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RECLAMATION

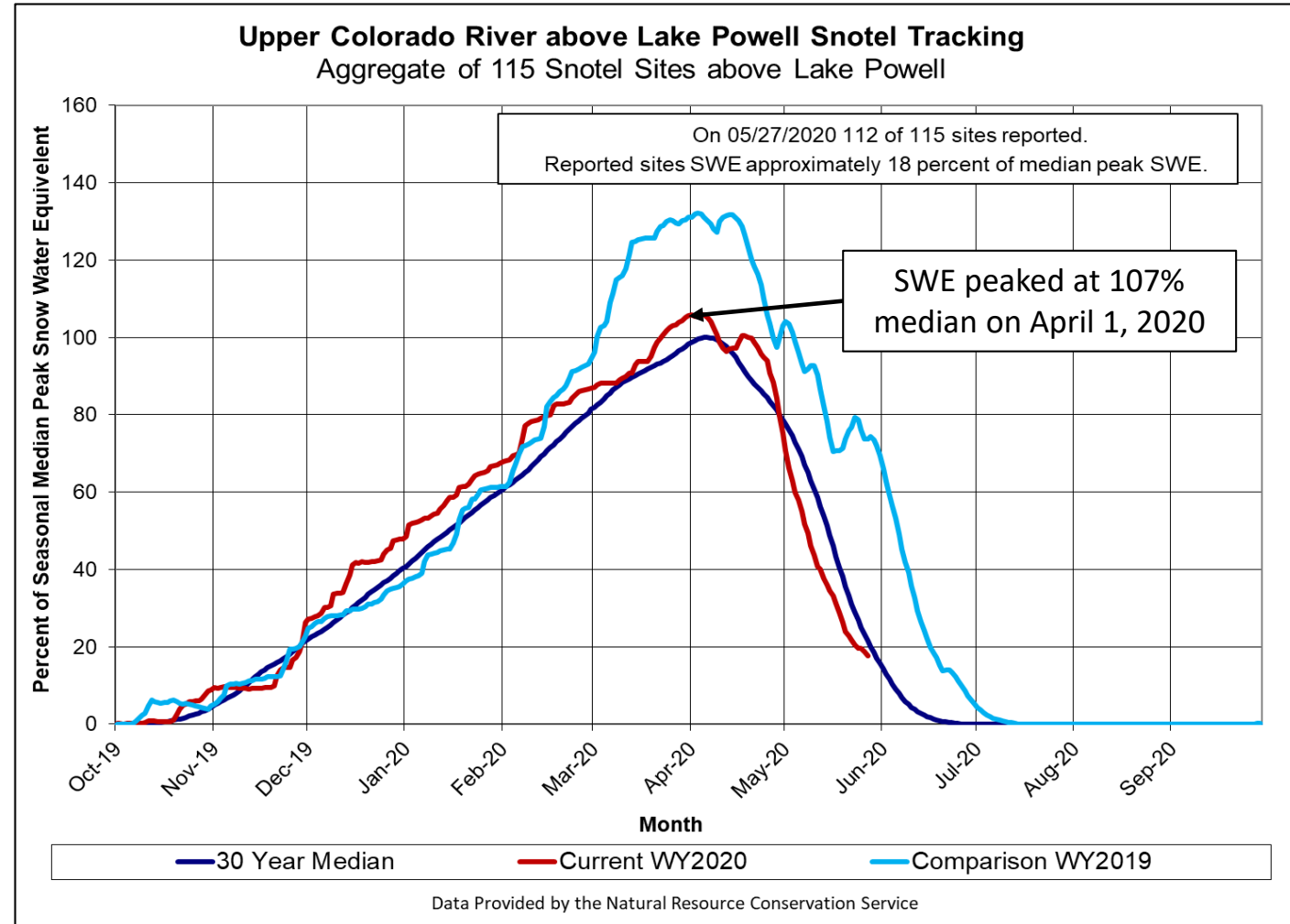
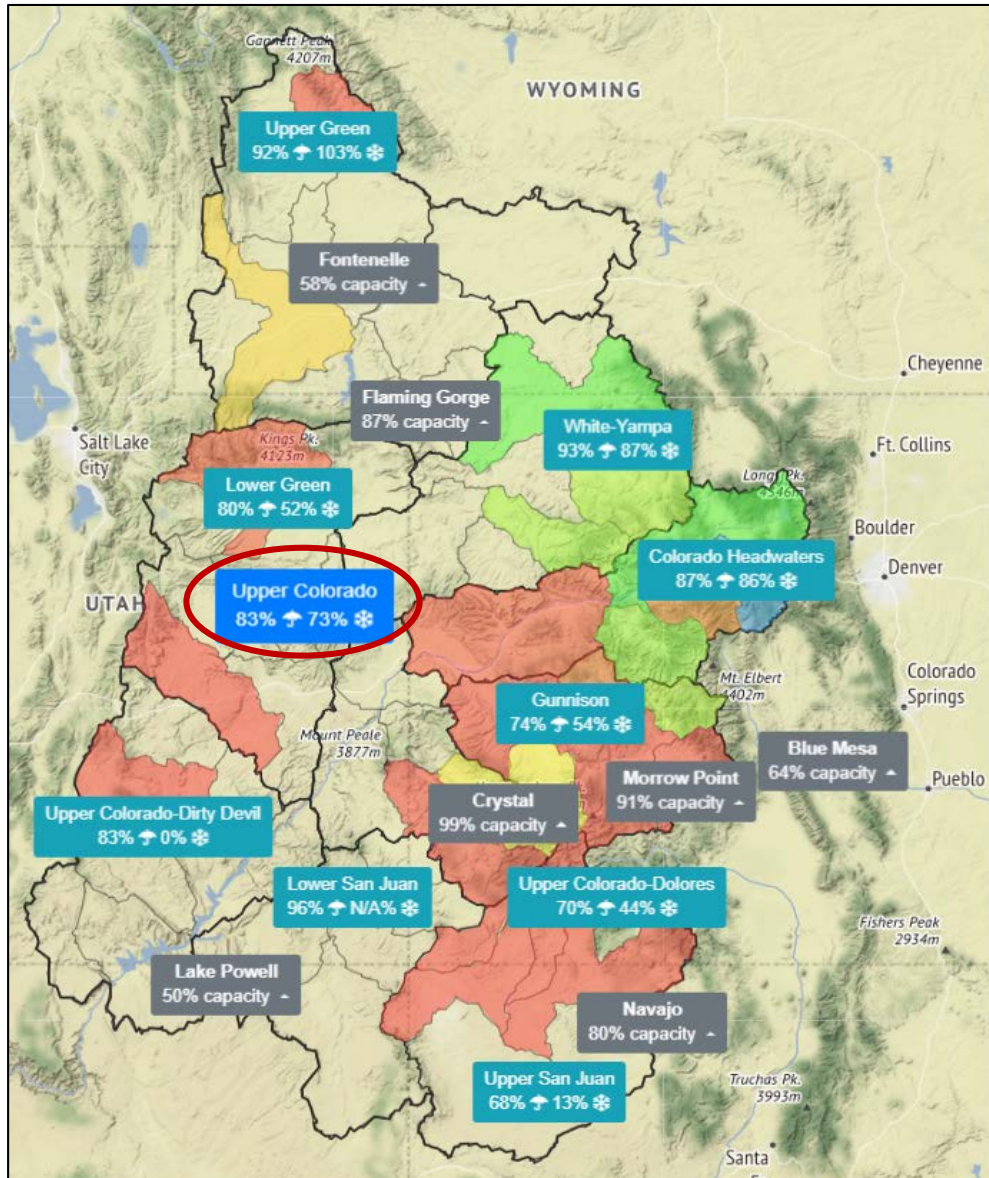
Glen Canyon Monthly Hydrology and Operations Update

