



USING AN ENVIRONMENTAL DATA WAREHOUSE TO INTEGRATE ANALYTICAL DATA, GIS, AND THE WEB

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What Is The Problem?

- Large, complex sites/facilities have a multitude of reports, extensive data, technical information and drawings related to:
 - Engineering,
 - Environmental Sciences
 - Biological Sciences
 - Safety

Examples

- CERCLA/RCRA (superfund) Sites
- Defense Installations
- Industrial Sites
- Hazardous Waste Storage Facilities
- Disaster Areas such as New Orleans

What are the Issues?

- Sites have many years of activity and research.
- Multiple contractors, researchers, and regulatory agencies hold “pieces” of complete data sets & technical information.
- Accumulated knowledge not readily accessible

As knowledge is gained so do concerns

Engineering Challenges

- Site & Facility Plans are not created equal
 - Details vary from one technical drawing to another depending on
 - » scopes of work for individual projects
 - » or areas of interest and
 - » contractor
- Variety of coordinate systems
 - Evolves over time
- Symbols and scales are not uniform
 - Different ways to represent same features

Scientific Challenges

- Data Generated from a Wide Range of Studies
 - Geotechnical and geophysical
 - Surface and Ground Water Studies & Modeling
 - Environmental Analyses
 - Emergency Response
 - Fauna and Flora Habitats
 - Land Use
 - Risk Assessment

Scientific Challenges

- Unique databases
 - From index cards to high-end relational dbs
 - Variety of field names representing same type of data or data collection locations
 - Unique naming of the same features
- Different levels of reporting standards
 - Always improving detection limits
 - Data Quality erratically reported
 - Data Validation erratically reported
 - Each researcher handles & reports data quality “exceptions” differently

Security, Safety, and other Regulatory Challenges

Federal, State, and Local Agencies

- Data Reporting Requirements differ between regulatory agencies
 - Multiple submissions of same data in different formats
- Security Issues
 - New levels of security bureaucracy in Post 9-11 era
 - New security rules in Post 9-11 era
 - Access to classified data?
- Paper, paper, paper
 - submission, tracking & storage via traditional reporting mechanisms

SOLUTION?

The Concept of an Integrated Data Management/Retrieval System

- A systematic and consistent approach
 - Ability to retrieve and display data, maps, and models in a consistent and easy-to-use format
 - Automatic and customized reformatting of data from a variety of inputs
 - Appropriate Security Access to data depending on security clearance

Who Will Benefit?

- Site/Facility Owners
- Contractors
- Researchers
- Regulators
- Public

Components of an Integrated Data Management/Retrieval System

- Data Warehouse
- Geographic Information System
- Web access
 - Intranet
 - Internet

Data Warehouse

- Analytical data from all known sources of data integrated into a single database.
 - Spatially-enabled data tables (likened to a master sample location feature table in GIS)
 - Unified parameter names, units, dates, and location names.
 - Consistent, rule-based loading of data applied
 - Detection limits,
 - Missing data,
 - Non-detects

Geographic Information System

- Uses geodatabase concept
 - Centralized spatial and attribute data storage
 - Line and polygon topology models
 - Easy-to-use customizing and validation rules
 - Available Standards for a variety of features

Geographic Information System

- Integrate features from a variety of GIS and CAD datasets
 - Consistent coordinate system
 - Layers converted to feature classes
 - Versioning abilities
 - Include raster datasets

