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Drainage Summary Report Redding Fire District No. 1 – 186 Black Rock Turnpike, Redding, CT

The Redding Fire District (“the District”) proposes demolishing the existing fire house at 186 Black Rock Turnpike and replacing it with a larger, more modern fire house. The site presently consists of a fire house, parking lot, cell tower, and associated pads and mechanical equipment. The proposed improvements to the 54,569 square-foot site will cover approximately 7,400 square feet of new impervious area. This report will show that runoff from the building, driveway and walkways in the front and side of the building can be retained in underground storage structures and that the proposed improvements will not have an adverse impact on downslope properties or drainage facilities.

Presently runoff from the site flows generally to one (1) point of concern (“POC”). Runoff from the parcel and a portion of the Black Rock Turnpike right-of-way (“R.O.W.”) flows from west to east across the parcel to a large, wooded wetland area. This wetland is in part fed by runoff from Black Rock Turnpike that flows from a catch basin to the north of the parcel, through a drainage ditch, and easterly towards the aforementioned wetland. This drainage ditch is severely eroded. As such, we have proposed reinforcing the portion of the ditch that is on the District property with rip-rap to the point where the ditch fans out into the wetlands. The POC does not change for the post-development condition. The soils on the majority of the site are fill soils of miscellaneous composition atop Paxton and Montauk soils with a Hydrologic Soil Group “C” rating. All existing impervious areas on the site, including the portions of the existing driveway in the R.O.W., flow untreated and unabated into the wetlands. The proposed activities will not alter the overall drainage pattern of the site.

Using the SCS TR-20 Method, our office has analyzed the runoff generated by the 1-, 2-, 5-, 10-, 25-, 50-, and 100-Year, 24-Hour Storms for the site work associated with the proposed fire house. In the existing conditions hydrologic analysis, the entire parcel plus that portion of the R.O.W. that drains onto the parcel has been identified as “Site”. A summary of the runoff rates leaving the site is included in Table I.

Table I – Summary of Existing & Proposed Runoff Rates for Site

Storm Event	Flow/Volume	Existing	Proposed	Δ	Δ(%)
1-Year	q (cfs)	2.03	1.73	-0.30	-14.78%
	v (CF)	6,862.00	7,516.00	654.00	9.53%
2-Year	q (cfs)	2.75	2.24	-0.51	-18.55%
	v (CF)	9,264.00	9,981.00	717.00	7.74%
5-Year	q (cfs)	3.74	3.20	-0.54	-14.44%
	v (CF)	12,618.00	13,394.00	776.00	6.15%
10-Year	q (cfs)	4.74	3.99	-0.75	-15.82%
	v (CF)	16,087.00	16,902.00	815.00	5.07%
25-Year	q (cfs)	6.38	5.21	-1.17	-18.34%
	v (CF)	21,878.00	22,734.00	856.00	3.91%

50-Year	q (cfs)	7.91	6.31	-1.60	-20.23%
	v (CF)	27,334.00	28,205.00	871.00	3.19%
100-Year	q (cfs)	9.80	7.77	-2.03	-20.71%
	v (CF)	34,244.00	35,165.00	921.00	2.69%

The area of the proposed building that flows to the north parking lot, as well as the lot itself and the portion of the R.O.W. that flows onto the driveway has been identified as “Drive North”, while the area of the southern parking lot, proposed terrace and walkway has been identified as “Drive South” in the post-development analysis. The remainder of the site, which includes the lawn, equipment pads, cell tower and rear of the building and walkways, is included in the “Site” sub-watershed.

To achieve the decrease in runoff rate shown in Table I, we propose retaining the runoff from the southern parking area and walkway four (4) 4’x8’x48” precast concrete galleries surrounded by gravel. Runoff from northern parking lot, walkway, majority of the new building, and portions of the R.O.W. that drains onto the parcel will be detained in gravel beneath the parking lot. Runoff will flow through a 100’-long level spreader under the driveway and filter through the gravel beneath the drive until it is dispersed on the low side of the parking lot retaining wall via a 6” PVC level spreader. As the cell tower cannot move, and a new septic system must be built in the rear of the parcel, stormwater treatment measures are limited to this type of filtration practice. The concrete galleries and stone beneath the northern parking lot have a total storage volume of 4,715 CF. Runoff from the remainder of the site will flow along existing drainage paths.

The proposed galleries and gravel beneath the northern parking lot will also retain the required Stormwater Quality Volume (WQV) for the new impervious areas. The WQV based on a one (1) inch rainfall for the northern lot is 1,319.3 CF, while the WQV for the southern lot is 298 CF. As stated earlier, the proposed galleries and gravel have a storage volume of 4,715 CF which is sufficient volume to treat the 1” rainfall event. Underground filtration devices such as the galleries and gravel, in conjunction with deep sump catch basins, have an estimated 90% Total Suspended Solids (TSS) removal rate. Please refer to the enclosed calculations and plans for further details. It is important to note that the proposed stormwater treatment system will be a vast improvement over existing conditions, as runoff from the subject parcel and the R.O.W. presently flows untreated into the wetlands.

With these drainage structures in place, it is our professional opinion that there will be no adverse hydrological or hydraulic impacts caused to surrounding or downstream properties or drainage facilities by this development. To the best of my knowledge, this drainage proposal complies with the Town of Redding Planning and Zoning Regulations.

Respectfully submitted,

Frangione Engineering, LLC



A handwritten signature in blue ink, appearing to read "R. Frangione".

Robert M. Frangione, P.E.
 Owner & Chief Engineer
 March 18, 2021

Enclosures

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Storm Water Quality Calculations
Redding Fire District No. 1 – 186 Black Rock Turnpike, Redding, CT
March 17, 2021

Water Quality Volume (WQV) – Southern Driveway:

Total Impervious Area (driveway and walks) = 3,575 SF

$$\text{WQV} = (1'' \times A)/12$$

$$= (1'' \times 3,575 \text{ SF})/12 \text{ in./ft.} = 298 \text{ CF}$$

Proposed Detention Facility: (4) 4'x8'x48" galleries surrounded by 12" of stone

Volume of Storage Provided: 535 CF (refer to hydrologic analysis) >> WQV

Water Quality Volume (WQV) – Northern Driveway:

Total Impervious Area (driveway, building and walks) = 15,832 SF

$$\text{WQV} = (1'' \times A)/12$$

$$= (1'' \times 15,832 \text{ SF})/12 \text{ in./ft.} = 1,319.3 \text{ CF}$$

Proposed Detention Facility: gravel infill beneath parking lot from El. 93.0 to outlet

Volume of Storage Provided: 4,180 CF (refer to hydrologic analysis) >> WQV

TSS Removal

See enclosed spreadsheet. 80% TSS Removal is met.

