Improving the OST Calculation

Garth Pettinger Trout Unlimited RFAC May 14, 2020

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All OST calculations are based on estimated quantities accumulated to Jun-1, except the selection of the Release Schedule; which is currently based on projecting the continuous use of the Decision Day "Total PCN" release rate, for the balance of the water year.

OST-2017 FFMP Release Summary
Decision Day: 6/1/2018

General Release Mass Balance

Combined Pepacton, Cannonsville, and Neversink (PCN) Storage:	265,645	MG
+ PCN Inflow Forecast Accumulated to Jun 1:	363,859	MG
- Expected PCN Diverson Accumulated to Jun 1:	192,981	MG
-Jun 1 Storage Target:	267,460	MG
= Available Release Quantity Accumulated to Jun 1:	169,063	MG

Available Release Quantity Evenly Distributed to June 1

Available Release Quantity Accumulated to Jun 1:	169,063	MG
/ Number of Days to Release Available Release Quantity:	365	days
Current PCN Release Target:	463	mgd
Current PCN Release Target:	717	cfs

Current Storage Zone for Schedule Selection

	Usable Storage	Usable Storage + Snow Storage	Zone
PCN	99.3%	*	L2
Pepacton	99.1%	*	L2
Cannonsville	99.6%	*	L2
Neversink	99.4%	*	L2

* Not applicable (snow storage is included in the forecast)

Use Release Target and Storage Zone to Select Release Schedule

	Storage Zone, Summer (cfs)			
	Pepacton	Cannonsville	Neversink	PCN
OST-FFMP Schedule	L2	L2	L2	
Table-4a	100	190	75	365
Table-4b	110	245	80	435
Table-4c	115	300	90	505
Table-4d	125	360	95	580
Table-4e	135	415	100	650
Table-4f	140	460	110	710
Table-4g	150	500	115	765

Selected Schedule: Table 4f vs Table 4g

Comments:

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* Not applicable (snow storage is included in the forecast)

Use Release Target and Storage Zone to Select Release Schedule

	Storage Zone, Summer (cfs)				Table releases accumulated to Jun 1
	Pepacton	Cannonsville	Neversink	PCN	PCN
OST-FFMP Schedule	L2	L2	L2		
Table-4a	100	190	75	365	224
Table-4b	110	245	80	435	269
Table-4c	115	300	90	505	314
Table-4d	125	360	95	580	360
Table-4e	135	415	100	650	402
Table-4f	140	460	110	710	445
Table-4g	150	500	115	765	486

Selected Schedule: Table 4f vs Table 4g

Comments:

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All OST calculations are based on estimated quantities accumulated to Jun-1, except the selection of the Release Schedule; which is currently based on projecting the continuous use of the Decision Day "Total PCN" release rate, for the balance of the water year.

Table release quantities change throughout the seasons (higher in the summer and lower in the winter, etc). The projected release quantity would therefore be more accurately and consistently reflected using the value of the Table releases accumulated to Jun-1.

Improving the OST Calculation

FFMP 2017 Table 4g

3/19/2018

CANNONSVILLE	Summer			Fall			Winter		Spring		Annual
	Jun	Jun	Jul - Aug	Sept	Sept	Oct - Nov	Dec - Mar	Apr	May	May	AVERAGE
Storage Zone	6/1 - 6/15	6/16 - 6/30	7/1 - 8/31	9/1 - 9/15	9/16-9/30	10/1 - 11/30	12/1 - 3/31	4/1 - 4/30	5/1 - 5/20	5/21-5/31	6/1 - 5/31
L1-a	600	1,500	1,500	1,500	1,500	1,500	1,500	1,500	600	600	1,387
L1-b	600	600	600	600	600	600	600	600	600	600	600
L1-c	550	550	550	475	425	175	175	375	425	475	331
L2	500	500	500	450	400	150	150	350	400	450	300

PEPACTON	Summer			Fall			Winter		Spring		Annual
	Jun	Jun	Jul - Aug	Sept	Sept	Oct - Nov	Dec - Mar	Apr	May	May	AVERAGE
Storage Zone	6/1 - 6/15	6/16 - 6/30	7/1 - 8/31	9/1 - 9/15	9/16-9/30	10/1 - 11/30	12/1 - 3/31	4/1 - 4/30	5/1 - 5/20	5/21-5/31	6/1 - 5/31
L1-a	300	700	700	700	700	700	700	700	300	300	650
L1-b	300	300	300	300	300	300	300	300	300	300	300
L1-c	170	170	170	160	145	100	100	100	145	160	126
L2	150	150	150	140	125	80	80	80	125	140	106