May 27, 2020

Heather E. Patno

Hydraulic Engineer

Snow Conditions

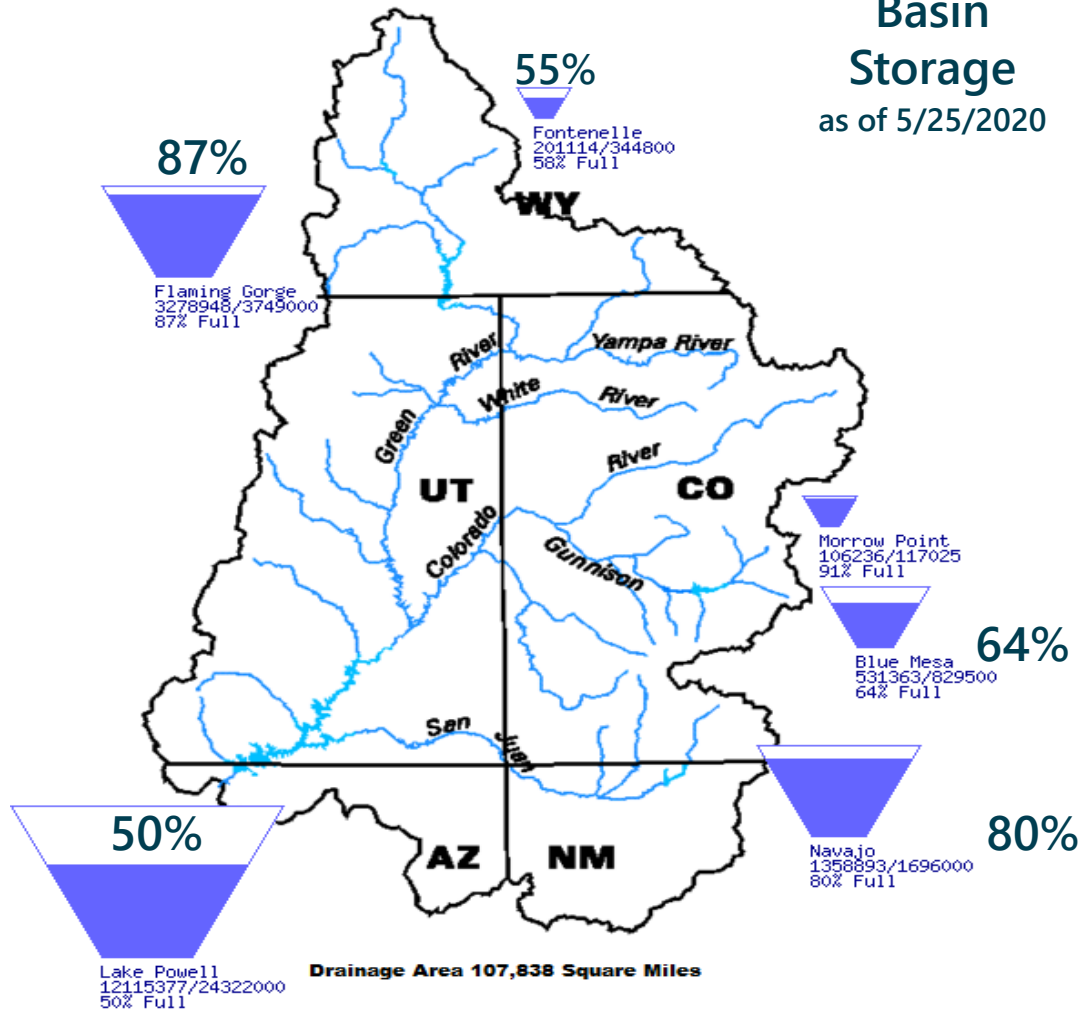


Upper Basin Storage

Data Current as of:
05/25/2020

Upper Colorado River Drainage Basin

Basin Storage
as of 5/25/2020



2020 April – July Unregulated Inflow Forecast

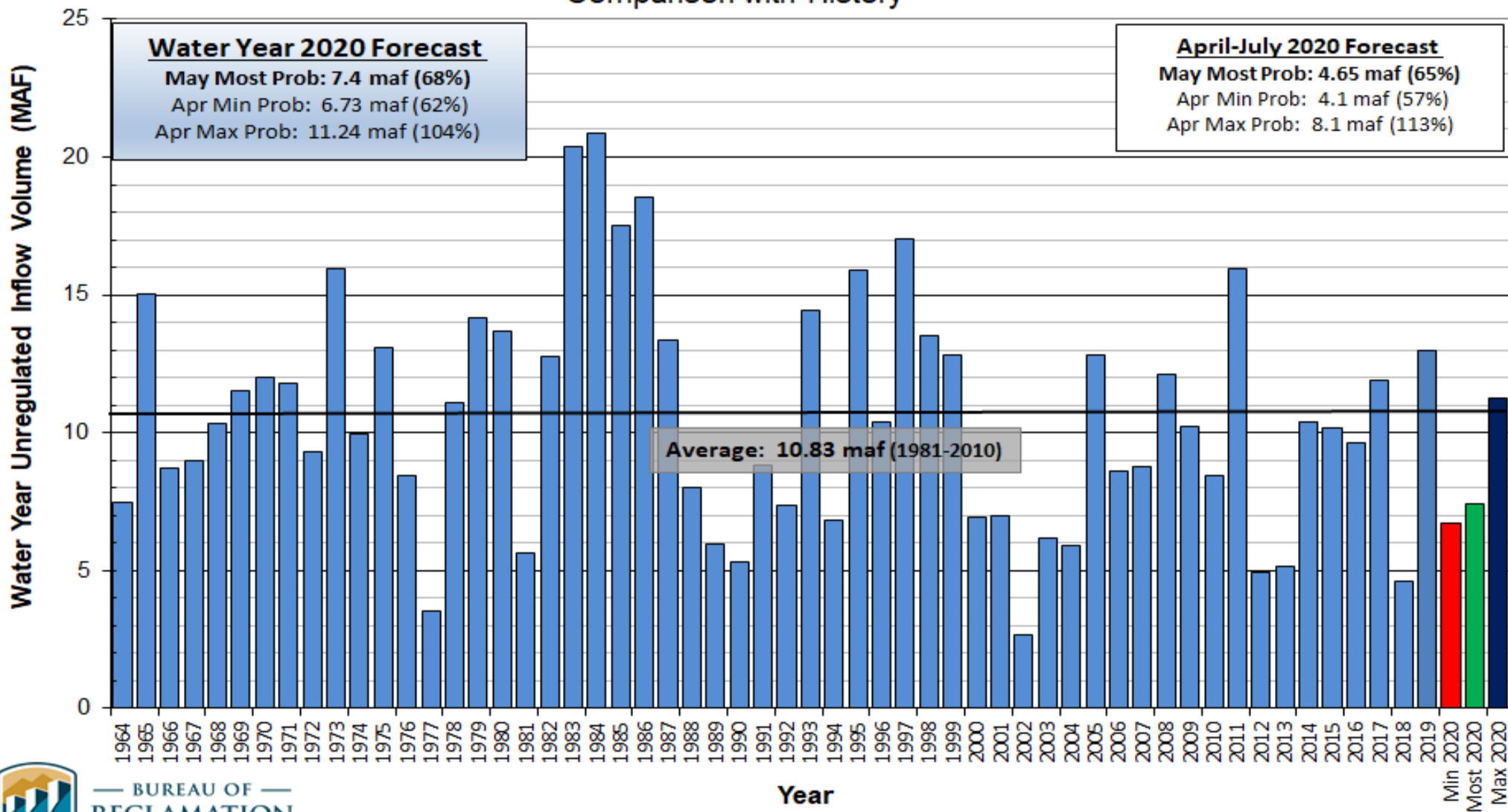
as of May 18, 2020

| Reservoir | Forecast (kaf) | Percent of Average ¹ |
|---------------|----------------|---------------------------------|
| Fontenelle | 640 | 88 |
| Flaming Gorge | 820 | 84 |
| Blue Mesa | 395 | 59 |
| Navajo | 365 | 50 |
| Powell | 4,400 | 61 |

¹ Percent of average based on the period of record from 1981-2010.



Lake Powell Unregulated Inflow Water Year 2020 Forecast *(issued May 4)* Comparison with History



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Timing of Operational Decisions

- August 24-Month Study projections of January 1 elevations sets the operating tiers for Lake Powell and Lake Mead
- When Lake Powell is in Upper Elevation Balancing Tier, April 24-Month Study projections of September 30 elevations may result in an adjustment to Powell's operations



B. Upper Elevation Balancing Tier

1. In Water Years when the projected January 1 Lake Powell elevation is below the elevation stated in the Lake Powell Equalization Elevation Table and at or above 3,575 feet, the Secretary shall release 8.23 maf from Lake Powell if the projected January 1 Lake Mead elevation is at or above 1,075 feet.
2. If the projected January 1 Lake Powell elevation is below the elevation stated in the Lake Powell Equalization Elevation Table and at or above 3,575 feet and the projected January 1 Lake Mead elevation is below 1,075 feet, the Secretary shall balance the contents of Lake Mead and Lake Powell, but shall release not more than 9.0 maf and not less than 7.0 maf from Lake Powell in the Water Year.
3. When operating in the Upper Elevation Balancing Tier, if the April 24-Month Study projects the September 30 Lake Powell elevation to be greater than the elevation in the Lake Powell Equalization Elevation Table, the Equalization Tier will govern the operation of Lake Powell for the remainder of the Water Year (through September).
4. When operating under Section 6.B.1, if the April 24-Month Study projects the September 30 Lake Mead elevation to be below 1,075 feet and the September 30 Lake Powell elevation to be at or above 3,575 feet, the Secretary shall balance the contents of Lake Mead and Lake Powell, but shall release not more than 9.0 maf and not less than 8.23 maf from Lake Powell in the Water Year.
5. When Lake Powell is projected to be operating under Section 6.B.2. and more than 8.23 maf is projected to be released from Lake Powell during the upcoming Water Year, the Secretary shall recalculate the August 24-Month Study projection of the January 1 Lake Mead elevation to include releases above 8.23 maf that are scheduled to be released from Lake Powell during the months of October, November, and December of the upcoming Water Year, for the purposes of determining Normal or Shortage conditions pursuant to Sections 2.A. or 2.D. of these Guidelines.