**TSS Removal
Calculation
Worksheet**

Location:

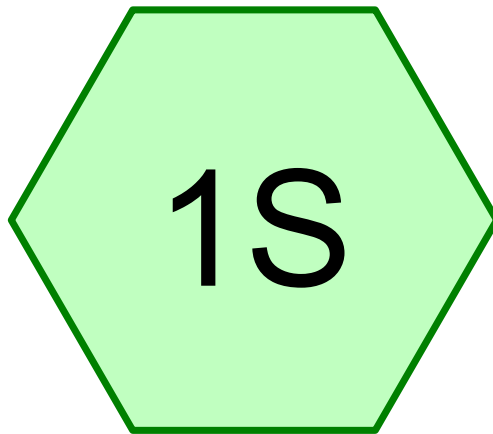
A BMP ¹	B TSS Removal Rate ¹	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Catch Basin Sumps	25%	1.00	0.25	0.75
Drywells/Gravel Treatment	90%	0.75	0.68	0.08
		0.08	0.00	0.08
		0.08	0.00	0.08
		0.08	0.00	0.08

Total TSS Removal =

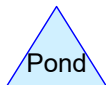
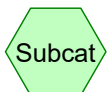
**Separate Form Needs to be
Completed for Each Outlet or
BMP Train**

Project:
 Prepared By:
 Date:

*Equals remaining load from previous BMP (E) which enters the BMP



Site



Redding FD Existing

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Type III 24-hr 100-Year Rainfall=9.10"

Printed 3/5/2021

Events for Subcatchment 1S: Site

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)
1-Year	2.90	2.03	6,862
2-Year	3.50	2.75	9,264
5-Year	4.30	3.74	12,618
10-Year	5.10	4.74	16,087
25-Year	6.40	6.38	21,878
50-Year	7.60	7.91	27,334
100-Year	9.10	9.80	34,244

Redding FD Existing

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Type III 24-hr 25-Year Rainfall=6.40"

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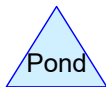
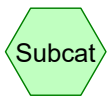
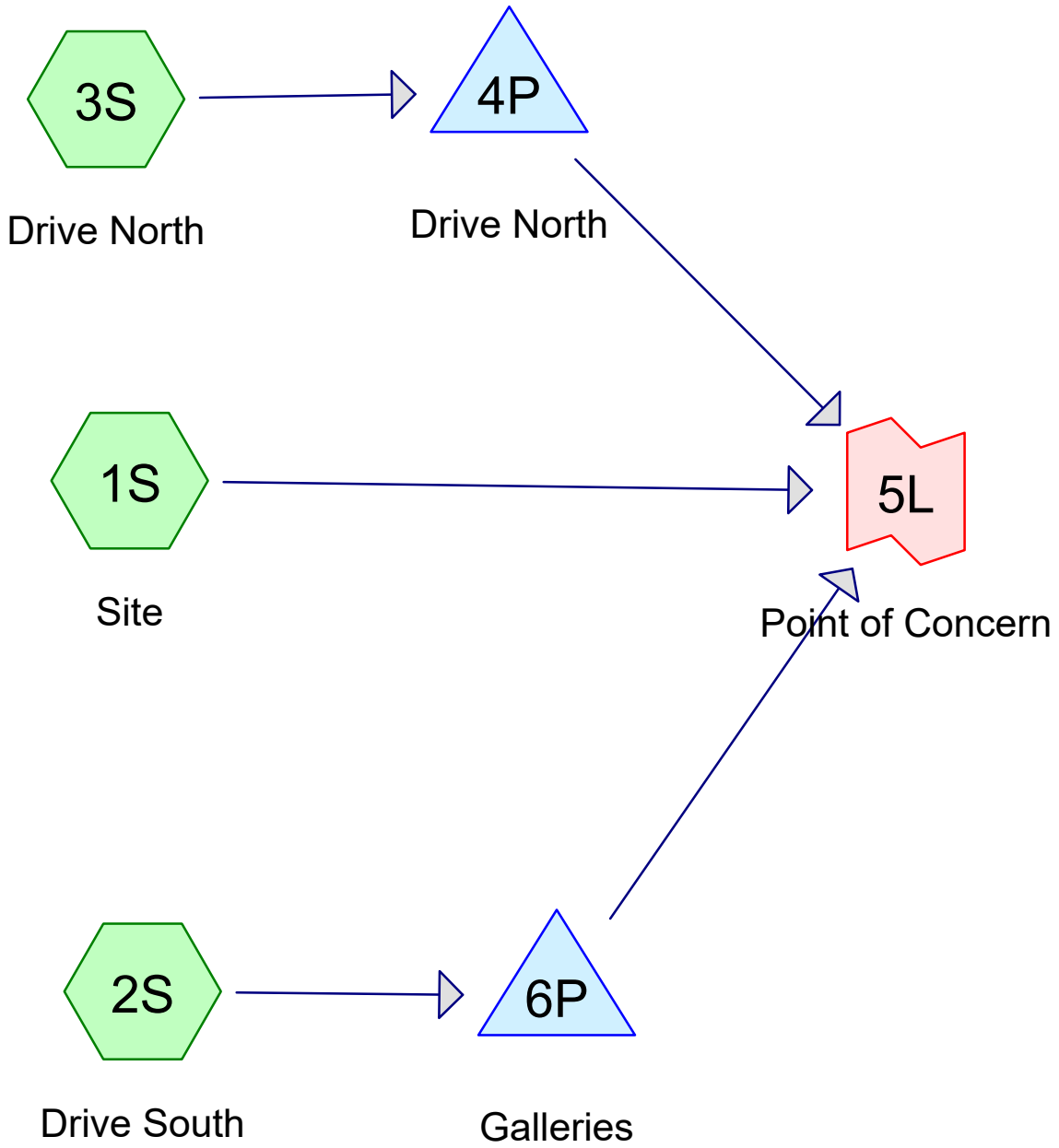
Summary for Subcatchment 1S: Site

Runoff = 6.38 cfs @ 12.12 hrs, Volume= 21,878 cf, Depth> 4.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.01 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=6.40"

