Successful MBR Performance Tests and Operation in an Oil Refinery

WATER ARABIA 2015

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Project Background

- The Bahrain Petroleum Company (BAPCO) oil refinery is one of the largest refineries in the Middle East processing in excess of 250,000 barrels a day.
- The refinery produces between 3,492 and 4,400 USgpm of wastewater that is discharged into the Arabian Gulf.
- BAPCO decided to upgrade its existing WWTP to comply with stricter discharge requirements using the best available technology: MBR.

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Project Background

- Before the MBR installation, the oily wastewater underwent only primary treatment consisting of American Petroleum Institute (API) oil separators followed by Induced Air Flotation (IAF) units.
- The MBR system now takes care of Ammonia, Nitrate, Suspended Solids, Sulfides, Phenols, BOD, COD etc., present in the refinery effluent.
- BAPCO effluent from Refinery is unique with high salinity (i.e. TDS > 30,000 ppm and high temperature (> 45 °C).

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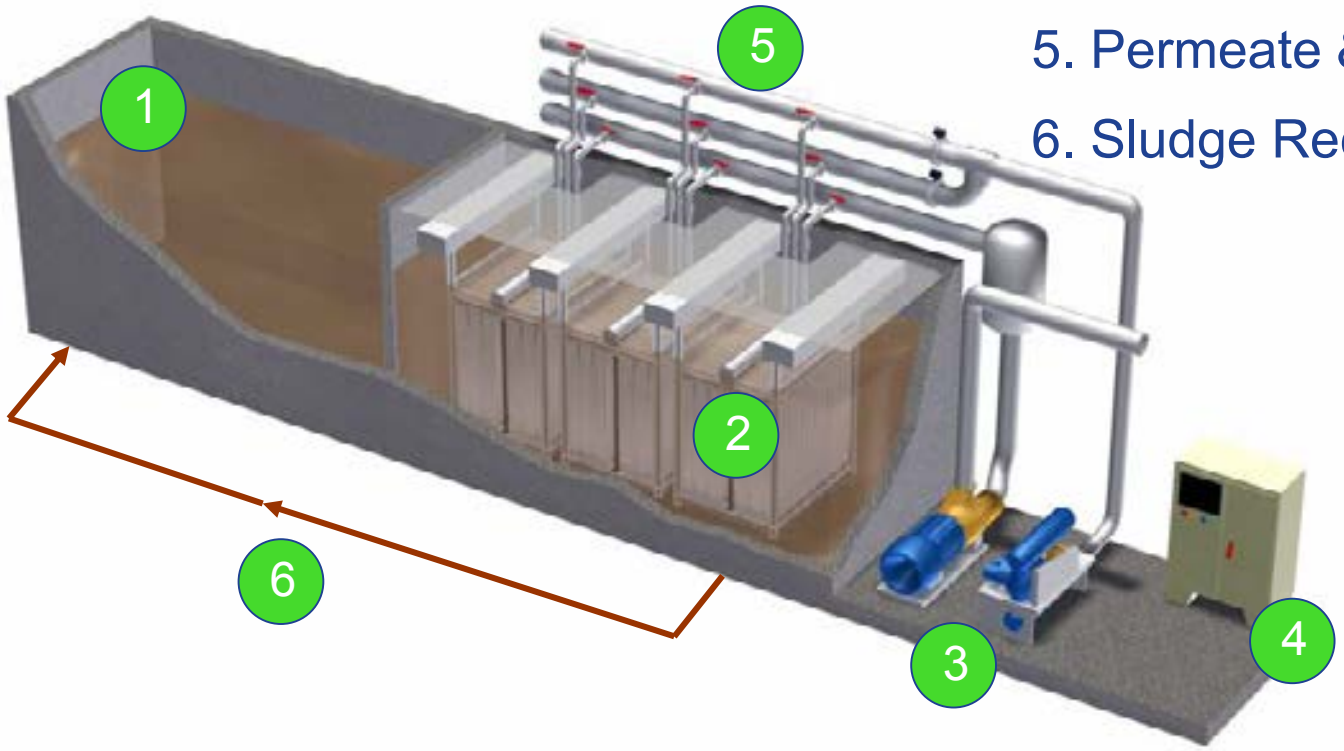
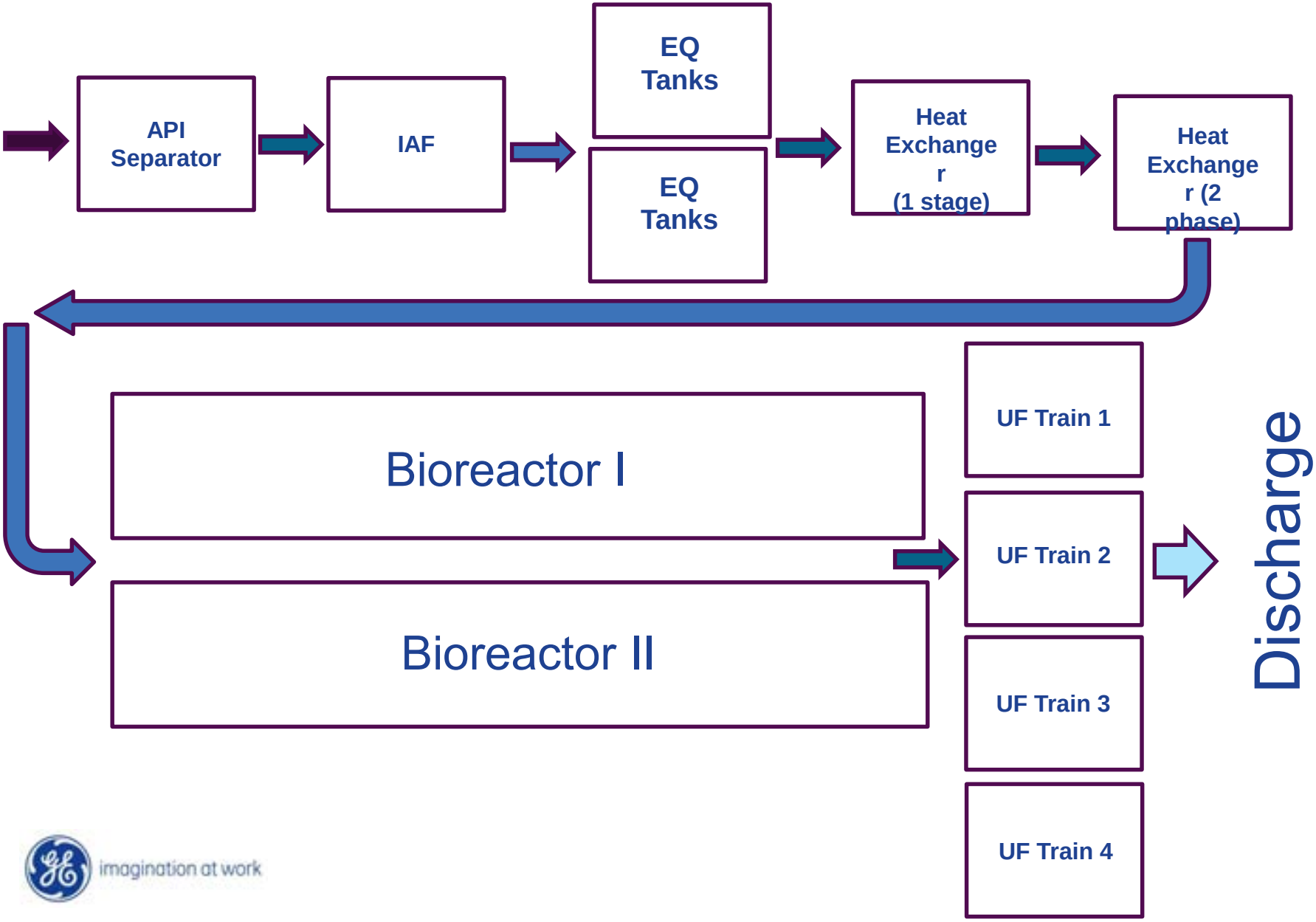
GE MBR System