August Determination

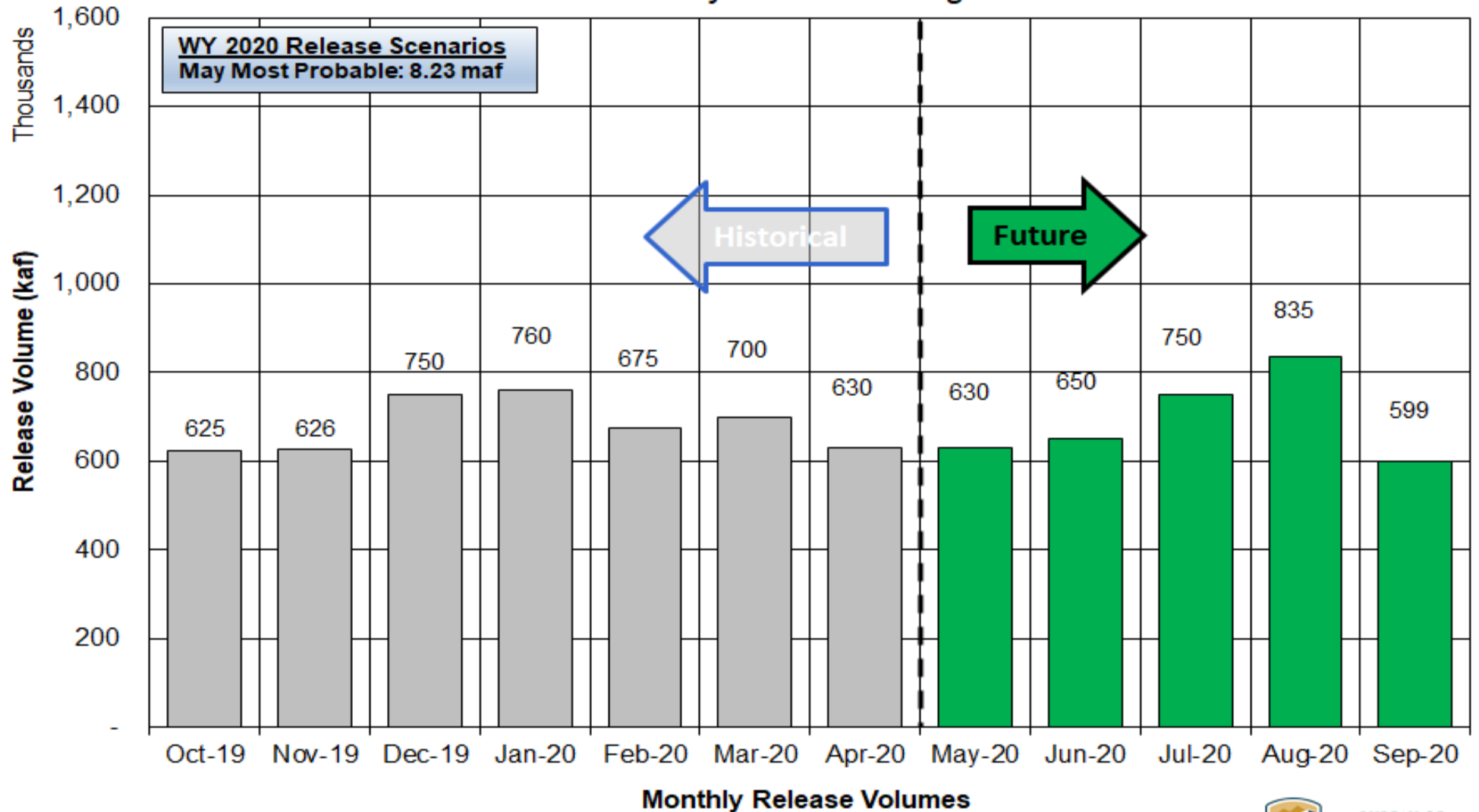
April Determination



Potential Lake Powell Monthly Release Volume Distribution

Release Scenarios for Water Year 2020

Based on May 2020 Modeling



B. Upper Elevation Balancing Tier

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3. When operating in the Upper Elevation Balancing Tier, if the April 24-Month Study projects the September 30 Lake Powell elevation to be greater than the elevation in the Lake Powell Equalization Elevation Table, the Equalization Tier will govern the operation of Lake Powell for the remainder of the Water Year (through September).
4. When operating under Section 6.B.1, if the April 24-Month Study projects the September 30 Lake Mead elevation to be below 1,075 feet and the September 30 Lake Powell elevation to be at or above 3,575 feet, the Secretary shall balance the contents of Lake Mead and Lake Powell, but shall release not more than 9.0 maf and not less than 8.23 maf from Lake Powell in the Water Year.
5. When Lake Powell is projected to be operating under Section 6.B.2. and more than 8.23 maf is projected to be released from Lake Powell during the upcoming Water Year, the Secretary shall recalculate the August 24-Month Study projection of the January 1 Lake Mead elevation to include releases above 8.23 maf that are scheduled to be released from Lake Powell during the months of October, November, and December of the upcoming Water Year, for the purposes of determining Normal or Shortage conditions pursuant to Sections 2.A. or 2.D. of these Guidelines.

August Determination

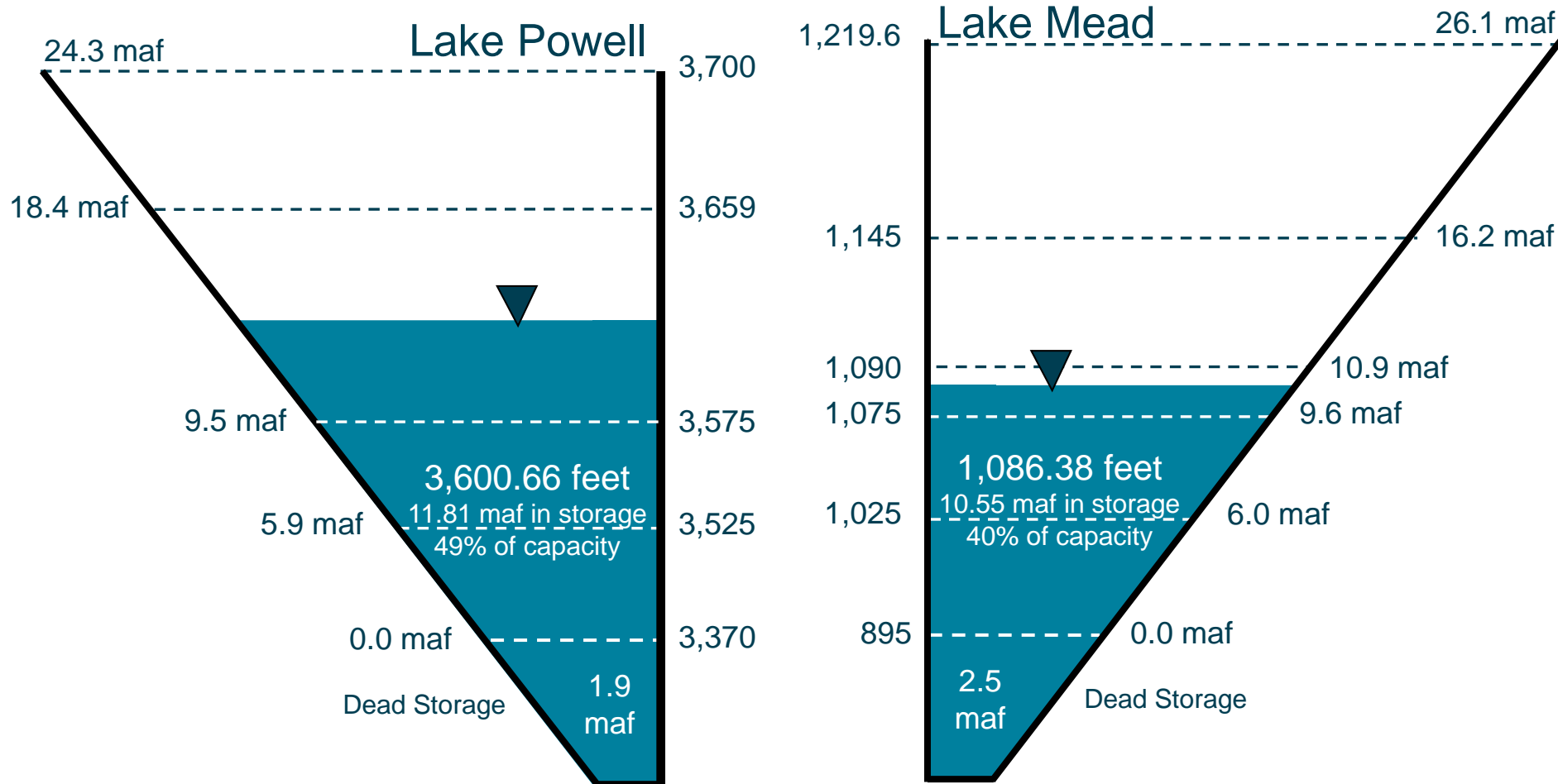
April Determination



End of Calendar Year 2020 Projections

May 2020 24-Month Study Most Probable Inflow Scenario¹

Based on a Lake Powell release of 8.23 maf in WY 2020 & 9.00 maf in WY 2021



Not to Scale

¹ WY 2020 unregulated inflow into Lake Powell is based on the CBRFC forecast dated 5/4/20.



