REVISED

BROWNE • WHEELER
ENGINEERS, INC

January 19, 2018

Todd McKittrick
Millenial Builders
6830 S. 220th Street
Kent, WA 98032

Re: Madison Grove Subdivision
Plat Utility Permit

Dear Todd,

This letter presents a utility design for the plat utility permit submittal on the Madison Grove Subdivision project.

STORMWATER DRAINAGE

Existing

The property consists of four parcels totaling 2.26-acres. The site is located to the west of Madison Avenue, east of Nakata Avenue, north of Wallace Way and south of Ihland Way (see Downstream Drainage Map). A residence, detached garage and shop currently exist on the property in addition to an access drive from Madison Avenue.

Soils on the site are mapped as Kapowsin gravelly ashy loam by the USDA. A preliminary geotechnical investigation was performed by ECI dated 11/11/16. Their test pit logs, stated that the soil in the site consists of a layer of top soil underlain by a silty fine sand to a depth of 1.5 to 3 feet below ground surface. Below this depth the soil changes to a cemented silty fine sand to clayey silt. They also noted that the soil was moist, but water was not encountered in the excavations. An unregulated wetland is located to the south of the property.

Based on these findings and the requirements in the City's code, infiltration is not feasible.

Upstream

The property receives runoff from the subdivisions to the north and west. The contributory area consists of the area to the east of Nakata Avenue and south of Ihland Way. During large storm events this water sheet flows onto the property.

Onsite

In general, the site slopes to the southeast. There were no signs of concentrated flow. There is evidence of localized ponding near the southwest portion of the site. The water from the site flows to the southeast and off of the property.

Downstream

Eventually the runoff enters Madison Avenue. At this point it is collected by the City's storm drain system. This system collects runoff from a mostly developed drainage basin that reaches north to High School Road. The system consists of mainly 12-inch diameter pipe from High School Road to almost Wyatt Way. Near Wyatt Way the pipe increases to 18-inch diameter and then at Wyatt Way it jumps to 30-inch diameter pipe. At Winslow Way the pipe increase in diameter to 36-inch and then again as it leaves the Bjune Drive Right of way to 42-inch.

The system north of Wyatt Way does not have sufficient capacity until it reaches the 18-inch portion of the system. During large storm events the system overtops and the water flows in the gutter line until it can be collected once the pipe size increases.

Proposed

The proposed project includes subdividing the property into 8 lots and providing the required improvements to meet City code and provide access and utility service to each of the lots. These improvements will include the construction of an access road that varies in width from 12 to 24-feet wide. The road will have curb and gutter until it reaches the culdesac. At that point a mountable curb will constructed around the culdesac to allow for vehicular access into the residences without requiring curb ramps for the sidewalk. The access road will be located in a 40 foot right of way that will be dedicated to the City.

The project proposes to create the 47,997 square feet of impervious area and 49,514 square feet of landscaped area. Based on these areas the project is required to meet Minimum Requirements 1-10. Table 1 describes how we are proposing to meet all of these requirements.

Onsite Stormwater

The proposed lots will vary in size from 8,184 to 10,833 square feet. There is limited ability to infiltrate on the lots because of required separation from lot lines and structures. In addition the soil on the site is limited in depth and quality and there is seasonal perched groundwater on the site. Because of these factors we are not proposing infiltration on the individual lots.

There may be an opportunity to disperse runoff from some of the lots depending on the location of the buildings. This will need to be determined during the building permit phase of the project. We assumed that each of the lots will install a perforated stubout connection to the proposed drainage system.

The runoff from the road will be routed to two rain gardens and a cartridge filter treatment system. Because of the soil on the site the rain gardens will be underdrain to prevent saturation of the engineered soil mix. The gardens will not be lined though to allow as much water to infiltrate as possible.

The majority of the site will drain to a detention system that will reduce the 100-year, 24-hour peak flow from the proposed project to match the existing rate. This will prevent the proposed project from impacting the limited capacity of the Madison Avenue drainage system. The proposed drainage system will run down the proposed access road and connect to the existing drainage system in Madison Avenue

Additionally, we are proposing to plant trees along the access roadway to reduce the runoff generated from the road. We are also proposing to reduce the impervious area of the project by constructing a smaller than standard width.

We will amend the disturbed soils on all of the disturbed areas to meet the requirements of BMP T5.13 Post Construction Soil Quality and Depth.

ROADWAYS AND DRIVEWAYS

Existing

The property is located on the west side of Madison Avenue. There is an existing sidewalk and bike lane along the frontage.

The site is currently accessed from Madison Avenue. This driveway also provides access to an existing duplex and an undeveloped lot. These lots are currently part of a separate landuse proposal that moves this access point to Madison Avenue.

Proposed

A new access point will be constructed at Madison Avenue to provide required two way traffic. From this point the road width will vary (12-feet minimum) to reduce impervious area, provide locations for rain gardens, increase landscape area and retain existing trees.

Once inside the project site the road will transition to a cul-de-sac. In the center of the cul-de-sac a rain garden is proposed.

To address accessibility concerns expressed by the community we are proposing a mountable concrete curb on the edge of the cul-de-sac so sidewalk ramps will not need to be installed at each driveway. This will make it easier to negotiate the neighborhood for everyone.

SANITARY SEWER

Existing

There is a sewer main in Madison Avenue.

Proposed

An 8-inch sewer main will be constructed in the project and 6-inch side sewers will be installed to provide service to each lot. The main will extend to the south across two properties and connect to the existing main running between Nakata Avenue and Madison Avenue.

WATER

Existing

A 12-inch water main runs along Madison Avenue and a 6-inch water main runs along Nakata Avenue. Both of these lines are on the "High" system.

Proposed

An 8-inch water main will be installed through the project that connects to Madison Avenue in two locations. A fire hydrant will be provided near the cul-de-sac.

DRY UTILITIES

Power, telephone, and cable television cable will be addressed by others.

EROSION CONTROL

The Contractor will be responsible for maintaining erosion control facilities on the site during construction and for ensuring that sediment does not leave the site. The general principles of construction pollution prevention are:

- Retain native vegetation
- Prevent erosion rather than treat sediment-laden water
- Employ site specific BMPs
- Divert upslope runoff around disturbed area
- Phase construction operations to reduce total amount of disturbance at one time
- Amend soils before seeding
- Minimize the slope length and steepness of disturbed areas
- Reduce runoff velocities
- Prevent the tracking of sediment off site
- Employ BMPs that address not only erosion but also other potential pollutants.

The plan shows a number of BMPs which we believe are the minimum required to prevent erosion. It should be noted that other measures may be needed to minimize the movement of sediment and shall be put in place as needed. To prevent erosion, the contractor should take special care to ensure that exposed soils are covered in accordance with the plans. Clearing limits are shown on the plan with silt fence and clearing limits fence. The contractor should install and maintain fencing along these limits. The contractor should also ensure that disturbance outside of these limits does not occur unless needed. A rock construction entrance will be constructed and maintained. A silt fence will be installed at specified areas along the downhill edge of the project to prevent sediment from leaving the site. Grass swales will

route runoff to two small sediment traps to remove sediment from the water before it leaves the site. Table 2 below describes how the minimum requirements for construction stormwater pollution prevention are addressed on the plan. if the contractor needs to employ additional BMPs they should reference the SWMMWW, 2014 edition for additional information.

Very truly yours
Browne Wheeler Engineers, Inc.

1/19/18

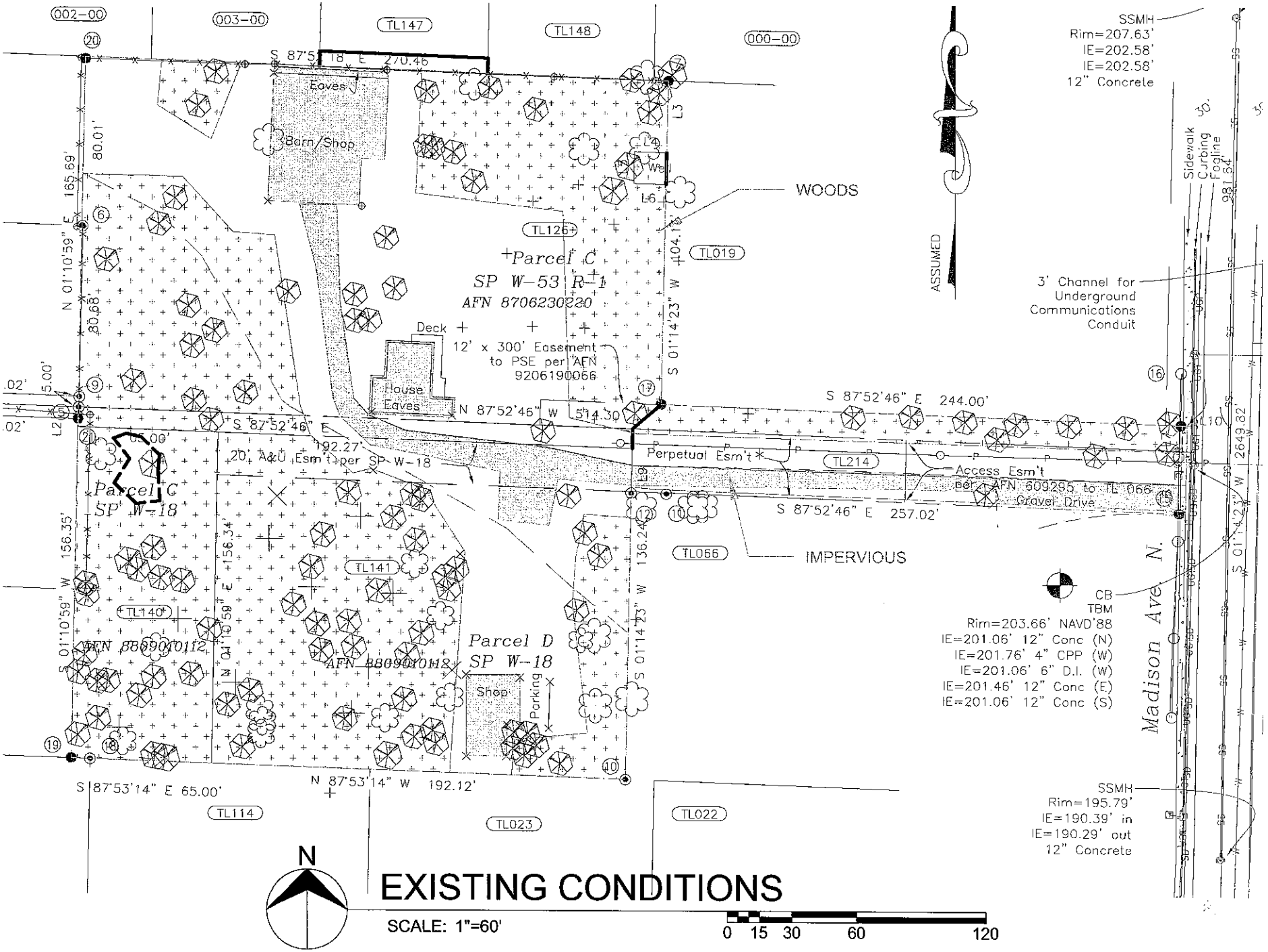
Table 1
Summary of Stormwater Minimum Requirements

Minimum Requirement	Comment
1. Stormwater site plan	A stormwater site plan is presented.
2. Construction stormwater pollution prevention	A TESC plan will be submitted at Plat Utility permit submittal.
3. Source control of pollutants	Not applicable.
4. Preservation of natural drainage systems and outfalls	All stormwater continues to discharge to the Madison Avenue drainage system. A detention system will be installed to reduce runoff from the site to existing levels.
5. On-site stormwater management	The runoff generated on the site will be dispersed to the maximum extent feasible using soil amendment and dispersion. Unlined underdrained rain gardens will be utilized. Trees will be planted adjacent to impervious areas. Disturbed soils will be amended to meet soil quality requirements.
6. Runoff treatment	Treatment will be provided by rain gardens and a Stormfilter.
7. Flow control	Durational flow control is not required because of direct discharge to salt water.
8. Wetlands protection	The project area does not drain to the unregulated wetland.
9. Operation and maintenance	A manual will be provided as part of the as built submittal.

