HYDROLOGICAL SIMULATION PROGRAM–FORTRAN MODELING OF THE SINCLAIR-DYES INLET WATERSHED FOR THE PUGET SOUND NAVAL SHIPYARD AND INTERMEDIATE MAINTENANCE FACILITY ENVIRONMENTAL INVESTMENT PROJECT – FY 2007 REPORT

Friday, February 23, 2007

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Table of Contents

1.0 INTRODUCTION.....1

2.0 CONSTRUCTION OF THE INPUT WDM FILE.....2

3.0 PREDICTION.....6
- 3.1 CHICO CREEK.....6
  - 3.1.1 CHICO CREEK INPUT FILES AND OUTPUT FILES.....7
- 3.2 STRAWBERRY CREEK.....12
  - 3.2.1 STRAWBERRY CREEK INPUT FILES AND OUTPUT FILES.....13
- 3.3 CLEAR CREEK.....15
  - 3.3.1 CLEAR CREEK INPUT FILES AND OUTPUT FILES.....16
- 3.4 BARKER CREEK.....18
  - 3.4.1 BARKER CREEK INPUT FILES AND OUTPUT FILES.....19
- 3.5 KARCHER CREEK.....22
  - 3.5.1 KARCHER CREEK INPUT FILES AND OUTPUT FILES.....23
- 3.6 BLACKJACK CREEK.....26
  - 3.6.1 BLACKJACK CREEK INPUT FILES AND OUTPUT FILES.....27
- 3.7 ANDERSON CREEK.....29
  - 3.7.1 ANDERSON CREEK INPUT FILES AND OUTPUT FILES.....30
- 3.8 GORST CREEK.....32
  - 3.8.1 GORST CREEK INPUT FILES AND OUTPUT FILES.....33
- 3.9 SPRINGBROOK CREEK.....35
  - 3.9.1 SPRINGBROOK CREEK INPUT FILES AND OUTPUT FILES.....36
- 3.10 BST 01.....39
  - 3.10.1 BST 01 INPUT FILES AND OUTPUT FILES.....40
- 3.11 LMK001.....42
  - 3.11.1 LMK001 INPUT FILES AND OUTPUT FILES.....43
- 3.12 LMK002.....45
  - 3.12.1 LMK002 INPUT FILES AND OUTPUT FILES.....46
- 3.13 LMK038.....48
  - 3.13.1 LMK038 INPUT FILES AND OUTPUT FILES.....49
- 3.14 B-ST CSO16.....51
  - 3.14.1 B-ST CSO16 INPUT FILES AND OUTPUT FILES.....51
- 3.15 BST 28.....54
  - 3.15.1 BST 28 INPUT FILES AND OUTPUT FILES.....55

4.0 CALIBRATED MODELS FOR PSNS NOT USED FOR PREDICTION.....57
- 4.1 PSNS 126 HYDROLOGIC CALIBRATION MODEL AND FILES.....57
- 4.2 PSNS 015 HYDROLOGIC CALIBRATION MODEL AND FILES.....58

5.0 REFRENCES.....59

1.0 INTRODUCTION

The objective of this document is to summarize scoped activities for FY 2007 related to Hydrological Simulation Program–Fortran (HSPF) model development and associated model application for the Sinclair–Dyes Inlet watershed located in Kitsap County, Washington. These efforts support the Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF) Environmental Investment (ENVVEST) Project.

2.0 CONSTRUCTION OF THE INPUT WDM FILE

The ANNIE and WDMUtil utility software packages, and also TSPROC (Doherty 2003), all in the public domain, were principally used to process, input, manipulate, and manage the time series data in a Watershed Data Management (WDM) file (Flynn et al. 1995). Table 1 lists some of the relevant data set numbers (DSNs) contained within the input WDM file, envvest.wdm, that was prepared for the study (DTMAX = maximum mean daily temperature; DTMIN = minimum mean daily temperature; DDPTP = mean daily dew point temperature; DWND = mean wind speed or total wind travel for the day; DEVP = daily Penman Pan Evaporation; EVAP = disaggregated Penman Pan Evaporation; DSOL = Global Solar Radiation data; PREC = precipitation; ATEM = hourly air temperature; SOLR = hourly solar radiation data; DEWP = hourly dew point temperature data; CLOU = cloud cover data; FLOW = flow data). Table 1 differs from Table 6 in Skahill and LaHatte (2006) in the following manner:

1. DSNs 201 and 202 now end at 12/31/2006 reflecting additional data received, processed, and input into envvest.wdm.
2. DSN 213 is now described.
3. The data associated with DSNs 1001 and 1002 is now described.
4. DSNs 1004 and 1005 are now described. The presumed missing data for the PSNS precipitation gage for the period June – October 2001 was filled in by taking the average of the values at the Bremerton precipitation gages 1 – 4.
5. DSNs 1011 – 1018 now end at different dates reflecting additional data received, processed, and input into envvest.wdm.
6. DSNs 1022 – 1052, for Bremerton gage 2, are now described.
7. DSNs 1160 – 1363 are now described. For WY 2005, DSN 1160 was updated using data from Bremerton Sta. 2. For WY 2005, missing data at Bremerton Airport was filled in using data from Bremerton Sta. 2, resulting in an update for DSN 1161. For WY 2005, missing data at Silverdale-Wixon was filled in using data from Bremerton Sta. 3, resulting in an update for DSN 1162. For WY 2005,

missing data at Airport Park was filled in using data from Bremerton Sta. 3, resulting in an update for DSN 1163.

8. DSNs 3009 – 9854 are now described. For WY 2005, the data at Bremerton Sta. 3 was used to fill in missing data at Bremerton Sta. 4, resulting in the update for DSN 9854.

DSN	Constituent	Start	End	Station Name
1	DTMAX	1/1/1994	12/31/2005	BREM - DAILY T MAX (Deg F)
2	DTMIN	1/1/1994	12/31/2005	BREM - DAILY T MIN (Deg F)
3	DDPTP	1/1/1994	12/31/2005	BREM - DAILY DEW POINT TEMP (Deg F)
4	DWND	1/1/1994	12/31/2005	BREM - DAILY WIND (MpH)
5	DWND	1/1/1994	12/31/2005	computed total daily wind travel
6	DEVP	1/1/1994	12/31/2005	computed daily pan evaporation (in)
7	EVAP	1/1/1994	12/31/2005	disaggregated PET (daily to hourly)
8	EVAP	1/1/1994	12/31/2005	disaggregated PET (hourly to 15 minute)
101	DTMAX	1/1/1996	12/31/2005	WA SEATTLE TACOMA AIRPORT - DAILY T MAX (Deg F)
102	DTMIN	1/1/1996	12/31/2005	WA SEATTLE TACOMA AIRPORT - DAILY T MIN (Deg F)
103	DDPTP	1/1/1996	12/31/2005	WA SEATTLE TACOMA AIRPORT - DAILY DPTP (Deg F)
104	DWND	1/1/1996	12/31/2005	WA SEATTLE TACOMA AIRPORT - DAILY WIND (MpH)
105	DSOL	1/1/1970	12/31/2005	WA SEATTLE TACOMA AIRPORT - DAILY SOLAR Rad
106	DWND	1/1/1996	12/31/2005	computed total daily wind travel
107	DEVP	1/1/1996	12/31/2005	computed daily pan evaporation (in)
108	EVAP	1/1/1996	12/31/2005	disaggregated PET (daily to hourly)
109	EVAP	1/1/1996	12/31/2005	disaggregated PET (hourly to 15 minute)
111	PREC	1/1/1970	12/31/1996	WA SEATTLE TACOMA AIRPO
112	EVAP	1/1/1970	12/31/1995	WA SEATTLE TACOMA AIRPO
113	ATEM	1/1/1970	12/31/1995	WA SEATTLE TACOMA AIRPO
114	WIND	1/1/1970	12/31/1995	WA SEATTLE TACOMA AIRPO
115	SOLR	1/1/1970	12/31/1995	WA SEATTLE TACOMA AIRPO
116	PEVT	1/1/1970	12/31/1995	WA SEATTLE TACOMA AIRPO
117	DEWP	1/1/1970	12/31/1995	WA SEATTLE TACOMA AIRPO
118	CLOU	1/1/1970	12/31/1995	WA SEATTLE TACOMA AIRPO
119	TMAX	1/1/1970	12/31/1995	WA SEATTLE TACOMA AIRPO
120	TMIN	1/1/1970	12/31/1995	WA SEATTLE TACOMA AIRPO
121	DWND	1/1/1970	12/31/1995	WA SEATTLE TACOMA AIRPO
122	DCLO	1/1/1970	12/31/1995	WA SEATTLE TACOMA AIRPO
123	DPTP	1/1/1970	12/31/1995	WA SEATTLE TACOMA AIRPO
124	DSOL	1/1/1970	12/31/1995	WA SEATTLE TACOMA AIRPO
125	DEVT	1/1/1970	12/31/1995	WA SEATTLE TACOMA AIRPO
126	DEVP	1/1/1970	12/31/1995	WA SEATTLE TACOMA AIRPO
201	FLOW	3/31/2004	12/31/2006	5 Minute Flow for Springbrook Creek on BI
202	PREC	3/31/2004	12/31/2006	5 Minute Prec for Springbrook Creek on BI
203	PREC	3/31/2004	11/9/2004	15 Minute Prec for Springbrook Creek on BI
204	PREC	10/1/1992	11/9/2004	15 Minute Prec for Springbrook Creek on BI
205	FLOW	3/31/2004	1/1/2005	15 Minute Flow for Springbrook Creek on BI
207	FLOW	3/18/2004	11/10/2004	15 Minute Flow for Trenton
209	FLOW	3/18/2004	11/10/2004	15 Minute Flow for B-ST 01
213	EVAP	10/1/1948	9/30/1999	Daily Pan Evaporation at Puyallup
245	FLOW	10/1/1991	9/30/1997	Daily Flow for Barker Creek
246	FLOW	10/1/1993	9/30/2000	Daily Flow for Clear Creek
248	FLOW	10/1/1991	9/30/1999	MEAN DAILY Q FOR STREAM # 248 - STRAWBERRY CK
259	FLOW	4/1/1991	3/18/1996	OBSERVED FLOW AT MAIN BASIN OUTLET GAGE
268	FLOW	10/24/1990	9/24/1996	MEAN DAILY Q FOR STREAM # 268 - GORST CK
272	FLOW	10/1/1994	9/30/2000	Daily Flow for Anderson Creek
279	FLOW	10/1/1992	5/31/1993	MEAN DAILY Q FOR STREAM # 279 - BLACKJACK CK
282	FLOW	10/1/1996	9/30/2000	Daily Flow for Karcher Creek
301	FLOW	4/5/2004	11/9/2004	15 Minute Flow for PO-POBLVD
303	FLOW	4/5/2004	11/10/2004	15 Minute Flow for LMK 136
305	FLOW	3/16/2004	11/10/2004	15 Minute Flow for PSNS 126

