



*Civil Engineering*

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Stevenson, WA 98648  
(425) 881-5904

August 20, 2023

City of Mercer Island  
Public Works Department  
Kevin Nguyen, PE  
9611 SE 36th Street  
Mercer Island, WA 98040

**RE: 2206-227, 4603 89th Ave. SE  
Post Permit Revision**

Dear Mr. Nguyen,

This letter accompanies plans for a post-permit revision. The revision consists of moving the proposed ADU east to attach to the proposed main house and incorporating a swim-spa area west of the ADU. The new ADU location encroaches on the proposed detention pipe location.

The new proposal is to reduce the footprint area of the detention pipe by increasing the diameter from 36 inches to 42 inches. The proposed building height has been reduced by 6 inches to facilitate this. The grades on the driveway outside the garage have been lifted 6 inches.

The proposed 42-inch diameter detention pipe was designed by matching rate control performance to that of a 48-inch diameter pipe designed per Table 1 of City's On-Site Detention Design Requirements document. The required 48-inch diameter pipe was input into a storm event model to determine required release rates. A summary of the performance data is attached. The proposed 42-inch diameter pipe has equivalent rate control performance to the 48-inch diameter pipe. Computer printouts are also attached.

Please call me if you have any questions.

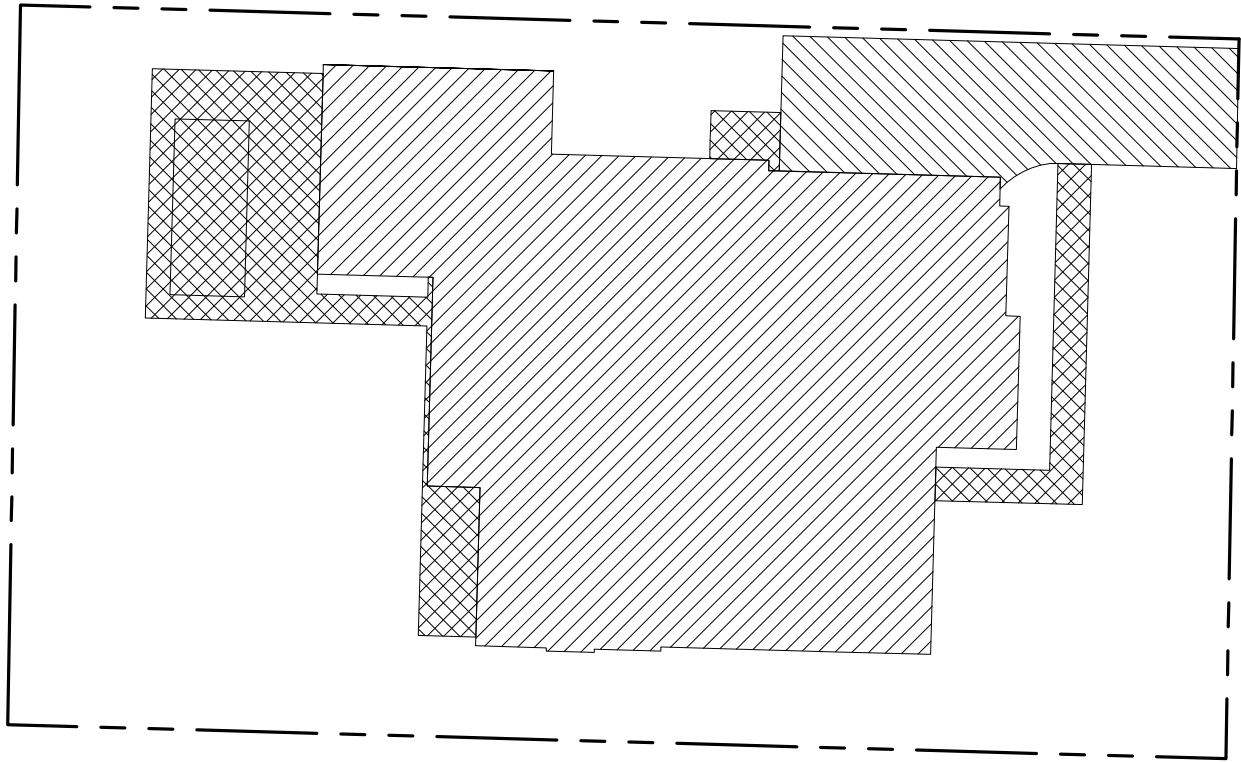
Very Truly Yours,

**NICK BOSSOFF ENGINEERING**


A handwritten signature in blue ink, appearing to read "N. Bossoff", with a long horizontal flourish extending to the right.