Area (sf)	CN	Description
* 5,161	98	Ex. Building
* 6,795	98	Ex. Drive
* 194	98	Ex. Walks
* 2,480	98	Ex. Cell Tower Pad
* 198	98	Ex. pads
* 10,475	83	Woods, Poor, HSG D (wetlands)
9,205	70	Woods, Good, HSG C
20,061	79	50-75% Grass cover, Fair, HSG C
* 1,527	98	Ex. Asphalt in ROW
* 1,393	79	Ex. Natural ROW
57,489	84	Weighted Average
41,134		71.55% Pervious Area
16,355		28.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	65	0.0307	0.13		Sheet Flow, Grass: Dense n= 0.240 P2= 3.50"
0.2	106	0.2450	7.97		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
8.3	171	Total			



Redding FD Proposed

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Type III 24-hr 100-Year Rainfall=9.10"

Printed 3/5/2021

Events for Link 5L: Point of Concern

Event	Rainfall (inches)	Inflow (cfs)	Volume (cubic-feet)
1-Year	2.90	1.73	7,516
2-Year	3.50	2.24	9,981
5-Year	4.30	3.20	13,394
10-Year	5.10	3.99	16,902
25-Year	6.40	5.21	22,734
50-Year	7.60	6.31	28,205
100-Year	9.10	7.77	35,165

Redding FD Proposed

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Type III 24-hr 1-Year Rainfall=2.90"

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Summary for Subcatchment 1S: Site

Runoff = 1.10 cfs @ 12.12 hrs, Volume= 3,770 cf, Depth> 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.01 hrs, dt= 0.03 hrs
Type III 24-hr 1-Year Rainfall=2.90"

	Area (sf)	CN	Description
*	1,627	98	Pr. Building
*	118	98	Pr. Walks
*	2,291	98	Cell Tower Pad
*	63	98	Pr. Pads
*	10,475	83	Woods, Poor, HSG D (wetlands)
	6,181	70	Woods, Good, HSG C
	15,586	79	50-75% Grass cover, Fair, HSG C
	287	96	Gravel surface, HSG C
	36,628	81	Weighted Average
	32,529		88.81% Pervious Area
	4,099		11.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	65	0.0307	0.13		Sheet Flow, Grass: Dense n= 0.240 P2= 3.50"
0.2	106	0.2450	7.97		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
8.3	171	Total			

Redding FD Proposed

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Type III 24-hr 1-Year Rainfall=2.90"

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Summary for Subcatchment 2S: Drive South

Runoff = 0.23 cfs @ 12.08 hrs, Volume= 762 cf, Depth> 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.01 hrs, dt= 0.03 hrs
Type III 24-hr 1-Year Rainfall=2.90"

	Area (sf)	CN	Description
*	2,838	98	Pr. Drive
*	498	98	Pr. Front Patio
*	143	98	Pr. Walks
	96	74	>75% Grass cover, Good, HSG C
	3,575	97	Weighted Average
	96		2.69% Pervious Area
	3,479		97.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Redding FD Proposed

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Type III 24-hr 1-Year Rainfall=2.90"

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Summary for Subcatchment 3S: Drive North

Runoff = 1.06 cfs @ 12.08 hrs, Volume= 3,532 cf, Depth> 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-24.01 hrs, dt= 0.03 hrs
Type III 24-hr 1-Year Rainfall=2.90"

	Area (sf)	CN	Description
*	4,413	98	Pr. Building
*	9,892	98	Pr. Drive (on-site)
*	1,527	98	Pr. Drive in ROW
*	1,393	79	Natural Area in ROW
*	61	98	Pr. Walk
	17,286	96	Weighted Average
	1,393		8.06% Pervious Area
	15,893		91.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Redding FD Proposed

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Type III 24-hr 1-Year Rainfall=2.90"

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Summary for Pond 4P: Drive North

Inflow Area = 17,286 sf, 91.94% Impervious, Inflow Depth > 2.45" for 1-Year event
 Inflow = 1.06 cfs @ 12.08 hrs, Volume= 3,532 cf
 Outflow = 0.65 cfs @ 12.19 hrs, Volume= 3,514 cf, Atten= 39%, Lag= 6.3 min
 Primary = 0.65 cfs @ 12.19 hrs, Volume= 3,514 cf

Routing by Stor-Ind method, Time Span= 1.00-24.01 hrs, dt= 0.03 hrs / 2
 Peak Elev= 85.56' @ 12.19 hrs Surf.Area= 525 sf Storage= 322 cf

Plug-Flow detention time= 8.7 min calculated for 3,514 cf (99% of inflow)
 Center-of-Mass det. time= 5.5 min (781.9 - 776.4)

Volume	Invert	Avail.Storage	Storage Description	
#1	81.99'	7,328 cf	Custom Stage Data (Prismatic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
81.99	1	0.0	0	0
82.00	1	40.0	0	0
83.00	82	40.0	17	17
84.00	246	40.0	66	82
85.00	424	40.0	134	216
86.00	606	40.0	206	422
87.00	790	40.0	279	701
88.00	986	40.0	355	1,057
89.00	1,199	40.0	437	1,494
90.00	1,430	40.0	526	2,019
91.00	1,665	40.0	619	2,638
92.00	1,916	40.0	716	3,355
93.00	2,170	40.0	817	4,172
94.00	2,423	40.0	919	5,090
95.00	2,692	40.0	1,023	6,113
95.90	2,609	40.0	954	7,068
96.00	2,609	100.0	261	7,328

Device	Routing	Invert	Outlet Devices
#1	Primary	83.00'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.65 cfs @ 12.19 hrs HW=85.56' (Free Discharge)

↑**1=Orifice/Grate** (Orifice Controls 0.65 cfs @ 7.44 fps)