NEVERSINK	Summer			Fall			Winter		Spring		Annual
	Jun	Jun	Jul - Aug	Sept	Sept	Oct - Nov	Dec - Mar	Apr	May	May	AVERAGE
Storage Zone	6/1 - 6/15	6/16 - 6/30	7/1 - 8/31	9/1 - 9/15	9/16-9/30	10/1 - 11/30	12/1 - 3/31	4/1 - 4/30	5/1 - 5/20	5/21-5/31	6/1 - 5/31
L1-a	150	190	190	190	190	190	190	190	110	120	182
L1-b	150	150	150	150	110	110	110	110	110	120	122
L1-c	125	125	125	115	100	75	75	75	100	115	93
L2	115	115	115	100	90	60	60	60	90	100	80

TOTAL PCN	Summer			Fall			Winter		Spring		Annual
	Jun	Jun	Jul - Aug	Sept	Sept	Oct - Nov	Dec - Mar	Apr	May	May	AVERAGE
Storage Zone	6/1 - 6/15	6/16 - 6/30	7/1 - 8/31	9/1 - 9/15	9/16-9/30	10/1 - 11/30	12/1 - 3/31	4/1 - 4/30	5/1 - 5/20	5/21-5/31	6/1 - 5/31
L1-a	1,050	2,390	2,390	2,390	2,390	2,390	2,390	2,390	1,010	1,020	2,218
L1-b	1,050	1,050	1,050	1,050	1,010	1,010	1,010	1,010	1,010	1,020	1,022
L1-c	845	845	845	750	670	350	350	550	670	750	550
L2	765	765	765	690	615	290	290	490	615	690	486

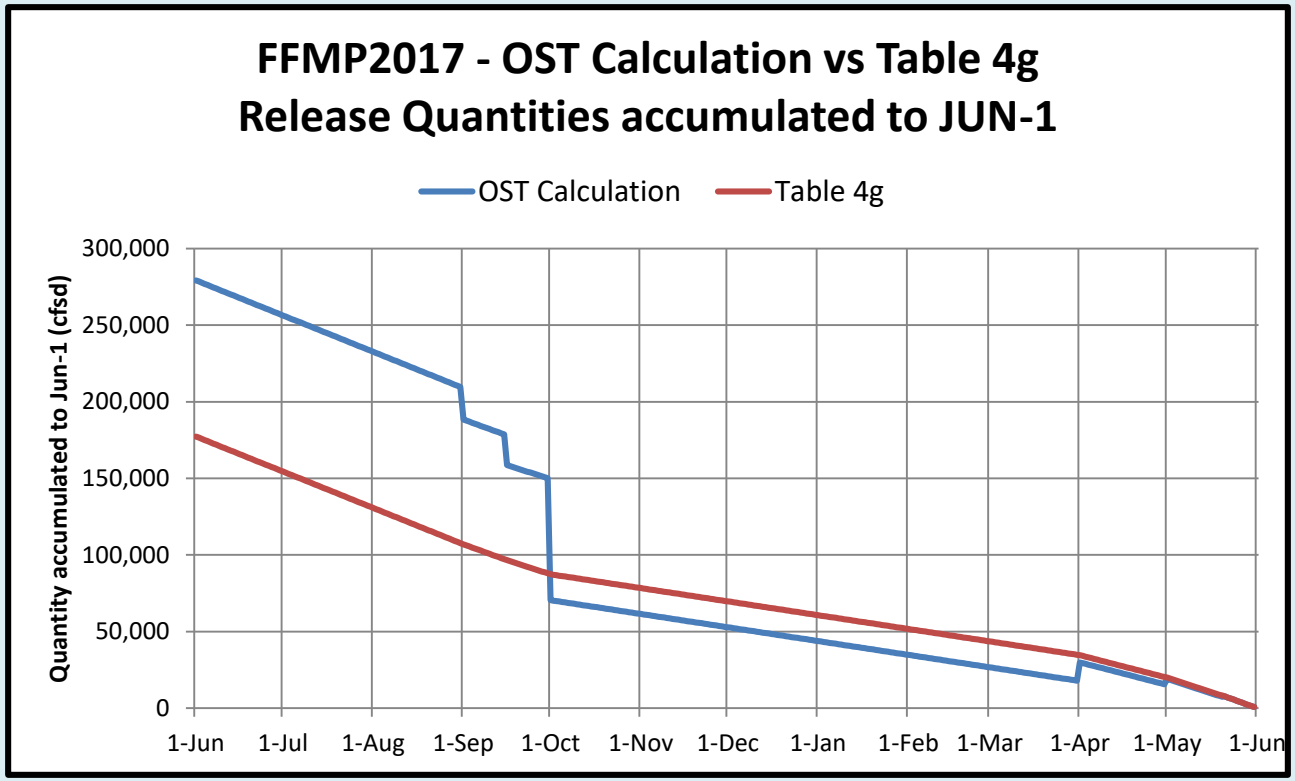
Severe Drought (to be negotiated depending on conditions)

