An Integrated Landslide Management System for Highway Applications

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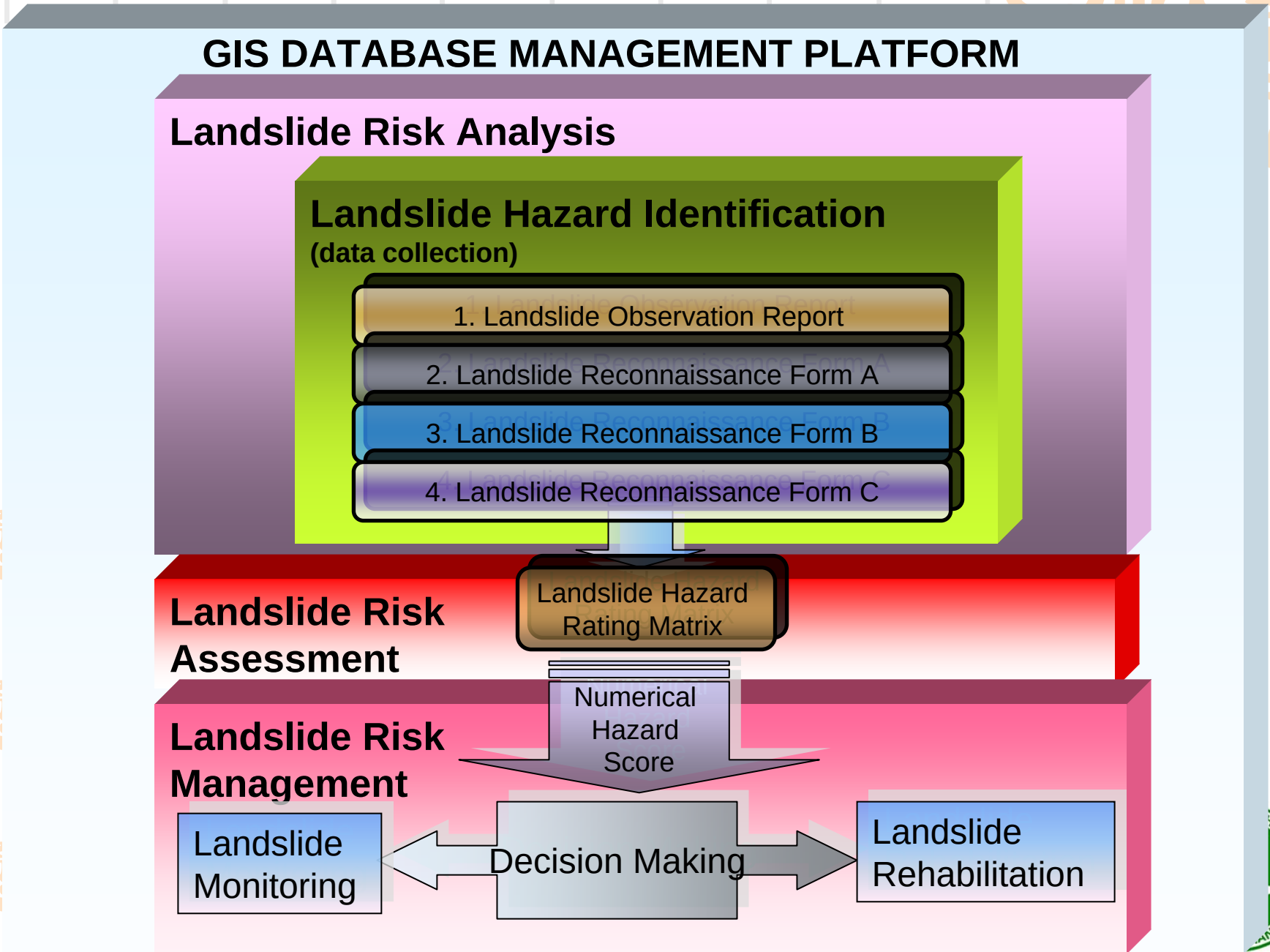
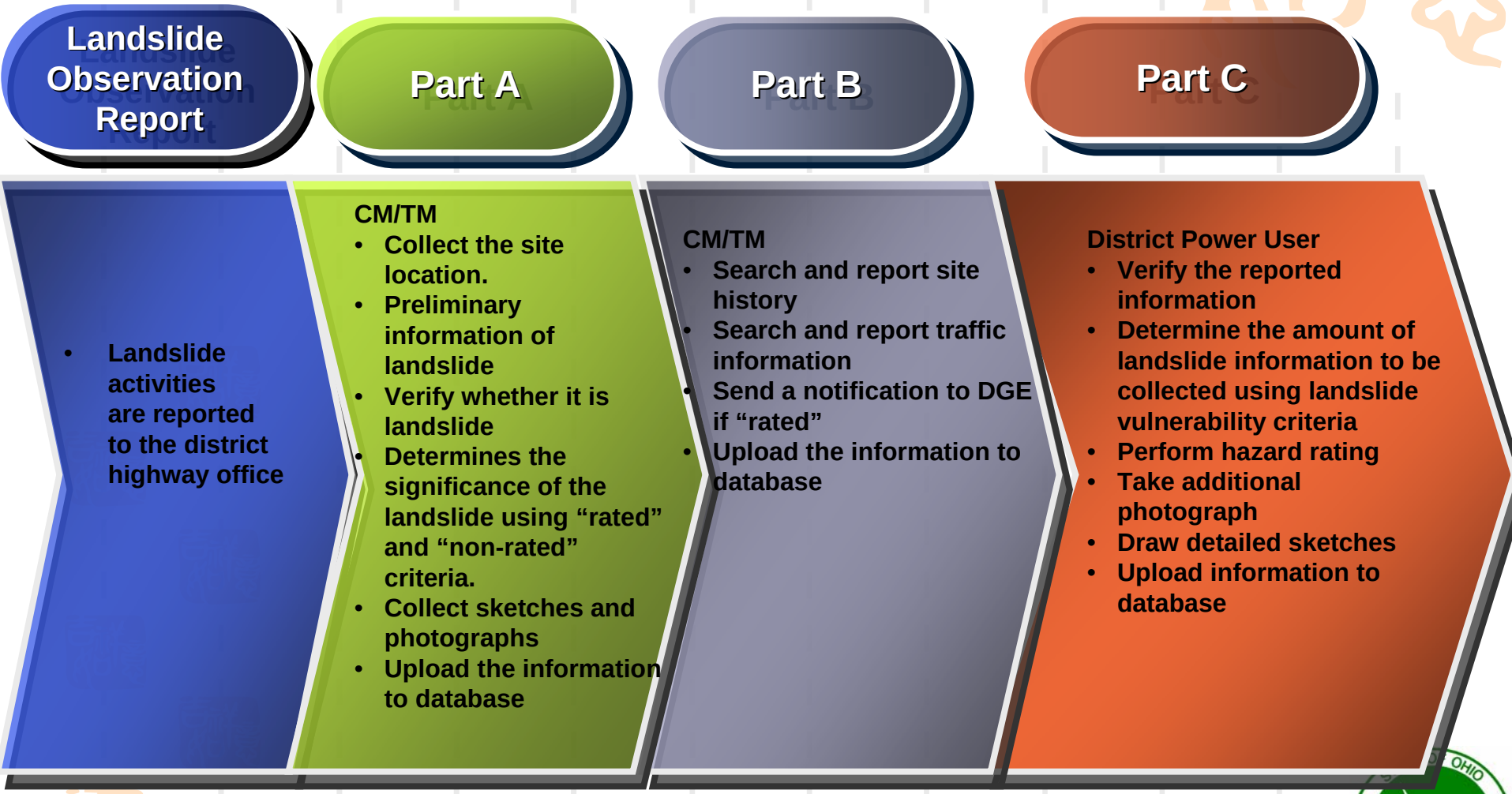
Outline of the Presentation

- ODOT Landslide Hazard Rating Matrix
- GIS Database
- Database Access via Internet

Landslide Management



Landslide Reconnaissance Processes



Landslide Vulnerability Criteria (Part A)

Probability of additional movement	Probability of significant impacts to the roadway, structures, adjacent property or features			
	Very High	***High***	***Moderate***	***Low***
Very High	Very High	Very High	High	Moderate
High	Very High	High	High	Moderate
Moderate	High	High	Moderate	Low
Low	Moderate	Moderate	Low	Low

- The landslide with low vulnerability is “non-rated” landslide otherwise “rated”.
- If landslide is “rated”, notification is sent to DGE for detailed investigation.

