

## Technical Memorandum

**Date:** June 4, 2024  
**Project Number:** 24003  
**Submitted To:** Grey Sauble Conservation Authority  
**Prepared By:** Michelle Henry, P.Eng.  
**Subject:** 10<sup>th</sup> Avenue East Floodplain Study of Kenny Drain

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The following memo has been prepared to establish the flood elevations adjacent to the proposed site plan at the termination of 10<sup>th</sup> Avenue East. The east end of the development is adjacent to the Kenny Drain in the northeast corner of Owen Sound.

The following information was considered as part of this analysis:

1. In 2011 an Environmental Study Report (ESR) was prepared for the Kenny Drain by Genivar Inc., including a HEC-RAS model, to establish existing and proposed floodplain elevations.
2. The ESR also evaluated the hydrology to determine the future flows to the Kenny Drain. The hydrology included two sets of flow data, the first being with no stormwater controls in place and the second with stormwater controls.
3. The floodplain work discussed below only considered the flows with no stormwater management controls in place for conservatism. This was obtained from the ESR (2011) Table 5 “Existing with Future” flows, see Attachment 1.
4. In 2014, the geometry included in the 2011 ESR model was updated by Genivar Inc. to reflect proposed construction in the vicinity of the rail trail downstream of the 10<sup>th</sup> Avenue Site.
5. On April 17, 2024, Clearwater Shores (CWS) staff visited the site to obtain a detailed topographic survey of the Kenny Drain adjacent to the proposed development.
6. There were no immediate obstructions or crossings downstream of the site that were noted as impacting the floodplain adjacent to the 10<sup>th</sup> Ave E Site.
7. The geometry file from the 2014 model was updated with new cross-sections from Section 30.0 to Section 30.9 to reflect the detailed topography.
8. It was determined that the new sections were approximately 1.4m higher than the tie in points of the Kenny Drain upstream and downstream of the surveyed section. Therefore, the revised sections were universally lowered by 1.4m. All results, when plotted on the floodplain drawing, were then increased by 1.4m for consistency with the topographic survey.

The final HEC-RAS Model developed by CWS incorporated the survey data, into the latest model from 2014. The flows that were applied through the model were obtained from the 2011 ESR and do not account for any stormwater management controls. The final results for the 100-year and Timmins Regional peak flows are summarized below, with full details in Attachment 2.

**Table 1: Kenny Drain Water Surface Elevations**

Reach	River Station	Water Surface Elevations (m)	
		100-Year	Regional
Kenny Drain	30.9	209.00	208.73
Kenny Drain	30.8	208.54	208.24
Kenny Drain	30.7	208.48	208.15
Kenny Drain	30.6	208.29	208.02
Kenny Drain	30.5	208.15	207.87
Kenny Drain	30.4	207.73	207.47
Kenny Drain	30.3	207.01	206.72
Kenny Drain	30.2	206.33	206.06
Kenny Drain	30.1	205.95	205.68
Kenny Drain	30	205.58	205.34

As shown above, the 100-year storm is the Regulatory storm for the floodplain in this area. The Regulatory floodplain was then plotted on the attached Figure FL. Due to the deeply incised watercourse in this area, the 100-year and Regional peak flows do not spill over the top bank of the Kenny Drain or impact the proposed 10<sup>th</sup> Avenue East site.

**Attachment 1** – Excerpt from ESR 2011

**Attachment 2** – Floodplain Results

**Attachment 3** – Floodplain Drawing



**TABLE 5**  
**FLOW COMPARISON SUMMARY – (100 YEAR AND REGIONAL) – ESR, ESMS AND ES-UR**  
 July 2011

Node	ESR (m <sup>3</sup> /sec.)	ESMS-SWMHYMO		ESR-UR – MIDUSS		ESR-UR – MIDUSS	
		100 YEAR		100 YEAR		Regional	
		Post Without Pond (m <sup>3</sup> /sec.)	Post With Pond (m <sup>3</sup> /sec.)	Existing With Future (m <sup>3</sup> /sec.)	Proposed Improvements (m <sup>3</sup> /sec.)	Existing With Future (m <sup>3</sup> /sec.)	Proposed Improvements (m <sup>3</sup> /sec.)
1	N/A	5.05	5.05	4.33	4.33	7.97	7.97
2	8.4	6.43	5.97	8.28	8.28	9.48	9.48
3	10.1	8.27	5.86	17.39	17.39	13.38	13.38
4	N/A	17.60	16.15	25.41	25.41	20.40	20.40
5	30.8	21.31	19.01	32.37	18.00	24.87	21.69
6	N/A	28.37	20.39	41.73	22.61	29.97	27.25
8	33.4	30.30	21.76	43.28	24.14	31.80	28.91
9	36.0	30.69	22.46	42.56	17.46	33.99	31.10
10	36.3	31.31	22.94	43.58	17.64	34.75	31.79

