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Dealing with Peaks and Valleys – Pump Station Upgrade Design

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2020 New England WEA – Boston, MA
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Session 12 – Collection System 2: Pumping

Overview

- Background
- Pump Station Upgrades (2005 – 2010)
- Resiliency Considerations (2013-2017)
- Efficiency Improvement (2017-2018)
- Lessons Learned

Two Bridges Sewerage Authority

1974

Formed in 1974 and operational in 1979

Where

Located in Northeast New Jersey, 25 miles from NYC

40,000

Service population

28.5

Square miles of service area

7 mi.

Of force main

14 mi.

Of interceptor sewer

5

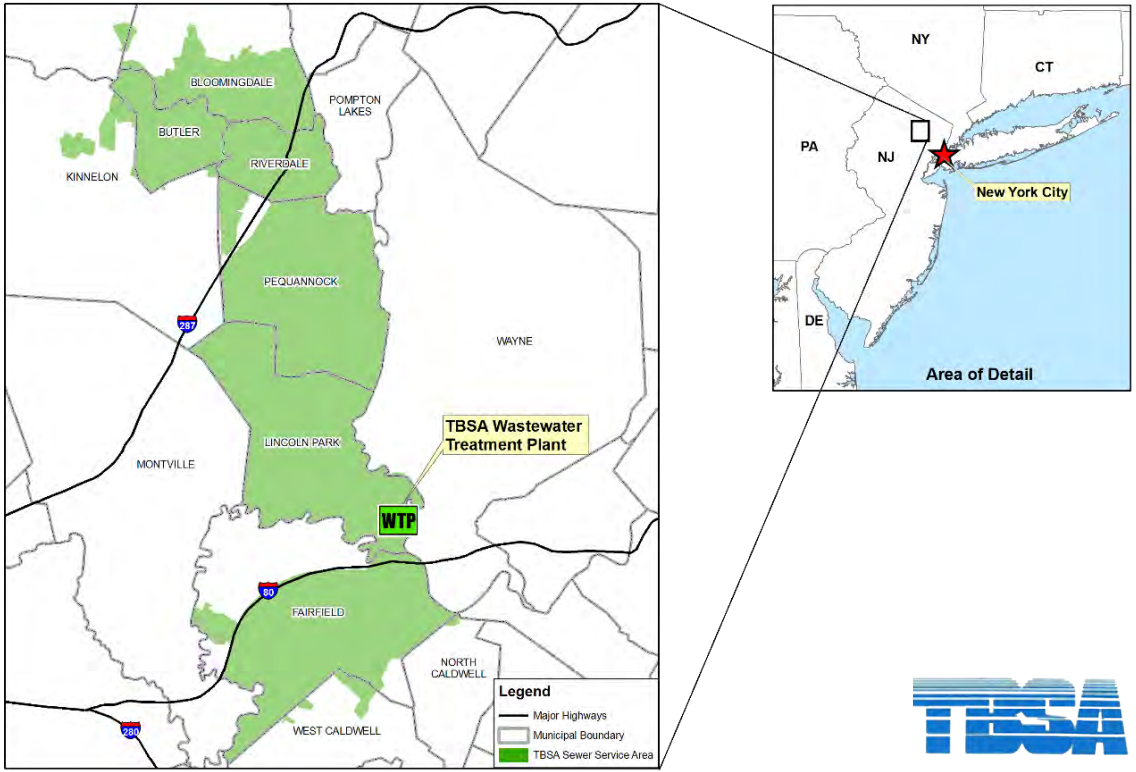
Remote pumping stations

7.5 mgd

(25 MGD peak) advanced WWTP

Two Bridges Sewerage Authority

Service Area



Pump Station Upgrades

- Central and South Side Pump Stations
- 2005 – 2010 Upgrade

Upgrade Scope

Two similar facilities originally constructed in 1979

- Central PS – 15.5 MGD
- South Side PS – 12.1 MGD

Project elements

- New dry-pit submersible pumps
- New controls and power distribution equipment
- HVAC upgrades
- Site & structural improvements
- Bypass pumping arrangements

