.49      .025      2.83      8.16
        + ID2= 2 (0100):    351.00      .721      7.00      6.51
          ================================================
          ID = 3 (0403):    354.49      .723      7.00      6.53

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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** SIMULATION NUMBER: 3 **
****

| READ STORM | Ptotal= 63.42 mm |

Filename: C:\My Documents\STORMS\Orillia\orchi25.stm
Comments: *Orillia Chicago 25 Year, 4 Hour Storm

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.20	3.72	1.20	8.17	2.20	36.46	3.20	5.47
.40	4.15	1.40	10.98	2.40	16.89	3.40	4.72
.60	4.72	1.60	16.89	2.60	10.98	3.60	4.15
.80	5.47	1.80	36.46	2.80	8.17	3.80	3.72
1.00	6.54	2.00	119.55	3.00	6.54	4.00	3.37

| CALIB NASHYD (0202) ID= 1 DT= 5.0 min |

Area (ha)= .26 Curve Number (CN)= 75.6
Ia (mm)= 3.80 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .27

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.083	3.72	1.083	8.17	2.083	36.46	3.08	5.47
.167	3.72	1.167	8.17	2.167	36.46	3.17	5.47
.250	3.98	1.250	9.86	2.250	24.72	3.25	5.02
.333	4.15	1.333	10.98	2.333	16.89	3.33	4.72
.417	4.26	1.417	12.16	2.417	15.71	3.42	4.61
.500	4.72	1.500	16.89	2.500	10.98	3.50	4.15
.583	4.72	1.583	16.89	2.583	10.98	3.58	4.15
.667	5.32	1.667	32.55	2.667	8.73	3.67	3.81
.750	5.47	1.750	36.46	2.750	8.17	3.75	3.72
.833	5.90	1.833	69.70	2.833	7.52	3.83	3.58
.917	6.54	1.917	119.55	2.917	6.54	3.92	3.37
1.000	6.54	2.000	119.55	3.000	6.54	4.00	3.37

Unit Hyd Qpeak (cms)= .037

PEAK FLOW (cms)= .019 (i)
TIME TO PEAK (hrs)= 2.250
RUNOFF VOLUME (mm)= 25.089
TOTAL RAINFALL (mm)= 63.424
RUNOFF COEFFICIENT = .396

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

| CALIB NASHYD (0201) ID= 1 DT= 5.0 min |

Area (ha)= 1.46 Curve Number (CN)= 57.3
Ia (mm)= 6.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .71

Unit Hyd Qpeak (cms)= .079

PEAK FLOW (cms)= .030 (i)

```
     TIME TO PEAK     (hrs)=   2.833
     RUNOFF VOLUME     (mm)=  13.365
     TOTAL RAINFALL    (mm)=  63.424
     RUNOFF COEFFICIENT   =    .211

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0203)   |   Area     (ha)=   1.77   Curve Number    (CN)= 66.2
|ID= 1 DT= 5.0 min   |   Ia       (mm)=   4.80   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .40

     Unit Hyd Qpeak  (cms)=    .169

     PEAK FLOW       (cms)=    .074 (i)
     TIME TO PEAK    (hrs)=   2.417
     RUNOFF VOLUME    (mm)=  18.248
     TOTAL RAINFALL   (mm)=  63.424
     RUNOFF COEFFICIENT   =    .288

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

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0400) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW     STORAGE    |  OUTFLOW     STORAGE
--------------------      (cms)      (ha.m.)    |   (cms)      (ha.m.)
                           .0000       .0000     |    .0200       .0210
                           .0010       .0050     |    .0210       .0280
                           .0100       .0120     |    .0000       .0000

                                 AREA      QPEAK      TPEAK       R.V.
                                 (ha)      (cms)      (hrs)       (mm)
     INFLOW : ID= 2 (0203)       1.77        .07       2.42      18.25
     OUTFLOW: ID= 1 (0400)       1.77        .02       3.50      17.53

               PEAK   FLOW   REDUCTION [Qout/Qin](%)= 26.66
               TIME SHIFT OF PEAK FLOW         (min)= 65.00
               MAXIMUM  STORAGE   USED       (ha.m.)=  .0207

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

--------------------
| ADD HYD   (0401) |
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
          ID1= 1 (0201):     1.46      .030      2.83     13.36
        + ID2= 2 (0400):     1.77      .020      3.50     17.53
          ==========================================================
          ID = 3 (0401):     3.23      .046      3.00     15.65

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0402) |
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
          ID1= 1 (0202):      .26      .019      2.25     25.09
```

```
        + ID2= 2 (0401):     3.23     .046     3.00     15.65
          ================================================
          ID = 3 (0402):     3.49     .053     2.75     16.35

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0100)   |   Area     (ha)= 351.00   Curve Number    (CN)= 59.3
|ID= 1 DT= 5.0 min   |   Ia       (mm)=   7.60   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   4.70

     Unit Hyd Qpeak  (cms)=   2.852

     PEAK FLOW       (cms)=   1.498 (i)
     TIME TO PEAK    (hrs)=   7.000
     RUNOFF VOLUME    (mm)=  13.540
     TOTAL RAINFALL   (mm)=  63.424
     RUNOFF COEFFICIENT    =    .213

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

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--------------------
| ADD HYD   (0403) |
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
          ID1= 1 (0402):     3.49     .053      2.75      16.35
        + ID2= 2 (0100):   351.00    1.498      7.00      13.54
          ================================================
          ID = 3 (0403):   354.49    1.504      7.00      13.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ****************************
  ** SIMULATION NUMBER:   4 **
  ****************************


--------------------
|    READ STORM    |    Filename: C:\My Documents\STORMS\Orillia\oschi100.stm
| Ptotal= 71.77 mm |    Comments: OWEN SOUND 100 YEAR 4 HOUR DURATION CHIC
--------------------
                TIME     RAIN |  TIME     RAIN |  TIME     RAIN |  TIME     RAIN
                hrs     mm/hr |   hrs    mm/hr |   hrs    mm/hr |   hrs    mm/hr
                .10      3.08 |  1.10     7.44 |  2.10    40.41 |  3.10     5.16
                .20      3.27 |  1.20     8.67 |  2.20    25.38 |  3.20     4.73
                .30      3.49 |  1.30    10.36 |  2.30    18.12 |  3.30     4.37
                .40      3.73 |  1.40    12.83 |  2.40    13.95 |  3.40     4.05
                .50      4.02 |  1.50    16.70 |  2.50    11.28 |  3.50     3.79
                .60      4.35 |  1.60    23.51 |  2.60     9.44 |  3.60     3.55
                .70      4.75 |  1.70    37.88 |  2.70     8.10 |  3.70     3.35
                .80      5.22 |  1.80    81.47 |  2.80     7.09 |  3.80     3.16
                .90      5.80 |  1.90   206.92 |  2.90     6.31 |  3.90     3.00
               1.00      6.52 |  2.00    83.92 |  3.00     5.67 |  4.00     2.85

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--------------------
| CALIB              |
```

NASHYD (0202)	ID= 1 DT= 5.0 min	Area (ha)= .26	Ia (mm)= 3.80	U.H. Tp(hrs)= .27	Curve Number (CN)= 75.6	# of Linear Res.(N)= 3.00

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.083	3.08	1.083	7.44	2.083	40.41	3.08	5.16
.167	3.23	1.167	8.42	2.167	28.39	3.17	4.82
.250	3.40	1.250	9.68	2.250	21.02	3.25	4.51
.333	3.59	1.333	11.35	2.333	16.45	3.33	4.24
.417	3.79	1.417	13.60	2.417	13.42	3.42	4.00
.500	4.02	1.500	16.70	2.500	11.28	3.50	3.79
.583	4.35	1.583	23.51	2.583	9.44	3.58	3.55
.667	4.67	1.667	35.01	2.667	8.37	3.67	3.39
.750	5.03	1.750	64.03	2.750	7.49	3.75	3.24
.833	5.45	1.833	131.65	2.833	6.78	3.83	3.10
.917	5.94	1.917	182.32	2.917	6.18	3.92	2.97
1.000	6.52	2.000	83.92	3.000	5.67	4.00	2.85

Unit Hyd Qpeak (cms)= .037

PEAK FLOW (cms)= .027 (i)
TIME TO PEAK (hrs)= 2.167
RUNOFF VOLUME (mm)= 30.788
TOTAL RAINFALL (mm)= 71.769
RUNOFF COEFFICIENT = .429

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

CALIB NASHYD (0201)	ID= 1 DT= 5.0 min	Area (ha)= 1.46	Ia (mm)= 6.00	U.H. Tp(hrs)= .71	Curve Number (CN)= 57.3	# of Linear Res.(N)= 3.00

Unit Hyd Qpeak (cms)= .079

PEAK FLOW (cms)= .040 (i)
TIME TO PEAK (hrs)= 2.750
RUNOFF VOLUME (mm)= 16.958
TOTAL RAINFALL (mm)= 71.769
RUNOFF COEFFICIENT = .236

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

CALIB NASHYD (0203)	ID= 1 DT= 5.0 min	Area (ha)= 1.77	Ia (mm)= 4.80	U.H. Tp(hrs)= .40	Curve Number (CN)= 66.2	# of Linear Res.(N)= 3.00

Unit Hyd Qpeak (cms)= .169

PEAK FLOW (cms)= .100 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 22.802
TOTAL RAINFALL (mm)= 71.769

RUNOFF COEFFICIENT = .318

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

RESERVOIR (0400)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
.0000	.0000	.0200	.0210
.0010	.0050	.0210	.0280
.0100	.0120	.0000	.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0203)	1.77	.10	2.33	22.80
OUTFLOW: ID= 1 (0400)	1.77	.02	3.50	22.08

PEAK FLOW REDUCTION [Qout/Qin](%)= 20.77
TIME SHIFT OF PEAK FLOW (min)= 70.00
MAXIMUM STORAGE USED (ha.m.)= .0271

ADD HYD (0401)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0201):	1.46	.040	2.75	16.96
+ ID2= 2 (0400):	1.77	.021	3.50	22.08
ID = 3 (0401):	3.23	.060	2.75	19.77

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0402)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0202):	.26	.027	2.17	30.79
+ ID2= 2 (0401):	3.23	.060	2.75	19.77
ID = 3 (0402):	3.49	.070	2.67	20.59

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB NASHYD (0100) ID= 1 DT= 5.0 min	Area (ha)= 351.00	Curve Number (CN)= 59.3
	Ia (mm)= 7.60	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 4.70	

Unit Hyd Qpeak (cms)= 2.852

PEAK FLOW (cms)= 1.913 (i)
TIME TO PEAK (hrs)= 6.917
RUNOFF VOLUME (mm)= 17.265
TOTAL RAINFALL (mm)= 71.769
RUNOFF COEFFICIENT = .241

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

ADD HYD (0403)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (0402):	3.49	.070	2.67	20.59
	+ ID2= 2 (0100):	351.00	1.913	6.92	17.26
	ID = 3 (0403):	354.49	1.922	6.83	17.30

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

****
** SIMULATION NUMBER: 5 **
****

READ STORM	Ptotal=193.00 mm

Filename: C:\My Documents\STORMS\Owen Sound\TIMMINS.12
Comments: TIMMINS REGIONAL 12 HOUR DURATION STORM

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.20	15.00	3.20	3.00	6.20	43.00	9.20	13.00
.40	15.00	3.40	3.00	6.40	43.00	9.40	13.00
.60	15.00	3.60	3.00	6.60	43.00	9.60	13.00
.80	15.00	3.80	3.00	6.80	43.00	9.80	13.00
1.00	15.00	4.00	3.00	7.00	43.00	10.00	13.00
1.20	20.00	4.20	5.00	7.20	20.00	10.20	13.00
1.40	20.00	4.40	5.00	7.40	20.00	10.40	13.00
1.60	20.00	4.60	5.00	7.60	20.00	10.60	13.00
1.80	20.00	4.80	5.00	7.80	20.00	10.80	13.00
2.00	20.00	5.00	5.00	8.00	20.00	11.00	13.00
2.20	10.00	5.20	20.00	8.20	23.00	11.20	8.00
2.40	10.00	5.40	20.00	8.40	23.00	11.40	8.00
2.60	10.00	5.60	20.00	8.60	23.00	11.60	8.00
2.80	10.00	5.80	20.00	8.80	23.00	11.80	8.00
3.00	10.00	6.00	20.00	9.00	23.00	12.00	8.00

CALIB NASHYD (0202)	ID= 1 DT= 5.0 min

Area (ha)= .26 Curve Number (CN)= 75.6
Ia (mm)= 3.80 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .27

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00

.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Unit Hyd Qpeak (cms)= .037

PEAK FLOW (cms)= .024 (i)
TIME TO PEAK (hrs)= 7.000
RUNOFF VOLUME (mm)= 131.924
TOTAL RAINFALL (mm)= 193.000
RUNOFF COEFFICIENT = .684

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

CALIB NASHYD (0201) ID= 1 DT= 5.0 min	Area (ha)= 1.46	Curve Number (CN)= 57.3	
	Ia (mm)= 6.00	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= .71		

Unit Hyd Qpeak (cms)= .079

PEAK FLOW (cms)= .074 (i)
TIME TO PEAK (hrs)= 7.417
RUNOFF VOLUME (mm)= 92.931
TOTAL RAINFALL (mm)= 193.000
RUNOFF COEFFICIENT = .482

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

CALIB NASHYD (0203)	Area (ha)= 1.77	Curve Number (CN)= 66.2

```
|ID= 1 DT= 5.0 min |    Ia      (mm)=   4.80   # of Linear Res.(N)= 3.00
-------------------    U.H. Tp(hrs)=    .40

     Unit Hyd Qpeak  (cms)=    .169

     PEAK FLOW       (cms)=    .131 (i)
     TIME TO PEAK    (hrs)=   7.083
     RUNOFF VOLUME    (mm)= 111.407
     TOTAL RAINFALL   (mm)= 193.000
     RUNOFF COEFFICIENT   =    .577

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

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0400) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |      OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)    |   (cms)     (ha.m.)
                           .0000      .0000     |    .0200      .0210
                           .0010      .0050     |    .0210      .0280
                           .0100      .0120     |    .0000      .0000
     **** WARNING : STORAGE-DISCHARGE TABLE WAS EXCEEDED.

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0203)       1.77       .13      7.08     111.41
     OUTFLOW: ID= 1 (0400)       1.77       .03     12.08     110.69

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 25.60
                    TIME SHIFT OF PEAK FLOW          (min)=300.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  .1153

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

--------------------
| ADD HYD   (0401) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0201):     1.46     .074     7.42    92.93
        + ID2= 2 (0400):     1.77     .033    12.08   110.69
          ==============================================
          ID = 3 (0401):     3.23     .099     7.50   102.66

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD   (0402) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0202):      .26     .024     7.00   131.92
        + ID2= 2 (0401):     3.23     .099     7.50   102.66
          ==============================================
          ID = 3 (0402):     3.49     .117     7.25   104.84

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0100) |   Area     (ha)= 351.00   Curve Number    (CN)= 59.3
```

```
|ID= 1 DT= 5.0 min |    Ia      (mm)=   7.60   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   4.70

     Unit Hyd Qpeak  (cms)=   2.852

     PEAK FLOW       (cms)=   8.794 (i)
     TIME TO PEAK    (hrs)=  13.167
     RUNOFF VOLUME    (mm)=  95.552
     TOTAL RAINFALL   (mm)= 193.000
     RUNOFF COEFFICIENT   =    .495

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

```
--------------------
| ADD HYD   (0403) |
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------           (ha)     (cms)     (hrs)      (mm)
          ID1= 1 (0402):      3.49      .117      7.25    104.84
        + ID2= 2 (0100):    351.00     8.794     13.17     95.55
          ==========================================================
          ID = 3 (0403):    354.49     8.836     13.17     95.64

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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 FINISH
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APPENDIX B:
HEC-RAS MODELLING RESULTS

HEC-RAS Plan: Existing River: Shadow Creek Reach: 1

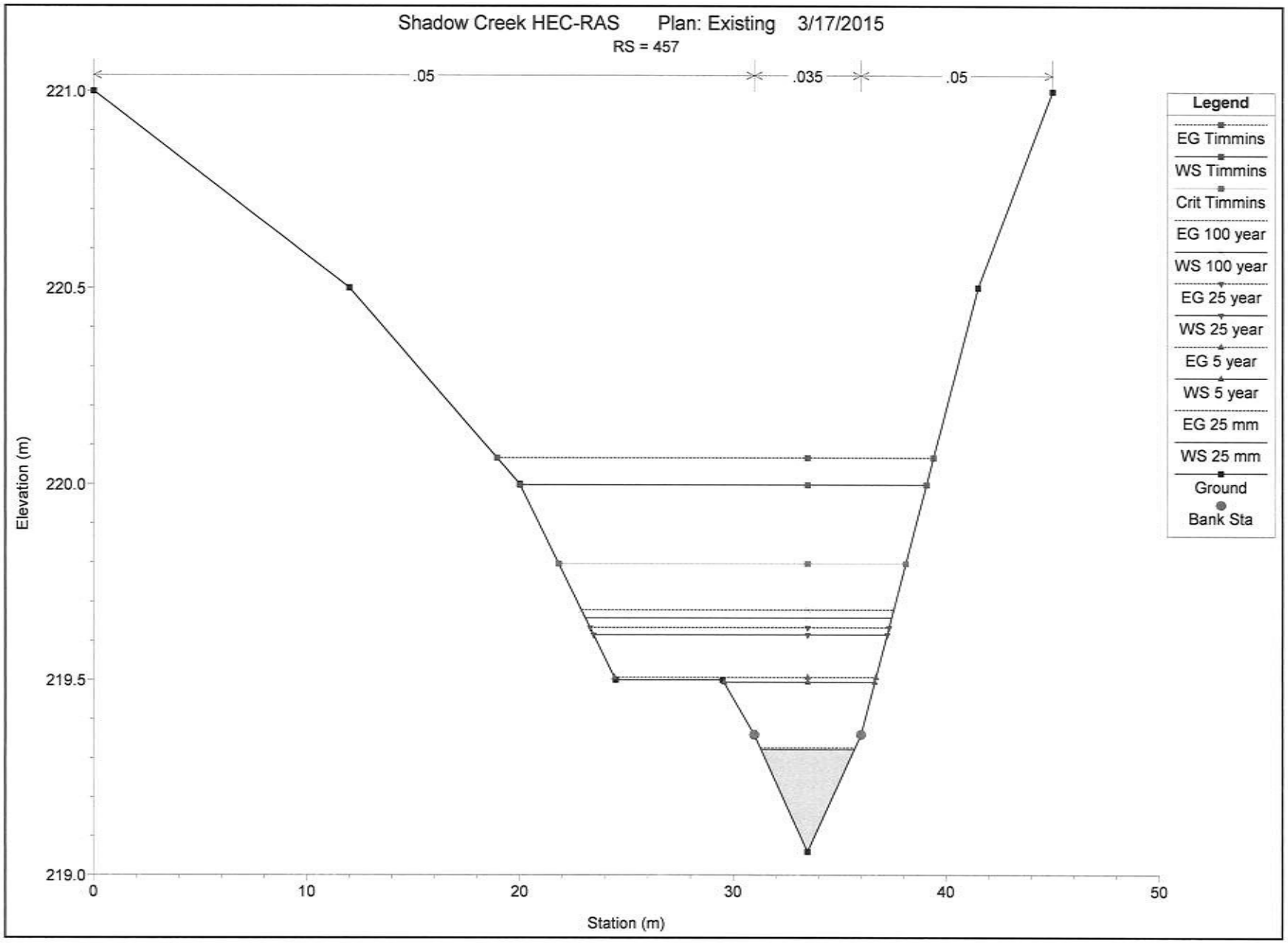
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	1000	25 mm	0.17	219.80	220.07		220.08	0.001056	0.25	0.97	15.00	0.21
1	1000	5 year	0.72	219.80	220.20		220.20	0.000757	0.30	3.92	27.65	0.20
1	1000	25 year	1.50	219.80	220.37		220.37	0.000279	0.26	8.76	28.80	0.13
1	1000	100 year	1.91	219.80	220.50		220.50	0.000146	0.23	12.57	29.78	0.10
1	1000	Timmins	8.80	219.80	221.10		221.10	0.000155	0.38	37.64	56.00	0.12
1	891	25 mm	0.17	219.63	219.89		219.90	0.002865	0.42	0.41	3.49	0.35
1	891	5 year	0.72	219.63	220.07		220.08	0.001707	0.53	2.07	13.55	0.30
1	891	25 year	1.50	219.63	220.33		220.34	0.000383	0.38	6.82	22.93	0.16
1	891	100 year	1.91	219.63	220.48		220.48	0.000203	0.32	10.62	28.28	0.12
1	891	Timmins	8.80	219.63	221.07		221.08	0.000266	0.55	30.13	41.06	0.15
1	860	25 mm	0.17	219.54	219.82		219.83	0.001945	0.37	0.47	3.37	0.29
1	860	5 year	0.72	219.54	220.02		220.03	0.001585	0.55	1.97	14.47	0.30
1	860	25 year	1.50	219.54	220.32		220.33	0.000273	0.35	7.63	22.71	0.14
1	860	100 year	1.91	219.54	220.47		220.48	0.000156	0.30	11.41	26.85	0.11
1	860	Timmins	8.80	219.54	221.07		221.07	0.000196	0.49	41.37	74.62	0.13
1	836	25 mm	0.17	219.47	219.69		219.72	0.015835	0.80	0.21	1.96	0.78
1	836	5 year	0.72	219.47	220.00		220.01	0.000540	0.33	3.94	23.83	0.18
1	836	25 year	1.50	219.47	220.32		220.32	0.000089	0.21	13.63	37.33	0.08
1	836	100 year	1.91	219.47	220.47		220.47	0.000053	0.18	19.86	43.89	0.06
1	836	Timmins	8.80	219.47	221.07		221.07	0.000072	0.30	57.67	83.55	0.08
1	821	25 mm	0.17	219.40	219.67	219.53	219.67	0.001021	0.32	0.54	37.54	0.22
1	821	5 year	0.72	219.40	219.98	219.66	220.00	0.000835	0.53	1.35	62.64	0.24
1	821	25 year	1.50	219.40	220.29	219.79	220.32	0.000763	0.69	2.16	77.39	0.24
1	821	100 year	1.91	219.40	220.44	219.84	220.47	0.000711	0.75	2.55	84.29	0.24
1	821	Timmins	8.80	219.40	221.07	220.51	221.07	0.000009	0.11	117.30	87.00	0.03
1	820		Culvert									
1	807	25 mm	0.17	219.24	219.64	219.38	219.65	0.000261	0.23	0.75	11.06	0.12
1	807	5 year	0.72	219.24	219.89	219.52	219.90	0.000789	0.56	1.29	21.09	0.23
1	807	25 year	1.50	219.24	220.06	219.66	220.10	0.001461	0.90	1.66	32.71	0.33
1	807	100 year	1.91	219.24	220.12	219.72	220.18	0.001782	1.05	1.81	33.47	0.37
1	807	Timmins	8.80	219.24	220.48	220.48	221.07	0.011455	3.40	2.59	36.00	1.00

