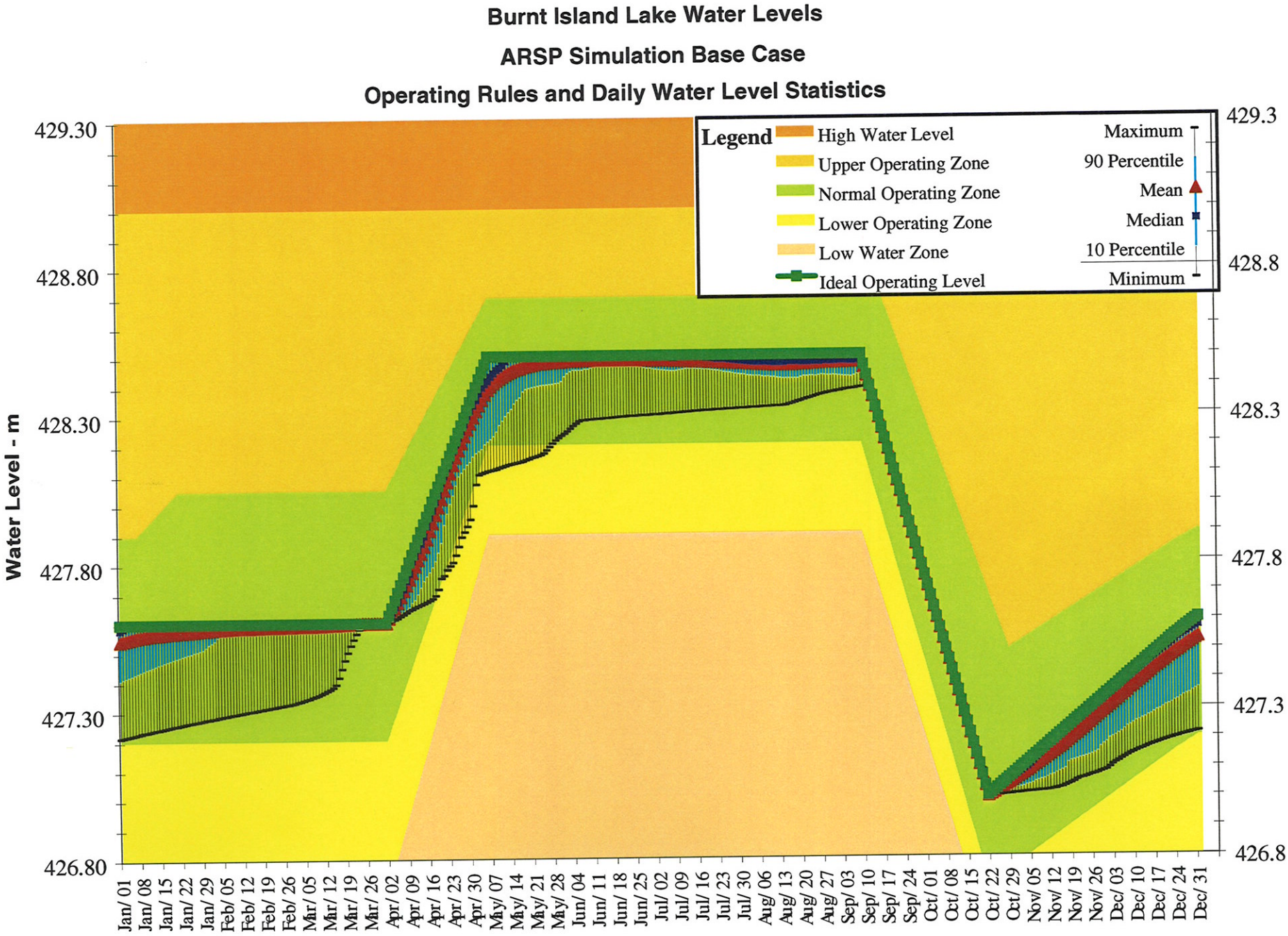
Appendix F

Option Development Process
ARSP Modeling and Analysis
of Lake Levels and River Flows

