2018 SPRING SPILL OPERATIONS

TMT Yearend Review
December 19, 2018

Dan Turner
Reservoir Control Center, USACE

"The views, opinions and findings contained in this report are those of the authors(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other official documentation."

US Army Corps of Engineers ®

U.S.ARMY

PRESENTATION OUTLINE

Procedure to set spill caps for gas cap spill
State Water Quality Standards
TDG Management:

- 2018 Spill summary
- 2018 process
- TDG monitoring
- Tailwater conditions
- Downstream forebay conditions
- Discussion of environmental factors

Lessons Learned
Summary Statistics
Conclusion

US Army Corps of Engineers ®

U.S.ARMY

PROCEDURE TO SET SPILL CAPS FOR GAS CAP SPILL

2018 Spring Spill Operations:

- April 3 – June 20 for lower Snake projects
- April 10 – June 15 for lower Columbia projects

Daily Process (completed 79 times, 7 days/week)

1. Review data and flow / weather forecast
2. Run SYSTDG, as needed* (33 days)
3. Estimate maximum spill level that meets but does not exceed the gas cap, considering:
   - Spill and TDG relationship
   - Forecasted environmental factors.
   - Most restrictive gauge.
   - Travel time.
4. Coordinate with NOAA
5. Notify projects and BPA
6. Post spill caps on web

Weekly coordination at TMT

Monthly reporting to Court

* Staff did not run on weekends, or during periods of involuntary spill

US Army Corps of Engineers ®

U.S.ARMY

TDG WATER QUALITY STANDARDS (WQS) FOR FISH PASSAGE SPILL: GAS CAP

Washington – Criteria Adjustment

- TDG must not exceed:
  - 120% in project tailrace on 12-hr average
  - 115% in the next downstream forebay on 12-hr average
  - 1-hr average of 125%
- 12-hr average based on consecutive hours (rolling average)
- Applies to all 8 projects

Oregon – Standard Modification

- Spill must be reduced if TDG exceeds:
  - 120% in project tailrace on 12-hr average
  - 2 hours exceed 125%
- 12-hr average based on highest 12 hours (not consecutive)
- Applies to McNary, John Day, The Dalles and Bonneville

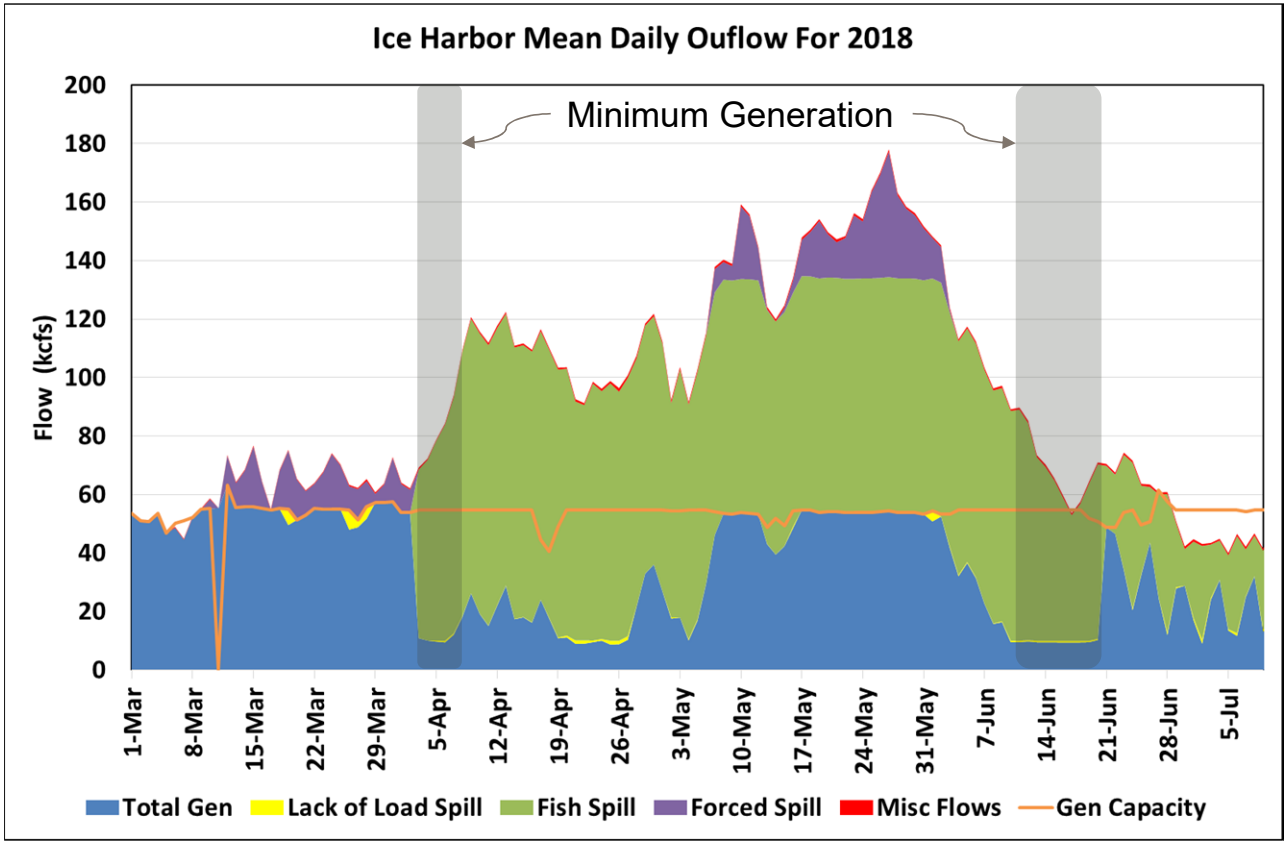
Corps must operate to the more restrictive state TDG WQS (and most restrictive gauge) in order to maintain TDG within all applicable state standards.

