In attendance: David Paylor, DEQ; Dr. Norman Oliver, VDH; David Campbell, USEPA; Dr. William Mann, Appointee; Doug Powell, Appointee; Whitney Katchmark, HRPDC; Harold Post, OWML (for Adil Godrej); Mark Widdowson, PARML; Gary Schafran, PARML, Kurt McCoy, USGS (for Mark Bennett)

The Chair, David Paylor called the meeting to order at 11 am.

Mark Widdowson and Gary Schafran, co-directors of the Potomac Aquifer Recharge Monitoring Lab made a presentation on the activities of the lab during the 4th quarter of 2019. The wet lab space is under design and is scheduled to be built-out in Spring 2020. After the presentation, Mark and Gary led the Committee on a tour of the PARML facilities.

Charles Bott (HRSD) made a presentation on continued operations at the SWIFT Research Center. In response to a question regarding whether the ozone/biofiltration process was converting undetectable PFAS precursors to detectable short chain PFAS compounds, Charles replied it is possible but other factors such as desorption of short chain PFAS from the biofilter GAC media may also be contributing to that issue and further study is needed to fully understand. In response to a question about GAC regeneration cycles, Charles responded that research continues to determine optimal regeneration time, ideally looking for at least 30,000 to 40,000 bed volumes. When asked about potential for the HRSD “salt chasers” work to provide data regarding the impact of SWIFT on the saltwater/freshwater interface in the aquifer, staff responded that the two were not related, but that the PARML could potentially focus modeling efforts on this issue.
Lauren Zuravnsky (HRSD) provided a briefing on the full-scale implementation program for SWIFT at HRSD. Current plans have four facilities online by 2030 with the 5th facility, Williamsburg online by 2032. Total capacity target (combined capacity of all five facilities) is still approximately 100 million gallons per day. Work continues on development of the bridging documents (approximately 30 percent design) of the SWIFT facilities to be constructed at the James River Treatment Plant. That will be the first full-scale SWIFT facility with a capacity of 16 million gallons per day and a scheduled substantial completion in 2025.

Jamie Mitchell (HRSD) provided a briefing on the status of permitting. The Underground Injection Control (UIC) permit package is nearly complete and will be routed to the Committee members for their review and comments in the coming weeks. A concurrent review will be made by the members of the Nation Water Research Institute expert panel. The permit package material will also be made available to interested professors and researchers at Virginia universities soliciting their input.

Ted Henifin (HRSD) discussed the process HRSD used to bottle SWIFT Water for promotional purposes. To continue to engage the public in discussions around reclaimed water, HRSD is planning to partner with a craft brewery to produce beer from SWIFT Water for use in future promotional work.

There were no public comments.

The Chair discussed next meeting dates and location. A poll will be sent to members for availability for a date in late March or early April. The meeting will be held in Richmond, exact location to be determined. The meeting adjourned at 1:50 pm.

Approved:  

David Paylor,  
Committee Chair
Potomac Aquifer Recharge Monitoring Laboratory (PARML): Report to Oversight Committee

Gary Schafran and Mark Widdowson
PARML Co-Directors

December 16, 2019
G. The Laboratory shall:

1. Monitor the impact of the SWIFT Project on the Potomac Aquifer by reviewing and synthesizing relevant water quality data;

2. Identify needs and recommend options for filling gaps in the monitoring of the Potomac Aquifer, such as by recommending changes to monitoring locations and protocols;

3. Conduct sampling and analysis of SWIFT Project water and groundwater on a local scale near SWIFT Project injections to verify monitoring data reported by HRSD, and transmit the results of such analyses to the Director of the Department, the State Health Commissioner, and HRSD;

4. Generate, assimilate, interpret, manage, and consolidate data to help inform decision making related to the impact of the SWIFT Project on the Potomac Aquifer. These actions may include the creation of a clearinghouse for aquifer and SWIFT Project data and the synthesis and dissemination of information to various audiences, including the public and the scientific community; and

5. Advance understanding of the Potomac Aquifer, aquifer science, managed aquifer recharge, water reuse treatment technology, and advanced water treatment, through research, analysis, or modeling.

H. The Laboratory shall focus initially on meeting the demonstration-phase needs of the SWIFT Project; however, development of the Laboratory shall be planned in a manner to support its timely and cost-effective expansion to meet the increased needs associated with the phased full-scale implementation of the SWIFT Project.
G. The Laboratory shall:

1. Monitor the impact of the SWIFT Project on the Potomac Aquifer by reviewing and synthesizing relevant water quality data;

   Participating in weekly research and pilot plant meetings where SWIFT RC treatment plant performance and operations, SWIFT water quality, recharge and aquifer response findings are presented

   Review of HRSD quarterly reports
Download, store, and examine SWIFT data contained in Dropbox SWIFT project folders. These data are being used for independent evaluation (e.g., trend analysis, inter-parameter correlations, treatment performance).

