Appendix C

Hydrologic and Hydraulic Calculations

DRAFT

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.31
Program License Number: 200510005
Run Date: 03/30/2014 3:49 PM

Input File Name: TDA 1.fld
Project Name: ELST - S Sammamish
Analysis Title: TDA 1 Flow Analysis
Comments: STA 216+76 to STA 226+50

——————————————— PRECIPITATION INPUT ———————————————

Computational Time Step (Minutes): 60

Extended Precipitation Timeseries Selected
Climatic Region Number: 13

Full Period of Record Available used for Routing
Precipitation Station : 96004005 Puget East 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** **WATERSHED DEFINITION** **********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : STA 216+76 to STA 226+50 ----------

	-------Area(Acres) --------
Till Forest	0.210
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.000
Subbasin Total	0.210

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1

---------- Subbasin : STA 216+76 to STA 226+50 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.210
Subbasin Total	0.210

********** **LINK DATA** **********

----------SCENARIO: PREDEVELOPED
Number of Links: 0

********** **LINK DATA** **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 0

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1
Number of Links: 0

*************Groundwater Recharge Summary ***************
Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: STA 216+76 to STA 22	36.411
Total:	36.411

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: STA 216+76 to STA 22	0.000
Total:	0.000

Total Predevelopment Recharge is Greater than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 0.230 ac-ft/year, Post Developed: 0.000 ac-ft/year

*************Water Quality Facility Data ***************

----------SCENARIO: PREDEVELOPED

Number of Links: 0

----------SCENARIO: POSTDEVELOPED

Number of Links: 0

*************Compliance Point Results ***************

Scenario Predeveloped Compliance Subbasin: STA 216+76 to STA 226+50

Scenario Postdeveloped Compliance Subbasin: STA 216+76 to STA 226+50

***** Point of Compliance Flow Frequency Data *****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	4.459E-03	2-Year	5.846E-02
5-Year	7.610E-03	5-Year	7.509E-02
10-Year	9.469E-03	10-Year	8.375E-02
25-Year	1.222E-02	25-Year	9.790E-02
50-Year	1.471E-02	50-Year	0.109
100-Year	1.766E-02	100-Year	0.123
200-Year	2.388E-02	200-Year	0.130

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

****** Flow Duration Performance ******

Excursion at Predeveloped 50%Q2 (Must be Less Than 0%):	676.6%	FAIL
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than 0%):	3258.8%	FAIL
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	99999.0%	FAIL
Percent Excursion from Q2 to Q50 (Must be less than 50%):	100.0%	FAIL

FLOW DURATION DESIGN CRITERIA: FAIL

****** LID Duration Performance ******

Excursion at Predeveloped 8%Q2 (Must be Less Than 0%):	47.9%	FAIL
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%):	676.6%	FAIL

LID DURATION DESIGN CRITERIA: FAIL

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.31
Program License Number: 200510005
Run Date: 03/30/2014 3:52 PM

Input File Name: TDA 2.fld
Project Name: ELST - S Sammamish
Analysis Title: TDA 2 Flow Analysis
Comments: STA 226+50 to STA 229+15

——————————————— PRECIPITATION INPUT ———————————————

Computational Time Step (Minutes): 60

Extended Precipitation Timeseries Selected
Climatic Region Number: 13

Full Period of Record Available used for Routing
Precipitation Station : 96004005 Puget East 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** **WATERSHED DEFINITION** **********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : STA 226+50 to STA 229+15 ----------

	-------Area(Acres) --------
Till Forest	0.240
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.000
Subbasin Total	0.240

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1

---------- Subbasin : STA 226+50 to STA 229+15 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.240
Subbasin Total	0.240

********** **LINK DATA** **********

----------SCENARIO: PREDEVELOPED
Number of Links: 0

********** **LINK DATA** **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 0

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1
Number of Links: 0

*************Groundwater Recharge Summary ***************
Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Model Element	Total Predeveloped Recharge During Simulation Recharge Amount (ac-ft)
Subbasin: STA 226+50 to STA 22	41.613
Total:	41.613

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: STA 226+50 to STA 22	0.000
Total:	0.000

Total Predevelopment Recharge is Greater than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 0.263 ac-ft/year, Post Developed: 0.000 ac-ft/year

*************Water Quality Facility Data ***************

----------SCENARIO: PREDEVELOPED

Number of Links: 0

----------SCENARIO: POSTDEVELOPED

Number of Links: 0

*************Compliance Point Results ***************

Scenario Predeveloped Compliance Subbasin: STA 226+50 to STA 229+15

Scenario Postdeveloped Compliance Subbasin: STA 226+50 to STA 229+15

***** Point of Compliance Flow Frequency Data *****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	5.096E-03	2-Year	6.681E-02
5-Year	8.697E-03	5-Year	8.581E-02
10-Year	1.082E-02	10-Year	9.572E-02
25-Year	1.396E-02	25-Year	0.112
50-Year	1.681E-02	50-Year	0.124
100-Year	2.018E-02	100-Year	0.140
200-Year	2.729E-02	200-Year	0.148

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

****** Flow Duration Performance ******

Excursion at Predeveloped 50%Q2 (Must be Less Than 0%):	676.6%	FAIL
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than 0%):	3258.8%	FAIL
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	99999.0%	FAIL
Percent Excursion from Q2 to Q50 (Must be less than 50%):	100.0%	FAIL

FLOW DURATION DESIGN CRITERIA: FAIL

****** LID Duration Performance ******

Excursion at Predeveloped 8%Q2 (Must be Less Than 0%):	47.9%	FAIL
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%):	676.6%	FAIL

LID DURATION DESIGN CRITERIA: FAIL

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.31
Program License Number: 200510005
Run Date: 03/30/2014 3:55 PM

Input File Name: TDA 3.fld
Project Name: ELST - S Sammamish
Analysis Title: TDA 3 Flow Analysis
Comments: STA 229+15 to STA 234+50

——————————————— PRECIPITATION INPUT ———————————————

Computational Time Step (Minutes): 60

Extended Precipitation Timeseries Selected
Climatic Region Number: 13

Full Period of Record Available used for Routing
Precipitation Station : 96004005 Puget East 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** **WATERSHED DEFINITION** **********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : STA 229+15 to STA 234+50 ----------

	-------Area(Acres) --------
Till Forest	0.200
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.000
Subbasin Total	0.200

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1

---------- Subbasin : STA 229+15 to STA 234+50 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.200
Subbasin Total	0.200

********** **LINK DATA** **********

----------SCENARIO: PREDEVELOPED
Number of Links: 0

********** **LINK DATA** **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 0

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1
Number of Links: 0

*************Groundwater Recharge Summary ***************
Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: STA 229+15 to STA 23	34.677
Total:	34.677

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: STA 229+15 to STA 23	0.000
Total:	0.000

Total Predevelopment Recharge is Greater than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 0.219 ac-ft/year, Post Developed: 0.000 ac-ft/year

*************Water Quality Facility Data ***************

----------SCENARIO: PREDEVELOPED

Number of Links: 0

----------SCENARIO: POSTDEVELOPED

Number of Links: 0

*************Compliance Point Results ***************

Scenario Predeveloped Compliance Subbasin: STA 229+15 to STA 234+50

Scenario Postdeveloped Compliance Subbasin: STA 229+15 to STA 234+50

***** Point of Compliance Flow Frequency Data *****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	4.246E-03	2-Year	5.568E-02
5-Year	7.247E-03	5-Year	7.151E-02
10-Year	9.018E-03	10-Year	7.976E-02
25-Year	1.164E-02	25-Year	9.324E-02
50-Year	1.401E-02	50-Year	0.104
100-Year	1.682E-02	100-Year	0.117
200-Year	2.274E-02	200-Year	0.124

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

****** Flow Duration Performance ******

Excursion at Predeveloped 50%Q2 (Must be Less Than 0%):	676.6%	FAIL
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than 0%):	3258.8%	FAIL
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	99999.0%	FAIL
Percent Excursion from Q2 to Q50 (Must be less than 50%):	100.0%	FAIL

FLOW DURATION DESIGN CRITERIA: FAIL

****** LID Duration Performance ******

Excursion at Predeveloped 8%Q2 (Must be Less Than 0%):	47.9%	FAIL
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%):	676.6%	FAIL

LID DURATION DESIGN CRITERIA: FAIL

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.31
Program License Number: 200510005
Run Date: 03/30/2014 3:58 PM

Input File Name: TDA 4.fld
Project Name: ELST - S Sammamish
Analysis Title: TDA 4 Flow Analysis
Comments: STA 234+50 to STA 239+00

——————————————— PRECIPITATION INPUT ———————————————

Computational Time Step (Minutes): 60

Extended Precipitation Timeseries Selected
Climatic Region Number: 13

Full Period of Record Available used for Routing
Precipitation Station : 96004005 Puget East 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** **WATERSHED DEFINITION** **********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : STA 234+50 to STA 239+00 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.170
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.000
Subbasin Total	0.170

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1

---------- Subbasin : STA 234+50 to STA 239+00 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.170
Subbasin Total	0.170

********** **LINK DATA** **********

----------SCENARIO: PREDEVELOPED
Number of Links: 0

********** **LINK DATA** **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 0

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1
Number of Links: 0

*************Groundwater Recharge Summary ***************
Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: STA 234+50 to STA 23	45.199
Total:	45.199

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: STA 234+50 to STA 23	0.000
Total:	0.000

Total Predevelopment Recharge is Greater than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 0.286 ac-ft/year, Post Developed: 0.000 ac-ft/year

*************Water Quality Facility Data ***************

----------SCENARIO: PREDEVELOPED

Number of Links: 0

----------SCENARIO: POSTDEVELOPED

Number of Links: 0

*************Compliance Point Results ***************

Scenario Predeveloped Compliance Subbasin: STA 234+50 to STA 239+00

Scenario Postdeveloped Compliance Subbasin: STA 234+50 to STA 239+00

***** Point of Compliance Flow Frequency Data *****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	3.336E-05	2-Year	4.733E-02
5-Year	3.405E-05	5-Year	6.078E-02
10-Year	3.423E-05	10-Year	6.780E-02
25-Year	7.929E-05	25-Year	7.925E-02
50-Year	1.573E-04	50-Year	8.812E-02
100-Year	2.433E-04	100-Year	9.938E-02
200-Year	4.378E-04	200-Year	0.105

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

****** Flow Duration Performance ******

Excursion at Predeveloped 50%Q2 (Must be Less Than 0%):	10591.3%	FAIL
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than 0%):	99999.0%	FAIL
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	99999.0%	FAIL
Percent Excursion from Q2 to Q50 (Must be less than 50%):	100.0%	FAIL

FLOW DURATION DESIGN CRITERIA: FAIL

****** LID Duration Performance ******

Excursion at Predeveloped 8%Q2 (Must be Less Than 0%):	2225.8%	FAIL
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%):	99999.0%	FAIL

LID DURATION DESIGN CRITERIA: FAIL

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.31
Program License Number: 200510005
Run Date: 03/30/2014 4:00 PM

Input File Name: TDA 5.fld
Project Name: ELST - S Sammamish
Analysis Title: TDA 5 Flow Analysis
Comments: STA 239+00 to STA 241+50

——————————————— PRECIPITATION INPUT ———————————————

Computational Time Step (Minutes): 60

Extended Precipitation Timeseries Selected
Climatic Region Number: 13

Full Period of Record Available used for Routing
Precipitation Station : 96004005 Puget East 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** **WATERSHED DEFINITION** **********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : STA 239+00 to STA 241+50 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.090
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.000
Subbasin Total	0.090

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1

---------- Subbasin : STA 239+00 to STA 241+50 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.090
Subbasin Total	0.090

********** **LINK DATA** **********

----------SCENARIO: PREDEVELOPED
Number of Links: 0

********** **LINK DATA** **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 0

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1
Number of Links: 0

*************Groundwater Recharge Summary ***************
Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: STA 239+00 to STA 24	23.929
Total:	23.929

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: STA 239+00 to STA 24	0.000
Total:	0.000

Total Predevelopment Recharge is Greater than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 0.151 ac-ft/year, Post Developed: 0.000 ac-ft/year