Criteria for Data Collection (Part C)

Probability of additional movement (A)	Probability of significant impacts to the roadway, structures, adjacent property or features (B)			
	Very High(4)	***High(3)***	***Moderate(2)***	***Low(1)***
Very High(4)	Very High (16)	Very High (12)	High (8)	Moderate (4)
High(3)	Very High (12)	High (9)	High (6)	Moderate (3)
Moderate(2)	High (8)	High (6)	Moderate (4)	Low (2)
Low(1)	Moderate (4)	Moderate (3)	Low (2)	Low (1)

Vulnerability score (X) =A×B

$X \leq 2$

- Verify existing information
- Verify sketches from part A
- Take additional photographs

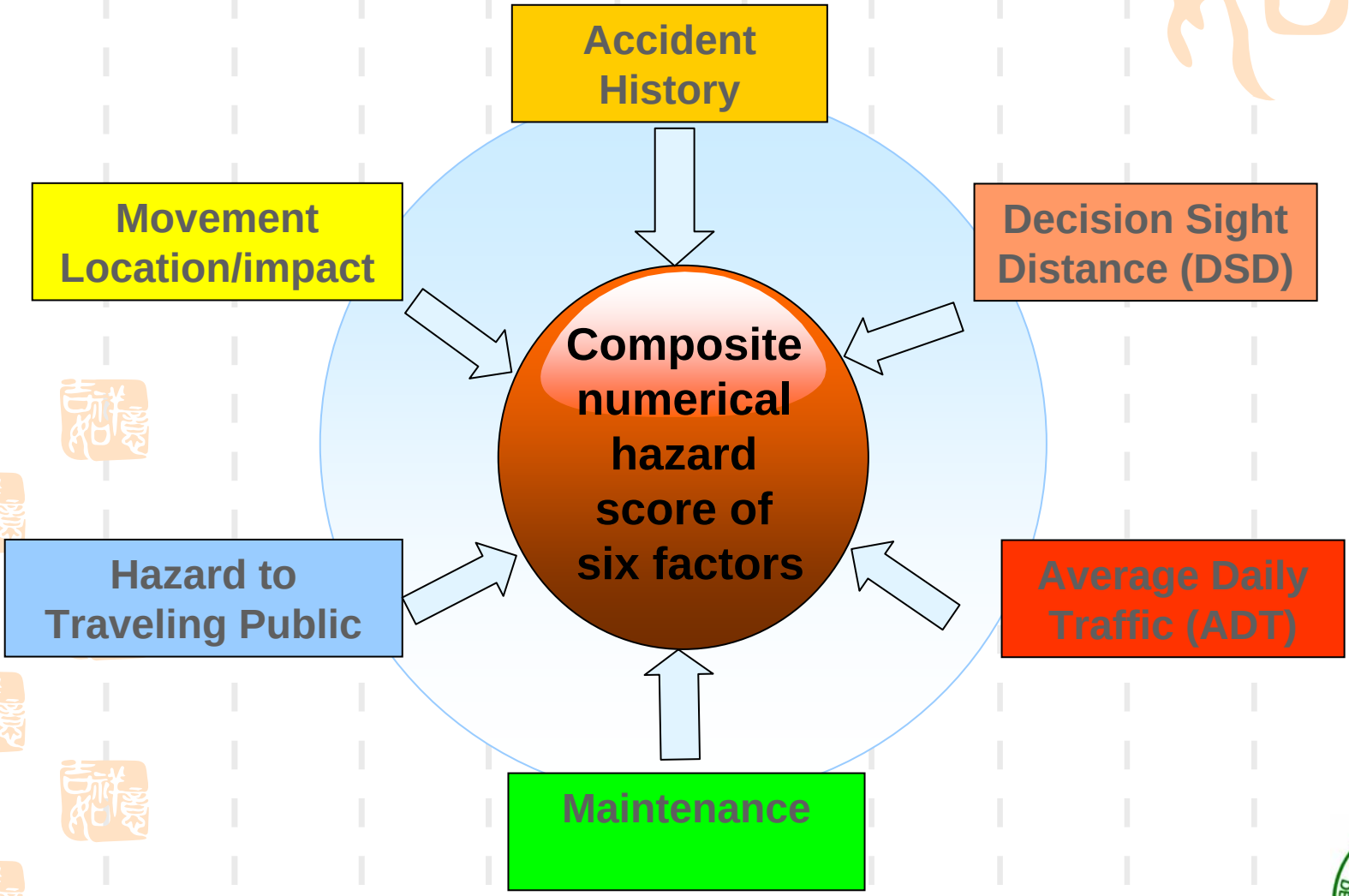
$2 < X \leq 9$

- Verify existing information
- Verify sketches from part A
- Take additional photographs
- Fill Form C

$X > 9$

- Verify existing information
- Verify sketches from part A
- Take additional photographs
- Fill Form C
- Provide Detailed Sketches

Six Risk Factors



ODOT Landslide Hazard Rating System

CATEGORY		RATING CRITERIA and SCORE			
		Points 3	Points 9	Points 27	Points 81
1. Movement location/ impact (select higher score)	Current and potential impact of landslide on roadway	On slope with a low potential to affect shoulder	On slope with a low potential to affect roadway	On shoulder, or on slope with a moderate potential to affect roadway	On roadway, or On slope with a high potential to affect roadway or structure
	Current and potential impact of landslide on area beyond right of way	On slope with a low potential to impact area beyond right of way	On slope with moderate potential to impact area beyond right of way	On slope with high potential to impact area beyond right of way	On slope with high potential to impact structure beyond right of way
2. Hazard to traveling public (Select higher score)	Rate of displacement in roadway if known	<1-inch/year	1 to 3-inches/year No single event ≥1-inch	3 to 6-inches/year No single event ≥3-inches	>6-inches/year Single event ≥3-inches
	Evidence of displacement in roadway	Visible crack or dip no vertical drop	≤1-inch of displacement	1 to 3-inches of displacement	≥ 3-inches of displacement