Table 2
Construction Stormwater Pollution Prevention Elements - Minimum Requirement #2

Element	Comment
1. Mark Clearing Limits	Clearing limits are marked by silt fence and clearing limits fence.
2. Construction Entrance	A rock construction entrance will be provided off of Duane Lane.
3. Control Flow Rates	Runoff will be routed to two sediment traps. The traps will control the flow from the site.
4. Sediment Controls	A silt fence will be installed along downslope edges of the disturbed area. Runoff will flow to sediment traps before leaving the site.
5. Stabilize Soils	Soil cover requirements are specified in the plan set notes.
6. Protect Slopes	Not applicable
7. Protect Drain Inlets	The catch basins on Madison Avenue near the project will be protected with sediment socks. Drains that will be installed as part of the dispersion trench system will be protected from receiving runoff during construction.
8. Stabilize Channels	Channels will be protected with grass.
9. Control Pollutants	A concrete containment area will be used on-site for washout of equipment and tools.
10. Control Dewatering	Notes addressing methods for handling dewatering water are specified in the plan notes.
11. Maintain BMPs	Note provided regarding maintenance.
12. Manage Project	Notes provided regarding scheduling and timing of disturbed soil exposure, and when erosion controls may be removed.
13. Protect Low-Impact Development BMPs	Notes are provided in the rain garden detail addressing protection of LID BMPs.

Engineering Calculations


002-00
003-00
TL147
TL148
000-00
S 87°5 18" E 270.46
Eaves
Barn/Shop
Well
WOODS
TL126
TL019
Parcel C
SP W-53 R-1
AFN 8706230220
Deck
12' x 300' Easement
to PSE per AFN
9206190066
House
Eaves
N 87°52'46" W 514.30
S 87°52'46" E 244.00'
S 87°52'46" E 192.27'
20' A&U Esm't per SP W-18
Perpetual Esm't
TL214
Access Esm't
per AFN 609295 to TL 066
Gravel Drive
S 87°52'46" E 257.02'
Parcel C
SP W-18
TL066
IMPERVIOUS
TL141
TL140
AFN 8809010112
Parcel D
SP W-18
AFN 8809010118
Shop
Parking
N 87°53'14" W 192.12'
S 87°53'14" E 65.00'
TL114
TL023
TL022
N 01°10'59" E 165.69'
80.01'
80.68'
S 01°10'59" W 156.35'
N 01°10'59" E 156.34'
S 01°14'23" W 136.24'
S 01°14'23" W 104.13'
S 01°14'23" W 2649.82'
ASSUMED
SSMH
Rim=207.63'
IE=202.58'
IE=202.58'
12" Concrete
Sidewalk
Curbing
Fogline
3' Channel for
Underground
Communications
Conduit
CB
TBM
Rim=203.66' NAVD'88
IE=201.06' 12" Conc (N)
IE=201.76' 4" CPP (W)
IE=201.06' 6" D.I. (W)
IE=201.46' 12" Conc (E)
IE=201.06' 12" Conc (S)
Madison Ave N.
SSMH
Rim=195.79'
IE=190.39' in
IE=190.29' out
12" Concrete
N
EXISTING CONDITIONS
SCALE: 1"=60'
0 15 30 60 120

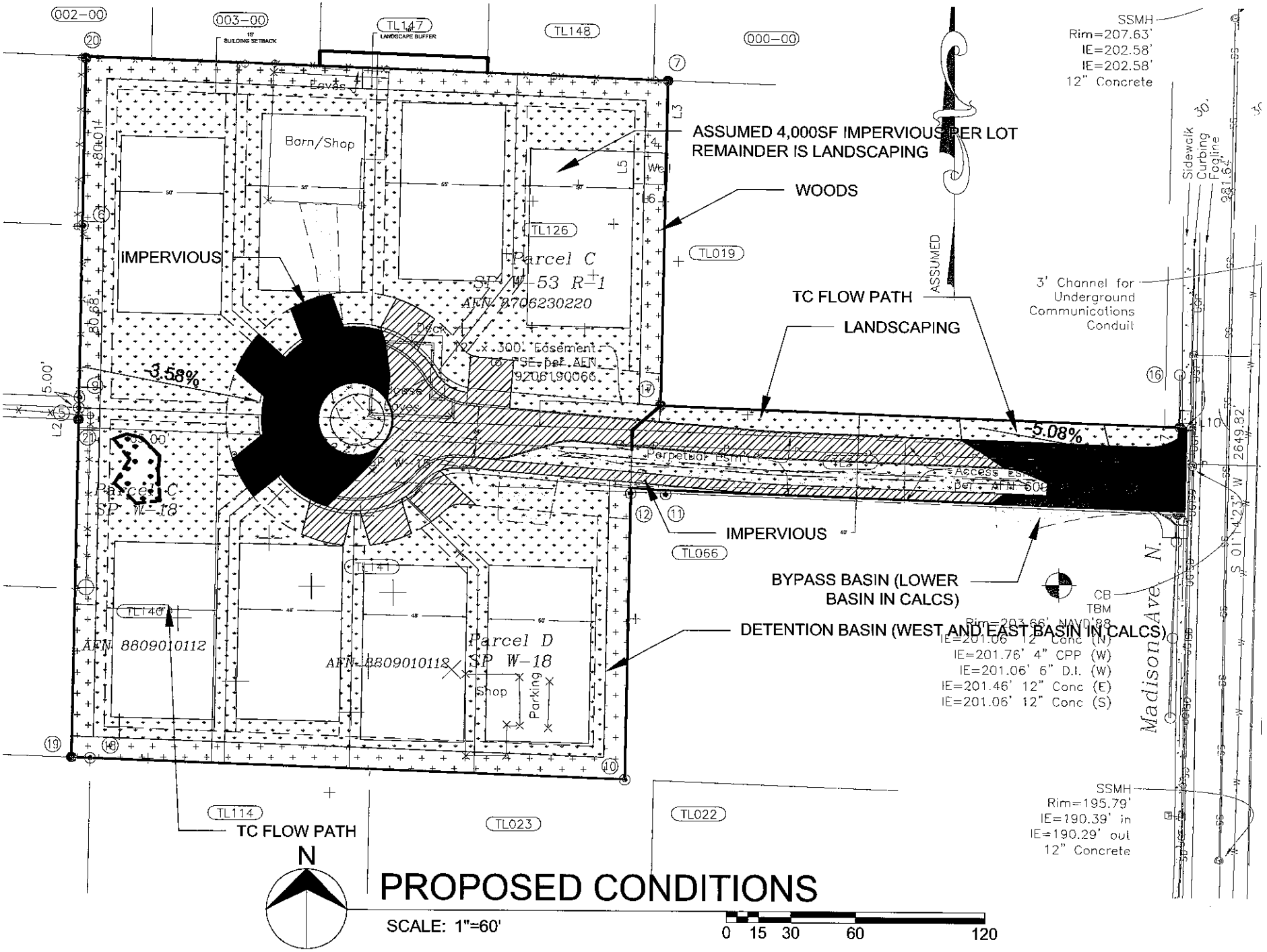
Madison Grove
Existing Basin Characteristics
10/18/2017

Total	97514 sf	2.24 ac	

Existing				CN
Impervious				
	Building	5040 sf	0.116 ac	98
	Driveway	5665 sf	0.13 ac	98
	Wetland	494 sf	0.011 ac	99
Pervious				
	Forest	56587 sf	1.299 ac	73
	Landscaping	29728 sf	0.682 ac	74
Total			2.24 ac	

Time of Concentration

Perv						Tc	
	Sheet						
		L= 75	S= 0.067	ns=	0.4	12.4	min
		L= 75	S= 0.067	ns=	0.15	5.7	min
	Shallow						
		L= 158	S= 0.051	k=	11	1.1	min
		L= 30	S= 0.067	k=	5	0.4	min
					Tt	**19.6**	min



PROPOSED CONDITIONS

Madison Grove
Proposed Basin Characteristics
10/18/2017

Total	97511 sf	2.24 ac	

Tank Basin			CN
Subtotal	87176 sf	2.00 ac	
Impervious			
Road	12980 sf	0.30 ac	98
Bldg	32000 sf	0.73 ac	98
Wetland	494 sf	0.01 ac	100
Pervious			
Forest	4364 sf	0.10 ac	73
Landscaping	37338 sf	0.86 ac	86
Total		2.00 ac	

Bypass Basin			CN
Subtotal	10335 sf	0.24 ac	
Impervious			
Road	2523 sf	0.06 ac	98
Pervious			
Forest	6828	0.16 ac	73
Landscaping	984 sf	0.02 ac	86
Total		0.24 ac	

