# Narragansett Bay Commission LIMS

## A

## Progressive Data Exchange

**Traceability**

**Integrity**

Presented by Kathy Smith

# BRIEF HISTORY

**Paper Logs**

**Paper Submission Sheets**

**Manual  Result Entry**

**Process Daily Reports somewhat manual**

**DMR Reports time consuming**

# What was the Problem?

- Data Integrity
- Traceability
- Reduce Human Error
- Efficient Use of Time
- Data Defensibility

# THE JOURNEY – A TEAM EFFORT

## IDENTIFY AREAS TO IMPROVE

**Transcription Errors**

**Calculation errors**

**Omission of data/information**

**Lost or compromised paper**

**Data transcription, double and triple transcription of information that already exists – increasing errors**

**Lack of real-time feedback, delays in decisions/actions**

# DEFINING THE GOALS

- ✓ **Automated Sample Tracking -**
  Starting at the sampling site with audittrails

- ✓ **Implementation of Mobile Devices –**
  Collectors using devices reducing transcription errors and repetition

- ✓ **Instrument Integration**
  Eliminating transcription errors and manual calculations

- ✓ **Automated Certificate of Analysis –**
  **Using electronic signature and notifications**

- ✓ **Embedded SOP Links –**
  **Giving the ability to click on the link a view the SOP as needed**

- ✓ **Wireless Scanners –**
  **Track the movement of samples in the lab and EMDA – Building a strong COC**

- ✓ **Integration with SharePoint –**

  Store worksheets, raw data, pdf's for auditing, integrity and defensibility

- ✓ **Electronic Laboratory Notebook (ELN)**

  Automation of paper logs; i.e. peer logs, temperature logs, reagent, submission sheets

- ✓ **Touch screen receipting –**

  A user friendly application scanning badges and bottles to provide an easy method to receipt samples and see the status of all samples i.e. in-transit, waiting analysis etc.

- ✓ **Inventory Management**

- ✓ **Calibration Management –**

  **Instrument calibration and history**

- ✓ **Reporting Tool –**

  **To allow easy reporting, analysis of not only LIMS data, but SCADA/PI in a central repository**

- ✓ **Chain of Custody –**

  The ability to record a electronic trail denoting transfers, times and a people through the life of a sample starting at sampling site.

- ✓ **QA/QC –**

  Maintain levels of quality needed, expected and delivered efficiently

- ✓ **Traceability and Defensibility –**

  The ability to retrace the life of a sample to ensure it meets compliance requirements including audit trails, raw data, coc etc.

# A TOTAL INTEGRATED LABORATORY SYSTEM

## Audittrails

**DEFEND THE INTEGRITY OF THE DATA IN THE COURTS**

**TRACEABILITY**

# WHAT DID WE GET?

| | |
|---|---|
| ELN | Implemented Electronic Lab Notebooks and Worksheets in the Laboratory and In The Field |
| Manage | Sample Management, Validate Analyses/Samples with ESigs (LIMS) |
| CoC | Chain of Custody using wireless scanners in the laboratory. Field Chain of Custody using iPad's as a scanner sending the data to the database |
| Track | Inventory Management – Locate, track and manage materials |
| Integrate Data | Repository for multiple sources to prepare Regulatory & Internal Reports ie. PI Historian - LIMS |
| Calibration | Calibration Manager - Instrument |
| Interface | Instrument and System Integration – driving the data into database automatically eliminating errors |