HEC-RAS Plan: Existing River: Shadow Creek Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	792	25 mm	0.17	219.41	219.64		219.64	0.001170	0.23	0.75	6.59	0.22
1	792	5 year	0.72	219.41	219.88		219.89	0.000356	0.24	3.24	22.02	0.14
1	792	25 year	1.50	219.41	220.07		220.07	0.000284	0.28	6.20	32.77	0.13
1	792	100 year	1.91	219.41	220.14		220.15	0.000256	0.29	7.91	37.79	0.13
1	792	Timmins	8.80	219.41	220.67		220.68	0.000254	0.47	33.03	72.24	0.15
1	753	25 mm	0.17	219.36	219.63		219.63	0.000082	0.10	2.24	12.60	0.06
1	753	5 year	0.72	219.36	219.88		219.88	0.000096	0.16	6.18	18.23	0.08
1	753	25 year	1.50	219.36	220.06		220.06	0.000118	0.22	9.80	21.38	0.09
1	753	100 year	1.91	219.36	220.14		220.14	0.000124	0.23	11.44	22.46	0.09
1	753	Timmins	8.80	219.36	220.66		220.67	0.000346	0.58	31.53	72.55	0.17
1	686	25 mm	0.17	219.25	219.63		219.63	0.000019	0.06	3.55	13.81	0.03
1	686	5 year	0.72	219.25	219.88		219.88	0.000045	0.14	7.69	19.60	0.06
1	686	25 year	1.50	219.25	220.06		220.06	0.000072	0.21	11.67	26.39	0.07
1	686	100 year	1.91	219.25	220.13		220.13	0.000083	0.24	13.83	31.61	0.08
1	686	Timmins	8.80	219.25	220.65		220.65	0.000161	0.45	39.92	64.53	0.12
1	637	25 mm	0.17	219.21	219.62		219.63	0.000143	0.12	1.42	8.32	0.08
1	637	5 year	0.72	219.21	219.87		219.87	0.000160	0.19	4.89	19.91	0.10
1	637	25 year	1.50	219.21	220.05		220.05	0.000154	0.23	9.21	28.20	0.10
1	637	100 year	1.91	219.21	220.12		220.13	0.000143	0.24	11.43	31.47	0.10
1	637	Timmins	8.80	219.21	220.64		220.64	0.000201	0.43	33.98	64.40	0.13
1	575	25 mm	0.17	219.22	219.58	219.48	219.60	0.004860	0.59	0.29	1.59	0.44
1	575	5 year	0.72	219.22	219.78	219.68	219.84	0.008202	1.03	0.70	2.48	0.62
1	575	25 year	1.50	219.22	219.90	219.84	220.01	0.013019	1.48	1.02	2.99	0.81
1	575	100 year	1.91	219.22	219.94	219.91	220.08	0.015353	1.67	1.14	3.18	0.89
1	575	Timmins	8.80	219.22	220.41	220.41	220.59	0.012596	2.08	5.68	15.74	0.88
1	525	25 mm	0.17	219.14	219.39		219.40	0.003166	0.40	0.42	3.32	0.36
1	525	5 year	0.72	219.14	219.57		219.59	0.003114	0.61	1.22	6.28	0.40
1	525	25 year	1.50	219.14	219.70		219.73	0.002673	0.76	2.29	9.48	0.40
1	525	100 year	1.91	219.14	219.76		219.79	0.002593	0.82	2.83	10.74	0.40
1	525	Timmins	8.80	219.14	220.22		220.28	0.002525	1.31	10.19	20.65	0.45
1	499	25 mm	0.17	219.10	219.37		219.37	0.000662	0.19	0.89	6.67	0.17
1	499	5 year	0.72	219.10	219.54		219.55	0.000646	0.28	2.98	24.37	0.18

HEC-RAS Plan: Existing River: Shadow Creek Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	499	25 year	1.50	219.10	219.66		219.67	0.000491	0.32	6.57	35.09	0.17
1	499	100 year	1.91	219.10	219.71		219.71	0.000470	0.34	8.26	39.85	0.17
1	499	Timmins	8.80	219.10	220.10		220.11	0.000397	0.49	32.83	86.12	0.17
1	457	25 mm	0.17	219.06	219.32		219.33	0.001637	0.30	0.57	4.37	0.26
1	457	5 year	0.72	219.06	219.49		219.51	0.001621	0.49	1.56	7.08	0.30
1	457	25 year	1.50	219.06	219.61		219.63	0.001672	0.64	3.09	13.76	0.32
1	457	100 year	1.91	219.06	219.66		219.68	0.001753	0.70	3.69	14.35	0.33
1	457	Timmins	8.80	219.06	220.00	219.80	220.07	0.003295	1.39	9.38	19.06	0.50
1	395	25 mm	0.17	218.79	218.98	218.98	219.03	0.027709	0.99	0.17	1.78	1.01
1	395	5 year	0.72	218.79	219.14	219.14	219.22	0.022379	1.31	0.55	3.18	1.00
1	395	25 year	1.50	218.79	219.27	219.27	219.34	0.024745	1.19	1.26	9.19	1.02
1	395	100 year	1.91	218.79	219.30	219.30	219.37	0.024754	1.21	1.57	11.14	1.03
1	395	Timmins	8.80	218.79	219.54	219.54	219.64	0.015719	1.42	6.67	40.14	0.91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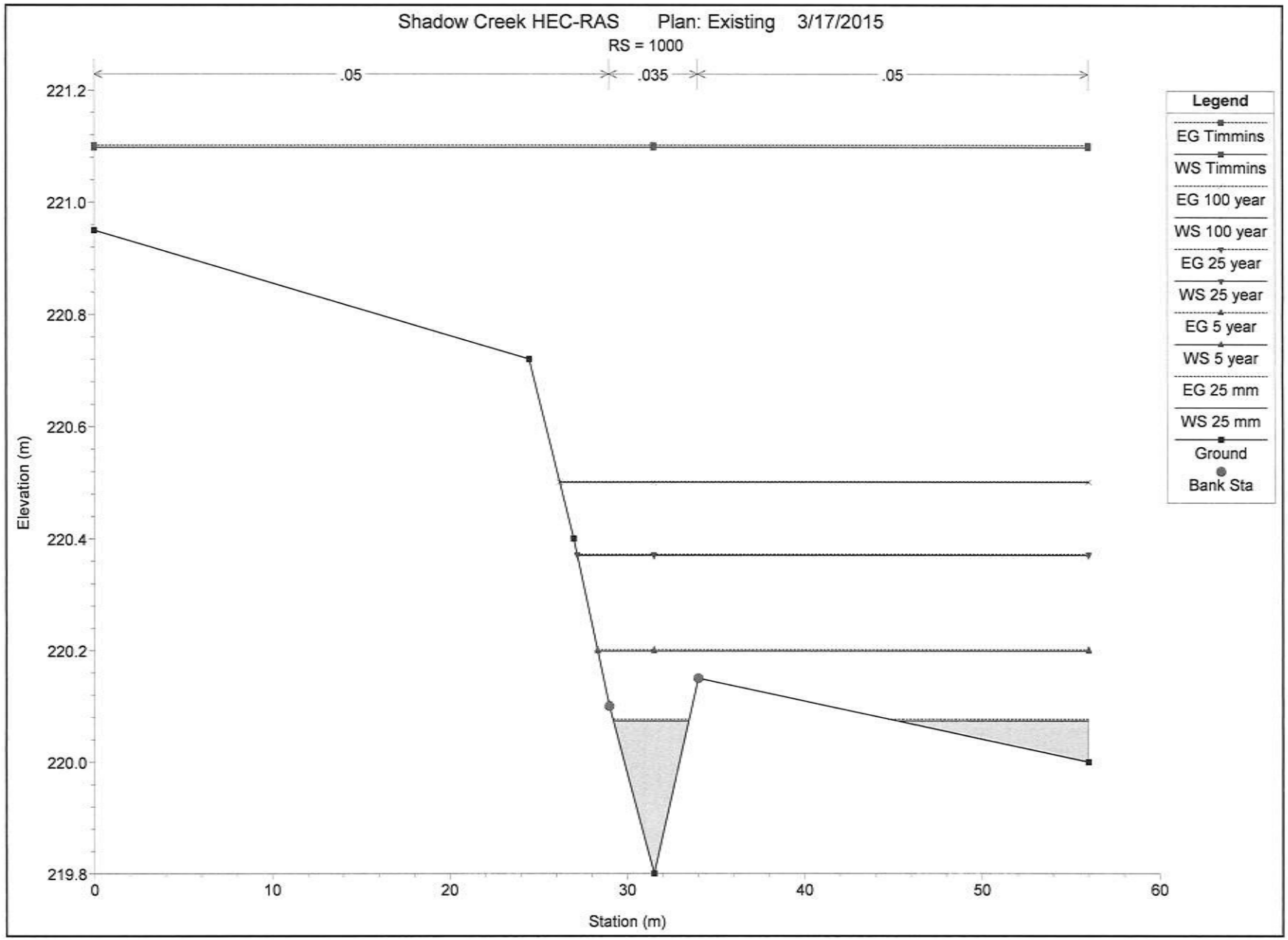
RS = 457
.05
.035
.05
221.0
220.5
220.0
219.5
219.0
Elevation (m)
0
10
20
30
40
50
Station (m)
Legend
EG Timmins
WS Timmins
Crit Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
EG 25 mm
WS 25 mm
Ground
Bank Sta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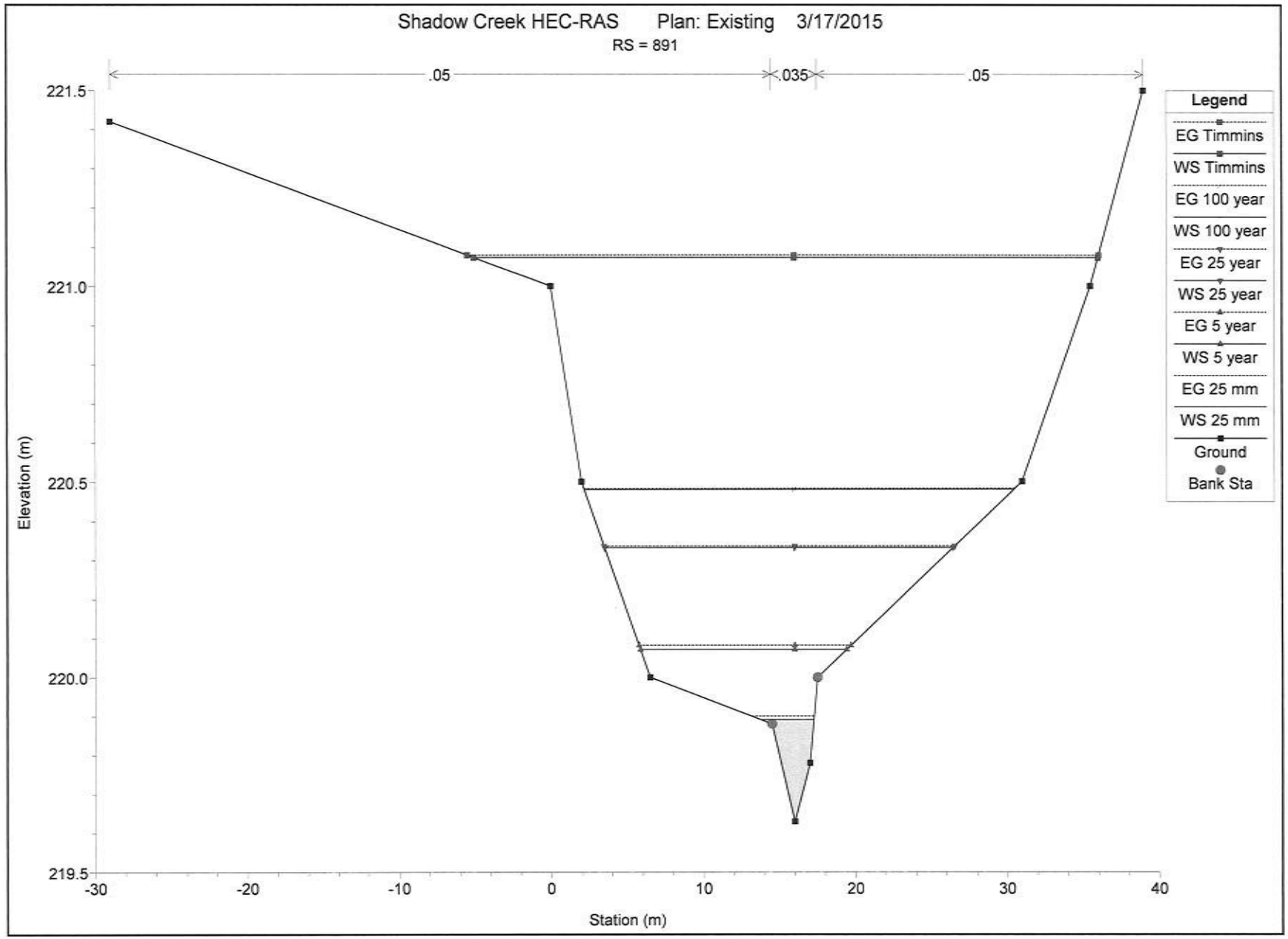
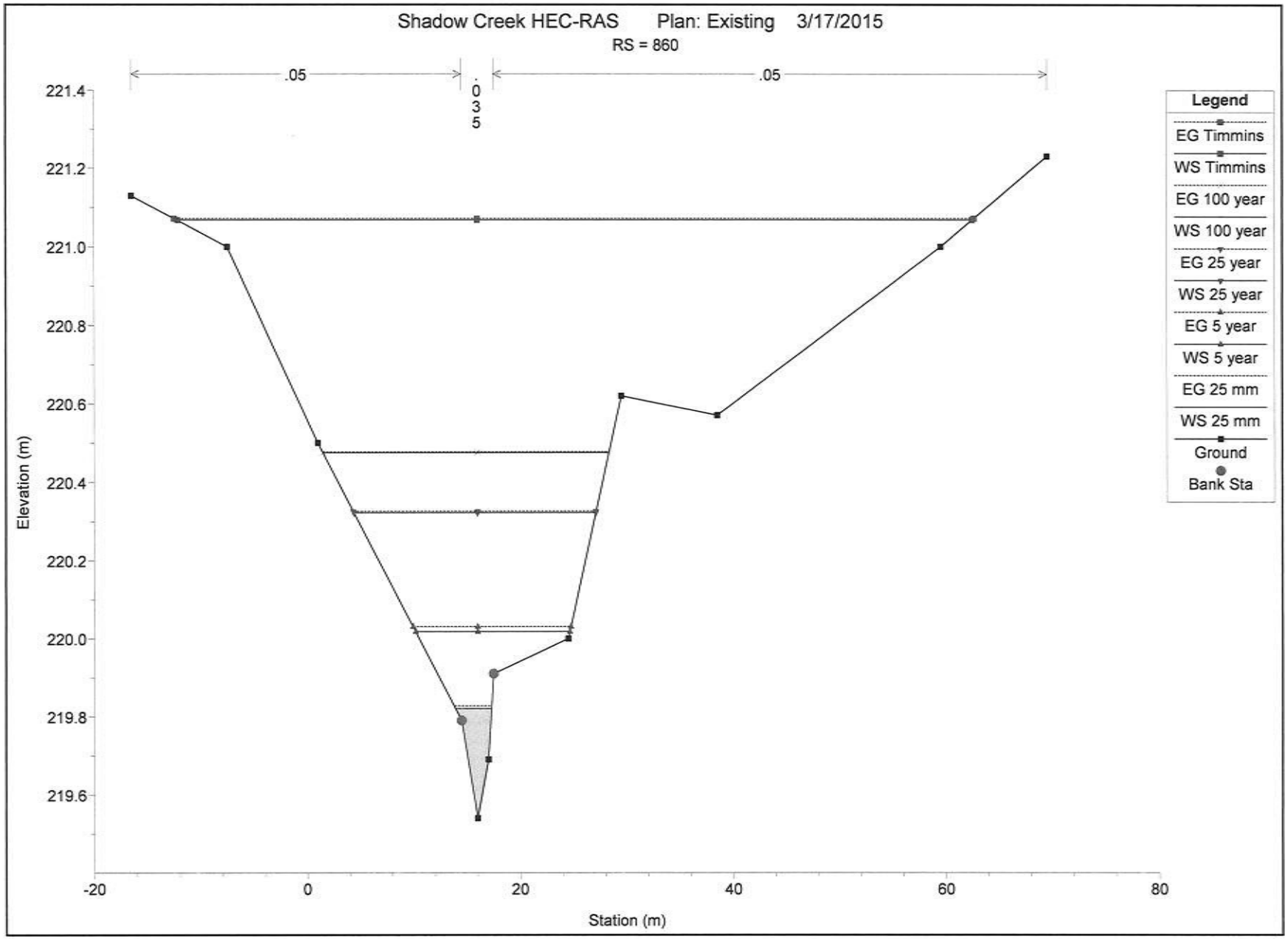
RS = 1000
.05
.035
.05
221.2
221.0
220.8
220.6
220.4
220.2
220.0
219.8
Elevation (m)
0
10
20
30
40
50
60
Station (m)
Legend
EG Timmins
WS Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
EG 25 mm
WS 25 mm
Ground
Bank Sta