Time of Concentration

Tank Basin

Sheet					Tc
	L= 82	S= 0.036	ns=	0.15	7.8 min
			Tt		**7.8** min

Bypass Basin

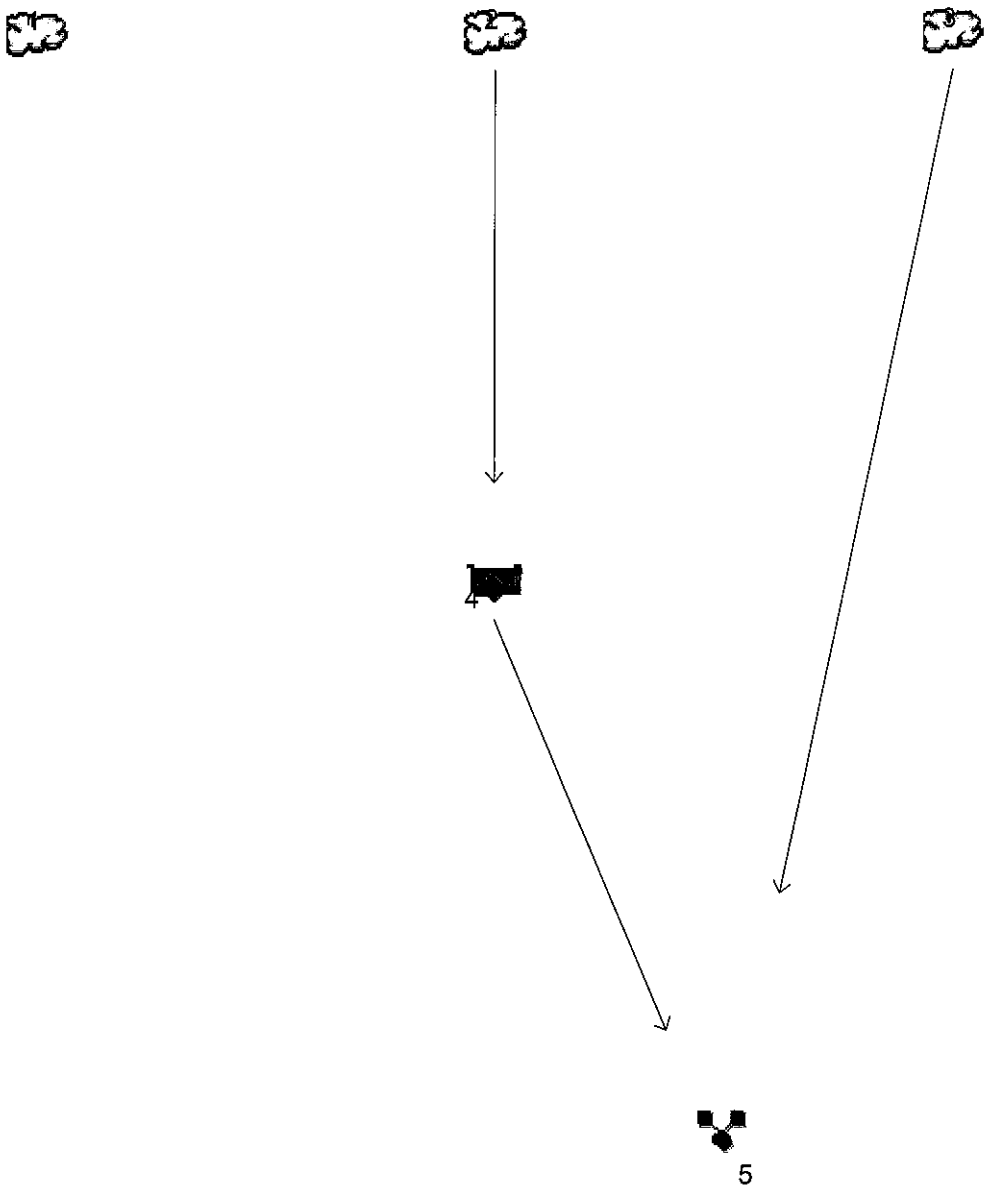
Sheet					Tc
	L= 68	S= 0.051	ns=	0.15	5.8 min
			Tt		**5.8** min

Madison Grove
1/19/18

Engineering Calculations

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3



Legend

Hyd.	Origin	Description
1	SBUH Runoff	Ex
2	SBUH Runoff	pro to tank
3	SBUH Runoff	Pro Bypass
4	Reservoir	Det Tank
5	Combine	Pro Discharge

Hydrograph Report

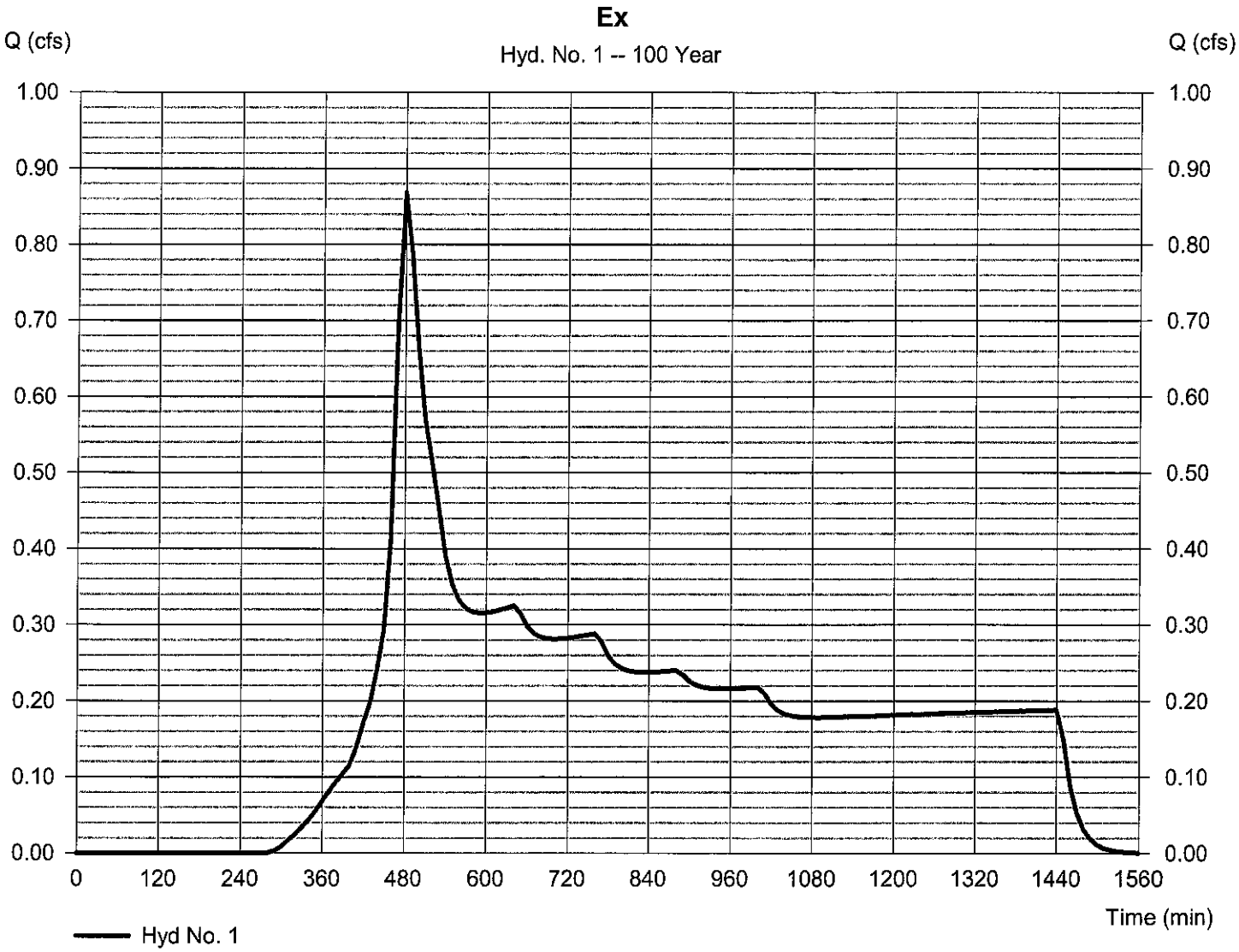
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Tuesday, 10 / 17 / 2017

Hyd. No. 1

Ex

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.869 cfs
Storm frequency	= 100 yrs	Time to peak	= 480 min
Time interval	= 10 min	Hyd. volume	= 16,671 cuft
Drainage area	= 2.240 ac	Curve number	= 76*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 19.60 min
Total precip.	= 4.40 in	Distribution	= Custom
Storm duration	= Z:\AAAprojects\type 1a.cds	Shape factor	= n/a

* Composite (Area/CN) = [(0.116 x 98) + (0.130 x 98) + (0.011 x 100) + (1.299 x 73) + (0.682 x 74)] / 2.240