Nick Bossoff, P.E.  
Civil Engineer

Pipe Data					Flow Performance		
Pipe Diameter. (in)	Pipe Length (ft)	Low Orifice Dia. (in)	Outlet Invert to Upper Orifice (ft)	Upper Orifice Dia. (in)	2-yr Release (cfs)	10-yr Release (cfs)	100-yr Release (cfs)
42"	65	0.5	2.5	1.5	0.0077	0.0104	0.0331
48"	49	0.5	2.9	1.5	0.0082	0.0109	0.0341



AREAS

 ROOF: 3,178 SF

 DRIVEWAY: 636 SF

 PATIO & SIDEWALK: 805 SF

TOTAL HARD SURFACE: 4,619 SF



1"=20'

# HARD SURFACES

**Table 1**

ON-SITE DETENTION DESIGN FOR PROJECTS BETWEEN 500 SF AND 9,500 SF NEW PLUS REPLACED IMPERVIOUS SURFACE AREA

New and Replaced Impervious Surface Area (sf)	Detention Pipe Diameter (in)	Detention Pipe Length (ft)		Lowest Orifice Diameter (in) <sup>(3)</sup>		Distance from Outlet Invert to Second Orifice (ft)		Second Orifice Diameter (in)	
		B soils	C soils	B soils	C soils	B soils	C soils	B soils	C soils
500 to 1,000 sf	36"	30	22	0.5	0.5	2.2	2.0	0.5	0.8
	48"	18	11	0.5	0.5	3.3	3.2	0.9	0.8
	60"	11	7	0.5	0.5	4.2	3.4	0.5	0.6
1,001 to 2,000 sf	36"	66	43	0.5	0.5	2.2	2.3	0.9	1.4
	48"	34	23	0.5	0.5	3.2	3.3	0.9	1.2
	60"	22	14	0.5	0.5	4.3	3.6	0.9	0.9
2,001 to 3,000 sf	36"	90	66	0.5	0.5	2.2	2.4	0.9	1.9
	48"	48	36	0.5	0.5	3.1	2.8	0.9	1.5
	60"	30	20	0.5	0.5	4.2	3.7	0.9	1.1
3,001 to 4,000 sf	36"	120	78	0.5	0.5	2.4	2.2	1.4	1.6
	48"	62	42	0.5	0.5	2.8	2.9	0.8	1.3
	60"	42	26	0.5	0.5	3.8	3.9	0.9	1.3
4,001 to 5,000 sf	36"	134	91	0.5	0.5	2.8	2.2	1.7	1.5
	48"	73	49	0.5	0.5	3.6	2.9	1.6	1.5
	60"	46	31	0.5	0.5	4.6	3.5	1.6	1.3
5,001 to 6,000 sf	36"	162	109	0.5	0.5	2.7	2.2	1.8	1.6
	48"	90	59	0.5	0.5	3.5	2.9	1.7	1.5
	60"	54	37	0.5	0.5	4.6	3.6	1.6	1.4
6,001 to 7,000 sf	36"	192	128	0.5	0.5	2.7	2.2	1.9	1.8
	48"	102	68	0.5	0.5	3.7	2.9	1.9	1.6
	60"	64	43	0.5	0.5	4.6	3.6	1.8	1.5
7,001 to 8,000 sf	36"	216	146	0.5	0.5	2.8	2.2	2.0	1.9
	48"	119	79	0.5	0.5	3.8	2.9	2.2	1.7
	60"	73	49	0.5	0.5	4.5	3.6	2.0	1.6
8,001 to 8,500 sf <sup>(1)</sup>	36"	228	155	0.5	0.5	2.8	2.2	2.1	1.9
	48"	124	84	0.5	0.5	3.7	2.9	1.9	1.8
	60"	77	53	0.5	0.5	4.6	3.6	2.0	1.6
8,501 to 9,000 sf	36"	NA <sup>(1)</sup>	164	0.5	0.5	NA <sup>(1)</sup>	2.2	NA <sup>(1)</sup>	1.9
	48"	NA <sup>(1)</sup>	89	0.5	0.5	NA <sup>(1)</sup>	2.9	NA <sup>(1)</sup>	1.9
	60"	NA <sup>(1)</sup>	55	0.5	0.5	NA <sup>(1)</sup>	3.6	NA <sup>(1)</sup>	1.7
9,001 to 9,500 sf <sup>(2)</sup>	36"	NA <sup>(1)</sup>	174	0.5	0.5	NA <sup>(1)</sup>	2.2	NA <sup>(1)</sup>	2.1
	48"	NA <sup>(1)</sup>	94	0.5	0.5	NA <sup>(1)</sup>	2.9	NA <sup>(1)</sup>	2.0
	60"	NA <sup>(1)</sup>	58	0.5	0.5	NA <sup>(1)</sup>	3.7	NA <sup>(1)</sup>	1.7

