

REHDER
& ASSOCIATES, INC.
Civil Engineers & Land Surveyors

PL202000055

PL2020-55

STORM WATER MANAGEMENT REPORT

FOR

Walser Toyota Ramp

3-18-20

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the State of Minnesota.

Report Prepared By:

Nicholas P. Adam, P.E.
Registration Number: 43856

NARRATIVE

Project Summary

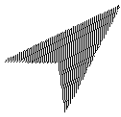
The proposed plan is the construction of a new parking ramp structure just south of the existing dealership building. In the existing conditions, a majority of the runoff from this area drains untreated and un-rate controlled directly to Wanda Miller Pond. The remaining area drains to a small basin previously designed for the site where it is treated and rate controlled before discharge to Wanda Miller Pond. In the proposed conditions, runoff from the upper level parking deck will be piped to an infiltration basin that will provide volume control, water quality treatment and rate control for all of the reconstructed and new impervious area before being discharged to Wanda Miller Pond.

Storm Water Management

Per the Watershed's and City's requirements, we were required to provide retention onsite for 1.1-inch of runoff from the new impervious surfaces, provide water quality to meet 60% phosphorous and 90% total suspended solids removal, and provide rate control for the 2, 10 and 100-year runoff rates off of the site.

To meet these requirements an infiltration basin is proposed to be constructed just south of the proposed parking structure. Runoff from the upper level of the structure (0.88 acres of impervious area) will be captured and piped to the basin. The basin is sized for the 1.1-inch of runoff from the new and reconstructed impervious areas (0.28 acres). Pre-treatment will be provided by two small micro-pools located at the locations of the roof drains. We do not anticipate the need for much pre-treatment due to the runoff sourcing the basin coming from the upper level parking deck. This area should not see a lot of sediment.

A P8 summary is included in the report showing the removals for TSS and TP are met.



REHDER
& ASSOCIATES, INC.
Civil Engineers & Land Surveyors

3440 Federal Drive, Suite 110
Eagan, MN 55122
Direct: 651.337.6729
Office: 651.452.5051
Website: www.rehder.com

WORKSHEET

By: _____ Date: _____
Project No: _____ Sheet _____ of _____
Subject: _____

PL202000055

PL2020-55

VOLUME CONTROL SIZING CALCULATIONS

REQUIRED VOLUME: (1.1 inch off of impervious)

Reconstructed Impervious Area + Proposed Impervious Area = 0.28 Acres

$$= \frac{1.10}{12 \text{ in./ft}} \times 0.28 \text{ ac} = \boxed{0.026} \text{ ac-ft}$$

$$= \boxed{1,118} \text{ cu.ft.}$$

PROVIDED VOLUME: See HydroCAD Storage Worksheet

2245016_WALSER TOYOTA

MSE 24-hr 3 100-Year Rainfall=7.32"

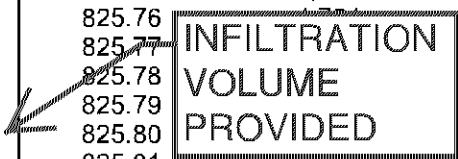
Prepared by Rehder & Associates, Inc.