Project cost

- $6,100,000

Construction completed

- October 2010

Central Pump Station

1,000 kW Emergency Generator and Automatic Transfer Switch

Central Pump Station

Central Pump Station

Wet Well Coating

South Side Pump Station

Bypass Pumping

Completed Upgrades - 2010

Resiliency Improvements

2013 - 2017

South Side Pump Station

Resiliency Improvements (2013)

- Peak flow – 12.1 MGD
- Flood barriers on doors and louvers
- New 450 kW exterior generator
- Service entrance switchboard moved indoors
- Cost - $600,000

Deepavaal Pump Station

Upgrade Project (2013)

- Peak Flow – 6.0 MGD
- 3 large pumps – 110 HP
- 2 jockey pumps – 20 HP
- Cost - $2,000,000
- Estimated 10% reduction in electrical usage
- Project received principal forgiveness as a resiliency project
- Open impellers selected to address rags

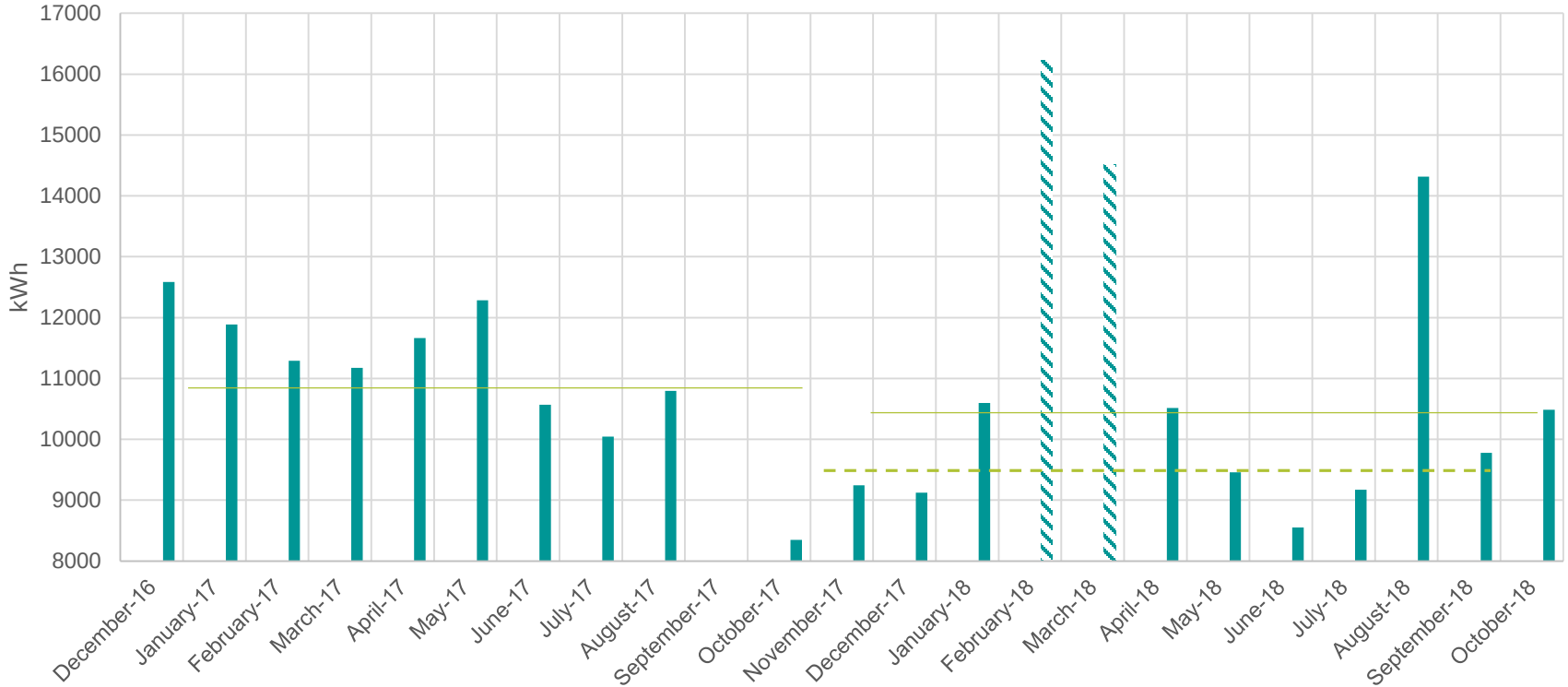
Deepavaal Pump Station

Resiliency Improvements

Deepavaal PS Completed - 2017

Deepavaal Pump Station

Electrical Usage Analysis



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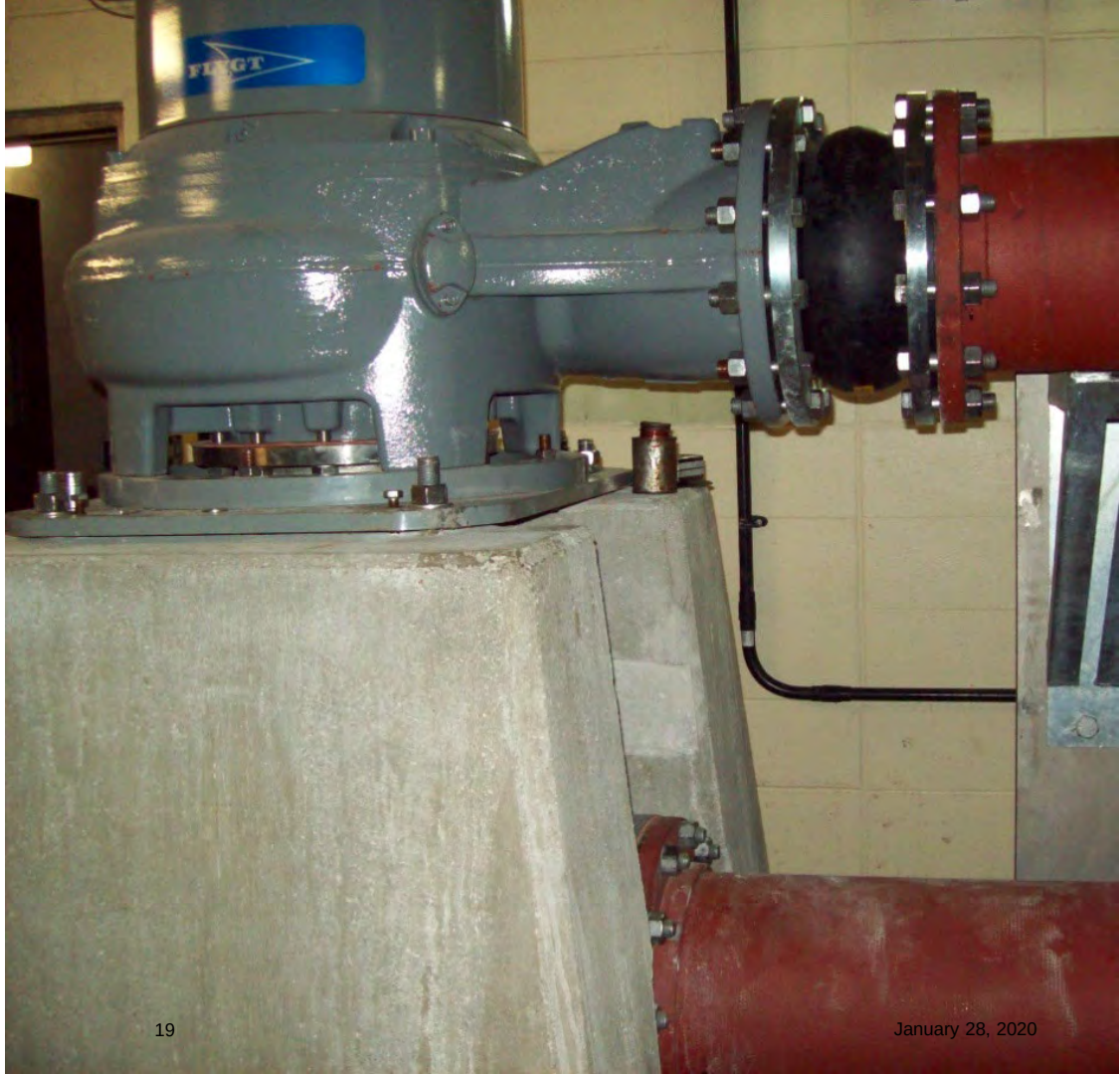
Efficiency Improvement (Central Pump Station)

