10-14-2010

# SLIDES: Geospatial Decision Support for Shale Gas Site Development

Malcolm Williamson

Jackson Cothren

Peter Smith

# GEOSPATIAL DECISION SUPPORT FOR SHALE GAS SITE DEVELOPMENT

Malcolm Williamson , Jackson Cothren,
and Peter Smith

Center for Advanced Spatial Technologies

# IPAS:

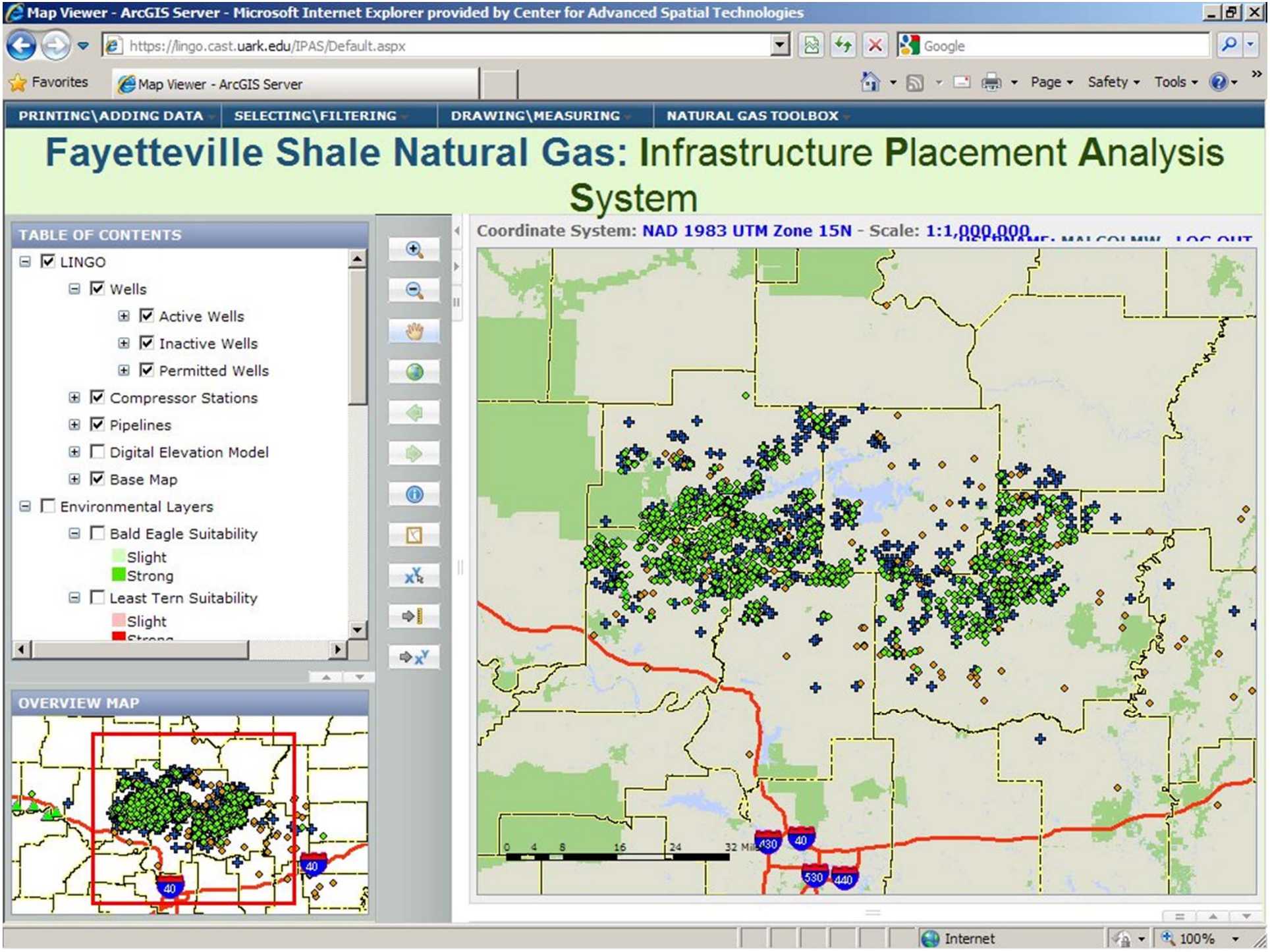
## "Infrastructure Placement Analysis System"