Table release quantities change throughout the seasons (higher in the summer and lower in the winter, etc). The projected release quantity would therefore be more accurately and consistently reflected using the value of the Table releases accumulated to Jun-1.

The difference between the two methods of calculation is more than 60 billion gallons during the summer months; when higher releases are most needed.

In effect, the current OST calculation withholds >22% of the combined total PCN storage capacity from the rivers and lower basin states, during the summer months.

Improving the OST Calculation



The differences in the "estimated" water usage of the OST calculation vs Table 4g accumulated release quantities, are shown above: and are particularly prominent during the summer months.
Of particular note is the 1-day (Sep-30 to Oct-1) step change in the OST's estimated water usage from 150,000 cfsd to 70,000 cfsd; a 50bg difference in 1-day.

OST-2017 FFMP Release Summary
Decision Day: 6/1/2018

General Release Mass Balance

Combined Pepacton, Cannonsville, and Neversink (PCN) Storage:	265,645	MG
+ PCN Inflow Forecast Accumulated to Jun 1:	363,859	MG
- Expected PCN Diverson Accumulated to Jun 1:	192,981	MG
-Jun 1 Storage Target:	267,460	MG
= Available Release Quantity Accumulated to Jun 1:	169,063	MG

Available Release Quantity Evenly Distributed to June 1

Available Release Quantity Accumulated to Jun 1:	169,063	MG
/ Number of Days to Release Available Release Quantity:	365	days
Current PCN Release Target:	463	mgd
Current PCN Release Target:	717	cfs

Current Storage Zone for Schedule Selection

	Usable Storage	Usable Storage + Snow Storage	Zone
PCN	99.3%	*	L2
Pepacton	99.1%	*	L2
Cannonsville	99.6%	*	L2
Neversink	99.4%	*	L2

* Not applicable (snow storage is included in the forecast)

Use Release Target and Storage Zone to Select Release Schedule

	Storage Zone, Summer (cfs)				Table releases accumulated to Jun 1
	Pepacton	Cannonsville	Neversink	PCN	PCN
OST-FFMP Schedule	L2	L2	L2		
Table-4a	100	190	75	365	224
Table-4b	110	245	80	435	269
Table-4c	115	300	90	505	314
Table-4d	125	360	95	580	360
Table-4e	135	415	100	650	402
Table-4f	140	460	110	710	445
Table-4g	150	500	115	765	486

Selected Schedule: Table 4f vs Table 4g

Comments:

Improving the OST Calculation

In the Jun-1 OST Summary, determining the Release Schedule based on projecting the continuous use of the Decision Day "Total PCN" release rate (710cfs), resulted in selection of Table 4f.

However; using the more accurate value of the Table releases accumulated to Jun-1 (486cfs), would have resulted in the selection of Table 4g.