- **ARSP Base Case**
- **ARSP Case One**
- **ARSP Case Two**

Burnt Island Lake


Burnt Island Lake Water Levels
ARSP Simulation Base Case
Operating Rules and Daily Water Level Statistics
Water Level - m
429.30
428.80
428.30
427.80
427.30
426.80
429.3
428.8
428.3
427.8
427.3
426.8
Legend
High Water Level
Upper Operating Zone
Normal Operating Zone
Lower Operating Zone
Low Water Zone
Ideal Operating Level
Maximum
90 Percentile
Mean
Median
10 Percentile
Minimum
Jan/ 01
Jan/ 08
Jan/ 15
Jan/ 22
Jan/ 29
Feb/ 05
Feb/ 12
Feb/ 19
Feb/ 26
Mar/ 05
Mar/ 12
Mar/ 19
Mar/ 26
Apr/ 02
Apr/ 09
Apr/ 16
Apr/ 23
Apr/ 30
May/ 07
May/ 14
May/ 21
May/ 28
Jun/ 04
Jun/ 11
Jun/ 18
Jun/ 25
Jul/ 02
Jul/ 09
Jul/ 16
Jul/ 23
Jul/ 30
Aug/ 06
Aug/ 13
Aug/ 20
Aug/ 27
Sep/ 03
Sep/ 10
Sep/ 17
Sep/ 24
Oct/ 01
Oct/ 08
Oct/ 15
Oct/ 22
Oct/ 29
Nov/ 05
Nov/ 12
Nov/ 19
Nov/ 26
Dec/ 03
Dec/ 10
Dec/ 17
Dec/ 24
Dec/ 31

Burnt Island Lake Water Levels
ARSP Simulation Base Case

Peak Water Levels	
HWZ	429
No of Days in Exceedance	0
No of Years Exceeded	0
Maximum WL	428.50

Time of spring peak levels before April 30	
Percentile	0.90
Peak percentile WL	428.35
Date of peak	30-Apr
Tolerance	0
Tolerated WL	428.35
Date tolerated exceeded	30-Apr

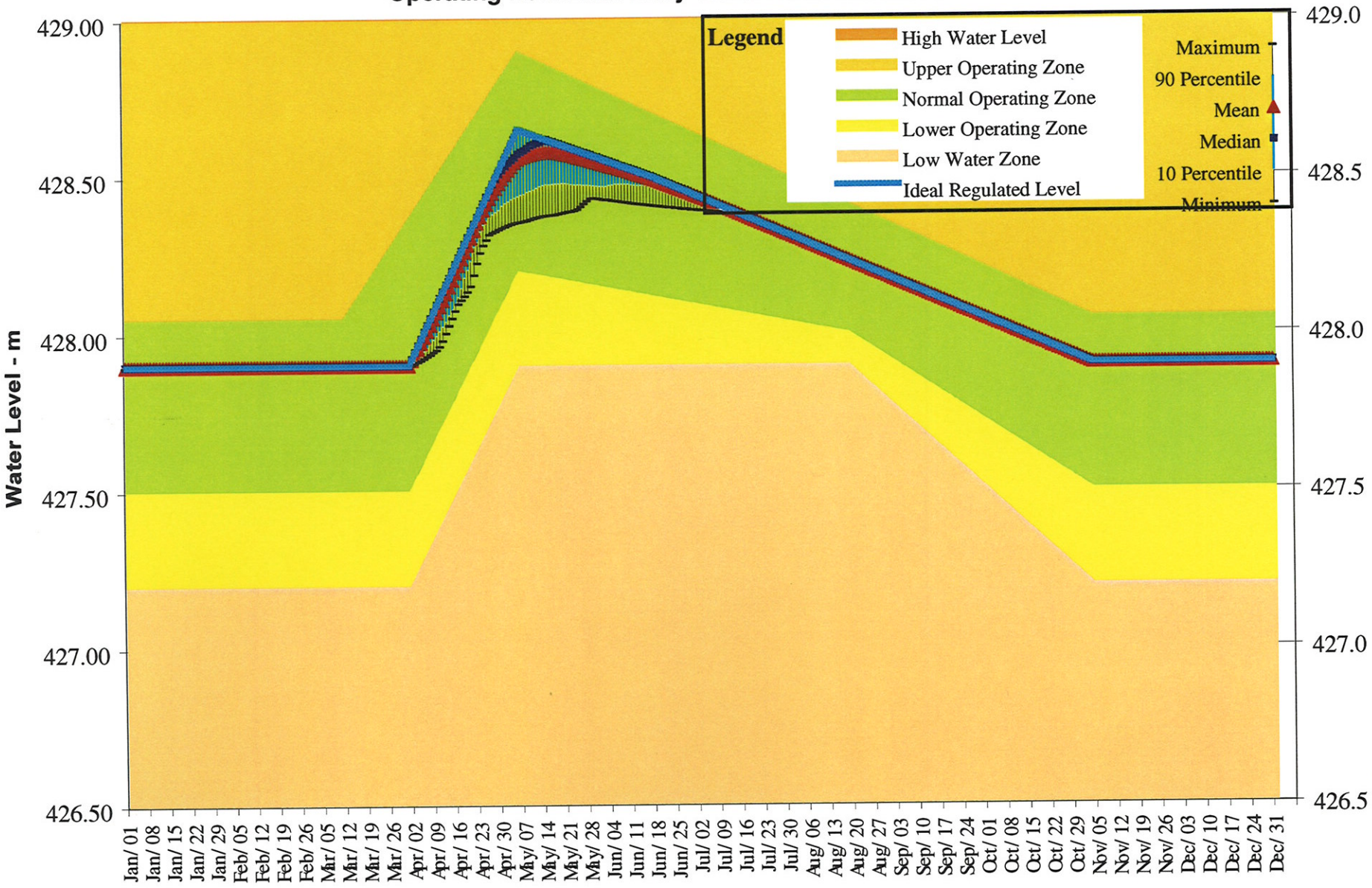
Summer recreation levels Jun-15 to Sep-30	
90 and 10 percentile range	
Max 90%	428.50
Min 10%	427.75
Range	0.75