The data being examined are predominately generated by HRSD CEL, SWIFT RC sensors, and contract laboratories.

PARML is not yet collecting samples, conducting analyses, and generating its own water quality data for the Potomac Aquifer.
Recent Examination:
Source Identification of Bromide at SWIFT RC
Influence of Bromide on SWIFT Water Treatment

Bromide present in water acts with chlorine and ozone to form brominated disinfection by-products

\[
\text{NOM} + \text{HOCl} + \text{Br} \rightarrow \text{THMs, HAAs}
\]

\[
\text{Br}^- + \text{O}_3 \rightarrow \text{BrO}_3^-
\]

Higher bromide concentrations lead to higher DBPs
Bromide Concentration in SPSA Leachate Discharged to Nansemond/SWIFT RC

Seawater Bromide Concentration

65 mg/L
4. Generate, assimilate, interpret, manage and consolidate data to help inform decision making related to impact on the PAS. May include clearinghouse for aquifer and SWIFT project data;

- We are collecting, organizing and archiving data generated at SWIFT RC

- Still working on developing a data management plan
2. Identify needs and recommend options for filling gaps in monitoring of the Potomac Aquifer such as monitoring locations and protocols;
Groundwater Monitoring: Web-Enabled Output

• Progress continues on the development of real-time monitoring of regional Potomac Aquifer water levels
  ▪ Collaboration with Groundswell Technologies, Inc.

• Developing historical data sets for beta testing (Jan 2020)
5. Advance understanding of the Potomac Aquifer, aquifer science, managed aquifer recharge, water and reuse treatment technology, and advanced water treatment through research, analysis, or modeling;
Groundwater Modeling: Site Model of SWIFT RC

- Objective: Develop math model to replicate groundwater flow conditions in the Potomac Aquifer at the SWIFT RC
SWIFT Well Overview

- **11 distinct screens** within the Potomac Aquifer System recharged at 1 MGD from MAR Well TW-1
- Breakthrough is monitored at MW-SAT and at **conventional wells**
- Samples taken from **discrete screens** in MW-SAT using the FLUTe system
Model vs Observed Head Values (8/3/18, Monitoring Well-UPA)
Centralizers were added to the flowmeter to keep it centered in the recharge well during operations
## Recharge Distribution Before and After Well Rehab

<table>
<thead>
<tr>
<th>Screen</th>
<th>% Flow Before Rehab</th>
<th>% Mean Flow Post-Rehab</th>
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<tbody>
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<td>1</td>
<td>18%</td>
<td>18.3%</td>
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<td>2</td>
<td>24%</td>
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<td>3</td>
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<td>11</td>
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</table>
3. Conduct sampling and analysis of SWIFT Project water and groundwater on a local scale to verify monitoring data reported by HRSD and transmit results to DEQ Director, State Health Commissioner and HRSD;

Developing a framework and data collection strategy that meets this mandate within available resources
## Monitoring Decision Framework

<table>
<thead>
<tr>
<th>Parameter</th>
<th>NP Influent</th>
<th>SWIFTRC Influent</th>
<th>Floc/Sed Effluent</th>
<th>Ozone Effluent</th>
<th>BAF IFE</th>
<th>BAF CFE</th>
<th>GAC CE</th>
<th>Tasting TANK</th>
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<td>Nitrate (NO₃-N) (SDWA PMCL)</td>
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PARML Water Quality Laboratory – Renovation Schedule

• PO for design issued – VT
• Design & Review – January 2020
• Bidding & Contract Awarded – February 2020
• Construction & Inspections – March
• Casework Installed – April
• Projected Completion – May
SWIFT Research Center
(1.0 MGD AWT + recharge well + monitoring wells + public outreach and education center + research facilities)
Process Flow Diagram for SWIFT Research Center