Printed 3/17/2020

HydroCAD® 10.00-24 s/n 02629 © 2018 HydroCAD Software Solutions LLC

Stage-Area-Storage for Pond 3P: INFILT. BASIN - PHASE 1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
825.00	4,175	0	825.53	4,555	2,313
825.01	4,182	42	825.54	4,562	2,358
825.02	4,189	84	825.55	4,569	2,404
825.03	4,196	126	825.56	4,577	2,450
825.04	4,203	168	825.57	4,584	2,495
825.05	4,210	210	825.58	4,591	2,541
825.06	4,217	252	825.59	4,599	2,587
825.07	4,224	294	825.60	4,606	2,633
825.08	4,231	336	825.61	4,613	2,679
825.09	4,238	379	825.62	4,621	2,725
825.10	4,245	421	825.63	4,628	2,772
825.11	4,252	464	825.64	4,635	2,818
825.12	4,259	506	825.65	4,643	2,864
825.13	4,267	549	825.66	4,650	2,911
825.14	4,274	591	825.67	4,658	2,957
825.15	4,281	634	825.68	4,665	3,004
825.16	4,288	677	825.69	4,672	3,051
825.17	4,295	720	825.70	4,680	3,098
825.18	4,302	763	825.71	4,687	3,144
825.19	4,309	806	825.72	4,695	3,191
825.20	4,316	849	825.73	4,702	3,238
825.21	4,323	892	825.74	4,710	3,285
825.22	4,331	936	825.75	4,717	3,332
825.23	4,338	979	825.76	4,725	3,380
825.24	4,345	1,022	825.77	4,732	3,427
825.25	4,352	1,066	825.78	4,740	3,474
825.26	4,359	1,109	825.79	4,747	3,522
825.27	4,366	1,153	825.80	4,755	3,569
825.28	4,373	1,197	825.81	4,762	3,617
825.29	4,381	1,240	825.82	4,769	3,664
825.30	4,388	1,284	825.83	4,777	3,712
825.31	4,395	1,328	825.84	4,784	3,760
825.32	4,402	1,372	825.85	4,792	3,808
825.33	4,409	1,416	825.86	4,799	3,856
825.34	4,417	1,460	825.87	4,807	3,904
825.35	4,424	1,505	825.88	4,814	3,952
825.36	4,431	1,549	825.89	4,822	4,000
825.37	4,438	1,593	825.90	4,829	4,048
825.38	4,445	1,638	825.91	4,837	4,097
825.39	4,453	1,682	825.92	4,844	4,145
825.40	4,460	1,727	825.93	4,852	4,194
825.41	4,467	1,771	825.94	4,860	4,242
825.42	4,474	1,816	825.95	4,867	4,291
825.43	4,482	1,861	825.96	4,875	4,340
825.44	4,489	1,906	825.97	4,882	4,388
825.45	4,496	1,951	825.98	4,890	4,437
825.46	4,503	1,996	825.99	4,897	4,486
825.47	4,511	2,041	826.00	4,905	4,535
825.48	4,518	2,086	826.01	4,905	4,535
825.49	4,525	2,131	826.02	4,905	4,535
825.50	4,533	2,176	826.03	4,905	4,535
825.51	4,540	2,222			
825.52	4,547	2,267			



INFILTRATION
VOLUME
PROVIDED

PL202000055
PL2020-55

P8 RESULTS

P8 Urban Catchment Model, Version 3.5

Case Waiser Toyota.p8c
Title WaiserToyota
PrefFile Msp6505.prp
ParFile nurp50.p8p

FirstDate 12/01/85
LastDate 03/01/95
Events 702
TotalHrs 82344

Run Date 03/17/20
Precip(in) 279.4
Rain(in) 247.37
Snow(in) 32.03
TotalYrs 9.38

Removal Efficiency (%)											
Device	Type	ColMlands	QVolAct	P0%	P10%	P30%	P50%	P80%	TSS	TP	TKN
INFIL BASIN	INF_BASIN	0.00	7.1	53.72	71.75	88.23	96.09	99.42	90.99	76.13	73.01
									CU	PB	ZN
									80.64	87.39	73.01
											HC
											87.39

Proposed
Removal %

TSS	TP
90.99	76.13

PL202000055
PL2020-55

P8 Urban Catchment Model, Version 3.5

Run Date 03/17/20

Case	Walser Toyota.p8c	FirstDate	12/01/85	Precip(in)	279.4
Title	WalserToyota	LastDate	06/01/95	Rain(in)	247.37
PrecFile	Msp5095.pcp	Events	702	Snow(in)	32.06
PartFile	nurp50.p8p	TotalHrs	82344	TotalYrs	9.39

Case Title	WalserToyota
Case Data File	Walser Toyota.p8c
Path	C:\P8_UserFiles\
Case Notes	simple startup case
Storm Data File	Msp5095.pcp
Particle File	nurp50.p8p
Air Temp File	Msp5095.tem