2017-2018

Central Pump Station

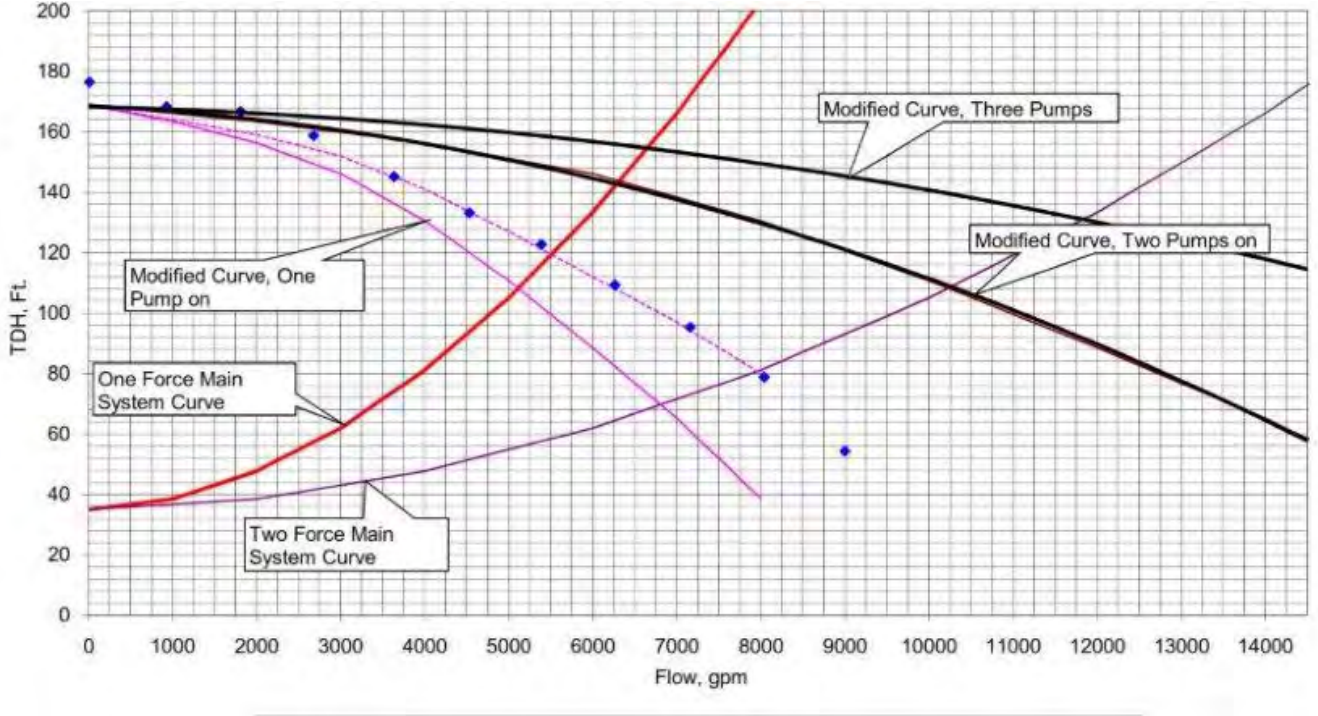
Jockey Pump Design

- Peak flow – 15.5 MGD
- Large pumps – 268 HP
- Jockey pump – 85 HP
- Pump start-up – May 2018
- Overall cost - $200,000
- Initial estimates of $1,000/month reduction in electric costs



