

Storm Sewer Design

10 yr. Storm
Project: Keefe Tracts 2 & 3
Job No.: 15M053.000

Formulas Used:
Q_r = ACI
V_p = 1.486 R^(2/3) S^(1/2)/n
Q_p = A_p V_p

Bayer Becker Engineers

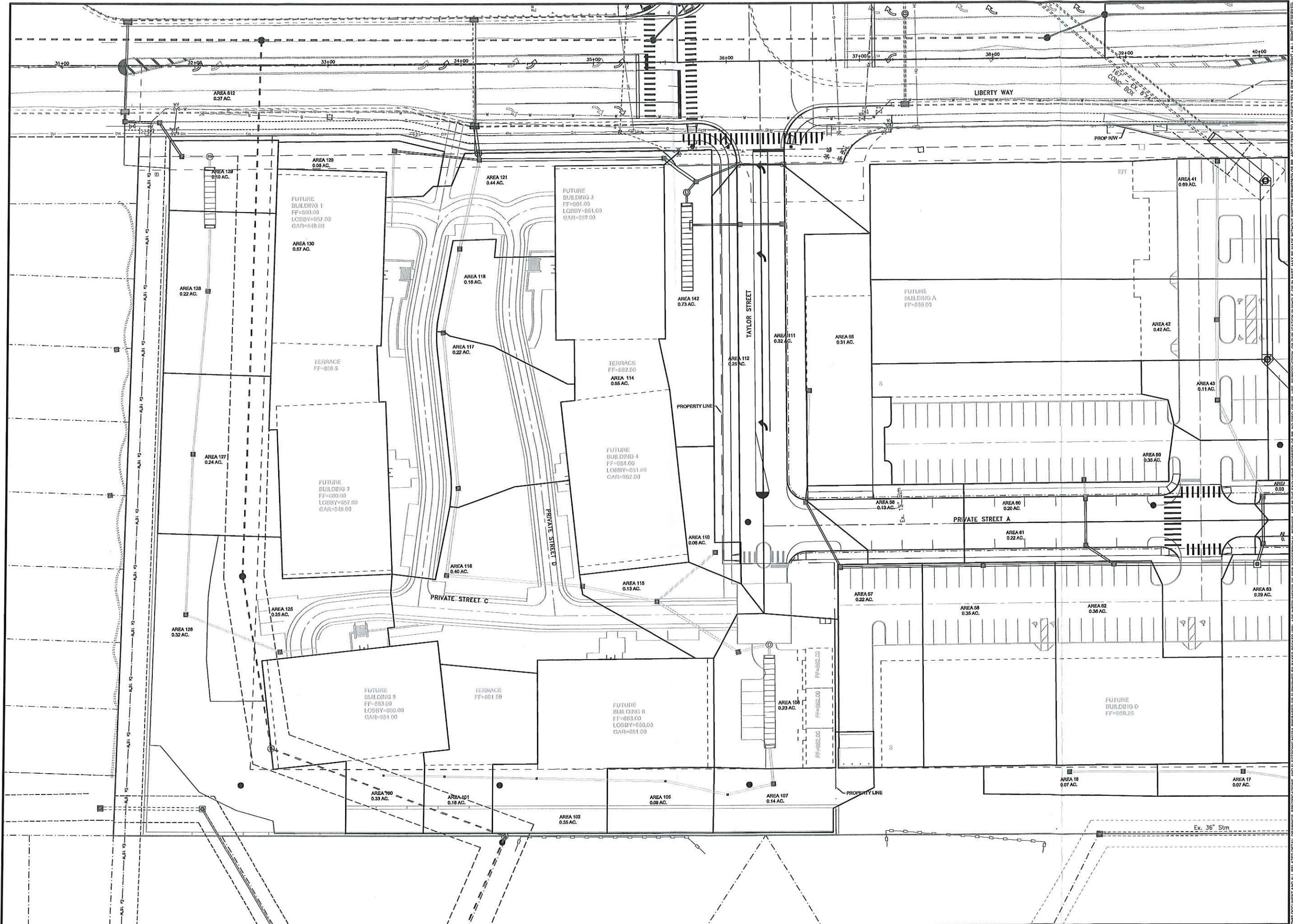
Designed By: MJL Date: 09/13/16
Reviewed By: Date:
Revisions: Date:
Revisions: Date:
Revisions: Date:

LOCATION		TOPOGRAPHY					TIME		Min. Tc=		DESIGN												Constant n value: 0.015		
Street	From Structure	To Structure	Area (acres)	"C"	Contributing Area	Composite C	T-inlet (min.)	T-upstr (min.)	T_c-conc. (min.)	Intensity (in./hr.)	Q _r (c.f.s.)	Pipe Size (inches)	"n"	Distance (ft.)	Slope (%)	Velocity (ft./sec)	Q _p (c.f.s.)	Flow Time (min.)	T/Grate	Inlet Invert	Outlet Invert	Inlet Clearance			
	1	4	0.44	0.90	0.44	0.90	10.00	10.00	10.00	5.15	2.04	15	0.015	109	0.50	3.23	3.96	0.56	864.35	861.3	860.76	1.80			
	3	4	0.06	0.90	0.06	0.90	10.00	10.00	10.00	5.15	0.28	12	0.015	75	1.49	4.80	3.77	0.26	868.07	864.54	863.42	2.53			
	4	5	0.13	0.90	0.63	0.90	10.00	10.56	10.56	5.07	2.87	15	0.015	55	0.50	3.23	3.96	0.28	867.28	860.76	860.49	5.27			
	5	6	0.63	0.90	1.26	0.90	10.00	10.85	10.85	5.02	5.70	18	0.015	79	0.50	3.64	6.44	0.36	866.95	860.13	859.74	5.32			
	6	7	0.12	0.90	1.38	0.90	10.00	11.21	11.21	4.97	6.17	18	0.015	69	1.00	5.15	9.10	0.22	868.06	859.74	859.05	6.82			
	7	8	0.15	0.90	1.53	0.90	10.00	11.43	11.43	4.94	6.80	18	0.015	19	2.00	7.29	12.87	0.04	865.72	853.37	853.00	10.85			
	10	11	0.17	0.60	0.17	0.60	10.00	10.00	10.00	5.15	0.53	12	0.015	18	2.00	5.56	4.37	0.05	866.34	853.36	853.00	11.98			
	12	13	0.00	0.40	0.00	0.40	10.00	10.00	10.00	5.15	0.00	42	0.015	12	4.00	18.13	174.39	0.01	866.00	853.15	852.67	9.35			
	14	15	0.00	0.40	0.00	0.40	10.00	10.00	10.00	5.15	0.00	18	0.015	17	4.00	10.30	18.21	0.03	865.43	853.35	852.67	10.58			
	16	17	0.07	0.35	0.07	0.35	10.00	10.00	10.00	5.15	0.13	12	0.015	130	0.50	2.78	2.18	0.78	864.7	862.7	862.05	1.00			
	17	18	0.07	0.35	0.14	0.35	10.00	10.78	10.78	5.03	0.25	12	0.015	210	0.50	2.78	2.18	1.26	864.7	862.05	861	1.65			
	18	19	0.00	0.00	0.14	0.35	10.00	12.04	12.04	4.85	0.24	36	0.015	21	2.00	11.57	81.75	0.03	862.67	853.41	853	6.26			
	30	34	0.27	0.90	0.27	0.90	10.00	10.00	10.00	5.15	1.25	12	0.015	151	0.50	2.78	2.18	0.91	864.4	861.01	860.26	2.39			
	31	32	0.20	0.90	0.20	0.90	10.00	10.00	10.00	5.15	0.93	12	0.015	92	0.50	2.78	2.18	0.55	862.13	858.80	858.34	2.33			
	32	33	0.50	0.90	0.70	0.90	10.00	10.55	10.55	5.07	3.19	15	0.015	27	1.00	4.56	5.60	0.10	861.84	858.1	857.83	2.49			
	33	34	0.63	0.90	1.33	0.90	10.00	10.65	10.65	5.05	6.05	18	0.015	103	0.50	3.64	6.44	0.47	861.84	855.39	854.88	4.95			
	34	37	0.00	0.00	1.60	0.90	10.00	11.12	11.12	4.98	7.17	18	0.015	73	1.00	5.15	9.10	0.24	865.03	854.88	854.15	8.65			