Stage-Area-Storage for Pond 4P: Drive North

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
81.99	1	0	83.05	90	18
82.01	2	0	83.07	93	19
82.03	3	0	83.09	97	20
82.05	5	0	83.11	100	21
82.07	7	0	83.13	103	21
82.09	8	0	83.15	107	22
82.11	10	0	83.17	110	23
82.13	12	0	83.19	113	24
82.15	13	0	83.21	116	25
82.17	15	1	83.23	120	26
82.19	16	1	83.25	123	27
82.21	18	1	83.27	126	28
82.23	20	1	83.29	130	29
82.25	21	1	83.31	133	30
82.27	23	1	83.33	136	31
82.29	24	1	83.35	139	32
82.31	26	2	83.37	143	33
82.33	28	2	83.39	146	34
82.35	29	2	83.41	149	36
82.37	31	2	83.43	153	37
82.39	33	3	83.45	156	38
82.41	34	3	83.47	159	39
82.43	36	3	83.49	162	41
82.45	37	3	83.51	166	42
82.47	39	4	83.53	169	43
82.49	41	4	83.55	172	45
82.51	42	4	83.57	175	46
82.53	44	5	83.59	179	47
82.55	46	5	83.61	182	49
82.57	47	5	83.63	185	50
82.59	49	6	83.65	189	52
82.61	50	6	83.67	192	53
82.63	52	7	83.69	195	55
82.65	54	7	83.71	198	56
82.67	55	8	83.73	202	58
82.69	57	8	83.75	205	60
82.71	59	8	83.77	208	61
82.73	60	9	83.79	212	63
82.75	62	9	83.81	215	65
82.77	63	10	83.83	218	66
82.79	65	10	83.85	221	68
82.81	67	11	83.87	225	70
82.83	68	11	83.89	228	72
82.85	70	12	83.91	231	74
82.87	71	13	83.93	235	75
82.89	73	13	83.95	238	77
82.91	75	14	83.97	241	79
82.93	76	14	83.99	244	81
82.95	78	15	84.01	248	83
82.97	80	16	84.03	251	85
82.99	81	16	84.05	255	87
83.01	84	17	84.07	258	89
83.03	87	18	84.09	262	91

Stage-Area-Storage for Pond 4P: Drive North (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
84.11	266	93	85.17	455	246
84.13	269	96	85.19	459	250
84.15	273	98	85.21	462	253
84.17	276	100	85.23	466	257
84.19	280	102	85.25	470	261
84.21	283	104	85.27	473	265
84.23	287	107	85.29	477	268
84.25	291	109	85.31	480	272
84.27	294	111	85.33	484	276
84.29	298	114	85.35	488	280
84.31	301	116	85.37	491	284
84.33	305	119	85.39	495	288
84.35	308	121	85.41	499	292
84.37	312	123	85.43	502	296
84.39	315	126	85.45	506	300
84.41	319	129	85.47	510	304
84.43	323	131	85.49	513	308
84.45	326	134	85.51	517	312
84.47	330	136	85.53	520	316
84.49	333	139	85.55	524	320
84.51	337	142	85.57	528	325
84.53	340	144	85.59	531	329
84.55	344	147	85.61	535	333
84.57	347	150	85.63	539	337
84.59	351	153	85.65	542	342
84.61	355	155	85.67	546	346
84.63	358	158	85.69	550	351
84.65	362	161	85.71	553	355
84.67	365	164	85.73	557	359
84.69	369	167	85.75	561	364
84.71	372	170	85.77	564	368
84.73	376	173	85.79	568	373
84.75	380	176	85.81	571	377
84.77	383	179	85.83	575	382
84.79	387	182	85.85	579	387
84.81	390	185	85.87	582	391
84.83	394	188	85.89	586	396
84.85	397	192	85.91	590	401
84.87	401	195	85.93	593	405
84.89	404	198	85.95	597	410
84.91	408	201	85.97	601	415
84.93	412	205	85.99	604	420
84.95	415	208	86.01	608	425
84.97	419	211	86.03	612	430
84.99	422	215	86.05	615	434
85.01	426	218	86.07	619	439
85.03	429	221	86.09	623	444
85.05	433	225	86.11	626	449
85.07	437	228	86.13	630	454
85.09	440	232	86.15	634	459
85.11	444	235	86.17	637	464
85.13	448	239	86.19	641	470
85.15	451	242	86.21	645	475

Stage-Area-Storage for Pond 4P: Drive North (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
86.23	648	480	87.29	847	796
86.25	652	485	87.31	851	803
86.27	656	490	87.33	855	810
86.29	659	496	87.35	859	817
86.31	663	501	87.37	863	824
86.33	667	506	87.39	866	831
86.35	670	512	87.41	870	838
86.37	674	517	87.43	874	845
86.39	678	522	87.45	878	852
86.41	681	528	87.47	882	859
86.43	685	533	87.49	886	866
86.45	689	539	87.51	890	873
86.47	692	544	87.53	894	880
86.49	696	550	87.55	898	887
86.51	700	555	87.57	902	894
86.53	704	561	87.59	906	901
86.55	707	567	87.61	910	909
86.57	711	572	87.63	913	916
86.59	715	578	87.65	917	923
86.61	718	584	87.67	921	931
86.63	722	590	87.69	925	938
86.65	726	595	87.71	929	946
86.67	729	601	87.73	933	953
86.69	733	607	87.75	937	960
86.71	737	613	87.77	941	968
86.73	740	619	87.79	945	976
86.75	744	625	87.81	949	983
86.77	748	631	87.83	953	991
86.79	751	637	87.85	957	998
86.81	755	643	87.87	961	1,006
86.83	759	649	87.89	964	1,014
86.85	762	655	87.91	968	1,021
86.87	766	661	87.93	972	1,029
86.89	770	667	87.95	976	1,037
86.91	773	673	87.97	980	1,045
86.93	777	679	87.99	984	1,053
86.95	781	686	88.01	988	1,061
86.97	784	692	88.03	992	1,068
86.99	788	698	88.05	997	1,076
87.01	792	705	88.07	1,001	1,084
87.03	796	711	88.09	1,005	1,092
87.05	800	717	88.11	1,009	1,101
87.07	804	724	88.13	1,014	1,109
87.09	808	730	88.15	1,018	1,117
87.11	812	737	88.17	1,022	1,125
87.13	815	743	88.19	1,026	1,133
87.15	819	750	88.21	1,031	1,141
87.17	823	756	88.23	1,035	1,150
87.19	827	763	88.25	1,039	1,158
87.21	831	769	88.27	1,044	1,166
87.23	835	776	88.29	1,048	1,175
87.25	839	783	88.31	1,052	1,183
87.27	843	790	88.33	1,056	1,191

Redding FD Proposed

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Type III 24-hr 1-Year Rainfall=2.90"

