TUALATIN LOGISTICS PARK

SW 124th Ave and SW Cimino Street
Tualatin, Oregon 97062

PRELIMINARY STORMWATER REPORT

VLMK Project Number: 20190311

Specht Properties
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July 28, 2021

VLMK
ENGINEERING + DESIGN

Project:	Tualatin Logistics Park	*Project Number:*	20190311
Project Address:	SW 124th Ave and SW Cimono Street Tualatin, Oregon 97062		

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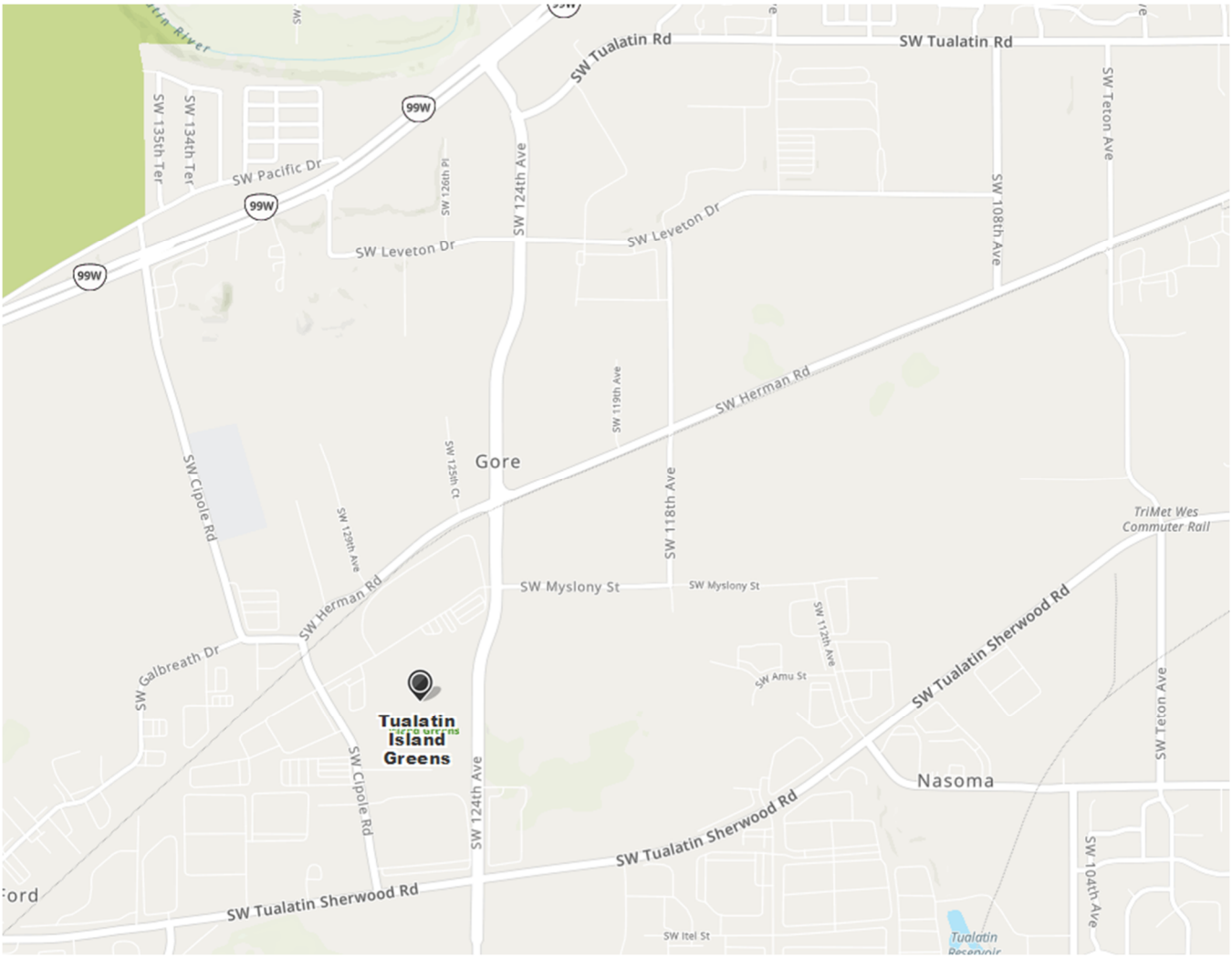
I. STORMWATER REPORT

A. Site Vicinity Map



B. **Project Information**

Tualatin Logistics Park is a proposed development in Tualatin, Oregon. This development includes one 455,000 square foot shell building capable of multiple tenants on a 24.16 acre site zoned General Manufacturing (MG). The proposed development includes 2 driveway entrances that access SW 124th Ave, with a 3rd access driveway on SW Cipole Road. Trailer parking, auto parking and drive aisles around the building will be paved with asphalt concrete. This report describes the proposed stormwater management approach for this building.

The existing site contains Tualatin Island Greens, a golf ball driving range with miniature golf. The site has an existing building with associated parking lot and grassy areas for golf activities. Offsite flow drains onto the site from a ditch in Cipole Road, which flows under the sidewalk and into an open ditch on the SW corner of the site. This flow continues to a concrete culvert that passes in front of the building, and discharges to an existing pond on the east side of the site. Runoff from the existing parking area and roof areas also drains to the existing pond. This existing pond is identified on the City's 1995 Natural Resource Inventory and Local Wetland Inventory as a wetland resource. A concrete pipe is the single outlet from this pond, flowing into a 24" culvert under SW 124th. This culvert discharges into an existing wetland on the east side of SW 124th Ave. Stormwater that does not enter the existing pond will drain toward the center of the golf ball driving area and infiltrate through the pervious ground.

Survey information for the site is from a topographic survey provided by: Northwest Surveying Inc. (1815 NW 169th Place, Suite 2090, Beaverton, OR 97006. (503)848-2127).

All stormwater facilities and conveyance systems for this development have been designed per the 2019 Clean Water Services Design & Construction Standards.

Additional design information was obtained from:

- USDA NRCS Web Soil Survey of Clackamas County, Oregon

Software used in design:

- HydroCAD Stormwater Modeling Software
- Microsoft Excel
- AutoCAD Civil 3D 2020

C. **Stormwater Narrative**

Onsite stormwater runoff will be collected at various catch basins, roof drains, and/or curb cuts located throughout the property. All stormwater runoff from pollution-generating surfaces (i.e. asphalt) will be treated on-site using Peak Diversion Stormfilter units manufactured by Contech. These units will be sized per CWS Design and Construction standards. Following treatment, stormwater will be routed to an underground detention chamber facility consisting of approximately (590) MC-4500 chambers manufactured by ADS. Detention will be achieved via a flow control manhole following the chamber system.

