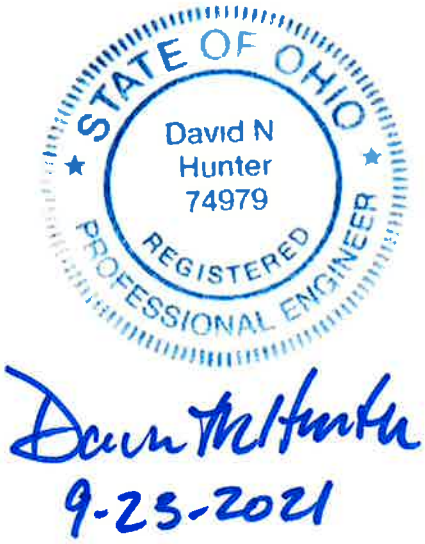
Stormwater Drainage Report

The Space Shop Massillon

2600 Lincoln Way E.

Massillon, Ohio



Prepared by: Jason Sutton, PE

Reviewed by: David N. Hunter, PE

PEA Group

PEA Group Project No. 2021-0277

September 9, 2021

(Revised September 23, 2021)

PEA GROUP

PROJECT NARRATIVE:

The existing fully developed site is 10.46 net acres. 1.78 acres is not part of this development. Currently 7.21 acres of the site is captured in an enclosed storm system that drains to the Lincoln Way storm system. The remaining 1.47 acres sheet flows to the Lincoln Way storm system. All of the drainage flows to Lincoln Way unrestricted.

Our design proposes to leave the existing storm sewer in place but reduce the area contributing to it to 6.51 acres. The remaining 2.17 acres will drain through a new storm system which is restricted and utilizes oversized pipes to provide storage. We have not included any required volume calculations for detention based on discussions with the City Engineer due to our reduction in runoff.

OVERALL CALCULATIONS:

The initial design was to simply look at a comparison of the existing vs proposed 100 year flows from the site, refer to Exhibit “A”. This shows a decrease in flow from 55.65 cfs to 43.26 cfs before the restriction is even considered.

The existing Lincoln Way system was verified based on reviewing plans provided by the city:

- Plans provided on June 15, 2021 dated February 27, 1930 by E.G. Pocock
- Plans provided on August 17, 2021 dated:
    - July 8, 2010 O’Reilly Auto Parts Site Utility Plan
    - November 15, 2010 Permit to Tap Sanitary with related as-built sketch

The system is currently under designed for what it’s receiving, refer to Exhibit “B”. When we modify where the flow is directed into the system and consider the restricted portion there is a reduction of the flow in the system, refer to Exhibit “C”.

EXHIBIT A

STORM WATER MANAGEMENT

EXISTING CONDITION (100 YEAR)

EXISTING STORM SEWER

GROSS AREA =	7.21	Acres
C =	0.95	
INTENSITY =	5.60	In/Hr
Qex =	38.36	cfs

EXISTING SHEET FLOW

GROSS AREA =	3.25	Acres
C =	0.95	
INTENSITY =	5.60	In/Hr
Qex =	17.29	cfs

TOTAL Q =	55.65	cfs

PROPOSED CONDITION (100 YEAR)

EXISTING STORM SEWER

GROSS AREA =	6.51	Acres
C =	0.89	
INTENSITY =	5.60	In/Hr
Qex =	32.45	cfs

PROPOSED STORM SEWER:

GROSS AREA =	2.17	Acres
C =	0.89	
INTENSITY =	5.60	In/Hr
Qex =	10.82	cfs

TOTAL Q =	43.26	cfs

EXHIBIT B

EXISTING STORM SEWER SYSTEM DESIGN

FROM STR	TO STR	AREA (A) (Acres)	COEF. C	A x C	TOTAL AREA (AxC)	TOTAL AREA (Acres)	TIME t (min.)	INT. I (in/hr)	FLOW Q (cfs)	PIPE CAP. (cfs)	PIPE DIA. (in.)	PIPE LENGTH (ft.)	PIPE SLOPE (%)	MIN HG PER "Q"	VEL. FULL (ft./sec)	TIME FLOW (min.)	INVERT ELEV. UP STREAM	INVERT ELEV. DOWN STREAM
11	10	0.00	0.00	0.00	0.00	0.00	20.00	3.89	0.00	2.92	12	72	0.67	0.00%	3.7	0.3	290.60	290.12
10	9	0.35	0.68	0.24	0.24	0.35	20.30	3.86	0.92	2.52	12	263	0.50	0.07%	3.2	1.4	290.12	288.81
9	8	1.49	0.85	1.27	1.50	1.84	21.70	3.75	5.64	8.37	15	409	1.68	0.76%	6.8	1.0	288.61	281.73
8	7	2.36	0.87	2.06	3.57	4.20	22.70	3.67	13.08	7.96	15	293	1.52	4.11%	6.5	0.8	281.73	277.28
7	6	0.83	0.71	0.59	4.15	5.02	23.50	3.61	14.98	6.39	15	268	0.98	5.38%	5.2	0.9	277.28	274.65
6	1	12.98	0.95	12.33	16.49	18.01	24.40	3.54	58.40	10.50	18	90	1.00	30.93%	5.9	0.3	274.45	273.55
1	EX1	0.00	0.00	0.00	16.49	18.01	24.70	3.52	58.40	10.50	18	61	1.00	30.93%	5.9	0.2	273.55	272.94
5	4	0.00	0.00	0.00	0.00	0.00	20.00	3.89	0.00	3.19	12	66	0.80	0.00%	4.1	0.3	276.70	276.17
4	3	0.00	0.00	0.00	0.00	0.00	20.30	3.86	0.00	4.33	15	268	0.45	0.00%	3.5	1.3	275.97	274.76
3	2	0.00	0.00	0.00	0.00	0.00	21.60	3.76	0.00	5.56	15	227	0.74	0.00%	4.5	0.8	274.76	273.08
2	1	0.00	0.00	0.00	0.00	0.00	22.40	3.69	0.00	5.99	15	40	0.86	0.00%	4.9	0.1	273.08	272.74
EX2	1	0.00	0.00	0.00	0.00	0.00	20.00	3.89	0.00	10.50	18	32	1.00	0.00%	5.9	0.1	273.86	273.55

