U.S. Army Corps of Engineers
Walla Walla District

Numerical Model Analysis of System-wide Dissolved Gas Abatement Alternatives

Appendix D

Complete Simulation Results for Snake River Pools

Draft Report

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1 System-wide Two-Dimensional Simulation Results

1.1 Fast-Track Scenarios

This section presents the complete results of the one/two-dimensional hybrid simulations of the fast-track alternative scenarios for the pools/reaches of the Snake River. The fast-track scenarios are summarized in Table 1.1. A more detailed description of the scenarios is presented in the main report.

Table 1.1: Fast-Track Alternatives Model Simulations

Project	Baseline	No. 1	No. 2	No. 3	No. 4
Lower Granite 8/8	Standard Spill	Uniform Spill	Standard Spill	Uniform Spill Power House/Spillway-Wall	Uniform Spill Power House/Spillway-Wall Raised Tail Race
Little Goose 6/8	Uniform Spill 6/8	Uniform Spill 6/8	2 Deflectors Uniform Spill	Uniform Spill 8/8 Power House/Spillway-Wall	Uniform Spill 8/8 Power House/Spillway-Wall Raised Tail Race
Lower Monumental 6/8	Uniform Spill 6/8	Uniform Spill 6/8	2 Deflectors Uniform Spill	Uniform Spill 8/8 Power House/Spillway-Wall	Uniform Spill 8/8 Power House/Spillway-Wall Raised Tail Race
Ice Harbor 10/10	Standard Spill	Uniform Spill	Standard Spill	Standard Spill	Standard Spill
McNary 18/21 (22*)	Standard Spill	Uniform Spill 18/22	Uniform Spill 22/22	Uniform Spill 22/22 Power House/Spillway-Wall	Uniform Spill 22/22 Power House/Spillway-Wall
John Day 18/20	Standard Spill	Uniform SPill 18/20	Standard Spill 20/20	Uniform Spill 20/20	Uniform Spill 20/20
The Dalles 0/23	Standard Spill	Uniform Spill	Standard Spill	Uniform Spill 23/23	Uniform Spill 23/23
Bonneville 13/16 (18**)	Standard Spill	Uniform Spill 13/19	Uniform Spill 18/18	Uniform Spill 18/18	Uniform Spill 18/18 Raised Tail Race

* McNary has 22 spillway bays, but only 21 are currently operational.
** The Bonneville standard spillway patterns limits bays 1 and 18 to a 4-inch gate opening.

Table 1.2: Percentage of daily highest 12 hour average TDG %sat exceeding the water quality waiver of 120% at 2-D simulation time series output location (FMS) for baseline and longterm scenarios in a medium flow season (1996)

Location	Pool	Baseline		Fast-Track No.1		Fast-Track No.2		Fast-Track No.3	
		Days	%	Days	%	Days	%	Days	%
North	LGS	7	4.7	38	25.3	7	4.7	38	25.3
	LMN	42	28.0	42	28.0	34	22.7	35	23.3
	IHR	35	23.3	34	22.7	21	14.0	2	1.3
	MCN	14	9.3	14	9.3	14	9.3	14	9.3
	JDA	85	56.7	54	36.0	38	25.3	37	24.7
	TDA	41	27.3	24	16.0	41	27.3	21	14.0
	BON	40	26.7	38	25.3	39	26.0	16	10.7
	TID	35	23.3	29	19.3	34	22.7	34	22.7
Mid-Channel	LGS	48	32.0	36	24.0	48	32.0	7	4.7
	LMN	46	30.7	46	30.7	33	22.0	16	10.7
	IHR	48	32.0	48	32.0	45	30.0	37	24.7
	MCN	26	17.3	26	17.3	20	13.3	15	10.0
	JDA	47	31.3	49	32.7	36	24.0	33	22.0
	TDA	24	16.0	24	16.0	20	13.3	16	10.7
	BON	37	24.7	35	23.3	34	22.7	8	5.3
	TID	78	52.0	74	49.3	63	42.0	60	40.0
South	LGS	5	3.3	6	4.0	5	3.3	0	0.0
	LMN	39	26.0	39	26.0	33	22.0	0	0.0
	IHR	58	38.7	58	38.7	57	38.0	56	37.3
	MCN	34	22.7	34	22.7	25	16.7	13	8.7
	JDA	9	6.0	9	6.0	8	5.3	6	4.0
	TDA	11	7.3	11	7.3	6	4.0	4	2.7
	BON	33	22.0	33	22.0	29	19.3	3	2.0
	TID	35	23.3	29	19.3	32	21.3	16	10.7

1.1.1 McNary Pool

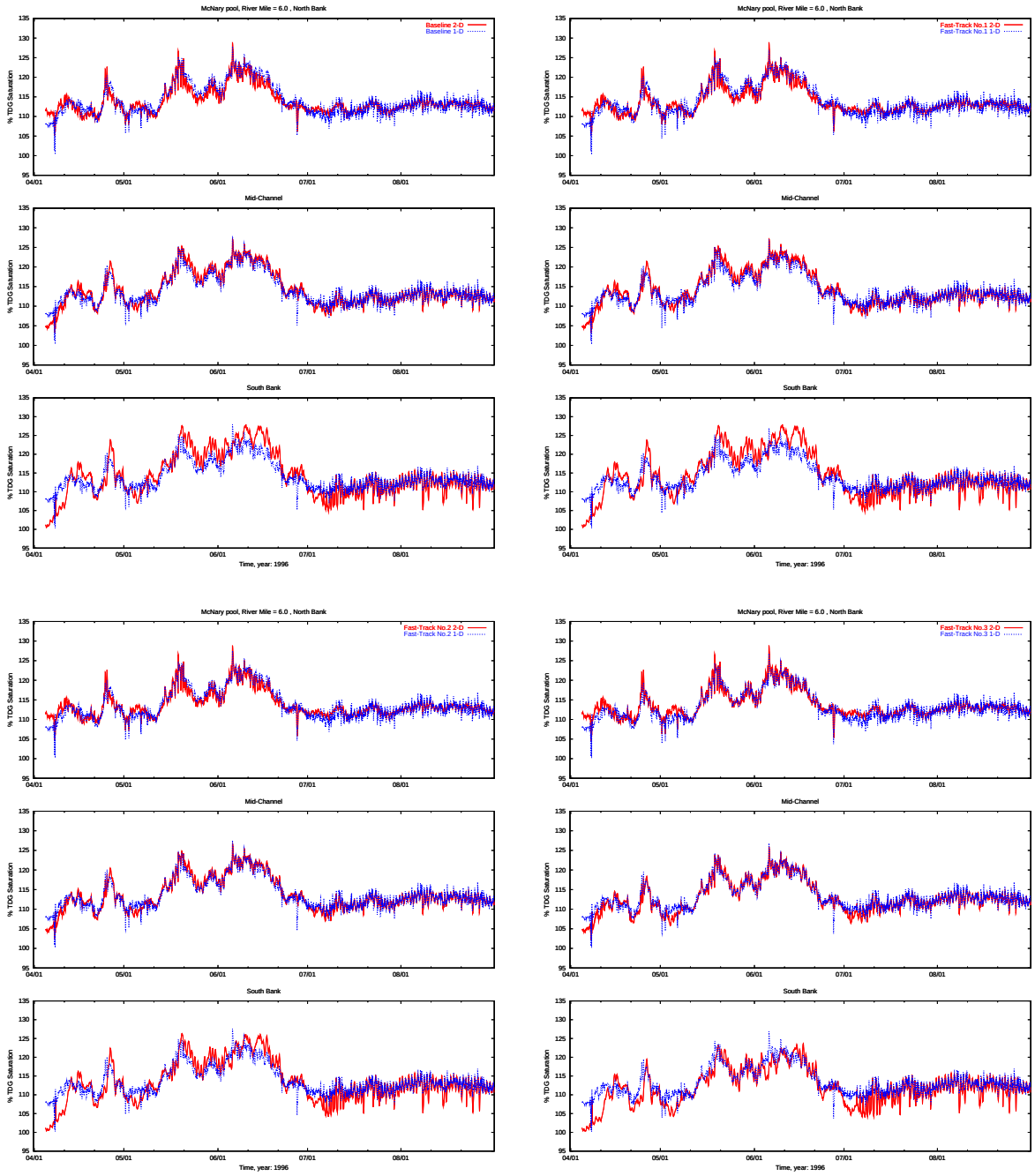

Figure 1.1: Time series plots of saturation at the FMS below Ice Harbor (IDSW) in McNary Pool from the fast-track hybrid simulations compared with the 1-D simulation values in a medium/high flow season (1996)

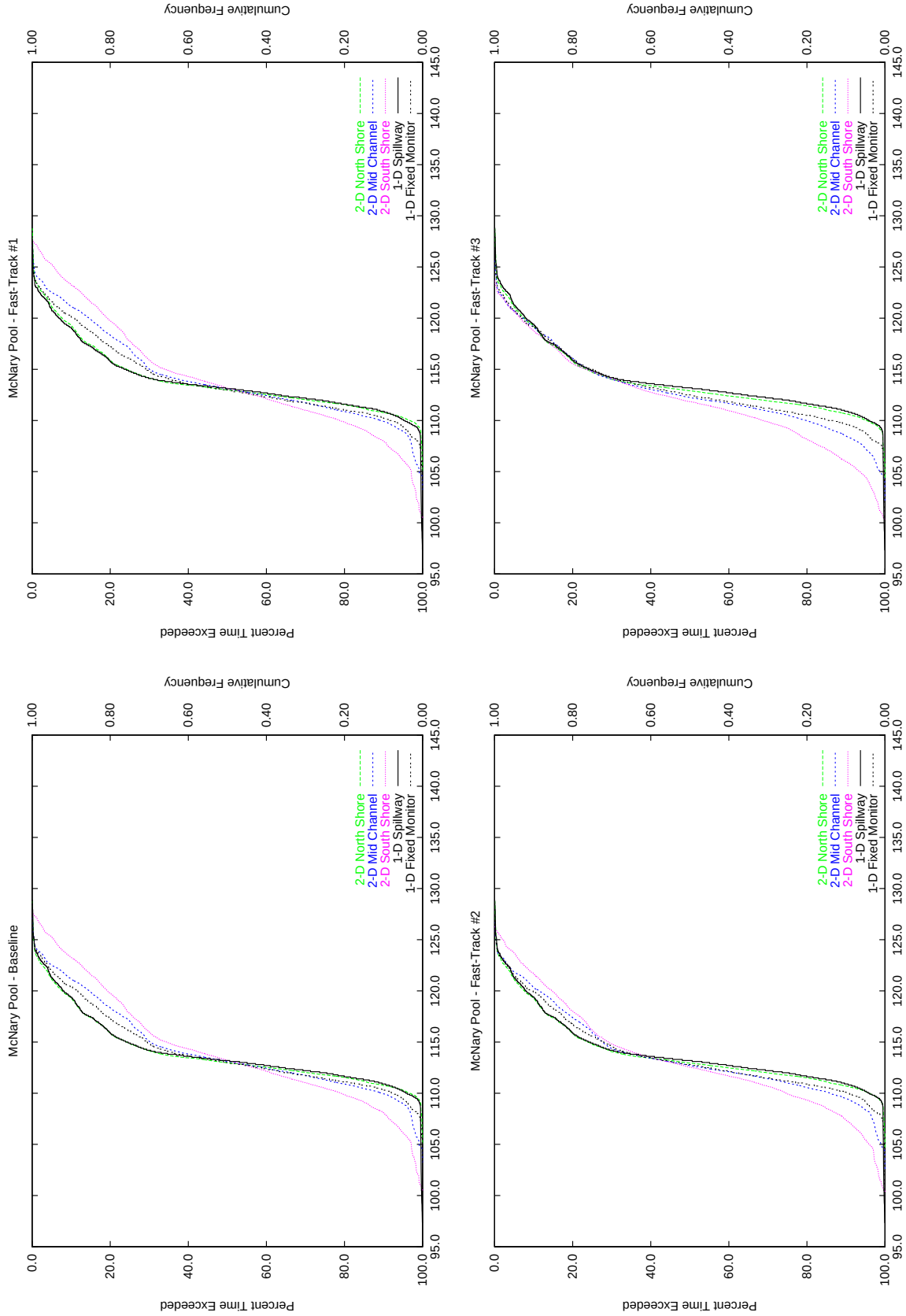

Figure 1.2: Cumulative frequency distributions TDG saturation simulated by the 1-D/2-D hybrid model for several points across the channel at the IDSW FMS location (SRM 6) McNary Pool during a medium/high flow (1996) season and each scenario compared with similar values from the 1-D simulations at the spillway and FMS location.

Table 1.3: Summary statistics of TDG saturation percentage of MASS2 and MASS1 time series output for fast-track scenarios in McNary pool in a medium flow season (1996)

Location		Base Line	Fast-Track No.1	Fast-Track No.2	Fast-Track No.3
North FMS	number	3577.0	3577.0	3577.0	3577.0
	mean	113.9	113.9	113.8	113.8
	median	113.0	113.0	112.9	112.9
	minimum	105.1	105.1	104.7	104.4
	lower quartile	111.8	111.8	111.8	111.7
	upper quartile	114.8	114.8	114.8	114.7
	10% exceedance	119.3	119.3	119.3	119.2
	maximum	128.8	128.8	128.8	128.8
	standard deviation	3.3	3.3	3.3	3.3
Mid-channel	number	3577.0	3577.0	3577.0	3577.0
	mean	114.2	114.2	113.7	113.0
	median	113.1	113.1	112.7	112.2
	minimum	103.2	103.2	102.6	102.2
	lower quartile	111.3	111.3	111.0	110.5
	upper quartile	117.0	117.0	115.9	114.8
	10% exceedance	121.2	121.2	120.3	119.1
	maximum	127.2	127.1	126.7	125.9
	standard deviation	4.3	4.3	4.1	3.9
South	number	3577.0	3577.0	3577.0	3577.0
	mean	114.3	114.2	113.4	112.0
	median	113.2	113.2	112.5	111.8
	minimum	100.5	100.5	100.4	100.3
	lower quartile	110.5	110.4	109.9	109.3
	upper quartile	117.8	117.8	116.2	114.8
	10% exceedance	123.3	123.2	121.7	118.8
	maximum	127.9	127.9	126.3	123.7
	standard deviation	5.7	5.7	5.3	4.7
1-D FMS	number	3577.0	3577.0	3577.0	3577.0
	mean	114.1	114.0	113.8	113.3
	median	113.0	113.0	112.8	112.5
	minimum	100.3	100.3	100.2	100.2
	lower quartile	111.4	111.4	111.2	110.8
	upper quartile	116.1	116.0	115.6	115.0
	10% exceedance	120.4	120.1	119.9	119.1
	maximum	127.9	127.0	127.5	126.8
	standard deviation	3.8	3.8	3.8	3.6

Table 1.4: Histogram table of TDG saturation percentage of MASS2 and MASS1 time series output for fast-track scenarios in McNary pool in a medium flow season (1996)

Location	TDG Range	Base Line		Fast-Track No.1		Fast-Track No.2		Fast-Track No.3	
		Days	%	Days	%	Days	%	Days	%
North FMS	less than 105	0	0.0	0	0.0	0	0.0	0	0.0
	105 - 110	5	3.3	5	3.3	6	4.1	7	4.8
	110 - 115	108	72.6	108	72.5	107	71.9	107	71.9
	115 - 120	25	16.5	25	16.5	24	16.3	24	15.9
	120 - 125	11	7.3	11	7.3	11	7.3	11	7.2
	125 - 130	0	0.3	0	0.3	0	0.3	0	0.3
	above 130	0	0.0	0	0.0	0	0.0	0	0.0
Mid-channel	less than 105	1	0.9	1	0.9	2	1.0	2	1.3
	105 - 110	14	9.5	15	9.9	20	13.1	28	18.9
	110 - 115	89	59.5	88	59.2	87	58.3	83	55.7
	115 - 120	23	15.5	23	15.5	24	16.3	25	16.9
	120 - 125	21	14.1	21	14.1	16	11.0	11	7.1
	125 - 130	1	0.5	1	0.5	0	0.3	0	0.1
	above 130	0	0.0	0	0.0	0	0.0	0	0.0
South	less than 105	4	2.9	4	2.9	6	4.1	10	6.5
	105 - 110	27	18.1	27	18.3	32	21.3	37	24.8
	110 - 115	66	44.6	67	44.8	68	45.5	68	45.4
	115 - 120	22	15.1	22	14.8	22	14.5	25	16.7
	120 - 125	20	13.7	20	13.6	19	12.5	10	6.5
	125 - 130	8	5.6	8	5.6	3	2.1	0	0.0
	above 130	0	0.0	0	0.0	0	0.0	0	0.0
1-D FMS	less than 105	0	0.1	0	0.1	0	0.2	0	0.3
	105 - 110	11	7.3	12	7.8	14	9.2	20	13.5
	110 - 115	94	63.2	94	62.8	94	62.9	91	61.3
	115 - 120	27	17.9	28	18.6	27	18.2	27	17.8
	120 - 125	17	11.2	16	10.4	14	9.3	10	6.9
	125 - 130	1	0.4	0	0.3	0	0.3	0	0.1
	above 130	0	0.0	0	0.0	0	0.0	0	0.0

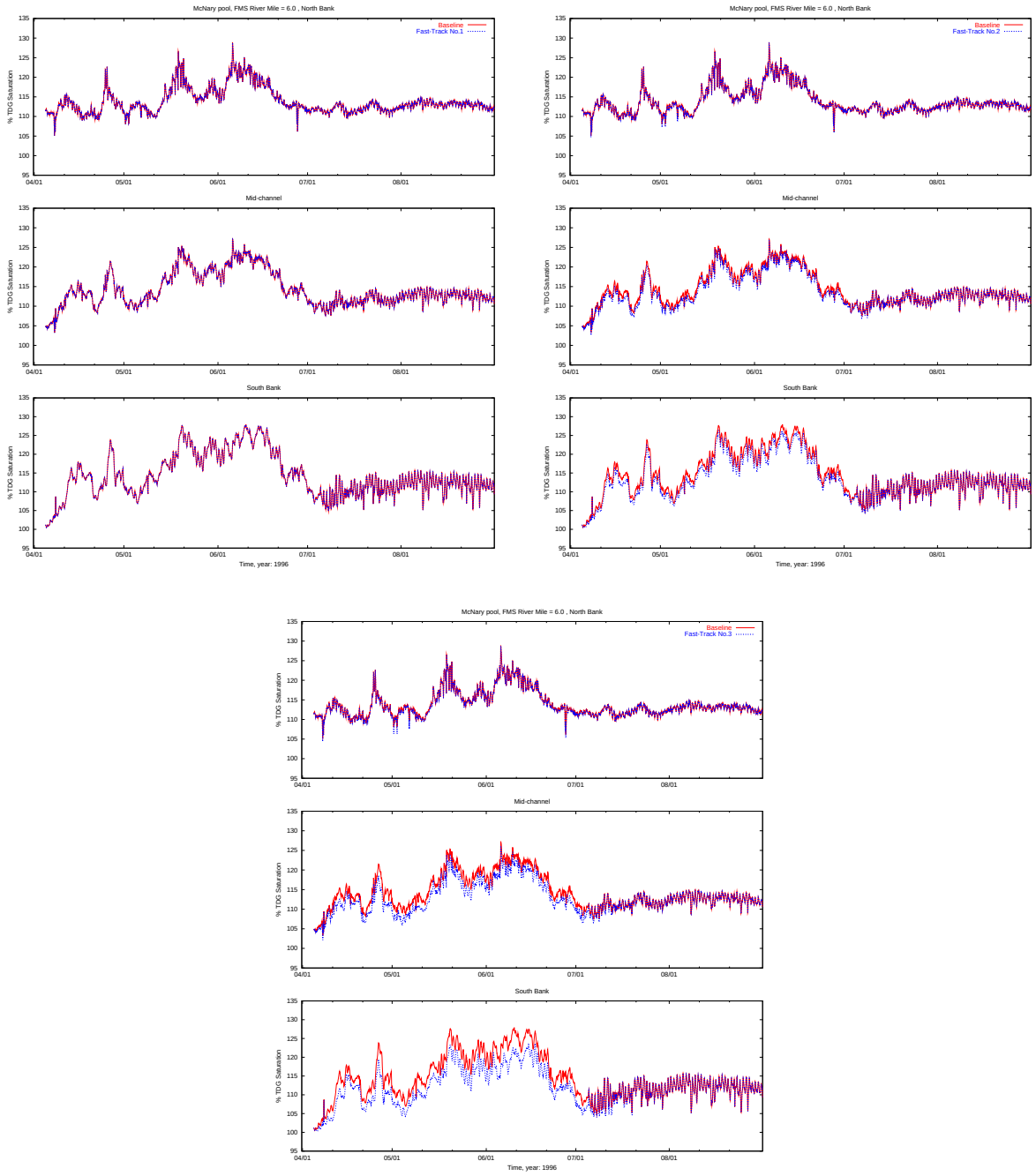

Figure 1.3: Time series plots of saturation at the FMS below Ice Harbor (IDSW) in McNary Pool from the fast-track hybrid simulations compared with the baseline hybrid simulation in a medium/high flow season (1996)

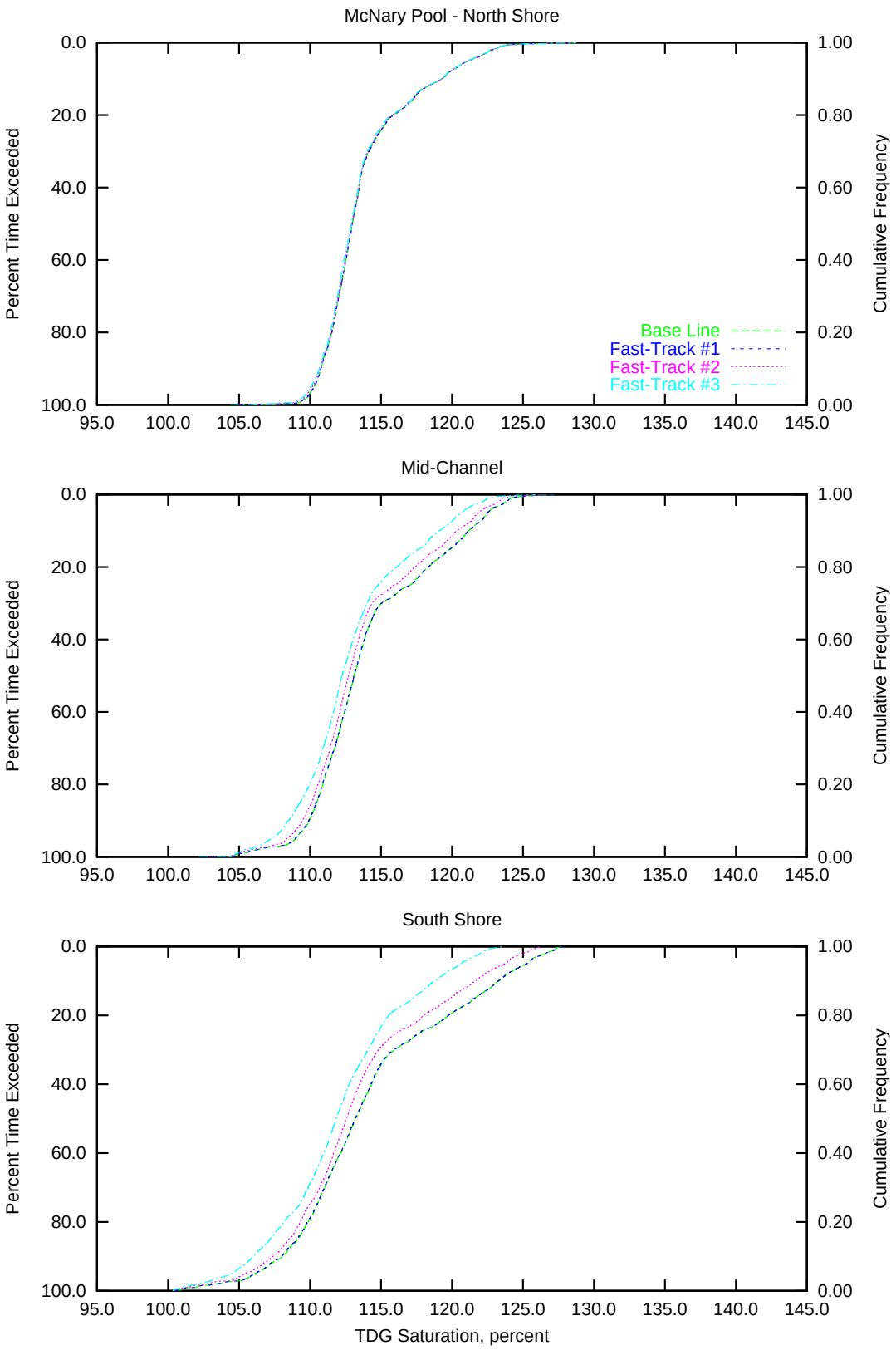

Figure 1.4: Comparision of simulated TDG saturation cumulative frequency distributions for several points across the channel at the IDSW FMS location (SRM 6) in the McNary Pool during a medium/high flow (1996) season.

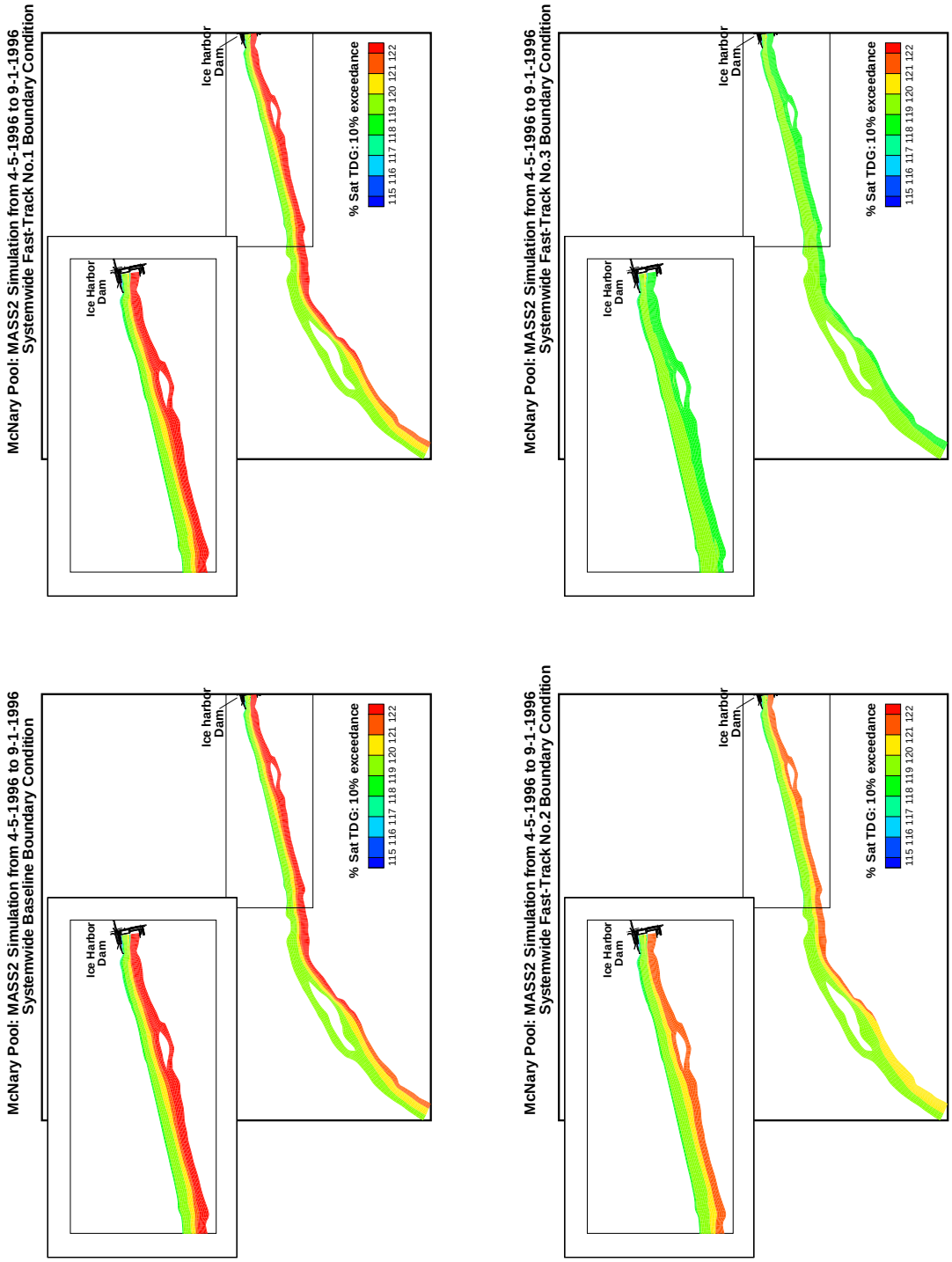

Figure 1.5: Areal comparison of TDG saturation exceeded 10% of a medium flow season (1996) for the fast-track scenarios in McNary Pool.

Table 1.5: Tabular histogram of TDG saturation exceeded 10% of the medium/high flow season (1996) over 2-D modeled area in McNary pool during the Fast-Track scenario simulations.

Baseline Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	0.0	0.0	0.0	0.0
115 - 120	736.3	45.6	12172.2	47.6
120 - 125	878.4	54.4	13376.2	52.4
≥ 125	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25548.4	100.0

Fast-Track #1 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	0.0	0.0	0.0	0.0
115 - 120	737.9	45.7	12204.8	47.8
120 - 125	876.8	54.3	13343.6	52.2
≥ 125	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25548.4	100.0

Fast-Track #2 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	0.0	0.0	0.0	0.0
115 - 120	886.6	54.9	14741.7	57.7
120 - 125	728.1	45.1	10806.8	42.3
≥ 125	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25548.4	100.0

Fast-Track #3 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	0.0	0.0	0.0	0.0
115 - 120	1613.3	99.9	25521.2	99.9
120 - 125	1.4	0.1	27.2	0.1
≥ 125	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25548.4	100.0

Table 1.6: Tabular histogram of TDG saturation exceeded 10% of the medium/high flow season (1996) over 2-D modeled area in McNary pool during the Fast-Track scenario simulations.

Baseline Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	4.0	0.2	72.5	0.3
6 - 8	1610.7	99.8	25475.9	99.7
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25548.4	100.0

Fast-Track #1 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	4.0	0.2	72.5	0.3
6 - 8	1610.7	99.8	25475.9	99.7
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25548.4	100.0

Fast-Track #2 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	4.0	0.2	72.5	0.3
6 - 8	1610.7	99.8	25475.9	99.7
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25548.4	100.0

Fast-Track #3 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	4.7	0.3	84.5	0.3
6 - 8	1610.0	99.7	25463.9	99.7
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25548.4	100.0

Table 1.7: Tabular histogram of TDG saturation exceeded 25% of the medium/high flow season (1996) over 2-D modeled area in McNary pool during the Fast-Track scenario simulations.

Baseline Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	391.4	24.2	6295.2	24.6
115 - 120	1223.3	75.8	19253.2	75.4
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25548.4	100.0

Fast-Track #1 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	391.4	24.2	6295.2	24.6
115 - 120	1223.3	75.8	19253.2	75.4
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25548.4	100.0

Fast-Track #2 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	471.4	29.2	7596.7	29.7
115 - 120	1143.3	70.8	17951.7	70.3
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25548.4	100.0

Fast-Track #3 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	1547.1	95.8	24272.8	95.0
115 - 120	67.6	4.2	1275.6	5.0
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25548.4	100.0

Table 1.8: Tabular histogram of TDG saturation exceeded 25% of the medium/high flow season (1996) over 2-D modeled area in McNary pool during the Fast-Track scenario simulations.

Baseline Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	1560.9	96.7	24947.9	97.6
6 - 8	53.8	3.3	600.5	2.4
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25548.4	100.0

Fast-Track #1 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	1573.2	97.4	25062.6	98.1
6 - 8	41.5	2.6	485.8	1.9
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25548.4	100.0

Fast-Track #2 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	1614.7	100.0	25548.4	100.0
6 - 8	0.0	0.0	0.0	0.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25548.4	100.0

Fast-Track #3 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	1614.7	100.0	25548.4	100.0
6 - 8	0.0	0.0	0.0	0.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25548.4	100.0

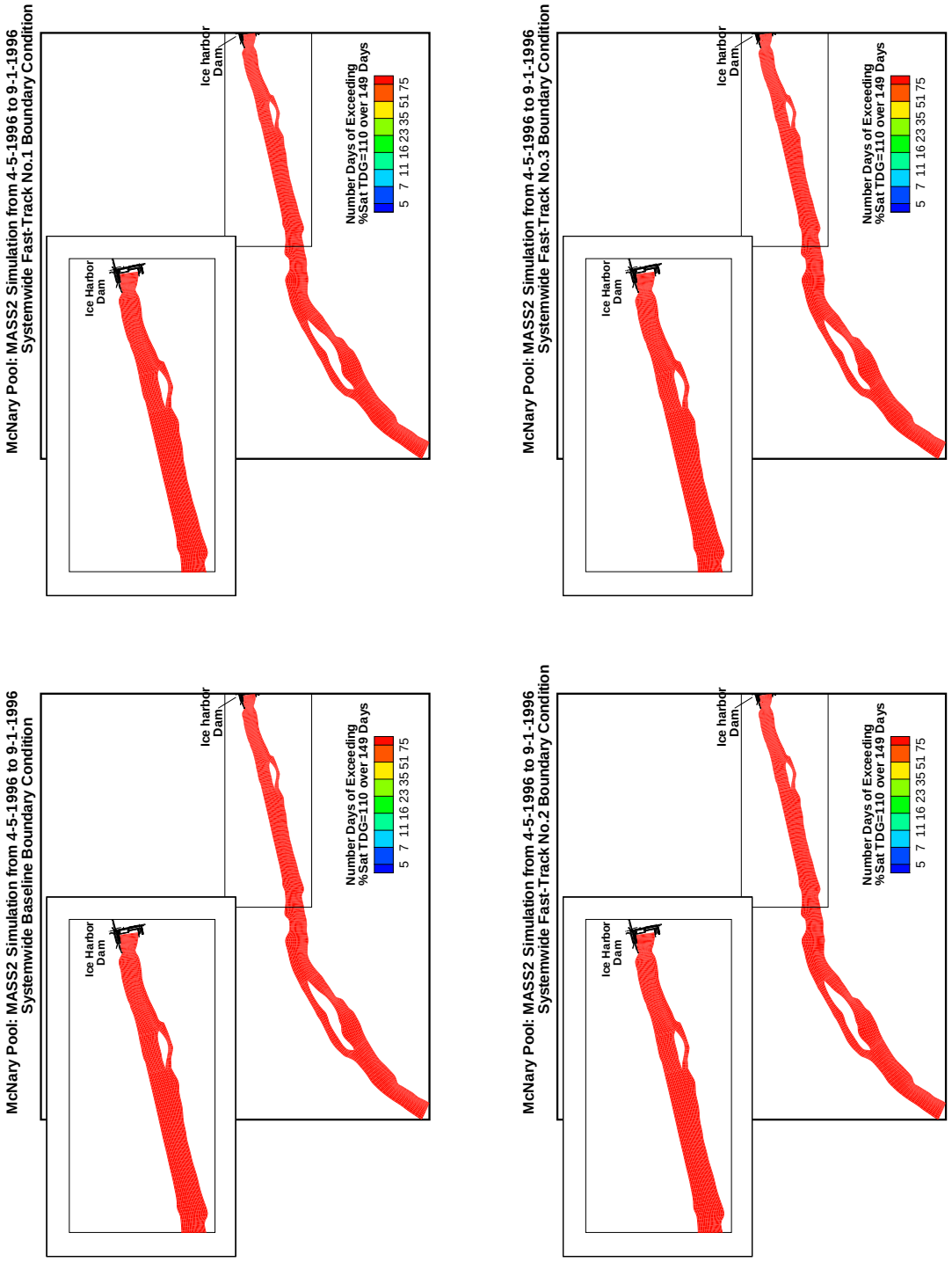

Figure 1.6: Areal comparison of days exceeding TDG saturation of 110% for fast-track scenarios in McNary Pool in a medium flow season (1996).

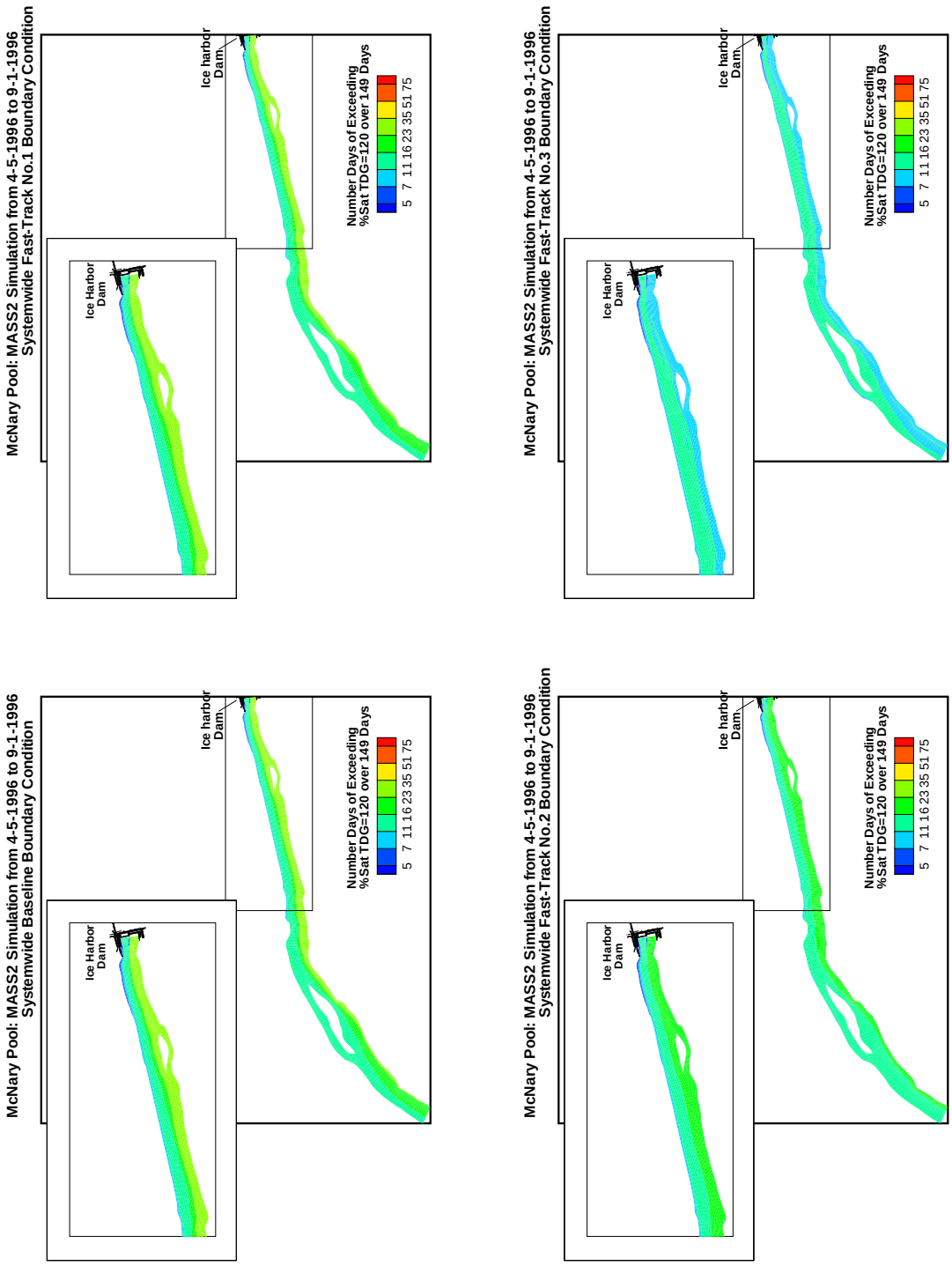

Figure 1.7: Areal comparison of days exceeding TDG saturation of 120% for fast-track scenarios in McNary Pool in a medium flow season (1996).

Table 1.9: Tabular histogram of that portion of the simulated McNary pool area where daily average saturation exceeded the listed value during the Fast-Track simulations.

Baseline Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.1	1.7	24.4	73.8
120	0.1	0.7	43.9	20.3	14.9	16.0	4.1	0.0	0.0
125	86.7	13.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Fast-Track #1 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.1	1.7	24.5	73.7
120	0.1	0.7	43.9	20.5	15.1	16.3	3.3	0.0	0.0
125	86.7	13.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Fast-Track #2 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.1	1.7	31.0	67.1
120	0.1	0.8	53.5	28.9	16.7	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Fast-Track #3 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.1	22.9	76.7	0.2
120	0.1	26.3	73.6	0.0	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 1.10: Tabular histogram of that portion of the simulated McNary pool volume where daily average saturation exceeded the listed value during the Fast-Track simulations.

Baseline Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.1	1.7	25.4	72.7
120	0.1	0.7	46.4	24.7	16.0	9.5	2.6	0.0	0.0
125	92.6	7.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Fast-Track #1 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.1	1.7	25.5	72.6
120	0.1	0.7	46.4	25.0	16.1	9.5	2.2	0.0	0.0
125	92.6	7.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Fast-Track #2 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.1	1.8	33.0	65.1
120	0.1	0.7	57.9	31.5	9.8	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Fast-Track #3 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.1	0.1	15.7	83.7	0.4
120	0.2	23.1	76.7	0.0	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1.1.2 Ice Harbor Pool

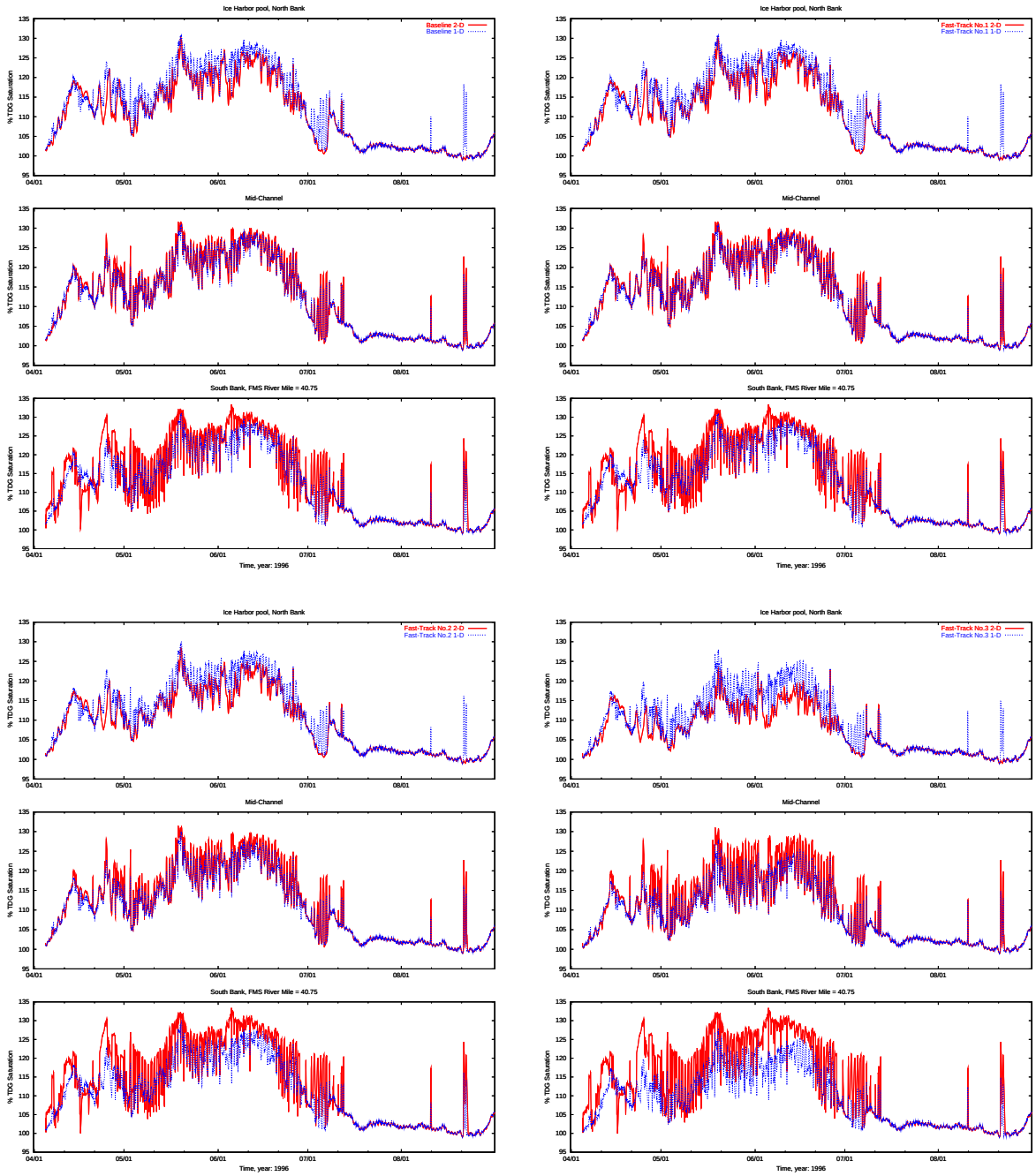

Figure 1.8: Time series plots at the FMS below Lower Monumental (LMNW) in Ice Harbor Pool compared with the 1-D simulation in a medium/high flow season (1996)

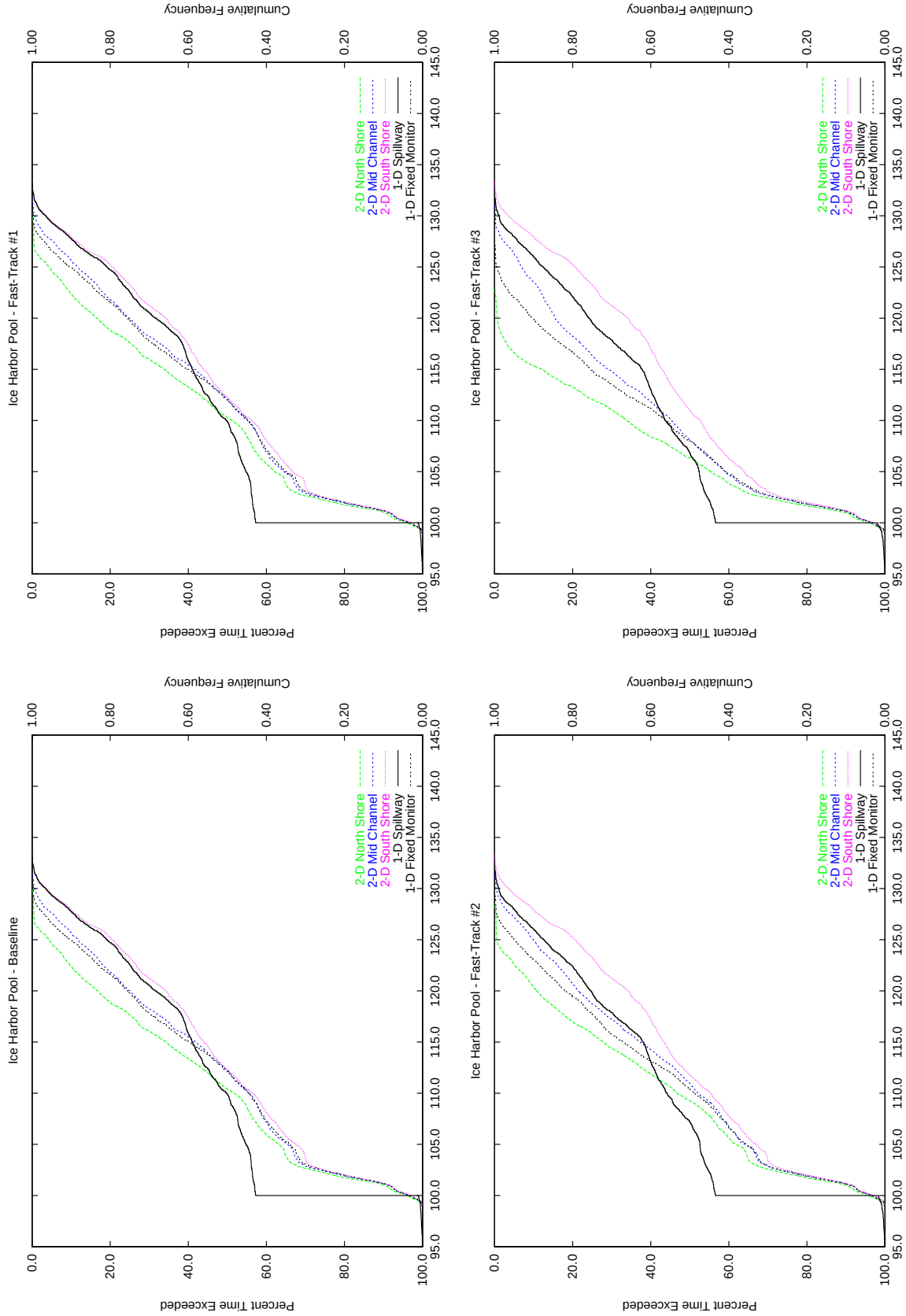

Figure 1.9: Cumulative frequency distributions TDG saturation simulated by the 1-D/2-D hybrid model for several points across the channel at the LMNW FMS location (SRM 41) Ice Harbor Pool during a medium/high flow (1996) season and each scenario compared with similar values from the 1-D simulations at the spillway and FMS location.