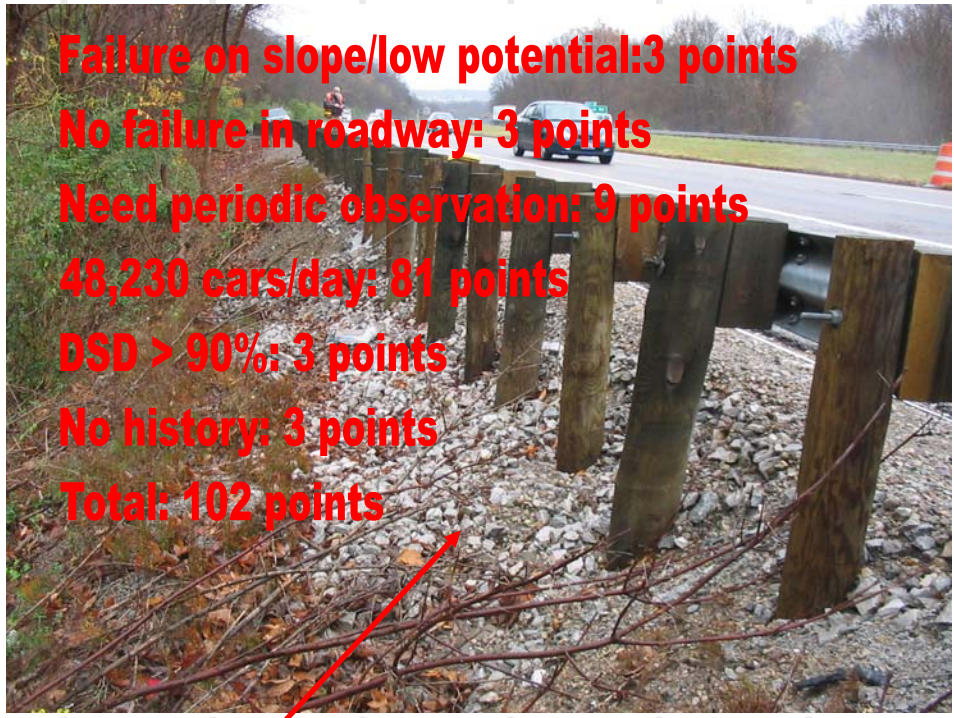
ODOT Landslide Hazard Rating System

CATEGORY		RATING CRITERIA and SCORE			
		Points 3	Points 9	Points 27	Points 81
3. Maintenance (Select higher score)	Maintenance frequency	None to rare	Annually (one time/year)	Seasonal (1 to 3 times/ year)	Continuous throughout year (> 3 times/year)
	Maintenance response	No response	Requires observation with periodic maintenance	Requires routine maintenance response to preserve roadway	Requires immediate response for safe travel or to protect adjacent structure
4. ADT		<2000	2001-5000	5001-15000	>15001
5. %Decision Sight Distance (DSD)		≥ 90	89 -50	49-35	< 34
6. Accident history		No accident	Vehicle or property damage	Injury	Fatality