307	FLOW	3/24/2004	10/25/2004	15 Minute Flow for PSNS 124
309	FLOW	3/16/2004	11/10/2004	15 Minute Flow for PSNS 015
311	FLOW	4/7/2004	11/10/2004	15 Minute Flow for LMK001
313	FLOW	4/5/2004	11/10/2004	15 Minute Flow for LMK002
315	FLOW	4/5/2004	11/10/2004	15 Minute Flow for LMK122
317	FLOW	3/16/2004	11/10/2004	15 Minute Flow for LMK038
319	FLOW	3/19/2004	11/10/2004	15 Minute Flow for CSO16
321	FLOW	3/17/2004	9/29/2004	15 Minute Flow for BST28
600	PREC	1/1/2001	6/4/2004	15 Minute Precipitation at GM
610	PREC	1/1/2001	9/30/2005	15 Minute Precipitation at BA
620	PREC	1/1/2001	9/30/2005	15 Minute Precipitation at Silverdale-Wixon
630	PREC	1/1/2001	9/30/2005	15 Minute Precipitation at Airport Park
640	PREC	10/1/2003	6/22/2004	15 Minute Precipitation at KPUD Station
1001	PREC	1/1/1994	12/2/2000	15 Minute Precipitation at East Bremerton
1002	PREC	1/1/1991	12/5/2000	15 Minute Precipitation at West Bremerton
1003	PREC	11/3/1999	6/13/2006	15 Minute Precipitation at PSNS
1004	PREC	1/1/1970	6/13/2006	15 Minute Precipitation at PSNS
1005	PREC	1/1/1970	6/13/2006	Processed 15 Min. Prec. at PSNS
1011	PREC	1/1/1992	6/18/2006	15 Minute Precipitation at City of Brem. Sta. 1
1012	PREC	1/1/1992	6/16/2006	15 Minute Precipitation at City of Brem. Sta. 2
1013	PREC	1/1/1997	6/16/2006	15 Minute Precipitation at City of Brem. Sta. 3
1014	PREC	10/21/1999	10/5/2005	15 Minute Precipitation at City of Brem. Sta. 4
1015	PREC	11/20/2001	4/30/2006	15 Minute Precipitation at City of Brem. Sta. 5
1016	PREC	2/7/2002	6/13/2006	15 Minute Precipitation at City of Brem. Sta. 6
1017	PREC	2/19/2002	12/31/2006	15 Minute Precipitation at City of Brem. Sta. 7
1018	PREC	1/8/2003	6/13/2006	15 Minute Precipitation at City of Brem. Sta. 8
1022	PREC	6/1/1991	12/31/1995	HOURLY RAINFALL AT BREMERTON GAGE 2
1032	PREC	1/1/1991	9/30/2000	DAILY TOTAL RAINFALL AT BREMERTON GAGE 2
1042	PREC	1/1/1991	10/1/1992	disaggregated precipitation (daily to hourly)
1052	PREC	1/1/1991	9/30/1992	15 Minute Precipitation
1160	PREC	10/1/1992	6/16/2006	Processed 15 Minute Precipitation at GM
1161	PREC	1/1/1970	9/30/2005	Processed 15 Minute Precipitation at BA
1162	PREC	10/1/1992	9/30/2005	Processed 15 Min. Prec. at Silverdale-Wixon
1163	PREC	10/1/1992	9/30/2005	Processed 15 Min. Prec. at Airport Park
1262	PREC	10/1/1992	12/22/2004	Processed 15 Min. Prec. at Silverdale-Wixon
1360	PREC	10/1/1992	12/19/2004	Processed 15 Minute Precipitation at GM
1361	PREC	1/1/1970	12/19/2004	Processed 15 Minute Precipitation at BA
1362	PREC	10/1/1992	12/19/2004	Processed 15 Min. Prec. at Silverdale-Wixon
1363	PREC	10/1/1992	12/19/2004	Processed 15 Min. Prec. at Airport Park
2231	FLOW	10/1/2000	9/30/2002	15 Minute Flow for steel creek
2451	FLOW	10/1/2000	9/30/2005	15 Minute Flow for Barker Creek
2461	FLOW	10/1/1996	9/30/2005	15 Minute Flow for Clear Creek
2462	FLOW	12/3/2000	9/30/2005	15 Minute Flow for Clear Creek East
2463	FLOW	10/1/2000	9/30/2003	15 Minute Flow for Clear Creek West
2481	FLOW	10/1/2001	9/30/2005	15 Minute Flow for Strawberry Creek
2591	FLOW	10/1/1999	9/30/2005	15 Minute Flow for Chico Creek
2592	FLOW	10/1/2000	9/30/2003	15 Minute Flow for Chico Creek Tributary at Tayl
2593	FLOW	10/1/2000	9/30/2005	15 Minute Flow for Dickerson Creek
2594	FLOW	10/1/2000	9/30/2005	15 Minute Flow for Kitsap Creek at lake outlet
2595	FLOW	10/1/2000	9/30/2002	15 Minute Flow for kitsap lake at control
2596	FLOW	10/1/2000	9/30/2005	15 Minute Flow for wildcat creek at lake outlet
2597	FLOW	10/1/2002	9/30/2003	15 Minute Stage for kitsap lake at control
2681	FLOW	10/1/2000	9/30/2003	15 Minute Flow for Gorst Creek
2683	FLOW	10/1/2001	9/30/2003	15 Minute Flow for Parish Creek
2684	FLOW	10/1/2001	9/30/2003	15 Minute Flow for Heins Creek
2721	FLOW	10/1/1994	9/25/2003	15 Minute Flow for Anderson Creek
2791	FLOW	10/1/2000	9/30/2005	15 Minute Flow for Blackjack Creek
2821	FLOW	10/1/1996	9/16/2003	15 Minute Flow for Karcher Creek
3009	FLOW	10/1/2000	9/29/2003	Mean Daily Flow for Dickerson Creek
3010	FLOW	10/1/2001	9/30/2003	Mean Daily Flow for Heins Creek
3011	FLOW	10/1/2001	9/30/2003	Mean Daily Flow for Parish Creek
3015	FLOW	10/1/1994	9/22/2002	Mean Daily Flow for Anderson Creek
3020	FLOW	10/1/1996	9/15/2003	Mean Daily Flow for Karcher Creek
3023	FLOW	10/1/2000	9/30/2003	Mean Daily Flow for Blackjack Creek
3027	FLOW	10/1/2000	9/30/2003	Mean Daily Flow for Kitsap Creek at lake outlet
3028	FLOW	10/1/2000	9/30/2003	Mean Daily Flow for Chico Creek Tributary at Tay

3029	FLOW	10/1/1999	9/30/2003	Mean Daily Flow for Chico Creek
3032	FLOW	10/1/2000	9/30/2003	Mean Daily Flow for Barker Creek
3053	FLOW	10/1/1996	9/30/2003	Mean Daily Flow for Clear Creek
3055	FLOW	10/1/2000	9/30/2003	Mean Daily Flow for Clear Creek West
3107	FLOW	10/1/2001	9/30/2003	Mean Daily Flow for Strawberry Creek
3201	FLOW	10/1/2000	9/30/2003	Mean Daily Flow for wildcat creek at lake outlet
9851	PREC	10/1/1992	6/18/2006	Processed 15 Min. Prec. at City of Brem. Sta. 1
9852	PREC	1/1/1970	6/16/2006	Processed 15 Min. Prec. at City of Brem. Sta. 2
9853	PREC	10/1/1992	6/16/2006	Processed 15 Min. Prec. at City of Brem. Sta. 3
9854	PREC	10/1/1992	6/16/2006	Processed 15 Min. Prec. at City of Brem. Sta. 4

Table 1. Brief description of some of the relevant data set numbers contained within the input WDM file, envvest.wdm, that was prepared for the study.

3.0 PREDICTION

3.1 CHICO CREEK

The Chico Creek HSPF model that was developed and employed during the calibration and verification effort was executed using data associated with the final version of the input WDM file. There were some observed differences between the simulated output associated with use of the final version of the input WDM file and the calibration and verification results for the Chico Creek HSPF hydrologic model that were reported in Skahill and LaHatte (2006). As noted in Skahill and LaHatte (2006), a final composite objective function value of 2594 was obtained for the Chico Creek HSPF model during hydrologic model calibration. Using the final version of the input WDM file, the same model (i.e., parameter set) yielded a composite objective function value of 4240. Tables 2 and 3 compare objective function values that were obtained during the hydrologic model calibration and also from model execution using the final version of the input WDM file, in each case using the parameter set obtained from the calibration and verification effort reported in Skahill and LaHatte (2006).