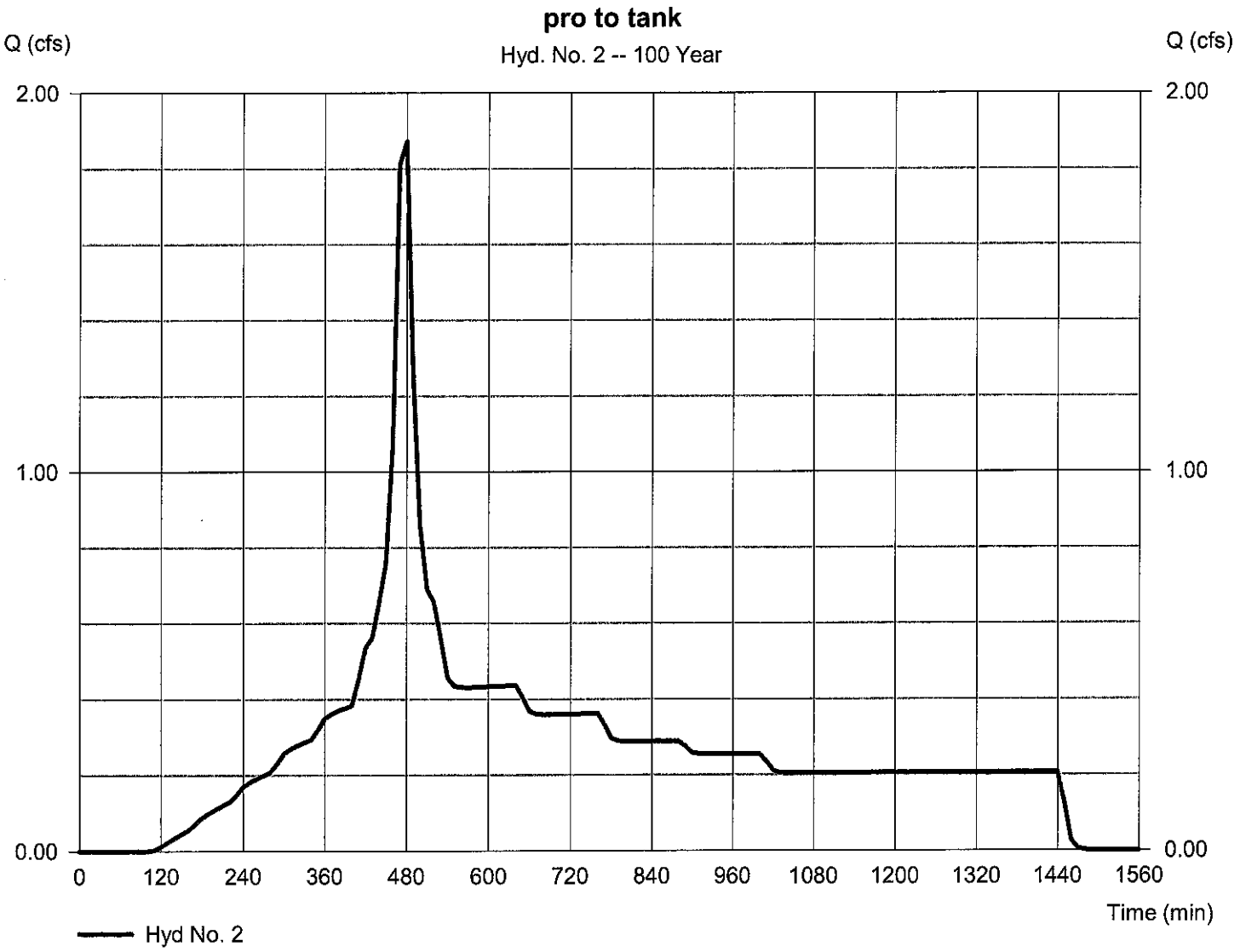
Hydrograph Report

Hyd. No. 2

pro to tank

Hydrograph type	= SBUH Runoff	Peak discharge	= 1.872 cfs
Storm frequency	= 100 yrs	Time to peak	= 480 min
Time interval	= 10 min	Hyd. volume	= 25,446 cuft
Drainage area	= 2.000 ac	Curve number	= 92*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.80 min
Total precip.	= 4.40 in	Distribution	= Custom
Storm duration	= Z:\AAAprojects\type 1a.cds	Shape factor	= n/a

* Composite (Area/CN) = [(0.300 x 98) + (0.730 x 98) + (0.010 x 100) + (0.100 x 73) + (0.860 x 86)] / 2.000



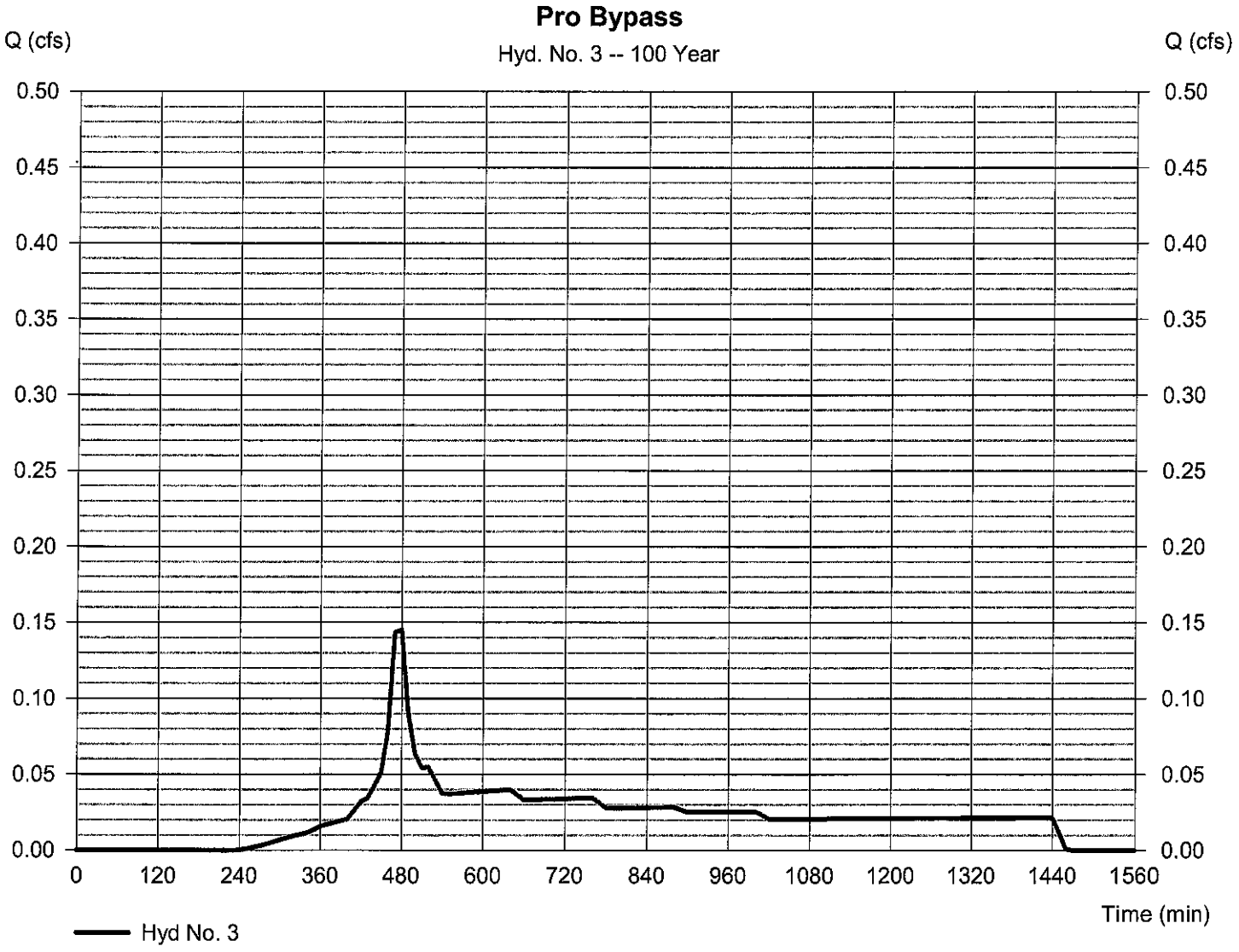
Hydrograph Report

Hyd. No. 3

Pro Bypass

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.145 cfs
Storm frequency	= 100 yrs	Time to peak	= 480 min
Time interval	= 10 min	Hyd. volume	= 2,070 cuft
Drainage area	= 0.240 ac	Curve number	= 80*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.80 min
Total precip.	= 4.40 in	Distribution	= Custom
Storm duration	= Z:\AAAprojects\type 1a.cds	Shape factor	= n/a

* Composite (Area/CN) = [(0.060 x 98) + (0.160 x 73) + (0.020 x 86)] / 0.240



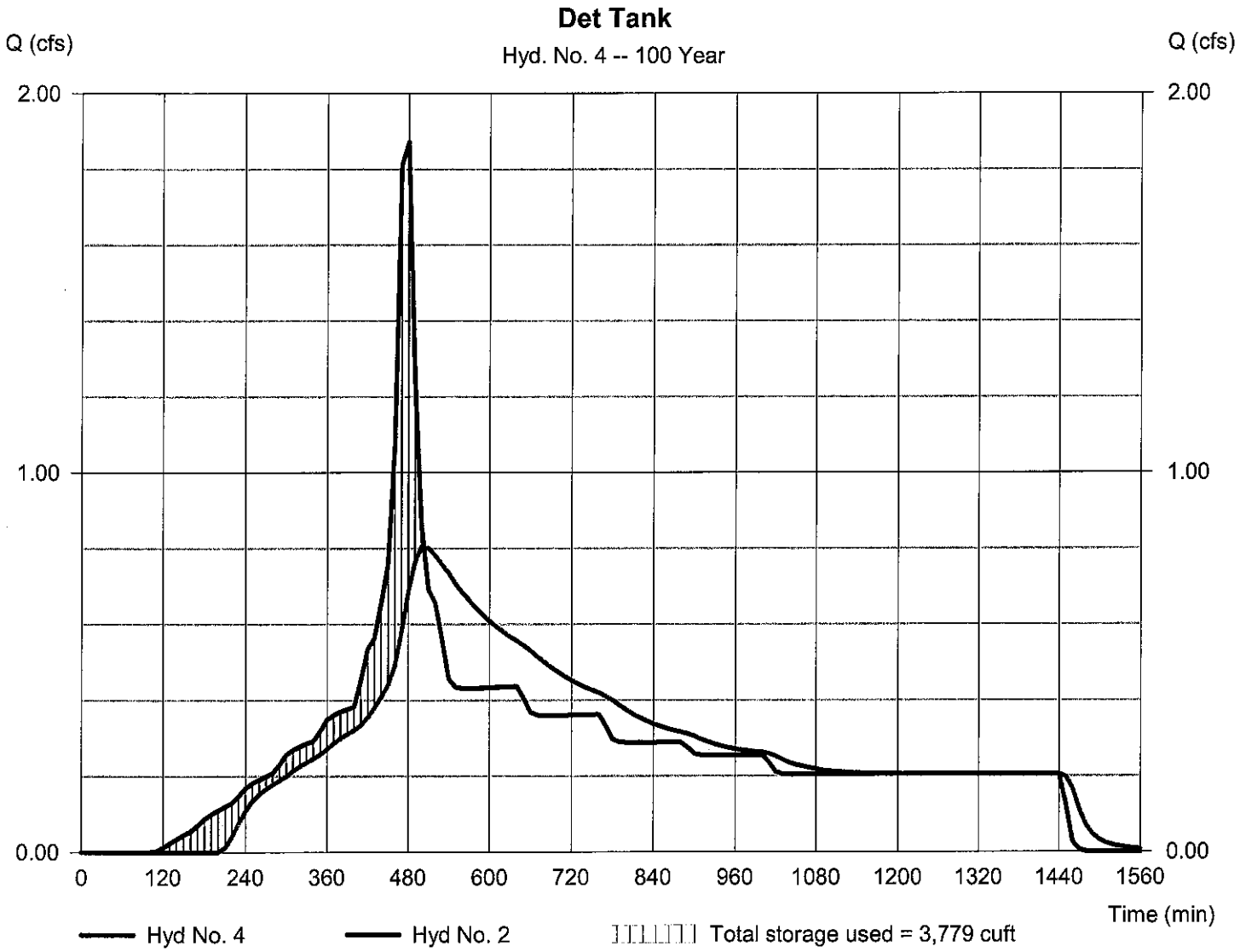
Hydrograph Report

Hyd. No. 4

Det Tank

Hydrograph type	= Reservoir	Peak discharge	= 0.805 cfs
Storm frequency	= 100 yrs	Time to peak	= 500 min
Time interval	= 10 min	Hyd. volume	= 25,139 cuft
Inflow hyd. No.	= 2 - pro to tank	Max. Elevation	= 103.95 ft
Reservoir name	= TANK CHARACTERISTICS	Max. Storage	= 3,779 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - TANK CHARACTERISTICS

Pond Data

UG Chambers -Invert elev. = 100.00 ft, Rise x Span = 4.00 x 4.00 ft, Barrel Len = 142.00 ft, No. Barrels = 2, Slope = 0.00%, Headers = Yes

