Motion requested. The following motion is recommended by TWG. However, no motion is officially made unless and until an AMWG member makes the motion in accordance with the AMWG Operating Procedures.

AMWG recommends to the Secretary of the Interior his approval the DOI-DOE Proposed Hydrograph for Water Year 2012 as follows:

- Monthly Release Volumes will be adjusted each month based on the most current forecast of the annual release required by the 2007 Interim Guidelines.
- Monthly Release Volumes are anticipated to vary within the targets identified for each month as set forth below. This monthly operational flexibility will be used for existing power production operations under the Modified Low Fluctuating Flow (MLFF) alternative selected by the 1996 ROD and contained in the 1995 FEIS. The targeted operation will also be adjusted as necessary to accommodate a targeted release volume for the month of August 2012 based on the schedule below:
  - January: August 2012 Volume target set to greater of 800 kaf or 10% remaining annual release volume.
  - February: August 2012 Volume target set to greater of 800 kaf or 10% remaining annual release volume.
  - March: August 2012 Volume target set to greater of 800 kaf or 12% remaining annual release volume.
  - April: August 2012 Volume target set to greater of 800 kaf or 15% remaining annual release volume.
  - May: August 2012 Volume target set to greater of 800 kaf or 20% remaining annual release volume.
  - June: August 2012 Volume target set to greater of 800 kaf or 25% remaining annual release volume.
  - July: August 2012 Volume target set to greater of 800 kaf or 40% remaining annual release volume.
  - August: Release volume established as 100% of remaining annual release volume (release could be less than 800 kaf in some cases).
- In some Equalization release scenarios, the release volume required in August could be as high as the full capacity of the powerplant.
- Steady flows will occur in September 2012 (and October 2012) per the 2008 HFE Environmental Assessment (EA).
- Monthly release volumes will be modified each month in consultation with Western Area Power Administration.
- The remaining annual release volume will be computed as the projected WY2012 annual release volume pursuant to the Interim Guidelines less volume already released in WY2012 less the September 2012 projected Steady Flow Experiment release volume.
Additionally, the Bureau of Reclamation will continue to apply best professional judgment in conducting actual operations and in response to changing conditions throughout the water year. Such efforts will continue to be undertaken in coordination with the DOI/DOE agencies to consider changing conditions and adjust projected operations in a manner consistent with the objectives of these parameters as stated above and pursuant to the Law of the River.

Presenters
Shane Capron, Chair, Technical Work Group (Western Area Power Administration)
Dave Trueman, Division Manager, Upper Colorado Region, Bureau of Reclamation

Previous Action Taken
✅ By TWG: At its June 2011 meeting, the TWG passed the following motion by a vote of 15-1-7. The TWG recommends to AMWG for their approval the DOI-DOE Proposed Hydrograph for Water Year 2012 as described in the Proposed Operating Parameters of the June 6, 2011 document.

Relevant Science
The TWG and AMWG were presented with the sediment/financial results from the DOI-DOE analysis of potential operational scenarios for 2012. These analyses were based upon the USGS sand retention model and Western’s GTMax power/financial model.

Background Information
Reclamation Report
The departments of Interior and Energy proposed a WY2012 hydrograph to TWG, which is recommending it to the AMWG. To assist in the deliberations of the Departments, Reclamation analyzed several combinations of hydrologic and operational scenarios with regard to impacts to sand retention and cost. The desired outcome was to minimize costs while maximizing sand retention high in the system for a potential fall HFE.

The presentation at the AMWG meeting will focus on the two operational “finalists,” which are compared in the following table.

<table>
<thead>
<tr>
<th>WY11 Hydrograph Method</th>
<th>Targeted Method (recommended for WY12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly volume may vary +/-100 kaf from average of remaining balance</td>
<td>August releases are limited using the percentage method to conserve sediment inputs</td>
</tr>
<tr>
<td>16,000 cfs daily limit up to 11.0 maf annual release</td>
<td>September and October low-steady releases also conserve sediment</td>
</tr>
<tr>
<td>22,000 cfs daily limit above 11.0 maf annual release</td>
<td>No limits on other months</td>
</tr>
<tr>
<td>No limits if needed for equalization</td>
<td>No limits if needed for equalization</td>
</tr>
<tr>
<td>ROD limits apply</td>
<td>ROD limits apply</td>
</tr>
</tbody>
</table>
Both of these operational options was analyzed against three different hydrologic tests, including:
- An “average” release that stayed constant at 9.3 maf throughout the year. This was the most probable release volume at the time of the study.
- Two tests that were designed to stress the operational scenarios with late season changes in both directions: increased volumes of water and decreased volumes.

The results of these analyses will be presented at the AMWG meeting.

The targeted hydrograph was recommended by DOI/DOE because of its performance in both the sand retention and cost categories.