Alternatives

Water Quality Treatment

The CWS water quality event used to size these facilities is 0.36" developed over 4 hours. Please see the appendix for a WQ Basin Map and sizing calculations.

Vegetated Low Impact Development treatment approaches were considered on this site. However, during the design phase it was found that there was a lot of variation in the surrounding grades requiring slopes that would not allow the construction of LIDA systems.

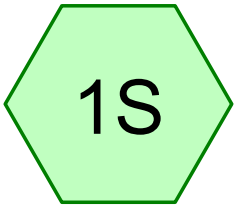
Storm Quantity Control (Complete Infiltration)

Stormtech underground chambers have been proposed as a method for stormwater detention. These chambers work well to create a centralized stormwater detention system for the whole site. A flow control manhole is located at the discharge of the chambers. The flow control system has been designed to detain storm to meet the hydromodification requirements set forth in Table 4-7 of the CWS Design and Construction Standards. A lift station will be designed to accommodate post-detention flows from up to the 100-year storm event.

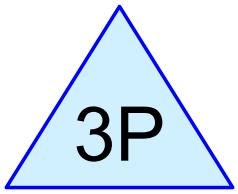
Because infiltration was employed as a stormwater discharge method for the existing site, infiltration was once again investigated during the stormwater design process. Although the Geotechnical Report was not obtained prior to preliminary stormwater design and the writing of this report, preliminary geotechnical information was received from the geotechnical engineer which indicated high groundwater elevation unsuitable for infiltration. Additionally, existing site conditions showed that there were no other alternate stormwater discharge locations, forcing the use of a lift station to utilize the existing culvert under 124th Ave.

II. APPENDIX

A. HydroCAD Calculations



Pre-Dev



Underground Chambers

Subcat Reach Pond Link

Routing Diagram for Tualatin Logistics Park
Prepared by VLMK Engineering, Printed 7/29/2021
HydroCAD® 10.00-25 s/n 09712 © 2019 HydroCAD Software Solutions LLC

Summary for Subcatchment 1S: Pre-Dev

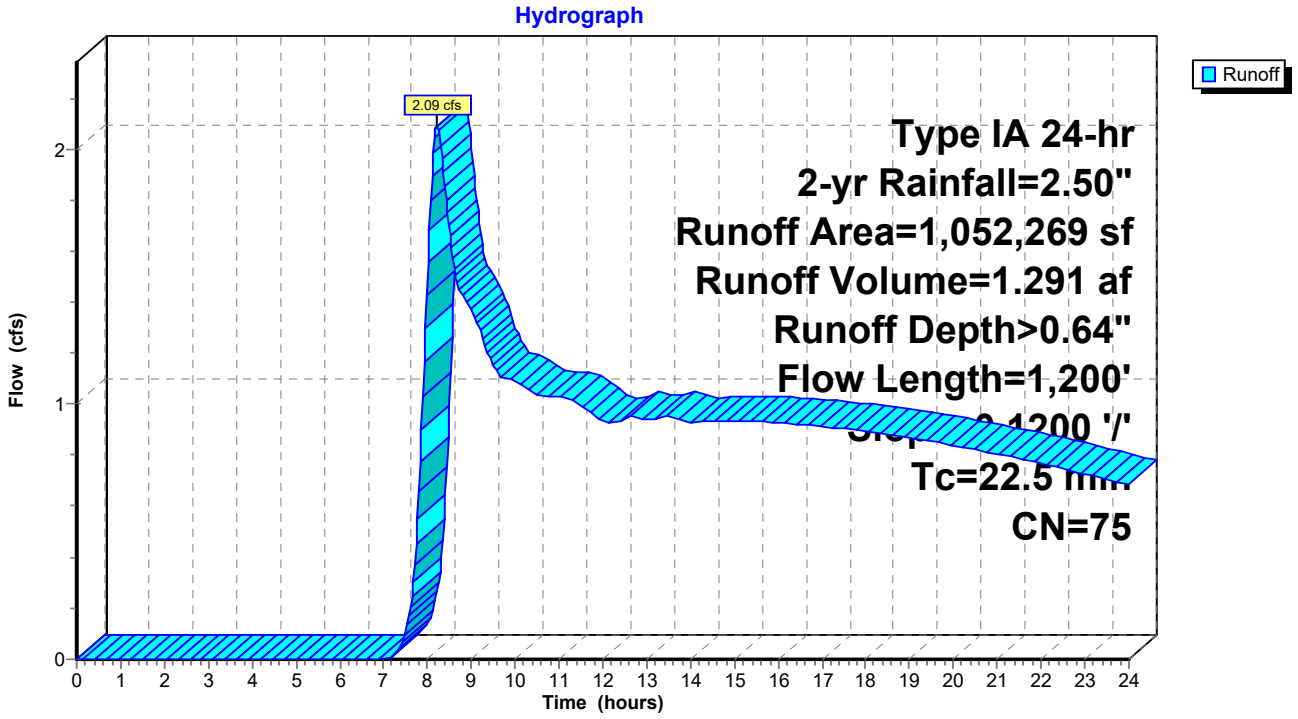
Runoff = 2.09 cfs @ 8.22 hrs, Volume= 1.291 af, Depth> 0.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
Type IA 24-hr 2-yr Rainfall=2.50"

	Area (sf)	CN	Description
*	1,052,269	75	Pre-Developed Area
	1,052,269		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.50"
10.6	1,100	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
22.5	1,200	Total			

Subcatchment 1S: Pre-Dev



Summary for Pond 3P: Underground Chambers

Inflow Area = 24.157 ac, 85.00% Impervious, Inflow Depth > 1.86" for 2-yr event
Inflow = 11.71 cfs @ 7.97 hrs, Volume= 3.750 af
Outflow = 1.03 cfs @ 24.00 hrs, Volume= 1.352 af, Atten= 91%, Lag= 961.5 min
Primary = 1.03 cfs @ 24.00 hrs, Volume= 1.352 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
Peak Elev= 144.90' @ 24.00 hrs Surf.Area= 0.516 ac Storage= 2.399 af