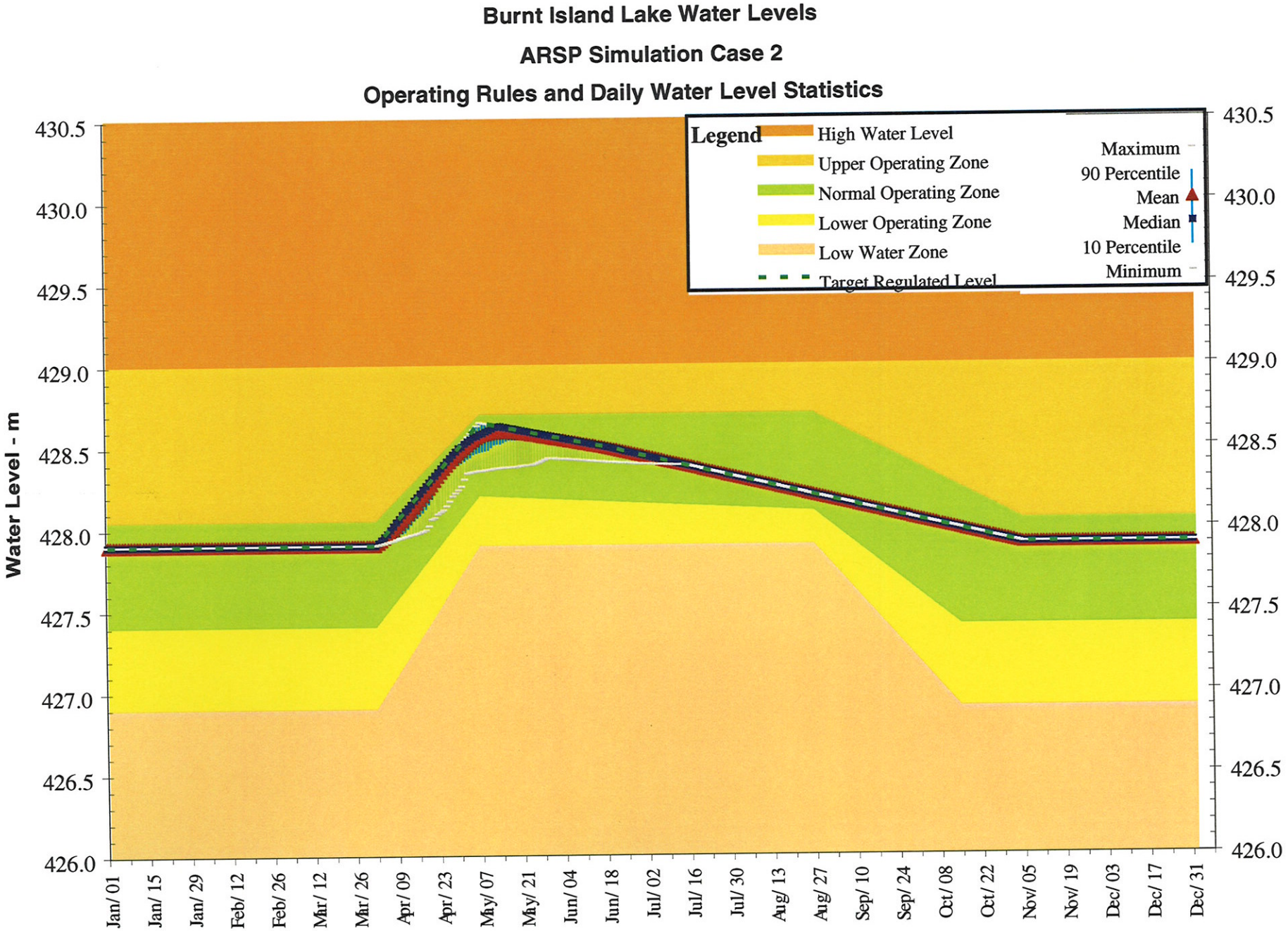
Median range	
Max Median	428.50
Min Median	427.75
Range	0.75

