COMMISSION MEETING MINUTES
January 24, 2017

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| Name | Title | Present for Item Nos. |
|---|---|---|
| Elofson, Frederick N. | Commission Chair | 1-17 |
| Lynch, Maurice P. | Commission Vice-Chair | 1-17 |
| Bredemeyer, Arthur C. | Commissioner | 1-17 |
| Glenn, Michael E. | Commissioner | Absent |
| Lakdawala, Vishnu K. | Commissioner | 1-17 |
| Levenston, Jr., Willie | Commissioner | 1-17 |
| Rodriguez, Stephen C. | Commissioner | 1-17 |
| Rotkis, Susan M. | Commissioner | Absent |

## 1. AWARDS AND RECOGNITION

**Action: No action required.**

**Brief:**

a. Mr. Wayne Staples, Wastewater Operations Specialist for the Virginia Department of Environmental Quality's Operator Training Program, presented a plaque to Commission Chair Elofson and Mr. Bob Rutherford in recognition of HRSD's C*ommitment, Service and Support of the Annual Virginia Tech Wastewater Treatment Plant Operator Short School*. HRSD has supported this valuable training program for 40 consecutive years. This year Jennifer See (Safety Manager), Bob Rutherford (James River Treatment Plant Manager) and Rhonda Bowen (Recycling Manager) participated as instructors.

b. Mr. Henifin announced HRSD, Moseley Architects and W.M. Jordan Company, Inc. received an Award of Merit for excellence in design-build delivery from the Hampton Roads chapter of the Design-Build Institute of America (DBIA) for the HRSD Operations Center, Phase VII project. DBIA's Design-Build Project/Team Awards recognize exemplary application of Design-Build Done Right™ that, at a minimum, resulted in highly successful design-build projects that achieved best value while meeting design and construction quality, cost and schedule goals.

**Attachment:** None
**Public Comment:** None

## 2. CONSENT AGENDA

**Action: Approve the items listed in the Consent Agenda.**

| | | | |
|---|---|---|---|
| **Moved:** | Maurice Lynch | **Ayes:** | 6 |
| **Seconded:** | Willie Levenston | **Nays:** | 0 |

**Brief:**

a. Approval of minutes from previous meeting.

b. Contract Awards

| | | |
|---|---|---|
| 1. | Emissions Stack Testing Services | $798,000 |
| 2. | Rate Model Consulting Services | $244,000 |

c. Task Orders

| | | |
|---|---|---|
| 1. | Prompt Repairs and On-Call Services Contract | $283,217 |

d. Change Orders

| | | |
|---|---|---|
| 1. | Effingham Street Interceptor Force Main Emergency Replacement | $51,310 |
| 2. | Norchester Street Pump Station Replacement | $170,524 |

e. Sole Source

1. APG-Neuros Turbo Blower Repairs
2. James River Treatment Plant Primary Biosolids Sludge Pump

f. HRSD Use of Existing Competitively Awarded Contract Vehicle

| | | |
|---|---|---|
| 1. | Information Technology Hardware, Software and Services Contract | $432,500 |

**Item(s) Removed for Discussion:** None

**Attachment #1:** Consent Agenda

**Public Comment:** None

3. **JAMES RIVER TREATMENT PLANT AMMONIA-BASED AERATION CONTROL (ABAC) WITH INTEGRATED FIXED-FILM ACTIVATED SLUDGE (IFAS) LICENSE AGREEMENT**

**Action: Approve the terms and conditions of the agreement with Veolia Water Technologies, Inc. dba Kruger, successor by merger to I. Kruger, Inc., for licensing a patented technology at zero cost to HRSD and authorize the General Manager to execute same, substantially as presented, together with such changes, modifications and deletions as the General Manager may deem necessary.**

| | | | |
|---|---|---|---|
| **Moved:** | Maurice Lynch | **Ayes:** | 6 |
| **Seconded:** | Arthur Bredemeyer | **Nays:** | 0 |

**Brief:** HRSD has implemented or will soon be implementing ammonia-based aeration control (ABAC) at several treatment plants including Nansemond, Boat Harbor, VIP and Army Base. The benefits include improved nitrogen removal performance, aeration energy savings and chemical savings, including for sodium hypochlorite, sodium hydroxide and methanol. ABAC itself is not a patented technology. However, the application of ABAC for processes employing Integrated Fixed-Film Activated Sludge (IFAS) was creatively patented by Kruger/Veolia with a priority date of May 2010 (see attached patent). Interestingly, the Kruger/Veolia patent application built upon and cited HRSD work published in 2009 and conducted as part of the IFAS Demonstration project that tested this new (at the time) technology at James River Treatment Plant (JRTP).

We believe that IFAS processes are actually much better applications of ABAC as compared to conventional activated sludge, because of the aeration energy intensity of the process and the wide range of operating dissolved oxygen concentration. It is our understanding that Kruger/Veolia currently has minimal experience actually implementing ABAC in IFAS applications, and JRTP would be one of the first to test this technology.

HRSD has negotiated the attached agreement with Kruger/Veolia to license the patented technology at zero cost in return for sharing information about the installation, including functional descriptions, distributed control system programming logic, instrument monitoring locations, set points, alarm conditions, procedures and programming relating management of IFAS media at high flow

rates, testing/evaluation program and performance data. If this agreement is approved, ABAC implementation and testing will begin in the spring of 2017.

The agreement has been reviewed by HRSD intellectual property legal counsel.

**Discussion Summary:** The MBBR process has been widely used in Europe, but not with the ABAC control system. The IFAS application is much more prevalent in North America, but we are not aware of anyone that has yet attempted ABAC with IFAS.

**Attachment #2:** Patent and Agreement

**Public Comment:** None

## 4. JEFFERSON AVENUE EXTENSION GRAVITY IMPROVEMENTS INITIAL APPROPRIATION AND CONTRACT AWARD

**Actions:**

**a. Appropriate total project funding in the amount of $2,870,400.**

**b. Award a contract to Woolpert, Inc. in the amount of $51,136.**

**Moved:** Willie Levenston
**Seconded:** Maurice Lynch
**Ayes:** 6
**Nays:** 0

**CIP Project: BH014800**

**Type of Procurement:** Competitive Negotiation

| Proposers | Technical Points | Recommended Selection Ranking |
|---|---|---|
| Woolpert, Inc. | 90 | 1 |
| Dewberry | 85 | 2 |

**Project Description** This project will rehabilitate or replace approximately 4,800 linear feet of gravity pipeline and associated manholes. The pipe diameters range from 27 to 36 inches. The project extends from MH-NG-103-2020 to MH-NG-106-8070 and from MH-NG-108-2800 to MH-NG-108-2340. MH-NG-106-719 is also included in the project. The majority of the existing gravity pipeline is located along Jefferson Avenue, between Sam Walton Way and 72nd Street with a small section between Arch Street and 50th Street. Some portions of the gravity pipeline are located within easements on the backside of parcels that front Jefferson Avenue.

**Funding Description:** The total cost of this project is estimated to be $2,870,400. The estimated cost for this project is based on a cost estimate prepared by HRSD Operations and reviewed by HRSD Design and Construction. This estimate assumes that a combination of replacement and rehabilitation work will be required.

**Contract Description:** The Professional Services Selection Committee selected the firm Woolpert Inc., whose professional qualifications and proposed services best serve the interest of HRSD. A meeting was held to discuss the project and scope of services. A fee of $51,136 was negotiated, which will provide the required professional services to develop a Preliminary Engineering Report based on the criteria and scope for the project.

**Analysis of Cost:** The PER for this project was negotiated and a fee of $51,136 was considered to be appropriate. This cost is 1.75 percent of the total project budget and is comparable with other projects of similar size and complexity.

| **Schedule:** | | | |
|---|---|---|---|
| | PER | February | 2017 |
| | Design | May | 2017 |
| | Bid | May | 2018 |
| | Construction | September | 2018 |
| | Project Completion | January | 2020 |

**Attachment:** None

**Public Comment:** None

5. **NEWTOWN ROAD INTERCEPTOR FORCE MAIN RELOCATION INITIAL APPROPRIATION AND CONTRACT AWARD (>$200,000)**

**Actions:**

**a. Appropriate total project funding in the amount of $16,555,000.**

**b. Award a contract to AECOM in the amount of $199,980.**

**Moved:** Arthur Bredemeyer **Ayes:** 6
**Seconded:** Maurice Lynch **Nays:** 0

**CIP Project: CE010520**

**Type of Procurement:** Competitive Negotiation

| Proposers | Technical Points | Recommended Selection Ranking |
|---|---|---|
| AECOM | 93 | 1 |
| Gannett Fleming, Inc. | 84 | 2 |
| Johnson Mirmiran and Thompson, Inc. | 67 | 3 |

**Project Description:** This project is to study, design and construct a force main to relocate approximately 4,700 linear feet of 48-inch pre-stressed concrete cylinder pipe (PCCP) SF-016 from its current location into the right-of-way of Diamond Springs Road from Wesleyan Drive to Northampton Boulevard in Virginia Beach and install new main line valves in order to isolate the line.

**Funding Description:** The initial appropriation is based on a construction cost estimate of $12,207,000 prepared by AECOM combined with estimated engineering services and a contingency allowance. Total engineering services, including construction phase services, were estimated at $2,190,000. An 18 percent contingency was included in the program cost estimate.

**Contract Description:** The Professional Services Selection Committee selected the firm AECOM whose professional qualifications and proposed services best serve the interest of HRSD. A meeting was held to discuss the project and scope of services. A fee of $199,980 was negotiated, which will

provide the required professional services to develop a Preliminary Engineering Report based on the criteria and scope for the project. The PER will summarize the evaluation of conceptual force main alignment alternatives, reconnection alternatives, condition assessment and abandonment plans. Design phase and construction phase services will be negotiated at completion of the PER.

**Analysis of Cost:** The fee negotiated with AECOM for this work is reasonable. Based on the preliminary construction cost estimate, the PER labor fee is 1.04 percent of the estimated construction cost, which compares favorably with other similar projects.

| **Schedule:** | | |
|---|---|---|
| | PER | October 2017 |
| | Design | November 2018 |
| | Bid | March 2019 |
| | Construction | March 2021 |
| | Project Completion | May 2021 |

**Attachment:** None

**Public Comment:** None

6. **WESTERN TRUNK FORCE MAIN REPLACEMENT**
**INITIAL APPROPRIATION AND CONTRACT AWARD (>$200,000)**

**Actions:**

**a. Appropriate total project funding in the amount of $4,286,000.**

**b. Award a contract to AECOM in the amount of $110,040.**

**Moved:** Arthur Bredemeyer **Ayes:** 6
**Seconded:** Maurice Lynch **Nays:** 0

**CIP Project: CE011700**

**Type of Procurement:** Competitive Negotiation

| Proposers | Technical Points | Recommended Selection Ranking |
|---|---|---|
| AECOM | 93 | 1 |
| Gannett Fleming, Inc. | 84 | 2 |
| Johnson Mirmiran and Thompson, Inc. | 67 | 3 |

**Project Description:** The project is to abandon in place 7,500 feet of 20-inch asbestos concrete pipe (SF-015) along Diamond Springs Road and reconnect multiple stations to the existing 48-inch pre-stressed concrete cylinder pipe (PCCP) force main (SF-016).

**Funding Description:** The initial appropriation is based on a construction cost estimate of $3,110,000 prepared by AECOM combined with estimated engineering services and a contingency allowance. Total engineering services, including construction phase services, were estimated at $719,000. A 15 percent contingency was included in the program cost estimate.

**Contract Description:** The Professional Services Selection Committee selected the firm AECOM, whose professional qualifications and proposed services best serve the interest of HRSD. A meeting was held to discuss the project and scope of services. A fee of $110,040 was negotiated, which will provide the required professional services to develop a Preliminary Engineering

Report based on the criteria and scope for the project. The PER will summarize the evaluation of conceptual force main alignment alternatives, reconnection alternatives, condition assessment and abandonment plans. Design phase and construction phase services will be negotiated at completion of the PER. The project is included in the Rehabilitation Plan.

**Analysis of Cost:** The fee negotiated with AECOM for this work is reasonable. Based on a preliminary cost estimate, the PER lump sum fee is three percent of the estimated construction cost. This appears high when compared to similar projects. Because of the many unknowns regarding the reconnection points and the existing pipe, a significant portion of the utility location and survey work is being performed early, during the PER phase, rather than during the design phase.

| **Schedule:** | | |
|---|---|---|
| | PER | October 2017 |
| | Design | November 2018 |
| | Bid | March 2019 |
| | Construction | March 2021 |
| | Project Completion | May 2021 |

**Discussion Summary:** Staff will provide a listing of Engineering Professional Services contracts be added to the next CIP quarterly briefing. Staff discussed the work with AECOM and feel they are able to perform the services requested with their current workload.

**Attachment:** None

**Public Comment:** None

## 7. SUSTAINABLE WATER PHASE 3 – DEMONSTRATION FACILITY APPROVAL OF GUARANTEED MAXIMUM PRICE (GMP)

**Action: Approve a partial Guaranteed Maximum Price of $2,722,500 to the Comprehensive Agreement with Crowder Construction Company.**

| | | | |
|---|---|---|---|
| **Moved:** | Maurice Lynch | **Ayes:** | 6 |
| **Seconded:** | Willie Levenston | **Nays:** | 0 |

**CIP Project:** GN016200

**Description:** This project is being procured through the Design-Build process. On November 22, 2016 the Commission approved a Comprehensive Agreement with Crowder Construction Company (Crowder) with a Construction Cost Limit (CCL) of up to $25,650,000. The HRSD project team and Design-Build team developed and evaluated initial value engineering opportunities during negotiation of the Comprehensive Agreement. Several opportunities were determined to be appropriate for inclusion at this early phase of design. The negotiated value of the accepted opportunities reduced the CCL to $24,143,000, which was included in the signed Comprehensive Agreement with Crowder.

Alternatives to the Basis of Design Report were requested by HRSD to address the more current understanding of treatment requirements that have resulted from further piloting activity since the development of the report in August 2016. These modifications have resulted in an increase of $188,700, which will revise the CCL to $24,331,700. The project team is currently developing additional value engineering opportunities to reduce the overall project cost.

This project requires that Crowder designs, constructs and commissions a complete SWIFT Demonstration Facility by January 26, 2018, which will allow for sufficient time to monitor the clean water's travel within the aquifer. Crowder developed a project schedule that includes two Guaranteed Maximum Price (GMP) packages. To meet this project's aggressive timeline, the major treatment equipment units that are subject to long lead times (approximately 30 weeks) need to be released for procurement prior to the design of the total facility reaching a sufficient level for the contractor to guarantee the total project's maximum price.

The project team's current request is for approval of GMP 1 to allow for Crowder to move forward with the procurement of the long-lead major treatment equipment units. The project team will present GMP 2 to the Commission in March 2017. GMP 2 will include the remainder of the project scope and represent the total project guaranteed maximum price.

This GMP 1 package includes the integrated flocculation and sedimentation system, bio-filters system, granular activated carbon adsorption system, ultraviolet disinfection system and ozonation system. Having completed the schematic design of the major treatment equipment units stated above, GMP 1 has been negotiated with the Design-Build team.

**Analysis of Cost:** The costs were prepared by Crowder and reviewed with HRSD during a workshop. Crowder provided a discussion of the vendors, equipment packages, and associated costs. The cost for each major equipment unit was provided in the GMP 1 package.

The CCL in the Comprehensive Agreement includes a specific line item for the procurement of major treatment equipment at the cost of $4,516,000. The lower cost of the GMP 1 package reflects a change in scope from the original estimate. Only the longest lead items that will be provided directly from the equipment manufacturers are included in the GMP 1 package. Additional required scope, such as filter media, adsorption media, pumps, variable frequency drives, valves and field instrumentation, will be provided by Crowder under GMP 2.

HRSD has negotiated GMP 1 with the Design-Build team to reflect the required treatment capabilities at an appropriate cost, and to include competitive and preferred vendors. CH2M Hill Engineers, who are providing Owner's Advisor services for this project, have reviewed the major treatment equipment design package and the GMP 1 costs and found them appropriate. Staff agrees and recommends the Comprehensive Agreement be amended to include the new GMP 1.

**Discussion Summary:** The Guaranteed Maximum Price (GMP) has been split into two packages to allow the equipment with long lead times to be procured now.

**Attachment:** None
**Public Comment:** None

8. **CAPITAL IMPROVEMENT PROGRAM (CIP) QUARTERLY UPDATE**

**Action: No action required.**

**Brief:** Implementing the CIP continues to be a significant challenge as we address numerous regulatory requirements and the need to replace aging infrastructure. Staff will provide a briefing describing the status of the CIP, financial projections, projects of significance and other issues affecting the program.

**Attachment #3:** PowerPoint Presentation

**Public Comment:** None

## 9. EPA CONSENT DECREE ANNUAL PUBLIC MEETING

**Action: No action required.**

**Moved:** **Ayes:**
**Seconded:** **Nays:**

**Brief:** The Consent Decree with EPA requires that we hold an annual informational meeting open to the public and the localities we serve. The meeting is intended to provide an update on compliance activities and status of all activities related to the Consent Decree. The meeting will be held at 1:30 p.m. on January 24, 2017 following the regular Commission meeting at the North Shore Operations Center. Staff will provide the Commission an overview of the materials to be presented at that meeting.

**Attachment #4:** PowerPoint Presentation

**Public Comment:** None

10. **RESCHEDULE COMMISSION MEETING DATE – JULY 2017**

**Action: Approve changing the date of the regularly scheduled July 25, 2017 Commission meeting to Wednesday, July 19, 2017.**

| | | | |
|---|---|---|---|
| **Moved:** | Stephen Rodriguez | **Ayes:** | 6 |
| **Seconded:** | Willie Levenston | **Nays:** | 0 |

**Brief:** Formal action is required to change a regularly scheduled Commission meeting date. This date will accommodate staff's participation in the NACWA Utility Leadership Conference. The Commission meeting time and location would remain as scheduled.

**Attachment:** None

**Public Comment:** None

11. **UNFINISHED BUSINESS** – None

12. **NEW BUSINESS** – None

## 13. COMMISSIONER COMMENTS

**Action: Approve Resolution Commending the Service of Nancy L. Munnikhuysen as Chief of Communications.**

| | | | |
|---|---|---|---|
| **Moved:** | Vishnu Lakdawala | **Ayes:** | 6 |
| **Seconded:** | Willie Levenston | **Nays:** | 0 |

**Brief:** Mr. Henifin said it was his privilege and honor to recognize Nancy Munnikhuysen, the retiring Chief of Communications, whose contributions to our organization during her 16-year tenure have been extraordinary.

Chair Elofson then read a Commending Resolution, which he presented to Ms. Munnikhuysen with a retirement plaque. Ms. Munnikhuysen thanked the Commission for this unexpected and humbling honor; Mr. Henifin for his kind words and visionary leadership; and HRSD employees for their many efforts that have made HRSD the extraordinary organization she has been proud to serve.

**Attachment #5:** Resolution

**Public Comment:** None

14. **PUBLIC COMMENTS NOT RELATED TO AGENDA** – None

15. **INFORMATIONAL ITEMS**

**Action: No action required.**

**Brief:** The items listed below were presented for information.

a. Management Reports

b. Strategic Planning Metrics Summary

c. Effluent Summary (Monthly and Annual)

d. Air Summary (Monthly and Annual)

**Attachment #6:** Informational Items

**Public Comment:** None

16. **CLOSED MEETING**

**Action: Motion to go into Closed Meeting for discussion with legal counsel and staff regarding litigation [Specific Exemption: Va. Code §2.2-3711.A7]**

| | | | |
|---|---|---|---|
| **Moved:** | Vishnu Lakdawala | **Ayes:** | 6 |
| **Seconded:** | Arthur Bredemeyer | **Nays:** | 0 |

**Brief:** Consultation with legal counsel and briefing by staff members pertaining to litigation, where such consultation or briefing in open meeting would adversely affect the negotiating or litigating posture of the public body.

| | | |
|---|---|---|
| **Roll call vote to return to Open Session:** | **Ayes:** | 6 |
| | **Nays:** | 0 |

17. **RECONVENED MEETING**

**Action: No action required.**

**Attachment:** None
**Public Comment:** None

## 18. ANNOUNCEMENTS

Chairman Elofson reminded the Commission of the Elizabeth River Project River Star Awards Luncheon to be held on January 26, 2017.

**Next Commission Meeting Date: February 28, 2017** at the HRSD South Shore Operations Complex, 1434 Air Rail Avenue, Virginia Beach, VA 23455

**Meeting Adjourned:** 10:26 a.m.

SUBMITTED:

Jennifer L. Cascio
Secretary

APPROVED:

Frederick N. Elofson, CPA
Chair

HRSD COMMISSION MEETING MINUTES
January 24, 2017

ATTACHMENT #1

AGENDA ITEM 1. – Consent Agenda

CONSENT AGENDA ITEM 2.b.1. – January 24, 2017

**Subject:** Emissions Stack Testing Services Contract
Contract Award (>$200,000)

**Recommended Action:** Award a blanket purchase contract for Emissions Stack Testing Services to Grace Consulting, Inc. in the estimated amount of $159,600 for year one with four annual renewal options and an estimated cumulative value in the amount of $798,000.

**Type of Procurement:** Competitive Bid

| Bidder | Bid Amount |
|---|---|
| Grace Consulting, Inc. | $159,600 |
| Environmental Source Samplers, Inc. | $187,500 |
| Air Tech Environmental LLC | $203,600 |
| TRC DBA TRC Environmental Corporation | $316,000 |
| FD Pace LLC DBA Pace Environmental | $367,810 |
| Air Hygiene International, Inc. | $450,000 |

**HRSD Estimate:** $180,000/year

**Contract Description:** This contract is an agreement for emissions stack testing services in order to comply with the Clean Air Act Section 129 Sewage Sludge Incineration Rule. Services, including testing and associated travel, will be performed at the Chesapeake-Elizabeth Treatment Plant, Virginia Initiative Plant, Boat Harbor Treatment Plant, Williamsburg Treatment Plant and the Army Base Treatment Plant.

Resource: Jay Bernas

CONSENT AGENDA ITEM 2.b.2. – January 24, 2017

**Subject:** Rate Model Consulting Services
Contract Award (>$200,000)

**Recommended Action:** Award a blanket purchase contract for Rate Model Consulting Services to Environmental and Economic Consultants, Inc. (EEC, Inc.) in the estimated amount of $48,800 for year one with four annual renewal options and an estimated cumulative value in the amount of $244,000.

**Contract Description:** This contract is for annual consulting services for review and updates of HRSD's general rates, charges and fees. The annual contract includes fixed consultant labor rates, which are fair and reasonable compared to similar consultant labor rates. EEC, Inc. was approved as a sole source provider for HRSD's Rate Model updates at the September 2015 Commission Meeting.

CONSENT AGENDA ITEM 2.c.1. – January 24, 2017

**Subject:** Prompt Repairs and On-Call Services Contract
Task Order (>$200,000)

**Recommended Action:** Approve a task order with T.A. Sheets in the amount of $283,217 for repairs along Beach Road in the City of Hampton.

**CIP Project: GN012113**

| | |
|---|---|
| Budget | $131,191,858* |
| Previous Expenditures and Encumbrances | ($129,144,100)* |
| Available Balance | $2,047,758* |

**Prompt Repairs and On-Call Services Contract - T.A. Sheets (TAS):**

| Contract Status: | Amount |
|---|---|
| Original Contract with TAS | $6,182,375 |
| Total Value of Previous Task Orders | $17,316,194 |
| Requested Task Order | $283,217 |
| Total Value of All Task Orders | $17,599,411 |
| Revised Contract Value | $23,567,004 |

*Includes all Consent Order CIPs: GN012110, GN012112, GN012113, GN012114, GN012115, GN012120, GN012130, GN012140, GN012150, CE011900, AT013800, JR013300, MP012800

**Project Description:** This task order is required as part of the Virginia Department of Environmental Quality (DEQ) Special Order by Consent and U.S. Environmental Protection Agency (EPA) Federal Consent Decree. HRSD will be required to comply with all the above stated Orders within required timeframes. Engineering and construction related support will be needed to meet the requirements stipulated in these Orders.

**Task Order Description:** This task order is to perform prompt repairs to HRSD gravity sewer assets along Beach Road in Hampton. Significant defects were identified in the 10-inch gravity sewer along Beach Road, between Catalina Drive and Westlawn Drive during condition assessment activities. Previously repaired gravity sewers just north of this location were transferred to the City of Hampton after they were replaced in 2012; consequently, HRSD plans to transfer the sewers included in this repair to the City of Hampton once the repairs are performed. This work includes the replacement of

approximately 300 feet of sewer and the rehabilitation with Cast in Place Pipe (CIPP) of approximately 300 feet of sewer. This work is being coordinated with Newport News Waterworks, who is replacing their water main in the same area. As a result, HRSD will be responsible for paving one-half of the roadway in the two-block work zone and Newport News Waterworks will pave and stripe the roadway.

**Analysis of Cost:** The cost for this task order is based on the unit costs defined in the Prompt Repairs and On Call services contract awarded to TAS in 2013.

**Schedule:** Project Completion April 2017

CONSENT AGENDA ITEM 2.d.1. – January 24, 2017

**Subject:** Effingham Street Interceptor Force Main Emergency Replacement Contract Change Order (>25% or $50,000)

**Recommended Action:** Approve a change order with Tidewater Utility Construction, Inc. in the amount of $51,310.

**CIP Project: VP017500**

| | |
|---|---|
| Budget | $3,133,275 |
| Previous Expenditures and Encumbrances | ($2,875,821) |
| Available Balance | $257,454 |

| **Contract Status:** | Amount | Cumulative % of Contract |
|---|---|---|
| Original Contract with Tidewater Utility | $1,385,589 | |
| Total Value of Previous Change Orders | $682,472 | 49% |
| Requested Change Order No. 4 | $51,310 | |
| Total Value of All Change Orders | $733,782 | 53% |
| Revised Contract Value | $2,119,371 | |

| | | |
|---|---|---|
| Time (Additional Calendar Days) | | 3 |

**Project Description:** This project will replace approximately 1,400 linear feet of 24-inch force main on Effingham Street from Firehouse Lane to Country Street in Portsmouth.

**Change Order Description:** This change order includes additional work due to unforeseen underground conditions.

**Analysis of Cost:** The Engineer prepared an independent estimate of costs and recommends approval of these changes.

**Schedule:** Project Completion March 2017

CONSENT AGENDA ITEM 2.d.2. – January 24, 2017

**Subject:** Norchester Street Pump Station Replacement
Contract Change Order (>25% or $50,000)

**Recommended Action:** Approve a change order with MEB General Contractors, Inc. in the amount of $170,524.

**CIP Project: VP013000**

| | |
|---|---|
| Budget | $7,967,356 |
| Previous Expenditures and Encumbrances | ($7,366,733) |
| Available Balance | $600,623 |

| **Contract Status:** | Amount | Cumulative % of Contract |
|---|---|---|
| Original Contract with MEB | $4,257,000 | |
| Total Value of Previous Change Orders | $1,060,843 | 24.9% |
| Requested Change Order No. 4 | $170,524 | |
| Total Value of All Change Orders | $1,231,367 | 28.9% |
| Revised Contract Value | $5,488,367 | |

| | | |
|---|---|---|
| Time (Additional Calendar Days) | | 98 |

**Project Description:** This project will replace the existing pump station installed in 1948. The design will address changing hydraulic conditions, deteriorated structures and persistent odor concerns. This project was originally chosen for replacement as part of the Pump Station Replacement Program – Phase I.

**Change Order Description:** This final change order includes the following items:

Changed conditions: Installation of a water supply booster pump, equalization tank and control system for the odor control unit due to fluctuating water pressure in the City supply line.

Additional scope: Installation of hose bibs in the wet well, a doghouse manhole in Norchester Avenue and additional hoist load testing.

Modifications from original design: Electrical modifications at the request of HRSD to the VFD's, seal fail relay box, current monitor for dry well exhaust fan, changes to mainline power trip units, relocation of pump vibration monitors and valve vault modifications.

**Analysis of Cost:** The Engineer prepared an independent estimate of costs and recommends approval of these changes.

The cost of this change order is based on review of actual costs provided by the Contractor and final negotiated costs.

| **Schedule:** | | |
|---|---|---|
| | Construction | December 2013 |
| | Project Completion | January 2017 |

Resource: Steve de Mik

CONSENT AGENDA ITEM 2.e.1. – January 24, 2017

**Subject:** APG-Neuros Turbo Blower Repairs
Sole Source (>$10,000)

**Recommended Action:** Approve APGN, Inc. to provide repair services to APG-Neuros Blower in use at HRSD.

**Sole Source Justification:**

- ☒ Compatibility with existing equipment or systems is required
- ☐ Support of a special program in which the product or service has unique characteristics essential to the needs of the program
- ☐ Product or service is covered by a patent or copyright
- ☐ Product or service is part of standardization program to minimize training for maintenance and operation, and parts inventory
- ☒ Only known source

**Details:** Services include an onsite field engineer for removal and shipping preparation, inspection and repair of APG-Neuros Blowers currently in service at HRSD. The high-efficiency turbo blowers reduce the amount of power used during the aeration process.

CONSENT AGENDA ITEM 2.e.2. – January 24, 2017

**Subject:** James River Treatment Plant Primary Biosolids Sludge Pump
Sole Source (>$10,000)

**Recommended Action:** Approve Moyno EZStrip™ Pump for the James River Treatment Plant.

**Sole Source Justification:**

- ☒ Compatibility with existing equipment or systems is required
- ☐ Support of a special program in which the product or service has unique characteristics essential to the needs of the program
- ☒ Product or service is covered by a patent or copyright
- ☐ Product or service is part of standardization program to minimize training for maintenance and operation, and parts inventory
- ☒ Only known source

**Details:** This biosolids sludge pump is to be used at the James River Treatment Plant. The product includes a Moyno EZStrip™ Z3AAC11RMB/E Pump with mechanical seal, baseplate, coupling and 7.5 horse power explosion proof right angle mounted gear motor.

The existing application requires the capability to have the pump rebuilt in place without having to remove the pump from service. The Moyno EZStrip™ Pump has a patented split coupling that allows for full drivetrain removal without any other disconnects and is designed with minimal parts compared to any other positive displacement pump.

CONSENT AGENDA ITEM 2.f.1. – January 24, 2017

**Subject:** Information Technology (IT) Hardware, Software and Services Contract
HRSD Use of Existing Competitively Awarded Contract Vehicle
(>$200,000)

**Recommended Action:** Approve the use of the County of Fairfax, Virginia contract for IT Hardware, Software and Services to CDW Government LLC in the estimated amount of $86,500 for year one with four annual renewal options and an estimated cumulative value in the amount of $432,500.

**HRSD Estimate:** $86,500/year (based on previous years' expenditures)

**Contract Description:** This contract is for the supply and delivery of hardware, software and services for use by HRSD's IT Department in accordance with a cooperative contract competitively solicited by the County of Fairfax, Virginia. Upon evaluation of the County's contract terms and conditions, as a public agency, HRSD is eligible to use the contract awarded to CDW Government LLC.

Online ordering capabilities, access to a broad catalog including key manufacturers, and pricing structure make this the most advantageous cooperative contract for HRSD. The contract is comprised of several product and service categories, which include discount pricing structures for hardware and software, firm fixed pricing for standard configurations and discounted hourly labor rates for services. The contract also offers a rebate incentive based on HRSD's annual contract spend.

HRSD COMMISSION MEETING MINUTES
January 24, 2017

ATTACHMENT #2

AGENDA ITEM 3. – James River Treatment Plant Ammonia-Based Aeration Control (ABAC) with Integrated Fixed-Film Activated Sludge (IFAS) License Agreement

US008268173B2

(12) **United States Patent**
**Bundgaard et al.**

(10) **Patent No.: US 8,268,173 B2**
(45) **Date of Patent: Sep. 18, 2012**

(54) **CONTROLLED AERATION OF INTEGRATED FIXED-FILM ACTIVATED SLUDGE BIOREACTOR SYSTEMS FOR THE TREATMENT OF WASTEWATER**

(75) Inventors: **Erik Bundgaard**, Vanloese (DK); **Richard E. DiMassimo**, Raleigh, NC (US)

(73) Assignee: **Veolia Water Solutions & Technologies Support**, Saint Maurice (FR)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 284 days.

(21) Appl. No.: **12/783,807**

(22) Filed: **May 20, 2010**

(65) **Prior Publication Data**

US 2011/0284461 A1 Nov. 24, 2011

(51) **Int. Cl.**
***C02F 3/00*** (2006.01)

(52) **U.S. Cl.** ..... **210/614**; 210/616; 210/620

(58) **Field of Classification Search** ..... 210/614, 210/616, 620
See application file for complete search history.

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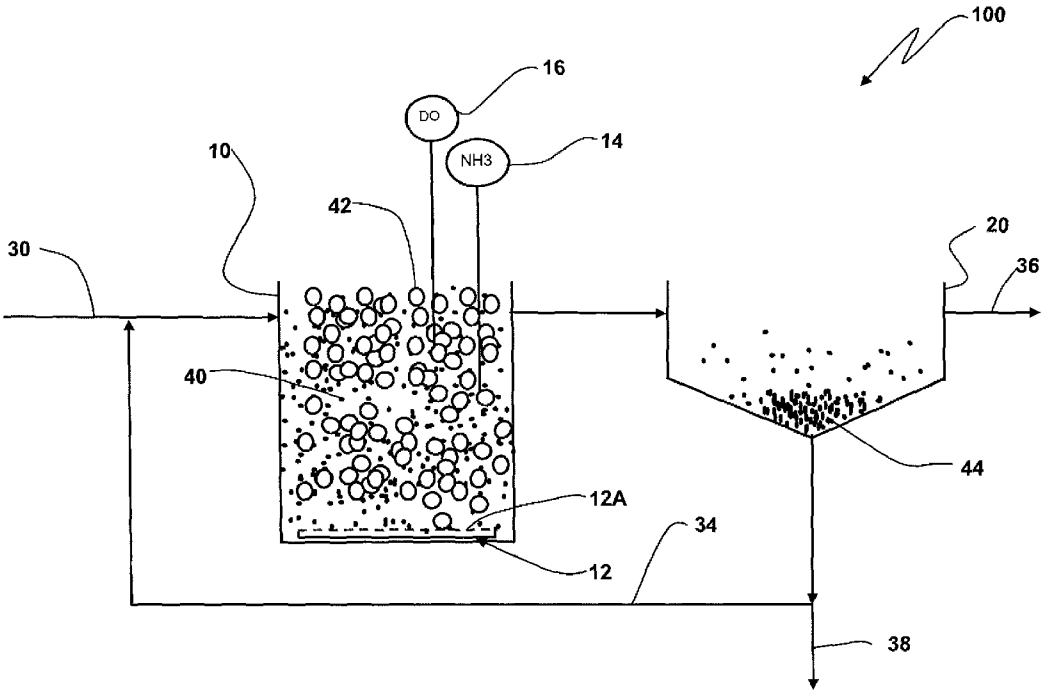
*Primary Examiner* — Chester Barry
(74) *Attorney, Agent, or Firm* — Coats & Bennett, P.L.L.C.

(57) **ABSTRACT**

A method of biologically treating wastewater with an integrated fixed film activated sludge process. The integrated fixed film activated sludge process includes biomass suspended in mixed liquor and biomass disposed on carriers. Under certain conditions the dissolved oxygen concentration in a reactor that includes the mixed liquor, biomass suspended in the mixed liquor, and the biomass on the carriers, biological treatment is performed primarily by the biomass in the mixed liquor. This is achieved by controlling or maintaining the dissolved oxygen concentration in the reactor at a relatively low concentration. When the biomass suspended in the mixed liquor is unable to adequately biologically treat the mixed liquor, the dissolved oxygen concentration in the reactor is controlled or maintained at a relatively high concentration. This enables biomass on the carriers to contribute more to the biological treatment of the mixed liquor than when the dissolved oxygen concentration was maintained relatively low.