Shadow Creek HEC-RAS Plan: Existing 3/17/2015
RS = 891
.05
.035
.05
221.5
221.0
220.5
220.0
219.5
Elevation (m)
-30
-20
-10
0
10
20
30
40
Station (m)
Legend
EG Timmins
WS Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
EG 25 mm
WS 25 mm
Ground
Bank Sta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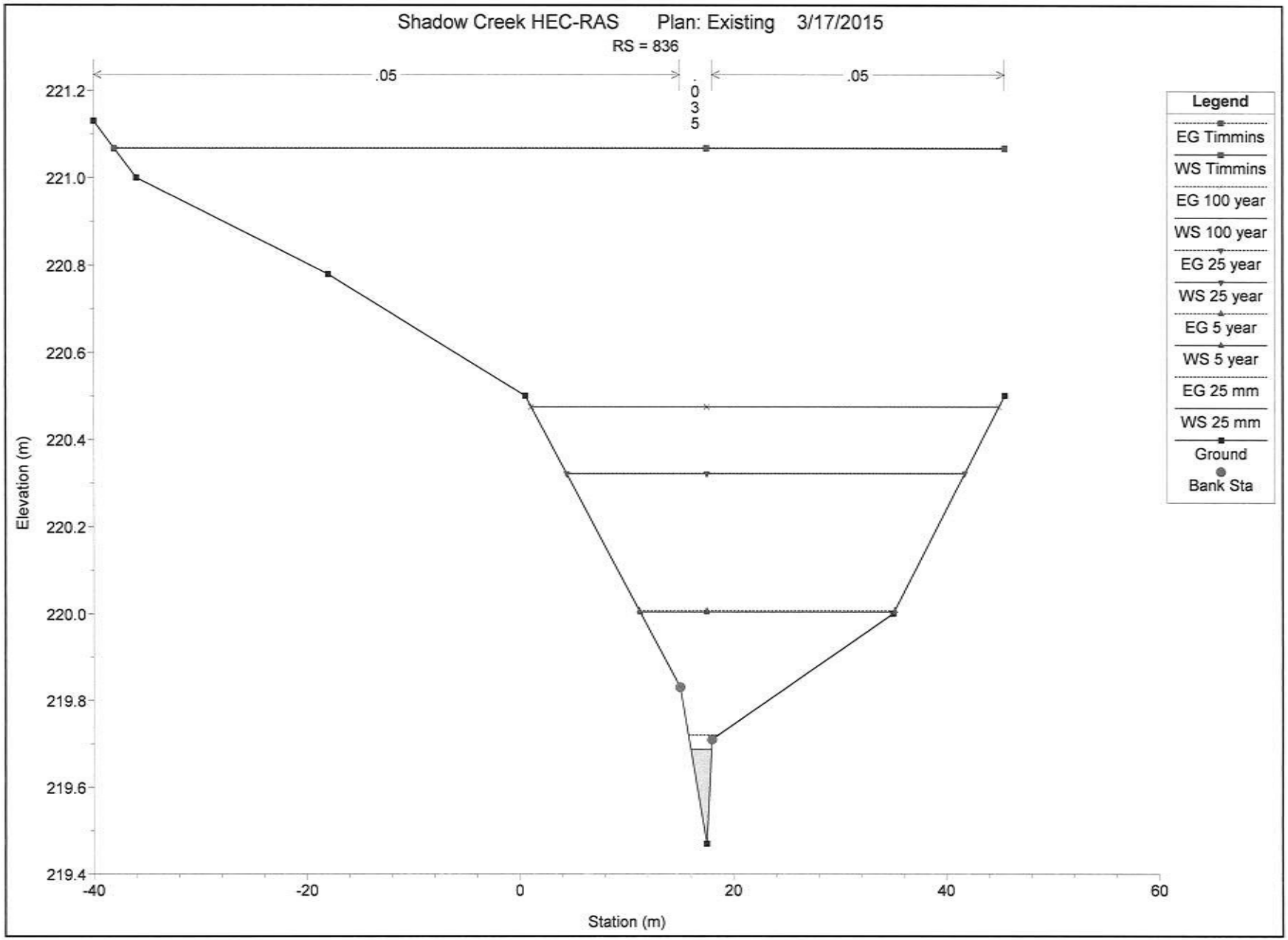
RS = 860
.05
.035
.05
Legend
EG Timmins
WS Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
EG 25 mm
WS 25 mm
Ground
Bank Sta
Elevation (m)
221.4
221.2
221.0
220.8
220.6
220.4
220.2
220.0
219.8
219.6
-20
0
20
40
60
80
Station (m)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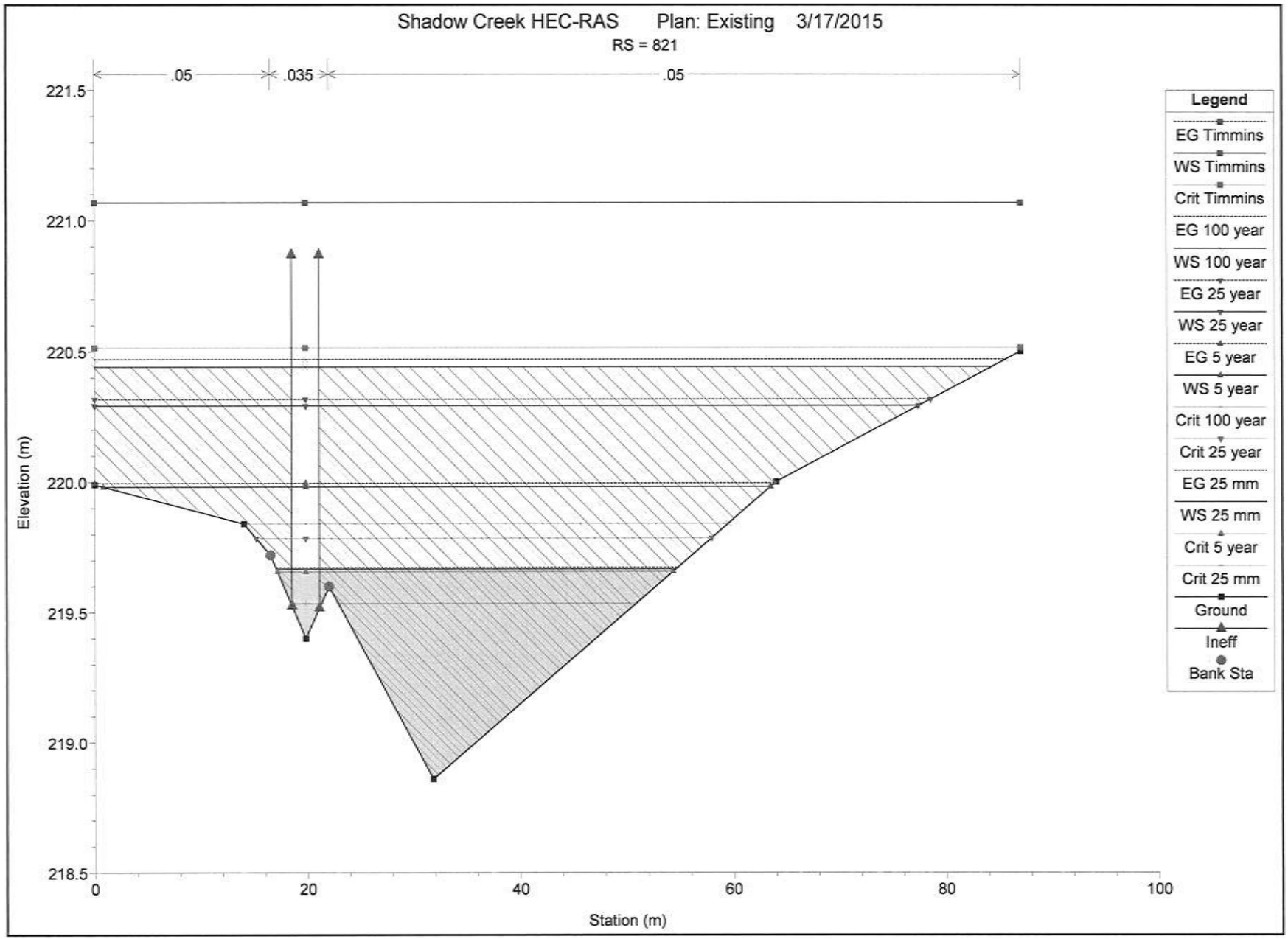
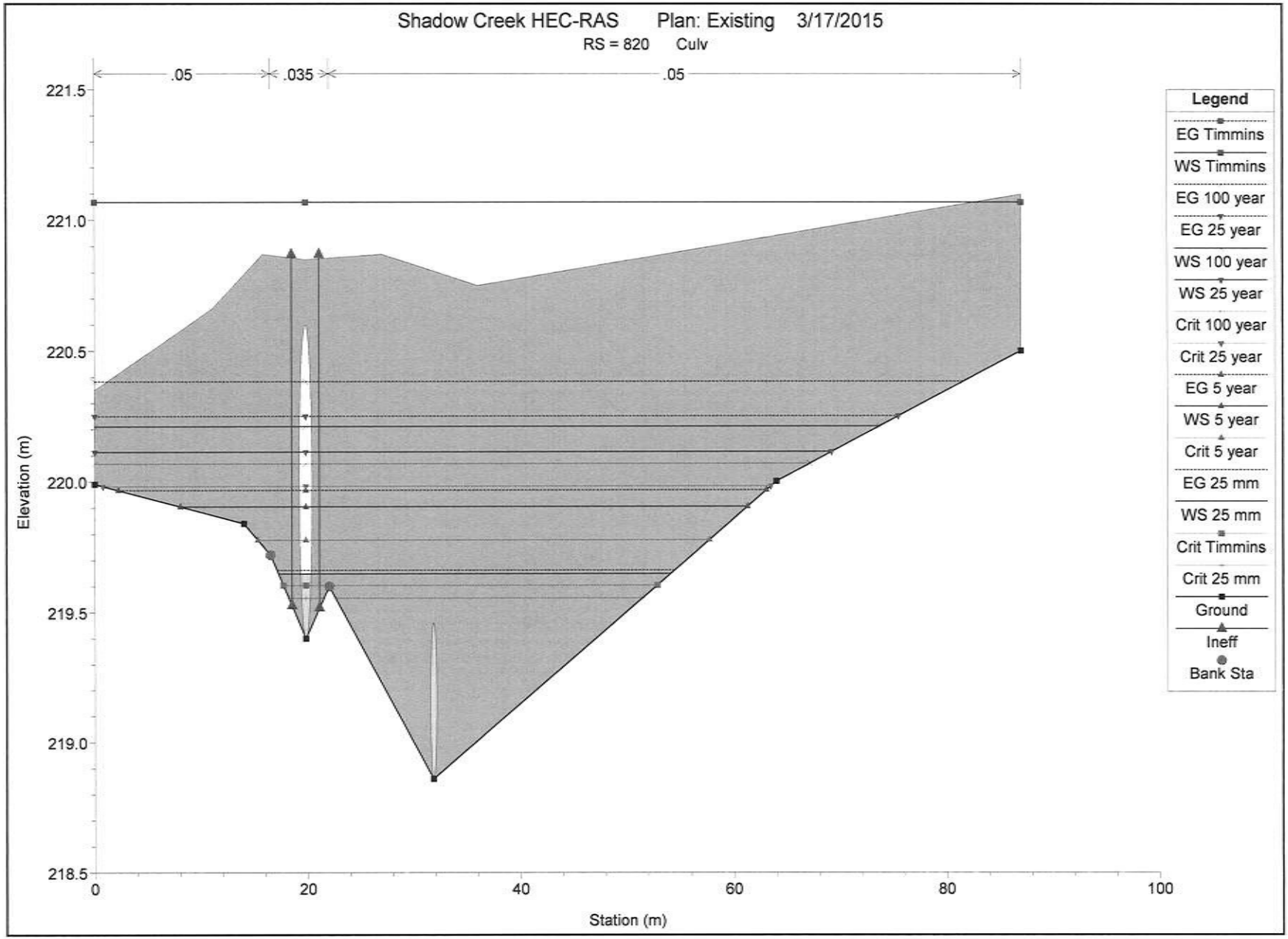
RS = 836
.05
.035
.05
221.2
221.0
220.8
220.6
220.4
220.2
220.0
219.8
219.6
219.4
Elevation (m)
-40
-20
0
20
40
60
Station (m)
Legend
EG Timmins
WS Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
EG 25 mm
WS 25 mm
Ground
Bank Sta


Shadow Creek HEC-RAS Plan: Existing 3/17/2015
RS = 821
.05
.035
.05
221.5
221.0
220.5
220.0
219.5
219.0
218.5
Elevation (m)
0
20
40
60
80
100
Station (m)
Legend
EG Timmins
WS Timmins
Crit Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
Crit 100 year
Crit 25 year
EG 25 mm
WS 25 mm
Crit 5 year
Crit 25 mm
Ground
Ineff
Bank Sta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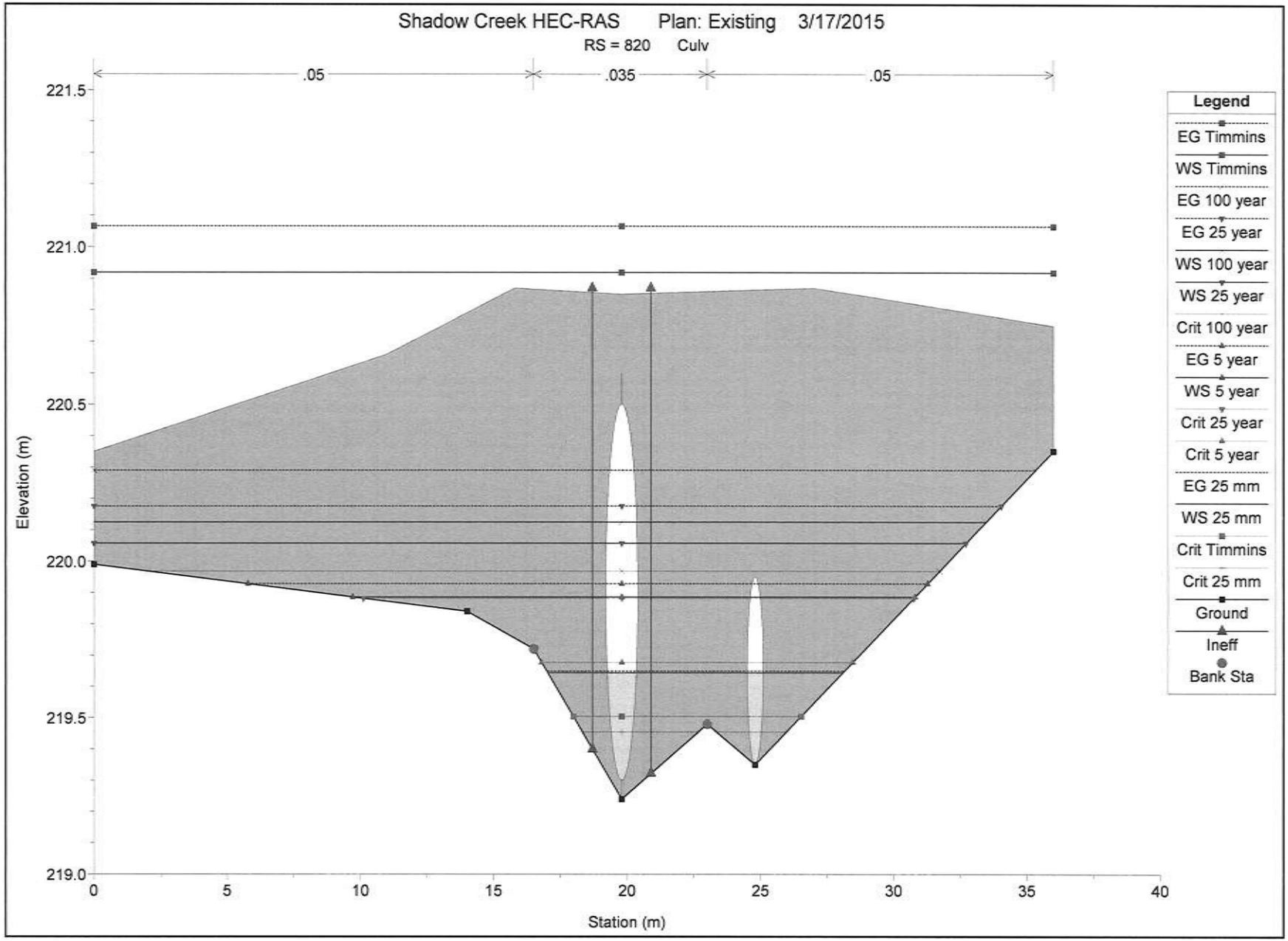
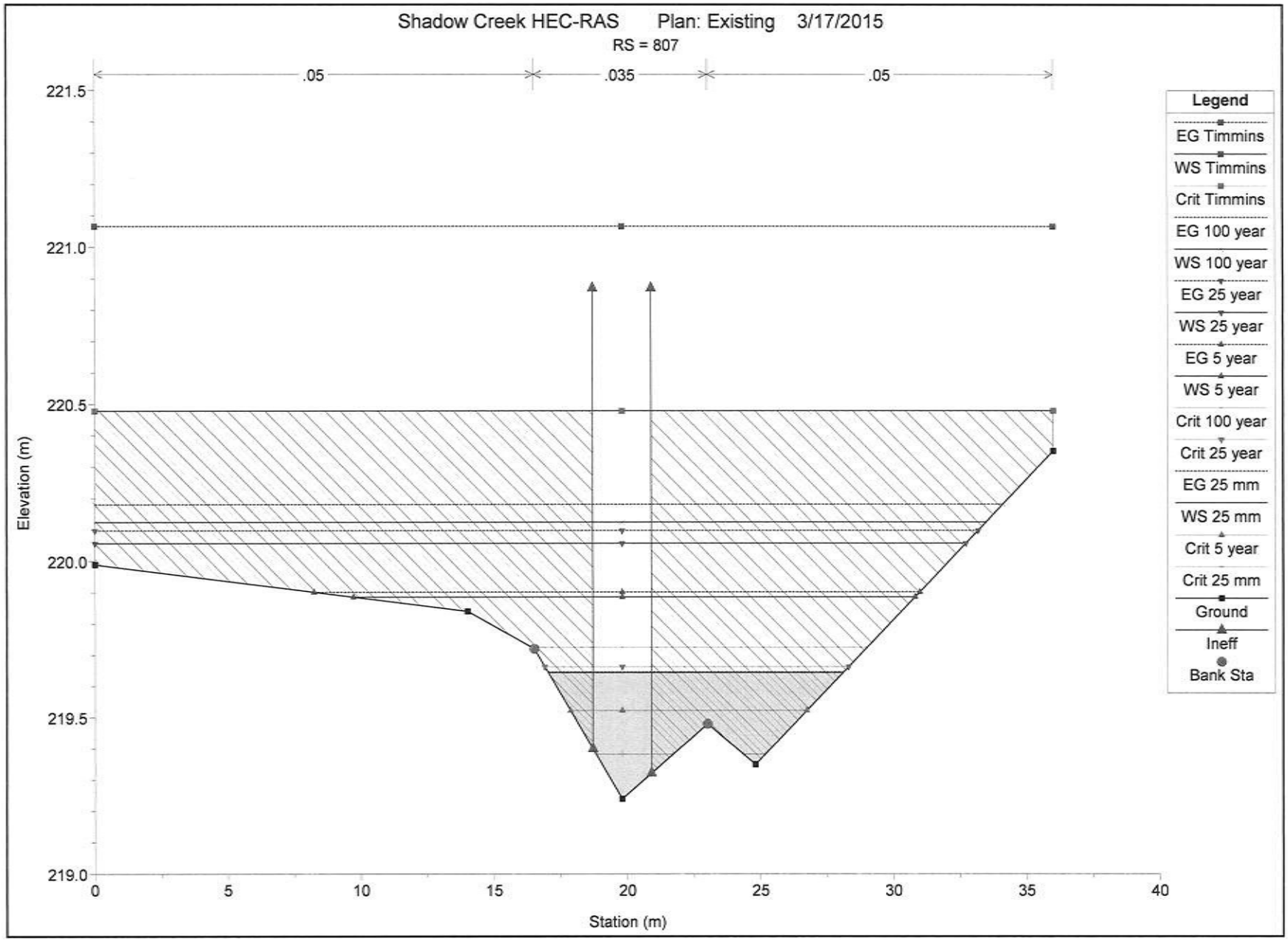
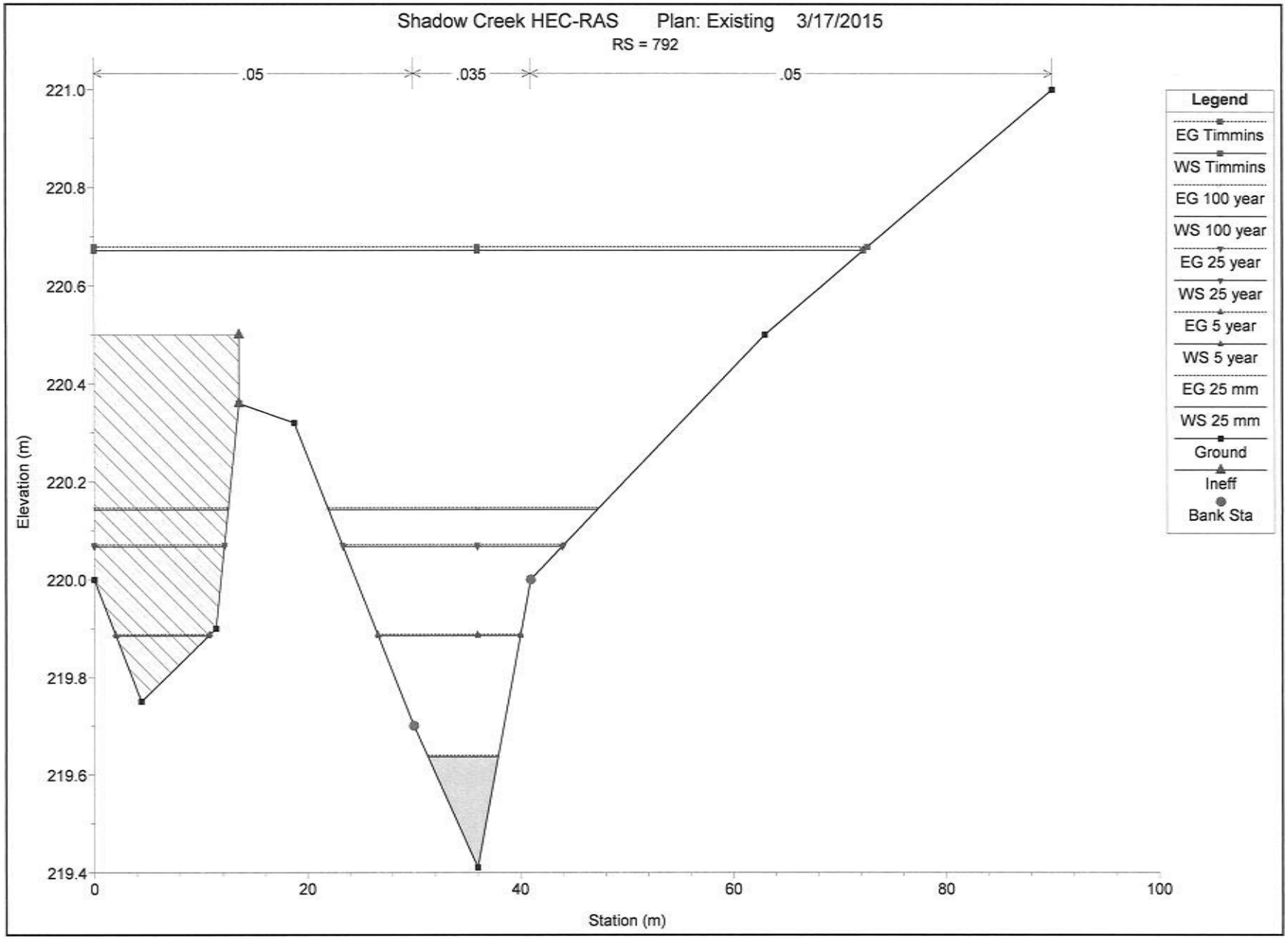
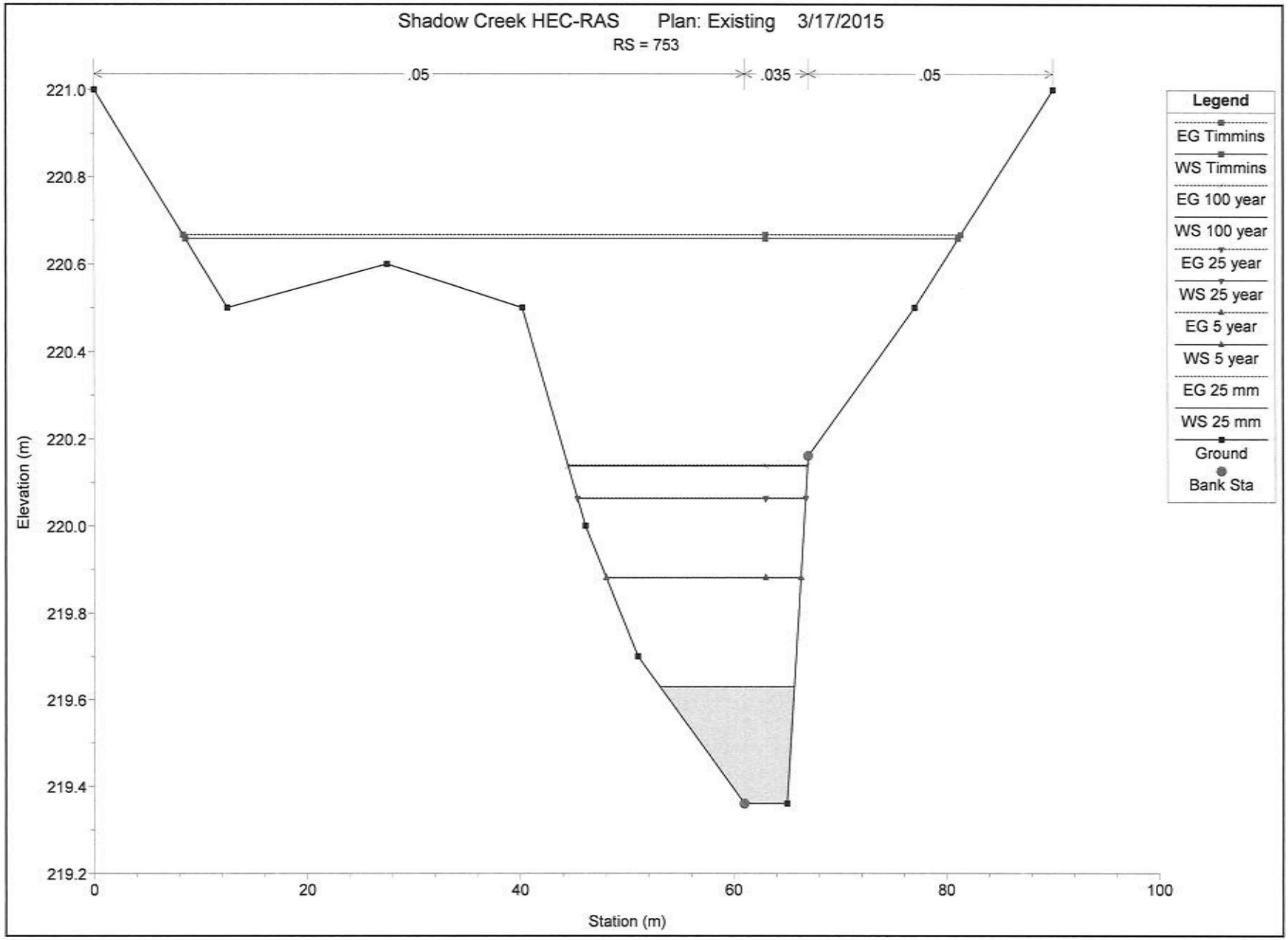
RS = 820 Culv
.05
.035
.05
221.5
221.0
220.5
220.0
219.5
219.0
218.5
Elevation (m)
0
20
40
60
80
100
Station (m)
Legend
EG Timmins
WS Timmins
EG 100 year
EG 25 year
WS 100 year
WS 25 year
Crit 100 year
Crit 25 year
EG 5 year
WS 5 year
Crit 5 year
EG 25 mm
WS 25 mm
Crit Timmins
Crit 25 mm
Ground
Ineff
Bank Sta