**Notes:**

▪ Minimum Requirement #7 (Flow Control) is required when the 100-year flow frequency causes a 0.15 cubic feet per second increase (when modeled in WWHM with a 15-minute timestep). Breakpoints shown in this table are based on a flat slope (0-5%). The 100-year flow frequency will need to be evaluated on a site-specific basis for projects on moderate (5-15%) or steep (> 15%) slopes.

- Soil type to be determined by geotechnical analysis or soil map.
- Sizing includes a Volume Correction Factor of 120%.
- Upper bound contributing area used for sizing.

<sup>(1)</sup> On Type B soils, new plus replaced impervious surface areas exceeding 8,500 sf trigger Minimum Requirement #7 (Flow Control)

<sup>(2)</sup> On Type C soils, new plus replaced impervious surface areas exceeding 9,500 sf trigger Minimum Requirement #7 (Flow Control)

<sup>(3)</sup> Minimum orifice diameter = 0.5 inches

in = inch

ft = feet

sf = square feet

**Basis of Sizing Assumptions:**

Sized per MR#5 in the Stormwater Management Manual for Puget Sound Basin (1992 Ecology Manual)  
 SBUH, Type 1A, 24-hour hydrograph  
 2-year, 24-hour storm = 2 in; 10-year, 24-hour storm = 3 in; 100-year, 24-hour storm = 4 in  
 Predeveloped = second growth forest (CN = 72 for Type B soils, CN = 81 for Type C soils)  
 Developed = impervious (CN = 98)  
 0.5 foot of sediment storage in detention pipe  
 Overland slope = 5%



- SARC-2202
  - Basins
    - DV
    - DV18
    - DV24
    - DV3
    - EX
    - PROTOTYPE
  - Discharge
    - COMBO
    - PROTOTYPE
    - REST
    - REST 42"
    - RISER
  - Hydrographs
  - Layouts
    - Untitled
  - Nodes
    - 42" PIPE
    - PIPE
    - PROTOTYPE
    - RLP RL
    - RLP RL42"
  - Reaches

### Basin Definition: DV

Basin Data | Perv CN | Perv TC | Imperv CN | Imperv TC | Compute Design Event

Basin ID: DV

Select Rainfall Type: TYPE1A 24.00 hr

Hydrograph Method: SCS Method

Hyd Interval (min): 10

Peak Factor: 484

Tp Factor: 4

Summary Data:

Perv TC: 0.00 min

Imperv TC: 5.00 min

Area: 0.1150 ac



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  - Nodes
  - Reaches

**Basin Definition: DV**

Basin Data | Perv CN | Perv TC | Imperv CN | Imperv TC | Compute Design Event

Description:	Area (ac)	CN
<input type="text"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
Add		
Description:	SubArea	CN
None Entered	0.1150	98.00
Update		
Delete		
Abs Coeff:	Total :	0.1150 ac 98.00