- LINGO - Low Impact Natural Gas and Oil
- DOE funded
  - NETL (National Energy Technology Laboratory)
- Integrates current technologies and practices to minimize adverse environmental impacts
- UofA
  - Chemical Engineering
  - CAST
- Argonne National Lab
  - Environmental Science Division

# IPAS:

## "Infrastructure Placement Analysis System"

- "Closed" web-based decision support system
  - Drillers and regulators share:
    - Geographic view of proposed infrastructure
    - Environmental and sensitive area data
    - Models of potential impacts
  - Increases communication efficiency
    - Speeds permitting
  - Increases transparency between regulators and drillers/producers
  - Clarifies uncertainty associated with geographic data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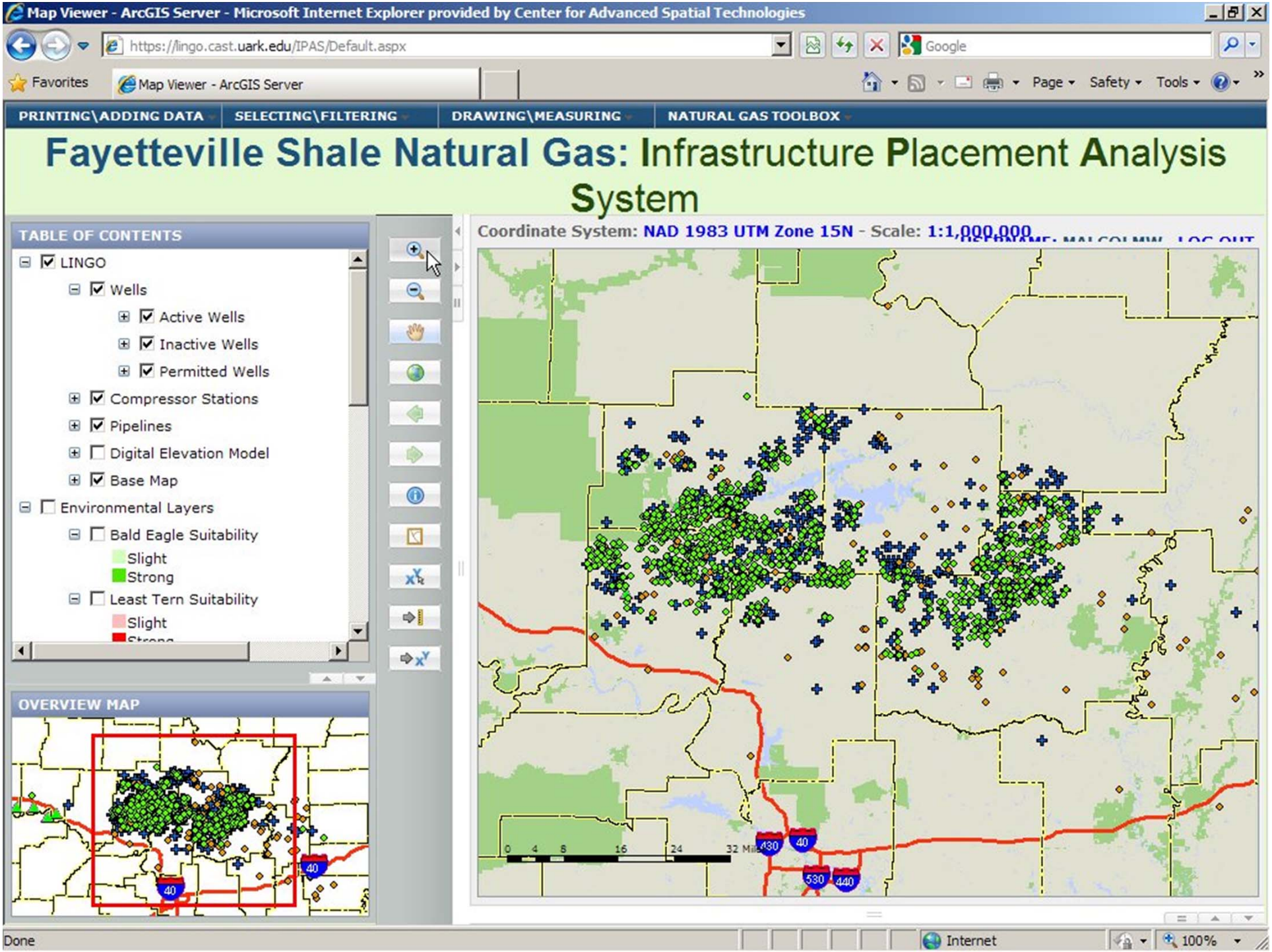
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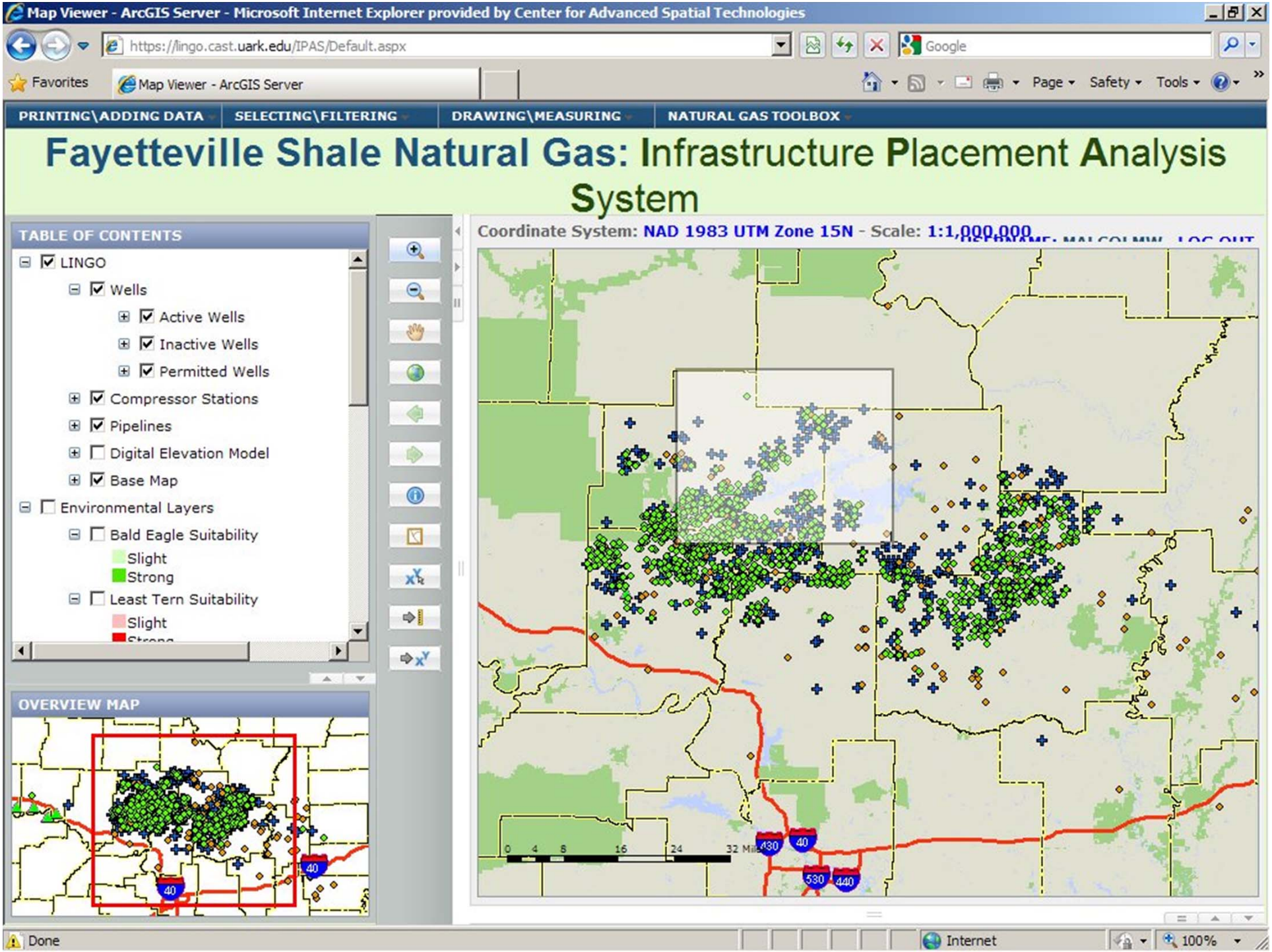