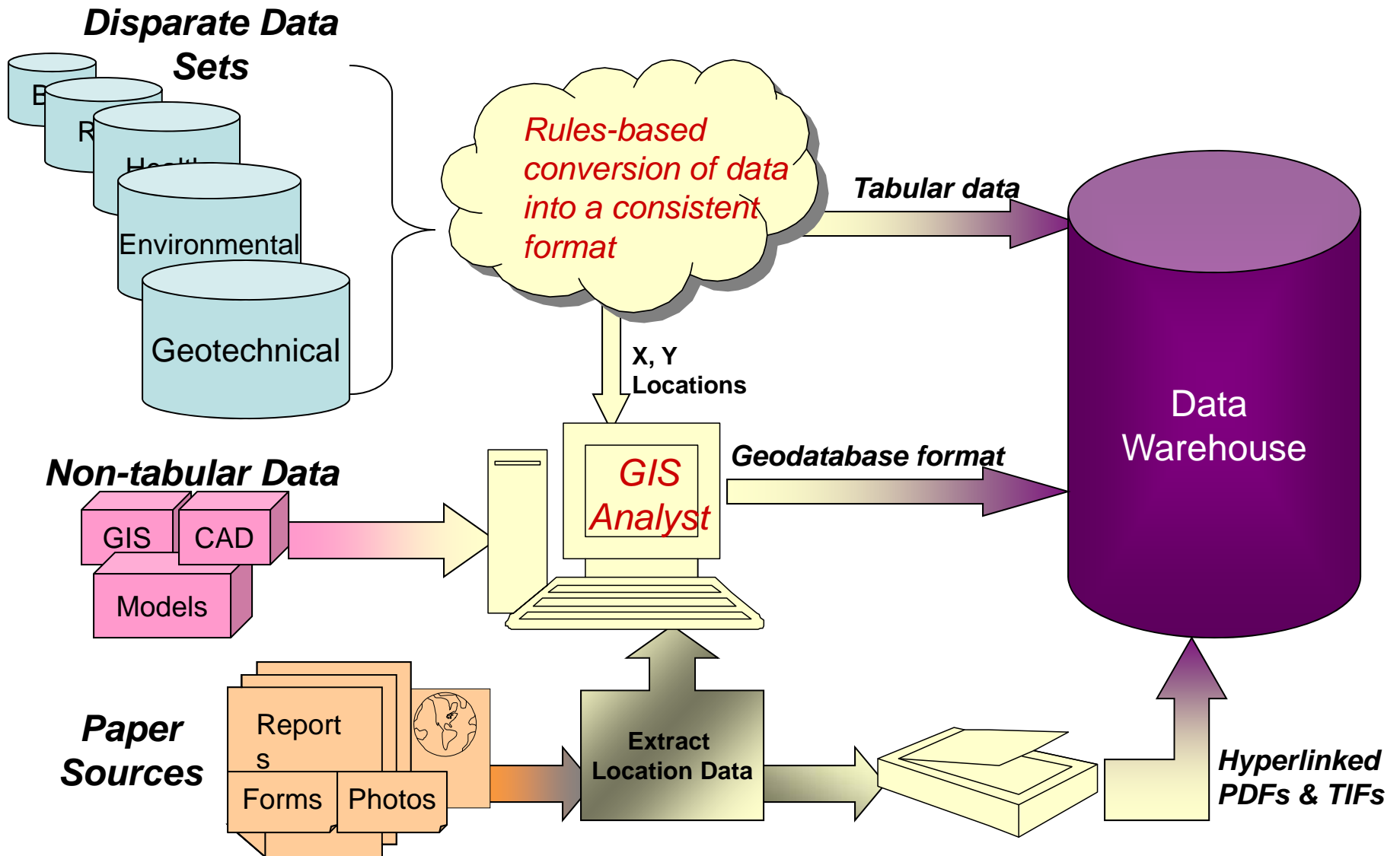
WEB Access

- Multiple query options
 - By form (drop-down lists)
 - By Map (point and click)
 - SQL queries (text-based)
- Multiple Views
 - Documents
 - Tabular data
 - maps

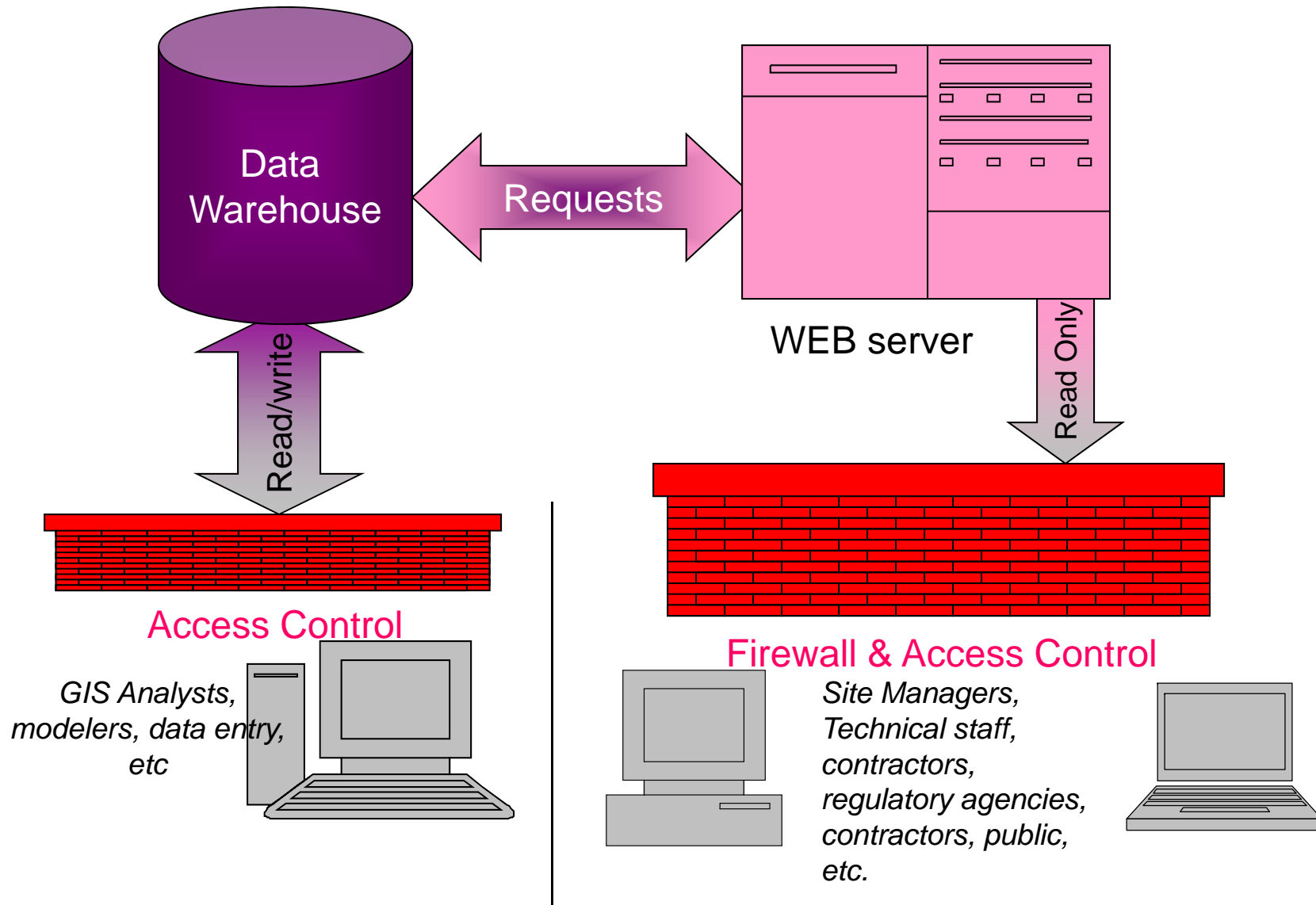
WEB Access

- INTRAnet OR INTERnet
- Variety of export features
 - To spreadsheets
 - Predefined models or applications
 - To reports
- Secure Access
 - Username and Password
 - “Public” access

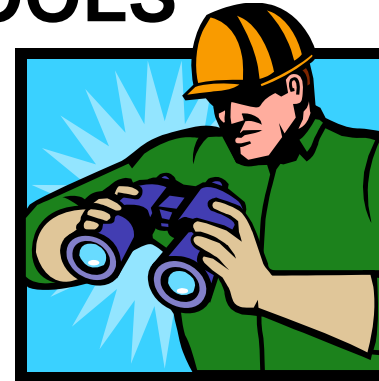
Input & Conversion



End-User Access



WEB Products SEARCH TOOLS



By Map

Paducah GIS

Home | Analytical Data & Plotting | Site Viewer | Well and Borehole Information | GeoScience Information

LOCATIONS: Click Here to Get all Locations
78BC58-UC
001-000
001-001
001-002

ANALYTES: Click Here to Get all Analytes
(1,1-Dimethyl-ethyl)benzene
1-Methyl-ethylbenzene
1-Methylpropylbenzene
(P)-Mepiprin-4-ol

MEDIA: Click Here to Get all Media
Ambient Air
Animal Tissue
Aquatic Animal
Cement

FRACTION: Click Here to Get all Fractions
Anions
Biological morphometric meas.
Biological toxicity tests
Dioxins or Furans

SAMPLING EVENT: Click Here to Get all Sampling Events
140 m3 Characterization - Profile 1-LLW94-03
140 m3 Characterization - Profile 2 & 3 LLW94-04
140 m3 Characterization - Profile 4-LLW94-05
140 m3 Characterization - Profile 4 - OLS-LLW94-07

DETECTS: NON-DETECTS

ENDING DEPTH: all

SAMPLE DATES: STARTING: 2/19/1985, ENDING: 6/20/2005

ORDER BY: Primary: Location, Secondary: Date Collected

Submit Query to View Data in Table | *Submit Query to Excel® Spreadsheet | Reset Lists

*It is recommended to submit your query to a table to ensure all the records generated by the query will fit on one Microsoft® Excel® Spreadsheet. Max (65,535 records)

By Form

Paducah GIS Viewer

INSULATION
LIQUID_EMULSION
LIQUID_FROM_TANK
LIQUID_WATER_LIQUID
METAL_SHAVINGS
NOT_AVAILABLE
NOT_WATER_LIQUID
OIL_ALL_TYPES
PLANT_TISSUE
SCRAPINGS
SEDIMENT_ASSOCIATED_WITH_SW
SLUDGE
SOIL
SOIL_GAS
SOLID_WASTE
SURFACE_WATER
SWAB_OR_WIPE
TREATED_WATER

MAIN MENU: Feature Search (by Name) | Feature Search (by Description) | Query Samples by Media

View Legend
Set Media Result Layers
Set Non-Media Layers
Zoom-Original Extent

http://204.115.179.18: SAMPLE MEDIA QUERY BY ANALYTE

LOCATE GROUNDWATERSAMPLES HAVING SELECTED ANIONS - DETECT OR NON-DETECT
SELECT CHEMICALS (QUERY MAY TAKE SEVERAL MINUTES)
Alkalinity
Alkalinity as CO3
Alkalinity as HCO3
Submit Query to View Data in Table
Submit Query to Excel Spreadsheet

SELECT MEDIA: Ambient Air
 HAVING CHEMICALS - DETECT OR NON-DETECT
 HAVING CHEMICALS - DETECT ONLY
 CHEMICAL EXCEEDANCE - DETECT ONLY

SELECT FRACTION: Anions

Submit

WEB Products

Display Results

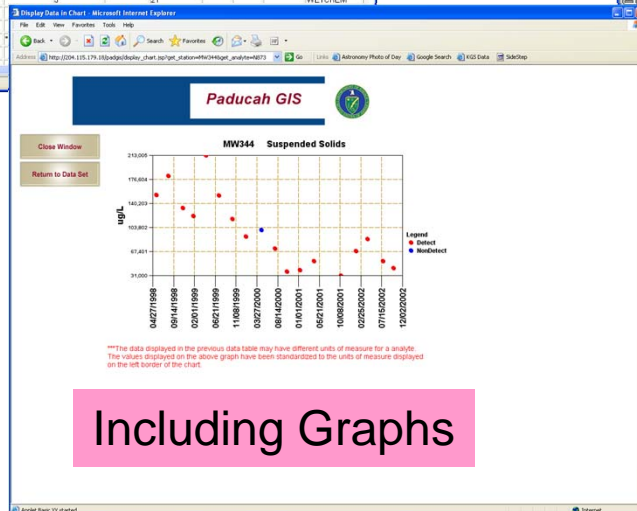
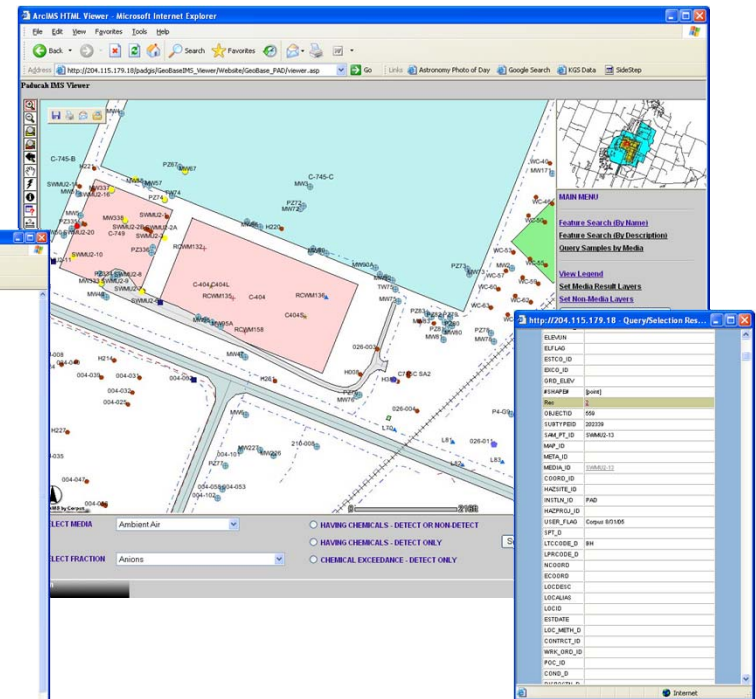
Tabular

Paducah GIS

The query generated 3972 record(s).

	STATION	DATE COLLECTED	ANALYTE	SAMPLE TYPE	RESULT	UNITS	RESULT QUALIFIER	VALIDATION QUALIFIER	PRECISE QUALIFIER	DETECTION LIMIT	RAD ERROR	RAD ERROR	BOTTOM SAMPLE DEPTH IN	FRACTION
Temporal Plot	004-020	09/11/1999	Suspended Solids	REG	2.63E7	ug/L	=			10		84.0	WETCHEM	
Temporal Plot	004-021	09/21/1999	Suspended Solids	REG	1919000.0	ug/L	=			10		85.0	WETCHEM	
Temporal Plot	004-022	12/02/1999	Suspended Solids	REG	8653000.0	ug/L	X			10		85.0	WETCHEM	
Temporal Plot	004-028	09/07/1999	Suspended Solids	REG	276000.0	ug/L	=			10		88.0	WETCHEM	
Temporal Plot	004-029	09/11/1999	Suspended Solids	REG	600000.0	ug/L	=			10		89.0	WETCHEM	
Temporal Plot	004-037	09/10/1999	Suspended Solids	REG	2154000.0	ug/L	X			10		45.0	WETCHEM	
Temporal Plot	005-013	09/27/1999	Suspended Solids	REG	876000.0	ug/L	X			10		73.0	WETCHEM	
Temporal Plot	005-015	07/26/1999	Suspended Solids	REG	700000.0	ug/L	X			10		60.0	WETCHEM	
Temporal Plot	005-018	12/16/1999	Suspended Solids	REG	1.336E7	ug/L	X			10		85.0	WETCHEM	
Temporal Plot	005-026	09/24/1999	Suspended Solids	REG	1164767	ug/L	X			10		83.0	WETCHEM	
Temporal Plot	005-016	07/13/1999	Suspended Solids	REG	1127000.0	ug/L	X			10		37.0	WETCHEM	
Temporal Plot	006-018	07/14/1999	Suspended Solids	REG	3.94E7	ug/L	X			0.01		27.0	WETCHEM	
Temporal Plot	006-019	02/01/2000	Suspended Solids	REG	3596000.0	ug/L	X			10		85.0	WETCHEM	
Temporal Plot	006-024	09/21/1999	Suspended Solids	REG	937000.0	ug/L	X			10		83.0	WETCHEM	
Temporal Plot	006-025	09/16/1999	Suspended Solids	REG	497000.0	ug/L	X			10		98.0	WETCHEM	
6P TANK	06/28/2003	Suspended Solids	REG	11000.0	ug/L	X				10			WETCHEM	
6P TANK	06/13/2003	Suspended Solids	REG	49000.0	ug/L	X				25			WETCHEM	
6P TANK	06/04/2003	Suspended Solids	REG	63000.0	ug/L	X				20			WETCHEM	
746KTB1	11/29/2001	Suspended Solids	REG	36000.0	ug/L	X				22			WETCHEM	
746KTB1	09/20/2002	Suspended Solids	REG	342000.0	ug/L	X				111			WETCHEM	
746KTB1	09/02/2003	Suspended Solids	REG	38000.0	ug/L	X				20			WETCHEM	
746KTB2	11/28/2001	Suspended Solids	REG	57000.0	ug/L	X				22			WETCHEM	
746KTB2	09/20/2002	Suspended Solids	REG	300000.0	ug/L	X				100			WETCHEM	
746KTB2	02/20/2003	Suspended Solids	REG	30000.0	ug/L	X				21			WETCHEM	
746KTB2	09/02/2003	Suspended Solids	REG	24000.0	ug/L	X							WETCHEM	
746KUP	09/19/2001	Suspended Solids	REG	55000.0	ug/L	X							WETCHEM	
746KUP	11/29/2001	Suspended Solids	REG	44000.0	ug/L	X							WETCHEM	
6V-006	02/29/2003	Suspended Solids	REG	36000.0	ug/L	X							WETCHEM	

Graphical



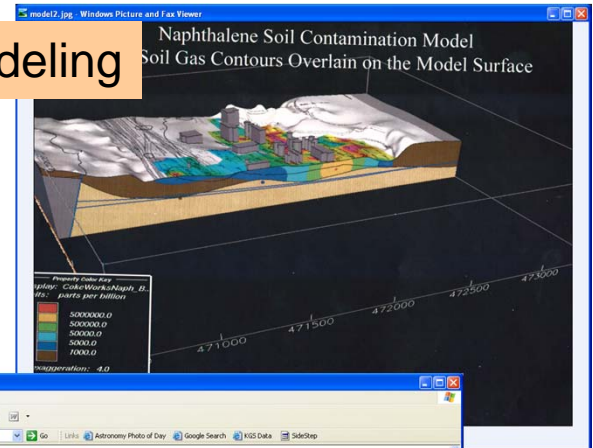
WEB Products

Ancillary Output Possibilities

Spreadsheet

Name	Boring	Easting	Elevation	Remarks
CFI-1	313697.2	1114242.4	444.5	Ground @ stake. No boring at this location.
CFI-2	314659.6	1113406.2	347.3	Ground @ boring.
CFI-3	314646.4	1114109.1	402.5	Ground @ stake. No boring at this location.
CFI-3A	314764.9	1114064.7	405.9	Ground @ boring.
CFI-4	315751.9	1112695.5	359.5	Ground @ boring.
CFI-5	316073.4	1113179.3	358.5	Ground @ boring. "300 FT SE" written on stake by boring.
CFI-6	316585.9	1113622.8	361.2	Ground @ boring.
CFI-6A	316597.7	1113627.6	369.3	Ground @ boring.
CFI-7A			???	
CFI-7	314242.5	1115044.5	309.8	Ground @ boring.
CFI-8	315011.9	1115645.5	345.9	Ground @ boring. "20 FT SW" written on stake by boring.
CFI-9	316119.7	1114544.5	345.6	Ground @ boring.
CFI-10	315709.4	1115313.3	345.7	Ground @ boring.
CFI-11	315298.9	1115512.0	344.6	Ground @ boring.
CFI-12	316127.1	1115615.3	325.9	Ground @ boring.
CFI-13	315029.3	1116220.1	350.7	Ground @ boring. "30 FT SW" written on stake by boring.
CFI-14	314200.4	1116115.5	352.3	Ground @ boring.
CFI-15	316377.2	1114906.1	349.1	Ground @ boring.
CFI-16A			???	
CFI-16	315579.3	1116214.5	349.7	Ground @ boring.
CFI-17	314208.3	1113634.5	344.8	Ground @ boring.
CFI-18	316094.6	1114709.8	345.7	Ground @ boring.
CFI-19	315236.9	1116619.2	345.4	Ground @ boring. "30 FT SW" written on stake by boring.
CFI-20	315869.3	1113654.4	345.4	Ground @ stake. "70 FT SW" written on stake. No boring at this location.
CFI-21A			???	
CFI-21	316903.2	1113070.0	346.1	Ground @ boring.
CFI-21	316210.9	1113066.9	349.9	Ground @ boring.
CFI-22A			???	
CFI-22	313959.4	1114857.7	354.9	Ground @ boring.

For Modeling



PDF Viewer

CEMS TEAM
WAG 3 RI
LITHOLOGIC LOG

LITHOLOGIC LOG BORING WELL NO. 004-020 PAGE 1 of 1

PROJECT NO. 990006 SUBPROJECT BECHTEL JACOBS PERSON: JEFF BROWNFIELD

LOCATION: TN 8 A BRIDGEPORT MILLER OVERLAND DISTRICT: 8 1/4"

DATE: 08/15/99 15:00 WELL NO. 004-020 1755 DISTRICT: 80 TOWN:

DEVELOPER: ARSA COORDINATOR: N-1223.57 E-6463.90 PROJECT NO. 990006

LOGGED BY: VIRGINIA MALLINS PAGE #7 "REVISED" DISTRICT: 80 TOWN:

DATE: 08/15/99

DESCRIPTION: LITHOLOGIC LOG

LOG: 1.00 to 1.05 ft. S&T, soil, soil from (CFI) by

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LOG: 7.55 to 7.60 ft. S&T, soil, soil from (CFI) by

LOG: 7.60 to 7.65 ft. S&T, soil, soil from (CFI) by

LOG: 7.65 to 7.70 ft. S&T, soil, soil from (CFI) by

LOG: 7.70 to 7.75 ft. S&T, soil, soil from (CFI) by

LOG: 7.75 to 7.80 ft. S&T, soil, soil from (CFI) by

LOG: 7.80 to 7.85 ft. S&T, soil, soil from (CFI) by

LOG: 7.85 to 7.90 ft. S&T, soil, soil from (CFI) by

LOG: 7.90 to 7.95 ft. S&T, soil, soil from (CFI) by

LOG: 7.95 to 8.00 ft. S&T, soil, soil from (CFI) by

LOG: 8.00 to 8.05 ft. S&T, soil, soil from (CFI) by

LOG: 8.05 to 8.10 ft. S&T, soil, soil from (CFI) by

LOG: 8.10 to 8.15 ft. S&T, soil, soil from (CFI) by

LOG: 8.15 to 8.20 ft. S&T, soil, soil from (CFI) by

LOG: 8.20 to 8.25 ft. S&T, soil, soil from (CFI) by

LOG: 8.25 to 8.30 ft. S&T, soil, soil from (CFI) by

LOG: 8.30 to 8.35 ft. S&T, soil, soil from (CFI) by

LOG: 8.35 to 8.40 ft. S&T, soil, soil from (CFI) by

LOG: 8.40 to 8.45 ft. S&T, soil, soil from (CFI) by

LOG: 8.45 to 8.50 ft. S&T, soil, soil from (CFI) by

LOG: 8.50 to 8.55 ft. S&T, soil, soil from (CFI) by

LOG: 8.55 to 8.60 ft. S&T, soil, soil from (CFI) by

LOG: 8.60 to 8.65 ft. S&T, soil, soil from (CFI) by

LOG: 8.65 to 8.70 ft. S&T, soil, soil from (CFI) by

LOG: 8.70 to 8.75 ft. S&T, soil, soil from (CFI) by

LOG: 8.75 to 8.80 ft. S&T, soil, soil from (CFI) by

LOG: 8.80 to 8.85 ft. S&T, soil, soil from (CFI) by

LOG: 8.85 to 8.90 ft. S&T, soil, soil from (CFI) by

LOG: 8.90 to 8.95 ft. S&T, soil, soil from (CFI) by

LOG: 8.95 to 9.00 ft. S&T, soil, soil from (CFI) by

LOG: 9.00 to 9.05 ft. S&T, soil, soil from (CFI) by

LOG: 9.05 to 9.10 ft. S&T, soil, soil from (CFI) by

LOG: 9.10 to 9.15 ft. S&T, soil, soil from (CFI) by

LOG: 9.15 to 9.20 ft. S&T, soil, soil from (CFI) by

LOG: 9.20 to 9.25 ft. S&T, soil, soil from (CFI) by

LOG: 9.25 to 9.30 ft. S&T, soil, soil from (CFI) by

LOG: 9.30 to 9.35 ft. S&T, soil, soil from (CFI) by

LOG: 9.35 to 9.40 ft. S&T, soil, soil from (CFI) by

LOG: 9.40 to 9.45 ft. S&T, soil, soil from (CFI) by

LOG: 9.45 to 9.50 ft. S&T, soil, soil from (CFI) by

LOG: 9.50 to 9.55 ft. S&T, soil, soil from (CFI) by

LOG: 9.55 to 9.60 ft. S&T, soil, soil from (CFI) by

LOG: 9.60 to 9.65 ft. S&T, soil, soil from (CFI) by

LOG: 9.65 to 9.70 ft. S&T, soil, soil from (CFI) by

LOG: 9.70 to 9.75 ft. S&T, soil, soil from (CFI) by

LOG: 9.75 to 9.80 ft. S&T, soil, soil from (CFI) by

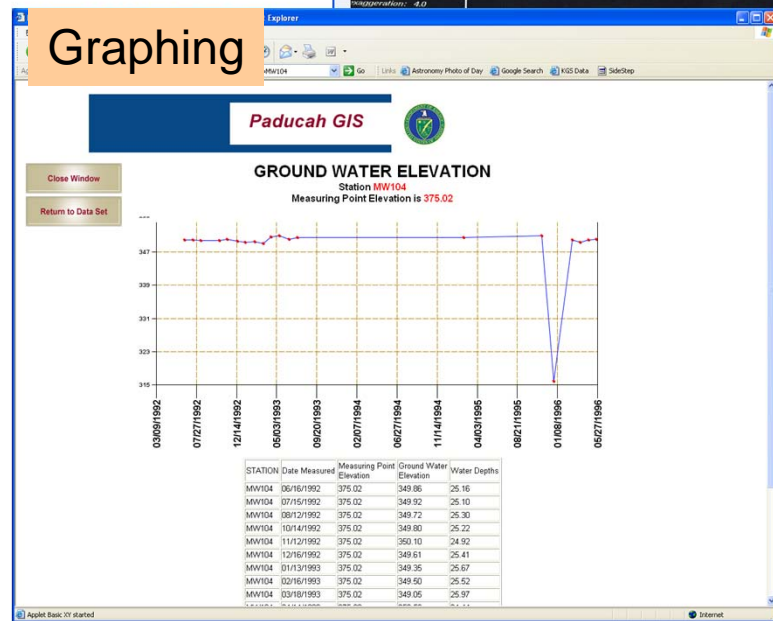
LOG: 9.80 to 9.85 ft. S&T, soil, soil from (CFI) by

LOG: 9.85 to 9.90 ft. S&T, soil, soil from (CFI) by

LOG: 9.90 to 9.95 ft. S&T, soil, soil from (CFI) by

LOG: 9.95 to 10.00 ft. S&T, soil, soil from (CFI) by

Graphing



Advantages/Disadvantages

- Minuses

- DW **requires routine** updates
- Conversion to geodatabases
- Need to update security as users come and go
- Very sophisticated system

- Pluses

- 1 Stop Shopping for Site/Facility Data
- Ends redundancy of Site/Facility data mining activities
- Multiple Data format Output Capability
 - Each user does not have to convert data
 - Consistent formats
- Uniform interface