*************Water Quality Facility Data ***************

----------SCENARIO: PREDEVELOPED

Number of Links: 0

----------SCENARIO: POSTDEVELOPED

Number of Links: 0

*************Compliance Point Results ***************

Scenario Predeveloped Compliance Subbasin: STA 239+00 to STA 241+50

Scenario Postdeveloped Compliance Subbasin: STA 239+00 to STA 241+50

***** Point of Compliance Flow Frequency Data *****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	1.766E-05	2-Year	2.505E-02
5-Year	1.803E-05	5-Year	3.218E-02
10-Year	1.812E-05	10-Year	3.589E-02
25-Year	4.198E-05	25-Year	4.196E-02
50-Year	8.328E-05	50-Year	4.665E-02
100-Year	1.288E-04	100-Year	5.261E-02
200-Year	2.318E-04	200-Year	5.565E-02

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

****** Flow Duration Performance ******

Excursion at Predeveloped 50%Q2 (Must be Less Than 0%):	10591.3%	FAIL
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than 0%):	99999.0%	FAIL
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	99999.0%	FAIL
Percent Excursion from Q2 to Q50 (Must be less than 50%):	100.0%	FAIL

FLOW DURATION DESIGN CRITERIA: FAIL

****** LID Duration Performance ******

Excursion at Predeveloped 8%Q2 (Must be Less Than 0%):	2225.8%	FAIL
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%):	99999.0%	FAIL

LID DURATION DESIGN CRITERIA: FAIL

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.31
Program License Number: 200510005
Run Date: 03/30/2014 4:03 PM

Input File Name: TDA 6.fld
Project Name: ELST - S Sammamish
Analysis Title: TDA 6 Flow Analysis
Comments: STA 241+50 to STA 244+05

——————————————— PRECIPITATION INPUT ———————————————

Computational Time Step (Minutes): 60

Extended Precipitation Timeseries Selected
Climatic Region Number: 13

Full Period of Record Available used for Routing
Precipitation Station : 96004005 Puget East 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** **WATERSHED DEFINITION** **********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : STA 241+50 to STA 244+05 ----------

	-------Area(Acres) --------
Till Forest	0.090
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.000
Subbasin Total	0.090

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1

---------- Subbasin : STA 241+50 to STA 244+05 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.090
Subbasin Total	0.090

********** **LINK DATA** **********

----------SCENARIO: PREDEVELOPED
Number of Links: 0

********** **LINK DATA** **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 0

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1
Number of Links: 0

*************Groundwater Recharge Summary ***************
Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: STA 241+50 to STA 24	15.605
Total:	15.605

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: STA 241+50 to STA 24	0.000
Total:	0.000

Total Predevelopment Recharge is Greater than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 0.099 ac-ft/year, Post Developed: 0.000 ac-ft/year

*************Water Quality Facility Data ***************

----------SCENARIO: PREDEVELOPED

Number of Links: 0

----------SCENARIO: POSTDEVELOPED

Number of Links: 0

*************Compliance Point Results ***************

Scenario Predeveloped Compliance Subbasin: STA 241+50 to STA 244+05

Scenario Postdeveloped Compliance Subbasin: STA 241+50 to STA 244+05

***** Point of Compliance Flow Frequency Data *****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	1.911E-03	2-Year	2.505E-02
5-Year	3.261E-03	5-Year	3.218E-02
10-Year	4.058E-03	10-Year	3.589E-02
25-Year	5.236E-03	25-Year	4.196E-02
50-Year	6.304E-03	50-Year	4.665E-02
100-Year	7.567E-03	100-Year	5.261E-02
200-Year	1.023E-02	200-Year	5.565E-02

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

****** Flow Duration Performance ******

Excursion at Predeveloped 50%Q2 (Must be Less Than 0%):	676.6%	FAIL
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than 0%):	3258.8%	FAIL
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	99999.0%	FAIL
Percent Excursion from Q2 to Q50 (Must be less than 50%):	100.0%	FAIL

FLOW DURATION DESIGN CRITERIA: FAIL

****** LID Duration Performance ******

Excursion at Predeveloped 8%Q2 (Must be Less Than 0%):	47.9%	FAIL
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%):	676.6%	FAIL

LID DURATION DESIGN CRITERIA: FAIL

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.31
Program License Number: 200510005
Run Date: 03/30/2014 4:05 PM

Input File Name: TDA 7.fld
Project Name: ELST - S Sammamish
Analysis Title: TDA 7 Flow Analysis
Comments: STA 244+05 to STA 249+25

——————————————— PRECIPITATION INPUT ———————————————

Computational Time Step (Minutes): 60

Extended Precipitation Timeseries Selected
Climatic Region Number: 13

Full Period of Record Available used for Routing
Precipitation Station : 96004005 Puget East 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** **WATERSHED DEFINITION** **********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : STA 244+05 to STA 249+25 ----------

	-------Area(Acres) --------
Till Forest	0.190
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.000
Subbasin Total	0.190

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1

---------- Subbasin : STA 244+05 to STA 249+25 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.190
Subbasin Total	0.190

********** **LINK DATA** **********

----------SCENARIO: PREDEVELOPED
Number of Links: 0

********** **LINK DATA** **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 0

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1
Number of Links: 0

*************Groundwater Recharge Summary ***************
Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: STA 244+05 to STA 24	32.944
Total:	32.944

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: STA 244+05 to STA 24	0.000
Total:	0.000

Total Predevelopment Recharge is Greater than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 0.209 ac-ft/year, Post Developed: 0.000 ac-ft/year

*************Water Quality Facility Data ***************

----------SCENARIO: PREDEVELOPED

Number of Links: 0

----------SCENARIO: POSTDEVELOPED

Number of Links: 0

*************Compliance Point Results ***************

Scenario Predeveloped Compliance Subbasin: STA 244+05 to STA 249+25

Scenario Postdeveloped Compliance Subbasin: STA 244+05 to STA 249+25

***** Point of Compliance Flow Frequency Data *****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	4.034E-03	2-Year	5.289E-02
5-Year	6.885E-03	5-Year	6.794E-02
10-Year	8.567E-03	10-Year	7.578E-02
25-Year	1.105E-02	25-Year	8.858E-02
50-Year	1.331E-02	50-Year	9.849E-02
100-Year	1.598E-02	100-Year	0.111
200-Year	2.160E-02	200-Year	0.117

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

****** Flow Duration Performance ******

Excursion at Predeveloped 50%Q2 (Must be Less Than 0%):	676.6%	FAIL
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than 0%):	3258.8%	FAIL
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	99999.0%	FAIL
Percent Excursion from Q2 to Q50 (Must be less than 50%):	100.0%	FAIL

FLOW DURATION DESIGN CRITERIA: FAIL

****** LID Duration Performance ******

Excursion at Predeveloped 8%Q2 (Must be Less Than 0%):	47.9%	FAIL
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%):	676.6%	FAIL

LID DURATION DESIGN CRITERIA: FAIL

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.31
Program License Number: 200510005
Run Date: 07/30/2014 12:17 PM

Input File Name: TDA 8.fld
Project Name: ELST - S Sammamish
Analysis Title: TDA 8 Flow Analysis
Comments: STA 249+25 to STA 261+50, Impervious areas to Infiltration Trenches are included in this analysis.

——————————————— PRECIPITATION INPUT ———————————————

Computational Time Step (Minutes): 60

Extended Precipitation Timeseries Selected
Climatic Region Number: 13

Full Period of Record Available used for Routing
Precipitation Station : 96004005 Puget East 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** **WATERSHED DEFINITION** **********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : STA 249+25 to STA 261+50 ----------

	-------Area(Acres) --------
Till Forest	0.250
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.200
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.000

Subbasin Total 0.450

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1

---------- Subbasin : STA 249+25 to STA 261+50 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.450
Subbasin Total	0.450

********** **LINK DATA** **********

----------SCENARIO: PREDEVELOPED
Number of Links: 0

********** **LINK DATA** **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 0

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1
Number of Links: 0

**********Groundwater Recharge Summary **********
Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: STA 249+25 to STA 26	96.523
Total:	96.523

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: STA 249+25 to STA 26	0.000
Total:	0.000

Total Predevelopment Recharge is Greater than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 0.611 ac-ft/year, Post Developed: 0.000 ac-ft/year

*************Water Quality Facility Data ***************

----------SCENARIO: PREDEVELOPED

Number of Links: 0

----------SCENARIO: POSTDEVELOPED

Number of Links: 0

*************Compliance Point Results ***************

Scenario Predeveloped Compliance Subbasin: STA 249+25 to STA 261+50

Scenario Postdeveloped Compliance Subbasin: STA 249+25 to STA 261+50

***** Point of Compliance Flow Frequency Data *****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	5.314E-03	2-Year	0.125
5-Year	9.065E-03	5-Year	0.161
10-Year	1.129E-02	10-Year	0.179
25-Year	1.462E-02	25-Year	0.210
50-Year	1.752E-02	50-Year	0.233
100-Year	2.116E-02	100-Year	0.263
200-Year	2.851E-02	200-Year	0.278

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

****** Flow Duration Performance ******

Excursion at Predeveloped 50%Q2 (Must be Less Than 0%):	963.3%	FAIL
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than 0%):	5056.0%	FAIL
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	99999.0%	FAIL
Percent Excursion from Q2 to Q50 (Must be less than 50%):	100.0%	FAIL

FLOW DURATION DESIGN CRITERIA: FAIL

****** LID Duration Performance ******

Excursion at Predeveloped 8%Q2 (Must be Less Than 0%):	73.2%	FAIL
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%):	963.3%	FAIL

LID DURATION DESIGN CRITERIA: FAIL

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.31
Program License Number: 200510005
Run Date: 07/30/2014 12:19 PM

Input File Name: TDA 9.fld
Project Name: ELST - S Sammamish
Analysis Title: TDA 9 Flow Analysis
Comments: STA 261+50 to STA 283+02

——————————————— PRECIPITATION INPUT ———————————————

Computational Time Step (Minutes): 60

Extended Precipitation Timeseries Selected
Climatic Region Number: 13

Full Period of Record Available used for Routing
Precipitation Station : 96004005 Puget East 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** **WATERSHED DEFINITION** **********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : STA 261+50 to STA 283+02 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.820
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.000
Subbasin Total	0.820

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1

---------- Subbasin : STA 261+50 to STA 283+02 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.820
Subbasin Total	0.820

********** **LINK DATA** **********

----------SCENARIO: PREDEVELOPED
Number of Links: 0

********** **LINK DATA** **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 0

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1
Number of Links: 0

*************Groundwater Recharge Summary ***************
Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Model Element	Total Predeveloped Recharge During Simulation Recharge Amount (ac-ft)
Subbasin: STA 261+50 to STA 28	218.021
Total:	218.021

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: STA 261+50 to STA 28	0.000
Total:	0.000

Total Predevelopment Recharge is Greater than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 1.380 ac-ft/year, Post Developed: 0.000 ac-ft/year

*************Water Quality Facility Data ***************

----------SCENARIO: PREDEVELOPED

Number of Links: 0

----------SCENARIO: POSTDEVELOPED

Number of Links: 0

*************Compliance Point Results ***************

Scenario Predeveloped Compliance Subbasin: STA 261+50 to STA 283+02

Scenario Postdeveloped Compliance Subbasin: STA 261+50 to STA 283+02

***** Point of Compliance Flow Frequency Data *****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	1.609E-04	2-Year	0.228
5-Year	1.643E-04	5-Year	0.293
10-Year	1.651E-04	10-Year	0.327
25-Year	3.825E-04	25-Year	0.382
50-Year	7.588E-04	50-Year	0.425
100-Year	1.174E-03	100-Year	0.479
200-Year	2.112E-03	200-Year	0.507