### Floodplain Results - Regional Design Storm

Date: 04-Jun-24  
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Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	W.S. Elev Adjust.* (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Kenny Drain	42	Regional	20.4	212.4	213.92			214.37	0.007958	3.01	7.12	5.92	0.83
Kenny Drain	40	Regional	20.4	210	212.21		212.21	213.01	0.022554	3.96	5.22	3.75	0.97
Kenny Drain	39	Regional	20.4	210	210.43		206.16	210.43	0.000001	0.01	465.18	109.9	0.01
Kenny Drain	38	Regional	20.4	207.65	210.43			210.43	0	0.01	858.89	195.4	0
Kenny Drain	36	Regional	20.4	206.03	210.4		207.12	210.43	0.000228	0.39	28.37	69.19	0.08
Kenny Drain	35	Regional	20.4	205.96	209.45		209.45	210.34	0.037755	4.17	4.89	2.79	1
Kenny Drain	34	Regional	20.4	206	209.13		206.8	209.15	0.000204	0.65	31.41	19.59	0.12
Kenny Drain	33		Culvert										
Kenny Drain	32	Regional	24.87	206	208.12			208.19	0.001063	1.21	20.6	12.46	0.3
Kenny Drain	30.9	Regional	24.87	205.43	207.33	208.73	207.33	207.97	0.010995	4.28	8.76	7.26	1.03
Kenny Drain	30.8	Regional	24.87	205.15	206.84	208.24	206.72	207.31	0.007766	3.17	9.19	8.07	0.84
Kenny Drain	30.7	Regional	24.87	204.83	206.75	208.15		207.14	0.006364	3.26	11.09	9.11	0.78
Kenny Drain	30.6	Regional	24.87	204.63	206.62	208.02		207.02	0.005646	3.25	10.97	8.3	0.76
Kenny Drain	30.5	Regional	24.87	204.69	206.47	207.87		206.89	0.005863	3.07	9.93	7.77	0.75
Kenny Drain	30.4	Regional	24.87	204.31	206.07	207.47	206.07	206.7	0.015613	5.06	8.47	6.96	1.23
Kenny Drain	30.3	Regional	24.87	203.69	205.32	206.72	205.32	206	0.014256	4.69	8.33	6.59	1.18
Kenny Drain	30.2	Regional	24.87	203.05	204.66	206.06	204.66	205.28	0.012934	4.29	8.61	7.5	1.1
Kenny Drain	30.1	Regional	24.87	202.47	204.28	205.68	204.28	204.91	0.013481	4.7	8.69	7.16	1.14
Kenny Drain	30	Regional	24.87	202.39	203.94	205.34	203.94	204.53	0.01484	4.36	8.6	7.63	1.15
Kenny Drain	28	Regional	24.87	201.7	203.02		203.02	203.42	0.009461	3.12	10.97	14.7	0.91
Kenny Drain	26	Regional	24.87	198.7	200.15		199.85	200.25	0.003192	1.52	26.4	104.72	0.5
Kenny Drain	25		Culvert										
Kenny Drain	24	Regional	29.97	198.6	199.15		199.14	199.31	0.014896	1.82	17.02	53.34	0.95
Kenny Drain	22	Regional	29.97	196.6	197.33		197.3	197.48	0.013888	1.74	17.55	53.5	0.91
Kenny Drain	20	Regional	29.97	194.1	194.94		194.94	195.06	0.009487	2.07	28.66	103.24	0.82
Kenny Drain	18	Regional	29.97	192.7	194.91		193.46	194.91	0.000013	0.14	334.7	345.27	0.04
Kenny Drain	17		Culvert										
Kenny Drain	16	Regional	31.8	189.6	192.03			192.03	0.000034	0.19	235.82	194.2	0.04
Kenny Drain	14	Regional	31.8	189.6	191.45		191.38	191.94	0.018824	3.1	10.27	9.12	0.93
Kenny Drain	12	Regional	31.8	188.55	189.96			190.22	0.00944	2.39	15.22	18	0.7
Kenny Drain	10	Regional	31.8	186.85	188.56			188.8	0.007036	2.23	15.79	16.43	0.62
Kenny Drain	8	Regional	31.8	186.2	188.65		187.46	188.66	0.000389	0.64	86.85	130	0.15
Kenny Drain	7		Culvert										
Kenny Drain	6	Regional	33.99	186.2	188.64			188.66	0.000455	0.71	83.4	121.15	0.16
Kenny Drain	5.5	Regional	33.99	186	188.27		188.25	188.52	0.007767	2.38	20.71	53.93	0.61
Kenny Drain	4.5	Regional	33.99	185.5	188.24			188.26	0.001173	1.03	61.29	105.97	0.24
Kenny Drain	4	Regional	33.99	184.75	188.15			188.17	0.000848	0.9	69.83	133.39	0.2
Kenny Drain	3	Regional	33.99	184.3	187.18		187.18	187.91	0.027357	3.78	9.02	6.54	0.99
Kenny Drain	2	Regional	33.99	177	177.96		177.96	178.41	0.022845	2.97	11.46	12.92	1.01