1. Biological Reactor
2. Membranes
3. Permeate Pump & Air Blower
4. Control System
5. Permeate & Air Piping
6. Sludge Recirculation System



BAPCO MBR Overview



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BioReactor

Membrane Feed Pump

Membrane Tank & Headers

Membrane Blowers

Control Room

Performance Test Conditions & Results

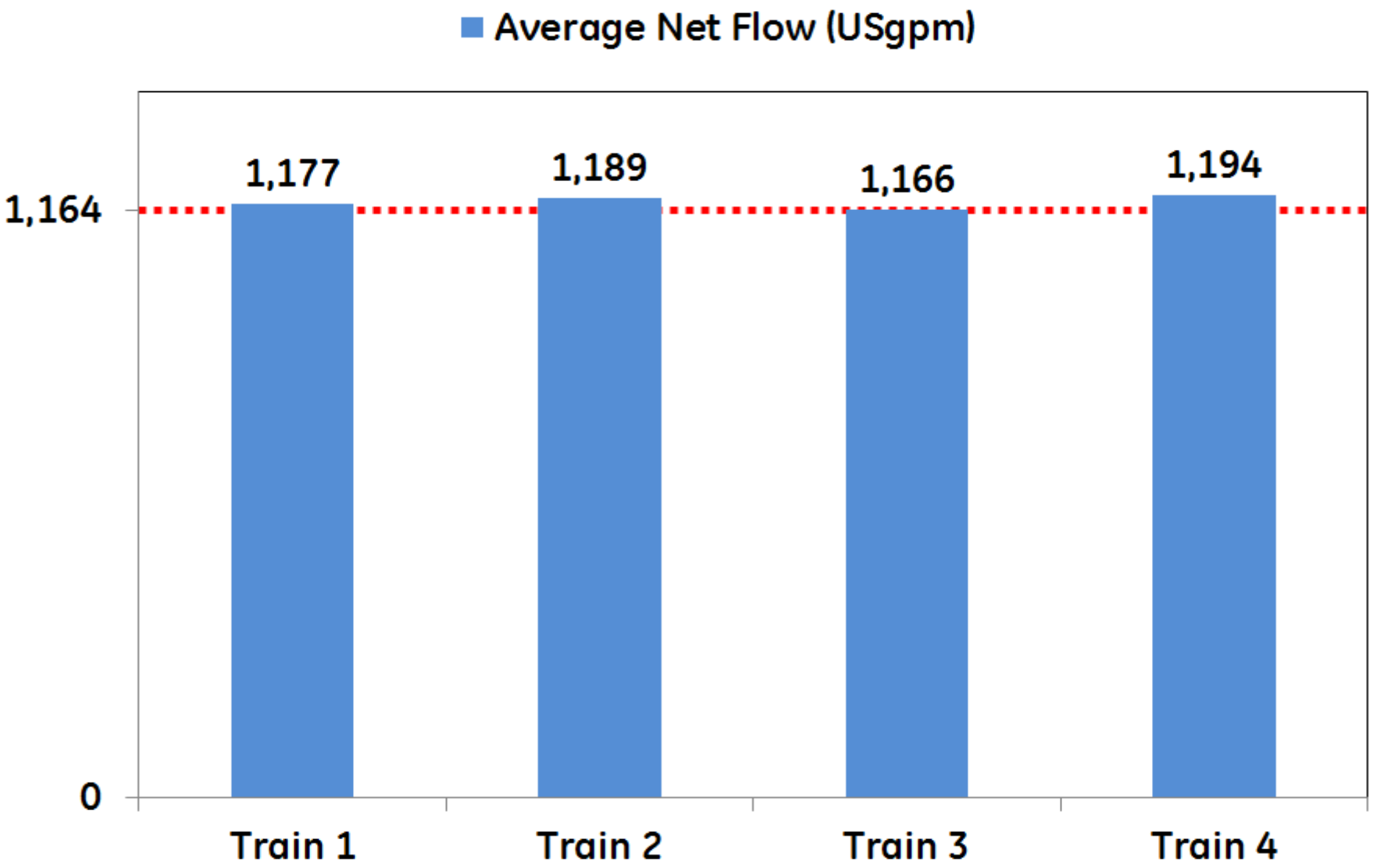
Performance Test Conditions

Performance Test Conditions	Net Flow per Train (USgpm)	Remarks
Average Day Flow (6 days)	1,164	3 membrane trains in operation and 1 train offline.
Peak Flow (4 days)	1,338	3 membrane trains in operation and 1 train offline.
Other Tests (4 days)		