Central Pump Station

Existing System

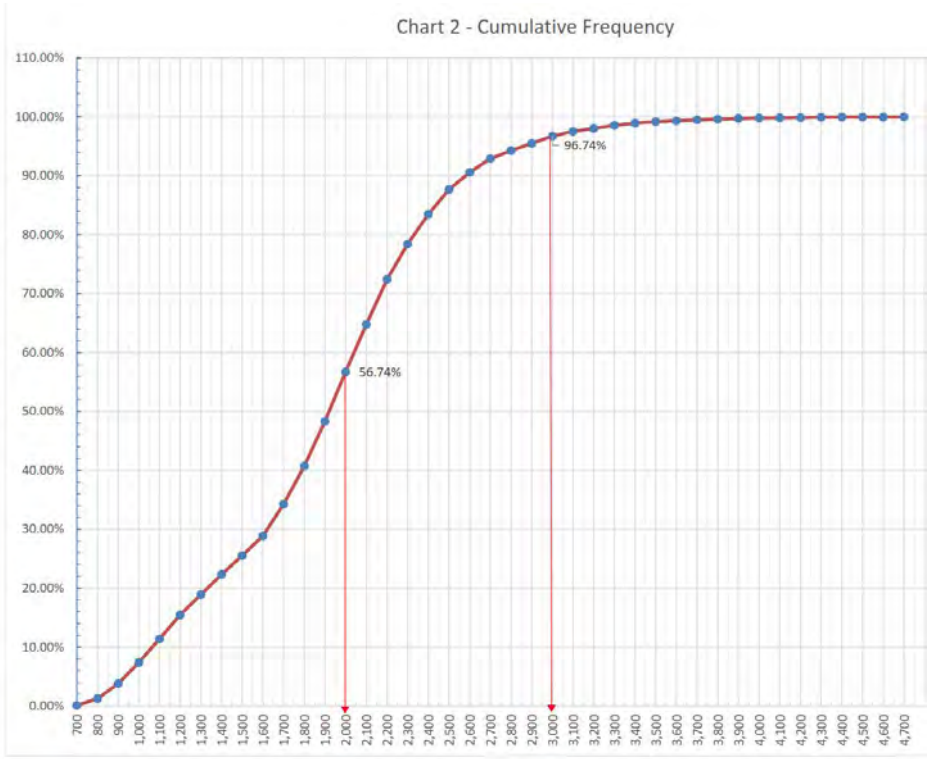


Main Pump and System Curves

- FA 30.78 Pumps
- 20” PCCP Force Main, L=9,130, K=24, C=100

Central Pump Station

Jockey Pump Selection

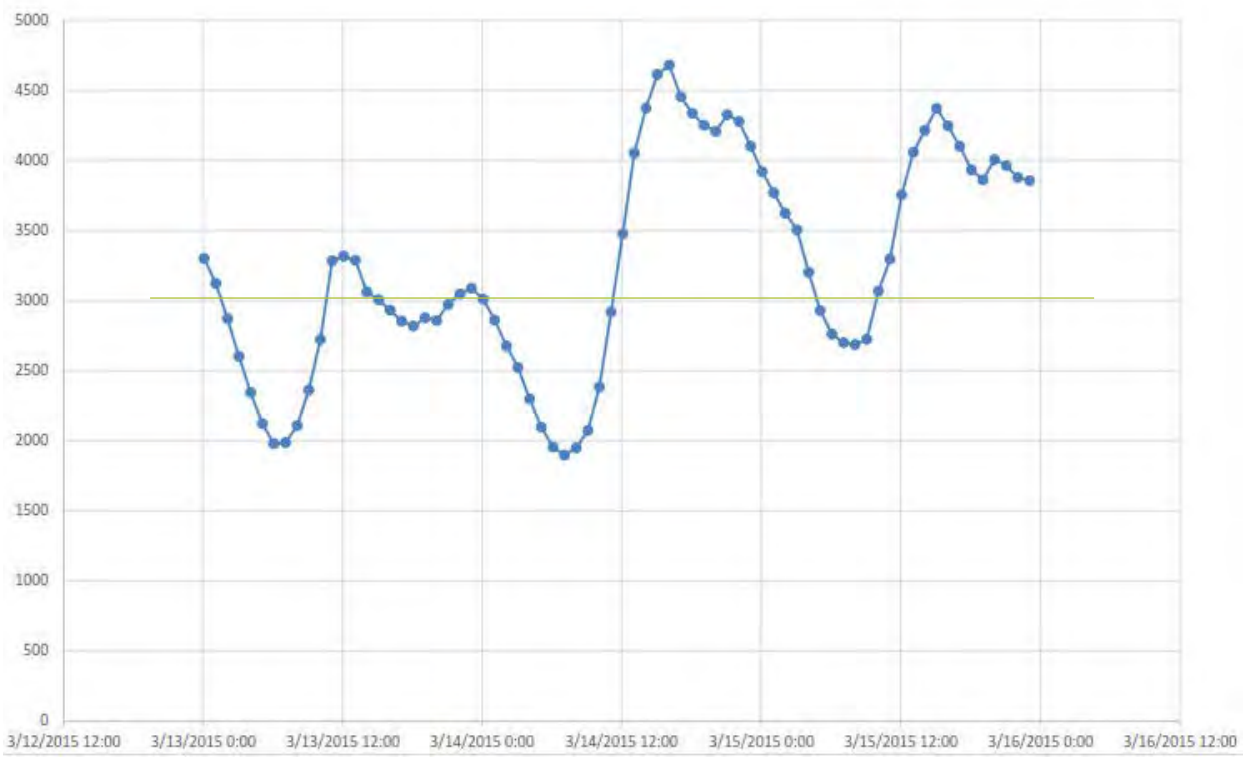


Cumulative Frequency

- Jockey Pump sized using analysis of hourly flow data for 2015
- 56.74% of points below 2,000 gpm