Plug-Flow detention time= 502.5 min calculated for 1.350 af (36% of inflow)
Center-of-Mass det. time= 200.8 min (928.4 - 727.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	137.50'	1.072 af	**46.67'W x 482.07'L x 8.00'H Field A** 4.132 af Overall - 1.451 af Embedded = 2.681 af x 40.0% Voids
#2A	139.50'	1.451 af	**ADS_StormTech MC-4500 +Cap** x 590 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 590 Chambers in 5 Rows Cap Storage= +35.7 cf x 2 x 5 rows = 357.0 cf
		2.523 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	137.50'	**2.7" Vert. Orifice/Grate X 2.00** C= 0.600
#2	Primary	145.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=1.03 cfs @ 24.00 hrs HW=144.90' (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 1.03 cfs @ 13.00 fps)
└**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Underground Chambers - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-4500 +Cap (ADS StormTech® MC-4500 with cap volume)
Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf
Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap
Cap Storage= +35.7 cf x 2 x 5 rows = 357.0 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

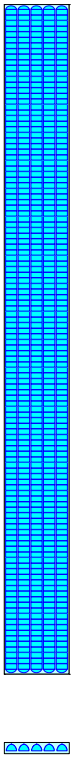
118 Chambers/Row x 4.02' Long +2.56' Cap Length x 2 = 480.07' Row Length +12.0" End Stone x 2 = 482.07' Base Length
5 Rows x 100.0" Wide + 9.0" Spacing x 4 + 12.0" Side Stone x 2 = 46.67' Base Width
24.0" Base + 60.0" Chamber Height + 12.0" Cover = 8.00' Field Height

590 Chambers x 106.5 cf + 35.7 cf Cap Volume x 2 x 5 Rows = 63,186.4 cf Chamber Storage

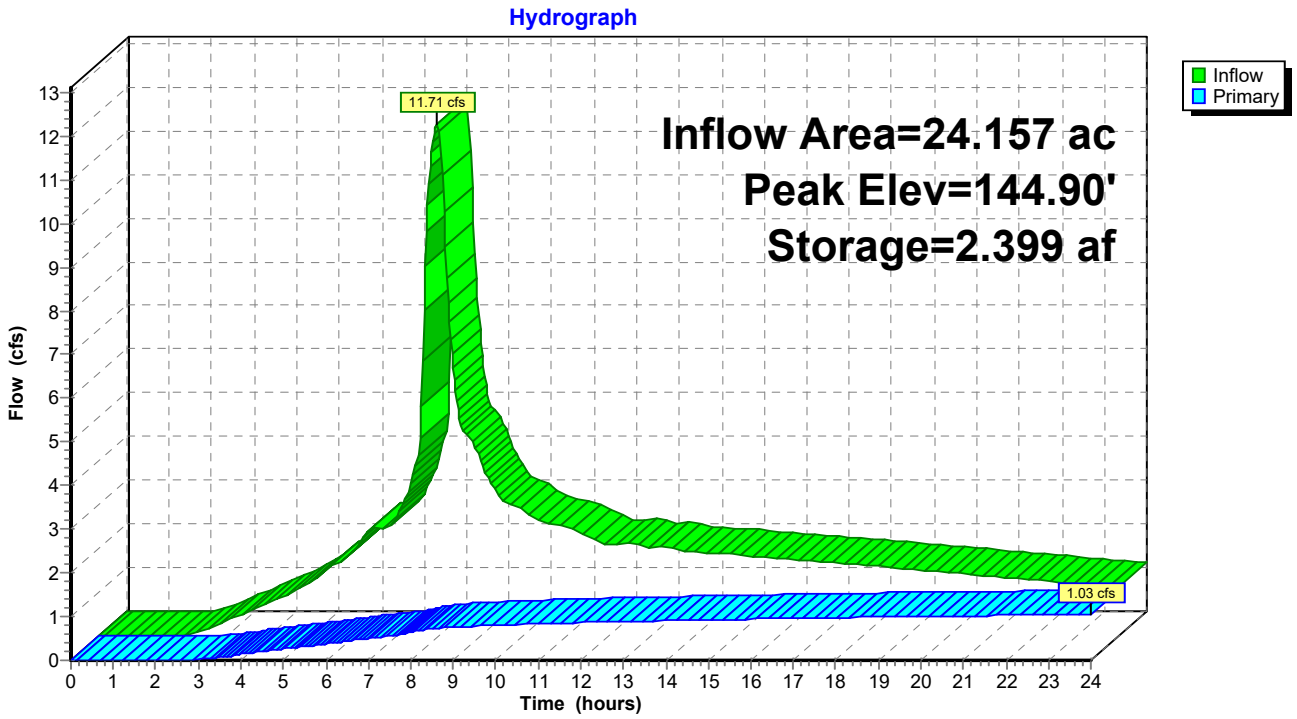
179,971.6 cf Field - 63,186.4 cf Chambers = 116,785.2 cf Stone x 40.0% Voids = 46,714.1 cf Stone Storage

Chamber Storage + Stone Storage = 109,900.4 cf = 2.523 af
Overall Storage Efficiency = 61.1%
Overall System Size = 482.07' x 46.67' x 8.00'