Burnt Island Lake Water Levels

ARSP Simulation Proposed Case 1

Operating Rules and Daily Water Level Statistics




Burnt Island Lake Water Levels
ARSP Simulation Case 2
Operating Rules and Daily Water Level Statistics
Legend
High Water Level
Upper Operating Zone
Normal Operating Zone
Lower Operating Zone
Low Water Zone
Target Regulated Level
Maximum
90 Percentile
Mean
Median
10 Percentile
Minimum
Water Level - m
430.5
430.0
429.5
429.0
428.5
428.0
427.5
427.0
426.5
426.0
Jan/ 01
Jan/ 15
Jan/ 29
Feb/ 12
Feb/ 26
Mar/ 12
Mar/ 26
Apr/ 09
Apr/ 23
May/ 07
May/ 21
Jun/ 04
Jun/ 18
Jul/ 02
Jul/ 16
Jul/ 30
Aug/ 13
Aug/ 27
Sep/ 10
Sep/ 24
Oct/ 08
Oct/ 22
Nov/ 05
Nov/ 19
Dec/ 03
Dec/ 17
Dec/ 31

Burnt Island Lake Water Levels
ARSP Simulation Case 2

Peak Water Levels	
HWZ	429
No of Days in Exceedance	0
No of Years Exceeded	0
Maximum WL	428.65