HACH WIMS

# INTERFACES TO SCADA / LIMS

## Central Repository

## Generating Regulatory reports / Calculations

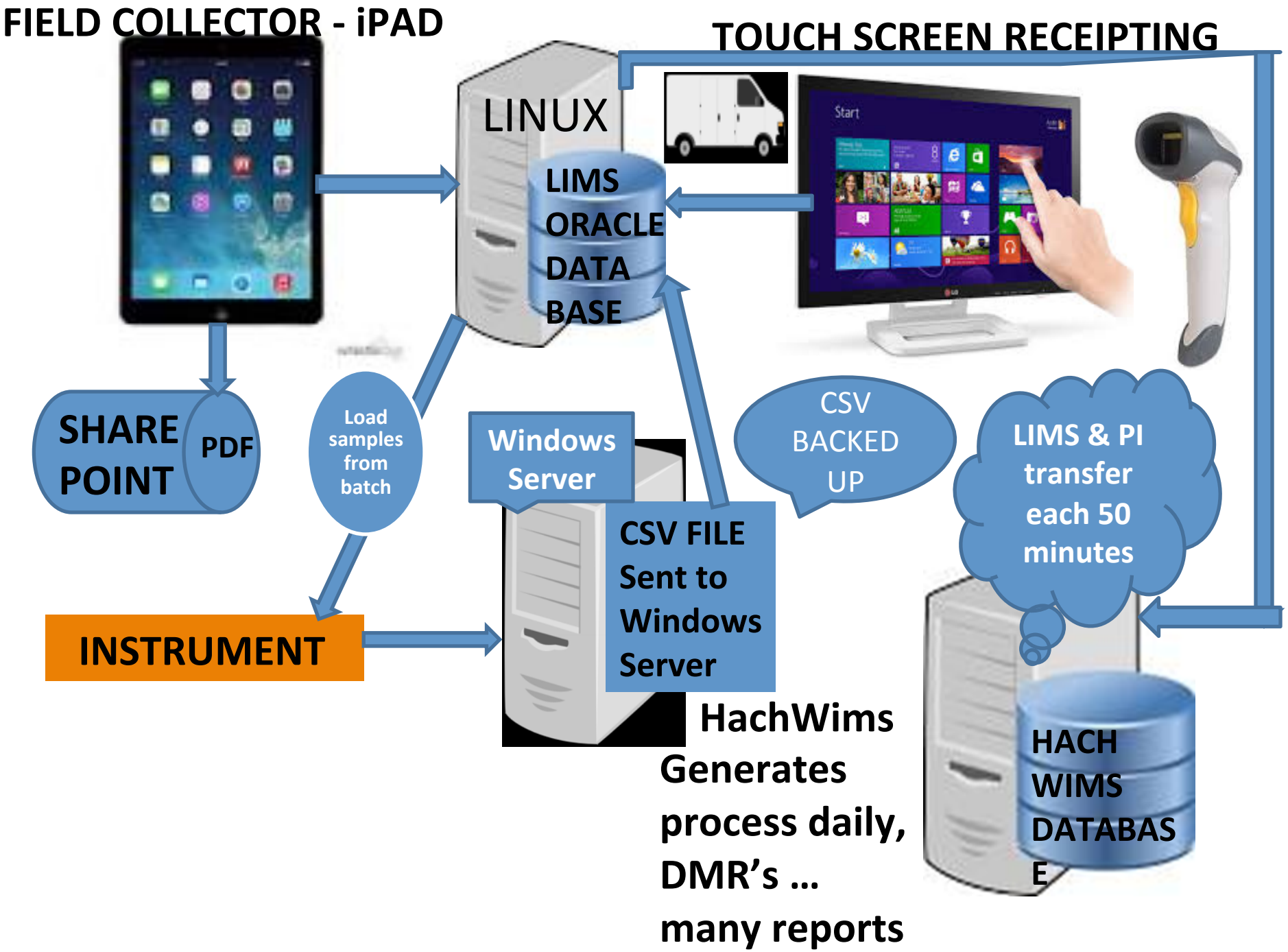
## Charts / Graphs

WIMSVARS.xls [Compatibility Mode] - Microsoft Excel

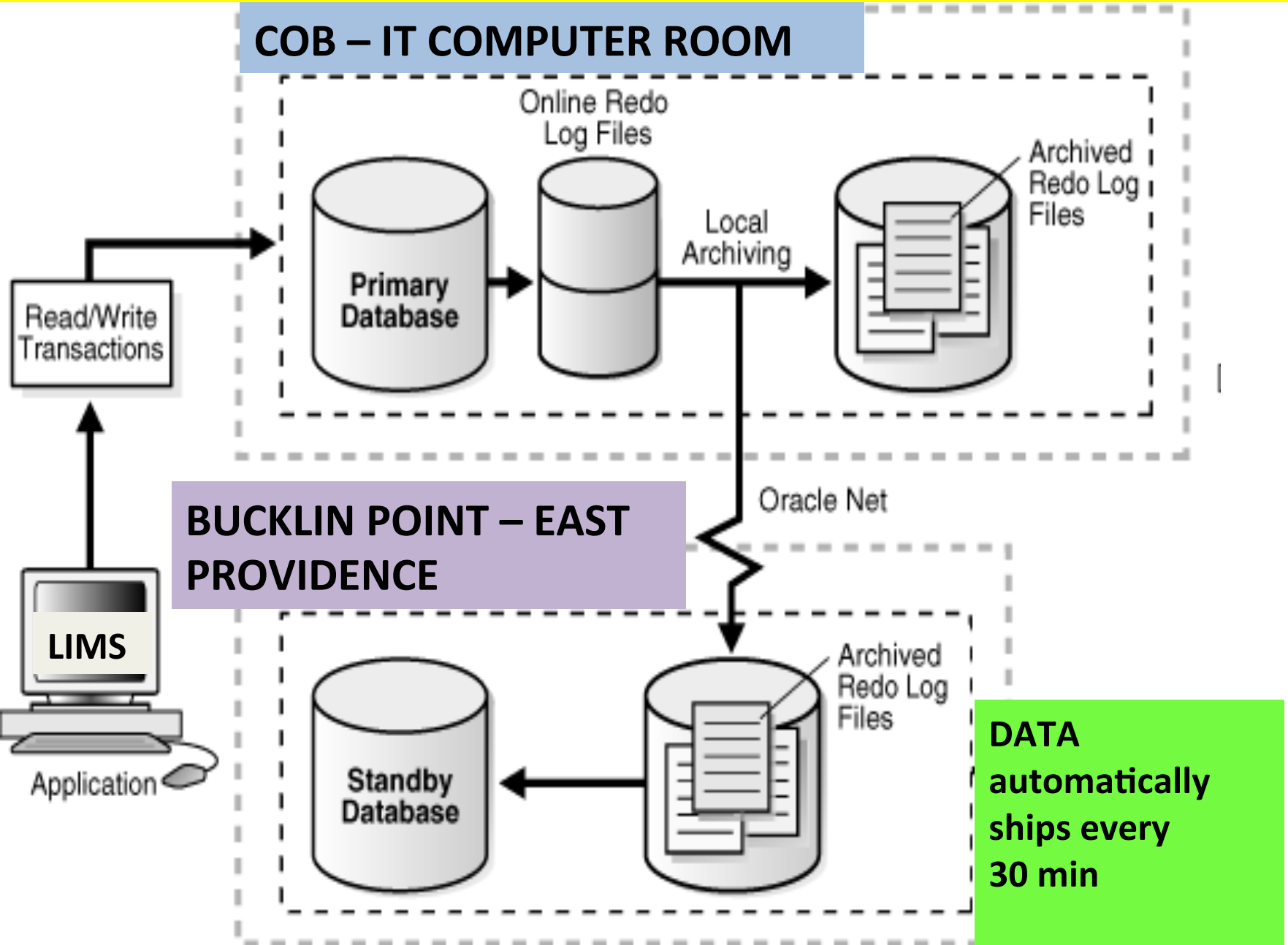
| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | Scada Interface Info | | | LIMS Interface | | | |
| Var # | Parameter Name | Short Name | Frequency | Type | Units | Dec Plcs | Allow Symbol | Equation | Entry Min | Entry Max | Description (Notes) | Storet Code | Signal Tag | Statistic | Scale Factor | LIMS LOC | LIMS TEST | UD1 | UD2 |
| 1 | Total Flow | | Day | Parameter | MGD | 2 | N | | 0 | 60 | from Day Tot | 50050 | | MAX | | | | | |
| 2 | Flow Min | | Day | Parameter | MGD | 2 | N | | 0 | 60 | | 50050 | | MIN | | | | | |
| 3 | Flow Min Time | | Day | Text Parameter | Time | 0 | N | | | | | | | MIN TIME | | | | | |
| 4 | Flow Max | | Day | Parameter | MGD | 2 | N | | 0 | 60 | | 50050 | | MAX | | | | | |
| 5 | Flow Max Time | | Day | Text Parameter | Time | 0 | N | | | | | | | MAX TIME | | | | | |
| 11 | BOD | | Day | Parameter | mg/L | 0 | Y | | | 500 | | 00310 | | | | | | | |
| 12 | BOD Load | | Day | Calculated | Lbs | 0 | N | V1 * V11 * 8.34 | | | | 00310 | | | | | | | |
| 21 | cBOD | | Day | Parameter | mg/L | 0 | Y | | | 500 | | 80082 | | | | | | | |
| 22 | cBOD Load | | Day | Calculated | Lbs | 0 | N | {Influent Flow in MGD} * V21 * 8.34 | | | | 80082 | | | | | | | |