590 Chambers
6,665.6 cy Field
4,325.4 cy Stone



Pond 3P: Underground Chambers



Summary for Subcatchment 1S: Pre-Dev

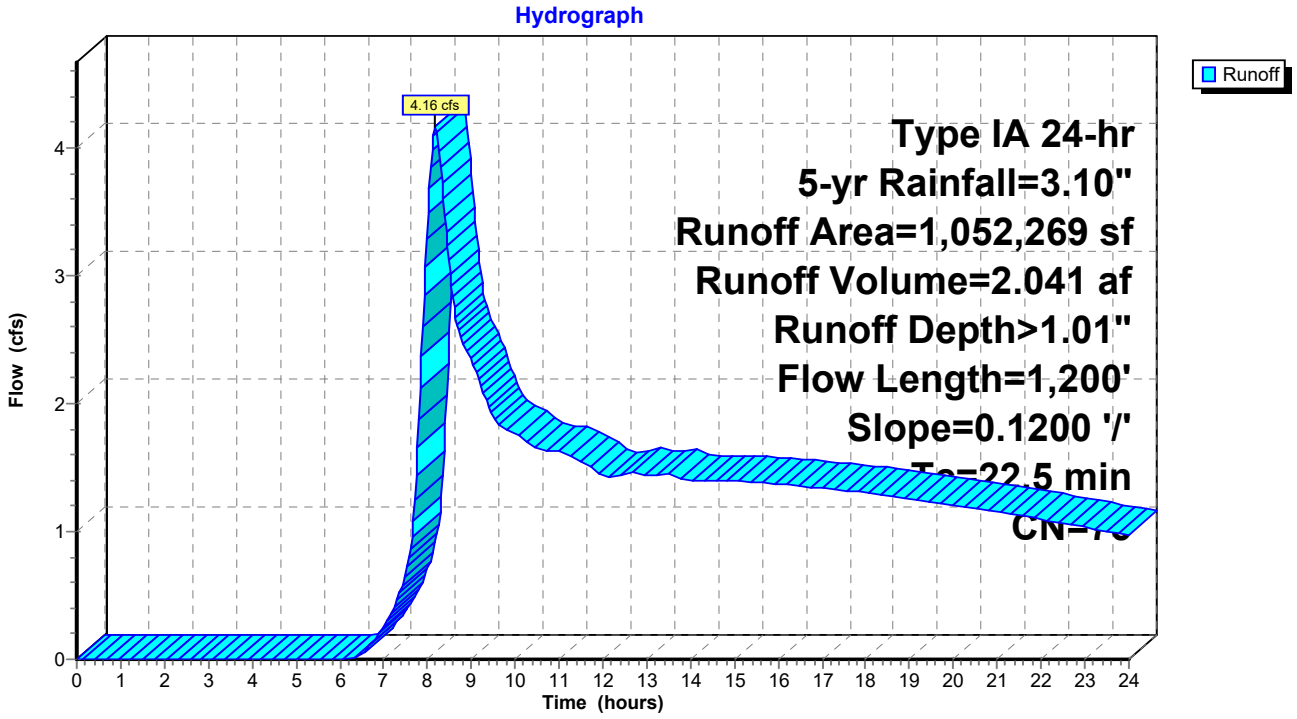
Runoff = 4.16 cfs @ 8.18 hrs, Volume= 2.041 af, Depth> 1.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
Type IA 24-hr 5-yr Rainfall=3.10"

	Area (sf)	CN	Description
*	1,052,269	75	Pre-Developed Area
	1,052,269		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.50"
10.6	1,100	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
22.5	1,200	Total			

Subcatchment 1S: Pre-Dev



Summary for Pond 3P: Underground Chambers

Inflow Area = 24.157 ac, 85.00% Impervious, Inflow Depth > 2.44" for 5-yr event
Inflow = 15.38 cfs @ 7.97 hrs, Volume= 4.910 af
Outflow = 2.58 cfs @ 13.37 hrs, Volume= 2.470 af, Atten= 83%, Lag= 324.2 min
Primary = 2.58 cfs @ 13.37 hrs, Volume= 2.470 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
Peak Elev= 145.24' @ 13.37 hrs Surf.Area= 0.516 ac Storage= 2.469 af

Plug-Flow detention time= 496.0 min calculated for 2.470 af (50% of inflow)
Center-of-Mass det. time= 235.5 min (950.2 - 714.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	137.50'	1.072 af	**46.67'W x 482.07'L x 8.00'H Field A** 4.132 af Overall - 1.451 af Embedded = 2.681 af x 40.0% Voids
#2A	139.50'	1.451 af	**ADS_StormTech MC-4500 +Cap** x 590 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 590 Chambers in 5 Rows Cap Storage= +35.7 cf x 2 x 5 rows = 357.0 cf
		2.523 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	137.50'	**2.7" Vert. Orifice/Grate X 2.00** C= 0.600
#2	Primary	145.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=2.56 cfs @ 13.37 hrs HW=145.24' (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 1.06 cfs @ 13.30 fps)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 1.51 cfs @ 1.60 fps)

Pond 3P: Underground Chambers - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-4500 +Cap (ADS StormTech® MC-4500 with cap volume)
Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf
Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap
Cap Storage= +35.7 cf x 2 x 5 rows = 357.0 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

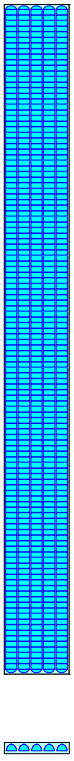
118 Chambers/Row x 4.02' Long +2.56' Cap Length x 2 = 480.07' Row Length +12.0" End Stone x 2 = 482.07' Base Length
5 Rows x 100.0" Wide + 9.0" Spacing x 4 + 12.0" Side Stone x 2 = 46.67' Base Width
24.0" Base + 60.0" Chamber Height + 12.0" Cover = 8.00' Field Height

590 Chambers x 106.5 cf + 35.7 cf Cap Volume x 2 x 5 Rows = 63,186.4 cf Chamber Storage

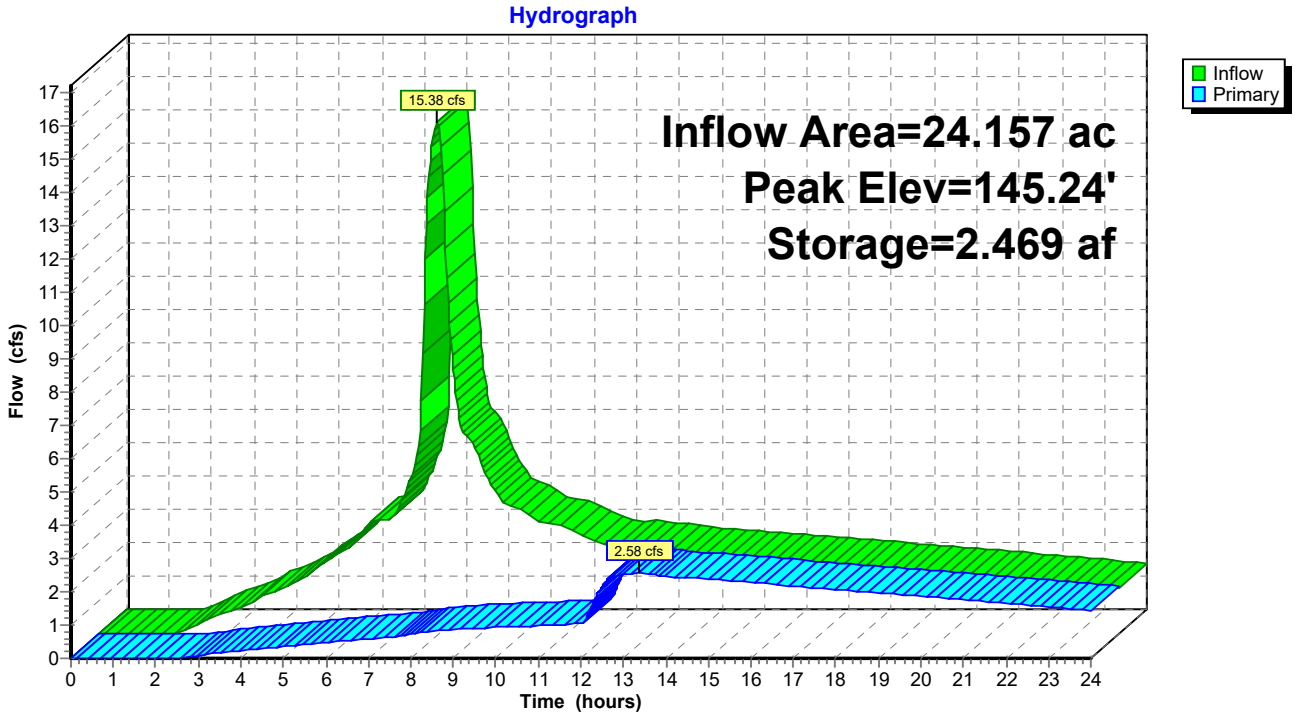
179,971.6 cf Field - 63,186.4 cf Chambers = 116,785.2 cf Stone x 40.0% Voids = 46,714.1 cf Stone Storage