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

****** Flow Duration Performance ******

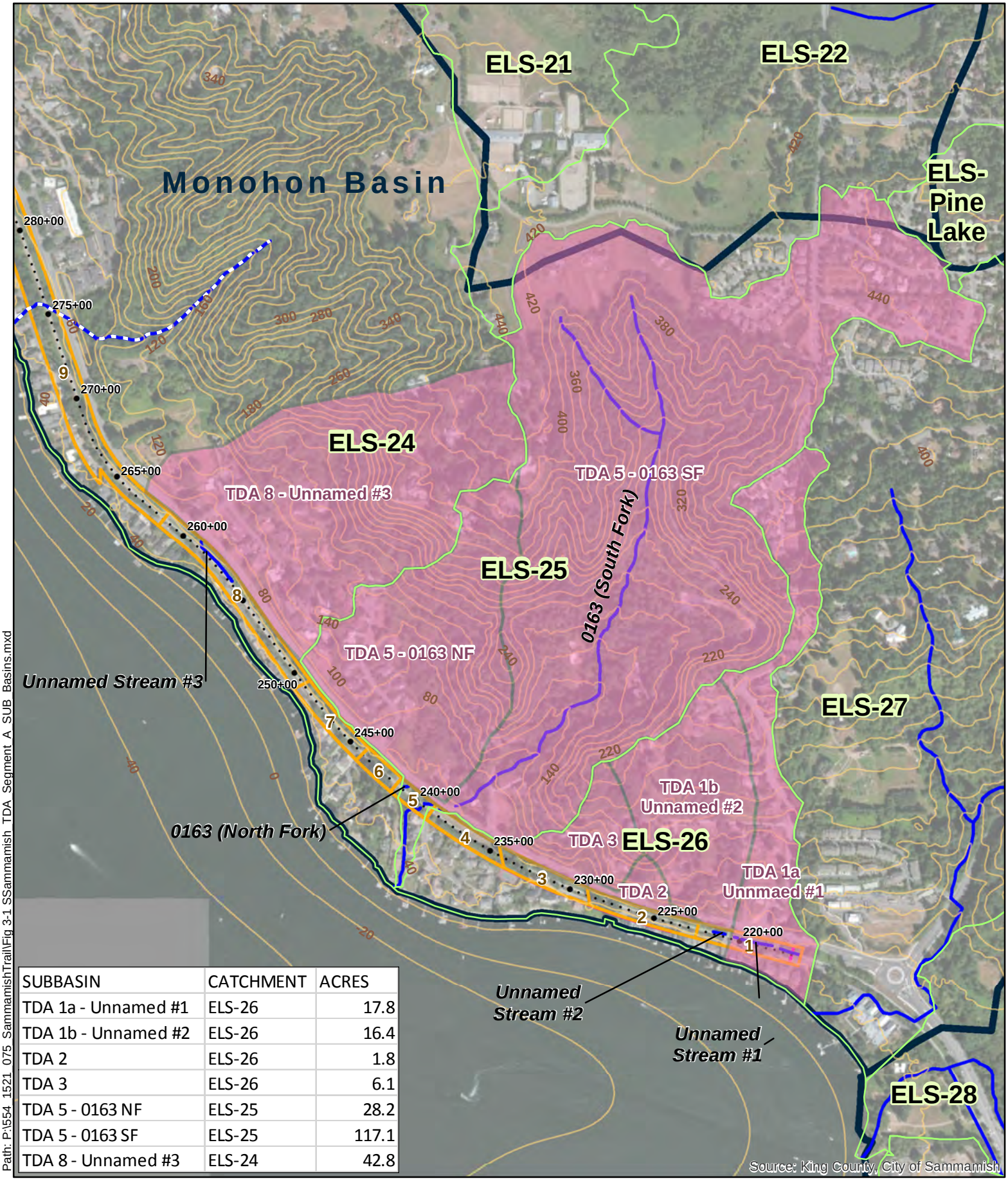
Excursion at Predeveloped 50%Q2 (Must be Less Than 0%):	10591.3%	FAIL
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than 0%):	99999.0%	FAIL
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	99999.0%	FAIL
Percent Excursion from Q2 to Q50 (Must be less than 50%):	100.0%	FAIL

FLOW DURATION DESIGN CRITERIA: FAIL

****** LID Duration Performance ******

Excursion at Predeveloped 8%Q2 (Must be Less Than 0%):	2225.8%	FAIL
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%):	99999.0%	FAIL

LID DURATION DESIGN CRITERIA: FAIL



SUBBASIN	CATCHMENT	ACRES
TDA 1a - Unnamed #1	ELS-26	17.8
TDA 1b - Unnamed #2	ELS-26	16.4
TDA 2	ELS-26	1.8
TDA 3	ELS-26	6.1
TDA 5 - 0163 NF	ELS-25	28.2
TDA 5 - 0163 SF	ELS-25	117.1
TDA 8 - Unnamed #3	ELS-24	42.8

Path: P:\554 1521 075 SammamishTrail\Fig 3-1 SSammamish TDA Segment A SUB Basins.mxd

Parametrix

N

0 500 1,000
Feet

South Sammamish Segment A Project Location
Stream Crossing Field-verified by Parametrix
Stream Crossing Not Found within Trail Corridor
City of Sammamish Basin
Drainage Subbasins
Threshold Discharge Area
Subcatchment
Contour - 20ft
480+00 485+00
Proposed Stationing

Appendix C
Off-site Drainage Areas

Drainage Basin areas delineated and calculated ArcGIS10. File Created by: CAB 7/23/2014

Land Use Residential Zoning from City of Sammamish GIS data.

The Zoning map displayed R 1-4 and R-4 throughout the delineated basins.

The below table describes the land use area and how the effective impervious area was calculated.

To be consistent with the Sammamish Basin Plan that Parametrix completed for the City in 2010, R-1=L and R-4=H.

To be conservative, use LU Code H to comply with R-4, since the designation R 1-4 can either be L or H. Therefore, effective impervious are will be 23.1% of the total area.

LU Code	Name	Density	% of Total Impervious	Effective Percentage	% Effective Impervious
RF	Rural Forest	<1 Unit/ac	10	40	4
RG	Rural Grass	<1 Unit/ac	10	40	4
L	Low Density I	1-3 Unit/ac	20	50	10
H	High Density	3-9 Units/ac	35	66	23.1
MF	Multi-Family	Multi-Family	60	80	48
C	Commercial/I	Commercial	90	95	85.5

Drainage Basin	Area (AC)
TDA 1a	17.8
TDA 1b	16.4
TDA 2	1.8
TDA 3	6.1
Stream 0163S	117.1
Stream 0163N	28.2
TDA 8 Unnamec	42.8

MGSFloodV4 land use input							
Land Type	TDA 1a	TDA 1b	TDA 2	TDA 3	Stream 0163S	Stream 0163N	TDA 8 Unnamed 3
Till Grass	13.688	12.612	1.384	4.691	90.050	21.686	32.913
Impervious	4.112	3.788	0.416	1.409	27.050	6.514	9.887
Total Area	17.800	16.400	1.800	6.100	117.100	28.200	42.800

MGSFloodV4 5 Min Timestep							
Flow Rate	TDA 1a	TDA 1b	TDA 2	TDA 3	Stream 0163S	Stream 0163N	TDA 8 Unnamed 3
Q_{2YR}	3.301	3.040	0.334	1.131	21.713	5.399	7.936
Q_{10YR}	6.782	6.248	0.686	2.324	44.617	11.094	16.307
Q_{25YR}	9.240	8.513	0.934	3.167	60.788	15.115	22.218
Q_{100YR}	16.275	14.994	1.646	5.577	107.066	26.622	39.133

Offsite Drainage Basin Areas delineated in figure named **Appendix C Offsite Drainage Areas**

Drainage Basin areas calculations below. Pervious areas delineated and measured in AutoCAD. File Created by: CAB 2/13/2014

MGSFloodV4 5 Min Timestep					
Flow Rate	TDA 1	TDA 2	TDA 3	TDA 5	TDA 8
Q_{2YR}	1.933	0.119	0.098	0.023	0.221
Q_{25YR}	3.949	0.235	0.199	0.047	0.443
Q_{100YR}	6.349	0.382	0.327	0.076	0.746

TDA 1

Impervious area measured by station and trail width calculation below

Begin STA	End STA	length	width	area (SF)	area (ACRE)
217+00	222+50	550	16	8,800	0.202

Pervious area measured in CAD.Area from east edge of KC R/W to east gravel shoulder edge of proposed trail.

File location: U:\Bell\Projects\Clients\1521-King Cnty\554-1521-075-ELST\99Svcs\CADD\Phase 20\Task 03\Engr\Craig

File name: SD-SSammA_cab-working Layer name: AreaMeasure

Area 18,560 SF
0.426 ACRE

MGSFlood Entries	
Cover	Areas (ac)
Till Forest	0.426
Impervious	0.202
Total	0.628

TDA 2

Impervious area measured by station and trail width calculation below

Begin STA	End STA	length	width	area (SF)	area (ACRE)
222+50	229+15	665	16	10,640	0.244

Pervious area measured in CAD.Area from east edge of KC R/W to east gravel shoulder edge of proposed trail.

File location: U:\Bell\Projects\Clients\1521-King Cnty\554-1521-075-ELST\99Svcs\CADD\Phase 20\Task 03\Engr\Craig

File name: SD-SSammA_cab-working Layer name: AreaMeasure

Area 20,308 SF
0.466 ACRE

MGSFlood Entries	
Cover	Areas (ac)
Till Forest	0.466
Impervious	0.244
Total	0.710

TDA 3

Impervious area measured by station and trail width calculation below

Begin STA	End STA	length	width	area (SF)	area (ACRE)
229+15	234+50	535	16	8,560	0.197

Pervious area measured in CAD.Area from east edge of KC R/W to east gravel shoulder edge of proposed trail.

File location: U:\Bell\Projects\Clients\1521-King Cnty\554-1521-075-ELST\99Svcs\CADD\Phase 20\Task 03\Engr\Craig

File name: SD-SSammA_cab-working Layer name: AreaMeasure

Area 23,361 SF
0.536 ACRE

MGSFlood Entries	
Cover	Areas (ac)
Till Forest	0.536
Impervious	0.197
Total	0.733

TDA 5 only area that flows to Stream 0163 South Fork

Impervious area measured by station and trail width calculation below

Begin STA	End STA	length	width	area (SF)	area (ACRE)
239+00	240+25	125	16	2,000	0.046

Pervious area measured in CAD.Area from edge of parkway pavement to east gravel shoulder edge of proposed trail.

File location: U:\Bell\Projects\Clients\1521-King Cnty\554-1521-075-ELST\99Svcs\CADD\Phase 20\Task 03\Engr\Craig

File name: SD-SSammA_cab-working Layer name: AreaMeasure

Area 5,881 SF
0.135 ACRE

MGSFlood Entries	
Cover	Areas (ac)
Till Forest	0.135
Impervious	0.046
Total	0.181

TDA 8

Impervious area measured by station and trail width calculation below

Begin STA	End STA	length	width	area (SF)	area (ACRE)
249+25	261+50	1225	16	19,600	0.450

Pervious area measured in CAD.Area from edge of parkway pavement to east gravel shoulder edge of proposed trail.

File location: U:\Bell\Projects\Clients\1521-King Cnty\554-1521-075-ELST\99Svcs\CADD\Phase 20\Task 03\Engr\Craig

File name: SD-SSammA_cab-working Layer name: AreaMeasure

Area 47,654 SF
1.094 ACRE

MGSFlood Entries	
Cover	Areas (ac)
Till Forest	1.094
Impervious	0.450
Total	1.544

Offsite Basin Flows

MGSFloodV4 5 Min Timestep							
Flow Rate	TDA 1a	TDA 1b	TDA 2	TDA 3	Stream 0163S	Stream 0163N	TDA 8 Unnamed 3
Q2YR	3.301	3.040	0.334	1.131	21.713	5.399	7.936
Q10YR	6.782	6.248	0.686	2.324	44.617	11.094	16.307
Q25YR	9.240	8.513	0.934	3.167	60.788	15.115	22.218
Q100YR	16.275	14.994	1.646	5.577	107.066	26.622	39.133

ROW/TDA Basin Flows

MGSFloodV4 5 Min Timestep					
Flow Rate	TDA 1	TDA 2	TDA 3	TDA 5	TDA 8
Q2YR	1.933	0.119	0.098	0.023	0.221
Q25YR	3.949	0.235	0.199	0.047	0.443
Q100YR	6.349	0.382	0.327	0.076	0.746

Total Contributing Flow to a Trail cross-culvert or downstream private drainage system

	TDA 1	TDA 2	TDA 3	TDA 8 Unnamed 3
Culvert Station	218+45	224+00	229+90	256+35
Q25YR	21.702	1.169	3.366	22.661
Q100YR	37.618	2.028	5.904	39.879

Use Q25YR as the design storm flow rate when evaluating conveyance and culvert capacity.