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	n/a	0	0
0.40	100.40	n/a	199	199
0.80	100.80	n/a	346	544
1.20	101.20	n/a	420	965
1.60	101.60	n/a	463	1,427
2.00	102.00	n/a	484	1,911
2.40	102.40	n/a	484	2,394
2.80	102.80	n/a	463	2,857
3.20	103.20	n/a	420	3,277
3.60	103.60	n/a	345	3,622
4.00	104.00	n/a	199	3,821

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	4.26	0.00	0.00
Span (in)	= 12.00	4.26	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 100.50	100.51	0.00	0.00
Length (ft)	= 20.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 2.00	0.00	0.00	0.00
Crest El. (ft)	= 103.95	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

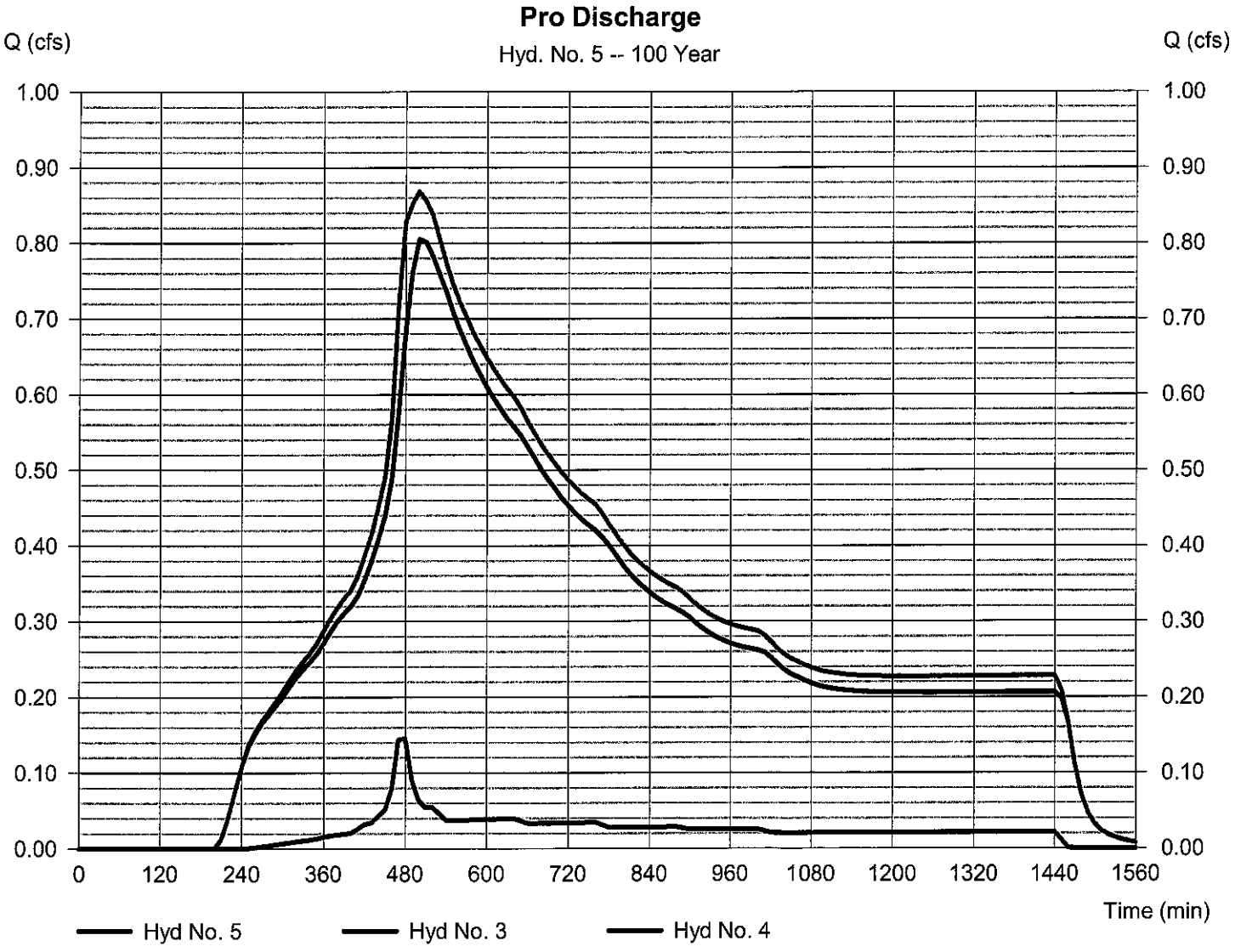
Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.40	199	100.40	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.80	544	100.80	0.14 oc	0.14 ic	---	---	0.00	---	---	---	---	---	0.143
1.20	965	101.20	0.31 oc	0.31 ic	---	---	0.00	---	---	---	---	---	0.306
1.60	1,427	101.60	0.42 oc	0.41 ic	---	---	0.00	---	---	---	---	---	0.412
2.00	1,911	102.00	0.51 oc	0.50 ic	---	---	0.00	---	---	---	---	---	0.500
2.40	2,394	102.40	0.58 oc	0.58 ic	---	---	0.00	---	---	---	---	---	0.576
2.80	2,857	102.80	0.65 oc	0.64 ic	---	---	0.00	---	---	---	---	---	0.643
3.20	3,277	103.20	0.71 oc	0.71 ic	---	---	0.00	---	---	---	---	---	0.706
3.60	3,622	103.60	0.77 oc	0.76 ic	---	---	0.00	---	---	---	---	---	0.763
4.00	3,821	104.00	0.89 oc	0.81 ic	---	---	0.07	---	---	---	---	---	0.886

Hydrograph Report

Hyd. No. 5

Pro Discharge

Hydrograph type	= Combine	Peak discharge	= 0.869 cfs
Storm frequency	= 100 yrs	Time to peak	= 500 min
Time interval	= 10 min	Hyd. volume	= 27,210 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 0.240 ac



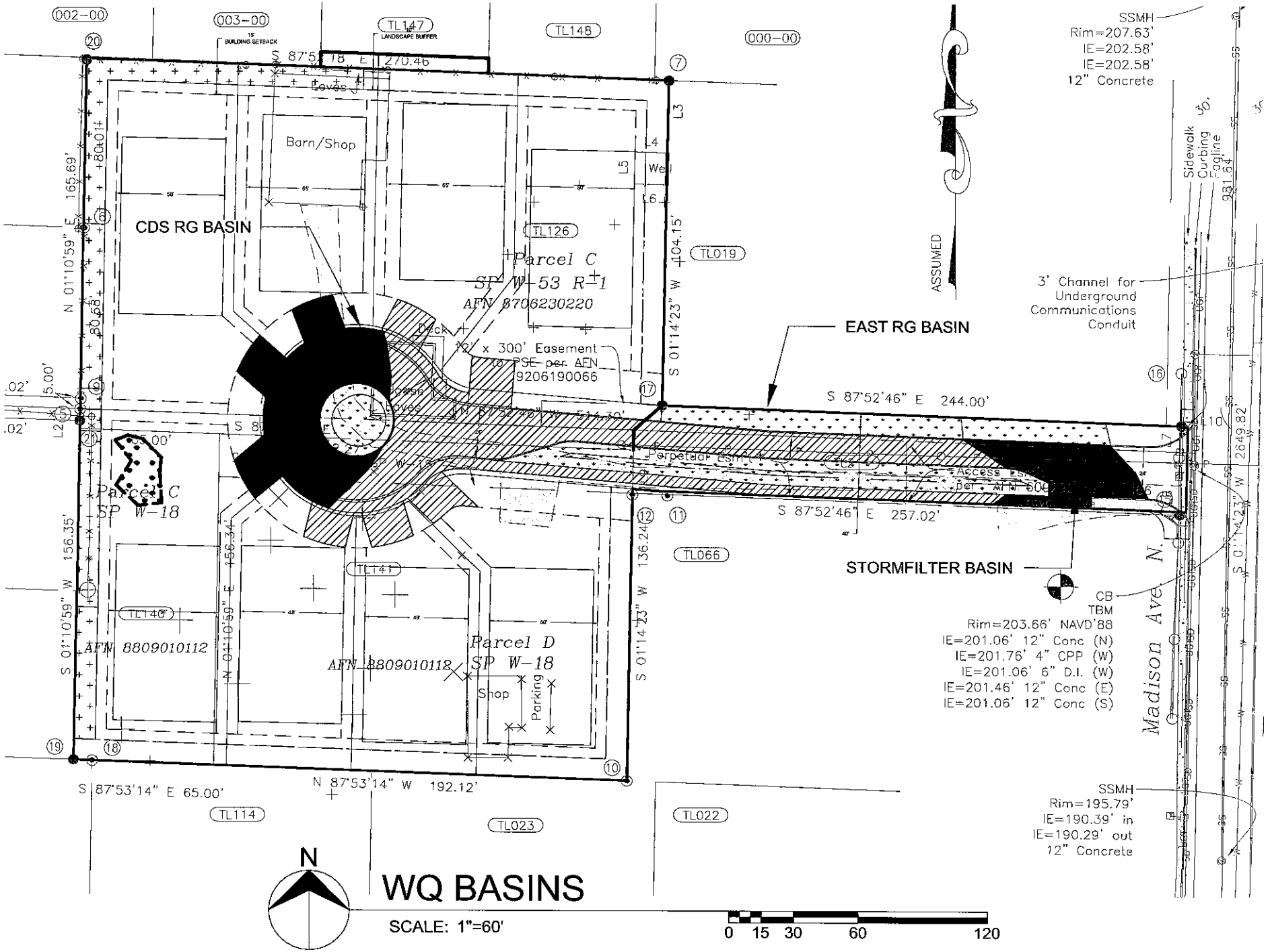
Madison Grove
Water Quality Areas
10/18/2017

	Impervious		Pervious	
Facility	sf	ac	sf	ac
CDS RG	3934	0.090	908	0.021
E. RG	9046	0.208	2828	0.065
SF	1600	0.037	675	0.015