| 31 | COD | | Day | Parameter | mg/L | 0 | N | | | 500 | | 00340 | | | | | | | |
| 32 | COD Load | | Day | Calculated | Lbs | 0 | N | V1 * V31 * 8.34 | | | | 00340 | | | | | | | |
| 41 | TSS | | Day | Parameter | mg/L | 0 | N | | | 500 | | 00530 | | | | | | | |
| 42 | TSS Load | | Day | Calculated | Lbs | 0 | N | V1 * V41 * 8.34 | | | | 00530 | | | | | | | |
| 51 | Oil & Grease | O & G | Day | Parameter | mg/L | 0 | N | | | | | 00550 | | | | | | | |
| 52 | Oil & Grease Load | | Day | Calculated | Lbs | 0 | N | {Influent Flow in MGD} * V51 * 8.34 | | | | 00550 | | | | | | | |
| 61 | Ammonia | Amm | Day | Parameter | mg/L | 1 | Y | | | | | 00610 | | | | | | | |
| 71 | Nitrite | NO2-N | Day | Parameter | mg/L | 2 | N | | | | | 00615 | | | | | | | |
| 81 | Nitrate | NO3-N | Day | Parameter | mg/L | 2 | N | | | | | 00620 | | | | | | | |
| 151 | Grit | | Hour | Parameter | Cu Yds | 0 | N | | 0 | 3 | | | | | | | | | |
| 161 | Screens | | Hour | Parameter | Cu Yds | 0 | N | | 0 | 3 | | | | | | | | | |
| 201 | Dewatering Operator | Op | 4 Hours | Text Parameter | Initials | 0 | N | | | | | | | | | | | | |
| 211 | Primary Operator | Op | 4 Hours | Text Parameter | Initials | 0 | N | | | | | | | | | | | | |
| 221 | Secondary Operator | Op | 4 Hours | Text Parameter | Initials | 0 | N | | | | | | | | | | | | |
| 231 | Shift Supervisor | Op | 4 Hours | Text Parameter | Initials | 0 | N | | | | | | | | | | | | |
| 301 | Pre Hypo Dose Rate | Pre Hypo Dose | Day | Parameter | GPH | 0 | N | | 0 | 50 | | | | | | | | | |