Time Steps Per Hour	4
Minimum Inter-Event Time (hrs)	10
Maximum Continuity Error %	2
Rainfall Breakpoint (inches)	0.8
Precipitation Scale Factor	1
Air Temp Offset (deg-F)	0
Loops Thru Storm File	1
Simulation Dates	
Start	12/1/1985
Keep	1/1/9999
Stop	6/1/1995

Max Snowfall Temperature (deg-f)	32.0
SnowMelt Temperature (deg-f)	32.0
Snowmelt Coef (in/degF-Day)	0.06
Soil Freeze Temp (deg-F)	32.0
Snowmelt Abstraction Factor	1.00
Evapo-Trans. Calibration Factor	1.00
Growing Season Start Month	5
Growing Season End Month	10

5-Day Antecedent Rainfall + Runoff (inches)		
CN Antecedent Moisture Condition	AMC-II	AMC-III
Growing Season	1.40	2.10
NonGrowing Season	0.50	1.10

Watershed Data							
Watershed Name	PROPOSED						
Runoff to Device	INFIL BASIN						
Infiltration to Device							
Watershed Area	0.88						
SCS Curve Number (Pervious)	79						
Scale Factor for Pervious Runoff Load	1						
Indirectly Connected Imperv Fraction	0						
UnSwept Impervious Fraction	0.88						
UnSwept Depression Storage (inches)	0.02						
UnSwept Imperv. Runoff Coefficient	1						
UnSwept Scale Factor for Particle Loads	1						
Swept Impervious Fraction	0						
Swept Depression Storage (inches)	0.02						
Swept Imperv. Runoff Coefficient	1						
Swept Scale Factor for Particle Loads	1						

PL202000055

PL2020-55

Sweeping Frequency	0						
Sweeping Efficiency	1						
Sweeping Start Date (MMDD)	101						
Sweeping Stop Date (MMDD)	1231						

Device Data							
Device Name	INFIL BASIN						
Device Type	INF BASIN						
Infiltration Outlet							
Normal Outlet							
Spillway Outlet							
Particle Removal Scale Factor	1						
Bottom Elevation (ft)	825						
Bottom Area (acres)	0.096						
Permanent Pool Area (acres)							
Permanent Pool Volume (ac-ft)							
Perm Pool Infil Rate (in/hr)							
Flood Pool Area (acres)	0.1						
Flood Pool Volume (ac-ft)	0.0264						
Flood Pool Infil Rate (in/hr)	0.068						
Infil Basin Void Fraction (%)	100						
Detention Pond Outlet Parameters							
Outlet Type							
Outlet Orifice Diameter (in)							
Orifice Discharge Coef							
Outlet Weir Length (ft)							
Weir Discharge Coef							
Perforated Riser Height (ft)							
Number of Holes in Riser							
Holes Diameter							
Flood Pool Drain Time (hrs)							
Swale Parameters							
Length of Flow Path (ft)							
Slope of Flow Path %							
Bottom Width (ft)							
Side Slope (ft-v/ft-h)							
Maximum Depth of Flow (ft)							
Mannings n Constant							
Hydraulic Model							
Pipe, Splitter, Aquifer Parameter							
Hydraulic Res. Time (hrs)							

Particle Data					
Particle File	nurp50.p8p				
Particle Class	P0%	P10%	P30%	P50%	P80%
Filtration Efficiency (%)	90	100	100	100	100
Settling Velocity (ft/hr)	0	0.03	0.3	1.5	15
First Order Decay Rate (1/day)	0	0	0	0	0
2nd Order Decay (1/day-ppm)	0	0	0	0	0
Impervious Runoff Conc (ppm)	1	0	0	0	0
Pervious Runoff Conc (ppm)	1	100	100	100	200
Pervious Conc Exponent	0	1	1	1	1
Accum. Rate (lbs-ac-day)	0	1.75	1.75	1.75	3.5
Particle Removal Rate (1/day)	0	0.25	0.25	0.25	0.25
Washoff Coefficient	0	20	20	20	20
Washoff Exponent	0	2	2	2	2
Sweeper Efficiency	0	0	0	5	15