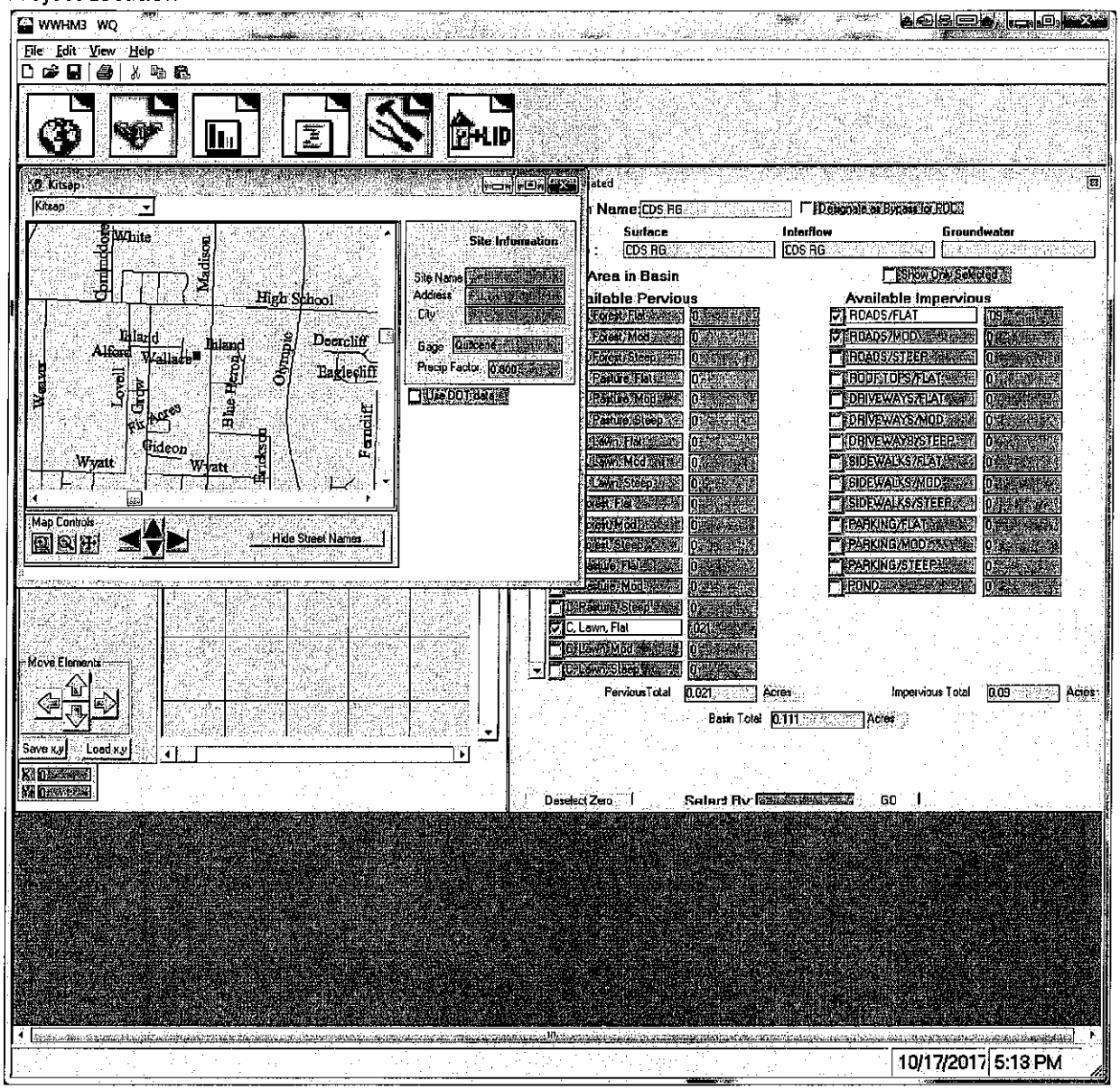
SF Qwq = 0.0088 cfs

Cartridge flow rate = 7.5 gpm
0.0167 cfs

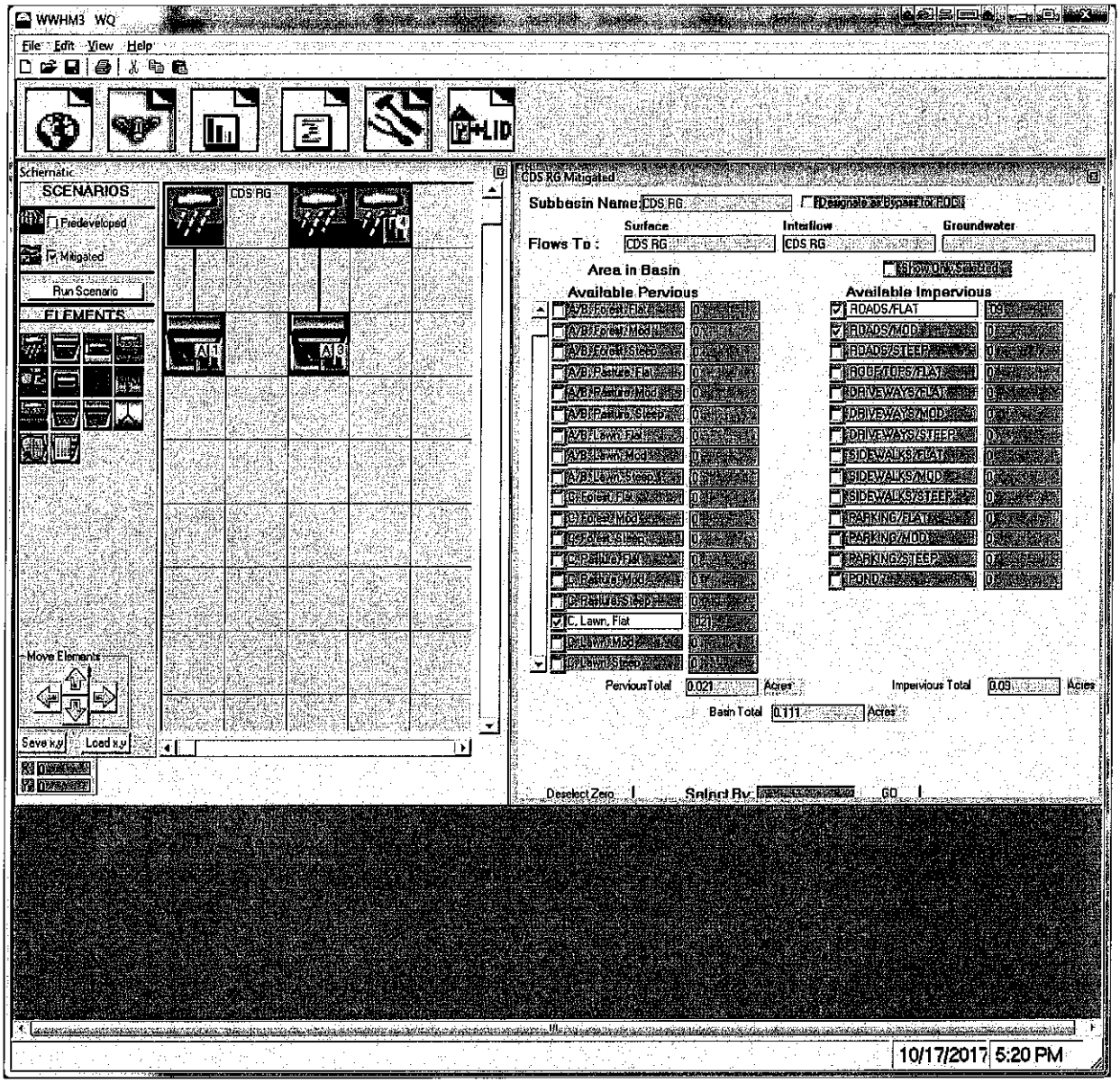
Number of Cartridges = 0.53 ⟶ 1


002-00
003-00
TL147
LANDSCAPE BUFFER
BUILDING SETBACK
TL148
000-00
S 87°53'18" E 270.46'
Eaves
Barn/Shop
CDS RG BASIN
TL126
Parcel C
SP W-53 R-1
AFN 8706230220
TL019
N 01°10'59" E 165.69'
80.68'
80.01'
L3
L4
L5
L6
Well
S 01°14'23" W 404.15'
Deck
12' x 300' Easement
PSE per AFN
9206190066
Eaves
N 87°52'46" W 514.30'
S 87°52'46" E 244.00'
EAST RG BASIN
ASSUMED
SSMH
Rim=207.63'
IE=202.58'
IE=202.58'
12" Concrete
Sidewalk
Curbing
Fogline
931.64'
3' Channel for
Underground
Communications
Conduit
Perpetual Easement
Access Easement
Parcel C
SP W-18
S 87°52'46" E 257.02'
TL066
STORMFILTER BASIN
CB
TBM
Rim=203.66' NAVD'88
IE=201.06' 12" Conc (N)
IE=201.76' 4" CPP (W)
IE=201.06' 6" D.I. (W)
IE=201.46' 12" Conc (E)
IE=201.06' 12" Conc (S)
S 01°10'59" W 156.35'
N 01°10'59" E 156.34'
TL140
TL141
AFN 8809010112
Parcel D
SP W-18
AFN 8809010118
Shop
Parking
S 01°14'23" W 136.24'
S 01°14'23" W 2649.82'
Madison Ave N.
SSMH
Rim=195.79'
IE=190.39' in
IE=190.29' out
12" Concrete
S 87°53'14" E 65.00'
N 87°53'14" W 192.12'
TL114
TL023
TL022
N
WQ BASINS
SCALE: 1"=60'
0 15 30 60 120