Numerical Hazard Score Criteria

Low Hazard
Score< 150

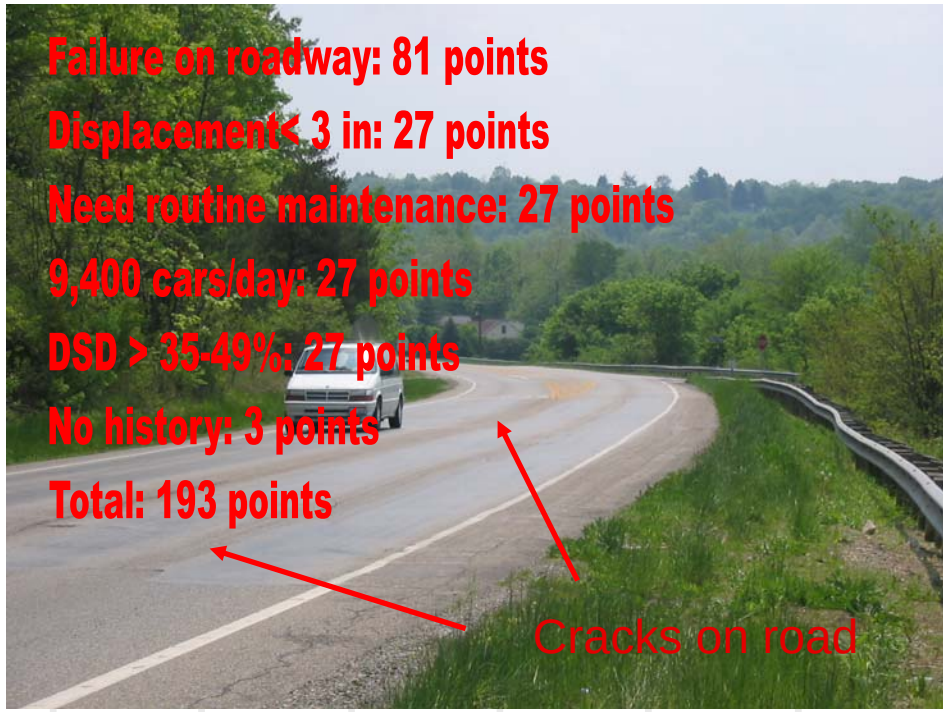
Failure surface



Failure surface

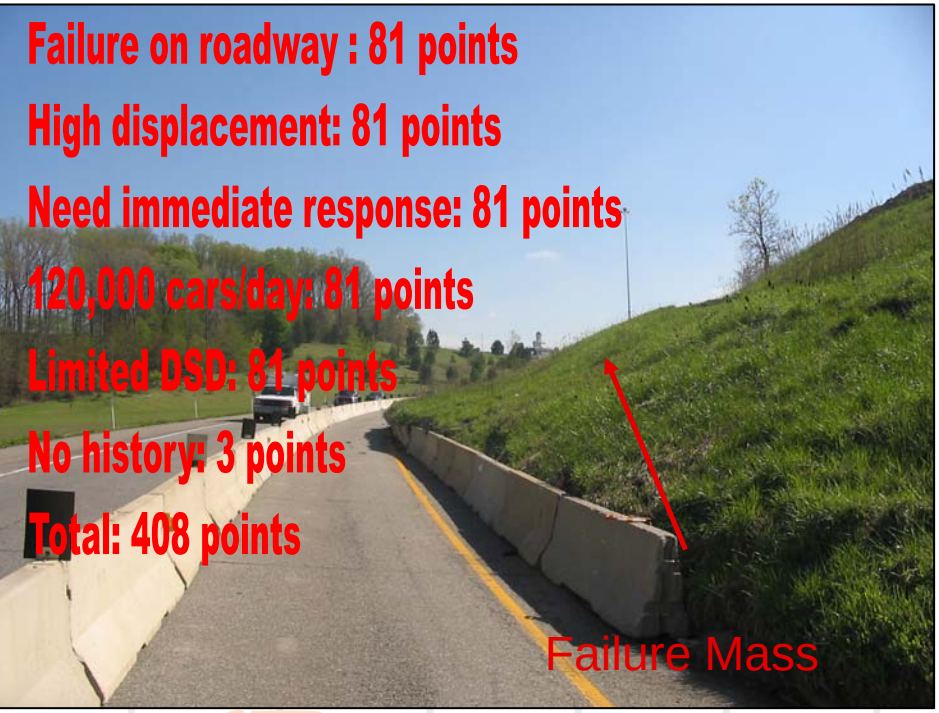
Numerical Hazard Score Criteria

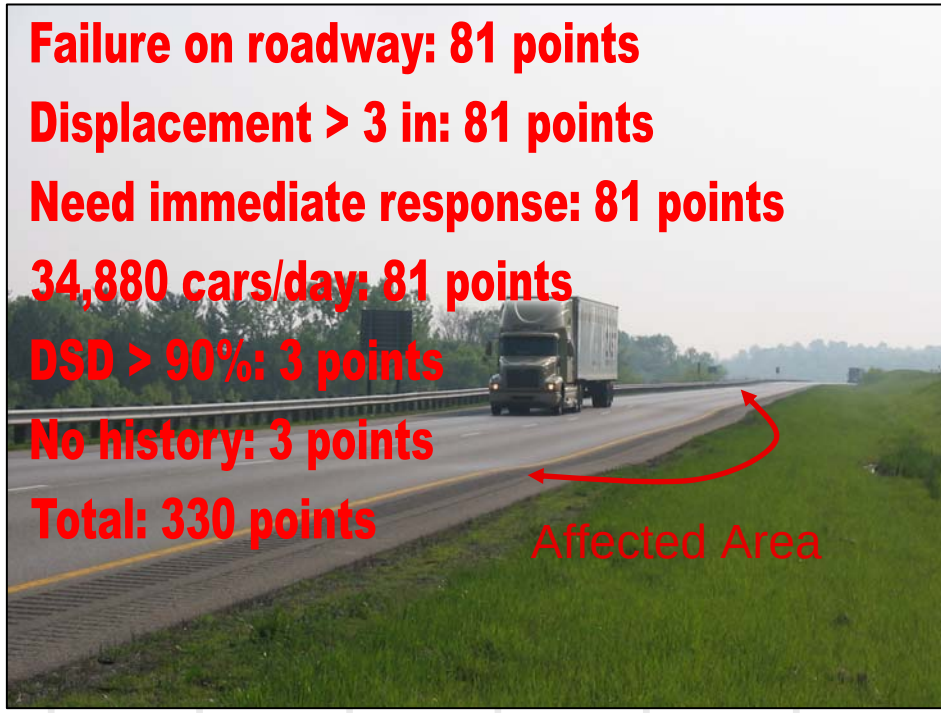
Medium Hazard
150<Score≤250



Numerical Hazard Score Criteria

High Hazard
Score>250

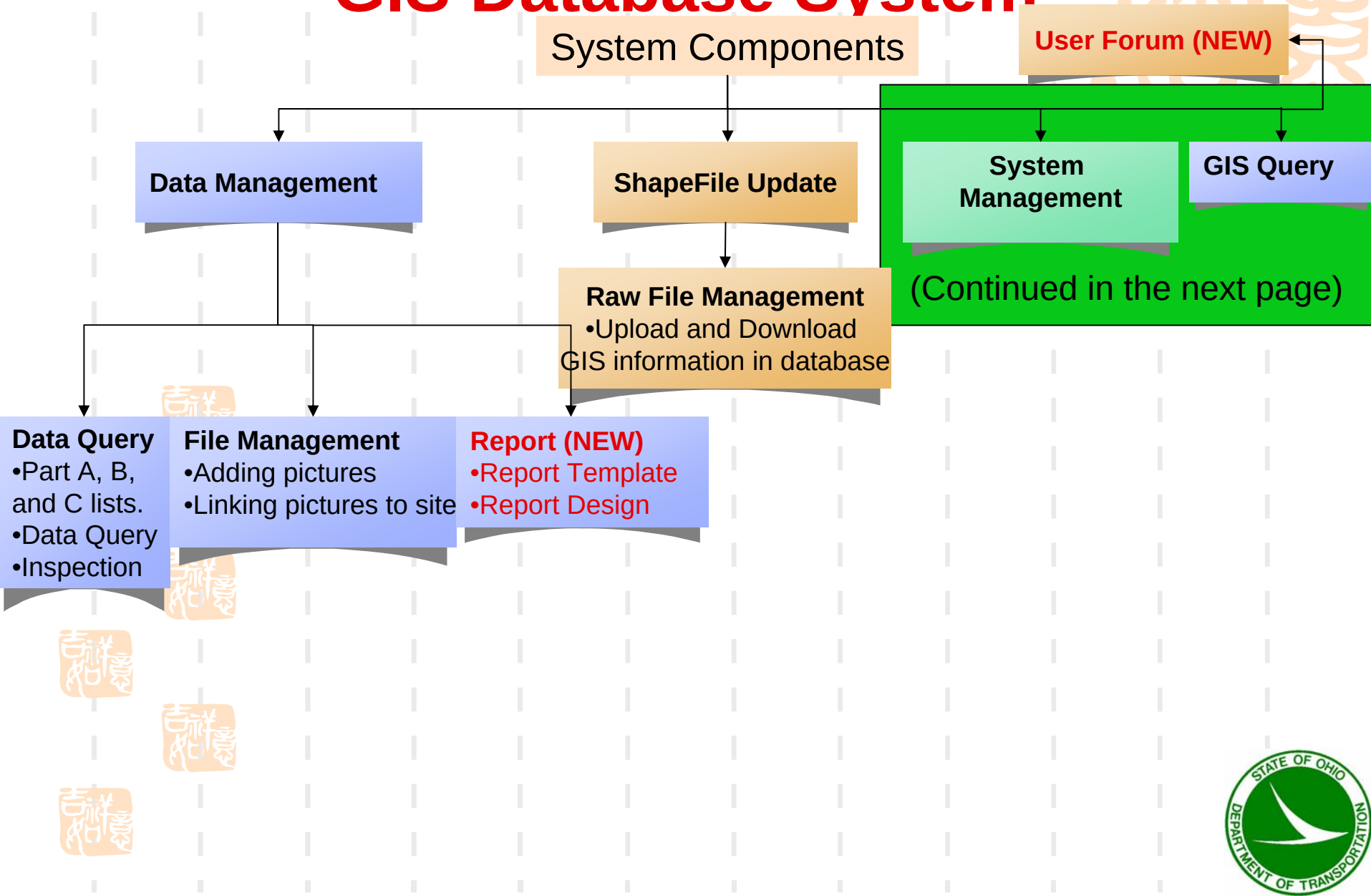




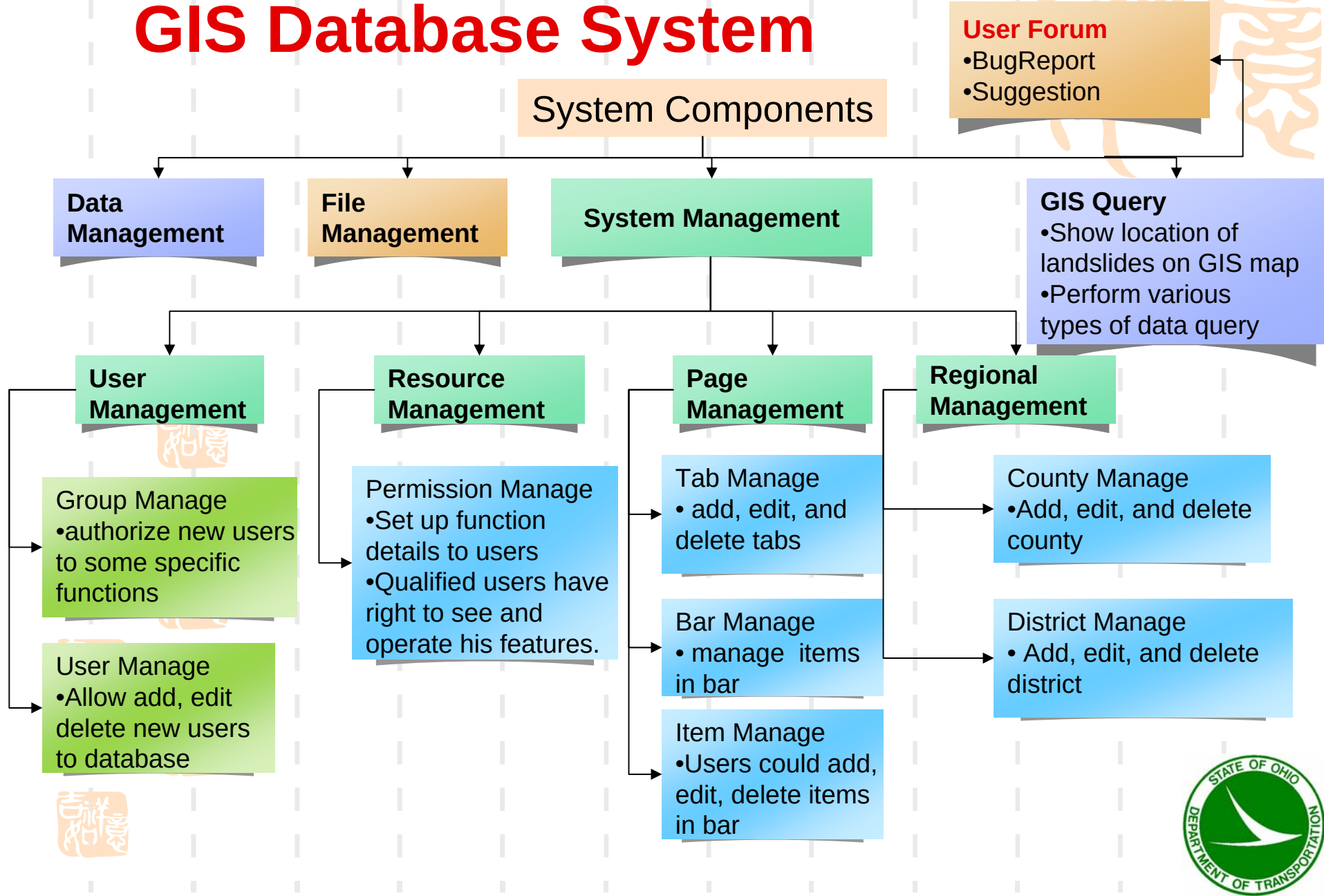
Privileges of Users in Database

User Types / Privilege	Normal User	County Power User (CM/TM)	District Power User (DGE)	State Power User	Administrator	System Power User	Supervisor
Download	X	X	X	X	X	X	X
Upload shape file into database		X	X	X	X	X	X
Data query		X	X	X	X	X	X
GIS query	X	X	X	X	X	X	X