2018 SPRING SPILL SUMMARY

2018 runoff was 118% of average at The Dalles.

<u>Spill at the spill caps</u>
Snake River:
- April 3 – May 6 and
- June 3 – June 20
- except Ice Harbor:
  - April 8 – May 6 and
  - June 8 - 10

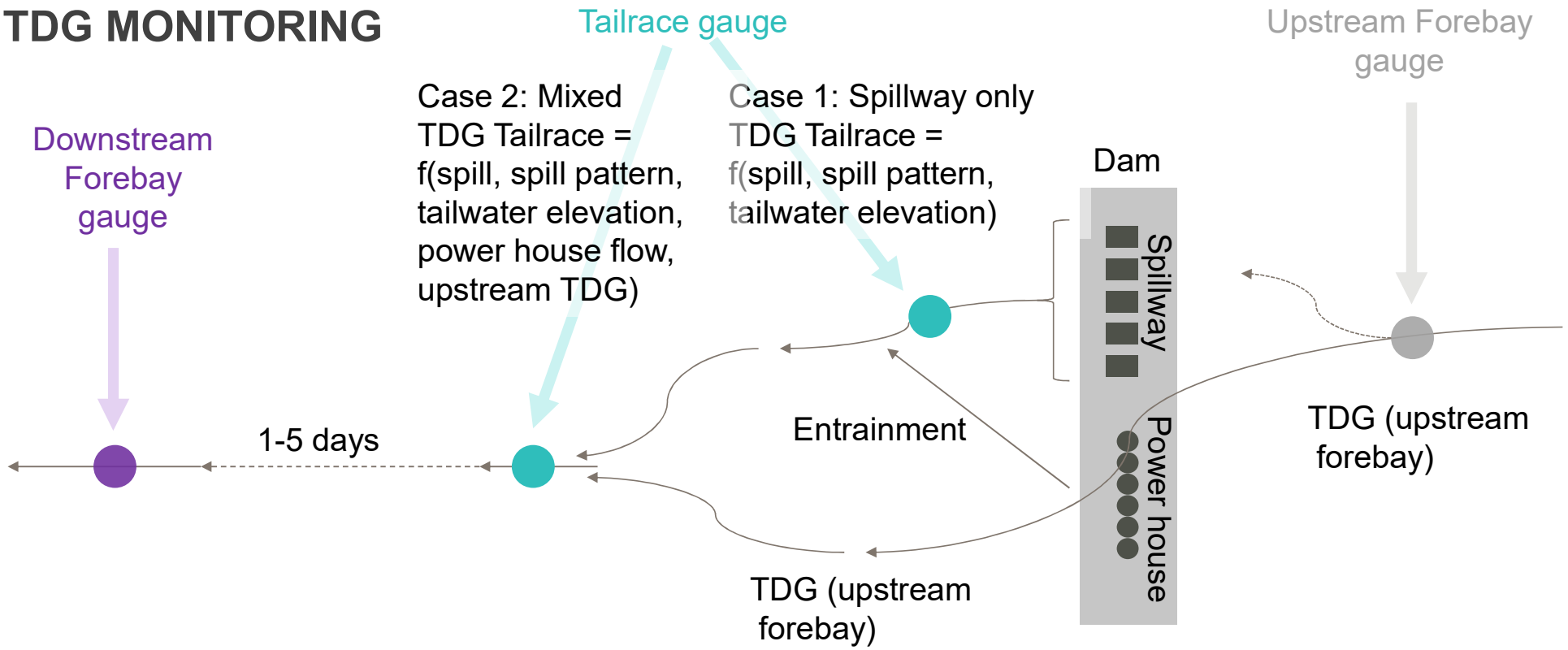
Columbia River:
- April 10 – April 28 and
- June 7 – June 15