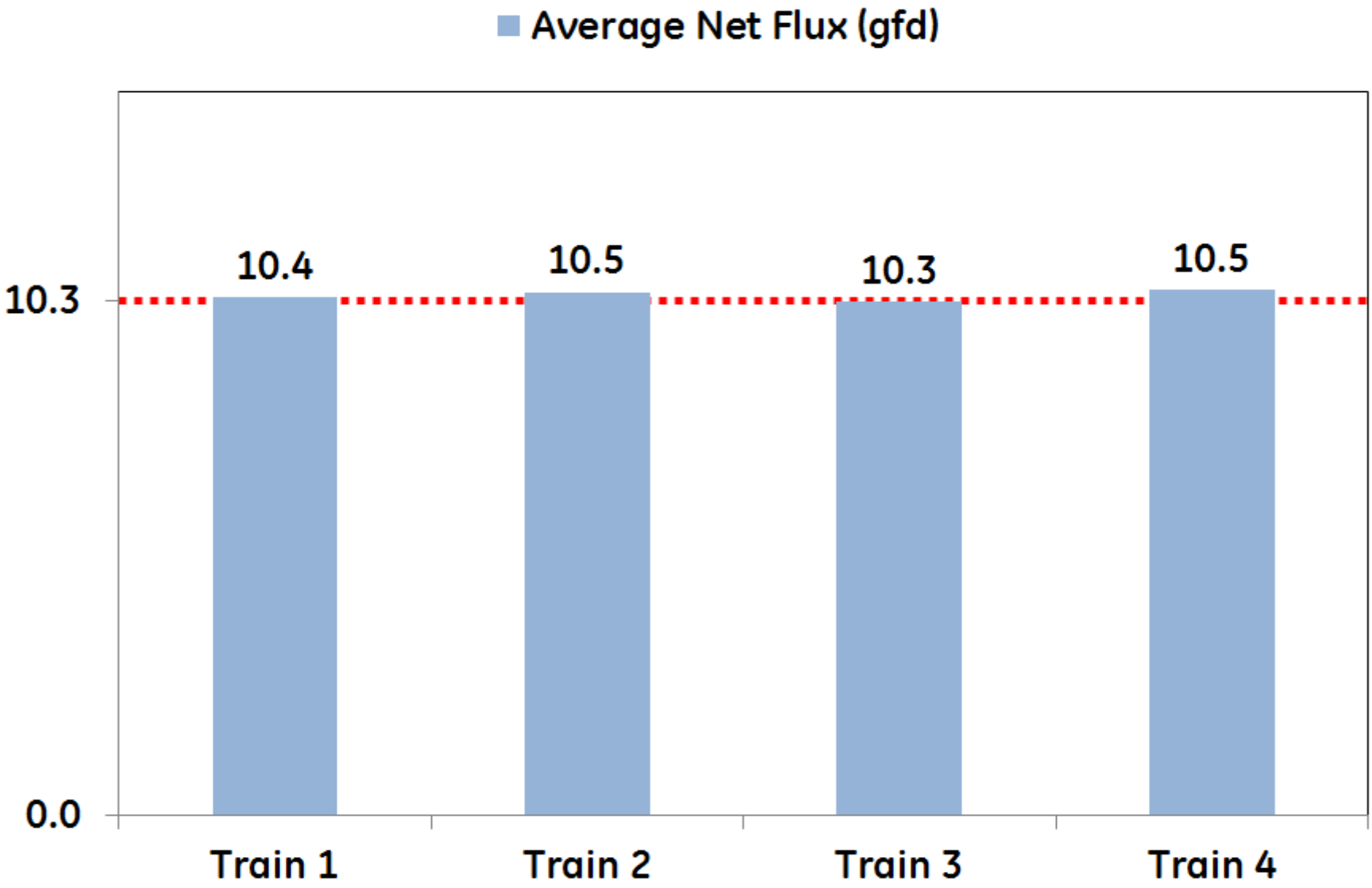
Performance Test Results –

Average Day Flow

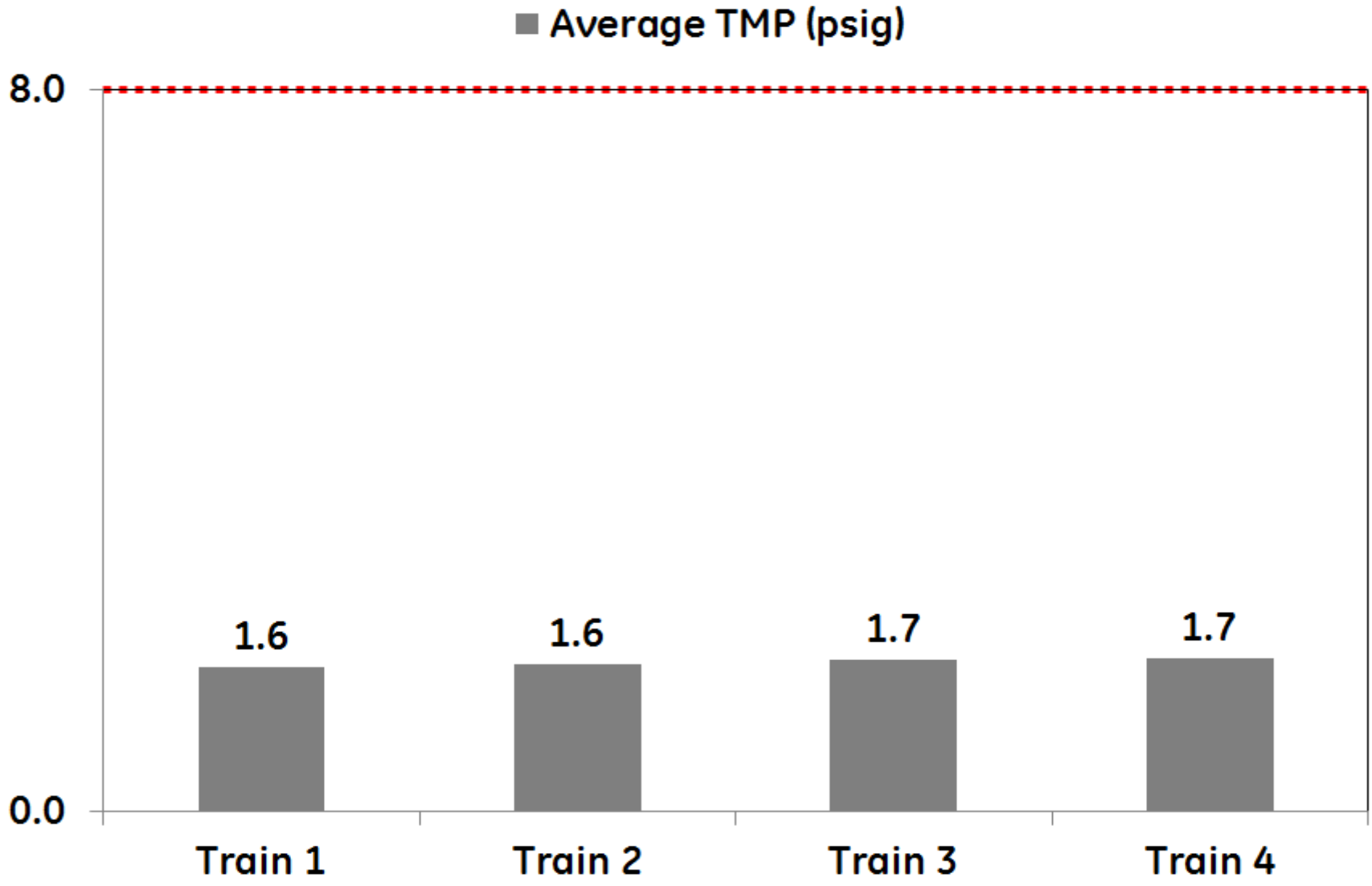
Performance Test Results – Average Day