Table 1.11: Summary statistics of TDG saturation percentage of MASS2 and MASS1 time series output for fast-track scenarios in Ice Harbor pool in a medium flow season (1996)

Location		Base Line	Fast-Track No.1	Fast-Track No.2	Fast-Track No.3
North	number	3577.0	3577.0	3577.0	3577.0
	mean	110.6	110.5	109.6	107.2
	median	110.4	110.3	109.2	106.3
	minimum	99.0	99.0	99.0	99.0
	lower quartile	102.2	102.2	102.1	102.0
	upper quartile	117.6	117.6	115.8	112.0
	10% exceedance	122.3	122.3	120.3	115.3
	maximum	130.1	130.1	128.4	123.0
	standard deviation	8.3	8.3	7.5	5.6
Mid-channel	number	3577.0	3577.0	3577.0	3577.0
	mean	112.1	112.1	111.5	110.0
	median	112.2	112.1	111.0	108.1
	minimum	98.9	98.9	98.9	98.9
	lower quartile	102.4	102.4	102.3	102.2
	upper quartile	120.0	119.9	118.7	116.3
	10% exceedance	125.6	125.6	124.9	123.5
	maximum	131.6	131.6	131.5	131.1
	standard deviation	9.4	9.4	9.1	8.5
South FMS	number	3577.0	3577.0	3577.0	3577.0
	mean	113.4	113.4	113.3	113.0
	median	112.3	112.3	111.8	111.0
	minimum	99.0	99.0	99.0	99.0
	lower quartile	102.5	102.5	102.5	102.4
	upper quartile	123.3	123.3	123.2	123.2
	10% exceedance	127.9	127.9	127.9	127.9
	maximum	133.4	133.4	133.4	133.4
	standard deviation	10.4	10.4	10.4	10.5
1-D FMS	number	3577.0	3577.0	3577.0	3577.0
	mean	111.9	111.9	110.8	109.1
	median	112.1	112.0	110.4	108.0
	minimum	99.0	99.0	99.0	99.0
	lower quartile	102.4	102.4	102.4	102.3
	upper quartile	119.8	119.8	117.7	114.9
	10% exceedance	124.9	124.9	123.0	119.9
	maximum	131.0	131.0	130.0	128.0
	standard deviation	9.1	9.1	8.3	7.3

Table 1.12: Histogram table of TDG saturation percentage of MASS2 and MASS1 time series output for fast-track scenarios in Ice Harbor pool in a medium flow season (1996)

Location	TDG Range	Base Line		Fast-Track No.1		Fast-Track No.2		Fast-Track No.3	
		Days	%	Days	%	Days	%	Days	%
North	less than 105	55	36.8	56	37.9	57	38.0	67	44.7
	105 - 110	17	11.4	16	10.9	23	15.3	32	21.4
	110 - 115	26	17.6	26	17.3	28	18.8	33	22.0
	115 - 120	26	17.5	26	17.3	26	17.1	17	11.2
	120 - 125	18	12.4	18	12.2	15	10.2	1	0.7
	125 - 130	6	4.2	6	4.2	1	0.6	0	0.0
	above 130	0	0.1	0	0.1	0	0.0	0	0.0
Mid-channel	less than 105	52	34.6	53	35.6	54	36.0	61	41.0
	105 - 110	15	9.9	14	9.3	18	11.9	20	13.6
	110 - 115	20	13.6	20	13.5	22	14.9	24	16.4
	115 - 120	25	16.9	25	16.7	24	16.0	20	13.5
	120 - 125	20	13.4	20	13.3	17	11.5	13	8.6
	125 - 130	16	11.0	16	11.0	14	9.5	10	6.7
	above 130	1	0.6	1	0.6	0	0.3	0	0.2
South FMS	less than 105	48	32.5	50	33.3	49	33.1	54	36.1
	105 - 110	17	11.1	16	10.5	17	11.6	17	11.3
	110 - 115	18	12.4	18	12.3	18	11.9	15	9.8
	115 - 120	15	9.8	14	9.7	14	9.2	13	8.8
	120 - 125	20	13.6	20	13.6	20	13.6	20	13.4
	125 - 130	25	17.1	25	17.1	25	17.1	25	17.1
	above 130	5	3.5	5	3.5	5	3.5	5	3.5
1-D FMS	less than 105	51	34.0	52	34.9	53	35.5	61	40.9
	105 - 110	16	10.5	15	9.9	20	13.4	23	15.2
	110 - 115	23	15.4	23	15.3	27	18.1	29	19.5
	115 - 120	23	15.7	23	15.6	22	14.9	22	15.0
	120 - 125	22	14.7	22	14.6	19	13.1	13	9.0
	125 - 130	14	9.4	14	9.4	8	5.0	1	0.6
	above 130	0	0.3	0	0.3	0	0.0	0	0.0

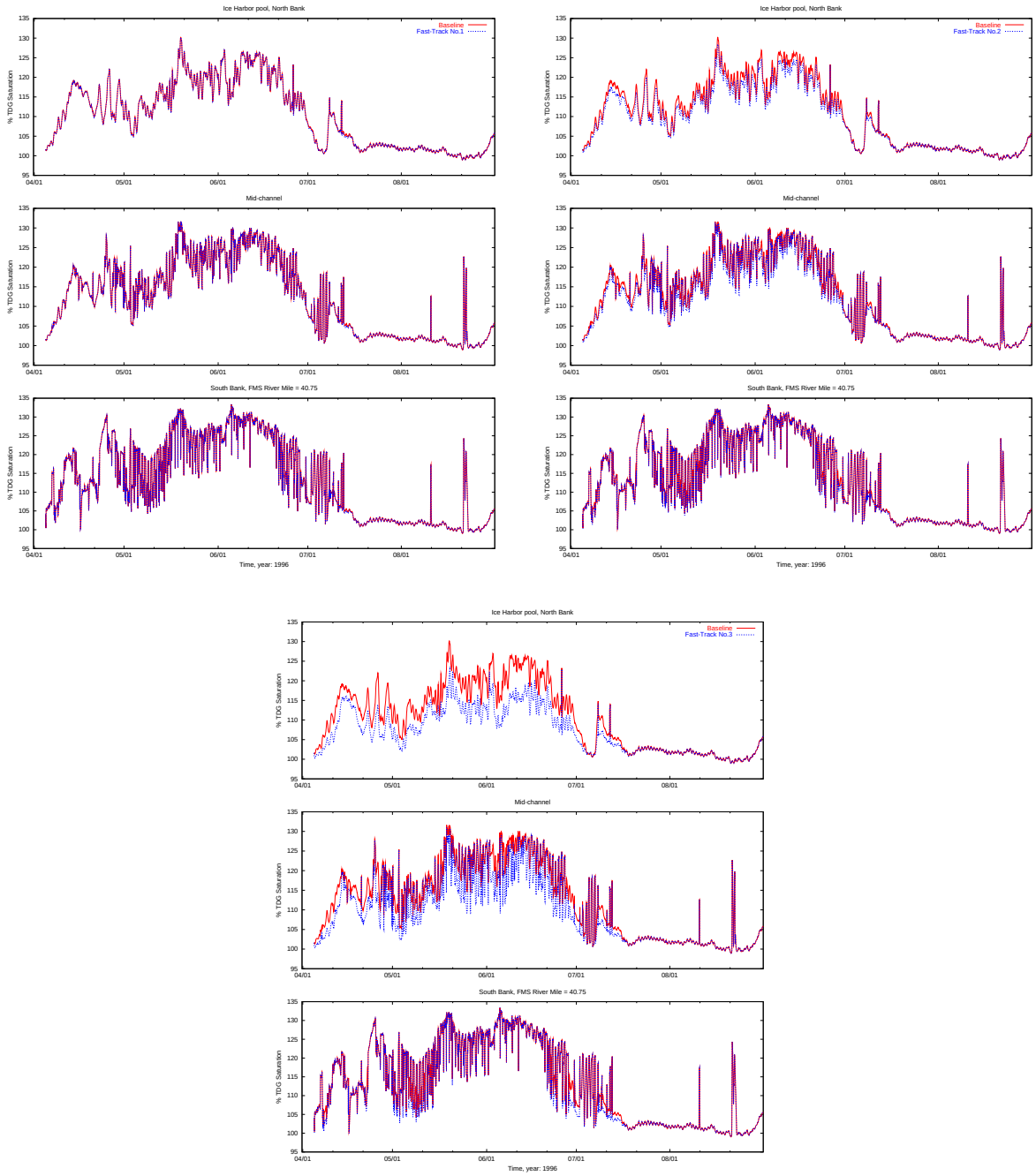

Figure 1.10: Time series plots of saturation at the FMS below Lower Monumental (LMNW) in Ice Harbor Pool from the fast-track hybrid simulations compared with the baseline hybrid simulation in a medium/high flow season (1996)

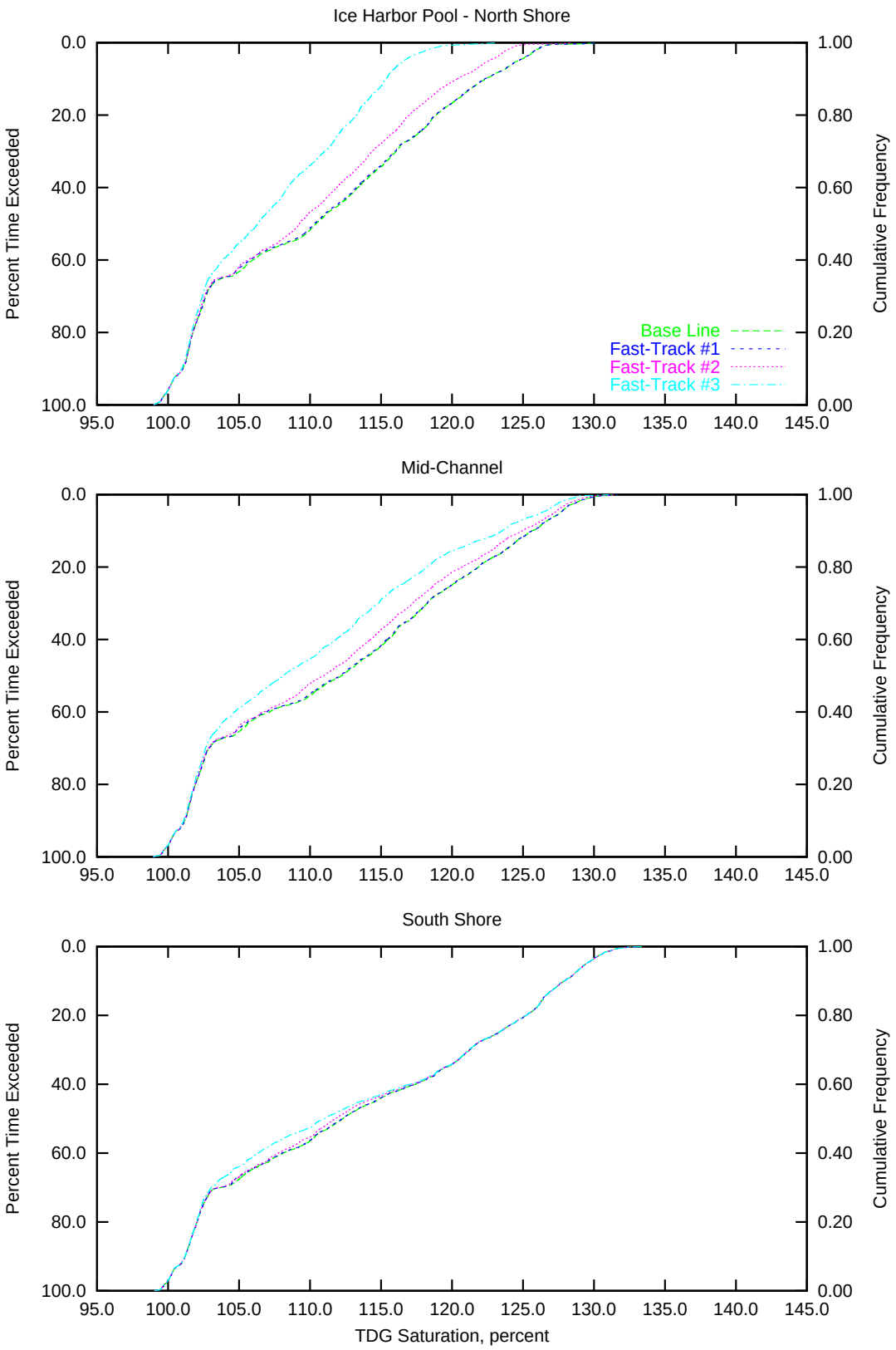

Figure 1.11: Comparision of simulated TDG saturation cumulative frequency distributions for several points across the channel at the LMNW FMS location (SRM 41) in the Ice Harbor Pool during a medium/high flow (1996) season.

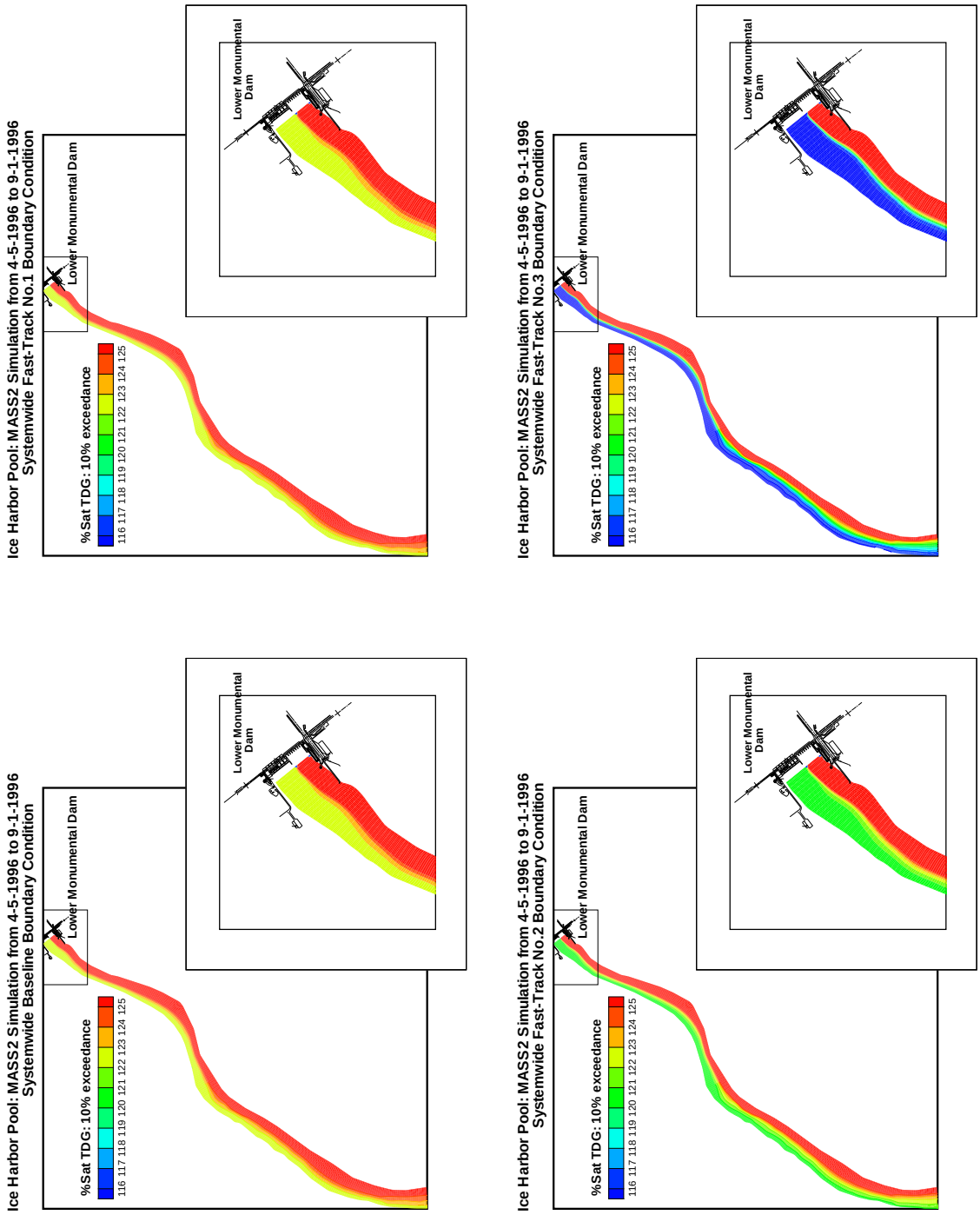

Figure 1.12: Areal comparison of TDG saturation exceeded 10% of a medium flow season (1996) for the fast-track scenarios in Ice Harbor Pool.

Table 1.13: Tabular histogram of TDG saturation exceeded 10% of the medium/high flow season (1996) over 2-D modeled area in Ice Harbor pool during the Fast-Track scenario simulations.

Baseline Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	0.1	0.0	3.5	0.0
115 - 120	0.0	0.0	1.5	0.0
120 - 125	580.6	51.5	13120.7	52.9
≥ 125	545.6	48.4	11654.6	47.0
Total	1126.4	100.0	24780.2	100.0

Fast-Track #1 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	0.1	0.0	3.5	0.0
115 - 120	0.0	0.0	1.5	0.0
120 - 125	581.3	51.6	13139.4	53.0
≥ 125	545.0	48.4	11635.8	47.0
Total	1126.4	100.0	24780.2	100.0

Fast-Track #2 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	0.1	0.0	3.5	0.0
115 - 120	0.0	0.0	1.5	0.0
120 - 125	650.4	57.7	15089.4	60.9
≥ 125	475.9	42.2	9685.8	39.1
Total	1126.4	100.0	24780.2	100.0

Fast-Track #3 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	0.1	0.0	5.0	0.0
115 - 120	513.9	45.6	11227.7	45.3
120 - 125	209.6	18.6	5819.4	23.5
≥ 125	402.7	35.8	7728.1	31.2
Total	1126.4	100.0	24780.2	100.0

Table 1.14: Tabular histogram of TDG saturation exceeded 10% of the medium/high flow season (1996) over 2-D modeled area in Ice Harbor pool during the Fast-Track scenario simulations.

Baseline Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	0.1	0.0	5.0	0.0
6 - 8	444.6	39.5	9340.0	37.7
8 - 10	681.6	60.5	15435.2	62.3
≥ 10	0.0	0.0	0.0	0.0
Total	1126.4	100.0	24780.2	100.0

Fast-Track #1 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	0.1	0.0	5.0	0.0
6 - 8	448.9	39.8	9447.4	38.1
8 - 10	677.4	60.1	15327.8	61.9
≥ 10	0.0	0.0	0.0	0.0
Total	1126.4	100.0	24780.2	100.0

Fast-Track #2 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	0.1	0.0	5.0	0.0
6 - 8	570.9	50.7	12820.5	51.7
8 - 10	555.3	49.3	11954.8	48.2
≥ 10	0.0	0.0	0.0	0.0
Total	1126.4	100.0	24780.2	100.0

Fast-Track #3 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	1.5	0.0
4 - 6	419.7	37.3	8627.5	34.8
6 - 8	251.8	22.4	7064.2	28.5
8 - 10	454.8	40.4	9087.0	36.7
≥ 10	0.0	0.0	0.0	0.0
Total	1126.4	100.0	24780.2	100.0

Table 1.15: Tabular histogram of TDG saturation exceeded 25% of the medium/high flow season (1996) over 2-D modeled area in Ice Harbor pool during the Fast-Track scenario simulations.

Baseline Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	0.1	0.0	5.0	0.0
115 - 120	609.6	54.1	13914.7	56.2
120 - 125	516.6	45.9	10860.5	43.8
≥ 125	0.0	0.0	0.0	0.0
Total	1126.4	100.0	24780.2	100.0

Fast-Track #1 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	0.1	0.0	5.0	0.0
115 - 120	612.4	54.4	13992.1	56.5
120 - 125	513.8	45.6	10783.2	43.5
≥ 125	0.0	0.0	0.0	0.0
Total	1126.4	100.0	24780.2	100.0

Fast-Track #2 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	1.5	0.0
110 - 115	0.1	0.0	3.5	0.0
115 - 120	692.3	61.5	16238.7	65.5
120 - 125	433.9	38.5	8536.5	34.4
≥ 125	0.0	0.0	0.0	0.0
Total	1126.4	100.0	24780.2	100.0

Fast-Track #3 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.1	0.0	3.0	0.0
110 - 115	521.3	46.3	11400.3	46.0
115 - 120	264.4	23.5	7199.7	29.1
120 - 125	340.6	30.2	6177.2	24.9
≥ 125	0.0	0.0	0.0	0.0
Total	1126.4	100.0	24780.2	100.0

Table 1.16: Tabular histogram of TDG saturation exceeded 25% of the medium/high flow season (1996) over 2-D modeled area in Ice Harbor pool during the Fast-Track scenario simulations.

Baseline Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	1.5	0.0
4 - 6	302.1	26.8	5607.0	22.6
6 - 8	824.2	73.2	19171.7	77.4
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1126.4	100.0	24780.2	100.0

Fast-Track #1 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	1.5	0.0
4 - 6	316.2	28.1	5951.7	24.0
6 - 8	810.1	71.9	18827.0	76.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1126.4	100.0	24780.2	100.0

Fast-Track #2 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	1.5	0.0
4 - 6	528.5	46.9	11611.7	46.9
6 - 8	597.8	53.1	13167.0	53.1
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1126.4	100.0	24780.2	100.0

Fast-Track #3 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.5	0.0	5.4	0.0
4 - 6	669.1	59.4	15599.9	63.0
6 - 8	456.8	40.6	9175.0	37.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1126.4	100.0	24780.2	100.0

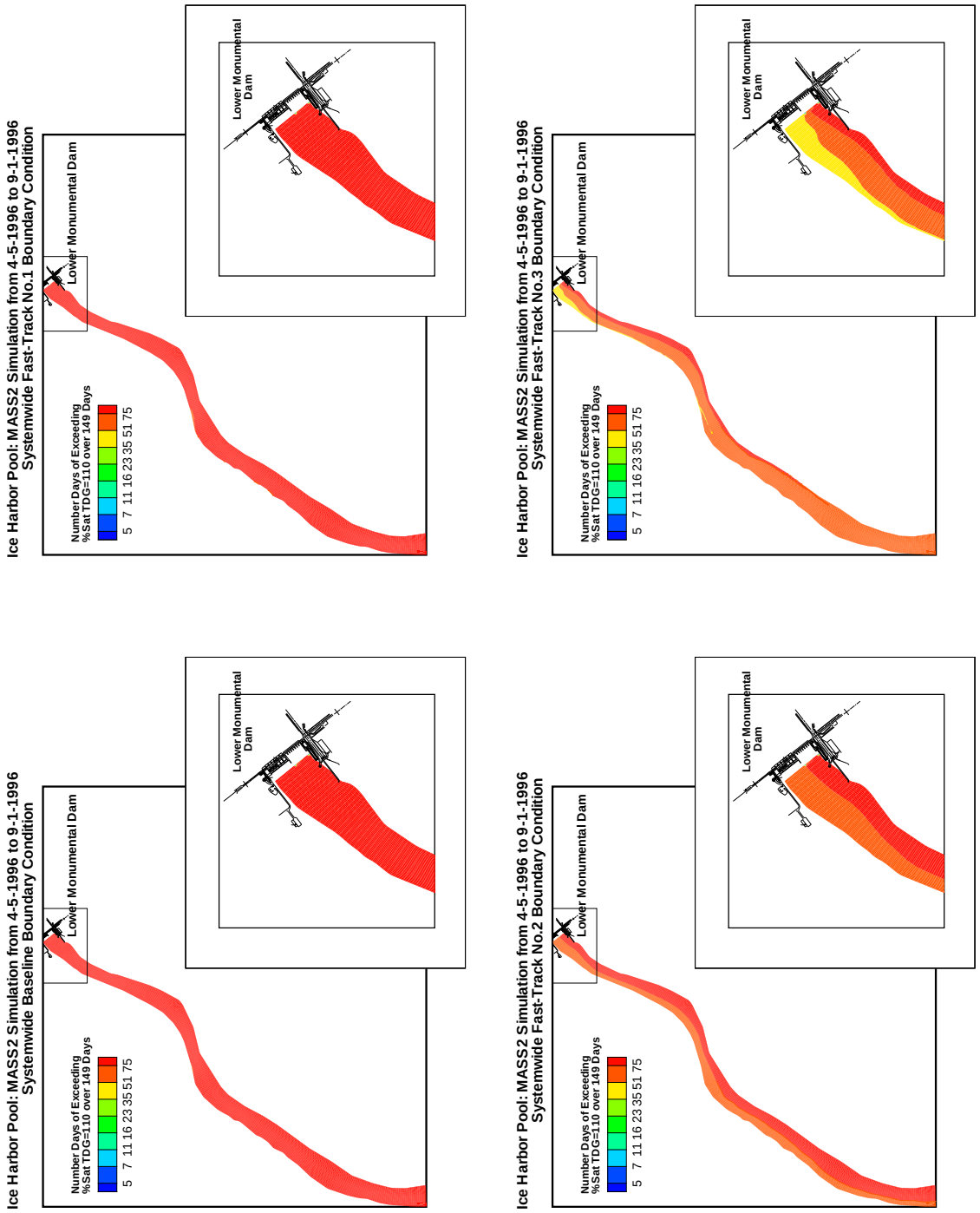

Figure 1.13: Areal comparison of days exceeding TDG saturation of 110% for fast-track scenarios in Ice Harbor Pool in a medium flow season (1996).

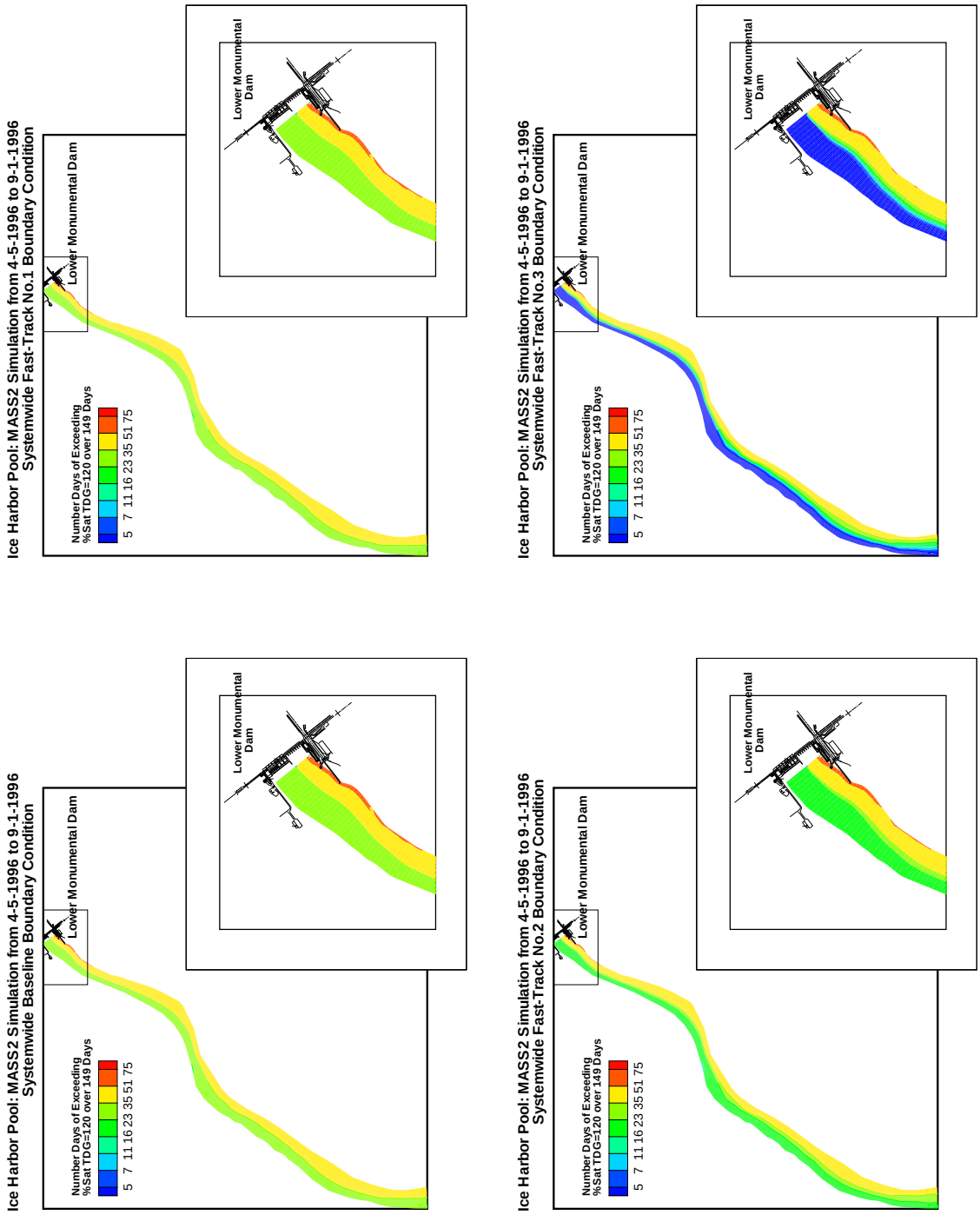

Figure 1.14: Areal comparison of days exceeding TDG saturation of 120% for fast-track scenarios in Ice Harbor Pool in a medium flow season (1996).

Table 1.17: Tabular histogram of that portion of the simulated Ice Harbor pool area where daily average saturation exceeded the listed value during the Fast-Track simulations.

Baseline Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
120	0.0	0.0	0.0	0.0	26.4	8.6	10.2	26.3	28.5
125	12.3	35.8	12.0	8.1	18.4	13.4	0.0	0.0	0.0

Fast-Track #1 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
120	0.0	0.0	0.0	0.0	26.7	8.8	9.9	26.4	28.1
125	11.7	36.5	12.0	8.0	18.4	13.4	0.0	0.0	0.0

Fast-Track #2 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
120	0.0	0.0	0.1	31.5	6.9	9.8	6.7	20.0	25.0
125	42.5	11.0	9.9	7.9	16.1	12.5	0.0	0.0	0.0

Fast-Track #3 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	18.6	11.3	6.4	5.3	5.3	53.2
120	38.2	4.9	5.0	5.5	3.7	3.4	5.0	13.2	21.1
125	58.3	4.6	6.5	8.0	12.0	10.5	0.0	0.0	0.0

Table 1.18: Tabular histogram of that portion of the simulated Ice Harbor pool volume where daily average saturation exceeded the listed value during the Fast-Track simulations.

Baseline Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
120	0.0	0.0	0.0	0.0	22.0	10.1	12.4	32.4	23.1
125	9.1	39.5	15.2	9.5	16.9	9.8	0.0	0.0	0.0

Fast-Track #1 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
120	0.0	0.0	0.0	0.0	22.5	10.4	12.0	32.6	22.5
125	8.7	40.1	15.3	9.3	16.9	9.7	0.0	0.0	0.0

Fast-Track #2 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
120	0.0	0.0	0.0	28.1	8.4	12.2	8.6	23.7	19.0
125	41.2	14.2	12.7	8.9	14.1	8.9	0.0	0.0	0.0

Fast-Track #3 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	14.1	11.8	7.6	6.4	6.9	53.2
120	36.0	6.0	6.5	7.1	4.7	4.3	6.0	14.1	15.3
125	61.6	5.7	7.5	8.4	9.6	7.1	0.0	0.0	0.0

1.1.3 Lower Monumental Pool

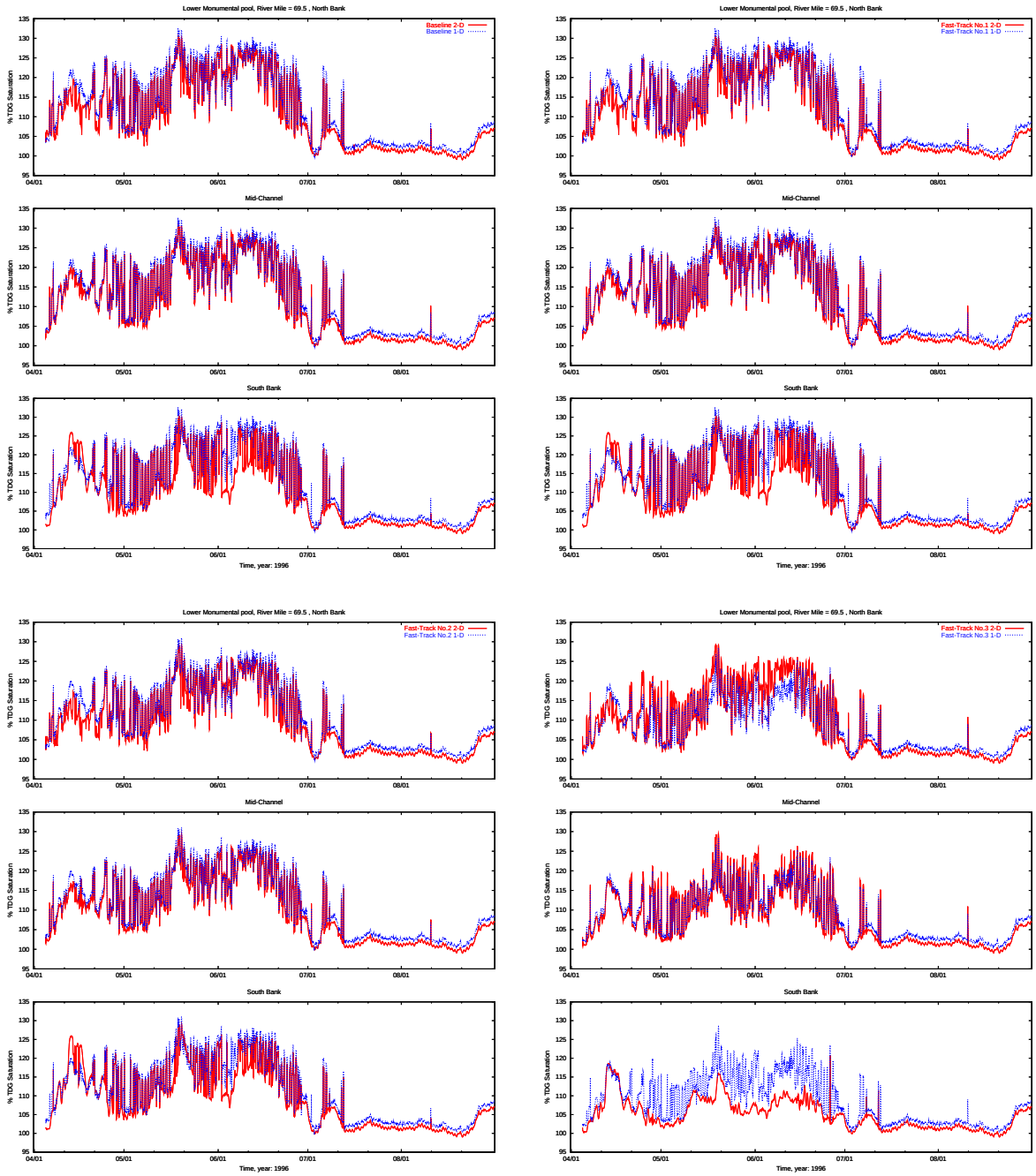

Figure 1.15: Time series plots at the FMS below Little Goose (LGSW) in Lower Monumental Pool compared with the 1-D simulation in a medium/high flow season (1996)

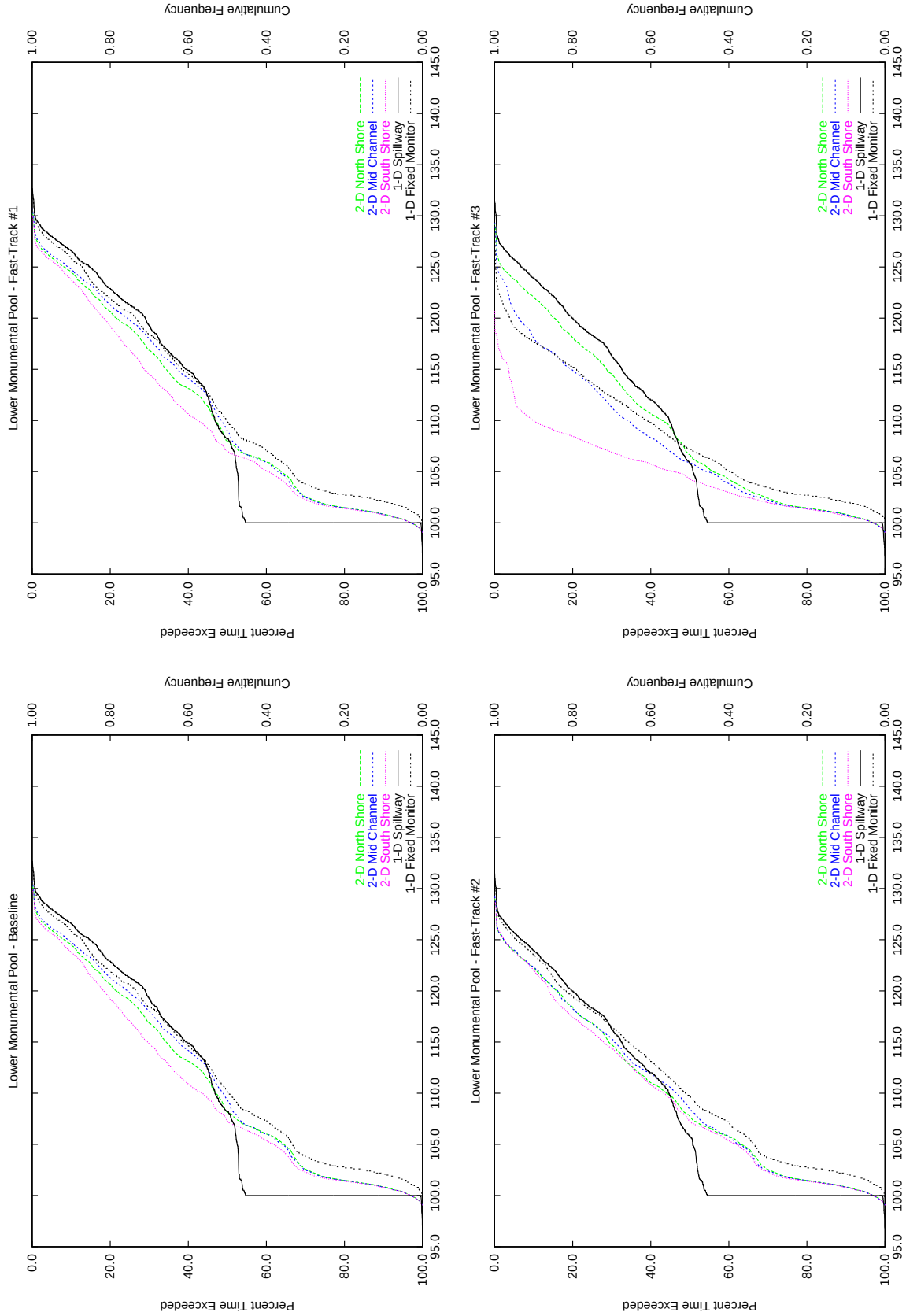

Figure 1.16: Cumulative frequency distributions TDG saturation simulated by the 1-D/2-D hybrid model for several points across the channel at the LGSW FMS location (SRM 70) Lower Monumental Pool during a medium/high flow (1996) season and each scenario compared with similar values from the 1-D simulations at the spillway and FMS location.