**TWG Report**
The TWG heard reports on the development of the hydrograph proposal at its March and June 2011 meetings. No significant issues were raised with regard to the targeted proposal. Some concerns were discussed regarding the potential effect of an HFE on the hydrograph and on some of the language in the other parts of the report. Thus, TWG focused on passing the required portion of the report that describes the proposed hydrograph: “Proposed Operating Parameters” of the June 6, 2011 DOI/DOE document. One TWG member could not support the proposed hydrograph but did not propose an alternative at the TWG meeting.
2012 Hydrograph Development

Status

August 2011
2012 Hydrograph Development

• Start with 2011 Hydrograph
  (+/-100 kaf w/16,000 & 22,000 cfs limits)
• Consider operating experiences from 2011
• Look to improve cost/benefit/flexibility
• Within existing environmental compliance
Methods

• USGS Model for sand
• Western’s GTMAX hourly model for costs to the Basin Fund
• Compare against original MLFF
• Average sediment inputs
• Objective – Retain sand inputs high in the system in anticipation of a potential HFE
Bounding the Options
Monthly Release Volumes for 9.3 maf year
With November 2011 HFE

- Steady
- +/- 25 KAF
- +/- 50 KAF
- +/- 100 KAF
- Original MLFF
- Pre-ROD
- Targeted
Bounding the Options
Upper Marble Canyon (RM30)
9.3 maf Release

<table>
<thead>
<tr>
<th></th>
<th>Nov 1</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steady</td>
<td>820 ktons</td>
<td>$2.66m</td>
</tr>
<tr>
<td>+/-25</td>
<td>732 ktons</td>
<td>$2.63m</td>
</tr>
<tr>
<td>+/-50</td>
<td>719 ktons</td>
<td>$2.36m</td>
</tr>
<tr>
<td>Targeted</td>
<td>694 ktons</td>
<td>$1.34m</td>
</tr>
<tr>
<td>+/-100</td>
<td>694 ktons</td>
<td>$1.75m</td>
</tr>
<tr>
<td>MLFF</td>
<td>572 ktons</td>
<td>Reference</td>
</tr>
<tr>
<td>Pre-ROD</td>
<td>453 ktons</td>
<td>-$2.78m</td>
</tr>
</tbody>
</table>
Finalists

2011 Hydrograph Method

- Monthly volume may vary +/- 100 kaf from average of remaining balance
- 16,000 cfs limit up to 11.0 maf annual release
- 22,000 cfs limit above 11.0 maf annual release
- No limits if needed for equalization
- ROD limits apply

Targeted Method

- August releases are limited using percentage method to conserve sediment inputs
- Sept/Oct low-steady releases also conserve sediment
- No limits on other months
- No limits if needed for equalization
- ROD limits apply
## 2012 Finalists
### 9.3 maf Release Example

#### +/-100 KAF (SCENARIO 18)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct</td>
<td>738</td>
<td>9.30</td>
<td>714</td>
<td>738</td>
<td>738</td>
</tr>
<tr>
<td>Nov</td>
<td>700</td>
<td>9.30</td>
<td>714</td>
<td>685</td>
<td>885</td>
</tr>
<tr>
<td>Dec</td>
<td>800</td>
<td>9.30</td>
<td>714</td>
<td>694</td>
<td>894</td>
</tr>
<tr>
<td>Jan</td>
<td>800</td>
<td>9.30</td>
<td>714</td>
<td>693</td>
<td>893</td>
</tr>
<tr>
<td>Feb</td>
<td>700</td>
<td>9.30</td>
<td>714</td>
<td>693</td>
<td>893</td>
</tr>
<tr>
<td>Mar</td>
<td>710</td>
<td>9.30</td>
<td>714</td>
<td>708</td>
<td>908</td>
</tr>
<tr>
<td>Apr</td>
<td>730</td>
<td>9.30</td>
<td>714</td>
<td>728</td>
<td>928</td>
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<tr>
<td>May</td>
<td>760</td>
<td>9.30</td>
<td>714</td>
<td>752</td>
<td>952</td>
</tr>
<tr>
<td>Jun</td>
<td>800</td>
<td>9.30</td>
<td>714</td>
<td>783</td>
<td>983</td>
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<tr>
<td>Jul</td>
<td>1,000</td>
<td>9.30</td>
<td>714</td>
<td>824</td>
<td>1,024</td>
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<tr>
<td>Aug</td>
<td>848</td>
<td>9.30</td>
<td>714</td>
<td>748</td>
<td>948</td>
</tr>
<tr>
<td>Sep</td>
<td>714</td>
<td>9.30</td>
<td>714</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Targeted (SCENARIO 19)