Influent | Grit Chamber | Primary Inf | Weather | Pri Sludge | Primary Clarifiers | Primary Effl | AerationBasin1 | Aer Summary | RAS | CCC | Effl

Ready


FIELD COLLECTOR - iPAD
TOUCH SCREEN RECEIPTING
LINUX
LIMS ORACLE DATA BASE
Start
SHARE POINT
PDF
Load samples from batch
Windows Server
CSV FILE Sent to Windows Server
CSV BACKED UP
LIMS & PI transfer each 50 minutes
INSTRUMENT
HachWims Generates process daily, DMR's … many reports
HACH WIMS DATABASE

# DIASTER RECOVERY



b30883

| SOURCE | | SAMPLER # | SAMPLE DATE / TIME |
|---|---|---|---|
| Q | Eaton Aerospace | 874 | 3/29/2016 09:00 AM |

| STREET | CITY | STATE | FACILITY CONTACT |
|---|---|---|---|
| | East Providence | RI | Michael Darbyshie |

| SUB-SOURCE | PTLOCATIONID | SUB-SOURCE DESCRIPTION |
|---|---|---|
| # 1 | 8685 | Sample port on the discharge pipe from the Bellows Cleaning & Pick |

icaranci

ery 5 minutes for ICPIND (metals); composite and preserve. Collect 4 grab samples for CN (cyanide); preserve