Table 1.19: Summary statistics of TDG saturation percentage of MASS2 and MASS1 time series output for fast-track scenarios in Lower Monumental pool in a medium flow season (1996)

Location		Base Line	Fast-Track No.1	Fast-Track No.2	Fast-Track No.3
North FMS	number	3577.0	3577.0	3577.0	3577.0
	mean	110.8	110.8	109.8	109.3
	median	108.2	108.0	107.7	106.6
	minimum	99.1	99.1	99.1	99.1
	lower quartile	101.8	101.8	101.8	101.7
	upper quartile	119.0	119.0	116.8	116.5
	10% exceedance	124.5	124.5	122.2	122.1
	maximum	130.3	130.3	129.1	129.2
	standard deviation	8.9	9.0	8.1	8.1
Mid-channel	number	3577.0	3577.0	3577.0	3577.0
	mean	111.2	111.2	109.9	107.9
	median	109.3	109.0	108.5	105.9
	minimum	99.1	99.1	99.1	99.1
	lower quartile	101.8	101.8	101.8	101.7
	upper quartile	119.8	119.8	116.8	113.3
	10% exceedance	124.8	124.8	122.3	118.0
	maximum	130.7	130.7	129.3	129.3
	standard deviation	9.2	9.2	8.1	6.9
South	number	3577.0	3577.0	3577.0	3577.0
	mean	110.0	109.9	109.5	105.0
	median	107.3	107.0	107.2	104.3
	minimum	99.0	99.0	99.0	99.0
	lower quartile	101.7	101.7	101.7	101.6
	upper quartile	117.0	116.9	116.0	107.6
	10% exceedance	123.8	123.7	122.0	110.0
	maximum	130.1	130.1	129.1	120.8
	standard deviation	8.6	8.6	8.0	4.0
1-D FMS	number	3577.0	3577.0	3577.0	3577.0
	mean	112.2	112.2	111.2	108.7
	median	110.2	110.0	109.7	107.2
	minimum	99.8	99.8	99.8	100.4
	lower quartile	103.1	103.1	103.1	102.9
	upper quartile	120.6	120.6	118.0	113.7
	10% exceedance	125.8	125.8	123.5	117.7
	maximum	132.7	132.7	131.0	128.4
	standard deviation	9.1	9.1	8.1	6.1

Table 1.20: Histogram table of TDG saturation percentage of MASS2 and MASS1 time series output for fast-track scenarios in Lower Monumental pool in a medium flow season (1996)

Location	TDG Range	Base Line		Fast-Track No.1		Fast-Track No.2		Fast-Track No.3	
		Days	%	Days	%	Days	%	Days	%
North FMS	less than 105	53	35.5	54	36.2	55	36.8	66	44.0
	105 - 110	26	17.4	25	16.9	28	19.1	20	13.1
	110 - 115	19	12.7	19	12.6	22	14.8	21	14.2
	115 - 120	19	12.7	19	12.7	20	13.2	20	13.4
	120 - 125	20	13.4	20	13.4	20	13.8	20	13.3
	125 - 130	12	8.0	12	8.0	3	2.3	3	1.9
	above 130	0	0.2	0	0.2	0	0.0	0	0.0
Mid-channel	less than 105	54	36.0	55	37.0	56	37.5	68	45.7
	105 - 110	22	15.1	22	14.6	24	16.0	30	20.2
	110 - 115	17	11.5	17	11.2	24	15.8	22	14.6
	115 - 120	19	13.1	19	12.8	22	14.5	20	13.3
	120 - 125	23	15.2	23	15.2	21	13.9	8	5.5
	125 - 130	13	8.9	13	8.9	3	2.3	1	0.7
	above 130	0	0.3	0	0.3	0	0.0	0	0.0
South	less than 105	57	38.0	59	39.5	57	38.0	81	54.3
	105 - 110	28	18.5	27	18.1	28	18.6	54	36.0
	110 - 115	21	13.9	20	13.7	23	15.4	9	6.2
	115 - 120	17	11.2	15	10.3	21	14.0	5	3.5
	120 - 125	17	11.3	17	11.3	17	11.4	0	0.1
	125 - 130	10	7.0	10	7.0	4	2.5	0	0.0
	above 130	0	0.0	0	0.0	0	0.0	0	0.0
1-D FMS	less than 105	50	33.4	50	33.6	50	33.6	59	39.4
	105 - 110	24	16.2	24	16.4	26	17.4	32	21.6
	110 - 115	17	11.7	17	11.6	22	14.9	27	18.1
	115 - 120	18	12.0	18	11.8	24	15.9	25	17.0
	120 - 125	21	13.9	20	13.7	19	12.6	5	3.7
	125 - 130	18	12.2	18	12.2	8	5.2	0	0.3
	above 130	1	0.6	1	0.6	0	0.3	0	0.0

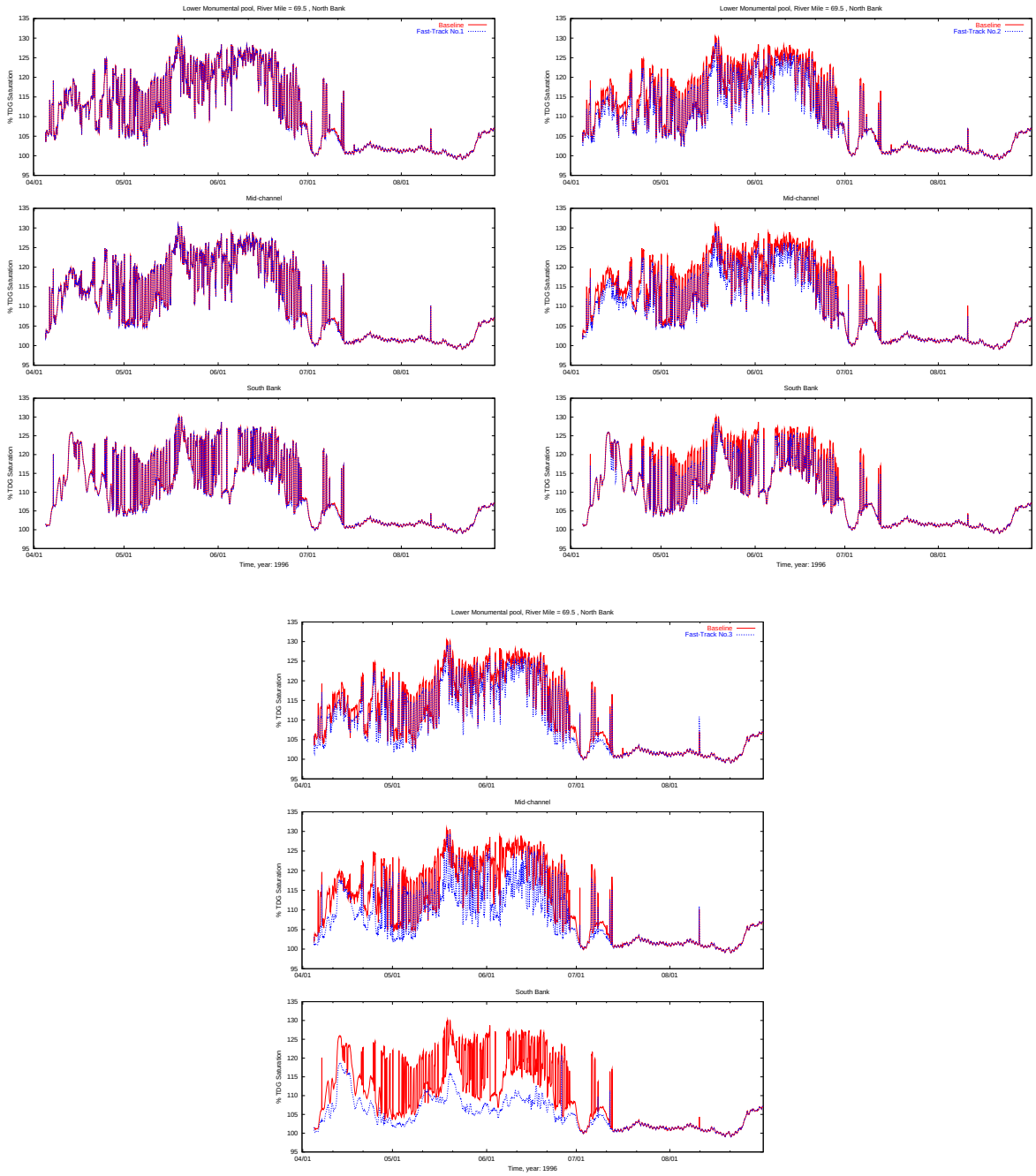

Figure 1.17: Time series plots of saturation at the FMS below Little Goose (LGSW) in Ice Harbor Pool from the fast-track hybrid simulations compared with the baseline hybrid simulation in a medium/high flow season (1996)

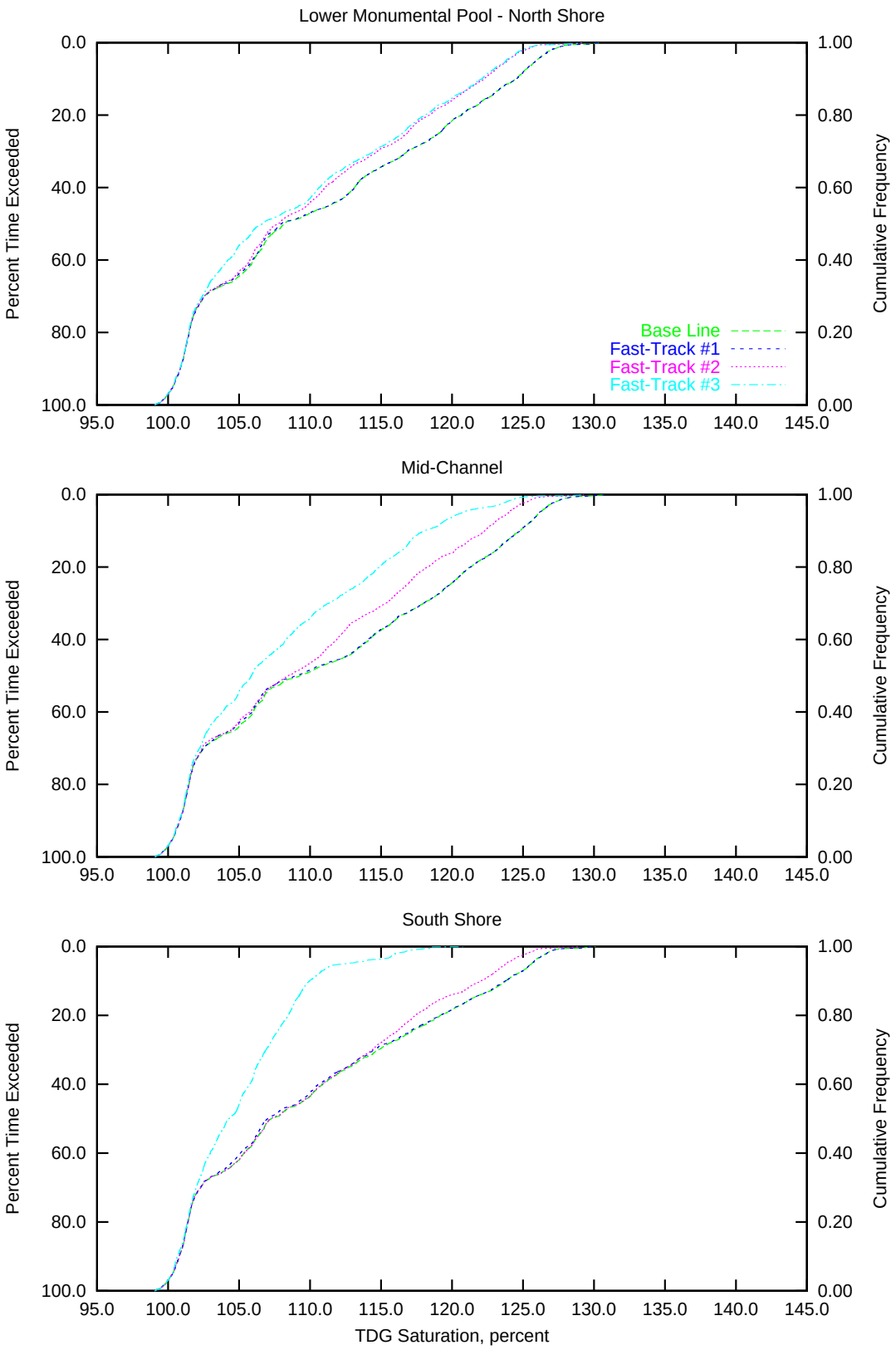

Figure 1.18: Comparision of simulated TDG saturation cumulative frequency distributions for several points across the channel at the LGSW FMS location (SRM 70) in the Lower Monumental Pool during a medium/high flow (1996) season.

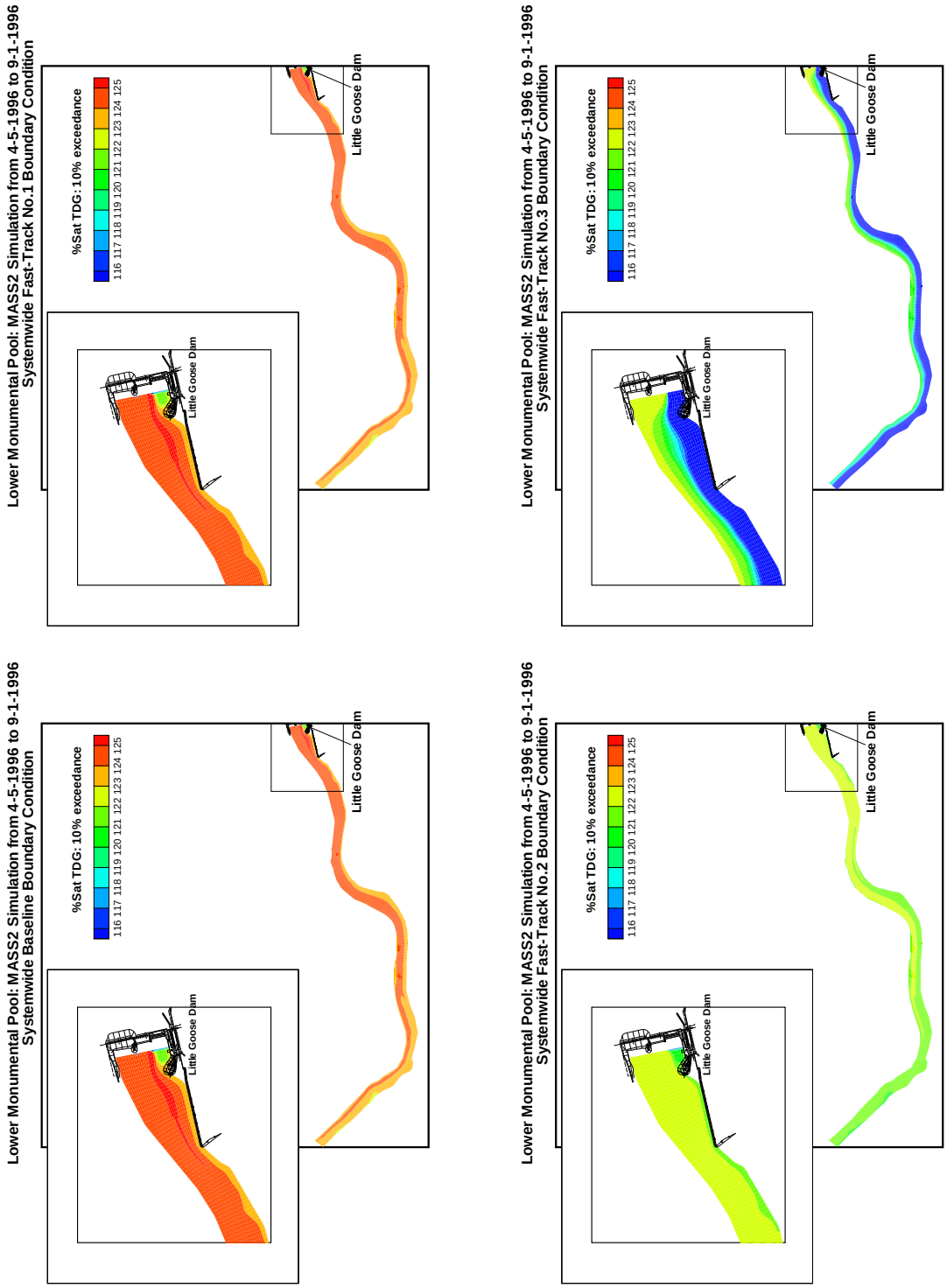

Figure 1.19: Areal comparison of TDG saturation exceeded 10% of a medium flow season (1996) for the fast-track scenarios in Lower Monumental Pool.

Table 1.21: Tabular histogram of TDG saturation exceeded 10% of the medium/high flow season (1996) over 2-D modeled area in Lower Monumental pool during the Fast-Track scenario simulations.

Baseline Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	0.0	0.0	0.0	0.0
115 - 120	1.4	0.1	49.9	0.1
120 - 125	1583.0	98.9	52504.0	99.2
≥ 125	16.4	1.0	378.1	0.7
Total	1600.8	100.0	52932.0	100.0

Fast-Track #1 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	0.0	0.0	0.0	0.0
115 - 120	1.4	0.1	49.9	0.1
120 - 125	1581.8	98.8	52471.6	99.1
≥ 125	17.6	1.1	410.5	0.8
Total	1600.8	100.0	52932.0	100.0

Fast-Track #2 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	0.0	0.0	0.0	0.0
115 - 120	0.9	0.1	27.4	0.1
120 - 125	1599.9	99.9	52906.8	99.9
≥ 125	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52934.2	100.0

Fast-Track #3 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	28.2	1.8	514.0	1.0
110 - 115	648.6	40.5	21203.8	40.1
115 - 120	524.8	32.8	21523.7	40.7
120 - 125	399.2	24.9	9689.4	18.3
≥ 125	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52931.0	100.0

Table 1.22: Tabular histogram of TDG saturation exceeded 10% of the medium/high flow season (1996) over 2-D modeled area in Lower Monumental pool during the Fast-Track scenario simulations.

Baseline Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	0.1	0.0	5.7	0.0
6 - 8	546.2	34.1	18597.1	35.1
8 - 10	1054.4	65.9	34329.2	64.9
≥ 10	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52932.0	100.0

Fast-Track #1 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	0.1	0.0	5.7	0.0
6 - 8	530.6	33.1	18314.4	34.6
8 - 10	1070.1	66.8	34611.9	65.4
≥ 10	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52932.0	100.0

Fast-Track #2 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	0.0	0.0	0.0	0.0
6 - 8	1600.8	100.0	52934.2	100.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52934.2	100.0

Fast-Track #3 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	310.9	19.4	7443.0	14.1
4 - 6	633.6	39.6	26040.9	49.2
6 - 8	656.2	41.0	19447.0	36.7
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52931.0	100.0

Table 1.23: Tabular histogram of TDG saturation exceeded 25% of the medium/high flow season (1996) over 2-D modeled area in Lower Monumental pool during the Fast-Track scenario simulations.

Baseline Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	4.0	0.3	113.9	0.2
115 - 120	1583.4	98.9	52489.9	99.2
120 - 125	13.3	0.8	328.2	0.6
≥ 125	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52932.0	100.0

Fast-Track #1 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	4.7	0.3	135.4	0.3
115 - 120	1583.7	98.9	52487.2	99.2
120 - 125	12.4	0.8	309.4	0.6
≥ 125	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52932.0	100.0

Fast-Track #2 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	5.2	0.3	133.0	0.3
115 - 120	1595.5	99.7	52801.2	99.7
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52934.2	100.0

Fast-Track #3 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	495.8	31.0	13272.8	25.1
110 - 115	846.4	52.9	33533.0	63.4
115 - 120	258.6	16.2	6125.2	11.6
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52931.0	100.0

Table 1.24: Tabular histogram of TDG saturation exceeded 25% of the medium/high flow season (1996) over 2-D modeled area in Lower Monumental pool during the Fast-Track scenario simulations.

Baseline Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.1	0.0	5.7	0.0
4 - 6	62.3	3.9	1173.6	2.2
6 - 8	1538.4	96.1	51752.7	97.8
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52932.0	100.0

Fast-Track #1 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.1	0.0	5.7	0.0
4 - 6	131.6	8.2	2637.0	5.0
6 - 8	1469.0	91.8	50289.2	95.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52932.0	100.0

Fast-Track #2 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	1600.8	100.0	52934.2	100.0
6 - 8	0.0	0.0	0.0	0.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52934.2	100.0

Fast-Track #3 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	778.2	48.6	25701.1	48.6
4 - 6	822.5	51.4	27229.9	51.4
6 - 8	0.0	0.0	0.0	0.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52931.0	100.0

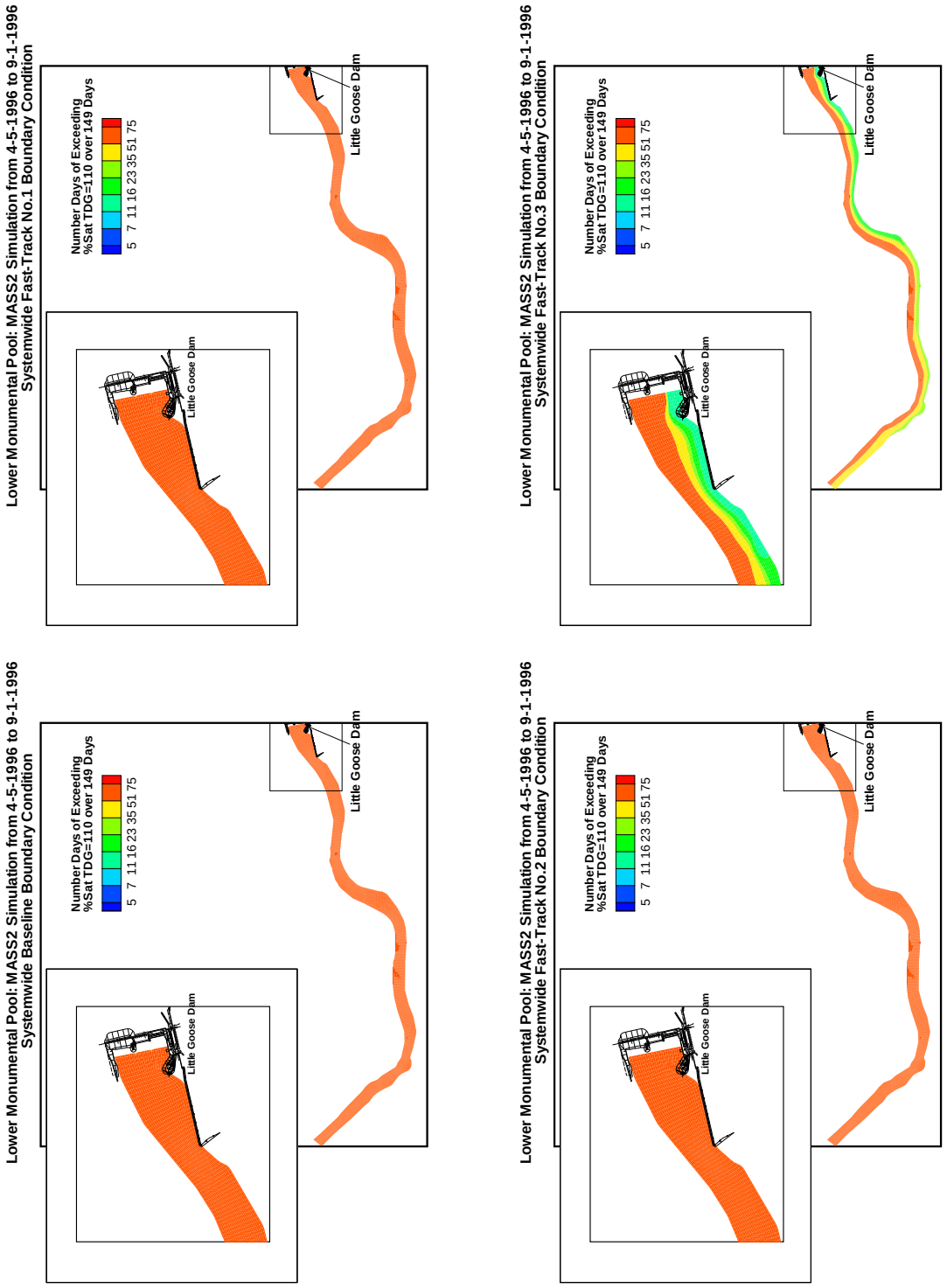

Figure 1.20: Areal comparison of days exceeding TDG saturation of 110% for fast-track scenarios in Lower Monumental Pool in a medium flow season (1996).

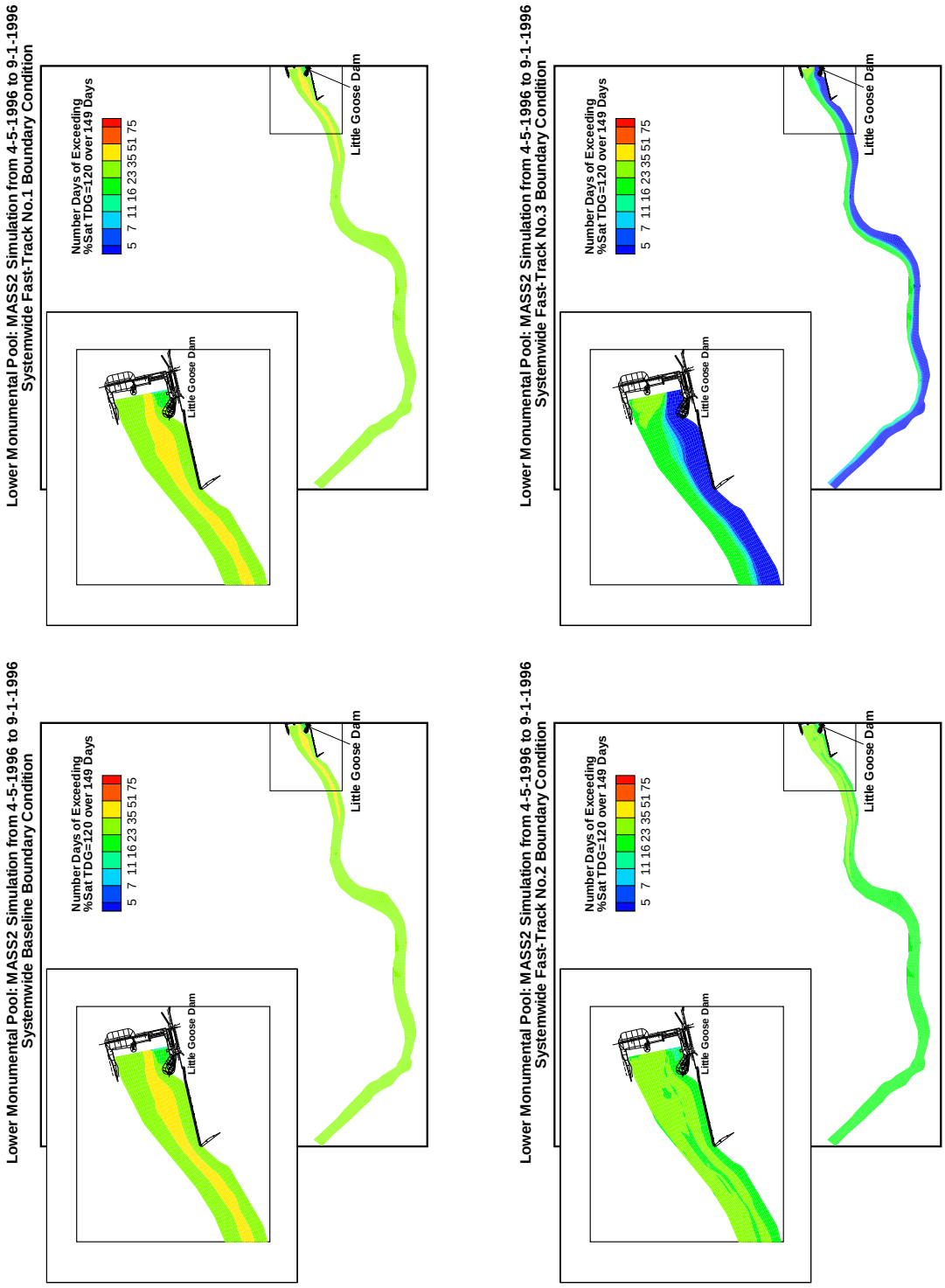

Figure 1.21: Areal comparison of days exceeding TDG saturation of 120% for fast-track scenarios in Lower Monumental Pool in a medium flow season (1996).

Table 1.25: Tabular histogram of that portion of the simulated Lower Monumental pool area where daily average saturation exceeded the listed value during the Fast-Track simulations.

Baseline Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	99.6
120	0.0	0.1	0.3	0.2	26.8	64.6	8.0	0.0	0.0
125	22.4	70.7	6.9	0.0	0.0	0.0	0.0	0.0	0.0

Fast-Track #1 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3	99.6
120	0.0	0.1	0.3	0.4	31.8	61.1	6.3	0.0	0.0
125	23.0	70.1	6.8	0.0	0.0	0.0	0.0	0.0	0.0

Fast-Track #2 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.1	0.3	21.6	78.1
120	0.0	0.3	1.7	98.0	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Fast-Track #3 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	9.1	4.1	6.3	5.3	6.7	68.6
115	0.0	42.6	3.9	4.4	9.8	6.9	13.7	18.5	0.1
120	63.9	10.0	19.6	6.5	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 1.26: Tabular histogram of that portion of the simulated Lower Monumental pool volume where daily average saturation exceeded the listed value during the Fast-Track simulations.

Baseline Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	99.7
120	0.0	0.1	0.3	0.1	23.1	69.9	6.6	0.0	0.0
125	22.4	71.7	5.9	0.0	0.0	0.0	0.0	0.0	0.0

Fast-Track #1 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	99.7
120	0.0	0.1	0.3	0.2	30.0	64.3	5.1	0.0	0.0
125	22.9	71.3	5.8	0.0	0.0	0.0	0.0	0.0	0.0

Fast-Track #2 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.1	0.2	16.1	83.6
120	0.0	0.2	0.7	99.1	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Fast-Track #3 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	5.9	3.2	5.2	4.5	6.9	74.4
115	0.0	41.1	5.0	6.2	13.0	8.6	13.6	12.4	0.1
120	70.4	10.4	15.1	4.1	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1.1.4 Little Goose Pool

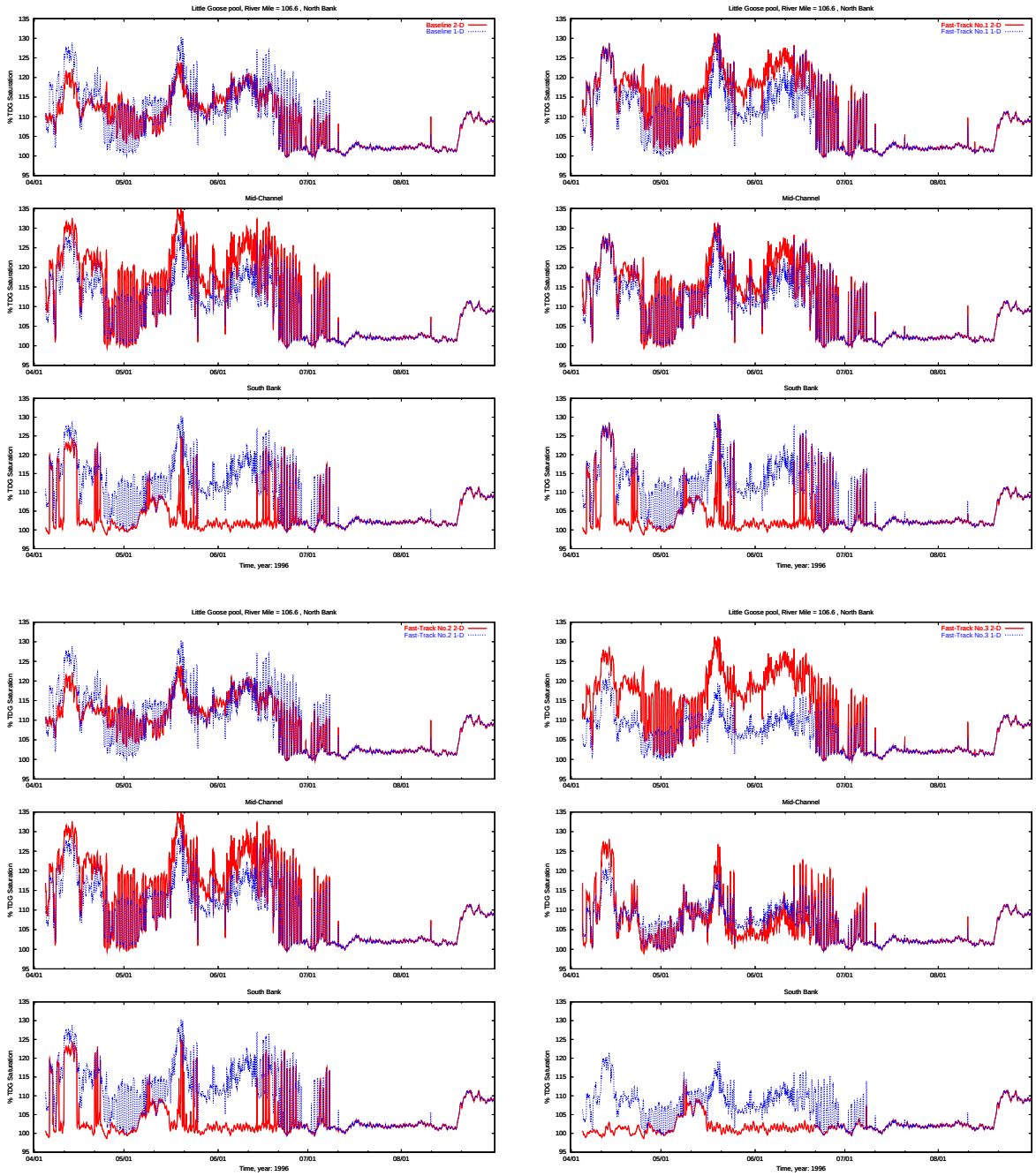

Figure 1.22: Time series plots at the FMS below Lower Granite (LGNW) in Little Goose Pool compared with the 1-D simulation in a medium/high flow season (1996)

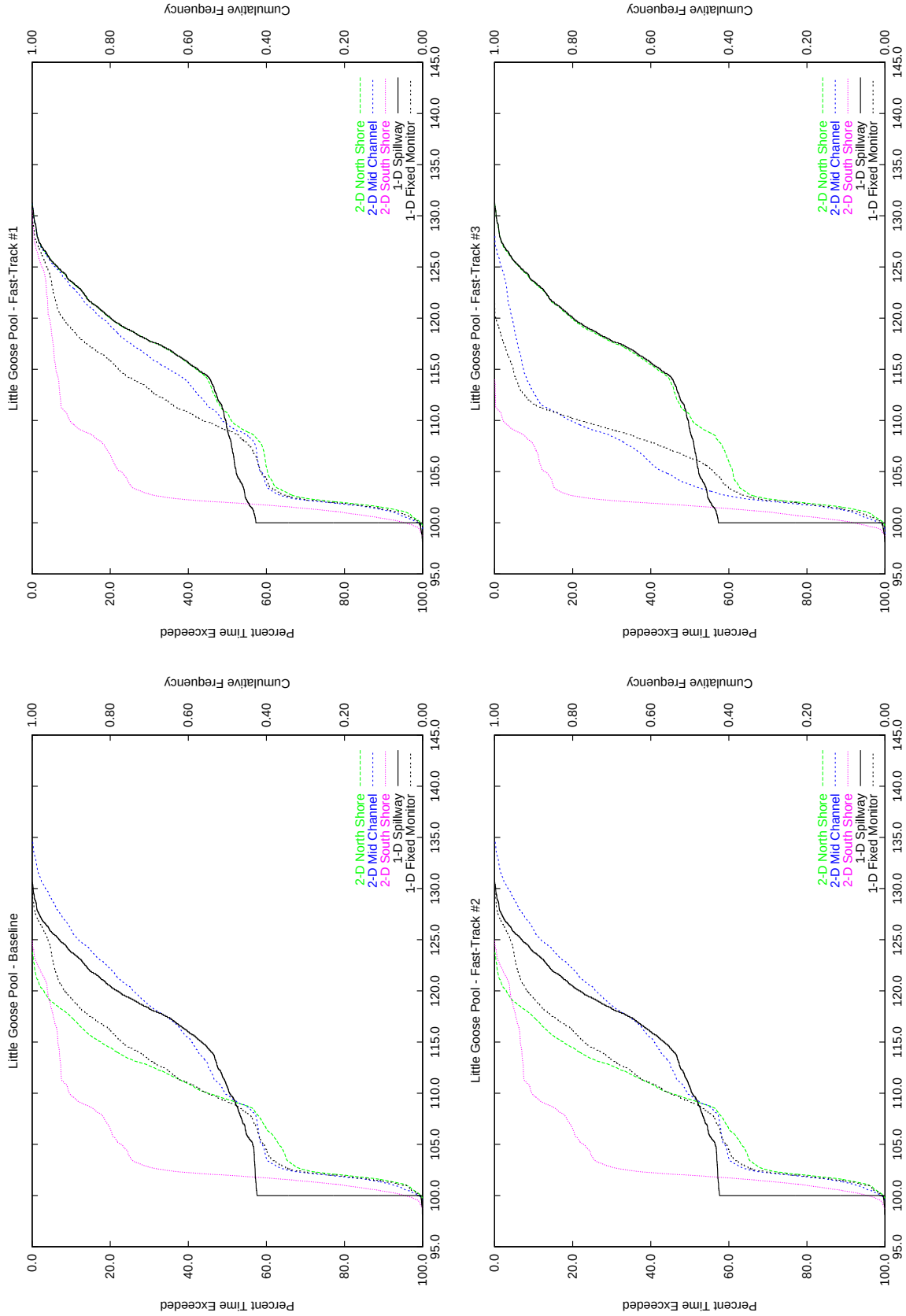

Figure 1.23: Cumulative frequency distributions TDG saturation simulated by the 1-D/2-D hybrid model for several points across the channel at the LGNW FMS location (SRM 107) Little Goose Pool during a medium/high flow (1996) season and each scenario compared with similar values from the 1-D simulations at the spillway and FMS location.

Table 1.27: Summary statistics of TDG saturation percentage of MASS2 and MASS1 time series output for fast-track scenarios in Little Goose pool in a medium flow season (1996)

Location		Base Line	Fast-Track No.1	Fast-Track No.2	Fast-Track No.3
North FMS	number	3577.0	3577.0	3577.0	3577.0
	mean	108.8	111.3	108.8	111.3
	median	109.4	110.8	109.4	110.4
	minimum	99.7	99.6	99.7	99.7
	lower quartile	102.2	102.2	102.2	102.1
	upper quartile	113.3	118.8	113.3	118.7
	10% exceedance	117.5	123.5	117.5	123.5
	maximum	123.8	131.2	123.8	131.2
	standard deviation	6.1	8.8	6.1	8.8
Mid-channel	number	3577.0	3577.0	3577.0	3577.0
	mean	111.8	110.6	111.8	106.1
	median	109.8	109.6	109.8	103.8
	minimum	99.5	99.4	99.5	98.9
	lower quartile	102.0	102.0	102.0	101.9
	upper quartile	120.4	117.6	120.4	109.1
	10% exceedance	126.0	123.1	126.0	112.7
	maximum	134.7	131.2	134.7	128.0
	standard deviation	9.9	8.6	9.9	5.7
South	number	3577.0	3577.0	3577.0	3577.0
	mean	104.0	104.1	104.0	102.3
	median	102.0	102.0	102.0	101.7
	minimum	98.7	98.7	98.7	98.7
	lower quartile	101.2	101.2	101.2	100.8
	upper quartile	103.8	103.7	103.8	102.4
	10% exceedance	109.8	109.8	109.8	107.6
	maximum	125.0	130.7	125.0	114.0
	standard deviation	5.2	5.7	5.2	2.7
1-D FMS	number	3577.0	3577.0	3577.0	3577.0
	mean	109.3	109.1	109.3	106.3
	median	109.1	109.0	109.1	106.4
	minimum	99.6	99.6	99.6	99.6
	lower quartile	102.1	102.1	102.1	102.0
	upper quartile	114.5	114.2	114.5	109.7
	10% exceedance	119.3	119.0	119.3	111.6
	maximum	130.4	131.0	130.4	121.5
	standard deviation	7.4	7.3	7.4	4.6

Table 1.28: Histogram table of TDG saturation percentage of MASS2 and MASS1 time series output for fast-track scenarios in Little Goose pool in a medium flow season (1996)

Location	TDG Range	Base Line		Fast-Track No.1		Fast-Track No.2		Fast-Track No.3	
		Days	%	Days	%	Days	%	Days	%
North FMS	less than 105	55	36.8	59	39.8	55	36.8	58	39.0
	105 - 110	27	18.3	14	9.2	27	18.3	15	10.4
	110 - 115	41	27.3	13	9.0	41	27.3	13	9.0
	115 - 120	22	14.6	33	22.1	22	14.6	33	22.1
	120 - 125	4	3.0	20	13.4	4	3.0	20	13.1
	125 - 130	0	0.0	9	6.2	0	0.0	9	6.1
	above 130	0	0.0	0	0.3	0	0.0	0	0.3
Mid-channel	less than 105	61	41.1	62	41.3	61	41.1	85	56.8
	105 - 110	14	9.5	15	9.9	14	9.5	36	23.9
	110 - 115	13	8.6	21	13.8	13	8.6	18	12.0
	115 - 120	22	15.0	26	17.2	22	15.0	4	2.9
	120 - 125	21	14.0	18	11.9	21	14.0	4	2.8
	125 - 130	13	8.4	8	5.6	13	8.4	2	1.7
	above 130	5	3.4	0	0.3	5	3.4	0	0.0
South	less than 105	115	77.2	115	77.2	115	77.2	130	87.1
	105 - 110	20	13.3	20	13.2	20	13.3	16	10.8
	110 - 115	4	2.9	5	3.5	4	2.9	3	2.1
	115 - 120	4	2.7	3	1.7	4	2.7	0	0.0
	120 - 125	6	3.9	3	1.9	6	3.9	0	0.0
	125 - 130	0	0.0	4	2.4	0	0.0	0	0.0
	above 130	0	0.0	0	0.0	0	0.0	0	0.0
1-D FMS	less than 105	61	40.7	62	41.4	61	40.7	66	44.0
	105 - 110	21	14.3	22	14.6	21	14.3	51	34.0
	110 - 115	33	22.1	32	21.8	33	22.1	26	17.2
	115 - 120	22	14.6	21	14.3	22	14.6	7	4.5
	120 - 125	6	4.4	6	4.1	6	4.4	0	0.3
	125 - 130	6	3.9	5	3.6	6	3.9	0	0.0
	above 130	0	0.1	0	0.1	0	0.1	0	0.0

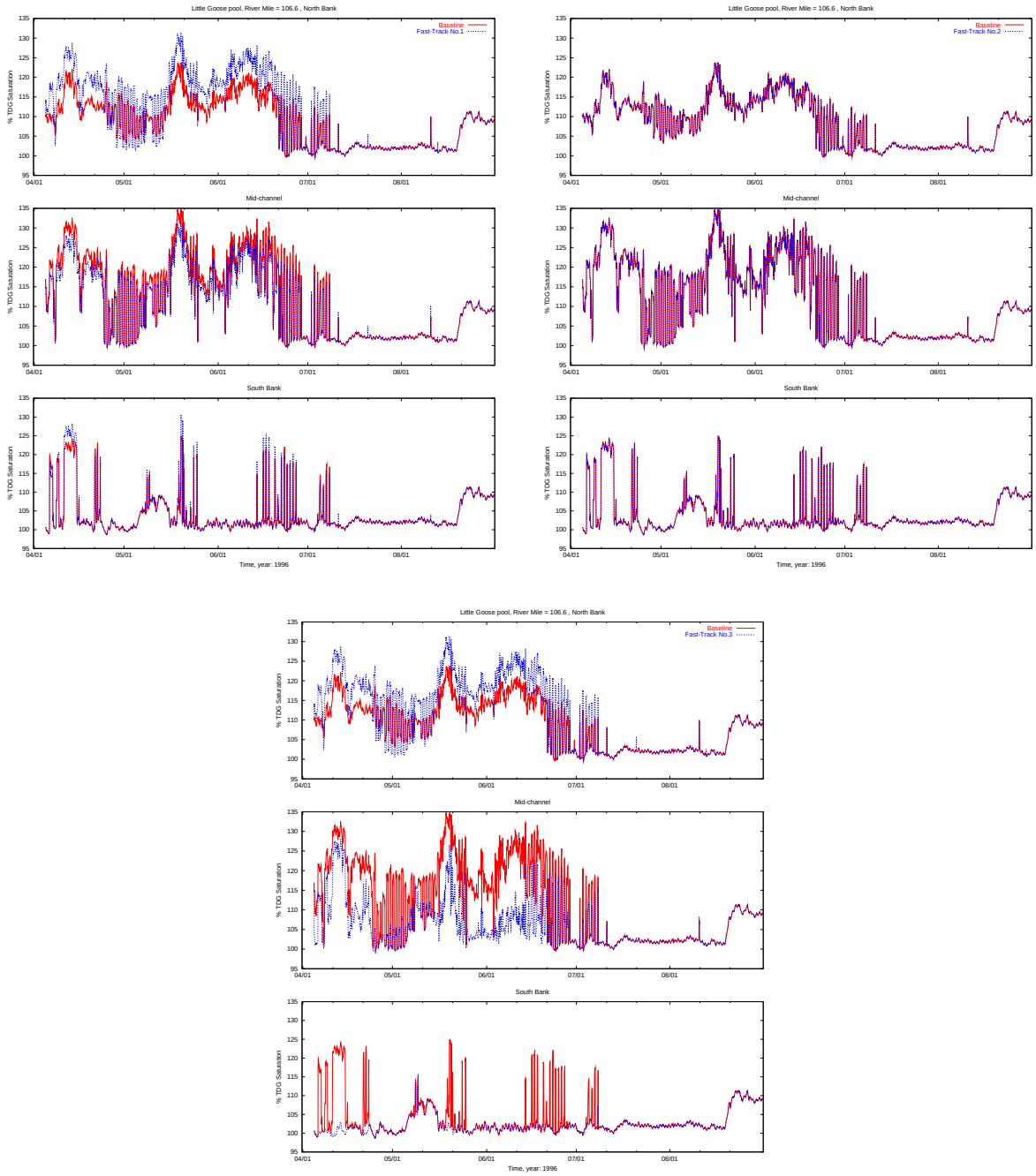

Figure 1.24: Time series plots of saturation at the FMS below Lower Granite (LGNW) in Little Goose Pool from the fast-track hybrid simulations compared with the baseline hybrid simulation in a medium/high flow season (1996)

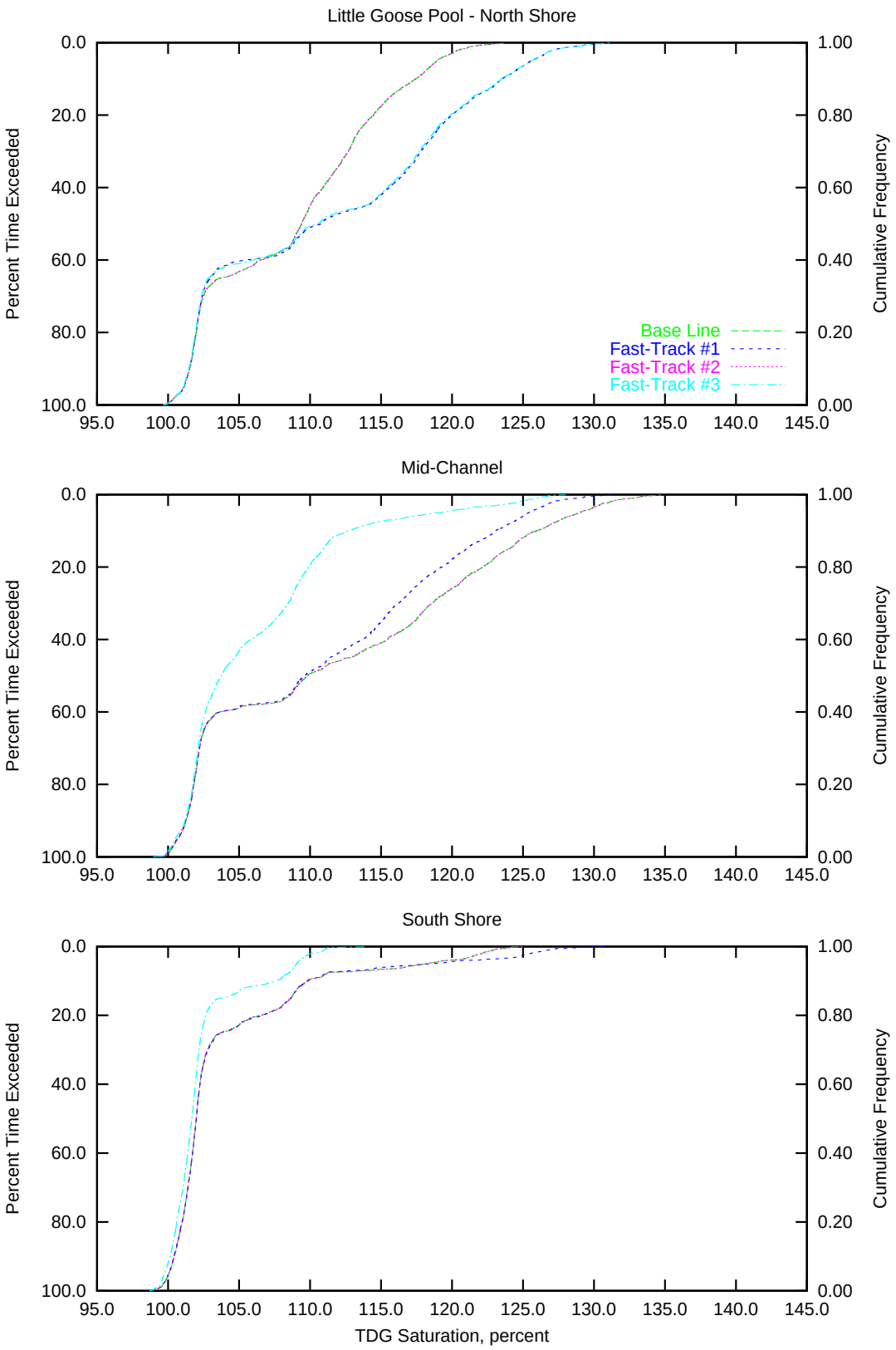

Figure 1.25: Comparision of simulated TDG saturation cumulative frequency distributions for several points across the channel at the LGNW FMS location (SRM 107) in the Little Goose Pool during a medium/high flow (1996) season.