Shadow Creek HEC-RAS Plan: Existing 3/17/2015
RS = 820 Culv
.05
.035
.05
221.5
221.0
220.5
220.0
219.5
219.0
Elevation (m)
0
5
10
15
20
25
30
35
40
Station (m)
Legend
EG Timmins
WS Timmins
EG 100 year
EG 25 year
WS 100 year
WS 25 year
Crit 100 year
EG 5 year
WS 5 year
Crit 25 year
Crit 5 year
EG 25 mm
WS 25 mm
Crit Timmins
Crit 25 mm
Ground
Ineff
Bank Sta


Shadow Creek HEC-RAS Plan: Existing 3/17/2015
RS = 807
.05
.035
.05
221.5
221.0
220.5
220.0
219.5
219.0
Elevation (m)
0
5
10
15
20
25
30
35
40
Station (m)
Legend
EG Timmins
WS Timmins
Crit Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
Crit 100 year
Crit 25 year
EG 25 mm
WS 25 mm
Crit 5 year
Crit 25 mm
Ground
Ineff
Bank Sta


Shadow Creek HEC-RAS Plan: Existing 3/17/2015
RS = 792
.05
.035
.05
221.0
220.8
220.6
220.4
220.2
220.0
219.8
219.6
219.4
Elevation (m)
0
20
40
60
80
100
Station (m)
Legend
EG Timmins
WS Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
EG 25 mm
WS 25 mm
Ground
Ineff
Bank Sta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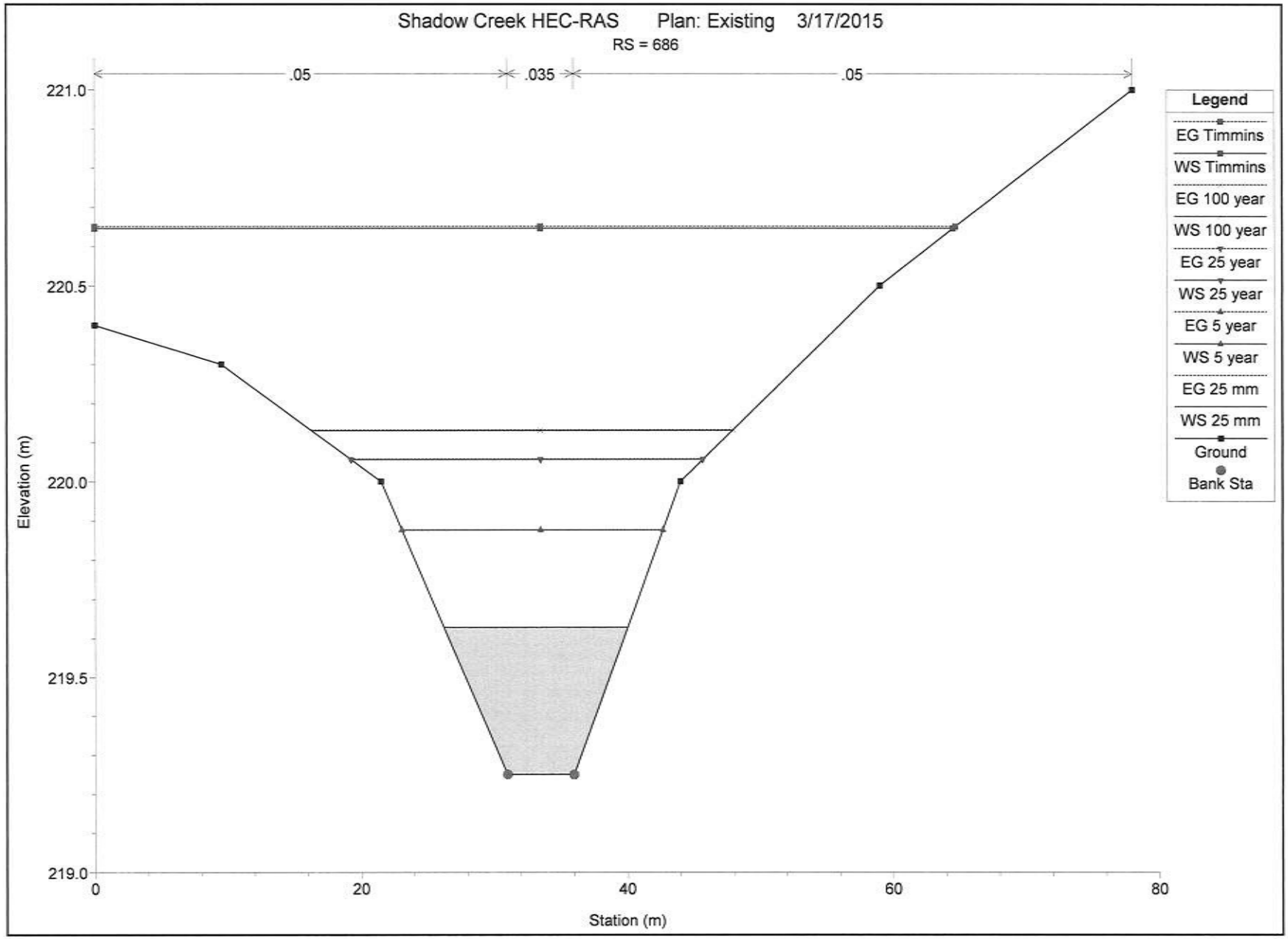
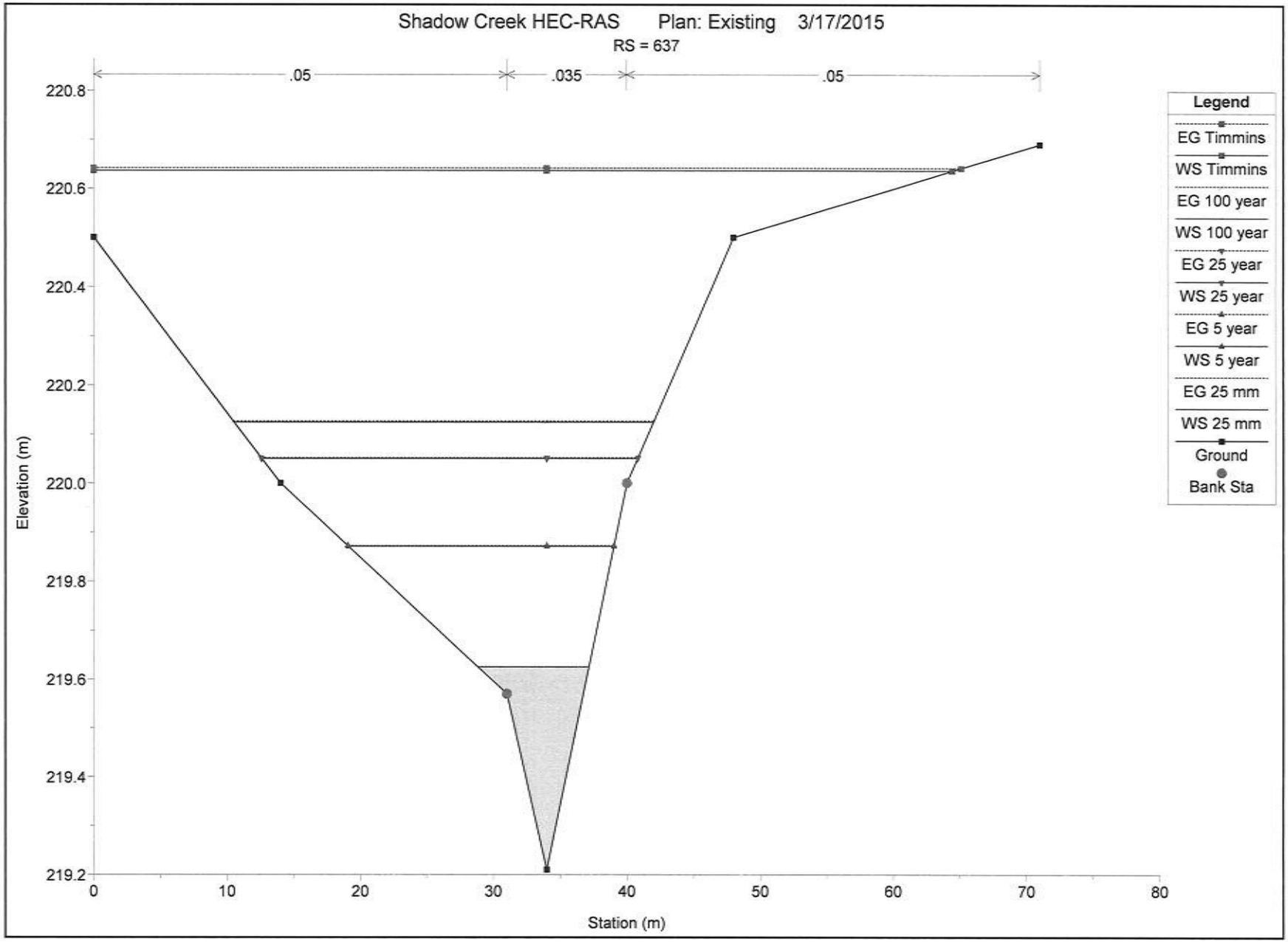
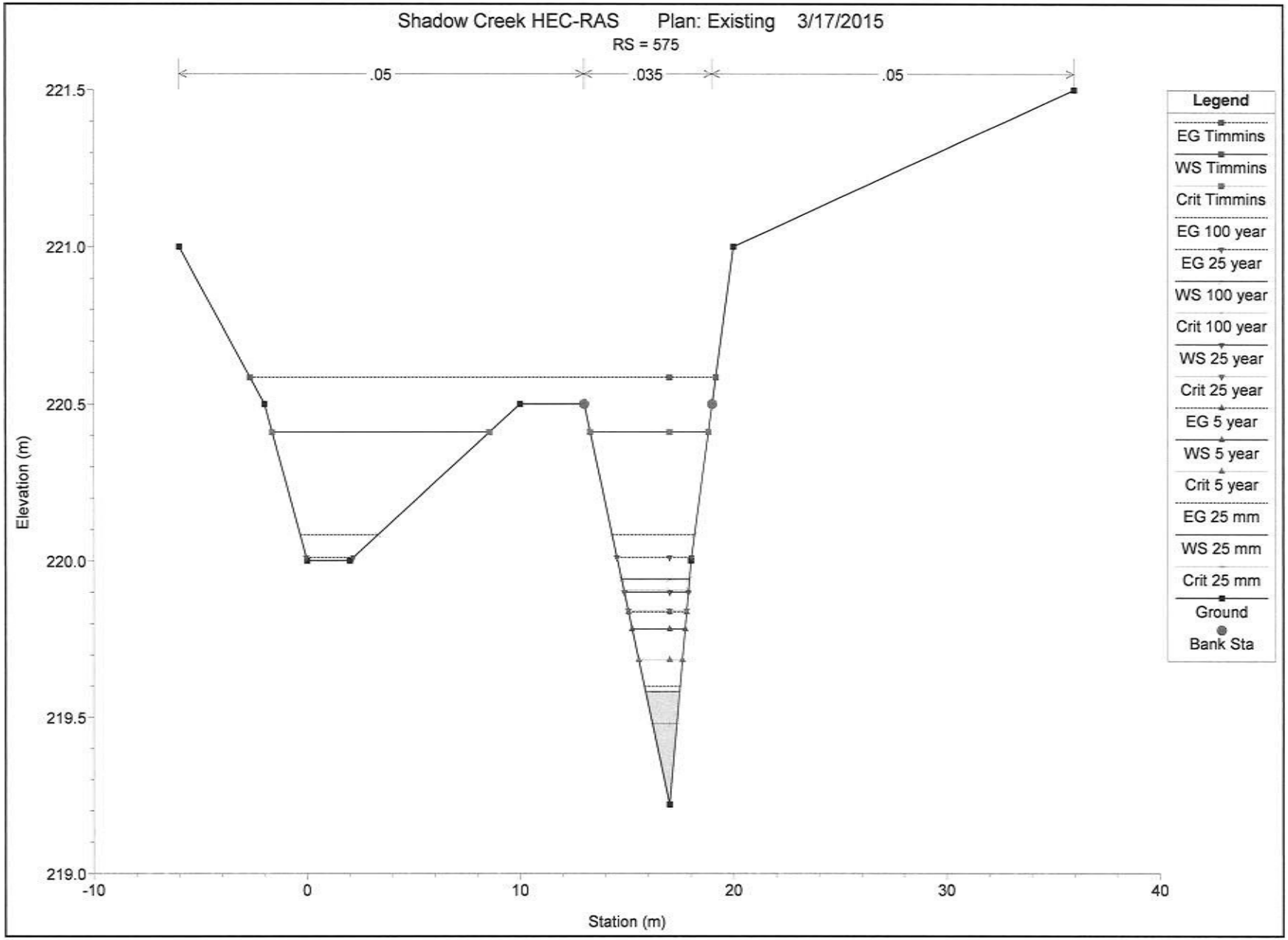
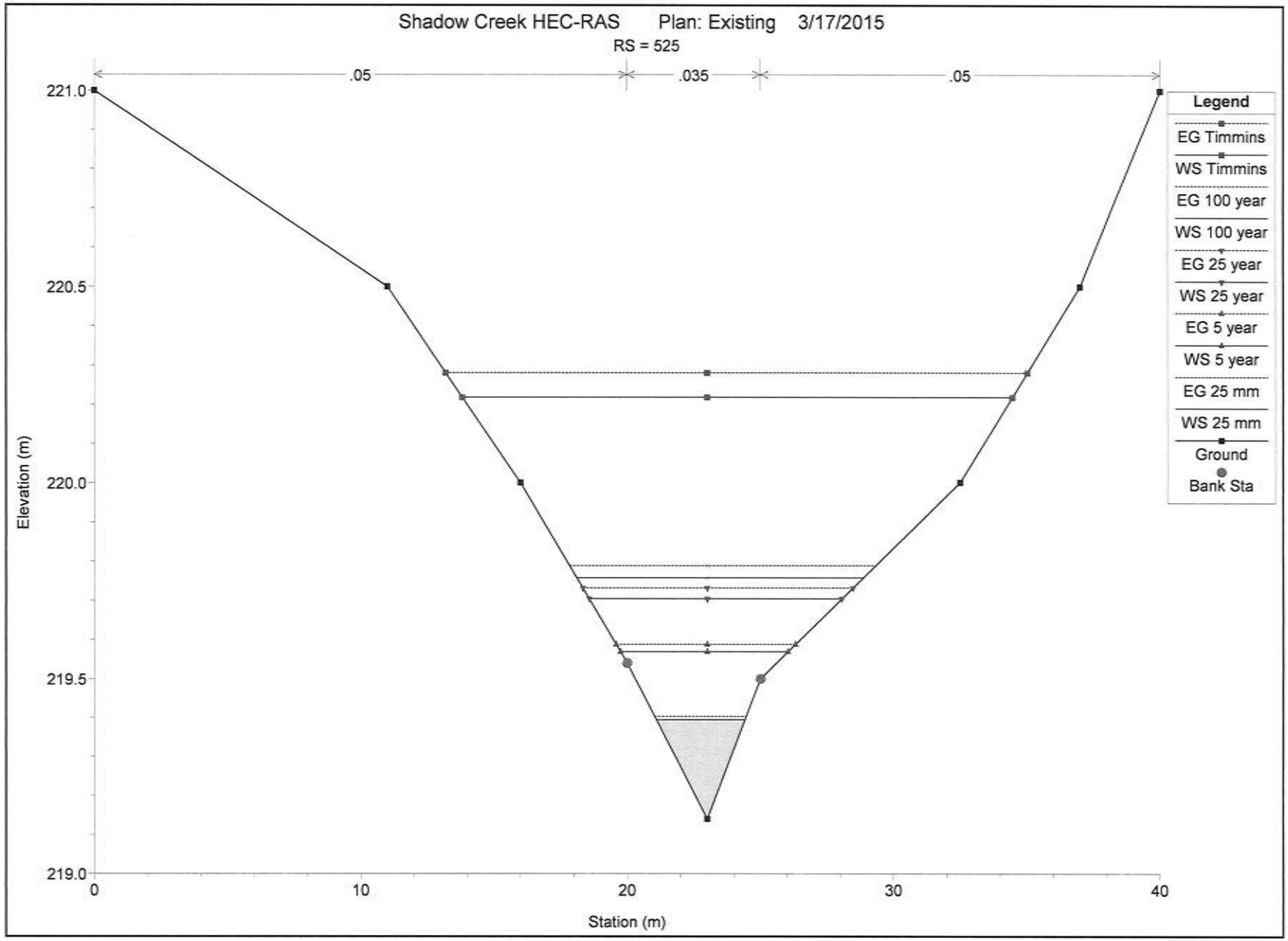
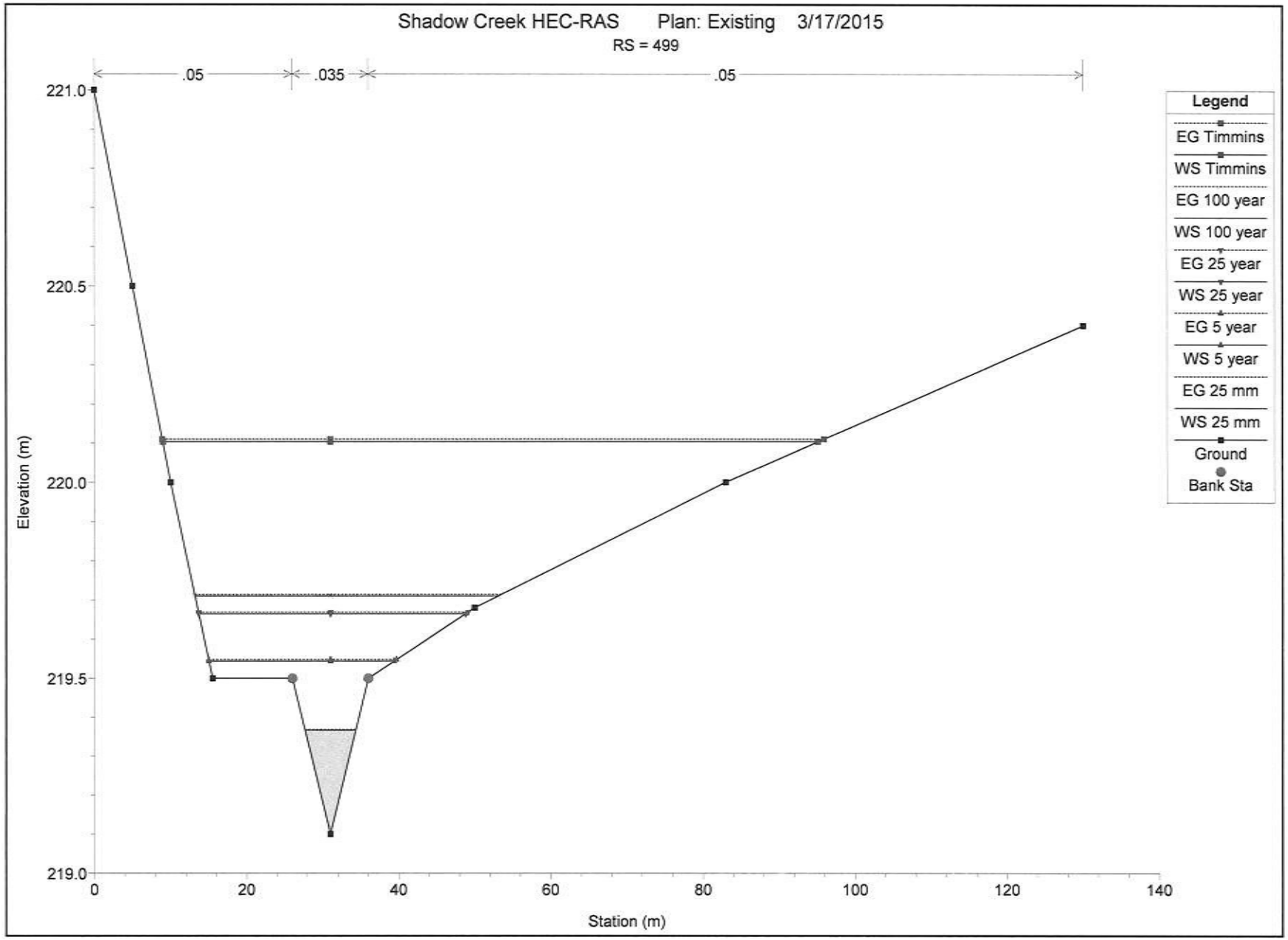
RS = 753
.05
.035
.05
221.0
220.8
220.6
220.4
220.2
220.0
219.8
219.6
219.4
219.2
Elevation (m)
0
20
40
60
80
100
Station (m)
Legend
EG Timmins
WS Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
EG 25 mm
WS 25 mm
Ground
Bank Sta


Shadow Creek HEC-RAS Plan: Existing 3/17/2015
RS = 686
.05
.035
.05
221.0
220.5
220.0
219.5
219.0
Elevation (m)
0
20
40
60
80
Station (m)
Legend
EG Timmins
WS Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
EG 25 mm
WS 25 mm
Ground
Bank Sta


Shadow Creek HEC-RAS Plan: Existing 3/17/2015
RS = 637
.05
.035
.05
220.8
220.6
220.4
220.2
220.0
219.8
219.6
219.4
219.2
Elevation (m)
0
10
20
30
40
50
60
70
80
Station (m)
Legend
EG Timmins
WS Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
EG 25 mm
WS 25 mm
Ground
Bank Sta


Shadow Creek HEC-RAS Plan: Existing 3/17/2015
RS = 575
.05
.035
.05
221.5
221.0
220.5
220.0
219.5
219.0
Elevation (m)
-10
0
10
20
30
40
Station (m)
Legend
EG Timmins
WS Timmins
Crit Timmins
EG 100 year
EG 25 year
WS 100 year
Crit 100 year
WS 25 year
Crit 25 year
EG 5 year
WS 5 year
Crit 5 year
EG 25 mm
WS 25 mm
Crit 25 mm
Ground
Bank Sta


Shadow Creek HEC-RAS Plan: Existing 3/17/2015
RS = 525
.05
.035
.05
221.0
220.5
220.0
219.5
219.0
Elevation (m)
0
10
20
30
40
Station (m)
Legend
EG Timmins
WS Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
EG 25 mm
WS 25 mm
Ground
Bank Sta