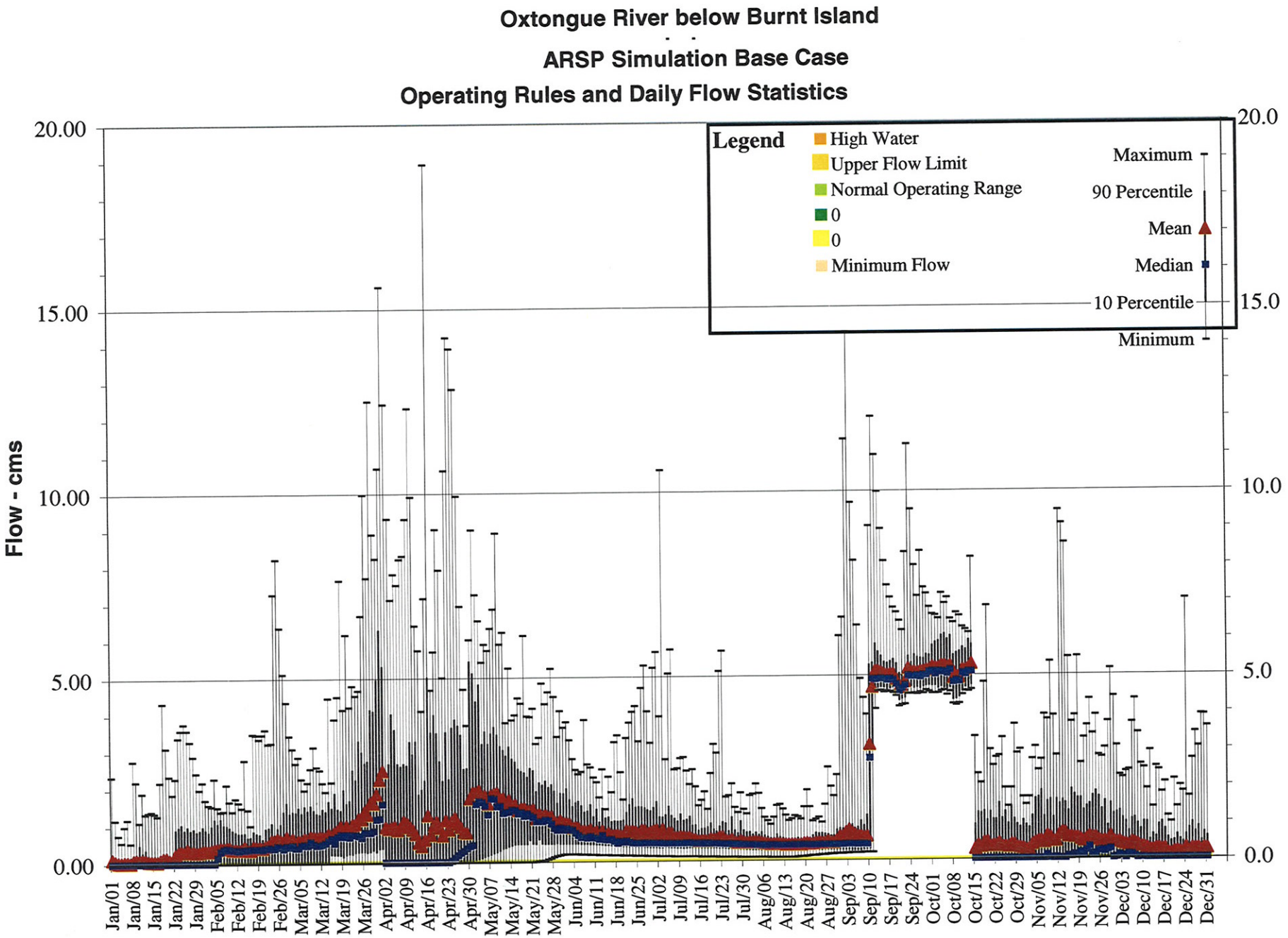
Time of spring peak levels before April 30	
Percentile	0.90
Peak percentile WL	428.52
Date of peak	30-Apr
Tolerance	0
Tolerated WL	428.52
Date tolerated exceeded	30-Apr

Summer recreation levels Jun-15 to Sep-30	
90 and 10 percentile range	
Max 90%	428.51
Min 10%	428.05
Range	0.46

Median range	
Max Median	428.51
Min Median	428.05
Range	0.46

Spring Peak Water Level

Maximum - 50 yr Average	428.60
Date - 50 yr Average	12/May
Summer Average Level	428.31


Oxtongue River below Burnt Island
ARSP Simulation Base Case
Operating Rules and Daily Flow Statistics
Flow - cms
20.00
15.00
10.00
5.00
0.00
20.0
15.0
10.0
5.0
0.0
Legend
High Water
Upper Flow Limit
Normal Operating Range
0
0
Minimum Flow
Maximum
90 Percentile
Mean
Median
10 Percentile
Minimum
Jan/01
Jan/08
Jan/15
Jan/22
Jan/29
Feb/05
Feb/12
Feb/19
Feb/26
Mar/05
Mar/12
Mar/19
Mar/26
Apr/02
Apr/09
Apr/16
Apr/23
Apr/30
May/07
May/14
May/21
May/28
Jun/04
Jun/11
Jun/18
Jun/25
Jul/02
Jul/09
Jul/16
Jul/23
Jul/30
Aug/06
Aug/13
Aug/20
Aug/27
Sep/03
Sep/10
Sep/17
Sep/24
Oct/01
Oct/08
Oct/15
Oct/22
Oct/29
Nov/05
Nov/12
Nov/19
Nov/26
Dec/03
Dec/10
Dec/17
Dec/24
Dec/31

Flow Evaluation

Yellow cells indicate values that can be changed for analysis

Oxtongue River below Burnt Island Lake
ARSP Simulation Base Case
Daily Flows Model Results 1951 to 2000

Walleye Spawning

Min Flow **0** m^3/s Achieved 100% of time

No of days above minumum flow

	First half of season	*Last half of season*	*For whole season*
Min	0 days	14 days	14 days
Avg	17.62 days	23.8 days	41.42 days
Years Provided	26%	98%	26%

