

# Risk Based Data Management for Water

## RBDMS for Water



The Ground Water Protection Council  
Ohio Department Natural Resources  
Division of Mineral Resources  
Management  
Virtual Engineering Solutions, Inc.  
Coordinate Solutions, Inc.



Gregg Miller



# Development of RBDMS for Water database: Phase 1

- Grant secured from the U.S. Dept of Energy and administered by the GWPC.
- Development team includes ODNR staff, VES, GWPC, and Coordinate Systems, Inc.
- As a comprehensive water information system, RBDMS for Water has vastly improved
  - The ability of the agency and its watershed partners to access and to analyze water quality and quantity data.
  - The confidence and speed with which program decisions are developed.

# Comprehensive Water Monitoring Data Management Program

- Complaint Investigation
- Long-term Monitoring
- Permit Compliance Monitoring
- NPDES
- Volunteer Reporting

For these areas of interest:

- Surface and Ground Water
- Oil Field Brine
- Acid Mine Drainage
- Watershed Restoration
- Who uses RBDMSW? anyone who takes or analyzes water samples.



## Program Needs:

- Coal Regulatory – Alerts
- Permitting and Applications – CHIA
- Complaint Investigation (Entire Division)
- AML/AMD – Watershed Restoration
- Oil and Gas – Urban Water Sampling & Frac Fluid

# Coal Regulatory

- Track compliance: QMR/Monthly and NPDES
- Electronic Submittal of QMR/Monthly and NPDES
- Electronic analysis of water data with alert emails sent to staff of any exceeded parameters.
- Alerts sent through email to staff of any missing water data.
- Evaluate trends: pre-/post-mining; bond releases
- Investigate complaints
- Incorporate legacy data



# Permitting/Applications

- Assist hydrologists preparing CHIA (Cumulative Hydraulic Impact Assessment) in Coal and Industrial Minerals programs
- Make historic data on Hydrologic Unit scale available
- Make other data available
  - AMD Watershed Data
  - Complaints
  - QMR/NPDES Data

# EPA DMR Report

**ODNR**

MONTHLY REPORT FORM

**Ohio EPA**

DEPARTMENT OF  
NATURAL RESOURCES

Ohio Environmental Protection Agency

COMPANY NAME: **Oxford Mining Co.**

COUNTY: **Tuscarawas** TOWNSHIP: **York, Jefferson, Clay**

SECTION: **B & 15** PIT IDENTIFICATION(S) ANY: **Spring**

DATE (MO., YR.): **Nov 2009** Page **1** of **2** Pages

OEPA PERMIT NO.: **OGM00303**

ODNR PERMIT NO.: **D-1149**

REPORTING LAB: **Reem & Haeger** ANALYST: **Tim Leverage**

OUT FALL	DAY	FLOW RATE	pH	TOTAL	IRON	MANGANESE	SPECIFIC	RAINFALL
		GALLONS PER DAY	STANDARD UNITS	SUSPENDED SOLIDS MGL	TOTAL MCL	TOTAL MGL	CONDUCTANCE MICROMHOS	24 HR TOTAL INCHES
		REPORTING CODE 9069	REPORTING CODE 1040	REPORTING CODE 0450	REPORTING CODE 7400	REPORTING CODE 7403	REPORTING CODE 0096	REPORTING CODE 0095
1	2	14400	7.5					0.08
	9	3036	7.54	10	0.840	0.830	943	0.0
	16	5760	7.6					0.0
	23	14400	7.5					0.0
	30	14400	7.5					0.12
9	2	36000	8.0					0.08
	9	36000	7.93	11	0.590	1.20	1660	0.0
	16	36000	8.0					0.0
	23	36000	8.0					0.0
	30	36000	8.0					0.12
11	2	0.0	7.0					
	9	0.0	7.0					
	16	0.0	7.0					
	23	0.0	7.0					
	30	0.0	7.0					
12E	2	5760	7.4					0.08
	9	5069	7.41	9	1.15	3.820	796	0.0
	16	5760	7.4					0.0
	23	5760	7.4					0.0
	30	5760	7.4					0.12
12W	2	17280	7.4					0.08
	9	11520	7.33	2	0.40	0.89	810	0.0
	16	11520	7.4					0.0
	23	11520	7.4					0.0
	30	11520	7.4					0.12
014	2	0.0	7.5					
	9	0.0	7.5					
	16	0.0	7.5					
	23	0.0	7.5					
	30	0.0	7.5					

RECEIVED  
DEC 2 6 2009

ALL REPORTING CODES MUST BE EXPLAINED. Discharge of pollutants into waters of the state without an effective permit is prohibited pursuant to 8111.04 and 8111.07 Ohio Revised Code.