EXHIBIT C

PROPOSED STORM SEWER SYSTEM DESIGN

FROM STR	TO STR	AREA (A) (Acres)	COEF. C	A x C	TOTAL AREA (AxC)	TOTAL AREA (Acres)	TIME t (min.)	INT. I (in/hr)	FLOW Q (cfs)	PIPE CAP. (cfs)	PIPE DIA. (in.)	PIPE LENGTH (ft.)	PIPE SLOPE (%)	MIN HG PER "Q"	VEL. FULL (ft./sec)	TIME FLOW (min.)	INVERT ELEV. UP STREAM	INVERT ELEV. DOWN STREAM
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10	9	0.35	0.68	0.24	0.24	0.35	20.30	3.86	0.92	2.52	12	263	0.50	0.07%	3.2	1.4	290.12	288.81
9	8	1.49	0.85	1.27	1.50	1.84	21.70	3.75	5.64	8.37	15	409	1.68	0.76%	6.8	1.0	288.61	281.73
8	7	2.36	0.87	2.06	3.57	4.20	22.70	3.67	13.08	7.96	15	293	1.52	4.11%	6.5	0.8	281.73	277.28
7	6	3.00	0.89	2.67	6.24	7.20	23.50	3.61	22.50	6.39	15	268	0.98	12.14%	5.2	0.9	277.28	274.65
6	1	10.81	0.89	9.62	15.86	18.01	24.40	3.54	56.17	10.50	18	90	1.00	28.62%	5.9	0.3	274.45	273.55
1	EX1	0.00	0.00	0.00	15.86	18.01	24.70	3.52	56.17	10.50	18	61	1.00	28.62%	5.9	0.2	273.55	272.94
5	4	0.00	0.00	0.00	0.00	0.00	20.00	3.89	0.00	3.19	12	66	0.80	0.00%	4.1	0.3	276.70	276.17
4	3	0.00	0.00	0.00	0.00	0.00	20.30	3.86	0.00	4.33	15	268	0.45	0.00%	3.5	1.3	275.97	274.76
3	2	0.00	0.00	0.00	0.00	0.00	21.60	3.76	0.00	5.56	15	227	0.74	0.00%	4.5	0.8	274.76	273.08
2	1	0.00	0.00	0.00	0.00	0.00	22.40	3.69	0.00	5.99	15	40	0.86	0.00%	4.9	0.1	273.08	272.74
EX2	1	0.00	0.00	0.00	0.00	0.00	20.00	3.89	0.00	10.50	18	32	1.00	0.00%	5.9	0.1	273.86	273.55

PROPOSED DESIGN CALCULATIONS:

The proposed design utilizes a restrictor and oversized pipes to reduce the flow from the newly re-developed area, refer to Exhibit “D”. This reduction is where the benefit to the whole system can be seen. The restriction calculations and detention volume provided can be found on Exhibit “E”.

EXHIBIT D
(REVISED)

STORM WATER FLOW ANALYSIS

		2 yr	5 yr	10 yr	10 -during construction	25 yr	50 yr	100 yr	
intensity		2.4	3	3.5	3.5	4.3	4.9	5.6	
Site Area Uncont =	6.51								
Site Area Contr =	2.17								
ex C =	0.95								
Pr C =	0.89								
Ex Peak Flow		19.79	24.74	28.86	28.86	35.46	40.41	46.18	
Pr uncontrolled		13.91	17.38	20.28	20.28	24.91	28.39	32.45	
pr Controlled		2.60	2.60	2.60	2.60	2.60	2.60	2.60	
Total Pr.		16.51	19.98	22.88	22.88	27.51	30.99	35.05	

EXHIBIT E
(REVISED)

STORM WATER STORAGE AND OUTLET

Underground Detention Storage Provided		
Pipe Diameter:	24	in
Pipe Volume per Linear Foot:	3.142	cft
Total Pipe Length:	64	ft
Pipe Diameter:	36	in
Pipe Volume per Linear Foot:	7.069	cft
Total Pipe Length:	153	ft
Total Volume=	1283	cft
Outlet Control Restriction Calculations		
Maximum Storage Elevation:	34.06	ft
Restriction Hole Invert:	26.98	ft
Depth of Water in Pipe:	7.08	ft
Restriction Hole Dia.:	6.00	in
Restriction Hole Area:	0.19635	sft
Flow thru Restriction Hole:	2.60	cfs
Time for Release of Volume:	0.14	hrs