Chamber Storage + Stone Storage = 109,900.4 cf = 2.523 af
Overall Storage Efficiency = 61.1%
Overall System Size = 482.07' x 46.67' x 8.00'

590 Chambers
6,665.6 cy Field
4,325.4 cy Stone



Pond 3P: Underground Chambers



Summary for Subcatchment 1S: Pre-Dev

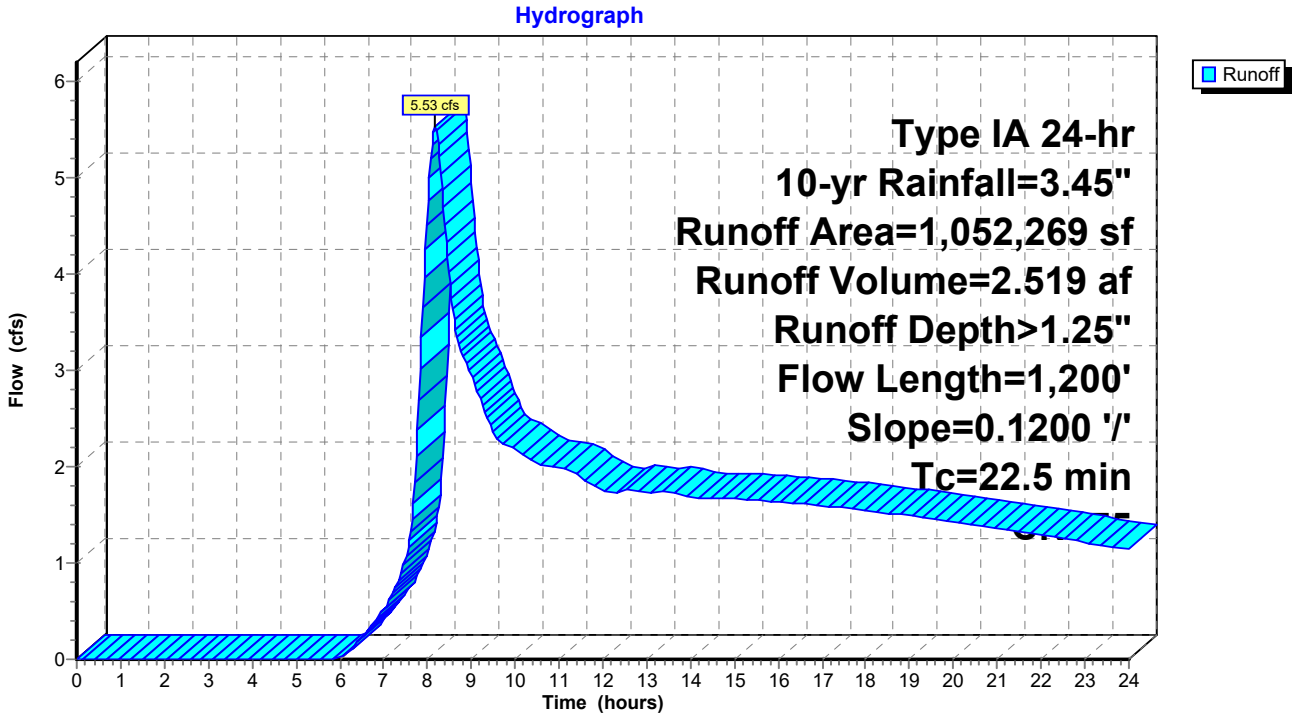
Runoff = 5.53 cfs @ 8.17 hrs, Volume= 2.519 af, Depth> 1.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
Type IA 24-hr 10-yr Rainfall=3.45"

	Area (sf)	CN	Description
*	1,052,269	75	Pre-Developed Area
	1,052,269		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.50"
10.6	1,100	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
22.5	1,200	Total			

Subcatchment 1S: Pre-Dev



Summary for Pond 3P: Underground Chambers

Inflow Area = 24.157 ac, 85.00% Impervious, Inflow Depth > 2.78" for 10-yr event
Inflow = 17.51 cfs @ 7.96 hrs, Volume= 5.592 af
Outflow = 3.59 cfs @ 10.99 hrs, Volume= 3.148 af, Atten= 80%, Lag= 181.5 min
Primary = 3.59 cfs @ 10.99 hrs, Volume= 3.148 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
Peak Elev= 145.34' @ 10.99 hrs Surf.Area= 0.516 ac Storage= 2.489 af

Plug-Flow detention time= 447.6 min calculated for 3.144 af (56% of inflow)
Center-of-Mass det. time= 208.4 min (917.3 - 708.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	137.50'	1.072 af	**46.67'W x 482.07'L x 8.00'H Field A** 4.132 af Overall - 1.451 af Embedded = 2.681 af x 40.0% Voids
#2A	139.50'	1.451 af	**ADS_StormTech MC-4500 +Cap** x 590 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 590 Chambers in 5 Rows Cap Storage= +35.7 cf x 2 x 5 rows = 357.0 cf
		2.523 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	137.50'	**2.7" Vert. Orifice/Grate X 2.00** C= 0.600
#2	Primary	145.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=3.59 cfs @ 10.99 hrs HW=145.34' (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 1.06 cfs @ 13.38 fps)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 2.52 cfs @ 1.90 fps)

Pond 3P: Underground Chambers - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-4500 +Cap (ADS StormTech® MC-4500 with cap volume)
Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf
Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap
Cap Storage= +35.7 cf x 2 x 5 rows = 357.0 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