The source for the observed differences in the results from the two simulations was investigated, and it is believed to primarily be due to differences in the solar radiation data utilized during the calibration effort and the solar radiation data contained in the final input WDM file (please note that solar radiation data, in each case, was used with other meteorological data to compute Penman Pan evaporation data that was subsequently used as input meteorological forcing data to support HSPF simulation). For the two simulations (i.e., the calibration effort and the simulation using the calibrated model (calibration parameter set) with the final input WDM file), notable differences in computed Penman Pan evaporation data were observed for June and July 2002, and smaller discrepancies were observed for April – August 2003. It should be noted that the calibration and verification efforts at times had to utilize provisional data that was later updated. The WDM file that was used for the Chico Creek HSPF calibration and verification effort will be distributed, and named in a manner such that it is clearly identifiable, with the final model for Chico Creek.

The Chico Creek HSPF model that was developed and calibrated for hydrology and sediment loading, as reported in Skahill and LaHatte (2006), was augmented to also simulate instream sediment transport and deposition. This included preparing output WDM files to receive the following HSPF simulated output:

1. suspended sediment concentrations (sand, silt, clay, and total),
2. bed depth,
3. deposition or scour (sand, silt, clay, and total),
4. sum of inflows of sediment (sand, silt, clay, and total),
5. total outflows of sediment (sand, silt, clay, and total),
6. sediment storages (bed sand, bed silt, bed clay), and
7. bed shear stress.

The Chico Creek HSPF model that was developed and calibrated for hydrology and sediment loading, and augmented to simulate instream sediment transport and deposition, was subsequently modified to simulate those systems that were designated to piggy back off of the parameter set obtained for Chico Creek during the hydrology and sediment loading calibration and verification efforts that were reported in Skahill and LaHatte (2006). Table 4 lists the systems that were involved in the Chico Creek HSPF hydrology and sediment loading calibration and verification efforts and also those systems that were specified to piggy back off of the HSPF hydrology and sediment loading calibration and verification efforts for Chico Creek. A WDM file was prepared to receive the simulated 15 minute flows for all of the Data Set Numbers (DSNs) listed in Table 4 for the period 01/01/1994 – 09/30/2005.

3.1.1 CHICO CREEK INPUT FILES AND OUTPUT FILES

The following HSPF related files constitute the calibrated and verified HSPF hydrology and sediment loading model for Chico Creek that was augmented to include instream sediment transport and deposition for Chico Creek and also modified to simulate flows for twelve additional systems that were predetermined to piggy back off of the Chico Creek HSPF hydrologic model calibration:

1. chico.uci – HSPF User's Control Input file,
2. chico.sup – HSPF User's Control Supplementary Input file (for use with the modified hspf model xhspfx),
3. envvest.wdm – input WDM file,
4. out1.wdm – output WDM file of hydrologic output, principally associated with calibration and verification efforts,
5. out3.wdm – output WDM file of sediment loading output, principally associated with calibration and verification efforts,
6. out4.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Chico Creek,
7. out5.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Chico Creek,
8. out6.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Chico Creek, and
9. chpred.wdm – output WDM file containing simulated 15 minute flows for the DSNs specified in Table 4 for the period 01/01/1994 – 09/30/2005.

Kitsap Creek at Lake Outlet					
	15 Min. Data	Daily			
	1	1	2	3	4
Calibration	59.14	83.97	217.1	41.78	254.6
Simulation with final input WDM file	59.16	84.01	217.1	43.96	290.9

Wildcat Creek at Lake Outlet						
	15 Min. Data	Daily				
	1	1	2	3	4	5
Calibration	234.4	200.2	86.56	52.04	86.84	253.8
Simulation with final input WDM file	234.3	200.4	86.57	52.06	108.9	255.5

Chico Tributary at Taylor Road					
	15 Min. Data	Daily			
	1	1	2	3	4
Calibration	199.2	77.7	13.79	47.77	309.3
Simulation with final input WDM file	199.2	77.69	19.88	45.89	342.1

Dickerson Creek			
	15 Min. Data	Daily	
	1	1	2
Calibration	34.2	20.17	2.782
Simulation with final input WDM file	34.22	20.36	2.822

Chico Creek Mainstem				
	15 Min. Data	Daily		
	1	1	2	3
Calibration	67.99	28.81	164.5	3.737
Simulation with final input WDM file	68.02	28.76	164.6	3.273

Table 2. Subcomponent objective function values for daily and 15 minute flows for Chico Creek HSPF hydrologic model calibration and simulation using final input WDM file, in each case using the parameter set obtained during calibration, as reported in Skahill and LaHatte (2006). Time periods associated with each component above are provided in Table 10 in Skahill and LaHatte (2006).

		"CALIBRATION"					"SIMULATION WITH FINAL WDM"				
		ID	SURO	IFWO	AGWO	TAET	ID	SURO	IFWO	AGWO	TAET
Kitsap Creek	SUBURBAN	1	1.37E-02	1.70E-03	3.86E-03	9.36E-03	1	4.31E-02	9.64E-02	8.13E-05	2.14E-03
	MULTI-FAMILY	2	1.51E-03	1.71E-05	2.37E-05	3.13E-04	2	8.88E-03	4.24E-03	1.41E-04	5.79E-03
	COMMERCIAL	3	9.25E-02	1.12E-02	9.55E-03	1.59E+00	3	1.13E-01	8.64E-03	9.08E-03	1.60E+00
	RURAL RESIDENTIAL	4	5.34E-04	4.16E-04	2.97E-02	1.94E-05	4	8.70E-03	1.51E+00	1.19E+03	1.02E+00
	LAWN	5	8.20E-03	1.97E-04	2.12E-01	5.83E-01	5	1.10E-02	1.21E-01	7.87E-01	1.71E-01
	PASTURE	6	1.37E-02	5.10E-03	3.38E-03	4.07E-03	6	1.11E-02	1.67E+00	3.21E-02	1.06E+00
	FOREST	7	3.63E-01	4.27E-03	3.96E+00	1.83E+00	7	3.58E-01	1.27E+01	1.33E-04	5.73E-01
	BAREGROUND	10	2.30E-03	1.25E-04	1.38E-03	1.75E-03	10	7.82E-03	9.38E-04	1.10E-03	1.85E-02
Wildcat Creek	SUBURBAN	12	2.07E-03	8.45E-03	3.45E-03	5.07E-02	12	9.28E-03	2.32E-02	3.74E-03	2.78E-03
	MULTI-FAMILY	13	4.16E-04	1.15E-06	1.33E-05	3.59E-03	13	4.76E-03	5.25E-03	3.29E-05	2.62E-04
	COMMERCIAL	14	1.08E+00	1.81E-03	6.85E-02	1.40E+01	14	1.16E+00	2.63E-03	7.09E-02	1.43E+01
	RURAL RESIDENTIAL	15	1.13E-02	8.96E-03	6.53E-05	2.03E-04	15	7.56E-02	1.09E+00	2.16E+00	5.54E+00
	LAWN	16	1.92E-01	4.44E-02	3.67E-02	5.34E-02	16	2.00E-01	1.41E-01	5.90E-01	8.15E-02
	PASTURE	17	6.96E-02	4.06E-02	8.49E-04	0.00E+00	17	6.17E-02	5.20E-01	4.65E+00	1.05E+01
	FOREST	18	1.67E-01	6.77E-02	5.67E-02	2.92E-01	18	1.61E-01	1.42E+01	3.56E-01	1.14E-02
	BAREGROUND	21	7.47E-02	8.00E-03	8.70E-03	2.65E-01	21	9.93E-02	3.96E-03	1.04E-02	3.70E-01
Chico Trib.	SUBURBAN	23	9.79E-02	3.08E-04	3.72E-03	4.80E-03	23	1.58E-01	3.38E-02	1.37E-04	2.58E-02
	MULTI-FAMILY	24	5.25E-03	3.81E-05	1.28E-03	1.30E-03	24	1.42E-02	3.37E-03	5.92E-04	1.07E-02
	COMMERCIAL	25	1.72E-01	1.55E-02	1.08E-02	2.43E+00	25	2.01E-01	1.23E-02	1.07E-02	2.45E+00
	RURAL RESIDENTIAL	26	1.21E-03	4.49E-04	1.81E-03	4.18E-02	26	4.34E-02	1.01E+00	1.39E+00	6.29E+00
	LAWN	27	1.82E-01	4.73E-02	7.86E-03	8.97E-02	27	2.13E-01	2.07E-01	3.26E-03	7.48E-01
	PASTURE	28	3.64E-03	6.99E-03	4.44E-04	3.21E-04	28	5.23E-03	1.01E+00	2.27E+00	5.87E+00
	FOREST	29	2.83E+00	3.10E-01	5.63E-01	3.43E-01	29	2.76E+00	5.88E+00	1.16E+00	3.76E-01
	BAREGROUND	32	2.02E-03	2.98E-04	2.97E-04	5.37E-03	32	6.67E-03	1.02E-04	6.51E-06	2.29E-02
Dickerson Creek	SUBURBAN	34	2.06E-02	2.65E-03	7.14E-03	9.31E-03	34	4.66E-02	2.92E-02	1.36E-03	4.99E-04
	MULTI-FAMILY	35	6.76E-03	1.47E-04	3.42E-03	3.99E-03	35	1.59E-02	4.24E-03	2.28E-03	1.40E-02
	COMMERCIAL	36	4.10E-01	2.96E-02	2.10E-02	4.75E+00	36	4.54E-01	2.44E-02	2.07E-02	4.74E+00
	RURAL RESIDENTIAL	37	2.40E-04	7.52E-04	6.02E-05	2.58E-05	37	6.54E-02	4.67E-01	6.92E-01	6.18E-03
	LAWN	38	5.43E-02	1.14E-02	4.10E-04	4.07E-03	38	7.65E-02	1.17E-01	1.12E-02	1.33E-01
	PASTURE	39	1.27E-03	3.28E-04	1.00E-04	1.01E-05	39	3.53E-04	5.41E-01	1.42E+02	5.40E-02
	FOREST	40	7.10E-01	9.06E-02	1.24E+00	8.56E-02	40	6.61E-01	4.56E+01	1.15E+00	2.32E+00
	BAREGROUND	43	9.19E-03	8.01E-07	2.98E-03	7.24E-02	43	1.88E-02	1.06E-03	3.36E-03	1.30E-01
Chico Creek Mainstem	SUBURBAN	45	1.85E-03	1.96E-04	6.63E-04	4.38E-04	45	1.25E-02	1.03E-02	8.09E-04	4.92E-04
	MULTI-FAMILY	46	2.29E-03	1.84E-04	1.87E-03	1.51E-02	46	8.39E-03	3.12E-03	7.14E-04	2.76E-02
	COMMERCIAL	47	6.02E-01	4.36E-02	5.43E-02	6.82E+00	47	6.57E-01	3.70E-02	5.26E-02	6.79E+00
	RURAL RESIDENTIAL	48	7.00E-03	3.35E-02	1.62E-03	3.82E-03	48	4.26E-02	1.26E-01	1.91E+00	4.06E-03
	LAWN	49	8.98E-04	7.30E-03	3.89E-04	1.59E-03	49	2.29E-03	4.53E-02	1.15E-01	8.23E-04
	PASTURE	50	2.26E-02	2.38E-02	2.45E-05	1.76E-03	50	1.76E-02	1.99E-01	7.80E+01	3.25E-03
	FOREST	51	2.68E+00	2.65E-01	2.17E+00	1.85E-01	51	2.57E+00	8.95E+00	7.87E-02	2.32E-01
	BAREGROUND	54	3.36E-03	3.93E-05	2.14E-04	3.22E-02	54	8.48E-03	1.85E-03	1.42E-04	5.86E-02
	IMPERVIOUS - KITSAP CK	111	3.93E-02			2.73E-02	111	5.52E-02			1.64E-02
	IMPERVIOUS - WILDCAT CK	121	9.46E-02			4.90E-02	121	9.93E-02			4.57E-02
	IMPERVIOUS - CHICO TRIB.	131	7.32E-02			6.70E-02	131	7.70E-02			6.33E-02
	IMPERVIOUS - DICKERSON	141	7.92E-02			7.49E-02	141	1.15E-01			4.62E-02
	IMPERVIOUS - CHICO MAINSTEM	151	8.49E-02			7.97E-02	151	8.92E-02			7.55E-02