DATE REPORT: **12/14/2009** SIGNATURE OF REPORTER: *[Signature]* TITLE OF REPORTER: **Permit Coordinator**

100 EPA 1114 (12/04) COPY - WHITE \* ODNR REGIONAL OFFICE COPY - YELLOW \* ODNR CENTRAL OFFICE COPY - PINK \* ODEMC COPY - GOLDENROD

# QMR Report

OHIO DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF MINERAL RESOURCES MANAGEMENT

Quarterly Monitoring Report Sheet  
(Submit in Quadruplicate)

RECEIVED

Jul 13 2010

Division of Mineral Resources Management

Permittee: Beaumont Mining LLC, Permit No. 0000000000

1<sup>st</sup> Quarter,  2<sup>nd</sup> Quarter,  3<sup>rd</sup> Quarter,  4<sup>th</sup> Quarter ( "X" appropriate box)

Pre-mining,  Mining,  Postmining ("X" appropriate box for mine status)

Monitoring Site Identification No. (i.e., S-1, W-3)	Q1	Q2	Q3	Q4	Pre-Mining
State Plane X-Y Coordinates	X: 2500000, Y: 2500000	X: 2500000, Y: 2500000	X: 2500000, Y: 2500000	X: 2500000, Y: 2500000	X: 2500000, Y: 2500000
State Whether Site was monitored for Quality, Quantity or Both	Quality	Quality	Quantity	Quantity	Quantity
Surface Elevation of Monitoring Site	500	500	500	500	500
Depth of Well Below Land Surface (feet)	N/A	N/A	100	100	100
Static Water Level of Well Below Land Surface (ft)	500	500	500	500	500
Stream or Spring Discharge (gpm)	2000	2000	2000	2000	2000
Date Measured	7/1/10	7/1/10	7/1/10	7/1/10	7/1/10
pH (Standard Units)	6.5	6.5	6.5	6.5	6.5
Total Acidity (mg/l CaCO <sub>3</sub> )	50	75	100	100	100
Total Alkalinity (mg/l CaCO <sub>3</sub> )	200	200	200	200	200
Total Iron (mg/l)	50	50	100	100	100
Total Manganese (mg/l)	100	100	100	100	100
Total Aluminum (mg/l)	100	100	100	100	100
Total Suspended Solids (mg/l)	20	20	20	20	20
Total Hardness (mg/l as CaCO <sub>3</sub> )	200	200	200	200	200
Total Sulfates (mg/l)	100	100	100	100	100
Specific Conductance (at 25°C umhos/cm)	200	200	200	200	200
Other: <u>None</u>	None	None	None	None	None

Permittee's Signature [Signature] Date 7-7-10

Laboratory Name Ream & Haeger Laboratory

Analyst's Signature [Signature] Date 4/23/10



**From:** eFormNotify [gregg.miller@dnr.state.oh.us]  
**Sent:** Monday, August 30, 2010 12:03 PM  
**To:** Miller, Gregg  
**Subject:** Ohio RBDMS for Water Alerts

## Ohio DNR Alerts for 8/30/2010

Alerts					
Alert Name	Set : Station	Sample Date			
Criteria Exceedance	Raccoon Creek Alert : EB337	6/21/2005	Analysis: pH	Result: 3.05	Criteria Range: 6.5 to 9
Criteria Exceedance	Raccoon Creek Alert : PR0135	7/15/2003	Analysis: Manganese	Result: 6.37	Criteria Range: 0 to 4
Criteria Exceedance	Raccoon Creek Alert : EB193	7/27/2004	Analysis: Manganese	Result: 11.9	Criteria Range: 0 to 4
Criteria Exceedance	Raccoon Creek Alert : EB200	5/11/2004	Analysis: pH	Result: 4.57	Criteria Range: 6.5 to 9
Criteria Exceedance	Raccoon Creek Alert : WB130	6/5/2000	Analysis: pH	Result: 4.32	Criteria Range: 6.5 to 9
Criteria Exceedance	Raccoon Creek Alert : FR0120	11/8/1998	Analysis: pH	Result: 2.61	Criteria Range: 6.5 to 9
Criteria Exceedance	Raccoon Creek Alert : MSSR0031	8/20/2002	Analysis: pH	Result: 2.78	Criteria Range: 6.5 to 9
Criteria Exceedance	Raccoon Creek Alert : FR0126	2/14/1999	Analysis: pH	Result: 2.89	Criteria Range: 6.5 to 9

# AML/AMD Watershed



- Evaluate water quality improvements following reclamation/treatment installation.
- Track samples.
- Share watershed data with other programs (Permitting, Coal Regulatory).



# Full-Cycle Collection, Analysis and Reporting of Monitoring Results

1. The assigned staff member prepares a water sampling report and prints a chain-of-custody form from RBDMS for Water, which assigns a unique Sample ID number.
2. The sampler collects the samples.
3. The sampler sends the printed chain-of-custody form and the sample to the lab and enters the results of field observations into RBDMS for Water.
4. The chemist checks the samples against the chain-of-custody, enters the Sample ID into the LIMS, and analyzes the samples. The results are transferred from the LIMS to RBDMS for Water electronically.
5. The DMRM staff evaluates the results with respect to their program objectives to determine further action.