PL202000055
PL2020-55

Water Quality Component Data								
Component Name	TSS	TP	TKN	CU	PB	ZN	HC	

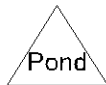
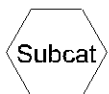
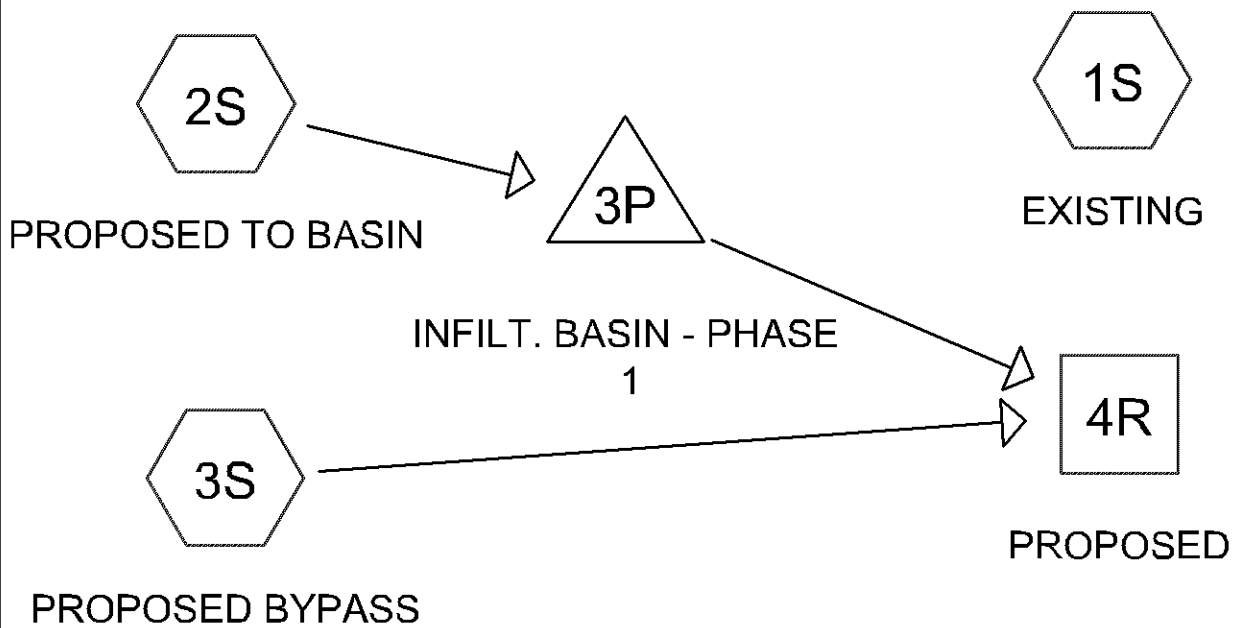
Water Quality Criteria (ppm)								
Level 1	5	0.025	2	2	0.02	5	0.1	
Level 2	10	0.05	1	0.0048	0.014	0.0362	0.5	
Level 3	20	0.1	0.5	0.02	0.15	0.38	1	

Content Scale Factor	1	1	1	1	1	1	1	
----------------------	---	---	---	---	---	---	---	--

Particle Composition (mg/kg)								
P0%	0	99000	600000	13600	2000	64000	250000	
P10%	1000000	3850	15000	340	180	1600	22500	
P30%	1000000	3850	15000	340	180	1600	22500	
P50%	1000000	3850	15000	340	180	1600	22500	
P80%	1000000	0	0	340	180	0	22500	

RATE CONTROL SUMMARY

STORM EVENT	EXISTING RATE OFFSITE	PROPOSED RATE OFFSITE
	CFS	CFS
2-YR	4.1	3.3
10-YR	6.3	5.5
100-YR	11.1	10.1



2245016_WALSER TOYOTA*MSE 24-hr 3 2-Year Rainfall=2.86"*

Prepared by Rehder & Associates, Inc.