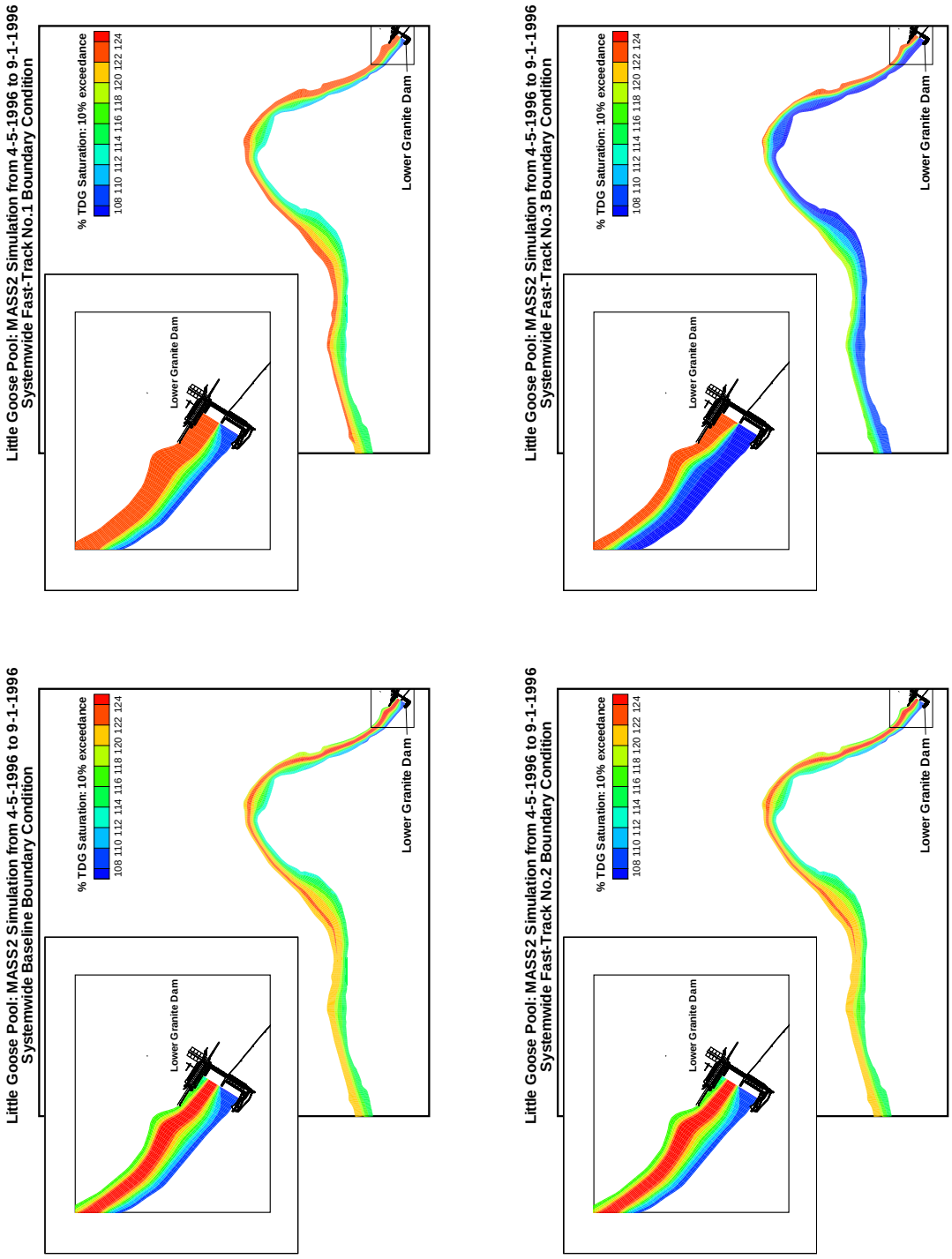

Figure 1.26: Areal comparison of TDG saturation exceeded 10% of a medium flow season (1996) for the fast-track scenarios in Little Goose Pool.

Table 1.29: Tabular histogram of TDG saturation exceeded 10% of the medium/high flow season (1996) over 2-D modeled area in Little Goose pool during the Fast-Track scenario simulations.

Baseline Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	18.0	1.0	305.8	0.6
110 - 115	307.8	16.6	5820.1	11.2
115 - 120	647.4	35.0	18482.9	35.5
120 - 125	825.3	44.6	25919.7	49.8
≥ 125	51.2	2.8	1545.6	3.0
Total	1849.9	100.0	52074.1	100.0

Fast-Track #1 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	17.7	1.0	295.2	0.6
110 - 115	450.9	24.4	9658.9	18.5
115 - 120	542.3	29.3	17146.1	32.9
120 - 125	838.9	45.3	24971.8	48.0
≥ 125	0.0	0.0	0.0	0.0
Total	1849.9	100.0	52072.1	100.0

Fast-Track #2 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	18.0	1.0	305.8	0.6
110 - 115	307.8	16.6	5820.1	11.2
115 - 120	647.4	35.0	18482.9	35.5
120 - 125	825.3	44.6	25919.7	49.8
≥ 125	51.2	2.8	1545.6	3.0
Total	1849.9	100.0	52074.1	100.0

Fast-Track #3 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	814.2	44.0	19342.3	37.1
110 - 115	432.4	23.4	16423.7	31.5
115 - 120	403.3	21.8	11912.2	22.9
120 - 125	199.9	10.8	4395.4	8.4
≥ 125	0.0	0.0	0.0	0.0
Total	1849.9	100.0	52073.7	100.0

Table 1.30: Tabular histogram of TDG saturation exceeded 10% of the medium/high flow season (1996) over 2-D modeled area in Little Goose pool during the Fast-Track scenario simulations.

Baseline Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	54.6	3.0	1014.9	1.9
4 - 6	674.5	36.5	16189.2	31.1
6 - 8	1055.0	57.0	32914.4	63.2
8 - 10	65.8	3.6	1955.5	3.8
≥ 10	0.0	0.0	0.0	0.0
Total	1849.9	100.0	52074.1	100.0

Fast-Track #1 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	73.5	4.0	1260.7	2.4
4 - 6	730.6	39.5	18267.1	35.1
6 - 8	1045.8	56.5	32544.3	62.5
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1849.9	100.0	52072.1	100.0

Fast-Track #2 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	54.6	3.0	1014.9	1.9
4 - 6	674.5	36.5	16189.2	31.1
6 - 8	1055.0	57.0	32914.4	63.2
8 - 10	65.8	3.6	1955.5	3.8
≥ 10	0.0	0.0	0.0	0.0
Total	1849.9	100.0	52074.1	100.0

Fast-Track #3 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	1048.3	56.7	27790.9	53.4
4 - 6	467.6	25.3	16773.4	32.2
6 - 8	333.9	18.1	7509.4	14.4
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1849.9	100.0	52073.7	100.0

Table 1.31: Tabular histogram of TDG saturation exceeded 25% of the medium/high flow season (1996) over 2-D modeled area in Little Goose pool during the Fast-Track scenario simulations.

Baseline Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	25.1	1.4	449.7	0.9
105 - 110	383.4	20.7	7672.0	14.7
110 - 115	556.7	30.1	16186.8	31.1
115 - 120	851.0	46.0	26768.3	51.4
120 - 125	33.6	1.8	997.3	1.9
≥ 125	0.0	0.0	0.0	0.0
Total	1849.9	100.0	52074.1	100.0

Fast-Track #1 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	24.4	1.3	432.4	0.8
105 - 110	426.4	23.0	8898.7	17.1
110 - 115	564.3	30.5	17618.3	33.8
115 - 120	834.8	45.1	25122.7	48.2
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1849.9	100.0	52072.1	100.0

Fast-Track #2 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	25.1	1.4	449.7	0.9
105 - 110	383.4	20.7	7672.0	14.7
110 - 115	556.7	30.1	16186.8	31.1
115 - 120	851.0	46.0	26768.3	51.4
120 - 125	33.6	1.8	997.3	1.9
≥ 125	0.0	0.0	0.0	0.0
Total	1849.9	100.0	52074.1	100.0

Fast-Track #3 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	583.4	31.5	12544.5	24.1
105 - 110	472.4	25.5	15458.2	29.7
110 - 115	606.9	32.8	19899.6	38.2
115 - 120	187.2	10.1	4171.3	8.0
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1849.9	100.0	52073.7	100.0

Table 1.32: Tabular histogram of TDG saturation exceeded 25% of the medium/high flow season (1996) over 2-D modeled area in Little Goose pool during the Fast-Track scenario simulations.

Baseline Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	32.0	1.7	622.8	1.2
2 - 4	601.9	32.5	13732.5	26.4
4 - 6	1142.2	61.7	35518.9	68.2
6 - 8	73.8	4.0	2199.8	4.2
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1849.9	100.0	52074.1	100.0

Fast-Track #1 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	31.3	1.7	603.3	1.2
2 - 4	653.3	35.3	15098.9	29.0
4 - 6	988.0	53.4	32177.0	61.8
6 - 8	177.3	9.6	4192.9	8.1
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1849.9	100.0	52072.1	100.0

Fast-Track #2 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	32.0	1.7	622.8	1.2
2 - 4	601.9	32.5	13732.5	26.4
4 - 6	1142.2	61.7	35518.9	68.2
6 - 8	73.8	4.0	2199.8	4.2
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1849.9	100.0	52074.1	100.0

Fast-Track #3 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	685.2	37.0	15352.5	29.5
2 - 4	612.7	33.1	22301.5	42.8
4 - 6	495.4	26.8	13335.3	25.6
6 - 8	56.5	3.1	1084.4	2.1
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1849.9	100.0	52073.7	100.0

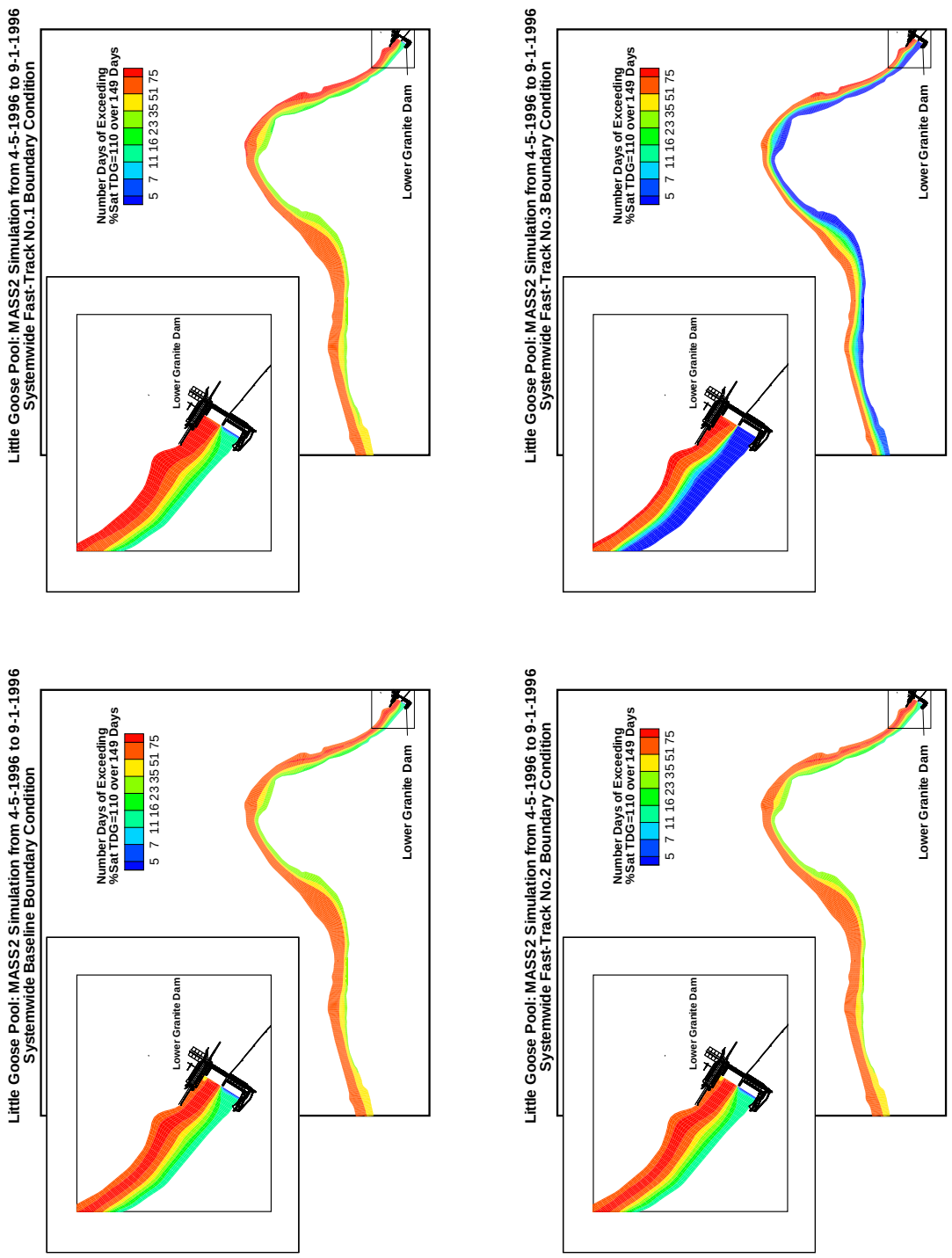

Figure 1.27: Areal comparison of days exceeding TDG saturation of 110% for fast-track scenarios in Little Goose Pool in a medium flow season (1996).

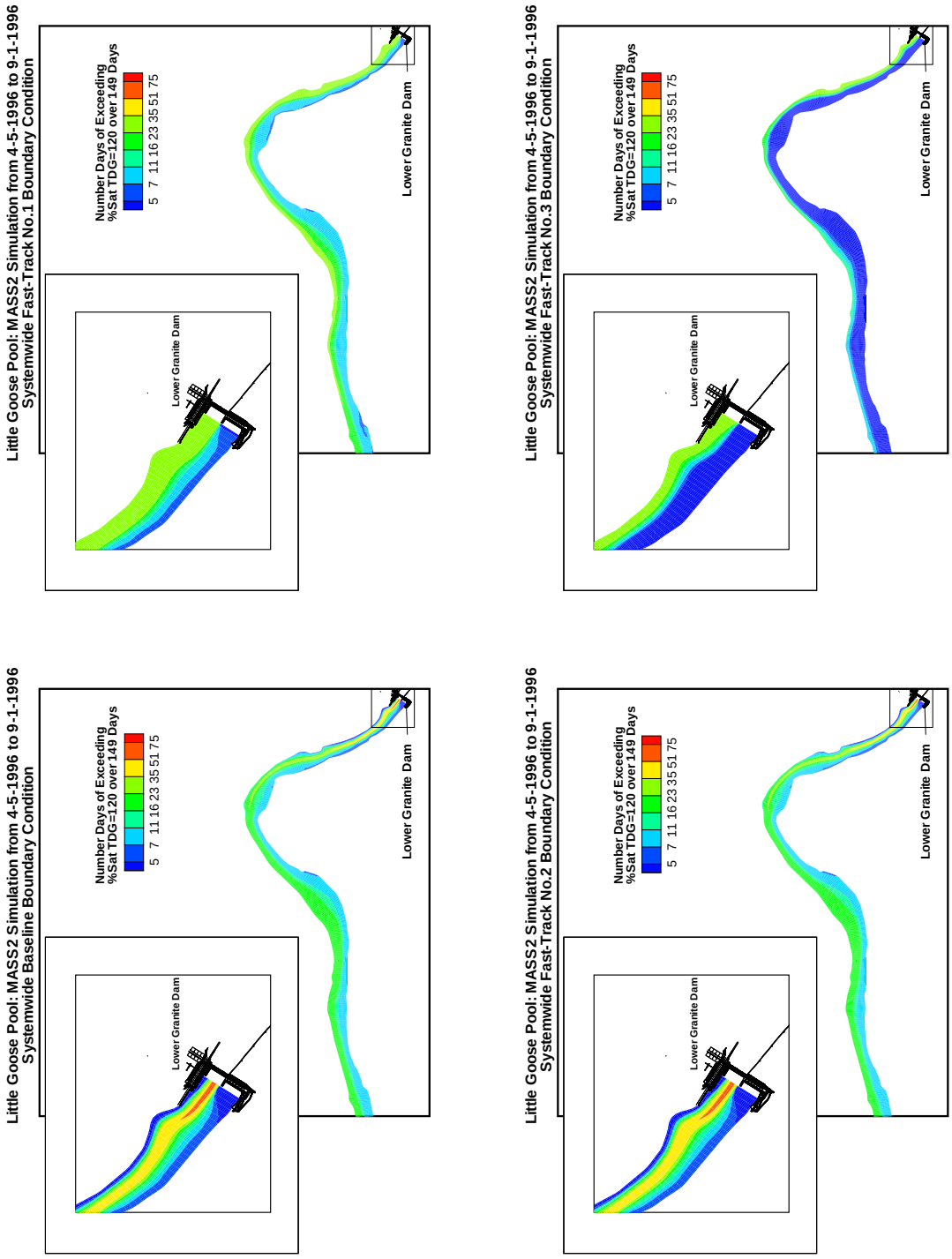

Figure 1.28: Areal comparison of days exceeding TDG saturation of 120% for fast-track scenarios in Little Goose Pool in a medium flow season (1996).

Table 1.33: Tabular histogram of that portion of the simulated Little Goose pool area where daily average saturation exceeded the listed value during the Fast-Track simulations.

Baseline Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.4	99.4
110	0.0	0.4	1.3	2.9	5.3	5.4	7.5	4.9	72.3
115	0.7	11.3	21.7	4.9	3.6	5.1	5.9	8.1	38.6
120	3.8	44.8	12.5	31.4	3.2	1.3	1.1	0.9	1.1
125	53.8	42.6	1.4	1.6	0.4	0.2	0.0	0.0	0.0

Fast-Track #1 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.6	99.2
110	0.0	0.1	1.6	2.5	9.2	5.7	5.5	5.1	70.4
115	0.2	16.1	19.7	4.3	3.8	6.5	4.5	6.9	38.0
120	1.3	48.1	10.8	18.3	11.2	10.3	0.0	0.0	0.0
125	54.9	45.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Fast-Track #2 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.4	99.4
110	0.0	0.4	1.3	2.9	5.3	5.4	7.5	4.9	72.3
115	0.7	11.3	21.7	4.9	3.6	5.1	5.9	8.1	38.6
120	3.8	44.8	12.5	31.4	3.2	1.3	1.1	0.9	1.1
125	53.8	42.6	1.4	1.6	0.4	0.2	0.0	0.0	0.0

Fast-Track #3 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.2	17.0	10.4	4.3	2.3	65.8
110	23.4	16.9	8.1	3.6	2.3	2.5	2.1	2.6	38.5
115	49.3	16.3	4.3	5.2	5.3	3.8	4.6	3.3	8.0
120	65.2	20.7	4.3	4.7	1.9	3.1	0.0	0.0	0.0
125	90.7	9.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 1.34: Tabular histogram of that portion of the simulated Little Goose pool volume where daily average saturation exceeded the listed value during the Fast-Track simulations.

Baseline Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	99.6
110	0.0	0.3	0.8	1.8	3.0	4.0	6.3	4.7	79.0
115	0.5	7.1	19.2	4.9	3.5	5.3	7.4	10.4	41.7
120	2.7	39.6	15.9	33.6	3.6	1.3	1.2	1.0	1.1
125	43.9	52.2	1.5	1.7	0.4	0.3	0.0	0.0	0.0

Fast-Track #1 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.3	99.5
110	0.0	0.1	1.0	1.3	6.0	4.6	5.0	5.1	77.0
115	0.2	10.4	18.5	4.5	4.2	7.8	6.1	9.5	38.6
120	0.8	43.7	14.9	22.9	9.4	8.2	0.0	0.0	0.0
125	54.3	45.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Fast-Track #2 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	99.6
110	0.0	0.3	0.8	1.8	3.0	4.0	6.3	4.7	79.0
115	0.5	7.1	19.2	4.9	3.5	5.3	7.4	10.4	41.7
120	2.7	39.6	15.9	33.6	3.6	1.3	1.2	1.0	1.1
125	43.9	52.2	1.5	1.7	0.4	0.3	0.0	0.0	0.0

Fast-Track #3 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.3	11.4	8.6	4.0	2.2	73.5
110	17.0	16.0	9.3	4.6	3.1	3.4	2.9	3.7	40.0
115	44.1	21.8	5.9	7.0	5.4	3.6	3.5	2.5	6.3
120	66.1	23.1	3.5	3.6	1.6	2.1	0.0	0.0	0.0
125	92.5	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1.2 Long Term Scenarios

This section presents the complete results of the one/two-dimensional hybrid simulations of the long term alternative scenarios for the pools/reaches of the Snake River. The fast-track scenarios are summarized in Table 1.1. A more detailed description of the scenarios is presented in the main report.

Table 1.35: Individual project modifications for the long term system-wide scenarios.

	Scenario		
Project	**Long Term #1**	**Long Term #2**	**Long Term #3**
Bonneville	Fast-Track #4	Fast-Track #4	Submerged Radial Gates Uniform Spill
The Dalles	Fast-Track #3	Fast-Track #3	Fast-Track #3
John Day	Additional Bays (6) Nonuniform Spill[a]	Additional Bays (6) Nonuniform Spill[a]	Additional Bays (6) Nonuniform Spill[a]
McNary	Fast-Track #3	Additional Bays (9) Uniform Spill	Additional Bays (9) Uniform Spill
Ice Harbor	Fast-Track #1	Fast-Track #1	Divider Wall Only Uniform Spill
Lower Monumental	Fast-Track #3	Fast-Track #3	Additional Bays (9) Divider Wall Uniform Spill
Little Goose	Fast-Track #3	Additional Bays (9) Divider Wall Uniform Spill	Additional Bays (9) Divider Wall Uniform Spill
Lower Granite	Additional Bays (9) Uniform Spill	Additional Bays (9) Divider Wall Uniform Spill	Additional Bays (9) Divider Wall Uniform Spill

[a]The additional bays would be opened first, one at a time, up to a flow of 6300 cfs. After all new bays are open, spill would be distributed evenly over the original 20 bays.

Table 1.36: Percentage of daily highest 12 hour average TDG %sat exceeding the water quality waiver of 120% at 2-D simulation time series output location (FMS) for baseline and longterm scenarios in a medium flow season (1996)

Location	Pool	Baseline		Longterm No.1		Longterm No.2		Longterm No.3	
		Days	%	Days	%	Days	%	Days	%
North	LGS	7	4.7	0	0.0	0	0.0	0	0.0
	LMN	42	28.0	35	23.3	0	0.0	0	0.0
	IHR	35	23.3	1	0.7	0	0.0	0	0.0
	MCN	14	9.3	13	8.7	12	8.0	11	7.3
	JDA	85	56.7	38	25.3	0	0.0	0	0.0
	TDA	41	27.3	4	2.7	4	2.7	4	2.7
	BON	40	26.7	13	8.7	9	6.0	9	6.0
	TID	35	23.3	13	8.7	6	4.0	0	0.0
Mid-Channel	LGS	48	32.0	0	0.0	0	0.0	0	0.0
	LMN	46	30.7	15	10.0	0	0.0	1	0.7
	IHR	48	32.0	29	19.3	23	15.3	3	2.0
	MCN	26	17.3	12	8.0	8	5.3	0	0.0
	JDA	47	31.3	36	24.0	19	12.7	19	12.7
	TDA	24	16.0	3	2.0	3	2.0	3	2.0
	BON	37	24.7	6	4.0	2	1.3	2	1.3
	TID	78	52.0	40	26.7	40	26.7	0	0.0
South	LGS	5	3.3	0	0.0	0	0.0	0	0.0
	LMN	39	26.0	0	0.0	0	0.0	0	0.0
	IHR	58	38.7	42	28.0	42	28.0	0	0.0
	MCN	34	22.7	13	8.7	3	2.0	0	0.0
	JDA	9	6.0	6	4.0	6	4.0	1	0.7
	TDA	11	7.3	6	4.0	0	0.0	0	0.0
	BON	33	22.0	3	2.0	0	0.0	0	0.0
	TID	35	23.3	6	4.0	3	2.0	0	0.0

1.2.1 McNary Pool

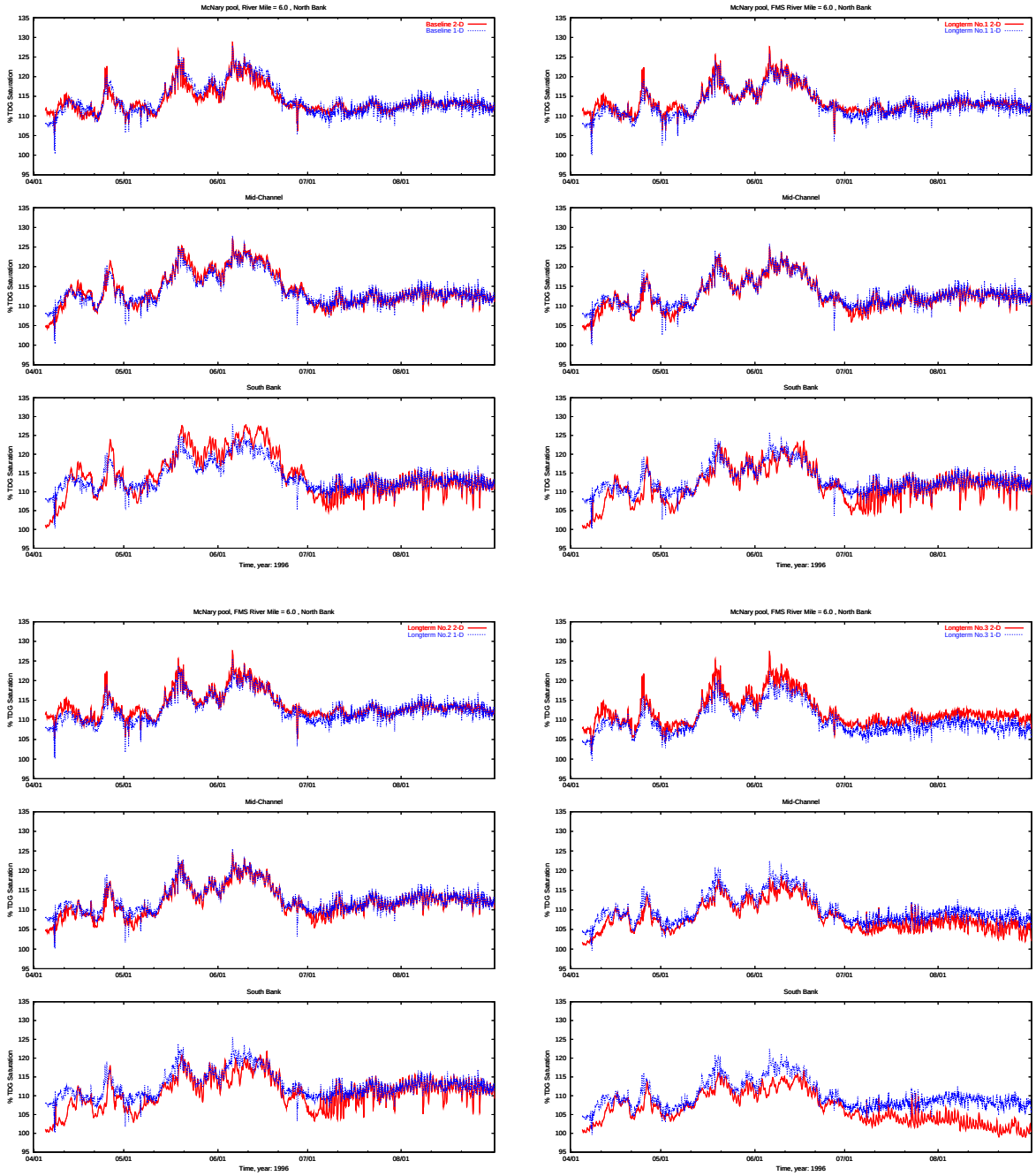

Figure 1.29: Time series plots at the FMS below Little Goose (LGSW) in Lower Monumental pool compared with the 1-D simulation in a medium/high flow season (1996) for long term scenarios.

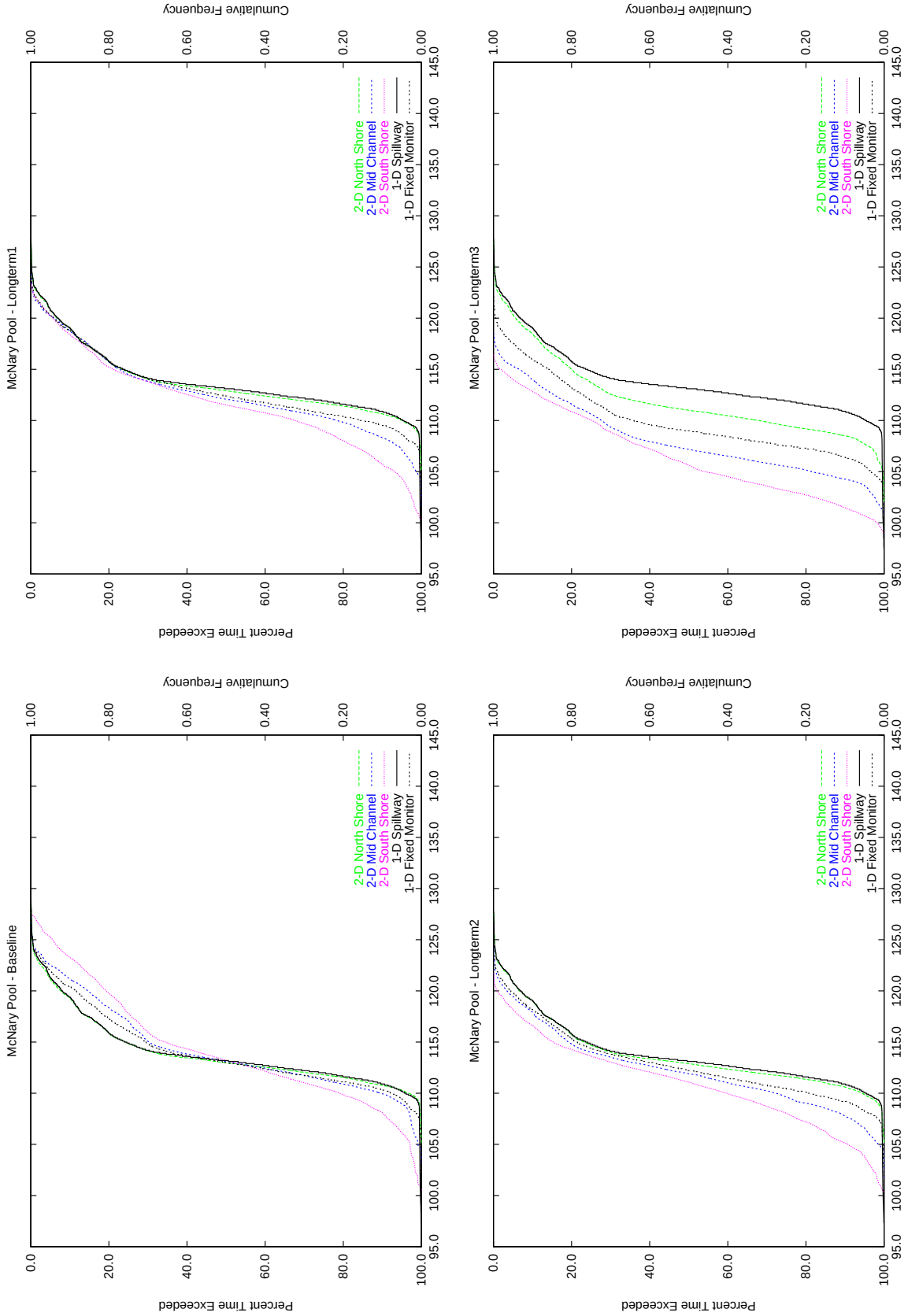

Figure 1.30: Cumulative frequency distributions TDG saturation simulated by the 1-D/2-D hybrid model for several points across the channel at the IDSW FMS location (SRM 6) McNary Pool during a medium/high flow (1996) season and each long term scenario compared with similar values from the 1-D simulations at the spillway and FMS location.

Table 1.37: Summary statistics of TDG saturation percentage of MASS2 and MASS1 time series output for longterm scenarios in McNary pool in a medium flow season (1996)

Location		Base Line	Longterm No.1	Longterm No.2	Longterm No.3
North FMS	number	3577.0	3577.0	3577.0	3577.0
	mean	113.9	113.7	113.7	112.1
	median	113.0	112.9	112.9	111.0
	minimum	105.1	105.2	105.2	102.1
	lower quartile	111.8	111.7	111.6	109.5
	upper quartile	114.8	114.7	114.7	113.7
	10% exceedance	119.3	119.0	119.0	118.5
	maximum	128.8	127.7	127.6	127.4
	standard deviation	3.3	3.2	3.2	3.8
Mid-channel	number	3577.0	3577.0	3577.0	3577.0
	mean	114.2	112.7	112.2	108.1
	median	113.1	112.1	111.9	107.2
	minimum	103.2	101.8	101.8	101.0
	lower quartile	111.3	110.3	109.6	105.5
	upper quartile	117.0	114.5	114.0	110.6
	10% exceedance	121.2	118.7	117.8	114.0
	maximum	127.2	125.0	124.6	118.5
	standard deviation	4.3	3.8	3.7	3.6
South	number	3577.0	3577.0	3577.0	3577.0
	mean	114.3	111.8	110.9	106.5
	median	113.2	111.5	111.1	105.6
	minimum	100.5	100.3	100.4	99.0
	lower quartile	110.5	109.0	108.0	103.1
	upper quartile	117.8	114.4	113.6	110.1
	10% exceedance	123.3	118.4	116.6	112.8
	maximum	127.9	123.4	121.8	116.5
	standard deviation	5.7	4.6	4.2	4.2
1-D FMS	number	3577.0	3577.0	3577.0	3577.0
	mean	114.1	113.2	112.8	110.0
	median	113.0	112.4	112.2	109.0
	minimum	100.3	100.1	100.1	99.6
	lower quartile	111.4	110.7	110.4	107.5
	upper quartile	116.1	114.8	114.4	112.0
	10% exceedance	120.4	118.8	118.2	116.0
	maximum	127.9	125.9	125.6	122.5
	standard deviation	3.8	3.5	3.4	3.6

Table 1.38: Histogram table of TDG saturation percentage of MASS2 and MASS1 time series output for longterm scenarios in McNary pool in a medium flow season (1996)

Location	TDG Range	Base Line		Longterm No.1		Longterm No.2		Longterm No.3	
		Days	%	Days	%	Days	%	Days	%
North FMS	less than 105	0	0.0	0	0.0	0	0.0	1	0.5
	105 - 110	5	3.3	7	5.0	8	5.6	47	31.6
	110 - 115	108	72.6	107	71.5	106	71.1	71	47.9
	115 - 120	25	16.5	25	16.8	25	16.7	21	14.3
	120 - 125	11	7.3	10	6.5	9	6.3	8	5.4
	125 - 130	0	0.3	0	0.3	0	0.3	0	0.3
	above 130	0	0.0	0	0.0	0	0.0	0	0.0
Mid-channel	less than 105	1	0.9	2	1.2	2	1.4	28	18.6
	105 - 110	14	9.5	31	20.5	39	26.4	80	53.7
	110 - 115	89	59.5	83	55.5	79	52.8	32	21.1
	115 - 120	23	15.5	25	16.8	24	15.9	10	6.6
	120 - 125	21	14.1	9	5.9	5	3.4	0	0.0
	125 - 130	1	0.5	0	0.0	0	0.0	0	0.0
	above 130	0	0.0	0	0.0	0	0.0	0	0.0
South	less than 105	4	2.9	10	6.8	14	9.3	69	46.0
	105 - 110	27	18.1	38	25.7	46	31.1	43	28.8
	110 - 115	66	44.6	69	46.4	66	44.4	35	23.3
	115 - 120	22	15.1	23	15.3	21	14.4	3	1.9
	120 - 125	20	13.7	9	5.8	1	0.9	0	0.0
	125 - 130	8	5.6	0	0.0	0	0.0	0	0.0
	above 130	0	0.0	0	0.0	0	0.0	0	0.0
1-D FMS	less than 105	0	0.1	0	0.3	0	0.3	5	3.4
	105 - 110	11	7.3	22	14.8	28	18.6	91	61.1
	110 - 115	94	63.2	91	61.3	89	59.7	32	21.4
	115 - 120	27	17.9	26	17.6	25	17.0	20	13.6
	120 - 125	17	11.2	9	5.9	6	4.3	1	0.6
	125 - 130	1	0.4	0	0.1	0	0.1	0	0.0
	above 130	0	0.0	0	0.0	0	0.0	0	0.0

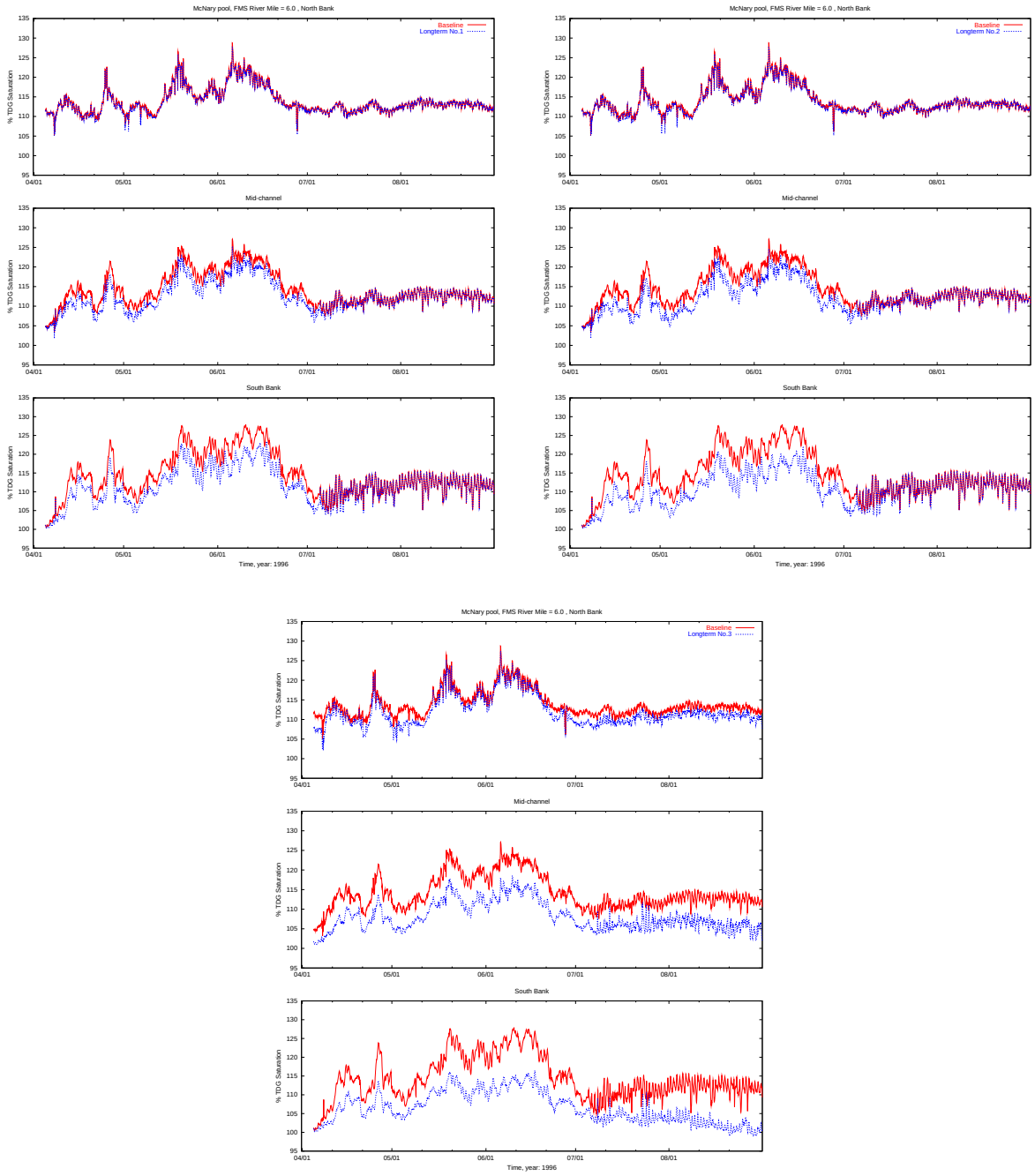

Figure 1.31: Time series plots of saturation at the FMS below Ice Harbor (IDSW) in McNary Pool from the long term hybrid simulations compared with the baseline hybrid simulation in a medium/high flow season (1996)

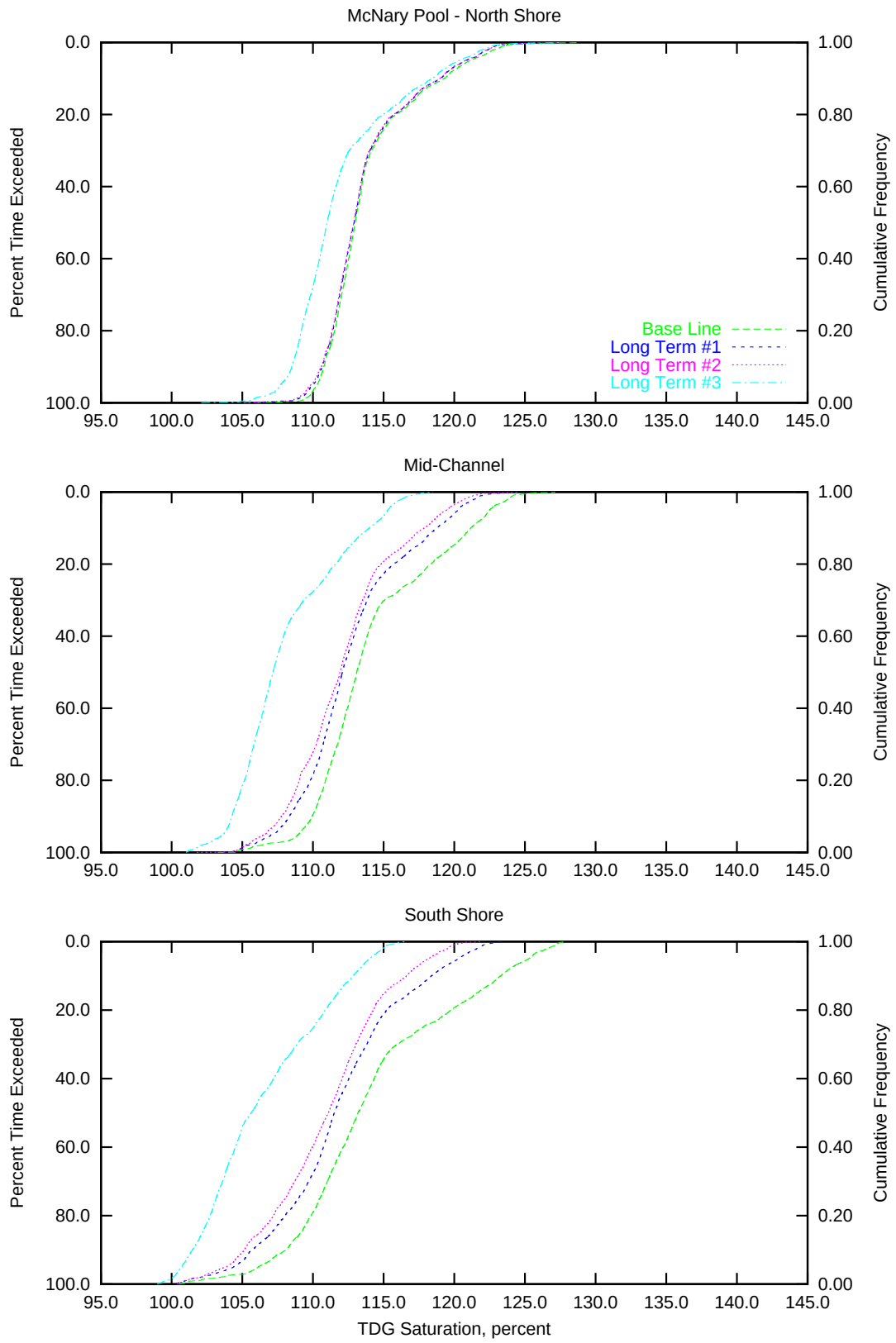

Figure 1.32: Comparision of simulated TDG saturation cumulative frequency distributions for several points across the channel at the IDSW FMS location (SRM 6) in the McNary Pool during a medium/high flow (1996) season.