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.31
Program License Number: 200510005
Run Date: 07/24/2014 12:40 AM

Input File Name: DrainageBasinFlows.fld
Project Name: ELST - S Sammamish Segment A
Analysis Title: Basin flows for Conveyance Sizing
Comments: Drainage basins for TDA1a, TDA 1b, TDA2, TDA3 and Stream #0163 SF, TDA 8

——————————————— PRECIPITATION INPUT ———————————————

Computational Time Step (Minutes): 5

Extended Precipitation Timeseries Selected
Climatic Region Number: 13

Full Period of Record Available used for Routing
Precipitation Station : 96004005 Puget East 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** **WATERSHED DEFINITION** **********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 10

---------- Subbasin : U/S Basin to Stream #0163 SF ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	90.050
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	27.050
Subbasin Total	117.100

---------- Subbasin : U/S Basin to TDA 2 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	1.384
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.416
Subbasin Total	1.800

---------- Subbasin : U/S Basin to TDA 3 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	4.691
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	1.409
Subbasin Total	6.100

---------- Subbasin : U/S to TDA 1a - Sta 218+95 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	13.688
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	4.112
Subbasin Total	17.800

---------- Subbasin : TDA 2 - Sta 224+00 ----------

	-------Area(Acres) --------
Till Forest	0.466
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000

Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.244
Subbasin Total	0.710

---------- Subbasin : TDA 3 - Sta 230+00 ----------

	-------Area(Acres) --------
Till Forest	0.536
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.197
Subbasin Total	0.733

---------- Subbasin : TDA 5 to O163 SF ----------

	-------Area(Acres) --------
Till Forest	0.135
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.046
Subbasin Total	0.181

---------- Subbasin : TDA 8 - Sta 256+35 ----------

	-------Area(Acres) --------
Till Forest	1.094
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.450
Subbasin Total	1.544

---------- Subbasin : U/S Basin to Unnamed #3 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	32.913
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	9.887
Subbasin Total	42.800

---------- Subbasin : U/S to TDA 1b - Sta 221+55 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	12.612
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	3.788
Subbasin Total	16.400

----------SCENARIO: POSTDEVELOPED

Number of Subbasins: 10

---------- Subbasin : U/S Basin to Stream #0163 SF ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	90.050
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	27.050
Subbasin Total	117.100

---------- Subbasin : U/S Basin to TDA 2 ----------

	-------Area(Acres) --------
Till Forest	0.000

Till Pasture	0.000
Till Grass	1.384
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.416
Subbasin Total	1.800

---------- Subbasin : U/S Basin to TDA 3 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	4.691
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	1.409
Subbasin Total	6.100

---------- Subbasin : U/S to TDA 1a - Sta 218+95 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	13.688
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	4.112
Subbasin Total	17.800

---------- Subbasin : TDA 2 - Sta 224+00 ----------

	-------Area(Acres) --------
Till Forest	0.466
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000

Impervious	0.244
Subbasin Total	0.710

---------- Subbasin : TDA 3 - Sta 230+00 ----------

	-------Area(Acres) --------
Till Forest	0.536
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.197
Subbasin Total	0.733

---------- Subbasin : TDA 5 to O163 SF ----------

	-------Area(Acres) --------
Till Forest	0.135
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.046
Subbasin Total	0.181

---------- Subbasin : TDA 8 - Sta 256+35 ----------

	-------Area(Acres) --------
Till Forest	1.094
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.450
Subbasin Total	1.544

---------- Subbasin : U/S Basin to Unnamed #3 ----------

	-------Area(Acres) --------
Till Forest	0.000

Till Pasture	0.000
Till Grass	32.913
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	9.887
Subbasin Total	42.800

---------- Subbasin : U/S to TDA 1b - Sta 221+55 ----------

-------Area(Acres) --------

Till Forest	0.000
Till Pasture	0.000
Till Grass	12.612
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	3.788
Subbasin Total	16.400

********** **LINK DATA** **********

----------SCENARIO: PREDEVELOPED
Number of Links: 1

Link Name: New Copy Lnk1
Link Type: Copy
Downstream Link: None

********** **LINK DATA** **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 1

Link Name: New Copy Lnk1
Link Type: Copy
Downstream Link: None

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 10
Number of Links: 1

********** **Subbasin: U/S Basin to Stream #0163 SF** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	21.713
5-Year	34.288
10-Year	44.617
25-Year	60.788
50-Year	89.964
100-Year	107.066
200-Year	109.168

********** **Subbasin: U/S Basin to TDA 2** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.334
5-Year	0.527
10-Year	0.686
25-Year	0.934
50-Year	1.383
100-Year	1.646
200-Year	1.678

********** **Subbasin: U/S Basin to TDA 3** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	1.131
5-Year	1.786
10-Year	2.324
25-Year	3.167
50-Year	4.686
100-Year	5.577
200-Year	5.687

********** **Subbasin: U/S to TDA 1a - Sta 218+95** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	3.301

5-Year	5.212
10-Year	6.782
25-Year	9.240
50-Year	13.675
100-Year	16.275
200-Year	16.594

********** **Subbasin: TDA 2 - Sta 224+00** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.119
5-Year	0.157
10-Year	0.192
25-Year	0.235
50-Year	0.336
100-Year	0.382
200-Year	0.398

********** **Subbasin: TDA 3 - Sta 230+00** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	9.753E-02
5-Year	0.129
10-Year	0.156
25-Year	0.199
50-Year	0.272
100-Year	0.327
200-Year	0.344

********** **Subbasin: TDA 5 to O163 SF** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	2.307E-02
5-Year	3.017E-02
10-Year	3.640E-02
25-Year	4.706E-02
50-Year	6.347E-02
100-Year	7.634E-02
200-Year	8.210E-02

********** **Subbasin: TDA 8 - Sta 256+35** **********

Flood Frequency Data(cfs)

(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.221
5-Year	0.292
10-Year	0.355
25-Year	0.443
50-Year	0.621
100-Year	0.746
200-Year	0.763

********** **Subbasin: U/S Basin to Unnamed #3** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	7.936
5-Year	12.532
10-Year	16.307
25-Year	22.218
50-Year	32.882
100-Year	39.133
200-Year	39.901

********** **Subbasin: U/S to TDA 1b - Sta 221+55** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	3.041
5-Year	4.802
10-Year	6.248
25-Year	8.513
50-Year	12.599
100-Year	14.994
200-Year	15.289

********** Link: New Copy Lnk1 ********** Link Inflow Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	34.845
5-Year	54.921
10-Year	71.577
25-Year	97.236
50-Year	143.962
100-Year	171.163
200-Year	174.430

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 10
Number of Links: 1

********** Subbasin: U/S Basin to Stream #0163 SF **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	21.713
5-Year	34.288
10-Year	44.617
25-Year	60.788
50-Year	89.964
100-Year	107.066
200-Year	109.168

********** Subbasin: U/S Basin to TDA 2 **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.334
5-Year	0.527
10-Year	0.686
25-Year	0.934
50-Year	1.383
100-Year	1.646
200-Year	1.678

********** Subbasin: U/S Basin to TDA 3 **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	1.131
5-Year	1.786
10-Year	2.324
25-Year	3.167
50-Year	4.686
100-Year	5.577
200-Year	5.687

********** Subbasin: U/S to TDA 1a - Sta 218+95 **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs) Flood Peak (cfs)

==========

2-Year	3.301
5-Year	5.212
10-Year	6.782
25-Year	9.240
50-Year	13.675
100-Year	16.275
200-Year	16.594

********** **Subbasin: TDA 2 - Sta 224+00** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.119
5-Year	0.157
10-Year	0.192
25-Year	0.235
50-Year	0.336
100-Year	0.382
200-Year	0.398

********** **Subbasin: TDA 3 - Sta 230+00** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	9.753E-02
5-Year	0.129
10-Year	0.156
25-Year	0.199
50-Year	0.272
100-Year	0.327
200-Year	0.344

********** **Subbasin: TDA 5 to O163 SF** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	2.307E-02
5-Year	3.017E-02
10-Year	3.640E-02
25-Year	4.706E-02
50-Year	6.347E-02
100-Year	7.634E-02
200-Year	8.210E-02

********** **Subbasin: TDA 8 - Sta 256+35** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.221
5-Year	0.292
10-Year	0.355
25-Year	0.443
50-Year	0.621
100-Year	0.746
200-Year	0.763

********** **Subbasin: U/S Basin to Unnamed #3** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	7.936
5-Year	12.532
10-Year	16.307
25-Year	22.218
50-Year	32.882
100-Year	39.133
200-Year	39.901

********** **Subbasin: U/S to TDA 1b - Sta 221+55** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	3.041
5-Year	4.802
10-Year	6.248
25-Year	8.513
50-Year	12.599
100-Year	14.994
200-Year	15.289

********** Link: New Copy Lnk1 ********** Link Inflow Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	37.886
5-Year	59.723
10-Year	77.825
25-Year	105.749
50-Year	156.561
100-Year	186.158

200-Year 189.719

*************Groundwater Recharge Summary ***************

Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: U/S Basin to Stream	10997.410
Subbasin: U/S Basin to TDA 2	169.022
Subbasin: U/S Basin to TDA 3	572.891
Subbasin: U/S to TDA 1a - Sta	1671.655
Subbasin: TDA 2 - Sta 224+00	80.200
Subbasin: TDA 3 - Sta 230+00	92.247
Subbasin: TDA 5 to O163 SF	23.234
Subbasin: TDA 8 - Sta 256+35	188.281
Subbasin: U/S Basin to Unnamed	4019.520
Subbasin: U/S to TDA 1b - Sta	1540.248
Link: New Copy Lnk1	Not Applicable
Total:	19354.710

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: U/S Basin to Stream	10997.410
Subbasin: U/S Basin to TDA 2	169.022
Subbasin: U/S Basin to TDA 3	572.891
Subbasin: U/S to TDA 1a - Sta	1671.655
Subbasin: TDA 2 - Sta 224+00	80.200
Subbasin: TDA 3 - Sta 230+00	92.247
Subbasin: TDA 5 to O163 SF	23.234
Subbasin: TDA 8 - Sta 256+35	188.281
Subbasin: U/S Basin to Unnamed	4019.520
Subbasin: U/S to TDA 1b - Sta	1540.248
Link: New Copy Lnk1	Not Applicable
Total:	19354.710

Total Predevelopment Recharge Equals Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 122.498 ac-ft/year, Post Developed: 122.498 ac-ft/year

*************Water Quality Facility Data ***************

----------SCENARIO: PREDEVELOPED

Number of Links: 1

----------SCENARIO: POSTDEVELOPED

Number of Links: 1

*************Compliance Point Results ***************

Scenario Predeveloped Compliance Link: New Copy Lnk1
Scenario Postdeveloped Compliance Link: New Copy Lnk1

***** Point of Compliance Flow Frequency Data *****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	34.845	2-Year	37.886
5-Year	54.921	5-Year	59.723
10-Year	71.577	10-Year	77.825
25-Year	97.236	25-Year	105.749
50-Year	143.962	50-Year	156.561
100-Year	171.163	100-Year	186.158
200-Year	174.430	200-Year	189.719

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.31
Program License Number: 200510005
Run Date: 04/16/2014 4:08 PM

Input File Name: IT1-TDA4.fld
Project Name: ELST - S Sammamish
Analysis Title: Infiltration Trench Sizing
Comments: TDA 4 Infiltration trench 1 from STA 243+77 to STA 238+67

——————————————— PRECIPITATION INPUT ———————————————

Computational Time Step (Minutes): 60

Extended Precipitation Timeseries Selected
Climatic Region Number: 13

Full Period of Record Available used for Routing
Precipitation Station : 96004005 Puget East 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** **WATERSHED DEFINITION** **********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : TDA 4 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.170
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.000
Subbasin Total	0.170

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1

---------- Subbasin : TDA 4 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.170
---	---
Subbasin Total	0.170

********** **LINK DATA** **********

----------SCENARIO: PREDEVELOPED
Number of Links: 0

********** **LINK DATA** **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 1

Link Name: Infilt Trench 1
Link Type: Infiltration Trench
Downstream Link: None

Trench Type	:	Trench on Embankment Sideslope
Trench Length (ft)	:	390.00
Trench Width (ft)	:	2.00
Trench Depth (ft)	:	2.00
Trench Bottom Elev (ft)	:	100.00
Trench Rockfill Porosity (%)	:	30.00