Add/Edit Parts A and B		X	X	X	X	X	X
Add/Edit Part C			X	X	X	X	X
Delete Parts A, B, and C				X	X	X	X
Manage landslide pictures		X	X	X	X	X	X
Manage regional information (County and District)				X	X	X	X
Update shape files in GIS server				X	X	X	X
Design of database webpage						X	X
User registration					X		X
Set user privileges							X

Components of Web-enabled GIS Database System



Components of Web-enabled GIS Database System



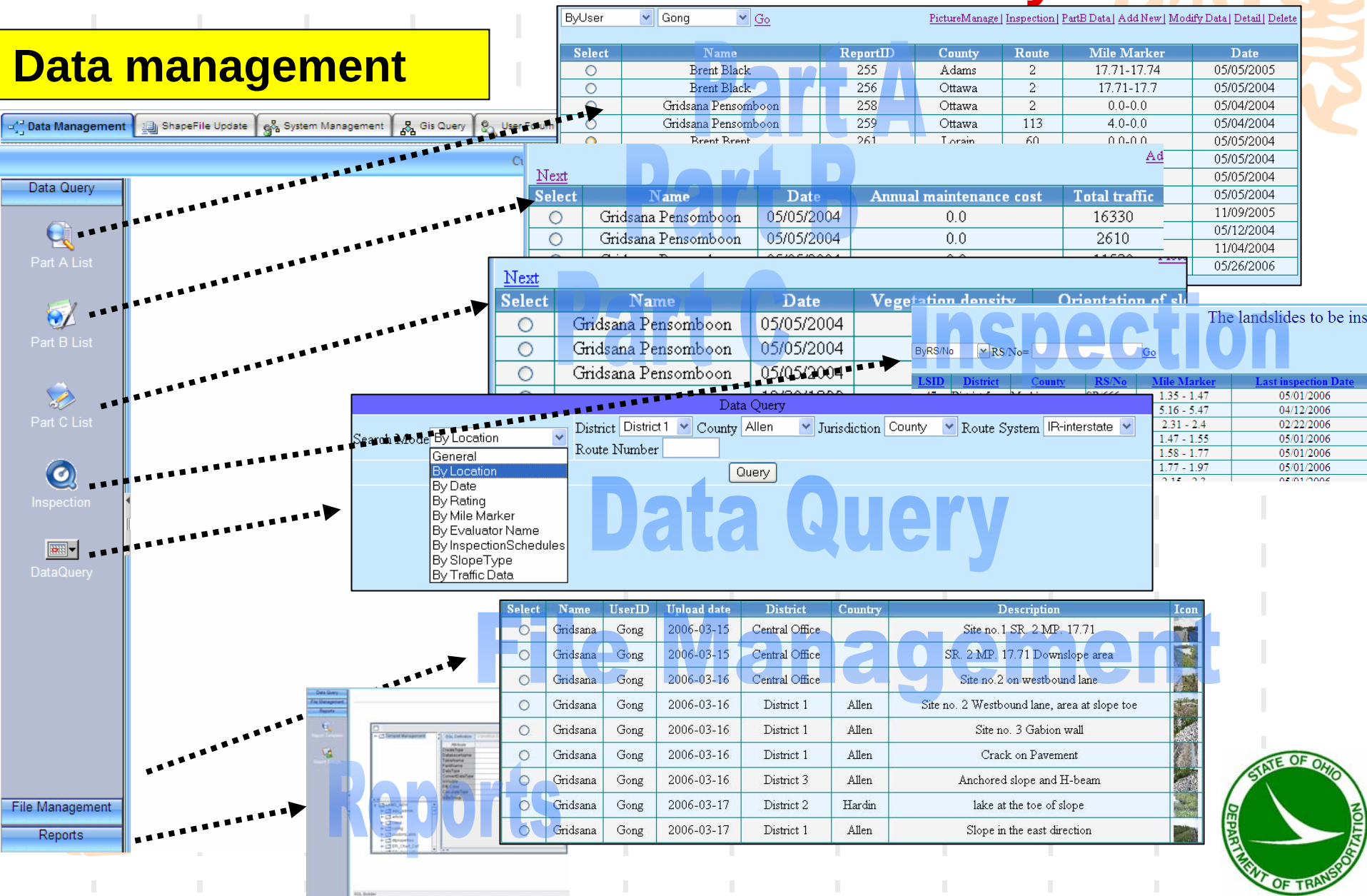
Resource/Asset management using Web-Enabled GIS Database System

User Login

- http://landslide.ascn3.uakron.edu/gisView
- Users login with user name and password

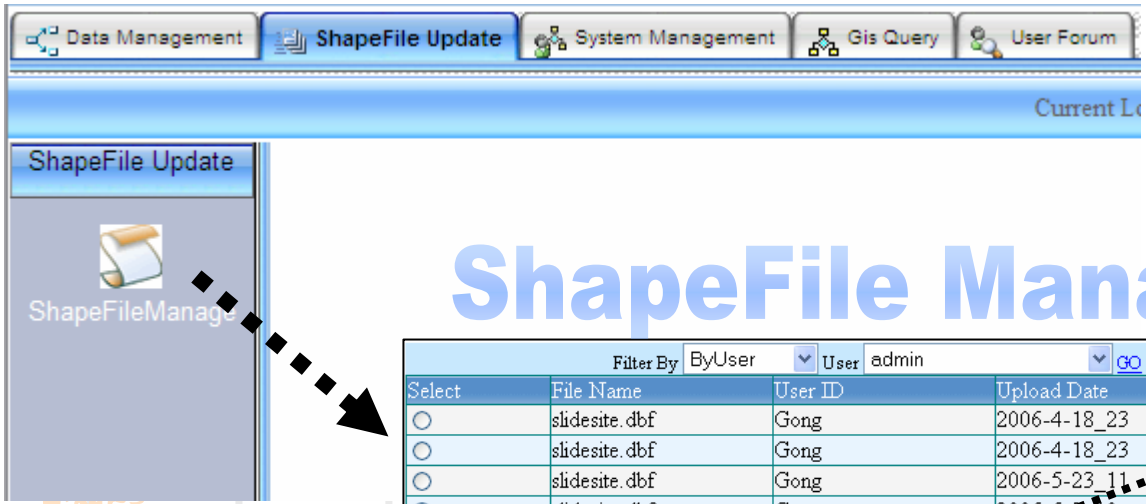
Resource/Asset management using Web-Enabled GIS Database System