US Army Corps of Engineers ®

U.S.ARMY

TDG MONITORING



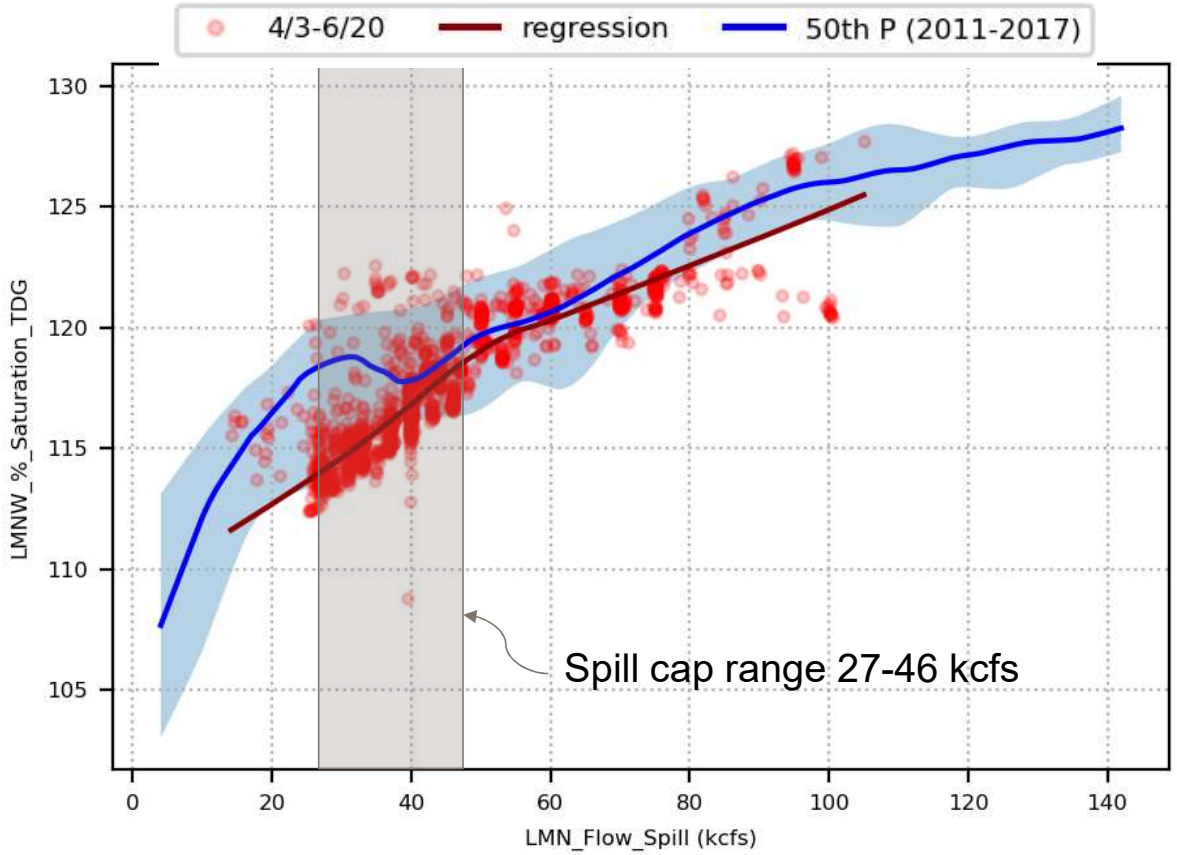
TDG downstream forebay = f(TDG Tailrace, TDG upstream forebay, spill flow, powerhouse flow, travel time, wind speed, water temperature, barometric pressure, dispersion)