	35	37	0.57	0.90	0.57	0.90	10.00	10.00	10.00	5.15	2.64	12	0.015	63	4.77	8.59	6.74	0.12	864.38	861.25	858.25	2.13			
	36	37	0.27	0.90	0.27	0.90	10.00	10.00	10.00	5.15	1.25	12	0.015	68	0.50	2.79	2.19	0.41	861.97	858.59	858.25	2.38			
	37	38	0.31	0.90	2.75	0.90	10.00	11.36	11.36	4.95	12.25	24	0.015	34	1.00	6.24	19.61	0.09	862.05	853.65	853.31	6.40			
	38	39	0.20	0.90	2.95	0.90	10.00	11.45	11.45	4.93	13.10	24	0.015	31	1.00	6.24	19.61	0.08	862.05	853.31	853	6.74			
	41	42	0.69	0.90	0.69	0.90	10.00	10.00	10.00	5.15	3.20	15	0.015	118	0.50	3.23	3.96	0.61	862.04	859.26	858.67	1.53			
	42	43	0.42	0.90	1.11	0.90	10.00	10.61	10.61	5.06	5.05	18	0.015	60	0.50	3.64	6.44	0.27	863.1	858.41	858.11	3.19			
	43	44	0.11	0.90	1.22	0.90	10.00	10.88	10.88	5.02	5.51	18	0.015	80	0.50	3.63	6.41	0.37	863.1	858.11	857.71	3.49			
	44	45	0.03	0.90	1.25	0.90	10.00	11.25	11.25	4.96	5.58	18	0.015	35	0.50	3.64	6.44	0.16	863.8	857.71	857.54	4.59			
	45	63	0.03	0.90	1.28	0.90	10.00	11.41	11.41	4.94	5.69	18	0.015	16	1.00	5.15	9.10	0.05	863.80	857.54	857.38	4.76			
	46	47	0.05	0.90	0.05	0.90	10.00	10.00	10.00	5.15	0.23	12	0.015	34	0.50	2.78	2.18	0.20	863.03	859.97	859.80	2.06			
	47	64	0.09	0.90	0.14	0.90	10.00	10.20	10.20	5.12	0.65	12	0.015	17	1.00	3.93	3.09	0.07	863.03	859.80	859.63	2.23			
	55	56	0.23	0.90	0.23	0.90	10.00	10.00	10.00	5.15	1.07	12	0.015	82	0.50	2.78	2.18	0.49	860.12	856.89	856.48	2.23			
	56	57	0.13	0.90	0.36	0.90	10.00	10.49	10.49	5.08	1.64	12	0.015	55	0.50	2.78	2.18	0.33	860.95	856.48	856.20	3.47			
	57	58	0.22	0.90	0.58	0.90	10.00	10.82	10.82	5.03	2.62	15	0.015	106	0.50	3.23	3.96	0.55	863.42	855.97	855.43	6.20			
	58	62	0.35	0.90	0.93	0.90	10.00	11.37	11.37	4.95	4.14	18	0.015	99	0.50	3.64	6.44	0.45	865.23	855.19	854.69	8.54			
	59	60	0.43	0.90	0.43	0.90	10.00	10.00	10.00	5.15	1.99	12	0.015	13	2.00	5.56	4.37	0.04	862.13	858.8	858.55	2.33			
	60	61	0.20	0.90	0.63	0.90	10.00	10.04	10.04	5.15	2.92	15	0.015	35	0.50	3.23	3.96	0.18	862.20	858.30	858.13	2.65			
	61	62	0.22	0.90	0.85	0.90	10.00	10.22	10.22	5.12	3.91	15	0.015	25	1.00	4.56	5.60	0.09	862.2	858.14	857.88	2.81			
	62	63	0.36	0.90	2.14	0.90	10.00	11.82	11.82	4.88	9.40	24	0.015	107	0.50	4.41	13.86	0.40	863.07	854.69	854.15	6.38			
	63	64	0.29	0.90	3.71	0.90	10.00	12.23	12.23	4.83	16.11	30	0.015	99	0.50	5.12	25.14	0.32	863.38	853.65	853.15	7.23			
	64	65	0.33	0.90	4.18	0.90	10.00	12.55	12.55	4.78	17.99	30	0.015	130	0.50	5.12	25.14	0.42	863.48	853.15	852.50	7.83			