Table 3. Subcomponent objective function values associated with targets for Chico Creek HSPF hydrologic model calibration and simulation using final input WDM file, in each case using the parameter set obtained during calibration, as reported in Skahill and LaHatte (2006).

DSN	
Calibrated	Piggy Back Systems
53	87
89	22
225	201
226	25
88	26
47	65
90	71
50	95
54	97
91	139
	145
	149

Table 4. Data Set Numbers that are simulated with the Chico Creek HSPF model.

3.2 STRAWBERRY CREEK

The Strawberry Creek HSPF model that was developed and employed during the calibration and verification effort was executed using data associated with the final version of the input WDM file. There were some observed differences between the simulated output associated with use of the final version of the input WDM file and the calibration and verification results for the Strawberry Creek HSPF hydrologic model that were reported in Skahill and LaHatte (2006). As noted in Skahill and LaHatte (2006), a final composite objective function value of 937 was obtained for the Strawberry Creek HSPF model during hydrologic model calibration. Using the final version of the input WDM file, the same model (i.e., parameter set) yielded a composite objective function value of 1103. The explanation for the above noted observed discrepancies in simulated output is the same as that already reported for the observed Chico Creek differences.

The Strawberry Creek HSPF model that was developed and calibrated for hydrology and sediment loading, as reported in Skahill and LaHatte (2006), was augmented to also simulate instream sediment transport and deposition. This included preparing output WDM files to receive the following HSPF simulated output:

1. suspended sediment concentrations (sand, silt, clay, and total),
2. bed depth,
3. deposition or scour (sand, silt, clay, and total),
4. sum of inflows of sediment (sand, silt, clay, and total),
5. total outflows of sediment (sand, silt, clay, and total),
6. sediment storages (bed sand, bed silt, bed clay), and
7. bed shear stress.

The Strawberry Creek HSPF model that was developed and calibrated for hydrology and sediment loading, and augmented to simulate instream sediment transport and deposition, was subsequently modified to simulate those systems that were designated to piggy back off of the parameter set obtained for Strawberry Creek during the hydrology and sediment loading calibration and verification efforts that were reported in Skahill and

LaHatte (2006). Table 5 lists the systems that were involved in the Strawberry Creek HSPF hydrology and sediment loading calibration and verification efforts and also those systems that were specified to piggy back off of the HSPF hydrology and sediment loading calibration and verification efforts for Strawberry Creek. A WDM file was prepared to receive the simulated 15 minute flows for all of the Data Set Numbers (DSNs) listed in Table 5 for the period 01/01/1994 – 09/30/2005.

3.2.1 STRAWBERRY CREEK INPUT FILES AND OUTPUT FILES

The following HSPF related files constitute the calibrated and verified HSPF hydrology and sediment loading model for Strawberry Creek that was augmented to include instream sediment transport and deposition for Strawberry Creek and also modified to simulate flows for seven additional systems that were predetermined to piggy back off of the Strawberry Creek HSPF hydrologic model calibration:

1. st.uci – HSPF User's Control Input file,
2. st.sup – HSPF User's Control Supplementary Input file (for use with the modified hspf model xhspfx),
3. envvest.wdm – input WDM file,
4. out1new.wdm – output WDM file of hydrologic output, principally associated with calibration and verification efforts,
5. out3.wdm – output WDM file of sediment loading output, principally associated with calibration and verification efforts,
6. out4.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Strawberry Creek,
7. out5.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Strawberry Creek,
8. out6.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Strawberry Creek, and
9. stpred.wdm – output WDM file containing simulated 15 minute flows for the DSNs specified in Table 5 for the period 01/01/1994 – 09/30/2005.

DSN	
Calibrated	Piggy Back Systems
94	66
	67
	68
	96
	98
	99
	137

Table 5. Data Set Numbers that are simulated with the Strawberry Creek HSPF model.

3.3 CLEAR CREEK

The Clear Creek HSPF model that was developed and employed during the calibration and verification effort was executed using data associated with the final version of the input WDM file. There were some observed differences between the simulated output associated with use of the final version of the input WDM file and the calibration and verification results for the Clear Creek HSPF hydrologic model that were reported in Skahill and LaHatte (2006). As noted in Skahill and LaHatte (2006), a final composite objective function value of 97.96 was obtained for the Clear Creek HSPF model during hydrologic model calibration. Using the final version of the input WDM file, the same model (i.e., parameter set) yielded a composite objective function value of 128.67. The explanation for the above noted observed discrepancies in simulated output is the same as that already reported for the observed Chico Creek differences.

The Clear Creek HSPF model that was developed and calibrated for hydrology and sediment loading, as reported in Skahill and LaHatte (2006), was augmented to also simulate instream sediment transport and deposition. This included preparing output WDM files to receive the following HSPF simulated output:

1. suspended sediment concentrations (sand, silt, clay, and total),
2. bed depth,
3. deposition or scour (sand, silt, clay, and total),
4. sum of inflows of sediment (sand, silt, clay, and total),
5. total outflows of sediment (sand, silt, clay, and total),
6. sediment storages (bed sand, bed silt, bed clay), and
7. bed shear stress.

The Clear Creek HSPF model that was developed and calibrated for hydrology and sediment loading, and augmented to simulate instream sediment transport and deposition, was subsequently modified to simulate those systems that were designated to piggy back off of the parameter set obtained for Clear Creek during the hydrology and sediment loading calibration and verification efforts that were reported in Skahill and LaHatte

(2006). Table 6 lists the systems that were involved in the Clear Creek HSPF hydrology and sediment loading calibration and verification efforts and also those systems that were specified to piggy back off of the HSPF hydrology and sediment loading calibration and verification efforts for Clear Creek. A WDM file was prepared to receive the simulated 15 minute flows for all of the Data Set Numbers (DSNs) listed in Table 6 for the period 01/01/1994 – 09/30/2005.

3.3.1 CLEAR CREEK INPUT FILES AND OUTPUT FILES

The following HSPF related files constitute the calibrated and verified HSPF hydrology and sediment loading model for Clear Creek that was augmented to include instream sediment transport and deposition for Clear Creek and also modified to simulate flows for the additional systems that were predetermined to piggy back off of the Clear Creek HSPF hydrologic model calibration:

1. clear.uci – HSPF User's Control Input file,
2. clear.sup – HSPF User's Control Supplementary Input file (for use with the modified hspf model xhspfx),
3. envvest.wdm – input WDM file,
4. out1.wdm – output WDM file of hydrologic output, principally associated with calibration and verification efforts,
5. out3.wdm – output WDM file of sediment loading output, principally associated with calibration and verification efforts,
6. out4.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Clear Creek,
7. out5.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Clear Creek,
8. out6.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Clear Creek, and
9. clpred.wdm – output WDM file containing simulated 15 minute flows for the DSNs specified in Table 6 for the period 01/01/1994 – 09/30/2005.

DSN	
Calibrated	Piggy Back Systems
105	125
108	129
106	130
113	131
114	132
107	133
121	134
122	135
109	136
110	
111	
120	
112	
115	
116	
117	
119	
118	
123	
124	
128	
1	
126	
127	

Table 6. Data Set Numbers that are simulated with the Clear Creek HSPF model.