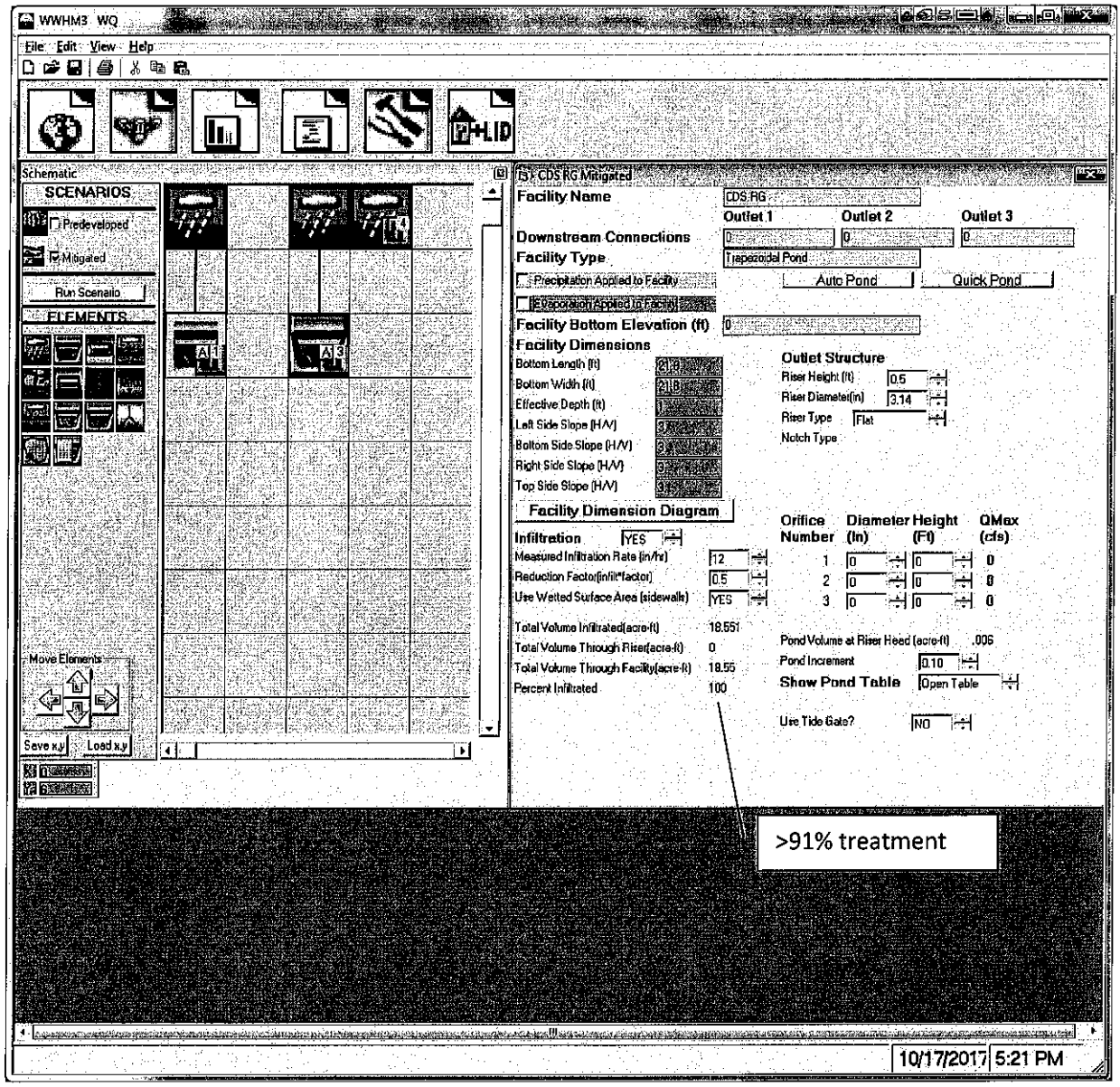
Project Location



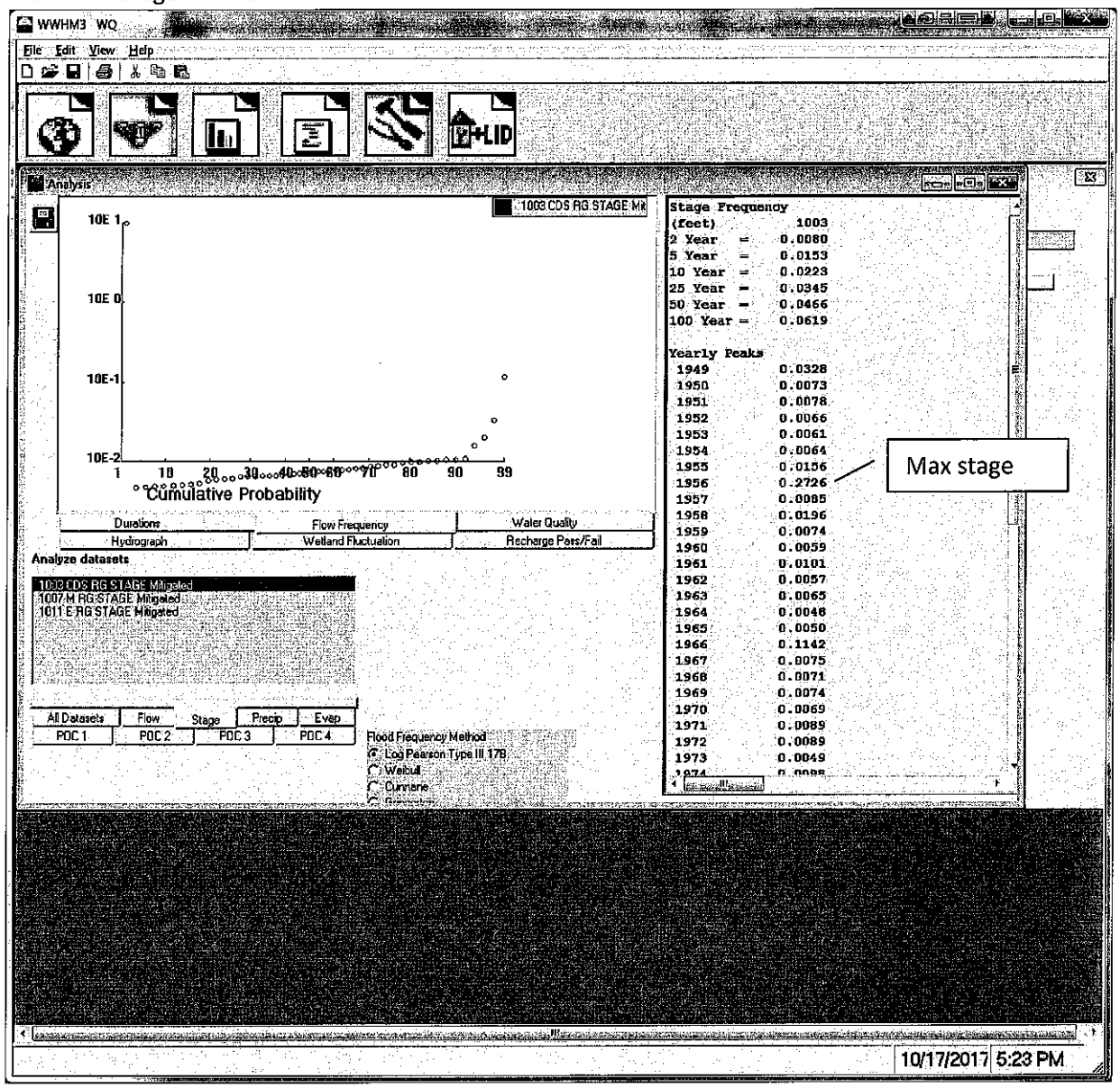
Cul De Sac Basin Characteristics



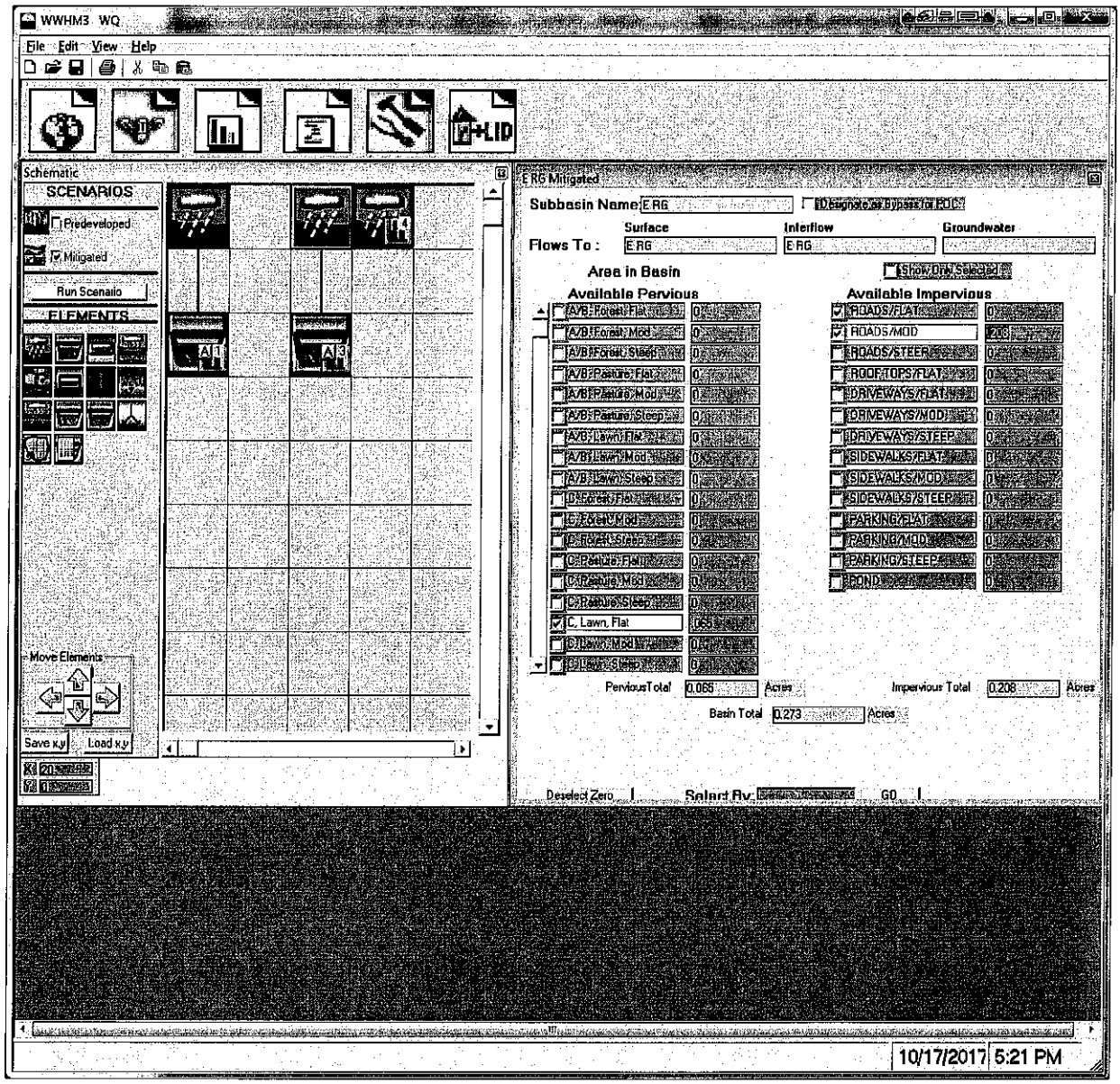
Cul De Sac Rain Garden Dimensions and Performance