- 96.74% of points below 3,000 gpm
- 3,000 gpm exceeded on 16% of the calendar days
- Pump selection based on BEP at 3,000 GPM

Central Pump Station

Jockey Pump Selection

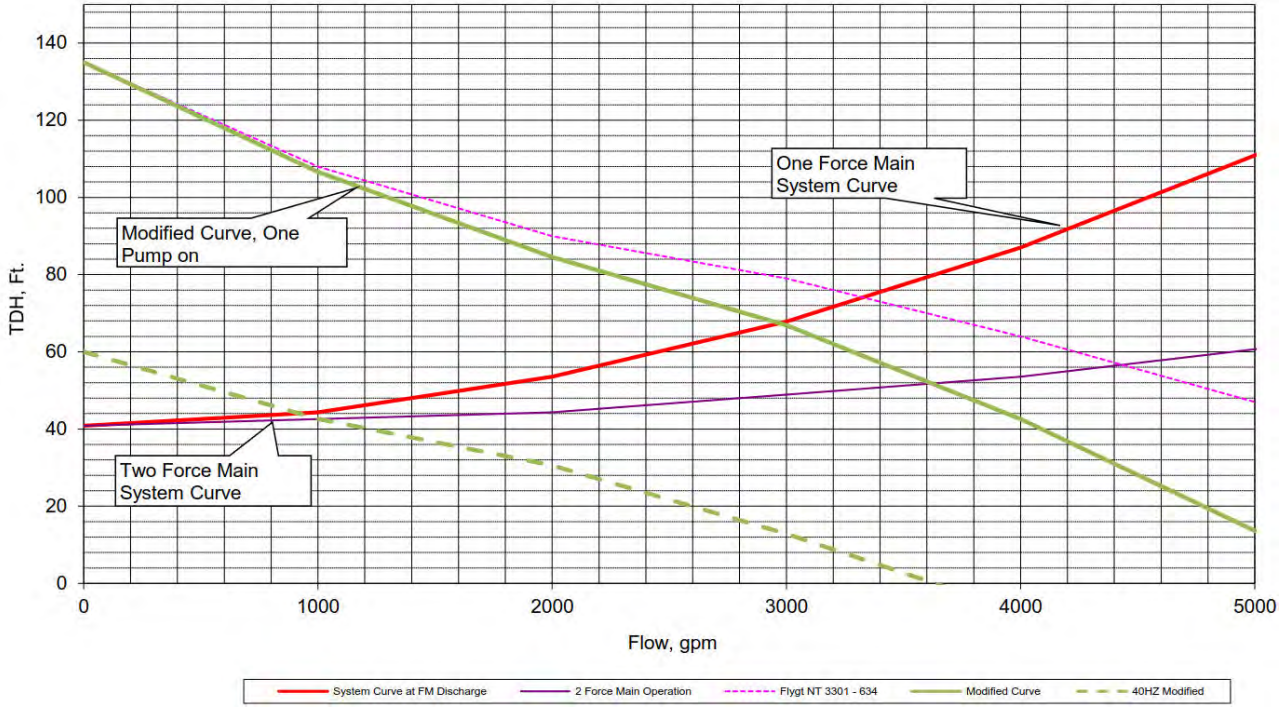


2015 Hourly Flow – Peak Period

- Graph shows a period leading up to the Peak Flow (4,500 GPM) in 2015
- This captures 3 days surrounding the peak hourly flows in 2015