OK Cancel Apply Help



- SARC-2202
  - Basins
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    - DV18
    - DV24
    - DV3
    - EX
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  - Discharge
    - COMBO
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    - REST
    - REST 42"
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    - PIPE
    - PROTOTYPE
    - RL
    - RL42"
  - Reaches

### Drainage Area Options

Select History File Commands 1

Add/Remove Conduit Defaults

Hyd Options

Default Labels

Extran Run Control

Program Configuration

**Project Precipitation Values**

	Descrip	Precip (in)
Precip 1	2 hr	2
Precip 2	10 hr	3
Precip 3	100 yr	4
Precip 4		
Precip 5		
Precip 6		

**Display Units**

U.S. Customary Units  
 S.I. Metric Units

Heading 1:

Heading 2:

Heading 3:

OK
Cancel
Apply
Help





SARC-2202

- Basins
  - DV
  - DV18
  - DV24
  - DV3
  - EX
  - PROTOTYPE
- Discharge
  - COMBO
  - PROTOTYPE
  - REST
  - REST 42"
  - RISER
- Hydrographs
- Layouts
  - Untitled
- Nodes
  - 42" PIPE
  - PIPE
  - PROTOTYPE
  - RLP RL
  - RLP RL42"
- Reaches

### Node Definition

Node Data | Undg Pipe

Node ID: 42" PIPE [New Node]

Descrip: 42" PIPE

Invert El (ft): 354.83    Crown El (ft): 358.33

Contrib Area: [ ] [Clear]

Contrib Hyd: [ ] [Clear]

North (ft): [0]    East [0]

Increm (ft): 0.1

Extran output option:

- Print Extran Head
- Plot Extran Head

Node Type

- Mh/CB/Inlet
- Vault
- Trap Pond
- Undg Pipe
- Stg-Sto
- RLPool
- Pipe Arch
- Ellipse Pipe
- Dummy Node

OK    Cancel    Apply    Help



- SARC-2202
  - Basins
    - DV
    - DV18
    - DV24
    - DV3
    - EX
    - PROTOTYPE
  - Discharge
    - COMBO
    - PROTOTYPE
    - REST
    - REST 42"
    - RISER
  - Hydrographs
  - Layouts
    - Untitled
  - Nodes
    - 42" PIPE
    - PIPE
    - PROTOTYPE
    - RLP RL
    - RLP RL42"
  - Reaches

### Node Definition

Node Data | Undg Pipe

Length (ft):  Up Node:

Diam (ft):  Dn Node:

Slope (%):  Num of pipes:

Maximum Volume: 625.3733 cf, 0.0144 acft  
(Note: Vol doesn't include Up or Dn Nodes!)



- SARC-2202
  - Basins
    - DV
    - DV18
    - DV24
    - DV3
    - EX
    - PROTOTYPE
  - Discharge
    - COMBO
    - PROTOTYPE
    - REST 42"
    - REST 48"
    - RISER
  - Hydrographs
  - Layouts
    - Untitled
  - Nodes
    - 42" PIPE
    - 48" PIPE
    - N-001
    - PROTOTYPE
    - RLP RL42"
    - RLP RL48"
  - Reaches

Discharge Control Definition: REST 42"

Discharge Data | Multiple Orifice

Discharge ID: REST 42"

New Control

Descr: Multiple Orifice

Outlet Inv (ft): 355.33

Max El (ft): 358.33

Increment (ft): 0.1

Select Control Type

- |   |                                    |
|---|------------------------------------|
| <input type="radio"/> BWeir               | <input type="radio"/> RWeir        |
| <input type="radio"/> Combo               | <input type="radio"/> VOrif        |
| <input type="radio"/> Culvert             | <input type="radio"/> VWeir        |
| <input checked="" type="radio"/> MOrifice | <input type="radio"/> Infiltration |
| <input type="radio"/> OWeir               | <input type="radio"/> Stg-Disch    |
| <input type="radio"/> Riser               | <input type="radio"/> Pump         |

 Treat as secondary discharge structure.