Lake Powell 2021 Operating Tier Scenarios

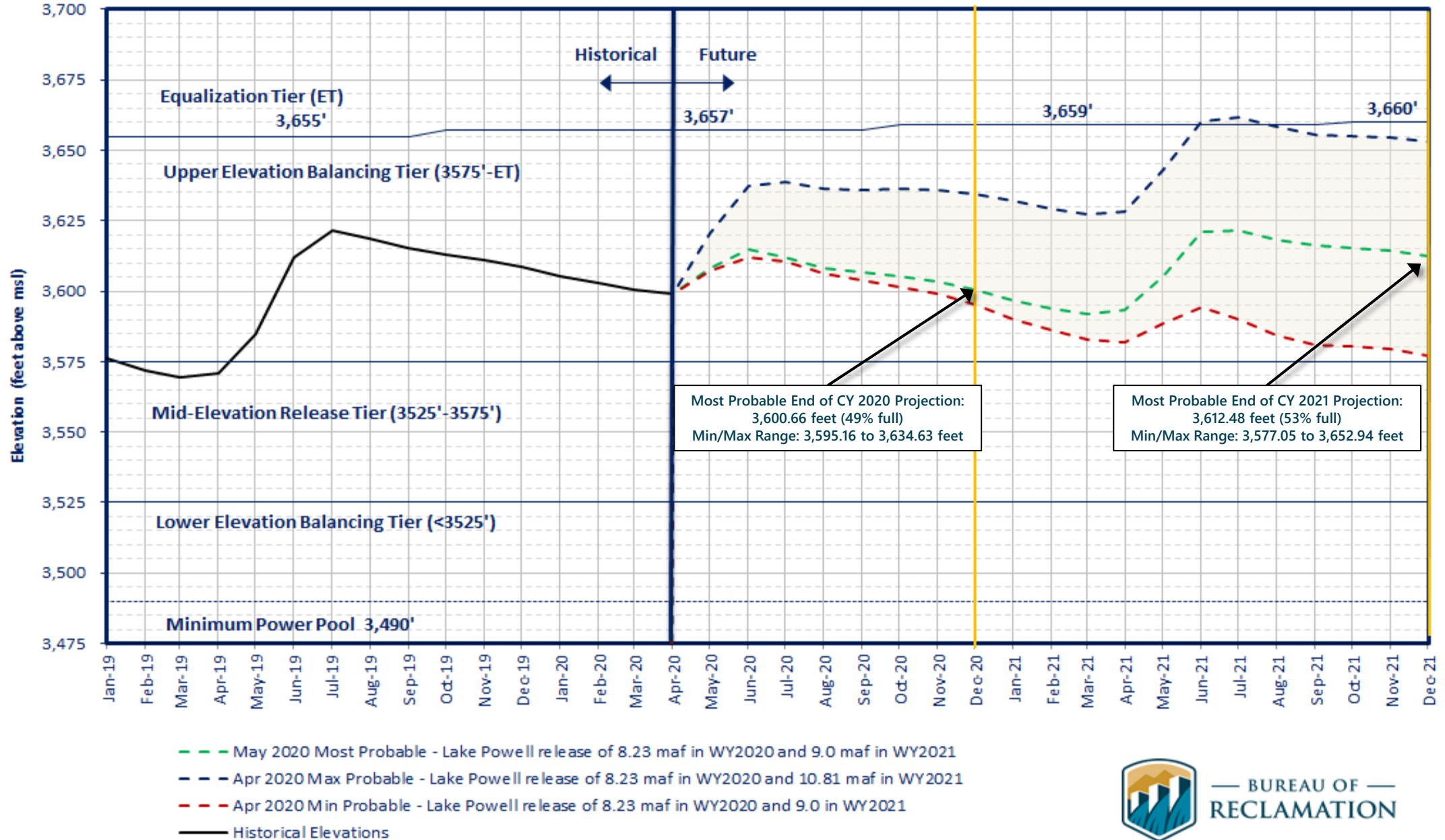
Based on April and May 2020 24-Month Study

| Inflow Scenario | Operating Tier/ Release Volume |
|------------------------|---------------------------------------|
| April Minimum Probable | Upper Elevation Balancing 9.00 maf |
| May Most Probable | Upper Elevation Balancing 9.00 maf |
| April Maximum Probable | Equalization 10.81 maf |



Lake Powell End of Month Elevations

Historic and Projected based on April and May 2020 24-Month Study Inflow Scenarios