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Stage-Area-Storage for Pond 4P: Drive North (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
88.35	1,061	1,200	89.41	1,294	1,698
88.37	1,065	1,208	89.43	1,298	1,708
88.39	1,069	1,217	89.45	1,303	1,719
88.41	1,073	1,225	89.47	1,308	1,729
88.43	1,078	1,234	89.49	1,312	1,740
88.45	1,082	1,243	89.51	1,317	1,750
88.47	1,086	1,251	89.53	1,321	1,761
88.49	1,090	1,260	89.55	1,326	1,771
88.51	1,095	1,269	89.57	1,331	1,782
88.53	1,099	1,278	89.59	1,335	1,793
88.55	1,103	1,286	89.61	1,340	1,803
88.57	1,107	1,295	89.63	1,345	1,814
88.59	1,112	1,304	89.65	1,349	1,825
88.61	1,116	1,313	89.67	1,354	1,836
88.63	1,120	1,322	89.69	1,358	1,847
88.65	1,124	1,331	89.71	1,363	1,857
88.67	1,129	1,340	89.73	1,368	1,868
88.69	1,133	1,349	89.75	1,372	1,879
88.71	1,137	1,358	89.77	1,377	1,890
88.73	1,141	1,367	89.79	1,381	1,901
88.75	1,146	1,376	89.81	1,386	1,912
88.77	1,150	1,386	89.83	1,391	1,923
88.79	1,154	1,395	89.85	1,395	1,935
88.81	1,159	1,404	89.87	1,400	1,946
88.83	1,163	1,413	89.89	1,405	1,957
88.85	1,167	1,423	89.91	1,409	1,968
88.87	1,171	1,432	89.93	1,414	1,980
88.89	1,176	1,441	89.95	1,418	1,991
88.91	1,180	1,451	89.97	1,423	2,002
88.93	1,184	1,460	89.99	1,428	2,014
88.95	1,188	1,470	90.01	1,432	2,025
88.97	1,193	1,479	90.03	1,437	2,037
88.99	1,197	1,489	90.05	1,442	2,048
89.01	1,201	1,498	90.07	1,446	2,060
89.03	1,206	1,508	90.09	1,451	2,071
89.05	1,211	1,518	90.11	1,456	2,083
89.07	1,215	1,527	90.13	1,461	2,095
89.09	1,220	1,537	90.15	1,465	2,106
89.11	1,224	1,547	90.17	1,470	2,118
89.13	1,229	1,557	90.19	1,475	2,130
89.15	1,234	1,567	90.21	1,479	2,142
89.17	1,238	1,576	90.23	1,484	2,153
89.19	1,243	1,586	90.25	1,489	2,165
89.21	1,248	1,596	90.27	1,493	2,177
89.23	1,252	1,606	90.29	1,498	2,189
89.25	1,257	1,616	90.31	1,503	2,201
89.27	1,261	1,626	90.33	1,508	2,213
89.29	1,266	1,637	90.35	1,512	2,225
89.31	1,271	1,647	90.37	1,517	2,237
89.33	1,275	1,657	90.39	1,522	2,250
89.35	1,280	1,667	90.41	1,526	2,262
89.37	1,284	1,677	90.43	1,531	2,274
89.39	1,289	1,688	90.45	1,536	2,286

Stage-Area-Storage for Pond 4P: Drive North (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
90.47	1,540	2,299	91.53	1,798	3,005
90.49	1,545	2,311	91.55	1,803	3,020
90.51	1,550	2,323	91.57	1,808	3,034
90.53	1,555	2,336	91.59	1,813	3,049
90.55	1,559	2,348	91.61	1,818	3,063
90.57	1,564	2,361	91.63	1,823	3,078
90.59	1,569	2,373	91.65	1,828	3,093
90.61	1,573	2,386	91.67	1,833	3,107
90.63	1,578	2,398	91.69	1,838	3,122
90.65	1,583	2,411	91.71	1,843	3,137
90.67	1,587	2,424	91.73	1,848	3,151
90.69	1,592	2,436	91.75	1,853	3,166
90.71	1,597	2,449	91.77	1,858	3,181
90.73	1,602	2,462	91.79	1,863	3,196
90.75	1,606	2,475	91.81	1,868	3,211
90.77	1,611	2,488	91.83	1,873	3,226
90.79	1,616	2,501	91.85	1,878	3,241
90.81	1,620	2,514	91.87	1,883	3,256
90.83	1,625	2,527	91.89	1,888	3,271
90.85	1,630	2,540	91.91	1,893	3,286
90.87	1,634	2,553	91.93	1,898	3,301
90.89	1,639	2,566	91.95	1,903	3,316
90.91	1,644	2,579	91.97	1,908	3,332
90.93	1,649	2,592	91.99	1,913	3,347
90.95	1,653	2,605	92.01	1,919	3,362
90.97	1,658	2,618	92.03	1,924	3,378
90.99	1,663	2,632	92.05	1,929	3,393
91.01	1,668	2,645	92.07	1,934	3,409
91.03	1,673	2,658	92.09	1,939	3,424
91.05	1,678	2,672	92.11	1,944	3,440
91.07	1,683	2,685	92.13	1,949	3,455
91.09	1,688	2,699	92.15	1,954	3,471
91.11	1,693	2,712	92.17	1,959	3,486
91.13	1,698	2,726	92.19	1,964	3,502
91.15	1,703	2,739	92.21	1,969	3,518
91.17	1,708	2,753	92.23	1,974	3,534
91.19	1,713	2,767	92.25	1,980	3,549
91.21	1,718	2,780	92.27	1,985	3,565
91.23	1,723	2,794	92.29	1,990	3,581
91.25	1,728	2,808	92.31	1,995	3,597
91.27	1,733	2,822	92.33	2,000	3,613
91.29	1,738	2,836	92.35	2,005	3,629
91.31	1,743	2,850	92.37	2,010	3,645
91.33	1,748	2,864	92.39	2,015	3,661
91.35	1,753	2,878	92.41	2,020	3,677
91.37	1,758	2,892	92.43	2,025	3,694
91.39	1,763	2,906	92.45	2,030	3,710
91.41	1,768	2,920	92.47	2,035	3,726
91.43	1,773	2,934	92.49	2,040	3,742
91.45	1,778	2,948	92.51	2,046	3,759
91.47	1,783	2,963	92.53	2,051	3,775
91.49	1,788	2,977	92.55	2,056	3,791
91.51	1,793	2,991	92.57	2,061	3,808