OK

Cancel

Apply

Help



- SARC-2202
  - Basins
    - DV
    - DV18
    - DV24
    - DV3
    - EX
    - PROTOTYPE
  - Discharge
    - COMBO
    - PROTOTYPE
    - REST
    - REST 42"
    - RISER
  - Hydrographs
  - Layouts
    - Untitled
  - Nodes
    - 42" PIPE
    - PIPE
    - PROTOTYPE
    - RLP RL
    - RLP RL42"
  - Reaches

Discharge Control Definition: REST 42"

Discharge Data Multiple Orifice

Orif Coeff: 0.62

Lowest Orif Elev (ft): 355.33

Lowest Diam (in): 0.5

Dist:3rd to 4th (ft): 0

Dist:Outlet to 2nd (ft): 2.5

4th Diam (in): 0

2nd Diam (in): 1.5

Dist:4th to 5th (ft): 0

Dist:2nd to 3rd (ft): 0

5th Diam (in): 0

3rd Diam (in): 0

OK

Cancel

Apply

Help



- SARC-2202
  - Basins
    - DV
    - DV18
    - DV24
    - DV3
    - EX
    - PROTOTYPE
  - Discharge
    - COMBO
    - PROTOTYPE
    - REST
    - REST 42"
    - RISER
  - Hydrographs
  - Layouts
    - Untitled
  - Nodes
    - 42" PIPE
    - PIPE
    - PROTOTYPE
    - RLP RL
    - RLP RL42"
  - Reaches

### Node Definition

Node Data | Level Pool Data

Node ID:

Descrip:

Start El (ft):  Max El (ft):

Contrib Area:

Contrib Hyd:

North (ft):  East

Increment (ft):

Extran output option:

- Print Extran Head
- Plot Extran Head

Node Type

- Mh/CB/Inlet
- Vault
- Trap Pond
- Undg Pipe
- Stg-Sto
- RLPool
- Pipe Arch
- Ellipse Pipe
- Dummy Node



- SARC-2202
  - Basins
    - DV
    - DV18
    - DV24
    - DV3
    - EX
    - PROTOTYPE
  - Discharge
    - COMBO
    - PROTOTYPE
    - REST
    - REST 42"
    - RISER
  - Hydrographs
  - Layouts
    - Untitled
  - Nodes
    - 42" PIPE
    - PIPE
    - PROTOTYPE
    - RLP RL
    - RLP RL42"
  - Reaches

Node Definition

Node Data | Level Pool Data

Storage ID: 42" PIPE Discharge ID: REST 42"

Summary Values:

Design Event:

Inflow Hyd: 0.00 cfs; 0.00 cf - 0.0000 acft

Out Hyd: 0.00 cfs; 0.00 cf - 0.0000 acft

Detention Vol: 0.00 cf - 0.0000 acft

Peak Stage: 0.0000 ft

OK Cancel Apply Help



SARC-2202

- Basins
  - DV
  - DV18
  - DV24
  - DV3
  - EX
  - PROTOTYPE
- Discharge
  - COMBO
  - PROTOTYPE
  - REST
  - REST 42"
  - RISER
- Hydrographs
- Layouts
  - Untitled
- Nodes
  - 42" PIPE
  - PIPE
  - PROTOTYPE
  - RLP RL
  - RLP RL42"
- Reaches

### Pond design

Level Pool Node Instruction Set:  Starting Stage:  ft

Design Event	Matching Hyd	% of Rate	Inflow Hyd	Out Hyd	
<input type="text" value="2 hr"/>	<input type="text" value="DV"/>	<input type="text" value="100"/>	<input type="text" value="DV"/>	<input type="text" value="OUT2"/>	<input type="button" value="Clear"/>
MatchQ=PeakQ= 0.0507 cfs Peak Out Q: 0.0077 cfs - Peak Stg: 356.61 ft - Active Vol: 318.95 cf - Pipe length: 65.00 ft					
<input type="text" value="10 hr"/>	<input type="text" value="DV"/>	<input type="text" value="100"/>	<input type="text" value="DV"/>	<input type="text" value="OUT10"/>	<input type="button" value="Clear"/>
MatchQ=PeakQ= 0.0778 cfs Peak Out Q: 0.0104 cfs - Peak Stg: 357.66 ft - Active Vol: 542.09 cf - Pipe length: 65.00 ft					
<input type="text" value="100 yr"/>	<input type="text" value="DV"/>	<input type="text" value="100"/>	<input type="text" value="DV"/>	<input type="text" value="OUT100"/>	<input type="button" value="Clear"/>
MatchQ=PeakQ= 0.1047 cfs Peak Out Q: 0.0331 cfs - Peak Stg: 357.96 ft - Active Vol: 589.89 cf - Pipe length: 65.00 ft					
<input type="text"/>	<input type="text"/>	<input type="text" value="100"/>	<input type="text"/>	<input type="text"/>	<input type="button" value="Clear"/>