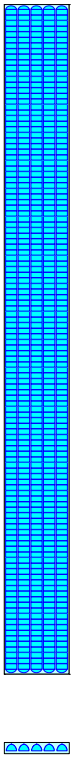
118 Chambers/Row x 4.02' Long +2.56' Cap Length x 2 = 480.07' Row Length +12.0" End Stone x 2 = 482.07' Base Length
5 Rows x 100.0" Wide + 9.0" Spacing x 4 + 12.0" Side Stone x 2 = 46.67' Base Width
24.0" Base + 60.0" Chamber Height + 12.0" Cover = 8.00' Field Height

590 Chambers x 106.5 cf + 35.7 cf Cap Volume x 2 x 5 Rows = 63,186.4 cf Chamber Storage

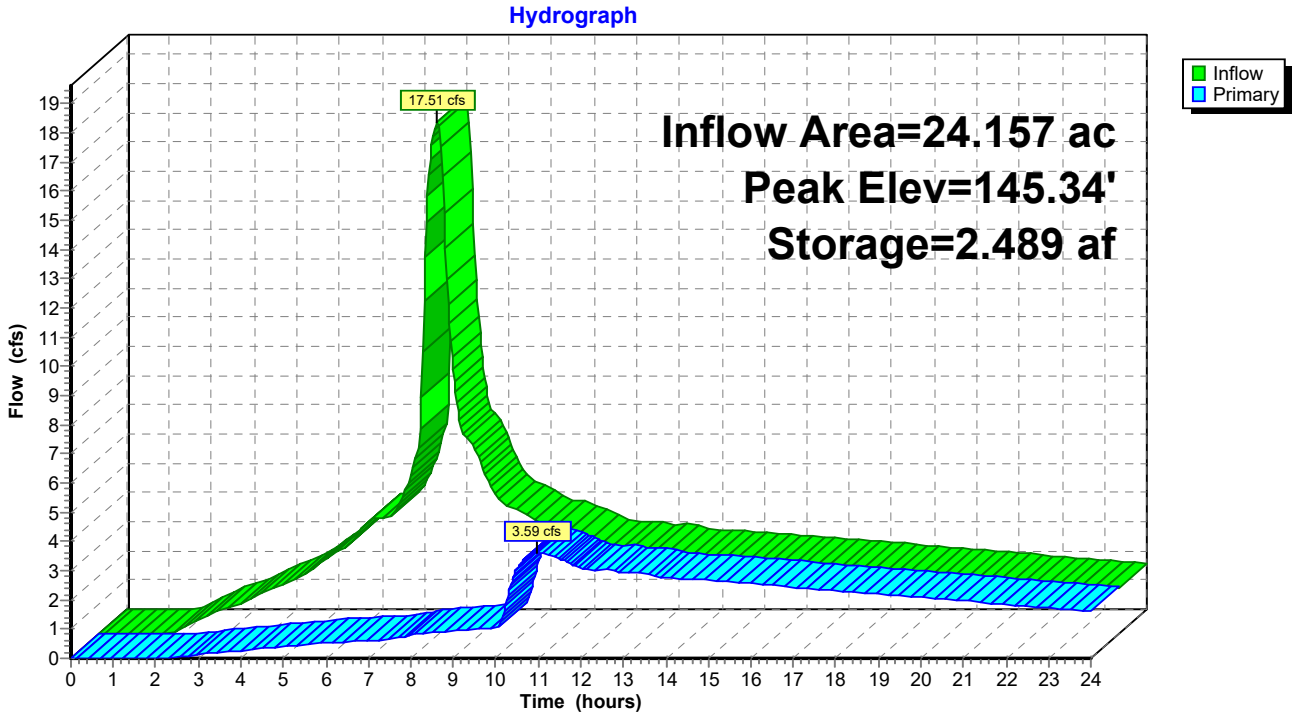
179,971.6 cf Field - 63,186.4 cf Chambers = 116,785.2 cf Stone x 40.0% Voids = 46,714.1 cf Stone Storage

Chamber Storage + Stone Storage = 109,900.4 cf = 2.523 af
Overall Storage Efficiency = 61.1%
Overall System Size = 482.07' x 46.67' x 8.00'

590 Chambers
6,665.6 cy Field
4,325.4 cy Stone



Pond 3P: Underground Chambers



Summary for Subcatchment 1S: Pre-Dev

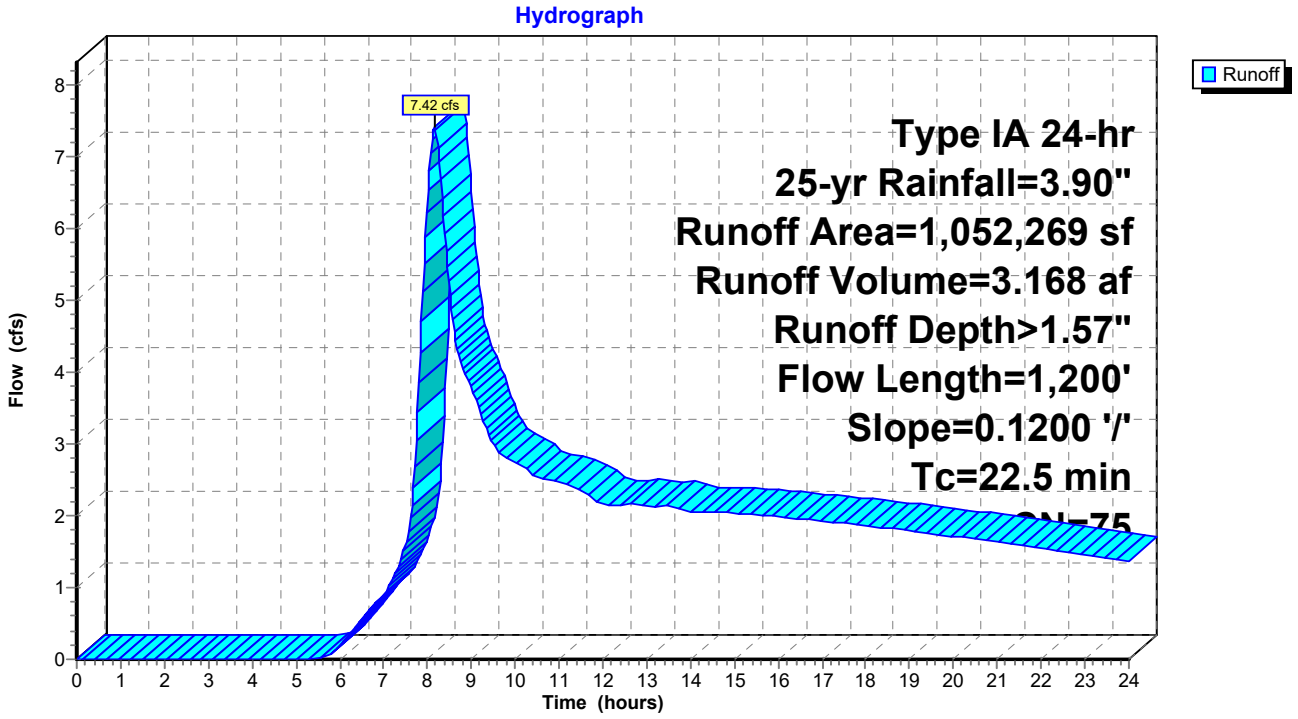
Runoff = 7.42 cfs @ 8.16 hrs, Volume= 3.168 af, Depth> 1.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
Type IA 24-hr 25-yr Rainfall=3.90"