3.4 BARKER CREEK

The Barker Creek HSPF model that was developed and employed during the calibration and verification effort was executed using data associated with the final version of the input WDM file. There were some observed differences between the simulated output associated with use of the final version of the input WDM file and the calibration and verification results for the Barker Creek HSPF hydrologic model that were reported in Skahill and LaHatte (2006). As noted in Skahill and LaHatte (2006), a final composite objective function value of 787.7 (or 420.26 when the contribution associated with prior information is excluded) was obtained for the Barker Creek HSPF model during hydrologic model calibration. Using the final version of the input WDM file, the same model (i.e., parameter set) yielded a composite objective function value of 421.84. The explanation for the above noted observed discrepancies in simulated output is the same as that already reported for the observed Chico Creek differences.

The Barker Creek HSPF model that was developed and calibrated for hydrology and sediment loading, as reported in Skahill and LaHatte (2006), was augmented to also simulate instream sediment transport and deposition. This included preparing output WDM files to receive the following HSPF simulated output:

1. suspended sediment concentrations (sand, silt, clay, and total),
2. bed depth,
3. deposition or scour (sand, silt, clay, and total),
4. sum of inflows of sediment (sand, silt, clay, and total),
5. total outflows of sediment (sand, silt, clay, and total),
6. sediment storages (bed sand, bed silt, bed clay), and
7. bed shear stress.

The Barker Creek HSPF model that was developed and calibrated for hydrology and sediment loading, and augmented to simulate instream sediment transport and deposition, was subsequently modified to simulate those systems that were designated to piggy back off of the parameter set obtained for Barker Creek during the hydrology and sediment loading calibration and verification efforts that were reported in Skahill and LaHatte (2006). Table 7 lists the systems that were involved in the Barker Creek HSPF hydrology and sediment loading calibration and verification efforts and also those systems that were specified to piggy back off of the HSPF hydrology and sediment loading calibration and verification efforts for Barker Creek. A WDM file was prepared to receive the simulated 15 minute flows for all of the Data Set Numbers (DSNs) listed in Table 7 for the period 01/01/1994 – 09/30/2005.

3.4.1 BARKER CREEK INPUT FILES AND OUTPUT FILES

The following HSPF related files constitute the calibrated and verified HSPF hydrology and sediment loading model for Barker Creek that was augmented to include instream sediment transport and deposition for Barker Creek and also modified to simulate flows for the additional systems that were predetermined to piggy back off of the Barker Creek HSPF hydrologic model calibration:

1. barker.uci – HSPF User's Control Input file,
2. barker.sup – HSPF User's Control Supplementary Input file (for use with the modified hspf model xhspfx),
3. envvest.wdm – input WDM file,
4. out1.wdm – output WDM file of hydrologic output, principally associated with calibration and verification efforts,
5. out3.wdm – output WDM file of sediment loading output, principally associated with calibration and verification efforts,
6. out4.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Barker Creek,
7. out5.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Barker Creek,
8. out6.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Barker Creek, and

9. bpred.wdm – output WDM file containing simulated 15 minute flows for the DSNs specified in Table 7 for the period 01/01/1994 – 09/30/2005.

DSN	
Calibrated	Piggy Back Systems
61	72
60	73
59	92
62	100
58	101
	102
	103

Table 7. Data Set Numbers that are simulated with the Barker Creek HSPF model.

3.5 KARCHER CREEK

The Karcher Creek HSPF model that was developed and employed during the calibration and verification effort was executed using data associated with the final version of the input WDM file. There were some observed differences between the simulated output associated with use of the final version of the input WDM file and the calibration and verification results for the Karcher Creek HSPF hydrologic model that were reported in Skahill and LaHatte (2006). As noted in Skahill and LaHatte (2006), a final composite objective function value of 154 (or 73.5 when the contribution associated with prior information is excluded) was obtained for the Karcher Creek HSPF model during hydrologic model calibration. Using the final version of the input WDM file, the same model (i.e., parameter set) yielded a composite objective function value of 106.58. The explanation for the above noted observed discrepancies in simulated output is the same as that already reported for the observed Chico Creek differences.

The Karcher Creek HSPF model that was developed and calibrated for hydrology and sediment loading, as reported in Skahill and LaHatte (2006), was augmented to also simulate instream sediment transport and deposition. This included preparing output WDM files to receive the following HSPF simulated output:

1. suspended sediment concentrations (sand, silt, clay, and total),
2. bed depth,
3. deposition or scour (sand, silt, clay, and total),
4. sum of inflows of sediment (sand, silt, clay, and total),
5. total outflows of sediment (sand, silt, clay, and total),
6. sediment storages (bed sand, bed silt, bed clay), and
7. bed shear stress.

The Karcher Creek HSPF model that was developed and calibrated for hydrology and sediment loading, and augmented to simulate instream sediment transport and deposition, was subsequently modified to simulate those systems that were designated to piggy back off of the parameter set obtained for Karcher Creek during the hydrology and sediment loading calibration and verification efforts that were reported in Skahill and LaHatte (2006). Table 8 lists the systems that were involved in the Karcher Creek HSPF hydrology and sediment loading calibration and verification efforts and also those systems that were specified to piggy back off of the HSPF hydrology and sediment loading calibration and verification efforts for Karcher Creek. A WDM file was prepared to receive the simulated 15 minute flows for all of the Data Set Numbers (DSNs) listed in Table 8 for the period 01/01/1994 – 09/30/2005.

3.5.1 KARCHER CREEK INPUT FILES AND OUTPUT FILES

The following HSPF related files constitute the calibrated and verified HSPF hydrology and sediment loading model for Karcher Creek that was augmented to include instream sediment transport and deposition for Karcher Creek and also modified to simulate flows for the additional systems that were predetermined to piggy back off of the Karcher Creek HSPF hydrologic model calibration:

1. karcher.uci – HSPF User's Control Input file,
2. karcher.sup – HSPF User's Control Supplementary Input file (for use with the modified hspf model xhspfx),
3. envvest.wdm – input WDM file,
4. out1.wdm – output WDM file of hydrologic output, principally associated with calibration and verification efforts,
5. out3.wdm – output WDM file of sediment loading output, principally associated with calibration and verification efforts,
6. out4.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Karcher Creek,
7. out5.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Karcher Creek,
8. out6.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Karcher Creek, and

9. kpred.wdm – output WDM file containing simulated 15 minute flows for the DSNs specified in Table 8 for the period 01/01/1994 – 09/30/2005.

DSN	
Calibrated	Piggy Back Systems
63	64
	33
	34
	35
	36
	37
	38
	39
	76
	77
	79
	80

Table 8. Data Set Numbers that are simulated with the Karcher Creek HSPF model.

3.6 BLACKJACK CREEK

The Blackjack Creek HSPF model that was developed and employed during the calibration and verification effort was executed using data associated with the final version of the input WDM file. There were some observed differences between the simulated output associated with use of the final version of the input WDM file and the calibration and verification results for the Blackjack Creek HSPF hydrologic model that were reported in Skahill and LaHatte (2006). The explanation for the above noted observed discrepancies in simulated output is the same as that already reported for the observed Chico Creek differences.

The Blackjack Creek HSPF model that was developed and calibrated for hydrology and sediment loading, as reported in Skahill and LaHatte (2006), was augmented to also simulate instream sediment transport and deposition. This included preparing output WDM files to receive the following HSPF simulated output:

1. suspended sediment concentrations (sand, silt, clay, and total),
2. bed depth,
3. deposition or scour (sand, silt, clay, and total),
4. sum of inflows of sediment (sand, silt, clay, and total),
5. total outflows of sediment (sand, silt, clay, and total),
6. sediment storages (bed sand, bed silt, bed clay), and
7. bed shear stress.

The Blackjack Creek HSPF model that was developed and calibrated for hydrology and sediment loading, and augmented to simulate instream sediment transport and deposition, was subsequently modified to simulate those systems that were designated to piggy back off of the parameter set obtained for Blackjack Creek during the hydrology and sediment loading calibration and verification efforts that were reported in Skahill and LaHatte (2006). Table 9 lists the systems that were involved in the Blackjack Creek HSPF hydrology and sediment loading calibration and verification efforts and also those systems that were specified to piggy back off of the HSPF hydrology and sediment loading calibration and verification efforts for Blackjack Creek. A WDM file was prepared to receive the simulated 15 minute flows for all of the Data Set Numbers (DSNs) listed in Table 9 for the period 01/01/1994 – 09/30/2005.

3.6.1 BLACKJACK CREEK INPUT FILES AND OUTPUT FILES

The following HSPF related files constitute the calibrated and verified HSPF hydrology and sediment loading model for Blackjack Creek that was augmented to include instream sediment transport and deposition for Blackjack Creek and also modified to simulate flows for the additional systems that were predetermined to piggy back off of the Blackjack Creek HSPF hydrologic model calibration:

1. bj.uci – HSPF User's Control Input file,
2. bj.sup – HSPF User's Control Supplementary Input file (for use with the modified hspf model xhspfx),
3. envvest.wdm – input WDM file,
4. out1.wdm – output WDM file of hydrologic output, principally associated with calibration and verification efforts,
5. out3.wdm – output WDM file of sediment loading output, principally associated with calibration and verification efforts,
6. out4.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Blackjack Creek,
7. out5.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Blackjack Creek,
8. out6.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Blackjack Creek, and
9. bjpred.wdm – output WDM file containing simulated 15 minute flows for the DSNs specified in Table 9 for the period 01/01/1994 – 09/30/2005.

DSN	
Calibrated	Piggy Back Systems
70	191
2	194
69	193
200	192
	185
	190
	189
	31
	32
	93
	202
	188
	183
	186
	187

Table 9. Data Set Numbers that are simulated with the Blackjack Creek HSPF model.

3.7 ANDERSON CREEK

The Anderson Creek HSPF model that was developed and employed during the calibration and verification effort was executed using data associated with the final version of the input WDM file. There were some observed differences between the simulated output associated with use of the final version of the input WDM file and the calibration and verification results for the Anderson Creek HSPF hydrologic model that were reported in Skahill and LaHatte (2006). As noted in Skahill and LaHatte (2006), a final composite objective function value of 425.5 was obtained for the Anderson Creek HSPF model during hydrologic model calibration. Using the final version of the input WDM file, the same model (i.e., parameter set) yielded a composite objective function value of 433.49. The explanation for the above noted observed discrepancies in simulated output is the same as that already reported for the observed Chico Creek differences.