Constant Infiltration Option Used
Infiltration Rate (in/hr): 10.00

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1
Number of Links: 1

*************Groundwater Recharge Summary ***************
Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: TDA 4	45.199
Total:	45.199

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: TDA 4	0.000
Link: Infilt Trench 1	75.078
Total:	75.078

Total Predevelopment Recharge is Less than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 0.286 ac-ft/year, Post Developed: 0.475 ac-ft/year

*************Water Quality Facility Data ***************

----------SCENARIO: PREDEVELOPED

Number of Links: 0

----------SCENARIO: POSTDEVELOPED

Number of Links: 1

********** Link: Infilt Trench 1 **********

Infiltration/Filtration Statistics----------
Total Runoff Volume (ac-ft): 75.08
Total Runoff Infiltrated (ac-ft): 75.08, 100.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Percent Treated (Infiltrated+Filtered)/Total Volume: 100.00%

*************Compliance Point Results ***************

Scenario Predeveloped Compliance Subbasin: TDA 4

Scenario Postdeveloped Compliance Link: Infilt Trench 1

***** Point of Compliance Flow Frequency Data *****

Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	3.336E-05	2-Year	1.118E-08
5-Year	3.405E-05	5-Year	1.490E-08
10-Year	3.423E-05	10-Year	1.490E-08
25-Year	7.929E-05	25-Year	2.235E-08
50-Year	1.573E-04	50-Year	2.235E-08
100-Year	2.433E-04	100-Year	2.235E-08
200-Year	4.378E-04	200-Year	2.729E-08

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

****** Flow Duration Performance ******

Excursion at Predeveloped 50%Q2 (Must be Less Than 0%):	0.0%	PASS	
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than 0%):		0.0%	PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	0.0%	PASS	
Percent Excursion from Q2 to Q50 (Must be less than 50%):	0.0%	PASS	

MEETS ALL FLOW DURATION DESIGN CRITERIA: PASS

****** LID Duration Performance ******

Excursion at Predeveloped 8%Q2 (Must be Less Than 0%):	0.0%	PASS
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%):	0.0%	PASS

MEETS ALL LID DURATION DESIGN CRITERIA: PASS

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.31
Program License Number: 200510005
Run Date: 04/30/2014 4:15 PM

Input File Name: IT2-TDA7.fld
Project Name: ELST - S Sammamish
Analysis Title: Infiltration Trench Sizing
Comments: Infiltration trenches 3 and 4 in TDA 8 from STA 249+25 to STA 261+50

——————————————— PRECIPITATION INPUT ———————————————

Computational Time Step (Minutes): 60

Extended Precipitation Timeseries Selected
Climatic Region Number: 13

Full Period of Record Available used for Routing
Precipitation Station : 96004005 Puget East 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** **WATERSHED DEFINITION** **********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : STA 244+05 to STA 249+25 ----------

	-------Area(Acres) --------
Till Forest	0.190
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.000
Subbasin Total	0.190

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1

---------- Subbasin : STA 244+05 to STA 249+25 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.190
---	---
Subbasin Total	0.190

********** **LINK DATA** **********

----------SCENARIO: PREDEVELOPED
Number of Links: 0

********** **LINK DATA** **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 2

Link Name: Infilt Trench 2
Link Type: Infiltration Trench
Downstream Link Name: TDA 7 POC

Trench Type	:	Trench on Embankment Sideslope
Trench Length (ft)	:	500.00
Trench Width (ft)	:	2.00
Trench Depth (ft)	:	2.00
Trench Bottom Elev (ft)	:	100.00
Trench Rockfill Porosity (%)	:	30.00

Constant Infiltration Option Used
Infiltration Rate (in/hr): 10.00

Link Name: TDA 7 POC
Link Type: Copy
Downstream Link: None

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1
Number of Links: 2

*************Groundwater Recharge Summary ***************
Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: STA 244+05 to STA 24	32.944
Total:	32.944

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: STA 244+05 to STA 24	0.000
Link: Infilt Trench 2	83.911
Link: TDA 7 POC	Not Applicable
Total:	83.911

Total Predevelopment Recharge is Less than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 0.209 ac-ft/year, Post Developed: 0.531 ac-ft/year

*************Water Quality Facility Data ***************

----------SCENARIO: PREDEVELOPED

Number of Links: 0

----------SCENARIO: POSTDEVELOPED

Number of Links: 2

********** Link: Infilt Trench 2 **********

Infiltration/Filtration Statistics----------
Total Runoff Volume (ac-ft): 83.91
Total Runoff Infiltrated (ac-ft): 83.91, 100.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Percent Treated (Infiltrated+Filtered)/Total Volume: 100.00%

*************Compliance Point Results ***************

Scenario Predeveloped Compliance Subbasin: STA 244+05 to STA 249+25

Scenario Postdeveloped Compliance Link: TDA 7 POC

***** Point of Compliance Flow Frequency Data *****

Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	4.034E-03	2-Year	1.118E-08
5-Year	6.885E-03	5-Year	1.490E-08
10-Year	8.567E-03	10-Year	1.490E-08
25-Year	1.105E-02	25-Year	1.490E-08
50-Year	1.331E-02	50-Year	2.235E-08
100-Year	1.598E-02	100-Year	2.235E-08
200-Year	2.160E-02	200-Year	2.235E-08

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

****** Flow Duration Performance ******

Excursion at Predeveloped 50%Q2 (Must be Less Than 0%):	0.0%	PASS	
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than 0%):		0.0%	PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	0.0%	PASS	
Percent Excursion from Q2 to Q50 (Must be less than 50%):	0.0%	PASS	

MEETS ALL FLOW DURATION DESIGN CRITERIA: PASS

****** LID Duration Performance ******

Excursion at Predeveloped 8%Q2 (Must be Less Than 0%):	0.0%	PASS
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%):	0.0%	PASS

MEETS ALL LID DURATION DESIGN CRITERIA: PASS

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.31
Program License Number: 200510005
Run Date: 07/30/2014 12:58 PM

Input File Name: IT34-TDA8.fld
Project Name: ELST - S Sammamish
Analysis Title: Infiltration Trench Sizing
Comments: Infiltration trenches 3 and 4 in TDA 8 from STA 249+25 to STA 261+50

——————————————— PRECIPITATION INPUT ———————————————

Computational Time Step (Minutes): 60

Extended Precipitation Timeseries Selected
Climatic Region Number: 13

Full Period of Record Available used for Routing
Precipitation Station : 96004005 Puget East 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** **WATERSHED DEFINITION** **********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : STA 249+25 to STA 261+50 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.430
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.000
Subbasin Total	0.430

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 2

---------- Subbasin : STA 249+25 to STA 256+29 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.260
Subbasin Total	0.260

---------- Subbasin : STA 256+70 to STA 261+50 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.170
Subbasin Total	0.170

********** **LINK DATA** **********

----------SCENARIO: PREDEVELOPED
Number of Links: 0

********** **LINK DATA** **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 3

Link Name: Infilt Trench 2
Link Type: Infiltration Trench
Downstream Link Name: Culvert at Sta 256+35

Trench Type : Trench on Embankment Sideslope

Trench Length (ft) : 704.00
Trench Width (ft) : 2.00
Trench Depth (ft) : 2.00
Trench Bottom Elev (ft) : 100.00
Trench Rockfill Porosity (%) : 30.00

Constant Infiltration Option Used
Infiltration Rate (in/hr): 10.00

Link Name: Culvert at Sta 256+35
Link Type: Copy
Downstream Link: None

Link Name: Infilt Trench 3
Link Type: Infiltration Trench
Downstream Link Name: Culvert at Sta 256+35

Trench Type : Trench on Embankment Sideslope
Trench Length (ft) : 457.00
Trench Width (ft) : 2.00
Trench Depth (ft) : 2.00
Trench Bottom Elev (ft) : 100.00
Trench Rockfill Porosity (%) : 30.00

Constant Infiltration Option Used
Infiltration Rate (in/hr): 10.00

*************************FLOOD FREQUENCY AND DURATION STATISTICS**********************

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 2
Number of Links: 3

*************Groundwater Recharge Summary ***************
Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: STA 249+25 to STA 26	114.328
Total:	114.328

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)

Subbasin: STA 249+25 to STA 25		0.000
Subbasin: STA 256+70 to STA 26		0.000
Link:	Infilt Trench 2	Not Computed
Link:	Culvert at Sta 256+3	Not Applicable
Link:	Infilt Trench 3	Not Computed
Total:		0.000

Total Predevelopment Recharge is Greater than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 0.724 ac-ft/year, Post Developed: 0.000 ac-ft/year

*************Water Quality Facility Data ***************

----------SCENARIO: PREDEVELOPED

Number of Links: 0

----------SCENARIO: POSTDEVELOPED

Number of Links: 3

*************Compliance Point Results ***************

Scenario Predeveloped Compliance Subbasin: STA 249+25 to STA 261+50

Scenario Postdeveloped Compliance Link: Culvert at Sta 256+35

***** Point of Compliance Flow Frequency Data *****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	8.437E-05	2-Year	2.608E-08
5-Year	8.614E-05	5-Year	2.608E-08
10-Year	8.658E-05	10-Year	3.533E-08
25-Year	2.006E-04	25-Year	3.725E-08
50-Year	3.979E-04	50-Year	4.470E-08
100-Year	6.154E-04	100-Year	5.195E-08
200-Year	1.107E-03	200-Year	5.215E-08

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

****** Flow Duration Performance ******

Excursion at Predeveloped 50%Q2 (Must be Less Than 0%):	0.0%	PASS
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than 0%):	0.0%	PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	0.0%	PASS
Percent Excursion from Q2 to Q50 (Must be less than 50%):	0.0%	PASS

MEETS ALL FLOW DURATION DESIGN CRITERIA: PASS

****** LID Duration Performance ******

Excursion at Predeveloped 8%Q2 (Must be Less Than 0%):	0.0%	PASS
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%):	0.0%	PASS

MEETS ALL LID DURATION DESIGN CRITERIA: PASS

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.31
Program License Number: 200510005
Run Date: 07/30/2014 12:55 PM

Input File Name: TDA8-Bypass.fld
Project Name: ELST - S Sammamish
Analysis Title: TDA 8 Bypass - 100-year peak discharge
Comments: Areas to Infiltration trenches 3 and 4 in TDA 8 are not included in the developed condition because they are fully infiltrated areas.