Shadow Creek HEC-RAS Plan: Existing 3/17/2015
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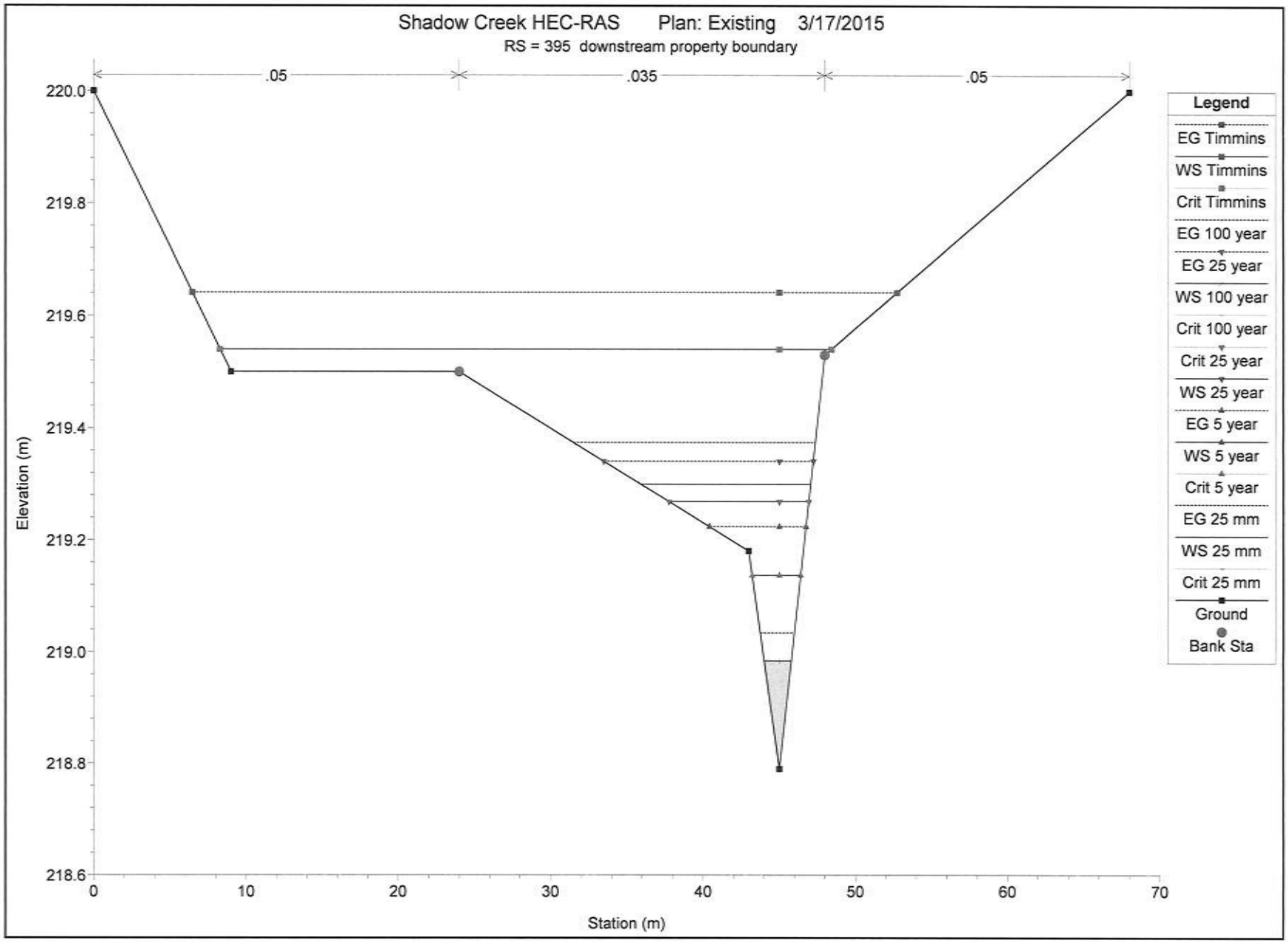
.035
.05
221.0
220.5
220.0
219.5
219.0
Elevation (m)
0
20
40
60
80
100
120
140
Station (m)
Legend
EG Timmins
WS Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
EG 25 mm
WS 25 mm
Ground
Bank Sta


Shadow Creek HEC-RAS Plan: Existing 3/17/2015
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.035
.05
220.0
219.8
219.6
219.4
219.2
219.0
218.8
218.6
Elevation (m)
0
10
20
30
40
50
60
70
Station (m)
Legend
EG Timmins
WS Timmins
Crit Timmins
EG 100 year
EG 25 year
WS 100 year
Crit 100 year
Crit 25 year
WS 25 year
EG 5 year
WS 5 year
Crit 5 year
EG 25 mm
WS 25 mm
Crit 25 mm
Ground
Bank Sta

HEC-RAS Plan: Proposed River: Shadow Creek Reach: 1

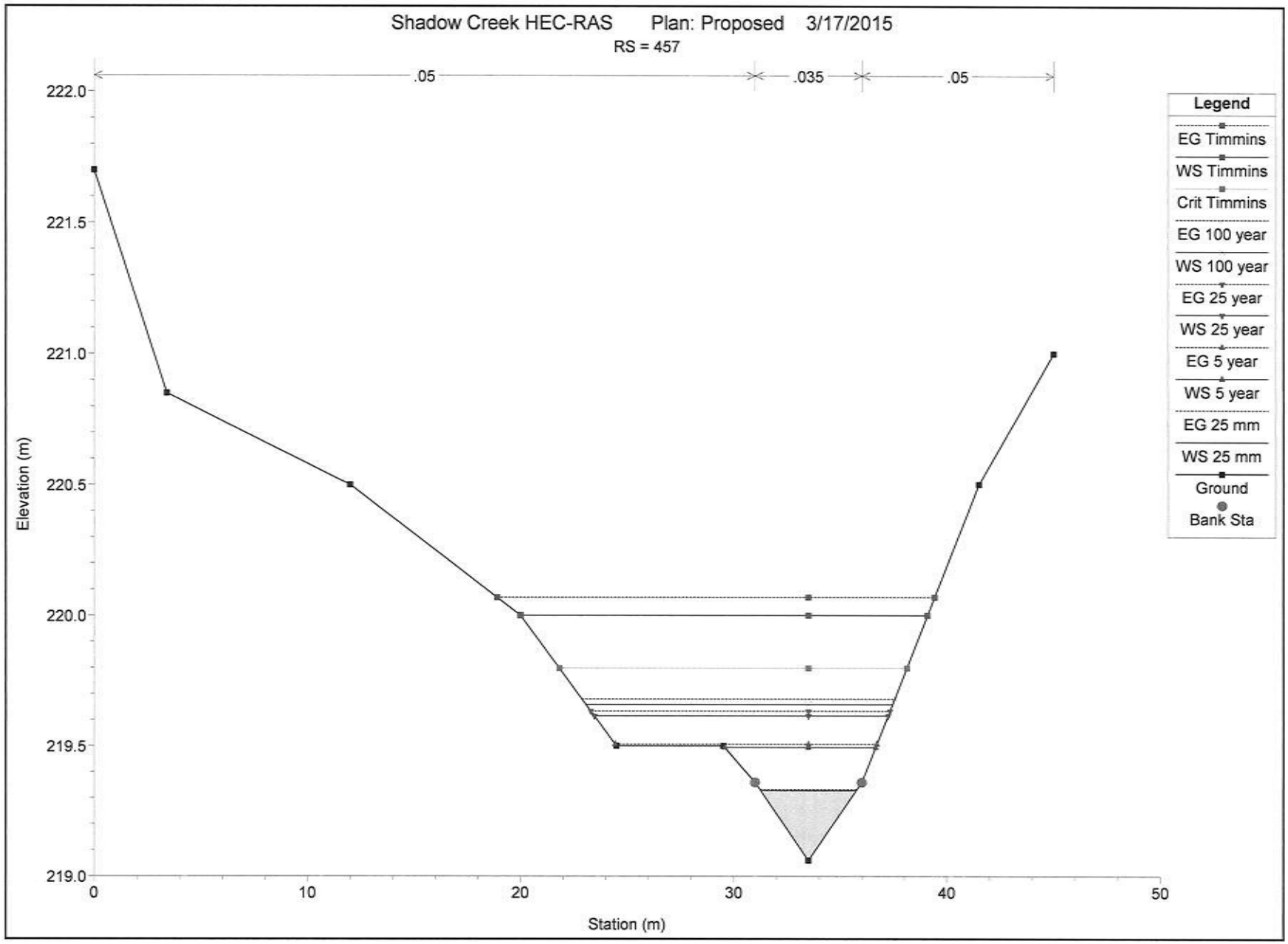
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	1000	25 mm	0.18	219.80	220.08		220.08	0.001049	0.25	1.04	15.70	0.21
1	1000	5 year	0.72	219.80	220.20		220.20	0.000757	0.30	3.92	27.65	0.20
1	1000	25 year	1.50	219.80	220.37		220.37	0.000279	0.26	8.76	28.80	0.13
1	1000	100 year	1.92	219.80	220.50		220.50	0.000144	0.23	12.67	29.81	0.10
1	1000	Timmins	8.84	219.80	221.10		221.11	0.000153	0.38	37.99	56.00	0.11
1	891	25 mm	0.18	219.63	219.90		219.91	0.002779	0.42	0.43	3.96	0.35
1	891	5 year	0.72	219.63	220.07		220.08	0.001707	0.53	2.07	13.55	0.30
1	891	25 year	1.50	219.63	220.33		220.34	0.000383	0.38	6.82	22.93	0.16
1	891	100 year	1.92	219.63	220.48		220.49	0.000200	0.32	10.73	28.41	0.12
1	891	Timmins	8.84	219.63	221.08		221.09	0.000264	0.55	30.39	41.55	0.15
1	860	25 mm	0.18	219.54	219.83		219.83	0.001967	0.38	0.48	3.48	0.30
1	860	5 year	0.72	219.54	220.02		220.03	0.001585	0.55	1.97	14.47	0.30
1	860	25 year	1.50	219.54	220.32		220.33	0.000273	0.35	7.63	22.71	0.14
1	860	100 year	1.92	219.54	220.48		220.48	0.000154	0.30	11.51	26.95	0.11
1	860	Timmins	8.84	219.54	221.07		221.08	0.000212	0.51	32.71	42.67	0.14
1	836	25 mm	0.18	219.47	219.69		219.73	0.014739	0.79	0.23	2.03	0.75
1	836	5 year	0.72	219.47	220.00		220.01	0.000540	0.33	3.94	23.83	0.18
1	836	25 year	1.50	219.47	220.32		220.32	0.000089	0.21	13.63	37.33	0.08
1	836	100 year	1.92	219.47	220.48		220.48	0.000053	0.18	20.03	44.04	0.06
1	836	Timmins	8.84	219.47	221.07		221.07	0.000069	0.30	56.86	73.96	0.08
1	821	25 mm	0.18	219.40	219.67	219.54	219.68	0.001008	0.32	0.56	37.85	0.22
1	821	5 year	0.72	219.40	219.98	219.66	220.00	0.000835	0.53	1.35	62.64	0.24
1	821	25 year	1.50	219.40	220.29	219.79	220.32	0.000763	0.69	2.16	77.39	0.24
1	821	100 year	1.92	219.40	220.44	219.84	220.47	0.000710	0.75	2.56	84.46	0.24
1	821	Timmins	8.84	219.40	221.07	220.52	221.07	0.000009	0.11	117.84	87.00	0.03
1	820		Culvert									
1	807	25 mm	0.18	219.24	219.65	219.39	219.65	0.000272	0.23	0.77	11.20	0.13
1	807	5 year	0.72	219.24	219.89	219.52	219.90	0.000789	0.56	1.29	21.09	0.23
1	807	25 year	1.50	219.24	220.06	219.66	220.10	0.001461	0.90	1.66	32.71	0.33
1	807	100 year	1.92	219.24	220.13	219.73	220.18	0.001789	1.06	1.81	33.48	0.37
1	807	Timmins	8.84	219.24	220.48	220.48	221.07	0.011408	3.40	2.60	36.00	1.00

HEC-RAS Plan: Proposed River: Shadow Creek Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	792	25 mm	0.18	219.41	219.64		219.65	0.001096	0.23	0.80	6.82	0.21
1	792	5 year	0.72	219.41	219.88		219.89	0.000356	0.24	3.24	22.02	0.14
1	792	25 year	1.50	219.41	220.07		220.07	0.000284	0.28	6.20	32.77	0.13
1	792	100 year	1.92	219.41	220.14		220.15	0.000255	0.29	7.96	37.90	0.13
1	792	Timmins	8.84	219.41	220.67		220.68	0.000258	0.47	32.96	72.18	0.15
1	753	25 mm	0.18	219.36	219.64		219.64	0.000082	0.10	2.34	12.85	0.07
1	753	5 year	0.72	219.36	219.88		219.88	0.000096	0.16	6.18	18.23	0.08
1	753	25 year	1.50	219.36	220.06		220.06	0.000118	0.22	9.80	21.38	0.09
1	753	100 year	1.92	219.36	220.14		220.14	0.000124	0.24	11.48	22.48	0.09
1	753	Timmins	8.84	219.36	220.66		220.67	0.000280	0.52	29.27	53.13	0.15
1	686	25 mm	0.18	219.25	219.64		219.64	0.000020	0.07	3.66	13.99	0.03
1	686	5 year	0.72	219.25	219.88		219.88	0.000045	0.14	7.69	19.60	0.06
1	686	25 year	1.50	219.25	220.06		220.06	0.000072	0.21	11.67	26.39	0.07
1	686	100 year	1.92	219.25	220.13		220.13	0.000083	0.24	13.88	31.72	0.08
1	686	Timmins	8.84	219.25	220.65		220.65	0.000167	0.46	37.38	56.12	0.12
1	637	25 mm	0.18	219.21	219.63		219.63	0.000144	0.13	1.48	8.68	0.09
1	637	5 year	0.72	219.21	219.87		219.87	0.000160	0.19	4.89	19.91	0.10
1	637	25 year	1.50	219.21	220.05		220.05	0.000154	0.23	9.21	28.20	0.10
1	637	100 year	1.92	219.21	220.13		220.13	0.000143	0.24	11.48	31.55	0.10
1	637	Timmins	8.84	219.21	220.64		220.64	0.000201	0.43	34.08	64.61	0.13
1	575	25 mm	0.18	219.22	219.59	219.49	219.61	0.004949	0.60	0.30	1.62	0.45
1	575	5 year	0.72	219.22	219.78	219.68	219.84	0.008202	1.03	0.70	2.48	0.62
1	575	25 year	1.50	219.22	219.90	219.84	220.01	0.013019	1.48	1.02	2.99	0.81
1	575	100 year	1.92	219.22	219.94	219.91	220.08	0.015412	1.67	1.15	3.18	0.89
1	575	Timmins	8.84	219.22	220.41	220.41	220.59	0.012600	2.08	5.70	15.77	0.88
1	525	25 mm	0.18	219.14	219.40		219.41	0.003160	0.41	0.44	3.39	0.36
1	525	5 year	0.72	219.14	219.57		219.59	0.003114	0.61	1.22	6.28	0.40
1	525	25 year	1.50	219.14	219.70		219.73	0.002673	0.76	2.29	9.48	0.40
1	525	100 year	1.92	219.14	219.76		219.79	0.002591	0.82	2.84	10.77	0.40
1	525	Timmins	8.84	219.14	220.22		220.28	0.002527	1.32	10.22	20.68	0.45
1	499	25 mm	0.18	219.10	219.37		219.37	0.000663	0.19	0.93	6.81	0.17
1	499	5 year	0.72	219.10	219.54		219.55	0.000646	0.28	2.98	24.37	0.18