OST-2017 FFMP Release Summary
Decision Day: 6/14/2018

General Release Mass Balance

Combined Pepacton, Cannonsville, and Neversink (PCN) Storage:	259,677	MG
+ PCN Inflow Forecast Accumulated to Jun 1:	359,059	MG
- Expected PCN Diverson Accumulated to Jun 1:	190,748	MG
-Jun 1 Storage Target:	267,460	MG
= Available Release Quantity Accumulated to Jun 1:	160,528	MG

Available Release Quantity Evenly Distributed to June 1

Available Release Quantity Accumulated to Jun 1:	160,528	MG
/ Number of Days to Release Available Release Quantity:	352	days
Current PCN Release Target:	456	mgd
Current PCN Release Target:	706	cfs

Current Storage Zone for Schedule Selection

	Usable Storage	Usable Storage + Snow Storage	Zone
PCN	97.1%	*	L2
Pepacton	97.8%	*	L2
Cannonsville	95.8%	*	L2
Neversink	97.5%	*	L2

* Not applicable (snow storage is included in the forecast)

Use Release Target and Storage Zone to Select Release Schedule

	Storage Zone, Summer (cfs)				Table releases accumulated to Jun 1
	Pepacton	Cannonsville	Neversink	PCN	PCN
OST-FFMP Schedule	L2	L2	L2		
Table-4a	100	190	75	365	218
Table-4b	110	245	80	435	263
Table-4c	115	300	90	505	306
Table-4d	125	360	95	580	352
Table-4e	135	415	100	650	393
Table-4f	140	460	110	710	435
Table-4g	150	500	115	765	476

Selected Schedule: Table 4e vs Table 4g

Comments:

Improving the OST Calculation

In the Jun-14 OST Summary, determining the Release Schedule based on projecting the continuous use of the Decision Day "Total PCN" release rate (650cfs), resulted in selection of Table 4e.

However; using the more accurate value of the Table releases accumulated to Jun-1 (476cfs), would have resulted in the selection of Table 4g.

OST-2017 FFMP Release Summary
Decision Day: 7/15/2018

General Release Mass Balance

Combined Pepacton, Cannonsville, and Neversink (PCN) Storage:	237,360	MG
+ PCN Inflow Forecast Accumulated to Jun 1:	334,959	MG
- Expected PCN Diverson Accumulated to Jun 1:	174,912	MG
-Jun 1 Storage Target:	267,460	MG
= Available Release Quantity Accumulated to Jun 1:	129,947	MG

Available Release Quantity Evenly Distributed to June 1

Available Release Quantity Accumulated to Jun 1:	129,947	MG
/ Number of Days to Release Available Release Quantity:	321	days
Current PCN Release Target:	405	mgd
Current PCN Release Target:	626	cfs

Current Storage Zone for Schedule Selection

	Usable Storage	Usable Storage + Snow Storage	Zone
PCN	88.7%	*	L2
Pepacton	89.0%	*	L2
Cannonsville	86.2%	*	L2
Neversink	94.5%	*	L2

* Not applicable (snow storage is included in the forecast)

Use Release Target and Storage Zone to Select Release Schedule

	Storage Zone, Summer (cfs)				Table releases accumulated to Jun 1
	Pepacton	Cannonsville	Neversink	PCN	PCN
OST-FFMP Schedule	L2	L2	L2		
Table-4a	100	190	75	365	204
Table-4b	110	245	80	435	246
Table-4c	115	300	90	505	287
Table-4d	125	360	95	580	330
Table-4e	135	415	100	650	368
Table-4f	140	460	110	710	408
Table-4g	150	500	115	765	448

Selected Schedule: Table 4d vs Table 4g

Comments:

Improving the OST Calculation

In the July-15 OST Summary, determining the Release Schedule based on projecting the continuous use of the Decision Day "Total PCN" release rate (580cfs), resulted in selection of Table 4d.

However; using the more accurate value of the Table releases accumulated to Jun-1 (448cfs), would have resulted in the selection of Table 4g.