Central Pump Station

Jockey Pump Selection



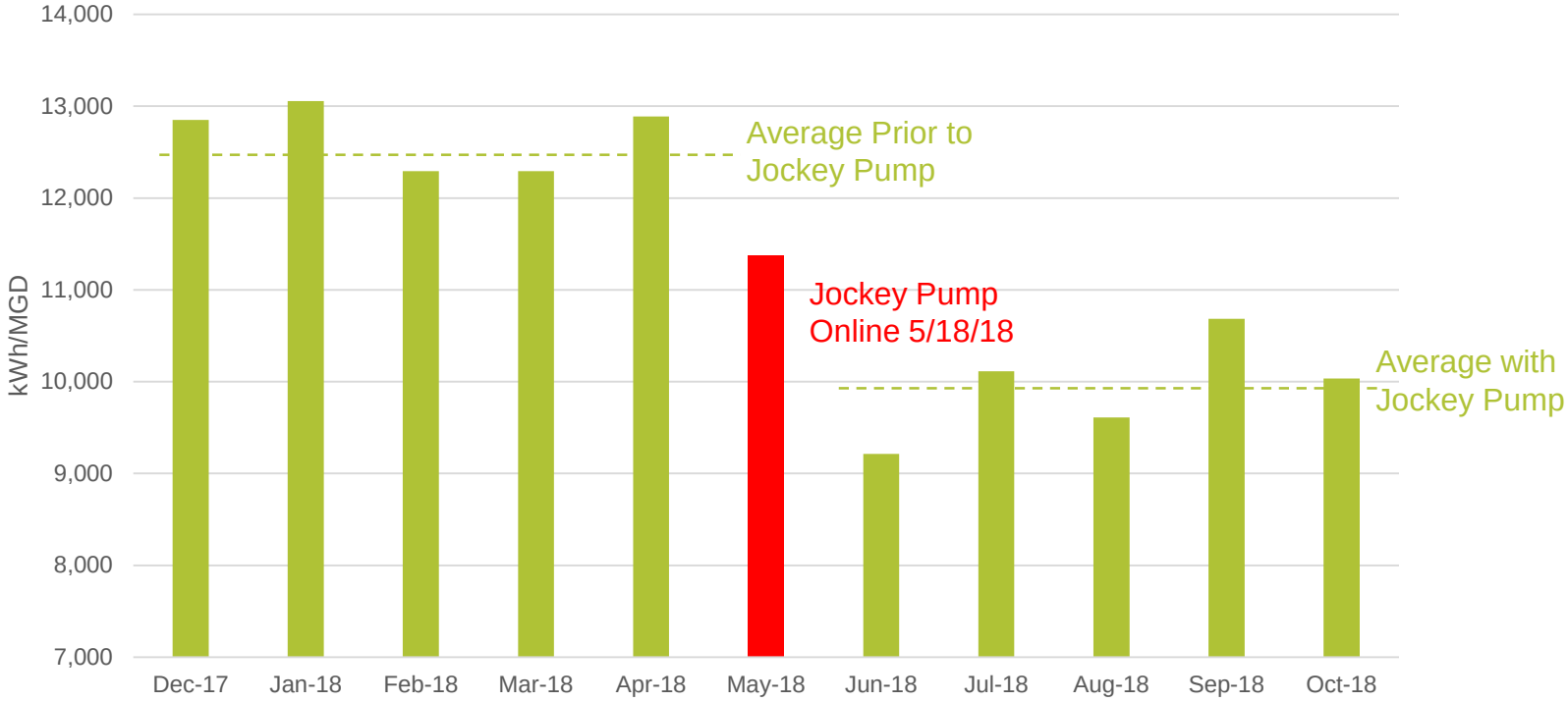
Jockey Pump and System Curves

- NT 3301 Pumps
- 20” PCCP Force Main, L=9, 130, K=24, C=100

Jockey Pump suction piping

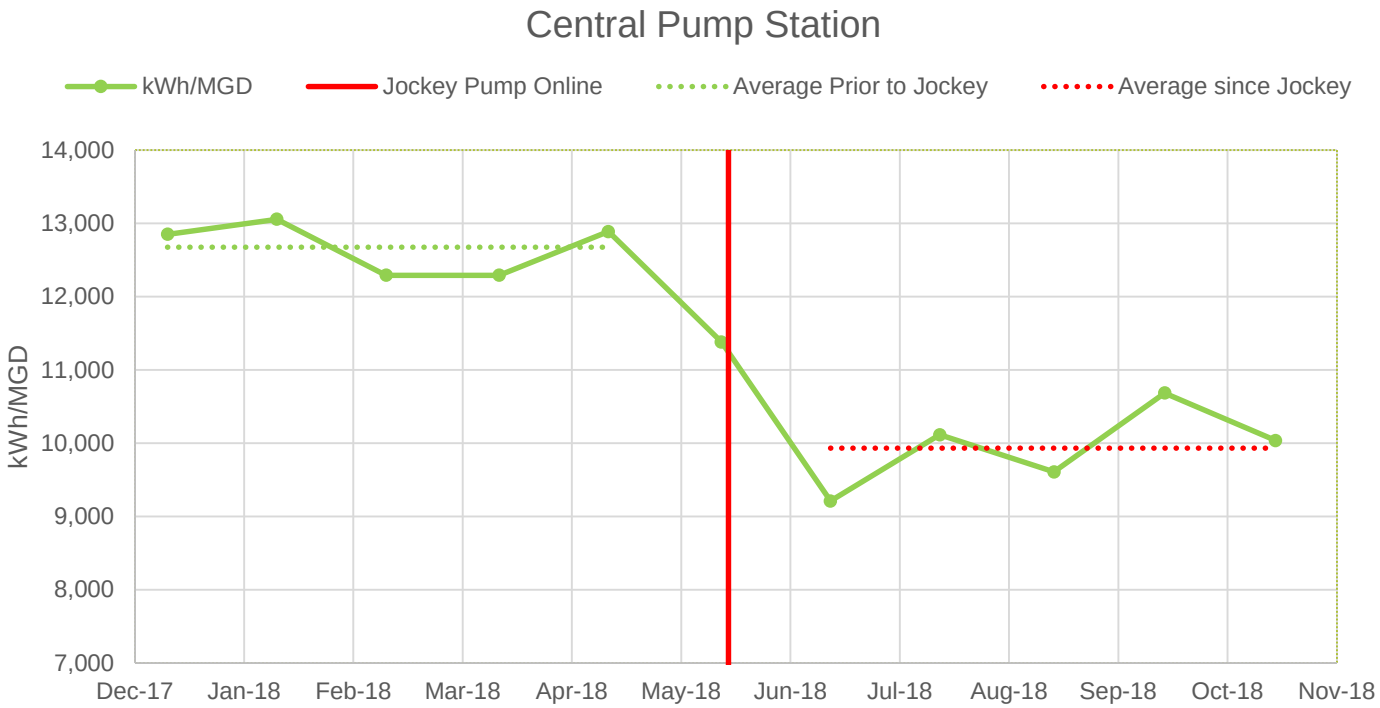
Central Pump Station

Jockey Pump – Electrical Savings



Central Pump Station

Jockey Pump – Electrical Savings



Lessons Learned

Lessons Learned

1. Through a series of pump station upgrades, the Authority's largest pump stations have improved resiliency and operational flexibility

2. Authority is satisfied with dry-pit submersible pump installations

3. Addition of jockey pumps sized to handle typical flows has resulted in significant costs savings

4. Open impeller style pumps operating close to full speed have eliminated frequent cleaning due to accumulation of rags

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Thank you

Questions?

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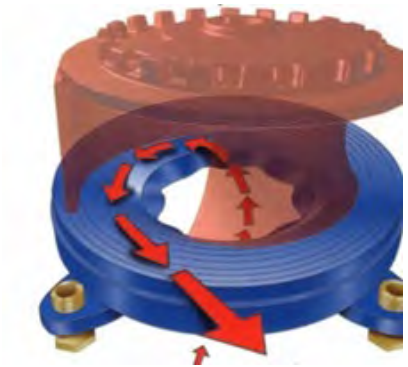
Pump Clogging Issues

Selected Open Impeller Styles



ABS Contrablock

Wilo “T”

Flygt “N”


09/17/2018