HEC-RAS Plan: Proposed River: Shadow Creek Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	499	25 year	1.50	219.10	219.66		219.67	0.000491	0.32	6.57	35.09	0.17
1	499	100 year	1.92	219.10	219.71		219.72	0.000470	0.34	8.30	39.97	0.17
1	499	Timmins	8.84	219.10	220.10		220.11	0.000397	0.49	32.96	86.30	0.17
1	457	25 mm	0.18	219.06	219.33		219.33	0.001643	0.30	0.60	4.46	0.26
1	457	5 year	0.72	219.06	219.49		219.51	0.001621	0.49	1.56	7.08	0.30
1	457	25 year	1.50	219.06	219.61		219.63	0.001672	0.64	3.09	13.76	0.32
1	457	100 year	1.92	219.06	219.66		219.68	0.001754	0.70	3.71	14.37	0.33
1	457	Timmins	8.84	219.06	220.00	219.80	220.07	0.003306	1.40	9.40	19.07	0.50
1	395	25 mm	0.18	218.79	218.99	218.99	219.04	0.027385	1.00	0.18	1.82	1.01
1	395	5 year	0.72	218.79	219.14	219.14	219.22	0.022379	1.31	0.55	3.18	1.00
1	395	25 year	1.50	218.79	219.27	219.27	219.34	0.024745	1.19	1.26	9.19	1.02
1	395	100 year	1.92	218.79	219.30	219.30	219.37	0.024776	1.21	1.58	11.18	1.03
1	395	Timmins	8.84	218.79	219.54	219.54	219.64	0.015673	1.43	6.70	40.19	0.90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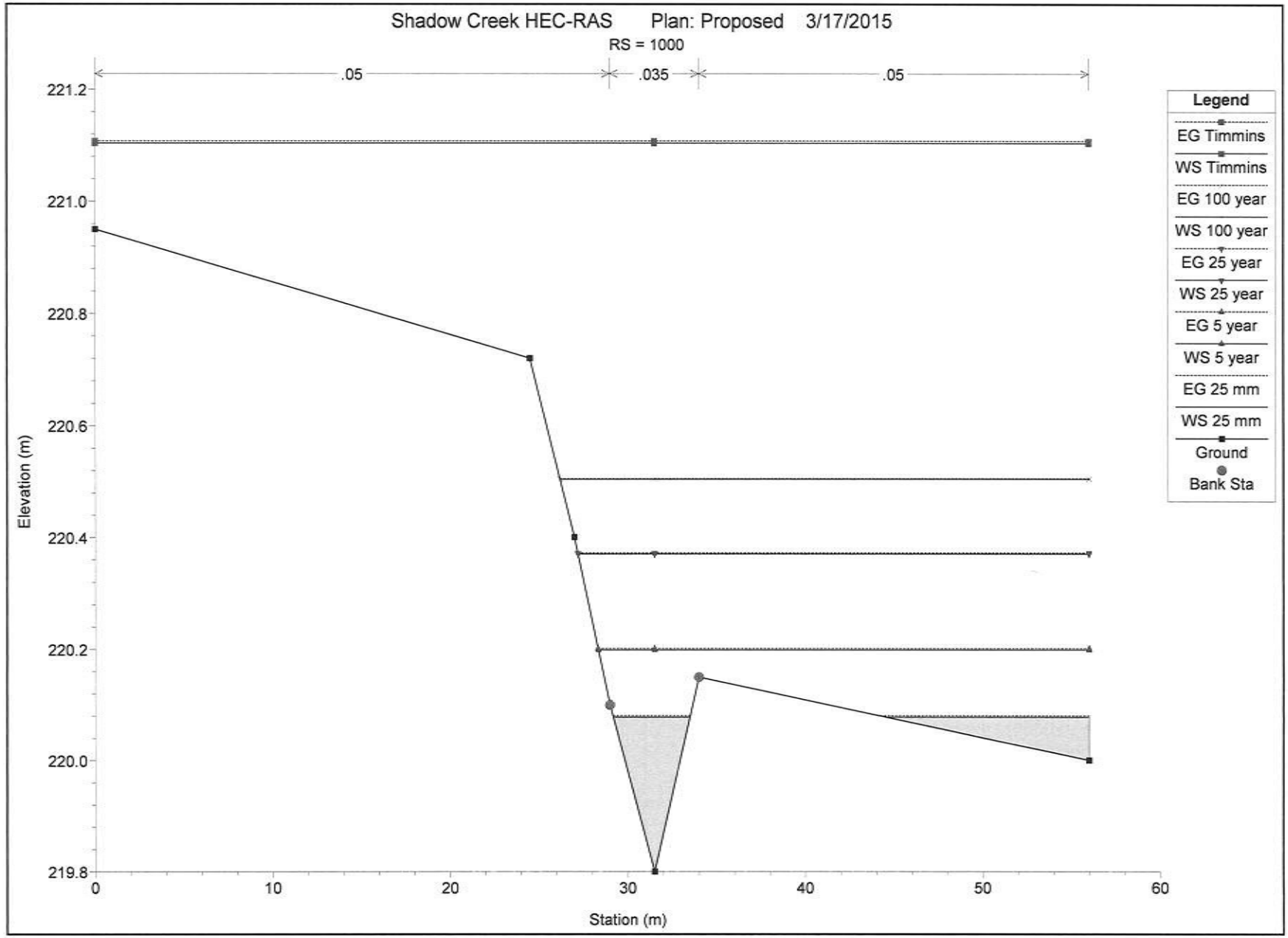
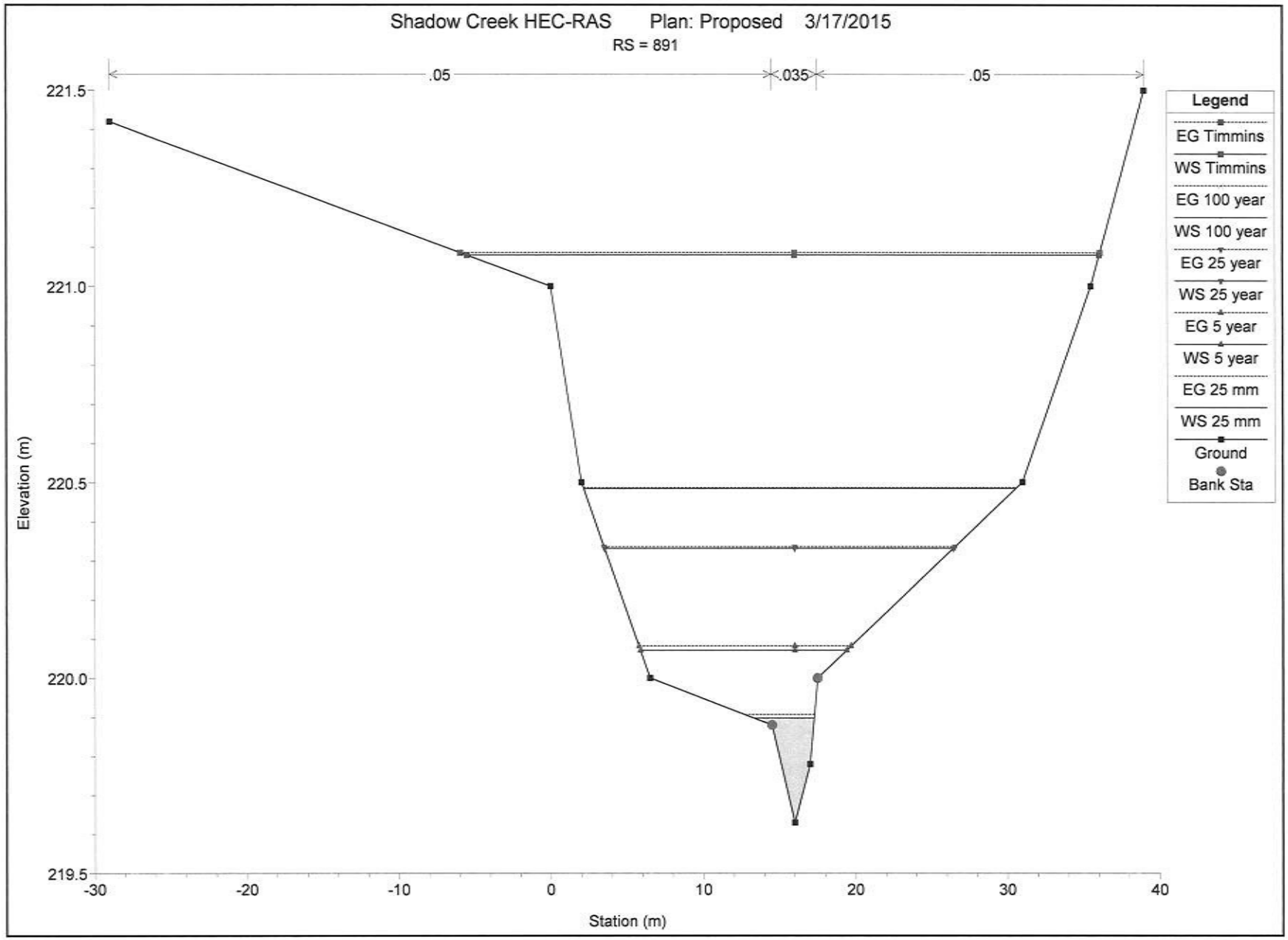
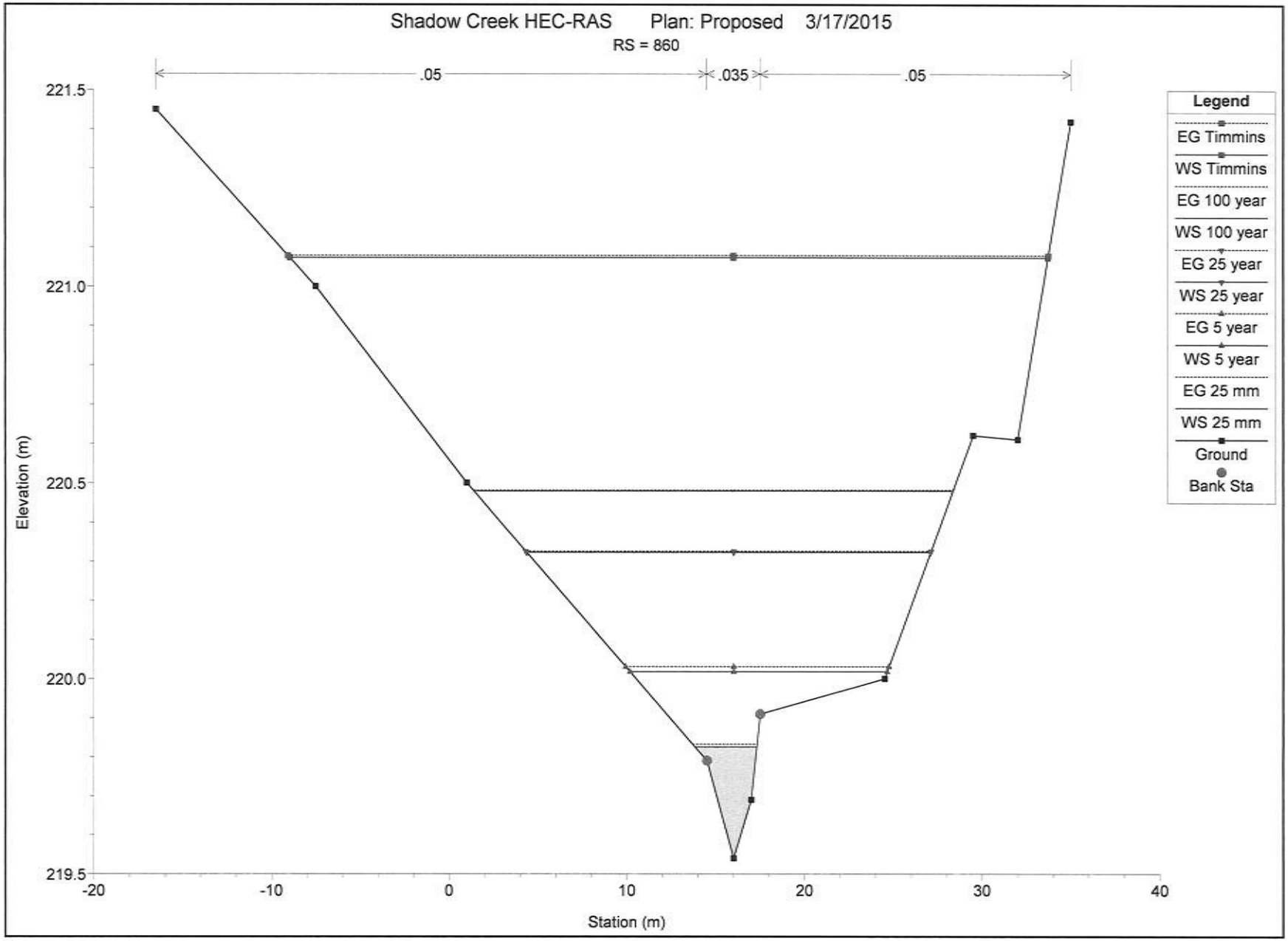
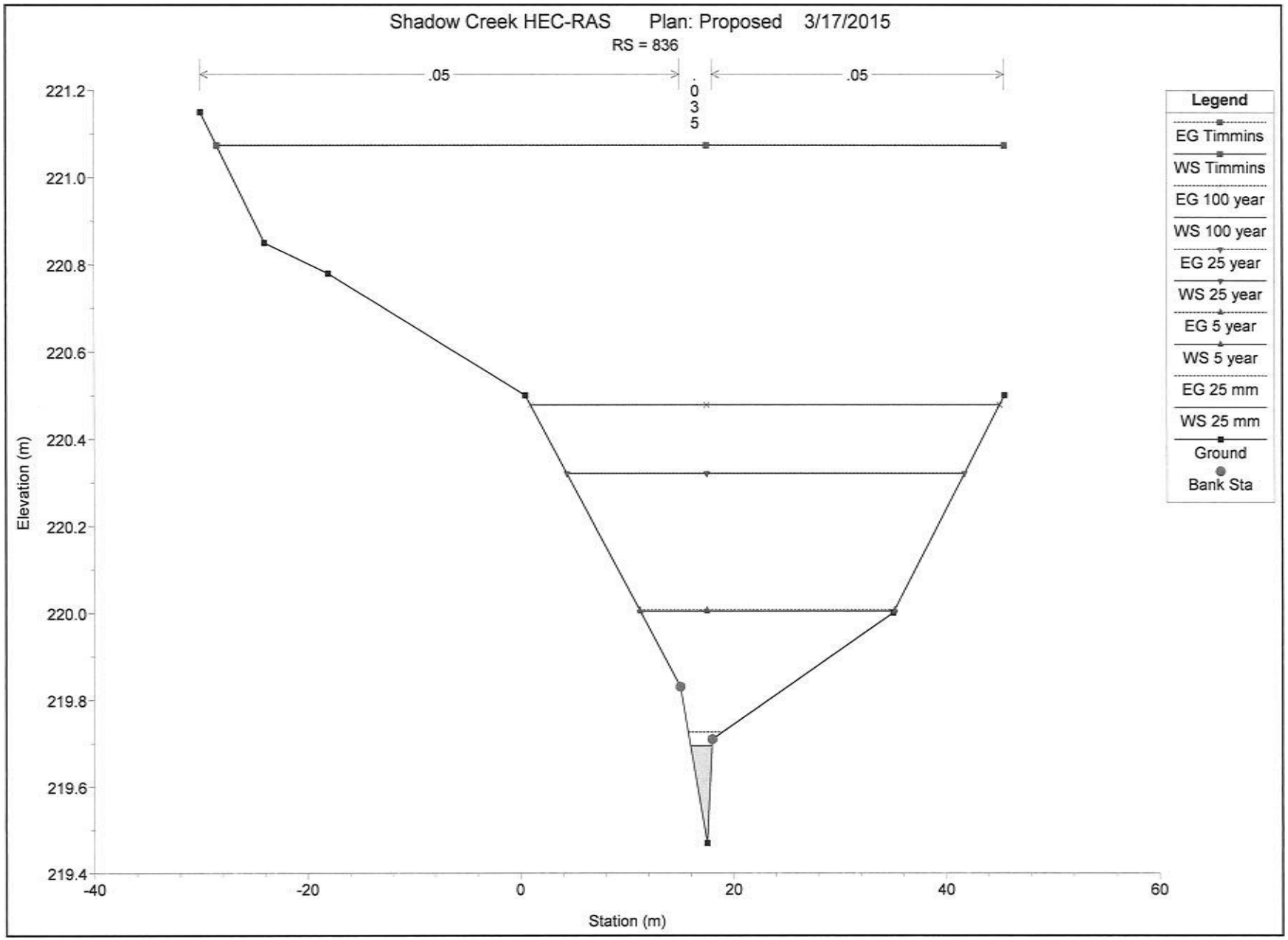
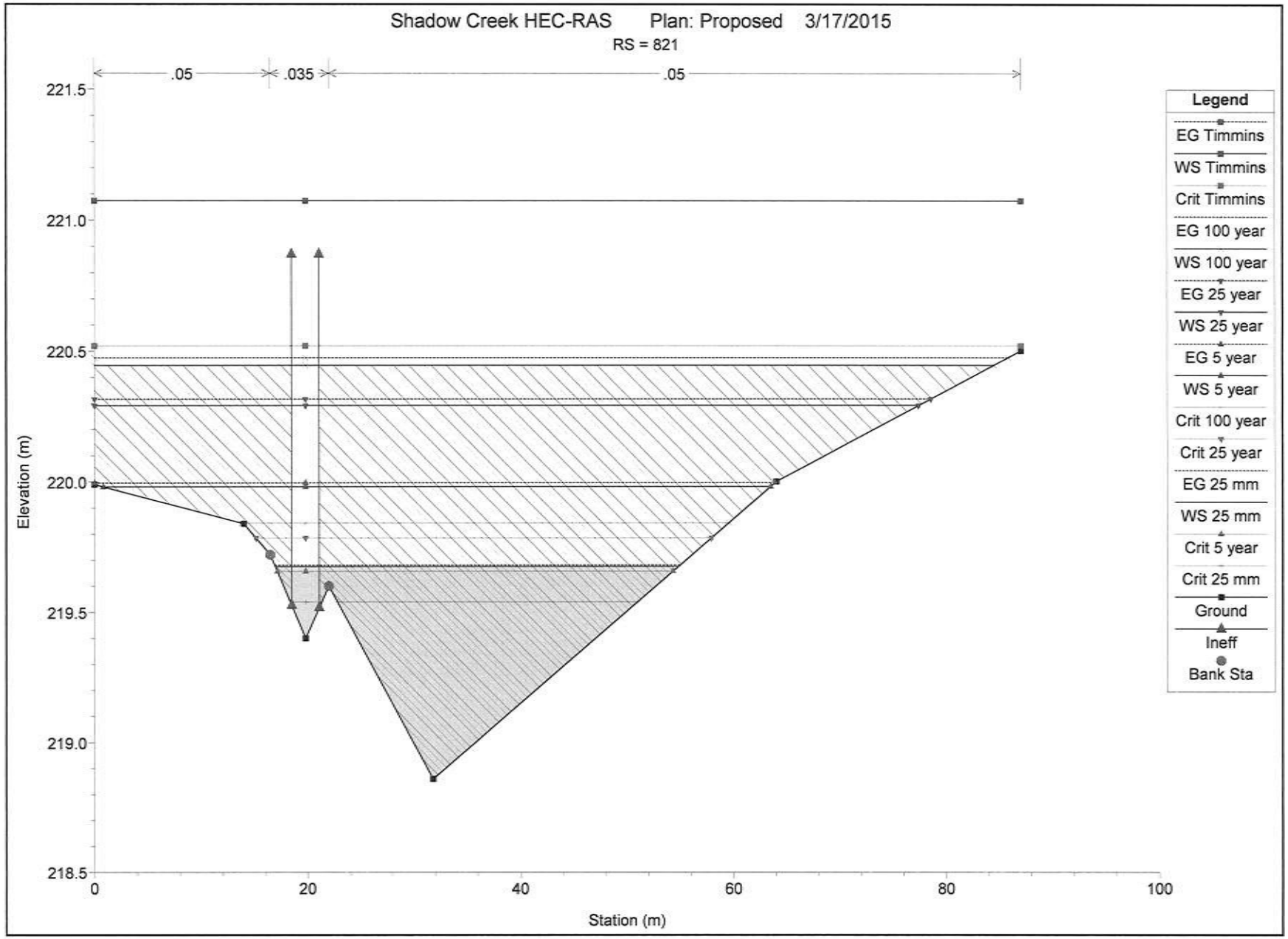
.035
.05
222.0
221.5
221.0
220.5
220.0
219.5
219.0
Elevation (m)
0
10
20
30
40
50
Station (m)
Legend
EG Timmins
WS Timmins
Crit Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
EG 25 mm
WS 25 mm
Ground
Bank Sta


Shadow Creek HEC-RAS Plan: Proposed 3/17/2015
RS = 1000
.05
.035
.05
221.2
221.0
220.8
220.6
220.4
220.2
220.0
219.8
Elevation (m)
0
10
20
30
40
50
60
Station (m)
Legend
EG Timmins
WS Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
EG 25 mm
WS 25 mm
Ground
Bank Sta


Shadow Creek HEC-RAS Plan: Proposed 3/17/2015
RS = 891
.05
.035
.05
221.5
221.0
220.5
220.0
219.5
Elevation (m)
-30
-20
-10
0
10
20
30
40
Station (m)
Legend
EG Timmins
WS Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
EG 25 mm
WS 25 mm
Ground
Bank Sta


Shadow Creek HEC-RAS Plan: Proposed 3/17/2015
RS = 860
.05
.035
.05
221.5
221.0
220.5
220.0
219.5
Elevation (m)
-20
-10
0
10
20
30
40
Station (m)
Legend
EG Timmins
WS Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
EG 25 mm
WS 25 mm
Ground
Bank Sta


Shadow Creek HEC-RAS Plan: Proposed 3/17/2015
RS = 836
.05
.035
.05
Legend
EG Timmins
WS Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
EG 25 mm
WS 25 mm
Ground
Bank Sta
Elevation (m)
221.2
221.0
220.8
220.6
220.4
220.2
220.0
219.8
219.6
219.4
-40
-20
0
20
40
60
Station (m)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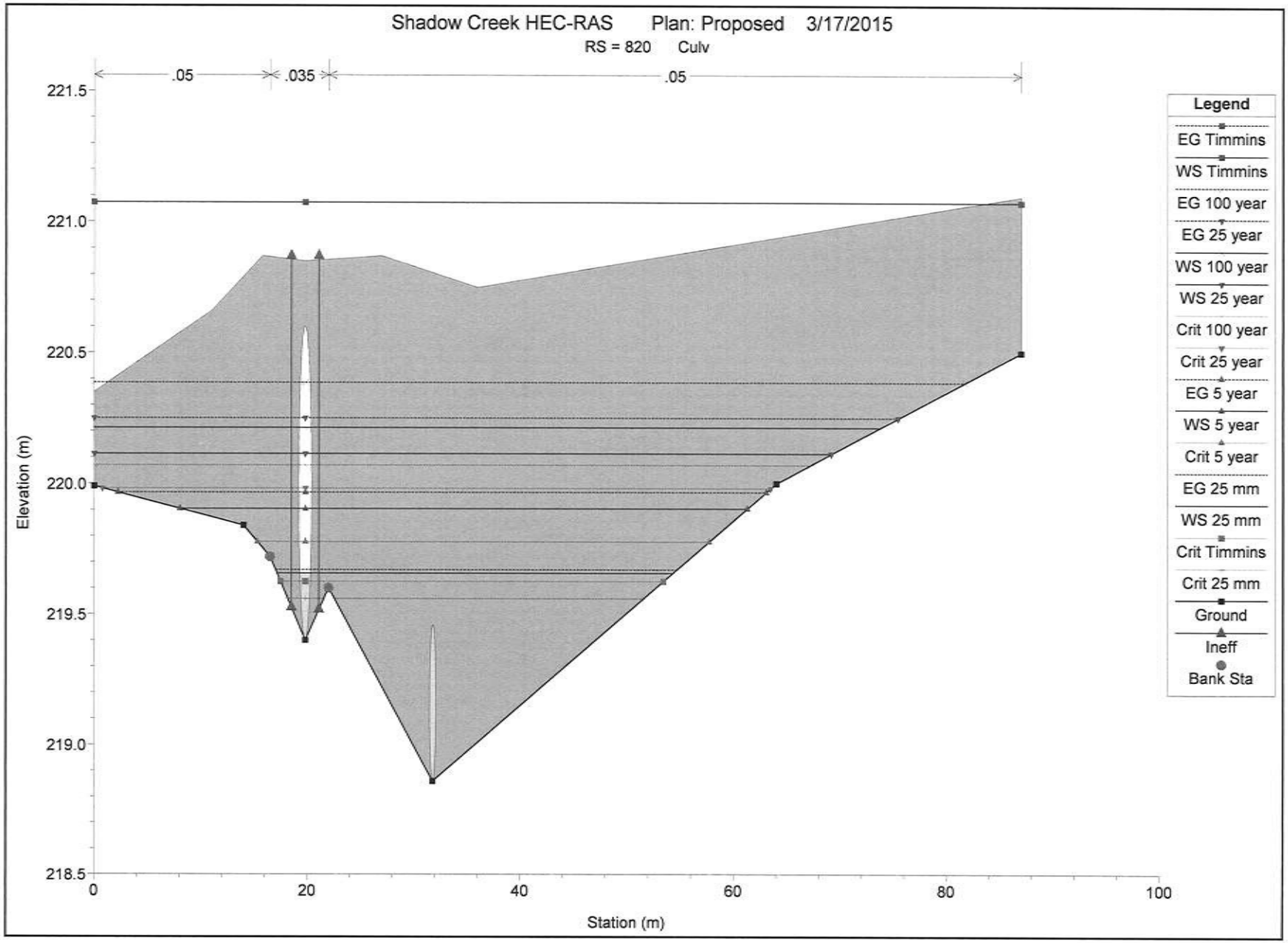
RS = 821
.05
.035
.05
221.5
221.0
220.5
220.0
219.5
219.0
218.5
Elevation (m)
0
20
40
60
80
100
Station (m)
Legend
EG Timmins
WS Timmins
Crit Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
Crit 100 year
Crit 25 year
EG 25 mm
WS 25 mm
Crit 5 year
Crit 25 mm
Ground
Ineff
Bank Sta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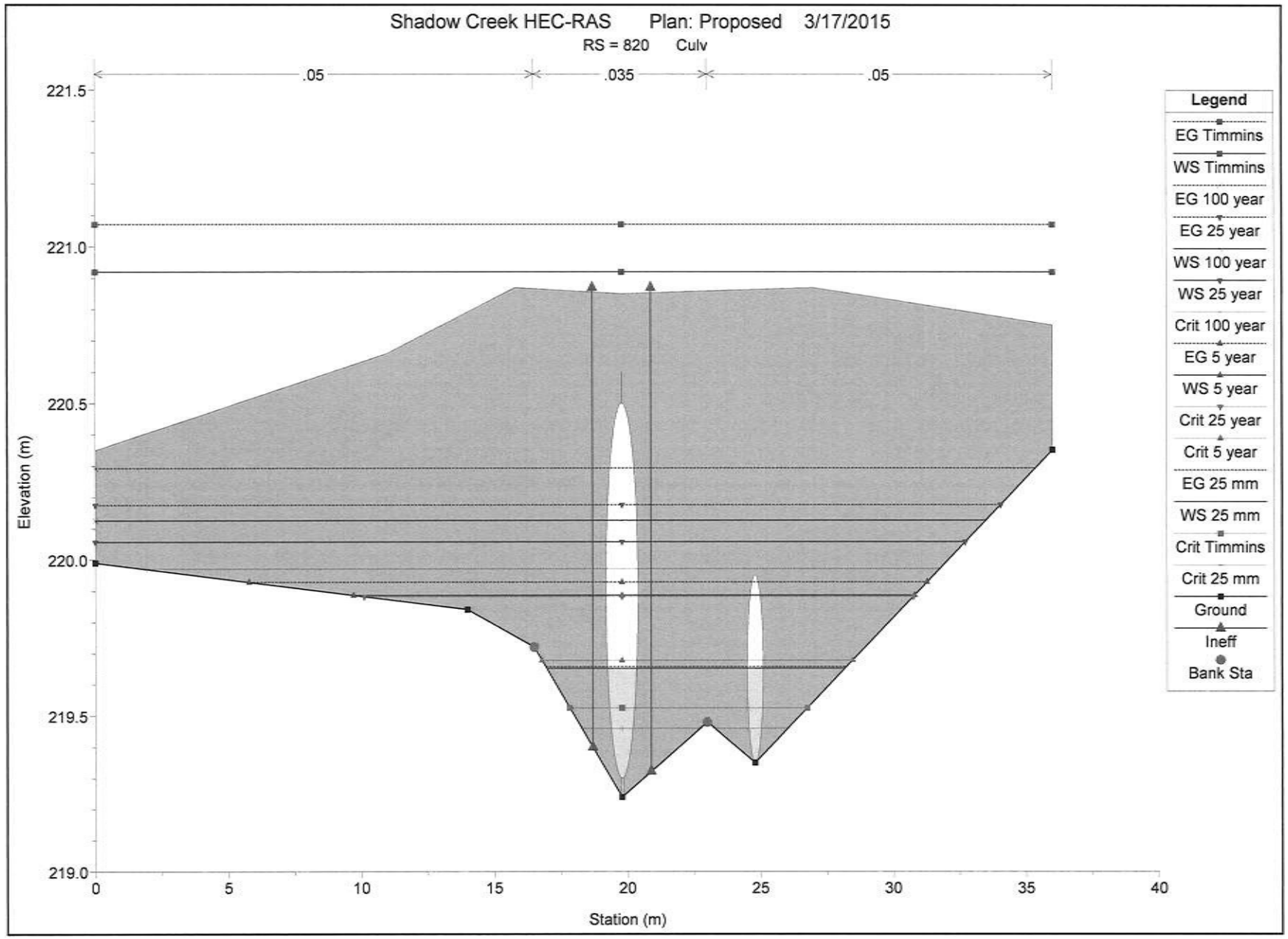
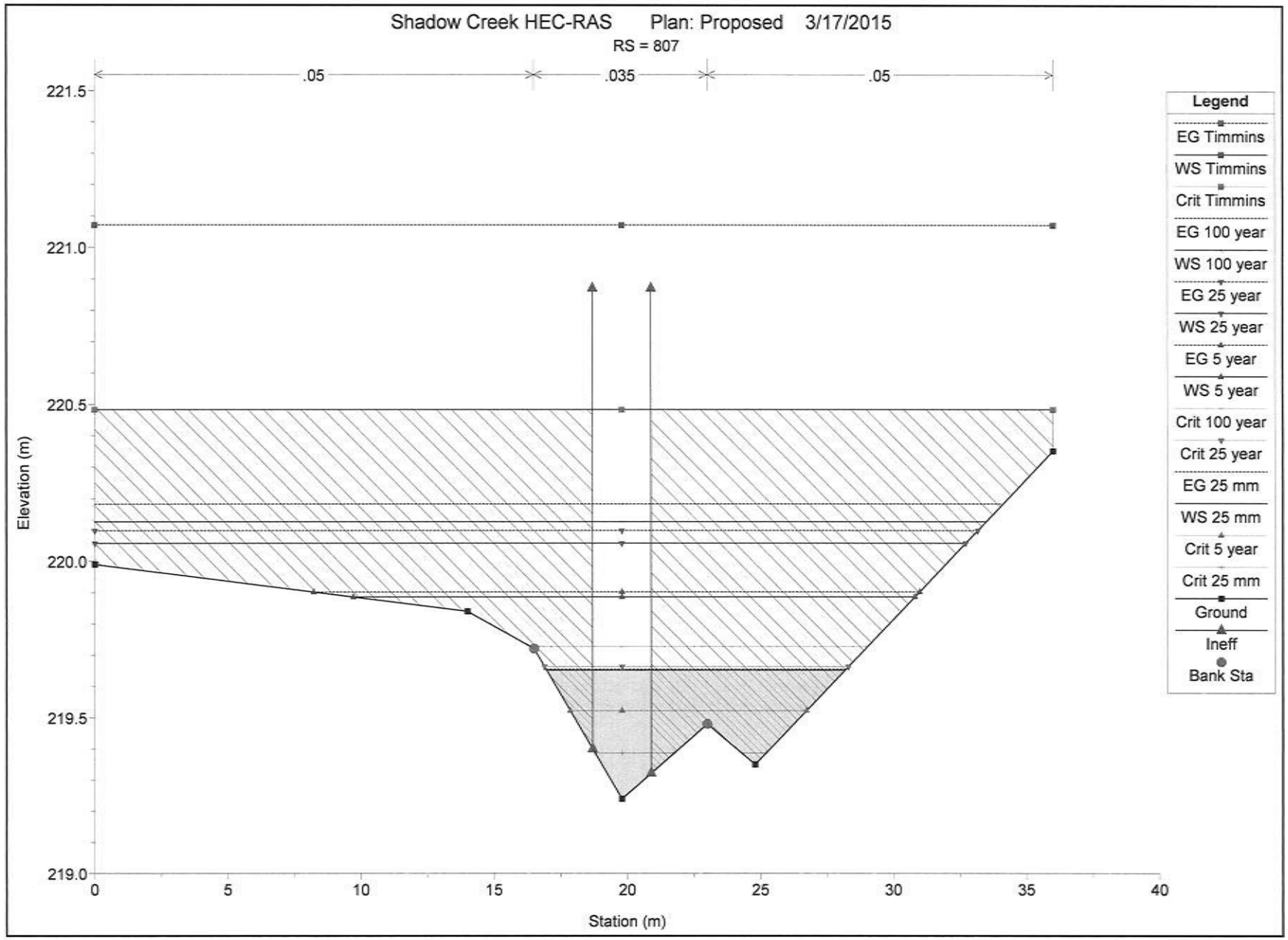
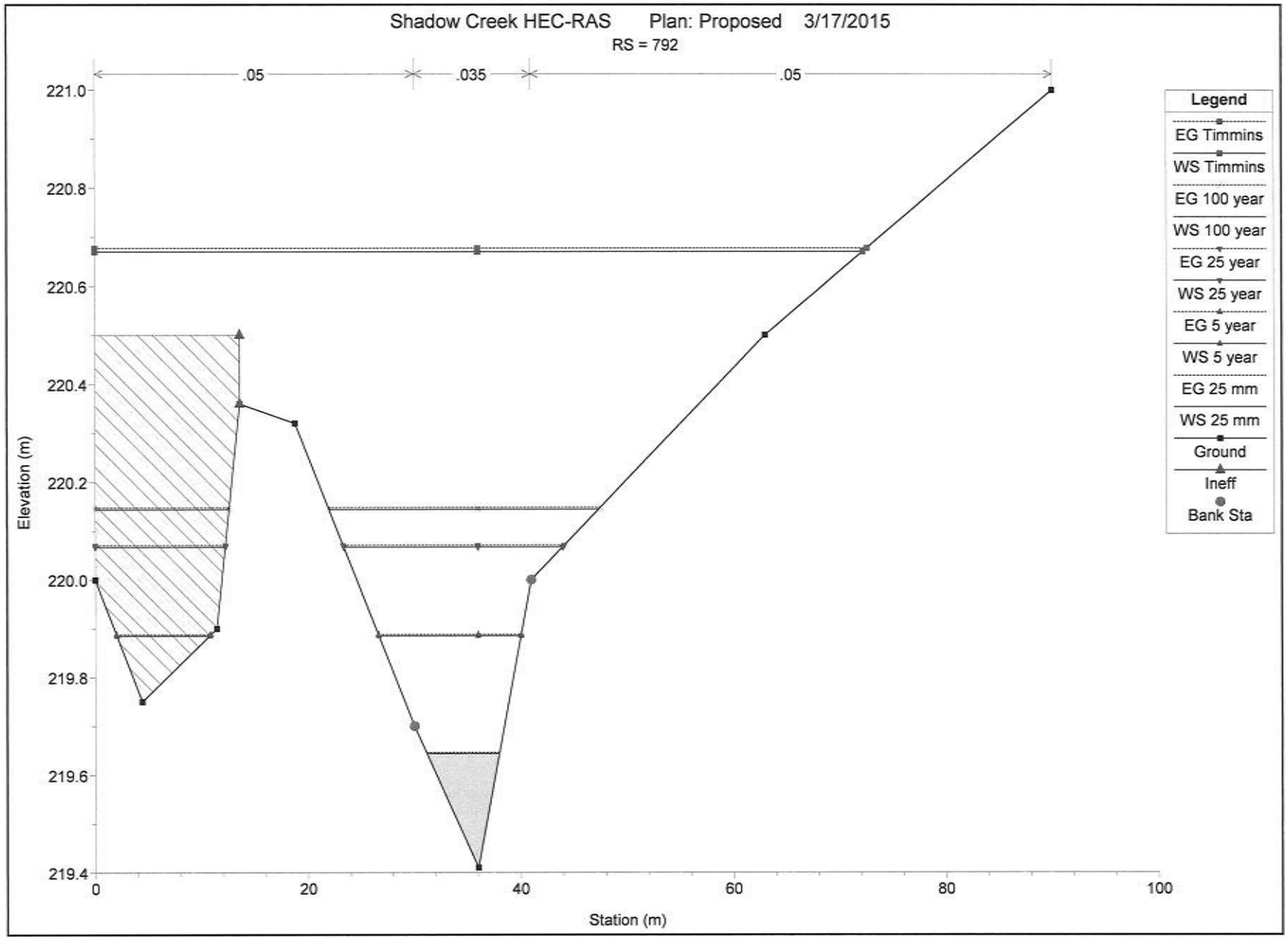
RS = 820 Culv
.05
.035
.05
221.5
221.0
220.5
220.0
219.5
219.0
218.5
Elevation (m)
0
20
40
60
80
100
Station (m)
Legend
EG Timmins
WS Timmins
EG 100 year
EG 25 year
WS 100 year
WS 25 year
Crit 100 year
Crit 25 year
EG 5 year
WS 5 year
Crit 5 year
EG 25 mm
WS 25 mm
Crit Timmins
Crit 25 mm
Ground
Ineff
Bank Sta