\* Elevations increase by 1.4m for consistency with topographic survey data

### Floodplain Results - 100-Year Design Storm

Date: 04-Jun-24

Project #: 24003

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	W.S. Elev Adjust.*	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)	
Kenny Drain	42	100 yr	25.41	212.4	214.13		213.96	214.65	0.007545	3.22	8.49	7.81	0.83
Kenny Drain	40	100 yr	25.41	210	212.55		212.55	213.37	0.018449	4.04	6.69	4.93	0.9
Kenny Drain	39	100 yr	25.41	210	210.84		206.19	210.84	0.000001	0.02	510.54	110.09	0.01
Kenny Drain	38	100 yr	25.41	207.65	210.84			210.84	0	0.02	939.51	195.55	0
Kenny Drain	36	100 yr	25.41	206.03	210.8		207.3	210.84	0.00026	0.44	31.38	69.51	0.09
Kenny Drain	35	100 yr	25.41	205.96	209.78		209.78	210.74	0.036783	4.36	5.83	3.04	1.01
Kenny Drain	34	100 yr	25.41	206	209.42		206.92	209.44	0.000204	0.7	50.97	114.03	0.13
Kenny Drain	33		Culvert										
Kenny Drain	32	100 yr	32.37	206	208.47			208.55	0.001031	1.29	25.14	13.37	0.3
Kenny Drain	30.9	100 yr	32.37	205.43	207.6	209	207.6	208.33	0.010661	4.64	10.83	7.93	1.04
Kenny Drain	30.8	100 yr	32.37	205.15	207.14	208.54		207.65	0.006769	3.35	11.65	8.76	0.81
Kenny Drain	30.7	100 yr	32.37	204.83	207.08	208.48		207.49	0.00552	3.4	14.26	10.04	0.75
Kenny Drain	30.6	100 yr	32.37	204.63	206.89	208.29		207.37	0.005743	3.59	13.35	9.27	0.78
Kenny Drain	30.5	100 yr	32.37	204.69	206.75	208.15		207.25	0.005646	3.34	12.22	8.41	0.76
Kenny Drain	30.4	100 yr	32.37	204.31	206.33	207.73	206.33	207.06	0.015459	5.53	10.32	7.49	1.26
Kenny Drain	30.3	100 yr	32.37	203.69	205.61	207.01	205.61	206.39	0.013522	5.08	10.26	7.09	1.18
Kenny Drain	30.2	100 yr	32.37	203.05	204.93	206.33	204.93	205.62	0.011989	4.59	10.73	8.13	1.09
Kenny Drain	30.1	100 yr	32.37	202.47	204.55	205.95	204.55	205.27	0.013044	5.09	10.7	7.77	1.15
Kenny Drain	30	100 yr	32.37	202.39	204.18	205.58	204.18	204.86	0.014373	4.74	10.46	8	1.16
Kenny Drain	28	100 yr	32.37	201.7	203.19		203.19	203.64	0.009339	3.39	13.53	15.9	0.92
Kenny Drain	26	100 yr	32.37	198.7	200.16		200.16	200.32	0.005047	1.92	27.51	105.42	0.63
Kenny Drain	25		Culvert										
Kenny Drain	24	100 yr	41.73	198.6	199.23		199.23	199.44	0.014225	2.04	21.82	59.39	0.96
Kenny Drain	22	100 yr	41.73	196.6	197.42		197.4	197.6	0.013414	1.93	22.64	62.09	0.92
Kenny Drain	20	100 yr	41.73	194.1	196.05		195	196.06	0.000048	0.29	274.68	257.44	0.07
Kenny Drain	18	100 yr	41.73	192.7	196.05		193.57	196.05	0.000002	0.08	767.34	402.62	0.02
Kenny Drain	17		Culvert										
Kenny Drain	16	100 yr	43.28	189.6	192.38			192.38	0.000029	0.2	308.27	215.37	0.04
Kenny Drain	14	100 yr	43.28	189.6	191.7		191.67	192.29	0.019797	3.41	12.68	10.09	0.97
Kenny Drain	12	100 yr	43.28	188.55	190.16			190.48	0.009377	2.64	18.85	18	0.72
Kenny Drain	10	100 yr	43.28	186.85	188.55		188.49	189	0.013627	3.07	15.53	16.29	0.85
Kenny Drain	8	100 yr	43.28	186.2	188.75		187.73	188.77	0.000488	0.74	99.98	130	0.17
Kenny Drain	7		Culvert										
Kenny Drain	6	100 yr	42.56	186.2	188.75			188.76	0.000491	0.76	95.95	121.97	0.16
Kenny Drain	5.5	100 yr	42.56	186	188.4		188.38	188.63	0.007122	2.41	28.98	70.55	0.59
Kenny Drain	4.5	100 yr	42.56	185.5	188.41			188.43	0.0009	0.95	79.63	110.41	0.21
Kenny Drain	4	100 yr	42.56	184.75	188.34			188.36	0.000602	0.8	97.45	148.12	0.17
Kenny Drain	3	100 yr	42.56	184.3	187.84		187.84	188.23	0.010038	2.92	19.27	33.78	0.64
Kenny Drain	2	100 yr	42.56	177	178.11		178.11	178.62	0.022081	3.17	13.41	13.22	1.01

\* Elevations increase by 1.4m for consistency with topographic survey data

