



Leaders in Laboratory Automation



Innovation.
Performance.
Success.

Lab Automation in the Environmental Sector



NEMC

2020 National Environmental Monitoring Conference



Presented by:

Ken Ochi

Accelerated Technology Laboratories, Manager of Global Marketing

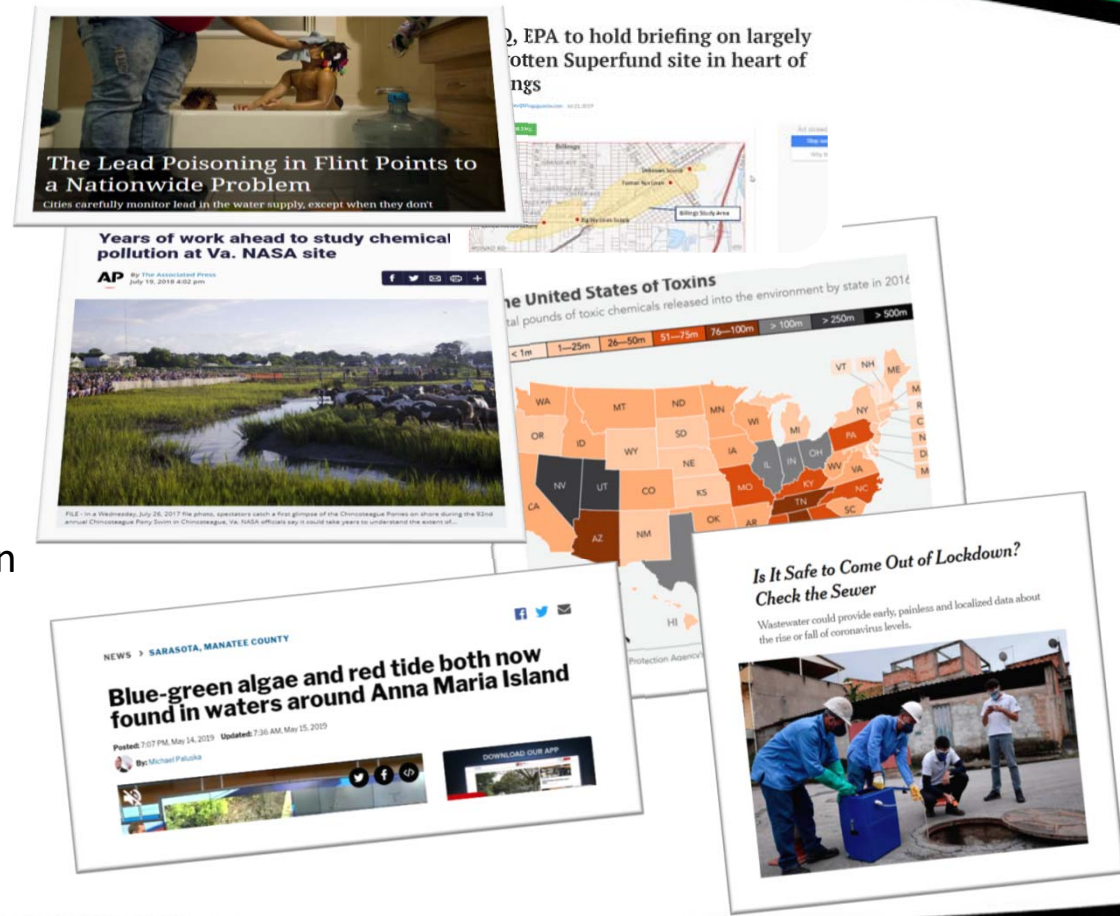


Agenda

- **Current Challenges**
 - The Environmental Sector
 - The Environmental Laboratory
- **The Critical Role of Lab Automation and LIMS in the Environmental Sector**
 - LIMS and Regulatory Compliance
 - MDL: Using Automation to Easily Comply With External Changes
 - Keys to Lab Efficiency: Instrument Integration and Positive ID
 - Wireless Environmental Monitoring
 - Growth of Mobile Technology in Environmental Laboratories
 - Web Portal to LIMS = Outstanding Customer Service
 - LIMS in the Cloud – A Growing Deployment Option for Today’s Laboratory
- **Wrap-up and Q & A**

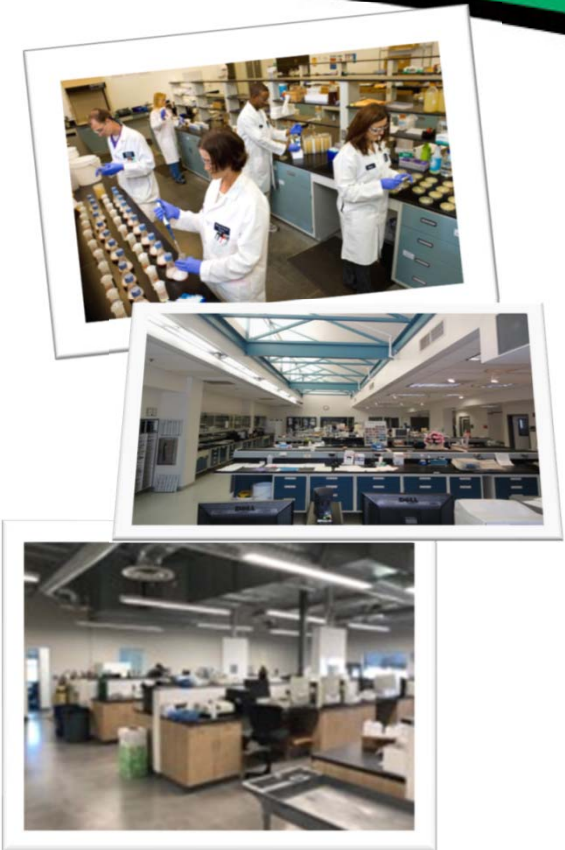
The Environmental Sector: Current Challenges

- Flint, MI and its impact on drinking water testing in the US
- A growing problem – Toxic pollution
- In VA...industrial chemicals (PFAS) found in groundwater wells
- In FL...Monitoring algae bloom problem
- In MT...cancerous vapors rising from forgotten Superfund site
- COVID-19



The Environmental Laboratory: *Challenges and Trends*

- Maintaining Profitability in an Ever-Changing Environment
 - Niche Market vs. Large, High Volume Labs
 - Reducing Costs Through Automation and Improved Processes
 - COVID-19: Remaining Productive During a Pandemic
- Accreditation and Regulatory Compliance
 - NELAP, ISO 17025
 - EPA and State Environmental Regulatory Compliance
- Trends to Watch
 - PFAS as a new business opportunity
 - Lab of the Future
 - Niche-oriented
 - Migrate from testing services to environmental analytical services



The Critical Role of Lab Automation & LIMS in the Environmental Laboratory

Ideal LIMS Solutions Platform for Today's Laboratory

"A Laboratory Information Management System or LIMS is a software-based system with features that support a modern laboratory's operations."



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Performance.
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Using a LIMS to Facilitate Regulatory Compliance

- EPA and state environmental agency compliance is a key requirement for any LIMS
- Around the US, state environmental agencies base the requirements for state-accredited environmental laboratories on the National Environmental Laboratory Accreditation Program (NELAP)
- Data retention requirements
- Submitting compliant reports in a timely manner
- Benefits of a LIMS for regulatory compliance and reporting
 - Preconfigured report formats
 - Electronic data deliverables (EDDs)
 - eDMRs



NORTH CAROLINA
Environmental Quality



Using a LIMS to Achieve ISO 17025 Accreditation

| ISO 17025 Requirement | Does LIMS Provide Functionality? |
|--|----------------------------------|
| Traceability | Yes |
| Personnel training records | Yes |
| Instrumentation calibration/maintenance | Yes |
| Chemical inventory | Yes/Some |
| Review of requests, tenders, contracts | Yes |
| Field sampling data (incl. location data) | Yes |
| Approved vendors data | Yes/Some |
| Document customer complaints/resolution | Yes/Some |
| Corrective Action / Preventative Action (CAPA) | Yes/Some |



LIMS & the Regulatory Landscape

- Regulatory Agencies

- TNI/NELAC
- ISO 17025
- EPA
- FDA/GxP
- CA ELAP
- CAP/CLIA



- Reporting

- Standard Templates
- Electronic Data Deliverables (EDDs)

Why Update the ISO 17025:2017 Standard?

- *The revision to the ISO/IEC 17025 was needed in order to align with the 9001 changes, in response to:*
- Adapting to an evolving world
- Increase the organizations ability to satisfy its customers
- Ensure that the revised standard encompasses changes of all stakeholders
- To reflect the increased complexity in which organizations operate
- Enhanced integration with other management systems
- Provide consistency

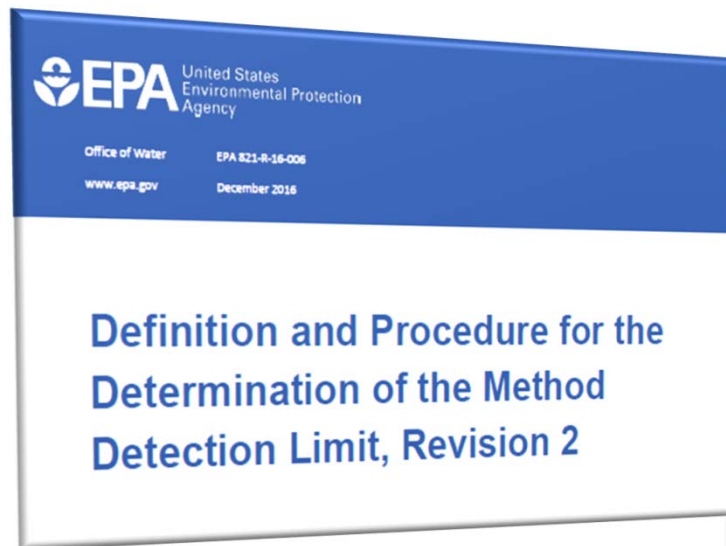
Major Regulatory Changes to ISO 17025: 2017

- Revised scope to include testing, calibration and sampling that is associated with subsequent calibration and testing.
- The Standard now has a stronger focus on information technology. This includes the utilization of computerized systems, electronic records and the productions of electronic signatures, results and reports.
- The introduction of the Process Approach bringing the old standard in line with the 9001 standard.
- The concept of Risk Based Thinking was introduced.

New Targets to Detect & Updated Requirements

- New Tests for various parameters: PFOA and PFOS
- Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA)
 - Manmade chemicals not naturally found in the environment
 - Fluorinated compounds that repel oil and water
 - Used in a variety of industrial and consumer products, such as clothing treatments, carpet and firefighting foams.
 - Extremely persistent in the environment.
 - Known to bioaccumulate in humans and wildlife
 - EPA has issued a Maximum Contaminant Level (MCL) for drinking water
 - Standard analytical methods utilize High Pressure Liquid Chromatography (HPLC) coupled with tandem mass spectrometry

UPDATE: LIMS and Method Detection Limit (MDL)

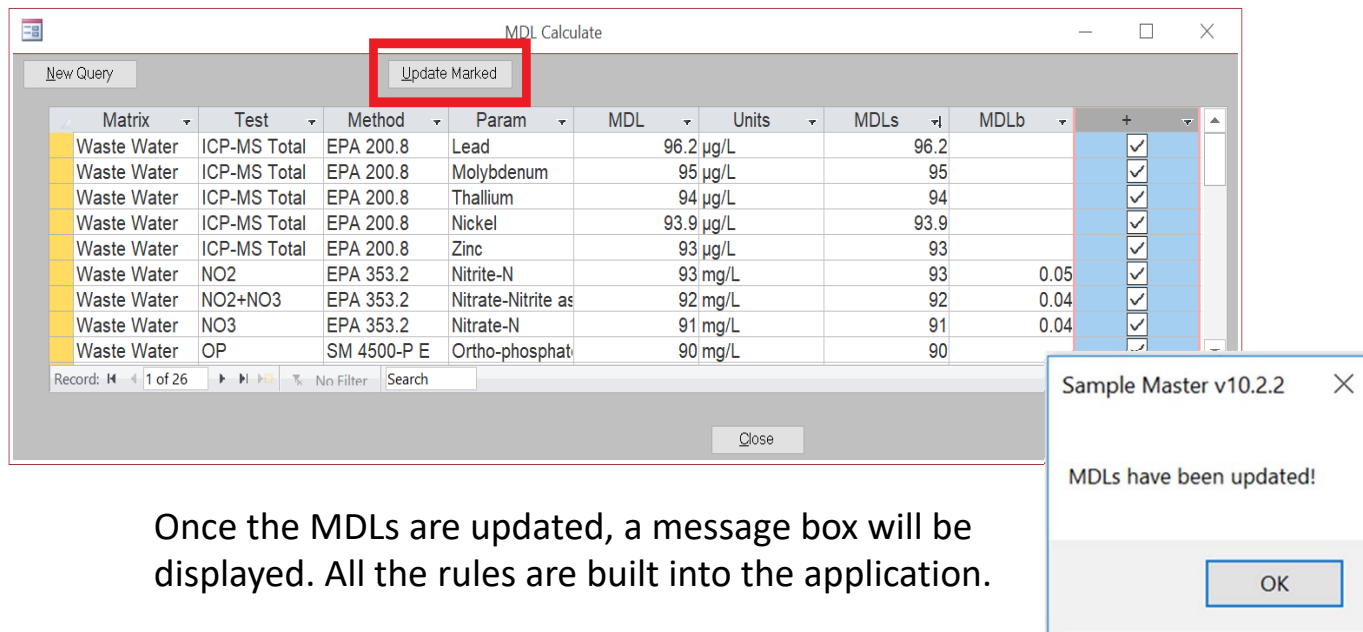


- Integrated MDL calculator in the LIMS allows laboratories to quickly comply with the EPA regulations

https://www.epa.gov/sites/production/files/2016-12/documents/mdl-procedure_rev2_12-13-2016.pdf

Integrated, Validated MDL Calculator

To update the MDLs, click the Update Marked button (6-7 clicks!)



The screenshot shows the 'MDL Calculate' application window. At the top, there is a 'New Query' button and an 'Update Marked' button, which is highlighted with a red rectangle. Below these is a table with the following columns: Matrix, Test, Method, Param, MDL, Units, MDLs, MDLb, and a column with checkmarks. The table contains 10 rows of data for various parameters like Lead, Molybdenum, Thallium, Nickel, Zinc, Nitrite-N, Nitrate-Nitrite as, Nitrate-N, and Ortho-phosphat. At the bottom of the window, there is a 'Close' button. Overlaid on the bottom right is a message box titled 'Sample Master v10.2.2' with the text 'MDLs have been updated!' and an 'OK' button.

| Matrix | Test | Method | Param | MDL | Units | MDLs | MDLb | + |
|-------------|--------------|-------------|--------------------|-----------|-------|------|------|-------------------------------------|
| Waste Water | ICP-MS Total | EPA 200.8 | Lead | 96.2 µg/L | | 96.2 | | <input checked="" type="checkbox"/> |
| Waste Water | ICP-MS Total | EPA 200.8 | Molybdenum | 95 µg/L | | 95 | | <input checked="" type="checkbox"/> |
| Waste Water | ICP-MS Total | EPA 200.8 | Thallium | 94 µg/L | | 94 | | <input checked="" type="checkbox"/> |
| Waste Water | ICP-MS Total | EPA 200.8 | Nickel | 93.9 µg/L | | 93.9 | | <input checked="" type="checkbox"/> |
| Waste Water | ICP-MS Total | EPA 200.8 | Zinc | 93 µg/L | | 93 | | <input checked="" type="checkbox"/> |
| Waste Water | NO2 | EPA 353.2 | Nitrite-N | 93 mg/L | | 93 | 0.05 | <input checked="" type="checkbox"/> |
| Waste Water | NO2+NO3 | EPA 353.2 | Nitrate-Nitrite as | 92 mg/L | | 92 | 0.04 | <input checked="" type="checkbox"/> |
| Waste Water | NO3 | EPA 353.2 | Nitrate-N | 91 mg/L | | 91 | 0.04 | <input checked="" type="checkbox"/> |
| Waste Water | OP | SM 4500-P E | Ortho-phosphat | 90 mg/L | | 90 | | <input checked="" type="checkbox"/> |

Once the MDLs are updated, a message box will be displayed. All the rules are built into the application.

Instrument Integration

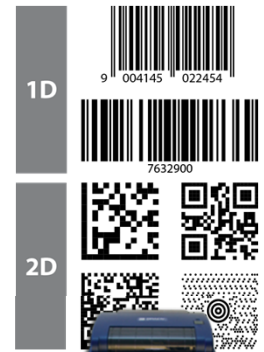
- ✓ Increases accuracy and throughput
- ✓ Avoids duplication
- ✓ Enhances productivity
- ✓ Achieves ROI typically within one year
- ✓ ATL has interfaced over 550 different instruments





Positive ID: Barcoding and RFID

1D and 2D Barcoding

- Elimination of manual entry will increase
 - Speed
 - Data Accuracy
 - Lab Efficiency
- LIMS should support 1D, 2D and RFID barcoding
- Managing Chain of Custody (CofC) is easier by using barcodes



Chain of Custody Record and Analysis Request Form

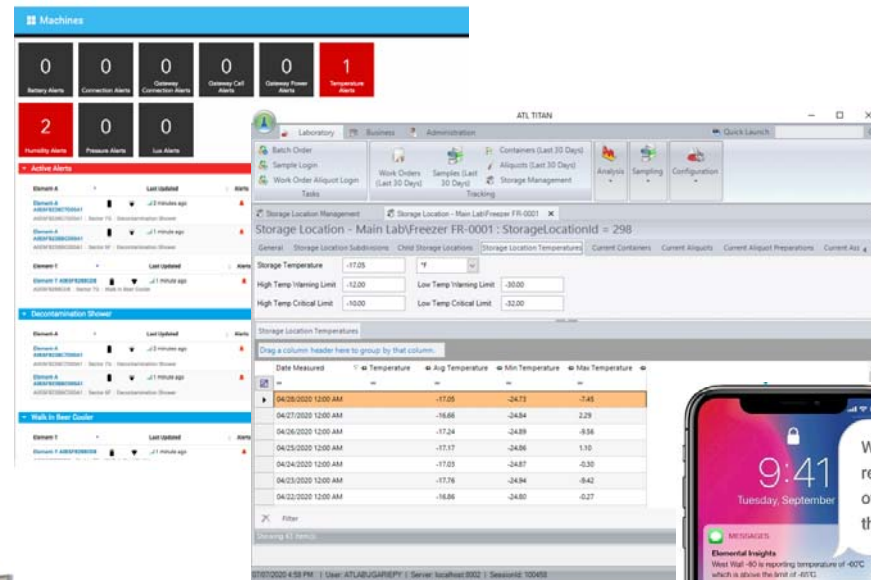
|  Accelerated Technology Laboratories, Inc. 490 Holly Grove School Rd. West End, NC 27376 Phone: 555-555-5555 Fax: 555-555-5556 | | Customer: <input type="text"/> Work Order #: <input type="text"/> Requester: <input type="text"/> Project: <input type="text"/> |  Phone: <input type="text"/> Fax: <input type="text"/> Email: <input type="text"/> | | | |
|--|------------|--|--|--|------------------|---------------------|
| Collection Information | | | | | | |
| LIMS Sample # | Sample # | Date | Time | Collector | Analysis Methods | Container |
| 10-1000000-01-001 | 7632900 | 8/20/2019 | 00:00 | | Ammonia (NH3) | 10-1000000-01-001-1 |
| 10-1000000-01-002 | 7632900 | 8/20/2019 | 00:00 | | Ammonia (NH3) | 10-1000000-01-001-1 |
| Customer to sign & date below | | | | | | |
| Accepted By: | Date/Time: | Accepted By: | Date/Time: | Total Samples: 2 Priority: Normal 10.00 day Date Results Requested: 10/7/2019 | | |
| Prepared By: | Date/Time: | Accepted By: | Date/Time: | | | |
| Prepared By: | Date/Time: | Accepted By: | Date/Time: | | | |
| Accepted By: | Date/Time: | Accepted By: | Date/Time: | | | |
| Test/Label By: | Date/Time: | Revised/Label Control By: | Date/Time: | | | |
| Test/Label By: | Date/Time: | Revised/Label Control By: | Date/Time: | | | |

RFID

- Benefits include ability to store more data vs barcodes and multiple tags can be read at the same time

Wireless Environmental Monitoring

- Supports regulatory compliance
- Minimizes manual entry
- Provides data security
- Offers real-time alerts
- 21 CFR Part 11 Compliant
- LIMS integration



The screenshot displays the ATLAB software interface. At the top, there are several status indicators for different machine types: Safety Alerts (0), Collection Alerts (0), Containment Alerts (0), Containment Call Alerts (0), Containment Probe Alerts (0), and Temperature Alerts (1). Below this, there are sections for 'Machines' and 'Storage Location Management'. The 'Storage Location Management' section shows details for 'Main Lab/Freezer FR-0001' with a 'Storage Location ID' of 298. It includes fields for 'Storage Temperature' (-17.05), 'High Temp Warning Limit' (-12.00), 'High Temp Critical Limit' (-10.00), 'Low Temp Warning Limit' (-20.00), and 'Low Temp Critical Limit' (-22.00). A table below shows 'Storage Location Temperatures' with columns for 'Date Measured', 'Temperature', 'Avg Temperature', 'Min Temperature', and 'Max Temperature'. The table contains data for several dates from 04/20/2020 to 04/23/2020.

| Date Measured | Temperature | Avg Temperature | Min Temperature | Max Temperature |
|---------------------|-------------|-----------------|-----------------|-----------------|
| 04/20/2020 12:00 AM | -17.05 | -24.73 | -7.45 | |
| 04/21/2020 12:00 AM | -16.66 | -24.84 | 2.29 | |
| 04/26/2020 12:00 AM | -17.24 | -24.89 | -9.56 | |
| 04/28/2020 12:00 AM | -17.17 | -24.86 | 1.10 | |
| 04/24/2020 12:00 AM | -17.03 | -24.87 | -3.30 | |
| 04/23/2020 12:00 AM | -17.76 | -24.94 | -8.42 | |
| 04/22/2020 12:00 AM | -16.86 | -24.80 | -2.27 | |



West Wall -80 is reporting temperature of -60°C, which is above the limit of -65°C.



Growth of Mobile Technology in Labs

- Use of mobile LIMS technology increases productivity of field technicians and lab staff
- Elimination of paper processes
- Real-time access of field testing results before technician returns to lab
- Recent advances in mobile technology
- Better options for remote connectivity
- More cost-effective and powerful hardware options available today



Leveraging Mobile Technology to Increase Productivity and Data Quality, while Reducing Costs

Field Data Collection



Cloud

Field collectors use mobile devices with the Sample Master®/ TITAN® iMobile Application, and data is instantly uploaded to the laboratory LIMS.

Prescheduled samples appear on the mobile device to notify collectors of their daily worklist, and non-routine samples may be added as needed.

GIS coordinates can automatically be recorded and new tests can be added from a drop down list.

LIMS & Web Servers



Web Server



LIMS Server
Sample Master® / TITAN®
on SQL Server

Laboratory

Sample Accessioning



Data Analysis



Q/C & Reporting



Benefits of Mobile Technology

- Transmit results directly from field to LIMS
- Reduce redundant data entry
- Maintain electronic COC
- Create new samples on the fly
- Data entry at the bench
- Saves time, money and paper



Mobile Technology Return on Investment

- Average of 25/35 minutes per person/day during collection
- Resource savings (avg. 60 min per day per person) x 6 field personnel = 6 hours/day time saved.
- Client recouped cost of Mobile solution within 6 months on labor savings alone.
- That includes cost of software, hardware, implementation.
- Case study sent upon request →



Leveraging Mobile Technology to Improve Water Quality Data
 Joe Yorke, Jojean Dolton, Melissa Dillman and Dr. Christine Paszko*
 Fairfax County Water Authority and Accelerated Technology Laboratories, Inc.*

ABSTRACT

The Fairfax County Water Authority (FCWA) water quality data collection and analysis process has been a challenge for many years. The data is collected from a wide geographic area and is often collected in a paper format. This process is time-consuming and costly. The FCWA has implemented a mobile technology solution to improve data collection and analysis. This solution has resulted in significant time and cost savings for the FCWA.

INTRODUCTION

The Fairfax County Water Authority (FCWA) is a large water utility serving over 2.5 million people in Fairfax County, Virginia. The FCWA is responsible for providing clean, safe drinking water to its customers. To ensure the quality of the water, the FCWA monitors water quality at numerous locations throughout the county. This monitoring is done through a network of water quality monitoring stations (WQMS) and manual sampling. The FCWA has implemented a mobile technology solution to improve data collection and analysis. This solution has resulted in significant time and cost savings for the FCWA.

THE CHALLENGE

The challenge facing the FCWA was how to collect and analyze water quality data more efficiently. The data is collected from a wide geographic area and is often collected in a paper format. This process is time-consuming and costly. The FCWA has implemented a mobile technology solution to improve data collection and analysis. This solution has resulted in significant time and cost savings for the FCWA.

THE SOLUTION

A mobile application was developed to collect and analyze water quality data. The application is designed to be used on a mobile device, such as a smartphone or tablet. The application allows field personnel to collect data in the field and upload it to a central database. The application also allows for data analysis and reporting. The FCWA has implemented this solution and has seen significant time and cost savings.

RESULTS

The FCWA has seen significant time and cost savings since implementing the mobile technology solution. The FCWA has saved approximately 6 hours per day in labor costs. The FCWA has also seen a reduction in data collection and analysis errors. The FCWA has implemented this solution and has seen significant time and cost savings.

SUMMARY

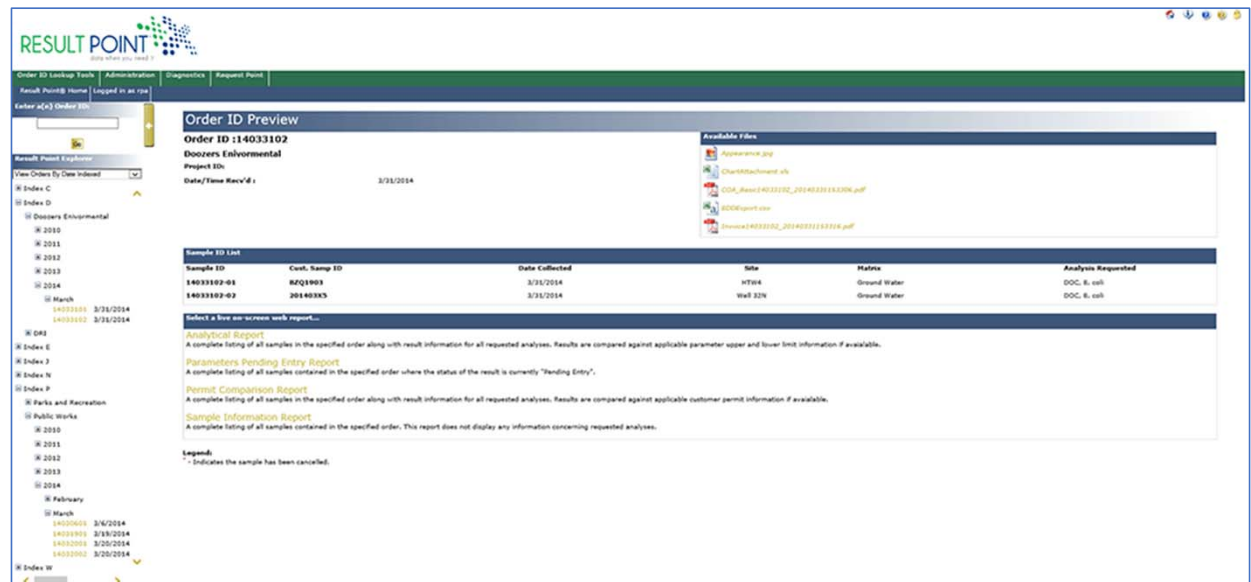
Implementing a mobile technology solution to improve water quality data collection and analysis has resulted in significant time and cost savings for the FCWA. The FCWA has saved approximately 6 hours per day in labor costs. The FCWA has also seen a reduction in data collection and analysis errors. The FCWA has implemented this solution and has seen significant time and cost savings.

ACKNOWLEDGEMENTS

The authors would like to thank the following individuals for their assistance in the development and implementation of this solution: Joe Yorke, Jojean Dolton, Melissa Dillman, and Dr. Christine Paszko.

Web Portal to LIMS Provides Powerful Access to Lab Data

- Securely access laboratory data 24/7
- View final and preliminary reports, COAs, invoices, images, EDDs, etc.
- Get real-time sample status and updates
- Access archive of past reports and more
- Ability for customers to request new tests and begin pre-log of these samples



RESULT POINT
2014 March 10, 11:00 AM

Order ID Lookup Tools Administration Diagnostics Request Point

Result Point Home Logged in as rse

Keller 2(4) Order ID

Result Point Customer

View Orders By Date Invoiced

Index C

Index D

Dozers Environmental

2010

2011

2012

2013

2014

March

14033101 3/31/2014

14033102 3/31/2014

Index E

Index J

Index N

Index P

Parks and Recreation

Public Works

2010

2011

2012

2013

2014

February

March

14033003 3/4/2014

14031901 3/15/2014

14033005 3/20/2014

14033002 3/20/2014

Index W

Order ID Preview

Order ID :14033102

Project Name: Dozers Environmental

Project ID:

Date/Time Recv'd : 3/31/2014

Available Files

Appearance.jpg

ChemMethCompnd.xls

COA_Pass14033102_2014033113.5306.pdf

CO2Report.xlsx

Invoice14033102_2014033113.5314.pdf

Sample ID List

| Sample ID | Cont. Stamp ID | Date Collected | Site | Matrix | Analysis Requested |
|-------------|----------------|----------------|----------|--------------|--------------------|
| 14033102-01 | 82Q1903 | 3/31/2014 | HT04 | Ground Water | DOC, E, col |
| 14033102-02 | 201403K3 | 3/31/2014 | Wall 22N | Ground Water | DOC, E, col |

Select a live on-screen web report...

Analytical Report
A complete listing of all samples in the specified order along with result information for all requested analyses. Results are compared against applicable parameter upper and lower limit information if available.

Parameters Pending Entry Report
A complete listing of all samples contained in the specified order where the status of the result is currently "Pending Entry".

Permit Comparison Report
A complete listing of all samples in the specified order along with result information for all requested analyses. Results are compared against applicable customer permit information if available.

Sample Information Report
A complete listing of all samples contained in the specified order. This report does not display any information concerning requested analyses.

Legend:
--- Indicates the sample has been cancelled.

Software as a Service (SaaS) or Cloud Deployment

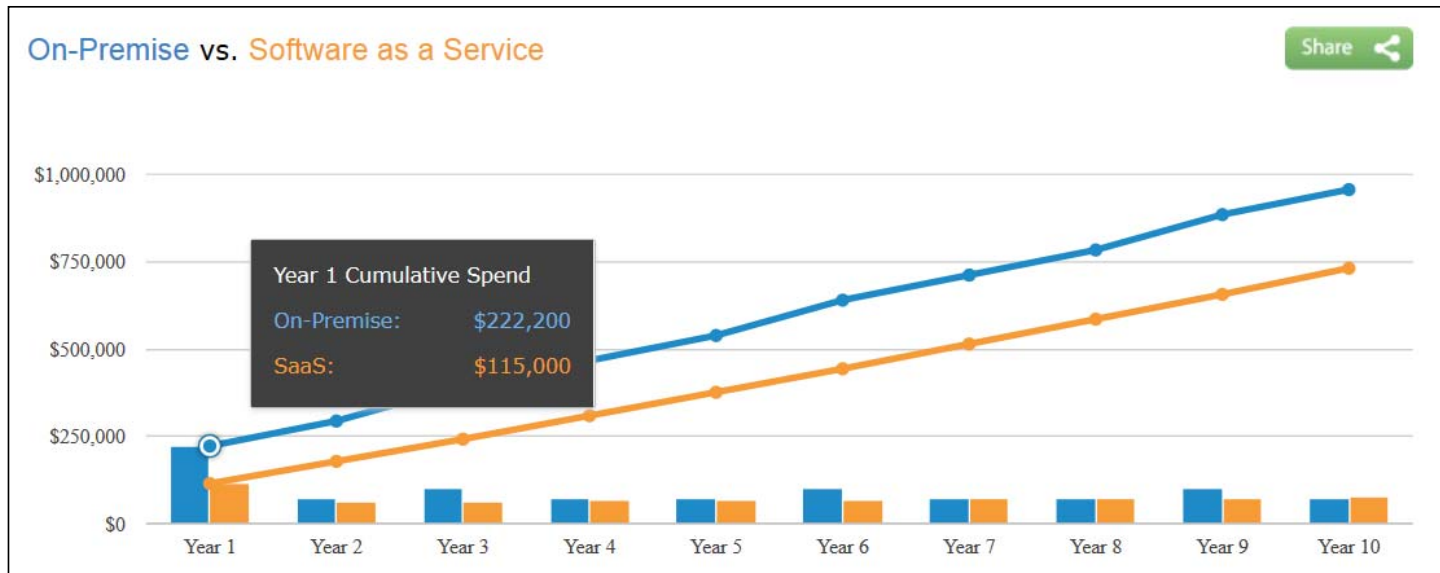
Key Benefits of SaaS Deployment:

- **Works with Any Browser – not just IE**
- Access to your LIMS – Anywhere and Anytime
- No capital investment needed for
 - Servers / Security / IT Support
- Reliability
- Lower cost of entry and TCO
- Ability to share most up to date information
- Prompt deployment and fully scalable
- Rapid ROI
- Monthly subscription fee



Software as a Service (SaaS) or Cloud Deployment

Lower Total Cost of Ownership (TCO) Comparison *On-Premise vs. SaaS*



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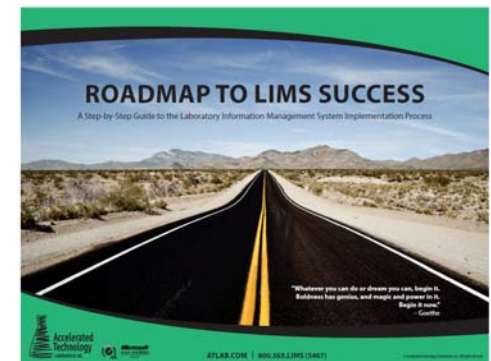
- **26 Years** of Expertise in LIMS & Laboratory Automation
- ATL LIMS solutions are installed in **over 600 laboratories**
- We offer an excellent solution for environmental laboratories that are seeking NELAP accreditation or ISO 17025 certification.
- **ATL Advantage Program**
- **ISO 9001:2015 Certified**
- **100% US (WBE/HUB) business** founded by **laboratory professionals and computer scientists**





THANK YOU!

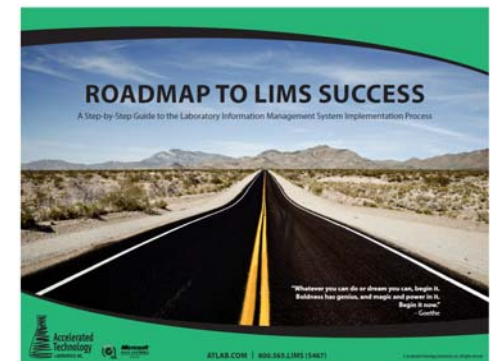
- For a copy of our Free LIMS Guide, call or email ATL:
info@atlab.com
 - 800.565.LIMS (5467) or call 910.673.8165
 - Website: atlab.com
 - Additional questions? Feel free to email me at kochi@atlab.com





THANK YOU!

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