The Anderson Creek HSPF model that was developed and calibrated for hydrology and sediment loading, as reported in Skahill and LaHatte (2006), was augmented to also simulate instream sediment transport and deposition. This included preparing output WDM files to receive the following HSPF simulated output:

1. suspended sediment concentrations (sand, silt, clay, and total),
2. bed depth,
3. deposition or scour (sand, silt, clay, and total),
4. sum of inflows of sediment (sand, silt, clay, and total),
5. total outflows of sediment (sand, silt, clay, and total),
6. sediment storages (bed sand, bed silt, bed clay), and
7. bed shear stress.

The Anderson Creek HSPF model that was developed and calibrated for hydrology and sediment loading, and augmented to simulate instream sediment transport and deposition, was subsequently modified to simulate those systems that were designated to piggy back off of the parameter set obtained for Anderson Creek during the hydrology and sediment loading calibration and verification efforts that were reported in Skahill and

LaHatte (2006). Table 10 lists the systems that were involved in the Anderson Creek HSPF hydrology and sediment loading calibration and verification efforts and also those systems that were specified to piggy back off of the HSPF hydrology and sediment loading calibration and verification efforts for Anderson Creek. A WDM file was prepared to receive the simulated 15 minute flows for all of the Data Set Numbers (DSNs) listed in Table 10 for the period 01/01/1994 – 09/30/2005.

3.7.1 ANDERSON CREEK INPUT FILES AND OUTPUT FILES

The following HSPF related files constitute the calibrated and verified HSPF hydrology and sediment loading model for Anderson Creek that was augmented to include instream sediment transport and deposition for Anderson Creek and also modified to simulate flows for the additional systems that were predetermined to piggy back off of the Anderson Creek HSPF hydrologic model calibration:

1. anderson.uci – HSPF User's Control Input file,
2. anderson.sup – HSPF User's Control Supplementary Input file (for use with the modified hspf model xhspfx),
3. envvest.wdm – input WDM file,
4. out1.wdm – output WDM file of hydrologic output, principally associated with calibration and verification efforts,
5. out3.wdm – output WDM file of sediment loading output, principally associated with calibration and verification efforts,
6. out4.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Anderson Creek,
7. out5.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Anderson Creek,
8. out6.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Anderson Creek, and
9. apred.wdm – output WDM file containing simulated 15 minute flows for the DSNs specified in Table 10 for the period 01/01/1994 – 09/30/2005.

DSN	
Calibrated	Piggy Back Systems
56	57
	28
	30

Table 10. Data Set Numbers that are simulated with the Anderson Creek HSPF model.

3.8 GORST CREEK

The Gorst Creek HSPF model that was developed and employed during the calibration and verification effort was executed using data associated with the final version of the input WDM file. There were some observed differences between the simulated output associated with use of the final version of the input WDM file and the calibration and verification results for the Gorst Creek HSPF hydrologic model that were reported in Skahill and LaHatte (2006). As noted in Skahill and LaHatte (2006), a final composite objective function value of 233.17 was obtained for the Gorst Creek HSPF model during hydrologic model calibration. Using the final version of the input WDM file, the same model (i.e., parameter set) yielded a composite objective function value of 242.04. The explanation for the above noted observed discrepancies in simulated output is the same as that already reported for the observed Chico Creek differences.

The Gorst Creek HSPF model that was developed and calibrated for hydrology and sediment loading, as reported in Skahill and LaHatte (2006), was augmented to also simulate instream sediment transport and deposition. This included preparing output WDM files to receive the following HSPF simulated output:

1. suspended sediment concentrations (sand, silt, clay, and total),
2. bed depth,
3. deposition or scour (sand, silt, clay, and total),
4. sum of inflows of sediment (sand, silt, clay, and total),
5. total outflows of sediment (sand, silt, clay, and total),
6. sediment storages (bed sand, bed silt, bed clay), and
7. bed shear stress.

The Gorst Creek HSPF model that was developed and calibrated for hydrology and sediment loading, and augmented to simulate instream sediment transport and deposition, was subsequently modified to simulate those systems that were designated to piggy back off of the parameter set obtained for Gorst Creek during the hydrology and sediment loading calibration and verification efforts that were reported in Skahill and LaHatte

(2006). Table 11 lists the systems that were involved in the Gorst Creek HSPF hydrology and sediment loading calibration and verification efforts and also those systems that were specified to piggy back off of the HSPF hydrology and sediment loading calibration and verification efforts for Gorst Creek. A WDM file was prepared to receive the simulated 15 minute flows for all of the Data Set Numbers (DSNs) listed in Table 11 for the period 01/01/1994 – 09/30/2005.

3.8.1 GORST CREEK INPUT FILES AND OUTPUT FILES

The following HSPF related files constitute the calibrated and verified HSPF hydrology and sediment loading model for Gorst Creek that was augmented to include instream sediment transport and deposition for Gorst Creek and also modified to simulate flows for the additional systems that were predetermined to piggy back off of the Gorst Creek HSPF hydrologic model calibration:

1. gorst.uci – HSPF User's Control Input file,
2. gorst.sup – HSPF User's Control Supplementary Input file (for use with the modified hspf model xhspfx),
3. envvest.wdm – input WDM file,
4. out1.wdm – output WDM file of hydrologic output, principally associated with calibration and verification efforts,
5. out3.wdm – output WDM file of sediment loading output, principally associated with calibration and verification efforts,
6. out4.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Gorst Creek,
7. out5.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Gorst Creek,
8. out6.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Gorst Creek, and
9. gpred.wdm – output WDM file containing simulated 15 minute flows for the DSNs specified in Table 11 for the period 01/01/1994 – 09/30/2005.

DSN	
Calibrated	Piggy Back Systems
49	27
51	29
52	
55	

Table 11. Data Set Numbers that are simulated with the Gorst Creek HSPF model.

3.9 SPRINGBROOK CREEK

The Springbrook Creek HSPF model that was developed and employed during the calibration and verification effort was executed using data associated with the final version of the input WDM file. There were some observed differences between the simulated output associated with use of the final version of the input WDM file and the calibration and verification results for the Springbrook Creek HSPF hydrologic model that were reported in Skahill and LaHatte (2006). As noted in Skahill and LaHatte (2006), a final composite objective function value of 18.43 was obtained for the Springbrook Creek HSPF model during hydrologic model calibration. Using the final version of the input WDM file, the same model (i.e., parameter set) yielded a composite objective function value of 44.75. The explanation for the above noted observed discrepancies in simulated output is the same as that already reported for the observed Chico Creek differences.

The Springbrook Creek HSPF model that was developed and calibrated for hydrology and sediment loading, as reported in Skahill and LaHatte (2006), was augmented to also simulate instream sediment transport and deposition. This included preparing output WDM files to receive the following HSPF simulated output:

1. suspended sediment concentrations (sand, silt, clay, and total),
2. bed depth,
3. deposition or scour (sand, silt, clay, and total),
4. sum of inflows of sediment (sand, silt, clay, and total),
5. total outflows of sediment (sand, silt, clay, and total),
6. sediment storages (bed sand, bed silt, bed clay), and
7. bed shear stress.

The Springbrook Creek HSPF model that was developed and calibrated for hydrology and sediment loading, and augmented to simulate instream sediment transport and deposition, was subsequently modified to simulate those systems that were designated to piggy back off of the parameter set obtained for Springbrook Creek during the hydrology and sediment loading calibration and verification efforts that were reported in Skahill and LaHatte (2006). Table 12 lists the systems that were involved in the Springbrook Creek HSPF hydrology and sediment loading calibration and verification efforts and also those systems that were specified to piggy back off of the HSPF hydrology and sediment loading calibration and verification efforts for Springbrook Creek. A WDM file was prepared to receive the simulated 15 minute flows for all of the Data Set Numbers (DSNs) listed in Table 12 for the period 01/01/1994 – 09/30/2005.

3.9.1 SPRINGBROOK CREEK INPUT FILES AND OUTPUT FILES

The following HSPF related files constitute the calibrated and verified HSPF hydrology and sediment loading model for Springbrook Creek that was augmented to include instream sediment transport and deposition for Springbrook Creek and also modified to simulate flows for the additional systems that were predetermined to piggy back off of the Springbrook Creek HSPF hydrologic model calibration:

1. sc.uci – HSPF User's Control Input file,
2. sc.sup – HSPF User's Control Supplementary Input file (for use with the modified hspf model xhspfx),
3. envvest.wdm – input WDM file,
4. out1.wdm – output WDM file of hydrologic output, principally associated with calibration and verification efforts,
5. out3.wdm – output WDM file of sediment loading output, principally associated with calibration and verification efforts,
6. out4.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Springbrook Creek,
7. out5.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Springbrook Creek,
8. out6.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for Springbrook Creek, and

9. scpred.wdm – output WDM file containing simulated 15 minute flows for the DSNs specified in Table 12 for the period 01/01/1994 – 09/30/2005.

DSN	
Calibrated	Piggy Back Systems
209	21
210	23
	24
	74
	75
	203
	204
	205
	206
	207
	208
	40
	41
	42
	43
	44
	45
	82
	83
	84
	85
	86

Table 12. Data Set Numbers that are simulated with the Springbrook Creek HSPF model.