## Additional data sources:

- LIMS (MRM laboratory)
- State databases
- EPA DMR: STORET
- USGS
- Website submittal of QMR data from industry



# Desktop application specifications

- Built on RBDMS.NET Framework, security, and administrative functions.
- WinForm smart client, deployed with ClickOnce technology.
- SQL Server 2005/2008 back end.

# Password-protected user access by role:

**Ohio Mining - RBDMS for Water**

Admin ▾ File ▾ Forms ▾ Sets ▾ Reports ▾ Help ▾

**Login**


Welcome to RBDMS for Water. If you have not been setup as a user of the system, please contact the system administrator to have a user account setup for you.

Windows Login Name:

RBDMSW Login (leave blank to use your Windows login name)

Login Name:

Password:



Access to specific sites, and alerts and program areas can be assigned to specific users profiles.

Ohio Mining - RBDMS for Water

File Forms Sets Reports Help Developer

Start

Basic Locations Samples GIS Edit Sample Set

Site Raccoon Creek IG, Raccoon Creek IG

My Home Sites Locations GIS Select

My Sites

My Sites

Drag a column header here to group by that column.

SiteName	Description	Manager	SiteTyp
Yellow Creek IG	Yellow Creek IG		
Sunday Creek IG	Sunday Creek IG		
Rush Creek IG	Rush Creek IG		
Raccoon Creek IG	Raccoon Creek IG		
D-2079			

- Set active site (or double click site)
- Zoom to linked GIS features
- Export grid to Excel
- Print grid
- Add locations from selected sites to active site
- Remove selected sites from My Sites