Shadow Creek HEC-RAS Plan: Proposed 3/17/2015
RS = 820 Culv
.05
.035
.05
221.5
221.0
220.5
220.0
219.5
219.0
Elevation (m)
0
5
10
15
20
25
30
35
40
Station (m)
Legend
EG Timmins
WS Timmins
EG 100 year
EG 25 year
WS 100 year
WS 25 year
Crit 100 year
EG 5 year
WS 5 year
Crit 25 year
Crit 5 year
EG 25 mm
WS 25 mm
Crit Timmins
Crit 25 mm
Ground
Ineff
Bank Sta


Shadow Creek HEC-RAS Plan: Proposed 3/17/2015
RS = 807
.05
.035
.05
221.5
221.0
220.5
220.0
219.5
219.0
Elevation (m)
0
5
10
15
20
25
30
35
40
Station (m)
Legend
EG Timmins
WS Timmins
Crit Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
Crit 100 year
Crit 25 year
EG 25 mm
WS 25 mm
Crit 5 year
Crit 25 mm
Ground
Ineff
Bank Sta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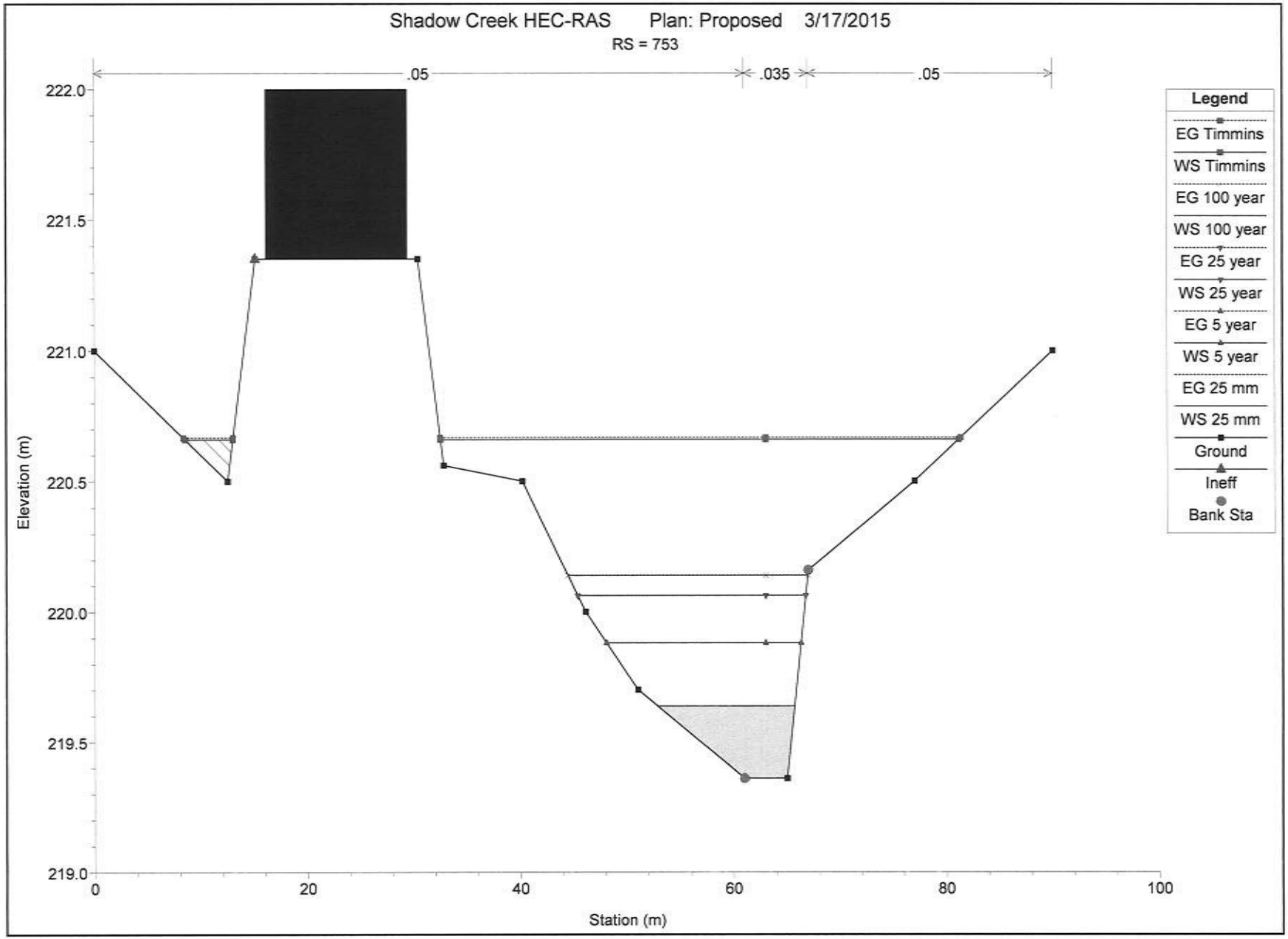
RS = 792
.05
.035
.05
221.0
220.8
220.6
220.4
220.2
220.0
219.8
219.6
219.4
Elevation (m)
0
20
40
60
80
100
Station (m)
Legend
EG Timmins
WS Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
EG 25 mm
WS 25 mm
Ground
Ineff
Bank Sta


Shadow Creek HEC-RAS Plan: Proposed 3/17/2015
RS = 753
.05
.035
.05
222.0
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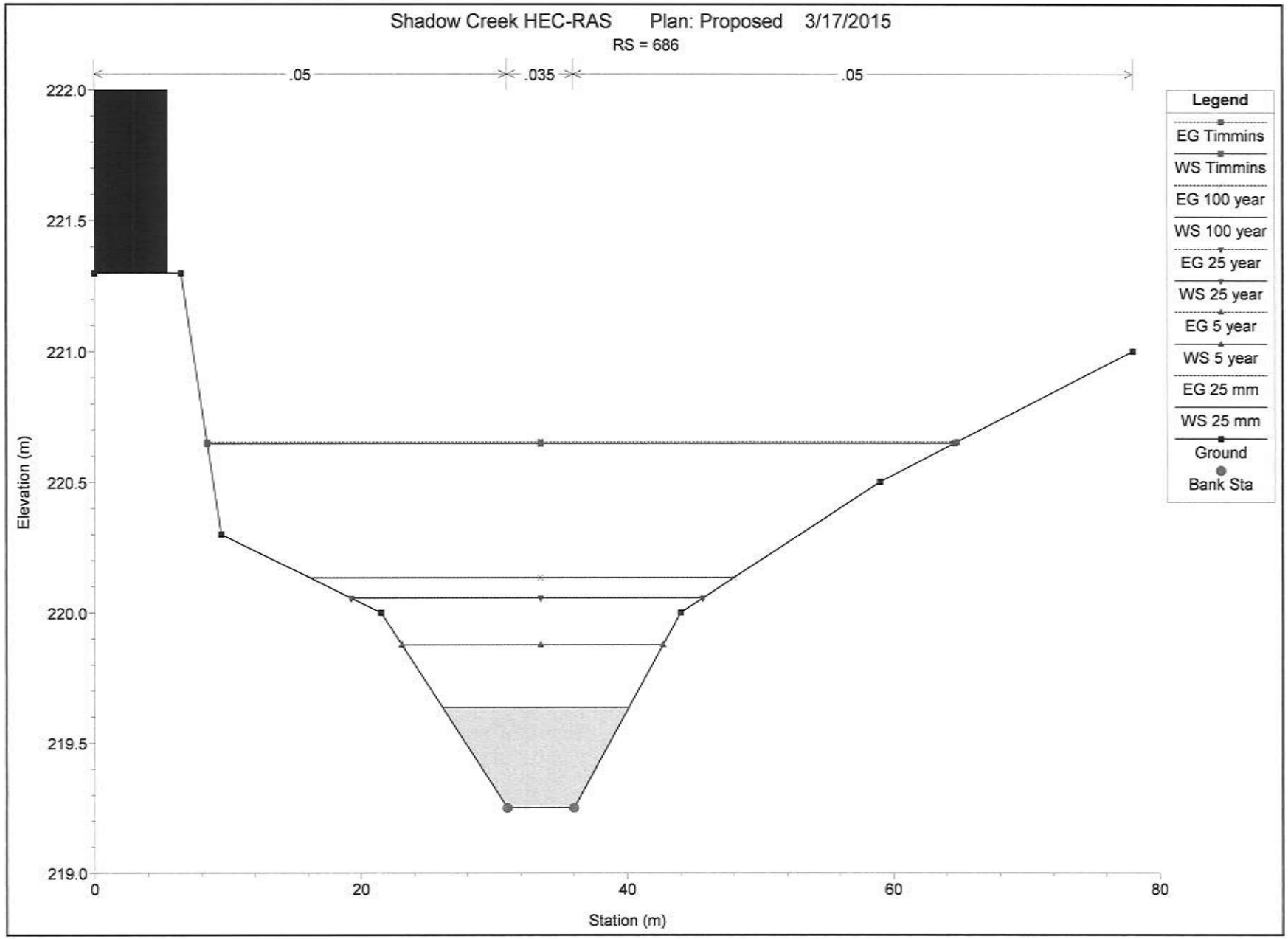
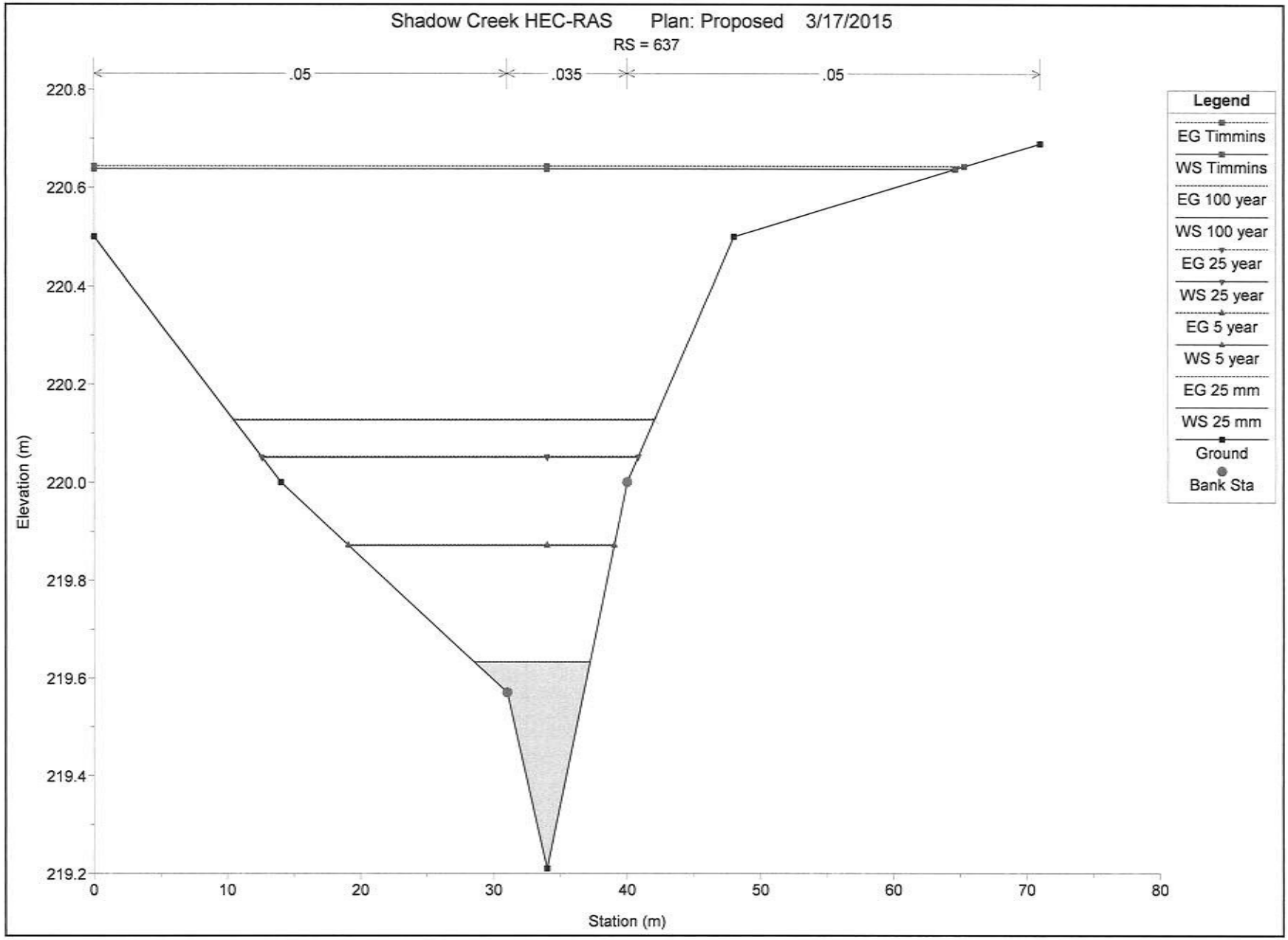
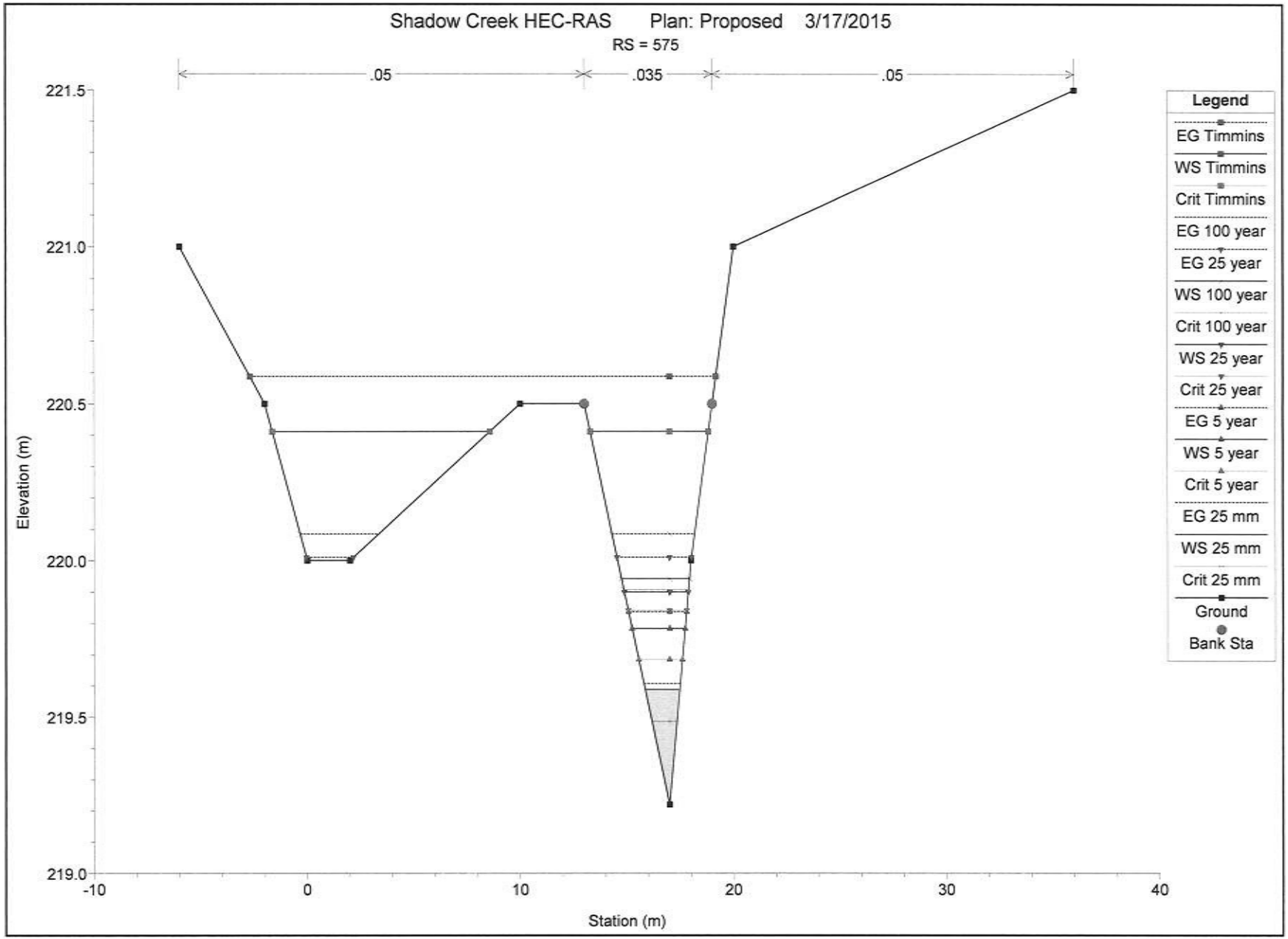
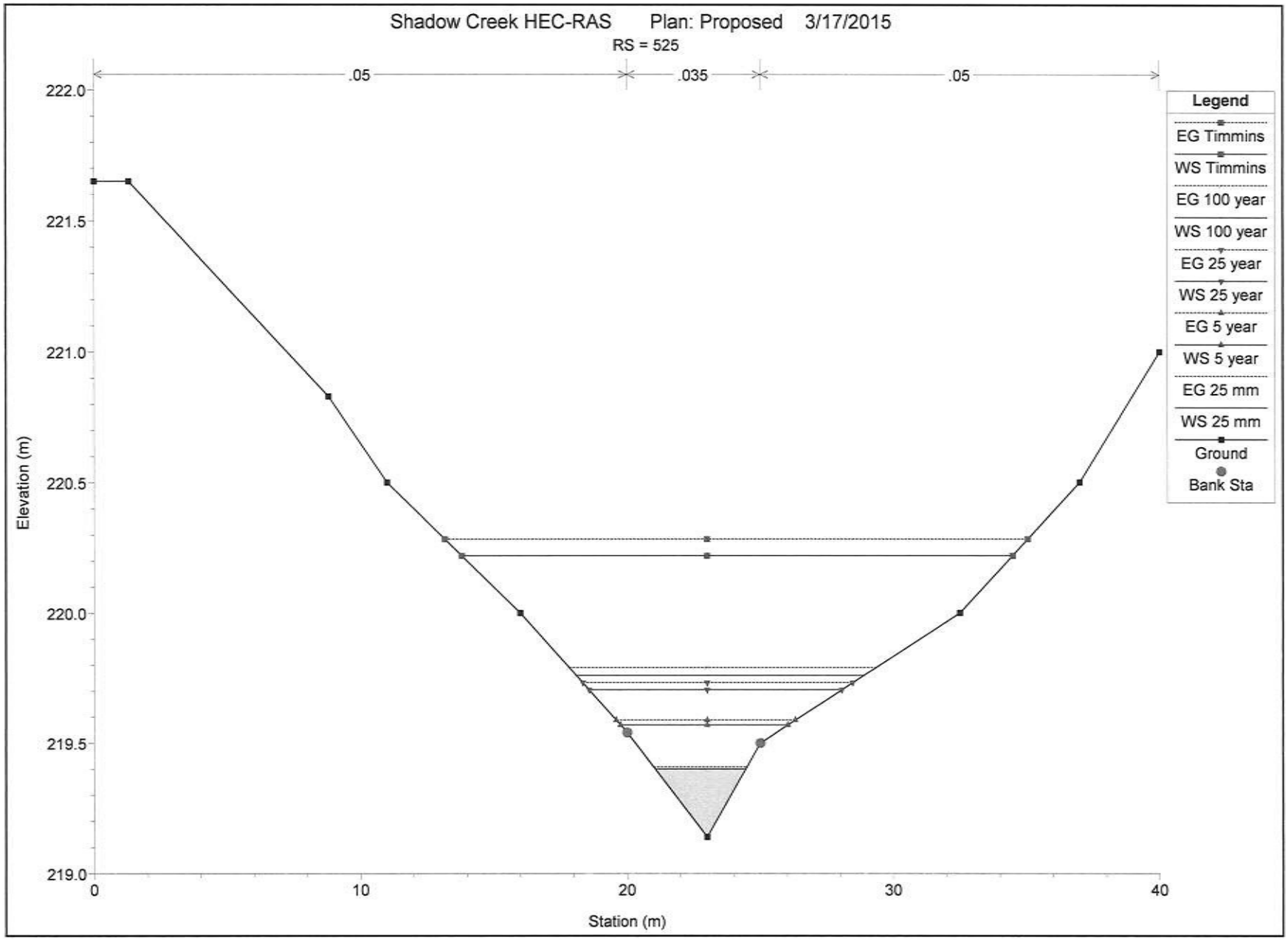
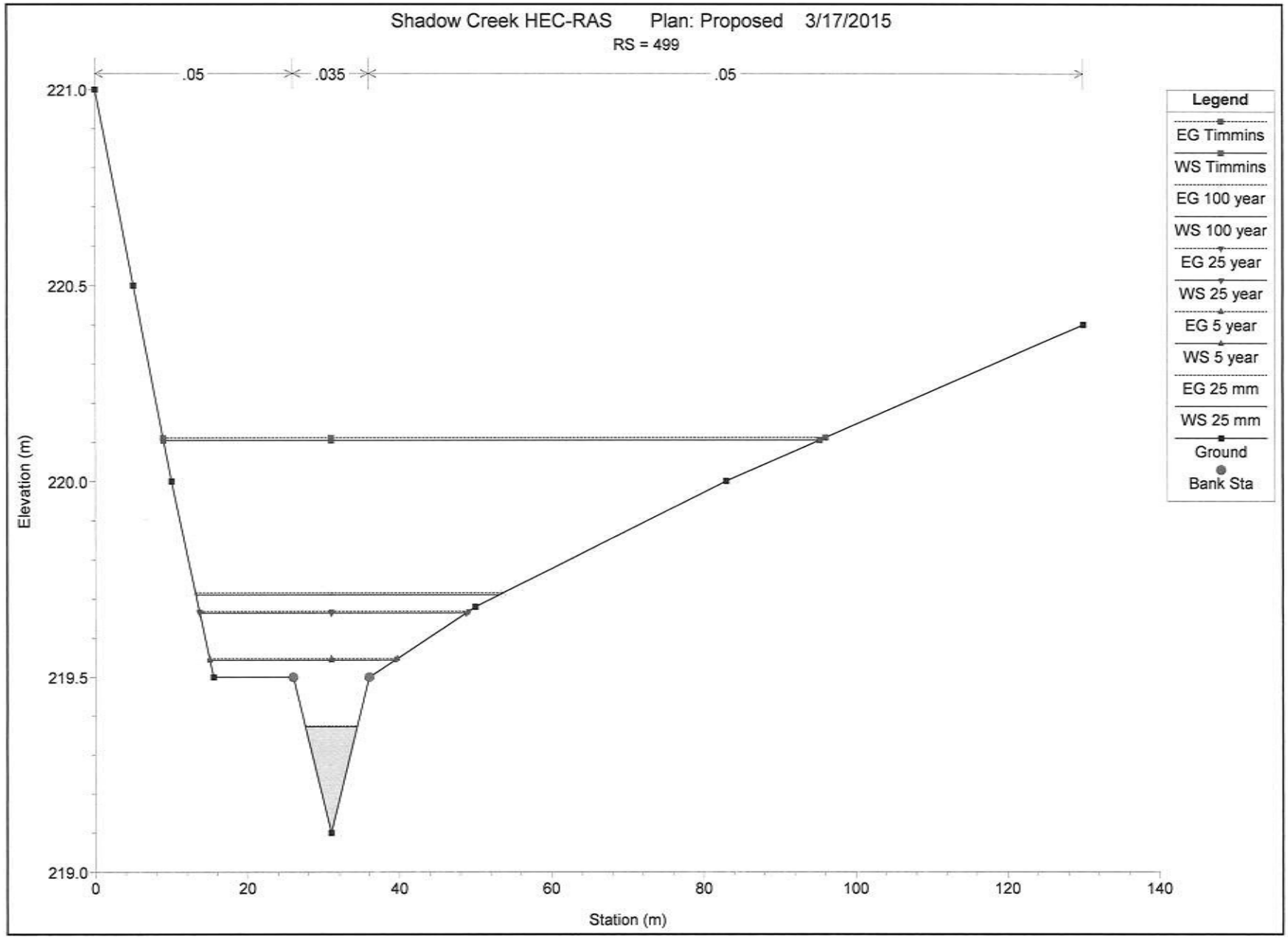
221.0
220.5
220.0
219.5
219.0
Elevation (m)
0
20
40
60
80
100
Station (m)
Legend
EG Timmins
WS Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
EG 25 mm
WS 25 mm
Ground
Ineff
Bank Sta