——————————————— PRECIPITATION INPUT ———————————————

Computational Time Step (Minutes): 60

Extended Precipitation Timeseries Selected
Climatic Region Number: 13

Full Period of Record Available used for Routing
Precipitation Station : 96004005 Puget East 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** **WATERSHED DEFINITION** **********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : STA 249+25 to STA 261+50 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.430
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.000

Subbasin Total 0.430

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1

---------- Subbasin : Bypass ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.023
Subbasin Total	0.023

********** **LINK DATA** **********

----------SCENARIO: PREDEVELOPED
Number of Links: 0

********** **LINK DATA** **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 1

Link Name: Culvert at Sta 256+35
Link Type: Copy
Downstream Link: None

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1
Number of Links: 1

*************Groundwater Recharge Summary ***************
Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: STA 249+25 to STA 26	114.328
Total:	114.328

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Bypass	0.000
Link: Culvert at Sta 256+3	Not Applicable
Total:	0.000

Total Predevelopment Recharge is Greater than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 0.724 ac-ft/year, Post Developed: 0.000 ac-ft/year

*************Water Quality Facility Data ***************

----------SCENARIO: PREDEVELOPED

Number of Links: 0

----------SCENARIO: POSTDEVELOPED

Number of Links: 1

*************Compliance Point Results ***************

Scenario Predeveloped Compliance Subbasin: STA 249+25 to STA 261+50

Scenario Postdeveloped Compliance Link: Culvert at Sta 256+35

***** Point of Compliance Flow Frequency Data *****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	8.437E-05	2-Year	6.403E-03
5-Year	8.614E-05	5-Year	8.147E-03
10-Year	8.658E-05	10-Year	9.173E-03
25-Year	2.006E-04	25-Year	1.072E-02
50-Year	3.979E-04	50-Year	1.192E-02
100-Year	6.154E-04	100-Year	1.345E-02
200-Year	1.107E-03	200-Year	1.422E-02

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

****** Flow Duration Performance ******
Excursion at Predeveloped 50%Q2 (Must be Less Than 0%): 5410.9% FAIL

Maximum Excursion from 50%Q2 to Q2 (Must be Less Than 0%): 99999.0% FAIL
Maximum Excursion from Q2 to Q50 (Must be less than 10%): 99999.0% FAIL
Percent Excursion from Q2 to Q50 (Must be less than 50%): 100.0% FAIL

FLOW DURATION DESIGN CRITERIA: FAIL

****** LID Duration Performance ******

Excursion at Predeveloped 8%Q2 (Must be Less Than 0%): 1228.1% FAIL
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%): 99999.0% FAIL

LID DURATION DESIGN CRITERIA: FAIL

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.31
Program License Number: 200510005
Run Date: 07/29/2014 9:24 AM

Input File Name: IT567-TDA9.fld
Project Name: ELST - S Sammamish
Analysis Title: Infiltration Trench Sizing
Comments: Infiltration trenches in TDA 9

——————————————— PRECIPITATION INPUT ———————————————

Computational Time Step (Minutes): 60

Extended Precipitation Timeseries Selected
Climatic Region Number: 13

Full Period of Record Available used for Routing
Precipitation Station : 96004005 Puget East 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** **WATERSHED DEFINITION** **********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : TDA 9 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.820
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.000
Subbasin Total	0.820

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 2

---------- Subbasin : TDA 9 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.790
Subbasin Total	0.790

---------- Subbasin : SE 33rd St Sidewalk ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User	0.000
Impervious	0.030
Subbasin Total	0.030

********** **LINK DATA** **********

----------SCENARIO: PREDEVELOPED
Number of Links: 0

********** **LINK DATA** **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 3

Link Name: Infilt Trench 5
Link Type: Infiltration Trench
Downstream Link Name: TDA 9 POC

Trench Type : Trench on Embankment Sideslope

Trench Length (ft) : 2083.00
Trench Width (ft) : 2.00
Trench Depth (ft) : 2.00
Trench Bottom Elev (ft) : 100.00
Trench Rockfill Porosity (%) : 30.00

Constant Infiltration Option Used
Infiltration Rate (in/hr): 10.00

Link Name: TDA 9 POC
Link Type: Copy
Downstream Link: None

Link Name: Infilt Trenches 6 and 7
Link Type: Infiltration Trench
Downstream Link Name: TDA 9 POC

Trench Type : Trench on Embankment Sideslope
Trench Length (ft) : 147.00
Trench Width (ft) : 2.00
Trench Depth (ft) : 2.00
Trench Bottom Elev (ft) : 100.00
Trench Rockfill Porosity (%) : 30.00

Constant Infiltration Option Used
Infiltration Rate (in/hr): 10.00

*************************FLOOD FREQUENCY AND DURATION STATISTICS**********************

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 2
Number of Links: 3

************ Subbasin: TDA 9 ************

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.220
5-Year	0.282
10-Year	0.315
25-Year	0.368
50-Year	0.409
100-Year	0.462
200-Year	0.488

********** **Subbasin: SE 33rd St Sidewalk** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	8.352E-03
5-Year	1.073E-02
10-Year	1.196E-02
25-Year	1.399E-02
50-Year	1.555E-02
100-Year	1.754E-02
200-Year	1.855E-02

********** Link: Infilt Trench 5 ********** Link Inflow Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.220
5-Year	0.280
10-Year	0.315
25-Year	0.368
50-Year	0.409
100-Year	0.462
200-Year	0.488

********** Link: Infilt Trench 5 ********** Link Outflow 1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	1.490E-08
5-Year	2.980E-08
10-Year	2.980E-08
25-Year	2.980E-08
50-Year	2.980E-08
100-Year	2.980E-08
200-Year	4.957E-08

********** Link: TDA 9 POC ********** Link Outflow 1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	2.142E-08
5-Year	3.812E-08

10-Year	3.888E-08
25-Year	4.005E-08
50-Year	4.191E-08
100-Year	4.282E-08
200-Year	6.385E-08

********** Link: Infilt Trenches 6 and 7 ********** Link Inflow Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	8.352E-03
5-Year	1.063E-02
10-Year	1.196E-02
25-Year	1.399E-02
50-Year	1.555E-02
100-Year	1.754E-02
200-Year	1.855E-02

********** Link: Infilt Trenches 6 and 7 ********** Link Outflow 1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	6.519E-09
5-Year	8.321E-09
10-Year	9.073E-09
25-Year	1.024E-08
50-Year	1.211E-08
100-Year	1.301E-08
200-Year	1.427E-08

*************Groundwater Recharge Summary ***************

Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: TDA 9	218.021
Total:	218.021

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: TDA 9	0.000
Subbasin: SE 33rd St Sidewalk	0.000
Link: Infilt Trench 5	348.893
Link: TDA 9 POC	Not Applicable
Link: Infilt Trenches 6 an	13.249

Total: 362.142

Total Predevelopment Recharge is Less than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 1.380 ac-ft/year, Post Developed: 2.292 ac-ft/year

*************Water Quality Facility Data ***************

----------SCENARIO: PREDEVELOPED

Number of Links: 0

----------SCENARIO: POSTDEVELOPED

Number of Links: 3

********** Link: Infilt Trench 5 **********

Infiltration/Filtration Statistics----------
Total Runoff Volume (ac-ft): 348.89
Total Runoff Infiltrated (ac-ft): 348.89, 100.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Percent Treated (Infiltrated+Filtered)/Total Volume: 100.00%

********** Link: Infilt Trenches 6 and 7 **********

Infiltration/Filtration Statistics----------
Total Runoff Volume (ac-ft): 13.25
Total Runoff Infiltrated (ac-ft): 13.25, 100.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Percent Treated (Infiltrated+Filtered)/Total Volume: 100.00%

*************Compliance Point Results ***************

Scenario Predeveloped Compliance Subbasin: TDA 9

Scenario Postdeveloped Compliance Link: TDA 9 POC

***** Point of Compliance Flow Frequency Data *****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	1.609E-04	2-Year	2.142E-08
5-Year	1.643E-04	5-Year	3.812E-08
10-Year	1.651E-04	10-Year	3.888E-08
25-Year	3.825E-04	25-Year	4.005E-08
50-Year	7.588E-04	50-Year	4.191E-08
100-Year	1.174E-03	100-Year	4.282E-08
200-Year	2.112E-03	200-Year	6.385E-08

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

****** Flow Duration Performance ******

Excursion at Predeveloped 50%Q2 (Must be Less Than 0%):	0.0%	PASS	
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than 0%):		0.0%	PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	0.0%	PASS	
Percent Excursion from Q2 to Q50 (Must be less than 50%):	0.0%	PASS	

MEETS ALL FLOW DURATION DESIGN CRITERIA: PASS

****** LID Duration Performance ******

Excursion at Predeveloped 8%Q2 (Must be Less Than 0%):	0.0%	PASS
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%):	0.0%	PASS

MEETS ALL LID DURATION DESIGN CRITERIA: PASS

Worksheet for STA 218+45 Exist - Q25

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.012	
Channel Slope	0.03390	ft/ft
Diameter	2.00	ft
Discharge	21.70	ft^3/s

Results

Normal Depth	0.98	ft
Flow Area	1.53	ft^2
Wetted Perimeter	3.10	ft
Hydraulic Radius	0.49	ft
Top Width	2.00	ft
Critical Depth	1.67	ft
Percent Full	48.9	%
Critical Slope	0.00763	ft/ft
Velocity	14.22	ft/s
Velocity Head	3.14	ft
Specific Energy	4.12	ft
Froude Number	2.87	
Maximum Discharge	48.54	ft^3/s
Discharge Full	45.12	ft^3/s
Slope Full	0.00784	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	48.88	%
Downstream Velocity	Infinity	ft/s

Worksheet for STA 218+45 Exist - Q25

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.98	ft
Critical Depth	1.67	ft
Channel Slope	0.03390	ft/ft
Critical Slope	0.00763	ft/ft

Worksheet for STA 218+45 Exist - Q100

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.012	
Channel Slope	0.03390	ft/ft
Diameter	2.00	ft
Discharge	37.62	ft^3/s

Results

Normal Depth	1.40	ft
Flow Area	2.34	ft^2
Wetted Perimeter	3.95	ft
Hydraulic Radius	0.59	ft
Top Width	1.84	ft
Critical Depth	1.94	ft
Percent Full	69.8	%
Critical Slope	0.02074	ft/ft
Velocity	16.07	ft/s
Velocity Head	4.02	ft
Specific Energy	5.41	ft
Froude Number	2.51	
Maximum Discharge	48.54	ft^3/s
Discharge Full	45.12	ft^3/s
Slope Full	0.02357	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	69.77	%
Downstream Velocity	Infinity	ft/s

Worksheet for STA 218+45 Exist - Q100

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.40	ft
Critical Depth	1.94	ft
Channel Slope	0.03390	ft/ft
Critical Slope	0.02074	ft/ft

STORM SEWER DESIGN (English Units)

This spreadsheet accomplishes a storm sewer design using the rational method. Enter the data in the non-shaded areas only.
Please use one spreadsheet per stormsewer run.

Project Name: ELST - S Sammamish Segment A

Designed By: C. Buitrago
Project Office: N/A

m = 6.89 **n =** 0.539 **Design Storm Event =** 25-yr MRI **Pavement thickness (ft) =** 0.5 **Pipe Thickness (inches) =** 2

Location														Discharge	Drain Design						Drain Profile										Remarks
Drain Located On	From Sta.	To Sta.	Source of Drainage	Drainage Area A (acre)	Runoff Coeff. C	CA (acre)	Sum CA (acre)	T_c Across Area (minutes)	Total Tc = Col. 8a + Tc across pipe length (minutes)	Rainfall Intensity (in/hr)	Runoff (cfs)	Contrib. Inflow (cfs)	Total Flow (cfs)	Pipe Dia. (in)	Manning roughness coefficient "n"	Pipe Slope (ft/ft)	Velocity Of Flow (ft/s)	Pipe Capacity (cfs)	Pipe Velocity Check (Desirable Minimum 3 ft/sec; Desirable Maximum 10 ft/sec for Column 16)	Pipe Capacity Check (Column 13 vs. Column 17)	Pipe Length*** (ft)	Elevation Change (ft)	Upstr. Invert Elev. (ft)	Downstr. Invert Elev. (ft)	Upstr. Ground Elev. (ft)	Downstr. Ground Elev. (ft)	Upstr. Pipe Cover (ft)	Downstr. Pipe Cover (ft)	Upstr. Pipe Cover Check (ft)	Downstr. Pipe Cover Check (ft)	
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*8a*	*9*	*10*	*11*	*12*	*13*	*14*	*14a*	*15*	*16*	*17*	*17a*	*17b*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*24*
ELST	218+45 RT	218+45 LT	Off-site Basin	0.00	0.00	0.00	0.00	5.0	0.0	2.89	0.00	21.70	21.70	24	0.014	0.0339	12.32	38.66	TRY TO REDUCE VELOCITY	ADEQUATE PIPE CAPACITY	33	1.12	40.14	39.02	40.14	39.02	-2.67	-2.67	Not Enough Cover - Need to Revise Pipe Elevations	Not Enough Cover - Need to Revise Pipe Elevations	Existing stream culvert at trail, outfall to open concrete basin
ELS ShoreLn	218+45 LT	218+45 LT	Shore Lane	0.00	0.00	0.00	0.00	5.0	0.0	2.89	0.00		21.70	16	0.014	0.0507	11.48	16.02	TRY TO REDUCE VELOCITY	NEED MORE CAPACITY	30	1.52	39.02	37.50	39.02	37.00	-2.00	-2.50	Not Enough Cover - Need to Revise Pipe Elevations	Not Enough Cover - Need to Revise Pipe Elevations	Existing culvert beneath ELS Shore Ln SE, assume 5% slope

See WSDOT Hydraulic Manual 6-5 for explanation of columns. http://www.wsdot.wa.gov/eesc/design/hydraulics/

Notes:

Column 12 represents inflow from a storm sewer line, branch, an offsite source that flows into the trunk line being analyzed.
The conservative assumption is that the flow enters the storm sewer run at the upstream end of the run being analyzed.