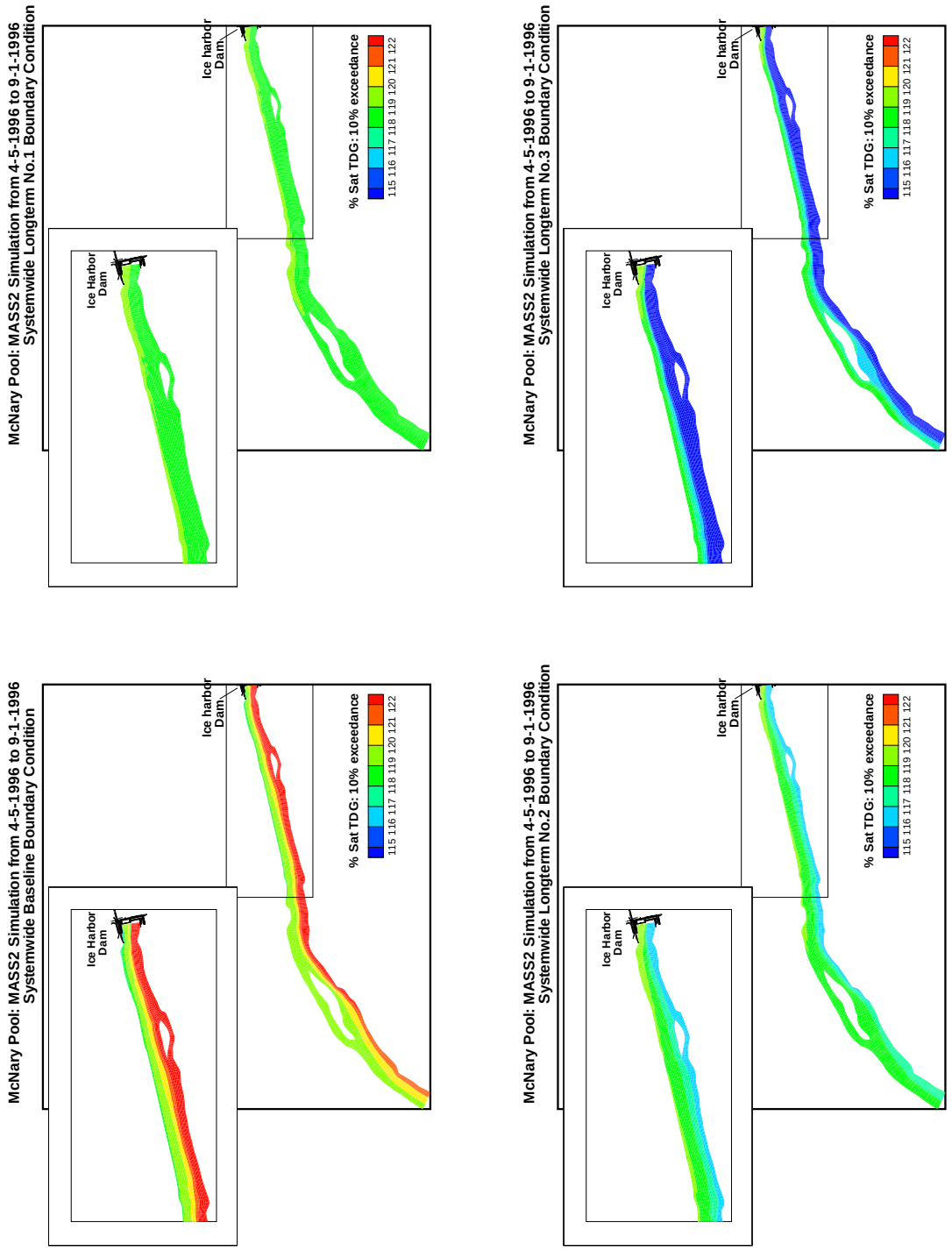

Figure 1.33: Areal comparison of TDG saturation exceeded 10% of a medium flow season (1996) for the long term scenarios in Lower Monumental pool.

Table 1.39: Tabular histogram of TDG saturation exceeded 10% of the medium/high flow season (1996) over 2-D modeled area in McNary pool during the Long Term scenario simulations.

Baseline Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	0.0	0.0	0.0	0.0
115 - 120	736.3	45.6	12172.2	47.6
120 - 125	878.4	54.4	13376.2	52.4
≥ 125	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25548.4	100.0

Long Term #1 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	0.0	0.0	0.0	0.0
115 - 120	1614.7	100.0	25551.5	100.0
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25551.5	100.0

Long Term #2 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	0.0	0.0	0.0	0.0
115 - 120	1614.7	100.0	25551.5	100.0
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25551.5	100.0

Long Term #3 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	664.3	41.1	9017.7	35.3
115 - 120	950.4	58.9	16542.2	64.7
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25559.9	100.0

Table 1.40: Tabular histogram of TDG saturation exceeded 10% of the medium/high flow season (1996) over 2-D modeled area in McNary pool during the Long Term scenario simulations.

Baseline Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	4.0	0.2	72.5	0.3
6 - 8	1610.7	99.8	25475.9	99.7
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25548.4	100.0

Long Term #1 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	0.0	0.0	0.0	0.0
6 - 8	1614.7	100.0	25551.5	100.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25551.5	100.0

Long Term #2 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	603.0	37.3	8328.7	32.6
6 - 8	1011.7	62.7	17222.8	67.4
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25551.5	100.0

Long Term #3 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	1263.9	78.3	19591.2	76.6
6 - 8	350.8	21.7	5968.7	23.4
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25559.9	100.0

Table 1.41: Tabular histogram of TDG saturation exceeded 25% of the medium/high flow season (1996) over 2-D modeled area in McNary pool during the Long Term scenario simulations.

Baseline Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	391.4	24.2	6295.2	24.6
115 - 120	1223.3	75.8	19253.2	75.4
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25548.4	100.0

Long Term #1 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	1614.7	100.0	25551.5	100.0
115 - 120	0.0	0.0	0.0	0.0
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25551.5	100.0

Long Term #2 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	1614.7	100.0	25551.5	100.0
115 - 120	0.0	0.0	0.0	0.0
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25551.5	100.0

Long Term #3 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	13.2	0.8	62.5	0.2
110 - 115	1601.5	99.2	25497.4	99.8
115 - 120	0.0	0.0	0.0	0.0
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25559.9	100.0

Table 1.42: Tabular histogram of TDG saturation exceeded 25% of the medium/high flow season (1996) over 2-D modeled area in McNary pool during the Long Term scenario simulations.

Baseline Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	1560.9	96.7	24947.9	97.6
6 - 8	53.8	3.3	600.5	2.4
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25548.4	100.0

Long Term #1 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	1614.7	100.0	25551.5	100.0
6 - 8	0.0	0.0	0.0	0.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25551.5	100.0

Long Term #2 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	1614.7	100.0	25551.5	100.0
6 - 8	0.0	0.0	0.0	0.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25551.5	100.0

Long Term #3 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	882.3	54.6	13357.6	52.3
4 - 6	732.4	45.4	12202.3	47.7
6 - 8	0.0	0.0	0.0	0.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1614.7	100.0	25559.9	100.0

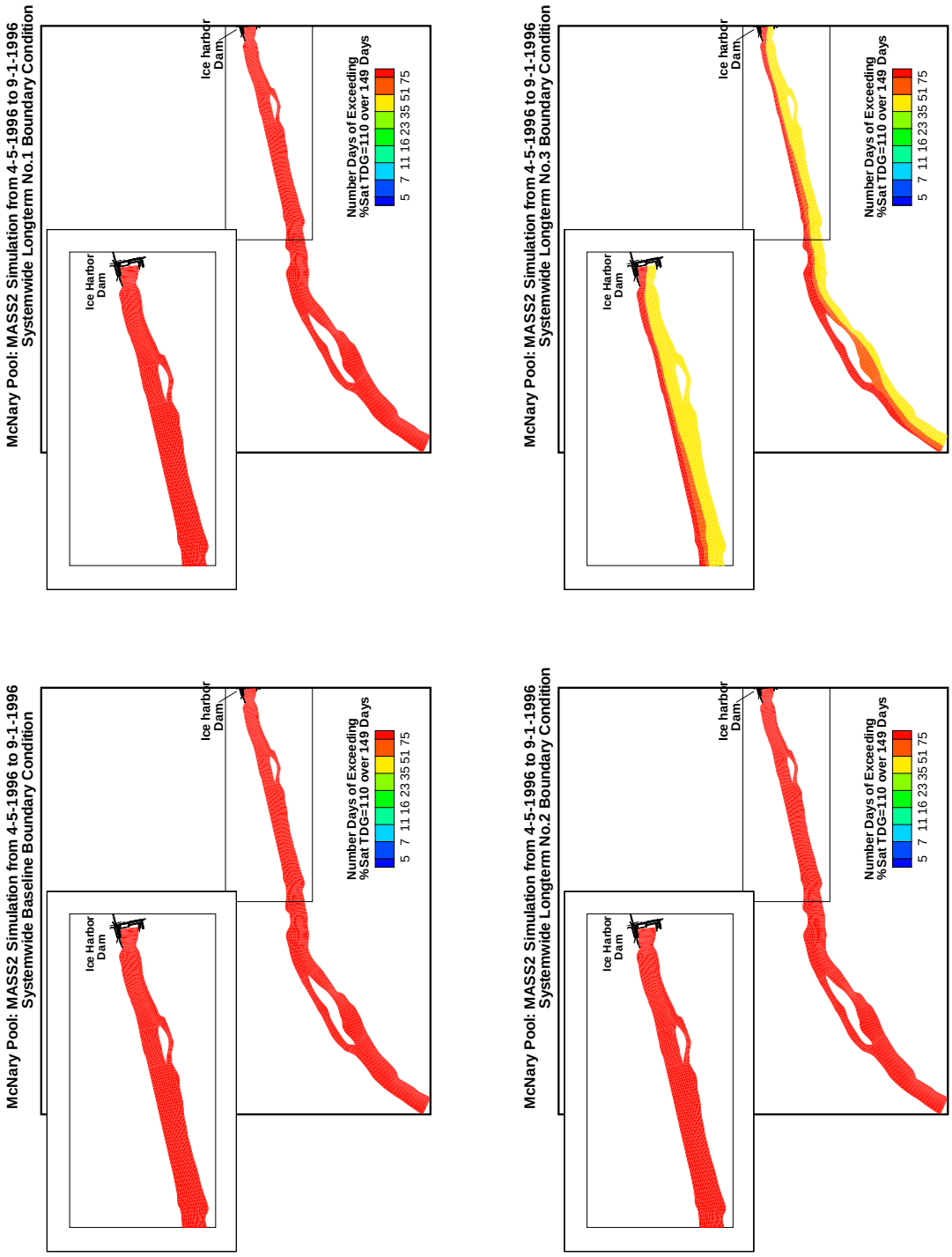

Figure 1.34: Areal comparison of days exceeding TDG saturation of 110% for long term scenarios in Lower Monumental pool in a medium flow season (1996).

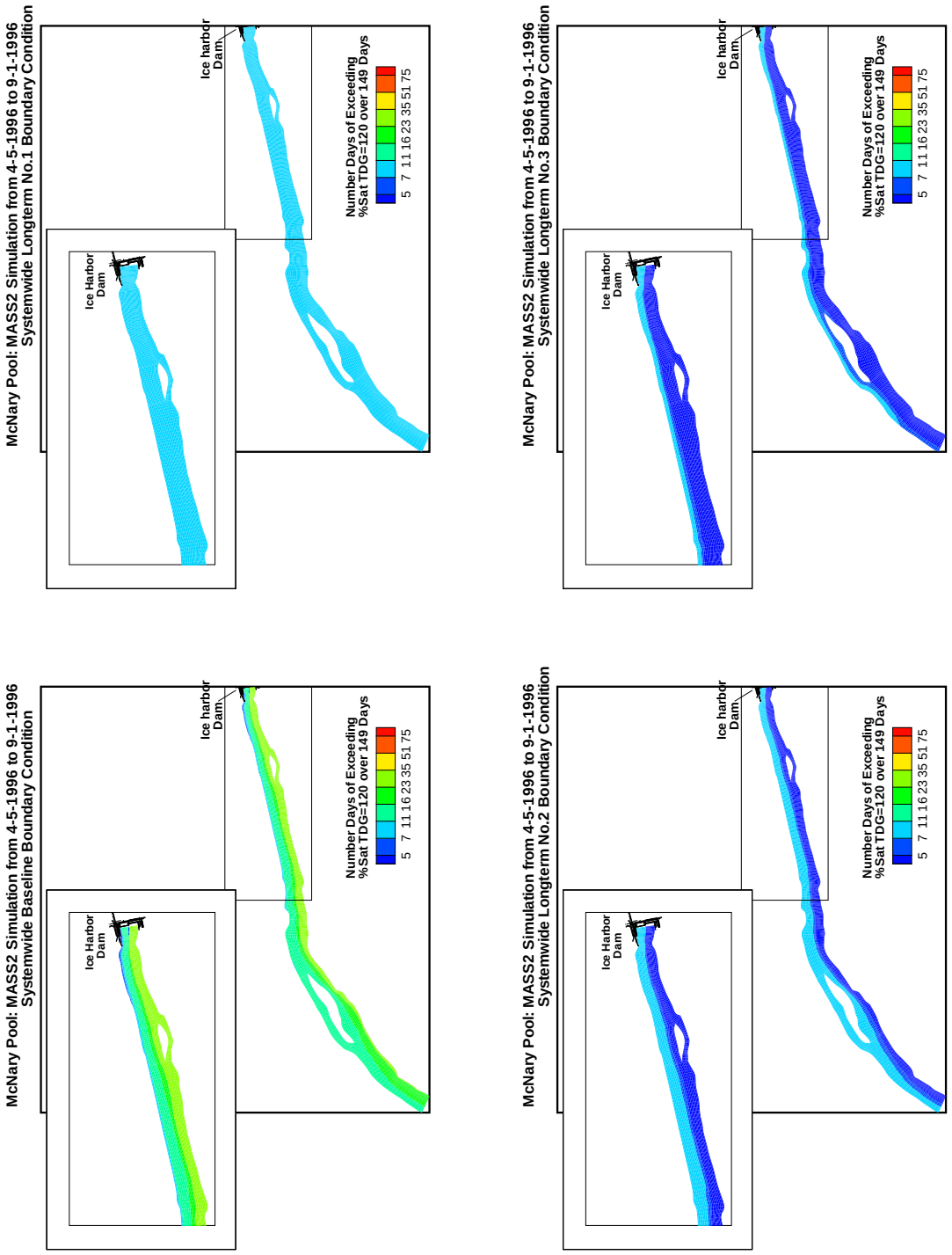

Figure 1.35: Areal comparison of days exceeding TDG saturation of 120% for long term scenarios in Lower Monumental pool in a medium flow season (1996).

Table 1.43: Tabular histogram of that portion of the simulated McNary pool area where daily average saturation exceeded the listed value during the Long Term simulations.

Baseline Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.1	1.7	24.4	73.8
120	0.1	0.7	43.9	20.3	14.9	16.0	4.1	0.0	0.0
125	86.7	13.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Long Term #1 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.0	56.0	44.0	0.0
120	0.0	61.3	38.7	0.0	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Long Term #2 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	15.9	27.4	30.6	26.1	0.0
120	32.3	33.1	34.6	0.0	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Long Term #3 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.0	74.0
115	23.4	6.8	9.5	9.9	19.4	22.7	6.6	1.6	0.0
120	67.8	26.4	5.8	0.0	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 1.44: Tabular histogram of that portion of the simulated McNary pool volume where daily average saturation exceeded the listed value during the Long Term simulations.

Baseline Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.1	1.7	25.4	72.7
120	0.1	0.7	46.4	24.7	16.0	9.5	2.6	0.0	0.0
125	92.6	7.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Long Term #1 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.0	54.0	46.0	0.0
120	0.0	60.6	39.4	0.0	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Long Term #2 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	9.3	30.5	32.4	27.9	0.0
120	26.2	38.1	35.7	0.0	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Long Term #3 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.5	83.5
115	14.8	6.5	11.6	13.6	19.8	24.9	7.0	1.9	0.0
120	65.5	27.5	7.0	0.0	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1.2.2 Ice Harbor Pool

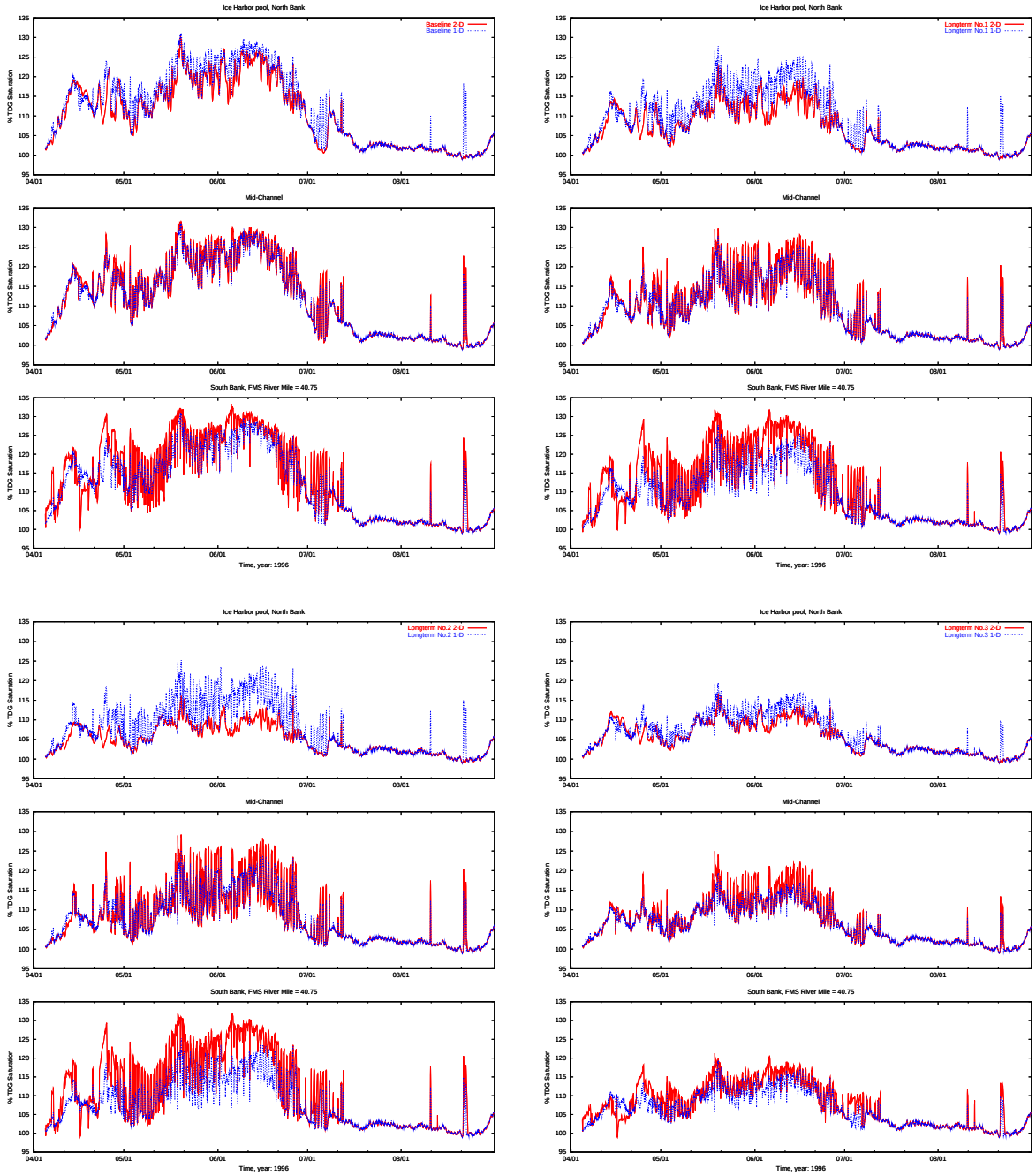

Figure 1.36: Time series plots at the FMS below Little Goose (LGSW) in Lower Monumental pool compared with the 1-D simulation in a medium/high flow season (1996) for long term scenarios.

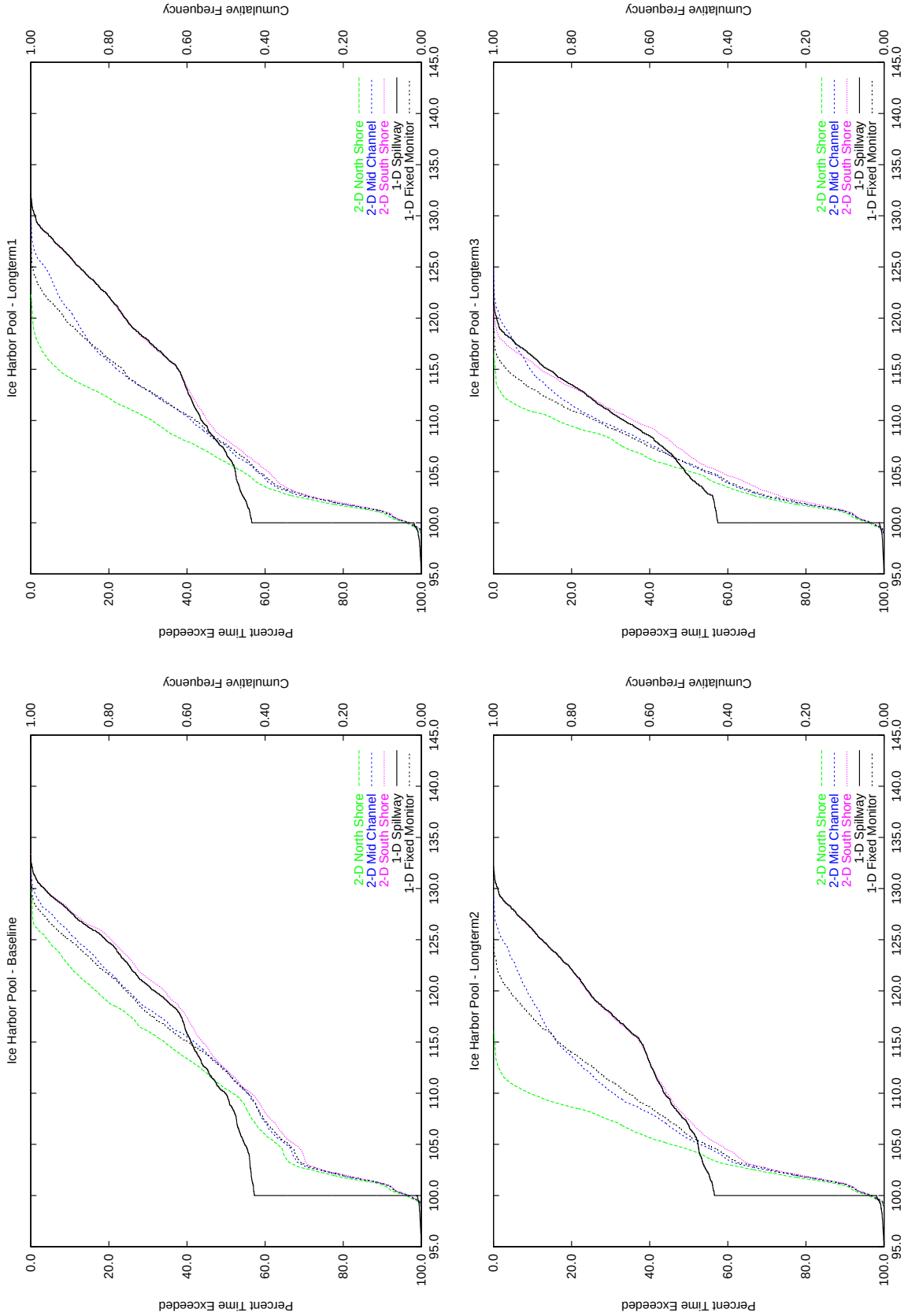

Figure 1.37: Cumulative frequency distributions TDG saturation simulated by the 1-D/2-D hybrid model for several points across the channel at the LMNW FMS location (SRM 41) Ice Harbor Pool during a medium/high flow (1996) season and each long term scenario compared with similar values from the 1-D simulations at the spillway and FMS location.

Table 1.45: Summary statistics of TDG saturation percentage of MASS2 and MASS1 time series output for longterm scenarios in Ice Harbor pool in a medium flow season (1996)

Location		Base Line	Longterm No.1	Longterm No.2	Longterm No.3
North	number	3577.0	3577.0	3577.0	3577.0
	mean	110.6	106.8	105.0	105.5
	median	110.4	105.9	104.5	105.0
	minimum	99.0	99.0	99.0	99.0
	lower quartile	102.2	102.0	101.9	102.0
	upper quartile	117.6	111.2	108.1	108.9
	10% exceedance	122.3	114.2	109.9	110.8
	maximum	130.1	122.5	116.1	116.6
	standard deviation	8.3	5.2	3.5	3.9
Mid-channel	number	3577.0	3577.0	3577.0	3577.0
	mean	112.1	109.0	107.8	106.8
	median	112.2	107.5	105.5	105.7
	minimum	98.9	98.9	98.9	98.9
	lower quartile	102.4	102.2	102.1	102.2
	upper quartile	120.0	114.1	111.9	110.4
	10% exceedance	125.6	120.8	119.0	114.7
	maximum	131.6	129.8	129.2	125.0
	standard deviation	9.4	7.5	7.0	5.4
South FMS	number	3577.0	3577.0	3577.0	3577.0
	mean	113.4	111.2	111.0	107.6
	median	112.3	108.2	107.4	106.6
	minimum	99.0	99.0	99.0	99.0
	lower quartile	102.5	102.3	102.2	102.4
	upper quartile	123.3	119.4	119.4	112.3
	10% exceedance	127.9	125.9	125.9	115.6
	maximum	133.4	131.9	131.9	121.3
	standard deviation	10.4	9.6	9.7	5.5
1-D FMS	number	3577.0	3577.0	3577.0	3577.0
	mean	111.9	108.8	107.7	106.4
	median	112.1	107.7	105.8	105.8
	minimum	99.0	99.0	99.0	99.0
	lower quartile	102.4	102.3	102.2	102.3
	upper quartile	119.8	114.2	112.7	110.2
	10% exceedance	124.9	119.4	117.4	113.1
	maximum	131.0	127.8	125.2	119.5
	standard deviation	9.1	7.1	6.3	4.6

Table 1.46: Histogram table of TDG saturation percentage of MASS2 and MASS1 time series output for longterm scenarios in Ice Harbor pool in a medium flow season (1996)

Location	TDG Range	Base Line		Longterm No.1		Longterm No.2		Longterm No.3	
		Days	%	Days	%	Days	%	Days	%
North	less than 105	55	36.8	68	45.7	81	54.6	74	49.6
	105 - 110	17	11.4	35	23.2	54	36.2	51	34.0
	110 - 115	26	17.6	36	24.1	13	8.9	24	16.0
	115 - 120	26	17.5	10	6.5	0	0.3	1	0.5
	120 - 125	18	12.4	1	0.4	0	0.0	0	0.0
	125 - 130	6	4.2	0	0.0	0	0.0	0	0.0
	above 130	0	0.1	0	0.0	0	0.0	0	0.0
Mid-channel	less than 105	52	34.6	63	42.2	70	47.1	68	46.0
	105 - 110	15	9.8	25	16.8	33	22.2	40	27.1
	110 - 115	20	13.7	28	19.0	22	14.6	26	17.6
	115 - 120	25	16.9	16	10.9	11	7.5	12	7.7
	120 - 125	20	13.4	11	7.5	9	6.3	2	1.6
	125 - 130	16	11.0	5	3.6	3	2.3	0	0.0
	above 130	1	0.6	0	0.0	0	0.0	0	0.0
South FMS	less than 105	48	32.5	58	39.2	63	42.4	63	42.0
	105 - 110	17	11.2	23	15.6	20	13.3	33	22.3
	110 - 115	18	12.4	11	7.7	10	6.9	35	23.8
	115 - 120	15	9.8	20	13.5	20	13.4	17	11.7
	120 - 125	20	13.6	17	11.7	17	11.7	0	0.2
	125 - 130	25	17.1	17	11.3	17	11.3	0	0.0
	above 130	5	3.5	1	1.0	1	1.0	0	0.0
1-D FMS	less than 105	51	34.0	62	41.7	68	45.6	67	45.1
	105 - 110	16	10.5	24	16.1	30	20.0	43	28.7
	110 - 115	23	15.4	28	18.8	26	17.8	34	22.7
	115 - 120	23	15.7	22	14.9	19	12.4	5	3.4
	120 - 125	22	14.7	12	8.2	6	4.1	0	0.0
	125 - 130	14	9.4	1	0.4	0	0.0	0	0.0
	above 130	0	0.3	0	0.0	0	0.0	0	0.0

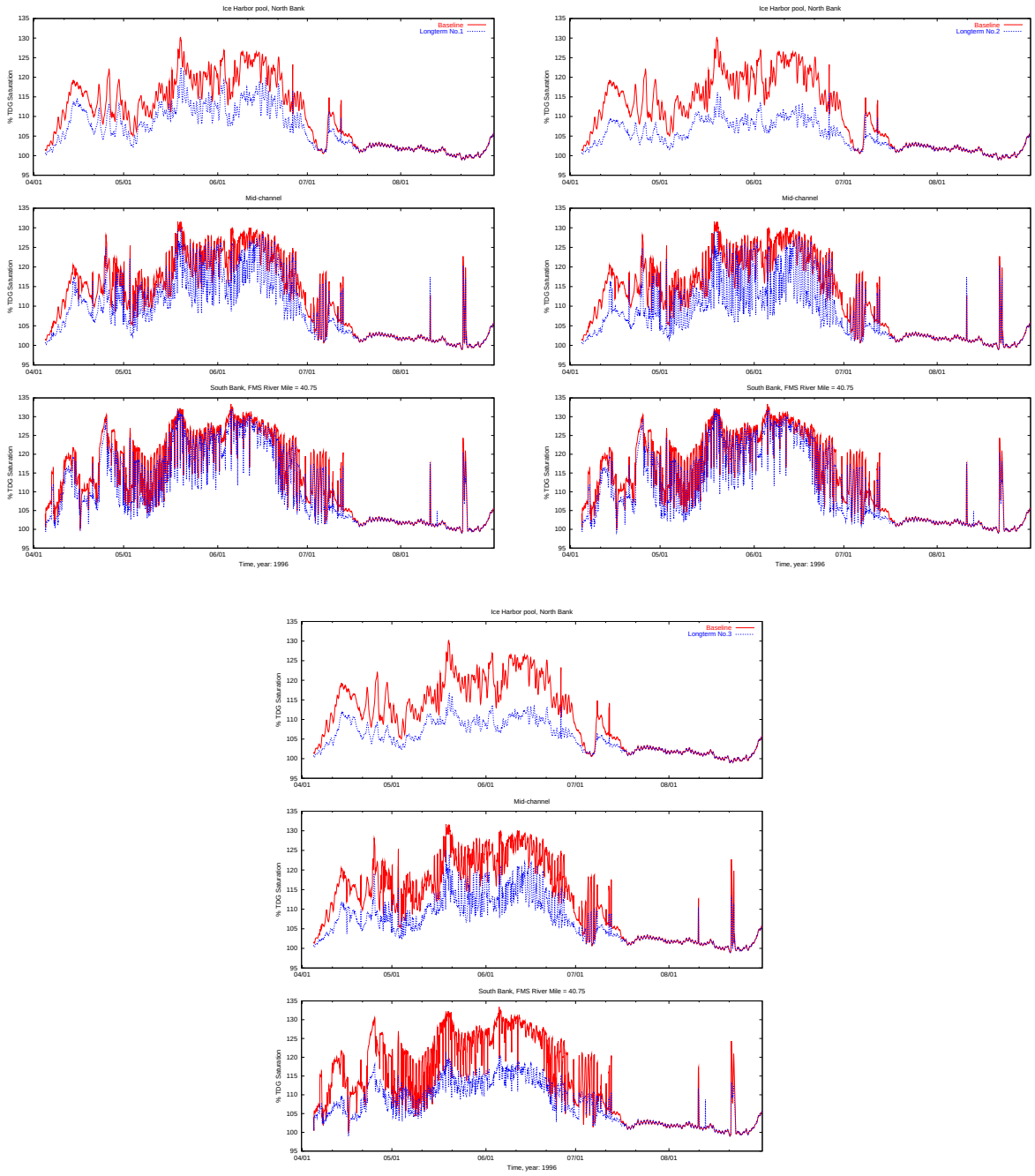

Figure 1.38: Time series plots of saturation at the FMS below Lower Monumental (LMNW) in Ice Harbor Pool from the long term hybrid simulations compared with the baseline hybrid simulation in a medium/high flow season (1996)

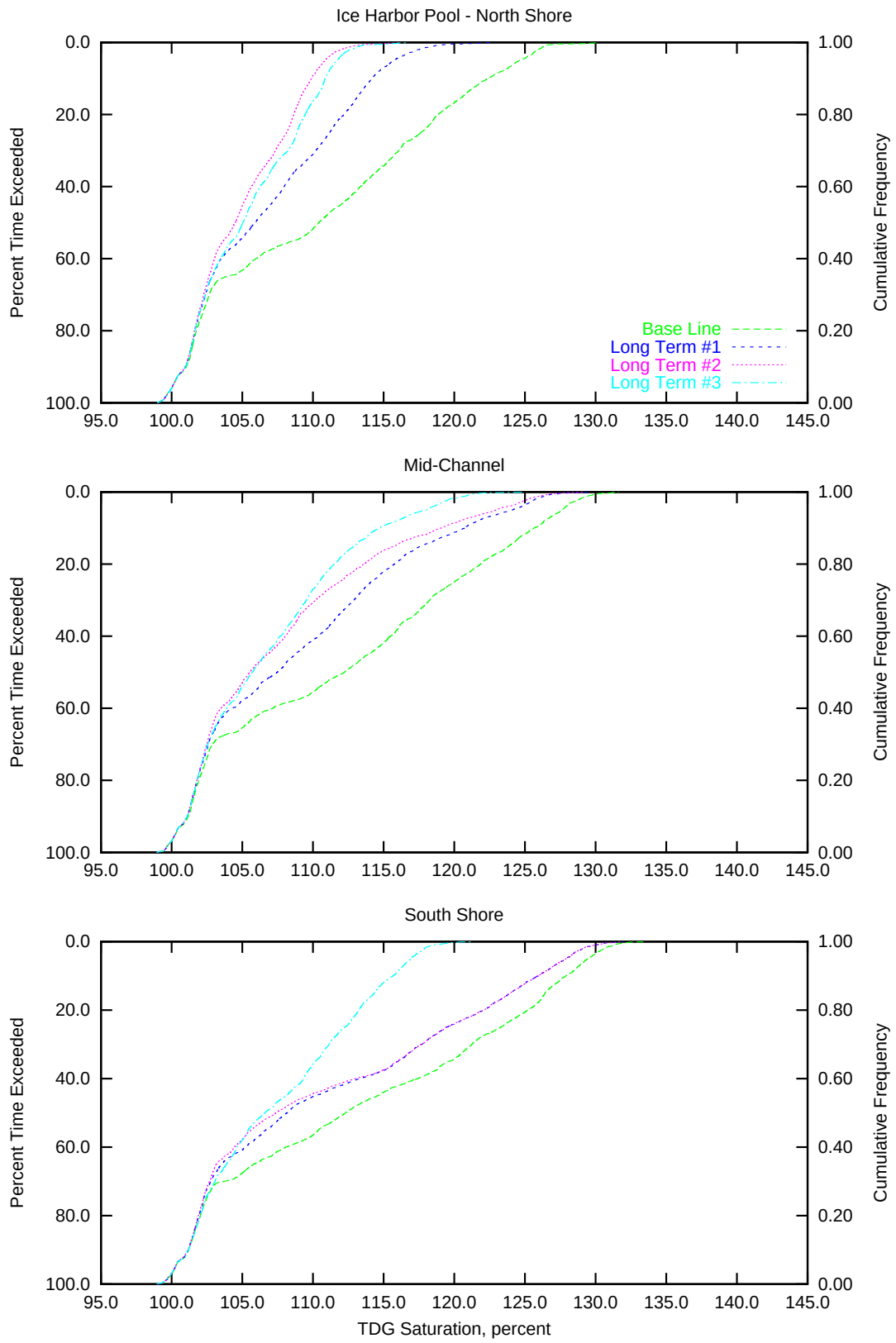

Figure 1.39: Comparision of simulated TDG saturation cumulative frequency distributions for several points across the channel at the LMNW FMS location (SRM 41) in the Ice Harbor Pool during a medium/high flow (1996) season.

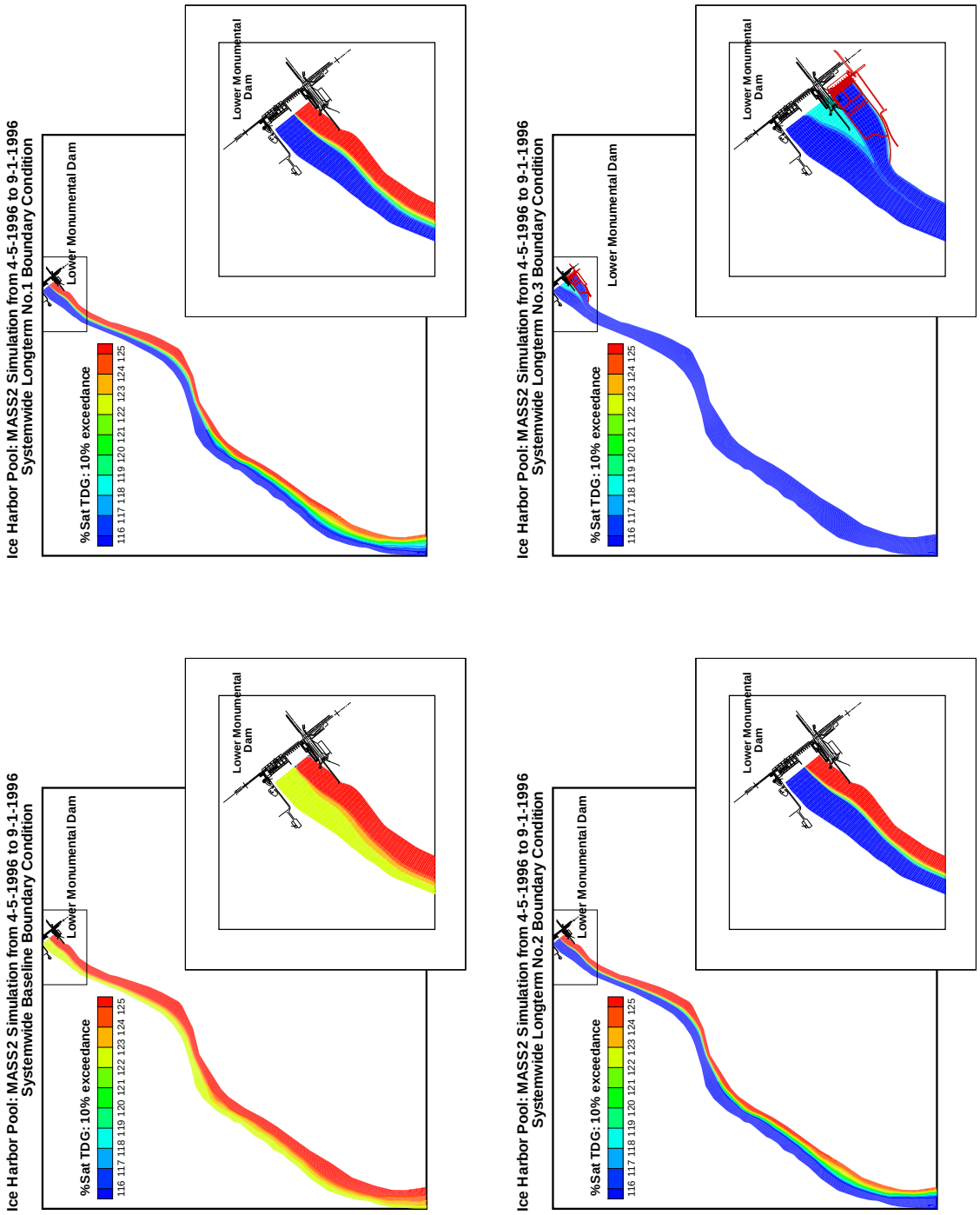

Figure 1.40: Areal comparison of TDG saturation exceeded 10% of a medium flow season (1996) for the long term scenarios in Lower Monumental pool.

Table 1.47: Tabular histogram of TDG saturation exceeded 10% of the medium/high flow season (1996) over 2-D modeled area in Ice Harbor pool during the Long Term scenario simulations.

Baseline Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	0.1	0.0	3.5	0.0
115 - 120	0.0	0.0	1.5	0.0
120 - 125	580.6	51.5	13120.7	52.9
≥ 125	545.6	48.4	11654.6	47.0
Total	1126.4	100.0	24780.2	100.0

Long Term #1 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	307.9	27.3	5677.9	22.9
115 - 120	301.1	26.7	8235.1	33.2
120 - 125	302.3	26.8	7306.2	29.5
≥ 125	215.1	19.1	3556.8	14.4
Total	1126.4	100.0	24775.9	100.0

Long Term #2 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	76.9	6.8	1210.4	4.9
110 - 115	435.4	38.7	9943.0	40.1
115 - 120	152.6	13.5	4350.8	17.6
120 - 125	266.4	23.7	6041.1	24.4
≥ 125	195.0	17.3	3230.7	13.0
Total	1126.4	100.0	24775.9	100.0

Long Term #3 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	1062.3	91.6	23549.9	93.4
115 - 120	97.4	8.4	1670.0	6.6
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1159.7	100.0	25219.9	100.0

Table 1.48: Tabular histogram of TDG saturation exceeded 10% of the medium/high flow season (1996) over 2-D modeled area in Ice Harbor pool during the Long Term scenario simulations.

Baseline Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	0.1	0.0	5.0	0.0
6 - 8	444.6	39.5	9340.0	37.7
8 - 10	681.6	60.5	15435.2	62.3
≥ 10	0.0	0.0	0.0	0.0
Total	1126.4	100.0	24780.2	100.0

Long Term #1 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	517.9	46.0	11320.8	45.7
6 - 8	276.5	24.6	7513.8	30.3
8 - 10	331.9	29.5	5941.4	24.0
≥ 10	0.0	0.0	0.0	0.0
Total	1126.4	100.0	24775.9	100.0

Long Term #2 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	389.8	34.6	7808.7	31.5
4 - 6	211.0	18.7	5872.9	23.7
6 - 8	223.6	19.9	5888.3	23.8
8 - 10	301.9	26.8	5206.1	21.0
≥ 10	0.0	0.0	0.0	0.0
Total	1126.4	100.0	24775.9	100.0

Long Term #3 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	417.2	36.0	8579.2	34.0
4 - 6	728.6	62.8	16326.2	64.7
6 - 8	13.9	1.2	314.5	1.2
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1159.7	100.0	25219.9	100.0

Table 1.49: Tabular histogram of TDG saturation exceeded 25% of the medium/high flow season (1996) over 2-D modeled area in Ice Harbor pool during the Long Term scenario simulations.

Baseline Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	0.1	0.0	5.0	0.0
115 - 120	609.6	54.1	13914.7	56.2
120 - 125	516.6	45.9	10860.5	43.8
≥ 125	0.0	0.0	0.0	0.0
Total	1126.4	100.0	24780.2	100.0

Long Term #1 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	644.4	57.2	14888.4	60.1
115 - 120	482.0	42.8	9887.6	39.9
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1126.4	100.0	24775.9	100.0

Long Term #2 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	468.7	41.6	9903.7	40.0
110 - 115	245.5	21.8	6908.9	27.9
115 - 120	412.1	36.6	7963.3	32.1
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1126.4	100.0	24775.9	100.0

Long Term #3 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	515.3	44.4	11227.6	44.5
110 - 115	644.4	55.6	13992.3	55.5
115 - 120	0.0	0.0	0.0	0.0
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1159.7	100.0	25219.9	100.0

Table 1.50: Tabular histogram of TDG saturation exceeded 25% of the medium/high flow season (1996) over 2-D modeled area in Ice Harbor pool during the Long Term scenario simulations.