US Army Corps of Engineers ®

U.S.ARMY

TAILWATER CONDITIONS

Lower Monumental, hourly TDG v spill

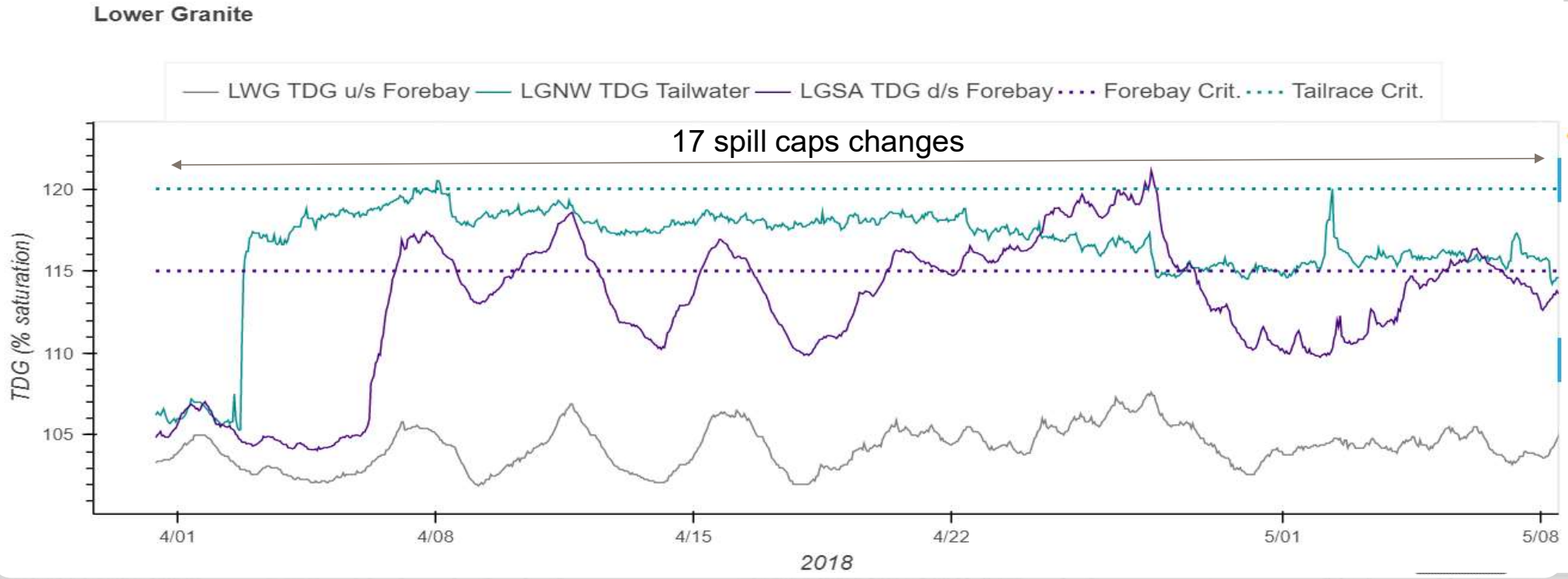


US Army Corps of Engineers ®

U.S.ARMY

EXAMPLE RESULTS:

- Travel time
- Degassing rate from tailrace to downstream forebay is variable.
- The downstream forebay can be greater to or equal to the tailrace TDG.
- The downstream forebay gauge is usually the most restrictive gauge.
- The factors outside of our control have a major impact on the forebay TDG.
- Changing spill rates cannot effectively keep forebay TDG at 115%.