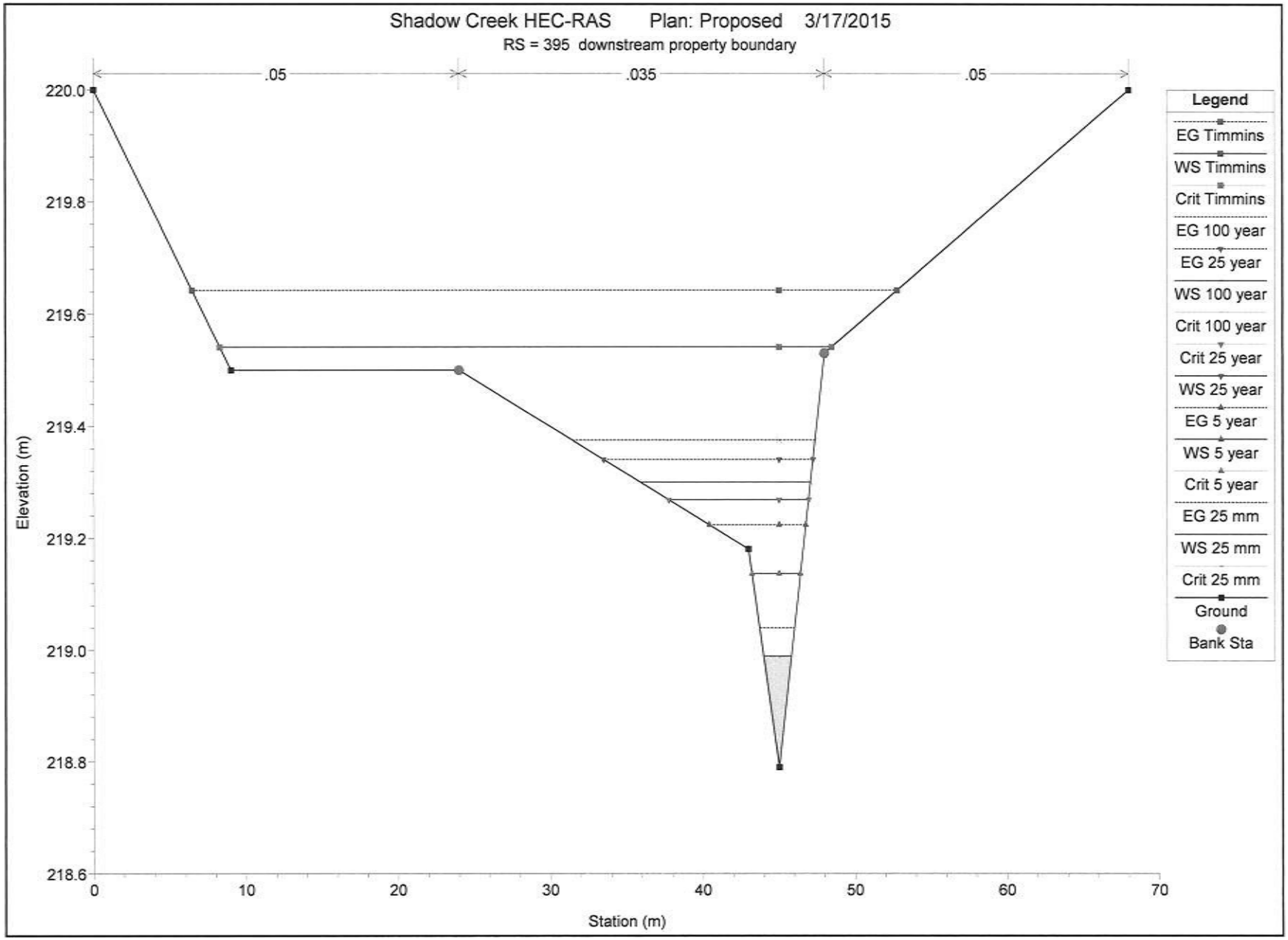

Shadow Creek HEC-RAS Plan: Proposed 3/17/2015
RS = 686
.05
.035
.05
222.0
221.5
221.0
220.5
220.0
219.5
219.0
Elevation (m)
0
20
40
60
80
Station (m)
Legend
EG Timmins
WS Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
EG 25 mm
WS 25 mm
Ground
Bank Sta


Shadow Creek HEC-RAS Plan: Proposed 3/17/2015
RS = 637
.05
.035
.05
220.8
220.6
220.4
220.2
220.0
219.8
219.6
219.4
219.2
Elevation (m)
0
10
20
30
40
50
60
70
80
Station (m)
Legend
EG Timmins
WS Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
EG 25 mm
WS 25 mm
Ground
Bank Sta


Shadow Creek HEC-RAS Plan: Proposed 3/17/2015
RS = 575
.05
.035
.05
221.5
221.0
220.5
220.0
219.5
219.0
Elevation (m)
-10
0
10
20
30
40
Station (m)
Legend
EG Timmins
WS Timmins
Crit Timmins
EG 100 year
EG 25 year
WS 100 year
Crit 100 year
WS 25 year
Crit 25 year
EG 5 year
WS 5 year
Crit 5 year
EG 25 mm
WS 25 mm
Crit 25 mm
Ground
Bank Sta


Shadow Creek HEC-RAS Plan: Proposed 3/17/2015
RS = 525
.05
.035
.05
222.0
221.5
221.0
220.5
220.0
219.5
219.0
Elevation (m)
0
10
20
30
40
Station (m)
Legend
EG Timmins
WS Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
EG 25 mm
WS 25 mm
Ground
Bank Sta


Shadow Creek HEC-RAS Plan: Proposed 3/17/2015
RS = 499
.05
.035
.05
221.0
220.5
220.0
219.5
219.0
Elevation (m)
0
20
40
60
80
100
120
140
Station (m)
Legend
EG Timmins
WS Timmins
EG 100 year
WS 100 year
EG 25 year
WS 25 year
EG 5 year
WS 5 year
EG 25 mm
WS 25 mm
Ground
Bank Sta


Shadow Creek HEC-RAS Plan: Proposed 3/17/2015
RS = 395 downstream property boundary
.05
.035
.05
220.0
219.8
219.6
219.4
219.2
219.0
218.8
218.6
Elevation (m)
0
10
20
30
40
50
60
70
Station (m)
Legend
EG Timmins
WS Timmins
Crit Timmins
EG 100 year
EG 25 year
WS 100 year
Crit 100 year
Crit 25 year
WS 25 year
EG 5 year
WS 5 year
Crit 5 year
EG 25 mm
WS 25 mm
Crit 25 mm
Ground
Bank Sta

LEGEND

CONTRACT DRAWINGS

CONTRACTOR MUST VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR SAME. ANY DISCREPANCIES MUST BE REPORTED TO THE ENGINEER BEFORE COMMENCING WORK. DRAWINGS ARE NOT TO BE SCALED.

TBM INFORMATION

NAIL IN HP ON SOUTH SIDE OF GRAND TAMARACK CRESCENT AT INTERSECTION OF GRAND TAMARACK CRESCENT AND TIMBERLINE AVENUE. ELEVATION 220.595

CONTRACT DRAWINGS

LEGAL SURVEY INFORMATION AND LOT DIMENSIONS SHOWN ON THIS PLAN FROM DRAFT PLAN OF SUBDIVISION BY LUCAS & ASSOCIATES DATED JUNE 20, 2013. INFORMATION MAY NOT BE FINAL AND IS NOT GUARANTEED.

NO.	REVISIONS	DATE	INITIAL
3	TOWNSHIP COMMENTS	APR. 2015	JN
2	REVISED FLOOD LINES AND LOT LINES	SEP. 2009	DJH
1	1:100 YEAR FLOODLINE	MAY. 2009	DJH

APPROVED

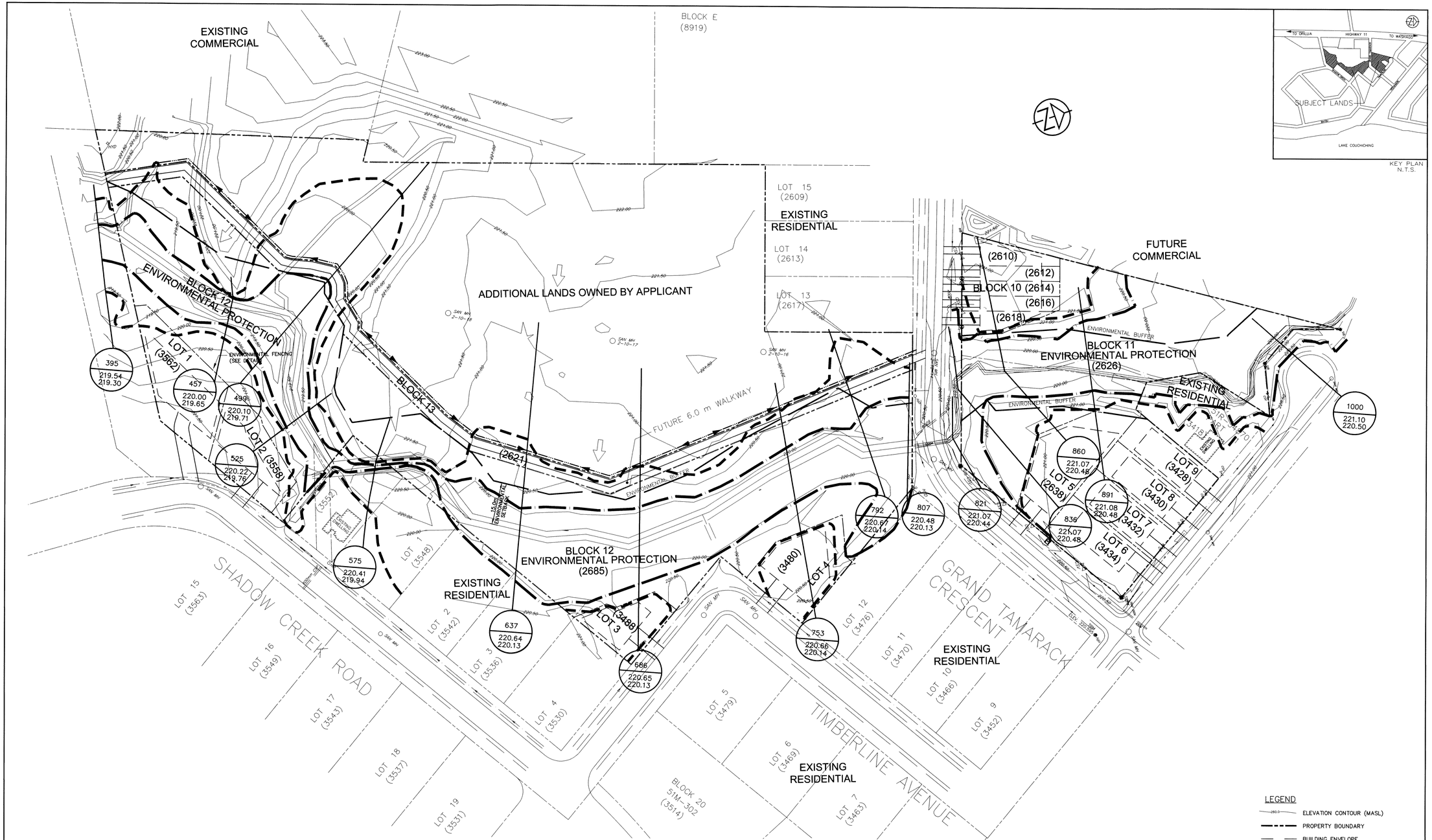
LICENSED PROFESSIONAL ENGINEER
J. A. NELLIST
100181826
Apr. 13, 2015
PROVINCE OF ONTARIO

DRAFT PLAN OF SUBDIVISION PART OF BLOCKs B AND C, REGISTERED PLAN 1233 TOWNSHIP OF SEVERN

EXISTING REGIONAL & 100 YEAR FLOODLINE PLAN

C.C. Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie

SCALE: 1:750		JOB NO.	305820
DESIGN: ALK	CHECKED: TCC	DWG.	FP-2
DRAWN: SMM	DATE: MAR. 2007		



LEGEND

CONTRACT DRAWINGS

CONTRACTOR MUST VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR SAME. ANY DISCREPANCIES MUST BE REPORTED TO THE ENGINEER BEFORE COMMENCING WORK. DRAWINGS ARE NOT TO BE SCALED.

TBM INFORMATION

NAIL IN HP ON SOUTH SIDE OF GRAND TAMARACK CRESCENT AT INTERSECTION OF GRAND TAMARACK CRESCENT AND TIMBERLINE AVENUE. ELEVATION 220.595

CONTRACT DRAWINGS

LEGAL SURVEY INFORMATION AND LOT DIMENSIONS SHOWN ON THIS PLAN FROM DRAFT PLAN OF SUBDIVISION BY LUCAS & ASSOCIATES DATED JUNE 20, 2013. INFORMATION MAY NOT BE FINAL AND IS NOT GUARANTEED.

NO.	REVISIONS	DATE	INITIAL
1	TOWNSHIP COMMENTS	APR. 2015	JN

APPROVED

LICENSED PROFESSIONAL ENGINEER
J. A. NEMISZ
100181826
Apr. 15, 2015
PROVINCE OF ONTARIO

DRAFT PLAN OF SUBDIVISION PART OF BLOCKs B AND C, REGISTERED PLAN 1233 TOWNSHIP OF SEVERN

PROPOSED REGIONAL & 100 YEAR FLOODLINE PLAN

C.C. Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie

SCALE: 1:750		JOB NO.	305820
DESIGN: JA/JN	CHECKED: TCC	DWG.	FP-3
DRAWN: SMM	DATE: MAR. 2015		