Map

RBDMS Wells

Visible Active Layer

- RBDMS Wells
- Producing Wells
- Plugged and Abandoned Wells
- Injection Wells

RBDMSW Data

Visible Active Layer

- Sample Locations checked
- Abandoned Underground Mines

Land Survey Data

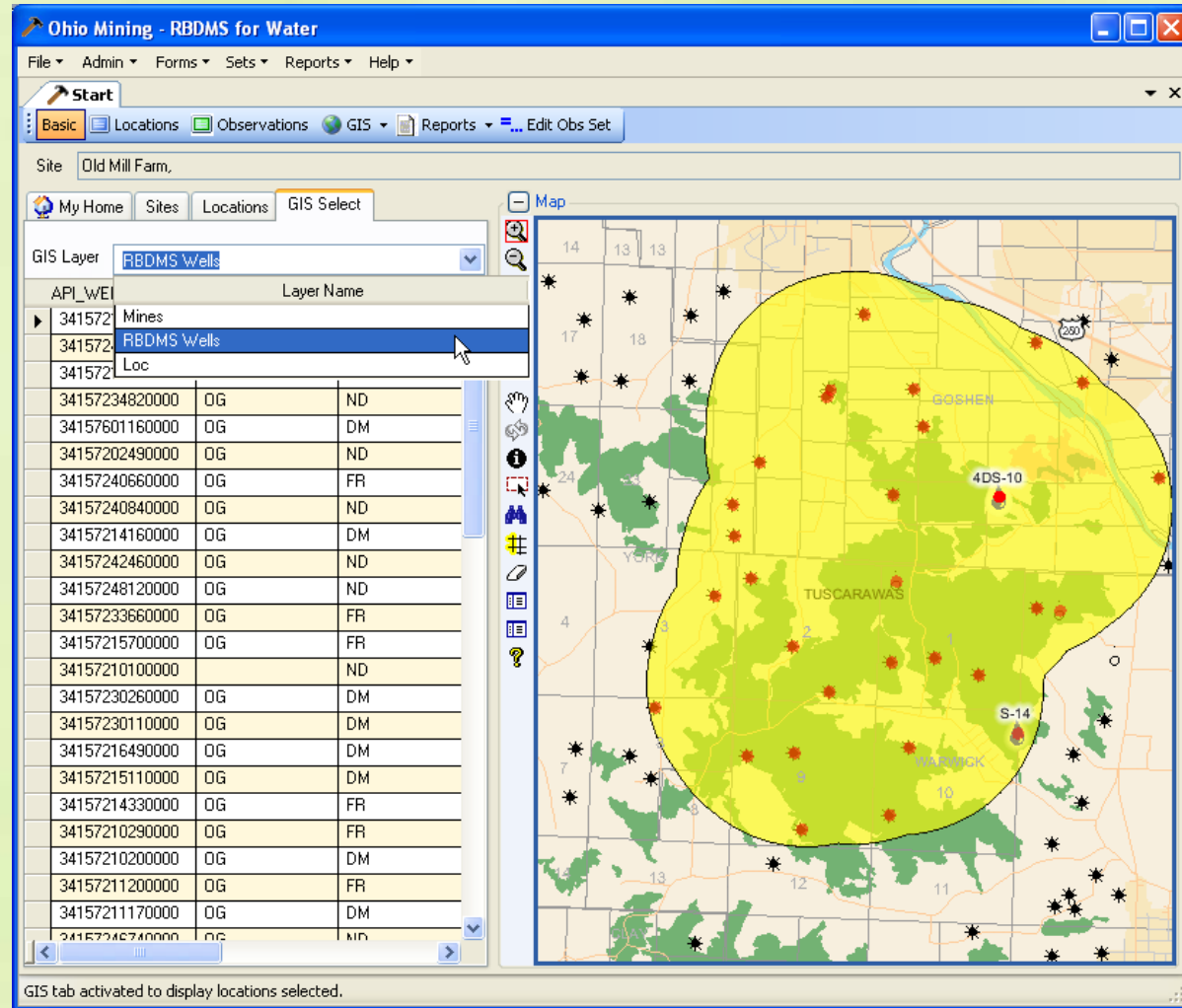
Environmental Data

Base Map

Welcome to RBDMS for Water

# RBDMS for Water Start page displays multiple interactive panes.

- Manage sites and locations.
- Perform GIS analyses.
- Manage analysis sets.
- Work with sample sets.
- Print chain-of-custody document.
- Record field results.
- Evaluate LIMS data.
- Check MCL.



Ohio Mining - RBDMS for Water

File Admin Forms Sets Reports Help

Start

Basic Locations Observations GIS Reports Edit Obs Set

Site Old Mill Farm.

My Home Sites Locations GIS Select Map

GIS Layer RBDMS Wells

API_WEL	Layer Name	
341572	Mines	
341572	RBDMS Wells	
341572	Loc	
34157234820000	OG	ND
34157601160000	OG	DM
34157202490000	OG	ND
34157240660000	OG	FR
34157240840000	OG	ND
34157214160000	OG	DM
34157242460000	OG	ND
34157248120000	OG	ND
34157233660000	OG	FR
34157215700000	OG	FR
34157210100000	OG	ND
34157230260000	OG	DM
34157230110000	OG	DM
34157216490000	OG	DM
34157215110000	OG	DM
34157214330000	OG	FR
34157210290000	OG	FR
34157210200000	OG	DM
34157211200000	OG	FR
34157211170000	OG	DM
34157246740000	OG	ND

GIS tab activated to display locations selected.



# Data structure based on five types of “sets.”

- **Sites:** Delineated by
  - Permit Number
  - Complainant
  - Project #
  - Watershed
  - NPDES facility
- **Locations:** Unique points or polygons within a site
  - QMR monitoring locations
  - Project within a watershed
  - Sampling locations on an AML/AMD project
- **Samples:** User-defined collections of sampling events or observations for a given site or location on a given date