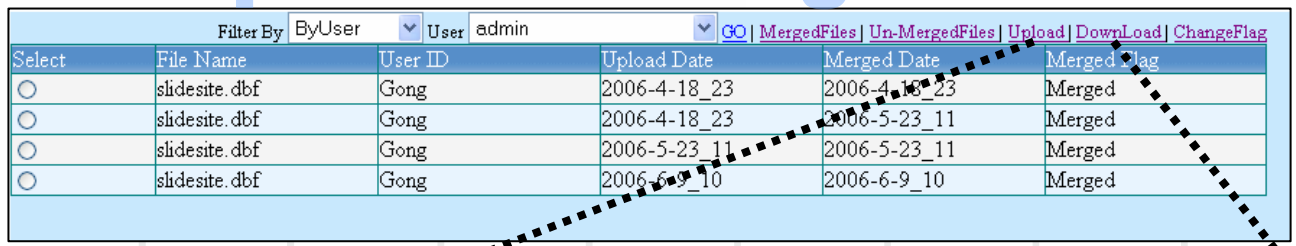
Data management

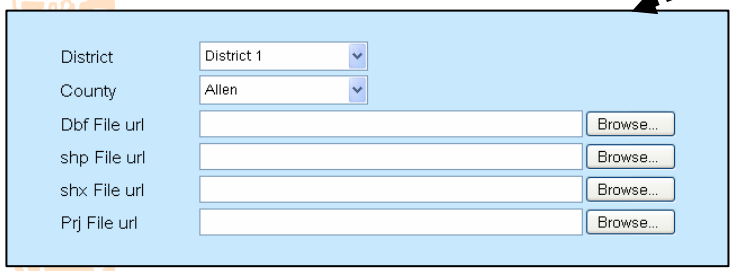


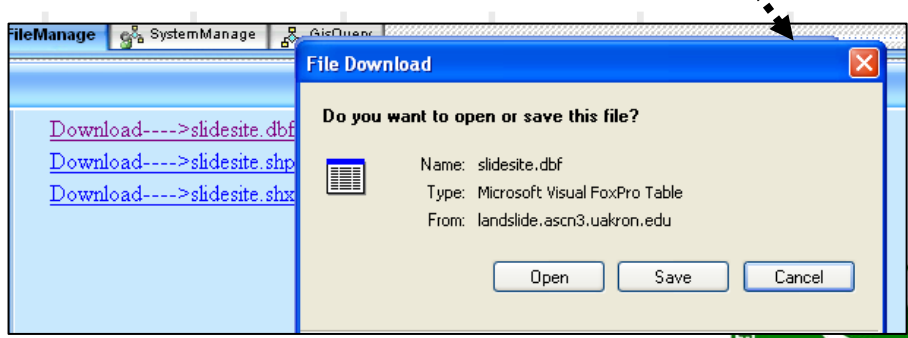
Resource/Asset management using Web-Enabled GIS Database System

ShapeFile Update





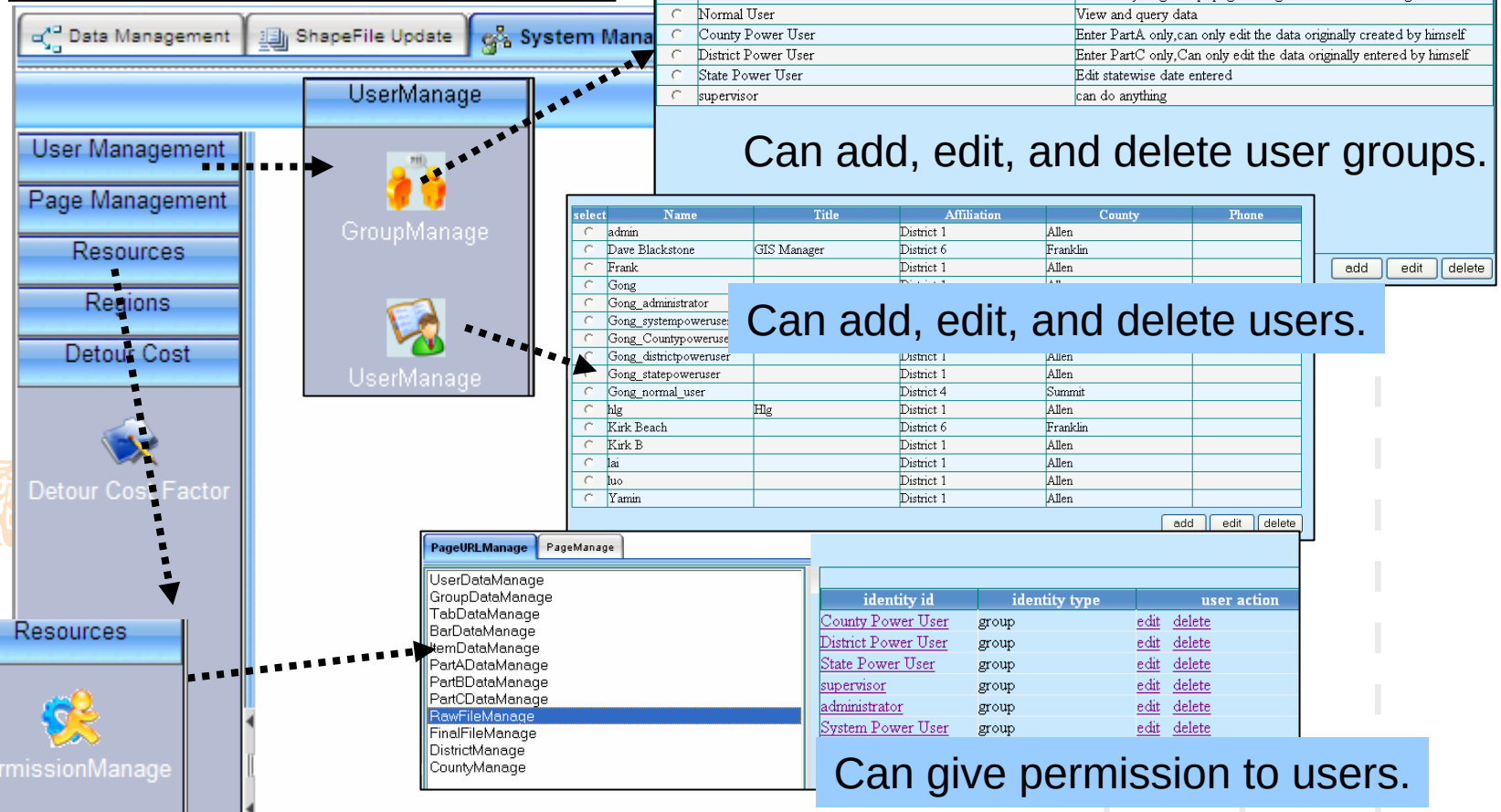




Upload needs at least 3 files. (Dbf, Shp, and Shx)