From flow duration curve

%	Flow	
99%	-	m^3/s
95%	-	m^3/s

No of days min flow is achievd 14 days

90% percentile peak flow 3 m3/s

Summer Minimum 7-day Flow

	Maximum	0.50 m^3/s
	Minimum	0.08 m^3/s
90%	Percentile	0.46 m^3/s
10%	Percentile	0.23 m^3/s
	Median	0.38 m^3/s
	Mean	0.35 m^3/s

Maximum Flows

Regulatory Flood Outflow No of years exceeded Maximum Daily Flow

N/A	m^3/s	0	18.92 m^3/s

Minumum Flows

Min Daily flow	*7-day minimums*		
	2	10	20 return period
	-yr 7Q2	-yr 7Q10	-yr 7Q20
0.00 m^3/s	0.00	0.00	0.00 m^3/s

Summer Fluctuations

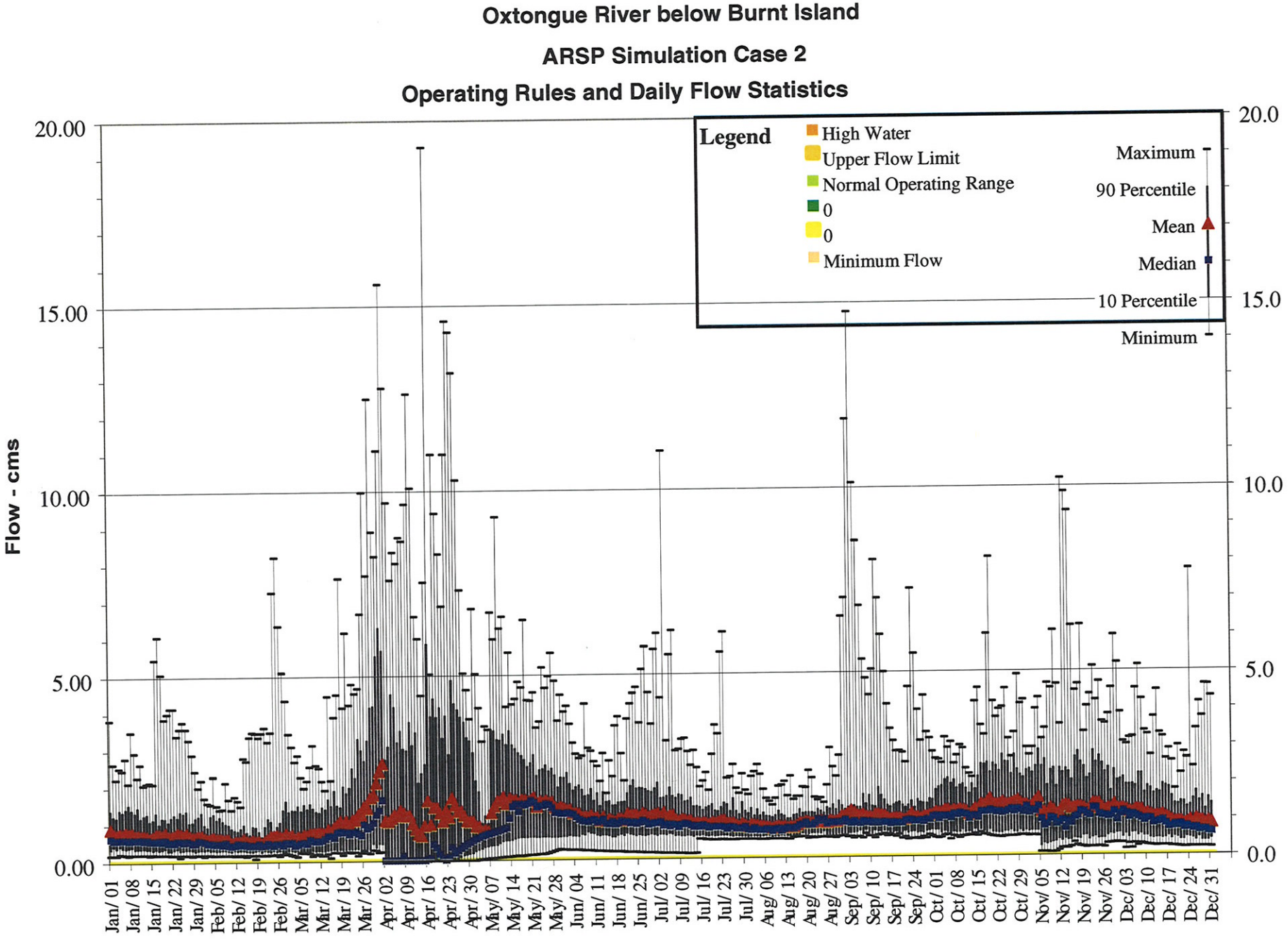
Delta Flow	Average number of daily flow fluctuations per year		
1	3.06		
3	1.00		
5	0.06		
>0.2375	14.66	0.5	ratio of summer median