<table>
<thead>
<tr>
<th>Month</th>
<th>Release (kaf)</th>
<th>Annual Forecast (maf)</th>
<th>Sept Steady Flow Target (kaf)</th>
<th>Aug Target Percent</th>
<th>Aug Target Volume (kaf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct</td>
<td>738</td>
<td>9.30</td>
<td>714</td>
<td></td>
<td>800</td>
</tr>
<tr>
<td>Nov</td>
<td>700</td>
<td>9.30</td>
<td>714</td>
<td></td>
<td>800</td>
</tr>
<tr>
<td>Dec</td>
<td>800</td>
<td>9.30</td>
<td>714</td>
<td></td>
<td>800</td>
</tr>
<tr>
<td>Jan</td>
<td>800</td>
<td>9.30</td>
<td>714</td>
<td>10</td>
<td>800</td>
</tr>
<tr>
<td>Feb</td>
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<tr>
<td>Mar</td>
<td>700</td>
<td>9.30</td>
<td>714</td>
<td>12</td>
<td>800</td>
</tr>
<tr>
<td>Apr</td>
<td>600</td>
<td>9.30</td>
<td>714</td>
<td>15</td>
<td>800</td>
</tr>
<tr>
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<td>9.30</td>
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<tr>
<td>Jul</td>
<td>1,000</td>
<td>9.30</td>
<td>714</td>
<td>40</td>
<td>800</td>
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<tr>
<td>Aug</td>
<td>800</td>
<td>9.30</td>
<td>714</td>
<td>100</td>
<td>800</td>
</tr>
<tr>
<td>Sep</td>
<td>714</td>
<td>9.30</td>
<td>714</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Monthly Release Volumes
9.3 maf Release

Release (kaf)

Oct  Nov  Dec  Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sep

Targeted
+-100
Upper Marble Canyon (RM30)
9.3 maf

Bedload Sand (ktons)

<table>
<thead>
<tr>
<th>Date</th>
<th>+/-100</th>
<th>Targeted</th>
<th>MLFF</th>
<th>Nov 1</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/1/2011</td>
<td>650</td>
<td>624</td>
<td>526</td>
<td>650 ktons</td>
<td>$0.64m</td>
</tr>
<tr>
<td>1/1/2012</td>
<td></td>
<td>624</td>
<td>526</td>
<td>624 ktons</td>
<td>$0.41m</td>
</tr>
<tr>
<td>1/1/2012</td>
<td></td>
<td>526</td>
<td></td>
<td>526 ktons</td>
<td>Reference</td>
</tr>
</tbody>
</table>

Legend:
- Red: +/-100 KAF
- Blue: August Target
- Purple: MLFF

Cost:
- $0.64m
- $0.41m
- Reference
Monthly Release Volumes

Release (kaf)

Oct    Nov    Dec    Jan    Feb    Mar    Apr    May    Jun    Jul    Aug    Sep

Targeted

+/100
Round 5b
Upper Marble Canyon (RM30)
9.3 maf > 8.23 maf

<table>
<thead>
<tr>
<th>Nov 1</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>+/-100</td>
<td>920 ktons</td>
</tr>
<tr>
<td>Targeted</td>
<td>910 ktons</td>
</tr>
<tr>
<td>MLFF</td>
<td>867 ktons</td>
</tr>
</tbody>
</table>
Monthly Release Volumes
9.3 maf > 9.72 maf Release (July 2009)
Round 5c
Upper Marble Canyon (RM30)
9.3 maf > 9.7 maf

<table>
<thead>
<tr>
<th>Nov 1</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>+/-100</td>
<td>501 ktons</td>
</tr>
<tr>
<td>Targeted</td>
<td>454 ktons</td>
</tr>
<tr>
<td>MLFF</td>
<td>369 ktons</td>
</tr>
</tbody>
</table>
Sand Retention in Upper Marble Canyon
Targeted Approach
June 24 Month Study Releases
(12.4 maf in 2011 and 12.8 in 2012)

All the releases scenarios converge at high equalization levels.

Releases are at or near powerplant capacity for the entire period causing releases to be relatively steady at about 23,000 cfs.

Releases during maintenance periods drop to a relatively steady 14,900 cfs.
Minimum Probable Inflow Scenario
Water Year 2012

Month
- Oct
- Nov
- Dec
- Jan
- Feb
- Mar
- Apr
- May
- Jun
- Jul
- Aug
- Sep

Monthly Release Volume (kaf)
- MLFF Approach
- Targeted Approach

October: 900 kaf
November: 1100 kaf
December: 1350 kaf
January: 1200 kaf
February: 650 kaf
March: 600 kaf
April: 600 kaf
May: 600 kaf
June: 600 kaf
July: 800 kaf
August: 800 kaf
September: 450 kaf
Most Probable Inflow Scenario
Water Year 2012

- MLFF Approach
- Targeted Approach