Printed 3/17/2020

HydroCAD® 10.00-24 s/n 02629 © 2018 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: EXISTING

Runoff Area=1.230 ac 83.74% Impervious Runoff Depth=2.31"

Tc=10.0 min CN=95 Runoff=4.06 cfs 0.237 af

Subcatchment 2S: PROPOSED TO BASIN

Runoff Area=1.120 ac 78.57% Impervious Runoff Depth=2.21"

Tc=10.0 min CN=94 Runoff=3.59 cfs 0.207 af

Pond 3P: INFILT. BASIN - PHASE 1

Peak Elev=825.54' Storage=2,355 cf Inflow=3.59 cfs 0.207 af

Discarded=0.01 cfs 0.020 af Primary=3.00 cfs 0.172 af Outflow=3.01 cfs 0.192 af

Subcatchment 3S: PROPOSED BYPASS

Runoff Area=0.110 ac 81.82% Impervious Runoff Depth=2.31"

Tc=10.0 min CN=95 Runoff=0.36 cfs 0.021 af

Reach 4R: PROPOSED

Inflow=3.30 cfs 0.193 af

Outflow=3.30 cfs 0.193 af

2245016_WALSER TOYOTA

MSE 24-hr 3 2-Year Rainfall=2.86"

Prepared by Rehder & Associates, Inc.

Printed 3/17/2020

HydroCAD® 10.00-24 s/n 02629 © 2018 HydroCAD Software Solutions LLC

Summary for Subcatchment 1S: EXISTING

Runoff = 4.06 cfs @ 12.17 hrs, Volume= 0.237 af, Depth= 2.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.86"

Area (ac)	CN	Description
* 1.030	98	
0.200	79	Woods/grass comb., Good, HSG D
1.230	95	Weighted Average
0.200		16.26% Pervious Area
1.030		83.74% Impervious Area

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

Summary for Subcatchment 2S: PROPOSED TO BASIN

Runoff = 3.59 cfs @ 12.17 hrs, Volume= 0.207 af, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.86"

Area (ac)	CN	Description
* 0.880	98	
0.240	79	Woods/grass comb., Good, HSG D
1.120	94	Weighted Average
0.240		21.43% Pervious Area
0.880		78.57% Impervious Area

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

Summary for Pond 3P: INFILT. BASIN - PHASE 1

Inflow Area = 1.120 ac, 78.57% Impervious, Inflow Depth = 2.21" for 2-Year event
 Inflow = 3.59 cfs @ 12.17 hrs, Volume= 0.207 af
 Outflow = 3.01 cfs @ 12.24 hrs, Volume= 0.192 af, Atten= 16%, Lag= 3.8 min
 Discarded = 0.01 cfs @ 12.23 hrs, Volume= 0.020 af
 Primary = 3.00 cfs @ 12.24 hrs, Volume= 0.172 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 825.54' @ 12.23 hrs Surf.Area= 4,561 sf Storage= 2,355 cf

Plug-Flow detention time= 148.5 min calculated for 0.192 af (93% of inflow)
 Center-of-Mass det. time= 115.4 min (896.7 - 781.4)

2245016_WALSER TOYOTA

MSE 24-hr 3 2-Year Rainfall=2.86"

Prepared by Rehder & Associates, Inc.