Water Usage

Median Flow		*10% Percentile*	
summer	winter	summer	winter
m^3/s	m^3/s	m^3/s	m^3/s
0.60	0.05	0.24	0.00

Power Generation

	Quarter				
	1	2	3	4	Annual
Flow	0.53	1.10	1.55	1.11	1.07 m^3/s


Oxtongue River below Burnt Island
ARSP Simulation Case 2
Operating Rules and Daily Flow Statistics
Legend
High Water
Upper Flow Limit
Normal Operating Range
0
0
Minimum Flow
Maximum
90 Percentile
Mean
Median
10 Percentile
Minimum
Flow - cms
20.00
15.00
10.00
5.00
0.00
20.0
15.0
10.0
5.0
0.0
Jan/ 01
Jan/ 08
Jan/ 15
Jan/ 22
Jan/ 29
Feb/ 05
Feb/ 12
Feb/ 19
Feb/ 26
Mar/ 05
Mar/ 12
Mar/ 19
Mar/ 26
Apr/ 02
Apr/ 09
Apr/ 16
Apr/ 23
Apr/ 30
May/ 07
May/ 14
May/ 21
May/ 28
Jun/ 04
Jun/ 11
Jun/ 18
Jun/ 25
Jul/ 02
Jul/ 09
Jul/ 16
Jul/ 23
Jul/ 30
Aug/ 06
Aug/ 13
Aug/ 20
Aug/ 27
Sep/ 03
Sep/ 10
Sep/ 17
Sep/ 24
Oct/ 01
Oct/ 08
Oct/ 15
Oct/ 22
Oct/ 29
Nov/ 05
Nov/ 12
Nov/ 19
Nov/ 26
Dec/ 03
Dec/ 10
Dec/ 17
Dec/ 24
Dec/ 31

Flow Evaluation

Yellow cells indicate values that can be changed for analysis

Oxtongue River below Burnt Island Lake
ARSP Simulation Case
2
Daily Flows Model Results 1951 to 2000

Walleye Spawning

Min Flow 0 m³/s Achieved 100% of time

No of days above minumum flow

First half of season

Min	9	days
Avg	20.3	days
Years Provided	36%	

Last half of season

Min	24	days
Avg	24	days
Years Provided	100%	

For whole season

Min	33	days
Avg	44.3	days
Years Provided	36%	

From flow duration curve

%	Flow	
99%	-	m³/s
95%	-	m³/s

No of days min flow is achievd
33 days

90% *percentile peak flow*
3 m3/s

Summer Minimum 7-day Flow

	Maximum	0.88	m³/s
	Minimum	0.14	m³/s
90%	Percentile	0.79	m³/s
10%	Percentile	0.53	m³/s
	Median	0.65	m³/s
	Mean	0.64	m³/s

Maximum Flows

Regulatory Flood Outflow		No of years exceeded	Maximum Daily Flow	
N/A	m³/s	0	19.29	m³/s

Minumum Flows

Min Daily flow		*7-day minimums*			
		2	10	20	return period
		-yr 7Q2	-yr 7Q10	-yr 7Q20	
0.00	m³/s	0.00	0.00	0.00	m³/s

Summer Fluctuations

Delta Flow	Average number of daily flow fluctuations per year		
1	1.92		
3	0.16		
5	0.04		
>0.442	8.38	0.5	ratio of summer median

Water Usage

Median Flow		*10% Percentile*	
summer	winter	summer	winter
m³/s	m³/s	m³/s	m³/s
0.94	0.66	0.60	0.00

Power Generation

	Quarter				
	1	2	3	4	Annual
Flow	0.81	1.27	1.00	1.21	1.07 m³/s