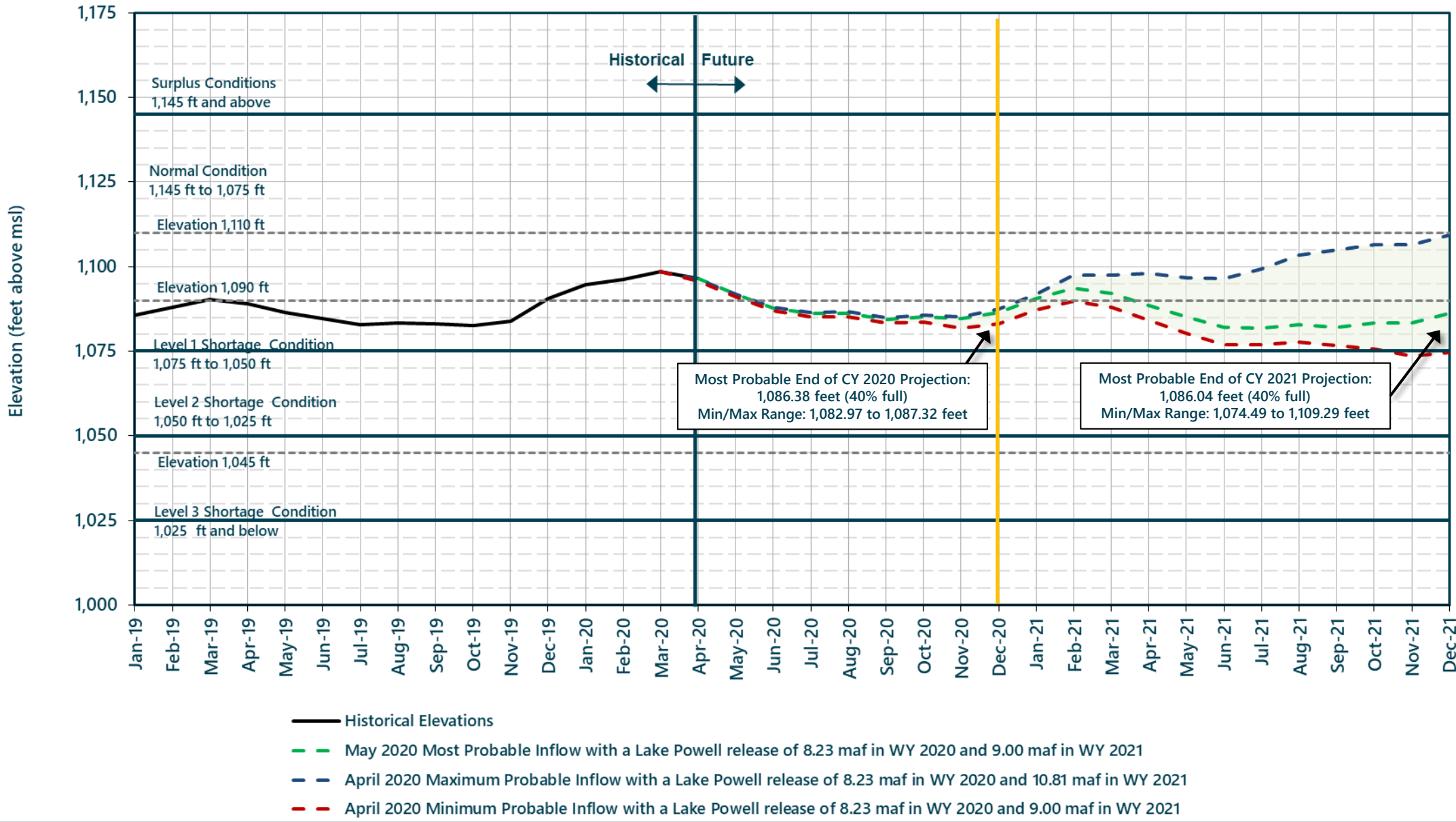


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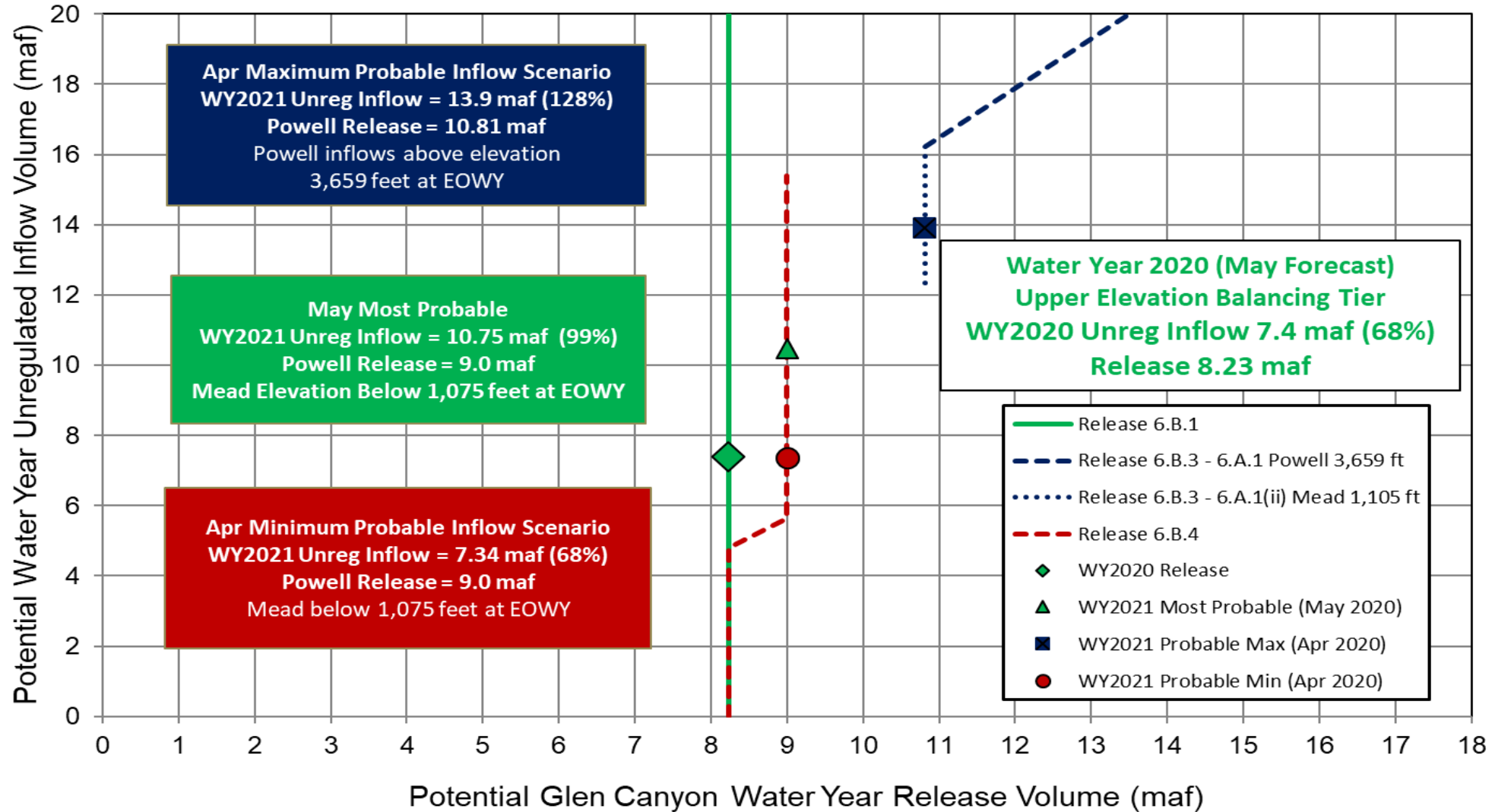
Lake Mead End of Month Elevations

Projections from the May 2020 24-Month Study Inflow Scenarios



Lake Powell Release Scenarios under Section 6.B

Water Year 2020 and 2021 Release Volume as a Function of Upper Elevation Balancing Tier based on April and May 2020 24-Month Study Conditions



Glen Canyon Power Plant Planned Unit Outage Schedule for Water Year 2020

| Unit Number | Oct 2019 | Nov 2019 | Dec 2019 | Jan 2020 | Feb 2020 | Mar 2020 | Apr 2020 | May 2020 | Jun 2020 | Jul 2020 | Aug 2020 | Sep 2020 |
|-------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------------------|----------|
| 1 | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| Units Available | 5 | 6 | 6 | 6 | 6 | 5 | 6 | 6 | 6 | 6 | 6 | 6 |
| Capacity (cfs) | 16,800 | 20,500 | 20,400 | 20,400 | 20,300 | 16,500 | 20,200 | 20,400 | 20,600 | 20,500 | 20,400 | 20,400 |
| Capacity (kaf/month) | 1,060 | 1,160 | 1,420 | 1,250 | 1,180 | 1,100 | 1,210 | 1,300 | 1,390 | 1,300 | 1,290 | 1,250 |
| Max (kaf) ¹ | 625 | 625 | 750 | 760 | 675 | 700 | 630 | 630 | 650 | 750 | 835 | 599 |
| Most (kaf) ² | 625 | 625 | 750 | 760 | 675 | 700 | 630 | 630 | 650 | 750 | 835 | 599 |
| Min (kaf) ¹ | 625 | 625 | 750 | 760 | 675 | 700 | 630 | 630 | 650 | 750 | 835 | 599 |
| | | | | | | | | | | | (updated 05-22-2020) | |

May MOST*
APR MAX
8.23
8.23
8.23

- 1 Projected release, based on May 2020 MOST Probable Inflow Projections and 24-Month Study model runs
- 2 Projected release, based on April 2020 Min and Max Probable Inflow Projections and 24-Month Study model runs
- 3 *Dependent upon availability to shift regulation and reserves



Glen Canyon Power Plant Planned Unit Outage Schedule for Water Year 2021

| Unit Number | Oct 2020 | Nov 2020 | Dec 2020 | Jan 2021 | Feb 2021 | Mar 2021 | Apr 2021 | May 2021 | Jun 2021 | Jul 2021 | Aug 2021 | Sep 2021 | |
|-------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------------------|----------|----------|-----------|
| 1 | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| Units Available | 4 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | |
| Capacity (cfs) | 12,900 | 20,300 | 20,200 | 20,100 | 20,100 | 20,000 | 20,000 | 20,300 | 20,700 | 20,700 | 20,700 | 20,600 | May MOST* |
| Capacity (kaf/month) | 1,310 | 1,270 | 1,290 | 1,290 | 1,160 | 1,310 | 1,240 | 1,300 | 1,280 | 1,360 | 1,350 | 1,310 | APR MAX |
| Max (kaf) ¹ | 640 | 640 | 720 | 860 | 970 | 920 | 1,030 | 910 | 960 | 1,110 | 1,170 | 877 | 10.81 |
| Most (kaf) ² | 640 | 640 | 720 | 860 | 750 | 800 | 710 | 710 | 750 | 850 | 900 | 670 | 9.0 |
| Min (kaf) ¹ | 640 | 640 | 720 | 860 | 750 | 800 | 710 | 710 | 750 | 850 | 900 | 670 | 9.0 |
| | | | | | | | | | | (updated 05-22-2020) | | | |

- 1 Projected release, based on May 2020 Most Probable Inflow Projections and 24-Month Study model runs
- 2 Projected release, based on April 2020 Min and Max Probable Inflow Projections and 24-Month Study model runs
- 3 *Dependent upon availability to shift regulation and reserves