- **Results:** User-defined collections are selected from lists of parameter and test IDs.
  - Basic analysis sets can be pre-prepared for selection
  - Users can create unique sets as needed
- **Alerts:** Self-designed “red flags:”
  - Percent deviation from baseline figures
  - Exceed SMCL or MCL
  - Exceed effluent standards
  - Flag for delinquent reports (QMR, NPDES)

The set builders in RBDMSW use a drop-and-drag interface.

The screenshot shows the 'Ohio Mining - RBDMS for Water' application window. The 'Analysis Sets' tab is active, displaying a tree view of analysis sets on the left and a list of parameters on the right.

**Analysis Sets Table:**

Set Name	User Name	Shared	Description	Date U
Metals		<input checked="" type="checkbox"/>	Metal Parameters	04/05/20
NPDES		<input checked="" type="checkbox"/>	NPDES DMR	
* Test Method Analysis Seq / Units Upper Criteria				
NA	Total Precipitation, Total P	0	Not Applicable.	
NA	Residue, Settleable, SS	0	mL/L	
NA	Flow Rate, FR	0	gpm	
NA	pH, pH	0	Standard pH U	9
NA	Specific Conductivity, SpC	0	Not Applicable.	
NA	Iron, Fe	0	mg/L	6
NA	Manganese, Mn	0	mg/L	4
NA	Total Suspended Solids, T	0	mg/L	72
* PKey CollID UserID				
QMR		<input checked="" type="checkbox"/>	Coal QMR	10/24/20
Group I		<input checked="" type="checkbox"/>	Group I Parameters	
Group II		<input checked="" type="checkbox"/>	Group II Parameters	
Extractable Metals	dba	<input checked="" type="checkbox"/>	Extractable Metals	
Baseline Coal permit		<input checked="" type="checkbox"/>	Coal Regulatory	11/28/20
Baseline		<input checked="" type="checkbox"/>	Coal permit application	11/28/20
Field		<input checked="" type="checkbox"/>	Field	
Group O/G		<input checked="" type="checkbox"/>	Oil & Gas Parameters	
zt_VESitgillesp	VESitgillesp	<input type="checkbox"/>		04/05/20
* Set Name User Name Shared Description Date U				