3.10 BST 01

The BST 01 HSPF model that was developed and employed during the calibration and verification effort was executed using data associated with the final version of the input WDM file. There were some observed differences between the simulated output associated with use of the final version of the input WDM file and the calibration and verification results for the BST 01 HSPF hydrologic model that were reported in Skahill and LaHatte (2006). As noted in Skahill and LaHatte (2006), a final composite objective function value of 801.3 was obtained for the BST 01 HSPF model during hydrologic model calibration. Using the final version of the input WDM file, the same model (i.e., parameter set) yielded a composite objective function value of 812.75. The explanation for the above noted observed discrepancies in simulated output is the same as that already reported for the observed Chico Creek differences.

The BST 01 HSPF model that was developed and calibrated for hydrology and sediment loading, as reported in Skahill and LaHatte (2006), was augmented to also simulate instream sediment transport and deposition. This included preparing output WDM files to receive the following HSPF simulated output:

1. suspended sediment concentrations (sand, silt, clay, and total),
2. bed depth,
3. deposition or scour (sand, silt, clay, and total),
4. sum of inflows of sediment (sand, silt, clay, and total),
5. total outflows of sediment (sand, silt, clay, and total),
6. sediment storages (bed sand, bed silt, bed clay), and
7. bed shear stress.

The BST 01 HSPF model that was developed and calibrated for hydrology and sediment loading, and augmented to simulate instream sediment transport and deposition, was subsequently modified to simulate those systems that were designated to piggy back off of the parameter set obtained for BST 01 during the hydrology and sediment loading calibration and verification efforts that were reported in Skahill and LaHatte (2006).

Table 13 lists the systems that were involved in the BST 01 HSPF hydrology and sediment loading calibration and verification efforts and also those systems that were specified to piggy back off of the HSPF hydrology and sediment loading calibration and verification efforts for BST 01. A WDM file was prepared to receive the simulated 15 minute flows for all of the Data Set Numbers (DSNs) listed in Table 13 for the period 01/01/1994 – 09/30/2005.

3.10.1 BST 01 INPUT FILES AND OUTPUT FILES

The following HSPF related files constitute the calibrated and verified HSPF hydrology and sediment loading model for BST 01 that was augmented to include instream sediment transport and deposition for BST 01 and also modified to simulate flows for the additional systems that were predetermined to piggy back off of the BST 01 HSPF hydrologic model calibration:

1. bst01.uci – HSPF User's Control Input file,
2. bst01.sup – HSPF User's Control Supplementary Input file (for use with the modified hspf model xhspfx),
3. envvest.wdm – input WDM file,
4. out1.wdm – output WDM file of hydrologic output, principally associated with calibration and verification efforts,
5. out3.wdm – output WDM file of sediment loading output, principally associated with calibration and verification efforts,
6. out4.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for BST 01,
7. out5.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for BST 01,
8. out6.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for BST 01, and
9. bst01pre.wdm – output WDM file containing simulated 15 minute flows for the DSNs specified in Table 13 for the period 01/01/1994 – 09/30/2005.

DSN	
Calibrated	Piggy Back Systems
3	195
4	199
7	8
	5
	9
	11
	12
	13
	10
	18
	15
	14
	17
	19
	6
	20
	16

Table 13. Data Set Numbers that are simulated with the BST 01 HSPF model.

3.11 LMK001

The LMK001 HSPF model that was developed and employed during the calibration and verification effort was executed using data associated with the final version of the input WDM file. There were some observed differences between the simulated output associated with use of the final version of the input WDM file and the calibration and verification results for the LMK001 HSPF hydrologic model that were reported in Skahill and LaHatte (2006). As noted in Skahill and LaHatte (2006), a final composite objective function value of 36.94 was obtained for the LMK001 HSPF model during hydrologic model calibration. Using the final version of the input WDM file, the same model (i.e., parameter set) yielded a composite objective function value of 37.229. The explanation for the above noted observed discrepancies in simulated output is the same as that already reported for the observed Chico Creek differences.

The LMK001 HSPF model that was developed and calibrated for hydrology and sediment loading, as reported in Skahill and LaHatte (2006), was augmented to also simulate instream sediment transport and deposition. This included preparing output WDM files to receive the following HSPF simulated output:

1. suspended sediment concentrations (sand, silt, clay, and total),
2. bed depth,
3. deposition or scour (sand, silt, clay, and total),
4. sum of inflows of sediment (sand, silt, clay, and total),
5. total outflows of sediment (sand, silt, clay, and total),
6. sediment storages (bed sand, bed silt, bed clay), and
7. bed shear stress.

The LMK001 HSPF model that was developed and calibrated for hydrology and sediment loading, and augmented to simulate instream sediment transport and deposition, was subsequently modified to simulate those systems that were designated to piggy back off of the parameter set obtained for LMK001 during the hydrology and sediment loading calibration and verification efforts that were reported in Skahill and LaHatte (2006).

Table 14 lists the systems that were involved in the LMK001 HSPF hydrology and sediment loading calibration and verification efforts and also those systems that were specified to piggy back off of the HSPF hydrology and sediment loading calibration and verification efforts for LMK001. A WDM file was prepared to receive the simulated 15 minute flows for all of the Data Set Numbers (DSNs) listed in Table 14 for the period 01/01/1994 – 09/30/2005.

3.11.1 LMK001 INPUT FILES AND OUTPUT FILES

The following HSPF related files constitute the calibrated and verified HSPF hydrology and sediment loading model for LMK001 that was augmented to include instream sediment transport and deposition for LMK001 and also modified to simulate flows for the additional systems that were predetermined to piggy back off of the LMK001 HSPF hydrologic model calibration:

1. lmk001.uci – HSPF User's Control Input file,
2. lmk001.sup – HSPF User's Control Supplementary Input file (for use with the modified hspf model xhspfx),
3. envvest.wdm – input WDM file,
4. out1.wdm – output WDM file of hydrologic output, principally associated with calibration and verification efforts,
5. out3.wdm – output WDM file of sediment loading output, principally associated with calibration and verification efforts,
6. out4.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for LMK001,
7. out5.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for LMK001,
8. out6.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for LMK001, and
9. lmk001.wdm – output WDM file containing simulated 15 minute flows for the DSNs specified in Table 14 for the period 01/01/1994 – 09/30/2005.

DSN	
Calibrated	Piggy Back Systems
217	

Table 14. Data Set Numbers that are simulated with the LMK001 HSPF model.

3.12 LMK002

The LMK002 HSPF model that was developed and employed during the calibration and verification effort was executed using data associated with the final version of the input WDM file. There were some observed differences between the simulated output associated with use of the final version of the input WDM file and the calibration and verification results for the LMK002 HSPF hydrologic model that were reported in Skahill and LaHatte (2006). As noted in Skahill and LaHatte (2006), a final composite objective function value of 209.4 was obtained for the LMK002 HSPF model during hydrologic model calibration. Using the final version of the input WDM file, the same model (i.e., parameter set) yielded a composite objective function value of 213.45. The explanation for the above noted observed discrepancies in simulated output is the same as that already reported for the observed Chico Creek differences.

The LMK002 HSPF model that was developed and calibrated for hydrology and sediment loading, as reported in Skahill and LaHatte (2006), was augmented to also simulate instream sediment transport and deposition. This included preparing output WDM files to receive the following HSPF simulated output:

1. suspended sediment concentrations (sand, silt, clay, and total),
2. bed depth,
3. deposition or scour (sand, silt, clay, and total),
4. sum of inflows of sediment (sand, silt, clay, and total),
5. total outflows of sediment (sand, silt, clay, and total),
6. sediment storages (bed sand, bed silt, bed clay), and
7. bed shear stress.

The LMK002 HSPF model that was developed and calibrated for hydrology and sediment loading, and augmented to simulate instream sediment transport and deposition, was subsequently modified to simulate those systems that were designated to piggy back off of the parameter set obtained for LMK002 during the hydrology and sediment loading calibration and verification efforts that were reported in Skahill and LaHatte (2006).

Table 15 lists the systems that were involved in the LMK002 HSPF hydrology and sediment loading calibration and verification efforts and also those systems that were specified to piggy back off of the HSPF hydrology and sediment loading calibration and verification efforts for LMK002. A WDM file was prepared to receive the simulated 15 minute flows for all of the Data Set Numbers (DSNs) listed in Table 15 for the period 01/01/1994 – 09/30/2005.

3.12.1 LMK002 INPUT FILES AND OUTPUT FILES

The following HSPF related files constitute the calibrated and verified HSPF hydrology and sediment loading model for LMK002 that was augmented to include instream sediment transport and deposition for LMK002 and also modified to simulate flows for the additional systems that were predetermined to piggy back off of the LMK002 HSPF hydrologic model calibration:

1. lmk002.uci – HSPF User's Control Input file,
2. lmk002.sup – HSPF User's Control Supplementary Input file (for use with the modified hspf model xhspfx),
3. envvest.wdm – input WDM file,
4. out1.wdm – output WDM file of hydrologic output, principally associated with calibration and verification efforts,
5. out3.wdm – output WDM file of sediment loading output, principally associated with calibration and verification efforts,
6. out4.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for LMK002,
7. out5.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for LMK002,
8. out6.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for LMK002, and
9. lmk002.wdm – output WDM file containing simulated 15 minute flows for the DSNs specified in Table 15 for the period 01/01/1994 – 09/30/2005.

DSN	
Calibrated	Piggy Back Systems
216	104

Table 15. Data Set Numbers that are simulated with the LMK002 HSPF model.

3.13 LMK038

The LMK038 HSPF model that was developed and employed during the calibration and verification effort was executed using data associated with the final version of the input WDM file. There were some observed differences between the simulated output associated with use of the final version of the input WDM file and the calibration and verification results for the LMK038 HSPF hydrologic model that were reported in Skahill and LaHatte (2006). As noted in Skahill and LaHatte (2006), a final composite objective function value of 142.1 was obtained for the LMK038 HSPF model during hydrologic model calibration. Using the final version of the input WDM file, the same model (i.e., parameter set) yielded a composite objective function value of 169.18. The explanation for the above noted observed discrepancies in simulated output is the same as that already reported for the observed Chico Creek differences.