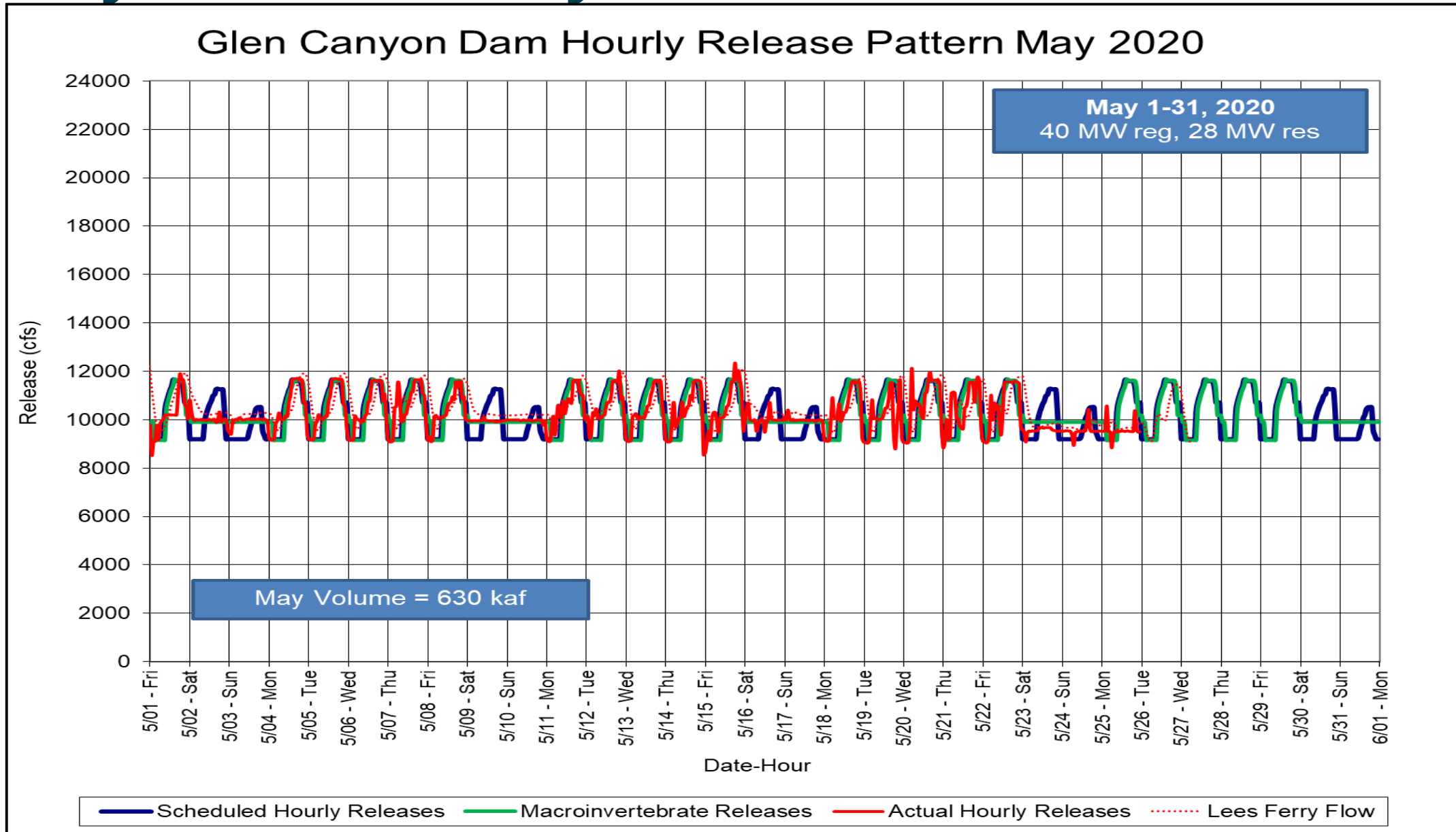


Bug Flow Hydrograph

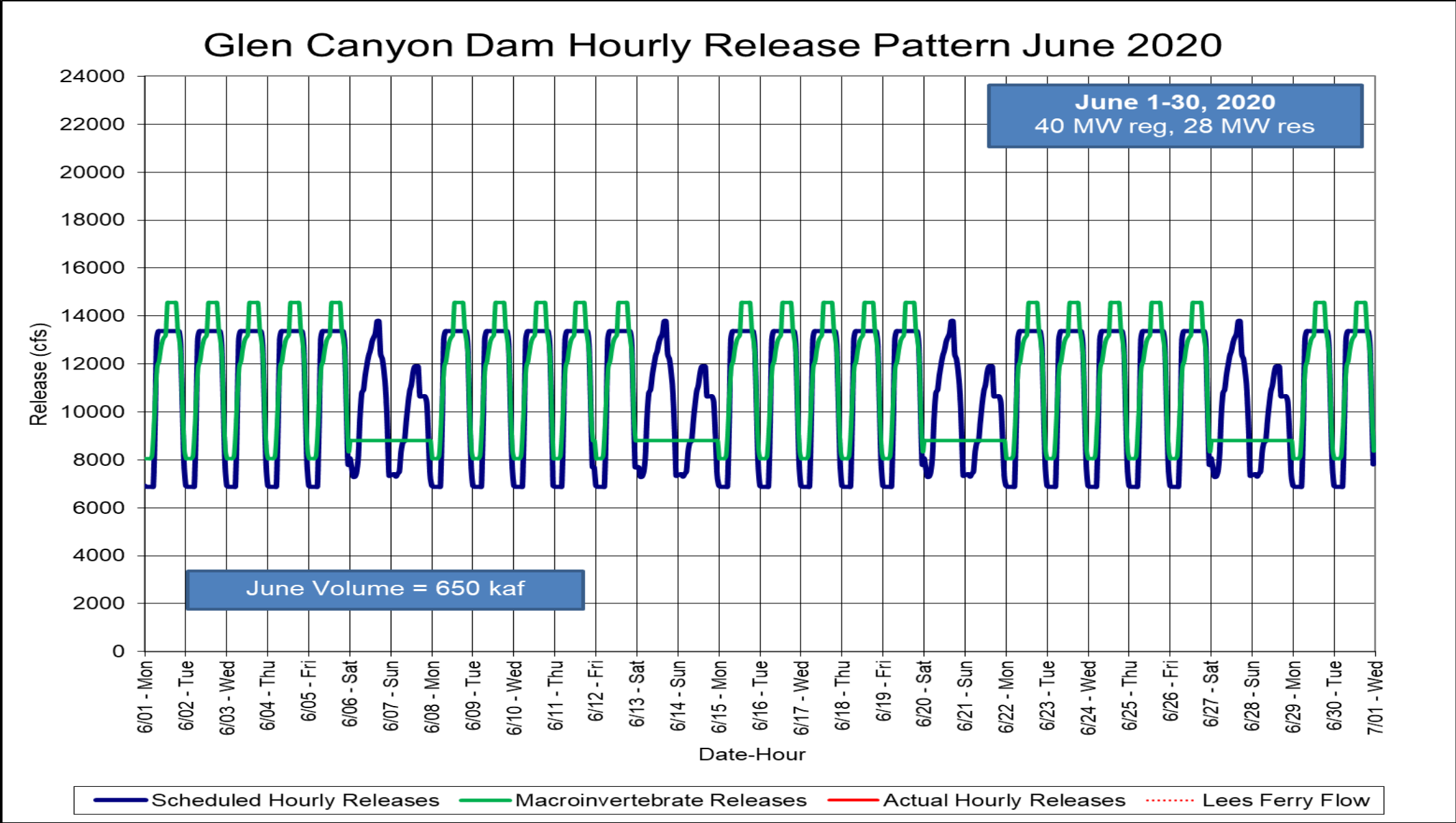
- Hydrograph characteristics:
 - Implement May 1 through August 31, 2020
 - Steady weekend lows, fluctuating weekday releases
 - Weekend lows 750 cfs higher than weekday lows
 - Weekly, monthly, and annual release volumes do not change
 - Hydropower reserves, regulation and emergency criteria remain in effect

| Month | Release Volume (af) | Maximum Daily Fluctuation (cfs) | Weekday Maximum (cfs) | Weekday Minimum (cfs) | Weekend Release (cfs) |
|--------|---------------------|---------------------------------|-----------------------|-----------------------|-----------------------|
| May | 630,000 | 2,525 | 11,665 | 9,135 | 9,890 |
| June | 650,000 | 6,500 | 14,565 | 8,065 | 8,815 |
| July | 750,000 | 7,500 | 16,030 | 8,530 | 9,280 |
| August | 835,000 | 8,000 | 17,880 | 9,880 | 10,630 |