Baseline Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	1.5	0.0
4 - 6	302.1	26.8	5607.0	22.6
6 - 8	824.2	73.2	19171.7	77.4
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1126.4	100.0	24780.2	100.0

Long Term #1 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	387.3	34.4	7728.8	31.2
4 - 6	472.1	41.9	12641.6	51.0
6 - 8	266.9	23.7	4405.5	17.8
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1126.4	100.0	24775.9	100.0

Long Term #2 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	578.8	51.4	12983.6	52.4
4 - 6	350.9	31.1	8628.8	34.8
6 - 8	196.7	17.5	3163.6	12.8
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1126.4	100.0	24775.9	100.0

Long Term #3 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	1053.7	90.9	23760.4	94.2
4 - 6	106.1	9.1	1459.5	5.8
6 - 8	0.0	0.0	0.0	0.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1159.7	100.0	25219.9	100.0

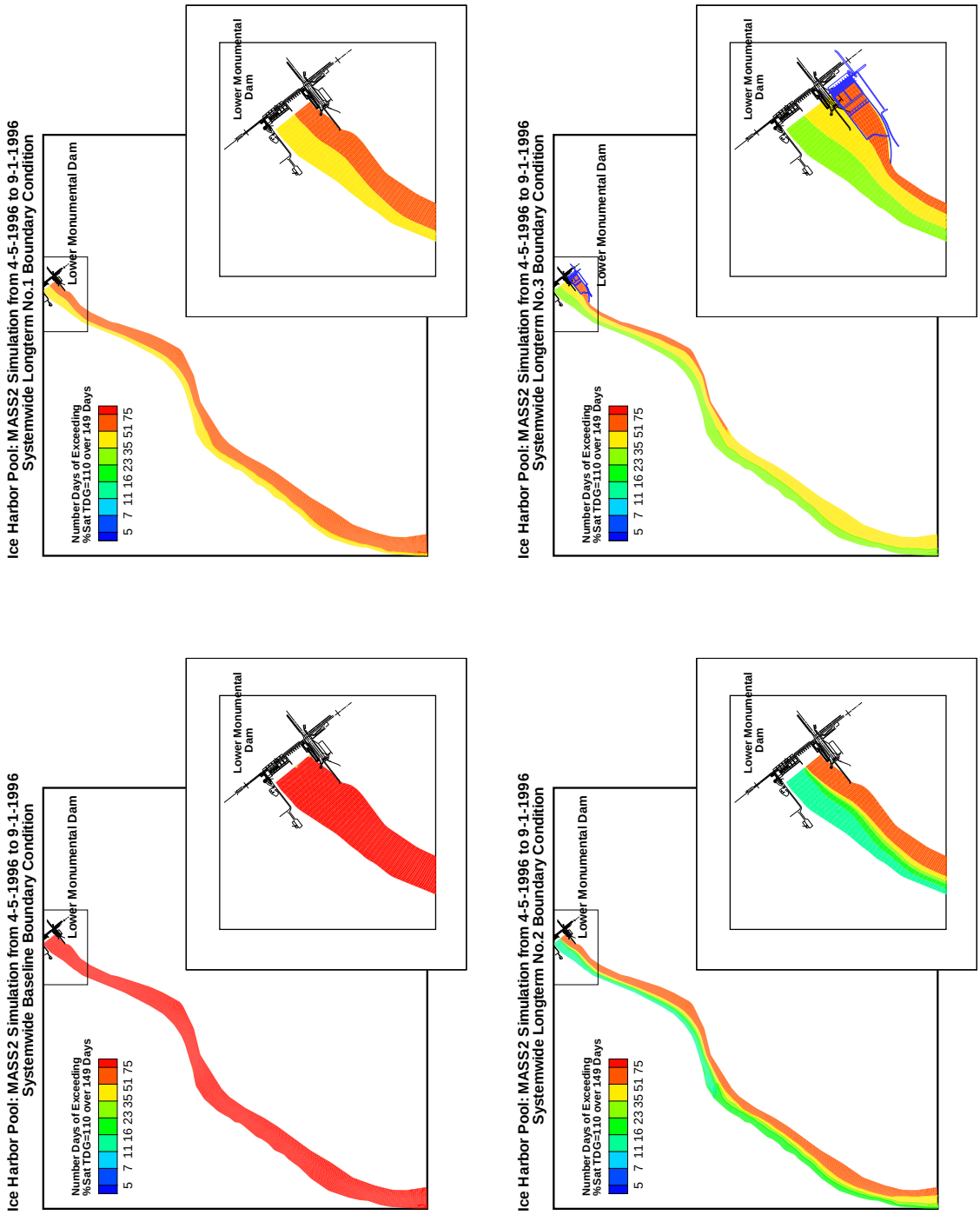

Figure 1.41: Areal comparison of days exceeding TDG saturation of 110% for long term scenarios in Lower Monumental pool in a medium flow season (1996).

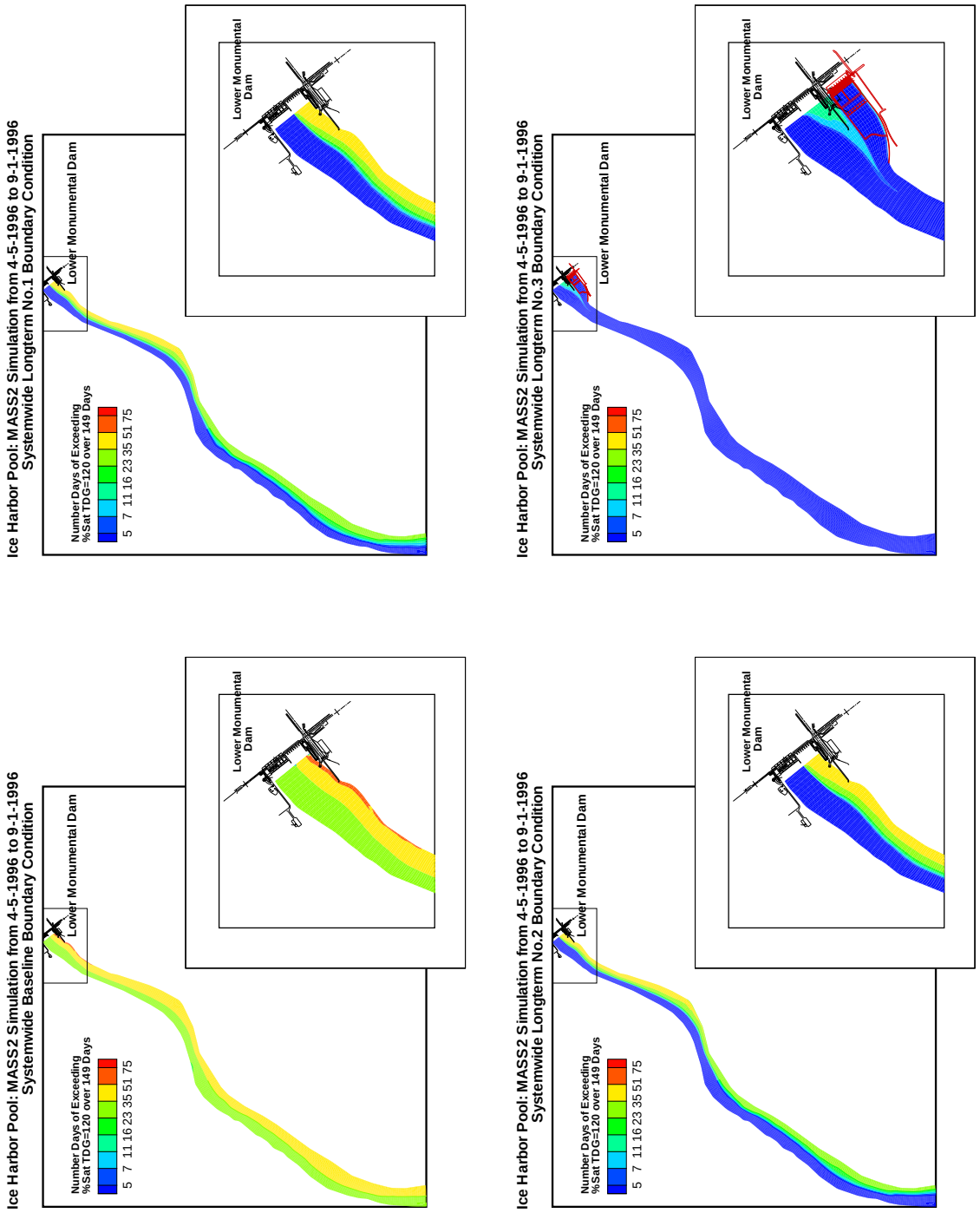

Figure 1.42: Areal comparison of days exceeding TDG saturation of 120% for long term scenarios in Lower Monumental pool in a medium flow season (1996).

Table 1.51: Tabular histogram of that portion of the simulated Ice Harbor pool area where daily average saturation exceeded the listed value during the Long Term simulations.

Baseline Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
120	0.0	0.0	0.0	0.0	26.4	8.6	10.2	26.3	28.5
125	12.3	35.8	12.0	8.1	18.4	13.4	0.0	0.0	0.0

Long Term #1 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	27.2	9.0	4.6	7.0	4.7	10.7	36.7
120	47.0	5.4	3.4	6.4	5.5	11.3	11.3	9.7	0.0
125	67.5	8.7	13.2	10.6	0.0	0.0	0.0	0.0	0.0

Long Term #2 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	21.0	7.6	4.7	3.2	3.2	60.2
115	39.7	3.9	3.0	3.5	2.9	4.1	3.7	8.8	30.5
120	55.6	2.9	3.4	5.7	4.8	13.4	6.2	7.9	0.0
125	70.9	10.0	9.5	9.7	0.0	0.0	0.0	0.0	0.0

Long Term #3 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	14.3	13.3	10.5	8.6	53.3
115	53.6	14.9	25.2	4.1	1.0	1.3	0.0	0.0	0.0
120	98.9	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 1.52: Tabular histogram of that portion of the simulated Ice Harbor pool volume where daily average saturation exceeded the listed value during the Long Term simulations.

Baseline Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
120	0.0	0.0	0.0	0.0	22.0	10.1	12.4	32.4	23.1
125	9.1	39.5	15.2	9.5	16.9	9.8	0.0	0.0	0.0

Long Term #1 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	23.0	10.6	5.7	8.7	6.1	13.6	32.2
120	47.0	7.0	4.3	8.1	6.4	11.2	9.1	6.9	0.0
125	72.6	9.8	10.0	7.7	0.0	0.0	0.0	0.0	0.0

Long Term #2 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	16.4	7.9	5.7	4.0	3.7	62.3
115	37.8	4.9	3.8	4.5	3.7	5.2	4.7	10.3	25.2
120	58.1	3.7	4.1	6.6	5.6	11.5	5.0	5.4	0.0
125	76.3	10.1	6.7	6.9	0.0	0.0	0.0	0.0	0.0

Long Term #3 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	10.8	12.9	12.7	11.0	52.5
115	55.5	16.9	22.6	3.0	0.7	1.3	0.0	0.0	0.0
120	98.9	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1.2.3 Lower Monumental Pool

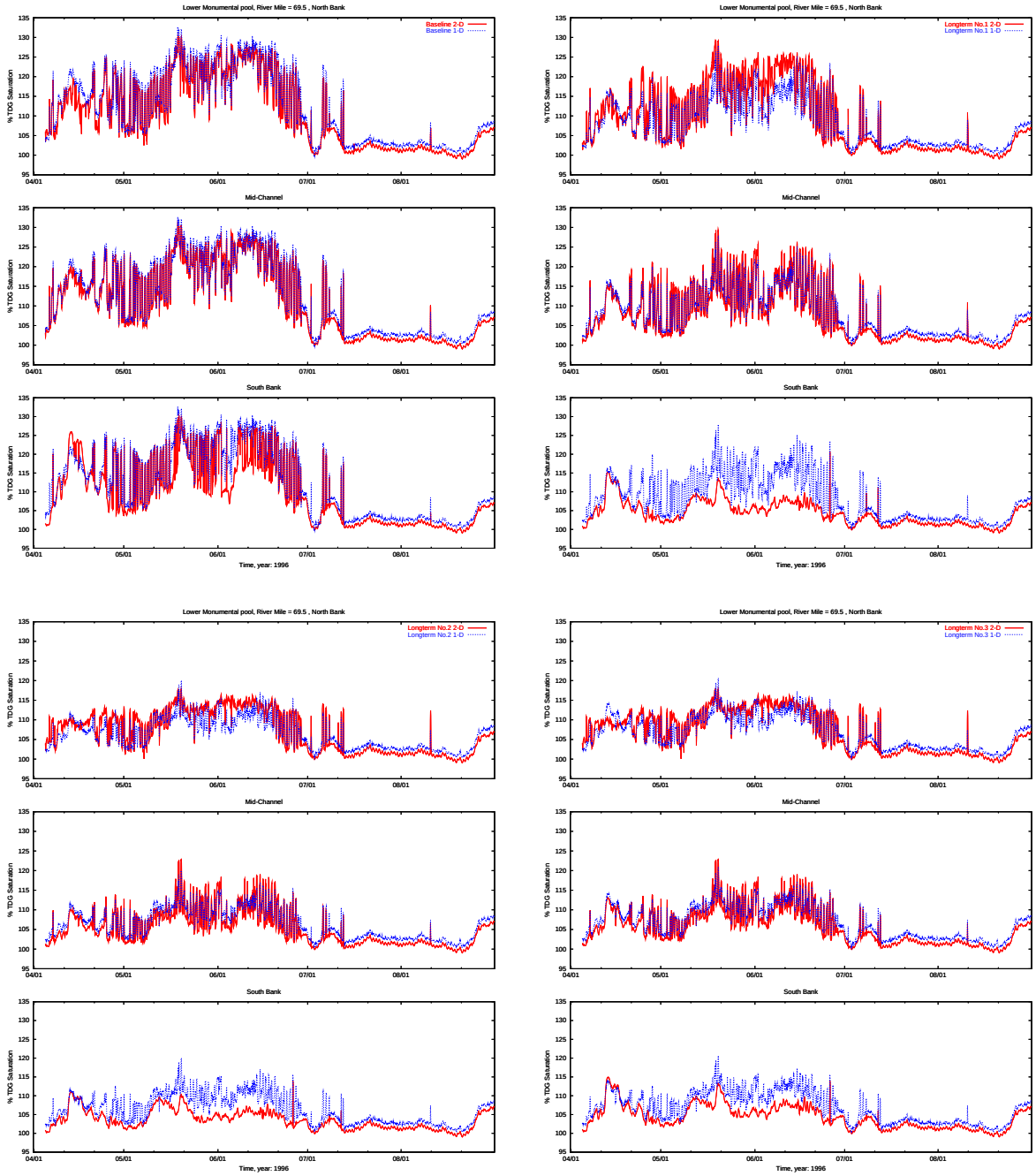

Figure 1.43: Time series plots at the FMS below Little Goose (LGSW) in Lower Monumental pool compared with the 1-D simulation in a medium/high flow season (1996) for long term scenarios.

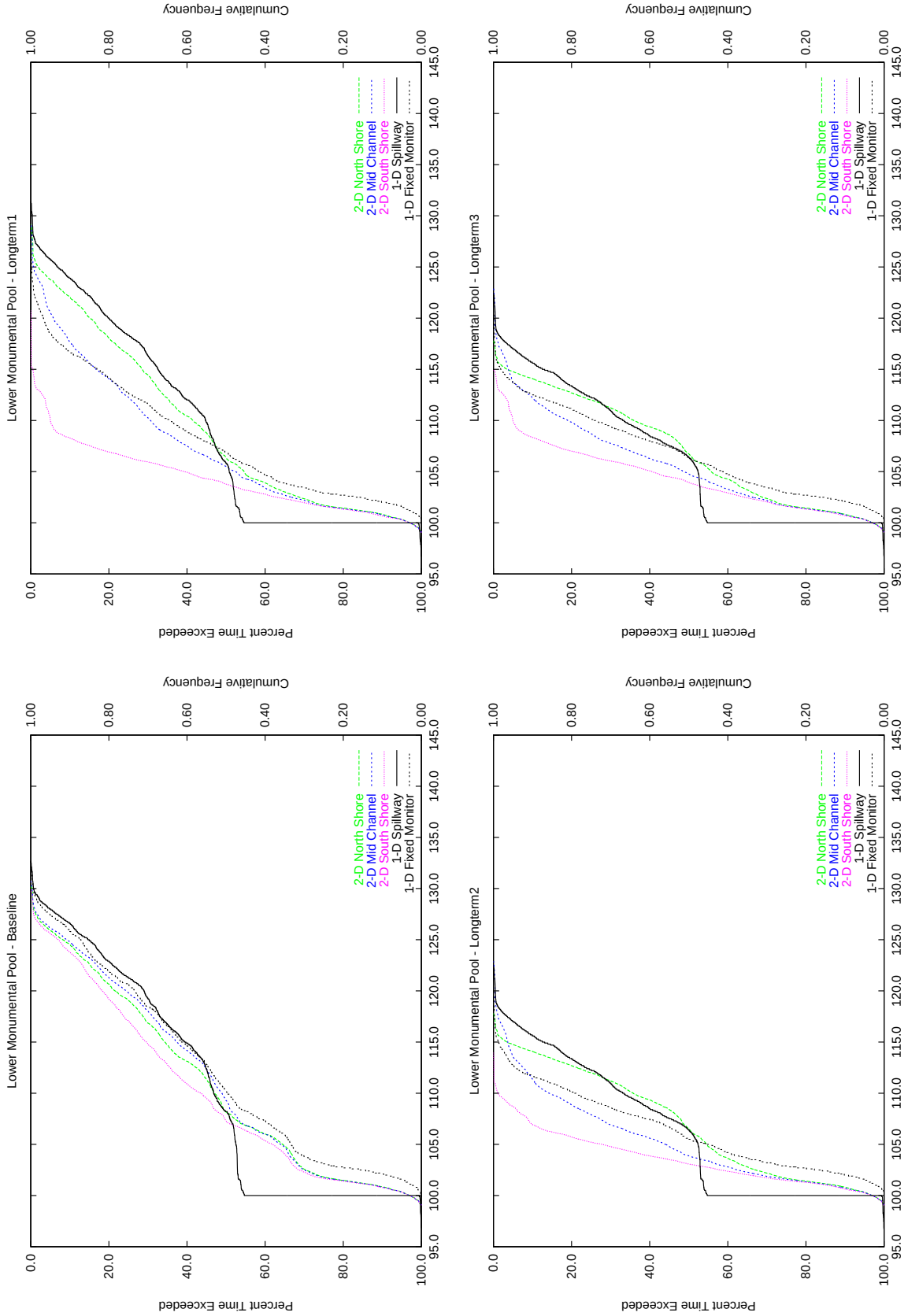

Figure 1.44: Cumulative frequency distributions TDG saturation simulated by the 1-D/2-D hybrid model for several points across the channel at the LGSW FMS location (SRM 70) Lower Monumental Pool during a medium/high flow (1996) season and each long term scenario compared with similar values from the 1-D simulations at the spillway and FMS location.

Table 1.53: Summary statistics of TDG saturation percentage of MASS2 and MASS1 time series output for longterm scenarios in Lower Monumental pool in a medium flow season (1996)

Location		Base Line	Longterm No.1	Longterm No.2	Longterm No.3
North FMS	number	3577.0	3577.0	3577.0	3577.0
	mean	110.8	109.2	107.0	107.1
	median	108.2	106.4	106.5	106.7
	minimum	99.1	99.1	99.1	99.1
	lower quartile	101.8	101.7	101.7	101.7
	upper quartile	119.0	116.5	112.0	112.0
	10% exceedance	124.5	122.1	114.1	114.1
	maximum	130.3	129.2	117.8	117.8
	standard deviation	8.9	8.1	5.2	5.2
Mid-channel	number	3577.0	3577.0	3577.0	3577.0
	mean	111.2	107.4	105.2	105.7
	median	109.3	105.5	103.9	104.8
	minimum	99.1	99.1	99.1	99.1
	lower quartile	101.8	101.6	101.6	101.6
	upper quartile	119.8	112.3	107.9	108.7
	10% exceedance	124.8	117.6	111.3	112.2
	maximum	130.7	129.3	122.9	122.9
	standard deviation	9.2	6.7	4.4	4.5
South	number	3577.0	3577.0	3577.0	3577.0
	mean	110.0	104.3	103.5	104.4
	median	107.3	103.8	103.1	103.9
	minimum	99.0	99.0	99.0	99.1
	lower quartile	101.7	101.6	101.5	101.6
	upper quartile	117.0	106.4	105.2	106.5
	10% exceedance	123.8	108.3	106.9	108.3
	maximum	130.1	120.8	114.0	114.9
	standard deviation	8.6	3.2	2.5	3.2
1-D FMS	number	3577.0	3577.0	3577.0	3577.0
	mean	112.2	108.2	106.3	106.9
	median	110.2	106.9	105.5	106.4
	minimum	99.8	100.4	100.4	100.4
	lower quartile	103.1	102.9	102.9	102.9
	upper quartile	120.6	112.7	109.3	110.1
	10% exceedance	125.8	116.7	111.7	112.5
	maximum	132.7	127.9	120.0	120.7
	standard deviation	9.1	5.8	3.8	4.1

Table 1.54: Histogram table of TDG saturation percentage of MASS2 and MASS1 time series output for longterm scenarios in Lower Monumental pool in a medium flow season (1996)

Location	TDG Range	Base Line		Longterm No.1		Longterm No.2		Longterm No.3	
		Days	%	Days	%	Days	%	Days	%
North FMS	less than 105	53	35.5	68	45.3	68	45.5	66	44.3
	105 - 110	26	17.4	20	13.2	28	18.8	30	19.8
	110 - 115	19	12.8	19	12.9	48	32.3	48	32.5
	115 - 120	19	12.7	20	13.4	5	3.4	5	3.4
	120 - 125	20	13.4	20	13.3	0	0.0	0	0.0
	125 - 130	12	8.0	3	1.9	0	0.0	0	0.0
	above 130	0	0.2	0	0.0	0	0.0	0	0.0
Mid-channel	less than 105	54	36.0	71	47.7	83	56.0	76	51.2
	105 - 110	22	15.1	32	21.6	44	29.8	44	29.7
	110 - 115	17	11.5	21	13.9	16	10.7	23	15.3
	115 - 120	19	13.1	16	10.9	5	3.2	5	3.5
	120 - 125	23	15.2	8	5.1	1	0.4	1	0.4
	125 - 130	13	8.9	1	0.7	0	0.0	0	0.0
	above 130	0	0.3	0	0.0	0	0.0	0	0.0
South	less than 105	57	38.0	90	60.7	108	72.1	88	59.4
	105 - 110	28	18.5	51	34.4	40	26.7	53	35.7
	110 - 115	21	13.9	7	4.4	2	1.1	7	4.9
	115 - 120	17	11.2	1	0.4	0	0.0	0	0.0
	120 - 125	17	11.3	0	0.1	0	0.0	0	0.0
	125 - 130	10	7.0	0	0.0	0	0.0	0	0.0
	above 130	0	0.0	0	0.0	0	0.0	0	0.0
1-D FMS	less than 105	50	33.4	62	41.4	67	45.1	62	41.5
	105 - 110	24	16.2	34	23.0	51	34.2	49	32.7
	110 - 115	17	11.7	28	18.5	29	19.5	36	23.9
	115 - 120	18	12.0	21	13.9	2	1.2	3	1.8
	120 - 125	21	13.9	4	3.0	0	0.0	0	0.1
	125 - 130	18	12.2	0	0.2	0	0.0	0	0.0
	above 130	1	0.6	0	0.0	0	0.0	0	0.0

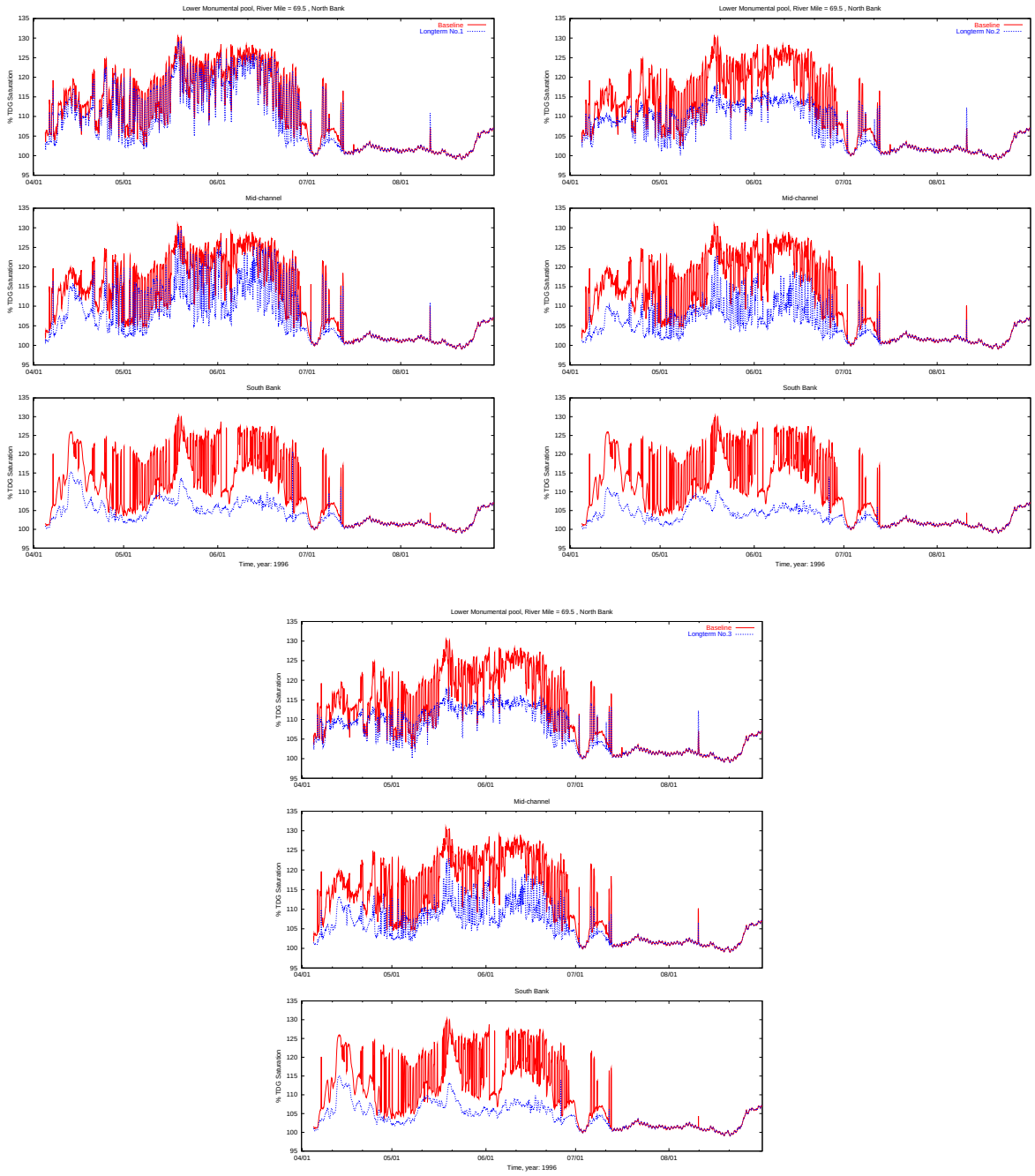

Figure 1.45: Time series plots of saturation at the FMS below Little Goose (LGSW) in Ice Harbor Pool from the long term hybrid simulations compared with the baseline hybrid simulation in a medium/high flow season (1996)

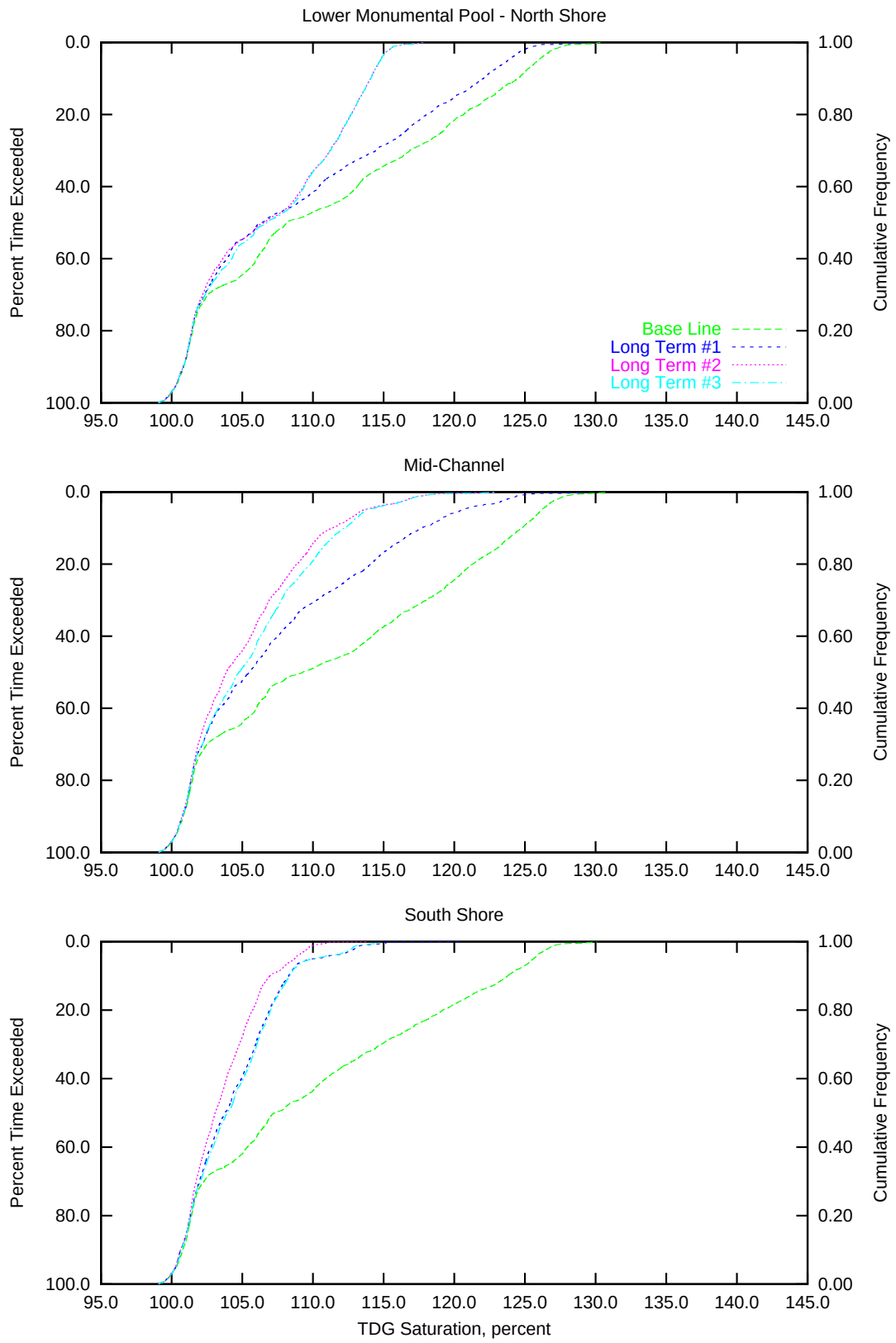

Figure 1.46: Comparision of simulated TDG saturation cumulative frequency distributions for several points across the channel at the LGSW FMS location (SRM 70) in the Lower Monumental Pool during a medium/high flow (1996) season.

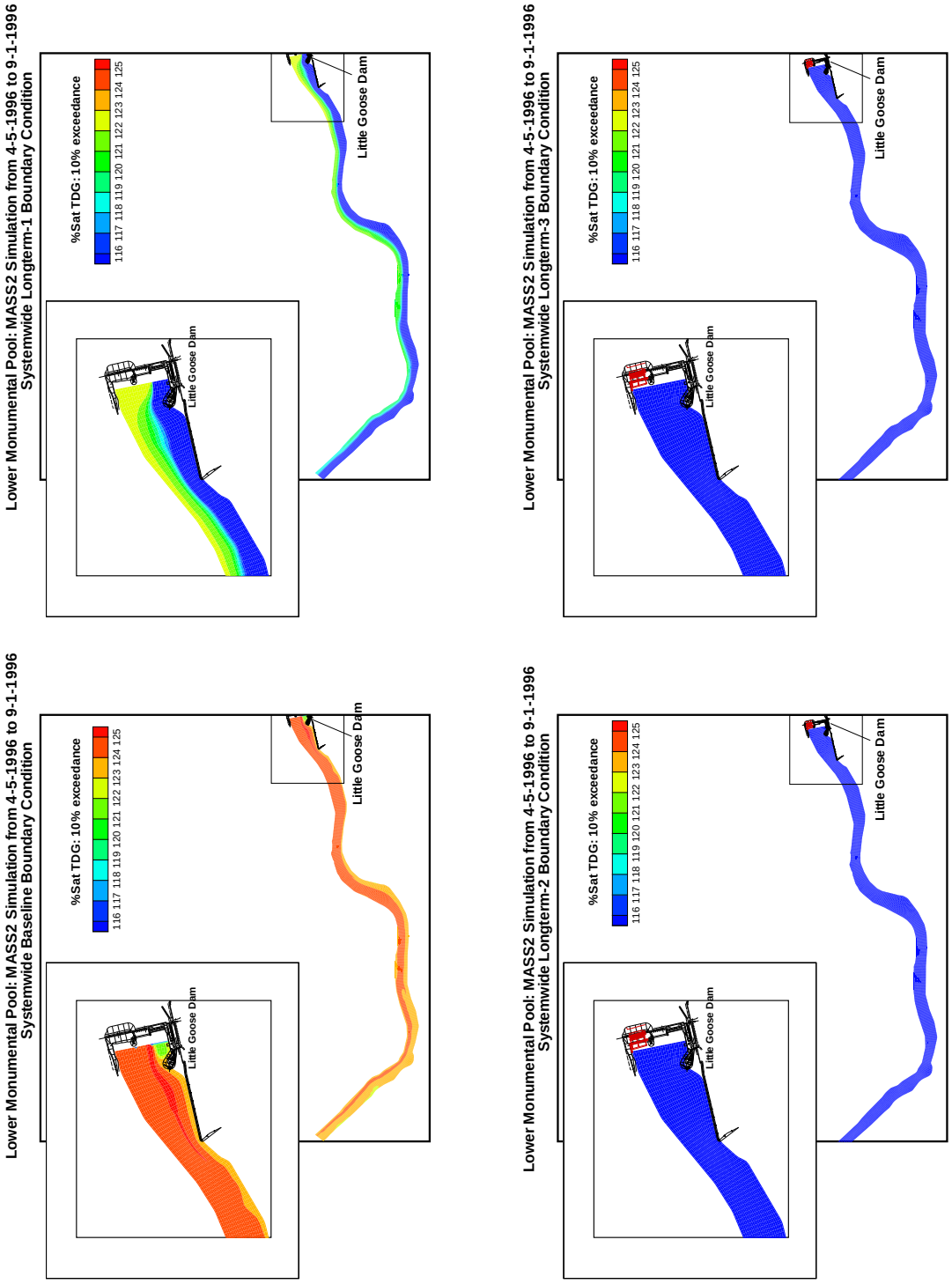

Figure 1.47: Areal comparison of TDG saturation exceeded 10% of a medium flow season (1996) for the long term scenarios in Lower Monumental pool.

Table 1.55: Tabular histogram of TDG saturation exceeded 10% of the medium/high flow season (1996) over 2-D modeled area in Lower Monumental pool during the Long Term scenario simulations.

Baseline Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	0.0	0.0	0.0	0.0
115 - 120	1.4	0.1	49.9	0.1
120 - 125	1583.0	98.9	52504.0	99.2
≥ 125	16.4	1.0	378.1	0.7
Total	1600.8	100.0	52932.0	100.0

Long Term #1 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	253.9	15.9	5948.5	11.2
110 - 115	516.3	32.3	19729.6	37.3
115 - 120	466.0	29.1	18509.7	35.0
120 - 125	364.5	22.8	8743.0	16.5
≥ 125	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52930.8	100.0

Long Term #2 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	763.1	47.7	25178.5	47.6
110 - 115	837.6	52.3	27751.1	52.4
115 - 120	0.0	0.0	0.0	0.0
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52929.6	100.0

Long Term #3 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	583.9	36.5	17361.7	32.8
110 - 115	1016.9	63.5	35567.9	67.2
115 - 120	0.0	0.0	0.0	0.0
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52929.6	100.0

Table 1.56: Tabular histogram of TDG saturation exceeded 10% of the medium/high flow season (1996) over 2-D modeled area in Lower Monumental pool during the Long Term scenario simulations.

Baseline Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.0	0.0	0.0	0.0
4 - 6	0.1	0.0	5.7	0.0
6 - 8	546.2	34.1	18597.1	35.1
8 - 10	1054.4	65.9	34329.2	64.9
≥ 10	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52932.0	100.0

Long Term #1 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	514.7	32.2	14332.6	27.1
4 - 6	473.8	29.6	21147.0	40.0
6 - 8	612.3	38.2	17451.2	33.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52930.8	100.0

Long Term #2 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	1030.1	64.3	37406.2	70.7
4 - 6	570.7	35.7	15523.4	29.3
6 - 8	0.0	0.0	0.0	0.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52929.6	100.0

Long Term #3 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	931.3	58.2	33002.1	62.4
4 - 6	669.4	41.8	19927.5	37.6
6 - 8	0.0	0.0	0.0	0.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52929.6	100.0

Table 1.57: Tabular histogram of TDG saturation exceeded 25% of the medium/high flow season (1996) over 2-D modeled area in Lower Monumental pool during the Long Term scenario simulations.

Baseline Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	0.0	0.0	0.0	0.0
110 - 115	4.0	0.3	113.9	0.2
115 - 120	1583.4	98.9	52489.9	99.2
120 - 125	13.3	0.8	328.2	0.6
≥ 125	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52932.0	100.0

Long Term #1 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	682.8	42.7	21464.3	40.6
110 - 115	717.5	44.8	26821.2	50.7
115 - 120	200.5	12.5	4645.2	8.8
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52930.8	100.0

Long Term #2 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	1347.3	84.2	47308.6	89.4
110 - 115	253.5	15.8	5621.0	10.6
115 - 120	0.0	0.0	0.0	0.0
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52929.6	100.0

Long Term #3 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	1258.2	78.6	45019.9	85.1
110 - 115	342.5	21.4	7909.7	14.9
115 - 120	0.0	0.0	0.0	0.0
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52929.6	100.0

Table 1.58: Tabular histogram of TDG saturation exceeded 25% of the medium/high flow season (1996) over 2-D modeled area in Lower Monumental pool during the Long Term scenario simulations.

Baseline Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	0.1	0.0	5.7	0.0
4 - 6	62.3	3.9	1173.6	2.2
6 - 8	1538.4	96.1	51752.7	97.8
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52932.0	100.0

Long Term #1 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	876.0	54.7	30060.9	56.8
4 - 6	724.8	45.3	22869.9	43.2
6 - 8	0.0	0.0	0.0	0.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52930.8	100.0

Long Term #2 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	242.5	15.1	5666.0	10.7
2 - 4	1334.5	83.4	46679.5	88.2
4 - 6	23.8	1.5	584.1	1.1
6 - 8	0.0	0.0	0.0	0.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52929.6	100.0

Long Term #3 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	1574.9	98.4	52308.0	98.8
4 - 6	25.8	1.6	621.5	1.2
6 - 8	0.0	0.0	0.0	0.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1600.8	100.0	52929.6	100.0

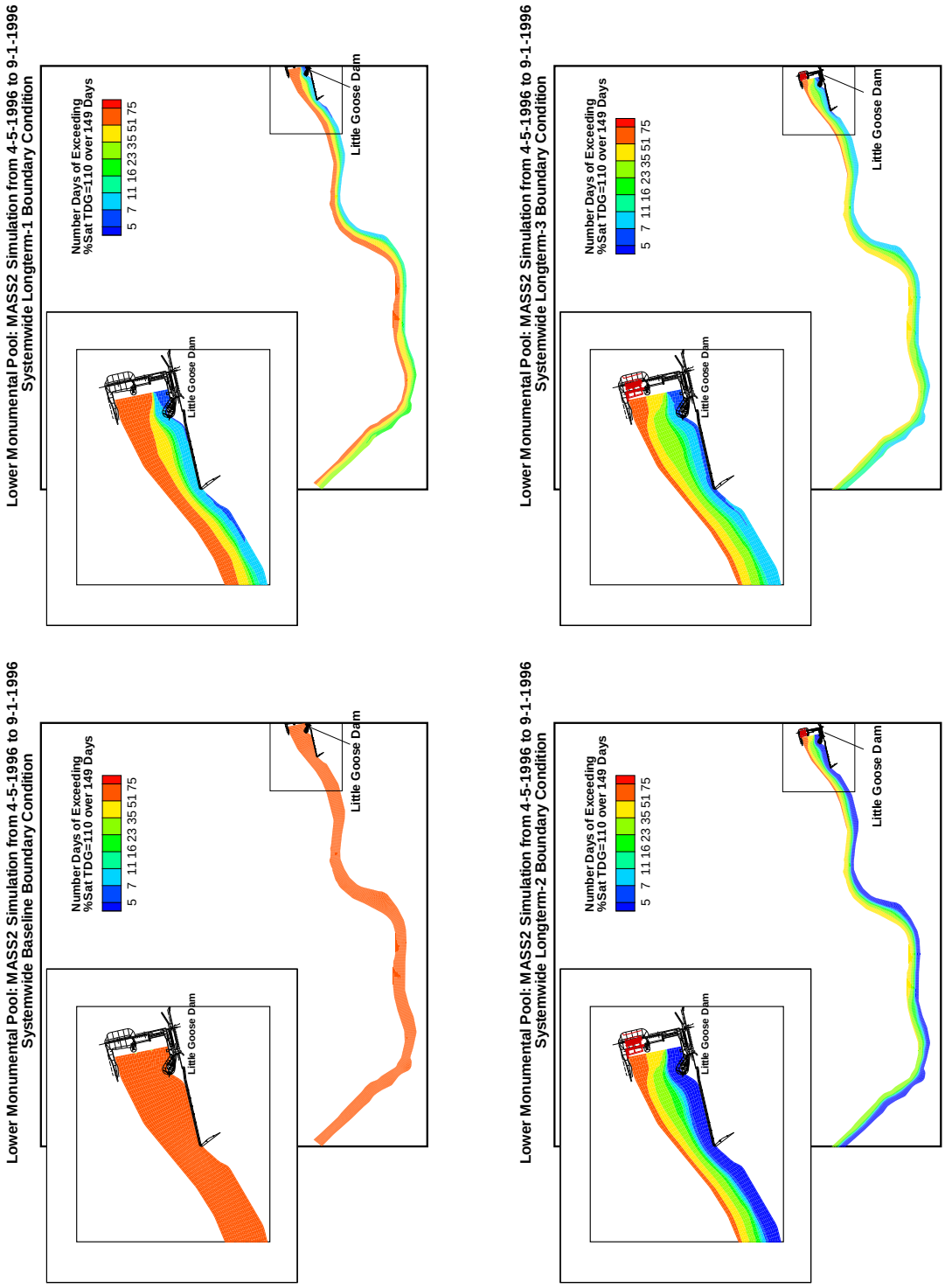

Figure 1.48: Areal comparison of days exceeding TDG saturation of 110% for long term scenarios in Lower Monumental pool in a medium flow season (1996).