The LMK038 HSPF model that was developed and calibrated for hydrology and sediment loading, as reported in Skahill and LaHatte (2006), was augmented to also simulate instream sediment transport and deposition. This included preparing output WDM files to receive the following HSPF simulated output:

1. suspended sediment concentrations (sand, silt, clay, and total),
2. bed depth,
3. deposition or scour (sand, silt, clay, and total),
4. sum of inflows of sediment (sand, silt, clay, and total),
5. total outflows of sediment (sand, silt, clay, and total),
6. sediment storages (bed sand, bed silt, bed clay), and
7. bed shear stress.

The LMK038 HSPF model that was developed and calibrated for hydrology and sediment loading, and augmented to simulate instream sediment transport and deposition, was subsequently modified to simulate those systems that were designated to piggy back off of the parameter set obtained for LMK038 during the hydrology and sediment loading calibration and verification efforts that were reported in Skahill and LaHatte (2006).

Table 16 lists the systems that were involved in the LMK038 HSPF hydrology and sediment loading calibration and verification efforts and also those systems that were specified to piggy back off of the HSPF hydrology and sediment loading calibration and verification efforts for LMK038. A WDM file was prepared to receive the simulated 15 minute flows for all of the Data Set Numbers (DSNs) listed in Table 16 for the period 01/01/1994 – 09/30/2005.

3.13.1 LMK038 INPUT FILES AND OUTPUT FILES

The following HSPF related files constitute the calibrated and verified HSPF hydrology and sediment loading model for LMK038 that was augmented to include instream sediment transport and deposition for LMK038 and also modified to simulate flows for the additional systems that were predetermined to piggy back off of the LMK038 HSPF hydrologic model calibration:

1. lmk038.uci – HSPF User's Control Input file,
2. lmk038.sup – HSPF User's Control Supplementary Input file (for use with the modified hspf model xhspfx),
3. envvest.wdm – input WDM file,
4. out1.wdm – output WDM file of hydrologic output, principally associated with calibration and verification efforts,
5. out3.wdm – output WDM file of sediment loading output, principally associated with calibration and verification efforts,
6. out4.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for LMK038,
7. out5.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for LMK038,
8. out6.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for LMK038, and
9. lmk038.wdm – output WDM file containing simulated 15 minute flows for the DSNs specified in Table 16 for the period 01/01/1994 – 09/30/2005.

DSN	
Calibrated	Piggy Back Systems
213	78
	81
	46
	211
	212
	196
	182

Table 16. Data Set Numbers that are simulated with the LMK038 HSPF model.

3.14 B-ST CSO16

The B-ST CSO16 HSPF model that was developed and employed during the calibration and verification effort was executed using data associated with the final version of the input WDM file after the HSPF model was modified to simulate those systems that were designated to piggy back off of the parameter set obtained for B-ST CSO16 during the hydrology and sediment loading calibration and verification efforts that were reported in Skahill and LaHatte (2006). Table 17 lists the systems that were involved in the B-ST CSO16 HSPF hydrology and sediment loading calibration and verification efforts and also those systems that were specified to piggy back off of the HSPF hydrology and sediment loading calibration and verification efforts for B-ST CSO16. A WDM file was prepared to receive the simulated 15 minute flows for all of the Data Set Numbers (DSNs) listed in Table 17 for the period 01/01/1994 – 09/30/2005. It should be emphasized that the entire basis of hydrologic prediction for PSNS is the model for B-ST CSO16, despite the fact that hydrologic calibration efforts were conducted for the systems associated with the hydrologic calibration endpoints PSNS 126 and PSNS 015 (see Skahill and LaHatte (2006) for further details). The calibrated models for PSNS 126 and PSNS 015 will be provided for possible use by the PSNS & IMF.

3.14.1 B-ST CSO16 INPUT FILES AND OUTPUT FILES

The following HSPF related files constitute the calibrated and verified HSPF hydrology and sediment loading model for B-ST CSO16 that was augmented to include instream sediment transport and deposition for B-ST CSO16 and also modified to simulate flows for the additional systems that were predetermined to piggy back off of the B-ST CSO16 HSPF hydrologic model calibration:

1. cso16.uci – HSPF User's Control Input file,
2. cso16.sup – HSPF User's Control Supplementary Input file (for use with the modified hspf model xhspfx),
3. envvest.wdm – input WDM file,

4. out3.wdm – output WDM file of sediment loading output, principally associated with calibration and verification efforts,
5. out4.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for B-ST CSO16,
6. out5.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for B-ST CSO16,
7. out6.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for B-ST CSO16, and
8. cso16.wdm – output WDM file containing simulated 15 minute flows for the DSNs specified in Table 17 for the period 01/01/1994 – 09/30/2005.

DSN	
Calibrated	Piggy Back Systems
220	218
	177
	222
	219
	162
	160
	161
	223
	144
	146
	147
	148
	150
	165
	166
	167
	168
	169
	170
	171
	172
	173
	174
	175
	176
	178

Table 17. Data Set Numbers that are simulated with the B-ST CSO16 HSPF model.

3.15 BST 28

The BST 28 HSPF model that was developed and employed during the calibration and verification effort was executed using data associated with the final version of the input WDM file. There were some observed differences between the simulated output associated with use of the final version of the input WDM file and the calibration and verification results for the BST 28 HSPF hydrologic model that were reported in Skahill and LaHatte (2006). As noted in Skahill and LaHatte (2006), a final composite objective function value of 19243 was obtained for the BST 28 HSPF model during hydrologic model calibration. Using the final version of the input WDM file, the same model (i.e., parameter set) yielded a composite objective function value of 16950. The explanation for the above noted observed discrepancies in simulated output is the same as that already reported for the observed Chico Creek differences.

The BST 28 HSPF model that was developed and calibrated for hydrology and sediment loading, as reported in Skahill and LaHatte (2006), was augmented to also simulate instream sediment transport and deposition. This included preparing output WDM files to receive the following HSPF simulated output:

1. suspended sediment concentrations (sand, silt, clay, and total),
2. bed depth,
3. deposition or scour (sand, silt, clay, and total),
4. sum of inflows of sediment (sand, silt, clay, and total),
5. total outflows of sediment (sand, silt, clay, and total),
6. sediment storages (bed sand, bed silt, bed clay), and
7. bed shear stress.

The BST 28 HSPF model that was developed and calibrated for hydrology and sediment loading, and augmented to simulate instream sediment transport and deposition, was subsequently modified to simulate those systems that were designated to piggy back off of the parameter set obtained for BST 28 during the hydrology and sediment loading calibration and verification efforts that were reported in Skahill and LaHatte (2006).

Table 18 lists the systems that were involved in the BST 28 HSPF hydrology and sediment loading calibration and verification efforts and also those systems that were specified to piggy back off of the HSPF hydrology and sediment loading calibration and verification efforts for BST 28. A WDM file was prepared to receive the simulated 15 minute flows for all of the Data Set Numbers (DSNs) listed in Table 18 for the period 01/01/1994 – 09/30/2005.

3.15.1 BST 28 INPUT FILES AND OUTPUT FILES

The following HSPF related files constitute the calibrated and verified HSPF hydrology and sediment loading model for BST 28 that was augmented to include instream sediment transport and deposition for BST 28 and also modified to simulate flows for the additional systems that were predetermined to piggy back off of the BST 28 HSPF hydrologic model calibration:

1. bst28.uci – HSPF User's Control Input file,
2. bst28.sup – HSPF User's Control Supplementary Input file (for use with the modified hspf model xhspfx),
3. envvest.wdm – input WDM file,
4. out1.wdm – output WDM file of hydrologic output, principally associated with calibration and verification efforts,
5. out3.wdm – output WDM file of sediment loading output, principally associated with calibration and verification efforts,
6. out4.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for BST 28,
7. out5.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for BST 28,
8. out6.wdm – output WDM file containing output associated with simulated instream sediment transport and deposition processes for BST 28, and
9. bst28.wdm – output WDM file containing simulated 15 minute flows for the DSNs specified in Table 18 for the period 01/01/1994 – 09/30/2005.

DSN	
Calibrated	Piggy Back Systems
156	221
157	158
224	155
	154
	140
	141
	142
	143
	151
	152
	153
	215
	214

Table 18. Data Set Numbers that are simulated with the BST 28 HSPF model.

4.0 CALIBRATED MODELS FOR PSNS NOT USED FOR PREDICTION

4.1 PSNS 126 HYDROLOGIC CALIBRATION MODEL AND FILES

Calibration and verification efforts were reported in Skahill and LaHatte (2006) for the approximated drainage area associated with the PSNS 126 flow monitoring location. However, the PSNS 126 model was not used for prediction. Relevant files that are associated with the PSNS 126 model are documented below:

1. psns126.uci – HSPF User's Control Input file,
2. psns126.sup – HSPF User's Control Supplementary Input file (for use with the modified hspf model xhspfx),
3. input.wdm – input WDM file,
4. out1.wdm – output WDM file of hydrologic output, principally associated with calibration and verification efforts,
5. psns126.wdm – output WDM file containing simulated 15 minute flows for the DSN 177.

4.2 PSNS 015 HYDROLOGIC CALIBRATION MODEL AND FILES

Calibration and verification efforts were reported in Skahill and LaHatte (2006) for the approximated drainage area associated with the PSNS 015 flow monitoring location. However, the PSNS 015 model was not used for prediction. Relevant files that are associated with the PSNS 015 model are documented below:

6. psns015.uci – HSPF User's Control Input file,
7. psns015.sup – HSPF User's Control Supplementary Input file (for use with the modified hspf model xhspfx),
8. input.wdm – input WDM file,
9. out1.wdm – output WDM file of hydrologic output, principally associated with calibration and verification efforts,
10. psns015.wdm – output WDM file containing simulated 15 minute flows for the DSN 167.

5.0 REFERENCES

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