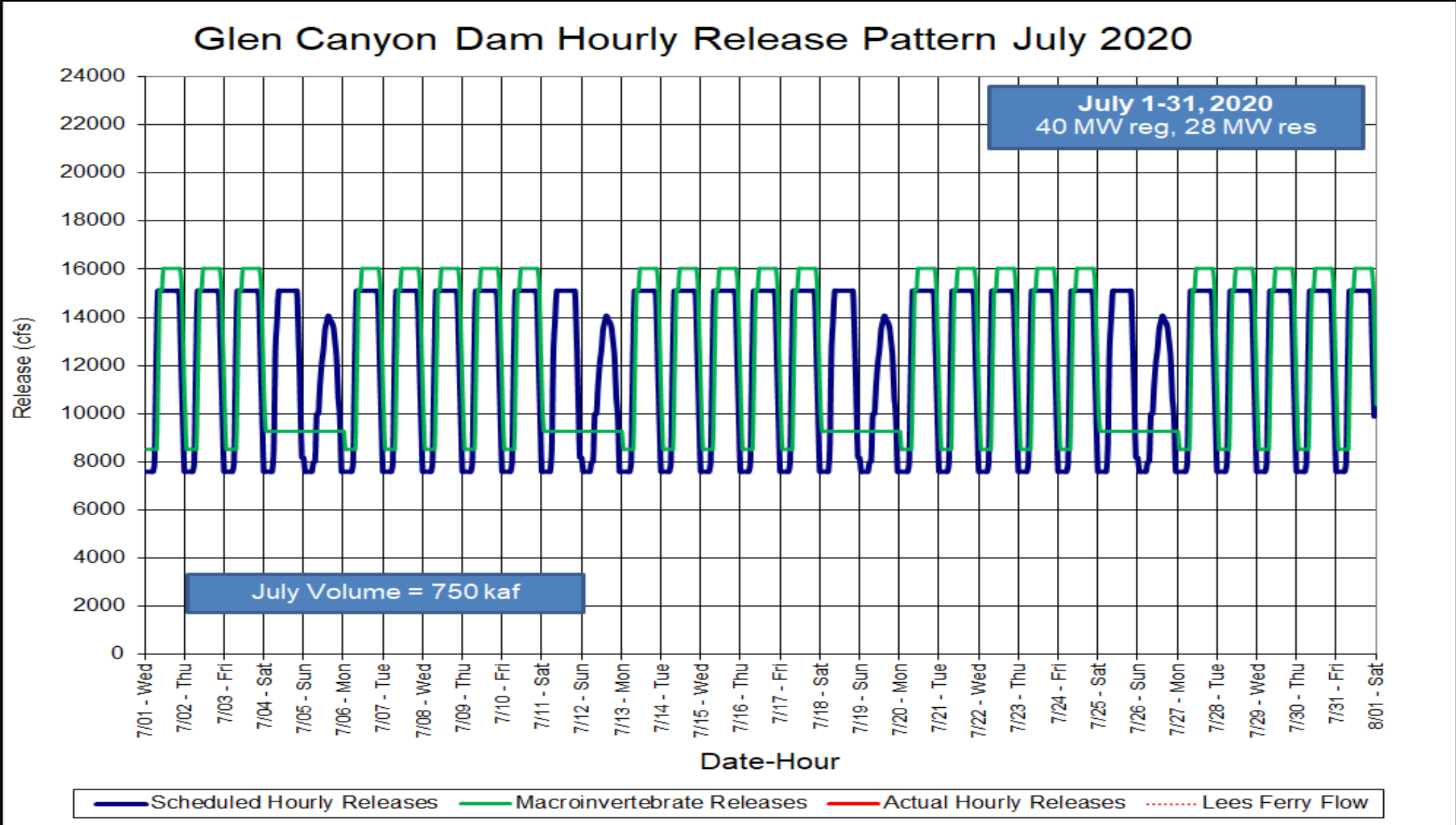
May 2020 Hourly Releases



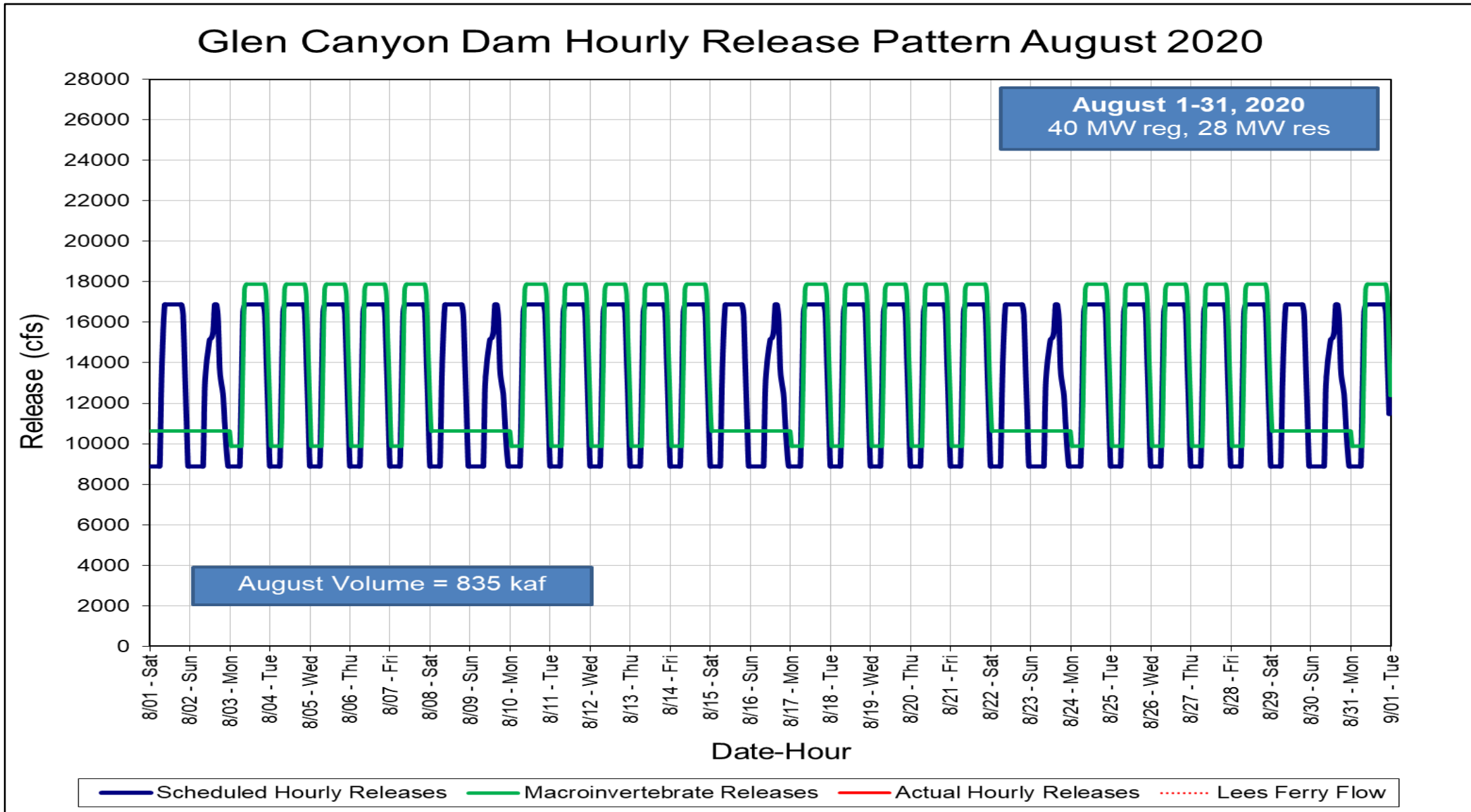
June 2020 Hourly Releases



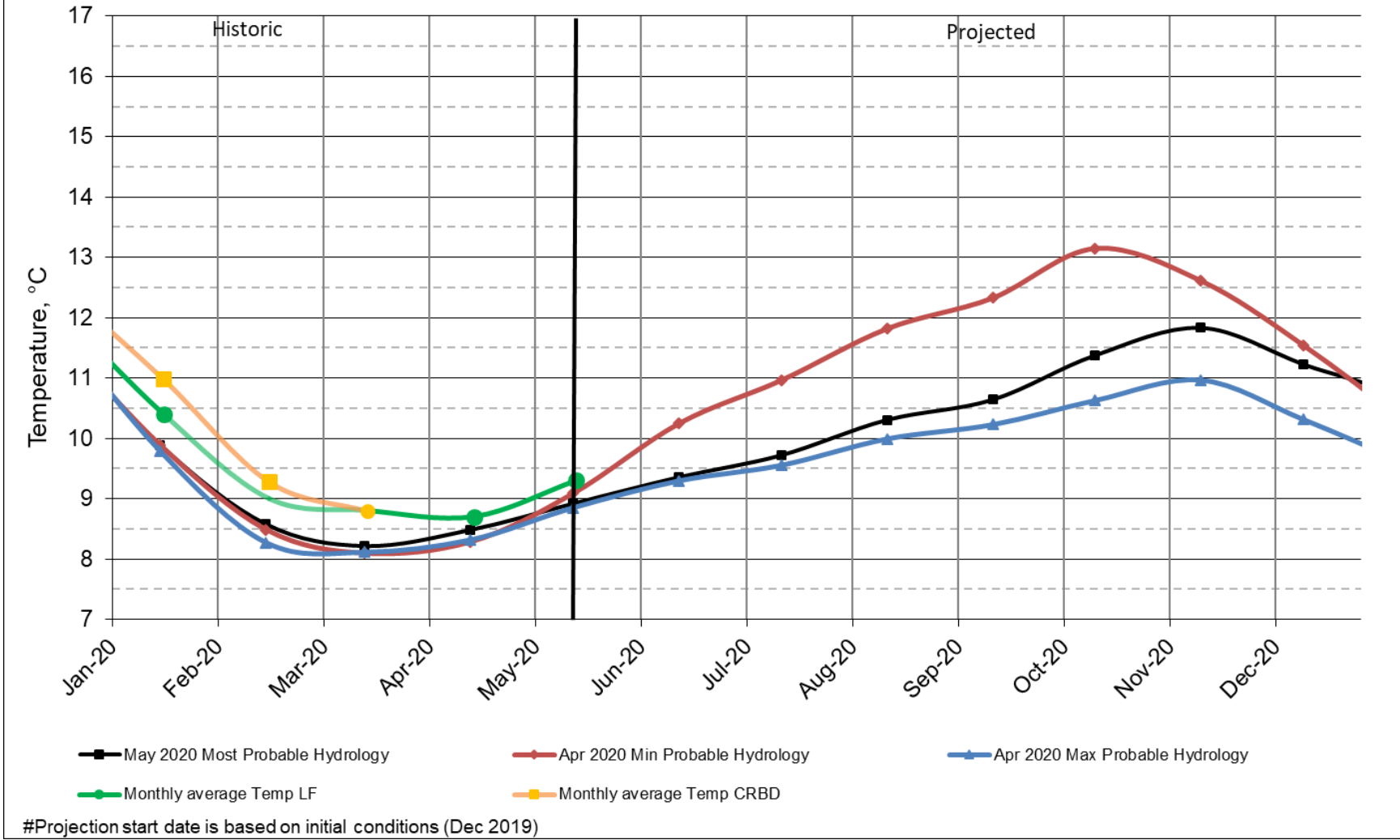
July 2020 Hourly Releases



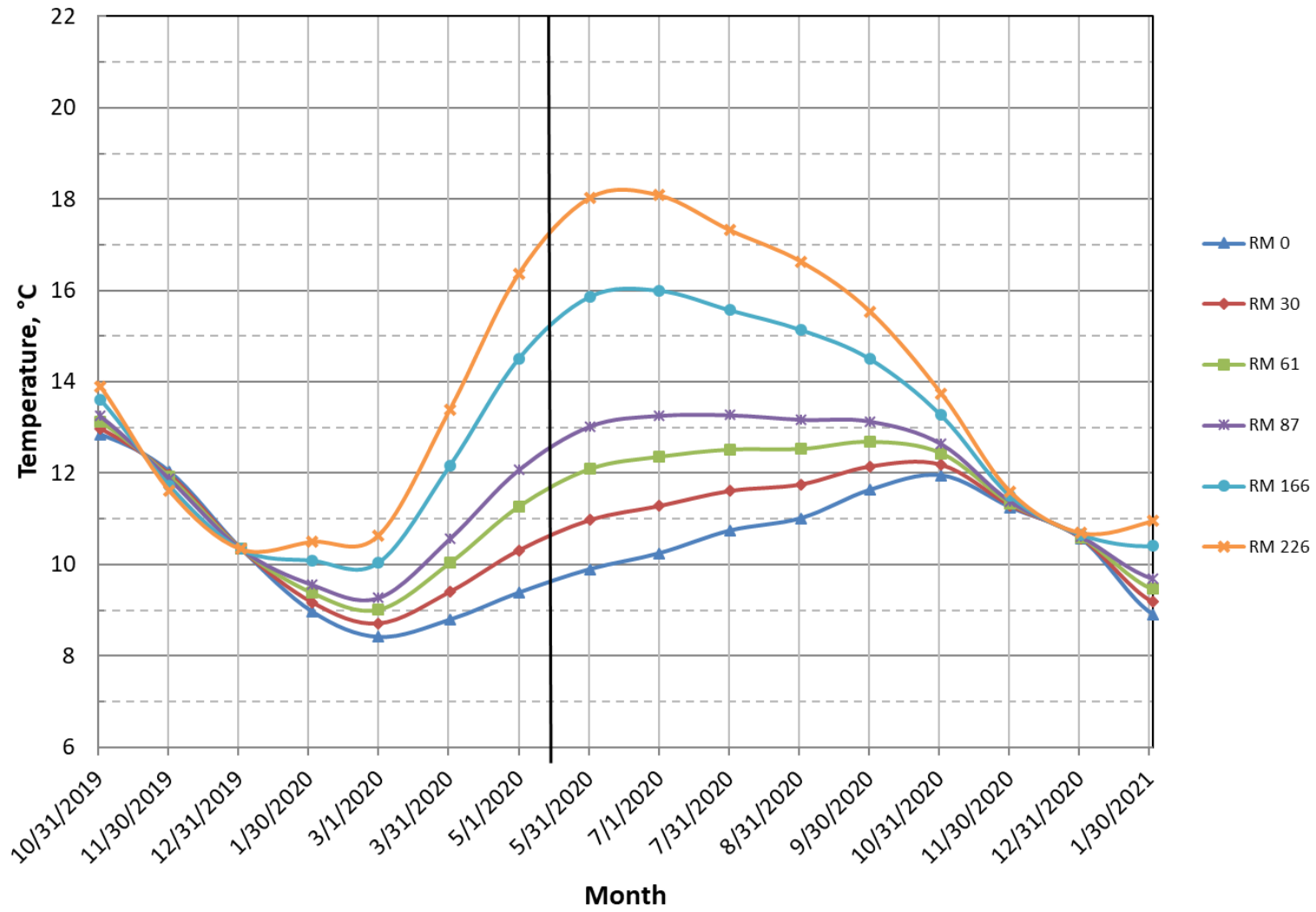
August 2020 Hourly Releases



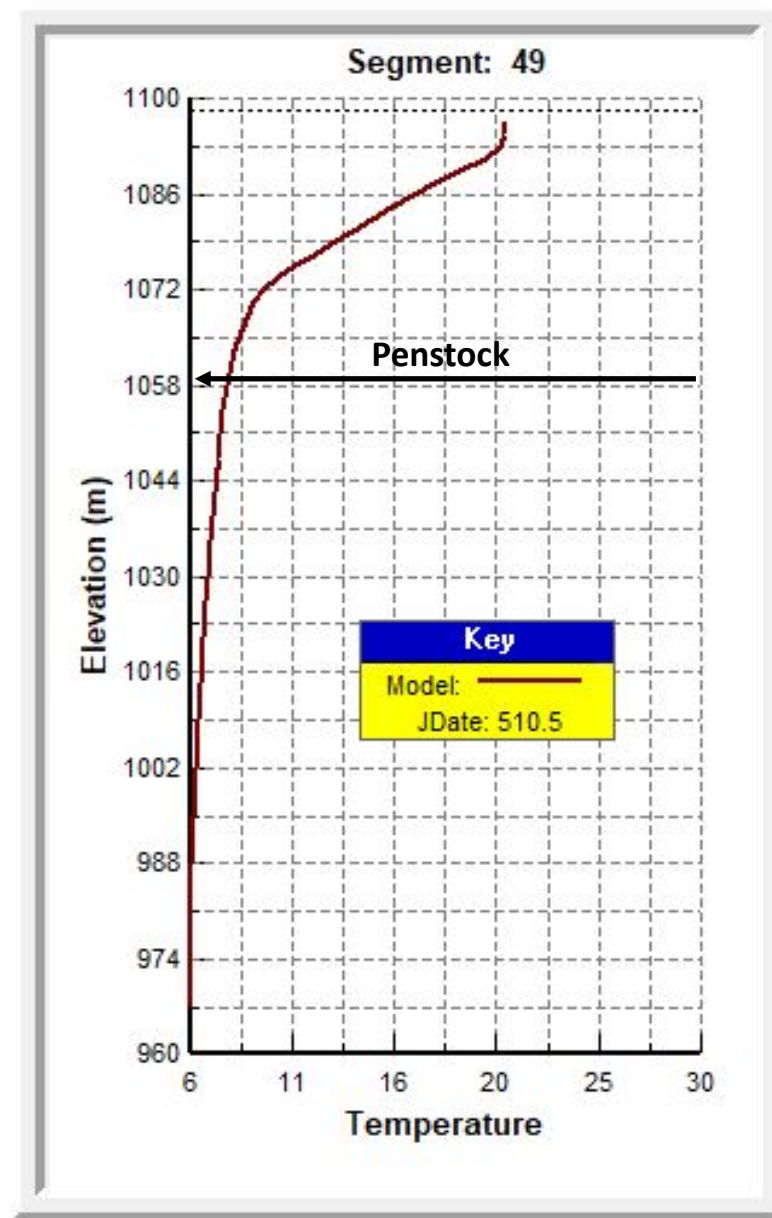