For pipe cover calculation, Pipe cover = (Ground or Rim Elevation - Pipe invert elevation) - (pavement thickness) - (top of pipe thickness) - (pipe diameter).
The pipe thickness is based on the pipe diameter per WSDOT Manual Concrete for Shallow Pipe Cover Installations Fill Height Table 8-11.2
Please specify the largest pipe thickness of the storm sewer run being analyzed.

The spreadsheet will only calculate one storm sewer line at a time. Please copy the "Blank Template" and use this for calculating new storm sewer lines.
If analyzing complicated stormsewer system with multiple lateral lines to the trunk line, it is recommended that Stormshed be used to
model the conveyance system. Please contact your region Hydraulic Contact.

WARNING: START YOUR STORMSEWER RUN ON ROW 12. DO NOT SKIP ANY ROWS IN BETWEEN. USE ONE SHEET PER STORMSEWER RUN

Please report any problems to the WSDOT HQ Hydraulics Office.

STORM SEWER DESIGN (English Units)

This spreadsheet accomplishes a storm sewer design using the rational method. Enter the data in the non-shaded areas only.
Please use one spreadsheet per stormsewer run.

Project Name: ELST - S Sammamish Segment A

Designed By: C. Buitrago
Project Office: N/A

m = 6.89 **n =** 0.539 **Design Storm Event =** 25-yr MRI **Pavement thickness (ft) =** 0.5 **Pipe Thickness (inches) =** 2

Location														Discharge	Drain Design						Drain Profile										Remarks
Drain Located On	From Sta.	To Sta.	Source of Drainage	Drainage Area A (acre)	Runoff Coeff. C	CA (acre)	Sum CA (acre)	T_c Across Area (minutes)	Total Tc = Col. 8a + Tc across pipe length (minutes)	Rainfall Intensity (in/hr)	Runoff (cfs)	Contrib. Inflow (cfs)	Total Flow (cfs)	Pipe Dia. (in)	Manning roughness coefficient "n"	Pipe Slope (ft/ft)	Velocity Of Flow (ft/s)	Pipe Capacity (cfs)	Pipe Velocity Check (Desirable Minimum 3 ft/sec; Desirable Maximum 10 ft/sec for Column 16)	Pipe Capacity Check (Column 13 vs. Column 17)	Pipe Length*** (ft)	Elevation Change (ft)	Upstr. Invert Elev. (ft)	Downstr. Invert Elev. (ft)	Upstr. Ground Elev. (ft)	Downstr. Ground Elev. (ft)	Upstr. Pipe Cover (ft)	Downstr. Pipe Cover (ft)	Upstr. Pipe Cover Check (ft)	Downstr. Pipe Cover Check (ft)	
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*8a*	*9*	*10*	*11*	*12*	*13*	*14*	*14a*	*15*	*16*	*17*	*17a*	*17b*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*24*
ELST	224+00 RT	224+00 LT	Off-site Basin	0.00	0.00	0.00	0.00	5.0	0.0	2.89	0.00	1.17	1.17	12	0.014	0.0500	9.42	7.39	VELOCITY OK	ADEQUATE PIPE CAPACITY	34	1.70	38.47	36.77	45.40	38.44	5.26	0.00	More than 2 ft of cover	Not Enough Cover - Need to Revise Pipe Elevations	Theoretical proposed SD connection to existing downstream
ELS ShoreLn	224+00 LT	224+00 LT	Shore Lane	0.01	0.90	0.01	0.01	5.0	5.0	2.89	0.03		1.20	4	0.013	0.0100	2.18	0.19	TRY TO INCREASE VELOCITY	NEED MORE CAPACITY	50	0.50	37.44	36.94	38.44	38.00	0.00	0.06	Not Enough Cover - Need to Revise Pipe Elevations	Not Enough Cover - Need to Revise Pipe Elevations	Existing Private Drainage System in ELS Shore Ln SE

See WSDOT Hydraulic Manual 6-5 for explanation of columns. http://www.wsdot.wa.gov/eesc/design/hydraulics/

Notes:

Column 12 represents inflow from a storm sewer line, branch, an offsite source that flows into the trunk line being analyzed.
The conservative assumption is that the flow enters the storm sewer run at the upstream end of the run being analyzed.

For pipe cover calculation, Pipe cover = (Ground or Rim Elevation - Pipe invert elevation) - (pavement thickness) - (top of pipe thickness) - (pipe diameter).
The pipe thickness is based on the pipe diameter per WSDOT Manual Concrete for Shallow Pipe Cover Installations Fill Height Table 8-11.2
Please specify the largest pipe thickness of the storm sewer run being analyzed.

The spreadsheet will only calculate one storm sewer line at a time. Please copy the "Blank Template" and use this for calculating new storm sewer lines.
If analyzing complicated stormsewer system with multiple lateral lines to the trunk line, it is recommended that Stormshed be used to
model the conveyance system. Please contact your region Hydraulic Contact.

WARNING: START YOUR STORMSEWER RUN ON ROW 12. DO NOT SKIP ANY ROWS IN BETWEEN. USE ONE SHEET PER STORMSEWER RUN

Please report any problems to the WSDOT HQ Hydraulics Office.

STORM SEWER DESIGN (English Units)

This spreadsheet accomplishes a storm sewer design using the rational method. Enter the data in the non-shaded areas only.
Please use one spreadsheet per stormsewer run.

Project Name: ELST - S Sammamish Segment A

Designed By: Enter Here
Project Office: Enter Here

m = 6.89 **n =** 0.539 **Design Storm Event =** 25-yr MRI **Pavement thickness (ft) =** 0.5 **Pipe Thickness (inches) =** 2

Location														Discharge Drain Design							Drain Profile										Remarks
Drain Located On	From Sta.	To Sta.	Source of Drainage	Drainage Area A (acre)	Runoff Coeff. C	CA (acre)	Sum CA (acre)	T_c Across Area (minutes)	Total Tc = Col. 8a + Tc across pipe length (minutes)	Rainfall Intensity (in/hr)	Runoff (cfs)	Contrib. Inflow (cfs)	Total Flow (cfs)	Pipe Dia. (in)	Manning roughness coefficient "n"	Pipe Slope (ft/ft)	Velocity Of Flow (ft/s)	Pipe Capacity (cfs)	Pipe Velocity Check (Desirable Minimum 3 ft/sec; Desirable Maximum 10 ft/sec for Column 16)	Pipe Capacity Check (Column 13 vs. Column 17)	Pipe Length*** (ft)	Elevation Change (ft)	Upstr. Invert Elev. (ft)	Downstr. Invert Elev. (ft)	Upstr. Ground Elev. (ft)	Downstr. Ground Elev. (ft)	Upstr. Pipe Cover (ft)	Downstr. Pipe Cover (ft)	Upstr. Pipe Cover Check (ft)	Downstr. Pipe Cover Check (ft)	
1	2	3	4	5	6	7	8	8a	9	10	11	12	13	14	14a	15	16	17	17a	17b	18	19	20	21	22	23	24	25	26	27	24
ELST	230+00 RT	229+90 LT	Off-site Basin	0.00	0.00	0.00	0.00	5.0	0.0	2.89	0.00	3.37	3.37	18	0.013	0.1116	19.85	35.06	TRY TO REDUCE VELOCITY	ADEQUATE PIPE CAPACITY	37	4.13	44.60	40.47	44.60	42.05	-2.17	-0.59	Not Enough Cover - Need to Revise Pipe Elevations	Not Enough Cover - Need to Revise Pipe Elevations	Surveyed info, D/S SD system is undersized
ELS ShoreLn	229+90 LT	228+93 LT	ELS Shore Ln	0.01	0.90	0.01	0.01	5.0	5.0	2.89	0.03		3.39	12	0.013	0.0231	6.89	5.40	VELOCITY OK	ADEQUATE PIPE CAPACITY	85	1.96	40.13	38.17	42.05	41.93	0.25	2.09	Not Enough Cover - Need to Revise Pipe Elevations	More than 2 ft of cover	Surveyed info, D/S SD system is undersized
ELS ShoreLn	228+93 LT	228+93 LT	ELS Shore Ln	0.00	0.00	0.00	0.01	5.0	5.2	2.83	0.03		3.39	12	0.013	0.0777	12.64	9.92	TRY TO REDUCE VELOCITY	ADEQUATE PIPE CAPACITY	118	9.17	38.17	29.00	41.93	31.50	2.09	0.83	More than 2 ft of cover	Low Cover - See Notes at Bottom	Outfall location and IE is guess based on property owner suggestion

See WSDOT Hydraulic Manual 6-5 for explanation of columns. http://www.wsdot.wa.gov/eesc/design/hydraulics/

Notes: Column 12 represents inflow from a storm sewer line, branch, an offsite source that flows into the trunk line being analyzed.
The conservative assumption is that the flow enters the storm sewer run at the upstream end of the run being analyzed.

For pipe cover calculation, Pipe cover = (Ground or Rim Elevation - Pipe invert elevation) - (pavement thickness) - (top of pipe thickness) - (pipe diameter).
The pipe thickness is based on the pipe diameter per WSDOT Manual Concrete for Shallow Pipe Cover Installations Fill Height Table 8-11.2
Please specify the largest pipe thickness of the storm sewer run being analyzed.

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model the conveyance system. Please contact your region Hydraulic Contact.

WARNING: START YOUR STORMSEWER RUN ON ROW 12. DO NOT SKIP ANY ROWS IN BETWEEN. USE ONE SHEET PER STORMSEWER RUN

Please report any problems to the WSDOT HQ Hydraulics Office.

STORM SEWER DESIGN (English Units)

This spreadsheet accomplishes a storm sewer design using the rational method. Enter the data in the non-shaded areas only.
Please use one spreadsheet per stormsewer run.

Project Name: ELST - S Sammamish Segment A

Designed By: C. Buitrago
Project Office: N/A

m = 6.89 **n =** 0.539 **Design Storm Event =** 25-yr MRI **Pavement thickness (ft) =** 0.5 **Pipe Thickness (inches) =** 2