**INFLUENT**

- POLYMER
- NH₃Cl
- NaCl
- NaOCl
- LAS

**Rapid Mix, Flocculation & Sedimentation**

- SOLIDS PUMPING

**Sedimentation**

- OZONE CONTACT
- NaOCl

**Biofilter**

- GAC FEED PS
- GAC ADSORPTION

**UV Reactor**

- TASTING SYSTEM CONTACT
- TASTING LOCATIONS/LAB

**AQUIFER RECHARGE**

- NP REAERATION CHANNEL

**Secondary Clarifiers**

- SECONDARY EFFLUENT 48° PIPING

**Chlorine Contact Tank**

- SECONDARY CLARIFIERS

**Existing Nansemond Treatment Plant (NP)**

- NP CHLORINE CONTACT INFLUENT
- NP EFFLUENT HOLDING POND

**Well**

- AQUIFER RECHARGE

**SWIFT RESEARCH CENTER PROCESS FLOW DIAGRAM**

**Sustainable Water Initiative for Tomorrow**
Nansemond Plant N removal has been acceptable
Biofilter NDMA removal is improving
SWIFT Water TOC Remains <4 mg/L
GAC flow split is the control variable
Moving TOC/TN analyzer to lab & Purchased hot standby analyzer

Sustainable Water Initiative for Tomorrow
UV Effluent Flow Control Valves – Now controlled by DCS
Bromate control has been borderline...
High tides have brought high bromide
High bromide is not from leachate....
High tide and seawater appear to be the source of excess bromide (similar to York River)
\[ y = 9.0716x + 0.9799 \]
\[ R^2 = 0.7225 \]

- Bromate @ MCL = 0.99 mg/L
- Aim to not exceed 0.85 mg/L

- New conductivity CCP = 1600 \( \mu \)S/cm
PFAS Sampling and Analysis
(in collaboration with SNWA/NCSU/WRF)

- GAC 1 only in service: SCE (SWIFT influent), BAF effluent, GAC 9 min EBCT, GAC 1 effluent, final SWIFT water
- GAC 1 & 2 in service: Above + GAC 2 Effluent
PFAS Preliminary Results

- Looked for 27 PFAS—only showing 13 detections (hollow short chain, solid long chain; green carboxylates, red sulfonates)
- Low concentrations in SCE—likely due to AFFF zero discharge policy
- Short chain more common than long chain in SCE—short chains more likely in aqueous, long chain partition to solids more readily
- Biofilter: PFPeA and PFHxA increases in Aug/Sept—either precursor conversion or desorption from carbon in biofilter
PFAS Preliminary Results cont.

- Long-chains removed effectively by GAC 1
- Short-chains begin breakthrough in June (~4,000 BVs)
- GAC 2 brought online early Aug—so far no breakthrough (not shown)
- SWIFT water decrease starting in Aug due to blending with GAC2 effluent (dilution)
Pilot Testing for Full-Scale Implementation
- James River – Ozone
- York River – Direct Filtration
Full Scale Implementation Program Update

Lauren Zuravnsky, P.E.
Chief of Design & Construction - SWIFT

Potomac Aquifer Recharge Oversight Committee
December 12, 2019
Update Agenda

➢ Program status
➢ Project status
➢ Design-Build approach
➢ Looking forward at James River
Update Agenda

- Program status
- Project status
- Design-Build approach
- Looking forward at James River
Phase 1 - Concept Feasibility
Phase 2 - Pilot Testing
Phase 3 - Demonstration Facility Construction
Phase 4 - Facility Plan Development
Phase 5 - Implementation Planning
Phase 6 - Full Scale Implementation Program (FSIP)
Implement sustainable managed aquifer recharge infrastructure by developing adaptable, innovative, and cost effective solutions through a collaborative process, while maintaining HRSD’s Mission, Vision, and Values.
SWIFT Full Scale Implementation Program is managed by a professional engineering services team.
WBTP
VIP
JRTP
YRTP
NP
16 MGD
10 MGD
33 MGD
38 MGD
8 MGD
10 MGD
Total Capacity
Goal
~ 100 MGD
Atlantic Ocean
Total Capacity
Goal
~ 100 MGD
Current Schedule for Facility Implementation

Data Date: November 30, 2019

Sustainable Water Initiative for Tomorrow
Update Agenda

➢ Program status
➢ Project status
➢ Design-Build approach
➢ Looking forward at James River
Initial design is on-going for wastewater treatment upgrades and SWIFT implementation at James River TP.
Current project focus at York River TP is optimizing wastewater treatment prior to SWIFT design.
Boat Harbor Transition: Treatment Plant to Pump Station, “Southbound”

Detailed alternative analysis will begin in January.
Wastewater expansion and SWIFT implementation at Nansemond TP will begin in January.
Army Base to VIP Pump Station and Transmission Force Main
Williamsburg
SWIFT Facility
Update Agenda

➢ Program status
➢ Project status
➢ Design-Build approach
➢ Looking forward at James River
Design-Build Alternative Project Delivery

Contract structure is different...