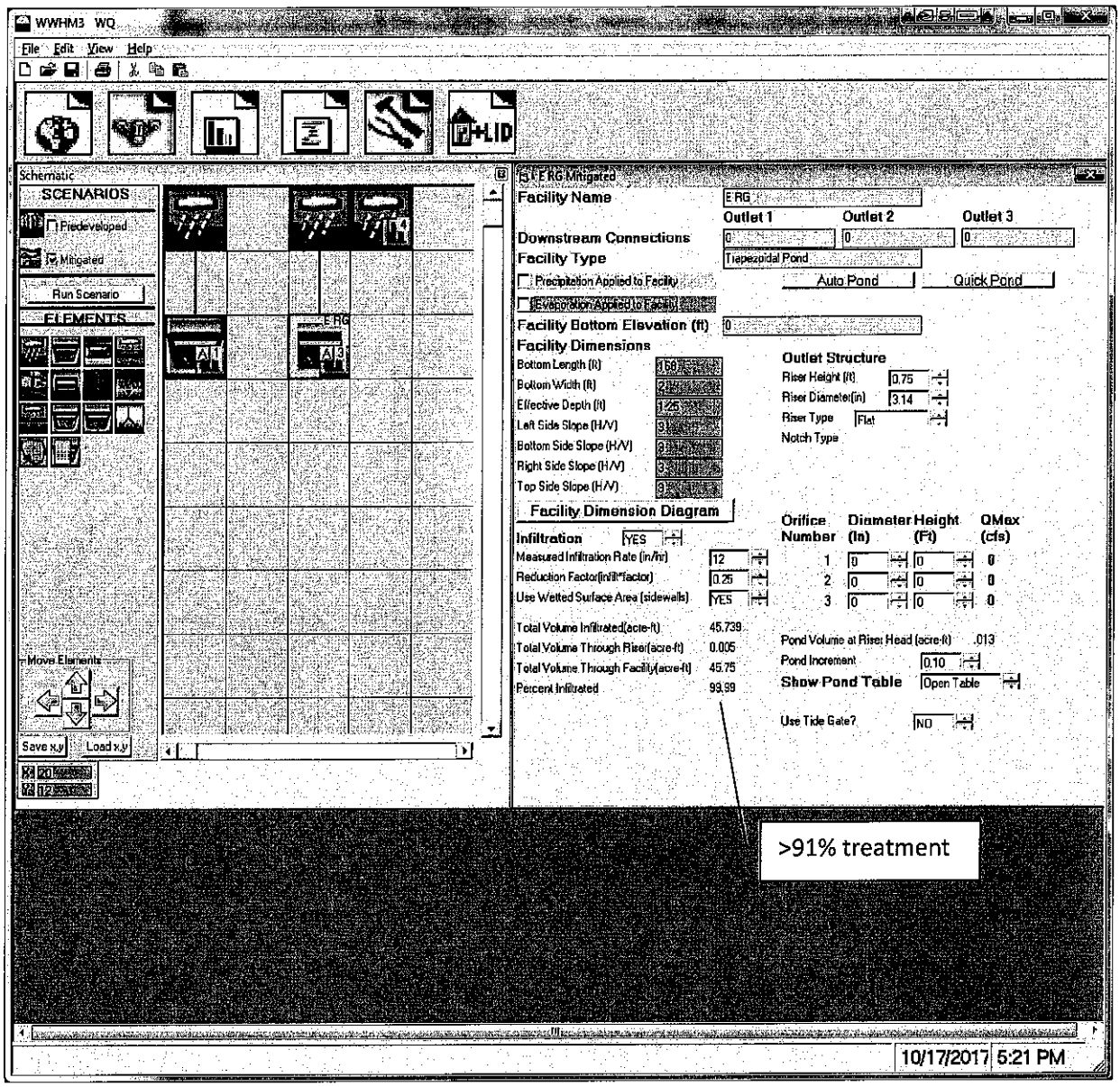
Maximum Stage in Cul De Sac Rain Garden



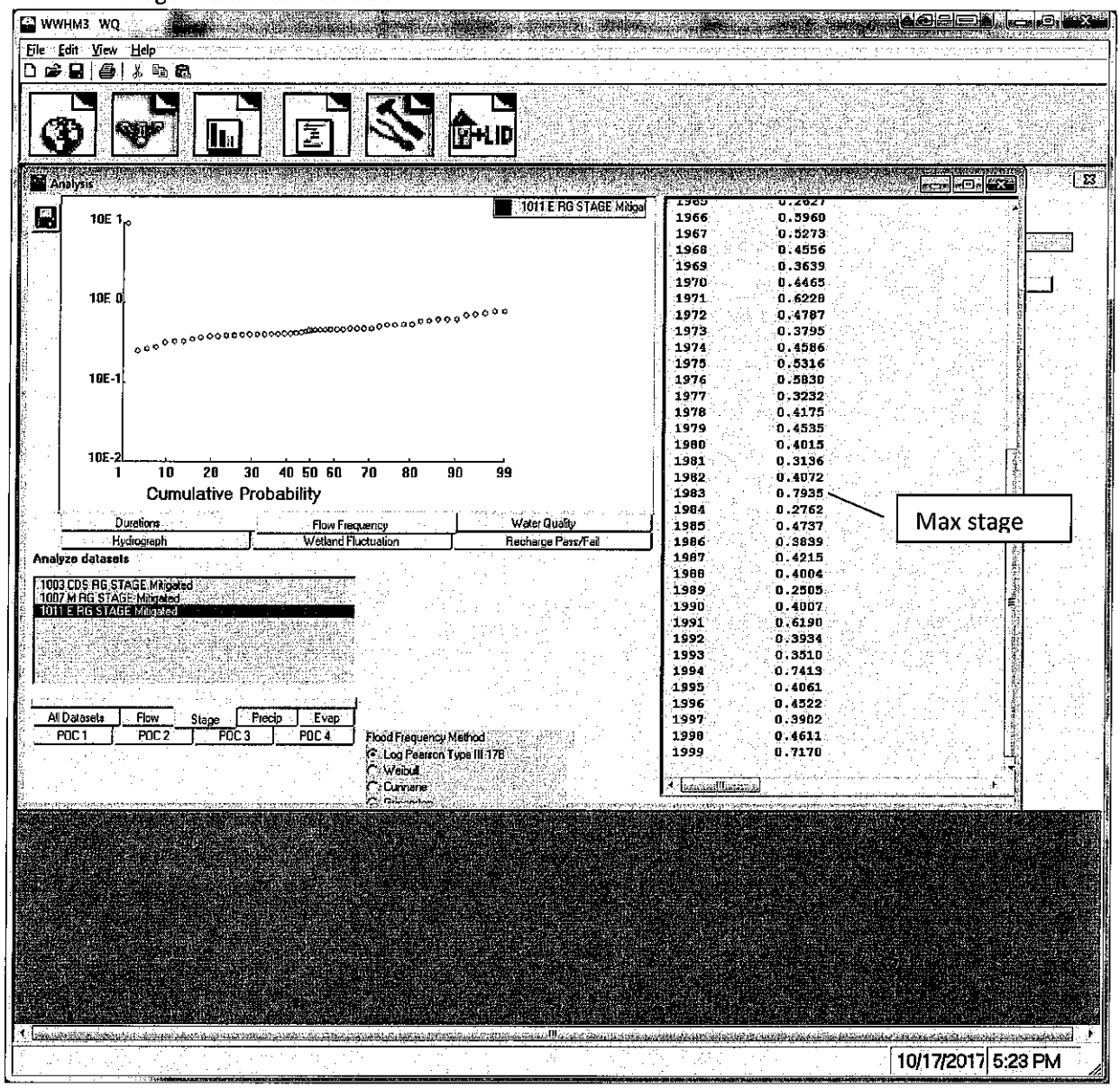
East Rain Garden Basin



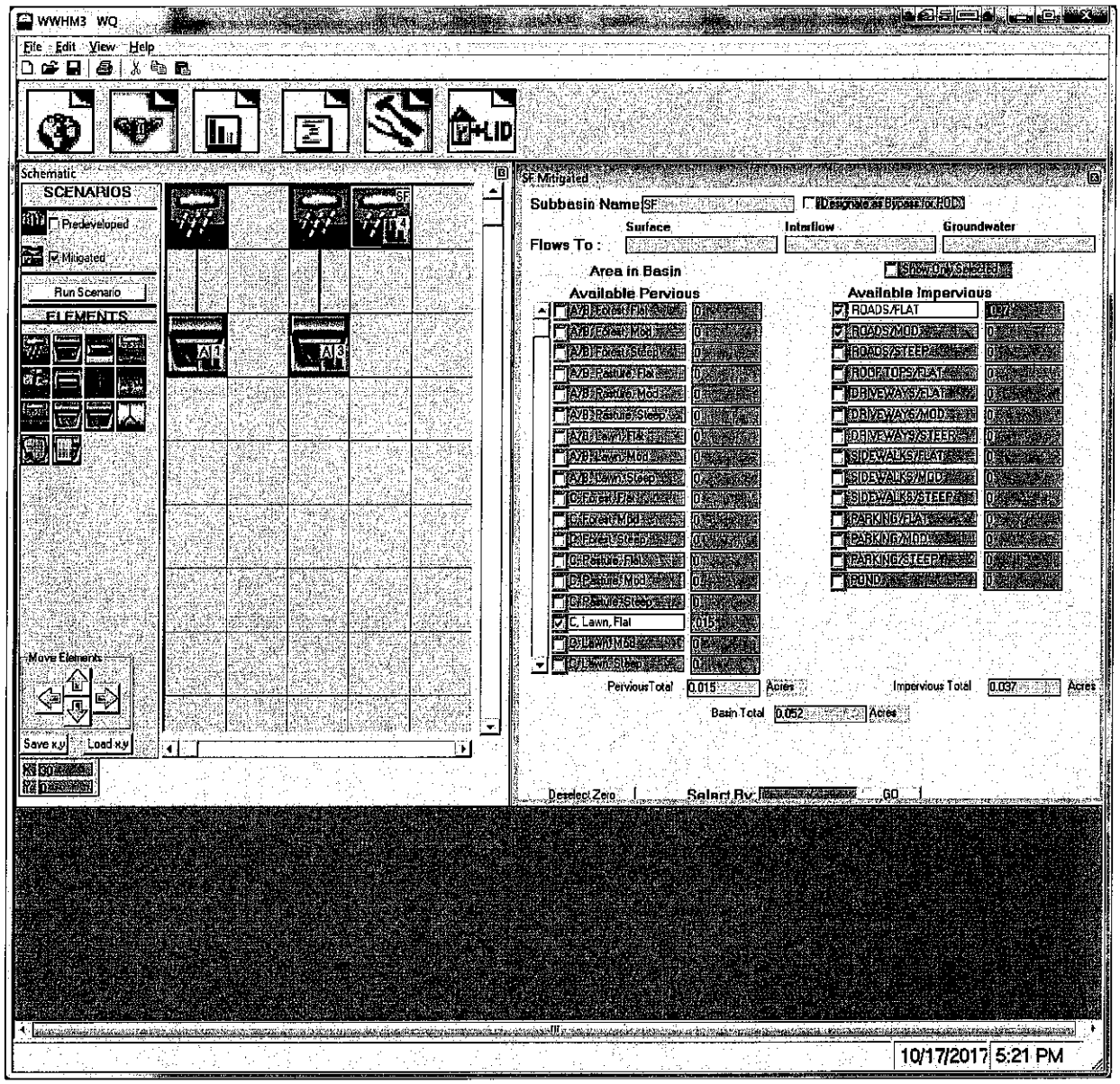
East Rain Garden Dimensions and Infiltration Performance



Maximum Stage in East Rain Garden



Stormfilter Basin Characteristics



Water Quality Flow Rate