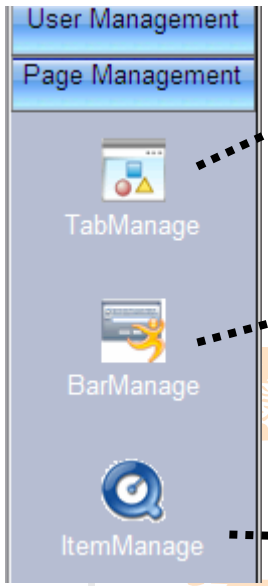
Resource/Asset management using Web-Enabled GIS Database System

System Management



Resource/Asset management using Web-Enabled GIS Database System

System Management



select	Name	Order	IconURL	Description
○	DataManage	1	images/tabimg/mapinfo.gif	asdf
○	FileManage	2	images/tabimg/finishedactivity_menu.gif	
○	SystemManage	3	images/tabimg/myrunninginstances.gif	this is tab2
○	GisQuery	4	images/tabimg/allrunninginstances.gif	

add edit delete

select	Name	Order	IconURL	Description
○	UserManage	1	asdasfd	asdfasfd
○	PageManage	2	asdf	asdfasfd
○	ResourceManage	3	aaaa	asdasdf
○	DataQuery	4	adsasdf	asdfasdf
○	PictureManage	6		
○	DataFileManage	7	a	
○	Regi			

select	Name	ItemURL	IconURL
○	Part A List	/viewPartAList.do?m=list	images/itemimg/271.png
○	Part C List	/viewPartCListAll.do?m=list	images/itemimg/118.png
○	Part B List	/viewPartBListAll.do?m=listAll	images/itemimg/123.png
○	PictureManage	/viewUploadFileManage.do?m=list	images/itemimg/118.png
○	DataQuery	/QueryData.do	images/itemimg/calbtn.gif
○	PermissionManage	/PermissionMain.do	images/itemimg/processes_icon.gif
○	ResourceManage	/ResourceDomainList.do	images/itemimg/actlet_icon.gif
○	GisQuery	/gis_redirect.htm	
○	UploadDbfFile	/DataMergeManage/dbfFileUpload.jsp	images/itemimg/123.png
○	TabManage	/ListTab.do	images/itemimg/field_icon.gif
○	GroupManage	/ListGroup.do	images/itemimg/182.png
○	UserManage	/ListUser.do	images/itemimg/531.png
○	BarManage	/ListBar.do	images/itemimg/forms.gif
○	ItemManage	/ListItem.do	images/itemimg/instances_icon.gif
○	CountyManage	/ListCounty.do	images/itemimg/120.png
○	DistrictManage	/ListDistrict.do	images/itemimg/118.png
○	DownloadDbfFile	/SelectDownLoadData.do	images/itemimg/Icons.png
○	FinalFileManage	/dataFileList.do?FileType=FINALFILE	images/itemimg/finishedActivities.gif
○	WorkingFile	/dataFileList.do?FileType=WORKINGFILE	images/itemimg/Applications.png
○	RawFileManage	/dataFileList.do?FileType=RAW	images/itemimg/actlet_icon.gif

add edit delete

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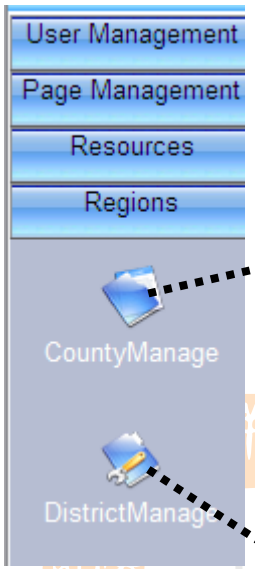
Resource/Asset management using Web-Enabled GIS Database System

System Management



select	Name	Address	Zip	Fax
	Adams			
	Allen			
	Ashland			
	Ashtabula			
	Athens			
	Auglaize			
	Belmont			
	Brown			
	Butler			
	Carroll			
	Champaign			
	Clark			

add edit delete

Add, edit, and delete County Information

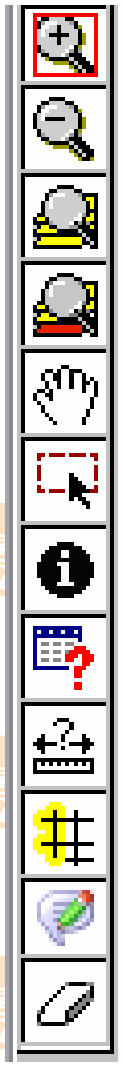
select	Name	Address	Zip	Fax
	District 1			
	District 10			
	District 11			
	District 12			
	District 2			
	District 3			
	District 4			
	District 5			
	District 6			
	District 7			
	District 8			
	District 9			