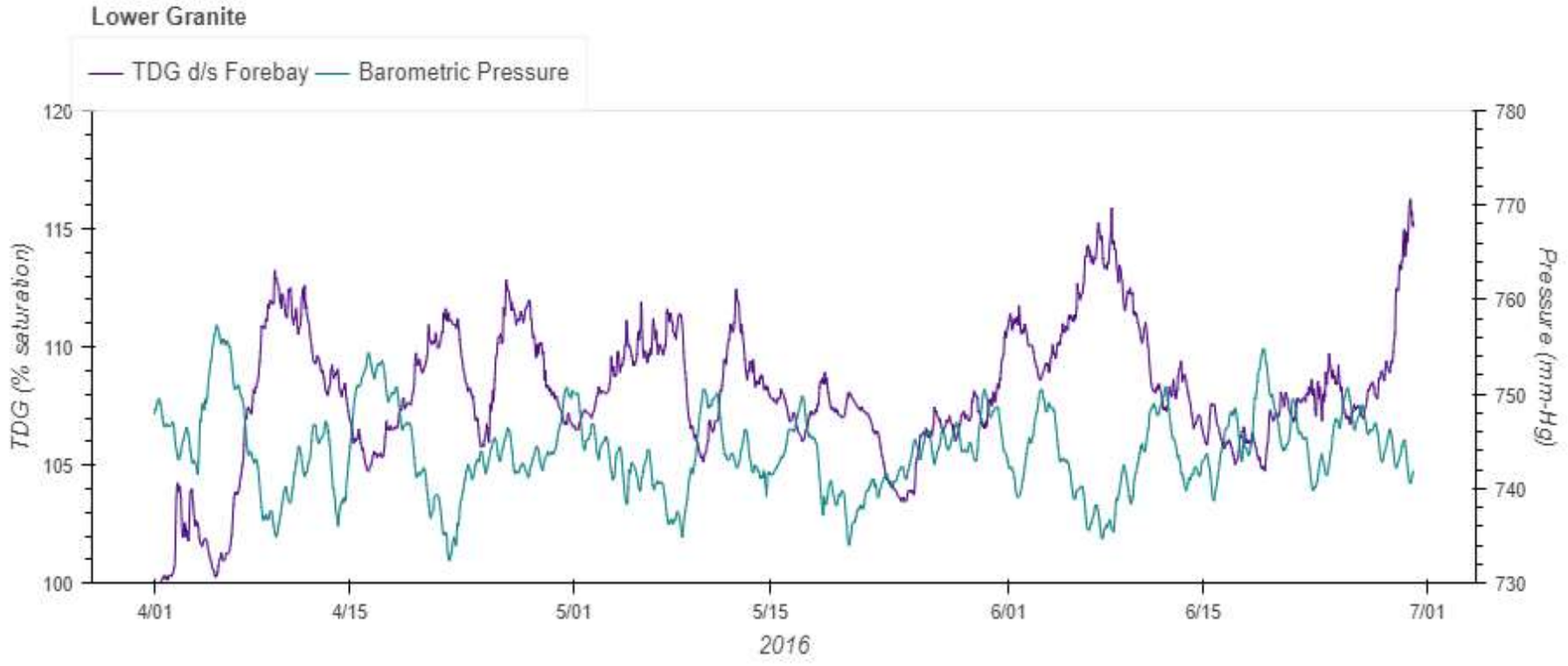


FACTORS BESIDES SPILL THAT IMPACT TDG: BAROMETRIC PRESSURE

$$TDG\ (\%\ of\ saturation) = \frac{TPP\ (mmHg)}{BP\ (mmHg)} * 100$$

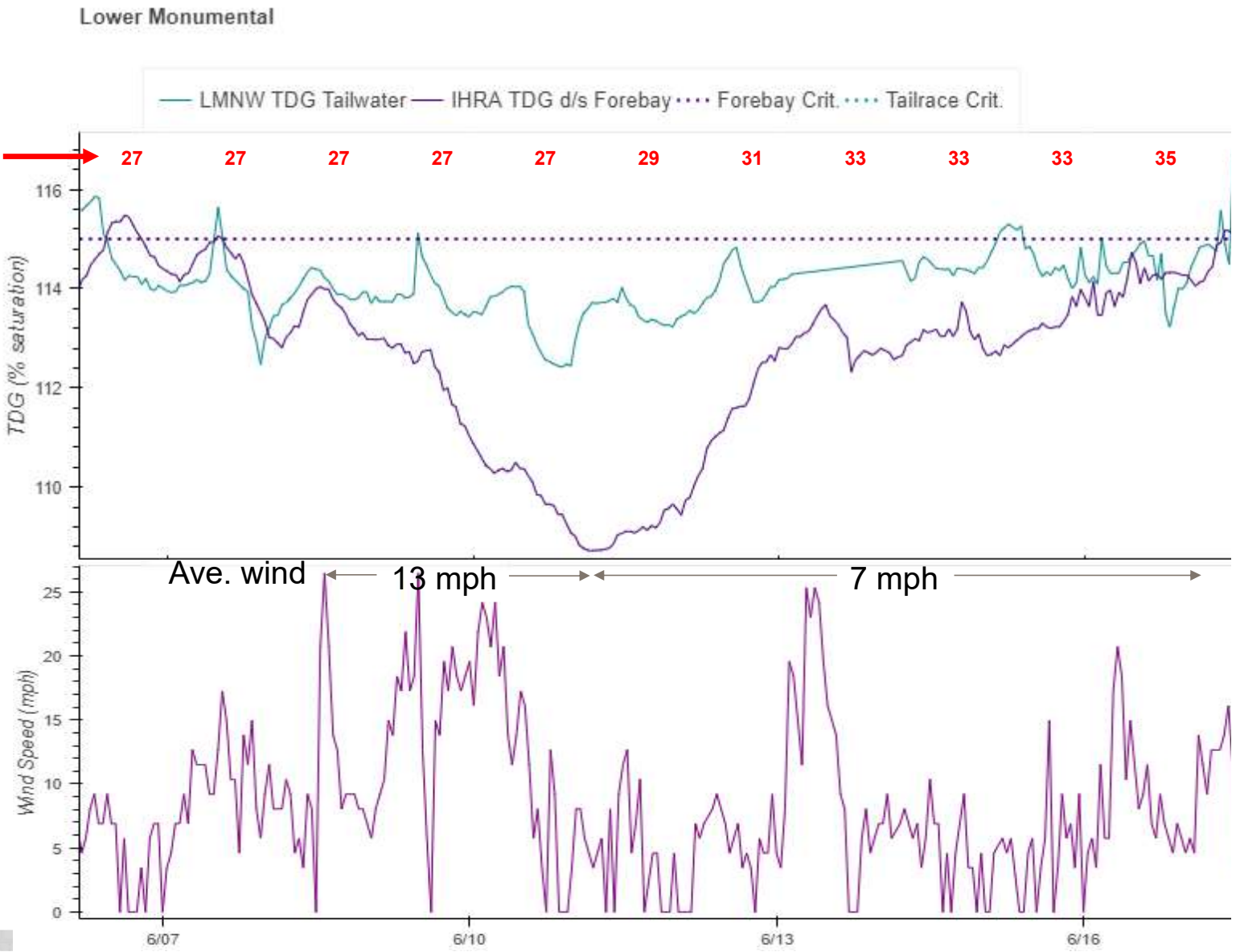
TPP = Partial pressure of all dissolved gases