Printed 3/17/2020

HydroCAD® 10.00-24 s/n 02629 © 2018 HydroCAD Software Solutions LLC

Volume	Invert	Avail.Storage	Storage Description
#1	825.00'	4,535 cf	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
825.00	4,175	475.0	0	0	4,175
826.00	4,905	500.0	4,535	4,535	6,175

Device	Routing	Invert	Outlet Devices
#1	Primary	825.27'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Head (feet) 0.00 0.76 Width (feet) 6.00 10.00
#2	Discarded	825.00'	0.060 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.01 cfs @ 12.23 hrs HW=825.54' (Free Discharge)↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)**Primary OutFlow** Max=2.96 cfs @ 12.24 hrs HW=825.54' (Free Discharge)↑**1=Custom Weir/Orifice** (Weir Controls 2.96 cfs @ 1.66 fps)**Summary for Subcatchment 3S: PROPOSED BYPASS**

Runoff = 0.36 cfs @ 12.17 hrs, Volume= 0.021 af, Depth= 2.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.86"

Area (ac)	CN	Description
* 0.090	98	
0.020	79	Woods/grass comb., Good, HSG D
0.110	95	Weighted Average
0.020		18.18% Pervious Area
0.090		81.82% Impervious Area

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

Summary for Reach 4R: PROPOSED

Inflow Area = 1.230 ac, 78.86% Impervious, Inflow Depth = 1.88" for 2-Year event

Inflow = 3.30 cfs @ 12.23 hrs, Volume= 0.193 af

Outflow = 3.30 cfs @ 12.23 hrs, Volume= 0.193 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

2245016_WALSER TOYOTA*MSE 24-hr 3 10-Year Rainfall=4.26"*

Prepared by Rehder & Associates, Inc.

Printed 3/17/2020

HydroCAD® 10.00-24 s/n 02629 © 2018 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: EXISTING

Runoff Area=1.230 ac 83.74% Impervious Runoff Depth=3.69"

Tc=10.0 min CN=95 Runoff=6.30 cfs 0.378 af

Subcatchment 2S: PROPOSED TO BASIN

Runoff Area=1.120 ac 78.57% Impervious Runoff Depth=3.58"

Tc=10.0 min CN=94 Runoff=5.64 cfs 0.334 af

Pond 3P: INFILT. BASIN - PHASE 1

Peak Elev=825.64' Storage=2,807 cf Inflow=5.64 cfs 0.334 af

Discarded=0.01 cfs 0.021 af Primary=4.94 cfs 0.298 af Outflow=4.95 cfs 0.319 af

Subcatchment 3S: PROPOSED BYPASS

Runoff Area=0.110 ac 81.82% Impervious Runoff Depth=3.69"

Tc=10.0 min CN=95 Runoff=0.56 cfs 0.034 af

Reach 4R: PROPOSED

Inflow=5.45 cfs 0.332 af

Outflow=5.45 cfs 0.332 af

2245016_WALSER TOYOTA

MSE 24-hr 3 10-Year Rainfall=4.26"

Prepared by Rehder & Associates, Inc.

Printed 3/17/2020

HydroCAD® 10.00-24 s/n 02629 © 2018 HydroCAD Software Solutions LLC

Summary for Subcatchment 1S: EXISTING

Runoff = 6.30 cfs @ 12.17 hrs, Volume= 0.378 af, Depth= 3.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.26"

Area (ac)	CN	Description
* 1.030	98	
0.200	79	Woods/grass comb., Good, HSG D
1.230	95	Weighted Average
0.200		16.26% Pervious Area
1.030		83.74% Impervious Area

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

Summary for Subcatchment 2S: PROPOSED TO BASIN

Runoff = 5.64 cfs @ 12.17 hrs, Volume= 0.334 af, Depth= 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.26"

Area (ac)	CN	Description
* 0.880	98	
0.240	79	Woods/grass comb., Good, HSG D
1.120	94	Weighted Average
0.240		21.43% Pervious Area
0.880		78.57% Impervious Area

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

Summary for Pond 3P: INFILT. BASIN - PHASE 1

Inflow Area = 1.120 ac, 78.57% Impervious, Inflow Depth = 3.58" for 10-Year event
 Inflow = 5.64 cfs @ 12.17 hrs, Volume= 0.334 af
 Outflow = 4.95 cfs @ 12.22 hrs, Volume= 0.319 af, Atten= 12%, Lag= 3.2 min
 Discarded = 0.01 cfs @ 12.22 hrs, Volume= 0.021 af
 Primary = 4.94 cfs @ 12.22 hrs, Volume= 0.298 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 825.64' @ 12.22 hrs Surf.Area= 4,634 sf Storage= 2,807 cf

Plug-Flow detention time= 99.7 min calculated for 0.319 af (95% of inflow)
 Center-of-Mass det. time= 78.4 min (850.4 - 772.1)

2245016_WALSER TOYOTA

MSE 24-hr 3 10-Year Rainfall=4.26"

Prepared by Rehder & Associates, Inc.