Stage-Area-Storage for Pond 4P: Drive North (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
92.59	2,066	3,824	93.65	2,334	4,757
92.61	2,071	3,841	93.67	2,340	4,776
92.63	2,076	3,858	93.69	2,345	4,795
92.65	2,081	3,874	93.71	2,350	4,814
92.67	2,086	3,891	93.73	2,355	4,832
92.69	2,091	3,908	93.75	2,360	4,851
92.71	2,096	3,924	93.77	2,365	4,870
92.73	2,101	3,941	93.79	2,370	4,889
92.75	2,107	3,958	93.81	2,375	4,908
92.77	2,112	3,975	93.83	2,380	4,927
92.79	2,117	3,992	93.85	2,385	4,946
92.81	2,122	4,009	93.87	2,390	4,965
92.83	2,127	4,026	93.89	2,395	4,984
92.85	2,132	4,043	93.91	2,400	5,004
92.87	2,137	4,060	93.93	2,405	5,023
92.89	2,142	4,077	93.95	2,410	5,042
92.91	2,147	4,094	93.97	2,415	5,061
92.93	2,152	4,111	93.99	2,420	5,081
92.95	2,157	4,129	94.01	2,426	5,100
92.97	2,162	4,146	94.03	2,431	5,120
92.99	2,167	4,163	94.05	2,436	5,139
93.01	2,173	4,180	94.07	2,442	5,159
93.03	2,178	4,198	94.09	2,447	5,178
93.05	2,183	4,215	94.11	2,453	5,198
93.07	2,188	4,233	94.13	2,458	5,217
93.09	2,193	4,250	94.15	2,463	5,237
93.11	2,198	4,268	94.17	2,469	5,257
93.13	2,203	4,285	94.19	2,474	5,276
93.15	2,208	4,303	94.21	2,479	5,296
93.17	2,213	4,321	94.23	2,485	5,316
93.19	2,218	4,339	94.25	2,490	5,336
93.21	2,223	4,356	94.27	2,496	5,356
93.23	2,228	4,374	94.29	2,501	5,376
93.25	2,233	4,392	94.31	2,506	5,396
93.27	2,238	4,410	94.33	2,512	5,416
93.29	2,243	4,428	94.35	2,517	5,436
93.31	2,248	4,446	94.37	2,523	5,456
93.33	2,253	4,464	94.39	2,528	5,477
93.35	2,259	4,482	94.41	2,533	5,497
93.37	2,264	4,500	94.43	2,539	5,517
93.39	2,269	4,518	94.45	2,544	5,537
93.41	2,274	4,536	94.47	2,549	5,558
93.43	2,279	4,554	94.49	2,555	5,578
93.45	2,284	4,573	94.51	2,560	5,599
93.47	2,289	4,591	94.53	2,566	5,619
93.49	2,294	4,609	94.55	2,571	5,640
93.51	2,299	4,628	94.57	2,576	5,660
93.53	2,304	4,646	94.59	2,582	5,681
93.55	2,309	4,665	94.61	2,587	5,702
93.57	2,314	4,683	94.63	2,592	5,722
93.59	2,319	4,702	94.65	2,598	5,743
93.61	2,324	4,720	94.67	2,603	5,764
93.63	2,329	4,739	94.69	2,609	5,785

Stage-Area-Storage for Pond 4P: Drive North (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
94.71	2,614	5,806	95.77	2,621	6,932
94.73	2,619	5,827	95.79	2,619	6,953
94.75	2,625	5,848	95.81	2,617	6,974
94.77	2,630	5,869	95.83	2,615	6,994
94.79	2,636	5,890	95.85	2,614	7,015
94.81	2,641	5,911	95.87	2,612	7,036
94.83	2,646	5,932	95.89	2,610	7,057
94.85	2,652	5,953	95.91	2,609	7,094
94.87	2,657	5,974	95.93	2,609	7,146
94.89	2,662	5,996	95.95	2,609	7,198
94.91	2,668	6,017	95.97	2,609	7,250
94.93	2,673	6,038	95.99	2,609	7,302
94.95	2,679	6,060			
94.97	2,684	6,081			
94.99	2,689	6,103			
95.01	2,691	6,124			
95.03	2,689	6,146			
95.05	2,687	6,167			
95.07	2,686	6,189			
95.09	2,684	6,210			
95.11	2,682	6,232			
95.13	2,680	6,253			
95.15	2,678	6,275			
95.17	2,676	6,296			
95.19	2,674	6,317			
95.21	2,673	6,339			
95.23	2,671	6,360			
95.25	2,669	6,381			
95.27	2,667	6,403			
95.29	2,665	6,424			
95.31	2,663	6,445			
95.33	2,662	6,467			
95.35	2,660	6,488			
95.37	2,658	6,509			
95.39	2,656	6,531			
95.41	2,654	6,552			
95.43	2,652	6,573			
95.45	2,651	6,594			
95.47	2,649	6,615			
95.49	2,647	6,637			
95.51	2,645	6,658			
95.53	2,643	6,679			
95.55	2,641	6,700			
95.57	2,639	6,721			
95.59	2,638	6,742			
95.61	2,636	6,763			
95.63	2,634	6,784			
95.65	2,632	6,806			
95.67	2,630	6,827			
95.69	2,628	6,848			
95.71	2,627	6,869			
95.73	2,625	6,890			
95.75	2,623	6,911			

Redding FD Proposed

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Type III 24-hr 1-Year Rainfall=2.90"

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Summary for Pond 6P: Galleries

Inflow Area = 3,575 sf, 97.31% Impervious, Inflow Depth > 2.56" for 1-Year event
 Inflow = 0.23 cfs @ 12.08 hrs, Volume= 762 cf
 Outflow = 0.02 cfs @ 13.01 hrs, Volume= 231 cf, Atten= 92%, Lag= 55.7 min
 Primary = 0.02 cfs @ 13.01 hrs, Volume= 231 cf

Routing by Stor-Ind method, Time Span= 1.00-24.01 hrs, dt= 0.03 hrs / 2
 Peak Elev= 96.33' @ 13.01 hrs Surf.Area= 194 sf Storage= 535 cf

Plug-Flow detention time= 382.3 min calculated for 231 cf (30% of inflow)
 Center-of-Mass det. time= 216.8 min (985.0 - 768.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	91.75'	194 cf	10.80'W x 18.00'L x 5.00'H Field A 972 cf Overall - 487 cf Embedded = 485 cf x 40.0% Voids
#2A	92.25'	374 cf	Concrete Galley 4x8x4 x 4 Inside #1 Inside= 42.0"W x 43.0"H => 12.47 sf x 7.50'L = 93.6 cf Outside= 52.8"W x 48.0"H => 15.20 sf x 8.00'L = 121.6 cf 4 Chambers in 2 Rows
		568 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	96.25'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.02 cfs @ 13.01 hrs HW=96.33' (Free Discharge)
 ↑1=Orifice/Grate (Orifice Controls 0.02 cfs @ 0.93 fps)