Performance Test Results – Average Day



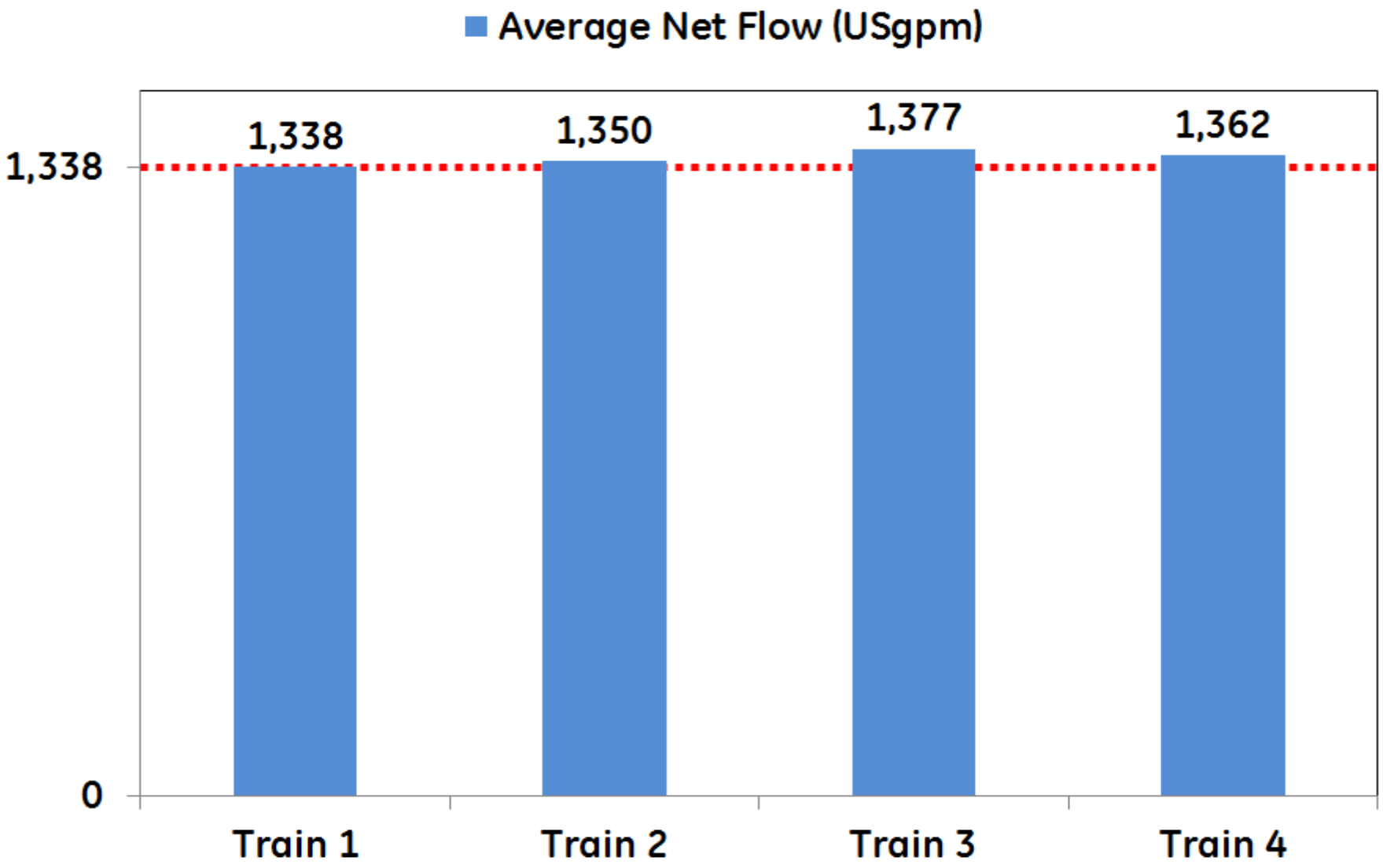
Performance Test Results – Average Day Flow