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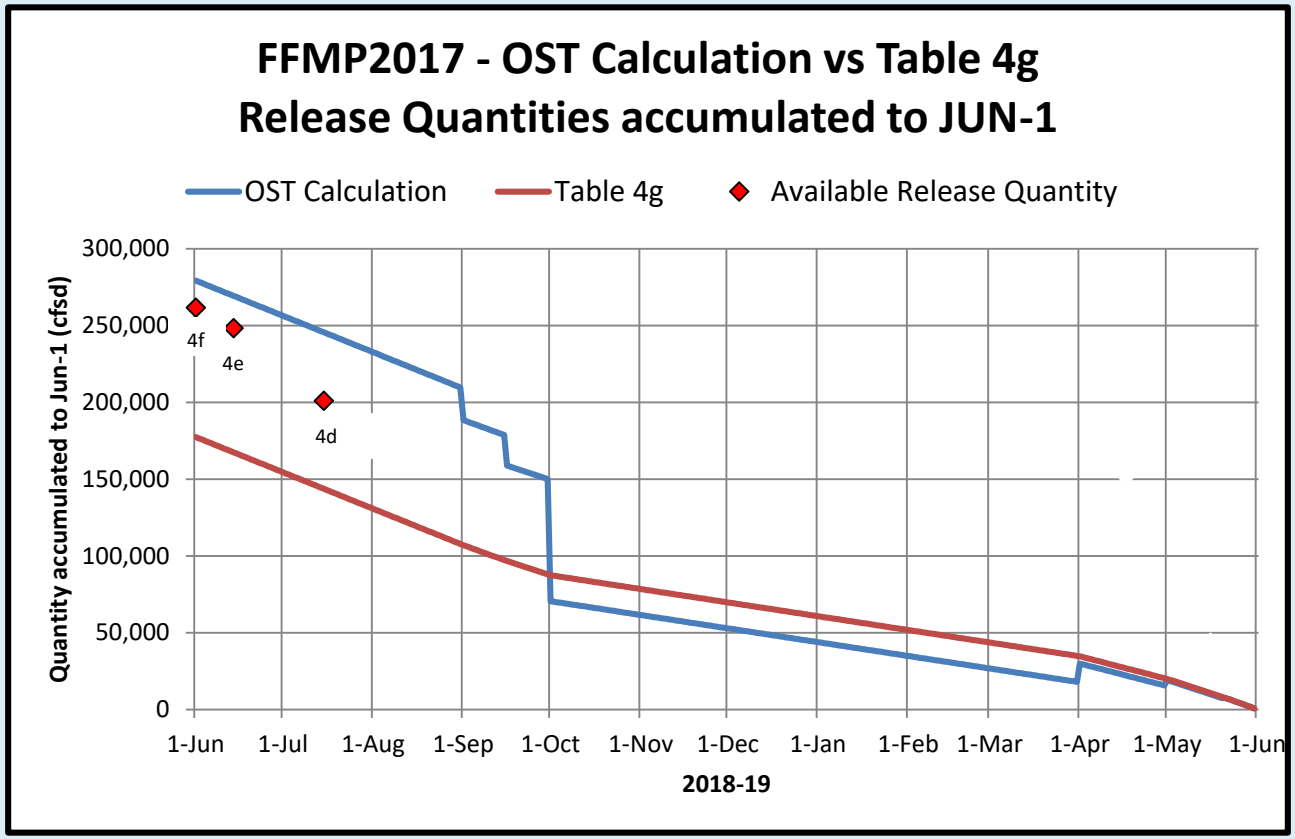

Adding the Available Release Quantities to the chart, illustrates how the OST's current calculation method adversely affected the selection of the appropriate release Tables in 2018.

SAMPLE

OST-2017 FFMP Release Summary
Decision Day: 7/15/2018

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Current PCN Release Target:	626	cfs

Current Storage Zone for Schedule Selection

	Usable Storage	Usable Storage + Snow Storage	Zone
PCN	88.7%	*	L2
Pepacton	89.0%	*	L2
Cannonsville	86.2%	*	L2
Neversink	94.5%	*	L2

* Not applicable (snow storage is included in the forecast)

Use Release Target, Storage Zone, and Table Releases accumulated to Jun-1 to Select Release Schedule

	Storage Zone, Summer (cfs)			Table releases accumulated to Jun 1
	Pepacton	Cannonsville	Neversink	PCN
OST-FFMP Schedule	L2	L2	L2	L2
Table-4a	100	190	75	204
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Selected Schedule: Table 4g

Comments:

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In Summary, Table release quantities change throughout the seasons (higher in the summer and lower in the winter, etc). The projected release quantity would therefore be more accurately and consistently reflected using the value of the Table releases accumulated to Jun-1.

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Using the "Total PCN" method, rather than the more accurate "Accumulation to Jun-1" method; results in the selection of lower release Tables during the summer, and an inaccuracy of approximately 60bg (>22% of the total PCN storage capacity) in the OST calculations.

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The Ask: We request that the selection of the OST Release Schedule be based upon the value of the Table releases accumulated to Jun-1; to improve both the accuracy and consistency of the OST Summary Sheet calculations.