Stage-Area-Storage for Pond 6P: Galleries

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
91.75	0	92.28	43	92.81	113
91.76	1	92.29	44	92.82	115
91.77	2	92.30	45	92.83	116
91.78	2	92.31	47	92.84	118
91.79	3	92.32	48	92.85	119
91.80	4	92.33	49	92.86	120
91.81	5	92.34	51	92.87	122
91.82	5	92.35	52	92.88	123
91.83	6	92.36	53	92.89	124
91.84	7	92.37	55	92.90	126
91.85	8	92.38	56	92.91	127
91.86	9	92.39	57	92.92	128
91.87	9	92.40	58	92.93	130
91.88	10	92.41	60	92.94	131
91.89	11	92.42	61	92.95	132
91.90	12	92.43	62	92.96	134
91.91	12	92.44	64	92.97	135
91.92	13	92.45	65	92.98	136
91.93	14	92.46	66	92.99	138
91.94	15	92.47	68	93.00	139
91.95	16	92.48	69	93.01	140
91.96	16	92.49	70	93.02	142
91.97	17	92.50	72	93.03	143
91.98	18	92.51	73	93.04	145
91.99	19	92.52	74	93.05	146
92.00	19	92.53	76	93.06	147
92.01	20	92.54	77	93.07	149
92.02	21	92.55	78	93.08	150
92.03	22	92.56	80	93.09	151
92.04	23	92.57	81	93.10	153
92.05	23	92.58	82	93.11	154
92.06	24	92.59	84	93.12	155
92.07	25	92.60	85	93.13	157
92.08	26	92.61	86	93.14	158
92.09	26	92.62	88	93.15	159
92.10	27	92.63	89	93.16	161
92.11	28	92.64	91	93.17	162
92.12	29	92.65	92	93.18	163
92.13	30	92.66	93	93.19	165
92.14	30	92.67	95	93.20	166
92.15	31	92.68	96	93.21	167
92.16	32	92.69	97	93.22	169
92.17	33	92.70	99	93.23	170
92.18	33	92.71	100	93.24	171
92.19	34	92.72	101	93.25	173
92.20	35	92.73	103	93.26	174
92.21	36	92.74	104	93.27	175
92.22	37	92.75	105	93.28	177
92.23	37	92.76	107	93.29	178
92.24	38	92.77	108	93.30	180
92.25	39	92.78	109	93.31	181
92.26	40	92.79	111	93.32	182
92.27	41	92.80	112	93.33	184

Stage-Area-Storage for Pond 6P: Galleries (continued)

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
93.34	185	93.87	256	94.40	327
93.35	186	93.88	257	94.41	328
93.36	188	93.89	259	94.42	330
93.37	189	93.90	260	94.43	331
93.38	190	93.91	261	94.44	332
93.39	192	93.92	263	94.45	334
93.40	193	93.93	264	94.46	335
93.41	194	93.94	265	94.47	336
93.42	196	93.95	267	94.48	338
93.43	197	93.96	268	94.49	339
93.44	198	93.97	269	94.50	340
93.45	200	93.98	271	94.51	342
93.46	201	93.99	272	94.52	343
93.47	202	94.00	273	94.53	344
93.48	204	94.01	275	94.54	346
93.49	205	94.02	276	94.55	347
93.50	206	94.03	277	94.56	348
93.51	208	94.04	279	94.57	350
93.52	209	94.05	280	94.58	351
93.53	210	94.06	281	94.59	352
93.54	212	94.07	283	94.60	354
93.55	213	94.08	284	94.61	355
93.56	214	94.09	285	94.62	356
93.57	216	94.10	287	94.63	358
93.58	217	94.11	288	94.64	359
93.59	218	94.12	289	94.65	360
93.60	220	94.13	291	94.66	362
93.61	221	94.14	292	94.67	363
93.62	222	94.15	293	94.68	364
93.63	224	94.16	295	94.69	366
93.64	225	94.17	296	94.70	367
93.65	227	94.18	297	94.71	368
93.66	228	94.19	299	94.72	370
93.67	229	94.20	300	94.73	371
93.68	231	94.21	302	94.74	372
93.69	232	94.22	303	94.75	374
93.70	233	94.23	304	94.76	375
93.71	235	94.24	306	94.77	376
93.72	236	94.25	307	94.78	378
93.73	237	94.26	308	94.79	379
93.74	239	94.27	310	94.80	380
93.75	240	94.28	311	94.81	382
93.76	241	94.29	312	94.82	383
93.77	243	94.30	314	94.83	384
93.78	244	94.31	315	94.84	385
93.79	245	94.32	316	94.85	387
93.80	247	94.33	318	94.86	388
93.81	248	94.34	319	94.87	389
93.82	249	94.35	320	94.88	391
93.83	251	94.36	322	94.89	392
93.84	252	94.37	323	94.90	393
93.85	253	94.38	324	94.91	395
93.86	255	94.39	326	94.92	396

Stage-Area-Storage for Pond 6P: Galleries (continued)

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
94.93	397	95.46	468	95.99	522
94.94	399	95.47	469	96.00	522
94.95	400	95.48	470	96.01	522
94.96	401	95.49	472	96.02	523
94.97	403	95.50	473	96.03	523
94.98	404	95.51	474	96.04	523
94.99	405	95.52	476	96.05	523
95.00	407	95.53	477	96.06	524
95.01	408	95.54	478	96.07	524
95.02	409	95.55	480	96.08	524
95.03	411	95.56	481	96.09	525
95.04	412	95.57	482	96.10	525
95.05	413	95.58	484	96.11	525
95.06	415	95.59	485	96.12	526
95.07	416	95.60	486	96.13	526
95.08	417	95.61	488	96.14	526
95.09	419	95.62	489	96.15	526
95.10	420	95.63	490	96.16	527
95.11	421	95.64	492	96.17	527
95.12	423	95.65	493	96.18	527
95.13	424	95.66	494	96.19	528
95.14	425	95.67	496	96.20	528
95.15	427	95.68	497	96.21	528
95.16	428	95.69	498	96.22	529
95.17	429	95.70	500	96.23	529
95.18	431	95.71	501	96.24	529
95.19	432	95.72	502	96.25	530
95.20	433	95.73	504	96.26	530
95.21	435	95.74	505	96.27	531
95.22	436	95.75	506	96.28	532
95.23	437	95.76	507	96.29	533
95.24	439	95.77	509	96.30	533
95.25	440	95.78	510	96.31	534
95.26	441	95.79	511	96.32	535
95.27	443	95.80	513	96.33	536
95.28	444	95.81	514	96.34	537
95.29	445	95.82	515	96.35	537
95.30	447	95.83	517	96.36	538
95.31	448	95.84	517	96.37	539
95.32	449	95.85	517	96.38	540
95.33	451	95.86	518	96.39	540
95.34	452	95.87	518	96.40	541
95.35	453	95.88	518	96.41	542
95.36	455	95.89	519	96.42	543
95.37	456	95.90	519	96.43	544
95.38	457	95.91	519	96.44	544
95.39	459	95.92	519	96.45	545
95.40	460	95.93	520	96.46	546
95.41	461	95.94	520	96.47	547
95.42	462	95.95	520	96.48	547
95.43	464	95.96	521	96.49	548
95.44	465	95.97	521	96.50	549
95.45	466	95.98	521	96.51	550