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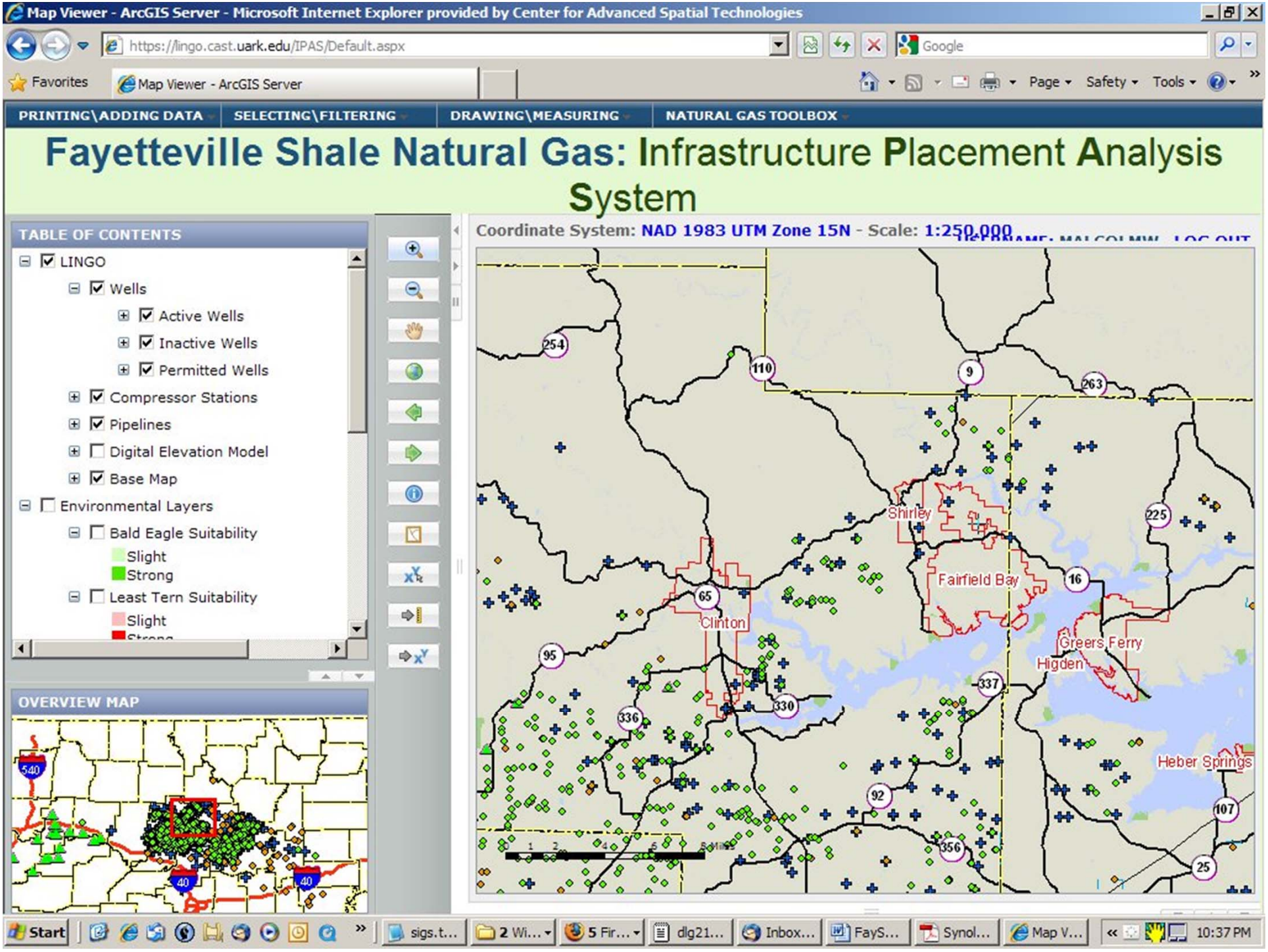
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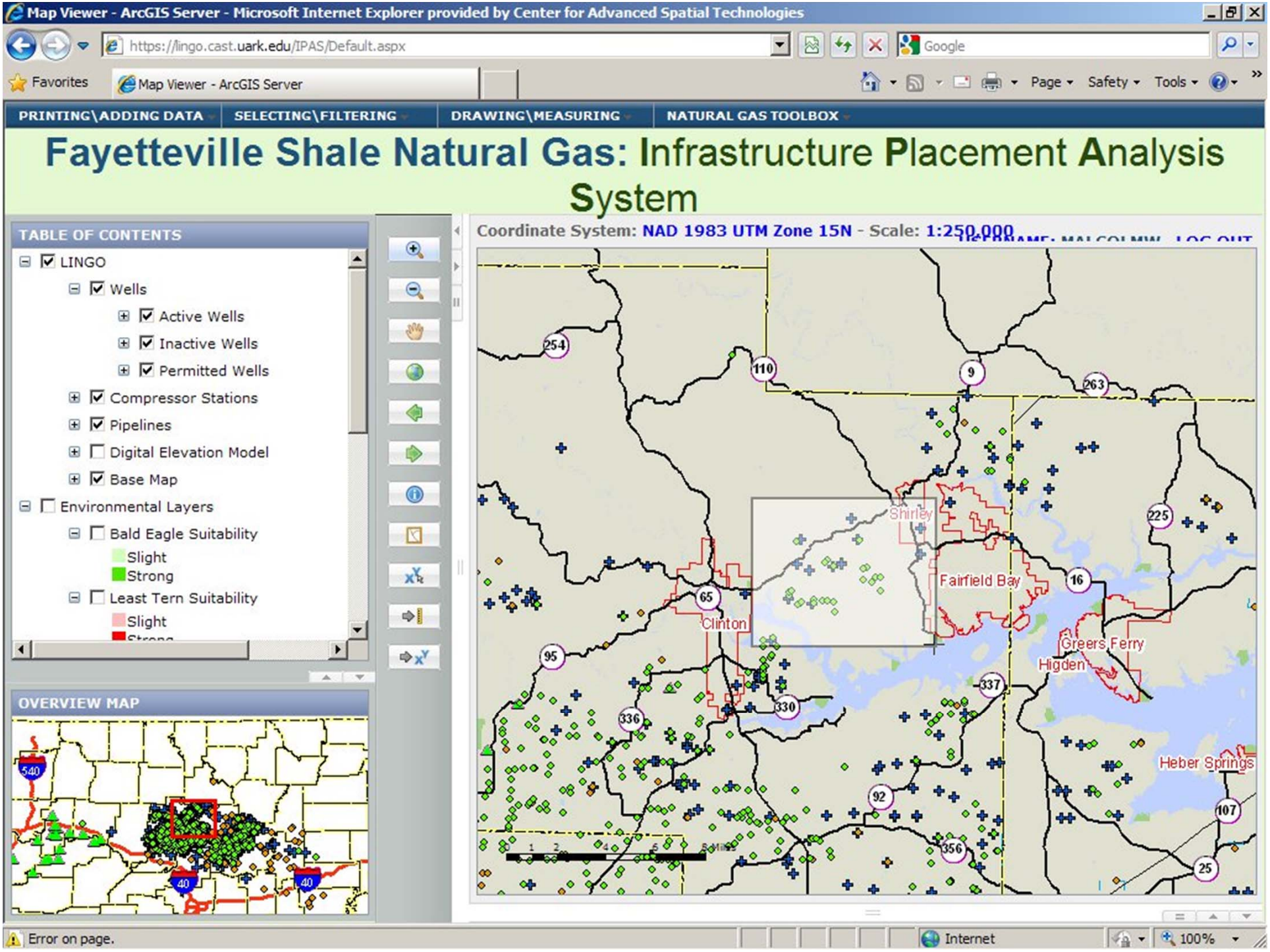