Printed 3/17/2020

HydroCAD® 10.00-24 s/n 02629 © 2018 HydroCAD Software Solutions LLC

Volume	Invert	Avail.Storage	Storage Description
#1	825.00'	4,535 cf	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
825.00	4,175	475.0	0	0	4,175
826.00	4,905	500.0	4,535	4,535	6,175

Device	Routing	Invert	Outlet Devices
#1	Primary	825.27'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Head (feet) 0.00 0.76 Width (feet) 6.00 10.00
#2	Discarded	825.00'	0.060 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.01 cfs @ 12.22 hrs HW=825.63' (Free Discharge)↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)**Primary OutFlow** Max=4.83 cfs @ 12.22 hrs HW=825.63' (Free Discharge)↑**1=Custom Weir/Orifice** (Weir Controls 4.83 cfs @ 1.92 fps)**Summary for Subcatchment 3S: PROPOSED BYPASS**

Runoff = 0.56 cfs @ 12.17 hrs, Volume= 0.034 af, Depth= 3.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.26"

Area (ac)	CN	Description
* 0.090	98	
0.020	79	Woods/grass comb., Good, HSG D
0.110	95	Weighted Average
0.020		18.18% Pervious Area
0.090		81.82% Impervious Area

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

Summary for Reach 4R: PROPOSED

Inflow Area = 1.230 ac, 78.86% Impervious, Inflow Depth = 3.24" for 10-Year event

Inflow = 5.45 cfs @ 12.22 hrs, Volume= 0.332 af

Outflow = 5.45 cfs @ 12.22 hrs, Volume= 0.332 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

2245016_WALSER TOYOTA*MSE 24-hr 3 100-Year Rainfall=7.32"*

Prepared by Rehder & Associates, Inc.

Printed 3/17/2020

HydroCAD® 10.00-24 s/n 02629 © 2018 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: EXISTING

Runoff Area=1.230 ac 83.74% Impervious Runoff Depth=6.72"

Tc=10.0 min CN=95 Runoff=11.11 cfs 0.689 af

Subcatchment 2S: PROPOSED TO BASIN

Runoff Area=1.120 ac 78.57% Impervious Runoff Depth=6.61"

Tc=10.0 min CN=94 Runoff=10.04 cfs 0.617 af

Pond 3P: INFILT. BASIN - PHASE 1

Peak Elev=825.81' Storage=3,599 cf Inflow=10.04 cfs 0.617 af

Discarded=0.01 cfs 0.022 af Primary=9.16 cfs 0.580 af Outflow=9.17 cfs 0.601 af

Subcatchment 3S: PROPOSED BYPASS

Runoff Area=0.110 ac 81.82% Impervious Runoff Depth=6.72"

Tc=10.0 min CN=95 Runoff=0.99 cfs 0.062 af

Reach 4R: PROPOSED

Inflow=10.08 cfs 0.641 af

Outflow=10.08 cfs 0.641 af

2245016_WALSER TOYOTA

MSE 24-hr 3 100-Year Rainfall=7.32"

Prepared by Rehder & Associates, Inc.