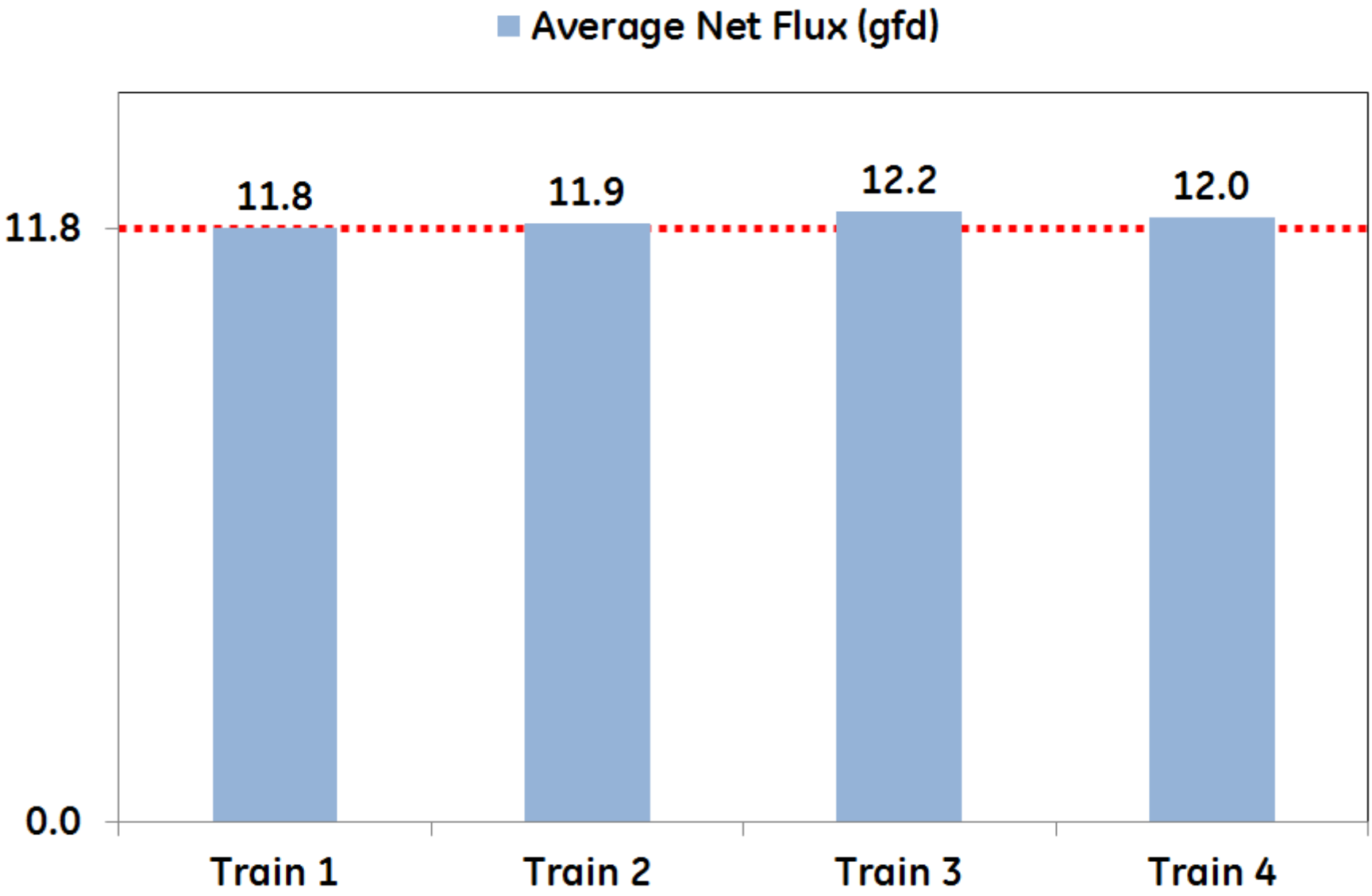
Performance Test Results –

Peak Flow

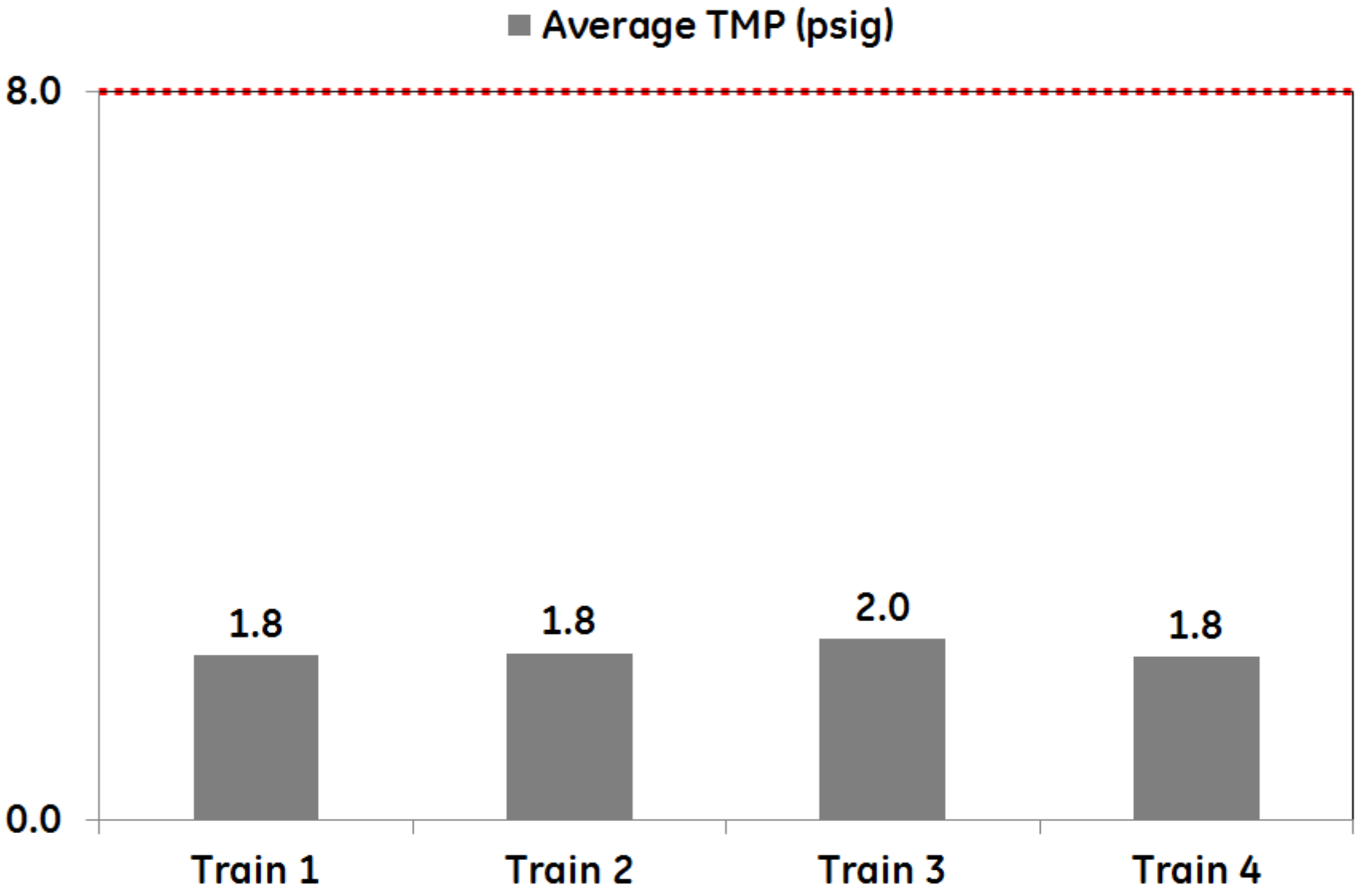
Performance Test Results – Peak Flow



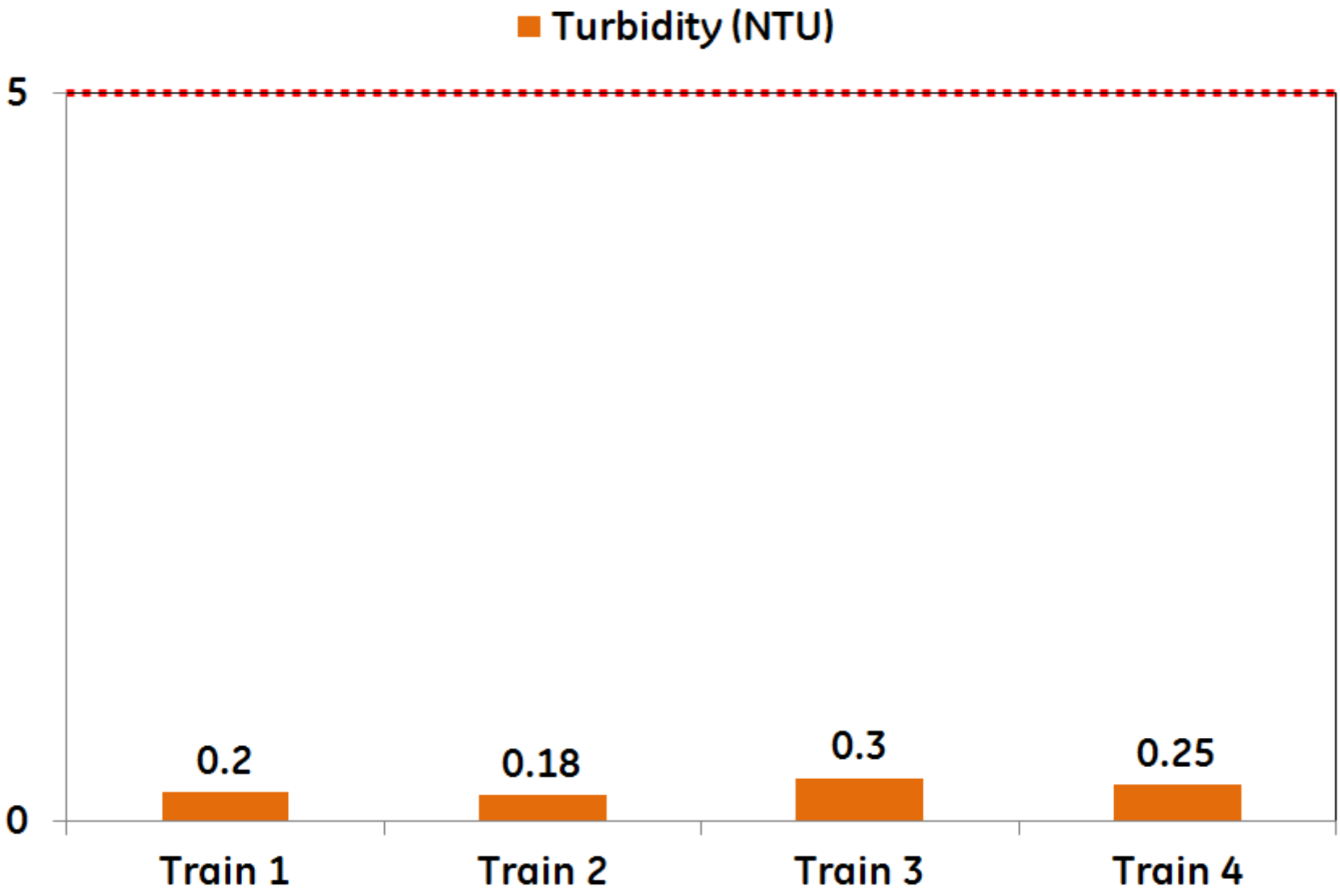
Performance Test Results – Peak Flow