Improving the OST Calculation

Any Questions?

SAMPLE OST-2017 FFMP Release Summary
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Use Release Target, Storage Zone, and Table Releases accumulated to Jun-1 to Select Release Schedule

	Storage Zone, Summer (cfs)			Table releases accumulated to Jun 1
	Pepacton	Cannonsville	Neversink	PCN
OST-FFMP Schedule	L2	L2	L2	L2
Table-4a	100	190	75	204
Table-4b	110	245	80	245
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Table-4e	135	415	100	368
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Selected Schedule: Table 4g

Comments:

FFMP 2017 Table 4g

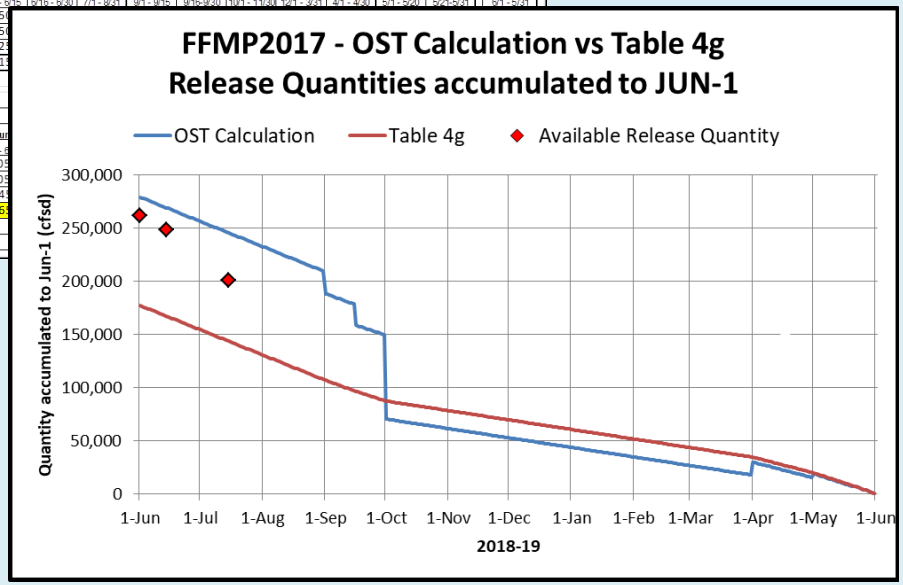
3/19/2018

CANNONSVILLE	Summer			Fall			Winter		Spring		Annual
	Jun	Jun	Jul - Aug	Sept	Sept	Oct - Nov	Dec - Mar	Apr	May	May	AVERAGE
Storage Zone	6/1 - 6/15	6/16 - 6/30	7/1 - 8/31	9/1 - 9/15	9/16-9/30	10/1 - 11/30	12/1 - 3/31	4/1 - 4/30	5/1 - 5/20	5/21-5/31	6/1 - 5/31
L1-a	600	1,500	1,500	1,500	1,500	1,500	1,500	1,500	600	600	1,387
L1-b	600	600	600	600	600	600	600	600	600	600	600
L1-c	550	550	550	475	425	175	175	375	425	475	331
L2	500	500	500	450	400	150	150	350	400	450	300

PEPACTON	Summer			Fall			Winter		Spring		Annual
	Jun	Jun	Jul - Aug	Sept	Sept	Oct - Nov	Dec - Mar	Apr	May	May	AVERAGE
Storage Zone	6/1 - 6/15	6/16 - 6/30	7/1 - 8/31	9/1 - 9/15	9/16-9/30	10/1 - 11/30	12/1 - 3/31	4/1 - 4/30	5/1 - 5/20	5/21-5/31	6/1 - 5/31
L1-a	300	700	700	700	700	700	700	700	300	300	650
L1-b	300	300	300	300	300	300	300	300	300	300	300
L1-c	170	170	170	160	145	100	100	100	145	160	126
L2	150	150	150	140	125	80	80	80	125	140	106

NEVERSINK	Summer			Fall			Winter		Spring		Annual
	Jun	Jun	Jul - Aug	Sept	Sept	Oct - Nov	Dec - Mar	Apr	May	May	AVERAGE
Storage Zone	6/1 - 6/15	6/16 - 6/30	7/1 - 8/31	9/1 - 9/15	9/16-9/30	10/1 - 11/30	12/1 - 3/31	4/1 - 4/30	5/1 - 5/20	5/21-5/31	6/1 - 5/31
L1-a	15										
L1-b	15										
L1-c	12										
L2	11										