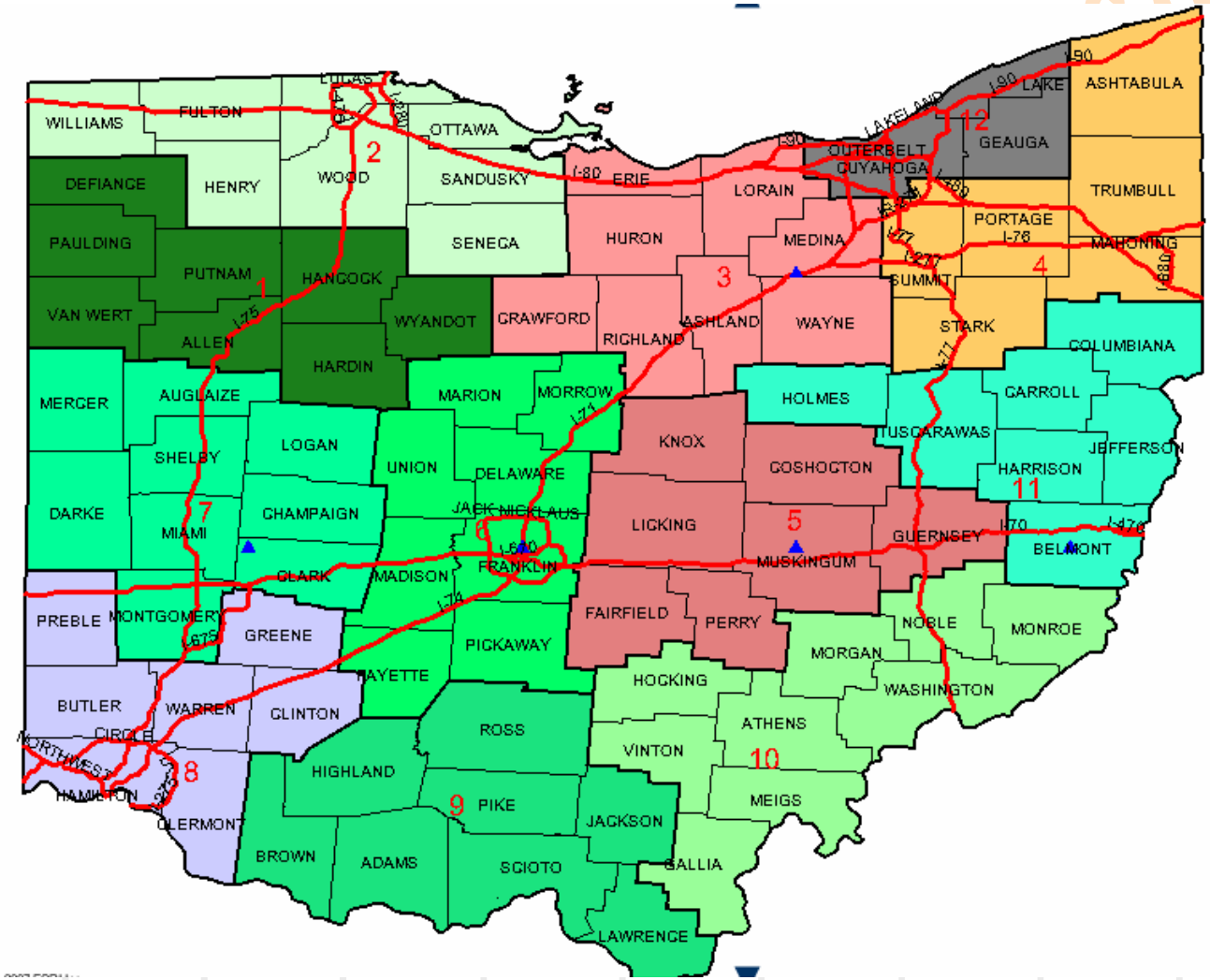
add edit delete

Add, edit, and delete ODOT district Information

Resource/Asset management using Web-Enabled GIS Database System

GIS Query





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Resource/Asset management using Web-Enabled GIS Database System

GIS Query

Identify

slidesite

Rec	Slide ID	Jurisdiction	District	Route Sytem	Route Number	NLF	Lane Number	Risk Level	Rank Score	#SHAPE#	#ID#
1	257	State	2	SR	105	0	1		126	[point]	3

Query

Field | Operator | Value

Slide ID | = | Get Samples | And | Or | Not | (|)

Add to Query String

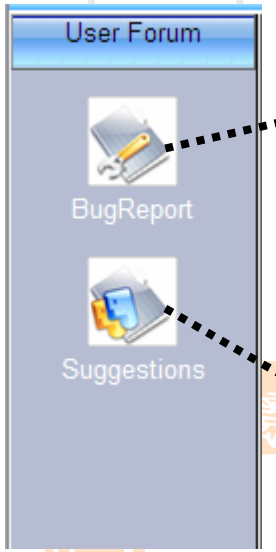
Execute | Undo | Clear

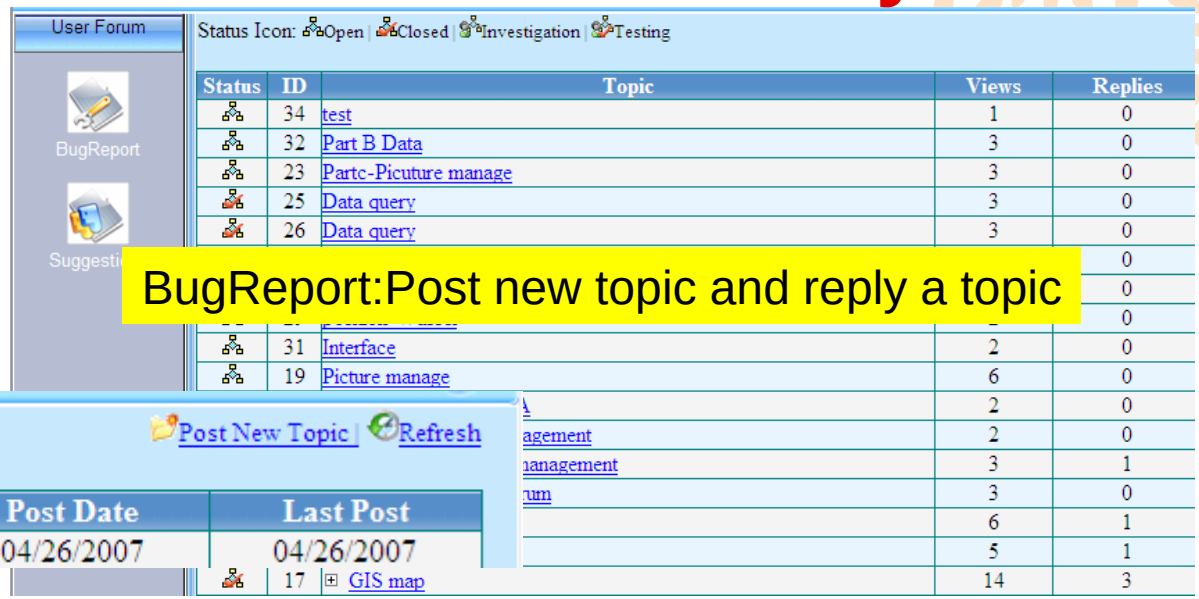
Total: 0 MILES Segment: 0 MILES

Distance measurement

Resource/Asset management using Web-Enabled GIS Database System

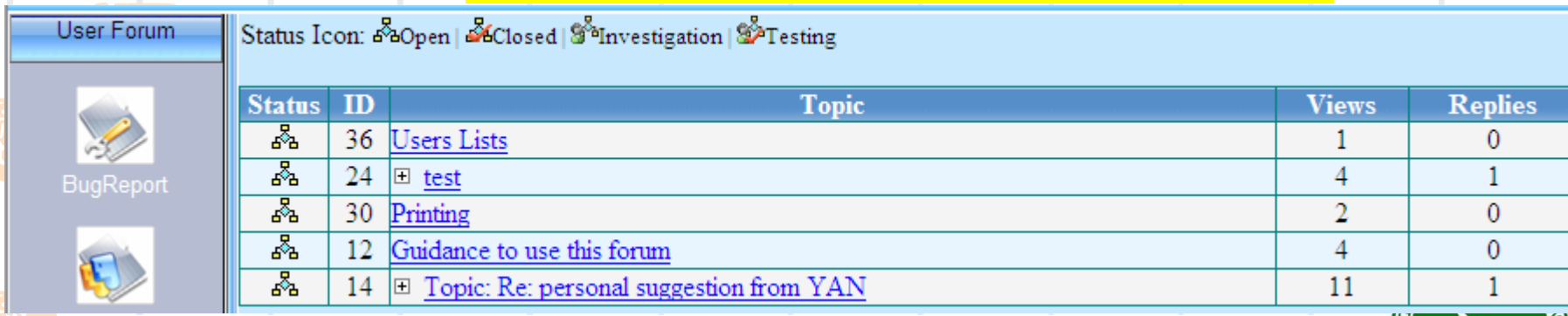
User Forum



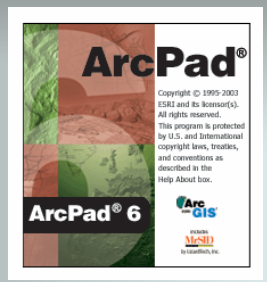


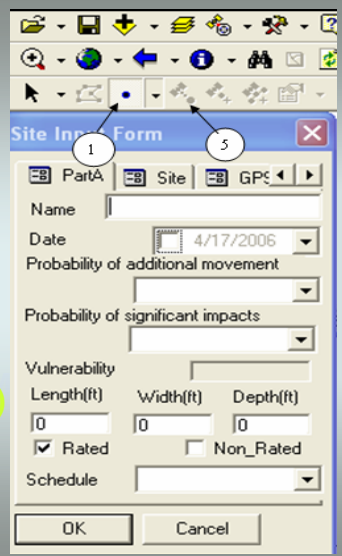
BugReport:Post new topic and reply a topic

Suggestions:Post new topic and reply a topic



Information Collection Process





Part A County/Transportation Manage (CM/TM)
Part B (CM/TM)
Part C District Power User

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Benefits of the Development

1. No paper work
2. Near real time monitoring
3. Centralized information
4. Uniform data collection
5. Shorten work time in office
6. Interchangeable information

Thank You !