Design-Build Structure  
HRSD  
Design-Build  
Single Contract

Design-Bid-Build Structure  
HRSD  
Designer  
Contractor

Sequencing is different too...

Design-Bid-Build Sequence

Design-Build Sequence

Potential Time Savings
Design Build delivery facilitated rapid design and construction of the Research Center

- Design-Build Contract Procurement
- Design Phase
- Construction Phase

- Request for Qualifications
  - July 2016

- Notice To Proceed
  - December 2016

- Ground Breaking
  - March 2017

- Substantial Completion
  - April 2018
Project site view and construction progress on June 15, 2017 when design reached “100 percent”
Proposed Design Build delivery timeline for JRTP

- **Bridging Document Development**
- **Design-Build Contract Procurement**
- **Design Phase**
- **Construction Phase**

**Key Dates:**
- **Request for Qualifications:** Late January 2020
- **Notice To Proceed:** December 2020
- **Ground Breaking:** October 2021
- **Notice To Proceed:** October 2021
- **Substantial Completion:** October 2025
- **Ground Breaking:** October 2021

**Timeline:**
Update Agenda

➢ Program status
➢ Project status
➢ Design-Build approach
➢ Looking forward at James River
James River project will upgrade wastewater treatment and implement SWIFT.
Two Capital Projects under One Contract

GN016360  
James River SWIFT Facility

JR013400  
James River Treatment Plant  
Advanced Nutrient Reduction Improvements
Menchville landfill site
HRSD James River Treatment Plant
HRSD Force Main Pipe

Proposed recharge well location
Proposed recharge water piping

Sustainable Water Initiative for Tomorrow
Current Schedule for Facility Implementation

- **2017**: Recharge Wells
- **2018**: Nutrient Reduction Improvements
- **2019**: SWIFT Facility
- **2020**: Recharge Wells
- **2021**: James River Crossing
- **2022**: Boat Harbor PS
- **2023**: SWIFT Facility
- **2024**: Recharge Wells
- **2025**: WW Upgrades
- **2026**: VIP SWIFT Site Work
- **2027**: SWIFT Facility
- **2028**: Recharge Wells
- **2029**: AB to VIP Transmission
- **2030**: HRSD issues RFQ
- **2031**: NTP for Construction
- **2032**: Recharge Wells

Data Date: November 30, 2019

Sustainable Water Initiative for Tomorrow
Current SWIFT Research Center
Regulatory Activities

- Regulatory reports generated for two quarters
  o 4th quarter report will be issued by January 31, 2019

- Research report generated for first quarter
  o Report compiling activities of 3rd and 4th quarter will be issued in February
James River SWIFT UIC Permit

- Map/Area of Review
- Geological/Geophysical Information
- Well Construction
- Injection Operation and Monitoring
  - SWIFT Water Quality Permit Limitations
  - Groundwater Monitoring Plan
- Plugging and Abandonment
- Financial Assurance
- Existing EPA/VA Permits (e.g. VPDES permits)
- Description of Business
James River SWIFT UIC Permit Plan for Review

- Key documents undergoing internal review
  - SWIFT Water Quality Permit Limitations
  - Groundwater Monitoring Plan
- Will provide for joint NWRI/PAROC review by January 27th
  - Will highlight any areas of uncertainty based on on-going design considerations
- Goal to submit permit to EPA by end of February
SWIFT Water Quality Permit Limitations

- Similar to Research Center approvals with following modifications:
  - Special section on PMCL compliance
    - Nearly all parameters with exception of TC/EC and nitrate/nitrite on Running Annual Average (similar to Waterworks regulation)
  - Adjustments to Critical Control Points based on learning from Research Center
    - Proposal will represent minimum CCP requirements. More CCPs may be added or thresholds may become more stringent as we move forward with JR SWIFT design
    - Will include language that CCPs may be modified as needed with on-going operations
      - More stringent or additional CCPs will be reported in quarterly report
      - Requests for removing or decreasing the threshold associated with a CCP will be formally made to the PAROC
  - Still includes the Research Center list of non-regulatory indicator parameters
    - Work is on-going to develop a targeted list
    - Targeted list will be completed before the James River facility comes on-line and will be used in parallel with the current list
Groundwater Monitoring Plan

- Groundwater Monitoring Plan for full-scale eliminates the research oriented 50 ft well and proposes two sets of nested monitoring wells
  - Each set will include one well screened in the Upper Potomac and one well screened in the Middle Potomac
  - Wells located approximately 500 ft from closest recharge well (specific siting still to be determined)
  - Four quarters of baseline data will be collected prior to recharge
  - Once recharge begins, monitoring will occur quarterly