not correct - additional system upstream

LOCATION			TOPOGRAPHY				TIME				DESIGN											
							Min. Tc= 10				Constant n value: 0.015											
Street	From Structure	To Structure	Area (acres)	"C"	Contributing Area	Composite C	T-inlet (min.)	T-upstr (min.)	T_c-conc. (min.)	Intensity (in./hr.)	Q_r (c.f.s.)	Pipe Size (inches)	"n"	Distance (ft.)	Slope (%)	Velocity (ft./sec)	Q_p (c.f.s.)	Flow Time (min.)	T/Grate	Inlet Invert	Outlet Invert	Inlet Clearance
	75	76	0.00	0.40	0.00	0.40	10.00	10.00	10.00	5.15	0.00	96	0.015	277	0.30	8.61	432.96	0.54	857.80	850.19	849.36	-0.39
	76	77	0.00	0.40	0.00	0.40	10.00	10.54	10.54	5.07	0.00	96	0.015	133	0.30	8.61	432.96	0.26	864.57	849.36	848.96	7.21
	77	78	0.00	0.40	0.00	0.40	10.00	10.79	10.79	5.03	0.00	96	0.015	51	0.30	8.61	432.96	0.10	863.31	848.96	848.81	6.35
	100	101	0.33	0.81	0.33	0.81	10.00	10.00	10.00	5.15	1.38	12	0.015	45	0.50	2.78	2.18	0.27	860.30	857.46	857.23	1.84
	101	102	0.18	0.35	0.51	0.65	10.00	10.27	10.27	5.11	1.69	12	0.015	69	0.50	2.78	2.18	0.41	860.60	857.23	856.89	2.37
	102	105	0.35	0.72	0.86	0.68	10.00	10.68	10.68	5.05	2.94	15	0.015	96	0.50	3.23	3.96	0.50	860.6	856.65	856.16	2.70
	105	106	0.09	0.35	0.95	0.65	10.00	11.18	11.18	4.97	3.05	15	0.015	48	0.50	3.23	3.96	0.25	861.2	856.16	855.93	3.79
	106	107	0.00	0.00	0.95	0.65	10.00	11.43	11.43	4.94	3.03	15	0.015	35	0.50	3.23	3.96	0.18	862.5	855.92	855.75	5.33
	107	108	0.14	0.35	1.09	0.61	10.00	11.61	11.61	4.91	3.26	15	0.015	27	0.50	3.23	3.96	0.14	860.8	855.76	855	3.79
	108	109	0.23	0.80	1.32	0.64	10.00	11.75	11.75	4.89	4.14	18	0.015	72	0.50	3.64	6.44	0.33	860.63	849.88	849.52	9.25
	110	109	0.06	0.40	0.06	0.40	10.00	10.00	10.00	5.15	0.12	12	0.015	57	1.50	4.82	3.78	0.20	860.51	856.8	855.94	2.71
	109	115	0.00	0.00	1.38	0.63	10.00	12.08	12.08	4.85	4.22	18	0.015	57	0.72	4.38	7.73	0.22	860	849.52	849.11	8.98
	111	112	0.32	0.90	0.32	0.90	10.00	10.00	10.00	5.15	1.48	12	0.015	35	2.00	5.56	4.37	0.10	851.52	848.40	847.70	2.12
	112	113	0.25	0.90	0.57	0.90	10.00	10.10	10.10	5.14	2.63	12	0.015	34	3.19	7.02	5.51	0.08	851.52	847.70	846.63	2.82
	142	113	0.73	0.78	0.73	0.78	10.00	10.00	10.00	5.15	2.93	12	0.015	11	2.00	5.56	4.37	0.03	856.41	846.84	846.63	8.57
	113	114	0.73	0.00	2.03	0.53	10.00	10.19	10.19	5.12	5.54	24	0.015	30	0.50	4.41	13.86	0.11	854.9	845.63	845.48	7.27