BP = Barometric pressure



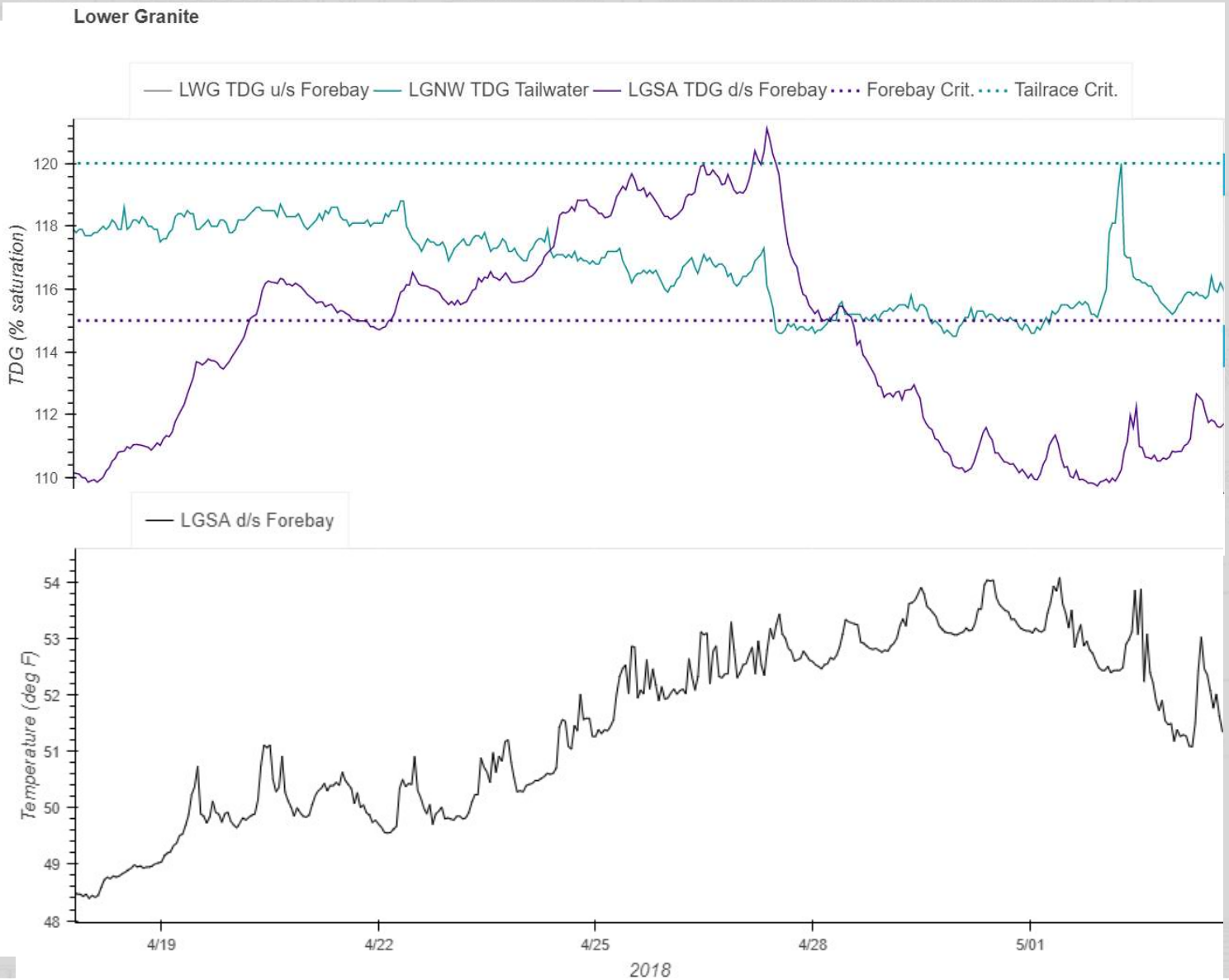
FACTORS BESIDES SPILL THAT IMPACT TDG:

WIND SPEED

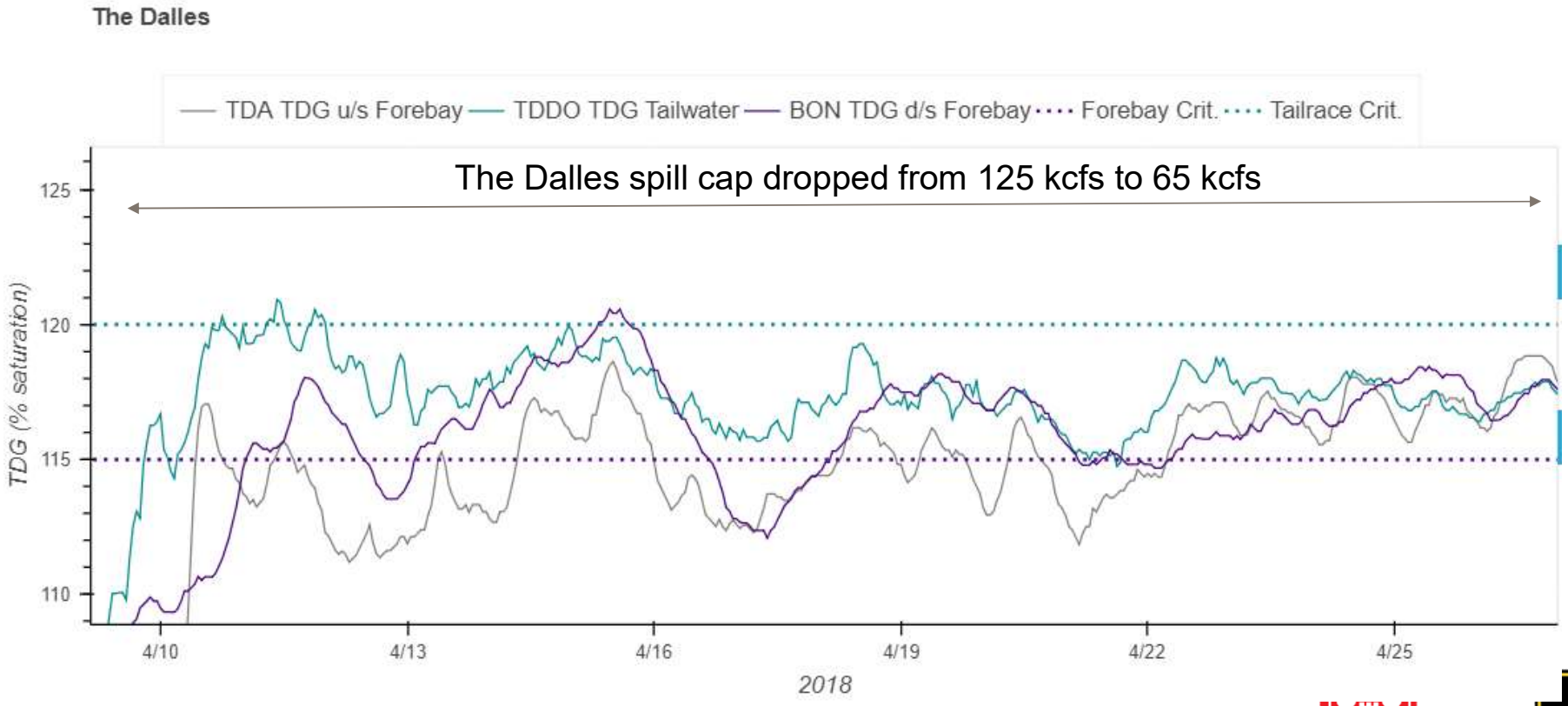


FACTORS BESIDES SPILL THAT IMPACT TDG:

TEMPERATURE



UPSTREAM INFLUENCES DOWNSTREAM

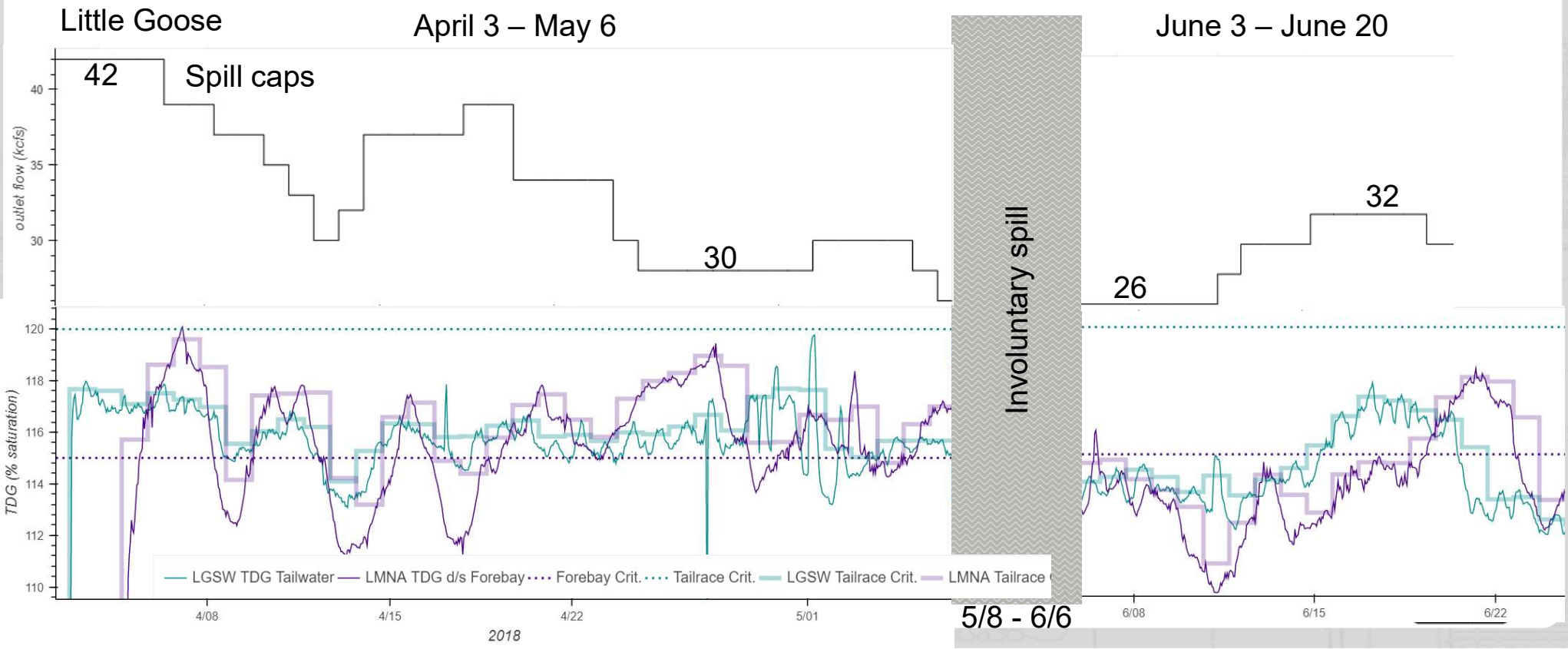


US Army Corps of Engineers ®

U.S.ARMY

LESSONS LEARNED:

Environmental factors have a large and variable impact on downstream forebay TDG.
There is no set of spill caps that can meet the downstream forebay TDG criteria of 115%.
Improvements to SYSTDG to better reflect weather forecasts.



SUMMARY STATISTICS, DURING SPILL CAP SPILL, SPRING 2018

Project	Spill caps (kcfs)			Range of actual spill (% of total flow)			Relationship of TDG to gas cap (% of days)			Downstream forebay most restrictive (% of days)	2017 FOP Spring Spill Levels (day/night, if applicable)
	Min	Ave	Max	Min	Ave	Max	Below	At	Above		
Lower Granite	31	37	53	24%	44%	75%	49%	14%	37%	74%	20 kcfs
Little Goose	26	30	42	24%	37%	63%	29%	13%	59%	96%	30%
Lower Monumental	27	33	46	26%	41%	73%	33%	18%	49%	89%	Gas Cap Spill (Spill Cap: 36-50-55 kcfs)
Ice Harbor	80	86	96	65%	81%	90%	32%	22%	46%	62%	4/3-28: 45 kcfs/GC 4/28-6/20: 30% & 45k/GC *
McNary	145	164	198	48%	65%	77%	33%	48%	18%	31%	40%
John Day	90	110	146	28%	45%	60%	33%	13%	53%	58%	4/10-28: 30% 4/28-6/15: 30% & 40% *
The Dalles	65	96	125	23%	37%	49%	23%	11%	66%	89%	40%
Bonneville	121	122	128	37%	42%	52%	11%	63%	26%	NA	100 kcfs

* Alternate 2-day blocks at IHR and JDA after 4/28

CONCLUSIONS

- The Corps implemented the daily process as regionally coordinated before the spill season and specified in FOP.
- Gas cap spill is a complex operation.
- Every water year (and every week) is going to look different and presents unique challenges to implementation.

US Army Corps of Engineers ®

U.S.ARMY