	Area (sf)	CN	Description
*	1,052,269	75	Pre-Developed Area
	1,052,269		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.50"
10.6	1,100	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
22.5	1,200	Total			

Subcatchment 1S: Pre-Dev



Summary for Pond 3P: Underground Chambers

Inflow Area = 24.157 ac, 85.00% Impervious, Inflow Depth > 3.22" for 25-yr event
Inflow = 20.25 cfs @ 7.96 hrs, Volume= 6.475 af
Outflow = 5.34 cfs @ 9.40 hrs, Volume= 4.024 af, Atten= 74%, Lag= 86.3 min
Primary = 5.34 cfs @ 9.40 hrs, Volume= 4.024 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
Peak Elev= 145.48' @ 9.40 hrs Surf.Area= 0.516 ac Storage= 2.519 af

Plug-Flow detention time= 394.1 min calculated for 4.024 af (62% of inflow)
Center-of-Mass det. time= 177.4 min (880.0 - 702.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	137.50'	1.072 af	**46.67'W x 482.07'L x 8.00'H Field A** 4.132 af Overall - 1.451 af Embedded = 2.681 af x 40.0% Voids
#2A	139.50'	1.451 af	**ADS_StormTech MC-4500 +Cap** x 590 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 590 Chambers in 5 Rows Cap Storage= +35.7 cf x 2 x 5 rows = 357.0 cf
		2.523 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	137.50'	**2.7" Vert. Orifice/Grate X 2.00** C= 0.600
#2	Primary	145.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=5.33 cfs @ 9.40 hrs HW=145.48' (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 1.07 cfs @ 13.51 fps)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 4.26 cfs @ 2.27 fps)

Pond 3P: Underground Chambers - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-4500 +Cap (ADS StormTech® MC-4500 with cap volume)
Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf
Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap
Cap Storage= +35.7 cf x 2 x 5 rows = 357.0 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

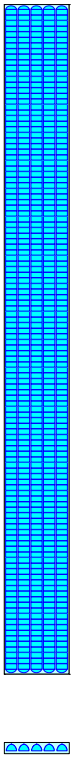
118 Chambers/Row x 4.02' Long +2.56' Cap Length x 2 = 480.07' Row Length +12.0" End Stone x 2 = 482.07' Base Length
5 Rows x 100.0" Wide + 9.0" Spacing x 4 + 12.0" Side Stone x 2 = 46.67' Base Width
24.0" Base + 60.0" Chamber Height + 12.0" Cover = 8.00' Field Height

590 Chambers x 106.5 cf + 35.7 cf Cap Volume x 2 x 5 Rows = 63,186.4 cf Chamber Storage

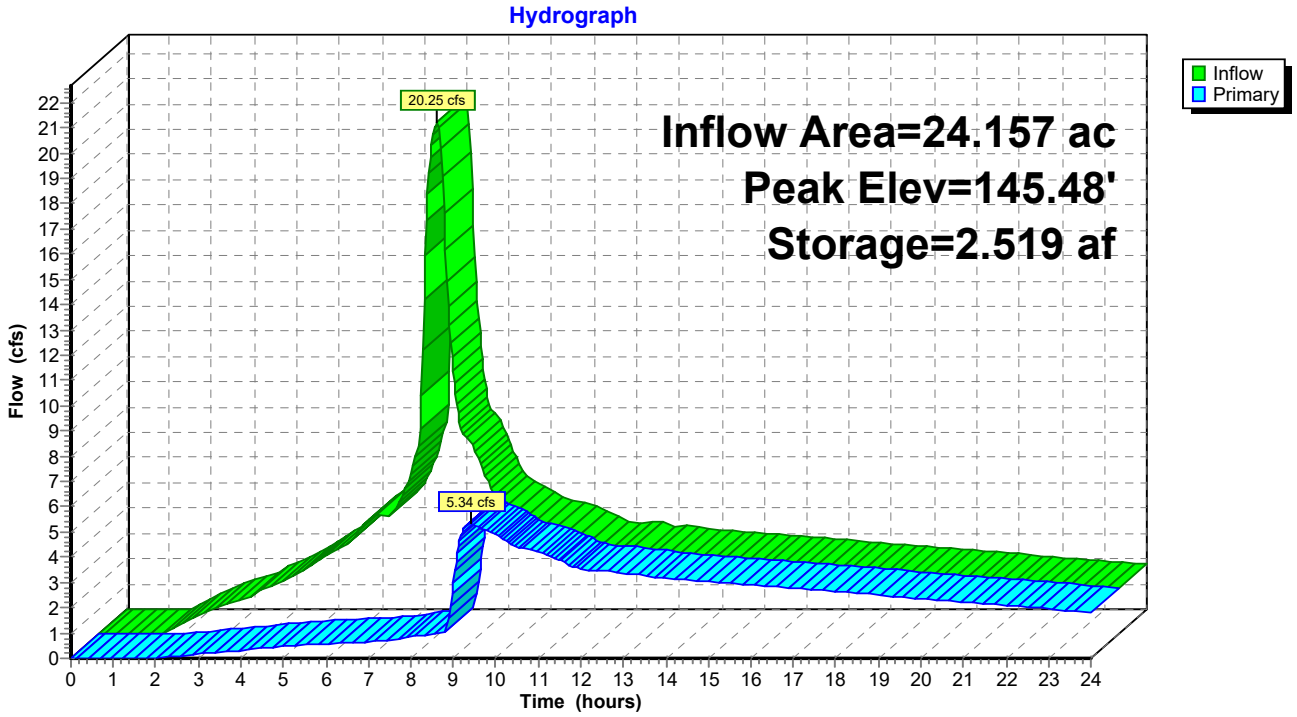
179,971.6 cf Field - 63,186.4 cf Chambers = 116,785.2 cf Stone x 40.0% Voids = 46,714.1 cf Stone Storage