	114	121	0.00	0.40	2.03	0.53	10.00	10.30	10.30	5.11	5.53	24	0.015	139	0.50	4.41	13.86	0.52	855.30	845.48	844.79	7.82
	115	116	0.13	0.40	1.51	0.61	10.00	12.29	12.29	4.82	4.44	18	0.015	102	0.71	4.33	7.64	0.39	858	849.11	848.39	7.39
	116	117	0.40	0.40	1.91	0.57	10.00	12.69	12.69	4.76	5.16	18	0.015	117	0.90	4.89	8.64	0.40	858.37	847.8	846.75	9.07
	117	118	0.22	0.40	2.13	0.55	10.00	13.09	13.09	4.71	5.52	18	0.015	64	1.00	5.15	9.10	0.21	855.83	846.75	846.11	7.58
	118	121	0.16	0.40	2.29	0.54	10.00	13.29	13.29	4.68	5.78	18	0.015	68	1.20	5.64	9.97	0.20	852.63	846.11	845.29	5.02
	120	121	0.08	0.35	0.08	0.35	10.00	10.00	10.00	5.15	0.14	12	0.015	64	0.50	2.78	2.18	0.38	847	845.11	844.79	0.89
	121	510	0.44	0.40	4.84	0.52	10.00	13.49	13.49	4.66	11.74	24	0.015	26	0.50	4.41	13.86	0.10	849.07	844.79	844.66	2.28
	125	126	0.25	0.85	0.25	0.85	10.00	10.00	10.00	5.15	1.09	12	0.015	76	0.50	2.78	2.18	0.46	851.10	848.90	848.52	1.20
	126	127	0.32	0.40	0.57	0.60	10.00	10.46	10.46	5.08	1.73	12	0.015	120	0.50	2.78	2.18	0.72	853.60	848.52	847.92	4.08
	127	128	0.24	0.35	0.81	0.52	10.00	11.18	11.18	4.97	2.11	12	0.015	122	0.50	2.78	2.18	0.73	853.60	847.92	847.31	4.68
	128	130	0.22	0.35	1.03	0.49	10.00	11.91	11.91	4.87	2.44	12	0.015	47	6.34	9.90	7.77	0.08	853.60	844.50	841.50	8.10
	130	129	0.57	0.90	1.60	0.63	10.00	11.99	11.99	4.86	4.93	15	0.015	21	1.00	4.56	5.60	0.08	847.83	840.19	839.98	6.39
	129	131	0.10	0.35	1.70	0.62	10.00	12.06	12.06	4.85	5.09	15	0.015	30	1.00	4.56	5.60	0.11	845.2	839.99	839.68	3.96
	131	132	0.00	0.40	1.70	0.62	10.00	12.17	12.17	4.83	5.07	15	0.015	26	1.00	4.56	5.60	0.09	842.81	839.68	839.42	1.88
	132	512	0.00	0.00	1.70	0.62	10.00	12.27	12.27	4.82	5.06	15	0.015	7	1.00	4.56	5.60	0.03	842	839.42	839.36	1.33

Plot Date: Oct 17, 2016, 1:29pm
Drawing Name: L:\2015\15M053-000\DWG\15M053-000 UTILITY.dwg - Layout Tab: West Drn Map



Scale of Bearings
State Plane NAD83 (2011)
0 30 45
SCALE: 1" = 30'

Item	Date	Drawn	Chk
1	07-28-16	AJW	JSD
2	08-13-16	AJW	JSD
3	10-14-16	AJW	JSD

KEEFE PROPERTY SP-PUD TRACTS 2&3
MASS EARTHWORK PERMIT SET
LIBERTY WAY & TYLERS PLACE BLVD
SECTION 18, TOWN 3, RANGE 2
WEST CHESTER TOWNSHIP
BUTLER COUNTY, OHIO

WEST DRAINAGE MAP

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Drawing: 15M053-000 UTILITY

Drawn by: AJW

Checked by: JSD

Issue Date: 08-17-16

Sheet: **WDrn**

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