Performance Test Results – Peak Flow

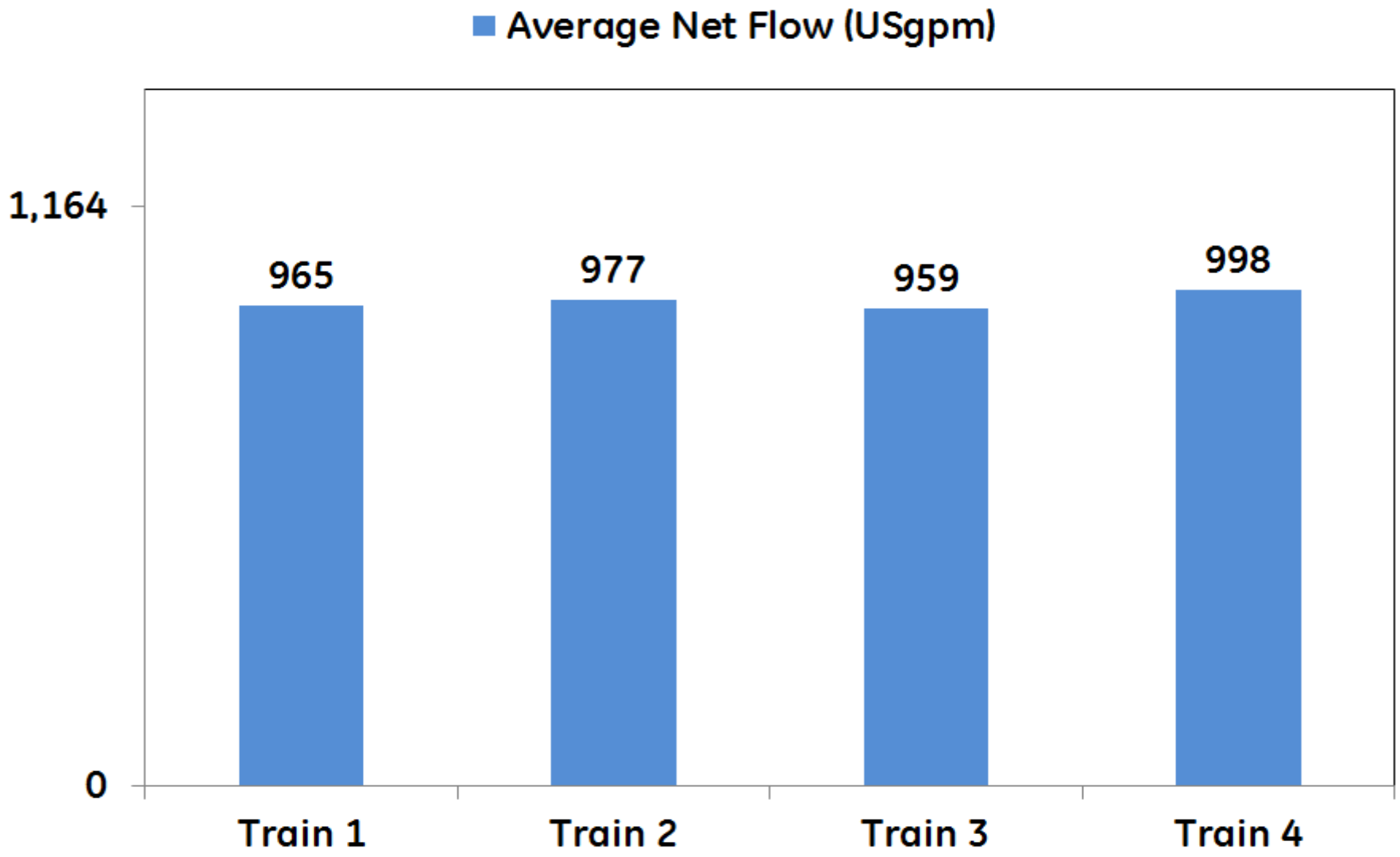


Performance Test Results – Turbidity

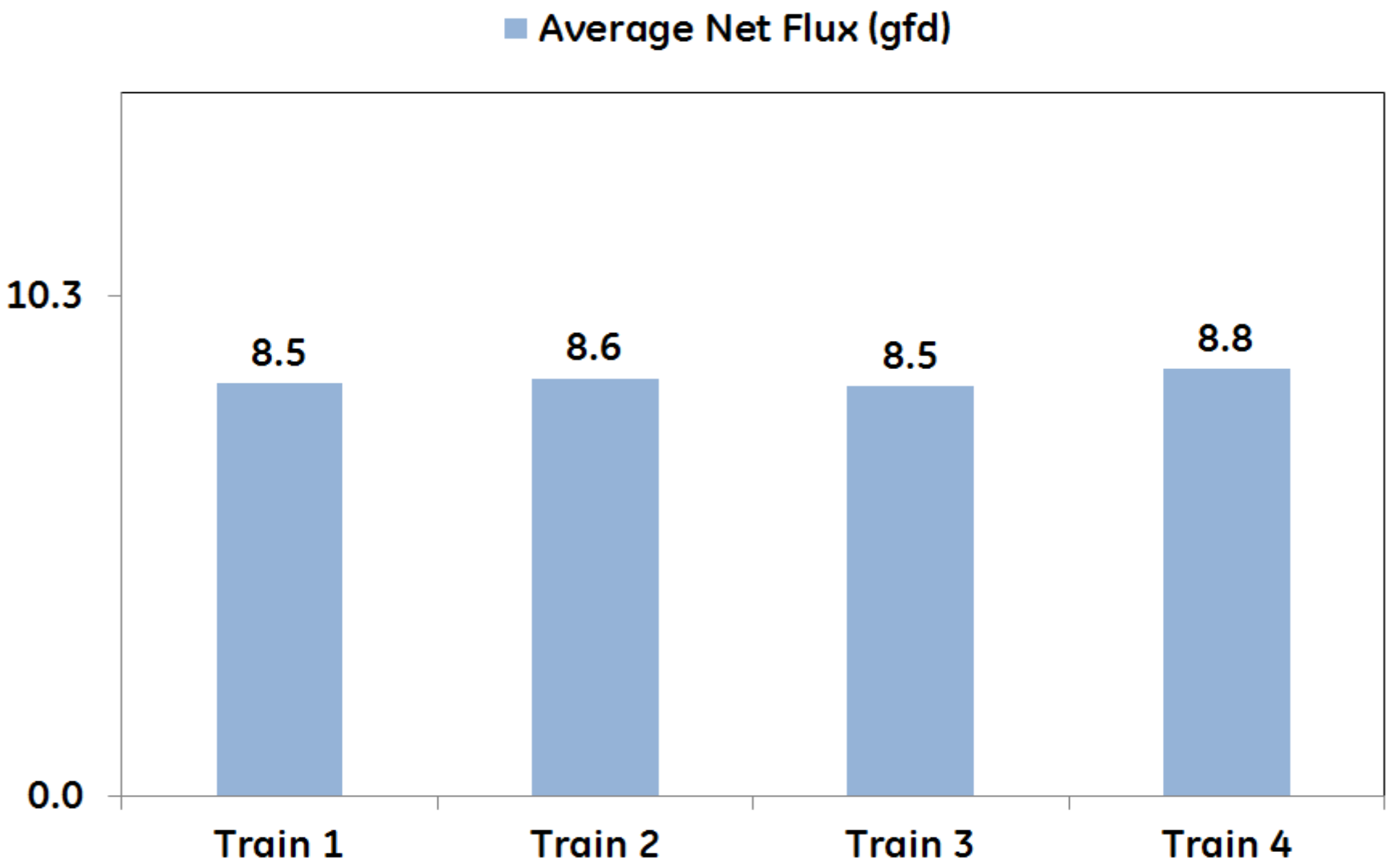


Results 6 months after Performance Test

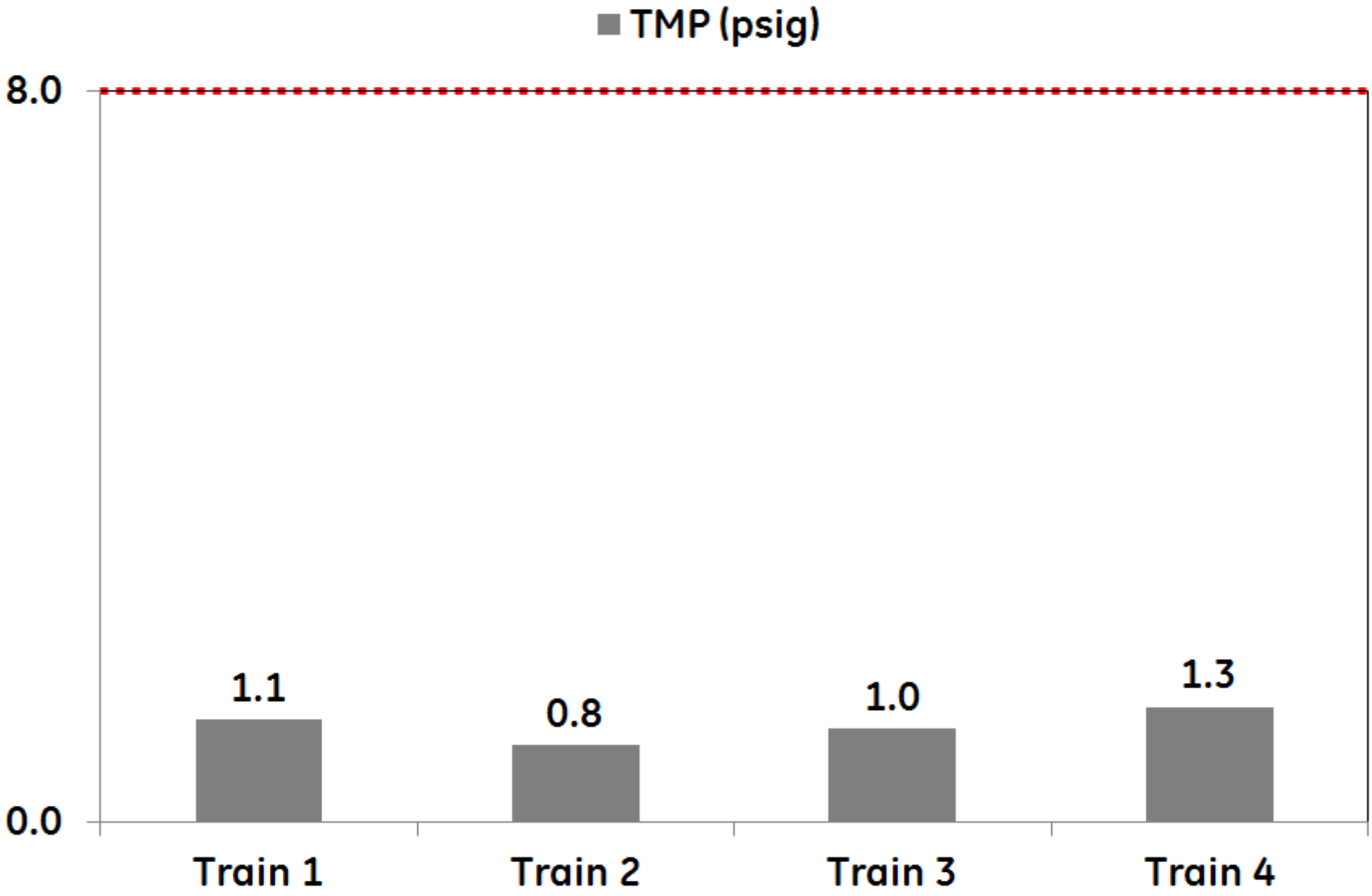
Performance 6 months after