Lake Powell Release Temperature Projected Temperature based on May 2020 Forecast



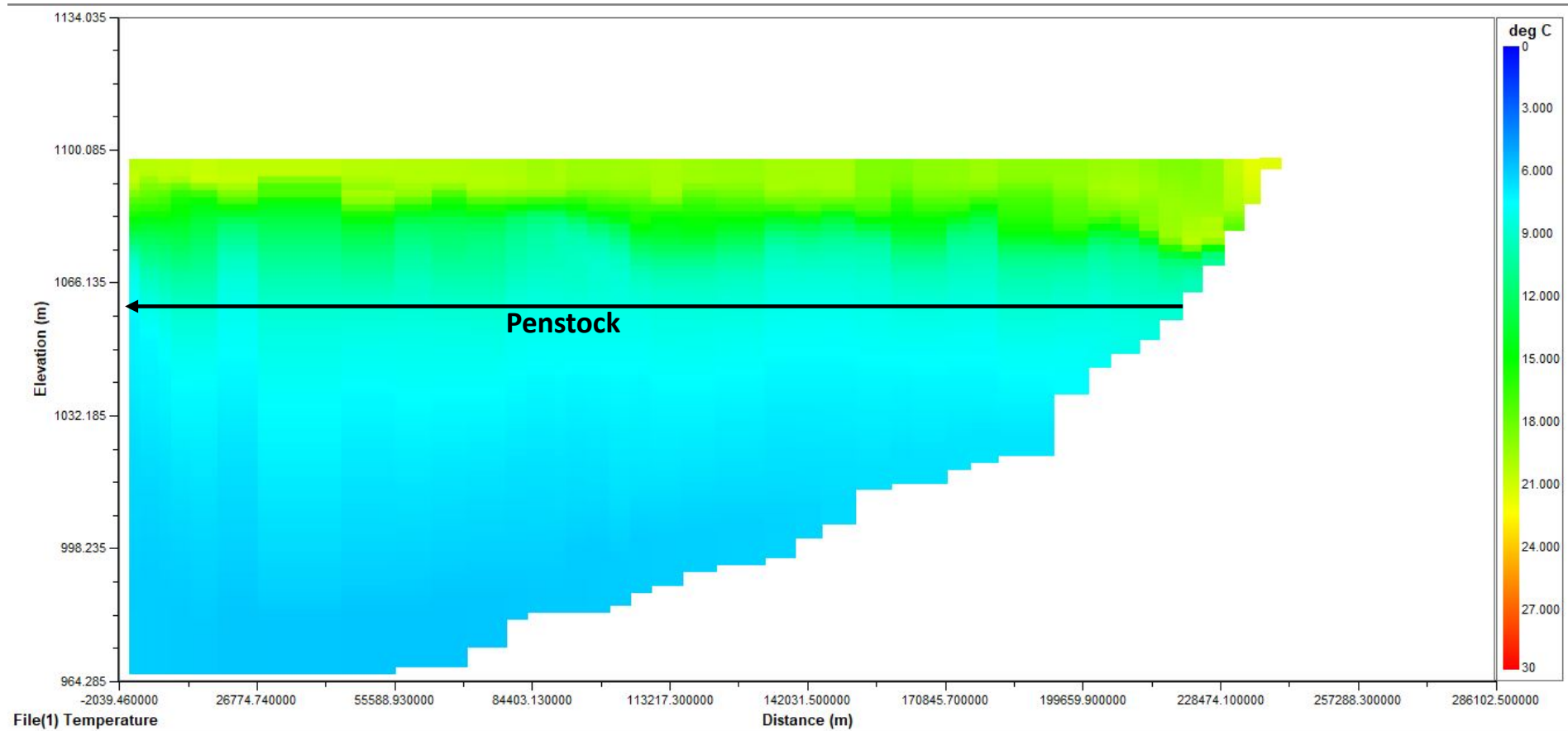
Colorado River, Grand Canyon Water Temperatures Projections based on May 2020, Most Probable Hydrology



Temperature Profile near GC Dam



Cross sectional Temperature Profile of Lake Powell



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