TOTAL PCN	Jun
Storage Zone	6/1 -
L1-a	1,05
L1-b	1,05
L1-c	84
L2	76



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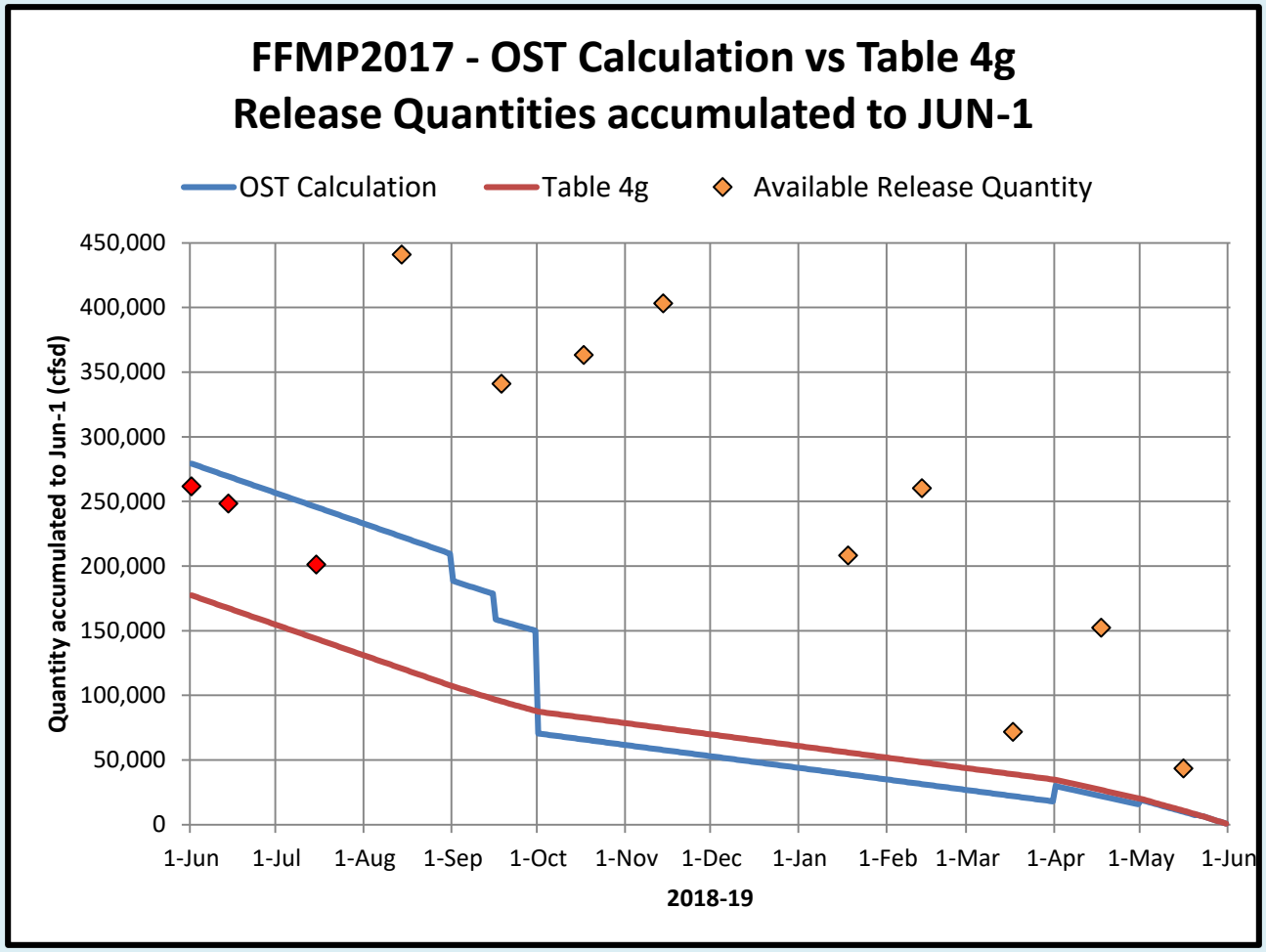

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