Send detailed routing to history.  
 Exclude infiltration from control design.



- SARC-2202
  - Basins
    - DV
    - DV18
    - DV24
    - DV3
    - EX
    - PROTOTYPE
  - Discharge
    - COMBO
    - PROTOTYPE
    - REST 42"
    - REST 48"
    - RISER
  - Hydrographs
  - Layouts
    - Untitled
  - Nodes
    - 42" PIPE
    - 48" PIPE
    - N-001
    - PROTOTYPE
    - RLP RL
    - RLP RL42"
  - Reaches

Node Definition

Node Data | Undg Pipe

Node ID: 48" PIPE

Descrip: 48" PIPE

Invert El (ft): 354.83      Crown El (ft): 357.83

Contrib Area:

Contrib Hyd:

North (ft):       East

Increm (ft):

Extran output option:

Print Extran Head

Plot Extran Head

Node Type

- Mh/CB/Inlet
- Vault
- Trap Pond
- Undg Pipe
- Stg-Sto
- RLPool
- Pipe Arch
- Ellipse Pipe
- Dummy Node





- SARC-2202
  - Basins
    - DV
    - DV18
    - DV24
    - DV3
    - EX
    - PROTOTYPE
  - Discharge
    - COMBO
    - PROTOTYPE
    - REST 42"
    - REST 48"
    - RISER
  - Hydrographs
  - Layouts
    - Untitled
  - Nodes
    - 42" PIPE
    - 48" PIPE
    - N-001
    - PROTOTYPE
    - RLP RL42"
    - RLP RL48"
  - Reaches

### Node Definition

Node Data | Undg Pipe

Length (ft):       Up Node:

Diam (ft):       Dn Node:

Slope (%):       Num of pipes:

Maximum Volume: 615.7522 cf, 0.0141 acft  
(Note: Vol doesn't include Up or Dn Nodes!)



- SARC-2202
  - Basins
    - DV
    - DV18
    - DV24
    - DV3
    - EX
    - PROTOTYPE
  - Discharge
    - COMBO
    - PROTOTYPE
    - REST 42"
    - REST 48"
    - RISER
  - Hydrographs
  - Layouts
    - Untitled
  - Nodes
    - 42" PIPE
    - 48" PIPE
    - N-001
    - PROTOTYPE
    - RLP RL42"
    - RLP RL48"
  - Reaches

### Discharge Control Definition: REST 48"

Discharge Data | Multiple Orifice

Discharge ID: REST 48" New Control

Descip: Multiple Orifice

Outlet Inv (ft): 355.33

Max El (ft): 358.83

Increment (ft): 0.1

Select Control Type

- BWeir
- RWeir
- Combo
- VOrif
- Culvert
- VWeir
- MOrifice
- Infiltration
- OWeir
- Stg-Disch
- Riser
- Pump

Treat as secondary discharge structure.