Location														Discharge	Drain Design						Drain Profile										Remarks
Drain Located On	From Sta.	To Sta.	Source of Drainage	Drainage Area A (acre)	Runoff Coeff. C	CA (acre)	Sum CA (acre)	T_c Across Area (minutes)	Total Tc = Col. 8a + Tc across pipe length (minutes)	Rainfall Intensity (in/hr)	Runoff (cfs)	Contrib. Inflow (cfs)	Total Flow (cfs)	Pipe Dia. (in)	Manning roughness coefficient "n"	Pipe Slope (ft/ft)	Velocity Of Flow (ft/s)	Pipe Capacity (cfs)	Pipe Velocity Check (Desirable Minimum 3 ft/sec; Desirable Maximum 10 ft/sec for Column 16)	Pipe Capacity Check (Column 13 vs. Column 17)	Pipe Length*** (ft)	Elevation Change (ft)	Upstr. Invert Elev. (ft)	Downstr. Invert Elev. (ft)	Upstr. Ground Elev. (ft)	Downstr. Ground Elev. (ft)	Upstr. Pipe Cover (ft)	Downstr. Pipe Cover (ft)	Upstr. Pipe Cover Check (ft)	Downstr. Pipe Cover Check (ft)	
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*8a*	*9*	*10*	*11*	*12*	*13*	*14*	*14a*	*15*	*16*	*17*	*17a*	*17b*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*24*
ELST	224+02 RT	224+02 RT	Off-site Basin	0.00	0.00	0.00	0.00	5.0	0.0	2.89	0.00	1.17	1.17	12	0.014	0.0215	6.18	4.85	VELOCITY OK	ADEQUATE PIPE CAPACITY	13	0.28	45.62	45.34	45.62	47.97	-1.67	0.96	Not Enough Cover - Need to Revise Pipe Elevations	Low Cover - See Notes at Bottom	Culvert Inlet to SD conveyance, Off-site Basin flows to TDA 2
ELST	224+02 RT	226+03 RT	N/A	0.00	0.00	0.00	0.00	5.0	0.0	2.89	0.00	0.00	1.17	12	0.014	0.0075	3.65	2.86	VELOCITY OK	ADEQUATE PIPE CAPACITY	200	1.50	45.34	43.84	47.97	48.47	0.96	2.96	Low Cover - See Notes at Bottom	More than 2 ft of cover	
ELST	226+03 RT	228+03 RT	N/A	0.00	0.00	0.00	0.00	5.0	0.9	2.89	0.00	0.00	1.17	12	0.014	0.0075	3.65	2.86	VELOCITY OK	ADEQUATE PIPE CAPACITY	200	1.50	43.84	42.34	48.47	49.03	2.96	5.02	More than 2 ft of cover	More than 2 ft of cover	
ELST	228+03 RT	229+85 RT	N/A	0.00	0.00	0.00	0.00	5.0	1.9	2.89	0.00	0.00	1.17	12	0.014	0.0075	3.64	2.86	VELOCITY OK	ADEQUATE PIPE CAPACITY	182	1.36	42.34	40.98	49.03	49.29	5.02	6.64	More than 2 ft of cover	More than 2 ft of cover	
ELST	229+85 RT	229+85 LT	N/A	0.00	0.00	0.00	0.00	5.0	2.7	2.89	0.00	3.37	4.54	18	0.014	0.0354	10.38	18.34	TRY TO REDUCE VELOCITY	ADEQUATE PIPE CAPACITY	24	0.85	38.30	37.45	49.29	41.78	8.82	2.16	More than 2 ft of cover	More than 2 ft of cover	Drop structure necessary to manage elevations difference of
ELS Shore Ln	229+85 LT	229+56 LT	N/A	0.00	0.00	0.00	0.00	5.0	2.7	2.89	0.00	0.00	4.54	18	0.014	0.0100	5.52	9.74	VELOCITY OK	ADEQUATE PIPE CAPACITY	30	0.30	37.45	37.15	41.78	41.46	2.16	2.14	More than 2 ft of cover	More than 2 ft of cover	ELST and East Lake Sammamish Shore Lane to the west.
ELS Shore Ln	229+56 LT	229+45 LT	N/A	0.00	0.00	0.00	0.00	5.0	2.8	2.89	0.00	0.00	4.54	18	0.014	0.0606	13.58	23.98	TRY TO REDUCE VELOCITY	ADEQUATE PIPE CAPACITY	54	3.27	37.15	33.88	41.46	38.07	2.14	2.02	More than 2 ft of cover	More than 2 ft of cover	
ELS Shore Ln	229+45 LT	Lake Outfall	N/A	0.00	0.00	0.00	0.00	5.0	2.9	2.89	0.00	0.00	4.54	18	0.014	0.0400	11.04	19.49	TRY TO REDUCE VELOCITY	ADEQUATE PIPE CAPACITY	74	2.96	32.18	29.22	38.07	31.00	3.72	-0.39	More than 2 ft of cover	Not Enough Cover - Need to Revise Pipe Elevations	Direct discharge outfall to Lake Sammamish at base flood elev.

See WSDOT Hydraulic Manual 6-5 for explanation of columns. http://www.wsdot.wa.gov/eesc/design/hydraulics/

Notes:

Column 12 represents inflow from a storm sewer line, branch, an offsite source that flows into the trunk line being analyzed.
The conservative assumption is that the flow enters the storm sewer run at the upstream end of the run being analyzed.

For pipe cover calculation, Pipe cover = (Ground or Rim Elevation - Pipe invert elevation) - (pavement thickness) - (top of pipe thickness) - (pipe diameter).
The pipe thickness is based on the pipe diameter per WSDOT Manual Concrete for Shallow Pipe Cover Installations Fill Height Table 8-11.2
Please specify the largest pipe thickness of the storm sewer run being analyzed.

The spreadsheet will only calculate one storm sewer line at a time. Please copy the "Blank Template" and use this for calculating new storm sewer lines.
If analyzing complicated stormsewer system with multiple lateral lines to the trunk line, it is recommended that Stormshed be used to
model the conveyance system. Please contact your region Hydraulic Contact.

WARNING: START YOUR STORMSEWER RUN ON ROW 12. DO NOT SKIP ANY ROWS IN BETWEEN. USE ONE SHEET PER STORMSEWER RUN

Please report any problems to the WSDOT HQ Hydraulics Office.

STORM SEWER DESIGN (English Units)

This spreadsheet accomplishes a storm sewer design using the rational method. Enter the data in the non-shaded areas only.
Please use one spreadsheet per stormsewer run.

Project Name: ELST - S Sammamish Segment A

Designed By: C. Buitrago
Project Office: N/A

m = 6.89 n = 0.539 Design Storm Event = 25-yr MRI Pavement thickness (ft) = 0.5 Pipe Thickness (inches) = 2

Location														Discharge	Drain Design						Drain Profile										Remarks
Drain Located On	From Sta.	To Sta.	Source of Drainage	Drainage Area A (acre)	Runoff Coeff. C	CA (acre)	Sum CA (acre)	T_c Across Area (minutes)	Total Tc = Col. 8a + Tc across pipe length (minutes)	Rainfall Intensity (in/hr)	Runoff (cfs)	Contrib. Inflow (cfs)	Total Flow (cfs)	Pipe Dia. (in)	Manning roughness coefficient "n"	Pipe Slope (ft/ft)	Velocity Of Flow (ft/s)	Pipe Capacity (cfs)	Pipe Velocity Check (Desirable Minimum 3 ft/sec; Desirable Maximum 10 ft/sec for Column 16)	Pipe Capacity Check (Column 13 vs. Column 17)	Pipe Length*** (ft)	Elevation Change (ft)	Upstr. Invert Elev. (ft)	Downstr. Invert Elev. (ft)	Upstr. Ground Elev. (ft)	Downstr. Ground Elev. (ft)	Upstr. Pipe Cover (ft)	Downstr. Pipe Cover (ft)	Upstr. Pipe Cover Check (ft)	Downstr. Pipe Cover Check (ft)	
1	2	3	4	5	6	7	8	8a	9	10	11	12	13	14	14a	15	16	17	17a	17b	18	19	20	21	22	23	24	25	26	27	24
ELST	229+85 RT	229+85 RT	Off-site Basin	0.00	0.00	0.00	0.00	5.0	0.0	2.89	0.00	3.37	3.37	18	0.014	0.0143	6.60	11.65	VELOCITY OK	ADEQUATE PIPE CAPACITY	21	0.30	45.12	44.82	45.12	49.29	-2.17	2.30	Not Enough Cover - Need to Revise Pipe Elevations	More than 2 ft of cover	Culvert Inlet to drop structure, Off-site Basin flows to TDA 3

See WSDOT Hydraulic Manual 6-5 for explanation of columns. http://www.wsdot.wa.gov/eesc/design/hydraulics/

Notes:

Column 12 represents inflow from a storm sewer line, branch, an offsite source that flows into the trunk line being analyzed.
The conservative assumption is that the flow enters the storm sewer run at the upstream end of the run being analyzed.

For pipe cover calculation, Pipe cover = (Ground or Rim Elevation - Pipe invert elevation) - (pavement thickness) - (top of pipe thickness) - (pipe diameter).
The pipe thickness is based on the pipe diameter per WSDOT Manual Concrete for Shallow Pipe Cover Installations Fill Height Table 8-11.2
Please specify the largest pipe thickness of the storm sewer run being analyzed.

The spreadsheet will only calculate one storm sewer line at a time. Please copy the "Blank Template" and use this for calculating new storm sewer lines.
If analyzing complicated stormsewer system with multiple lateral lines to the trunk line, it is recommended that Stormshed be used to
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Worksheet for STA 256+35 Exist - Q25

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.16250	ft/ft
Diameter	1.50	ft
Discharge	22.66	ft^3/s

Results

Normal Depth	0.78	ft
Flow Area	0.93	ft^2
Wetted Perimeter	2.42	ft
Hydraulic Radius	0.38	ft
Top Width	1.50	ft
Critical Depth	1.48	ft
Percent Full	52.1	%
Critical Slope	0.04242	ft/ft
Velocity	24.37	ft/s
Velocity Head	9.23	ft
Specific Energy	10.01	ft
Froude Number	5.45	
Maximum Discharge	45.55	ft^3/s
Discharge Full	42.34	ft^3/s
Slope Full	0.04654	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	52.06	%
Downstream Velocity	Infinity	ft/s

Worksheet for STA 256+35 Exist - Q25

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.78	ft
Critical Depth	1.48	ft
Channel Slope	0.16250	ft/ft
Critical Slope	0.04242	ft/ft

Worksheet for STA 256+35 Exist - Q100

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.16250	ft/ft
Diameter	1.50	ft
Discharge	39.88	ft^3/s

Results

Normal Depth	1.16	ft
Flow Area	1.46	ft^2
Wetted Perimeter	3.22	ft
Hydraulic Radius	0.45	ft
Top Width	1.26	ft
Critical Depth	1.50	ft
Percent Full	77.2	%
Critical Slope	0.13953	ft/ft
Velocity	27.25	ft/s
Velocity Head	11.54	ft
Specific Energy	12.69	ft
Froude Number	4.45	
Maximum Discharge	45.55	ft^3/s
Discharge Full	42.34	ft^3/s
Slope Full	0.14415	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	77.19	%
Downstream Velocity	Infinity	ft/s

Worksheet for STA 256+35 Exist - Q100

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.16	ft
Critical Depth	1.50	ft
Channel Slope	0.16250	ft/ft
Critical Slope	0.13953	ft/ft

STORM SEWER DESIGN (English Units)

This spreadsheet accomplishes a storm sewer design using the rational method. Enter the data in the non-shaded areas only.
Please use one spreadsheet per stormsewer run.

Project Name: ELST - S Sammamish Segment A

Designed By: C. Buitrago
Project Office: N/A

m = 6.89 **n =** 0.539 **Design Storm Event =** 25-yr MRI **Pavement thickness (ft) =** 0.5 **Pipe Thickness (inches) =** 2

Location														Discharge	Drain Design						Drain Profile										Remarks
Drain Located On	From Sta.	To Sta.	Source of Drainage	Drainage Area A (acre)	Runoff Coeff. C	CA (acre)	Sum CA (acre)	T_c Across Area (minutes)	Total Tc = Col. 8a + Tc across pipe length (minutes)	Rainfall Intensity (in/hr)	Runoff (cfs)	Contrib. Inflow (cfs)	Total Flow (cfs)	Pipe Dia. (in)	Manning roughness coefficient "n"	Pipe Slope (ft/ft)	Velocity Of Flow (ft/s)	Pipe Capacity (cfs)	Pipe Velocity Check (Desirable Minimum 3 ft/sec; Desirable Maximum 10 ft/sec for Column 16)	Pipe Capacity Check (Column 13 vs. Column 17)	Pipe Length*** (ft)	Elevation Change (ft)	Upstr. Invert Elev. (ft)	Downstr. Invert Elev. (ft)	Upstr. Ground Elev. (ft)	Downstr. Ground Elev. (ft)	Upstr. Pipe Cover (ft)	Downstr. Pipe Cover (ft)	Upstr. Pipe Cover Check (ft)	Downstr. Pipe Cover Check (ft)	
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*8a*	*9*	*10*	*11*	*12*	*13*	*14*	*14a*	*15*	*16*	*17*	*17a*	*17b*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*24*
ELST	256+35 RT	256+35 LT	Off-site Basin	0.00	0.00	0.00	0.00	5.0	0.0	2.89	0.00	22..66	0.00	18	0.014	0.1585	21.97	38.80	TRY TO REDUCE VELOCITY	ADEQUATE PIPE CAPACITY	41	6.50	51.21	44.71	51.41	44.71	-1.97	-2.17	Not Enough Cover - Need to Revise Pipe Elevations	Not Enough Cover - Need to Revise Pipe Elevations	Existing stream culvert at trail, outfall to open concrete basin
ELS ShoreLn	256+35 LT	256+35 LT	Shore Lane	0.00	0.00	0.00	0.00	5.0	0.0	2.89	0.00		0.00	12	0.014	0.0500	9.42	7.39	VELOCITY OK	ADEQUATE PIPE CAPACITY	40	2.00	39.00	37.00	44.18	43.00	3.51	4.33	More than 2 ft of cover	More than 2 ft of cover	Existing culvert beneath ELS Shore Ln SE, assume 5% slope
																															outfall on private property

See WSDOT Hydraulic Manual 6-5 for explanation of columns. http://www.wsdot.wa.gov/eesc/design/hydraulics/

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