**Parameters List Table:**

Code	Description
Residue	residue
Total Precipita	Total Precipitation
SS	Residue, Settleable
antimony	antimony
arsenic	arsenic
barium	barium
beryllium	beryllium
cadmium	cadmium
chromium	chromium
mercury	mercury
nickel	nickel
selenium	selenium
sulfate	sulfate
thallium	thallium
Lead	Lead
Copper	Copper
nitrate	nitrate
nitrite	nitrite
chloroform	chloroform
SWL	Static Water Level
FR	Flow Rate
Al	Aluminum
ACD_T	Acidity, Total
ALK_P	Alkalinity, Phen.
BCAlk	Bicarbonate Alkalinity
BOD	Biological Oxygen Demand
B	Boron
ALK_T	Alkalinity, Total
Ca	Calcium
Calk	Carbonate Alkalinity
COD	Chemical Oxygen Demand
Cl	Chloride
Br	Bromide
Co	Cobalt
DO	Dissolved Oxygen
FecC	Fecal Coliform
COND	Conductivity
Hard	Hardness
FeBac	Iron Bacteria

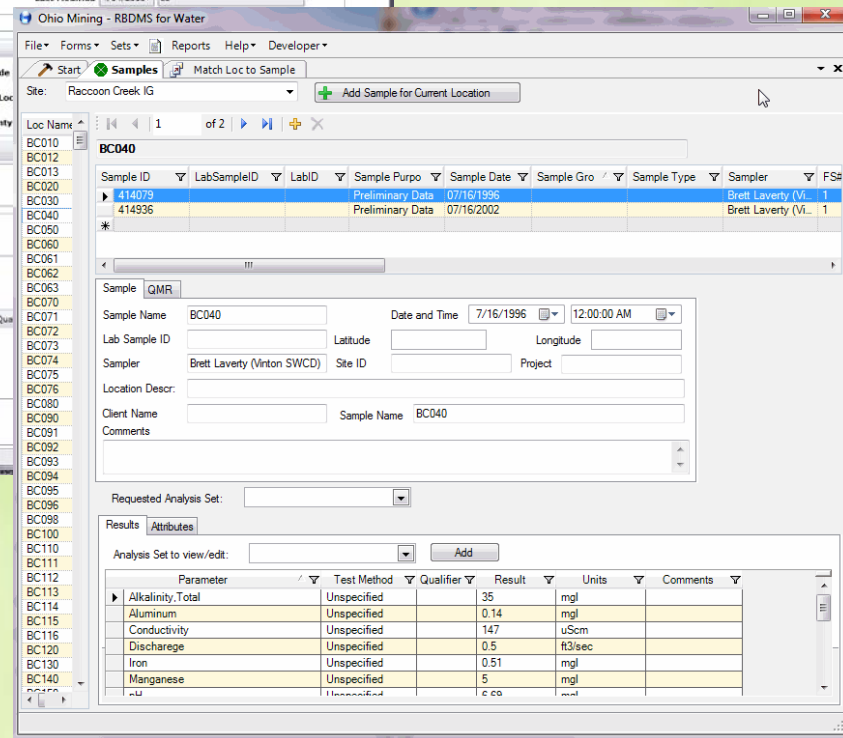
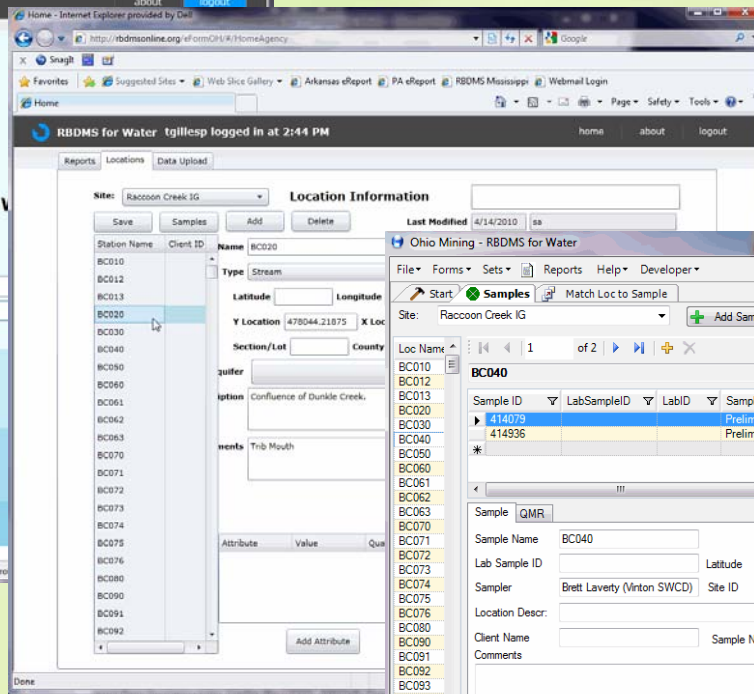
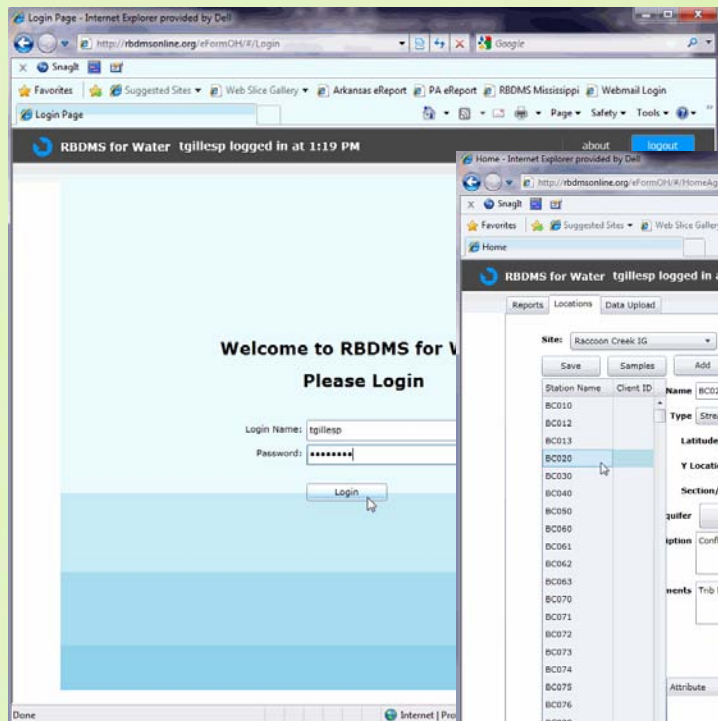
## Phase 1 accomplishments:

- Beta testing
- Available for all DMRM staff
- Links to internal programs:
  - CTS (Central Tracking System)
  - RBDMS (O& G permitting/enforcement, UIC)
- Electronic transfer of laboratory analysis and data from LIMS and other state approved labs
- Electronic transfer from OEPA (DMR)
- Transfer from LIMS (MRM Laboratory) to Watershed Application and Watershed Application to LIMS

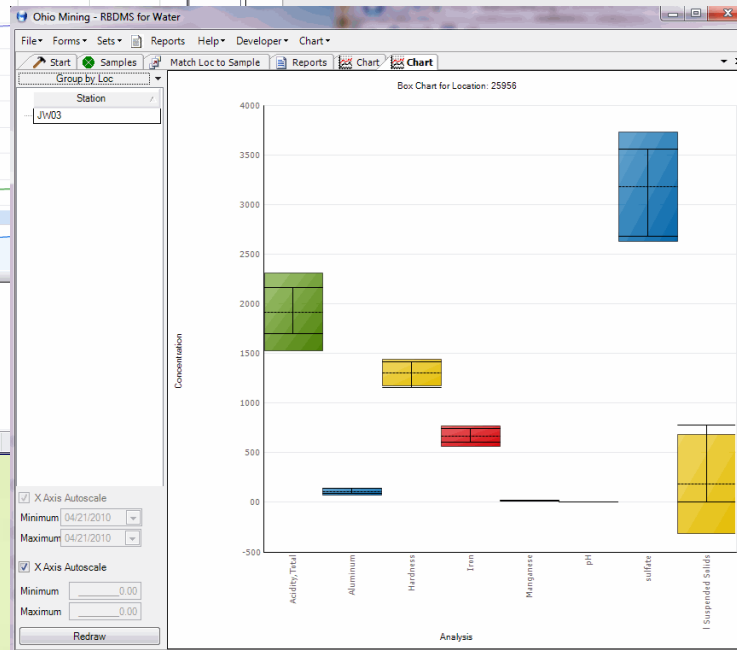
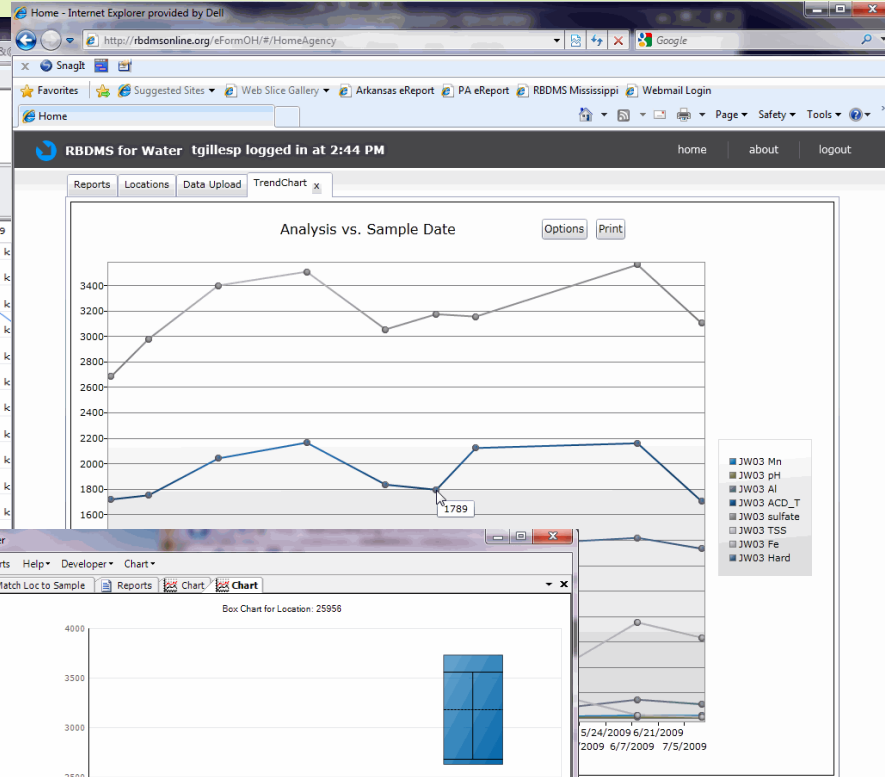
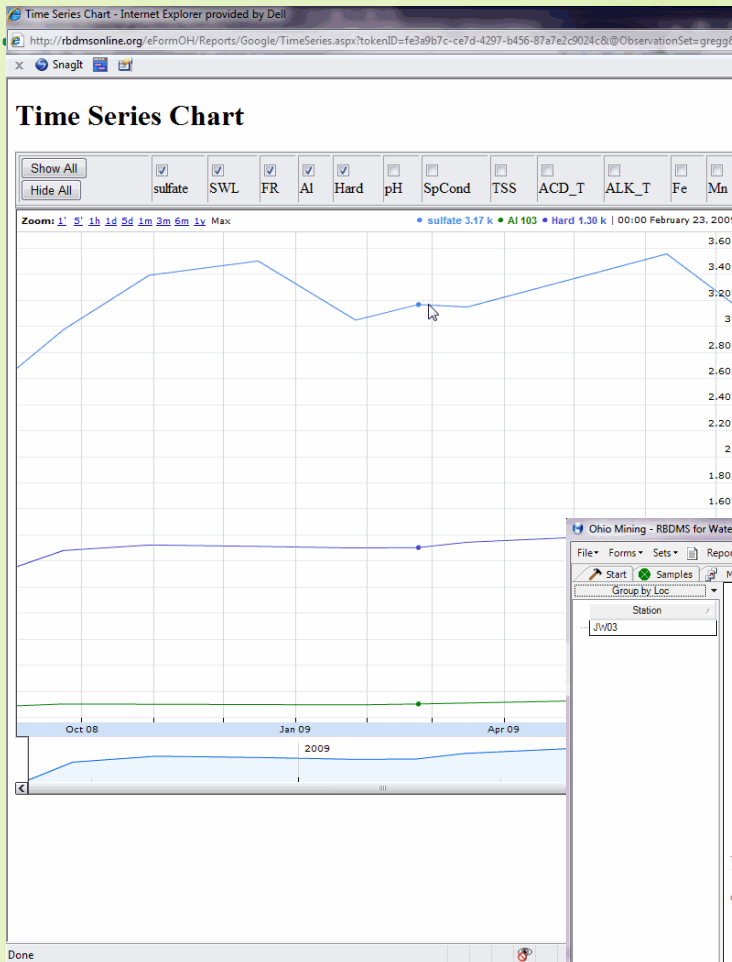
## Phase 2 application development:

- Underwritten by OSM through GWPC administration with the express purpose of making data accessible from DMRM webpage to
  - OSM and other federal and state agencies
  - Public
  - Watershed organizations
  - Universities
- Large portions of the desktop application are being Web enabled for data reporting by inspectors, watershed volunteers, and others with multiple levels of data quality control.
- Notification module will allow inspectors, project coordinators, and sister agencies to subscribe to system alerts.
- The Web site includes a data upload portal for industry laboratories to submit data in a format compatible with EPA's schema for water quality (<http://www.epa.gov/storet/wqx.html>).

# Website Built with Silverlight 4 and base eForm code with a WCF middle tier.



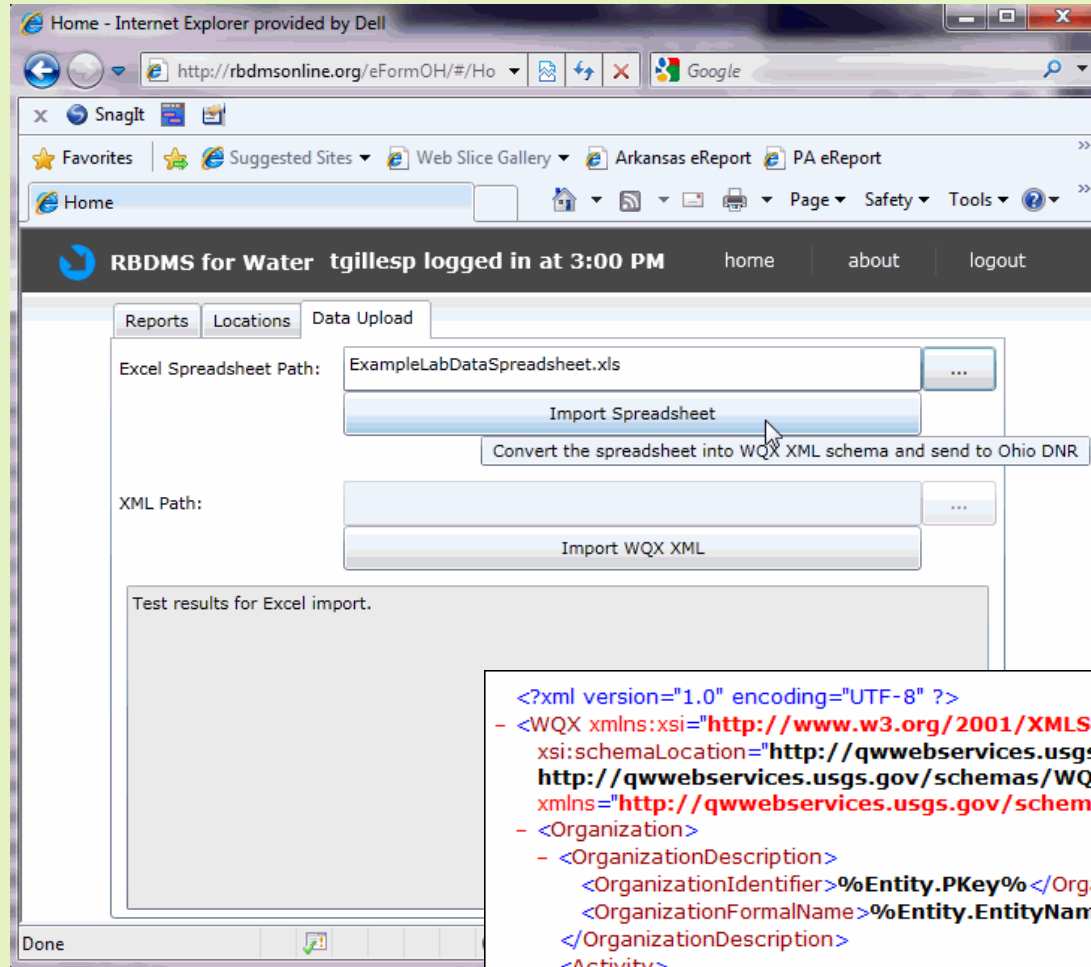
# Full statistical reporting features multiple formats (trend, box-whisker, tabular, others).



# Excel spreadsheet upload format shown with data mapping to OHRBDMSW:

Organization	ID	Name						
	%Entity.PKey%	%Entity.EntityName%						
	123	ABC Labs						
Sample	Location ID	Reason	Matrix	Sample Date	Time	Project Code	Sampler	Station Name
	%Obs.LocID%	%Obs.Reason%	%Obs.Matrix%	%Obs.ObsDate%	%Obs.ObsDate%	%Obs.ProjectCode%	%Obs.Sampler%	%Loc.LocStation%
	21345	Routine	Surface Water	2/14/2010	13:10	Project1	Gregg	Yellow Creek 1
Result	Analysis ID	Value	Units	Qualifier	Method ID	Method Name	Lab Comments	Detection Limit
	%Result.ParamID%	%Result.ResultValue%	%Result.Units%	%Result.Qualifier%	%Result.TestID%		%Result.LabComments%	%Result.DetectionLimit%
	Temp	25	C		Therm	Thermometer		-50
	DO	8.2	mg/l		Probe	DO Probe		0.1
	CA	50	mg/l		ICAP	ICAP		0.1
Sample	Location ID	Reason	Matrix	Sample Date	Time	Project Code	Sampler	Station Name
	6789	Monthly	Ground Water	2/1/2010	9:15	Project 2	Tom	MW1
Result	Analysis ID	Value	Units	Qualifier	Method ID	Method Name	Lab Comments	Detection Limit
	Temp	15	C		Therm	Thermometer		-50
	DO	0	mg/l		Probe	DO Probe		0.1
	CA	100	mg/l		ICAP	ICAP		0.1

# Data upload portal accepts formatted Excel or WQX-compliant xml files.



```
<?xml version="1.0" encoding="UTF-8" ?>
- <WQX xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://qwwebservices.usgs.gov/schemas/WQX-Outbound/2_0/
  http://qwwebservices.usgs.gov/schemas/WQX-Outbound/2_0/index.xsd"
  xmlns="http://qwwebservices.usgs.gov/schemas/WQX-Outbound/2_0/">
- <Organization>
- <OrganizationDescription>
  <OrganizationIdentifier>%Entity.PKey%</OrganizationIdentifier>
  <OrganizationFormalName>%Entity.EntityName%</OrganizationFormalName>
</OrganizationDescription>
- <Activity>
- <ActivityDescription>
  <ActivityIdentifier>%Obs.LocID%</ActivityIdentifier>
  <ActivityTypeCode>%Obs.Reason%</ActivityTypeCode>
  <ActivityMediaName>%Obs.Matrix%</ActivityMediaName>
  <ActivityMediaSubdivisionName>%Obs.Matrix%</ActivityMediaSubdivisionName>
```



## Plans for successive rollouts:

- The Ohio RBDMS for Water Phase 2 project is planned for a completion date of end-Oct 2010.
- The project has been developed to meet DMRM's specific business needs while providing the flexibility to meet other agencies' requirements through middle-tier customization.
- The GWPC plans to use the Ohio version of RBDMS for Water as the code base for other state agency installations.
- Updates to the base business logic made in these later projects will be offered back to the DMRM as an updated installer package that will not disturb OH-specific programming.