Printed 3/17/2020

HydroCAD® 10.00-24 s/n 02629 © 2018 HydroCAD Software Solutions LLC

Summary for Subcatchment 1S: EXISTING

Runoff = 11.11 cfs @ 12.17 hrs, Volume= 0.689 af, Depth= 6.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.32"

Area (ac)	CN	Description
* 1.030	98	
0.200	79	Woods/grass comb., Good, HSG D
1.230	95	Weighted Average
0.200		16.26% Pervious Area
1.030		83.74% Impervious Area

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

Summary for Subcatchment 2S: PROPOSED TO BASIN

Runoff = 10.04 cfs @ 12.17 hrs, Volume= 0.617 af, Depth= 6.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.32"

Area (ac)	CN	Description
* 0.880	98	
0.240	79	Woods/grass comb., Good, HSG D
1.120	94	Weighted Average
0.240		21.43% Pervious Area
0.880		78.57% Impervious Area

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

Summary for Pond 3P: INFILT. BASIN - PHASE 1

Inflow Area = 1.120 ac, 78.57% Impervious, Inflow Depth = 6.61" for 100-Year event
 Inflow = 10.04 cfs @ 12.17 hrs, Volume= 0.617 af
 Outflow = 9.17 cfs @ 12.21 hrs, Volume= 0.601 af, Atten= 9%, Lag= 2.6 min
 Discarded = 0.01 cfs @ 12.21 hrs, Volume= 0.022 af
 Primary = 9.16 cfs @ 12.21 hrs, Volume= 0.580 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 825.81' @ 12.21 hrs Surf.Area= 4,759 sf Storage= 3,599 cf

Plug-Flow detention time= 64.6 min calculated for 0.601 af (98% of inflow)
 Center-of-Mass det. time= 50.6 min (811.7 - 761.0)

2245016_WALSER TOYOTA

MSE 24-hr 3 100-Year Rainfall=7.32"

Prepared by Rehder & Associates, Inc.

Printed 3/17/2020

HydroCAD® 10.00-24 s/n 02629 © 2018 HydroCAD Software Solutions LLC

Volume	Invert	Avail.Storage	Storage Description
#1	825.00'	4,535 cf	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
825.00	4,175	475.0	0	0	4,175
826.00	4,905	500.0	4,535	4,535	6,175

Device	Routing	Invert	Outlet Devices
#1	Primary	825.27'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Head (feet) 0.00 0.76 Width (feet) 6.00 10.00
#2	Discarded	825.00'	0.060 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.01 cfs @ 12.21 hrs HW=825.80' (Free Discharge)↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)**Primary OutFlow** Max=8.99 cfs @ 12.21 hrs HW=825.80' (Free Discharge)↑**1=Custom Weir/Orifice** (Weir Controls 8.99 cfs @ 2.29 fps)**Summary for Subcatchment 3S: PROPOSED BYPASS**

Runoff = 0.99 cfs @ 12.17 hrs, Volume= 0.062 af, Depth= 6.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.32"

Area (ac)	CN	Description
* 0.090	98	
0.020	79	Woods/grass comb., Good, HSG D
0.110	95	Weighted Average
0.020		18.18% Pervious Area
0.090		81.82% Impervious Area

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

Summary for Reach 4R: PROPOSED

Inflow Area = 1.230 ac, 78.86% Impervious, Inflow Depth = 6.26" for 100-Year event

Inflow = 10.08 cfs @ 12.21 hrs, Volume= 0.641 af

Outflow = 10.08 cfs @ 12.21 hrs, Volume= 0.641 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

WANDA MILLER POND
 NWL = 821.22
 100-YR HWL = 825.17

EASEMENT FOR
FLOODING PURPOSES
(PER PLAT)

EXISTING NUPP P
WATER LEVEL: 620
(04/10/2015)

PROPOSED PARKING STRUCTURE

35

25

LOCATION OF ROOF DRAIN
OUTLET FROM STRUCTURE

MODULAR BLOCK RETAINING WALL

14 C.Y. CL. II RIPPAP ON GEOTEXTILE FABRIC

3 C.Y. CL. II RIPPAP ON
GEOTEXTILE FABRIC

RETENTION BASIN

RETENTION VOL. = 1,110 CU.FT.
MIN. VOL. = 1,153 CU.FT.
RR HWL = 825.8

WANDA MILLER POND

NWL = 821.22

100-YR HWL = 825.17

EASEMENT FOR
FLOODING PURPOSES
(PER PLAT)