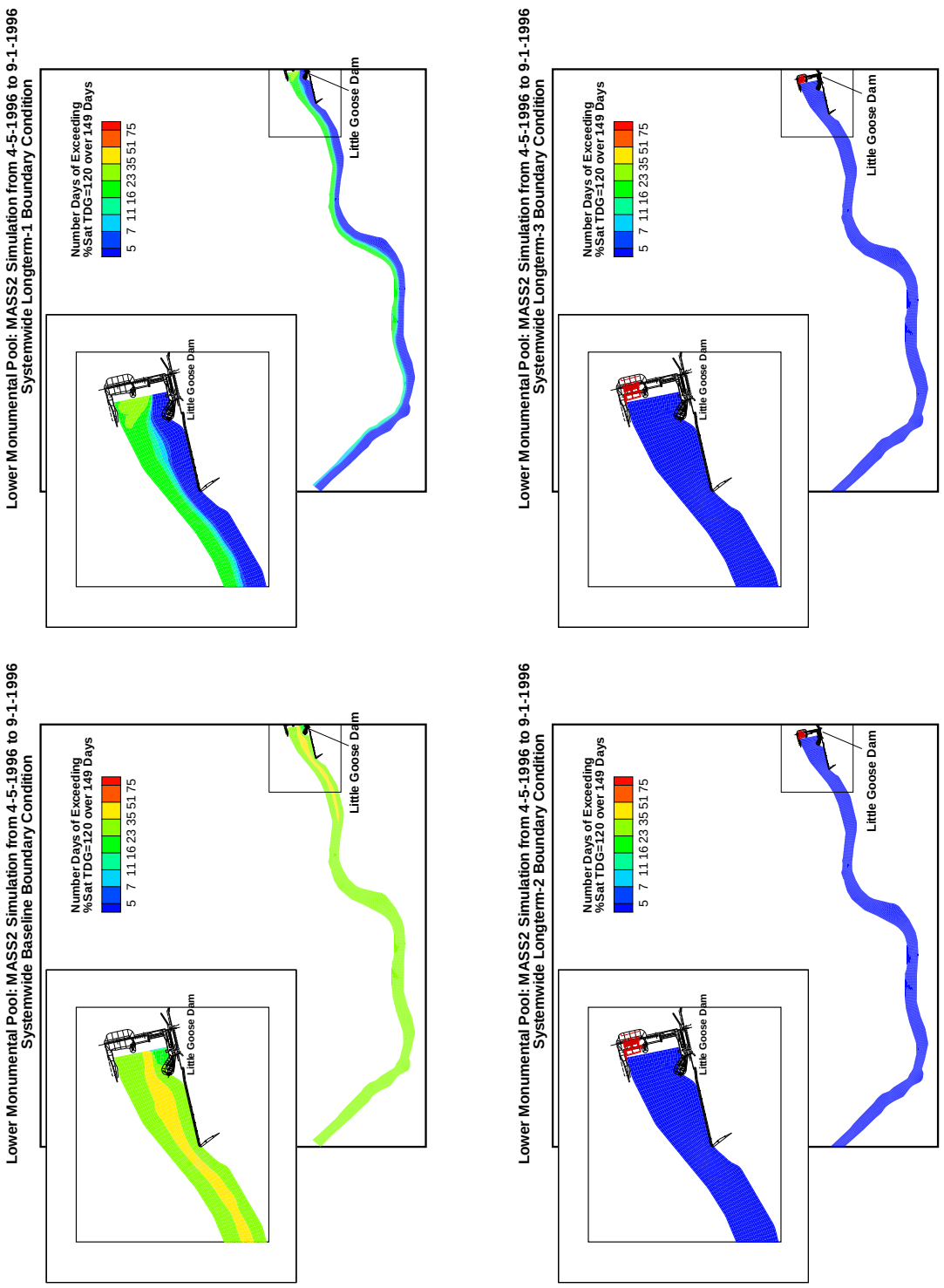

Figure 1.49: Areal comparison of days exceeding TDG saturation of 120% for long term scenarios in Lower Monumental pool in a medium flow season (1996).

Table 1.59: Tabular histogram of that portion of the simulated Lower Monumental pool area where daily average saturation exceeded the listed value during the Long Term simulations.

Baseline Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	99.6
120	0.0	0.1	0.3	0.2	26.8	64.6	8.0	0.0	0.0
125	22.4	70.7	6.9	0.0	0.0	0.0	0.0	0.0	0.0

Long Term #1 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	12.8	6.2	4.0	5.7	5.4	3.7	4.6	57.7
115	45.4	3.5	3.1	8.4	8.4	11.8	6.7	12.6	0.0
120	67.5	9.5	16.8	6.1	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Long Term #2 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	41.7	5.5	3.6	6.9	10.9	9.1	5.8	8.1	8.3
115	98.3	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
120	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Long Term #3 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	35.3	5.1	4.3	12.0	8.2	9.8	10.2	15.1
115	97.6	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
120	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 1.60: Tabular histogram of that portion of the simulated Lower Monumental pool volume where daily average saturation exceeded the listed value during the Long Term simulations.

Baseline Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
115	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	99.7
120	0.0	0.1	0.3	0.1	23.1	69.9	6.6	0.0	0.0
125	22.4	71.7	5.9	0.0	0.0	0.0	0.0	0.0	0.0

Long Term #1 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	9.0	4.8	3.4	5.3	6.5	4.8	5.7	60.5
115	44.7	4.6	4.0	12.2	10.6	10.7	5.1	8.1	0.0
120	74.5	9.0	12.6	3.9	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Long Term #2 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	39.9	7.0	4.8	9.3	13.6	9.9	4.7	5.9	5.0
115	98.4	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
120	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Long Term #3 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
110	0.0	31.5	6.5	5.7	15.5	9.9	12.3	9.3	9.4
115	97.8	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
120	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1.2.4 Little Goose Pool

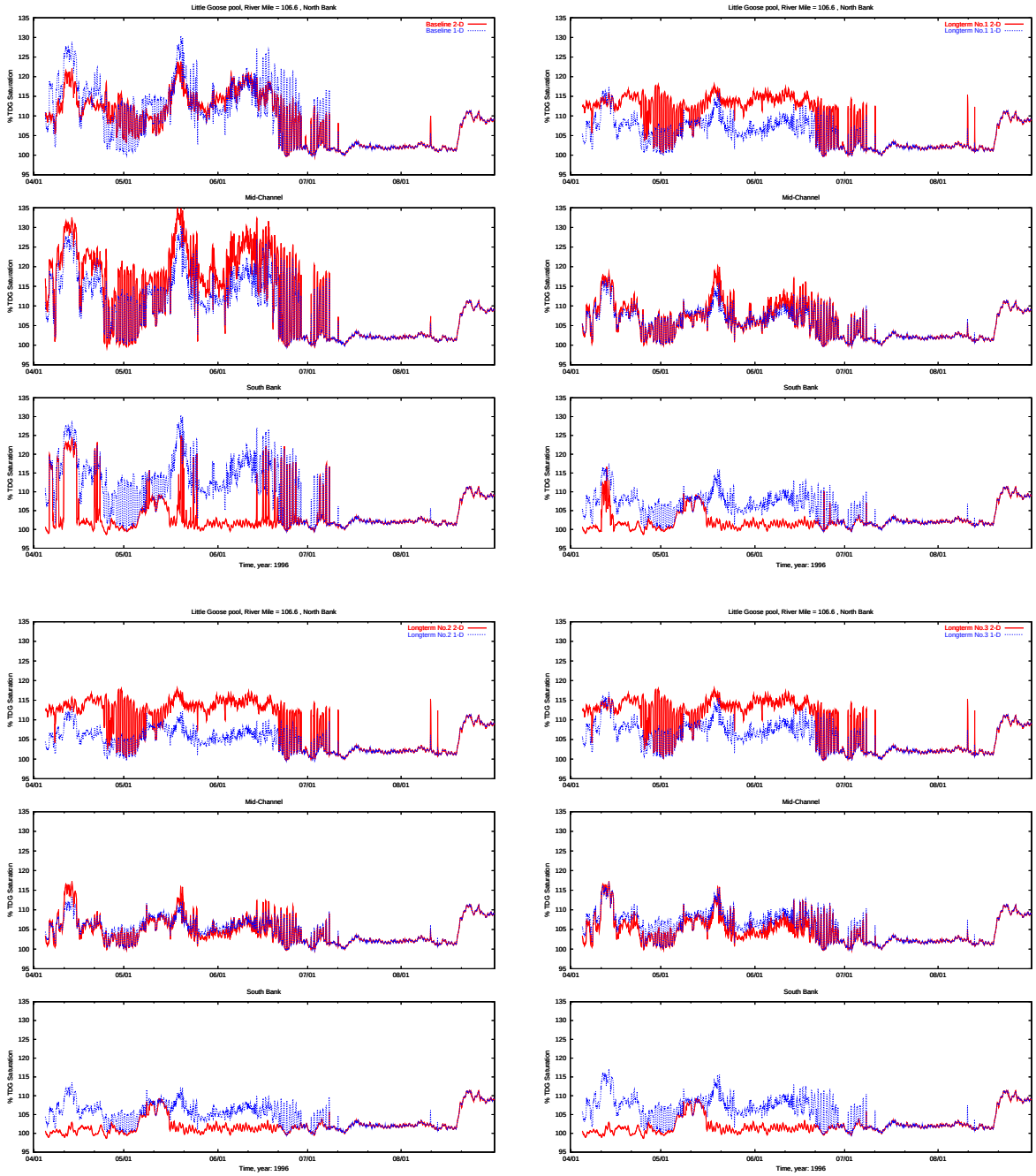

Figure 1.50: Time series plots at the FMS below Lower Granite (LGNW) in Little Goose Pool compared with the 1-D simulation in a medium/high flow season (1996) for long term scenarios.

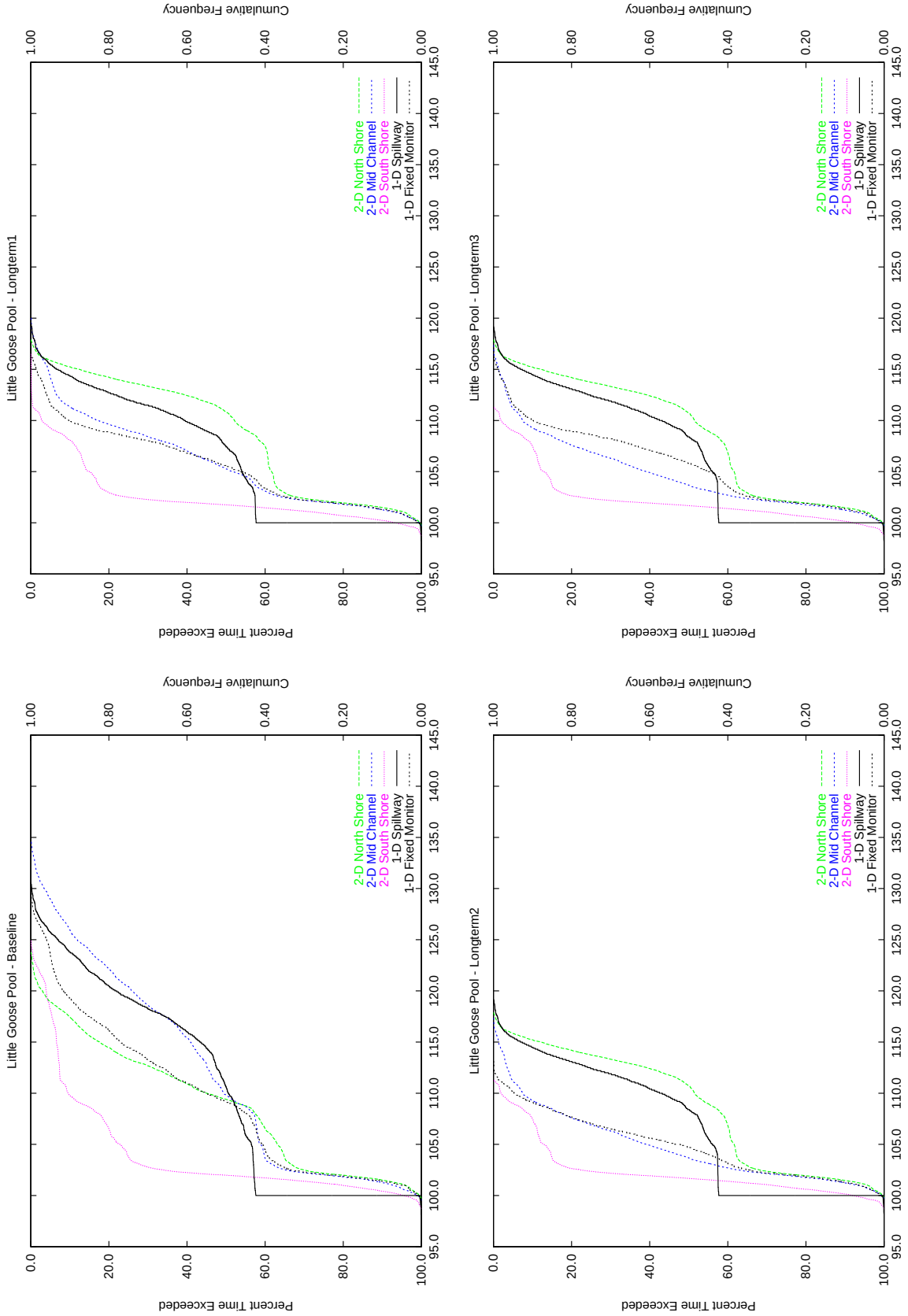

Figure 1.51: Cumulative frequency distributions TDG saturation simulated by the 1-D/2-D hybrid model for several points across the channel at the LGNW FMS location (SRM 107) Little Goose Pool during a medium/high flow (1996) season and each long term scenario compared with similar values from the 1-D simulations at the spillway and FMS location.

Table 1.61: Summary statistics of TDG saturation percentage of MASS2 and MASS1 time series output for longterm scenarios in Little Goose pool in a medium flow season (1996)

Location		Base Line	Longterm No.1	Longterm No.2	Longterm No.3
North FMS	number	3577.0	3577.0	3577.0	3577.0
	mean	108.8	108.7	108.6	108.6
	median	109.4	110.8	110.7	110.7
	minimum	99.7	99.6	99.6	99.6
	lower quartile	102.2	102.2	102.1	102.1
	upper quartile	113.3	113.7	113.7	113.7
	10% exceedance	117.5	115.2	115.2	115.2
	maximum	123.8	118.0	118.0	118.0
	standard deviation	6.1	5.7	5.7	5.7
Mid-channel	number	3577.0	3577.0	3577.0	3577.0
	mean	111.8	105.9	104.7	104.7
	median	109.8	105.3	103.7	103.7
	minimum	99.5	99.7	99.7	99.7
	lower quartile	102.0	102.0	102.0	102.0
	upper quartile	120.4	109.0	106.9	106.9
	10% exceedance	126.0	111.3	109.3	109.3
	maximum	134.7	120.2	117.3	117.3
	standard deviation	9.9	4.3	3.5	3.5
South	number	3577.0	3577.0	3577.0	3577.0
	mean	104.0	102.5	102.3	102.3
	median	102.0	101.8	101.7	101.7
	minimum	98.7	98.7	98.7	98.7
	lower quartile	101.2	100.9	100.8	100.8
	upper quartile	103.8	102.5	102.4	102.4
	10% exceedance	109.8	108.1	107.5	107.5
	maximum	125.0	116.6	111.3	111.3
	standard deviation	5.2	2.8	2.6	2.6
1-D FMS	number	3577.0	3577.0	3577.0	3577.0
	mean	109.3	105.6	104.8	105.7
	median	109.1	105.5	104.7	105.8
	minimum	99.6	99.6	99.6	99.6
	lower quartile	102.1	102.0	102.0	102.0
	upper quartile	114.5	108.4	107.0	108.6
	10% exceedance	119.3	110.0	109.1	110.0
	maximum	130.4	117.5	113.5	117.1
	standard deviation	7.4	3.7	3.0	3.7

Table 1.62: Histogram table of TDG saturation percentage of MASS2 and MASS1 time series output for longterm scenarios in Little Goose pool in a medium flow season (1996)

Location	TDG Range	Base Line		Longterm No.1		Longterm No.2		Longterm No.3	
		Days	%	Days	%	Days	%	Days	%
North FMS	less than 105	55	36.8	57	38.4	57	38.4	57	38.4
	105 - 110	27	18.2	14	9.5	15	10.1	15	10.1
	110 - 115	41	27.4	59	39.7	59	39.3	59	39.3
	115 - 120	22	14.6	18	12.4	18	12.2	18	12.2
	120 - 125	4	3.0	0	0.0	0	0.0	0	0.0
	125 - 130	0	0.0	0	0.0	0	0.0	0	0.0
	above 130	0	0.0	0	0.0	0	0.0	0	0.0
Mid-channel	less than 105	61	41.1	72	48.3	91	60.8	91	60.8
	105 - 110	14	9.5	52	34.6	47	31.7	47	31.7
	110 - 115	13	8.6	19	12.7	9	6.2	9	6.2
	115 - 120	22	15.0	6	4.4	2	1.3	2	1.3
	120 - 125	21	14.0	0	0.1	0	0.0	0	0.0
	125 - 130	13	8.4	0	0.0	0	0.0	0	0.0
	above 130	5	3.4	0	0.0	0	0.0	0	0.0
South	less than 105	115	77.2	127	85.1	130	87.1	130	87.1
	105 - 110	20	13.3	18	12.1	16	11.0	16	11.0
	110 - 115	4	2.9	4	2.7	3	1.9	3	1.9
	115 - 120	4	2.7	0	0.1	0	0.0	0	0.0
	120 - 125	6	3.9	0	0.0	0	0.0	0	0.0
	125 - 130	0	0.0	0	0.0	0	0.0	0	0.0
	above 130	0	0.0	0	0.0	0	0.0	0	0.0
1-D FMS	less than 105	61	40.7	69	46.1	79	52.8	66	44.6
	105 - 110	21	14.3	66	44.1	62	41.9	67	45.2
	110 - 115	33	22.1	13	8.5	8	5.3	13	9.0
	115 - 120	22	14.6	2	1.4	0	0.0	2	1.1
	120 - 125	6	4.4	0	0.0	0	0.0	0	0.0
	125 - 130	6	3.9	0	0.0	0	0.0	0	0.0
	above 130	0	0.1	0	0.0	0	0.0	0	0.0

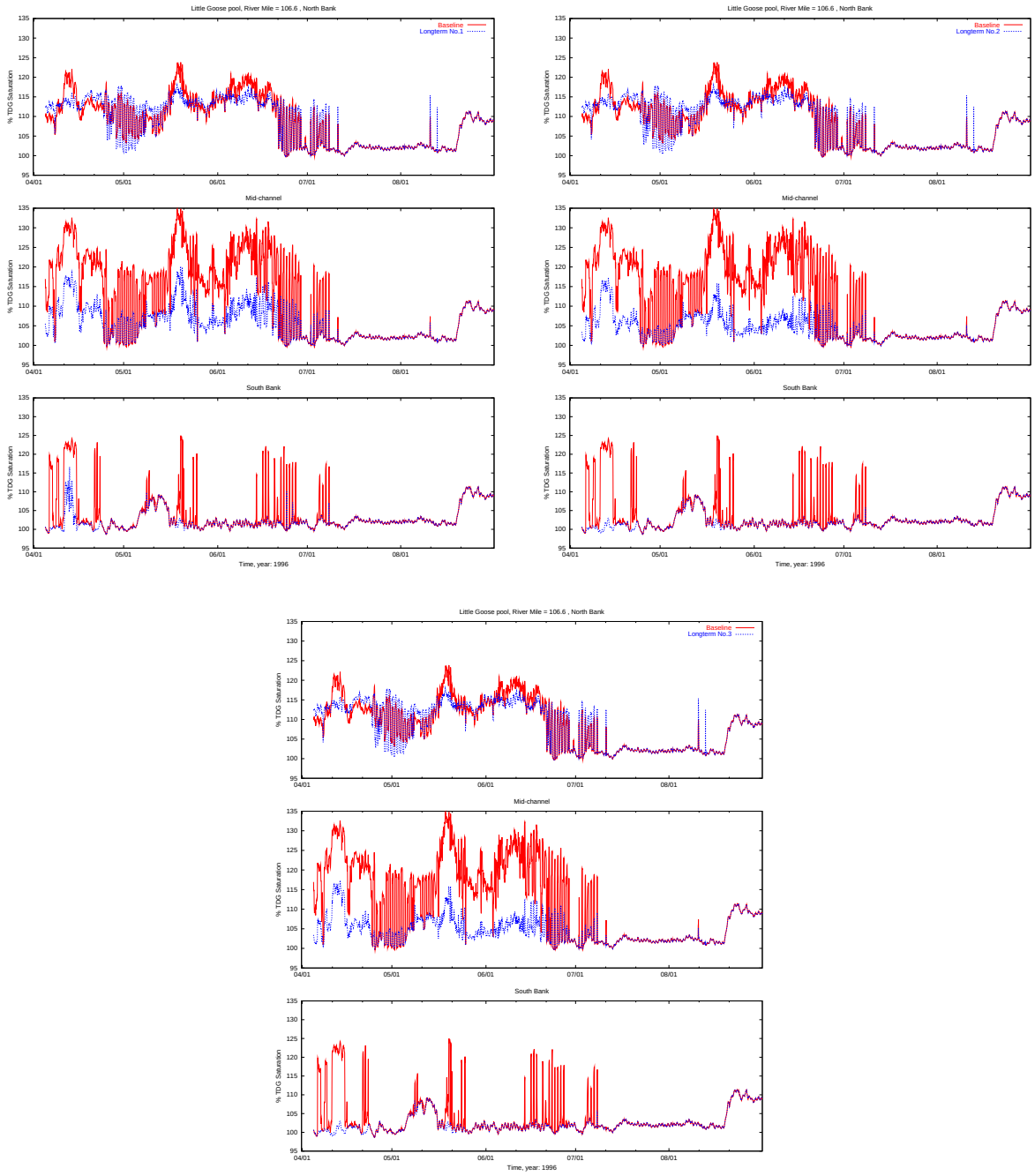

Figure 1.52: Time series plots of saturation at the FMS below Lower Granite (LGNW) in Little Goose Pool from the long term hybrid simulations compared with the baseline hybrid simulation in a medium/high flow season (1996)

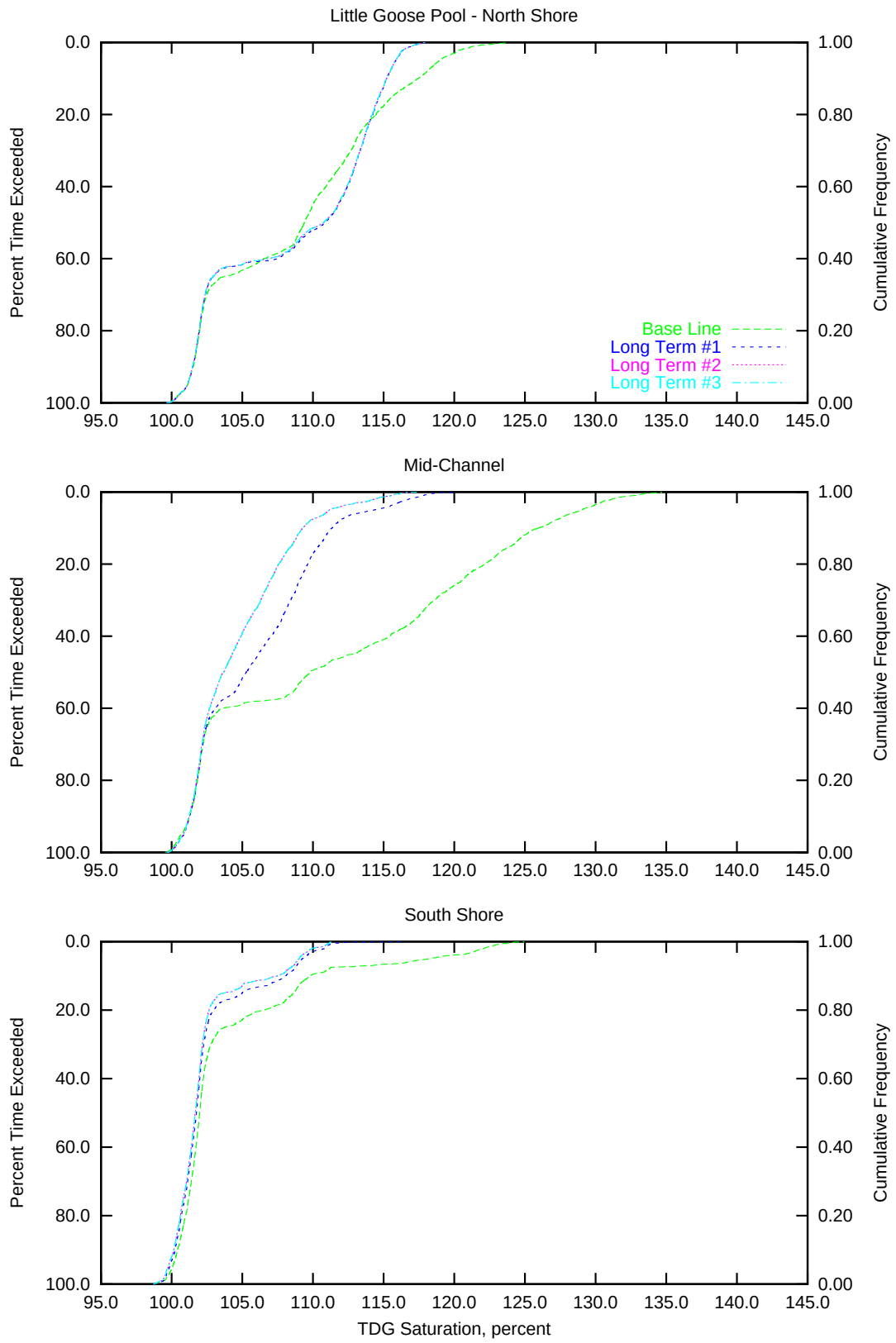

Figure 1.53: Comparision of simulated TDG saturation cumulative frequency distributions for several points across the channel at the LGNW FMS location (SRM 107) in the Little Goose Pool during a medium/high flow (1996) season.

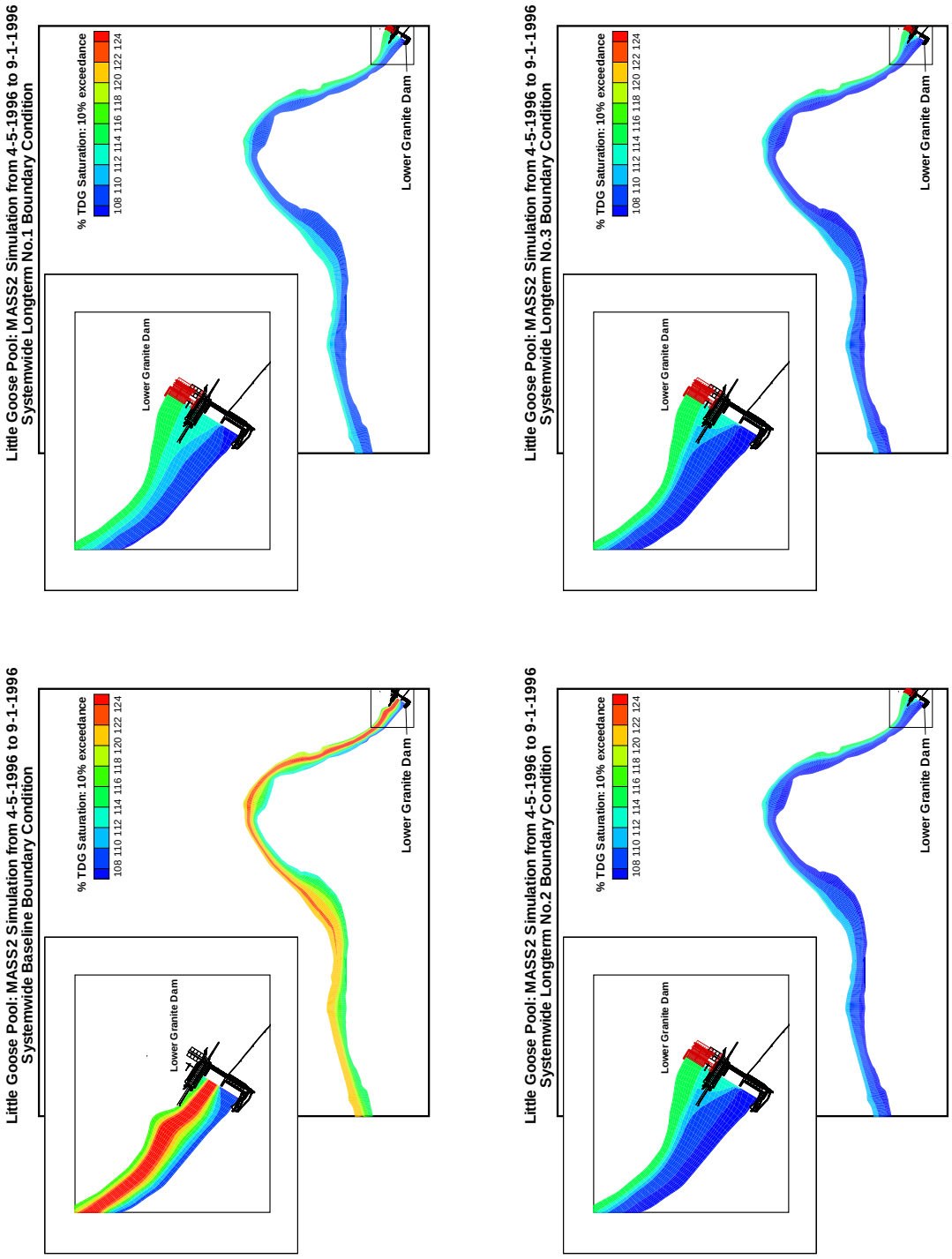

Figure 1.54: Areal comparison of TDG saturation exceeded 10% of a medium flow season (1996) for the long term scenarios in Little Goose Pool.

Table 1.63: Tabular histogram of TDG saturation exceeded 10% of the medium/high flow season (1996) over 2-D modeled area in Little Goose pool during the Long Term scenario simulations.

Baseline Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	18.0	1.0	305.8	0.6
110 - 115	307.8	16.6	5820.1	11.2
115 - 120	647.4	35.0	18482.9	35.5
120 - 125	825.3	44.6	25919.7	49.8
≥ 125	51.2	2.8	1545.6	3.0
Total	1849.9	100.0	52074.1	100.0

Long Term #1 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	968.9	51.6	24951.1	47.4
110 - 115	878.0	46.8	27127.9	51.6
115 - 120	30.9	1.6	536.4	1.0
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1877.7	100.0	52615.4	100.0

Long Term #2 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	1317.6	70.2	38218.7	72.6
110 - 115	532.8	28.4	13922.6	26.5
115 - 120	27.3	1.5	473.7	0.9
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1877.7	100.0	52615.0	100.0

Long Term #3 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	0.0	0.0	0.0	0.0
105 - 110	1317.6	70.2	38218.7	72.6
110 - 115	532.8	28.4	13922.6	26.5
115 - 120	27.3	1.5	473.7	0.9
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1877.7	100.0	52615.0	100.0

Table 1.64: Tabular histogram of TDG saturation exceeded 10% of the medium/high flow season (1996) over 2-D modeled area in Little Goose pool during the Long Term scenario simulations.

Baseline Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	54.6	3.0	1014.9	1.9
4 - 6	674.5	36.5	16189.2	31.1
6 - 8	1055.0	57.0	32914.4	63.2
8 - 10	65.8	3.6	1955.5	3.8
≥ 10	0.0	0.0	0.0	0.0
Total	1849.9	100.0	52074.1	100.0

Long Term #1 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	1441.8	76.8	42536.8	80.8
4 - 6	435.9	23.2	10078.6	19.2
6 - 8	0.0	0.0	0.0	0.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1877.7	100.0	52615.4	100.0

Long Term #2 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	1689.2	90.0	48667.7	92.5
4 - 6	188.5	10.0	3947.3	7.5
6 - 8	0.0	0.0	0.0	0.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1877.7	100.0	52615.0	100.0

Long Term #3 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	0.0	0.0	0.0	0.0
2 - 4	1689.2	90.0	48667.7	92.5
4 - 6	188.5	10.0	3947.3	7.5
6 - 8	0.0	0.0	0.0	0.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1877.7	100.0	52615.0	100.0

Table 1.65: Tabular histogram of TDG saturation exceeded 25% of the medium/high flow season (1996) over 2-D modeled area in Little Goose pool during the Long Term scenario simulations.

Baseline Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	25.1	1.4	449.7	0.9
105 - 110	383.4	20.7	7672.0	14.7
110 - 115	556.7	30.1	16186.8	31.1
115 - 120	851.0	46.0	26768.3	51.4
120 - 125	33.6	1.8	997.3	1.9
≥ 125	0.0	0.0	0.0	0.0
Total	1849.9	100.0	52074.1	100.0

Long Term #1 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	405.9	21.6	7858.2	14.9
105 - 110	993.2	52.9	33318.9	63.3
110 - 115	478.6	25.5	11438.3	21.7
115 - 120	0.0	0.0	0.0	0.0
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1877.7	100.0	52615.4	100.0

Long Term #2 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	724.3	38.6	16342.7	31.1
105 - 110	917.1	48.8	31440.7	59.8
110 - 115	236.4	12.6	4831.6	9.2
115 - 120	0.0	0.0	0.0	0.0
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1877.7	100.0	52615.0	100.0

Long Term #3 Medium/High Flow

Range of TDG Saturation Median (percent)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 105	724.3	38.6	16342.7	31.1
105 - 110	917.1	48.8	31440.7	59.8
110 - 115	236.4	12.6	4831.6	9.2
115 - 120	0.0	0.0	0.0	0.0
120 - 125	0.0	0.0	0.0	0.0
≥ 125	0.0	0.0	0.0	0.0
Total	1877.7	100.0	52615.0	100.0

Table 1.66: Tabular histogram of TDG saturation exceeded 25% of the medium/high flow season (1996) over 2-D modeled area in Little Goose pool during the Long Term scenario simulations.

Baseline Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	32.0	1.7	622.8	1.2
2 - 4	601.9	32.5	13732.5	26.4
4 - 6	1142.2	61.7	35518.9	68.2
6 - 8	73.8	4.0	2199.8	4.2
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1849.9	100.0	52074.1	100.0

Long Term #1 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	603.3	32.1	13234.1	25.2
2 - 4	1162.0	61.9	37168.9	70.6
4 - 6	112.4	6.0	2212.5	4.2
6 - 8	0.0	0.0	0.0	0.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1877.7	100.0	52615.4	100.0

Long Term #2 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	880.8	46.9	21333.0	40.5
2 - 4	909.6	48.4	29586.9	56.2
4 - 6	87.3	4.6	1695.0	3.2
6 - 8	0.0	0.0	0.0	0.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1877.7	100.0	52615.0	100.0

Long Term #3 Medium/High Flow

Range of Compensation Depth Median (feet)	Simulated Area (acres)	Simulated Area (percent)	Season Average Simulated Volume (acre-feet)	Season Average Simulated Volume (percent)
< 2	880.8	46.9	21333.0	40.5
2 - 4	909.6	48.4	29586.9	56.2
4 - 6	87.3	4.6	1695.0	3.2
6 - 8	0.0	0.0	0.0	0.0
8 - 10	0.0	0.0	0.0	0.0
≥ 10	0.0	0.0	0.0	0.0
Total	1877.7	100.0	52615.0	100.0

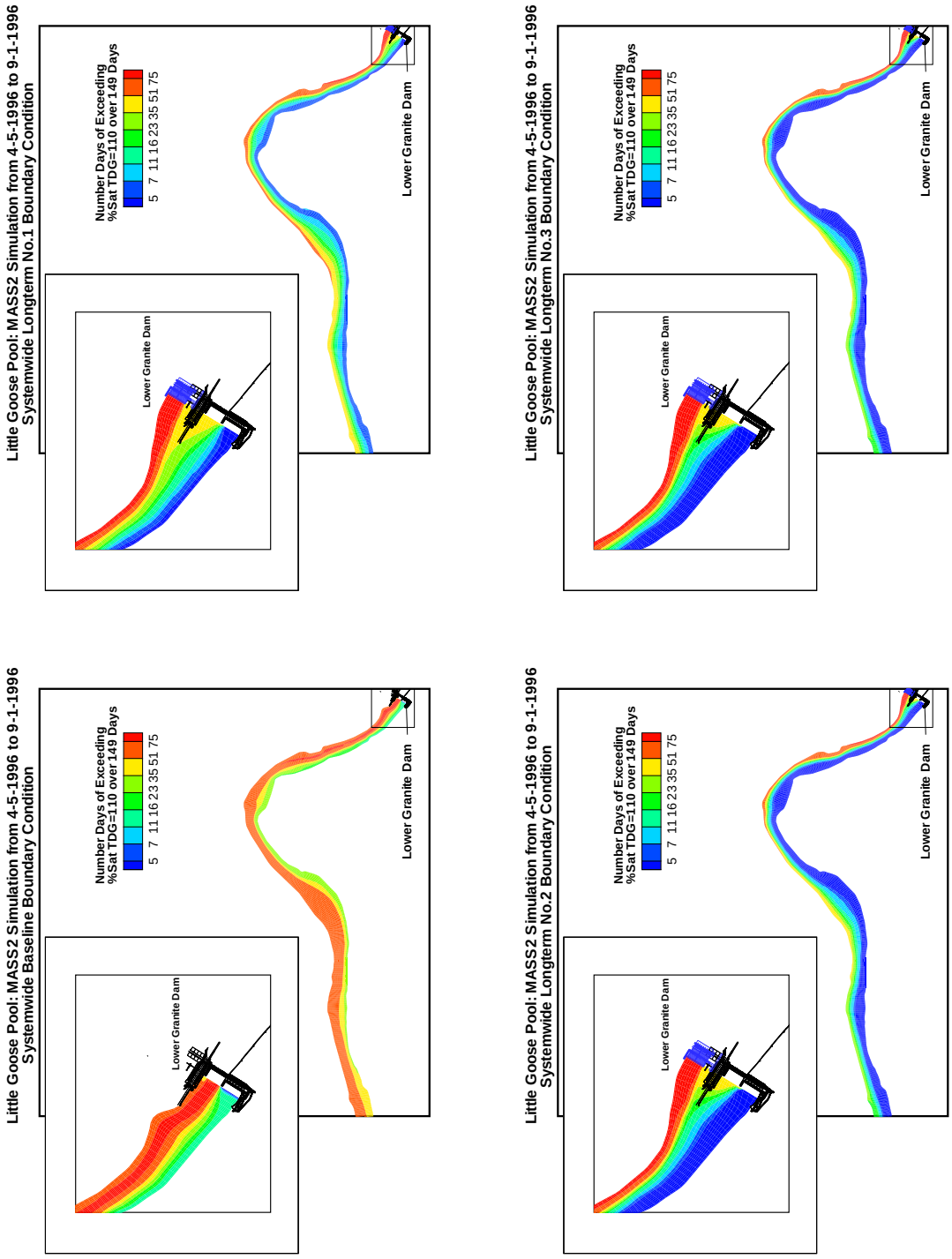

Figure 1.55: Areal comparison of days exceeding TDG saturation of 110% for long term scenarios in Little Goose Pool in a medium flow season (1996).

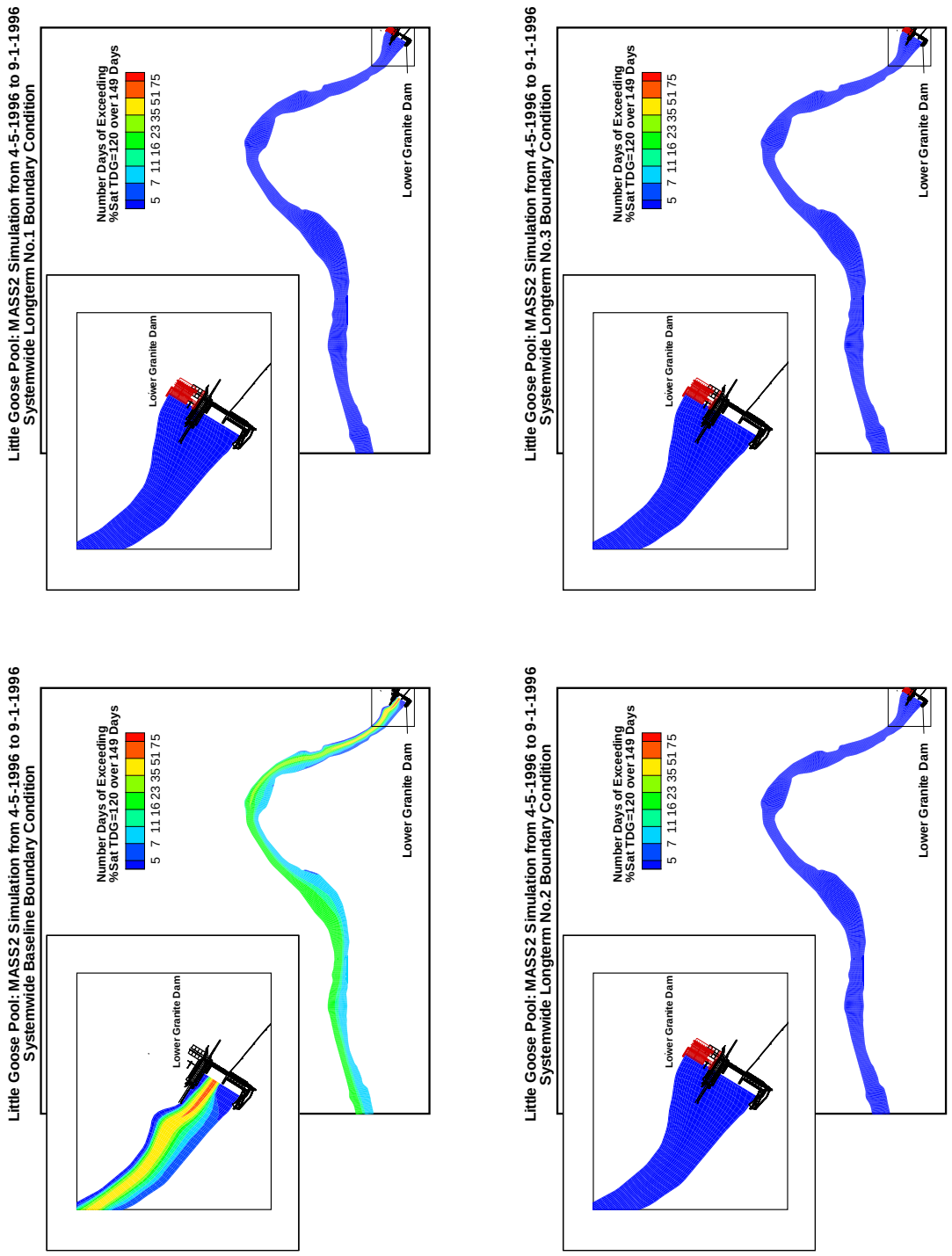

Figure 1.56: Areal comparison of days exceeding TDG saturation of 120% for long term scenarios in Little Goose Pool in a medium flow season (1996).

Table 1.67: Tabular histogram of that portion of the simulated Little Goose pool area where daily average saturation exceeded the listed value during the Long Term simulations.

Baseline Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.4	99.4
110	0.0	0.4	1.3	2.9	5.3	5.4	7.5	4.9	72.3
115	0.7	11.3	21.7	4.9	3.6	5.1	5.9	8.1	38.6
120	3.8	44.8	12.5	31.4	3.2	1.3	1.1	0.9	1.1
125	53.8	42.6	1.4	1.6	0.4	0.2	0.0	0.0	0.0

Long Term #1 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.1	2.1	12.4	6.9	3.9	74.7
110	2.0	34.3	20.6	5.3	4.1	5.6	6.0	5.1	17.0
115	91.6	6.4	0.9	1.0	0.0	0.0	0.0	0.0	0.0
120	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Long Term #2 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.4	23.3	11.7	3.2	3.1	58.1
110	40.3	19.3	14.0	4.1	4.4	4.5	2.6	1.9	9.0
115	96.2	2.0	0.8	0.9	0.0	0.0	0.0	0.0	0.0
120	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Long Term #3 Medium/High Flow

Daily Average	**Percent Area for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.4	23.3	11.7	3.2	3.1	58.1
110	40.3	19.3	14.0	4.1	4.4	4.5	2.6	1.9	9.0
115	96.2	2.0	0.8	0.9	0.0	0.0	0.0	0.0	0.0
120	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 1.68: Tabular histogram of that portion of the simulated Little Goose pool volume where daily average saturation exceeded the listed value during the Long Term simulations.