Chamber Storage + Stone Storage = 109,900.4 cf = 2.523 af
Overall Storage Efficiency = 61.1%
Overall System Size = 482.07' x 46.67' x 8.00'

590 Chambers
6,665.6 cy Field
4,325.4 cy Stone



Pond 3P: Underground Chambers



B. **Water Quality Treatment Sizing Calculations**

VLMK ENGINEERING + DESIGN

Project: TLP Job #: 20190311 By: Init's Date: XX-XX-XX Sheet #:

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Water Quality Calculations

Based on the CWS December 2019 Design and Construction Standards

Treat Using Contech StormFilter Units:
Each Cartridge Treats 22.5 gpm (0.05 cfs)

SOUTH BASIN 442,124 sf of Impervious Surface Area

Water Quality Volume (V_{wq}):

V_{wq} = Impervious Area • 0.36"

V_{wq} = 442,124 sf • 0.36 in • 1/12 ft/in

V_{wq} = 13,264 cf

Water Quality Flowrate (Q_{wq}):

$Q_{wq} = V_{wq} / Time$ Time = 4 hours

Q_{wq} = 0.921 cfs < 0.950 cfs

Use Nineteen Cartridge Catch Basin Unit(s)

Water Quality Requirements Met

VLMK ENGINEERING + DESIGN EST 1971

VLMK ENGINEERING + DESIGN

Project: TLP | Job #: 20190311 | By: Init's | Date: XX-XX-XX | Sheet #:

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Water Quality Calculations

Based on the CWS December 2019 Design and Construction Standards

Treat Using Contech StormFilter Units:
Each Cartridge Treats 22.5 gpm (0.05 cfs)

NORTH BASIN 486,653 sf of Impervious Surface Area

Water Quality Volume (V_{wq}):

V_{wq} = Impervious Area • 0.36"

V_{wq} = 486,653 sf • 0.36 in • 1/12 ft/in

V_{wq} = 14,600 cf

Water Quality Flowrate (Q_{wq}):

$Q_{wq} = V_{wq} / Time$ Time = 4 hours

Q_{wq} = 1.014 cfs < 1.050 cfs

Use Twenty-one Cartridge Catch Basin Unit(s)

Water Quality Requirements Met

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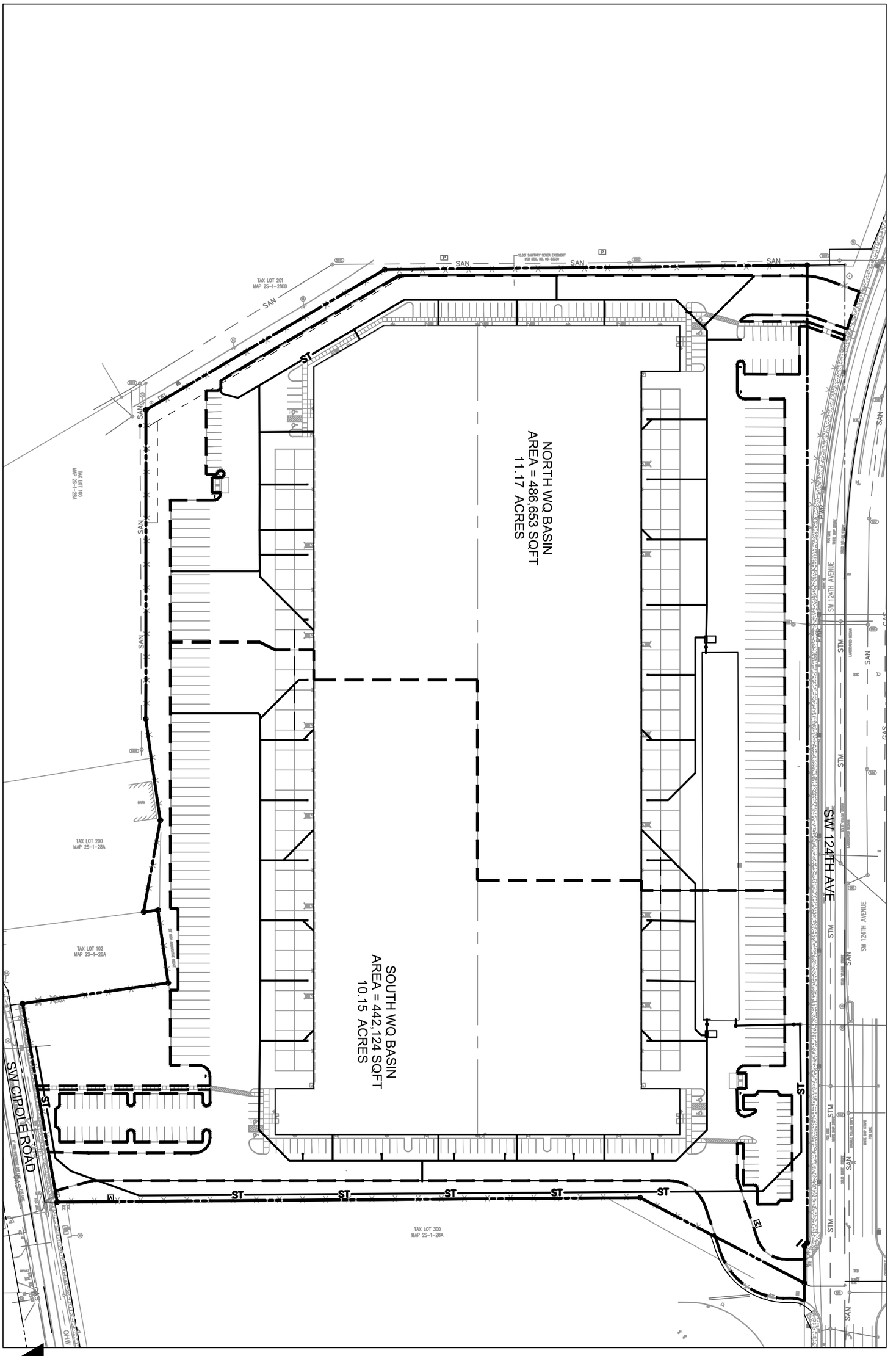

TUALATIN LOGISTICS PARK

SW 124TH AVE, TUALATIN OREGON

SCALE: AS NOTED
DATE:
PROJ. NO.: 20190311
DRAWN:
CHECKED:

VLMK ENGINEERING + DESIGN

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