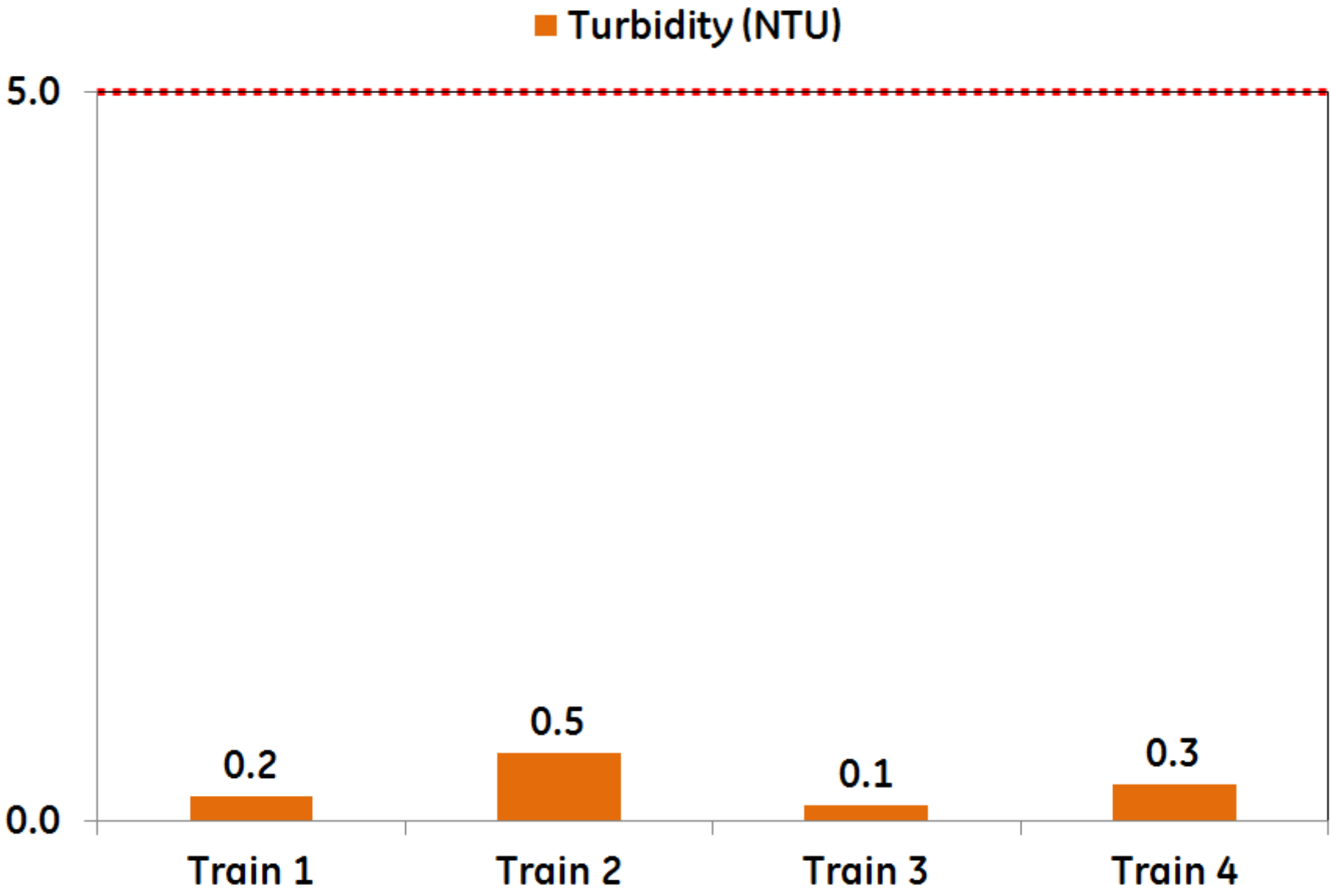
Performance 6 months after



Performance 6 months after



Performance 6 months after



Conclusions

- The MBR system successfully passed all Performance Test conditions. It met all capacity (i.e. average and peak flow) and quality requirements (i.e. turbidity) while keeping TMP values well below th maximum limit of 8 psig.

- The MBR system continued to meet all capacity and quality requirements 6 months after the completion of the Performance Test.

Questions?