VATION DATA

et Bottle Data ...

| Time Stop | Container | Requested Analysis | Sample Type (G) or (C) | Initial pH | Nitric Acid | HCl | Res. Cl (+) or (-) | Lead Acetate (+) or (-) | NaOH | Ascorbic Acid | Other | Final pH | Sealed By | User Accepted Split/Rep Sample? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 500 ml plastic bottle - Metals Sample | | C | | ☐ | ☐ | | | ☐ | ☐ | ☐ | | | N |
| | 500 ml plastic bottle - Duplicate metals sample | | C | | ☐ | ☐ | | | ☐ | ☐ | ☐ | | | N |

Complete | Info | Print | Calcs Off | OK | Cancel | Help

# Lab Receiptor

Clear | Pause | LESLIE AHLBORG

Scanned 16 / 16 ›

| | | | |
|---|---|---|---|
| BB13341-A<br>4/26/2016 8:30:00 AM<br>OCEAN_ST_POTATOES<br>Ocean State Peeled Potato-...<br>BOD,TSS | BB13330-A<br>4/26/2016 8:45:00 AM<br>NGC_INC<br>NGC Inc.-Solids and grease...<br>OILGRB | BB13330-E<br>4/26/2016 8:45:00 AM<br>NGC_INC<br>NGC Inc.-Solids and grease... | BB13330-I<br>4/26/2016 8:45:00 AM<br>NGC_INC<br>NGC Inc.-Solids and grease...<br>BOD,TSS |
| BB13341-B<br>4/26/2016 8:30:00 AM<br>OCEAN_ST_POTATOES<br>Ocean State Peeled Potato-... | BB13330-B<br>4/26/2016 8:45:00 AM<br>NGC_INC<br>NGC Inc.-Solids and grease... | BB13330-F<br>4/26/2016 8:45:00 AM<br>NGC_INC<br>NGC Inc.-Solids and grease... | BB13330-J<br>4/26/2016 8:45:00 AM<br>NGC_INC<br>NGC Inc.-Solids and grease... |
| BB13341-C<br>4/26/2016 8:30:00 AM<br>OCEAN_ST_POTATOES<br>Ocean State Peeled Potato-...<br>NH3,NO3NO2 | BB13330-C<br>4/26/2016 8:45:00 AM<br>NGC_INC<br>NGC Inc.-Solids and grease... | BB13330-G<br>4/26/2016 8:45:00 AM<br>NGC_INC<br>NGC Inc.-Solids and grease... | BB13330-K<br>4/26/2016 8:45:00 AM<br>NGC_INC<br>NGC Inc.-Solids and grease...<br>NH3,NO3NO2 |
| BB13341-D<br>4/26/2016 8:30:00 AM<br>OCEAN_ST_POTATOES<br>Ocean State Peeled Potato-...<br>TKN,TKN_ACCEPT,TOT_NIT | BB13330-D<br>4/26/2016 8:45:00 AM<br>NGC_INC<br>NGC Inc.-Solids and grease... | BB13330-H<br>4/26/2016 8:45:00 AM<br>NGC_INC<br>NGC Inc.-Solids and grease... | BB13330-L<br>4/26/2016 8:45:00 AM<br>NGC_INC<br>NGC Inc.-Solids and grease...<br>TKN,TKN_ACCEPT,TOT_NIT |