Baseline Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	99.6
110	0.0	0.3	0.8	1.8	3.0	4.0	6.3	4.7	79.0
115	0.5	7.1	19.2	4.9	3.5	5.3	7.4	10.4	41.7
120	2.7	39.6	15.9	33.6	3.6	1.3	1.2	1.0	1.1
125	43.9	52.2	1.5	1.7	0.4	0.3	0.0	0.0	0.0

Long Term #1 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.1	1.3	7.9	5.5	3.5	81.6
110	0.8	29.2	24.7	7.4	5.5	7.3	7.3	4.7	13.2
115	92.9	5.9	0.6	0.6	0.0	0.0	0.0	0.0	0.0
120	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Long Term #2 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.3	16.9	10.8	3.2	3.4	65.3
110	34.0	24.7	18.3	4.7	4.4	3.9	1.8	1.4	6.7
115	97.4	1.5	0.5	0.6	0.0	0.0	0.0	0.0	0.0
120	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Long Term #3 Medium/High Flow

Daily Average	**Percent Volume for Days Average Exceeded**								
Saturation	**< 5**	**5 - 10**	**10 - 15**	**15 - 20**	**20 - 25**	**25 - 30**	**30 - 35**	**35 - 40**	**≥ 40**
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
105	0.0	0.0	0.0	0.3	16.9	10.8	3.2	3.4	65.3
110	34.0	24.7	18.3	4.7	4.4	3.9	1.8	1.4	6.7
115	97.4	1.5	0.5	0.6	0.0	0.0	0.0	0.0	0.0
120	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1.3 Full pool Baseline Scenario

1.3.1 McNary Pool

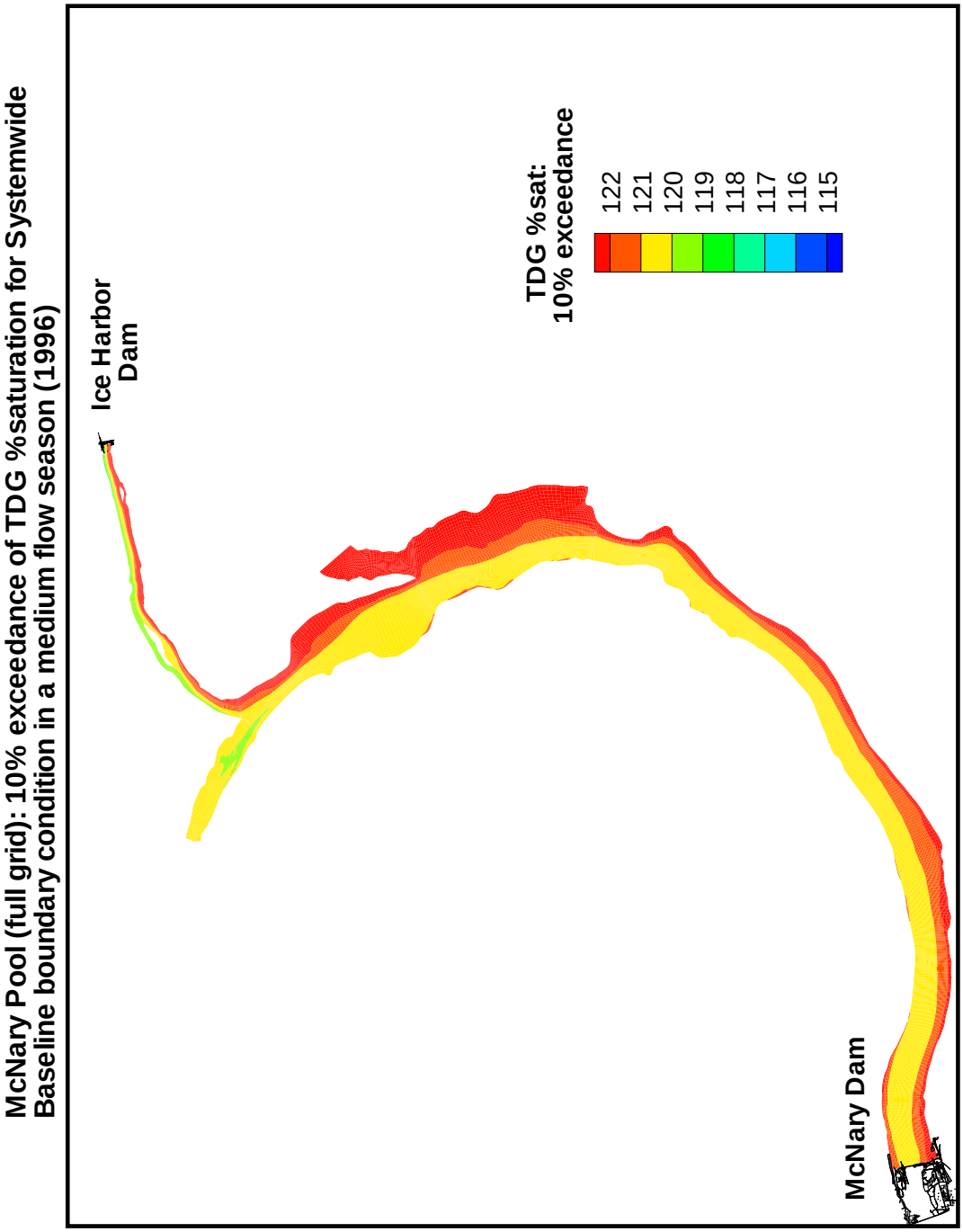

Figure 1.57: 10% exceedance of % TDG Saturation for baseline scenario in McNary Pool (full grid) in a medium flow season (1996)

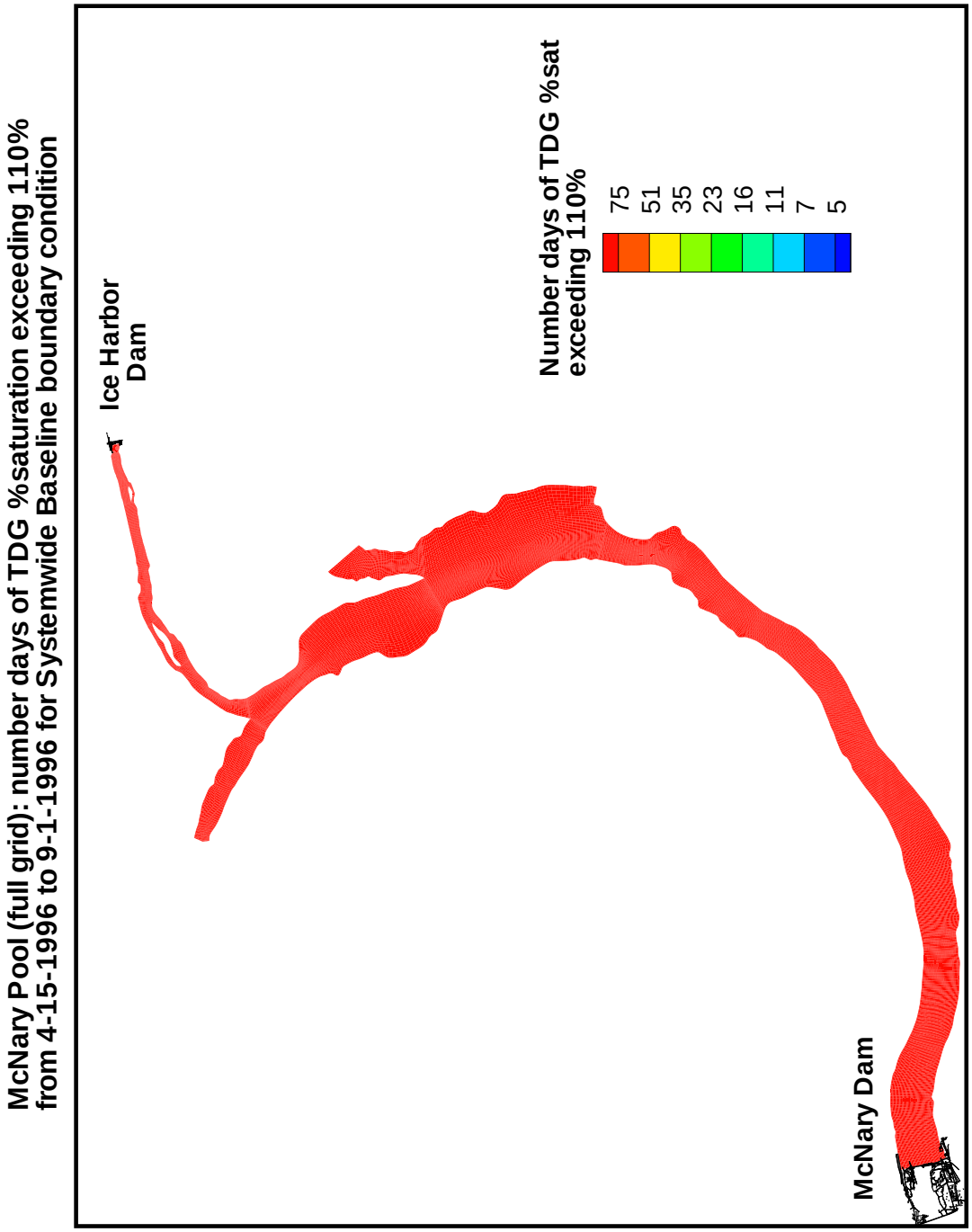

Figure 1.58: Number days exceeding % TDG saturation of 110% in the baseline scenario simulation of McNary Pool (full grid) in a medium flow season (1996)

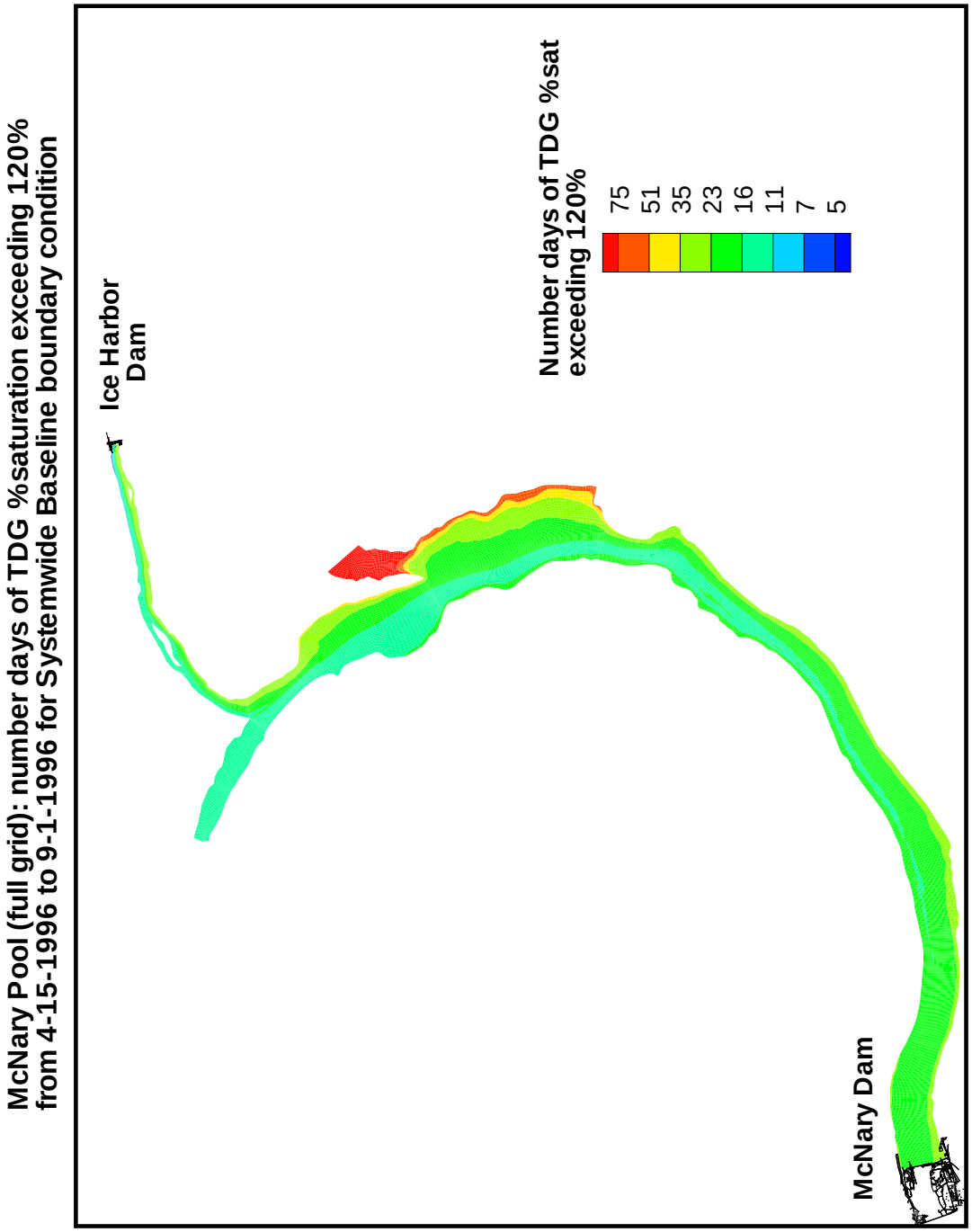

Figure 1.59: Number days exceeding % TDG saturation of 120% in the baseline scenario simulation of McNary Pool (full grid) in a medium flow season (1996)

1.3.2 Ice Harbor Pool

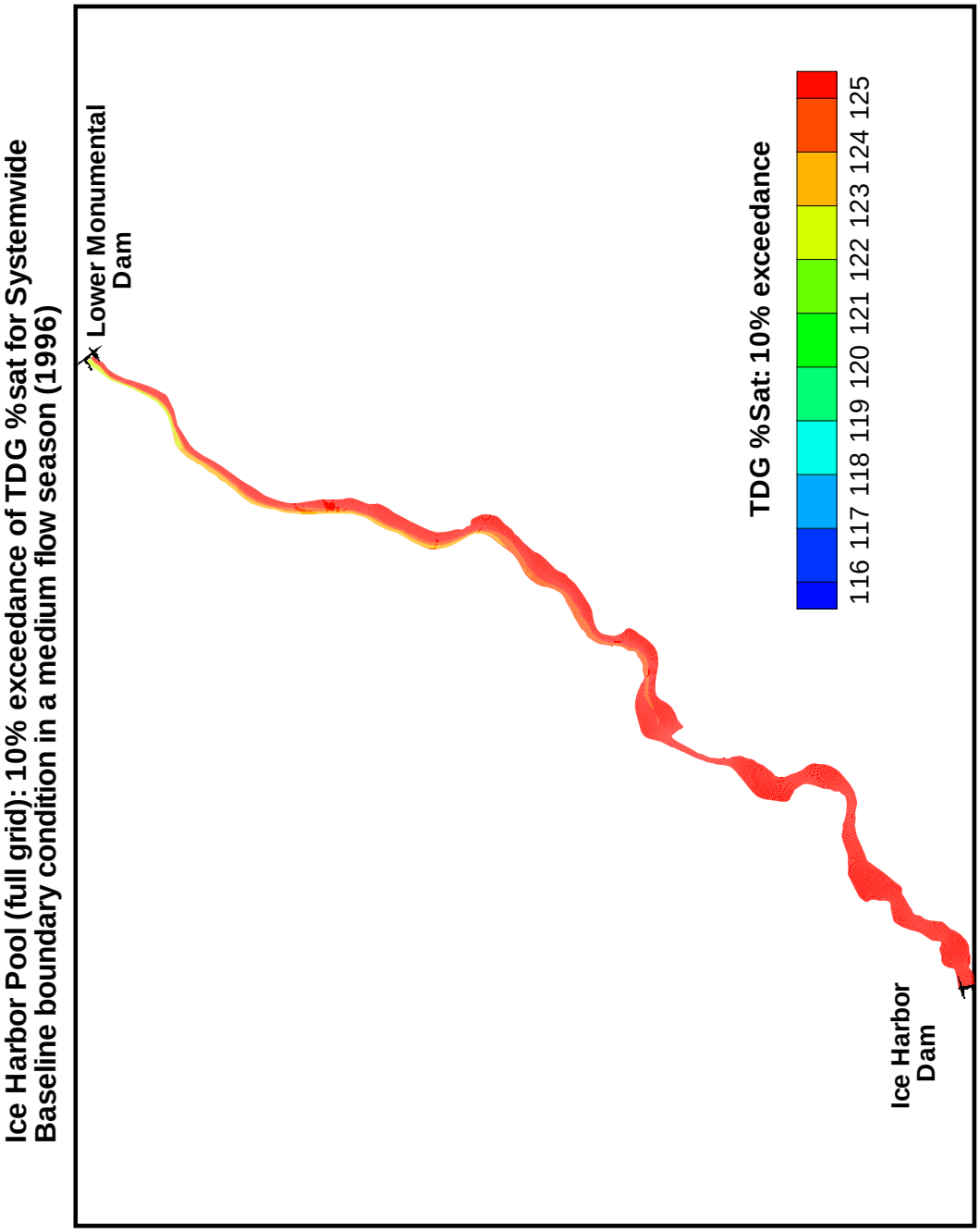

Figure 1.60: 10% exceedance of % TDG Saturation for baseline scenario in Ice Harbor Pool (full grid) in a medium flow season (1996)

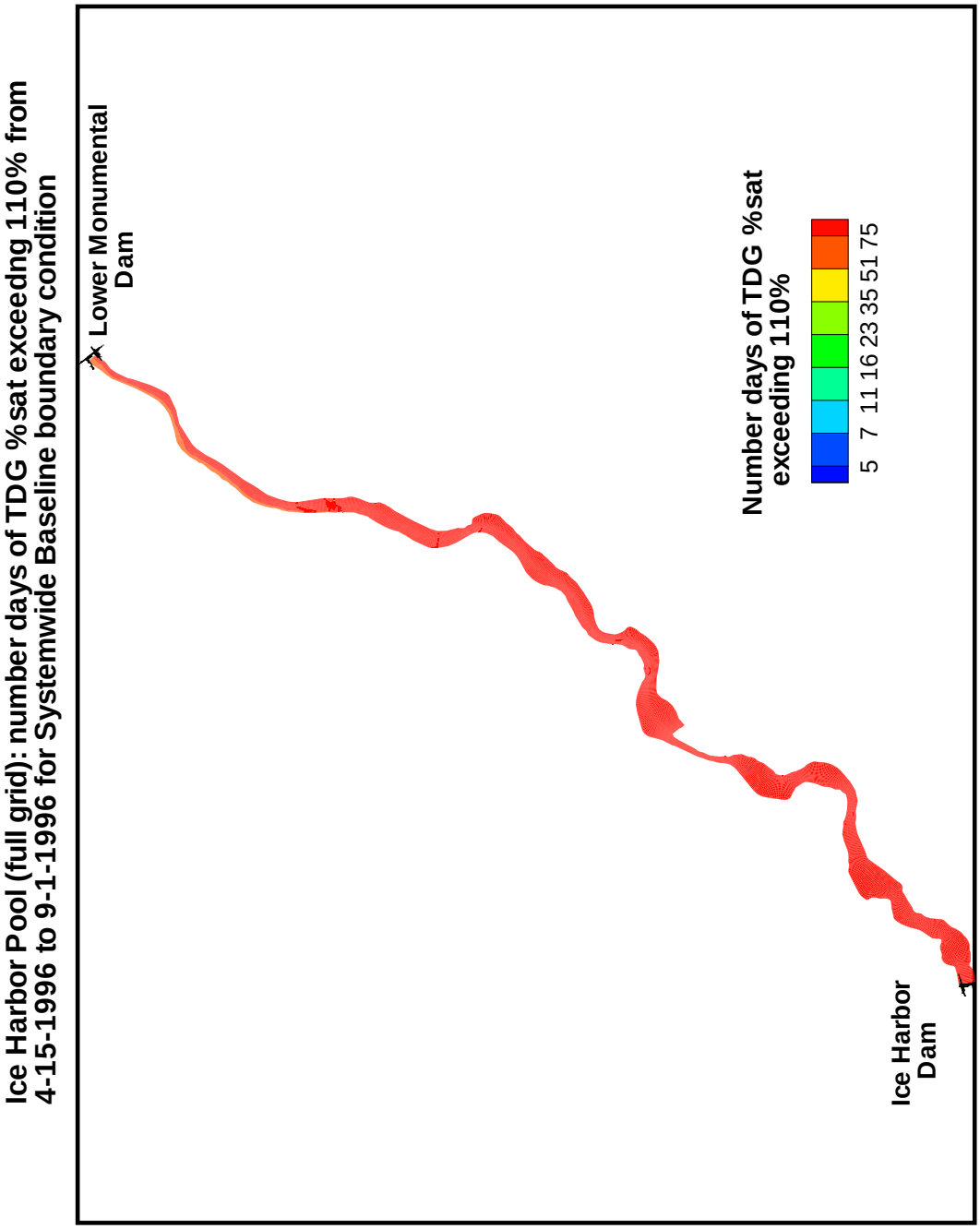

Figure 1.61: Number days exceeding % TDG saturation of 110% for baseline scenario simulation of Ice Harbor Pool (full grid) in a medium flow season (1996)

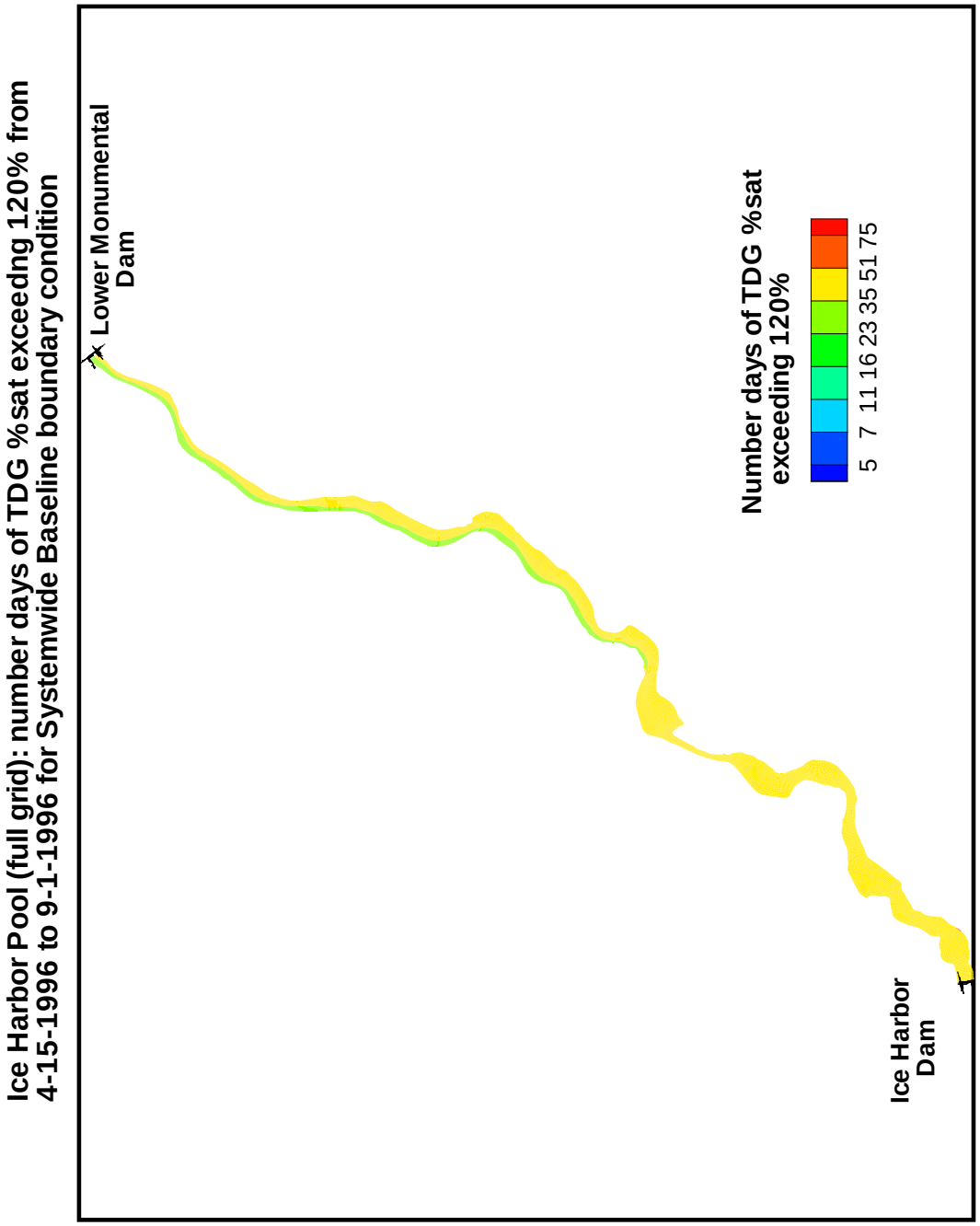

Figure 1.62: Number days exceeding % TDG saturation of 120% for baseline scenario simulation of Ice Harbor Pool (full grid) in a medium flow season (1996)

1.3.3 Lower Monumental Pool

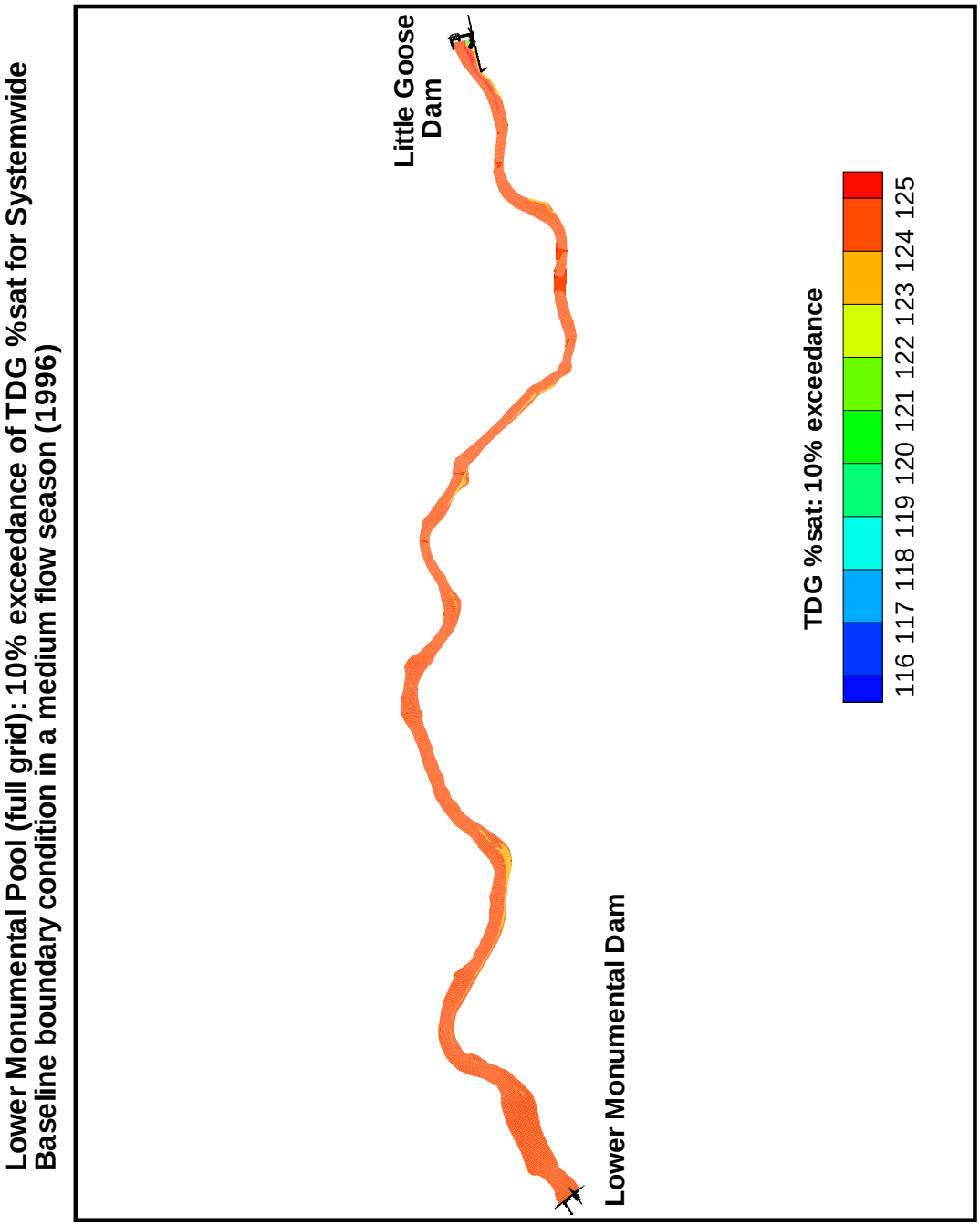

Figure 1.63: 10% exceedance of % TDG Saturation for baseline scenario in Lower Monumental Pool (full grid) in a medium flow season (1996)

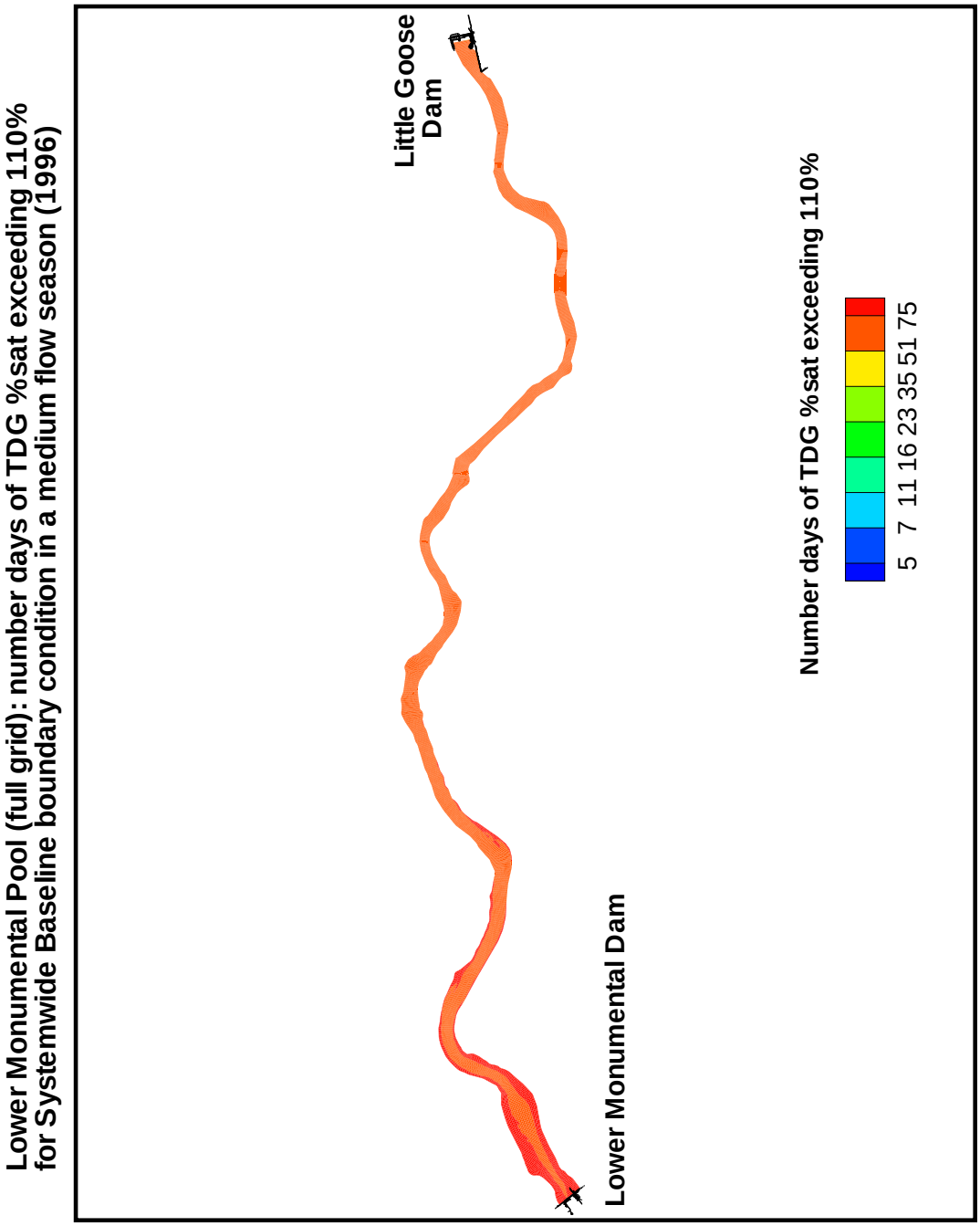

Figure 1.64: Number days exceeding % TDG saturation of 110% for baseline scenario simulation of Lower Monumental Pool (full grid) in a medium flow season (1996)

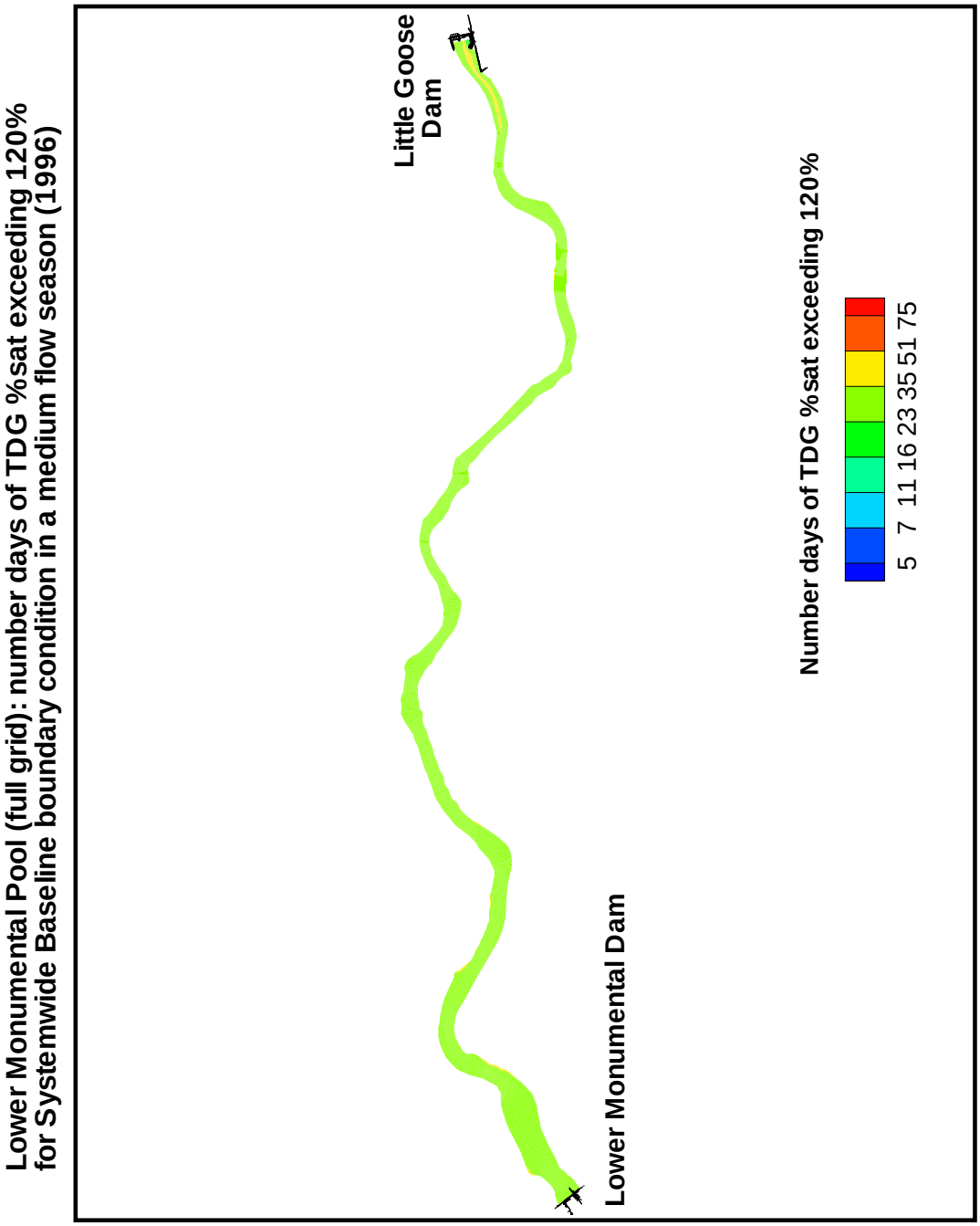

Figure 1.65: Number days exceeding % TDG saturation of 120% for baseline scenario simulation of Lower Monumental Pool (full grid) in a medium flow season (1996)

1.3.4 Little Goose Pool

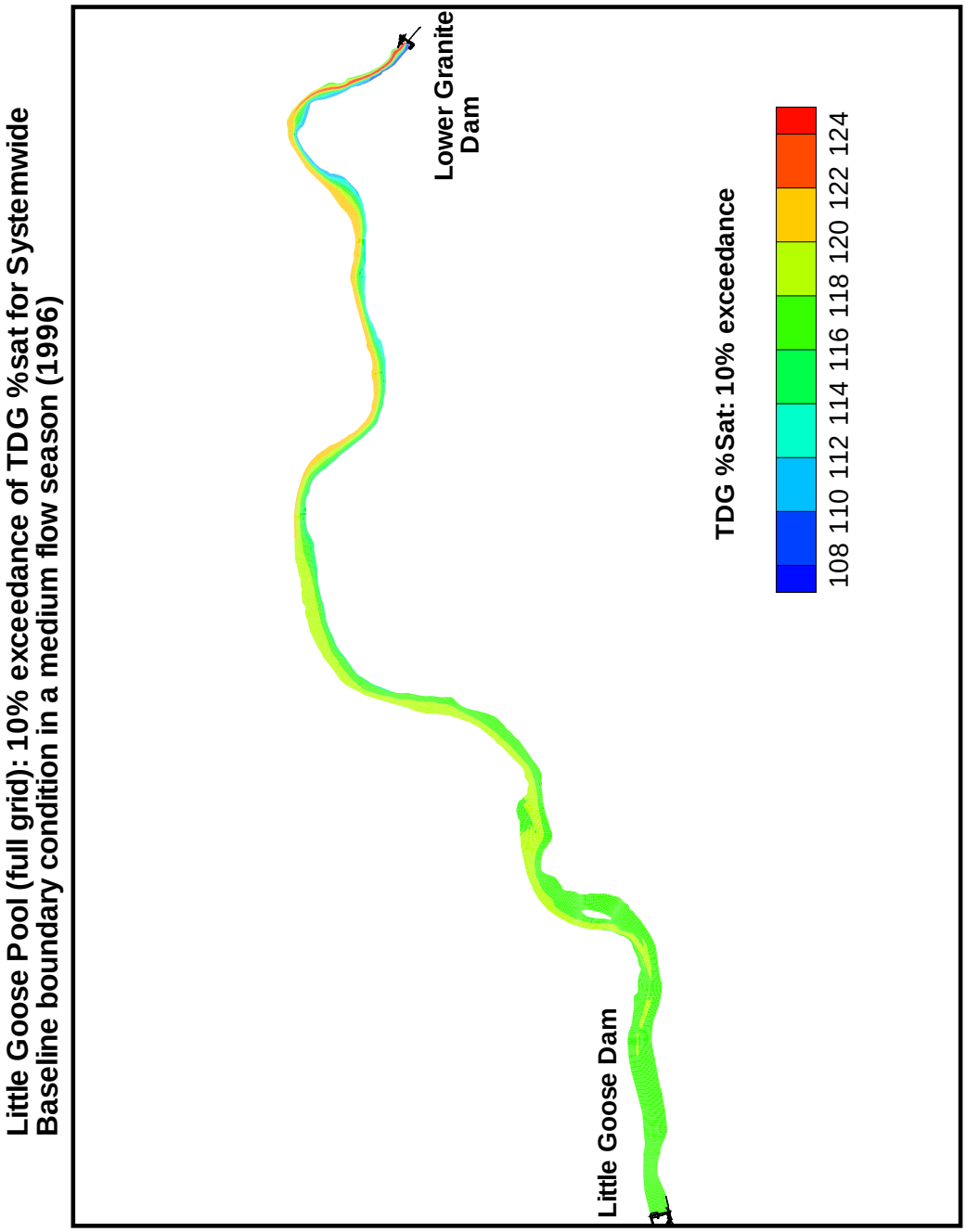

Figure 1.66: 10% exceedance of % TDG Saturation for baseline scenario in Little Goose Pool (full grid) in a medium flow season (1996)

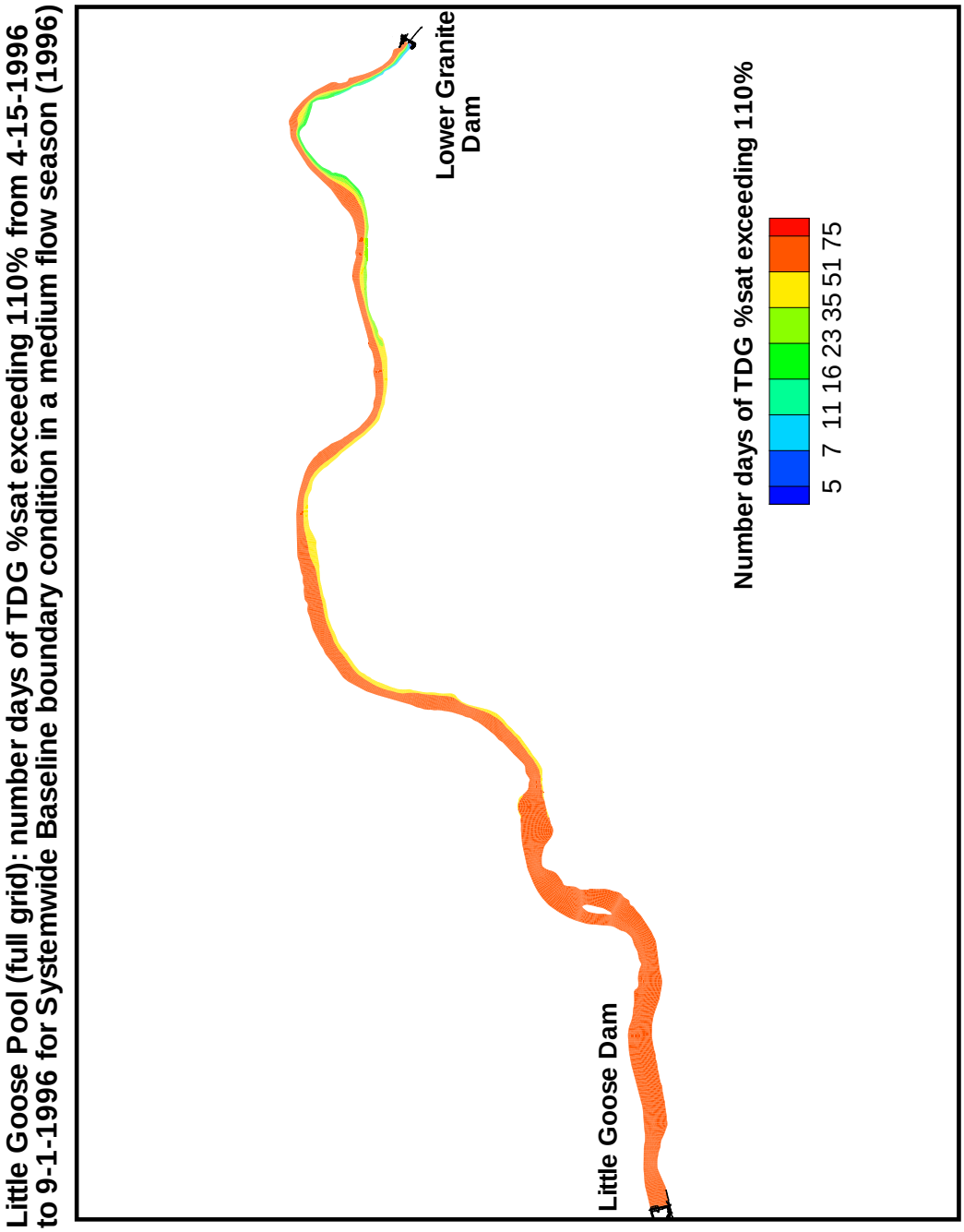

Figure 1.67: Number days exceeding % TDG saturation of 110% for the baseline scenario simulation of Little Goose Pool (full grid) in a medium flow season (1996)

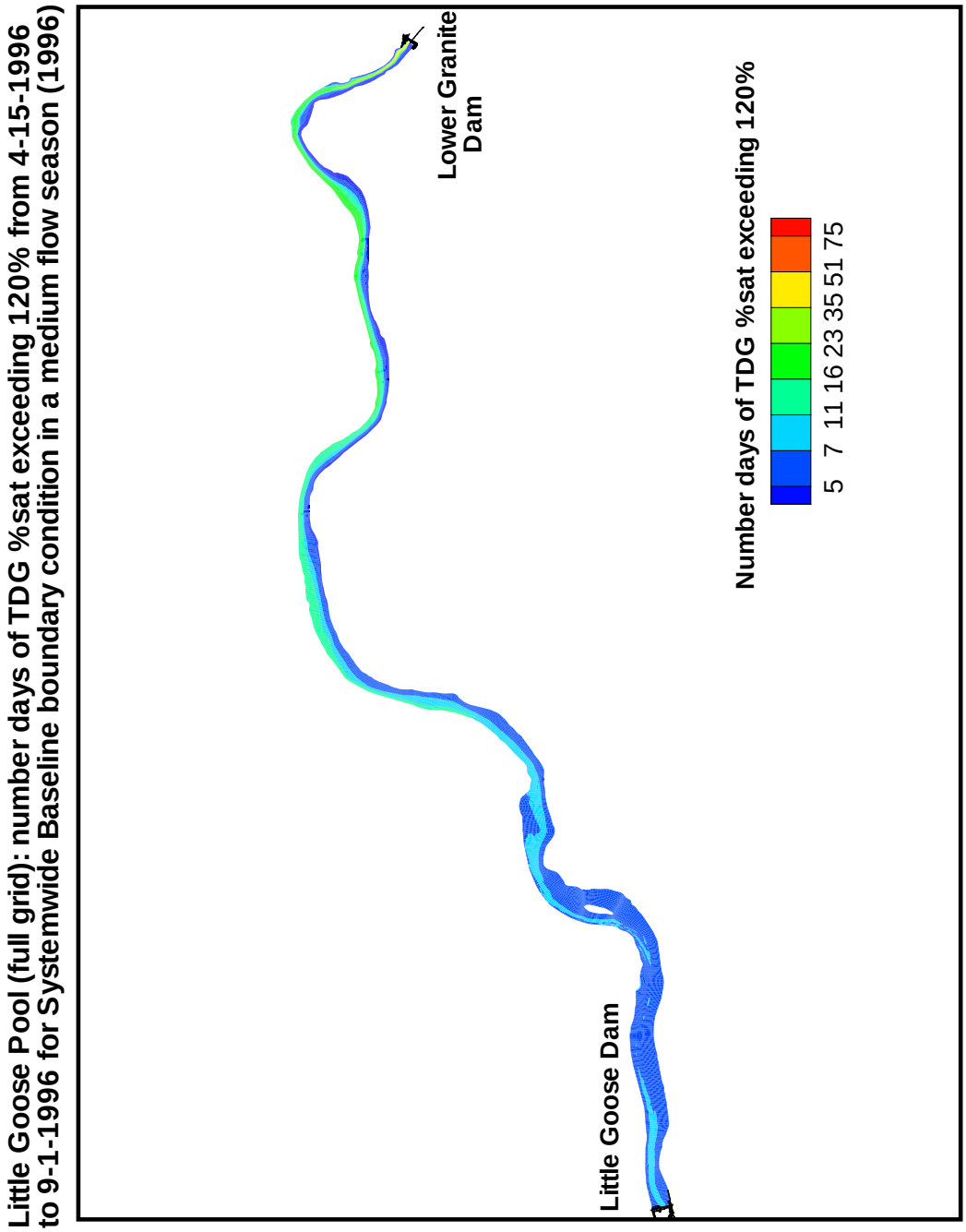

Figure 1.68: Number days exceeding % TDG saturation of 120% for the baseline scenario simulation of Little Goose Pool (full grid) in a medium flow season (1996)