OK Cancel Apply Help



- SARC-2202
  - Basins
    - DV
    - DV18
    - DV24
    - DV3
    - EX
    - PROTOTYPE
  - Discharge
    - COMBO
    - PROTOTYPE
    - REST 42"
    - REST 48"
    - RISER
  - Hydrographs
  - Layouts
    - Untitled
  - Nodes
    - 42" PIPE
    - PIPE
    - PROTOTYPE
    - RLP RL
    - RLP RL42"
  - Reaches

Discharge Control Definition: REST 48"

Discharge Data Multiple Orifice

Orif Coeff:	0.62	Lowest Orif Elev (ft):	355.33
Lowest Diam (in):	0.5	Dist:3rd to 4th (ft):	0
Dist:Outlet to 2nd (ft):	2.9	4th Diam (in):	0
2nd Diam (in):	1.5	Dist:4th to 5th (ft):	0
Dist:2nd to 3rd (ft):	0	5th Diam (in):	0
3rd Diam (in):	0		

OK Cancel Apply Help



- SARC-2202
  - Basins
    - DV
    - DV18
    - DV24
    - DV3
    - EX
    - PROTOTYPE
  - Discharge
    - COMBO
    - PROTOTYPE
    - REST 42"
    - REST 48"
    - RISER
  - Hydrographs
  - Layouts
    - Untitled
  - Nodes
    - 42" PIPE
    - 48" PIPE
    - N-001
    - PROTOTYPE
    - RLP RL42"
    - RLP RL48"
  - Reaches

### Node Definition

Node Data | Level Pool Data

Node ID:

Descrip:

Start El (ft):  Max El (ft):

Contrib Area:

Contrib Hyd:

North (ft):  East

Increm (ft):

Extran output option:

Print Extran Head

Plot Extran Head

Node Type

Mh/CB/Inlet

Vault

Trap Pond

Undg Pipe

Stg-Sto

RLPool

Pipe Arch

Ellipse Pipe

Dummy Node



- SARC-2202
  - Basins
    - DV
    - DV18
    - DV24
    - DV3
    - EX
    - PROTOTYPE
  - Discharge
    - COMBO
    - PROTOTYPE
    - REST 42"
    - REST 48"
    - RISER
  - Hydrographs
  - Layouts
    - Untitled
  - Nodes
    - 42" PIPE
    - 48" PIPE
    - N-001
    - PROTOTYPE
    - RLP RL42"
    - RLP RL48"
  - Reaches

Node Definition

Node Data | Level Pool Data

Storage ID 48" PIPE

Discharge ID REST 48"

Summary Values:

Design Event:

Inflow Hyd:

Out Hyd:

Detention Vol:

Peak Stage:

OK

Cancel

Apply

Help



- SARC-2202
- Basins
  - DV
  - DV18
  - DV24
  - DV3
  - EX
  - PROTOTYPE
- Discharge
  - COMBO
  - PROTOTYPE
  - REST 42"
  - REST 48"
  - RISER
- Hydrographs
- Layouts
  - Untitled
- Nodes
  - 42" PIPE
  - 48" PIPE
  - N-001
  - PROTOTYPE
  - RLP RL42"
  - RLP RL48"
- Reaches

### Pond design

Level Pool Node Instruction Set: RL48" Starting Stage: 354.83 ft

Design Event	Matching Hyd	% of Rate	Inflow Hyd	Out Hyd	
<span>2 hr</span>	<span>DV</span>	<span>100</span>	<span>DV</span>	<span>OUT2</span>	<span>Clear</span>
MatchQ=PeakQ= 0.0507 cfs Peak Out Q: 0.0082 cfs - Peak Stg: 356.78 ft - Active Vol: 298.82 cf - Pipe length: 49.00 ft					
<span>10 hr</span>	<span>DV</span>	<span>100</span>	<span>DV</span>	<span>OUT10</span>	<span>Clear</span>
MatchQ=PeakQ= 0.0778 cfs Peak Out Q: 0.0109 cfs - Peak Stg: 357.93 ft - Active Vol: 512.66 cf - Pipe length: 49.00 ft					
<span>100 yr</span>	<span>DV</span>	<span>100</span>	<span>DV</span>	<span>OUT100</span>	<span>Clear</span>
MatchQ=PeakQ= 0.1047 cfs Peak Out Q: 0.0341 cfs - Peak Stg: 358.36 ft - Active Vol: 575.38 cf - Pipe length: 49.00 ft					
		<span>100</span>			<span>Clear</span>

Create Report Macro
Edit Storage
Edit Control

Compute

Send detailed routing to history.  
 Exclude infiltration from control design.

Size Outlet
Close