**27 Claims, 4 Drawing Sheets**



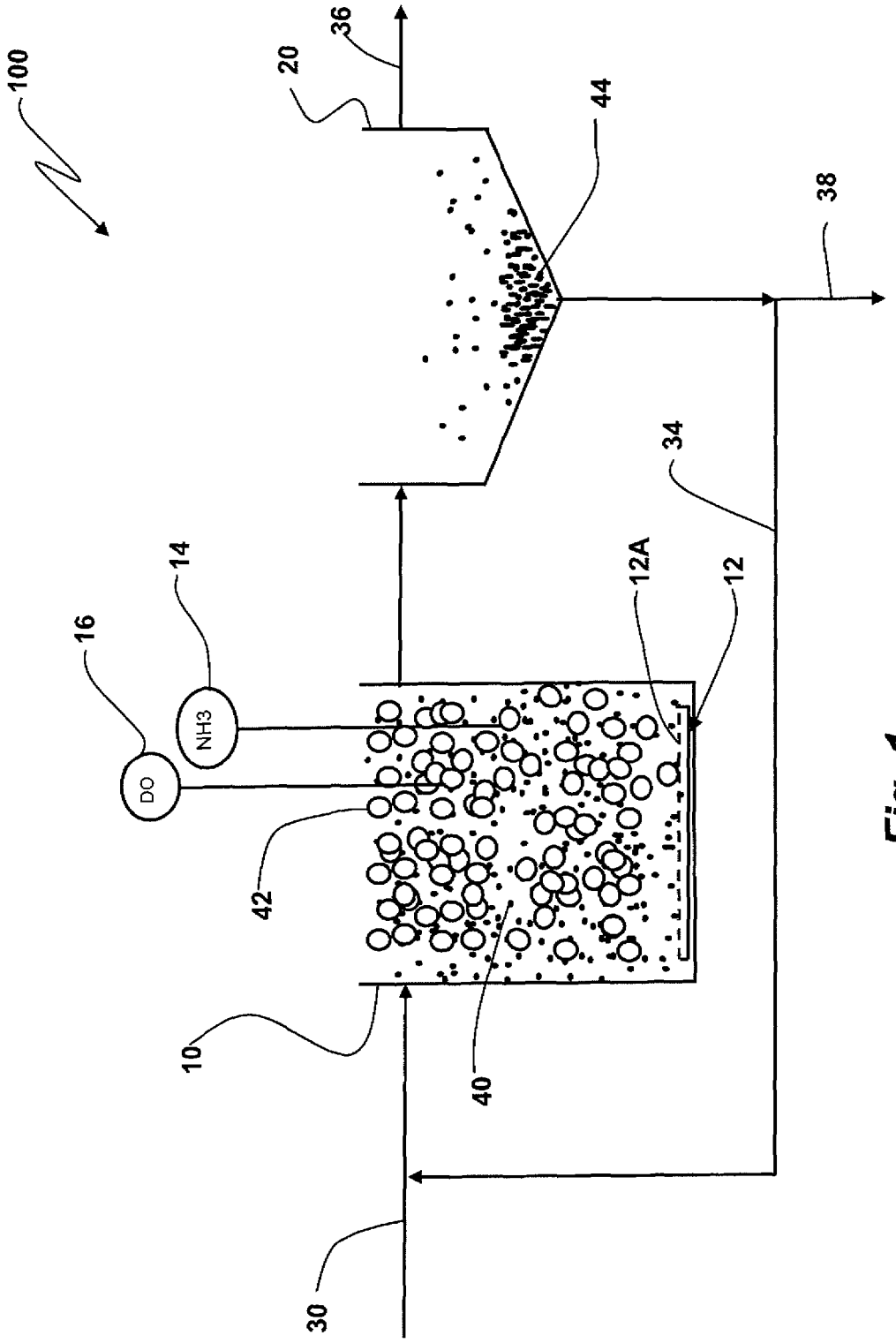



Fig. 1

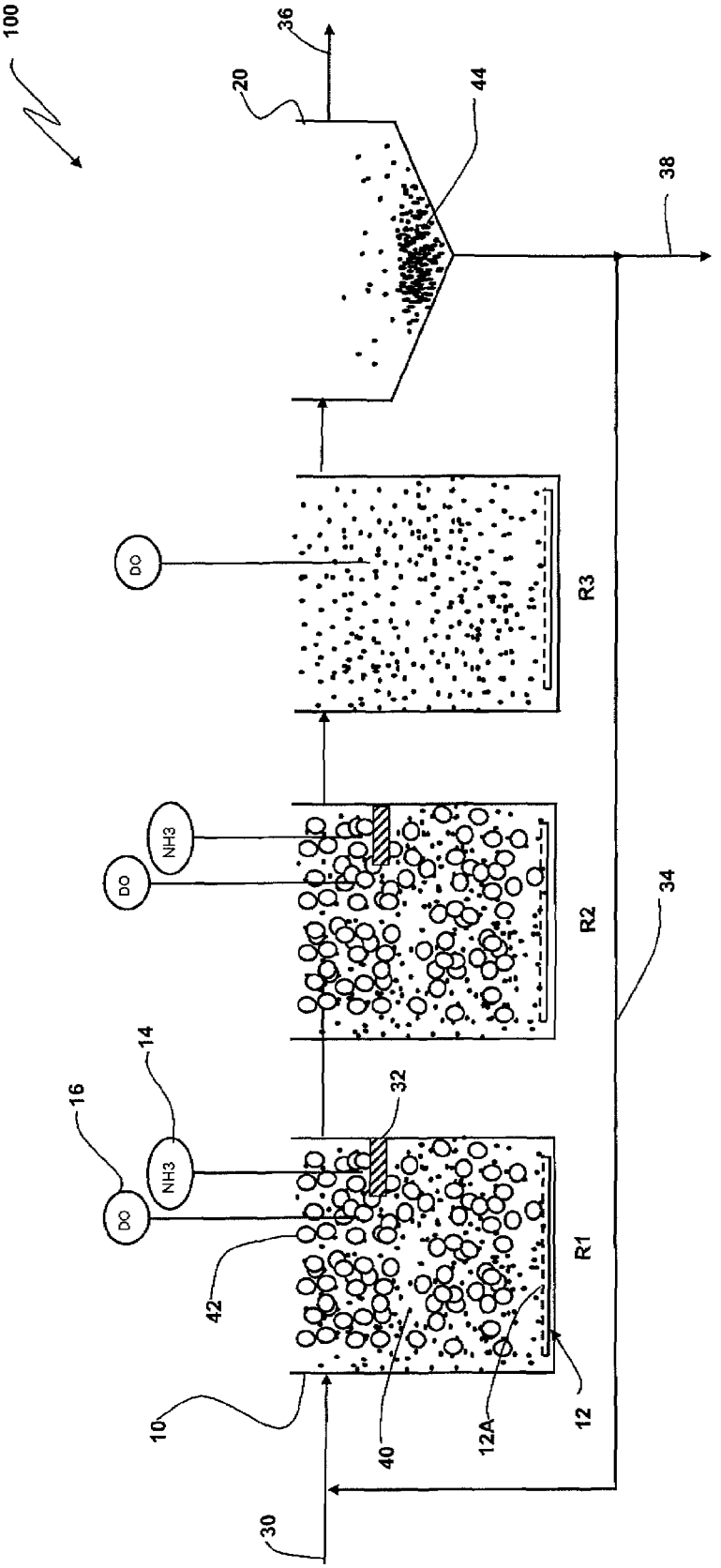
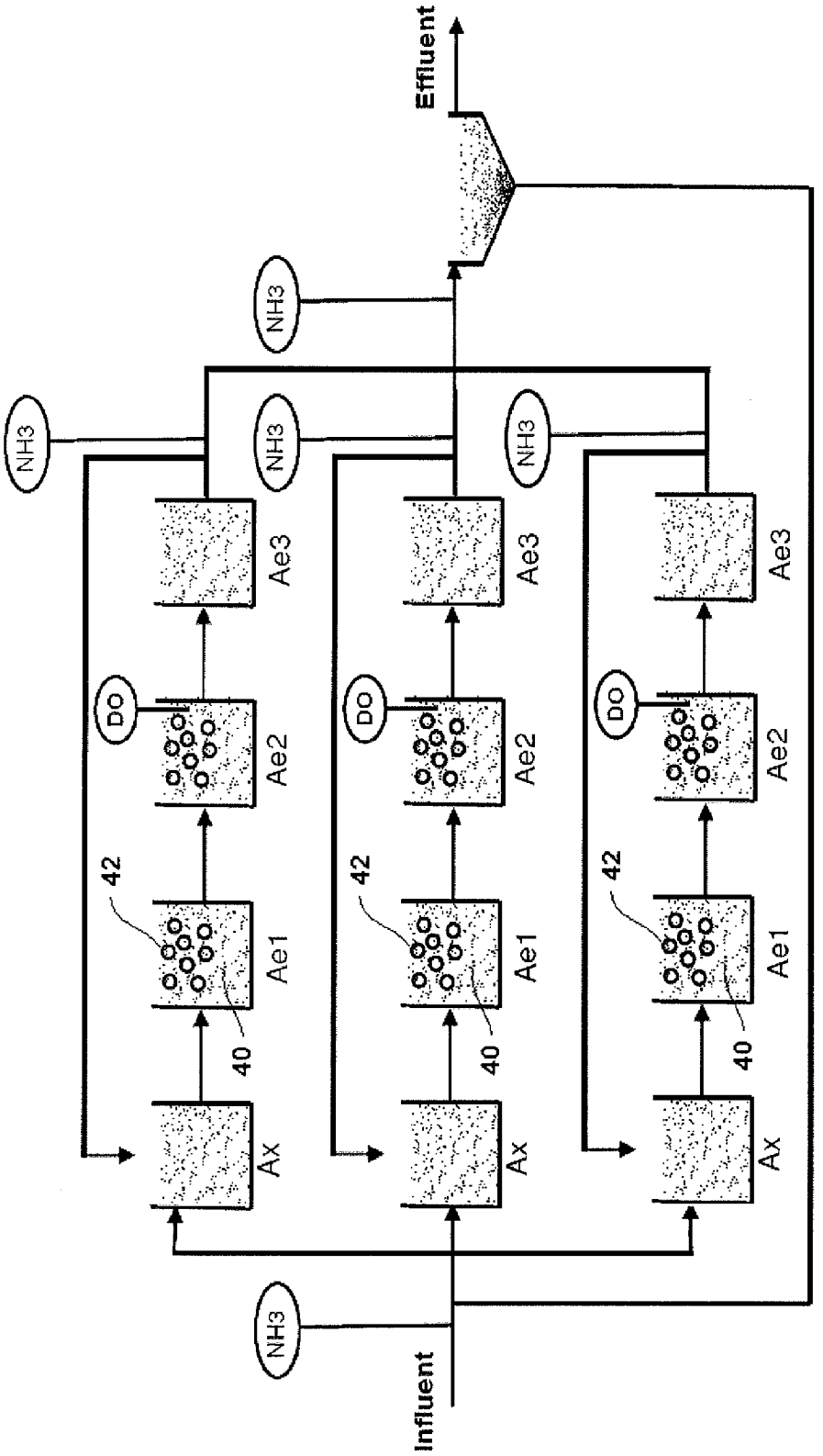

100
36
20
44
38
DO
R3
NH3
DO
R2
34
14
16
32
NH3
DO
42
R1
10
40
12A
12
30

Fig. 1A


Effluent
NH3
NH3
NH3
NH3
Ae3
Ae3
Ae3
DO
DO
DO
Ae2
Ae2
Ae2
42
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Ae1
Ae1
Ae1
40
40
40
Ax
Ax
Ax
NH3
Influent

*Fig. 2*

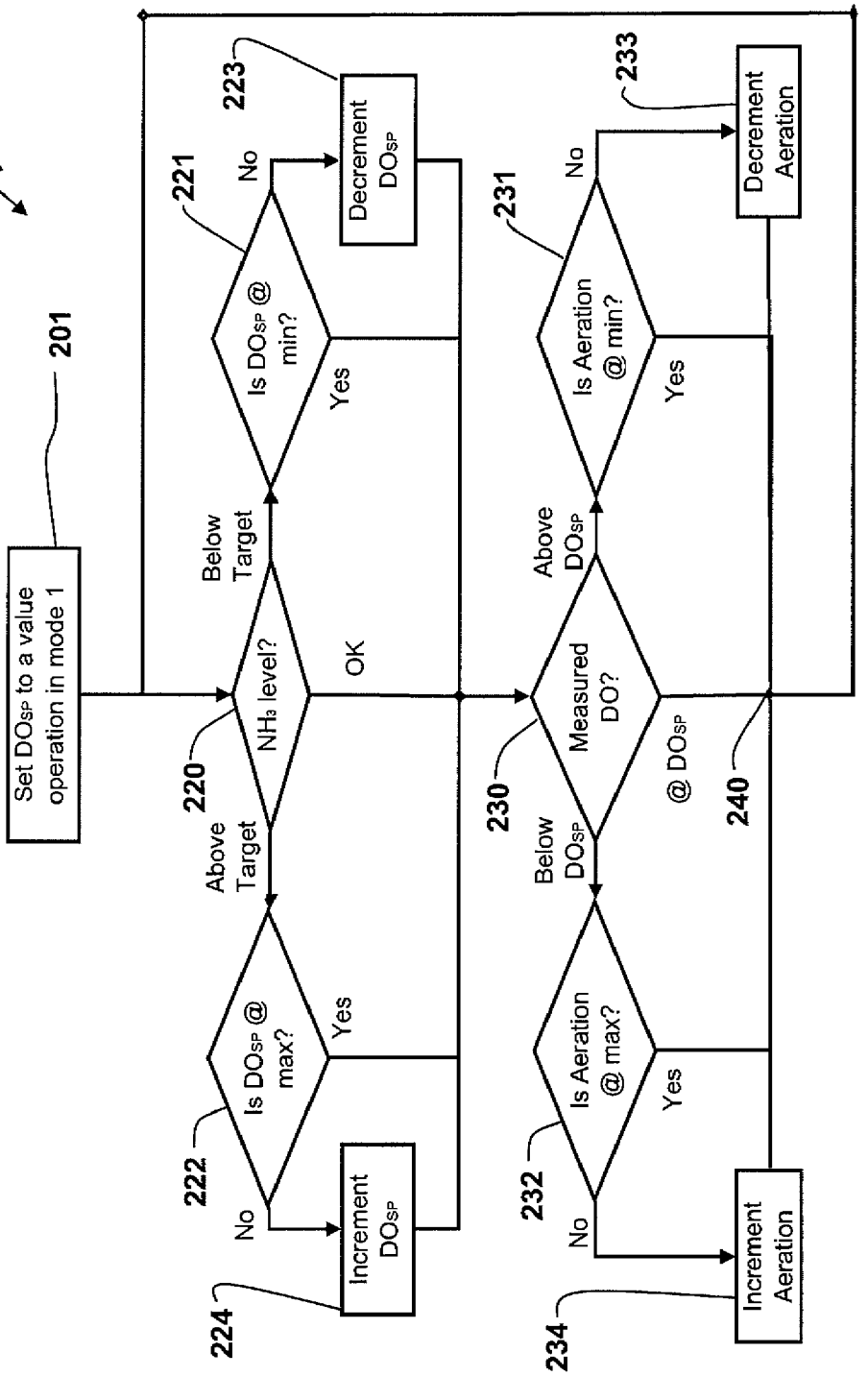
200
201
Set DOSP to a value operation in mode 1
220
NH3 level?
Below Target
OK
Above Target
221
Is DOSP @ min?
No
Yes
223
Decrement DOSP
222
Is DOSP @ max?
No
Yes
224
Increment DOSP
230
Measured DO?
Above DOSP
Below DOSP
@ DOSP
231
Is Aeration @ min?
No
Yes
233
Decrement Aeration
232
Is Aeration @ max?
No
Yes
234
Increment Aeration
240

*Fig. 3*

# CONTROLLED AERATION OF INTEGRATED FIXED-FILM ACTIVATED SLUDGE BIOREACTOR SYSTEMS FOR THE TREATMENT OF WASTEWATER

## FIELD OF THE INVENTION

The present invention is related to wastewater treatment processes wherein aeration is utilized to promote biological treatment of the wastewater. More specifically, the invention relates to controlling aeration in multiple modes of operation of a biological wastewater treatment reactor wherein the modes are associated with substantially different aeration levels.

## BACKGROUND

Wastewater treatment systems are designed to remove contaminants from wastewater. For many years, many wastewater treatment systems have been designed for biological treatment. For example, biological treatment is utilized to remove BOD from the wastewater. Another example of biological treatment involves removing ammonia from wastewater. This is referred to as nitrification and denitrification. Another example of biological treatment is the use of microorganisms to remove phosphorus from wastewater.

More particularly, biological organisms or microbes generally extant in wastewater can be stimulated to perform wastewater treatment processes by consuming waste materials, and in some cases, producing other materials or compounds that are acceptable, or that can be subsequently removed from the wastewater.

Generally, sustained activation of microbial populations in wastewater requires oxygen, in that most of the organisms are aerobic in nature. Commonly, oxygen is provided by aerating the wastewater. Aeration may be done in various ways. However, typical approaches to aeration can be costly in terms of the energy required to operate pumps, compressors, agitators, stirrers, and the like. Minimizing energy costs is a major factor in the operation of wastewater treatment plants, and aeration costs can be a major part of total wastewater treatment plant energy costs.

There has been and continues to be a need for biological wastewater treatment systems and processes that control aeration and provide for an efficient cost-effective means for biologically treating wastewater.

## SUMMARY OF THE INVENTION

The present invention relates to a process for biologically treating wastewater utilizing an integrated fixed film activated sludge process. By the traditional operation of such plants the mixing of the media with the mixed liquor and the wastewater is continuously ensured by intensive aeration which also ensure sufficient oxygen level to ensure biological activity on the media. In this method, wastewater is mixed with activated sludge to form mixed liquor. The mixed liquor is treated in a reactor having biomass disposed on media or carriers and also having biomass suspended in the mixed liquor. The aeration to the reactor having the mixed liquor is varied so as to efficiently aerate and supply dissolved oxygen to the mixed liquor. In one mode of operation, the aeration and dissolved oxygen concentration is maintained relatively low because the biomass suspended in the mixed liquor is sufficient to primarily carry out the required biological treatment. During such conditions the carriers are typically floating in the upper section of the biological reactor and are not taking part in the purification/treatment process of the wastewater. In a second mode of operation, the aeration to the reactor is increased and this effectively increases the dissolved oxygen concentration in the reactor which increases the biological activity of the biomass on the carriers which in turn generally increases the contribution of the biomass on the carriers to the biological treatment, and the carriers are generally evenly distributed in the reactor due to the higher aeration activity.



In one particular embodiment of the present invention, a method of biologically treating wastewater utilizing an integrated fixed film activated sludge process is provided. Here, the method includes mixing the wastewater with activated sludge to form mixed liquor. The mixed liquor is biologically treated in a reactor that includes biomass on the carriers and biomass suspended in the mixed liquor. The amount of biomass on the carriers will vary depending on temperature and the loading of organic matter and ammonia nitrogen in relation to the amount of activated sludge in the system (MLSS). The method includes controlling the dissolved oxygen concentration in the reactor in such a way that the biomass on the carriers is only removing pollutants (organic matter and ammonia) when the mixed liquor is not able to handle the complete treatment by itself. i.e., the carriers are only "working" when required. The dissolved oxygen concentration in the reactor is maintained relatively low when the biomass in the mixed liquor can perform the required biological treatment. Under certain conditions the biomass in the mixed liquor is unable to biologically treat the wastewater without substantial contributions from the biomass on the carriers. When this is the case, the dissolved oxygen concentration in the mixed liquor is raised and this enables the biomass on the carriers to substantially contribute to the biological treatment of the wastewater.

Other objects and advantages of the present invention will become apparent and obvious from a study of the following description and the accompanying drawings which are merely illustrative of such invention.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic of a wastewater treatment plant in accordance with an embodiment of the present invention.

FIG. **1**A is a schematic of a wastewater treatment plant in accordance with an alternate embodiment of the present invention.

FIG. **2** is a schematic of a wastewater treatment plant in accordance with a multi-train embodiment of the present invention.

FIG. **3** is a flow chart describing exemplary control logic appropriate to the present invention.

## DETAILED DESCRIPTION

The present invention relates to wastewater treatment processes to remove pollutants or contaminants from wastewater and generally to render the water cleaner and less harmful to the environment. Typical pollutants in wastewater, particularly municipal wastewater, comprise carbonaceous organics, organic N and ammonia. The present invention relates more specifically to biological treatment of wastewater as may be performed in a plant **100** illustrated schematically in FIG. **1**. An influent wastewater stream **30** is biologically treated by passing through plant **100** to produce a clarified effluent stream **36**. Plant **100** includes a reactor **10** and a clarifier **20** in fluid communication such that wastewater flows through reactor **10**. Generally, reactor **10** is a portion of plant **100** where the biological treatment occurs. It is appreciated that

more than one reactor may be used in a wastewater treatment plant as is shown in FIG. **1**A. However, where biological treatment is a design objective, at least one reactor such as reactor **10** is included. Reactor **10** is designed to meet a specific objective of enabling and supporting biological treatment. Generally, plant **100** is designed such that wastewater, in passing through the plant, resides in reactor **10** for a selected period of time sufficient to meet the biological treatment objective of the reactor. Sensors **14** and **16**, for example, may be deployed to provide for measuring process variables indicative of operating conditions of plant **10**. While sensors **14**, **16** are illustrated in FIG. **1** disposed in reactor **10**, it is appreciated that one or more sensors can be disposed at any of various sites in plant **10** and be useful, perhaps in different ways, in assessing plant operation and the efficiency of the overall biological wastewater treatment process. See, for example, FIGS. **1**A and **2**.

Biological treatment of wastewater utilizes microorganisms or biomass to treat the wastewater. Microorganisms can perform a variety of treatment processes. Some microorganisms can remove BOD, while other microorganisms can perform nitrification, while others can perform denitrification. Furthermore, and in the way of an example, some microorganisms can be utilized in a wastewater treatment process to remove phosphorus.

The present invention entails a wastewater treatment process or system that utilizes an integrated fixed film activated sludge (IFAS) process. Here the microorganisms or biomass reside suspended in the mixed liquor that is typical in conventional activated sludge processes, and the biomass also resides on media or carriers **42**. See FIG. **1**. That is, the biomass in an IFAS process can be found suspended in the mixed liquor and on the carriers **42**. As conditions such as temperature and the amount of substrate (organic loading) and loading of ammonia nitrogen change, the amount of biomass (nitrifying and organic substrate removing microorganisms) on the carriers **42** as well as in the mixed liquor can vary. During some periods, the amount of biomass or the density of the biomass on the carriers **42** is greater than at other times. For example, during seasonal warm weather there may be less biomass on the carriers **42** and there may be more nitrifying microorganisms suspended in the mixed liquor. Similarly, as temperatures become lower and there is a seasonal change to colder weather, the amount of nitrifying biomass in the mixed liquor may decrease. This change in population is not instantaneous. It usually occurs gradually. But the change in ammonia loading may change during the daily loading variations.

FIG. **1**A illustrates another example of an IFAS process. In this example the process includes three reactors, R**1**, R**2** and R**3**. Reactors R**1** and R**2** include the biofilm carriers **42** while reactor R**3**, located downstream from R**1** and R**2**, does not include biofilm carriers. All three reactors in this example are aerated. Consistent with the present invention as described above, aeration may be intermittent (on/off) or varied for reactors R**1** and R**2** under conditions of low $NH_3$ loading and warm temperature. In such cases, as discussed before, most of the nitrification occurs in the suspended biomass. Again, it should be appreciated that the processes shown in FIGS. **1** and **1**A are exemplary processes and that the concepts of the present invention can be applied in many biological wastewater treatment processes.

The present invention recognizes that biological activity exists in a wastewater treatment process with both the biomass in the mixed liquor and the biomass on the carriers **42**. One principle that the present invention recognizes and appreciates is that at certain times and under certain conditions there may be more biological activity associated with the biomass in the mixed liquor than at other times. Likewise, at certain times and under certain conditions there may be more biological activity associated with the biomass on the carriers **42** than at other times. The present invention envisions a control process that is efficient and makes effective use of the biomass in the mixed liquor and on the carriers **42**. One approach to controlling nitrification, for example, is to control the dissolved oxygen concentration in reactor **10** such that in one mode of operation, the primary biological activity that contributes to biological treatment emanates from the biomass in the mixed liquor. For example, when temperatures are relatively high during summer months, the wastewater treatment process described herein can function while maintaining the dissolved oxygen concentration relatively low. This, of course, requires less aeration which in turn reduces energy costs. Under such conditions, there is sufficient nitrifying biomass in the mixed liquor to perform adequate nitrification under conditions where the dissolved oxygen concentration is maintained relatively low. Under these conditions, individual carrier-filled reactors, as shown for example in FIG. **1**A, may be intermittently aerated (implementing an air on/air off scenario) for fixed time periods while monitoring the $NH_4$ near the reactor discharge point. If a relatively long period of zero aeration is utilized, it may be necessary to include short aeration pulses within this overall period. Outlet screens **32** (FIG. **1**A) can be positioned such that screen blockage due to media migration is minimized during carrier mixing-limited conditions, or alternatively, mechanical mixers can be utilized and operated during air-off periods. Even during these times where the dissolved oxygen concentration is maintained relatively low, the nitrifying biomass on the carriers **42** may still contribute to the total nitrification process. The contribution made by the biomass on the carriers **42** may be small compared to the contribution made by the biomass suspended in the mixed liquor. Such conditions will change and as an example, seasons will change and the wastewater treatment process will be exposed to colder temperatures or there might be sudden load increases. Over a period of time, as the wastewater temperature decreases, biomass concentrations in the mixed liquor will decrease and more biomass will grow on the carriers **42**. When this occurs, there may be insufficient biomass in the mixed liquor to adequately nitrify within the mixed liquor alone at a relatively low dissolved oxygen concentration and the mass transfer limitations across the biofilms would limit the amount of nitrification which could potentially occur within the fixed film on the carriers. Hence, to perform adequate nitrification in the mixed liquor, the control system reacts by increasing the dissolved oxygen concentration to a relatively high dissolved oxygen concentration. In a separate mode of operation, the relatively high dissolved oxygen concentration causes the nitrifying biomass on the carriers **42** to significantly contribute to the nitrification process. It is postulated that at a relatively high dissolved oxygen concentration, that the nitrifying biomass in the second mode of operation will include substantially more nitrifying activity than was associated with the nitrifying biomass on the carriers **42** during the first mode of operation where the dissolved oxygen concentration was maintained at a relatively low concentration. In the second mode of operation where the dissolved oxygen concentration is maintained relatively high, both the biomass on the carriers and the biomass in the mixed liquor contribute to total nitrification.

There are numerous ways to control the wastewater treatment process described so as to efficiently use energy and effectively treat the wastewater. In the case of a nitrification process for example, the ammonia sensors **14** measure the

concentration of ammonia in the mixed liquor in the reactor **10**, or in a subsequent reactor. When the ammonia concentration exceeds a threshold value or falls outside of a target ammonia concentration range, the system can gradually increase aeration so as to raise the dissolved oxygen concentration in the reactor **10** sufficient to nitrify the mixed liquor in reactor. Likewise, when the ammonia concentration in the reactor is extremely low, then the control system can reduce aeration and hence reduce energy costs because such is unnecessary.

The ammonia level in incoming wastewater is known to vary, both diurnally and from season to season. Thus required net rate of nitrification can be affected by the changing concentration of ammonia in influent **30**. Likewise, the temperature of the wastewater is known to have an effect on the rate of nitrification as well as an effect on the amount of ammonia in the wastewater. During relatively cold parts of the day or of the year, nitrification proceeds at a lower rate than during relatively warm parts of a day or warm periods of the year. Likewise, while wastewater is in transit to plant **10**, for example, ammoniafication proceeds more slowly at lower temperatures than at higher temperatures.

Generally, for a given set of operating conditions, such as temperature, influent ammonia loading, and flow rate through plant **10**, the rate at which ammonia is converted to nitrate is one indicator of the effectiveness of nitrification reactor **10**. Those of ordinary skill in the operation of wastewater biological treatment plants are cognizant of, for example, how many pounds of ammonia must be converted per hour for generally acceptable operation. While influent ammonia loading and temperature may vary, it is commonly understood that there is a minimum net nitrification rate, below which the reactor **10** maybe deemed ineffective. For example, when operating at a relatively low dissolved oxygen concentration set point, nitrification is usually primarily performed by the biomass in the mixed liquor. When the ammonia concentration increases over a threshold or target level, or when the net nitrification rate falls below an established minimum, the control system will raise the dissolved oxygen concentration set point. When the dissolved oxygen concentration set point is raised, then this calls for additional aeration in order to raise the dissolved oxygen concentration in the reactor. The raising of the dissolved oxygen concentration set point will increase the dissolved oxygen concentration in the reactor and that will increase the nitrifying activity of the biomass on the carriers. Now, at this raised or elevated dissolved oxygen concentration set point, substantial nitrification is carried out by both the biomass in the mixed liquor and the biomass on the carriers.

There are numerous control approaches to controlling biological activity of the biomass to reduce and conserve energy. In FIG. **3**, to be described later, there is disclosed a relatively sophisticated control process for nitrifying wastewater. However, a control approach can be relatively simple. A simple control approach is to have dissolved oxygen control based on ammonia measurement. The dissolved oxygen concentration is gradually increased or decreased based on the measured ammonia concentration in the reactor or in a subsequent reactor. The dissolved oxygen is increased by increasing aeration which generally increases mixing intensity in the reactor. Increasing the dissolved oxygen concentration and mixing intensity will increase the biological activity of the biomass on the carriers and this will in turn increase the contributions of the biomass on the carriers to the total biological treatment being performed.

Turning now to one specific exemplary embodiment of a control system operable to control a nitrification process as described above, there is shown in FIG. **3** a flow chart **200** that describes an exemplary control logic. It should be appreciated that there are numerous logic control schemes that can be employed, and that the logic control shown in FIG. **3** is simply one example. Before describing the logic, it is of use to discuss measured, calculated, and controlled variables and operating parameters associated with the control system and the plant. The measured variables are the ammonia concentration ($NH_3$) and the dissolved oxygen (DO) concentration expressed, for example in mg/l, in the wastewater. The values of the measured variables, $NH_3$ and DO, at any arbitrary time are acquired from sensors **14**, **16** (or measured in a subsequent reactor) by conventional and well-known means. For purposes of discussing one exemplary approach, change in ammonia level for a given change in dissolved oxygen ($\Delta NH_3/\Delta DO$) can be used. The controlled variable is the aeration rate, AR, expressed, for example, in cfm of air flow. There are known ways to vary aeration. Aeration rate may be varied, for example, by an electronic control valve responding to a command signal from the control system in a conventional and well known manner.

Parameters are values that various variables may take on or may be limited or constrained by during the operation of the control system. The dissolved oxygen DO maybe continuously controlled by varying AR to keep the DO as close as practically possible to a set point value, $DO_{SP}$. There is a known first range for $DO_{SP}$ for operating in the first mode where nitrification is mainly or primarily carried out by the activated sludge **40**. A second range for $DO_{SP}$ can be employed when it is desired to increase the nitrifying activity of the biomass on the carriers. These ranges are known based on experience by those skilled in wastewater treatment. The first range represents a practical range in which to vary DO and provide nitrification mainly or primarily due to the activated sludge **40**. The second range represents a practical range in which to vary the dissolved oxygen concentration where the dissolved oxygen concentration is effective to increase the nitrifying activity of the biomass on the carriers **42** and increasing the mixing of the carriers into the total reactor volume. In the way of an example, the first dissolved oxygen set point may include a range of 0.5 mg/L to 2.0 mg/L. In this example, this dissolved oxygen concentration range will encourage substantial nitrifying activity from the biomass in the mixed liquor and which will result in the biomass in mixed liquor primarily contributing to nitrification. In this example, the dissolved oxygen set point for the second range is 2.5 mg/L to 5 mg/L. In this dissolved oxygen range, is it postulated that this dissolved oxygen range will increase nitrifying activity of the biomass on the carriers **42** and increase the mixing of the carriers into the total reactor volume such that in general, the biomass on the carriers will contribute significantly to nitrification. In this second dissolved oxygen set point range, it is believed that both the biomass in the mixed liquor and the biomass on the carriers will contribute significantly to total nitrification. These ranges are experience-based and may be determined based on, among other things, energy costs.

The ammonia concentration $NH_3$ has a target value which is an objective of the wastewater nitrification process. This is generally the level to which it is desired to reduce the ammonia concentration before the wastewater moves to a subsequent stage in the treatment plant. The target value of $NH_3$ may be based on effluent requirements or legal limits for returning treated water to a river or basin. A typical target range for ammonia is 0.2-10 mg/L.

In one exemplary embodiment, a minimum value of the net nitrification rate for the first mode to remain selected is an

experience-based value based on characteristics of the activated sludge and the cost of aeration. Oppositely, a maximum value of net nitrification rate for the second mode to remain selected generally exists, and the value is likewise experience based and based at least partly on the cost of aeration. The control system, then operates with the objective of keeping net nitrification rate between a minimum value, and the maximum value in order to achieve the desired ammonia level in the effluent.

There is a minimum aeration rate obtainable with whatever aeration system is implemented. In general the minimum aeration rate is 0 or near 0 cfm. Likewise, there could be a maximum aeration rate associated with the particular aeration system utilized.

The control system is depicted in the exemplary flow chart of FIG. **3**. There are many different ways in which the logic can be designed. What follows is simply one exemplary approach. Once initialized (block **201**), the control system is designed to operate in a cyclic fashion wherein a cycle begins at block **210**. The measurements and control responses called for beginning with block **210** are executed to reach point **240**, and the cycle ends by returning to block **210**. The time required for one cycle is time step $\delta T$. $DO_{SP}$ and AR are potentially changed in each step by incrementing or decrementing by a fixed value or step, $\delta DO_{SP}$ and $\delta AR$, respectively. Step values $\delta T$, $\delta DO_{SP}$, and $\delta AR$ values can be adjusted for stability and responsiveness of the control system by well known control system methods. Typical values for these control variables and parameters are well known and appreciated by those skilled in the art, and it is appreciated that various values can be employed depending on circumstances and conditions surrounding treatment.

Returning now to FIG. **3** and considering the control logic or strategy, an initialization step **201** is provided to start the control system working. The initialization adjustment step is followed by a dissolved oxygen set point adjustment step that commences with block **220** to adjust the dissolved oxygen set point according to the current ammonia level in the wastewater. The dissolved oxygen set point step is followed by the aeration level adjustment step, which begins with block **230** and ends at point **240** from whence control passes for the next time step back to the dissolved oxygen set point step at block **220**.

Initialization step, block **201**, is only executed at a startup of the control system. In this step, through operator entry or other means of entry, the various parameters of the plant and the control system as described here are entered.

After completion of the initialization step, control passes to the dissolved oxygen set point adjustment step, commencing with block **220**. The current ammonia level is sensed and compared to the ammonia target for the treatment occurring in reactor **10**. If the ammonia level is above the target level, control passes to block **222** where the current dissolved oxygen set point is compared to the maximum allowable dissolved oxygen set points. If the dissolved oxygen set point is not maximized, it is incremented, or increased, by the parameter, $\delta DO_{SP}$. If the dissolved oxygen set point is maximized, no control action is taken and control passes to the aeration adjustment step.

Returning now to block **220**, if the ammonia level is below the target, control passes to block **221** where the current dissolved oxygen set point is compared to the minimum allowable dissolved oxygen set point. If the dissolved oxygen set point is not minimized, it is decremented, or decreased, by the parameter, $\delta DO_{SP}$, block **223**. If the dissolved oxygen set point is minimized, no control action is taken and control passes to the aeration adjustment step.

The aeration adjustment step begins with block **230** where the currently measured dissolved oxygen in the wastewater is compared with the current dissolved oxygen set point. If the currently measured dissolved oxygen is below the current set point value, control passes to block **232**, and if the measured dissolved oxygen is above the current set point, control passes to block **231**. If the dissolved oxygen set point is at the set point, no control action occurs as a result of the block **230** decisions. When control passes to block **232**, the current aeration level is compared to the value that was set as the maximum allowable or obtainable aeration level. If aeration is not maximized, the aeration is incremented by the amount $\delta AR$ (block **234**) and control passes to the next dissolved oxygen set point step at block **220**. If aeration is already maximized, no control action results and control passes to block **220**. When control passes to block **231**, the current aeration level is compared to the value that was set as the minimum allowable or obtainable aeration level. If aeration is not minimized, the aeration is decremented by the amount $\delta AR$ (block **233**) and control passes to the next dissolved oxygen set point step at block **220**. If aeration is already minimized, no control action results and control passes to the next dissolved oxygen set point step at block **220**.

It is recognized that, as is well known by those skilled in control system design, any control decision based on comparing a variable value and determining if, for example, the value is equal to a specific set point or target value involves numerical tolerances. Such comparisons are to be implemented by using small tolerances about the actual desired set point value to avoid instability. When, for example, the measured dissolved oxygen is compared to a target level, it is to be considered equal to the set point level it if is within plus or minus a very small range about the set point value. It is well within the skill of the ordinarily skilled artisan to set these small comparison ranges, sometimes called deltas.

In the control logic shown in FIG. **3**, it is appreciated that the first level of control looks at $NH_3$ levels and determines if the DO set point should be raised or lowered. Then, in the succeeding second level, the control logic looks at measured DO and determines if the aeration should be increased or decreased. It is appreciated that this order could be reversed. For example, the section of the control logic directed at determining if the DO set point should be raised or lowered could be at the second level while the determination whether aeration should be increased or decreased could occur at the first level. Many variations of this type can be implemented.

The present invention has been described in the context of a nitrification process. However, it should be understood and appreciated that the present invention can be utilized in various types of biological wastewater treatment processes including, but not limited to, BOD removal, phosphorous removal, and denitrification. Further, the process shown in FIG. **1** is a simple single train process. It is appreciated that the present invention can be incorporated into a multi-train process for a wide variety of biological wastewater treatment processes. In such a multi-train configuration, illustrated in FIG. **2**, process variables such as dissolved oxygen, ammonia concentration can be monitored at various locations in the trains. If the trains are producing a common effluent, process variables can be monitored in the common effluent.

In the exemplary system and process shown in FIG. **2**, there are shown three separate process trains that are operatively associated. The basic principles and concepts discussed with respect to the systems and processes shown in FIGS. **1** and **1**A apply here. In the case of the individual trains shown in FIG. **2**, each train includes four reactors, an anoxic reactor Ax followed by three aerobic reactors, Ae**1**, Ae**2** and Ae**3**. Vari-

ous monitoring approaches can be implemented for such process trains. As illustrated in FIG. **2**, $NH_3$ is monitored before the influent is directed into each of the trains and $NH_3$ is also monitored in the final effluent that is taken from all three trains. In addition, $NH_3$ is monitored in the effluent from each train, before the respective effluents are combined. Finally, in this example, dissolved oxygen concentration is measured or monitored in the second aerobic reactor Ae**2** in each train.

In FIG. **1**, it is appreciated that during the first mode of operation, that the biofilm carriers **42** may have a tendency to accumulate about the surface of the wastewater. In addition, the biofilm carriers **42** may have a tendency to accumulate at the outlet of the reactor **10**, and in some cases it may be possible that the biofilm carriers **42** could inhibit or restrict the flow of wastewater through the outlet of the reactor **10** and to the clarifier **20**. Therefore, to reduce this tendency, the present invention could provide means in the area of the reactor outlet to prevent the biofilm carriers **42** from restricting or inhibiting the flow of wastewater through this area. One such means is the provision of an air distribution means near the outlet of the reactor that would disburse air into this area and effectively prevent the biofilm carriers **42** from accumulating in the outlet area. The amount of air distributed in this area could be controlled such that it would not impact the basic control concerning operation in the first and second modes. That is, the air supplied here would be controlled such that when the system was operating in the first mode of operation, that this particular amount of air would not substantially activate the microorganisms associated with the biofilm carriers **42**. Another approach to dealing with this concern is to provide outlets in the lower portion of the reactor **10**. In this case, the biofilm carriers, at least in the first mode of operation, would not inhibit the flow of wastewater through such lower disposed outlets.

The present invention may, of course, be carried out in other ways than those specifically set forth herein without departing from essential characteristics of the invention. The present embodiments are to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

What is claimed is:

**1**. A method of biologically treating wastewater utilizing an integrated fixed film activated sludge process, the method comprising:

mixing the wastewater with activated sludge to form mixed liquor;

biologically treating the mixed liquor in a reactor utilizing an integrated fixed film activated sludge process that includes biomass on carriers and biomass suspended in the mixed liquor;

wherein from time-to-time, depending on conditions in the reactor, the amount of biomass on the carriers varies; and

controlling the dissolved oxygen concentration in the reactor by maintaining a relatively low dissolved oxygen concentration in the reactor when the amount of biomass on the carriers is relatively low, and maintaining a relatively high dissolved oxygen concentration in the reactor when the amount of biomass on the carriers is relatively high.

**2**. The method of claim **1** wherein when the dissolved oxygen concentration is maintained at a relatively low concentration, a majority of the biological treatment is performed by the biomass in the mixed liquor and less than a majority of the biological treatment is performed by the biomass on the carriers; and wherein when the dissolved oxygen concentration is maintained at a relatively high concentration, the biomass on the carriers contribute more to the biological treatment of the wastewater than when the dissolved oxygen concentration was maintained at a relatively low concentration.

**3**. The method of claim **1** including controlling the dissolved oxygen concentration in the reactor such that when the dissolved oxygen concentration is relatively low the biomass on the carriers contribute less than 50% of the total biological activity in the reactor and wherein, when the dissolved oxygen concentration is relatively high the biomass on the carriers contribute more than 50% of the biological activity in the reactor.

**4**. The method of claim **1** including determining the effectiveness of the biological treatment in the reactor, and based on the determined effectiveness of the biological treatment, maintaining the dissolved oxygen concentration in the reactor at a relatively low or relatively high concentration.

**5**. The method of claim **1** wherein the method is carried out in first and second modes of operation wherein in the first mode of operation the dissolved oxygen concentration is maintained relatively low and in the second mode of operation the dissolve oxygen concentration is maintained relatively high, and wherein the method includes shifting from the first mode of operation to the second mode of operation and vice versa based on the dissolved oxygen concentration in the mixed liquor, the ammonia concentration in the mixed liquor, or the nitrification rate occurring in the mixed liquor.

**6**. The method of claim **5** including establishing a dissolved oxygen concentration set point range for each mode of operation, and varying the dissolved oxygen concentration set point within the respective ranges while biologically treating the wastewater.

**7**. The method of claim **1** including aerating the mixed liquor in the reactor and varying the aeration of the mixed liquor based in part at least on ammonia concentration within the reactor.

**8**. The method of claim **7** wherein in a first mode of operation the dissolved oxygen concentration in the reactor is maintained relatively low and in a second mode of operation the dissolved oxygen concentration in the reactor is maintained relatively high, and wherein in the first mode of operation the method includes providing a relatively low level of aeration to the reactor, and in the second mode of operation providing a relatively high level of aeration to the reactor.

**9**. The method of claim **8** wherein the method is a nitrification process and wherein in the first mode of operation nitrification is primarily carried out by the biomass in the mixed liquor while the biomass on the carriers contribute less to nitrification than the biomass in the mixed liquor.

**10**. The method of claim **9** wherein in the second mode of operation, the biomass on the carriers contributes substantially to nitrification and contributes more to nitrification than in the first mode of operation.

**11**. The method of claim **8** wherein in the first mode of operation the method includes supplying aeration to the reactor such that the carriers are not substantially mixed with the mixed liquor in the reactor; and in the second mode of operation, supplying aeration to the reactor such that the carriers are substantially mixed with the mixed liquor in the reactor.

**12**. The method of claim **1** including when the ambient temperature is relatively high over a selected period of time, maintaining the dissolved oxygen concentration relatively low; and when the ambient temperature is relatively low over a selected period of time maintaining the dissolved oxygen concentration relatively high.

**13**. The method of claim **1** including treating the wastewater in a first mode of operation during a relatively warm weather period; and treating the wastewater in a second mode of operation in a relatively cold weather period; and wherein in the first mode of operation the dissolved oxygen concentration in the reactor is maintained relatively low, and in the

second mode of operation the dissolved oxygen concentration in the reactor is maintained generally high.

**14**. A method of efficiently nitrifying wastewater with an integrated fixed film activated sludge process, the method comprising:

mixing the wastewater with activated sludge to form mixed liquor;

nitrifying the mixed liquor in a reactor utilizing the integrated fixed film activated sludge process that includes biomass on carriers and biomass suspended in mixed liquor;

varying the nitrifying activity of the biomass in the mixed liquor and the biomass on the carriers by varying the dissolved oxygen concentration in the reactor;

in the first mode of operation, causing the nitrifying activity of biomass in the mixed liquor to contribute more to the total nitrifying activity in the reactor than the biomass on the carriers by maintaining the dissolved oxygen concentration in the reactor at a relatively low concentrations;

in a second mode of operation, increasing the nitrifying activity of the biomass on the carriers and causing the biomass on the carriers to contribute more to the total nitrifying activity in the reactor than the biomass on the carriers contributed in the first mode of operation by maintaining the dissolved oxygen concentration in the reactor at a relatively high concentration; and

wherein in the first mode of operation, the biomass in the mixed liquor contributes primarily to nitrification and in the second mode of operation, both the biomass in the mixed liquor and the biomass on the carriers contribute to nitrification.

**15**. The method of claim **14** wherein maintaining the dissolved oxygen concentrations in the reactor at relatively low and high concentrations includes providing aeration to the reactor and varying the aeration to the reactor such that in the first mode of operation, the dissolved oxygen concentration in the reactor is relatively low and in the second mode of operation, the dissolved oxygen concentration in the reactor is relatively high.

**16**. The method of claim **14** wherein in the first mode of operation, the biomass in the mixed liquor contributes the majority of the nitrifying activity that takes place in the reactor, and wherein in the second mode of operation the nitrifying activity of the biomass on the carriers is substantially increased over the level of nitrifying activity of the biomass on the carriers in the first mode of operation.

**17**. The method of claim **14** wherein maintaining the dissolved oxygen concentration at the relatively low or high concentration includes: (1) measuring ammonia concentration in the reactor; (2) comparing the measured ammonia concentration in the reactor to a target ammonia concentration or a target ammonia concentration range; and (3) if the measured ammonia concentration is not equal to the target ammonia concentration or lies outside of the target ammonia concentration range, the method includes raising or lowering the dissolved oxygen concentration accordingly.

**18**. The method of claim **17** including raising or lowering the dissolved oxygen concentration by varying aeration to the reactor.

**19**. A method of efficiently nitrifying wastewater with an integrated fixed film activated sludge process, the method comprising:

mixing the wastewater with activated sludge to form mixed liquor;

nitrifying the mixed liquor in the reactor utilizing an integrated fixed film activated sludge process that includes biomass on carriers and biomass suspended in the mixed liquor;

controlling nitrification such that a nitrification priority is given to the biomass suspended in the mixed liquor such that under certain conditions nitrification of the mixed liquor is primarily performed by the biomass in the mixed liquor;

maintaining the dissolved oxygen concentration in the reactor relatively low when nitrification is primarily performed by the biomass in the mixed liquor; and

in response to the method being unable to adequately nitrify the mixed liquor at the relatively low dissolved oxygen concentration, increasing the dissolved oxygen concentration in the reactor and maintaining the dissolved oxygen concentration relatively high in the reactor and increasing the nitrifying activity of the biomass on the carriers such that nitrification is carried out by both the biomass in the mixed liquor and the biomass on the carriers and wherein at the relatively high DO concentration, the biomass on the carriers contribute more nitrification than at the relatively low dissolved oxygen concentration.

**20**. The method of claim **19** including measuring the ammonia concentration at a selected location and controlling the dissolved oxygen concentration based on the measured ammonia concentration.

**21**. The method of claim **20** including measuring the ammonia concentration in the reactor and controlling the dissolved oxygen concentration in the reactor based on the measured ammonia concentration in the reactor.

**22**. The method of claim **1** wherein maintaining a relatively low dissolved oxygen concentration in the reactor occurs when the biomass suspended in the mixed liquor is able to perform the biological treatment and wherein maintaining a relatively high dissolved oxygen concentration in the reactor occurs when the biomass suspended in the mixed liquor is not able to perform the biological treatment.

**23**. The method of claim **1** wherein when organic and ammonia loading to the process is relatively low, the method includes maintaining a relatively low dissolved oxygen concentration in the reactor and wherein when the organic and ammonia loading to the process is relatively high, the method entails maintaining a relatively high dissolved oxygen concentration in the reactor.

**24**. The method of claim **1** wherein when the dissolved oxygen concentration is maintained relatively high, the method includes mixing the carriers in the wastewater such that the carriers are distributed in a substantial portion of the wastewater.

**25**. The method of claim **14** including causing the carriers to be more uniformly mixed in the wastewater during the second mode of operation than in the first mode of operation.

**26**. The method of claim **14** wherein the method includes providing aeration to the reactor and utilizing the aeration to mix the carrier with the wastewater.

**27**. The method of claim **19** wherein increasing the dissolved oxygen concentration in the reactor includes aerating the wastewater in the reactor and utilizing the aeration to mix the carriers in the wastewater.

* * * * *

# PATENT LICENSE AGREEMENT

This Patent License Agreement ("**Agreement**") is dated January 31, 2017 ("**Effective Date**") and is by and between Hampton Roads Sanitation District, a political subdivision of the Commonwealth of Virginia having a place of business at 1434 Air Rail Avenue, Virginia Beach, VA 23455 ("**HRSD**"), Veolia Water Technologies, Inc. dba Kruger, successor by merger to I. Kruger, Inc., a Delaware corporation having an address at 4001 Weston Parkway, Cary, NC 27513 ("**Kruger**") and Veolia Water Solutions & Technology Support having an address at 1 Place Montgolfier, Saint-Maurice, France 94417 ("**Veolia**") (Kruger and Veolia are individually and collectively referred to as "**Kruger-Veolia**"). (HRSD, Kruger and Veolia are referred to singularly as "**Party**," and collectively as "**Parties**").

## RECITALS

**WHEREAS**, HRSD owns and operates several biological nutrient removal ("**BNR**") plants where it has been using ammonia-based aeration control ("**ABAC**"); HRSD plans to test ABAC at its James River Treatment Plant located in Newport News, Virginia in an effort to save in caustic addition, reduce chlorine demand, reduce blower energy demand, and possibly improve total nitrogen removal; and, HRSD currently employs an integrated fixed-film activated sludge ("**IFAS**") system in a BNR process at its James River Treatment Plant.

**WHEREAS**, Kruger wishes to be included in development of testing protocols and implementation of ABAC for IFAS applications under certain Patent (defined below);

**WHEREAS**, HRSD has licensed certain patent rights to Kruger pursuant to that certain Patent License Agreement between HRSD and Kruger dated June 28, 2016 ("**ANITA Mox Patent License**"), attached hereto as Appendix 1; and

**WHEREAS**, Kruger-Veolia own said certain Patent relating to ABAC for IFAS applications, which HRSD wishes to license from Kruger-Veolia, and Kruger-Veolia wishes to grant such license to HRSD under said certain Patent hereinafter defined.

**NOW, THEREFORE,** in consideration of the sum of ten U.S. Dollars ($10) to be divided equally amongst Kruger and Veolia, and the mutual covenants contained in this Agreement, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Parties agree as follows:

**ARTICLE 1.** Definitions

**1.1.** "**Field**" means waste and wastewater treatment, limited to using IFAS.

**1.2.** "**HRSD**" has the meaning set forth in the introductory paragraph and includes any successor or permitted assigns.

**1.3.** "**IFAS Plant**" means the James River Treatment Plant located in Newport News, Virginia.

**1.4.** "**Implementation Work Information**" means functional descriptions, programming materials, instrument monitoring locations, set points, alarm conditions, procedures and programming relating to ABAC monitoring and operation, and procedures and programming relating to management of media at high flow rates, and performance data that are developed by HRSD using Licensed Products within the IFAS system at the James River Treatment Plant.

**1.5.** "**Kruger**" has the meaning set forth in the introductory paragraph and includes any successor or permitted assigns.

**1.6.** "**Licensed Product**" means any product or process that is, or can be used in the Field and the Territory, and that but for the license granted pursuant to this Agreement, would infringe, or contribute to, or induce the infringement of, a valid claim of the Patent. Licensed Product shall include ABAC for only IFAS applications.

**1.7.** "**Patent**" means U.S. Patent No. 8,864,993, issued October 21, 2014, and titled "Process for Removing Ammonium from a Wastewater Stream".

**1.8.** "**Territory**" means the James River Treatment Plant located in Newport News, Virginia.

**1.9.** "**Veolia**" has the meaning set forth in the introductory paragraph and includes any successor or permitted assigns.

## ARTICLE 2. DEVELOPMENT

**2.1.** **No Guarantees; Assumption of Risk**. Each Party recognizes and assumes the risk that the goals and objectives set forth in this Agreement may not be obtainable.

**2.2.** **Access to data, materials and information**. In consideration for the license granted herein, HRSD agrees to provide Implementation Work Information to Kruger that results directly from HRSD using Licensed Products to implement ABAC in the IFAS system at the IFAS Plant. For avoidance of doubt, Kruger-Veolia at its sole and absolute discretion may use Implementation Work Information for purposes it chooses, including but not limited to developing and marketing product improvements or additions to its IFAS process for sale. Kruger-Veolia must obtain the prior, written approval of HRSD's Director of Communication for the use of HRSD's identifying information, including HRSD's name or logo in any marketing or commercial activities and for the use of any trade name, trademark, trade dress, copyright (whether registered or not), copyrightable material, Confidential Information or know how that belongs to, or is provided by HRSD.

**2.3.** **External Communications by HRSD regarding ABAC at JRTP**. In any external communication made by HRSD regarding the use, testing, performance, implementation, or capabilities of ABAC at the IFAS Plant, including but not limited to white papers and seminars, HRSD will acknowledge the Patent is owned and licensed by Kruger and Veolia.

## ARTICLE 3. OWNERSHIP AND LICENSES

**3.1. Grant of License to HRSD.** Kruger-Veolia hereby grant to HRSD, to the extent of the Field and the Territory, a fully paid-up, irrevocable non-exclusive license under the Patent to make, use, and import the Licensed Products. For avoidance of doubt, no sub-licenses or license transfers of any kind from HRSD to another party are permitted under this Agreement.

**3.2. Kruger's License for Improvements.** In the future, HRSD may make improvements to the Patent ("**Improvements**"). HRSD agrees to grant to Kruger a license under the Improvements on substantially the same terms and conditions as those set forth in the ANITA Mox Patent License; provided that HRSD shall retain ownership of all rights, title and interest in and to the Improvements.

## ARTICLE 4. CONFIDENTIALITY

**4.1. General Definition of Confidential Information**. For purposes of this Agreement, "**Confidential Information**" means all non-public and/or proprietary information disclosed by one Party (the "**Disclosing Party**") to another Party (the "**Receiving Party**") in the course of, or to which the Receiving Party gains access to as a result of, activity pursuant to this Agreement, provided that such information is: (i) in the case of a written disclosure, there is affixed to the document a legend that clearly identifies the Confidential Information as such; or (ii) in the case of an oral or visual disclosure, the disclosing Party makes a contemporaneous oral statement and delivers to the recipient a written statement within thirty (30) days to the effect that such disclosure is Confidential Information. Notwithstanding the foregoing, Confidential Information does not include information that (i) is known by the Receiving Party prior to the time of disclosure by the Disclosing Party; (ii) is publicly available through no act or omission on the Receiving Party's part; (iii) is developed by the Receiving Party independent of any Confidential Information it receives from the Disclosing Party; or (iv) the Receiving Party receives from a third party free to make such disclosure without breach of any legal obligation.

**4.2. Confidentiality Obligations**. Each Party agrees to use Confidential Information belonging to any other Party only for the purpose of performing their obligations pursuant to this Agreement. No Party shall disclose, discuss or use any other Party's Confidential Information, directly or indirectly, for any other purpose, except as may be necessary pursuant to applicable law or a valid order of a court or authorized government agency, provided that the recipient has given the Disclosing Party an opportunity to defend, limit or protect such disclosure. Each Party shall hold each other Party's Confidential Information in confidence for five (5) years from the date of disclosure, using such measures as the Receiving Party uses to protect the confidentiality of its own Confidential Information of like importance, but in no event using less than reasonable care.

**4.3. Return of Confidential Information**. Upon written request by a Disclosing Party, the Receiving Party shall promptly return all Confidential Information belonging to the requesting Disclosing Party, including all materials the Receiving Party may have created that reveal or are based in any way on any Confidential Information of the requesting Disclosing Party, and all copies of the foregoing, in whatever form, except as may be necessary to give effect to any Party's rights under this Agreement.

**4.4. Equitable Relief**. Each Party acknowledges that the Disclosing Party would suffer immediate and irreparable harm for which monetary damages would be an inadequate remedy if it were to breach its obligations under this Article 4. Each Party expressly agrees that the Disclosing Party may obtain equitable relief, including injunctive relief, to protect the Disclosing Party's intellectual property rights and interests under this Agreement, in addition to such other remedies as may be available at law or in equity.

**ARTICLE 5. REPRESENTATIONS; WARRANTIES; LIABILITY.**

**5.1. Representations and Warranties**. Each Party hereto represents and warrants to the others that: (i) such Party is validly existing under the laws of the jurisdiction in which it is organized, with full power and authority to carry on its business as it is now being conducted; (ii) the execution, delivery and performance of this Agreement has been duly authorized by such Party, and no other action or other proceeding on the part of such Party or its governing body is necessary to authorize this Agreement; and (iii) entering into this Agreement does not and will not violate any contract or obligation existing between such Party and any third party. Kruger-Veolia represents and warrants that it owns the Patent, and that Kruger-Veolia has the necessary rights, title and interests in and to the Patent to grant the license to the Licensed Products under the terms and conditions of this Agreement.

**5.2. DISCLAIMER**. ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, EXPRESS OR IMPLIED, ARE DISCLAIMED. ANY RIGHTS, INFORMATION AND MATERIALS PROVIDED AS DESCRIBED IN THIS AGREEMENT ARE PROVIDED ON AN "AS IS" BASIS FOR USE BY EACH PARTY AS SO DESCRIBED, AT THE USING PARTY'S SOLE RISK AND RESPONSIBILITY. EXPRESS OR IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE DISCLAIMED AND EXCLUDED HEREUNDER.

**5.3. LIMITATION OF LIABILITY**. IN NO EVENT SHALL ANY PARTY BE LIABLE TO ANY OTHER PARTY OR TO ANY OTHER PERSON OR ENTITY UNDER ANY EQUITY, COMMON LAW, TORT, CONTRACT, ESTOPPEL, NEGLIGENCE, STRICT LIABILITY, OR OTHER THEORY, FOR ANY SPECIAL, INDIRECT, INCIDENTAL, PUNITIVE, CONSEQUENTIAL OR CONTINGENT DAMAGES, OR ANY DAMAGES RESULTING FROM LOSS OF SALE, BUSINESS, PROFITS, DATA, OPPORTUNITY OR GOODWILL, EVEN IF THE REMEDIES PROVIDED FOR IN THIS AGREEMENT FAIL OF THEIR ESSENTIAL PURPOSE, AND EVEN

IF THE PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

## ARTICLE 6. TERM

**6.1. Term**. This Agreement shall commence on the Effective Date and shall continue until the expiration of the Patent, unless otherwise terminated earlier in accordance with the provisions herein (the "**Term**"). For the avoidance of doubt, Kruger-Veolia has the right to abandon the Patent at any time in its sole discretion, and such abandonment shall not give rise to any liability of any kind on the part of Kruger-Veolia. HRSD may terminate this Agreement at any time upon 10 days' written notice to Kruger-Veolia that it will, upon or prior to termination of this Agreement, cease use of ABAC at the IFAS Plant. HRSD will continue to provide Implementation Work Information until such termination date, unless the Parties otherwise mutually agree in writing.

**6.2. Survival**. Upon termination of this Agreement, the provisions of Article 1 (Definitions), Article 5 (Representations; Warranties; Liability), Section 6.2 (Survival), Article 7 (Dispute Resolution), and Article 8 (Miscellaneous) shall remain in full force and effect, together with such other provisions of this Agreement as are necessary in order for the Parties to meet their obligations herein, and in accordance with their respective provisions or until specifically terminated by the mutual written agreement of the Parties.

## ARTICLE 7. DISPUTE RESOLUTION

**7.1. Good Faith Efforts to Resolve Disputes.** The Parties shall make good faith efforts to resolve any claim, dispute or controversy between the Parties arising out of or relating to the Agreement, including but not limited to those arising out of or related to the breach, termination or invalidity of the Agreement ("**Dispute**").

**7.2. Governing Law; Venue**. The Parties hereto agree that this Agreement, and any controversy arising pursuant to this Agreement, shall be governed by the laws of the State of Delaware. Subject to Section 7.3 below, the Parties hereto irrevocably and unconditionally submit to the exclusive jurisdiction of the federal or state courts in Delaware. The Parties hereto irrevocably and unconditionally waive any objection to the laying of venue of any such suit, action or proceeding brought in any such court and any claim that such suit, action or proceeding brought in any such court has been brought in an inconvenient forum.

**7.3. Negotiation-Mediation-Arbitration.** The Parties shall in the event of any Dispute consult and negotiate with one another and, recognizing their mutual interests, attempt to reach a solution satisfactory to all Parties. If the Parties do not reach settlement within a period of thirty (30) days, then the Parties agree to endeavor to settle the Dispute by mediation administered by the American Arbitration Association under its Commercial Mediation Procedures before resorting to arbitration. Any unresolved Dispute may be settled by non-binding arbitration administered by the American Arbitration Association in accordance with its Commercial Arbitration Rules. If the

Parties agree, a mediator involved in the Parties' mediation may be asked to serve as the arbitrator.

## ARTICLE 8. MISCELLANEOUS

**8.1. Entire Agreement.** This Agreement constitutes and contains the complete and final understanding and agreement of the Parties relating to the subject matter of this Agreement. Any and all prior negotiations, correspondence, understandings and agreements, whether oral or written, between the Parties respecting the subject matter hereof shall henceforth not be binding on any Party except to the extent expressly set forth in this Agreement. Nothing in this Agreement, express or implied, is intended to confer upon any Party, other than the Parties and their respective successors and assigns, any rights, remedies, obligations or liabilities under or by reason of this Agreement, except as expressly provided in this Agreement. This Agreement may not be amended, modified or supplemented except by a writing executed by all Parties.

**8.2. No Agency.** Kruger-Veolia and HRSD shall be deemed to be independent contractors and not an agent, joint venturer, or representative of each other, and neither Kruger-Veolia nor HRSD may create any obligations or responsibilities on behalf of or in the name of the other. Under no circumstances may Kruger-Veolia or HRSD hold itself out to be a partner, employee, franchisee, representative, servant or agent of the other. Each Party agrees not to make false or misleading statements, claims or representations about the any other Party, or the relationship of the Parties.

**8.3. Waiver**. Any provision of this Agreement may be waived by the Party entitled to the benefit thereof, except that no Party shall be deemed, by any act or omission, to have waived any of its rights or remedies hereunder unless such waiver is in writing and signed by an authorized representative of such Party and then only to the extent specifically set forth in such writing. A waiver with reference to one event shall not be construed as continuing or as a bar to or waiver of any right or remedy as to a subsequent event.

**8.4. Notices**. Notices required or given hereunder shall be addressed as set forth in the signature blocks below and delivered (as elected by the Party giving notice): (i) personally; (ii) by postage prepaid registered or certified airmail, return receipt requested; (iii) by internationally recognized express courier; or (iv) by facsimile. Notices shall be deemed to have been duly given on: (a) the date of receipt (or if delivery is refused, the date of such refusal) if delivered personally, by mail or by express courier; or (b) if sent by facsimile, upon confirmation of receipt. Any Party may change its address for purposes hereof on not less than three (3) days' prior notice to each other Party.

**8.5. Severability**. If the application of any provision or provisions of this Agreement to any particular facts or circumstances is held to be invalid or unenforceable by any court of competent jurisdiction, then: (i) the validity and enforceability of such provision or provisions as applied to any other particular facts or circumstances and the validity of other provisions of this Agreement shall not in any way be affected or impaired

thereby; and (ii) such provision or provisions shall be reformed without further action by the Parties hereto and only to the extent necessary to make such provision or provisions valid and enforceable when applied to such particular facts and circumstances.

**8.6. Counterparts; Headings.** This Agreement may be executed in counterparts with the same force and effect as if each of the signatories had executed the same instrument. The headings in this Agreement are inserted merely for the purpose of convenience and shall not affect the meaning or interpretation of this Agreement.

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**IN WITNESS WHEREOF**, the Parties hereby have executed this Patent License Agreement, as of the date first above written.

**Veolia Water Technologies, Inc. dba Kruger ("Kruger"):**

By: _____
Name: MICHAEL GOTSHALL
Title: Vice - President

Address:

4001 Weston Parkway
Cary, NC 27513
Attention:

Fax:

**Hampton Roads Sanitation District ("HRSD"):**

By: _____
Edward G. Henifin, P.E.
General Manager

Address:

1434 Air Rail Avenue
Virginia Beach, VA 23455
Attention: Edward Henifin

**Veolia Water Solutions & Technology Support ("Veolia"):**

By: _____
Name: Geoffroy CARLIER
Title: President.

Address:

1 Place Montgolfier
Saint-Maurice, France 94417
Attention:

Fax:

# APPENDIX 1

**PATENT LICENSE AGREEMENT**

This Patent License Agreement ("**Agreement**") is dated June 28, 2016 ("**Effective Date**") and is by and between Hampton Roads Sanitation District, a political subdivision of the Commonwealth of Virginia having a place of business at 1434 Air Rail Avenue, Virginia Beach, VA 23455 ("**HRSD**") and I. Kruger, Inc., a North Carolina corporation having an address at 4001 Weston Parkway, Cary, NC 27513 ("**Kruger**"). (HRSD and Kruger are referred to singularly as "**Party**", and collectively as "**Parties**").

**RECITALS**

**WHEREAS,** HRSD owns and operates the James River Treatment Plant ("**JRTP**") located in Newport News, Virginia, and HRSD operates an ANITA™ Mox system and/or process ("**ANITA Mox**") that it purchased from Kruger pursuant to and as set forth in that Sale Agreement between Kruger and HRSD dated March 8, 2013 (the "**Sale Agreement**"), attached hereto as Exhibit 1;

**WHEREAS,** Kruger desires to license certain Patent Rights of HRSD relating to controlling Kruger's ANITA Mox where the ANITA Mox is operated under certain conditions; and

**WHEREAS,** pursuant to the Sale Agreement, the Parties agree to enter into a patent license agreement pertaining to these Patent Rights.

**NOW, THEREFORE,** in consideration of the mutual covenants contained in this Agreement and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Parties agree as follows:

**ARTICLE 1.** Definitions

**1.1.** "**Affiliate**" of any Person will be defined to mean an individual, a university, a corporation, a partnership, an association, a limited liability company, a labor union, a trust or any other entity or organization, including a government, a governmental or judicial or regulatory organization or body, a political subdivision or an agency or instrumentality thereof ("**Person**") that directly or indirectly through one or more intermediaries controls, is controlled by, or is under common control with, the first Person. For purposes of this definition, the term "control", "controlled by" or "under common control with" will be defined to mean the power, direct or indirect, to direct or cause the direction of the management and policies of a Person, whether through the ownership of voting shares of capital stock, by contract, as trustee or executor, or otherwise.

**1.2.** "**Field**" means, and is limited to, the practice of the Patent Rights in conjunction with Kruger's ANITA Mox; provided that such ANITA Mox incorporates HRSD's basic control system or method that comprises sensing pH, ammonia-nitrogen, specific conductivity or alkalinity to make automated adjustments to dissolved oxygen or airflow in such ANITA Mox. ANITA Mox includes, but is not limited to, moving bed

biofilm reactor (MBBR) processes and integrated fixed-film activated sludge (IFAS) processes.

**1.3.** "**Licensed Patent Rights**" means the Patent Rights licensed to Kruger pursuant to this Agreement.

**1.4.** "**Licensed Product**" means any product or service that controls or relates to controlling an aspect of ANITA Mox using the subject matter of the Patents, and any product or service that (a) but for the license granted pursuant to this Agreement, would infringe, or contribute to, or induce the infringement of, a valid claim of any issued, unexpired Patent, or (b) is covered by a claim in a pending Patent. "Covered by a claim in a pending Patent" means that use, practice, manufacture, sale, or offer for sale or import in the Territory of a product or service would, but for the license granted pursuant to this Agreement, constitute infringement, contributory infringement, or inducement of infringement, of such claim if such claim were issued in a patent. Licensed Product shall include core ANITA Mox components, including media, seed media, screens, air grids, mixers, blowers and/or control valves, air isolation valves, air lift pumps for foam suppression, alkalinity feed system (if required for guarantee), micronutrient feed system (if required for guarantee), reactor covers (if required for guarantee), and I&C. Licensed Product shall not include: (i) items outside of the core ANITA Mox components, which include but are not limited to: treatment process components upstream or downstream of the ANITA Mox reactors such as dewatering equipment, drumfilters, EQ pumps, transfer pumps, and piping; (ii) work to install any core ANITA Mox components or other components; or (iii) any equipment or work contracted for the ANITA Mox and procured more than one year after the original sale of the ANITA Mox (i.e. supplemental media for later expansion, additional instrumentation).

**1.5.** "**Net Sales Price**" for the purpose of computing Royalties, means gross sales price of the Licensed Products sold during the Term of this Agreement to non-Affiliate third parties, including Kruger's agents, less the sum of the following (to the extent actually incurred or accrued): (1) sales tax, use tax, value-added tax, and duties, including import, export, and excise duties or other governmental charges imposed with respect to Licensed Product sales; and (2) freight, postage, shipping, insurance and other transportation expenses associated with sale of the Licensed Products. Where Licensed Products are not offered for sale or sold, but are otherwise disposed of by Kruger or its Affiliates, the Net Sales Price of such Licensed Products for the purposes of computing Royalties, will be the greater of (i) the average sale price at which products of similar kind and quality, sold in similar quantities, are currently being sold or offered for sale by Kruger or its Affiliates, as applicable; (ii) the average sale price at which products of similar kind and quality, sold in similar quantities, are then currently being offered for sale by other manufacturers, or (iii) Kruger's cost of manufacture, as determined by Kruger's or its Affiliates' customary accounting procedures, plus sixty percent (60%). In order to assure to HRSD the full payment of Royalties contemplated in this Agreement, Kruger agrees that in the event any Licensed Products are sold to an Affiliate for purposes of resale, the Royalties to be paid in respect to such Licensed Products will be computed on the net sales price at which the Affiliate sells such Licensed Products to others rather than upon Kruger's net sales price.

**1.6.** "**Patent**" or "**Patents**" means U.S. Provisional Patent Applications, Nos. 62/028,185 and 62/085,959, filed July 23, 2014 and December 1, 2014, respectively, U.S. Patent Application Serial No. 14/806,524, filed July 22, 2015, international PCT Application No. PCT/US15/41622, filed July 22, 2015, and any patent applications and patents claiming priority thereto, including all divisions, continuations, reissues, substitutes, reexaminations, and extensions thereof.

**1.7.** "**Patent Challenge**" means a challenge to the validity, patentability, enforceability and/or non-infringement of any Patent or Patent Rights.

**1.8.** "**Patent Rights**" means any and all rights, title and interests in and to the Patents.

**1.9.** "**Research Fund**" means a research fund or account that HRSD establishes or will have established on its behalf that will be used to fund research identified by HRSD, which research may be within the mission of the Water Environment Research Foundation ("WERF"), to assist HRSD in meeting its NPDES Permit discharge requirements, improve the quality of wastewater treatment, improve the overall operation of its facilities, or benefit the wastewater industry.

**1.10.** "**Royalties**" shall have the meaning set forth in Article 5 of this Agreement.

**1.11.** "**Territory**" means worldwide.

## ARTICLE 2. DEVELOPMENT AND COMMERCIALIZATION

**2.1.** **No Guarantees; Assumption of Risk.** Each Party recognizes and assumes the risk that the goals and objectives set forth in this Agreement may not be obtainable. Therefore, the provisions of this Agreement will not constitute a guarantee of the successful development, implementation, or commercialization of the Patent Rights.

**2.2.** **Kruger's Sales Goals.** Kruger will proceed with the implementation, installation, and commercialization (including marketing and sale) of Licensed Products. Kruger shall sell the Licensed Products in at least one (1) ANITA Mox system prior to December 01, 2019. In addition, Kruger shall sell the Licensed Products in at least one (1) ANITA Mox system between December 01, 2019 and November 30, 2022.

**2.3.** **Access to data, materials and information.** Each Party may provide access to data, materials and information generated by it or through third parties engaged by it in present collaborative efforts between the Parties, and the other Party may use such data, materials and information solely to perform its obligations pursuant to this Agreement and subject to Article 7.

## ARTICLE 3. OWNERSHIP AND LICENSES

**3.1.** **Ownership of Patents.** HRSD owns all Patent Rights. Kruger hereby acknowledges HRSD's ownership in the Patent Rights.

**3.2. Grant of License.** HRSD hereby grants to Kruger, to the extent of the Field and the Territory, an exclusive license for the Term under the Patent Rights, to (i) make, use, sell, offer for sale and import the Licensed Product, (ii) sue for present and future damages, and (iii) collect damages for infringement under the Patent Rights. Kruger reserves the right to grant sub-licenses to purchasers that have purchased the ANITA Mox from Kruger pursuant to this Agreement.

**3.3. Grant of License to Future Improvements.** In the future, HRSD may make improvements to the ANITA Mox MBBR or IFAS sidestream process ("**Improvements**"). HRSD hereby grants to Kruger, to the extent of the Field and the Territory, an exclusive license for the Term to the Improvements and any rights, title or interests therein.

## ARTICLE 4. ENFORCEMENT

**4.1. Notice of Infringement.** Each Party will notify the other Party in writing of any suspected infringement of the Patent Rights in the Territory and will provide to the other Party any evidence of such infringement.

**4.2. Enforcement.** Subject to the terms and conditions herein, including Section 5.4, Kruger has the first right to institute suit for infringement under the Patent Rights in the Territory during the Term. However, if Kruger does not institute suit for infringement within ninety (90) days after discovery of infringement or receipt of written notice from HRSD, then HRSD may institute suit for infringement in its own name, on its own behalf, and at its own expense, or take any other appropriate action that HRSD determines to be appropriate.

**4.3. Joinder.** HRSD shall not be required to join and may not be joined as a plaintiff in any lawsuit by Kruger without HRSD's written consent.

**4.4. Remedy.** The Parties shall share equally in any and all recovery of damages after deduction of the Parties' legal costs, attorney's fees and expenses ("**Remedy**") resulting from a lawsuit brought by either Party.

**4.5. Settlement.** No Party may settle with an infringer without the prior written approval of the other Party if such settlement would affect the rights of the other Party under the Patent Rights.

**4.6. Marking.** Kruger must place in a conspicuous location on equipment of Kruger's ANITA Mox a patent notice in accordance with 35 U.S.C. §287. Kruger agrees to mark such equipment used in ANITA Mox that is covered by the Patent Rights with the number of each such patent and with respect to such patent to respond to any request for disclosure under 35 U.S.C. §287(b)(4)(B) by only notifying HRSD of the request for disclosure.



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## ARTICLE 5. ROYALTIES AND PAYMENTS

**5.1. Royalties for Licensed Patent Rights**. Kruger shall pay to the Research Fund an aggregate royalty of one percent (1.0%) of the Net Sales of all Licensed Products sold or otherwise disposed of under the license granted under this Agreement ("**Royalty**" or "**Royalties**"), payable to the Research Fund within 45 days of the end of each semiannual period (December 31st and June 30th). For the avoidance of doubt, during the patent pending stage of the Patent or Patents, Kruger is only obligated to pay Royalties based on ANITA Mox systems sold if such ANITA Mox system incorporates HRSD's basic control system or method that comprises sensing pH, ammonia-nitrogen, specific conductivity, or alkalinity and making automated adjustments to dissolved oxygen or airflow to the ANITA Mox system. No Royalties in any case are due on an ANITA Mox system sale that does not incorporate that basic technology. Further, a Royalty payment shall only be due in any given semiannual period if Kruger or an affiliate of Kruger delivered final equipment (typically seed media) to the jobsite of a respective project. For the avoidance of doubt, a Royalty payment is not due on the sale of Licensed Products until Kruger or an affiliate of Kruger delivers final equipment (typically seed media) in regards to such sale. Should Royalty payments made by Kruger pursuant to this Agreement not be eligible as a tax deduction under the United States Internal Revenue Code, then Kruger may request a reasonably lower percentage rate than one-percent (1.0%) for the Royalty.

**5.2. Remedy Fee.** Kruger shall pay to the Research Fund fifty percent (50%) of any Remedy under Section 4.4 of this Agreement ("**Remedy Fee**"), payable to the Research Fund within thirty (30) days of receiving any portion of the Remedy Fee.

**5.3. Annual Royalty Cap.** During any annual period (January 1 through December 31st) the cumulative Royalties during the annual period shall be limited to $100,000USD ("**Royalty Cap**"). The Royalty Cap shall not include any Remedy Fee, which may exceed the Royalty Cap and be due to be paid to the Research Fund pursuant to the terms of this Agreement.

**5.4. HRSD's Option to Revoke Exclusivity.** In either or both instances that Kruger does not meet a sales goal set forth in Section 2.2, then HRSD will have the right and option to reduce Kruger's exclusive license to a non-exclusive license, which, if exercised by HRSD, shall supersede the rights granted in Article 3. If HRSD chooses to exercise this right and option, it shall give Kruger written notice thereof within a reasonable amount of time from the date of the failure to meet the respective sales goal.

**5.5. Payments.** Unless as otherwise set forth herein, not later than the last day of each January and July, Kruger shall furnish to HRSD a written statement in such detail as HRSD may reasonably require of all royalties and fees due pursuant to Article 5 of this Agreement for the semiannual periods ended the last days of the preceding December and June, respectively, and must pay to the Research Fund all Royalties and Remedy Fees set forth in Article 5 accrued during such semiannual period. If no amount is accrued during any semiannual period, a written statement to that effect will be furnished. Kruger will make all payments under this Agreement either by check or

bank wire transfer, payable to "_____" at the following address:

Checks: Water Environment Research Foundation
635 Slates Lane
Suite G-110
Alexandria, VA 22314
Attn: _____
RE: Research Fund Account Number _____

Bank Wire: _____
[WERF to provide bank wiring and account information]

**5.6. Bank Fees.** Kruger will be responsible for all bank transfer charges for payments made under this Agreement. All payments due from Kruger will be payable in U.S. dollars ("USD"). Payments provided for in this Agreement, when overdue, will bear interest at a rate per annum equal to the lesser of the maximum permitted by law or five percent (5%) in excess of the "Primate Rate" published by "The Wall Street Journal" at the time such payments are due, and for the time period until payments are received by the Research Fund.

**5.7. Termination Payment.** If this Agreement is for any reason terminated before all of the payments herein provided for have been made, Kruger shall immediately submit a terminal report and pay to the Research Fund any remaining unpaid balance under this Article 5 even though the due date as above provided has not been reached.

## ARTICLE 6. PROSECUTION OF PATENTS

**6.1. Prosecution and Maintenance of Patents in the U.S.** HRSD shall be responsible for filing, prosecution and maintenance of the Patents in the United States, including payment of all fees and costs, including attorneys' fees. HRSD shall be responsible for filing one international Patent Cooperation Treat (PCT) patent application that is included in the Patents. Any decision concerning the prosecution, issuance, maintenance, or abandonment of a Patent in the United States shall be within the sole discretion of HRSD.

**6.2. Prosecution and Maintenance of Patents Outside of U.S.** Kruger shall be responsible for filing, prosecution and maintenance of the Patents outside of the United States, including payment of all fees and costs, including attorneys' fees, except for the preparation and filing of the PCT patent application noted in Section 6.1. Kruger acknowledges that all Patents outside of the United States based on the international PCT Application No. PCT/US15/41622 must be filed by the national filing deadlines for the PCT member countries that Kruger selects. Any decision concerning the prosecution, issuance, maintenance, or abandonment of a Patent outside of the United States, including payment of all fees, shall be within the sole discretion and responsibility of Kruger.



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## ARTICLE 7. CONFIDENTIALITY

**7.1. General Definition of Confidential Information.** For purposes of this Agreement, "**Confidential Information**" means all non-public and/or proprietary information disclosed by one Party (the "**Disclosing Party**") to the other (the "**Receiving Party**") in the course of, or to which the Receiving Party gains access to as a result of, activity pursuant to this Agreement, provided that such information is: (i) in the case of a written disclosure, there is affixed to the document a legend that clearly identifies the Confidential Information as such; (ii) in the case of an oral or visual disclosure, the disclosing Party makes a contemporaneous oral statement and delivers to the recipient a written statement within thirty (30) days to the effect that such disclosure is Confidential Information; or (iii) notwithstanding (i) or (ii) of this Section 7.1, is otherwise learned or viewed by the Receiving Party during a visit to the Disclosing Party's premises and the Receiving Party should reasonably know that such information is confidential or proprietary. Notwithstanding the foregoing, Confidential Information does not include information that (i) is known by the Receiving Party prior to the time of disclosure by the Disclosing Party; (ii) is publicly available through no act or omission on the Receiving Party's part; (iii) is developed by the Receiving Party independent of any Confidential Information it receives from the Disclosing Party; or (iv) the Receiving Party receives from a third party free to make such disclosure without breach of any legal obligation.

**7.2. Confidentiality Obligations.** The Parties agree to use Confidential Information belonging to the other Party only for the purpose of performing their obligations pursuant to this Agreement. Neither Party shall disclose, discuss or use any of the other Party's Confidential Information, directly or indirectly, for any other purpose, except as may be necessary (i) pursuant to applicable law or a valid order of a court or authorized government agency, provided that the recipient has given the other Party an opportunity to defend, limit or protect such disclosure; or (ii) in connection with the commercially reasonable exercise of its license to Intellectual Property granted in this Agreement. The Parties shall hold each other's Confidential Information in confidence for so long as it remains non-public and/or proprietary, using such measures as the Party uses to protect the confidentiality of its own Confidential Information of like importance, but in no event using less than reasonable care.

**7.3. Return of Confidential Information.** Upon written request by a Party, the other Party shall promptly return all Confidential Information belonging to the requesting Party, including all materials the Party may have created that reveal or are based in any way on any Confidential Information of the requesting Party, and all copies of the foregoing, in whatever form, except as may be necessary to give effect to either Party's rights under this Agreement.

**7.4. Equitable Relief.** Each Party acknowledges that the other would suffer immediate and irreparable harm for which monetary damages would be an inadequate remedy if it were to breach its obligations under this Section. Each Party expressly agrees that the other may obtain equitable relief, including injunctive relief, to protect its intellectual

property rights and interests under this Agreement, in addition to such other remedies as may be available at law or in equity.

**7.5. Publicity.** All notices to third parties and all other publicity concerning this Agreement or its subject matter shall be jointly planned and coordinated between the Parties. Neither Party shall act unilaterally in this regard without the prior written approval of the other Party, which approval shall not be unreasonably withheld, and which shall be deemed to be given when disclosure is specifically required by law.

**ARTICLE 8. REPRESENTATIONS; WARRANTIES; LIABILITY.**

**8.1. Mutual Representations and Warranties.** Each Party hereto represents and warrants to the other that: (i) such Party is validly existing under the laws of the jurisdiction in which it is organized, with full power and authority to carry on its business as it is now being conducted; (ii) the execution, delivery and performance of this Agreement has been duly authorized by such Party, and no other action or other proceeding on the part of such Party or its governing body is necessary to authorize this Agreement; and (iii) entering into this Agreement does not and will not violate any contract or obligation existing between such Party and any third party.

**8.2. DISCLAIMER.** EACH PARTY DISCLAIMS ALL WARRANTIES, EITHER EXPRESS OR IMPLIED, AS TO THE ACCURACY, SUITABILITY, RELIABILITY, COMPLETENESS, SUFFICIENCY, SAFETY OR UTILITY OF ANY OF THE PATENTS LICENSED UNDER THIS AGREEMENT. WITHOUT LIMITING THE FOREGOING, ALL WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT, VALIDITY, ENFORCEABILITY AND FITNESS FOR A PARTICULAR PURPOSE, EXPRESS OR IMPLIED, ARE DISCLAIMED. ANY RIGHTS, INFORMATION AND MATERIALS PROVIDED AS DESCRIBED IN THIS AGREEMENT ARE PROVIDED ON AN "AS IS" BASIS FOR USE BY EACH PARTY AS SO DESCRIBED, AT THE USING PARTY'S SOLE RISK AND RESPONSIBILITY. EXPRESS OR IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT, VALIDITY, ENFORCEABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE DISCLAIMED AND EXCLUDED HEREUNDER. NEITHER PARTY MAKES ANY WARRANTY, EXPRESS OR IMPLIED, AS TO THE ACCURACY, SUITABILITY, RELIABILITY, COMPLETENESS, SUFFICIENCY, UTILITY OR SAFETY OF ANY PATENTS UNDER THIS AGREEMENT.

**8.3. LIMITATION OF LIABILITY.** IN NO EVENT SHALL EITHER PARTY BE LIABLE TO THE OTHER PARTY OR TO ANY OTHER PERSON OR ENTITY UNDER ANY EQUITY, COMMON LAW, TORT, CONTRACT, ESTOPPEL, NEGLIGENCE, STRICT LIABILITY, OR OTHER THEORY, FOR ANY SPECIAL, INDIRECT, INCIDENTAL, PUNITIVE, CONSEQUENTIAL OR CONTINGENT DAMAGES, OR ANY DAMAGES RESULTING FROM LOSS OF SALE, BUSINESS, PROFITS, DATA, OPPORTUNITY OR GOODWILL, EVEN IF THE REMEDIES PROVIDED FOR IN THIS AGREEMENT FAIL OF THEIR



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ESSENTIAL PURPOSE, AND EVEN IF THE PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

**8.4. Indemnification.** Kruger shall defend and hold HRSD harmless against any loss, liability or expense, including but not limited to, reasonable attorneys' fees, court costs, expert fees, and reimburse and indemnify HRSD for damages resulting from or related to Kruger's breach of, or any act or omission by Kruger relating to this Agreement. HRSD reserves and does not waive its immunity from liability and nothing in this agreement shall be interpreted as a waiver of immunity.

## ARTICLE 9. TERM; TERMINATION

**9.1. Term.** At the time of this Agreement, it is acknowledged by both parties that the patents in question are pending patents. If a Patent is not issued by December 01, 2019, Kruger reserves the right to cancel the Agreement at any time after such date via written notice. However, if Kruger does not exercise such right, Kruger's license to sell the Licensed Products shall be paid-up and royalty free between December 01, 2019 and the date the Patent is issued; that is to say, Kruger shall not owe a Royalty payment pursuant to its sales of the Licensed Products which occur between December 01, 2019 and the date of Patent issuance. Otherwise, this Agreement shall commence on the Effective Date and shall continue until the expiration of the last-to-expire or last-to-be-abandoned Patent, unless otherwise terminated earlier in accordance with the provisions herein (the "**Term**").

**9.2. Termination.** This Agreement may be terminated prior to expiration of the Term: (i) by mutual agreement of the Parties; (ii) by either Party without cause upon one-hundred-twenty (120) days' advance written notice; or (iii) by either Party in the event of the other Party's material breach of any representation, warranty, covenant or obligation under this Agreement, provided that the terminating Party shall have notified the other Party of the breach and such other Party shall have failed to cure such breach within thirty (30) days of the giving of such notice.

**9.3. Termination as a Consequence of Patent Challenge.** If Kruger or any of its Affiliates brings a Patent Challenge against HRSD, or assists others in bringing a Patent Challenge against HRSD, then HRSD may immediately terminate this Agreement.

**9.4. Survival.** Upon termination of this Agreement, the provisions of Sections 1.1-1.11, 3.1, 5.2, 5.4-5.6, 9.4, 10.1-10.3 and 11.1-11.7 shall remain in full force and effect, together with such other provisions of this Agreement as are necessary in order for the Parties to meet their obligations herein, and in accordance with their respective provisions or until specifically terminated by the mutual written agreement of the Parties.

## ARTICLE 10. DISPUTE RESOLUTION

**10.1. Good Faith Efforts to Resolve Disputes.** The Parties shall make good faith efforts to resolve any claim, dispute or controversy between the Parties arising out of or relating



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to the Agreement, including but not limited to those arising out of or related to the breach, termination or invalidity of the Agreement ("**Dispute(s)**").

**10.2. Continuance Pending Dispute.** The Parties shall at all times during the course of any Dispute resolution process under this Article 10, and pending the final resolution of any Dispute, continue to fulfill their obligations under this Agreement.

**10.3. Negotiation-Mediation-Arbitration.** The Parties shall in the event of any Dispute consult and negotiate with one another and, recognizing their mutual interests, attempt to reach a solution satisfactory to all Parties. If the Parties do not reach settlement within a period of thirty (30) days, then the Parties agree to endeavor to settle the Dispute by mediation administered by the American Arbitration Association under its Commercial Mediation Procedures before resorting to arbitration. Any unresolved Dispute may be settled by non-binding arbitration administered by the American Arbitration Association in accordance with its Commercial Arbitration Rules. If both Parties agree, a mediator involved in the Parties' mediation may be asked to serve as the arbitrator.

## ARTICLE 11. MISCELLANEOUS

**11.1. Entire Agreement.** This Agreement constitutes and contains the complete and final understanding and agreement of the Parties relating to the subject matter of this Agreement. Any and all prior negotiations, correspondence, understandings and agreements, whether oral or written, between the Parties respecting the subject matter hereof shall henceforth not be binding on either Party except to the extent expressly set forth in this Agreement. Nothing in this Agreement, express or implied, is intended to confer upon any Party, other than the Parties and their respective successors and assigns, any rights, remedies, obligations or liabilities under or by reason of this Agreement, except as expressly provided in this Agreement. This Agreement may not be amended, modified or supplemented except by a writing executed by all Parties.

**11.2. No Agency.** Each Party shall be deemed to be an independent contractor and not an agent, joint venturer, or representative of the other Party and neither Party may create any obligations or responsibilities on behalf of or in the name of the other Party. Under no circumstances may either Party hold itself out to be a partner, employee, franchisee, representative, servant or agent of the other Party. Each Party also agrees not to make false or misleading statements, claims or representations about the other Party, or the relationship of the Parties.

**11.3. Waiver**. Any provision of this Agreement may be waived by the Party entitled to the benefit thereof, except that neither Party shall be deemed, by any act or omission, to have waived any of its rights or remedies hereunder unless such waiver is in writing and signed by an authorized representative of such Party and then only to the extent specifically set forth in such writing. A waiver with reference to one event shall not be construed as continuing or as a bar to or waiver of any right or remedy as to a subsequent event.



**11.4. Assignment**. Kruger may not assign or transfer this Agreement or any rights hereunder (whether expressly, by implication or by operation of law, including any merger or sale of assets or business), or delegate its performance under this Agreement, to any third party, without obtaining the prior written consent of HRSD. Any purported transfer, assignment or delegation without the appropriate prior written consent shall be null and void when attempted and of no force or effect. Subject to the foregoing, this Agreement shall bind and inure to the benefit of the successors and permitted assigns of the Parties.

**11.5. Notices**. Notices required or given hereunder shall be addressed as set forth in the signature blocks below and delivered (as elected by the Party giving notice): (i) personally; (ii) by postage prepaid registered or certified airmail, return receipt requested; (iii) by internationally recognized express courier; or (iv) by facsimile. Notices shall be deemed to have been duly given on: (a) the date of receipt (or if delivery is refused, the date of such refusal) if delivered personally, by mail or by express courier; or (b) if sent by facsimile, upon confirmation of receipt. Either Party may change its address for purposes hereof on not less than three (3) days' prior notice to the other Party.

**11.6. Severability**. If the application of any provision or provisions of this Agreement to any particular facts or circumstances is held to be invalid or unenforceable by any court of competent jurisdiction, then: (i) the validity and enforceability of such provision or provisions as applied to any other particular facts or circumstances and the validity of other provisions of this Agreement shall not in any way be affected or impaired thereby; and (ii) such provision or provisions shall be reformed without further action by the Parties hereto and only to the extent necessary to make such provision or provisions valid and enforceable when applied to such particular facts and circumstances.

**11.7. Counterparts; Headings.** This Agreement may be executed in counterparts with the same force and effect as if each of the signatories had executed the same instrument. The headings in this Agreement are inserted merely for the purpose of convenience and shall not affect the meaning or interpretation of this Agreement.

[*The remainder of this page has been intentionally left blank.*]



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**IN WITNESS WHEREOF**, the Parties hereby have executed this Agreement, as of the date first above written.

**I. Kruger, Inc. ("Kruger"):**

By: _____
Name: Michael Gutshall
Title: President

Address:

4001 Weston Parkway
Cary, NC 27513
Attention:

Fax: (919) 677-0082

**Hampton Roads Sanitation District:**

By: _____
Name: Edward Henifin, P.E.
Title: General Manager

Address:

1434 Air Rail Avenue
Virginia Beach, VA 23455

HRSD COMMISSION MEETING MINUTES
January 24, 2017

ATTACHMENT #3

AGENDA ITEM 8. – Capital Improvement Program (CIP) Quarterly Update
PowerPoint Presentation

HRSD

Cleaning wastewater every day for a better Bay.

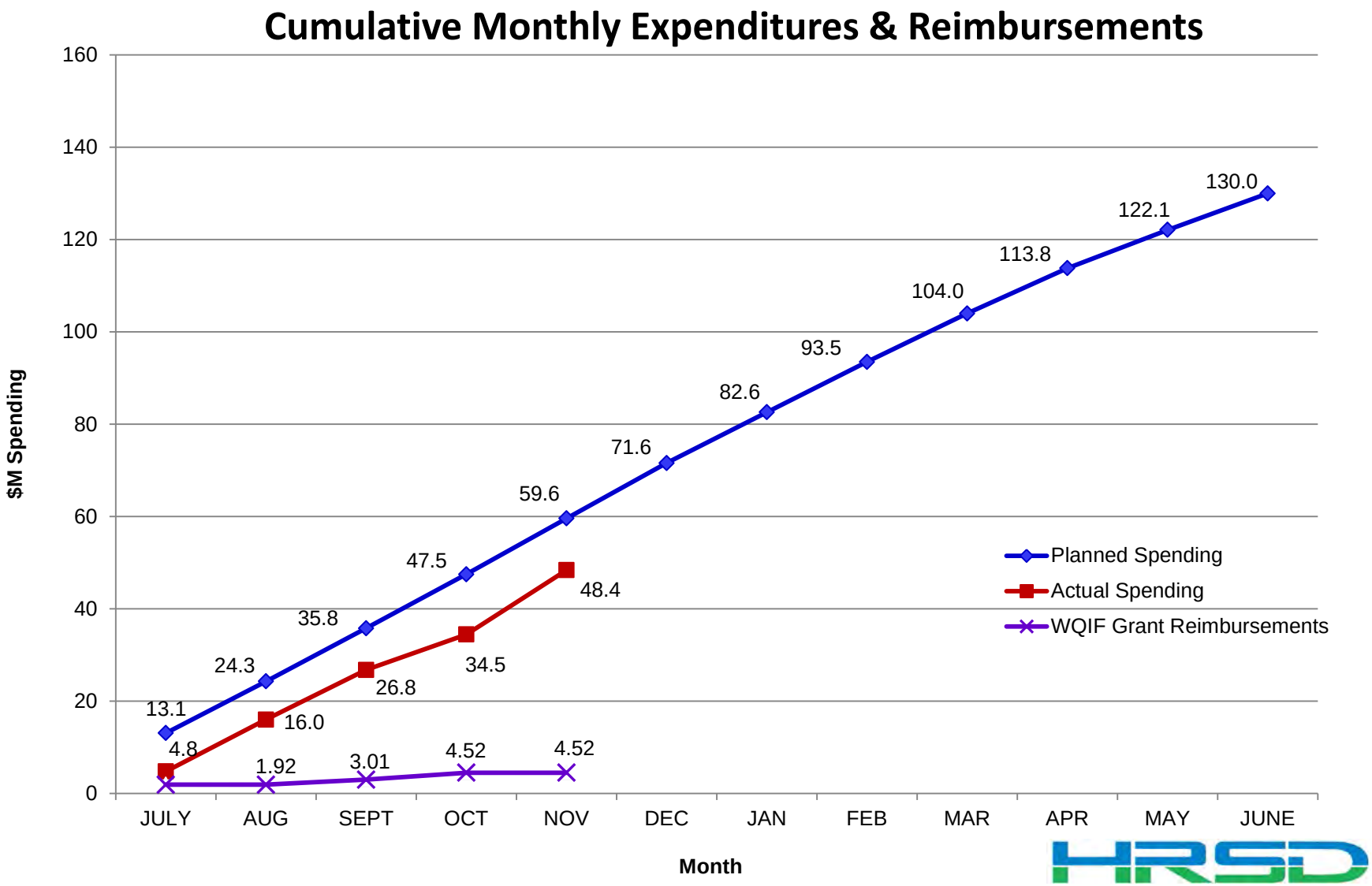
# Capital Improvement Program
# Commission Briefing

January 24, 2017

# Outline

- CIP Expenditures for FY-2017
- Summary of Projects Requiring Additional Appropriation in CY-2016
- CIP Performance Metrics
- Consent Decree/SSO Reduction Project Updates
- Project Focus

# CIP Expenditures for FY-2016



# CIP Expenditures for FY-2016 (cont.)

| Project Name | Planned Spending for FY | Prorated Spending thru Dec. | Spent to Date | Differential |
|---|---|---|---|---|
| Virginia Initiative Plant Nutrient Reduction Improvements – Contract B | $33,936,000 | $14,140,000 | $12,884,189 | $1,255,811 |
| Interceptor System Pump Station Controls and SCADA Upgrades | $7,643,000 | $3,184,583 | $3,017,458 | $167,125 |
| Bridge Street Pump Station Replacement | $6,788,000 | $2,828,333 | $2,102,452 | $725,881 |
| York River Treatment Plant Outfall and Diffuser Modifications | $6,521,000 | $2,717,083 | $3,192,444 | -$475,361 |
| Holland Road Section A – Phase I | $6,290,000 | $2,620,833 | $3,341,282 | -$720,449 |
| Warwick Boulevard to James River Influent Section 2 | $5,496,000 | $2,290,000 | $3,777,026 | -$1,487,026 |
| Regional Hydraulic Model & Other Consent Order Requirements | $4,600,000 | $1,916,667 | $2,630,313 | -$713,646 |
| South Trunk Sewer Section G | $4,064,000 | $1,693,333 | $931,855 | $761,478 |
| Williamsburg IFM Contract A Replacement | $3,094,000 | $1,289,167 | $400,112 | $889,055 |

**Total = $402,868**

## CIP Summary

| | |
|---|---|
| Total Value of 10-Year CIP: | $1.52B |
| CIP Spending in CY-2016: | $140.3M |
| Total # of Projects in 10-Year CIP: | 157 |
| # of Active Projects in CY-2016: | 89 |

# Summary of Projects Requiring Additional Appropriation in CY-2016 (cont.)

| Project Name | CIP | Original Appropriation | Additional Appropriation | % Increase |
|---|---|---|---|---|
| 58th Street Connecting Sewer | BH010100 | $2,475,000.00 | $503,845.00 | 20.4 |
| Aquifer Replenishment System | GN015700 | $3,000,000.00 | $4,540,000.00 | 151.3 |
| Bridge Street Pump Station Replacement | BH011600 | $6,604,000.00 | $7,519,400.00 | 113.9 |
| Effingham Street IFM | VP017500 | $2,478,000.00 | $655,275.00 | 26.4 |
| Hampton Trunk Sewer Division A Replacement | BH011200 | $4,538,000.00 | $600,000.00 | 13.2 |
| Hampton Trunk Sewer Extension Div. E Gravity Replace | BH012000 | $1,858,000.00 | $396,489.00 | 21.3 |
| Middle Ground Boulevard – City Center Interconnect FM | JR011000 | $6,568,000.00 | $32,457.00 | 0.5 |
| Nansemond TP Digester Rehabilitation | NP013300 | $1,099,042.00 | $405,758.00 | 36.9 |
| North Shore Odor Control and Chemical Injection Study | GN013800 | $646,000.00 | $51,465.00 | 8.0 |
| Regional Hydraulic Model | GN012110 | $101,254,812.00 | $2,993,900.00 | 3.0 |
| State Street PS Electrical Mods | VP012100 | $2,089,000.00 | $269,034.00 | 12.9 |
| Sustainable Water Phase 3 – Demonstration Facility | GN016200 | $15,000,000.00 | $12,064,623.00 | 80.4 |
| West Point Pump Station 3 – Gravity Systems Repair | MP012800 | $560,000.00 | $104,816.00 | 18.7 |
| York River TP Chemical Facility Imp | YR013200 | $2,246,071.00 | $83,082.00 | 3.7 |
| | Totals = | $150,415,925.00 | $30,220,144.00 | 20.1 |

*Original appropriation is from start of calendar year (includes additional appropriations from prior calendar years)

# CIP Performance Metrics

- CIP Spending and Staffing
- Construction Contracts Awarded in CY-2016
- Construction Contracts Completed in CY-2016

# CIP Spending and Staffing

CIP Spending for Calendar Year 2016 = $140.3M
($35M Design, $105.3M Construction)

**Internal Staffing:**

Engineering Department Staff = 39 Full-Time, 4 Part-Time

**External Staffing:**

Design Services Staff = 178 Full-Time Employees

Construction Services Staff = 579 Full-Time Employees

Total = 757 Full-Time Employees

# Construction Contracts Awarded in 2016

## 2016 Construction Bids

| Project Name | CIP | Bid Date | CIP Estimate | Engineer's Estimate | Low Bid | Average of Bids | High Bid | # Bidders |
|---|---|---|---|---|---|---|---|---|
| North Shore Odor Control and Chemical Injection Study | GN013800 | 01/07/16 | $235,000.00 | $282,968.00 | $159,900.00 | $164,521.50 | $169,143.00 | 2 |
| Bridge Street Pump Station Replacement | BH011600 | 02/02/16 | $13,024,975.00 | $11,921,503.00 | $10,430,625.00 | $11,562,696.60 | $13,881,000.00 | 5 |
| Center Avenue I & I – Phase II (Rebid) | JR011500 | 06/28/16 | $2,156,392.00 | $1,867,267.00 | $1,209,213.00 | $1,518,219.57 | $1,936,279.29 | 4 |
| Warwick Boulevard to James River IFM Sec 3 – Phase II | JR012020 | 06/30/16 | $3,716,028.00 | $2,867,347.70 | $2,488,140.00 | $3,046,869.28 | $3,867,213.00 | 8 |
| Hampton Trunk Sewer Ext Div E Gravity Replacement | BH012000 | 08/02/16 | $1,587,356.00 | $1,769,620.00 | $1,587,195.10 | $2,027,318.59 | $2,988,725.00 | 6 |
| Atlantic Treatment Plant Primary Clarifier Influent Channel | AT013320 | 09/20/16 | $910,000.00 | $1,459,506.00 | $878,870.00 | $1,083,190.00 | $1,416,700.00 | 3 |
| Warwick Boulevard to James River IFM Sec 1 | JR011100 | 11/17/16 | $5,014,864.00 | $3,307,814.00 | $2,271,247.50 | $2,960,688.34 | $3,611,813.89 | 7 |
| **Totals** | | | | **$23,476,025.70** | **$19,025,190.60** | **$22,363,503.88** | **$27,870,874.18** | |
| **% Difference** | | | | | **-19%** | **-5%** | **19%** | |

# Construction Contracts Completed in 2016

| Project Name | Original Contract | Final Contract | # CO | CO Percentage |
|---|---|---|---|---|
| Boat Harbor E and W Raw Influent Chamber Rehab | $264,940.00 | $264,940.00 | 0 | 0.0 |
| Center Avenue PS – Contract B | $2,632,000.00 | $2,707,428.02 | 1 | 2.9 |
| Center Avenue PS I&I Remediation – Contract C | $2,923,353.40 | $3,257,407.85 | 5 | 11.4 |
| Coliseum Drive PRS and Offline Storage | $9,364,489.00 | $10,117,780.23 | 4 | 8.0 |
| Hampton Trunk Sewer Division A Replacement | $3,969,775.00 | $4,565,607.43 | 4 | 15.0 |
| Hampton Trunk Sewer Ext Div I & J Relocation Ph I | $589,469.00 | $563,854.96 | 1 | -4.3 |
| North Shore Odor Control and Chemical Injection | $159,900.00 | $159,900.00 | 0 | 0.0 |
| Providence Road Interim Pressure Reducing Station | $2,628,561.68 | $3,414,028.24 | 6 | 29.9 |
| Sewerage System Improvements Division C Phase I | $1,350,000.00 | $1,354,808.60 | 1 | 0.4 |
| VIP Emergency Generator | $4,539,000.00 | $4,934,454.00 | 4 | 8.7 |
| VIP NRI Contract A | $13,036,000.00 | $13,944,214.01 | 6 | 7.0 |
| West Point TP Influent Gravity Line Replacement | $324,160.50 | $345,726.50 | 2 | 6.7 |
| York River TP Effluent Pump Station Improvements | $969,000.00 | $1,008,594.77 | 2 | 4.1 |
| **Totals** | **$42,750,648.58** | **$46,638,744.61** | | **Avg. = 6.9%** |

# Consent Decree/SSO Reduction Project Updates

- 33 CIP projects were included in the original Federal Consent Decree.
- 18 CIP projects were added to the Federal Consent Decree as part of the negotiation to consider regionalization of the sanitary sewer system.
- These projects involve improvements to the interceptor sewer system and numerous pump stations.
- HRSD has until **February 23, 2018** to complete these projects.
- 2 CIP projects were added to the Federal Consent Decree as part of the final negotiation to implement the Regional Wet Weather Program. HRSD has until **Dec. 31, 2018** to complete these projects.

| Ref No. | Project Title | Consent Decree Estimate | Authorized/ Completed | Status |
|---|---|---|---|---|
| 1 | Claremont Avenue Pump Station Rehabilitation | $1,500,000 | $2,202,900 | Complete |
| 2 | Atlantic Pressure Reducing Station Emergency Generator Replacement | $1,000,000 | $1,281,100 | Complete |
| 3 | Lake Ridge Interceptor Force Main Section B - Contract 2 (Land) | $3,000,000 | $2,676,700 | Complete |
| 4 | Big Bethel Road to J Clyde Morris Boulevard Interceptor Force Main Replacement | $2,500,000 | $2,865,502 | Complete |
| 5 | Williamsburg-James River Connection Force Main Section II and Lucas Creek-Woodhaven Interceptor Force Main Replacements - Phase I | $4,000,000 | $1,965,951 | Complete |
| 6 | Route 171 Interceptor Force Main | $8,000,000 | $6,487,309 | Complete |
| 7 | Kiln Creek Interceptor Force Main | $7,000,000 | $6,629,172 | Complete |
| 8 | South Trunk Sewer Section F 20-Inch, Section H 8-Inch, and Section H 12-Inch Interceptor Force Main Replacement and Gravity Sewer Chesterfield Blvd. Replacement | $11,000,000 | $6,366,600 | Complete |
| 9 | Eastern Branch Sections A & B, Green Run Section C, and 24-Inch Kempsville Road Force Main Replacements | $6,000,000 | $6,145,600 | Complete |
| 10 | North Trunk Sewer Section W 8-Inch and 12-Inch Force Mains and Larchmont Force Mains (Formerly Siphon Lines) Replacements* | NA | NA | Project Deleted |

| Ref No. | Project Title | Consent Decree Estimate | Authorized/ Completed | Status |
|---|---|---|---|---|
| 11 | North Trunk Sewer Section R 6-Inch Interceptor Force Main and 10-Inch Gravity Replacement | $1,000,000 | $2,653,502 | Complete |
| 12 | North Trunk Sewer Section D 24-Inch Interceptor Force Main Replacement | $6,000,000 | $5,796,148 | Complete |
| 13 | Hilltop/Point O'Woods Interceptor Force Main Replacements; Section B | $6,000,000 | $6,576,300 | Complete |
| 14 | Hilltop/Point O'Woods Interceptor Force Main Replacements; Section A | $5,000,000 | $6,576,300 | Complete |
| 15 | Williamsburg Interceptor Force Main Contract A Replacement | $6,000,000 | $8,002,922 | Construction |
| 16 | 33rd Street Pump Station Replacement/Rehabilitation | $3,000,000 | $5,327,931 | Construction |
| 17 | Sanitary Sewer System Portsmouth VA Contract A Clifford Street Force Main | $1,000,000 | $1,162,862 | Complete |
| 18 | James River Diversion 35th Street Phase III and Boat Harbor Outlet Sewer Relocation I-664 Rehabilitation | $2,000,000 | $979,053 | Complete |
| 19 | Hampton Trunk Sewer Division A Replacement | $1,000,000 | $4,405,794 | Complete |
| 20 | Lucas Creek Pump Station Upgrade* | NA | NA | Project Deleted |

| Ref No. | Project Title | Consent Decree Estimate | Authorized/ Completed | Status |
|---|---|---|---|---|
| 21 | South Trunk Sewer Section C-42 inch Force Main Replacement | $4,000,000 | $13,850,753 | Complete |
| 22 | Section W Force Main Replacement* | NA | NA | Project Deleted |
| 23 | Coliseum Drive Pressure Reducing Station | $6,000,000 | $10,793,202 | Complete |
| 24 | Center Avenue Pump Station Replacement | $4,000,000 | $4,371,694 | Construction |
| 25 | Norchester St Pump Station Replacement/Rehabilitation | $2,000,000 | $7,315,557 | Complete |
| 26 | Providence Road Pressure Reducing Station Modifications | $2,000,000 | $4,046,218 | Complete |
| 27 | 58th Street Connecting Sewer Rehabilitation | $1,000,000 | $2,809,090 | Construction |
| 28 | Bridge St. Pump Station Replacement/Rehabilitation | $2,000,000 | $13,279,910 | Construction |
| 29 | South Trunk Sewer Section G-36 inch Force Main Replacement | $3,000,000 | $12,582,216 | Construction |
| 30 | Interceptor Systems Pump Station Control and SCADA Upgrades and Enhancements | $10,000,000 | $24,037,523 | Construction |
| 31 | Wilroy Pressure Reducing Station, Pughsville PRS Upgrades, Suffolk PS Upgrades* | NA | NA | Project Deleted |
| 32 | Army Base 24-Inch and 20-Inch Transmission Main Replacements* | NA | NA | Project Deleted |
| 33 | Normandy Lane Interceptor Force Main Replacement* | NA | NA | Project Deleted |
| | | **$109,000,000** | **$174,946,311** | |

| Ref No. | Project Title | Consent Decree Estimate | Authorized/ Completed | Status |
|---|---|---|---|---|
| 34 | Great Neck Road IFM Replacement – Section A | $4,500,000 | $6,882,627 | Complete |
| 35 | Military Highway Interim Pressure Reducing Station | $750,000 | $220,572 | Complete |
| 36 | Hampton Trunk Sewer Extension Division E – Gravity Replacement | $750,000 | $2,047,165 | **Construction** |
| 37 | Victoria Boulevard Pump Station | $3,600,000 | $3,762,546 | Complete |
| 38 | Ivy Home – Shell Road Sewer Extension Division I – Replacement* | NA | NA | Project Deleted |
| 39 | South Shore Interceptors Air Vent Rehabilitation | $2,500,000 | $225,463 | Construction |
| 40 | North Shore Air Vent Replacements | $1,200,000 | $811,296 | Complete |
| 41 | Center Avenue Pump Station Service Area I/I Remediation | $4,000,000 | $4,371,694 | Construction |
| 42 | Middle Ground Boulevard – City Center Interconnect Force Main | $5,000,000 | $6,158,975 | Complete |
| 43 | Center Avenue I&I Remediation – Phase II | $3,000,000 | $1,689,006 | Construction |
| 44 | Jefferson Avenue IFM Replacement – Phase I | $4,500,000 | $4,105,599 | Complete |

| Ref No. | Project Title | Consent Decree Estimate | Authorized/ Completed | Status |
|---|---|---|---|---|
| 45 | Warwick Boulevard to James River Influent Force Main - Section 3* | NA | NA | Project Deleted |
| 46 | Holland Road 24-inch IFM – Section A | $14,000,000 | $20,357,110 | Construction |
| 47 | Pughsville Pressure Reducing Station Upgrades | $5,000,000 | $222,879 | Design |
| 48 | Sewerage System Improvements Division C | $750,000 | $1,544,509 | Complete |
| 49 | Lafayette River Crossing/Norview – Estabrook Force Main Replacement | $3,000,000 | $4,199,050 | Complete |
| 50 | Courthouse Interim Pressure Reducing Station | $1,500,000 | $2,883,362 | Complete |
| 51 | Hampton Pump Station 023 Upgrades and Discharge Force Main | $750,000 | $800,097 | Complete |
| | | **$54,800,000** | **$60,466,666** | |

| Ref No. | Project Title | Consent Decree Estimate | Authorized/ Completed | Status |
|---|---|---|---|---|
| 52 | Virginia Initiative Plant Nutrient Reduction Improvements, Contract A | $18,000,000 | $18,343,768 | Complete |
| 53 | Virginia Initiative Plant Nutrient Reduction Improvements, Contract B | $125,000,000 | $129,727,278 | Construction |
| | | **$143,000,000** | **$148,071,046** | |
| | Total for all work: | **$306,800,000** | **$383,484,023** | |

# Holland Road 24-Inch IFM – Section A

**Project Description:**

This project will replace 7,000 feet of existing 10-inch City of Suffolk force main and over 15,000 feet of existing 14-inch, 18-inch and 20-inch HRSD force main along Holland Road in the City of Suffolk. In cooperation with the City of Suffolk, over 5,000 feet of water mains will also be installed. This project is an Interim System Improvement as part of the Federal Consent Decree.

**Design Engineer:**

Michael Baker International, Inc.

**Contractors:**

T.A. Sheets General Contractors (Phase I)

Tidewater Utility Construction (Phase II)

**Project Budget:**

| | | |
|---|---|---|
| Phase I | = | $14.4M |
| Phase II | = | $ 8.3M |
| Total | = | $22.7M |

# Holland Road 24-Inch IFM – Section A (cont.)

## Financial Summary:

| **Phase I** | |
|---|---|
| Total Engineering Costs | $ 1,800,000 |
| Original Construction Contract | $10,260,320 |
| Change Order(s) | One pending ($260,000) |

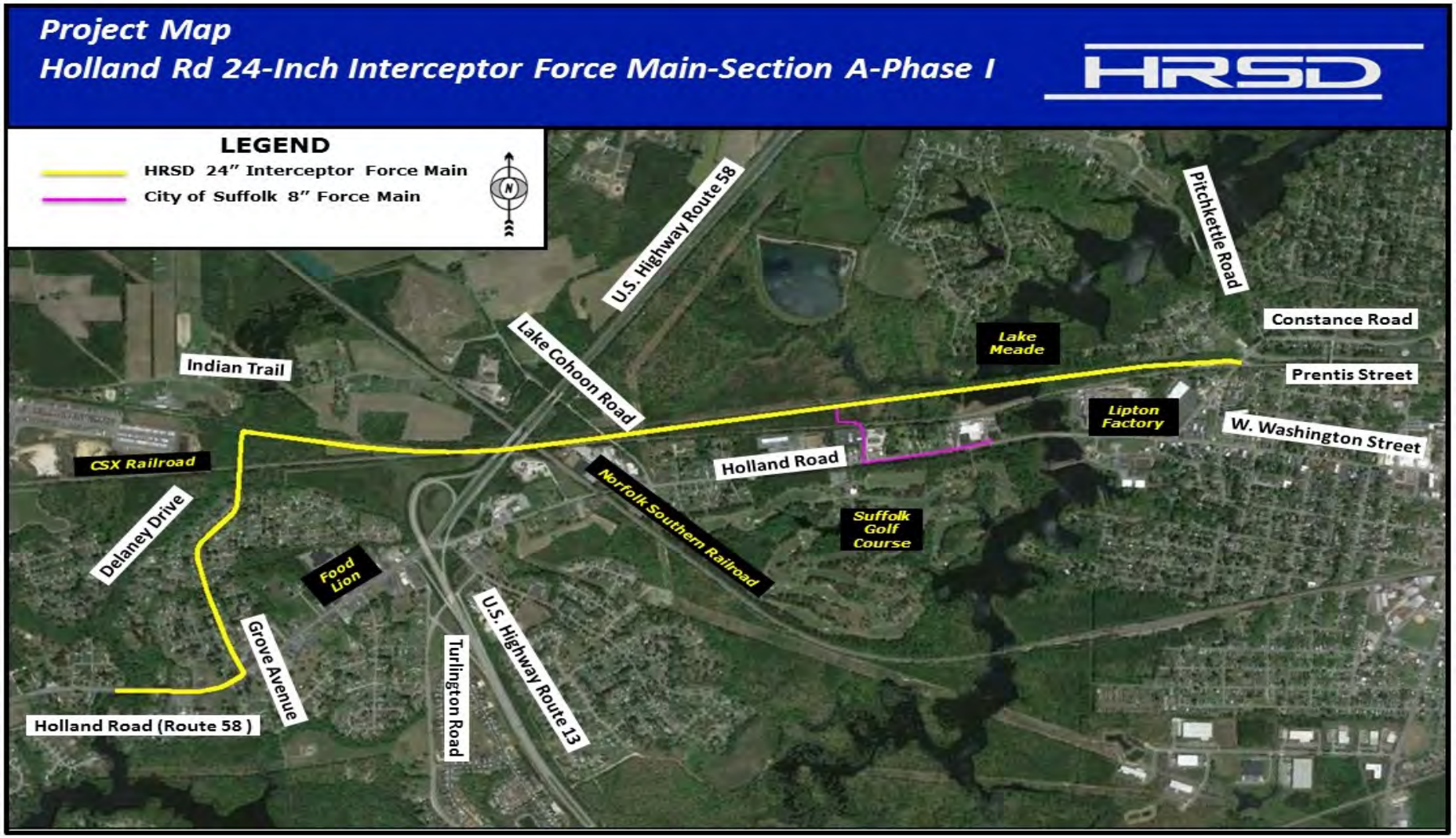
| **Phase II** | |
|---|---|
| Total Engineering Costs | $1,500,000 |
| Original Construction Contract | $5,720,899 |
| Change Order(s) | Three ($511,431) |

# Holland Road 24-Inch IFM – Section A (cont.)

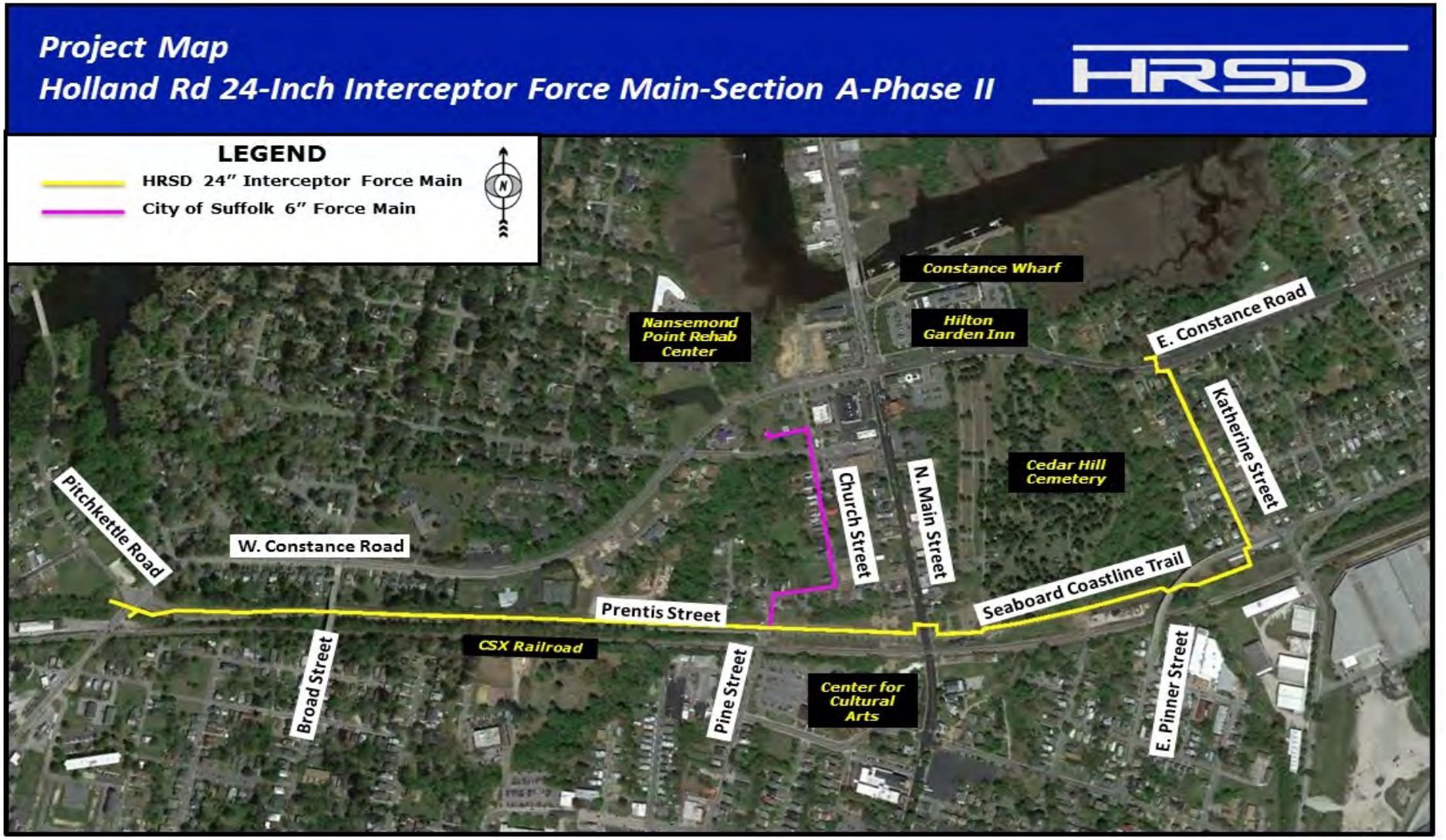
## Schedule Summary:

| | |
|---|---|
| Design Start | June 2011 |
| Phase I Construction | Jan. 2016 to Feb. 2018<br>(Planned completion Nov. 2017) |
| Phase II Construction | July 2015 to Jan. 2017<br>(Substantially complete) |

# Holland Road 24-Inch IFM – Section A (cont.)



# Holland Road 24-Inch IFM – Section A (cont.)



# Holland Road 24-Inch IFM – Section A (cont.)

# Holland Road 24-Inch IFM – Section A (cont.)

# Questions?

HRSD COMMISSION MEETING MINUTES
January 24, 2017

ATTACHMENT #4

AGENDA ITEM 9. – EPA Consent Decree Annual Public Meeting PowerPoint Presentation

HRSD

Cleaning wastewater every day for a better Bay.

# EPA Consent Decree
# Annual Informational Meeting
# Regional Wet Weather Management Plan

January 24, 2017

# Annual Public Meeting

Requirements of the Consent Decree

- *"…after providing reasonable notice on its webpage and in a newspaper of general circulation"*
- *"…shall hold an annual informational meeting open to the Localities and the public"*
- *"HRSD shall convey information on the status of the Regional Wet Weather Management Plan, HRSD – Locality cooperation and steps citizens within the Localities can take to protect the receiving waters"*

# Objective of the Consent Decree

- “HRSD, working in consultation with the Localities, to fulfill the objectives of the Clean Water Act with a goal of eliminating Sanitary Sewer Overflows (SSOs)”
- The Regional Wet Weather Management Plan will establish the Level of Service for elimination of SSOs

# Regionalized Approach

- Localities and HRSD agreed in Memorandum of Agreement to Regionalized Approach
- HRSD will be responsible for capacity in the regional sanitary sewer system
- HRSD completed additional flow monitoring and SSES in Locality systems

# Major Change in Compliance Orders

- Consent Decree Modification No. 3 in August 2014 puts sole responsibility on HRSD for:
  - Development of Regional Wet Weather Management Plan (RWWMP)
  - Implement RWWMP
  - Capacity in the entire regional sanitary sewer system

- Special Order by Consent (SOC) modified in December 2014 focuses on Localities' Management, Operations and Maintenance (MOM) issues
  - Eliminates HRSD from SOC
  - Adds Norfolk to SOC and terminates prior Order

# Overall Regulatory Status

- HRSD continues to implement requirements of Federal Consent Decree, which was originally entered with the court on February 23, 2010, and was modified August 2014
- All Consent Decree required submittals have been on time

# Rehabilitation Action Plan

- Requires addressing specific features with condition defects identified in Consent Decree Condition Assessment Program (CAP)
- EPA/DEQ approved the plan in May 2015
- Addresses more than $183 M of required improvements in gravity mains, force mains, pump stations, and associated system components
- Implementation Plan has three phases through May 2025

# Rehabilitation Action Plan

- First phase due May 2018:
  - Approximately 90% complete
  - Remaining 10% ahead of schedule
- Second phase due May 2021:
  - Approximately 10% complete,10% in construction, 50% in planning/design, 30% in pre-planning
- Third phase due May 2025:
  - Approximately 5% complete or in construction, 15% in planning/design, 80% in pre-planning

# Interim System Improvements

- Consent Decree includes requirement to complete 45 CIP projects totaling approximately $383M by February 23, 2018 (with exception of two projects due December 2018)
- Of the 45 projects, thirty-one (31) are completed, thirteen (13) are in construction, and the remaining one (1) is in design
- On track for completion by 2018 deadlines

# Management, Operations, and Maintenance (MOM) Program

- MOM Program approved by EPA/DEQ in 2011
- The MOM Program was updated in July 2015 to reflect:
  - Organizational updates
  - Current programs and updated status of initiatives
- Performance measures are continuing to be tracked to evaluate the effectiveness of the programs
- Continuous improvements initiatives are being completed and new ones added accordingly

# FY2016 MOM Program Performance

- 56 metrics were tracked for FY2016
- 53 met or exceeded specified goals
  - Includes 6 Consent Decree required metrics
- 2 additional measures are planned to begin tracking with the completion of the RWWMP
- 3 metrics fell short of targets
  - “Miss” Utility Responses – 2 missed out of 52,300
  - SSO Response Plans – 1 SSO follow-up action plan was not developed within the 90-day window due to a pending forensic investigation
  - Capacity/Locality Team Meetings – 1 meeting was delayed a month, which pushed it outside of FY2016 (June to July)

# Consent Decree Performance Measures Review

## Year-over-Year Performance Summary

| Metric | Target | FY-12 Actual | FY-13 Actual | FY-14 Actual | FY-15 Actual | FY-16 Actual |
|---|---|---|---|---|---|---|
| Pump Station Annual PM | 82 | 84 | 83 | 83 | 84 | 85 |
| Back-up Generator Annual PM | 55 | 112 | 81 | 121 | 129 | 129 |
| Force Main Air Vent PM | 1,550 | 3,096 | 3,274 | 3,304 | 3,486 | 3,327 |
| Non-Invasive Force Main Inspection (LF) | 2,400 | 15,098 | 2,800 | 2,562 | 4,355 | 2,562 |
| Gravity Sewer Inspection (LF) | 39,600 | 72,730 | 98,185 | 81,841 | 89,757 | 71,595 |
| Gravity Sewer Cleaning (LF) | 29,400 | 234,463 | 207,724 | 194,838 | 208,059 | 190,160 |

# Regional Wet Weather Management Plan (RWWMP)

- Alternative Analysis Report submitted in August 2016 as Integrated Plan with SWIFT
- Commit to a 4-year level of service and build 5-year level of service (LOS) improvements
- RWWMP (due October 2017) will finalize the projects, costs and schedule to address capacity challenges to a selected level of service
- Approved RWWMP will be incorporated into the Consent Decree

# AAR Estimated Cost Breakdown(5 year LOS)

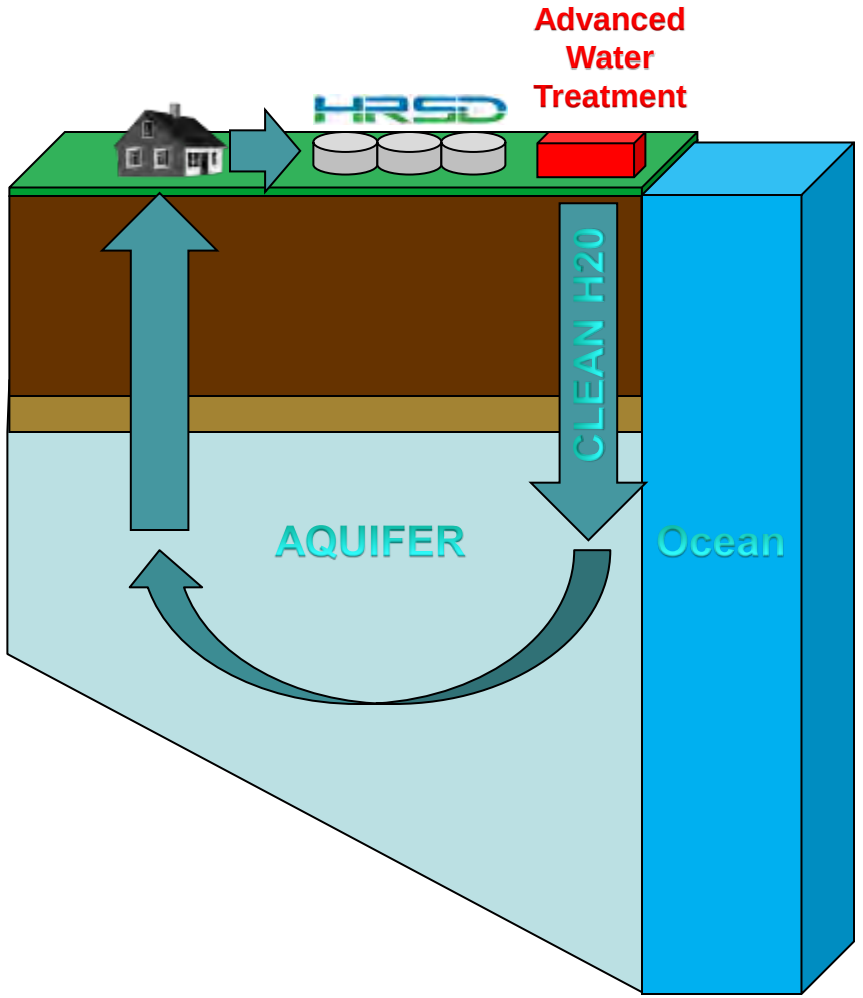
| Wet Weather Capacity Improvements | | | | | | | I/I Reduction Program | | Total |
|---|---|---|---|---|---|---|---|---|---|
| Force Main | Gravity Main | Pump Stations | Pressure Reducing Stations | Storage | Siphon | Treatment Plants | Public Asset Costs | Private Asset Costs | |
| $243M | $143M | $251M | $206M | $93M | $17M | $99M | $977M | $150M | $2.18B |
| | | | | | | | **$1.13B** | | |

# Water Issues Challenging Virginia and Hampton Roads

- Restoration of the Chesapeake Bay
  - Harmful Algal Blooms
  - Localized bacteria impairments
  - Urban stormwater retrofits (cost and complexity)
- Depletion of groundwater resources
  - Including protection from saltwater contamination
- Adaptation to sea level rise
  - Recurrent flooding
- Wet weather sewer overflows
  - Compliance with Federal enforcement action

# SWIFT – Sustainable Water Initiative for Tomorrow

- Treat water to meet drinking water standards and replenish the aquifer with clean water to:
  - Provide regulatory stability for wastewater treatment
  - Reduce nutrient discharges to the Bay
  - Reduce the rate of land subsidence
  - Provide a sustainable supply of groundwater
  - Protect the groundwater from saltwater contamination



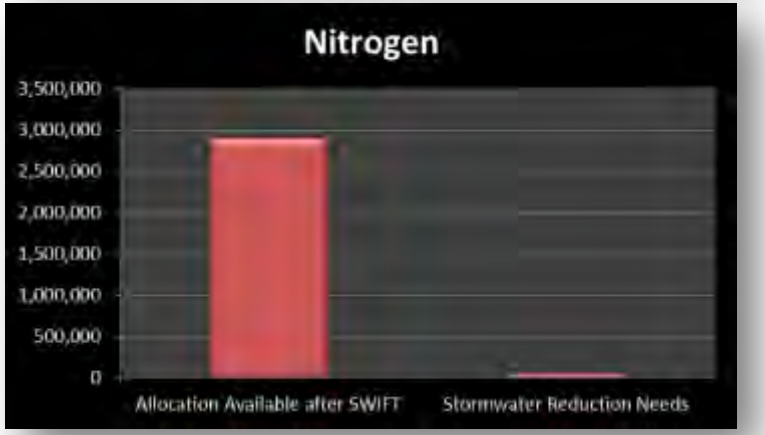
# Potential to offset stormwater reductions

| | HRSD Bay TMDL Allocations | HRSD Post SWIFT Loads (2030) | Available for other needs | Stormwater Reduction Needs* |
|---|---|---|---|---|
| **Nitrogen** | | | | |
| James | 3,400,000 | 500,000 | 2,900,000 | 63,039 |
| York | 275,927 | 25,000 | 250,927 | 19,114 |
| **Phosphorus** | | | | |
| James | 300,009 | 50,000 | 250,009 | 13,088 |
| York | 18,395 | 2,000 | 16,395 | 3,887 |
| **Sediment** | | | | |
| James | 14,000,000 | 700,000 | 13,300,000 | 5,269,142 |
| York | 1,400,000 | 98,000 | 1,302,000 | 1,413,762 |

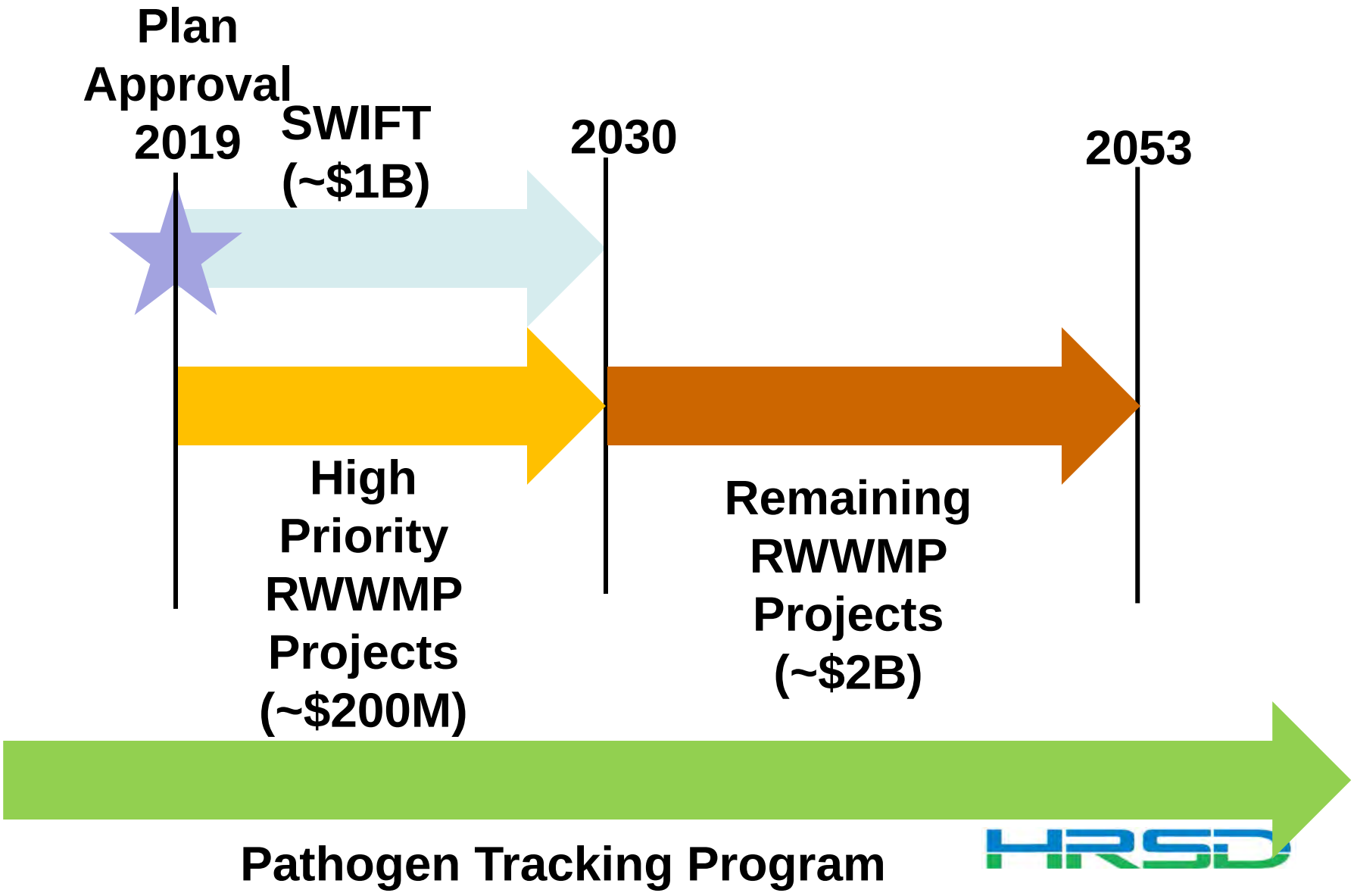
* DEQ Regulated Stormwater w/o federal lands

# Hampton Roads' Localities Stormwater Nutrient & Sediment Reductions

- Required in Virginia's Watershed Implementation Plan (WIP)
- Localities expected to spend $2.0B (proposed IP reduces to $500M)
- SWIFT will essentially eliminate HRSD's dry weather discharges
- Virginia has required laws, regulations and infrastructure to facilitate trading
- Draft agreements provided to Localities
- Term credits used to meet TMDL schedule
- Permanent credits offset once SWIFT is in place



# Sequence Places the Greatest Water Quality Benefits First



# Possible Criteria for Prioritizing RWWMP Projects During SWIFT Implementation

- Pollutant Load Reduction
- Benefit to Public Beaches
- Benefit to Drinking Water Sources
- Benefit to Open Shellfish Grounds
- Drains to Bacterially Impaired Waters
- I/I Reduction

# Activities and Schedule to Complete the RWWMP

| Activity | Start | Completion |
|---|---|---|
| Optimization | Underway | April 2017 |
| Cost Estimation | March 2017 | June 2017 |
| High Priority Project Selection | April 2017 | July 2017 |
| Sequencing/Scheduling | May 2017 | August 2017 |
| Affordability Analysis | July 2017 | August 2017 |
| Prepare RWWMP | June 2017 | September 2017 |

# Recent HRSD SSOs

| Calendar Year | # of SSOs | Volume (gal) | # of Unknown SSO Volumes (during wet weather) | Total Inches of Rain near ORF |
|---|---|---|---|---|
| 2011 | 35 | 1,880,086 | 13 | 55 |
| 2012 | 40 | 22,850,543* | 6 | 52 |
| 2013 | 14 | 722,237 | 2 | 50 |
| 2014 | 29 | 2,250,915 | 10 | 45 |
| 2015 | 18 | 516,704 | 3 | 53 |
| 2016 | 49** | 6,148,239** | 23** | 69** |

*Included single SSO at Wilroy Road of 18,352,000 gallons. Remaining volume ~4,500,000 gallons for 2012

**Included two major weather events in Hurricane Matthew and Tropical Storm Hermine

# Capacity Related SSO's

| Calendar Year | Total # of SSOs | Total Volume Of SSO's (gal) | Volume for Capacity (Gals) | # of Capacity SSOs | # of SSO at or Below LOS | Volume of SSO's Below LOS | Named Storm |
|---|---|---|---|---|---|---|---|
| 2011 | 35 | 1,880,086 | 1,409,796 | 16 | 4 | 230,920 | Hurricane Irene |
| 2012 | 40 | 22,850,543 | 4,249,483 | 31 | 8 | 387,463 | Hurricane Sandy |
| 2013 | 14 | 722,237 | 584,784 | 5 | 3 | 19,628 | Remnants of Hurricane Andrea (1) |
| 2014 | 29 | 2,250,915 | 681,392 | 15 | 5 | 267 | None |
| 2015 | 18 | 516,704 | 207,177 | 15 | 0 | 207,177 | None |
| 2016 | 49 | 6,148,239 | 2,133,775 | 35 | 6 | 109,675 | TS Julia & Hurricane Matthew |

# Coordination with Localities

- Meetings with individual Localities to review capacity enhancements in their systems
- Periodic meetings of Capacity Team
- Monthly Directors of Utilities meetings
- HRSD providing GIS, flow, pressure and rainfall data to Localities

# Public Participation

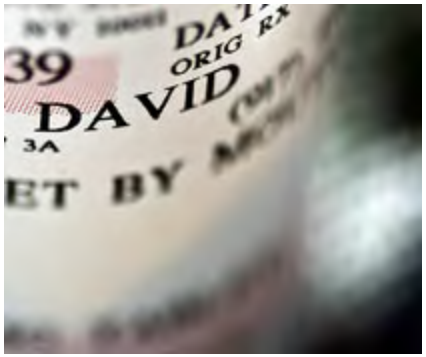
- Annual newsletter (due out before February 23, 2017)
- Annual public informational meeting with public notice (January 24, 2017)

# Steps Citizens Can Take to Protect Receiving Waters

- Report Sanitary Sewer Overflows – Call your local utility department
- Inspect home, yard and sewer service pipes to ensure separation between storm and sanitary systems
- Reduce storm water runoff by using rain barrels, rain gardens and establishing a buffer

# Steps Citizens Can Take to Protect Receiving Waters (Cont.)

- Practice proper disposal of pharmaceuticals, household chemicals, food wastes and kitchen grease – minimize use of or eliminate garbage disposal




# Steps Citizens Can Take to Protect Receiving Waters (Cont.)

- Improve water quality by raising oysters
- Limit synthetic fertilizer and other lawn chemical applications – use natural products like compost


# Steps Citizens Can Take to Protect Receiving Waters (Cont.)

- Pick up animal waste
- Avoid feeding wildlife
- Support “No Dumping” and use boater pump out facilities


# Questions?

ATTACHMENT #5

AGENDA ITEM 13. – Nancy Munnikhuysen Resolution

HRSD

# RESOLUTION

## *Commending the Service of Nancy L. Munnikhuysen as Chief of Communications*

***WHEREAS***, Nancy L. Munnikhuysen was appointed as the first Chief of Communications for HRSD in March 2001;

***WHEREAS***, she has applied her skills, knowledge and passion selflessly to the betterment of HRSD, the Hampton Roads Region, the Commonwealth and the environment;

***WHEREAS***, she brought HRSD out of the shadows and into the light, becoming an active and visible member of the Hampton Roads community and a shining example of what regional cooperation can be;

***WHEREAS***, she worked tirelessly to help the HRSD staff of scientists and engineers become better communicators, looking beyond their shoes, prepared to deal with the public and the media;

***WHEREAS***, she planned and executed numerous open houses, ground breakings, ribbon cuttings and other public events with attention to every detail;

***WHEREAS***, she provided sound counsel and advice on a wide range of subjects to two General Managers and sixteen Governor appointed Commissioners;

***WHEREAS***, she earned the respect of local and state elected officials, the Commission and the entire HRSD staff; therefore, be it

**RESOLVED by the HRSD Commission** that it hereby commend Nancy L. Munnikhuysen for her outstanding service as Chief of Communications; and, be it

**RESOLVED FURTHER,** that the Secretary of the HRSD Commission prepare a copy of this resolution for presentation to Nancy L. Munnikhuysen as an expression of the Commission's appreciation and esteem.

*Adopted by the HRSD Commission on the twenty-fourth day of January, 2017*

_____

Frederick N. Elofson, CPA
HRSD Commission Chair

HAMPTON ROADS SANITATION DISTRICT COMMISSION
VIRGINIA
SIC SEMPER TYRANNIS

ATTACHMENT #6

AGENDA ITEM 15. – Informational Items

a. Management Reports

(1) General Manager

(2) Communications

(3) Engineering

(4) Finance

(5) Information Technology

(6) Operations

(7) Special Assistant for Compliance Assurance

(8) Talent Management

(9) Water Quality

(10) Report of Internal Audit Activities

b. Strategic Planning Metrics Summary

c. Effluent Summary (Monthly and Annual)

d. Air Summary (Monthly and Annual)

January 18, 2017

Re: General Manager's Report

Dear Commissioners:

The final monthly report for calendar year 2016 provides an opportunity to reflect upon the past year. It is hard to believe how far we have come with our Sustainable Water Initiative for the Future (SWIFT) during 2016. What was a concept in January of 2016 has now been studied, piloted, publicized and integrated into HRSD's culture as the one-water future of Eastern Virginia. We have designed and built a pilot facility, held focus groups, conducted tours and served SWIFT water to more than 500 people, all in one short year. We have garnered attention from decision makers, the environmental community and the press. The United States Geological Survey is installing an extensometer at the Nansemond Treatment Plant and we have completed two of our own test wells. A design-build team is under contract and busy designing a one million gallon per day demonstration facility that will be nearing completion at this time next year.

All of this focus on SWIFT is made possible by our talented and dedicated staff, which ensures our plants meet permit every day, our interceptor system keeps pumping, our control systems are optimized and our IT network is up. They also procure needed goods and services; resolve customer issues and answer questions; find and train the talent we need; keep everyone safe; make certain everyone is paid; collect and analyze tens of thousands of samples; monitor our industrial customers; manage our capital improvements; plan for the future; ensure needed data is gathered and accurate; comply with our Consent Decree; communicate our message; conduct research; keep everything powered up, rolling, dry and comfortable; and bill and collect the revenue required to pay for it all. During 2016 we added a new community with the acquisition of Lawnes Point and navigated the required procedures to expand the HRSD territory to include Surry County.

The attached monthly reports review activities throughout the month, with a few items highlighted below:

1. **Treatment, Compliance and System Operations:** All Virginia Pollutant Discharge Elimination System (VPDES) and air permit requirements were met in December with the exception of the annual total phosphorus concentration limit at King William.

2. **Internal Communications:** I participated in the following meetings/activities with HRSD personnel:

    a. A meeting to review sizing of the Advanced Water Treatment Plant facilities with SWIFT
    b. A conference call to prepare for the meeting with U.S. Department of Justice (DOJ) and U.S. Environmental Protection Agency (EPA) staff
    c. A new employee orientation session
    d. Interviews for the Director of Communications
    e. One tour of the SWIFT pilot for employees
    f. A review of progress on the Regional Wet Weather Management Plan (RWWMP)

3. **External Communications:** I participated in the following meetings/activities:

    a. A tour of SWIFT and the York River Treatment Plant for an interested young professional
    b. The monthly meeting of the Hampton Roads Planning District Commission Director of Utilities Committee meeting with the regional stormwater professionals
    c. A meeting with the Middlesex County Administrator and one member of the Board of Supervisors to discuss providing sewer service to Deltaville
    d. A presentation by Meiden, a manufacturer of ceramic membranes
    e. A call with the Chesapeake Bay Foundation to further explore nutrient trading issues associated with SWIFT
    f. Presented SWIFT with Charles Bott during the Virginia Coastal Policy Conference hosted by the College of William and Mary
    g. Presented SWIFT to the Virginia Resources Authority Risk Management Committee

h. Attended a Water Environment Federation Utility of the Future Recognition Committee meeting
i. Attended the 10th anniversary celebration of the HRSD Toastmasters chapter
j. Presented an update on SWIFT to the Rappahannock River Basin Commission
k. The quarterly Virginia Association of Municipal Wastewater Agencies membership meeting
l. SWIFT briefing with Charles Bott for EPA staff and others at EPA headquarters
m. Participated in the SWIFT stakeholder update workshop
n. Met with DOJ/EPA and Virginia Department of Environmental Quality (DEQ) staff about amending the Consent Decree to allow submittal of a wet weather plan integrated with SWIFT to meet the requirements of the Consent Decree

Our meeting with EPA, DOJ and DEQ in Washington on December 19 was successful as we received a draft modification to the Consent Decree on December 23r that meets our desire to amend the decree to permit submittal of a RWWMP with a schedule integrated with SWIFT. We have agreed to language and anticipate the amendment will be entered with the court in early January. The significance of this amendment cannot be over emphasized. While the burden is on HRSD to make a strong case for an appropriately sequenced schedule when we make our RWWMP submittal in October 2017, this Consent Decree amendment paves the way for approval of an integrated schedule, keeping SWIFT on track for full implementation by 2030, prior to the majority of the wet weather work.

Thanks for your continued dedicated service to HRSD, the Hampton Roads region, the Commonwealth and the environment. **I look forward to seeing you on Tuesday, January 24, 2017 in Newport News.**

Respectfully submitted,

*Ted Henifin*

Ted Henifin, P.E.
General Manager

TO: General Manager

FROM: Chief of Communications

SUBJECT: Communications Monthly Report for December 2016

DATE: January 12, 2017

A. Publicity and Promotion

1. December 4, 2016 – Digging Deep for a Sea Rise Solution (*The Virginian-Pilot,* front page) http://www.hrsd.com/pdf/NewsReleases16/DiggingDeepForSea-RiseSolution_VirginianPilot20161204.pdf

2. Operations Challenge Team Becomes Extension of Apprenticeship Program (*WE&T*, December 2016) http://www.hrsd.com/pdf/NewsReleases16/OperationsChallengeTeamBecomesExtensionOfApprenticeProgram_WET20161201.pdf

3. Provided an article for the Conduit newsletter.

4. Submitted a blog for askHRgreen.

B. Outreach and Education Activities

Arranged lab and treatment plant tours for the Chesapeake Public School System's Science and Medicine Academy.

C. Community Engagement

1. Facebook Reach: 9,301

2. Twitter: 2,019 tweet impressions

3. SWIFT website visits: 445

4. Construction Project Page Hits: 5,005

D. News Releases and Project Notices

1. HRSD General Manager resigns from Virginia Association of Municipal Wastewater Agencies board

2. HRSD Employees Earn National Honors

*Note: Several localities required that we suspend construction activities during December to minimize disruption to businesses and travelers during the busy holiday season. In addition, many contractors offer extended holiday vacations to their employees. Consequently, there was no need for construction notices this month.*

E. Special Projects

Coordinated the design and production of a new game to promote the Sustainable Water Initiative for Tomorrow (SWIFT) at outreach events.

F. Internal Communications

1. Updated the HRSD Orientation Manual and prepared a comprehensive briefing book to facilitate a smooth transition for the new Director of Communications.

2. Developed "SWIFTly Speaking" talking points for staff and project partners to use when explaining SWIFT.

G. Metrics

1. Number of Community Partners: 1

   a. Chesapeake Public Schools

2. Number of Research Partners: 0

| Item # | Strategic Planning Measure | Unit | December 2016 |
|---|---|---|---|
| M-1.4a | Total Training Hours per Full Time Employee (1) - Current Month | Hours / #FTE | 0 |
| M-1.4b | Total Training Hours per Full Time Employee (1) - Cumulative Fiscal Year-to-Date | Hours / #FTE | 0 |
| M-5.2 | Educational and Outreach Events | Number | 1 |
| M-5.3 | Number of Community Partners | Number | 1 |
| M-5.4 | Number of Research Partners | Number | 0 |

Nancy L. Munnikhuysen

TO: General Manager

FROM: Director of Engineering

SUBJECT: Engineering Monthly Report for December 2016

DATE: January 11, 2017

A. General

1. Capital Improvement Program (CIP) spending for the fifth month of Fiscal Year-2017 was $13.93 million, while the planned expenditure for the month was estimated at $12.10 million. CIP spending is tracking at only 81 percent of planned spending for the year. This trend will be reviewed and discussed at the January Commission Meeting. There were no Water Quality Improvement Fund (WQIF) grant reimbursements for the month.

2. Construction costs in 2016 rose by 3.9 percent as the economy has shown some signs of improvement as documented by the Engineering News Record (ENR) Construction Cost Index. Construction starts are expected to increase by one percent in the Mid-Atlantic Region and the overall outlook for construction in 2017 continues to be restrained. The ENR also predicts a three percent increase in their Construction Cost Index in 2017 due to modest increases for materials and labor. Many of HRSD's projects, including smaller plant, pump station and pipeline work, had numerous bidders in the past year. These bidders were very competitive in their pricing and as a result HRSD continues to see stable costs for many of our CIP projects. Large plant projects, which are more sensitive to national trends in both materials and labor, could have measurable increases in the coming years. Capital spending in both the public and private sectors has picked up but with a limited backlog of work by the contractors in our region, we expect a continued competitive bidding environment in 2017. These issues should help to control costs for many of HRSD's CIP projects to be bid and constructed in 2017.

B. Asset Management Division

1. Staff is reviewing the benefits of using three dimensional (3D) modeling to assist with the initial design and long-term management of assets as part of CIP projects. Building Information Modeling (BIM) has been used for a number of years by designers to better consider 3D structures and look for conflicts between various disciplines during the design and construction phase of a project. Using this tool, assets associated with a project can be specifically identified and associated operation and maintenance (O&M) data can be assigned to these assets. The use of BIM software could allow

HRSD to build better projects and have critical O&M data immediately available for the critical assets associated with these projects. A study is underway using two active projects to test the benefits of this software and determine which data is needed and in what format it should be provided.

2. The Corrosion Protection Services Consultant, Pond & Company, has recently completed a field survey of all HRSD cathodic protection test stations. These test stations are used to monitor corrosion rates on metallic pipe within the interceptor sewer system. The survey provided a detailed inspection of each test station and verified that each station is functioning as originally planned. Needed repairs or improvements will be highlighted and a plan for making these repairs will be suggested.

C. North Shore and South Shore Design & Construction Divisions

1. The design of the Sustainable Water Initiative for Tomorrow (SWIFT) Demonstration Facility continues. Design review meetings are being held with the Design-Build Team and HRSD staff. The site layout and early purchase of equipment are a focus of these initial meetings. The submittal for the required City of Suffolk permitting is being prepared with a goal to have this package ready for review in the coming month.

2. Progress continues on the construction of the Virginia Initiative Plant Nutrient Reduction Improvement project. Construction efforts are ongoing and the project is on schedule. The first part of the project (Group 1) involves the nutrient reduction portion of the project. Ongoing work includes air piping, mixing for the versatile bioreactor, support piles for yard piping, supplemental carbon (methanol) storage and feed system, secondary clarifier and electrical work needed for these facilities. The next milestone for this part of the project is the activation of the versatile bioreactor, which should occur in the coming month. The substantial completion date for the Group 1 work is March 2017. The second part of the project (Group 2) involves the construction of the plant peak flow capacity improvements. Ongoing work includes the foundation work for the preliminary treatment facility and equalization basin and construction for a new Raw Water Influent Pump Station. The substantial completion date for this part of the project is July 2018. This is HRSD's largest single CIP project and the work will continue for the next two years. The project team is working well together and this effort is an example of good planning and communication. The Virginia Department of Environmental Quality conducted a site visit in October as part of its project assurance because it is funded with the WQIF.

D. Planning & Analysis Division

1. SWIFT continues to be a significant focus for staff. Presentations were recently made to Old Dominion University (ODU) staff and the Virginia Society of Professional Engineers (VSPE). The United States Geological Survey (USGS) has completed well drilling for the future extensometer at the Nansemond Treatment Plant. It is anticipated that USGS will complete their construction efforts in 2017.

2. The number of requests for plan and associated construction coordination reviews has risen in recent months. This work includes plan reviews for new development, requests for new sewer connections and reviews of potential conflicts with existing HRSD infrastructure. This increase in workload is related to an improvement in commercial and residential development in the region. Much of this review work is conducted by part-time employees who are ODU engineering students. This staffing model has shown to be an effective way to manage this workload and provide valuable experience to future engineers.

E. Strategic Planning Metrics Summary

1. Educational and Outreach Events: 3

   a. Staff met with two ODU professors to discuss opportunities to collaborate on subsidence monitoring.

   b. Staff made a presentation on SWIFT to the VSPE.

   c. Staff made a presentation on HRSD's Force Main Failure Analysis Program at the 2016 Sustainable Water Infrastructure Management (SWIM) Conference sponsored by Virginia Tech.

2. Number of Community Partners: 3

   a. ODU
   b. VSPE
   c. Virginia Tech

3. Number of Research Partners: 0

| Item # | Strategic Planning Measure | Unit | December 2016 |
|---|---|---|---|
| M-1.4a | Total Training Hours per Full Time Employee (39) - Current Month | Hours / #FTE | 2.42 |
| M-1.4b | Total Training Hours per Full Time Employee (39) - Cumulative Fiscal Year-to-Date | Hours / #FTE | 20.65 |
| M-5.2 | Educational and Outreach Events | Number | 3 |
| M-5.3 | Number of Community Partners | Number | 3 |
| M-5.4 | Number of Research Partners | Number | 0 |

*Bruce W. Husselbee, P.E.*

Bruce W. Husselbee, P.E.

TO: General Manager

FROM: Director of Finance

SUBJECT: Monthly Report for December 2016

DATE: January 11, 2017

A. General

1. For the second time in a decade, the Federal Reserve raised the short-term interest rate by 0.25 percent in December. This means that HRSD will pay more interest on our $50 million in variable rate debt, but will be hedged by the additional interest we are earning in our Local Government Investment Pool, which had a balance of $82 million at the end of December.

2. On December 13, the State Water Control Board approved $73 million in Virginia Clean Water Revolving Loans Funds (VCWRLF) to HRSD. The funds are dispersed on a monthly reimbursement basis as invoices are submitted. Interest accrues during construction, but the first debt service payment is not due until the project is complete. A Commission resolution for the subsidized loans will be prepared in the coming months.

3. Revenues are slightly higher than budget as water consumption remains essentially flat relative to the three-year average. Personal Services and Fringe Expenses are on target while all other expenses are lower than budget.

4. HRSD receives on an annual basis a small percentage rebate from Bank of America for almost all purchases made with Procards. In September 2016, HRSD received $310,353, which is the largest rebate since the Procard program was established.

5. Quarterly investment reports for HRSD's Operating Funds and the Retiree Health Plan Trust are attached. A minor change was made from the previous quarterly report ending September 30, 2016: $31.8 million from the former Debt Service Reserve Fund was previously classified as part of the Capital Investment Strategy. These funds are reclassified as part of the Total Return Strategy to earn additional yield since there is not an immediate cash flow need. In Section B3 of this report, a reserve column was added to show these unrestricted funds are set aside.

B. Interim Financial Report

1. Operating Budget for the Period Ended December 31, 2016

| | Amended Budget | Current YTD | Current YTD as % of Budget (50% Budget to Date) | Prior YTD as % of Prior Year Budget |
|---|---|---|---|---|
| **Operating Revenues** | | | | |
| Wastewater | $ 242,810,000 | $ 126,577,380 | 52% | 52% |
| Surcharge | 1,500,000 | 950,528 | 63% | 55% |
| Indirect Discharge | 2,500,000 | 1,356,989 | 54% | 53% |
| Norfolk Sludge | 90,000 | 34,374 | 38% | 50% |
| Fees | 2,843,000 | 1,493,954 | 53% | 46% |
| Municipal Assistance | 1,250,000 | 416,348 | 33% | 48% |
| Miscellaneous | 750,000 | 550,259 | 73% | 50% |
| Total Operating Revenue | 251,743,000 | 131,379,832 | 52% | 52% |
| **Non Operating Revenues** | | | | |
| Facility Charge | 5,850,000 | 2,957,115 | 51% | 46% |
| Interest Income | 1,400,000 | 166,617 | 12% | 13% |
| Build America Bond Subsidy | 2,400,000 | 1,193,083 | 50% | 51% |
| Other | 840,000 | 306,521 | 36% | 56% |
| Total Non Operating Revenue | 10,490,000 | 4,623,336 | 44% | 44% |
| **Total Revenues** | 262,233,000 | 136,003,168 | 52% | 52% |
| Transfers from Reserves | 7,901,331 | 3,950,666 | 50% | 50% |
| **Total Revenues and Transfers** | **$ 270,134,331** | **$ 139,953,834** | **52%** | **52%** |
| **Operating Expenses** | | | | |
| Personal Services | $ 52,521,153 | $ 26,149,783 | 50% | 45% |
| Fringe Benefits | 24,287,503 | 12,036,211 | 50% | 46% |
| Materials & Supplies | 7,374,956 | 3,383,644 | 46% | 63% |
| Transportation | 1,448,541 | 637,376 | 44% | 43% |
| Utilities | 12,286,132 | 4,911,683 | 40% | 38% |
| Chemical Purchases | 9,360,735 | 3,853,572 | 41% | 40% |
| Contractual Services | 31,903,100 | 11,978,587 | 38% | 44% |
| Major Repairs | 9,846,266 | 3,307,616 | 34% | 25% |
| Capital Assets | 3,519,171 | 644,025 | 18% | 17% |
| Miscellaneous Expense | 2,378,476 | 1,051,262 | 44% | 38% |
| **Total Operating Expenses** | 154,926,033 | 67,953,759 | 44% | 43% |
| **Debt Service and Transfers** | | | | |
| Debt Service | 61,947,000 | 31,306,365 | 51% | 57% |
| Cost of Issuance Bonds | 900,000 | 2,809 | 0% | 15% |
| Transfer to CIP | 52,101,298 | 26,050,649 | 50% | 50% |
| Transfer to Risk management | 260,000 | 130,006 | 50% | 50% |
| Total Debt Service and Transfers | 115,208,298 | 57,489,829 | 50% | 54% |
| **Total Expenses and Transfers** | **$ 270,134,331** | **$ 125,443,588** | **46%** | **47%** |

2. Notes to Interim Financial Report

The Interim Financial Report summarizes the results of HRSD's operations on a basis of accounting that differs from generally accepted accounting principles. Revenues are recorded on an accrual basis whereby they are recognized when billed. Expenses are generally recorded on a cash basis. No provision is made for non-cash items such as depreciation and bad debt expense.

This interim report does not reflect financial activity for capital projects contained in HRSD's Capital Improvement Program.

Transfers represent certain budgetary policy designations as follows:

a. Transfer to CIP: represents current period's cash and investments that are designated to partially fund HRSD's capital improvement program.

b. Transfers to Reserves: represents the current period's cash and investments that have been set aside to meet HRSD's cash and investments policy objectives.

3. Reserves and Capital Resources (Cash and Investments Activity) for the Period Ended December 31, 2016

| | General | Risk Management | Reserve | Capital |
|---|---|---|---|---|
| **Beginning of Period - July 1, 2016** | $ 155,644,784 | $ 2,740,508 | $ - | $ 124,405,496 |
| **Add: Current Year Sources of Funds** | | | | |
| Cash Receipts | 151,810,858 | | | |
| Capital Grants | | | | 4,520,756 |
| Line of Credit | | | | - |
| Bond Proceeds (includes interest) | | | | 247,022 |
| Transfers In | - | 130,006 | 31,754,250 | 26,050,649 |
| **Sources of Funds** | 151,810,858 | 130,006 | 31,754,250 | 30,818,427 |
| **Total Funds Available** | $ 307,455,642 | $ 2,870,514 | $ 31,754,250 | $ 155,223,923 |
| **Deduct: Current Year Uses of Funds** | | | | |
| Cash Disbursements | 120,207,950 | | | 65,452,407 |
| Transfers Out | 26,180,655 | | | 31,754,250 |
| **Uses of Funds** | 146,388,605 | - | - | 97,206,657 |
| **End of Period - December 31, 2016** | $ 161,067,037 | $ 2,870,514 | $ 31,754,250 | $ 58,017,266 |

4. Capital Improvements Budget and Activity Summary for Active Projects the Period Ended December 31, 2016

| Classification/ Treatment Service Area | Budget | Expenditures prior to June 30, 2016 | Year to Date FY 2017 Expenditures | Total Expenditures | Outstanding Encumbrances | Available Balance |
|---|---|---|---|---|---|---|
| Administration | $ 40,961,073 | $ 35,489,810 | $ 1,265,623 | $ 36,755,433 | $ 2,256,988 | $ 1,948,652 |
| Army Base | 156,834,000 | 117,268,663 | 902,306 | 118,170,968 | 4,383,557 | 34,279,475 |
| Atlantic | 91,488,147 | 37,540,037 | 1,736,222 | 39,276,259 | 7,630,021 | 44,581,867 |
| Boat Harbor | 83,802,681 | 33,305,878 | 3,377,857 | 36,683,735 | 12,436,298 | 34,682,648 |
| Ches-Eliz | 9,307,274 | 4,781,814 | 728,643 | 5,510,457 | 1,025,919 | 2,770,898 |
| James River | 74,913,961 | 36,167,539 | 4,876,838 | 41,044,377 | 10,678,737 | 23,190,847 |
| Middle Peninsula | 37,394,839 | 5,170,712 | 432,788 | 5,603,500 | 3,830,342 | 27,960,997 |
| Nansemond | 74,720,570 | 24,996,903 | 4,506,939 | 29,503,842 | 7,015,682 | 38,201,046 |
| VIP | 252,375,811 | 195,724,686 | 17,361,113 | 213,085,798 | 29,997,830 | 9,292,183 |
| Williamsburg | 11,396,383 | 7,646,446 | 433,313 | 8,079,759 | 1,603,073 | 1,713,551 |
| York River | 45,160,886 | 30,560,270 | 3,893,596 | 34,453,866 | 5,398,447 | 5,308,573 |
| General | 231,727,960 | 141,618,472 | 8,886,562 | 150,505,034 | 25,938,035 | 55,284,891 |
| | $ 1,110,083,585 | $ 670,271,230 | $ 48,401,800 | $ 718,673,028 | $ 112,194,929 | $ 279,215,628 |

5. Debt Management Overview

| | Debt Outstanding ($000's) | | | | |
|---|---|---|---|---|---|
| | November 2016 | Principal Payments | Net Refunding | December 2016 | Interest Payments |
| **Fixed Rate** | | | | | |
| Senior | $ 437,218 | $ - | $ - | $ 437,218 | $ - |
| Subordinate | 303,770 | 1,026 | - | 302,744 | 265 |
| **Variable Rate** | | | | | |
| Subordinate | 50,000 | - | - | 50,000 | 22 |
| **Line of Credit** | - | - | - | - | - |
| **Total** | $ 790,988 | $ 1,026 | $ - | $ 789,962 | $ 287 |

Series 2016 Variable Rate Interest Summary - Variable Rate Debt Benchmark (SIFMA) as of 12/30/2016

| | SIFMA Index | HRSD | Spread to SIFMA |
|---|---|---|---|
| Maximum | 0.87% | 0.88% | 0.01% |
| Average | 0.15% | 0.14% | -0.01% |
| Minimum | 0.01% | 0.01% | 0.00% |
| As of 12/30/16 | 0.72% | 0.71% | -0.01% |

* Since October 20, 2011 HRSD has averaged 14 basis points on Variable Rate Debt

6. Financial Performance Metrics for the Period Ended December 31, 2016

| | Current YTD | Policy Minimum |
|---|---|---|
| Capital % Cash Funded | 40% | 15% |
| General Reserve as % of Operations | 104% | 75-100% |
| Risk Management Reserve as % of Projected Claims Costs | 25% | 25% |

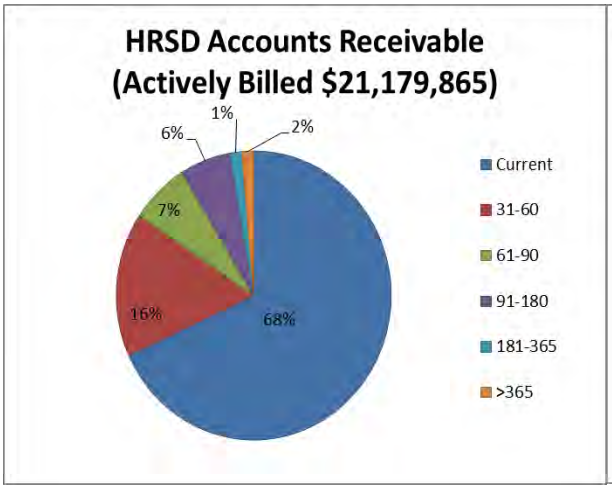
## 7. Summary of Billed Consumption

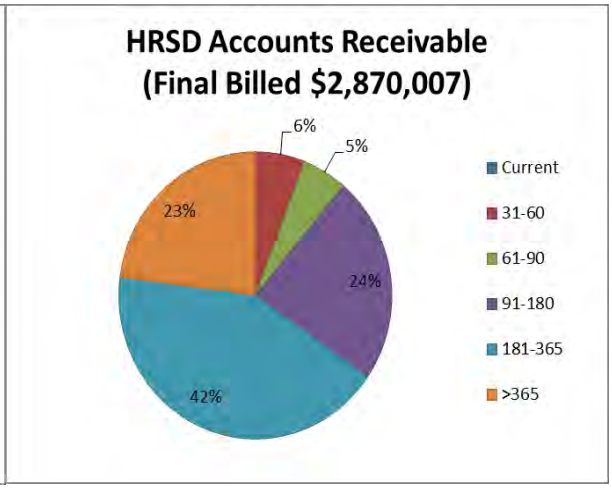
| Summary of Billed Consumption (*ccf*) | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | % Difference | | |
| *Month* | *Cumulative 3 Year Average* | *Cumulative 2016 Actual* | *2017 Cumulative Budget Estimate* | *2017 Cumulative Actual* | *From Budget* | *From 2016* | *From 3 Year Average* |
| July | 4,902 | 4,819 | 4,784 | 4,776 | -0.2% | -0.9% | -2.6% |
| Aug | 9,774 | 9,783 | 9,382 | 9,275 | -1.1% | -5.2% | -5.1% |
| Sept | 14,337 | 14,290 | 13,595 | 14,227 | 4.6% | -0.4% | -0.8% |
| Oct | 19,210 | 18,976 | 18,284 | 19,017 | 4.0% | 0.2% | -1.0% |
| Nov | 23,362 | 23,486 | 22,761 | 23,282 | 2.3% | -0.9% | -0.3% |
| Dec | 27,733 | 27,627 | 26,918 | 27,761 | 3.1% | 0.5% | 0.1% |
| Jan | 31,997 | 31,844 | 31,009 | - | N/A | N/A | N/A |
| Feb | 36,132 | 35,960 | 34,750 | - | N/A | N/A | N/A |
| March | 40,991 | 40,706 | 40,257 | - | N/A | N/A | N/A |
| Apr | 45,205 | 44,834 | 44,861 | - | N/A | N/A | N/A |
| May | 49,487 | 49,022 | 48,879 | - | N/A | N/A | N/A |
| June | 54,069 | 53,503 | 52,788 | - | N/A | N/A | N/A |

# C. Customer Care Center

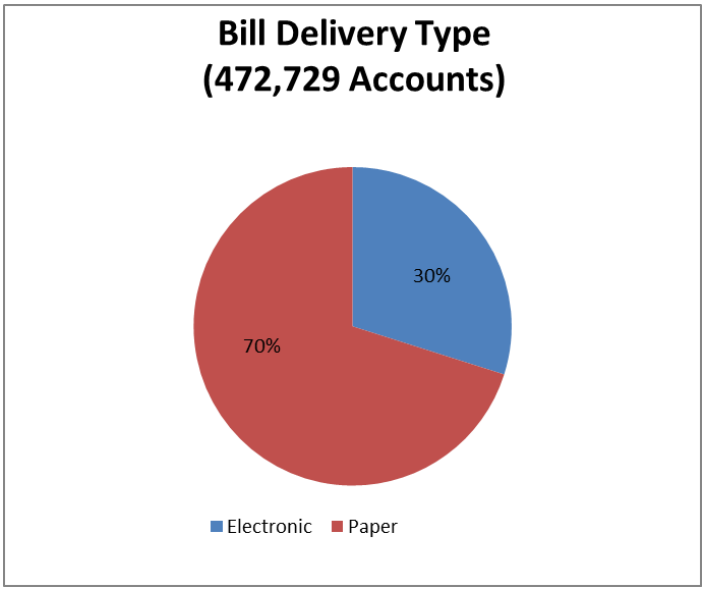
## 1. Accounts Receivable Overview

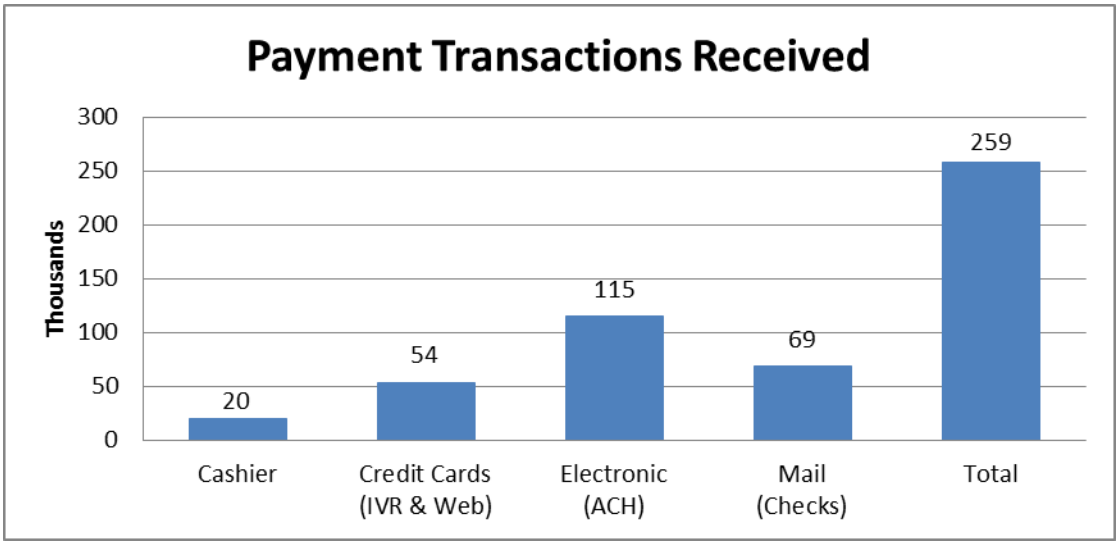
| | HRSD | Juris | Total |
|---|---|---|---|
| **Roll Forward** | | | |
| **November A/R Balance** | $ 22,901,687 | $ 24,878,237 | $ 47,779,924 |
| Billings | 21,689,848 | 25,942,050 | 47,631,898 |
| Payments | (24,921,301) | (18,427,231) | (43,348,532) |
| Delinquency Activity Fees | 137,085 | - | 137,085 |
| Late Payment Charges | 92,062 | 23,126 | 115,188 |
| Adjustments | 4,384,265 | (4,631,559) | (247,294) |
| Balances Written Off | (233,774) | (250,699) | (484,473) |
| **December A/R Balance** | **$ 24,049,872** | **$ 27,533,924** | **$ 51,583,796** |

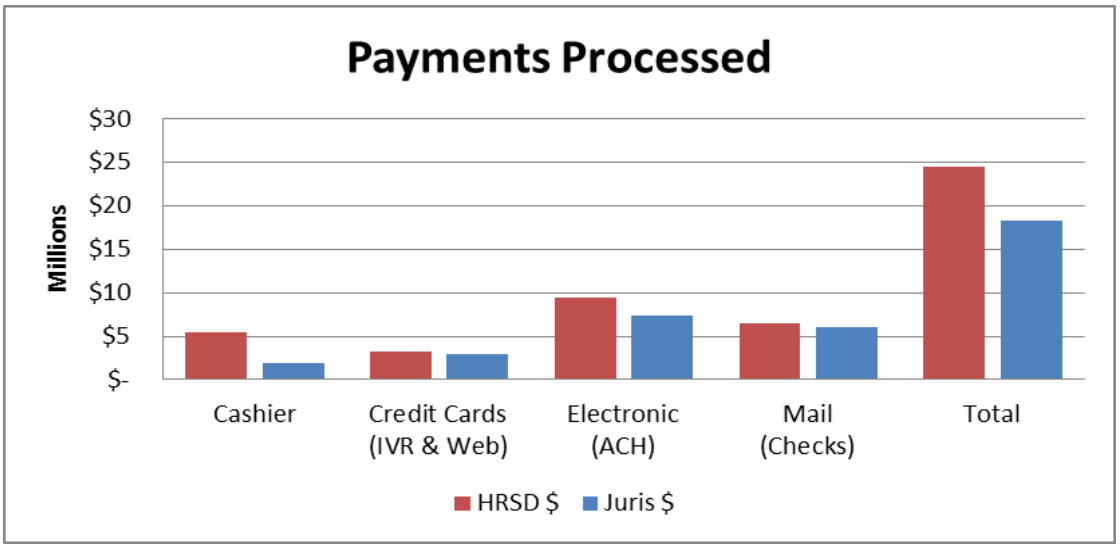


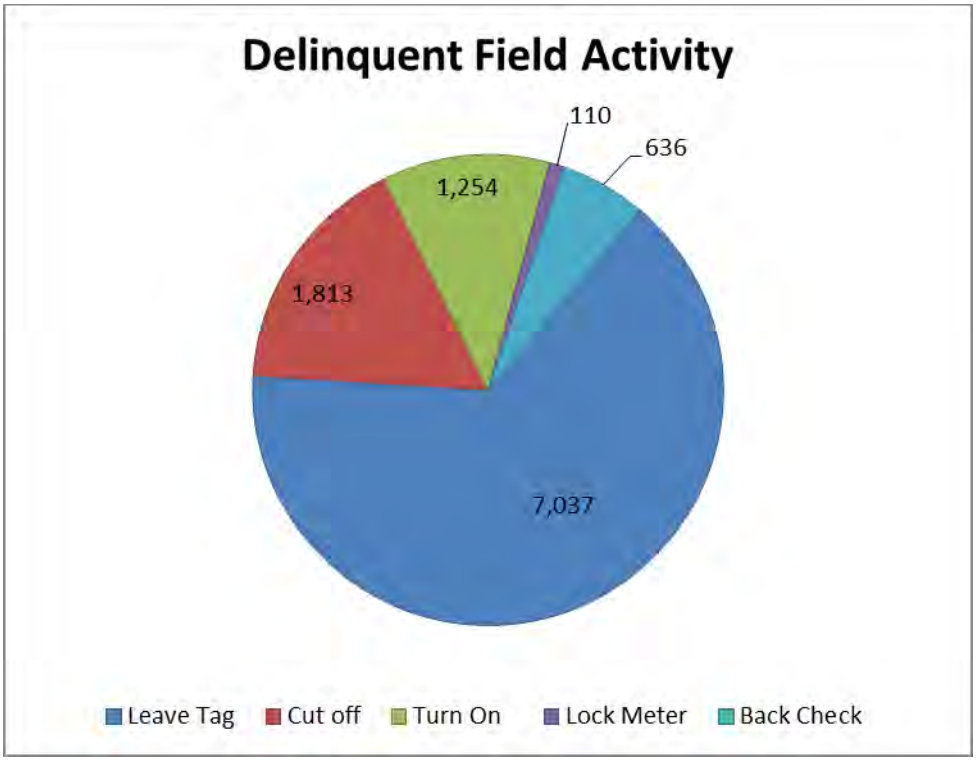



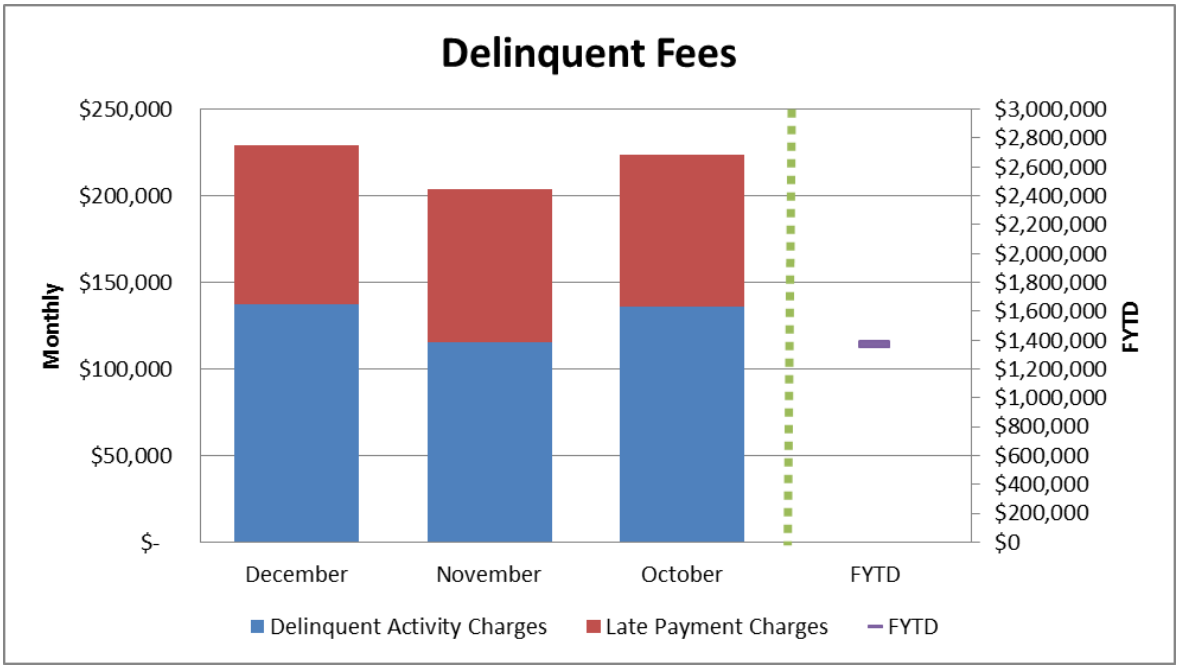
2. Customer Care Center Statistics for the Period Ended December 31, 2016

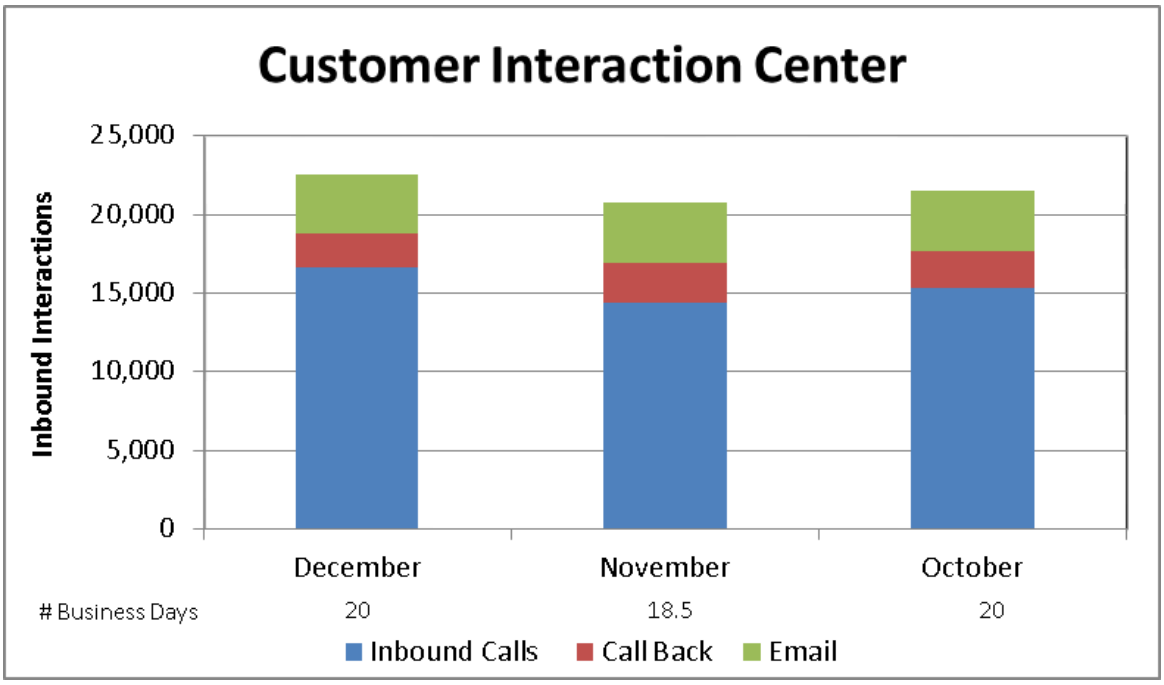



Delinquent Field Activity
110
636
1,254
1,813
7,037
Leave Tag
Cut off
Turn On
Lock Meter
Back Check


Delinquent Fees
$250,000
$200,000
$150,000
$100,000
$50,000
$-
Monthly
$3,000,000
$2,800,000
$2,600,000
$2,400,000
$2,200,000
$2,000,000
$1,800,000
$1,600,000
$1,400,000
$1,200,000
$1,000,000
$800,000
$600,000
$400,000
$200,000
$0
FYTD
December
November
October
FYTD
Delinquent Activity Charges
Late Payment Charges
FYTD




| Customer Interaction Statistics | December | November | October |
|---|---|---|---|
| Calls Answered within 3 minutes | 74% | 69% | 66% |
| Average Wait Time | 2:20 | 2:51 | 2:51 |
| Calls Abandoned | 1,643 | 1,903 | 1,977 |

D. Procurement

1. Procurement Statistics

| | Current Period | FYTD |
|---|---|---|
| Bid Cost Savings | $ 95,438 | $4,225,262 |
| Negotiated Cost Savings | $ 28,200 | $ 44,870 |
| Salvage Revenues | $ 4,932 | $ 17,636 |
| Corporate VISA Card - Estimated Rebate | $ 18,248 | $ 108,307 |

Average Cycle Time (Receipt of Requisition to Award)

| Solicitation Types | Award Amounts | Nov-16 | | Dec-16 | |
|---|---|---|---|---|---|
| | | No. Days | Count | No. Days | Count |
| RFQs | < $10,000 | 28 | 23 | 54 | 20 |
| | $10,000 - $50,000 | 45 | 15 | 54 | 20 |
| IFBs | $50,000 - $100,000 | 72 | 6 | 39 | 7 |
| IFBs/RFPs | >$100,000 | 70 | 6 | 62 | 6 |

Requisition Volume Comparison

| Requisition Amounts | 7/1/2015 - 6/30/2016 Requisitions | 7/1/2016 - 12/31/2016 Requisitions | Percent Comparison of Past Year |
|---|---|---|---|
| < $10,000 | 260 | 118 | 45% |
| $10,000 – $50,000 | 274 | 115 | 42% |
| $50,000 – $100,000 | 47 | 24 | 51% |
| >$100,000 | 78 | 45 | 58% |
| **Total** | **659** | **302** | **46%** |

2. Some of the more formal technical competitive bid solicitations for the month included:

   a. Incinerator Hearth Repair at the Boat Harbor Treatment Plant
   b. Landscaping at the South Shore Operations Center for the Support Systems Division
   c. HRSD Operations Center Entry Plaza Streetscape Project
   d. Replacement of a 42-Inch Spur Gear on Primary Clarifier #2 at the York River Treatment Plant

E. Business Intelligence – Enterprise Resource Planning (ERP)

1. ERP Helpdesk received 272 work orders. Four are in progress, 87 remain open, four are waiting on user and 177 were closed. Of the 177 work orders that were closed in December, 64 were closed within one hour.

2. The ERP team worked with the consultant, Emtech, to redesign the security layout of Business Intelligence Reports to better access and utilize data.

3. Emtech conducted Business Intelligence report construction and administration training. for

4. During the weekend of December 9, several mandatory patches were successfully applied to the production environment with no major issues. Additional year-end patching was successfully completed on December 22.

5. Staff worked with Information Technology to prepare Hyperion for budget input for the Fiscal Year-2018 budget.

F. Strategic Planning Metrics Summary

1. Educational and Outreach Events: 0

2. Community Partners: 0

| Item # | Strategic Planning Measure | Unit | December 2016 |
|---|---|---|---|
| M-1.4a | Training During Work Hours Per Full Time Employee (100) – Current Month | Hours / #FTE | 1.13 |
| M-1.4b | Total Training During Work Hours Per Full Time Employee (100) – Cumulative Fiscal Year-to-Date | Hours / #FTE | 21.99 |
| M-5.2 | Educational and Outreach Events | Number | 0 |
| M-5.3 | Number of Community Partners | Number | 0 |
| | Wastewater Revenue | Percentage of budgeted | 104% |
| | General Reserves | Percentage of Operating Budget less Depreciation | 104% |
| | Accounts Receivable (HRSD) | Dollars | $24,049,872 |
| | Aging Accounts Receivable | Percentage of receivables greater than 90 days | 18% |

Respectfully,
*Jay A. Bernas*
Jay A. Bernas, P.E.
Director of Finance

Attachments:

HRSD Operating Funds Quarterly Investment Report

Retiree Health Plan Trust Quarterly Investment Report

# Portfolio Summary

| | Yield as of | Market Value | |
|---|---|---|---|
| | **December 31, 2016** | **December 31, 2016** | September 30, 2016* |
| Operating Liquidity Strategy | **0.54%** | **$ 40,505,746** | $ 32,464,589 |
| Total Return Strategy | **1.06%** | **$ 155,186,055** | $ 155,692,291 |
| Capital Investment Strategy | **0.61%** | **$ 58,017,266** | $ 73,656,971 |
| **Total Portfolio** | | **$ 253,709,067** | $ 261,813,851 |

## Investment Recap and Strategies

- The **Operating Liquidity Strategy** is managed to provide liquidity for day-to-day cash needs and unforeseen events. Currently, the Operating Liquidity Strategy funds are held in an account meeting the requirements of the Security for Public Deposits Act (SPDA) and a local government investment pool (LGIP).
- The **Total Return Strategy** consists of operating funds that will not be a major source of day-to-day disbursement requirements and operational needs. The strategy includes a portfolio invested in longer-term securities in order to generate a higher investment rate of return. The strategy also includes funds designated as a reserve that are invested in an account meeting the requirements of the SPDA and an LGIP.
- The **Capital Investment Strategy** is managed to provide liquidity for capital projects. Currently, the Capital Investment Strategy funds are held in an account meeting the requirements of the SPDA and LGIPs.

## Portfolio Performance Summary

- Performance for the Operating Liquidity Strategy and Capital Investment Strategy is measured by comparing the average current yield of the portfolios to the average yield of a short term index. During the quarter, the Operating Liquidity Strategy had an average yield of 0.47% and the Capital Investment Strategy had an average yield of 0.42%, compared to the Merrill Lynch 3-month Treasury Bill's average yield of 0.42%. The one-year trailing return for the Operating Liquidity Strategy and the Capital Investment Strategy, were 0.29%, and 0.42%, respectively, compared to the benchmark's return of 0.31%.
- Performance for the Total Return Strategy is measured on a total return basis, which captures interest income, realized gains/losses, and unrealized gains/losses. This performance calculation methodology is most appropriate for investment portfolios that have longer-term investment horizons. During the quarter, the Total Return Strategy Portfolio generated a total return of -0.26% (-1.01% annualized), outperforming the Merrill Lynch 1 - 3 Year U.S. Treasury Index's return of -0.43% (-1.71% annualized).

**$31.8 million was previously classified as part of the Capital Investment Strategy. These funds have been set aside as a reserve and have been reclassified as part of the Total Return Strategy*

# Portfolio Summary *(continued)*

## Total Return Strategy Managed Portfolio

- The Total Return Strategy Managed Portfolio (the "Portfolio") is well diversified among U.S. Treasury securities, federal agency securities, supra sovereign agencies, certificates of deposit, municipal bonds, corporate notes, commercial paper, and high quality money market mutual funds. The Portfolio's average credit quality is AA+.

- In the fourth quarter of 2016, the Total Return Strategy Managed Portfolio, which does not include the reserve fund, generated a total return of -0.35% (-1.40% annualized), outperforming the Merrill Lynch 1 - 3 Year U.S. Treasury Index's return of -0.43% (-1.71% annualized). The one-year trailing return for the Total Return Strategy was 1.15% compared to the benchmark's return of 0.89%.

- Interest rate movements in the fourth quarter were primarily driven by the market's anticipation of and reaction to the U.S. presidential election. Yields surged in the post-election period as expectations for U.S. economic growth and inflationary expectations rose, and in anticipation of a December federal funds target rate hike.

- At its December meeting, the Federal Open Market Committee ("FOMC") increased the target range for the federal funds rate by 0.25% to 0.50%-0.75%. Projections released after the meeting indicate that the FOMC anticipates an additional three rate hikes in 2017 and another three hikes in 2018. Market expectations are more conservative, expecting only two hikes over the next year.

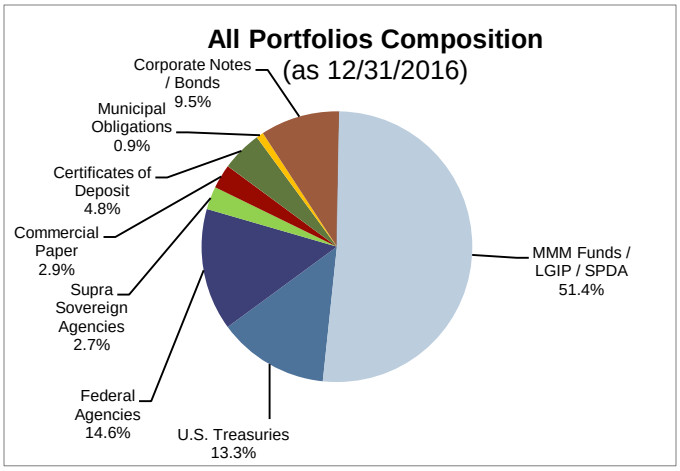
- During the beginning of the quarter, in anticipation of market volatility and rising interest rates, the duration of the Portfolio was allowed to gradually shorten in order to reduce the sensitivity of the Portfolio to changes in interest rates. After interest rates increased following the election, the duration was extended to be in line with that of the benchmark. As 2017 starts with the highest yields in several years, the strategy of the Portfolio is to continue to position the duration to be aligned with the benchmark. As of December 31, 2016, the Portfolio's duration was 1.81 years.

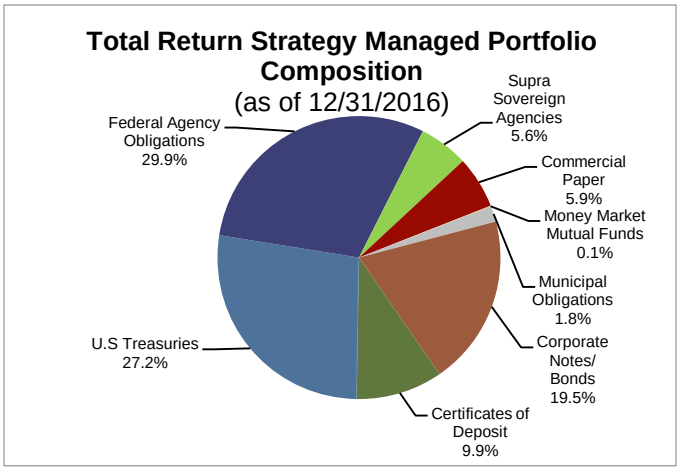
- Agency yield spreads over Treasuries remain narrow. As a result, the strategy of the portfolio will generally favor U.S. Treasuries over agencies, unless specific issues offer identifiable value.

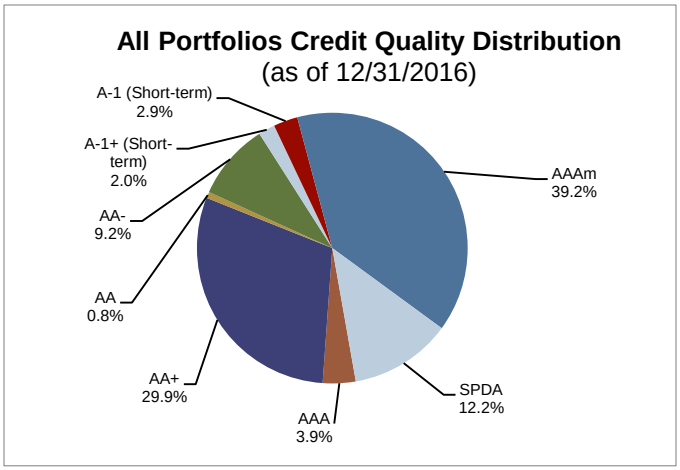
- Yield spreads on corporate securities also remain narrow. Identifying incremental return potential in the corporate bond sector requires careful relative value analysis. Improving corporate profits, as well as anticipated pro-business tax reform from the incoming Trump administration, support favorable fundamentals of the credit sector. Yields on commercial paper and negotiable CDs continue to offer significant yield pickup relative to short-term government securities.

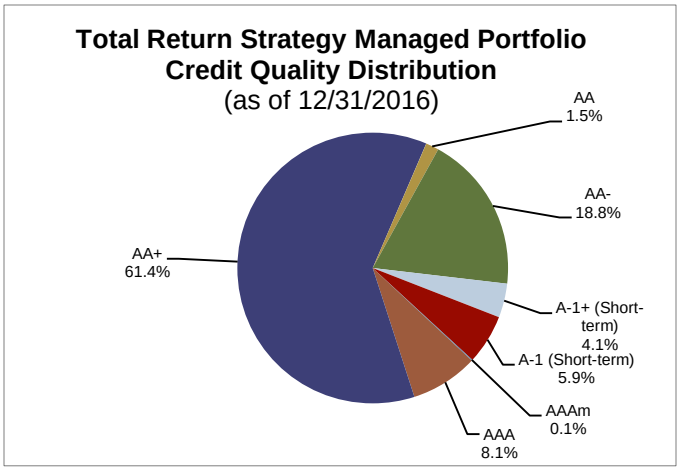
# Portfolio Composition

| Security Type | December 31, 2016 | % of Portfolio | September 30, 2016 | % of Portfolio | Permitted by Policy |
|---|---|---|---|---|---|
| U.S. Treasuries | $33,628,145 | 13.3% | $29,964,895 | 11.4% | 100% |
| Federal Agencies | 36,957,996 | 14.6% | 39,860,674 | 15.2% | 100% |
| Supra Sovereign Agencies | 6,950,691 | 2.7% | 5,765,602 | 2.2% | 15% |
| Commercial Paper | 7,327,070 | 2.9% | 12,216,822 | 4.7% | 25% |
| Certificates of Deposit | 12,225,944 | 4.8% | 9,741,832 | 3.7% | 10% |
| Municipal Obligations | 2,183,655 | 0.9% | 2,184,900 | 0.8% | 15% |
| Corporate Notes / Bonds | 24,046,067 | 9.5% | 24,079,065 | 9.2% | 25% |
| Money Market Mutual Funds / LGIP / Cash | 130,389,498 | 51.4% | 138,000,060 | 52.7% | 100% |
| **Totals** | **$253,709,067** | **100.0%** | **$261,813,851** | **100.0%** | |



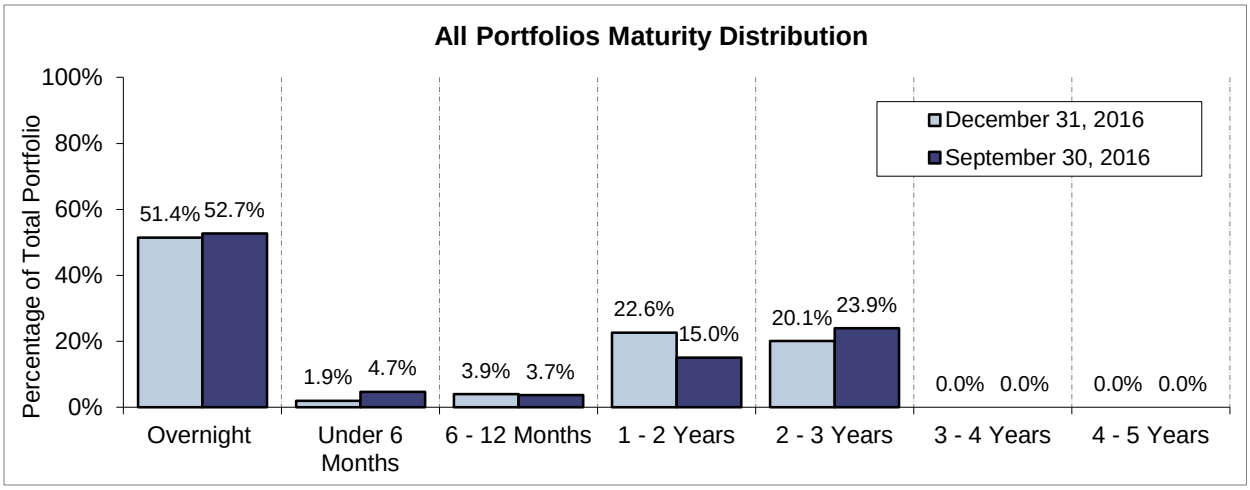



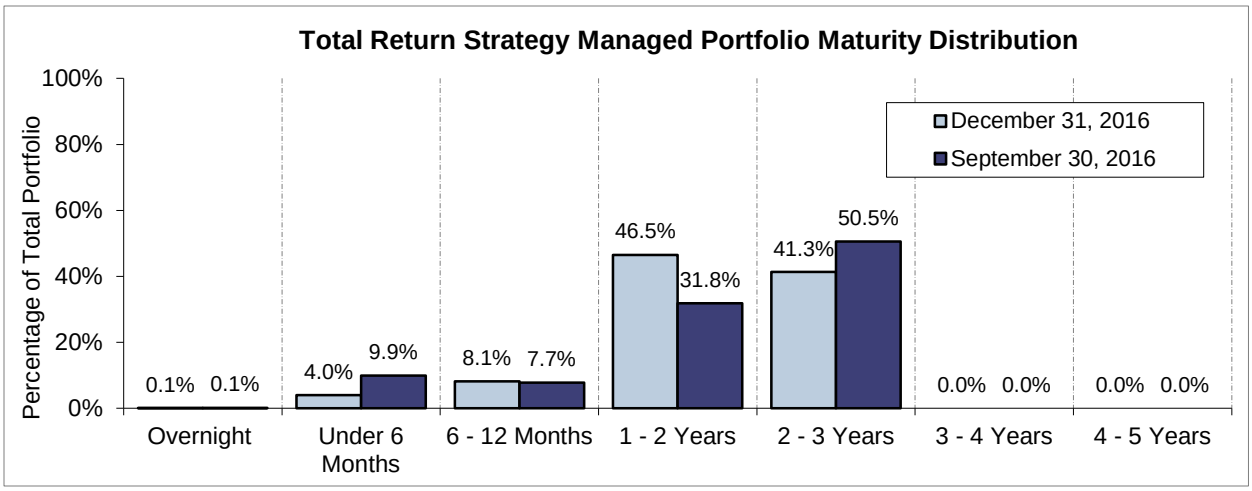



# Portfolio Maturity Distribution

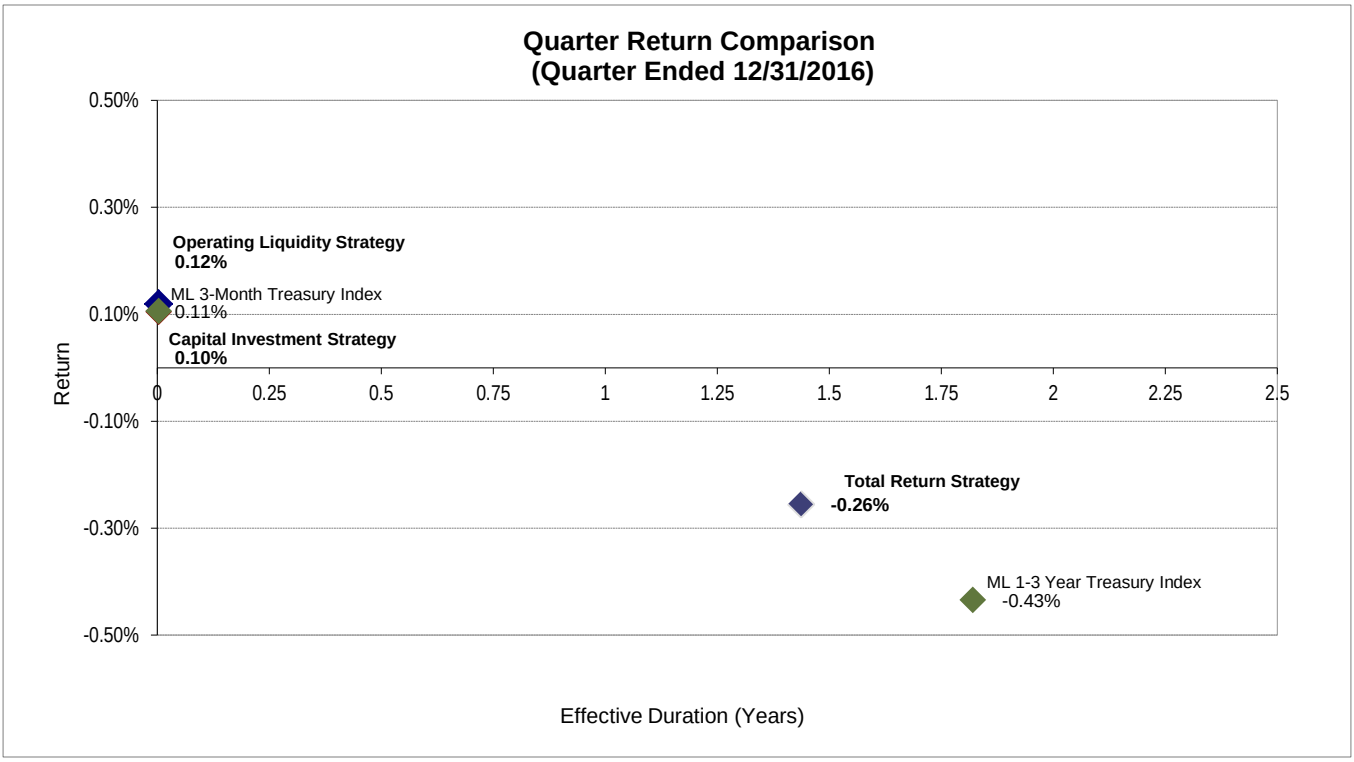
| Maturity Distribution | December 31, 2016 | September 30, 2016 |
|---|---|---|
| Overnight | 130,389,498 | 138,000,060 |
| Under 6 Months | 4,894,480 | 12,216,822 |
| 6 - 12 Months | 10,009,693 | 9,581,824 |
| 1 - 2 Years | 57,407,564 | 39,396,257 |
| 2 - 3 Years | 51,007,831 | 62,618,888 |
| 3 - 4 Years | 0 | 0 |
| 4 - 5 Years | 0 | 0 |
| 5 Years and Over | 0 | 0 |
| **Totals** | **$253,709,067** | **$261,813,851** |



# Portfolio Performance

| | Quarter Ended December 31, 2016 | Annualized Quarterly Return | Last 24 Months | Last 36 Months | Annualized Since Inception* |
|---|---|---|---|---|---|
| **Total Return Performance** | | | | | |
| **Total Return Strategy** | -0.26% | -1.01% | 1.02% | 0.91% | 1.11% |
| Total Return Strategy Managed | -0.35% | -1.40% | 0.97% | 0.88% | 1.10% |
| Total Return Strategy Managed (net of fees) | -0.37% | -1.48% | 0.88% | 0.79% | 1.00% |
| Merrill Lynch 1-3 Year Treasury Index | -0.43% | -1.71% | 0.71% | 0.68% | 0.93% |
| **Book Value Performance** | | | | | |
| **Operating Liquidity Strategy** | **0.12%** | **0.47%** | **0.27%** | **0.26%** | **0.27%** |
| **Capital Investment Strategy** | **0.10%** | **0.42%** | **0.32%** | **0.27%** | **0.26%** |
| Merrill Lynch 3 Month Treasury Bill Index | 0.11% | 0.42% | 0.18% | 0.13% | 0.10% |




**Since inception returns are calculated since September 30, 2009 to present. Performance for the Operating Liquidity Strategy and Capital Investment Strategy is calculated using a weighted average yield of cash and investments, including the monthly bank earnings credit rate and interest rate and the monthly distribution yield of the local government investment pools or money market mutual funds, and book value earnings on short-term fixed income securities. Performance for the Total Return Strategy Managed Portfolio is calculated as the total return, which captures interest income, realized gains/losses, and unrealized gains/losses, on the managed portfolio of short-term fixed income securities. The Total Return Strategy performance is calculated as the weighted average of the total return of the Managed Portfolio and average yield of cash balances. Calculations are based on provided information and are believed to be accurate based upon available data.*

# Portfolio Summary

## Total Portfolio Value

| | December 31, 2016 | September 30, 2016 |
|---|---|---|
| Investment Assets | **$ 38,991,439** | $ 38,557,652 |
| Combined Assets | **$ 39,001,976** | $ 38,569,182 |

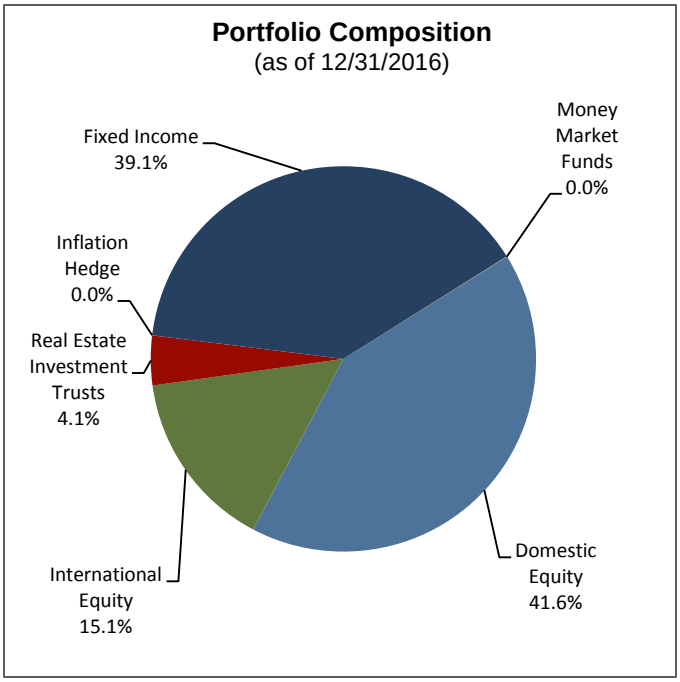
## Portfolio Recap & Strategy

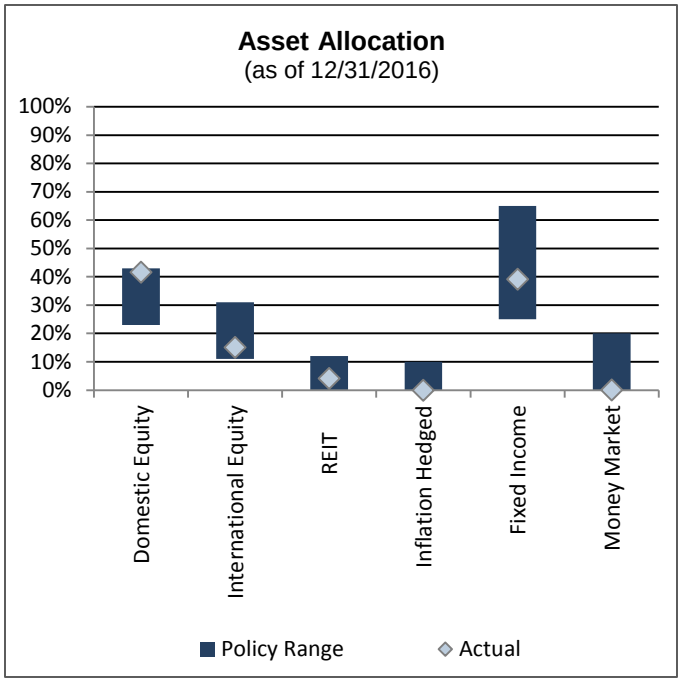
- The Retiree Health Plan Trust portfolio returned 0.12% (combined assets) for the quarter ended December 31, 2016, above the -0.06% return of the blended benchmark of 33% Russell 3000, 21% MSCI ACWI ex US (net), 3% NAREIT Equity REITs, 3% Bloomberg Commodity TR and 40% Barclays Aggregate.* The one-year trailing return for the Retiree Health Plan Trust portfolio was 6.73% compared to the benchmark return of 6.99%
- While domestic equity markets, as represented by the S&P 500 Index, rose by 3.8% for the quarter, markets told two different stories during the fourth quarter with the inflection point coming on the Presidential Election night. Leading up to the election, markets were down 1.1% for the quarter as uncertainty over the pending election persisted. In the hours immediately following Trump's surprise victory, equity futures sold off sharply then rebounded later that night and continued rallying for the remainder of the quarter. All told, the S&P rose 5.0% since election night as the market has looked favorably upon Trump's promised tax cuts and reform, increased infrastructure spending, and regulatory reform. Small-cap stocks continued its strong 2016, outperforming large- (Russell 1000 Index) and mid-cap (Russell Mid Cap Index) stocks for the third consecutive quarter. Small-caps, as represented by the Russell 2000 Index, rose 8.8% on the quarter, pushing its 2016 return up to 21.3%. With this said, both large- and mid-cap also experienced strong quarters, rising a respective 3.8% and 3.2%.
- Developed markets outside of North America, as measured by the MSCI EAFE Index, fell 0.7% in the fourth quarter. The index ended 2016 up just 1.0%. Performance over the last quarter and year was mixed with periods of gains and declines as investors weighed everything from slowing global growth and geopolitical concerns to increased central bank stimulus and attractive valuations. Despite political uncertainty within the country, Italy led the way on the quarter (10.8%) with a strong December return as investors bought up beaten down stocks following the expected failure of the Italian referendum on constitutional changes. Belgium (-11.8%) was the worst performer followed by Israel (-11.3%), the biggest laggard of 2016 (-24.9%).
- Emerging markets (EM) this quarter gave back some of the previous quarter's strong gains as investors grew concerned about the stability of the region with a stronger dollar and incoming U.S. administration's trade policies. The MSCI EM Index fell 4.2% during the fourth quarter but finished the year up 11.2%. EM country performance was mixed. Russia, one of the top performers this year, gained the most in the quarter, rising 18.6% amidst the prospects of higher oil prices and better relations with the U.S. Egypt (-23.3%) was the biggest laggard in the fourth quarter, more than offsetting strong gains from last quarter.
- After experiencing declining yields for the first two quarters of the year, yields amongst all U.S. Treasury tenors picked up once again for the second consecutive quarter while the curve also steepened. Most of the sell-off was felt in the weeks following Trump's election victory. Yield increases were significant in the intermediate portion of the curve with the 7-year rising 82 basis points (bps) and the 10-year rising 85 bps. Despite all of the yield movements in 2016, the curve sits only slightly higher than it did at the beginning of the year. Following a strong first half of the year, investment grade fixed income returns were negative for the quarter as interest rates rose throughout. The Bloomberg Barclays (Blmbg BC) U.S. Aggregate Index fell 3.0% on the quarter while the Blmbg BC U.S. Universal Bond Index (which includes High Yield and other allocations) fell a slightly lower 2.6%. Investment-grade credit within the Aggregate also fell 3.0% and there was no discernable tilt among the different credit rating categories within it.

**Performance is unreconciled*

# Portfolio Composition

| Security Type | December 31, 2016 | % of Portfolio | September 30, 2016 | % of Portfolio | Permitted by Policy |
|---|---|---|---|---|---|
| Domestic Equity | $ 16,236,977 | 41.6% | $ 16,262,368 | 42.2% | 23% - 43% |
| International Equity | $ 5,872,697 | 15.1% | $ 5,766,620 | 15.0% | 11% - 31% |
| Real Estate Investment Trusts | $ 1,618,421 | 4.1% | $ 1,543,885 | 4.0% | 0% - 12% |
| Inflation Hedge | $ - | 0.0% | $ - | 0.0% | 0% - 10% |
| Fixed Income | $ 15,263,343 | 39.1% | $ 14,984,710 | 38.9% | 25% - 65% |
| Money Market Funds | $ 10,538 | 0.0% | $ 11,600 | 0.0% | 0% - 20% |
| **Totals** | **$ 39,001,976** | **100.0%** | **$ 38,569,182** | **100.0%** | |

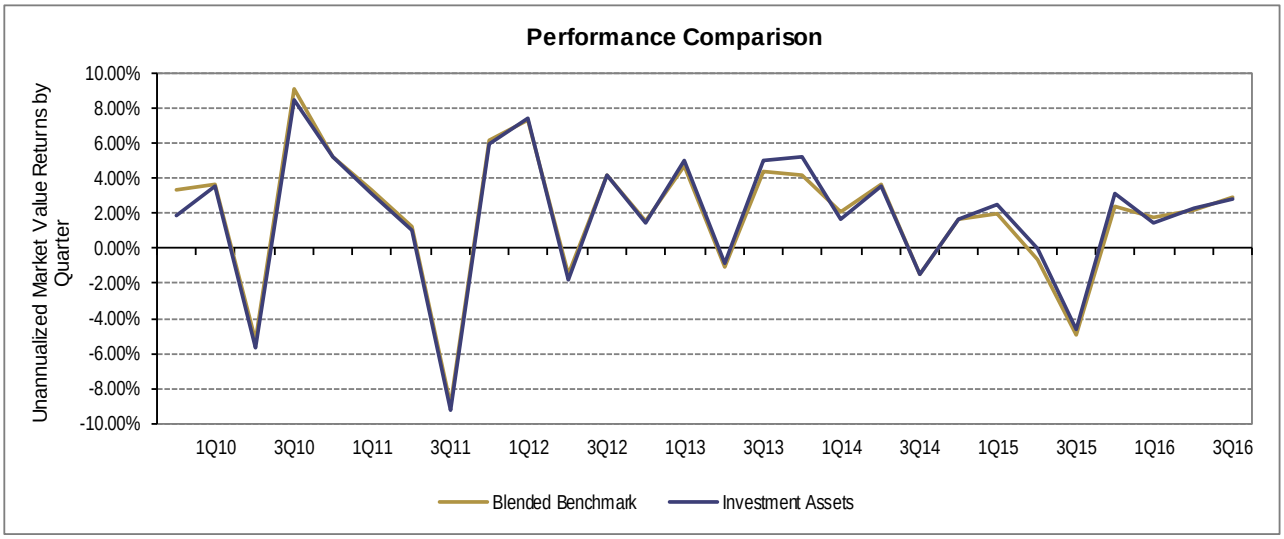


# Portfolio Performance – Investment Assets

## *Quarter Ended September 30, 2016*

| Index | Market Values | % | 1 Quarter | Year to Date | Trailing 1 Year | Trailing 3 Years | Trailing 5 Years | Apr 2013 to Sep 2016* | Since Inception | Inception Date |
|---|---|---|---|---|---|---|---|---|---|---|
| **Domestic Equity** | | | | | | | | | | |
| Vanguard Total Stock Market Index | $ 12,188,991 | 31.6% | 4.40% | 8.21% | 14.98% | 10.42% | 16.33% | 11.65% | 13.71% | 9/1/2009 |
| *Russell 3000 Index* | | | *4.40%* | *8.18%* | *14.96%* | *10.44%* | *16.36%* | *11.66%* | *13.68%* | *9/1/2009* |
| Vanguard Dividend Growth | $ 2,444,095 | 6.3% | 0.81% | 6.46% | 13.73% | 10.07% | 14.70% | 11.15% | 11.15% | 4/1/2013 |
| *S&P 500* | | | *3.85%* | *7.84%* | *15.43%* | *11.16%* | *16.37%* | *12.02%* | *12.02%* | *4/1/2013* |
| Vanguard Small Cap Index Fund | $ 1,629,282 | 4.2% | 6.17% | 11.50% | 14.97% | 7.92% | 16.70% | 10.33% | N/A | 10/1/2016 |
| *Russell 2000 Index* | | | *9.05%* | *11.46%* | *15.47%* | *6.71%* | *15.82%* | *9.65%* | *N/A* | *10/1/2016* |
| **International Equity** | | | | | | | | | | |
| Vanguard Total International Stock Index Fund | $ 1,713,488 | 4.4% | 6.65% | 6.74% | 9.66% | 0.89% | 6.78% | 2.65% | N/A | 10/1/2016 |
| *MSCI AC World ex USA (Net)* | | | *6.91%* | *5.82%* | *9.26%* | *0.18%* | *6.04%* | *2.02%* | *N/A* | *10/1/2016* |
| Vanguard International Value | $ 1,432,579 | 3.7% | 6.04% | 5.63% | 8.26% | -0.45% | 7.29% | 2.83% | 3.56% | 5/1/2016 |
| *MSCI AC World ex USA (Net)* | | | *6.91%* | *5.82%* | *9.26%* | *0.18%* | *6.04%* | *2.02%* | *3.50%* | *5/1/2016* |
| J. O. Hambro International Select | $ 1,754,183 | 4.5% | 7.44% | 12.21% | 14.70% | 7.21% | 13.68% | 9.98% | 12.21% | 1/1/2016 |
| *MSCI AC World ex USA (Net)* | | | *6.91%* | *5.82%* | *9.26%* | *0.18%* | *6.04%* | *2.02%* | *5.82%* | *1/1/2016* |
| Oppenheimer International Small Company | $ 866,370 | 2.2% | 7.39% | 5.33% | 10.82% | 10.42% | 16.94% | 14.70% | 9.04% | 4/1/2015 |
| *MSCI AC World ex USA Small Cap (Net)* | | | *7.56%* | *7.23%* | *12.24%* | *2.85%* | *7.99%* | *4.59%* | *2.34%* | *4/1/2015* |
| **REITs** | | | | | | | | | | |
| Vanguard REIT Index | $ 1,543,885 | 4.0% | -1.47% | 11.83% | 19.70% | 14.00% | 15.69% | 10.41% | 5.22% | 4/1/2016 |
| *MSCI US REIT Index* | | | *-1.45%* | *11.91%* | *19.83%* | *14.11%* | *15.79%* | *10.50%* | *5.27%* | *4/1/2016* |
| **Fixed Income** | | | | | | | | | | |
| Metropolitan West Total Return | $ 3,744,476 | 9.7% | 0.74% | 5.24% | 4.82% | 4.01% | 4.83% | 3.10% | 3.10% | 4/1/2013 |
| *Bloomberg Barclays U.S. Aggregate* | | | *0.46%* | *5.80%* | *5.19%* | *4.03%* | *3.08%* | *2.91%* | *2.91%* | *4/1/2013* |
| Baird Core Plus | $ 4,942,724 | 12.8% | 1.10% | 7.27% | 6.39% | 4.74% | 4.37% | 3.46% | 4.37% | 5/1/2014 |
| *Bloomberg Barclays U.S. Aggregate* | | | *0.46%* | *5.80%* | *5.19%* | *4.03%* | *3.08%* | *2.91%* | *3.93%* | *5/1/2014* |
| Vanguard Intermediate-Term Investment Grade | $ 4,945,177 | 12.8% | 0.93% | 7.10% | 6.90% | 5.04% | 4.84% | 3.66% | 3.66% | 4/1/2013 |
| *Bloomberg Barclays Capital U.S. Credit: 5 - 10 Yr* | | | *1.24%* | *8.80%* | *8.23%* | *5.84%* | *5.50%* | *4.02%* | *4.02%* | *4/1/2013* |
| Vanguard High Yield Corporate | $ 1,352,333 | 3.5% | 4.40% | 10.45% | 9.93% | 5.60% | 7.72% | 4.66% | 7.94% | 4/1/2016 |
| *Bloomberg Barclays US Corp: High Yield* | | | *5.55%* | *15.11%* | *12.73%* | *5.28%* | *8.34%* | *4.75%* | *11.38%* | *4/1/2016* |
| **Aggregate** | | | | | | | | | | |
| Retiree Health Plan Trust | **$ 38,557,652** | | **2.80%** | **6.61%** | **9.98%** | **6.07%** | **9.07%** | **6.42%** | **8.10%** | **9/1/2009** |
| *33% Russell 3000 / 21% MSCI ACWI ex USA (net) / 3% FTSE NAREIT Equity REITs / 3% Bloomberg Commodity TR / 40% Barclays Aggregate* | | | *2.92%* | *7.05%* | *9.66%* | *5.27%* | *8.44%* | *5.48%* | *7.96%* | *9/1/2009* |




**Active Strategy implemented April 1, 2013.*

TO: General Manager

FROM: Director of Information Technology (IT)

SUBJECT: Information Technology Department Report for December 2016

DATE: January 12, 2017

A. General

1. To facilitate online course instruction for HRSD's apprenticeship program, additional hardware and software are being installed at the West Point office of the Small Communities Division.

2. Preparations are complete for upgrading to the latest version of the Customer Care and Billing (CC&B) application. Deployment and go-live will take place January 13-17.

3. Upgrade and expansion of HRSD's primary storage and backup hardware are nearly complete. Currently, the management and control components of the platform are being configured. There will be a 30 day burn-in and stabilization period, after which data migration to the new platform will occur.

4. Staff is participating in testing the hardware and software for the Supervisory Control and Data Acquisition (SCADA) project. Next month, testing of the broadband microwave equipment will be conducted.

5. As part of the IT Department's ongoing technology refresh program, replacement of the treatment plants' network servers is scheduled to commence next month.

B. Strategic Planning Metrics Summary

1. Educational and Outreach Events: 0

2. Number of Community Partners: 0

| Item # | Strategic Planning Measure | Unit | December 2016 |
|---|---|---|---|
| M-1.4a | Training During Work Hours Per Full Time Employee (48) – Current Month | Total Training Hours / # FTE | 1.08 |
| M-1.4b | Total Training During Work Hours Per Full Time Employee (48) – Cumulative Fiscal Year-to-Date | Total Training Hours / # FTE | 7.76 |
| M-5.2 | Educational and Outreach Events | Number | 0 |
| M-5.3 | Number of Community Partners | Number | 0 |

Respectfully,
*Don Corrado*

TO: General Manager

FROM: Director of Operations

SUBJECT: Operations Report for December 2016

DATE: January 10, 2017

A. Interceptor Systems

1. *North Shore (NS) Interceptor Systems*

a. There were two interceptor complaints and three system alarms during the month. Staff followed up on all of these issues, ensuring they were fully resolved.

b. A plan for treating the Lawnes Point Treatment Plant pond was determined. Work on the necessary infrastructure and piping will commence in January.

c. Staff spent a significant amount of hours on the following projects:

1) Assisted a contractor with line stop insertion/removal, tie-ins and force main activation on the Williamsburg Interceptor Force Main Replacement Capital Improvement Program project. Once all work is complete, staff will activate the looped system in southern Williamsburg, which should reduce system pressures during wet weather events.

2) Responded to and repaired two infrastructure problems in the Lawnes Point collection system.

3) Performed two pump and haul operations at the Lawnes Point Treatment Plant.

4) Assisted a contractor with the inspection of 196 cathodic protection and test station sites.

2. *South Shore (SS) Interceptor Systems*

December was a quiet month with no emergencies or large project support efforts. This allowed SS Interceptor crews to focus on preventative maintenance, which included winterizing all of the bypass pumps in the SS system. Crews also spent a significant amount of time clearing trees along

the Shingle Creek right of way and Atlantic Treatment Plant outfall right of way that had fallen due to Hurricane Matthew.

B. Major Treatment Plant Operations

1. Army Base Treatment Plant (ABTP) – Staff reported two air permit deviations. The first involved using the bypass stack when the ID Fan tripped. The second occurred when both the total hydrocarbon analyzer and the stack oxygen analyzer failed.

   Staff reported one regulatory reportable event when operators failed to sample the appropriate contact tank. Staff conducted retraining.

   Staff began feeding methanol on December 9. After a period of acclimation, the plant produced a total nitrogen (TKN) average of 4.9 mg/L for the last two weeks of the month. The plant expects biological phosphorous stability to increase due to less nitrate recycle to the anaerobic zone.

   On December 23, aeration tank blower 4 experienced a catastrophic failure with the harmonic filter. Staff is working with the manufacturer of the aeration blowers. This marks the second failure of the blower system in three months.

2. Atlantic Treatment Plant (ATP) – The annual stack tests for the Combined Heat and Power (CHP) engines were completed during December. Based on the preliminary results, it appears the engines will pass the testing for CO and NOx.

3. Boat Harbor Treatment Plant (BHTP) – Staff struggled this month to comply with its air permit, with 37 deviations from a low differential pressure on the packed media bed. With the exception of one use of the bypass stack, all other air permit requirements were met.

   Staff spent a significant amount of time attempting to increase the packed bed differential pressure on the furnace scrubber. BHTP is the only HRSD plant with this particular air pollution control device. The low differential pressure problem started in November and staff spent a significant amount of time attempting to resolve the problem. Troubleshooting included multiple calibrations of instrumentation equipment, storing solids in the holding tanks in order to increase feed to the furnace, opening large holes in the bottom of the scrubber system in order to increase airflow through the scrubber, trying different burner configurations and moving the burn zone within the furnace. Throughout the month, staff conducted visible

emissions readings every 12 hours to comply with a Department of Environmental Quality (DEQ) request for additional monitoring of the process. An expert engineering consultant was hired. Their report indicated that a primary cause of the low differential pressure is that the scrubber is both oversized and operating well below its design capacity. They also identified that differential pressure is an inappropriate performance and regulatory monitoring parameter for this type of wet scrubber. Staff shared the report with DEQ. Based on all the work performed to date, we are currently seeking a waiver of the monitoring requirement from DEQ given that the scrubber's low-pressure condition is not harmful to the environment. Staff also intends to retest the furnace in February with a new feed rate, which should establish more reasonable operating parameters.

On December 18, the plant experienced a loss of power in the incinerator building, resulting in a 1 hour and 54 minute use of the bypass stack. Staff discovered and repaired a defective breaker in a 480 Volt panel.

4. Chesapeake-Elizabeth Treatment Plant (CETP) – The plant experienced two air permit deviations:
   a. On December 16, the furnace draft control settings were out of adjustment for a few hours, causing the pressure drop across the upper scrubber impingement plate trays to be less than minimum. The operator adjusted the draft and return air settings to correct the situation.

   b. On December 29, a loose bolt caused the clinker breaker to jam, forcing staff to make an unplanned burn out.

   Staff and a contractor repaired the short outfall valve components destroyed by Hurricane Matthew's floodwaters. The short outfall valve was used for approximately 15 minutes to set the new actuator limits and test automatic and manual controls.

   Contact Tank #4 was cleaned and inspected. The contact tank influent electric valve actuators were replaced and tested.

5. James River Treatment Plant (JRTP) –Staff completed maintenance and repairs to the #2 secondary clarifier while the tank was out of service to replace the main bearing and repair the ring gear. Staff also made repairs to both the solids thickening building and digester auxiliary boilers. The solids thickening building boiler required replacement of the draft fan and the digester auxiliary boiler required repairs to the recycle hot water control line.

The contractor completed replacement of corroded odor control ductwork servicing the primary treatment section of the plant.

The contractor poured concrete covers for manhole #8 and the new manhole chamber connecting the bypass line to the primary influent line. Leakage tests were performed on manholes #8 and #41 and the 42-inch pipe connecting the two manholes.

6. Nansemond Treatment Plant (NTP) – The plant experienced issues with nutrient removal during the month. The drop in wastewater temperature and increase in influent TKN loading resulted in incomplete nitrification. To support the additional nutrient load and drop in temperature, additional aeration capacity was added. The influent phosphorous load to the plant increased during the same period. Ferric Sulfate was increased to supplement biological phosphorous removal. The biological nutrient removal system is in recovery.

7. Virginia Initiative Plant (VIP) – The final effluent phosphorus was higher than the targeted value. An inline phosphorus meter installed as part of construction indicated that internal recycle flows needed adjustment. Phosphorus levels are now below target values.

   Three variable frequency drives failed due to the combination of excessive construction dust, repeated power interruptions and obsolescence. Staff will replace the drives with updated equipment.

   The solids receiving facility underground electrical duct bank settled due to vibration caused by construction equipment and pile driving, resulting in the loss of control to the two solids receiving pumps. Staff installed aboveground conduit and cables to restore control to the pumps. The control cable loss interrupted solids deliveries from NTP for a short time.

8. Williamsburg Treatment Plant (WBTP) – One odor exception occurred this month when an operator switched odor trains and immediately took a sample without adding sodium hypochlorite and sodium hydroxide. Operation returned to normal once the chemicals were added.

   The plant experienced air permit deviations within a couple minutes of each other when an operator did not follow a Standard Operating Procedure.

   Two of the four aeration tanks were modified to include an anaerobic selector zone for biological phosphorus removal. The second tank was placed in service mid-month. Staff drained, cleaned and began modifying another aeration tank to include an anaerobic selector zone.

9. York River Treatment Plant (YRTP) – Staff worked on finalizing the Fiscal Year-2018 budget.

C. Small Communities Division (SCD)

*SCD Treatment*

1. West Point Treatment Plant (WPTP)
A small-scale pilot trial of a Huber dewatering screw press this month showed promising results. A more comprehensive test is scheduled for spring/summer of 2017. Testing continues on the new chemical feed system; the hypochlorite tank was filled and bisulfite is expected the second week of January. Both systems will be operational by end of January.

2. Urbanna Treatment Plant (UBTP)
The in-house coatings work for train #1 was completed, including the secondary clarifier.

3. King William Treatment Plant (KWTP)
The final facility-planning document was submitted by CH2M and is currently under review by the HRSD team. A meeting was help with several representatives of Meiden Singapore & Japan at the KWTP concerning the applicability of ceramic membranes as part of the facility upgrade. The design team will evaluate the feasibility of retrofitting the existing membrane tanks with a custom designed ceramic membrane module in addition to sizing for new separate membrane tanks.

The HRSD King William facility VPDES permit has a total phosphorous annual concentration limit of 0.30 mg/l and an annual load limit of 190 pounds. A total of 45 individual King William effluent samples were collected and analyzed for total phosphorous concentration across the entire year of 2016. The mathematical annual average of all 45 analytical results ([sum of all 45 measurements]/45) is 0.30 mg/l; however the annual average as calculated using the method of the Nutrient General Permit is 0.52 mg/l. The difference between the two averages is due to the disproportionate influence of a single data point (11.6 mg/l) reported to DEQ with the King William DMR for the month of May, 2016 using the Nutrient General Permit calculation method. HRSD increased the collection of data points for the remainder of the year to provide more information regarding treatment performance and demonstrated that the annual average concentration discharged, except for this single incident in May of 2016, was .04 mg/l. This average is 7.5 times less than the annual

average limit. The single, high concentration measured was due to a short term but immediate release of total phosphorous into the effluent stream that resulted from contractor installed treatment media that did not meet HRSD's specifications.

D. Support Systems

1. Automotive

a. Repair work on the #2 generator engine at ABTP progresses. The contractor drained fluids and removed components so the engine could be lifted and removed. ATP Combined Heat and Power (CHP) generator #2 returned to service after performing its 12,000-hour preventative maintenance. BHTP's #1 generator repairs were completed and it was returned to service.

b. Staff performed generator load bank tests at Colonial Williamsburg, Elmhurst Lane and Park Avenue Pump Stations All generators operated as designed and were returned to service.

2. Carpentry Shop

The SS Carpenters completed 15 projects including: fabricating 78 grit wear shoes for NTP, designing and constructing twelve polyvinyl chloride (PVC) oyster molds for Engineering and the Elizabeth River Oyster Restoration Project, repairing flooring in the Technical Services Division's hallway, and constructing shelves and countertops for the Automotive Shop's library and the Central Environmental Lab.

3. Coatings and Concrete

Support Systems hired two Concrete and Coatings Inspectors. The Inspectors examined numerous, ongoing coatings projects to include: the rehabilitation work on BHTP's aeration tanks, JRTP's deteriorating coating on its Gravity Thickener #1, NTP's Triple A/Aeration Tank restoration project and the Primary Clarifier and Aeration piping at YRTP.

4. Facilities Maintenance

a. The Facilities Maintenance Superintendent is working with NS Interceptor Systems on the removal of several trees from the Northshore Operations Center property. The Federal Aviation Administration identified the trees as obstructions in the flight path of Newport News International Airport's runway #7. .

b. A contractor continues to work on the CEL's roof and heating, ventilation and air conditioning (HVAC) upgrade project. Temporary HVAC units are in place to maintain temperatures within workable limits. Installation of the new main air handler unit (AHU), boilers and humidifiers is complete with start-up slated for the first week of January 2017. Demolition and replacement of two, 200-ton chillers will begin once the new AHU is on line.

c. Replacement of 320 uninterrupted power supply (UPS) batteries at 1424 Air Rail Avenue was accomplished.

5. Machine Shop

The Machine Shop completed ten projects including: fabricating Teflon plugs for the Technical Services Division, boring large plastic sprockets for NTP, constructing impeller rings for Camden Avenue Pump Station and building boot scrapers for NS Interceptors.

E. Electrical and Energy Management

1. Two new blowers at ABTP recently experienced catastrophic failures. Staff and a contractor are reviewing the failures and seeking possible solutions to avoid future failures.

2. Wet well anomalies were experienced at the Rodman Pump Station. Staff replaced the controller and wrote a new program to correct the anomalies.

3. Staff completed repairs to the actuator at the CETP outfall located on the Little Creek Amphibious Base. This work is the result of Motorola Supervisory Control and Data Acquisition (MOSCAD) communication failures that occurred during Hurricane Matthew.

4. Staff tested the generator-to-generator synchronization as well as electrical system synchronization between BHTP and Dominion Virginia Power. The generators performed as designed.

5. Staff repaired a motor circuit breaker at 25th Street Pump Station identified during annual thermographic inspection (infrared heat scan).

F. Water Technology and Research

The Sustainable Water Initiative for Tomorrow (SWIFT) pilot has been operating under stable conditions at YRTP since early July. Updates from recent work include:

1. Bromate is now well controlled with upstream preformed monochloramine addition.
2. All instrumentation issues have been addressed and the knowledge gained from this experience will be very useful for the design of the Nansemond demonstration project.
3. The wet weather challenge testing was successfully completed and involved increasing the pilot feed suspended solids concentration to levels consistent with what would be expected in a severe wet weather event. The carbon-based system functioned very well with no negative consequences, though the coagulant dose was increased according to the anticipated requirement. As expected, the ultrafiltration pilot demonstrated a much faster than normal increase in transmembrane pressure (TMP), but the system recovered with backwashing and chemical cleaning after the simulated event.
4. Virus challenge testing using MS2 coliphage demonstrated more than eight logs of virus removal across both the membrane- and the carbon-based pilot systems.
5. Emerging contaminant removal continues to be very good, even though total organic carbon in the effluent of the more highly loaded granular activated carbon unit is approaching 4 mg/L.
6. Detailed pilot testing results were presented to a large group of internal and external stakeholders on December 14.
7. The membrane-based pilot testing was terminated as of December 15 and the leased pilot units returned to the vendor.

G. Strategic Measurement Data

1. Education and Outreach Events: 11

    a. Charles Bott participated in the quarterly Chesapeake Bay Program Science and Technical Advisory Committee meeting
    b. Charles Bott hosted a tour of JRTP and YRTP for Loudoun Water
    c. Charles Bott and Ted Henifin conducted a SWIFT briefing during a conference at William and Mary
    d. Charles Bott hosted a tour for the Process Engineer from the City of Raleigh, NC
    e. Charles Bott and Ted Henifin conducted a SWIFT briefing for the US Environmental Protection Agency Office of Water staff

f. YRTP staff provided a plant tour for a group of Loudoun County public utilities employees interested in the centrate treatment and equalization
g. SS Interceptor Systems staff participated in a Virginia Beach Technical Education Center Emergency Operations Class
h. EEM staff participated in the United States Marine Corps (USMC) Toys for Tots drive
i. ATP plant staff provided a tour for a Green Run High School AP Environmental Science Class
j. CETP staff provided a tour for members of Boy Scout Troop 480
k. SCD staff participated in the Virginia Department of Transportation's (VDOT) Adopt-A-Spot bi-annual cleaning

2. Community Partners: 10

a. VIMS
b. ODU
c. Chesapeake Bay Foundation – oyster restoration
d. Elizabeth River Oyster Project
e. Loudoun County
f. Boy Scouts of America Troop 480
g. Green Run High School
h. VDOT
i. USMC
j. Virginia Beach Technical Education Center

| Item # | Strategic Planning Measure | Unit | December 2016 |
|---|---|---|---|
| M-1.4a | Training During Work Hours per Full Time Employee (FTE) (507) – Current Month- | Hours / FTE | 3.12 |
| M-1.4b | Total Training During Work Hours per FTE (507) – Cumulative Year-to-Date | Hours / FTE | 21.25 |
| M-2.3a | Planned Maintenance Total Maintenance Hours | Total Recorded Maintenance Labor Hours | 28,982.00 |
| M-2.3b | Planned Maintenance – Preventive and Condition Based | % of Total Maintenance Hours | 47.88 |
| M-2.3c | Planned Maintenance - Corrective Maintenance | % of Total Maintenance Hours | 25.56 |
| M-2.3d | Planned Maintenance-Projects | % of Total Maintenance Hours | 26.56 |

| Item # | Strategic Planning Measure | Unit | December 2016 |
|---|---|---|---|
| M- 4.1a | Energy Use: Treatment ***reported for November 2016** | kWh/MG | 2,276 |
| M-4.1b | Energy Use: Pump Stations ***reported for November 2016** | kWh/MG | 206 |
| M-4.1c | Energy Use: Office Building ***reported for November 2016** | kWh/MG | 113 |
| M-5.2 | Educational and Outreach Events | Number | 11 |
| M-5.3 | Number of Community Partners | Number | 10 |

Respectfully submitted,

**Steve de Mik**
Director of Operations

TO: General Manager

FROM: Special Assistant for Compliance Assurance

SUBJECT: Monthly Report for December 2016

DATE: January 6, 2017

A. General

HRSD continues to implement the hybrid regionalized approach to the Regional Wet Weather Management Plan (RWWMP) with the next major Consent Decree milestone, the submittal of the final RWWMP, scheduled for October 1, 2017.

HRSD received an information request from the U.S. Environmental Protection Agency (EPA) under the authority of Section 308 of the Clean Water Act on October 7, 2016. Requests under this authority must be responded to within 30 days and carry significant penalties for failure to comply. The information requested was primarily for detailed financial information that will become the basis of the affordability analysis and ultimately the schedule for the Regional Wet Weather Management Plan **(**RWWMP). While some of this information was used to prepare the preliminary schedule included in the Alternatives Analysis Report, the detailed information requested is actually required to support the schedule we will submit with the RWWMP in October 2017. As such, HRSD invoked dispute resolution on October 28, 2016. A face-to-face meeting with the EPA and the U.S. Department of Justice was held on **December 19**, and discussions are ongoing regarding modification to the Consent Decree and response to the original 308 request.

B. Submittals Completed in December 2016 – No submittals required during this period.

C. Activities

1. **Phase 6 – Rehabilitation Plan**. Work continues on Fiscal Year-2017 work orders. No work orders were completed in December.

2. **Phase 7 – RWWMP**. Optimization of the RWWMP solution sets from the Alternatives Analysis Report continued in December, and the first series of optimization workshops were completed. The Regional Hydraulic Model is being used to test the solutions developed. The Locality Hydraulic Models have been updated and are ready to test against the new flow set.

Revisions to the Infiltration and Inflow (I/I) Reduction Program were balanced against capacity improvements to reduce the overall program cost.

A technical coordination team meeting was held on **December 15** to review overall progress. Additional meetings were held in December to review the projects associated with the Chesapeake-Elizabeth Treatment Plant closure.

3. **Phase 8 – EPA Consent Decree Services.** A quarterly review of Interim System Improvement projects and Rehab Action Plan projects was held on **December 5**. HRSD continues to share information with the Localities through the regional SharePoint site and flow, pressure and rainfall data portal.

4. **Phase 9 – Supplemental Services.** A monthly compliance program meeting was held on **December 7** to review overall progress.

   Management, Operations and Maintenance (MOM) Program elements are ongoing including the Hydrogen Sulfide (H2S) Monitoring Program and implementation of a Business Intelligence (BI) system for the Small Communities Division (SCD). This includes a MOM update manual guidance document for use on the next major update expected in 2018.

   The Flow, Pressure and Rainfall (FPR) monitoring program continued in December with data collection and analysis being performed as part of the MOM Program.

   Condition assessment field work was completed for Work Order FMP2 038 Southern Boulevard and FMP2 037 Pocahontas Trail under Phase II of the Force Main Condition Assessment (FMCA) Program. Construction of the repair for SR 062 Euclid Avenue is completed as part of the Sewer Repair contract. Field work continued in December under the Gravity Sewer Inspection Phase II Program, which included Work Order GMP2 SCD 013 PS 5 Service Area. Work order development is in progress to inspect approximately 20,000 linear feet of HRSD gravity line along Shingle Creek in Suffolk. Work on the FY-2016 Condition Assessment Annual Report continued in December.

D. Next Submittals

1. Quarterly Briefing with the EPA/Virginia Department of Environmental Quality – January 24, 2017

2. Annual Public Meeting – January 24, 2017

3. Annual Newsletter – February 2017

E. Program Budget Status

The overall program budget is **$131,191,858**, excluding the Master Metering Program. A summary of appropriations and expenses is attached.

F. Strategic Planning Metrics Summary

1. Educational and Outreach Events: 0

2. Number of Community Partners: 0

| Item # | Strategic Planning Measure | Unit | December 2016 |
|---|---|---|---|
| M-1.4a | Total Training Hours Per Full Time Employee (1) – Current Month | Total Training Hours / # FTE | 0 |
| M-1.4b | Total Training Hours Per Full Time Employee (1) – Cumulative Fiscal Year to Date | Total Training Hours / # FTE | 36 |
| M-5.2 | Educational and Outreach Events | Number | 0 |
| M-5.3 | Number of Community Partners | Number | 0 |

Respectfully submitted,

*Phil Hubbard, P.E.*

Attachments: Consent Order State & EPA Expenditures

**Consent Order State & EPA Expenditures**

| | Total Appropriation | December 2016 Obligations | Available Balance |
|---|---|---|---|
| **Regional Consent Order and Other Consent Order Requirements** | | | |
| Regional Hydraulic Model | $104,248,712 | $107,863,788 | -$3,615,076 |
| Manhole Rehab/Replacement Phase I & North Shore Siphon Chamber | $2,834,000 | $441,822 | $2,392,178 |
| Pump Station Wet Well Rehabilitation Phase I | $2,890,000 | $317,920 | $2,572,080 |
| Locality System Monitoring and Condition Assessment | $21,219,146 | $20,520,570 | $698,576 |
| Subtotal - In progress | $131,191,858 | $129,144,100 | $2,047,758 |
| **Completed Work** | | | |
| Regional Consent Order and Other Consent Order Requirements | | (Included in subtotal above) | |
| Master Metering Program III | | $2,005,140 | |
| Master Metering Program IV | | $13,628,635 | |
| Total | | $144,777,875 | |

TO: General Manager

FROM: Director of Talent Management

SUBJECT: Monthly Report for December 2016

DATE: January 6, 2017

## A. Human Resources

### 1. Recruitment

#### a. Summary

| | |
|---|---|
| New Recruitment Campaigns | 6 |
| Job Offers Accepted | |
| Internal Selections | 4 |
| External Selections | 2 |
| Internal Applications | 15 |
| External Applications | 138 |
| Average Days to Fill Position | 56 |

### 2. Enterprise Resource Planning (ERP)

a. HRSD participated in several conference calls with the managed services vendor to address benefit module issues and reconfiguration.

b. A meeting was held with Safety staff to discuss the ERP Learning Management module class setup and enrollment for 2017 safety training.

c. Service requests related to OSHA reporting, self-service functionality, and benefits setup were addresses with Oracle.

d. Staff worked with Information Technology (IT) on report requests for Human Resources related data.

### 3. Benefits and Compensation

a. The Retiree Supplemental Health Plan open enrollment was completed.

b. Planning began to implement changes based on the Employee Benefits Internal Audit Report recommendations. An action plan was developed to track changes, timelines and progress.

c. The Wellness Program structure in relation to the Employee Health Plan benefits was reviewed to ensure compliance with Equal Employment Opportunity Commission (EEOC) guidance.

d. Meetings were held with Accounting, Human Resources and Information Technology staff to address 2016 Internal Revenue Service Affordable Care Act reporting requirements.

e. Several jobs were evaluated for potential Compensation and Classification review based on department requests and compensation study outcomes.

4. Wellness

a. Participation Activities

| Year 3 Participation Activities | Unit | December 2016 | Year to Date (March 2016–February 2017) |
|---|---|---|---|
| Biometric Screenings | Number | 4 | 30 |
| Preventive Health Exams | Number | 15 | 100 |
| Preventive Health Assessments | Number | 34 | 443 |
| Coaching Calls | Number | 0 | 4 |
| On-Line Health Improvement Programs | Number | 126 | 1630 |
| Web-MD Online Health Tracking | Number | 210 | 1717 |
| Challenges Completed | Number | 0 | 1 |
| Fit-Bit Promotion | Number | 8 | 87 |

b. Healthy breakfast demonstrations were held at six Operations work centers.

c. A Team Push-Up Challenge Award ceremony was held and a trophy presented to the Virginia Initiative Plant (VIP) team.

d. Weekly newsletters were sent to participants during the Maintain Don’t Gain Holiday Challenge.

5. Workers Compensation

   a. Five new cases were opened with 10 cases remaining active.

   b. Issues with the insurance carrier continue to be addressed and improvements implemented.

6. Employee Relations

   a. Staff continued to partner and meet with work center supervisors to provide guidance. Policies related to retiree health plan eligibility, professional development and military leave were updated. Specialists assisted Operations with updating job descriptions.

   b. EEO Refresher Training was completed for all Operations work centers. The training, which incorporated updates to guidance and regulations plus interactive activities and updated videos, received overall positive feedback.

7. General

   a. The Web Center Team met to establish scanning processes for Safety and Human Resources files.

   b. Staff attended the following training:

      (1) Optima Employee Assistance Program Emotional Intelligence training
      (2) Emtec Business Intelligence Report training
      (3) HRSD EEO training
      (4) Storyline Articulate software webcasts

   c. Staff participated in the following:

      (1) Water Environment Federation Utility Management Committee's Human Resources and Operations Workgroup
      (2) HRSD Toastmaster's 10th Anniversary Celebration
      (3) HRSD Asset Management Gap Analysis Workshop
      (4) HRSD Apprenticeship Committee

B. Organization Development and Training

1. Training – The following was performed in relation to the HRSD University team:

   a. Team members met with Human Resources staff to present e-learning software functionality and to begin discussing development of a pilot to deliver online employee benefit information for open enrollment and employee onboarding.
   b. Planning began for development of the pilot training video on Biological Nutrient Removal. A web portal was established by IT to facilitate capture and transcription of the information for the instructional designer.

2. The Training Catalog was completed and communication materials were developed to provide additional information and to facilitate enrolment.

3. Apprenticeship Program improvements continued including preparing apprentices for new Department of Professional and Occupational Regulation testing requirements. Second quarter administrative items were completed and preparations began for the third quarter.

4. Work Center Planning Day documentation was reviewed and parking board items are being compiled for Quality Steering Team review.

C. Safety

1. Mishaps and Work Related Injuries

   a. HRSD-Wide Injury Mishap Status to Date (OSHA Recordable)

| | **2015** | **2016** |
|---|---|---|
| **Mishaps** | 49 | 42 |
| **Lost Time Mishaps** | 11 | 8 |
| *Numbers subject to change pending HR review of each case.* | | |

b. MOM Program Year Performance Measure Work Related Injuries

| December 2016 Injuries For Operations | December 2016 Injuries for Other HRSD Departments | Total Lost Time Injuries Since July 2016 | Total HRSD Injuries Since July 2016 |
|---|---|---|---|
| 4 | 0 | 4 | 21 |

c. Follow-up investigations were performed on five work related injuries and four auto accidents.

2. HRSD Safety Training

| Strategic Planning Measure | Unit | December 2016 |
|---|---|---|
| Total Safety Training Hours per Full Time Employee (814) All HRSD – December 2016 | 297Hours / 814 FTE | 0.36 |
| Total Safety Training Hours Per Full Time Employee (814) – Cumulative July 2016 | 1809.18 Hours / 814 FTE | 2.22 |

3. In addition to regularly scheduled safety training and medical monitoring, the following sessions were conducted:

a. One external briefing for contractors working at HRSD treatment plants and pump stations

b. Aerial Lift Certification training for North Shore Interceptors and Electrical/Instrumentation employees, including on-site training at the Coliseum pump station

c. Two Chemical Hygiene Plan training sessions for Water Quality employees

4. Safety Inspections, Testing and Monitoring

   a. Weekly on-site inspections of the following construction sites:

      (1) Virginia Initiative Plant
      (2) York River Treatment Plant
      (3) James River Treatment Plant
      (4) Central Environmental Lab (CEL)

   b. Quarterly safety inspections of the following work centers:

      (1) South Shore Machine, Carpentry, Automotive and Electrical Shops
      (2) Atlantic Treatment Plant
      (3) Chesapeake-Elizabeth Treatment Plant
      (4) James River Treatment Plant
      (5 Williamsburg Treatment Plant
      (6) CEL
      (7) Technical Services
      (8) South Shore P3
      (9) Small Communities treatment plants and pump stations

   c. Monitoring and testing for the following:

      (1) Radioactivity screening of incinerator ash
      (2) Monthly hood velocity tests on CEL and Technical Services lab hoods

5. Safety Programs

   a. Evaluation of potential options for a prescription safety eyewear program began in response to parking board items identified at work center planning days. An employee survey was initiated to evaluate employee interest.

   b. The Safety Standard Operating Procedures were updated to incorporate new and updated programs.

   c. Hot Work permits were completed for a contactor working at the CEL.

   d. The Electrical Safety Program was updated and submitted to Electrical Managers for final review.

e. Annual audiometric testing continued for employees that were unable to attend work center testing.

f. The following was performed for the confined space program:

(1) Updated confined space permits for South Shore Operations
(2) Evaluated a confined space entry into an Atlantic Treatment Plant scum well

g. Army Base Treatment Plant Methanol Delivery procedures were developed and incorporated into response procedures.

h. Staff met with Boat Harbor, Nansemond and York River Treatment Plant Superintendents to update chemical inventories and emergency response procedures.

i. Respiratory Protection Program training was scheduled for Operations work centers.

j. The 2017 Medical Monitoring, Training and Inspection Calendar was finalized, distributed and posted on SharePoint. Safety Training courses are being entered into the ERP Leaning Management module.

k. Updates to Main Office Emergency Response Procedures were initiated.

6. General

a. Safety Manager attended the Former Nansemond Ordinance Depot Restoration Advisory Board meeting. Issues related to post storm inspections by the Army Corp of Engineers were addressed.

b. Staff participated in the SharePoint Governance Team Quarterly Meeting

c. The Safety Coordinator continued to maintain Operation's Safety Accident Tracking report.

D. Monthly Strategic Planning Metrics Summary

1. Education and Outreach Events: (0)

2. Community Partners: (0)

| Item # | Strategic Planning Measure | Unit | December 2016 |
|---|---|---|---|
| M-1.1a | Employee Turnover Rate (Total) | Percentage | 0.77% |
| M-1.1b | Employee Turnover due to Service Retirements | Percentage | 0.26% |
| M-1.4a | Total Training Hours Per Full Time Employee (15) – Current Month | Total Training Hours/ FTE | 2.4 |
| M-1.4b | Total Training Hours Per FTE (15) Cumulative Fiscal Year-to-Date | Total Training Hours/ FTE | 30.6 |
| M-5.2 | Educational and Outreach Events | Number | 0 |
| M-5.3 | Community Partners | Number | 0 |

Respectfully submitted,
***Paula A. Hogg***
Director of Talent Management

TO: General Manager

FROM: Director of Water Quality (WQ)

SUBJECT: Monthly Report for December 2016

DATE: January 10, 2017

A. General

1. There was one Civil Penalty assessed this month.

**BFI Waste Systems of Virginia LLC – Little Plymouth**

An Enforcement Order was issued to BFI Waste Systems of Virginia (King & Queen Landfill) in November 2016 for violations that occurred in June, July, August, September and October. The Order contained an invoice totaling $15,100 in Civil Penalties resulting from exceedances of permit limits for Methyl Ethyl Ketone (MEK) and Arsenic, improper analytical technique for Biochemical Oxygen Demand (BOD) samples, failure to report a violation and late submittal of monthly reports. The permit limit exceedances resulted in the facility being unable to successfully complete their initial 15-day Baseline Monitoring Report (BMR) sampling requirements. As a result, BFI Waste Systems of Virginia LLC ceased discharge to HRSD as of September 8, 2016 while they further investigated the sources of MEK and Arsenic. The landfill leachate is currently being contained and hauled out of the service area for disposal. The Enforcement Orders were accepted and the Civil Penalty was paid in December, 2016.

2. The Director represented HRSD during the latest meeting of the Virginia Department of Environmental Quality (DEQ) James River Chlorophyll Criteria Regulatory Advisory Panel (RAP). DEQ is asking the RAP for feedback regarding its proposal for new water quality chlorophyll-based criteria to be implemented on the saltwater part of the James River. Chlorophyll-based criteria are being updated to address impacts on aquatic life due to nutrient-related effects. HRSD has seven treatment facilities on this part of the James River and new chlorophyll-based criteria, adopted as regulation, could result in regulatory requirements for removal of phosphorous and nitrogen for these facilities in addition to that already planned for 2017 and beyond. DEQ committed to conducting additional model runs to determine the potential for impact on regulatory requirements for dischargers if the latest draft criteria are adopted. These model runs will be conducted over the next few months and provided to the RAP for consideration prior to completing the RAP process and DEQ finalizing the criteria.

3. The Chief of Central Environmental Laboratory, Stacie Metzler, accepted an appointment by the Water Environment Federation (WEF) president to the Association of Boards of Certification (ABC) Board of Directors to represent WEF in developing a partnership for Professional Operator Certification and other training initiatives in support of water professionals on a national scale.

B. Quality Improvement and Strategic Activities

1. The Sustainability Advocacy Group (SAG) reported that HRSD's second "One Thing" Challenge closed at the end of October and received five projects.

   a. Bob Jones from the James River Treatment Plant submitted book ends that were made from scrap structural steel beam and worn out gears from a Moyno Pump and a Bar Screen Drive along with new clear coat paint.
   b. Rosemary Benesh, Coleen Cataulin, Jacquie Harrison, Roger Nichols and Amy Seron from the Information Technology Department (ITD) submitted a light made from used CD's, DVD's, highlighter markers and a phone charger.
   c. Rosemary Benesh, Coleen Cataulin, Jacquie Harrison, Roger Nichols and Amy Seron from ITD submitted a new LED Stick light.
   d. Christeena Kelley, James Sabo, James Hayes and Angela Kilgore from North Shore Pretreatment and Pollution Prevention (P3) submitted a Rain Barrel made from a used plastic barrel, pallet and spigot, along with purchased zip ties, caulking and screws.
   e. Lisa Bolen, Lindsey Bidder, Veronica Gantley, Tiffanie Garner and Kyle Strickland from South Shore P3 submitted a wash cart and a planter made from used pallets, paint, plastic bags, absorbent mats, brackets, latches, sampler bases, bench top, dirt, hinges, screws and new casters and plants.

   The items are still being reviewed and judged with final award decisions to be announced in January, 2017.

   The team also reports that the Flavia Freshpack Recycling initiative was rolled out in October to all work centers and is looking for new exciting initiatives that can help reduce everyone's environmental footprint. The SAG proposed new annual sustainability metrics to the HRSD Quality Steering Team (QST) in October. The SAG will now begin calculating the carbon footprint of each work center in order to make this metric more actionable.

2. The Pretreatment Information Management System (PIMS) Team reported that HRSD has received approval from DEQ to incorporate procedures that comply with the Cross-Media Electronic Reporting Rule (CROMERR) into the

Pretreatment Program. The new internet based Publicly Owned Treatment Works Administration and Compliance System (iPACS) and the soon to be implemented GovOnline application allows permitted industries to securely submit reports and documents to P3 electronically.

3. The Technical Services Division (TSD) Technology Team and HRSD's ITD have completed an evaluation of a digital transformation forms program. The team is in the process of reaching out to other departments to see if this technology will be a benefit to others. A presentation will be made at the February Operations Department QST meeting to see if this group could benefit from the technology.

4. The WQ Communication Team continues to monitor and measure inter-divisional communication issues within the WQ Department. Quarterly reports will be distributed to the WQ Quality Steering Team (QST).

C. Municipal Assistance

1. HRSD provided sampling and analytical services to Hanover County and the City of Franklin to support their Virginia Pollution Discharge Elimination System (VPDES) permit application process.

2. The Municipal Assistance Billed Reimbursements per service between October 1 and December 31, 2016 are attached.

3. The Municipal Assistance Invoice Summary for the fourth quarter of the 2016 calendar year is attached.

D. Strategic Planning Metrics Summary

1. Educational and Outreach Events: 1

   a. Staff conducted a laboratory tour for Deep Creek High School's Science and Medicine Academy.

2. Community Partners: 8

   a. P3 staff participated in an askHRgreen.org (Fats, Oils, Grease) FOG Committee meeting.
   b. P3 staff participated in the work of the HRSD United Way committee.
   c. TSD and the Laboratory Division assisted the City of Newport News with a microbial source tracking project at Hilton Beach.
   d. TSD and the Laboratory Division assisted the City of Virginia Beach in its bacteria study in Mill Dam Creek watershed.

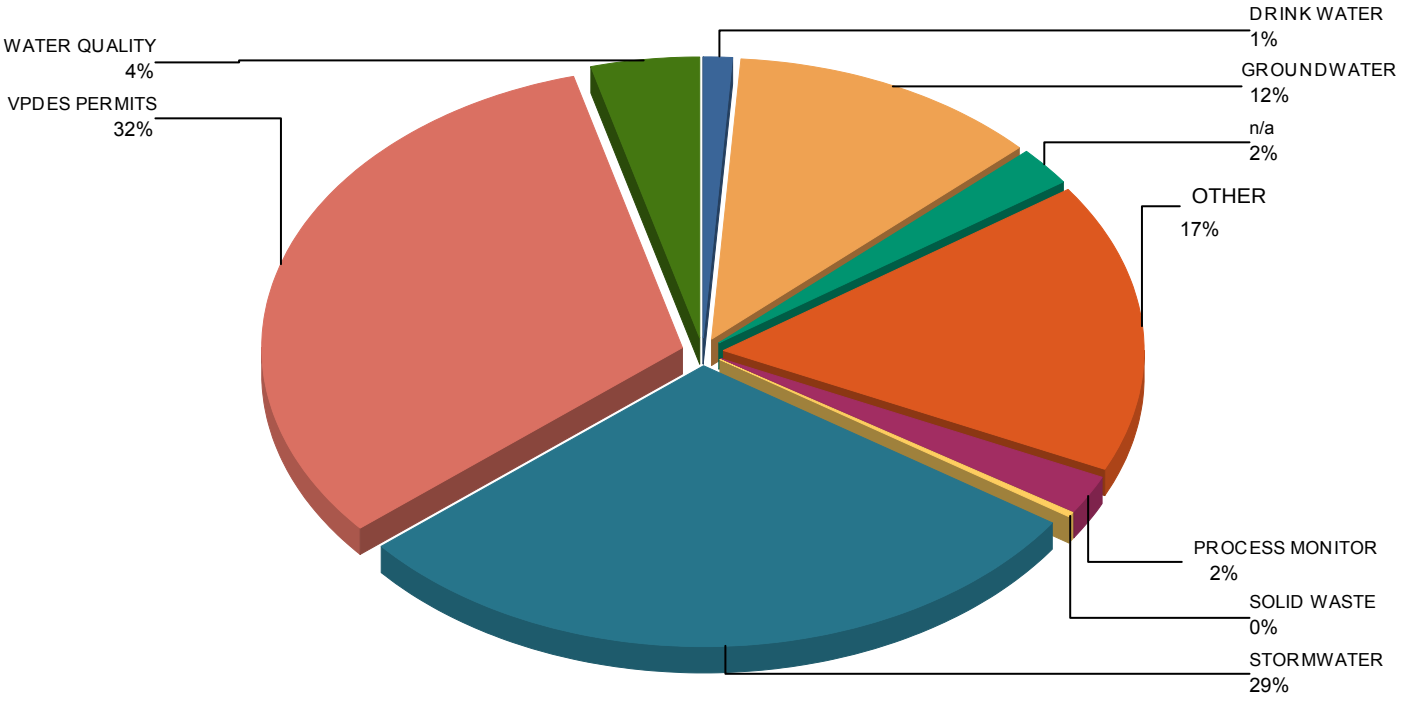
e. TSD and the Laboratory Division assisted the City of Suffolk with a fecal source identification project in Shingle Creek.
f. TSD and the Laboratory Division provided Chlorophyll Monitoring and Assessment Program support to the Virginia Department of Environmental Quality in monitoring the James River.
g. TSD and the Laboratory Division assisted the City of Chesapeake and the Elizabeth River Project with bacterial monitoring and fecal source identification in the Indian River.
h. TSD and the Laboratory Division assisted the City of Norfolk with a microbial source tracking project at Knitting Mill Creek.

| Item # | Strategic Planning Measure | Unit | December 2016 |
|---|---|---|---|
| M-1.4a | Training During Work Hours Per Full Time Employee (105) (Current Month) | Total Hours / # FTE | 4.20 |
| M-1.4b | Total Training During Work Hours Per Full Time Employee (105) (Cumulative Fiscal Year-to-Date) | Total Hours / # FTE | 32.44 |
| M-2.5 | North Shore/South Shore Capacity Related Overflows | # within Level of Service | 0 |
| M-3.1 | Permit Compliance | # of Exceedances: # of Permitted Parameters | 4:26,246 |
| M-3.2 | Odor Complaints | # | 0 |
| M-3.4 | Pollutant Removal | Total Pounds Removed | 96,483,209 |
| M-3.5 | Pollutant Discharge | % Pounds Discharged/Pounds Permitted | 22% |
| M-5.2 | Educational and Outreach Events | # | 1 |
| M-5.3 | Community Partners | # | 8 |
| | Average Daily Flow | Total MGD for all Treatment Plants | 135.69 |
| | Industrial Waste Related System Issues | # | 0 |

Respectfully submitted,
*James Plett, PhD*
Director of Water Quality

# Municipal Assistance Billed Reimbursements per Service
# From 10/01/2016 to 12/31/2016

## Attachment 1




Notes: Other = Equipment purchase, consultation, validation studies, boater pump-out program, etc.

## Municipal Assistance Invoice Summary
## From 10/01/2016 - 12/31/2016

| Municipality | Reimbursments |
|---|---|
| Accomack County | $10,476.55 |
| Bedford County PSA | $2,232.88 |
| Buckingham County | $1,015.52 |
| City of Chesapeake | $4,078.97 |
| City of Emporia | $215.60 |
| City of Lynchburg | $416.13 |
| City of Newport News | $457.74 |
| City of Norfolk | $9,381.25 |
| City of Portsmouth | $3,518.96 |
| City of Suffolk | $8,202.06 |
| City of Virginia Beach | $14,394.46 |
| Dept of Corrections | $822.22 |
| HRPDC | $76,155.81 |
| Hanover County | $29,015.70 |
| Hopewell RWTF | $3,866.32 |
| James City County Service Authority | $1,074.00 |
| Metro Wastewater Reclaimation District | $233.94 |
| New Kent County | $8,274.31 |
| Northampton County | $20,972.03 |
| Prince William County | $5,735.75 |
| Stafford County | $6,470.31 |
| Town of Blackstone | $5,541.49 |
| Town of Cape Charles | $7,837.37 |
| Town of Lawrenceville | $9,315.24 |
| Town of South Hill | $8,979.27 |
| Virginia Department of Health | $21,254.31 |
| Virginia Port Authority | $537.36 |
| Warsaw WWTP | $533.94 |
| Westmoreland County | $956.04 |
| **Total Reimbursements 4th Quarter** | **$261,965.53** |

**Hampton Roads Sanitation District**
**Internal Audit Status**
**December 31, 2016**

## Engagement Background

Our team is continuing to progress with the planned internal audit assignments. During the month of December, we presented the draft 2016 HRSD Risk Assessment and suggested audit plans to the Director of Finance. Additionally, we continued fieldwork procedures for the Inventory Process Review. These procedures included the review and testing of documentation provided by HRSD.

Our audit process consists of three phases:

- Planning: Reviewing relevant background information, gaining an understanding of, and documenting the key areas to be reviewed
- Fieldwork: Testing and examining pertinent documents, reports, transactions, and information to confirm the strength of the processes and related controls
- Reporting: Discussing the conclusions of our audit work and ultimately issuing a written report with suggestions being provided (if identified)

## Project Accomplishment Summary

During the month of December, our team performed the following:

- Inventory Process Review:
  - Selected samples for testing and communicated document requests to HRSD personnel
  - Reviewed and tested documentation received
  - Began drafting the audit report

- Risk Assessment Refresh/Internal Audit Plan Development
  - Finalized the evaluation of risk and updated the risk assessment documentation
  - Presented the revised risk assessment documentation and projected audit plans to senior management

## Projected Tasks for January

During the month of January, our team will:

- Inventory Process Review:
  - Complete audit fieldwork testing steps
  - Draft the audit report and discuss findings with the process owners

- Risk Assessment Refresh/Internal Audit Plan Development
  - Present the risk assessment and audit plan results to the General Manager
  - Finalize the risk assessment documentation and the audit plans with any necessary changes

- Procurement Process Review:
  - Conduct kick-off meeting with process owners
  - Deliver initial documentation request list

## Engagement Notes/Delays

No delays in our audit process were incurred. The HRSD teams continue to be helpful and supportive of the internal audit function.

## Future Activity/Engagements

Following presentation to management, we will submit our FY2018 audit plan to the Commissioners for review and discussion and begin performing the internal audits.

**Annual Metrics**

| Item | Strategic Planning Measure | Unit | Target | FY-10 | FY-11 | FY-12 | FY-13 | FY-14 | FY-15 | FY-16 |
|---|---|---|---|---|---|---|---|---|---|---|
| M-1.1a | Employee Turnover Rate (Total) | Percentage | < 8% | 5.63% | 4.09% | 6.64% | 7.62% | 8.22% | 9.97% | 6.75% |
| M-1.1b | Employee Turnover Rate within Probationary Period | | 0% | | 2.22% | 8.16% | 14.58% | 9.68% | 0.66% | 0.13% |
| M-1.2 | Internal Employee Promotion Eligible | Percentage | 100% | | 59% | 80% | 69.57% | 71.43% | 64.00% | 69.00% |
| M-1.3 | Average Time to Fill a Position | Calendar Days | < 30 | | 70 | 60 | 52 | 43.76 | 51 | 56 |
| M-1.4 | Training Hours per Employee - cumulative fiscal year-to-date | Hours | > 40 | | 30.0 | 43.8 | 37.5 | 35.9 | 42.8 | 49.0 |
| M-1.5a | Safety OSHA 300 Incidence Rate Total Cases | # per 100 Employees | < 3.5 | 6.57 | 6.15 | 5.8 | 11.2 | 5.07 | 3.87 | 7 |
| M-1.5b | Safety OSHA 300 Incidence Rate Cases with Days Away | # per 100 Employees | < 1.1 | 0.74 | 1.13 | 1.33 | 0.96 | 1.4 | 0.82 | 1.9 |
| M-1.5c | Safety OSHA 300 Incidence Rate Cases with Restriction, etc. | # per 100 Employees | < 0.8 | 3.72 | 4.27 | 2.55 | 4.5 | 2 | 1.76 | 3.6 |
| M-2.1 | CIP Delivery - Budget | Percentage | | | 113% | 96% | 124% | 149% | 160% | 151% |
| M-2.2 | CIP Delivery - Schedule | Percentage | | | 169% | 169% | 161% | 150% | 190% | 172% |
| M-2.3a | Total Maintenance Hours | Total Available Mtc Labor Hours Monthly Avg | | | 16,495 | 22,347 | 27,615 | 30,863 | 35,431 | 34,168 |
| M-2.3b | Planned Maintenance | Percentage of Total Mtc Hours Monthly Avg | | | 20% | 27% | 70% | 73% | 48% | 41% |
| M-2.3c | Corrective Maintenance | Percentage of Total Mtc Hours Monthly Avg | | | 63% | 51% | 12% | 10% | 18% | 25% |
| M-2.3d | Projects | Percentage of Total Mtc Hours Monthly Avg | | | 18% | 22% | 20% | 18% | 32% | 34% |
| M-2.4 | Infrastructure Investment | Percentage of Total Cost of Infrastructure | 2% | | 8.18% | 6% | 6% | 4% | 7% | 7% |
| M-3.3 | Carbon Footprint | Tons per MG Annual Total | | | 1.61 | 1.57 | 1.47 | 1.46 | 1.44 | 1.45 |
| M-3.6 | Alternate Energy | Total KWH | | | 0 | 0 | 0 | 5,911,289 | 6,123,399 | 6,555,096 |
| M-4.1a | Energy Use: Treatment | kWh/MG Monthly Avg | | | 2,473 | 2,571 | 2,229 | 2,189 | 2,176 | 2205 |
| M-4.1b | Energy Use: Pump Stations | kWh/MG Monthly Avg | | | 197 | 173 | 152 | 159 | 168 | 163 |
| M-4.1c | Energy Use: Office Buildings | kWh/MG Monthly Avg | | | 84 | 77 | 102 | 96 | 104 | 97 |
| M-4.2 | R&D Budget | Percentage of Total Revenue | > 0.5% | | 1.0% | 1.4% | 1.0% | 1.3% | 1.0% | 0.8% |
| M-4.3 | Total Labor Cost/MGD | Personal Services + Fringe Benefits/365/5-Year Average Daily Flow | | $1,028 | $1,095 | $1,174 | $1,232 | $1,249 | $1,279 | $1,246 |
| M-4.4 | Affordability | 8 CCF Monthly Charge/ Median Household Income | < 0.5% | | 0.48% | 0.48% | 0.41% | 0.43% | 0.53% | 0.55% |
| M-4.5 | Total Operating Cost/MGD | Total Operating Expense/ 365/5-Year Average Daily Flow | | $2,741 | $2,970 | $3,262 | $3,316 | $3,305 | $3,526 | $3,434 |
| M-5.1 | Name Recognition | Percentage (Survey Result) | 100% | 67% | 71% | N/A | 62% | N/A | 60% | N/A |
| M-5.4 | Value of Research | Percentage - Total Value/HRSD Investment | | | 129% | 235% | 177% | 149% | 181% | 178% |
| M-5.5 | Number of Research Partners | Annual Total Number | | | 42 | 36 | 31 | 33 | 28 | 35 |
| | Rolling 5 Year Average Daily Flow | MGD | | 157.8 | 155.3 | 152 | 154.36 | 155.2 | 151.51 | 153.09 |
| | Rainfall | Annual Total Inches | | 66.9 | 44.21 | 56.21 | 46.65 | 46.52 | 51.95 | 54.14 |
| | Billed Flow | Annual Percentage of Total Treated | | 71.9% | 82.6% | 78% | 71% | 73% | 74% | 72% |
| | Senior Debt Coverage | Net Revenue/Senior Annual Debt Service | > 1.5 | 2.51% | 2.30% | 2.07% | 1.88% | 1.72% | 1.90% | 2.56% |
| | Total Debt Coverage | Net Revenue/Total Annual Debt | >1.4 | 1.67% | 1.67% | 1.46% | 1.45% | 1.32% | 1.46% | 1.77% |

**Monthly Updated Metrics**

| Item | Strategic Planning Measure | Unit | Target | FY-10 | FY-11 | FY-12 | FY-13 | FY-14 | FY-15 | FY-16 | Nov-16 | Dec-16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Average Daily Flow | MGD at the Plants | < 249 | | 136 | 146.5 | 158.7 | 156.3 | 153.5 | 155.8 | 134.5 | 135.7 |
| | Industrial Waste Related System Issues | Number | 0 | | 3 | 6 | 6 | 6 | 2 | 4 | 1 | 0 |
| | Wastewater Revenue | Percentage of budgeted | 100% | | 97% | 96% | 98% | 107% | 102% | 104% | 105% | 104% |
| | General Reserves | Percentage of Operating and Improvement Budget | 75% - 100% | | 72% | 82% | 84% | 92% | 94% | 95% | 102% | 104% |
| | Accounts Receivable (HRSD) | Dollars (Monthly Avg) | | | $ 17,013,784 | $ 17,359,488 | $ 18,795,475 | $ 20,524,316 | $ 20,758,439 | $ 22,444,273 | $22,901,687 | $24,049,872 |
| | Aging Accounts Receivable | Percentage of receivables greater than 90 days | | | 21% | 20% | 18% | 19% | 21% | 20% | 18% | 18% |
| M-2.5 | Capacity Related Overflows | Number within Level of Service | 0 | | 25 | 1 | 30 | 5 | 11 | 16 | 0 | 0 |
| M-3.1 | Permit Compliance | # of Exceedances to # of Permitted Parameters | 0 | | 12:55,045 | 1:51995 | 2:52491 | 1:52491 | 2:52491 | 2:52,491 | 3:21871 | 4:26246 |
| M-3.2 | Odor Complaints | Number | 0 | | 6 | 2 | 7 | 11 | 5 | 9 | 1 | 0 |
| M-3.4 | Pollutant Removal (total) | Total Pounds Removed | | | 178,163,629 | 171,247,526 | 176,102,248 | 185,677,185 | 180,168,546 | 193,247,790 | 80,708,479 | 96,483,209 |
| M-3.5 | Pollutant Discharge (% of permitted) | Pounds Discharged/Pounds Removed | < 40% | | 25% | 22% | 25% | 22% | 22% | 20% | 22% | 22% |
| M-5.2 | Educational and Outreach Events | Number | | | 302 | 184 | 238 | 322 | 334 | 443 | 67 | 0 |
| M-5.3 | Number of Community Partners | Number | | | 280 | 289 | 286 | 297 | 321 | 354 | 35 | 0 |

## EFFLUENT SUMMARY FOR DECEMBER 2016

| PLANT | FLOW mgd | % of Design | BOD mg/l | TSS mg/l | FC #/UBl | ENTERO #/UBl | TP mg/l | TP CY Avg | TN mg/l | TN CY Avg | TKN mg/l | NH3 mg/l | CONTACT TANK EX |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARMY BASE | 7.94 | 44% | 3 | 2.5 | 5 | 3 | 0.87 | 0.89 | 6.3 | 8.1 | NA | NA | 12 |
| ATLANTIC | 26.12 | 48% | 11 | 6.5 | 4 | 1 | NA | NA | NA | NA | NA | NA | 5 |
| BOAT HARBOR | 11.60 | 46% | 7 | 5.9 | 2 | 1 | 0.36 | 0.59 | 10 | 17 | NA | NA | 10 |
| CENT. MIDDLESEX | 0.011 | 43% | <2 | 1.4 | 7 | 15 | NA | NA | NA | NA | NA | NA | NA |
| CHES-ELIZ | 16.89 | 70% | 21 | 25 | 62 | 13 | 1.7 | 1.4 | 33 | 30 | NA | NA | 12 |
| JAMES RIVER | 10.36 | 52% | 5 | 3.7 | 2 | 1 | 0.89 | 0.76 | 8.7 | 7.4 | NA | NA | 0 |
| KING WILLIAM | 0.040 | 40% | <2 | 0.32 | NA | <1 | 0.056 | 0.52 | 0.71 | 0.70 | 0.21 | NA | NA |
| NANSEMOND | 17.49 | 58% | 5 | 10 | 2 | 5 | 1.6 | 1.3 | 10 | 7.3 | NA | NA | 13 |
| URBANNA | 0.038 | 38% | 13 | 20 | 17 | 20 | 3.5 | 4.5 | 32 | 22 | NA | <0.20 | NA |
| VIP | 26.09 | 65% | 8 | 9.4 | 4 | 2 | 1.2 | 0.96 | 9.4 | 8.4 | NA | NA | 12 |
| WEST POINT | 0.297 | 50% | 25 | 16 | 1 | 4 | 3.8 | 2.8 | 22 | 15 | NA | 14 | 0 |
| WILLIAMSBURG | 7.71 | 34% | 3 | 3.0 | 4 | 3 | 0.51 | 0.68 | 5.6 | 6.2 | NA | NA | 2 |
| YORK RIVER | 11.10 | 74% | 2 | 1.4 | <1 | <1 | 0.16 | 0.28 | 3.5 | 4.4 | NA | NA | 15 |
| | 135.69 | | 9 | 8 | | | | | | | | | |

| | % of Capacity |
|---|---|
| North Shore | 49% |
| South Shore | 57% |
| Mid Peninsula | 45% |

**Tributary Summary**

| | Annual Total Nitrogen | | | Annual Total Phosphorus | | |
|---|---|---|---|---|---|---|
| | Discharged YTD | Operational Projection CY16 | | Discharged YTD | Operational Projection CY16 | |
| **Tributaries** | % | Lbs | % | % | Lbs | % |
| James River | 74% | 4,491,499 | 75% | 95% | 350,550 | 94% |
| York River | 70% | 195,919 | 68% | 77% | 14,656 | 76% |
| Rappahannock | 243% | NA | NA | 716% | NA | NA |

Permit Exceedances:Total Possible Exceedances, FY17 to Date: 4:26,246
Pounds of Pollutants Removed in FY17 to Date: 96,483,209
Pollutant Lbs Discharged/Permitted Discharge FY17 to Date: 22%

**Rainfall**

| | North Shore (PHF) | South Shore (ORF) | Small Communities (FYJ) |
|---|---|---|---|
| Month | 2.54" | 2.54" | 2.84" |
| Normal for Month | 3.78" | 3.54" | 3.76" |
| Year to Date Total | 51.06" | 68.86" | 51.07" |
| Normal for YTD | 51.03" | 49.96" | 47.82" |

# 2016 EFFLUENT SUMMARY

| PLANT | FLOW MGD | BOD MG/L | TSS MG/L | FC #/100 ML | ENTERO #/100 ML | TP MG/L | TN MG/L | CONTACT TANK EX | NH3 MG/L |
|---|---|---|---|---|---|---|---|---|---|
| ARMY BASE | 10.09 | 4 | 5.1 | 8 | 2 | 0.89 | 8.1 | 9 | NA |
| ATLANTIC | 28.31 | 11 | 7.6 | 6 | 1 | NA | NA | NA | NA |
| BOAT HARBOR | 15.68 | 7 | 7.0 | 6 | 2 | 0.59 | 17 | 6 | NA |
| C. MIDDLESEX | 0.014 | 0 | 0.51 | 3 | 3 | NA | NA | NA | 0.0 |
| CHES-ELIZ | 19.14 | 18 | 19 | 41 | 7 | 1.4 | 30 | 10 | NA |
| JAMES RIVER | 13.59 | 3 | 3.5 | 2 | 2 | 0.76 | 7.4 | 2 | NA |
| KING WILLIAM | 0.04 | 0 | 0.12 | NA | 1 | 0.52 | 0.70 | NA | NA |
| NANSEMOND | 19.40 | 4 | 5.7 | 3 | 2 | 1.3 | 7.3 | 13 | NA |
| URBANNA | 0.048 | 6 | 13 | 5 | 5 | 4.5 | 22 | NA | 2.3 |
| VA INITIATIVE | 33.48 | 6 | 6.7 | 6 | 2 | 0.96 | 8.4 | 5 | NA |
| WEST POINT | 0.471 | 19 | 19 | 3 | 6 | 2.8 | 15 | 0 | 8.2 |
| WILLIAMSBURG | 8.31 | 3 | 3.8 | 7 | 5 | 0.68 | 6.2 | 2 | NA |
| YORK RIVER | 12.80 | 4 | 1.5 | 1 | 1 | 0.28 | 4.4 | 12 | NA |
| | 12.41 | 7 | 7 | | | 1.3 | | | |

Permit Exceedences:

January 2016: Army Base pH  less than 6.0

May 2016: West Point TSS monthly loading (remnants of Tropical Storm Bonnie)

August 2016: Central Middlesex Dissolved Oxygen

October 2016: Ches-Eliz TSS and BOD weekly loading (Hurricane Matthew)

December 2016:  King William total phosphorous calendar year limit

## AIR EMISSIONS SUMMARY FOR DECEMBER 2016

| | No. of Permit Deviations below 129 SSI Rule Minimum Operating Parameters | | | | | | | | | Part 503e Limits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MHI PLANT | BZ Temp 12 hr ave (F) | Venturi(s) PD 12 hr ave (in. WC) | Tray PD 12 hr ave (in. WC) | Precooler Flow 12 hr ave (GPM) | Spray Flow 12 hr ave (GPM) | Venturi Flow 12 hr ave (GPM) | Tray/PBs Flow 12 hr ave (GPM) | Scrubber pH 3 hr ave | Any Bypass Stack Use | THC Mo. Ave (PPM) | THC DC (%) | BZ Temp Daily Ave Days >Max |
| ARMY BASE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 42 | 90 | 0 |
| BOAT HARBOR | 0 | 0 | 37 | 0 | n/a | 0 | 0 | 0 | 1 | 37 | 100 | 0 |
| CHES-ELIZ | 0 | 0 | 2 | n/a | 0 | 0 | 0 | 0 | 0 | 30 | 98 | 0 |
| VIP | 0 | 0 | 0 | 0 | n/a | 0 | 0 | 0 | 0 | 70 | 100 | 0 |
| WILLIAMSBURG | 0 | 0 | 0 | 0 | n/a | 0 | 0 | 0 | 2 | 10 | 100 | 0 |

ALL OPERATIONS

| | |
|---|---|
| DEQ Reportable Air Incidents: | 1 |
| DEQ Request for Corrective Action (RCA): | 0 |
| DEQ Notice of Violation (NOV): | 0 |
| Other Air Permit Deviations: | 0 |
| Odor Complaints Received: | 0 |
| Odor Scrubber HRSD Exceptions: | 2 |

No. of Permit Deviations/Possible No. of Permit Deviations (12/16) = 43/3317
No. Permit Deviations/No. Possible Permit Deviations (CY16 to date)* = 299/30,941

Total Time on Bypass/Total Time Operating (12/16) = 2 hrs/3284 hrs
Total Time on Bypass/Total Time Operating (CY16 to date)* = 29 hrs/31,272 hrs

Dry Tons Solids Processed (12/16) = 2008
Total Dry Tons Solids Processed (CY16 to date)* = 22,466
Monthly average Dry Ton per Day (DTD) per MHI unit = 13.7

** CY16 commences with 03/21/16 compliance requirements*

## AIR EMISSIONS SUMMARY FOR CY 2016*

| | No. of Permit Deviations below 129 SSI Rule Minimum Operating Parameters | | | | | | | | | Part 503e Limits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MHI PLANT | BZ Temp 12 hr ave (F) | Venturi(s) PD 12 hr ave (in. WC) | Tray PD 12 hr ave (in. WC) | Precooler Flow 12 hr ave (GPM) | Spray Flow 12 hr ave (GPM) | Venturi Flow 12 hr ave (GPM) | Tray/PBs Flow 12 hr ave (GPM) | Scrubber pH 3 hr ave | Any Bypass Stack Use | THC Mo. Ave (PPM) | THC DC (%) | BZ Temp Daily Ave Days >Max |
| ARMY BASE | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 6 | 29 | 37 | 98 | 0 |
| BOAT HARBOR | 2 | 25 | 55 | 0 | n/a | 1 | 3 | 1 | 12 | 37 | 98 | 2 |
| CHES-ELIZ | 4 | 9 | 7 | n/a | 0 | 1 | 0 | 45 | 13 | 30 | 99 | 0 |
| VIP | 1 | 0 | 3 | 0 | n/a | 0 | 0 | 3 | 22 | 61 | 99 | 0 |
| WILLIAMSBURG | 0 | 0 | 0 | 0 | n/a | 0 | 0 | 0 | 19 | 14 | 99 | 0 |

ALL OPERATIONS

| | |
|---|---|
| DEQ Reportable Air Incidents: | 7 |
| DEQ Request for Corrective Action (RCA): | 1 |
| DEQ Notice of Violation (NOV): | 2 |
| Other Air Permit Deviations: | 0 |
| Odor Complaints Received: | 4 |
| Odor Scrubber HRSD Exceptions: | 24 |

No. of Permit Deviations/Possible No. of Permit Deviations (12/16) = 43/3317
No. Permit Deviations/No. Possible Permit Deviations (CY16 to date)* = 299/30,941

Total Time on Bypass/Total Time Operating (12/16) = 2 hrs/3284 hrs
Total Time on Bypass/Total Time Operating (CY16 to date)* = 29 hrs/31,272 hrs

Dry Tons Solids Processed (12/16) = 2008
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** CY16 commences with 03/21/16 compliance requirements*