BP WWTP ›

| | | | |
|---|---|---|---|
| BB35623-A<br>4/26/2016 2:30:00 PM<br>BP-PTEC<br>BP Primary Treatment Effluent...<br>ALKLTY | BB35623-E<br>4/26/2016 2:30:00 PM<br>BP-PTEC<br>BP Primary Treatment Effluent...<br>TKN,TKN_ACCEPT,TPHOSP | BB35622-D<br>4/26/2016 7:00:00 AM<br>BP-FEFFC<br>BP Final Effluent Composite...<br>BOD,TSS | BB35622-H<br>4/26/2016 7:00:00 AM<br>BP-FEFFC<br>BP Final Effluent Composite...<br>$ICPTSN |
| BB35623-B<br>4/26/2016 2:30:00 PM<br>BP-PTEC<br>BP Primary Treatment Effluent...<br>BOD,PH,TSS | BB35622-A<br>4/26/2016 7:00:00 AM<br>BP-FEFFC<br>BP Final Effluent Composite...<br>NH3,NO3,NO3NO2 | BB35622-E<br>4/26/2016 7:00:00 AM<br>BP-FEFFC<br>BP Final Effluent Composite...<br>$ICPMS_EFF | BB35621-A<br>4/26/2016 4:00:00 AM<br>BP-CENT<br>BP Centrate Composite<br>TSS |
| BB35623-C<br>4/26/2016 2:30:00 PM<br>BP-PTEC<br>BP Primary Treatment Effluent...<br>NH3,NO3NO2 | BB35622-B<br>4/26/2016 7:00:00 AM<br>BP-FEFFC<br>BP Final Effluent Composite...<br>NO2 | BB35622-F<br>4/26/2016 7:00:00 AM<br>BP-FEFFC<br>BP Final Effluent Composite...<br>HEXCHR | BB35621-B<br>4/26/2016 4:00:00 AM<br>BP-CENT<br>BP Centrate Composite<br>NO2 |
| BB35623-D<br>4/26/2016 2:30:00 PM<br>BP-PTEC<br>BP Primary Treatment Effluent...<br>NO2 | BB35622-C<br>4/26/2016 7:00:00 AM<br>BP-FEFFC<br>BP Final Effluent Composite...<br>TKN,TKN_ACCEPT,TOT_NIT,TP... | BB35622-G<br>4/26/2016 7:00:00 AM<br>BP-FEFFC<br>BP Final Effluent Composite...<br>HG | BB35621-C<br>4/26/2016 4:00:00 AM<br>BP-CENT<br>BP Centrate Composite<br>BOD,TS,VS,VSS |

All | Ready To Collect | In Transit | **Waiting Analysis** | Waiting Validation | Received

EliteOne 800

All Plant TSS-VSS_4-1-2016.xlsm [Read-Only] - Microsoft Excel

Home Insert Page Layout Formulas Data Review View Developer Design

rver Read-Only This workbook was opened from a server in read-only mode. Edit Workbook

X17

Pivot Refresh | Submit

**FIELD'S POINT TSS/VSS RAW DATA LOG** *Every Wednesday - FPPRESS sample needs to be run for TSS & VSS*

Date of Analysis: 4/1/2016 BATCH TSS-33268 Date of Sample: 3/31/2016 QC: 3

ech: BB

| Location Code | LIMS # | Sample Description | Vol ml | Vm #1 | Vm + Sm #2 | Diff. | TSS-mg/l | Vm + Sm #3 | Diff. (#2 and | % | Vm + Sm #4 | Diff.2 | VSS-mg/l | Vm + Sm #5 | Diff. (#4 and |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | TSS | | | | | | VSS | | |
| | | Influent-1 | 50 | 0.1110 | 0.1183 | 0.0073 | 146.00 | 0.1182 | 0.0001 | 0.08% | 0.1116 | 0.0067 | 134.00 | 0.1115 | 0.0001 |
| | | Influent-2 | 50 | 0.1132 | 0.1210 | 0.0078 | 156.00 | 0.1209 | 0.0001 | 0.08% | 0.1137 | 0.0073 | 146.00 | 0.1137 | 0.0000 |
| | | Influent-3 | 50 | 0.1051 | 0.1120 | 0.0069 | 138.00 | 0.1119 | 0.0001 | 0.09% | 0.1054 | 0.0066 | 132.00 | 0.1053 | 0.0001 |
| FPINFC | BB33202 | *AVG* | | | | | 146.67 | | | | | | 137.33 | | |
| FPPINFC | BB33207 | Primary Inf-4 | 50 | 0.1081 | 0.1153 | 0.0072 | 144.00 | 0.1151 | 0.0002 | 0.17% | | | | | |
| FPPEFFC | BB33206 | Primary Eff-5 | 50 | 0.1081 | 0.1113 | 0.0032 | 64.00 | 0.1113 | 0.0000 | 0.00% | | | | | |
| | | Effluent-6 | 1000 | 0.1085 | 0.1113 | 0.0028 | 2.80 | 0.1113 | 0.0000 | 0.00% | | | | | |
| | | Effluent-7 | 1000 | 0.1087 | 0.1113 | 0.0026 | 2.60 | 0.1113 | 0.0000 | 0.00% | | | | | |
| | | Effluent-8 | 1000 | 0.1100 | 0.1130 | 0.0030 | 3.00 | 0.1130 | 0.0000 | 0.00% | | | | | |
| FPFEFFC | BB33201 | *AVG* | | | | | 2.80 | | | | | | | | |
| | | Mixed Liq C-9 | 15 | 0.4115 | 0.4609 | 0.0494 | 3293.33 | 0.4606 | 0.0003 | 0.07% | 0.4197 | 0.0412 | 2746.67 | 0.4195 | 0.0002 |
| | | Mixed Liq C-10 | 15 | 0.4119 | 0.4583 | 0.0464 | 3093.33 | 0.4581 | 0.0002 | 0.04% | 0.4191 | 0.0392 | 2613.33 | 0.4190 | 0.0001 |
| FPMXLC | BB33203 | *AVG* | | | | | 3193.33 | | | | | | 2680.00 | | |
| | | Mixed Liq C-11 | 15 | 0.4114 | 0.4581 | 0.0467 | 3113.33 | 0.4580 | 0.0001 | 0.02% | 0.4189 | 0.0392 | 2613.33 | 0.4186 | 0.0003 |
| | | Mixed Liq C-12 | 15 | 0.4121 | 0.4583 | 0.0462 | 3080.00 | 0.4580 | 0.0003 | 0.07% | 0.4195 | 0.0388 | 2586.67 | 0.4193 | 0.0002 |
| FPMXLC1 | BB33204 | *AVG* | | | | | 3096.67 | | | | | | 2600.00 | | |
| | | | | | | | | | | | | | | | |
| | | RAS-27 | 15 | 0.4090 | 0.5288 | 0.1198 | 7986.67 | 0.5286 | 0.0002 | 0.04% | 0.4277 | 0.1011 | 6740.00 | 0.4274 | 0.0003 |
| | | RAS-28 | 15 | 0.4102 | 0.5315 | 0.1213 | 8086.67 | 0.5311 | 0.0004 | 0.08% | 0.4294 | 0.1021 | 6806.67 | 0.4293 | 0.0001 |
| FPRASC | BB33208 | *AVG* | | | | | 8036.67 | | | | | | 6773.33 | | |
| | | RAS-29 | 15 | 0.4120 | 0.5332 | 0.1212 | 8080.00 | 0.5330 | 0.0002 | 0.04% | 0.4311 | 0.1021 | 6806.67 | 0.4310 | 0.0001 |
| | | RAS-30 | 15 | 0.4106 | 0.5332 | 0.1226 | 8173.33 | 0.5328 | 0.0004 | 0.08% | 0.4295 | 0.1037 | 6913.33 | 0.4293 | 0.0002 |
| FPRASC2 | BB33209 | *AVG* | | | | | 8126.67 | | | | | | 6860.00 | | |
| | | | | | | | | | | | | | | | |
| | | FPMXLC SPLITTER BOX 2 | | | | | | 5 | | | | | | | |
| | | FPMXLC#1 SPLITTER BOX 1 | | | | | | 5 | | | | | | | |
| | | FP CSO | | | | | | | 0.0000 | #DIV/0! | | | | | |
| P_CSO_TUNNEL_EF | BB33213 | Tunnel Effluent | 100 | 0.1091 | 0.1135 | 0.0044 | 44.00 | 0.1134 | 0.0001 | 0.09% | | | | | |
| | | | | | | | | | | | | | | | |
| FPCENT | BB33197 | FP Centrate | 25 | 0.1099 | 0.1160 | 0.0061 | 244.00 | 0.1158 | 0.0002 | 0.17% | | | | | |
| FPCENT | BB33197 | *WEEKLY* | | | | | | | | | na | #VALUE! | #VALUE! | na | #VALUE! |

# SUMMARY

| | |
|---|---|
| **Was it Successful?** | **MOSTLY** |
| **Was there Problems?** | **YES** |
| **Was it Worth it?** | **YES** |