Redding FD Proposed

Prepared by Microsoft

HydroCAD® 10.10-5a s/n 11202 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 1-Year Rainfall=2.90"

Printed 3/18/2021

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Stage-Area-Storage for Pond 6P: Galleries (continued)

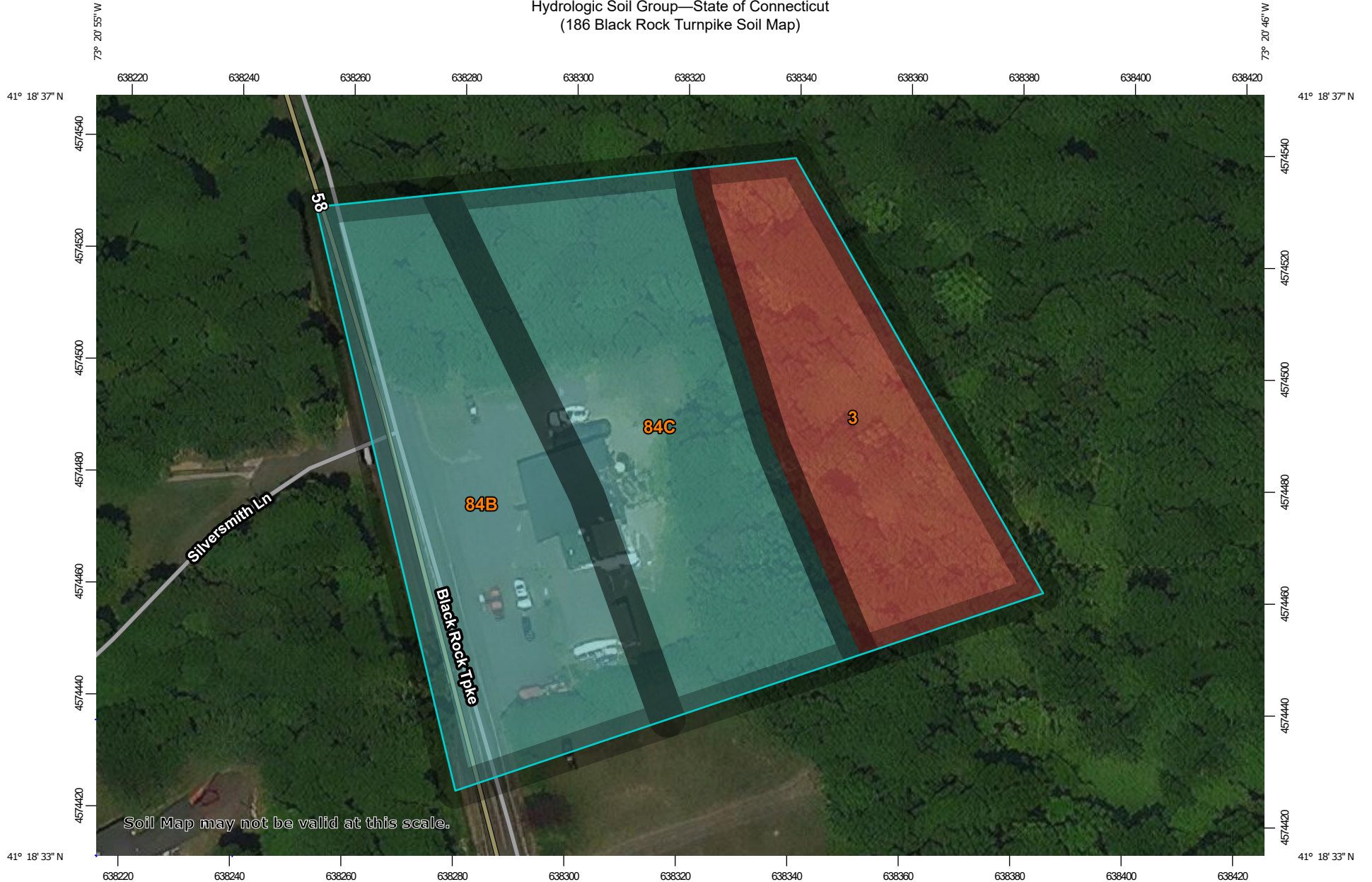
Elevation (feet)	Storage (cubic-feet)
96.52	551
96.53	551
96.54	552
96.55	553
96.56	554
96.57	554
96.58	555
96.59	556
96.60	557
96.61	558
96.62	558
96.63	559
96.64	560
96.65	561
96.66	561
96.67	562
96.68	563
96.69	564
96.70	565
96.71	565
96.72	566
96.73	567
96.74	568
96.75	568

Summary for Link 5L: Point of Concern

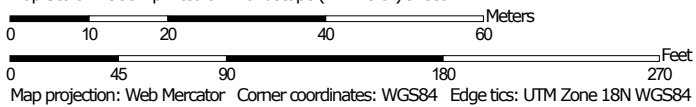
Inflow Area = 57,489 sf, 40.83% Impervious, Inflow Depth > 1.57" for 1-Year event
Inflow = 1.73 cfs @ 12.13 hrs, Volume= 7,516 cf
Primary = 1.73 cfs @ 12.13 hrs, Volume= 7,516 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-24.01 hrs, dt= 0.03 hrs

Hydrologic Soil Group—State of Connecticut
(186 Black Rock Turnpike Soil Map)




Map Scale: 1:958 if printed on A landscape (11" x 8.5") sheet.



MAP LEGEND

Area of Interest (AOI)









 Area of Interest (AOI)

Soils

Soil Rating Polygons





 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines


 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points






 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available


Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: State of Connecticut
 Survey Area Data: Version 20, Jun 9, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Oct 5, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	D	0.6	26.4%
84B	Paxton and Montauk fine sandy loams, 3 to 8 percent slopes	C	0.8	35.6%
84C	Paxton and Montauk fine sandy loams, 8 to 15 percent slopes	C	0.9	38.0%
Totals for Area of Interest			2.4	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher