

Mobile computing and geodatabase application for coal mine inspection

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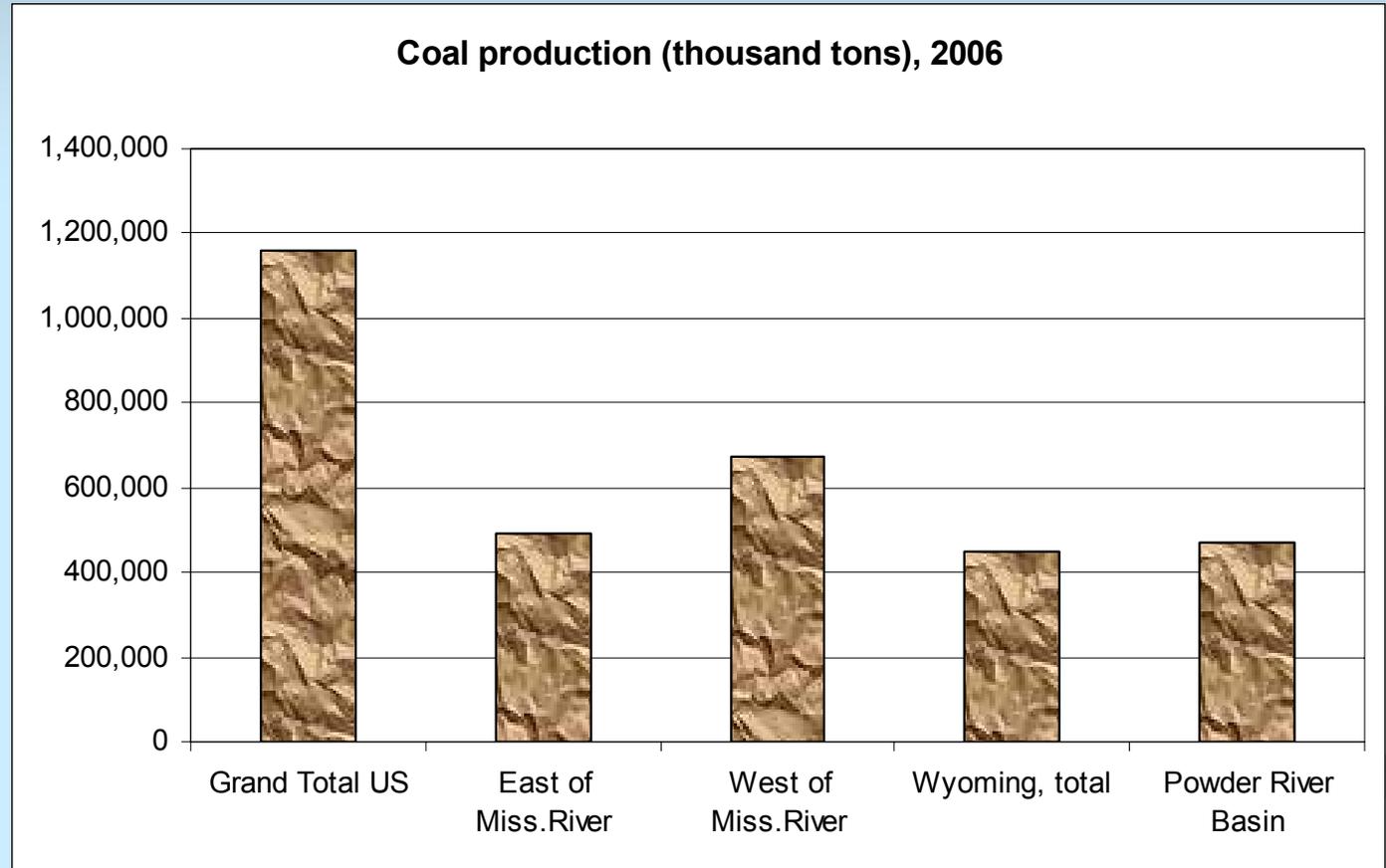
Introduction

Coal mine inspections require:

- **assessment (repetitive) of mining and reclamation activities**
- **verification of compliance with regulatory requirements of the Wyoming Environmental Quality Act and Wyoming Department of Environmental Quality (WDEQ) Coal Rules and Regulations**
- **verification of compliance with permit commitments**

Coal mine inspections in Wyoming –

a challenge for the Land Quality Division of the Department of Environmental Quality

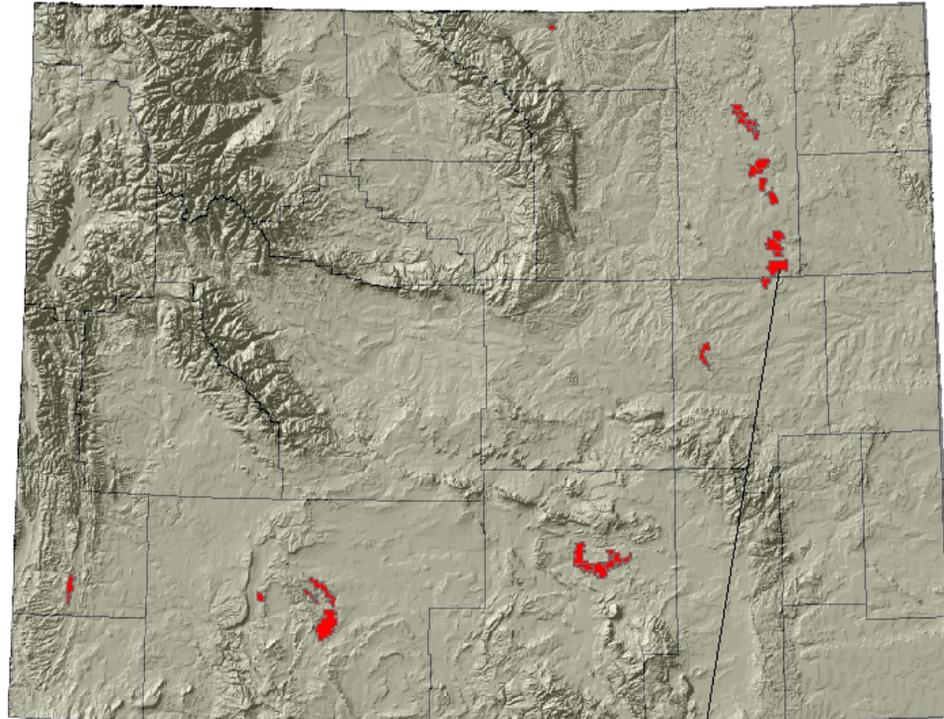


Source: U.S. Department of Labor, Mine Safety and Health Administration, Form 7000-2, "Quarterly Mine Employment and Coal Production Report."

**1/3 coal production
in USA**

Coal Mine Permits, Wyoming

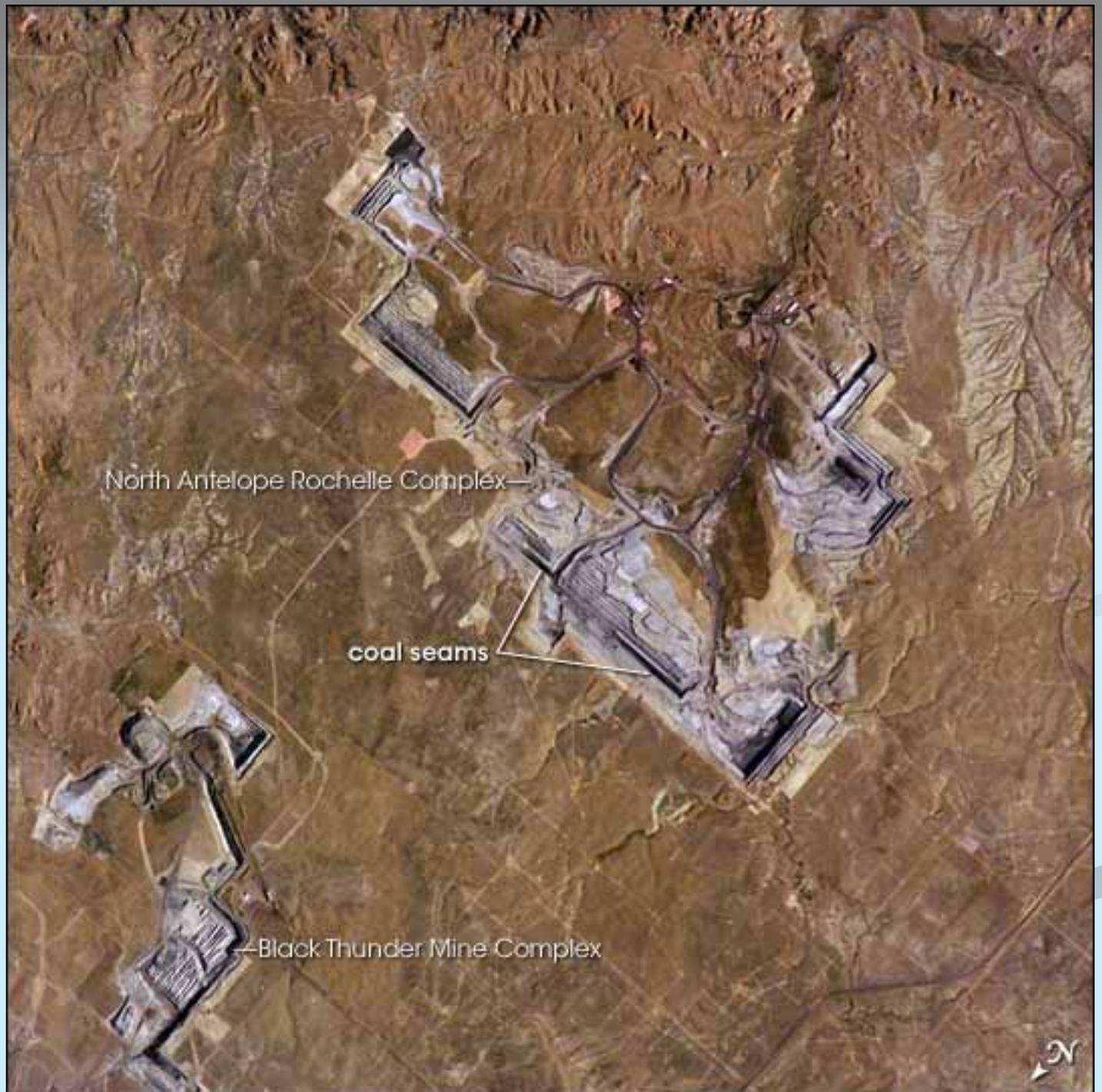
0 15 30 60 90 120 Miles



North Antelope Rochelle Mine

Astronaut Photograph

2005



Coal mine: North Antelope Rochelle Mine
Permit area: 45,975 acres
Coal Production (2007): 96 million tons



Coal mine inspection report:

Past

- » **narrative summaries, taking photographs, xero copy maps. Transcribed from the inspection notebooks (1-2 days of writing the report).**

Current

- » **series of spreadsheet (Excel) including: Mining; Reclamation; and Maintenance activities; list of: topsoil stockpiles (TSP), impoundments, culverts, alternative sediment control measures (ASCM's) (< 1 day of writing the report). Using a laptop and a GPS unit (Pathfinder) at the mine.**

Current/Future

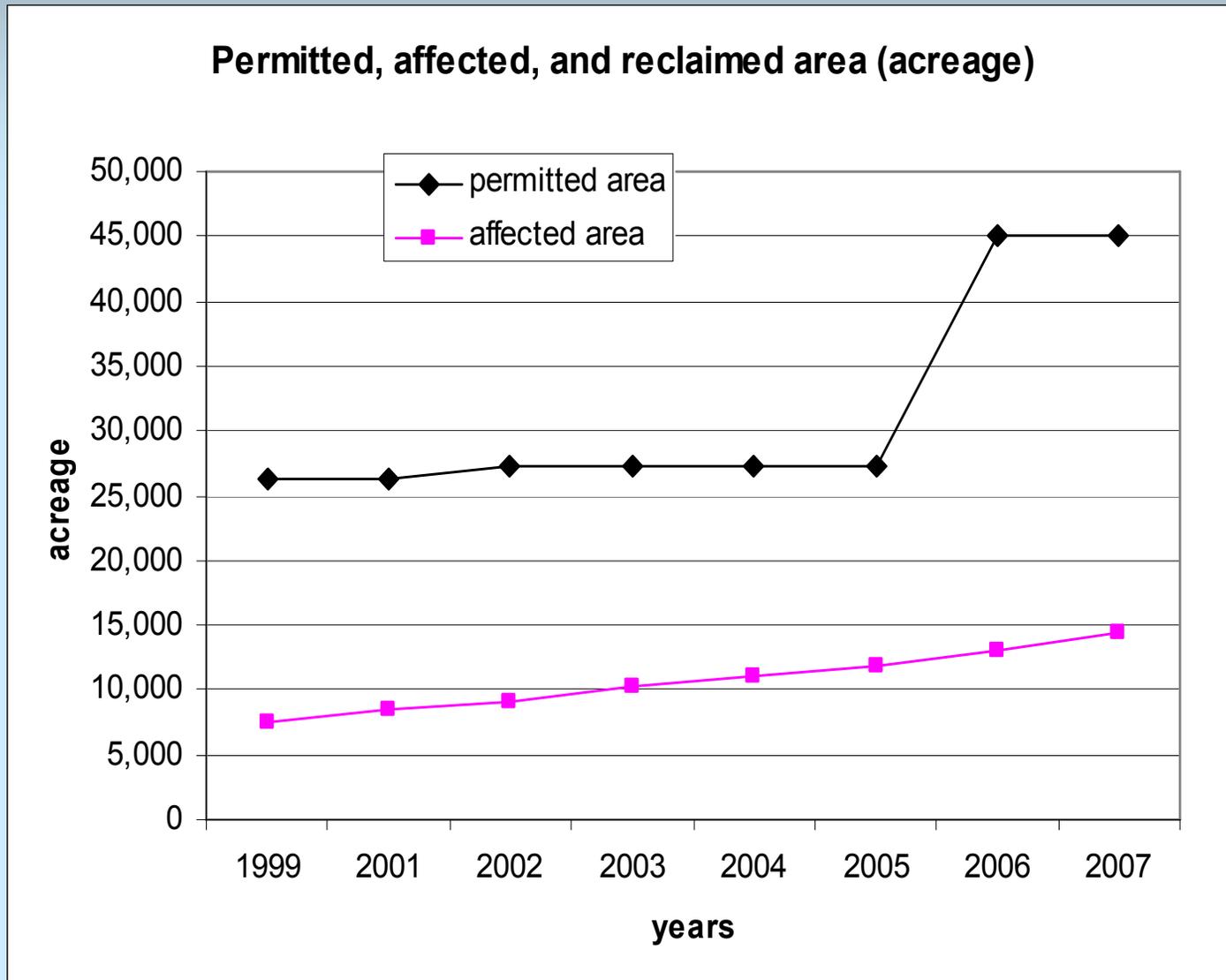
- » **Geodatabase (inspection GIS)– tracking spatial changes. Series of printouts and series of spreadsheet (Excel). Using a laptop and a GPS unit (ArcPad) at the mine.**





Reasons for developing a geodatabase:

■ Increasing permit acreage of the mine



Reasons for developing a geodatabase:

- **Increasing coal production**

By 2011 approximately additional 9000 acres will be mined and the coal production will increase to 115,000,000 tons per year.

Year	Coal production Tons x 1000
Through 2006	1,048,311
2007	96,000
2008	100,000
2009	108,000
2010	112,000
2011	115,000
2012-2016	529,924

North Antelope Rochelle Mine



May 2005



July 2006

Reasons for developing a geodatabase:

Increasing numbers of stockpiles, sediment control and diversion area, monitoring facilities, active coal pit areas, mined and permanently reclaimed areas etc.

The inspected features recorded within NARM's permit area, as of December 2007, included:

- **88 topsoil stockpiles**
- **82 ponds structures (sediment pond, sediment trap, facility, flood control, and backfill ponds and diversion)**
- **109 culverts**
- **23 alternate sediment control measure (ASCM's)**
- **192 groundwater monitoring wells**
- **6 surface water monitoring sites**

- 500 – total features**

Extreme size requires extreme measures

Main goals of the developed geodatabase:

- ◆ **Spatial inventory of all types of inspection features**
- ◆ **Track compliance information associated with all (and every) inspected features**

Methods

- ▶ GIS geodatabase using an ESRI Personal Geodatabase, ArcInfo 9.2 (ArcMap, ArcCatalog, and ArcTools)
- ▶ Mobile GIS function - Trimble GeoExplorer Series GeoXM handheld GPS unit using ESRI ArcPad 7.1

Data sources:

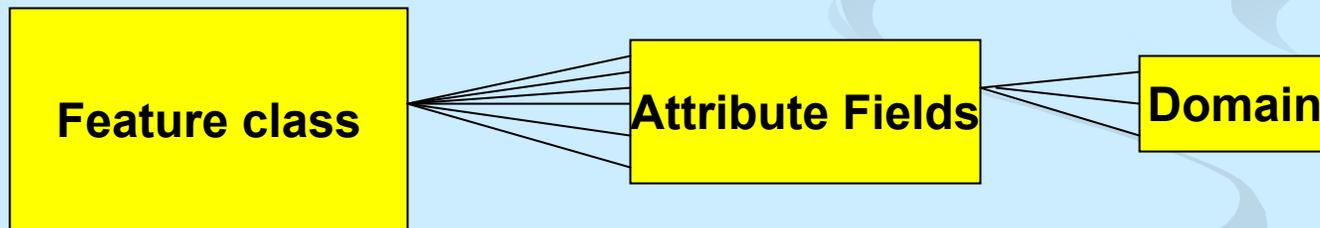
Mine map layers submitted from the:

- mine operator,
- inspection reports,
- field collected GPS data

Results

Developing a spatial database (geodatabase) for the inspection purposes. A spatial database is structured using tables. Each row represents a record contained within the thematic layer (feature class) and columns (attribute fields) contain all required types of information associated with the record including the location.

1. Choosing thematic layers to organize information - **Feature Classes**
2. Creating **Attribute Table** (Attribute Fields) for each of the feature class
3. Choosing **Data Types** and **Domains**



4. Using a mobile GIS application to collect and update inspection features

1. Choosing thematic layers for the spatial database

All thematic layers require a form of spatial representation (points, lines or polygons). Within the ESRI Geodatabase they are called Feature Class. It is a table with shape fields.

Feature Classes are chosen on the basis of requirements of the:

- Wyoming Environmental Quality Act
- Wyoming Department of Environmental Quality Rules and Regulations (WDEQ)
- Permit Commitments

Feature classes that are related by the type of data they support can be organized using a feature dataset.

Thematic Layers (Feature Classes)	Feature Dataset	Spatial Representation
Topsoil Stockpile (TSP)		Polygon
Impoundment		Polygon
Culvert		Point
Alternate Sediment Control Measure - ASCM's		Point
Monitoring Location		Point
Topsoil Application	Topsoil Dataset	Polygon
Topsoil Depth Verification		Point
Erosion Feature	Erosion Dataset	Line
Erosion Point		Point
Rough Backfill Verification		Polygon

2. Creating Attribute Table for each of the feature class

Each feature class is described by the various specific Attribute Field Name (text or date).

Attribute Tables are chosen on the basis of requirements of the:

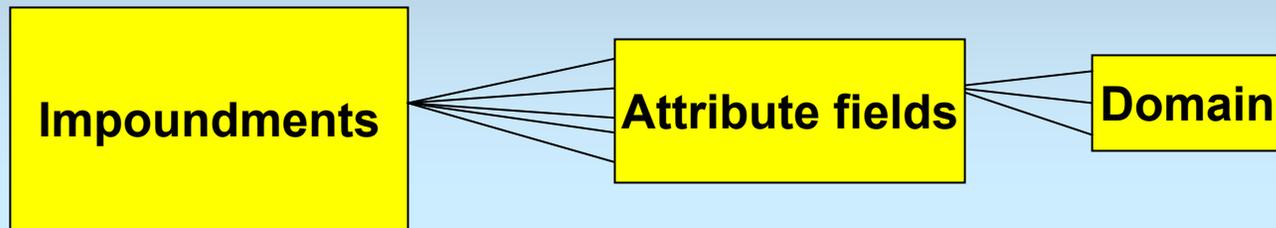
- Wyoming Environmental Quality Act
- Wyoming Department of Environmental Quality Rules and Regulations (WDEQ)
- Permit Commitments

3. Choosing:

- **Data Types (Date or Text)**
- **Domain**

The **Domain** name includes:

- Various type of ASCM's,
- Various type of impoundments,
- Erosional feature type,
- Impoundment capacity,
- Impoundment status,
- Reclamation status,
- Topsoil stockpile status,
- Surface water monitoring station status



Impoundments, NARM

U1



Impoundments Feature Class and Attribute Fields

According to WDEQ Coal Rules and Regulations the performance standard for the inspection of impoundments includes:

“Sedimentation ponds shall be designated and maintained to contain adequate storage as determined by acceptable empirical methods.”



Attribute field

Impoundment capacity

“Faces of embankments and surrounding areas shall be vegetated, except that faces where water is impounded may be riprapped or otherwise stabilized in accordance with accepted design practices.”



Attribute field

Impoundment stability

Impoundment Attribute Table, Data Type, and Domain Names

Attribute Field name	Data type	Domain	Comments
Impoundment ID	text		Unique identifier used to reference the feature
Impoundment Status	text	Permanent Temporary	Describes time of the uses
Impoundment Type	text	Flood Control Facility Sediment Control Sediment Trap Diversion Backfill	Describes type of the feature
Construction Date	date	Calendar	Records date of the last disturbance due to construction
Removal Date	date	Calendar	Date of removal (<null> means End of Mining)
NPDES Status	text	Yes, No	Describes NPDES status
Discharge	text	Yes, No	Describes whether water is present
Inspection date	date	Calendar	Records date of most recent inspection
Inspector name	text	Waitkus, Buchanan	Choose the inspector name
Erosion Compliance	text	Acceptable Not Acceptable	If inlet, outlet, or sides of the pond show significant erosional features that can affect integrity of the pond
Erosion Compliance Date	date	Calendar	Date when the erosional features are supposed to be repaired. Scheduled date of correction.
Capacity Compliance	text	Acceptable Not Acceptable	If the sediment pond is full of sediment and needs to be cleaned.
Capacity Compliance Date	date	Calendar	Scheduled date of correction
Water present	text	Yes, No	Describes whether water is present
Comments	text		

File Edit View Insert Selection Tools Window Help

1:53,408

100%

Editor Task: Create New Feature Target:

Info - P:\GIS\Inspection\NARM\NARM_Inspection.gdb

Tools Window Help

Inspection\NARM\NARM_Inspection.gdb

Contents Preview Metadata

Name

- ASCM
- Culverts
- Erosion_Feature
- Erosion_Point
- Groundwater_Monitoring
- Impoundments
- Impoundments_test
- narm9_25_07_nad27spwye
- Surfacewater_Monitoring
- Topsoil_Application
- Topsoil_Depth
- TSP

2007 Topsoil Verification EXPRESSIONS

Monthly Inspections

NARM Inspection GIS

Copy of NARM_Inspection.gdb

NARM_Inspection.gdb

erosion.mxd

Inspection_test.mxd

sedcontr.mxd

note Display

ToWDEQ-LQD_080213

tions

t Imagery

Shared GIS Files

Feature Class Properties

General XY Coordinate System Tolerance Resolution

Fields Indexes Subtypes Relationships

Subtype Field: <None>

Default Subtype:

Subtypes:

Code	Description

Default Values and Domains:

Field Name	Default Value	Domain
Impoundment_ID		
Impoundment_Status		Imp_Status
Impoundment_Type		Imp_type
Construction_Date		
Removal_Date		
NPDES_Status	Yes No	

Use Defaults Domains...

OK Cancel Apply

Workspace Domains

Domains

Domain Name	Description
ASCM_type	types of ASCMS
Cover_Status	
Eros_type	
Eros_Type_2	
Imp_Capacity	Evaluates available impoundment capacity
Imp_Status	Life of the impoundment
Imp_type	Describes type of impoundment
Inspector	
Permit	

Domain Properties:

Field Type	Text
Domain Type	Coded Values
Split policy	Default Value
Merge policy	Default Value

Coded Values:

Code	Description
1	Sediment Control
2	Sediment Trap
3	Diversion
4	Facility
5	Flood Control
Backfill	Backfill

OK Cancel Apply

Display Source Selection

Drawing

Arial 10 B I U

Geo4534E00083

File Zoom Tools Help

ArcPad 1:20

Topsoil_Depth

Impoundments

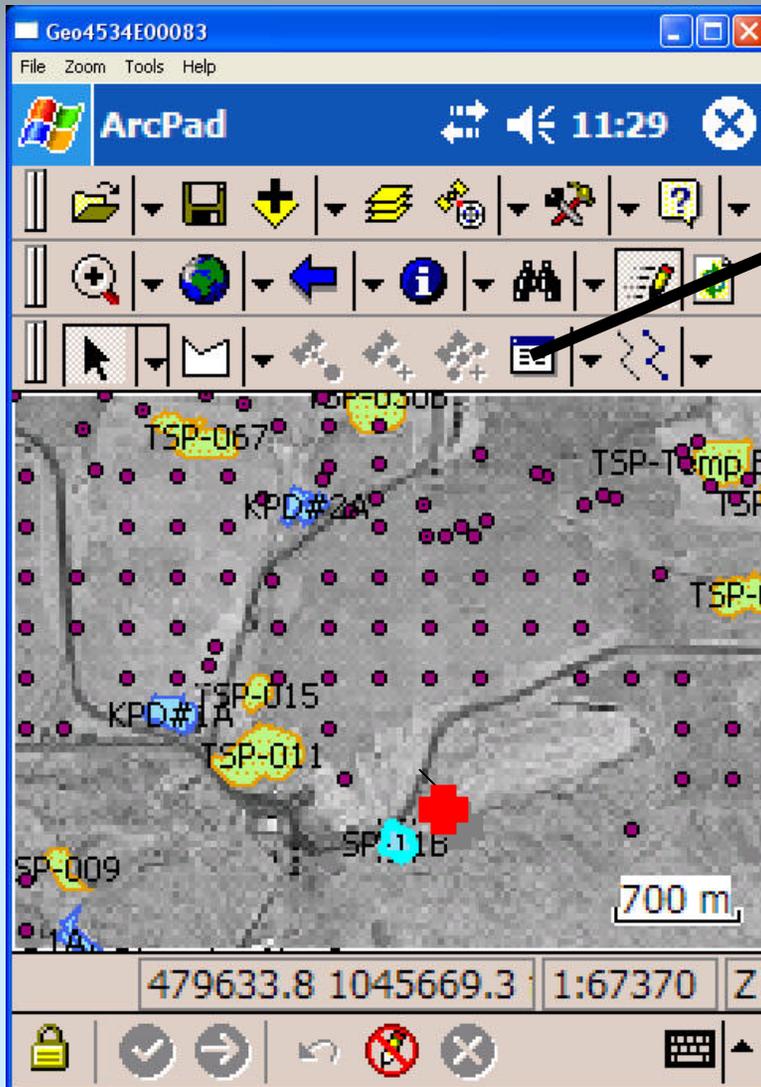
TSP

Boss Draw res.

Porcupine Creek Diversion No. 2

3 km

475802.8 1048494.0 1:298114 Z



Geo4534E00083

File Zoom Tools Help

ArcPad 11:33

Impoundments

Property	Value
Impound...	SP-11B
Impound...	Temporary
Impound...	Sediment Control
Construc...	1985-01-01 00:00:00
Removal...	<Null>
NPDES_S...	Yes
Discharge	No
Inspectio...	2008-02-19 00:00:00
Inspector	Waitkus
Eros_Co...	Acceptable
Eros_Co...	<Null>

Attributes Picture Symbols

ok X

Advantages of the spatial Impoundment geodatabase:

Quality:

- Analyze data for the permit purposes, e.g. revising the removal date of sediment ponds, revising names of the sediment ponds etc.

Efficiency:

- Accelerating the process of exchanging information between various agencies, e.g. with Water Quality Division for NPDES

1:64,360

100%

Task: Create New Feature Target:

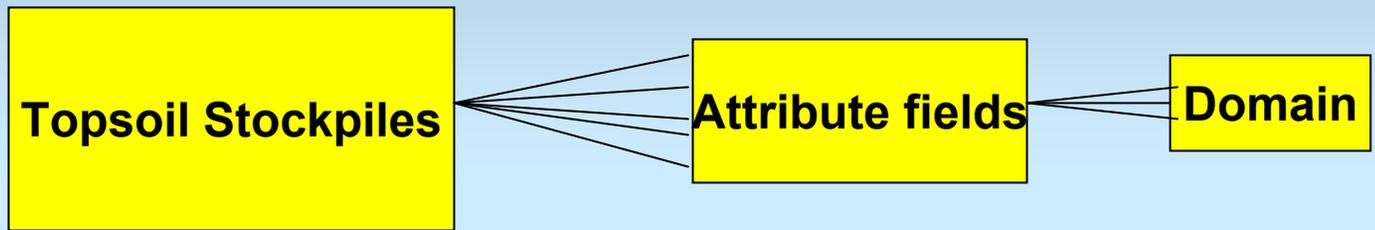
Revising list of the NPDES

Attributes of Impoundments

Impoundment_ID	NPDES_Status	Discharge	Inspection_Date	Inspector
Shop Reservoir	Yes	No	2/19/2008	Waitkus
SP-6A	Yes	No	3/8/2007	Waitkus
NA SHOP Res.	Yes	No	7/26/2007	Waitkus
Railroad loop Res.	Yes	No	7/26/2007	Waitkus
SP-10	Yes	No	2/19/2008	Waitkus
SP-9A	Yes	No	2/19/2008	Waitkus
SP-8	Yes	No	2/19/2008	Waitkus
SP-7A	Yes	No	2/19/2008	Waitkus
SP-42A	Yes	No	9/5/2007	Waitkus
SP-52	Yes	No	9/5/2007	Waitkus
SP-11B	Yes	No	2/19/2008	Waitkus
SP-53	Yes	No	1/18/2007	Waitkus
SP-41A	Yes	No	9/5/2007	Waitkus
SP-47	Yes	No	9/5/2007	Waitkus
SP-46	Yes	No	9/5/2007	Waitkus
SP-54	Yes	No	2/19/2008	Waitkus
SP-55	Yes	No	1/18/2007	Waitkus
SP-56	Yes	No	1/18/2007	Waitkus
SP-60	Yes	No	1/18/2007	Buchanan

Record: 0 Show: All Selected Records (20 out of 76 Selected)





Topsoil Stockpile Feature Class and Attribute Fields

According to WDEQ Coal Rules and Regulations the performance standard for the inspection of topsoil stockpile includes:

“When topsoil is not promptly redistributed, the topsoil or approved surface material shall be stockpiled on stable areas within the permit area in such a manner so as to minimize wind and water erosion and unnecessary compaction.”)

↓
Attribute field

Berm/Ditch Present, Erosion Type, and Vegetation Status

“Topsoil stockpiles shall be marked with a legible sign containing letters not less than six inches high on all approach roads to such stockpiles. Said signs shall contain the word “Topsoil” and shall be placed not more than 150 feet from any and all stockpiles of topsoil. Such signs must be in place at the time stockpiling is begun.”

↓
Attribute field

Sign Present

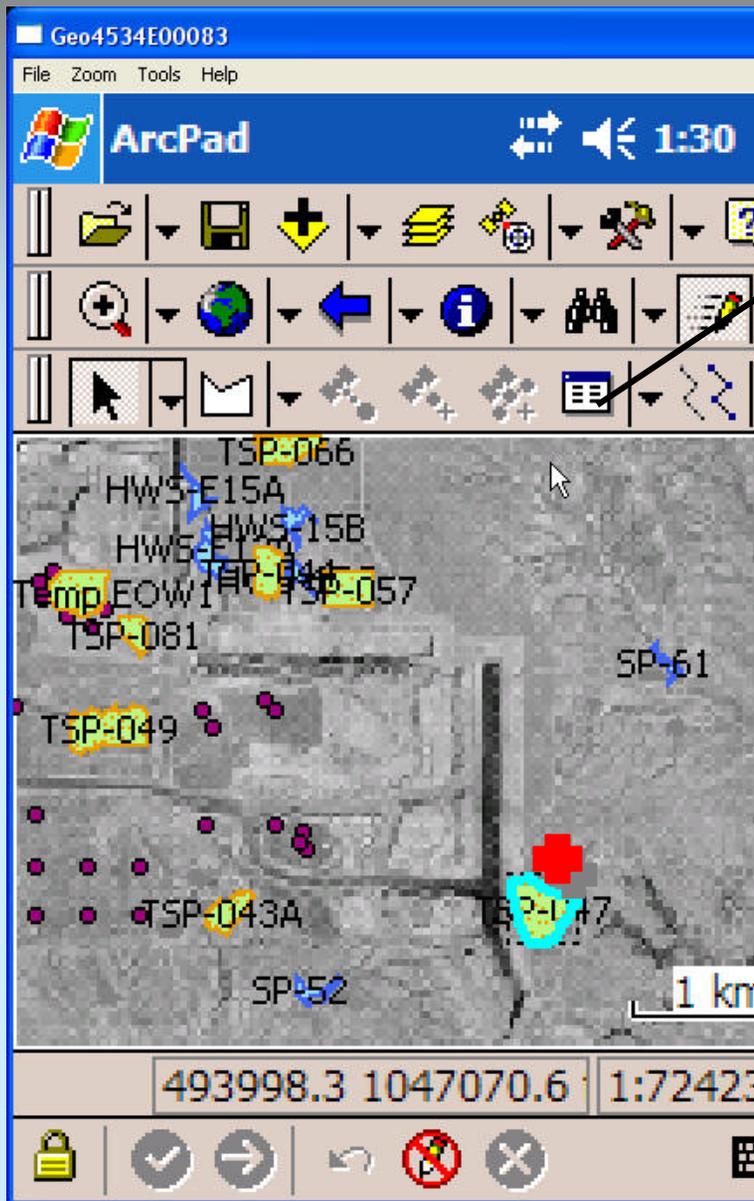
The permit commitments: - seed all topsoil stockpiles within one year after being completed; - grade topsoil stockpile slopes to less than 3:1 (approx. 33%).

↓
Attribute field

Seeding Date and Grading Status

Topsoil Stockpile (TSP) Attribute Table, Data Type, and Domain Names

Attribute Field name	Data type	Domain	Comments
TSP ID	text		Unique identifier used to reference the feature
TSP status		Completed Active	Describes construction activity (completed or active)
Construction date	Date	Calendar	Records date of the last disturbance due to construction
Inspection date	Date	Calendar	Records date of most recent inspection
Inspector name	Text	Waitkus, Buchanan	Choose the inspector name
Sign present	Text	Yes, No	Describes whether sign is present
Ditch/Berm present	text	Yes, No	Describes if runoff from disturbed area is being controlled and topsoil resources preserved
Grading status	text	Acceptable Not acceptable	Used to assess slope compliance
Seeding date	date	Calendar	Date of the last seeding, Used to assess one year seeding commitment
Vegetation status	text	Active Acceptable Not acceptable	Describes if runoff from disturbed area is being controlled and topsoil resources preserved
Erosion Type	text	None Rilling Gully	Describes if topsoil resources are preserved
Erosion compliance	text	Acceptable Not acceptable	Describes if topsoil resources are preserved
Compliance date	date		Scheduled date of correction



Geo4534E00083

File Zoom Tools Help

ArcPad 1:31

TSP

Property	Value
abc TSP_ID	TSP-047
abc TSP_Status	active
7 Construc...	2006-01-01 00:00:00
7 Inspectio...	2008-02-19 00:00:00
abc Inspector	Waitkus
abc Sign_Pre...	Yes
abc Berm_Pre...	Yes
abc Grade_St...	acceptable
7 Seed_Date	<Null>
abc Veg_Status	active
abc Erosion_...	none

Attributes Picture Symbols

ok X

Waitkus, Calle

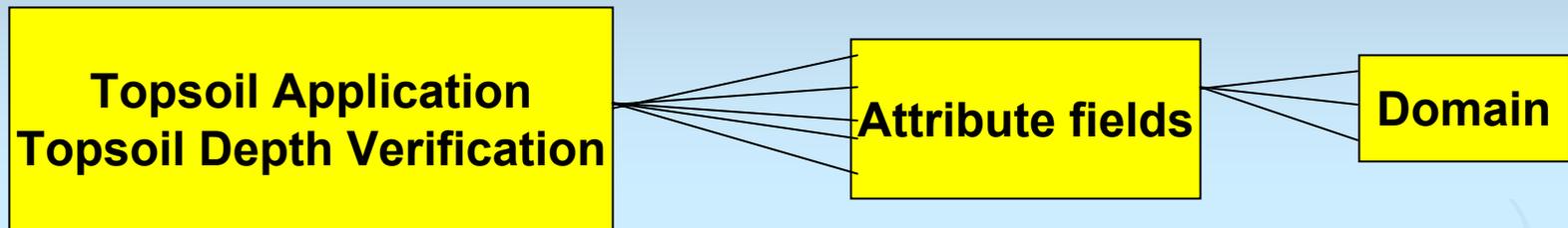
Atlanta, 2008

Advantages of the spatial Topsoil Stockpile (TSP) geodatabase:

- ▣ **The geodatabase allows tracking of the permit commitment and to identify and correct problems before they become enforcement actions.**

Example

The majority of TSP's are active. Topsoil is being added or removed. TSP must be seeded within one year from the end of the construction (e.g. query of all topsoil stockpiles that are active and check the date of the last activity)



Topsoil Application Area Feature Class and Attribute Fields

According to WDEQ Coal Rules and Regulations:

“Topsoil, subsoil, and/or an approved topsoil substitute shall be redistributed in a manner that:

- (A) *Achieves an approximate uniform, stable thickness consistent with the approved permit and the approved postmining land uses, contours and surface water drainage system;*
- (B) *Prevents compaction which would inhibit water infiltration and plant growth;*
- (C) *Protects the topsoil from wind and water erosion before and after it is seeded until vegetation has become adequately established.”*

Attribute field

Topsoil depth and erosion compliance

Topsoil Application Area Attribute Table and Domain Names

Attribute Field name	Data type	Domain	Comments
Topsoil polygon ID	text		Number
Inspection date	date	Calendar	Date of the last inspection
Inspector name	text	Waitkus Buchanan	Choose the inspector name
Topsoil Depth Compliance	text	Acceptable, Not acceptable	Acceptable or not acceptable to the permit commitment
Topsoil Depth Compliance Date	date	Calendar	Target date when the topsoil application will be restored
Erosion Compliance	text	Acceptable, Not acceptable	A significant and active erosional feature is not acceptable
Erosion Compliance Date	date	Calendar	Target date when the erosion feature will be repaired
Comments	text		

Advantages of the spatial Topsoil Application and Topsoil Depth Verification geodatabase:

Efficiency:

- The analysis of the geodatabase allows more efficiently to prepare for the next inspection (e.g pulling out the topsoiled area where the depth of application needs to be verified)

Quality:

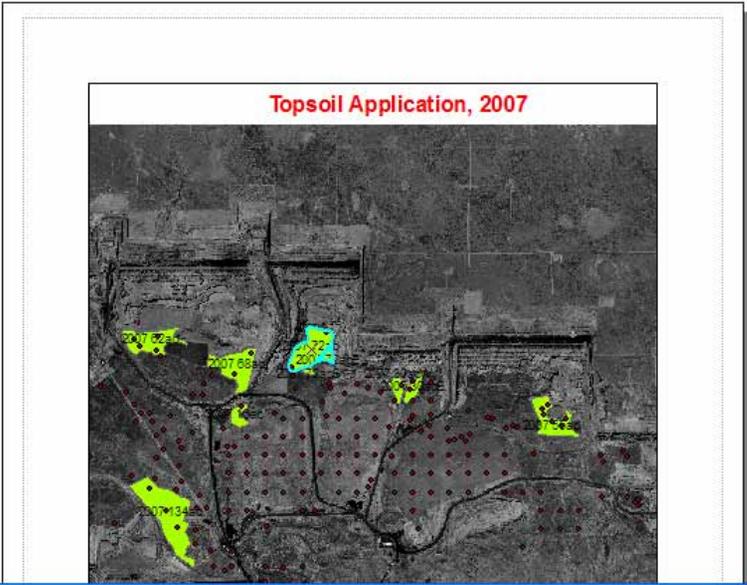
The geodatabase allows tracking of the permit commitment to identify and correct problems before they become enforcement actions.

- Verifying topsoil depth before seeding to follow the topsoil depth application commitment

Preparing for the next inspection

Layers

- P:\GIS\Inspection\NAF
 - Topsoil_Depth
 - Topsoil_Application
 - TSP
 - Impoundments
 - narm9_25_07_nac
 - Value
 - High : 255
 - Low : 1



Attributes of Topsoil_Application

Topsoil_ID	Inspection_Date	Inspector	Topsoil_Depth_Compliance	Topsoil_Depth_Comp_Dat	Eros_Compliance	Eros_Comp_Date	Comments
2007 30acE	8/28/2007	Buchanan	Acceptable	<Null>	Acceptable	<Null>	24 inches
2007 30acW	8/28/2007	Buchanan	Acceptable	<Null>	Acceptable	<Null>	21 inches
2007 72acS	8/28/2007	Buchanan	Acceptable	<Null>	Acceptable	<Null>	16 and 22 inches
2007 72acE	8/28/2007	Buchanan	<Null>	<Null>	<Null>	<Null>	<Null>
2007 72ac	8/28/2007	Buchanan	<Null>	<Null>	<Null>	<Null>	<Null>
2007 16ac	8/28/2007	Buchanan	Acceptable	<Null>	Acceptable	<Null>	25 inches
2007 68ac	8/28/2007	Buchanan	Acceptable	<Null>	Acceptable	<Null>	16 and 26 inches
2007 62ac	8/28/2007	Buchanan	Acceptable	<Null>	Acceptable	<Null>	13, 19, 26 inches
2007 134ac	9/5/2007	Waikus	Acceptable	<Null>	Acceptable	<Null>	18 and 21 inches
2007 55ac	9/5/2007	Waikus	Acceptable	<Null>	Acceptable	<Null>	21, 27 inches

Record: 5 Show: All Selected Records (2 out of 10 Selected) Options

Alternate Sediment Control Measure Attribute Table and Domain Names

Field name	Data type	Domain	Comments
ASCM ID	text		ASCM number
ASCM Type	text	Straw bails Silt fence Gabion Rock check dams Vegetated Rock/Gabion Others	
Inspection Date	date	Calendar	Date of the last inspection
Inspector Name	text	Waitkus Buchanan	Choose the inspector name
ASCM Compliance	text	Acceptable, Not Acceptable	The function is to trap additional sediment
ASCM Compliance Date	date	Calendar	A target date of the repair
Comments	text		

Erosional feature Attribute Table and Domain Names

Field name	Data type	Domains	Comments
Feature ID	text		Number
Inspection Date	date	Calendar	Date of the last inspection
Inspector Name	text	Waitkus Buchanan	Choose the inspector name
Erosion Type	text	Rill active Rill inactive Gully active Gully inactive	
Erosion Compliance	text	Acceptable, Not acceptable	A significant active or inactive feature is not acceptable
Erosion Compliance Date	date	Calendar	A target date when the erosional feature will be repaired
Cover status	text	Permanent seeded Temporary seeded Mulched	
Vegetation present	text	Yes, No	
Comments	text		

Inspection report



Inspection report

OBJECTID *	Shape *	Impoundment_ID	Impoundment_Status	Impoundment_Type	Construction_Date	Removal_Date	NPDES_Status	Discharge	Inspection_Date	Inspector
7	Polygon	Mad Ferret Reservoir	Temporary	Facility	1/1/2000	<Null>	No	No	3/4/2008	Buchanan
8	Polygon	Stovall Reservoir	Temporary	Facility	1/1/2001	<Null>	No	No	3/4/2008	Waitkus
9	Polygon	Big J Reservoir	Temporary	Facility	1/1/2001	<Null>	No	No	3/4/2008	Waitkus
58	Polygon	Sleeping Dog	Temporary	Sediment Control	1/1/1991	<Null>	No	No	3/4/2008	Waitkus
62	Polygon	5C	Temporary	Sediment Control	1/1/1999	<Null>	No	No	3/4/2008	Waitkus
71	Polygon	NARST-4	Temporary	Sediment Trap	1/1/2000	<Null>	No	No	3/4/2008	Buchanan
77	Polygon	Hansen Draw Reservoir	Permanent	Backfill	1/1/1997	<Null>	No	No	3/4/2008	Buchanan
80	Polygon	Sue's Draw Reservoir	Temporary	Backfill	1/1/1996	<Null>	No	No	3/4/2008	Buchanan
81	Polygon	5A-1 Reservoir	Permanent	Backfill	1/1/1997	<Null>	No	No	3/4/2008	Buchanan
13	Polygon	KPD#1A	Permanent	Facility	1/1/1994	<Null>	No	No	2/20/2008	Waitkus
27	Polygon	PHWS-10	Temporary	Flood Control	1/1/2004	1/1/2019	No	No	2/20/2008	Waitkus
28	Polygon	PHWS-9	Temporary	Flood Control	1/1/2004	1/1/2020	No	No	2/20/2008	Waitkus
30	Polygon	PHWS-8	Temporary	Flood Control	1/1/2004	1/1/2020	No	No	2/20/2008	Waitkus
31	Polygon	PHWS-6A	Temporary	Flood Control	1/1/2004	1/1/2009	No	No	2/20/2008	Waitkus
33	Polygon	North Corder Creek	Temporary	Flood Control	1/1/2000	1/1/2009	No	No	2/20/2008	Waitkus
34	Polygon	PHWS-7	Temporary	Flood Control	1/1/2004	1/1/2021	No	No	2/20/2008	Waitkus
37	Polygon	PHWS-6B	Temporary	Flood Control	1/1/2004	1/1/2009	No	No	2/20/2008	Waitkus
75	Polygon	NARST-1	Temporary	Sediment Trap	1/1/2000	<Null>	No	No	2/20/2008	Buchanan
6	Polygon	Shop Reservoir	Temporary	Facility	1/1/1982	<Null>	Yes	No	2/19/2008	Waitkus
44	Polygon	SP-10	Temporary	Sediment Control	1/1/1985	<Null>	Yes	No	2/19/2008	Waitkus
45	Polygon	SP-9A	Temporary	Sediment Control	1/1/1985	<Null>	Yes	No	2/19/2008	Waitkus
49	Polygon	SP-8	Temporary	Sediment Control	1/1/2005	<Null>	Yes	No	2/19/2008	Waitkus
50	Polygon	SP-7A	Permanent	Sediment Control	1/1/1985	<Null>	Yes	No	2/19/2008	Waitkus
53	Polygon	SP-11B	Temporary	Sediment Control	1/1/1985	<Null>	Yes	No	2/19/2008	Waitkus

Record: 17 Show: All Selected Records (0 out of 82 Selected) Options

8	Polygon	TSP-046B	completed	1/1/2006	3/4/2008	Waitkus	Yes	Yes	acceptable	1/1/2006	unacceptable	none	Acceptable
11	Polygon	TSP-084	completed	1/1/2006	3/4/2008	Waitkus	Yes	Yes	acceptable	1/1/2006	acceptable	none	Acceptable
14	Polygon	TSP-089I	completed	1/1/2006	3/4/2008	Buchanan	Yes	Yes	acceptable	1/1/2006	acceptable	none	Acceptable
16	Polygon	TSP-089H	completed	1/1/2006	3/4/2008	Buchanan	Yes	Yes	acceptable	1/1/2006	acceptable	none	Acceptable
29	Polygon	TSP-018	completed	1/1/1999	3/4/2008	Waitkus	Yes	Yes	acceptable	1/1/1999	acceptable	none	Acceptable
32	Polygon	TSP-022	completed	1/1/1999	3/4/2008	Waitkus	Yes	Yes	acceptable	1/1/1999	acceptable	none	Acceptable
33	Polygon	TSP-089G	completed	1/1/2006	3/4/2008	Buchanan	Yes	Yes	acceptable	1/1/2006	acceptable	none	Acceptable
34	Polygon	TSP-089A	completed	1/1/2006	3/4/2008	Buchanan	Yes	Yes	acceptable	1/1/2006	active	none	Acceptable
35	Polygon	TSP-089C	completed	1/1/2006	3/4/2008	Buchanan	Yes	Yes	acceptable	1/1/2006	acceptable	none	Acceptable
36	Polygon	TSP-089D	completed	1/1/2006	3/4/2008	Waitkus	Yes	Yes	acceptable	1/1/2006	acceptable	none	Acceptable
37	Polygon	AL-1	completed	1/1/2006	3/4/2008	Waitkus	Yes	Yes	acceptable	<Null>	active	none	Acceptable
54	Polygon	TSP-018A	completed	1/1/1999	3/4/2008	Waitkus	Yes	Yes	acceptable	1/1/1999	acceptable	none	Acceptable
65	Polygon	TSP-038A	completed	1/1/2002	3/4/2008	Waitkus	Yes	Yes	acceptable	1/1/2002	acceptable	none	Acceptable
66	Polygon	TSP-089E	completed	1/1/2006	3/4/2008	Buchanan	Yes	Yes	acceptable	1/1/2006	acceptable	none	Acceptable
67	Polygon	TSP-089F	completed	1/1/2006	3/4/2008	Buchanan	Yes	Yes	acceptable	1/1/2006	acceptable	none	Acceptable
76	Polygon	TSP-089B	completed	1/1/2006	3/4/2008	Buchanan	Yes	Yes	acceptable	1/1/2006	active	none	Acceptable
81	Polygon	TSP-046A	completed	1/1/2003	3/4/2008	Waitkus	Yes	Yes	acceptable	1/1/2003	acceptable	none	Acceptable
84	Polygon	TSP-045A	completed	1/1/2003	3/4/2008	Waitkus	Yes	Yes	acceptable	1/1/2003	acceptable	none	Acceptable
22	Polygon	TSP-049	completed	1/1/2006	2/20/2008	Waitkus	Yes	Yes	acceptable	1/1/2000	acceptable	none	Acceptable
26	Polygon	TSP-011	completed	1/1/1999	2/20/2008	Waitkus	Yes	Yes	acceptable	1/1/1999	acceptable	none	Acceptable
43	Polygon	TSP-010	completed	1/1/1999	2/20/2008	Waitkus	Yes	Yes	acceptable	1/1/1999	acceptable	none	Acceptable
56	Polygon	TSP-086W	completed	1/1/2006	2/20/2008	Waitkus	Yes	Yes	active	<Null>	active	none	Acceptable
62	Polygon	TSP-056	completed	1/1/2004	2/20/2008	Waitkus	Yes	Yes	acceptable	1/1/2004	acceptable	none	Acceptable
63	Polygon	TSP-078	completed	1/1/2007	2/20/2008	Waitkus	Yes	Yes	acceptable	9/1/2008	active	none	Acceptable
86	Polygon	TSP-086E	completed	1/1/2006	2/20/2008	Waitkus	Yes	Yes	active	<Null>	active	none	Acceptable
70	Polygon	TSP-047	active	1/1/2006	2/19/2008	Waitkus	Yes	Yes	acceptable	<Null>	active	none	Acceptable

Record: 2 Show: All Selected Records (0 out of 88 Selected) Options

Anticipated benefits include:

● Records storage and maintenance

- ▣ **Field Mapping - Create, edit, and use GIS maps in the field.**

- * **Completing the monitoring portion of the inspection in the field.**

- * **Accelerating the process of preparing inspection reports.**

- ▣ **Feature Maintenance**

Update features location, condition, and schedule maintenance.

- **Feature Inventories**

Create and maintain an inventory of inspection locations and attribute information (improve efficiency and quality).

- ▣ **Analyze data for permit purposes (e.g. removal date of sediment ponds)**
- ▣ **Accelerating the process of exchanging information between various agencies e.g. Water Quality Division of DEQ**

Compliance assessment

Being able to identify and correct problems before they become enforcement actions.

- ▣ **Inspections - Maintain digital records and locations of mine features for compliance assessment.**
- ▣ **Inspection Reporting - Document the location and circumstances of incidents and events for further action or reporting.**