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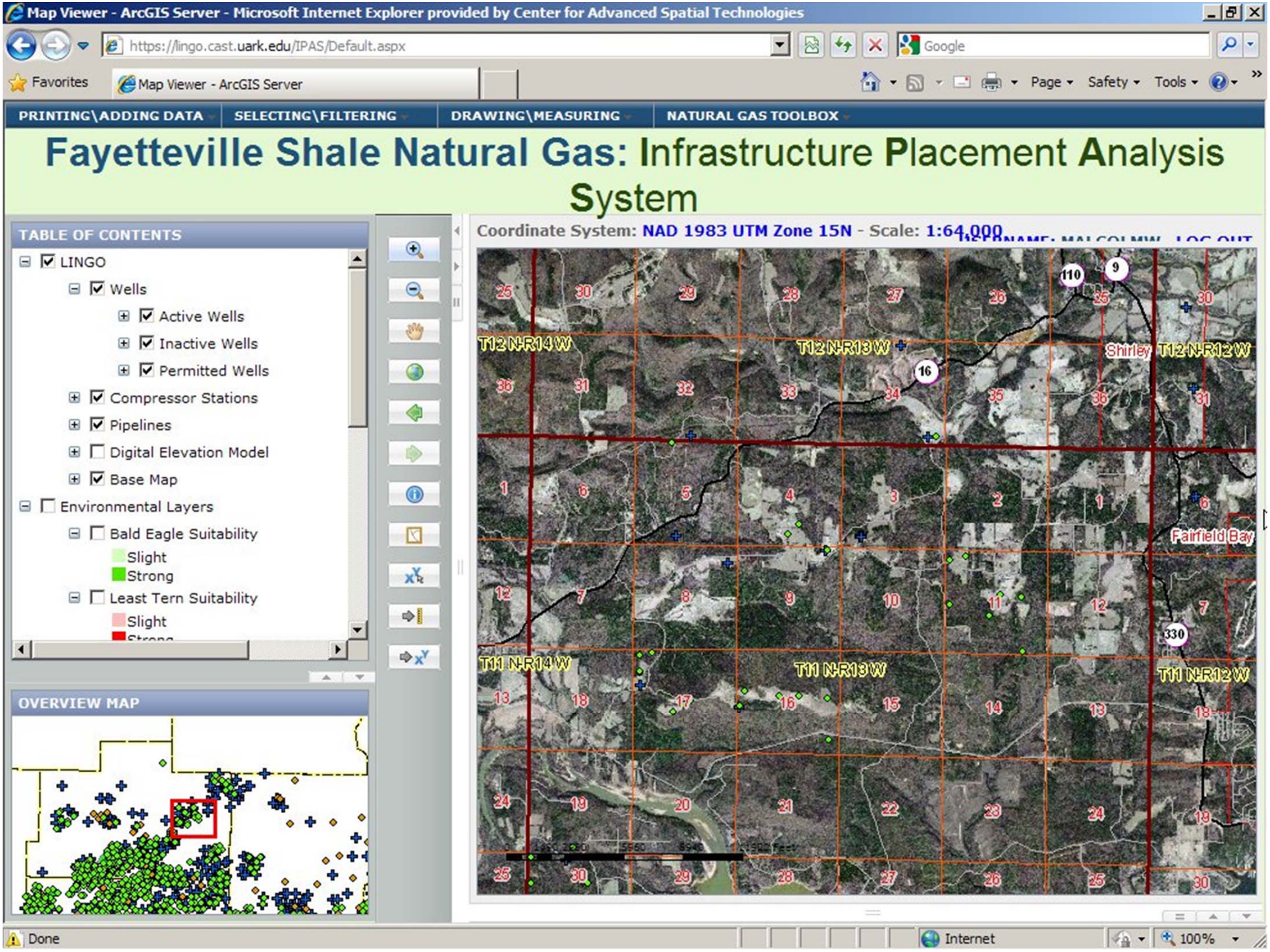
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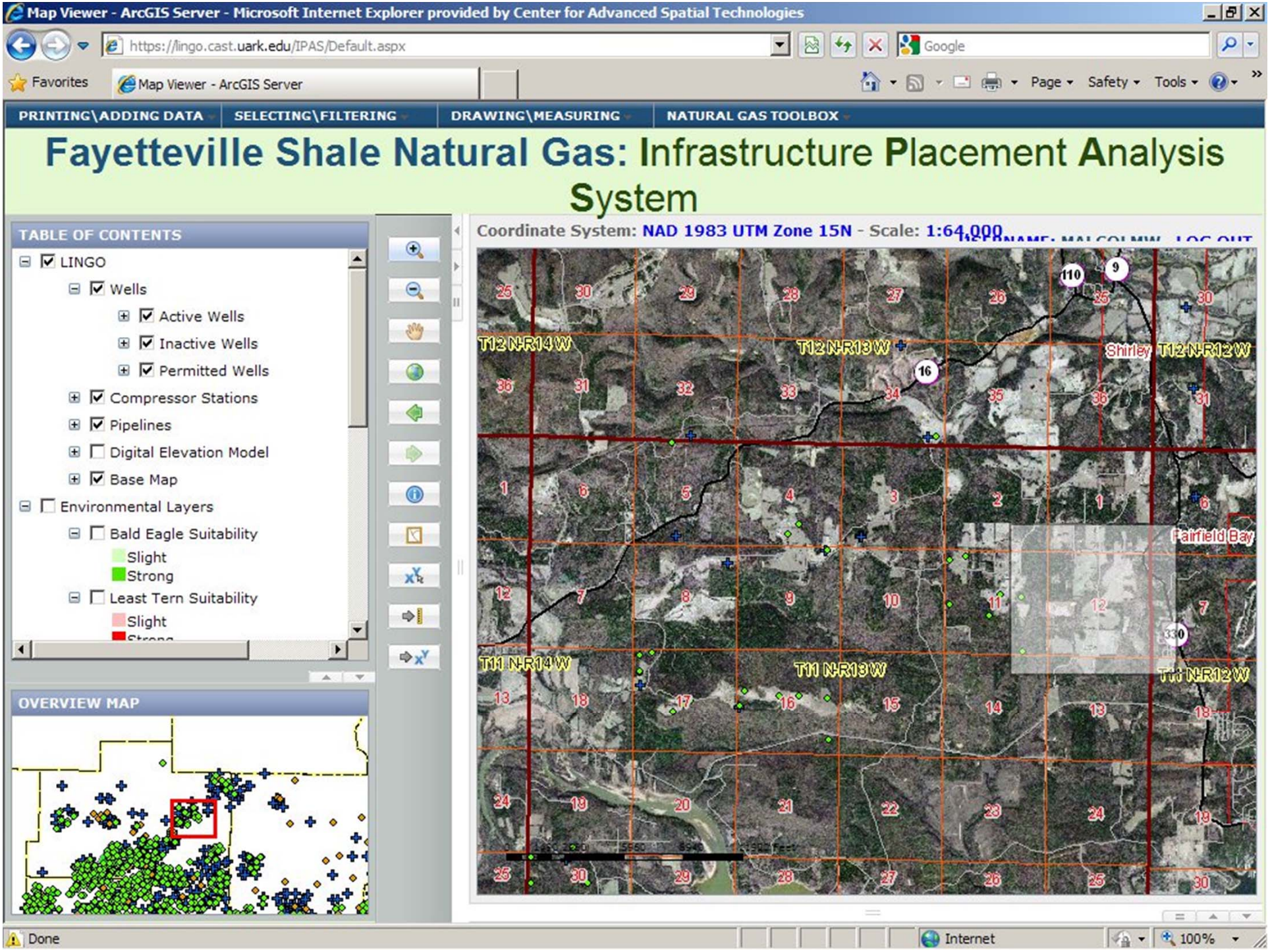
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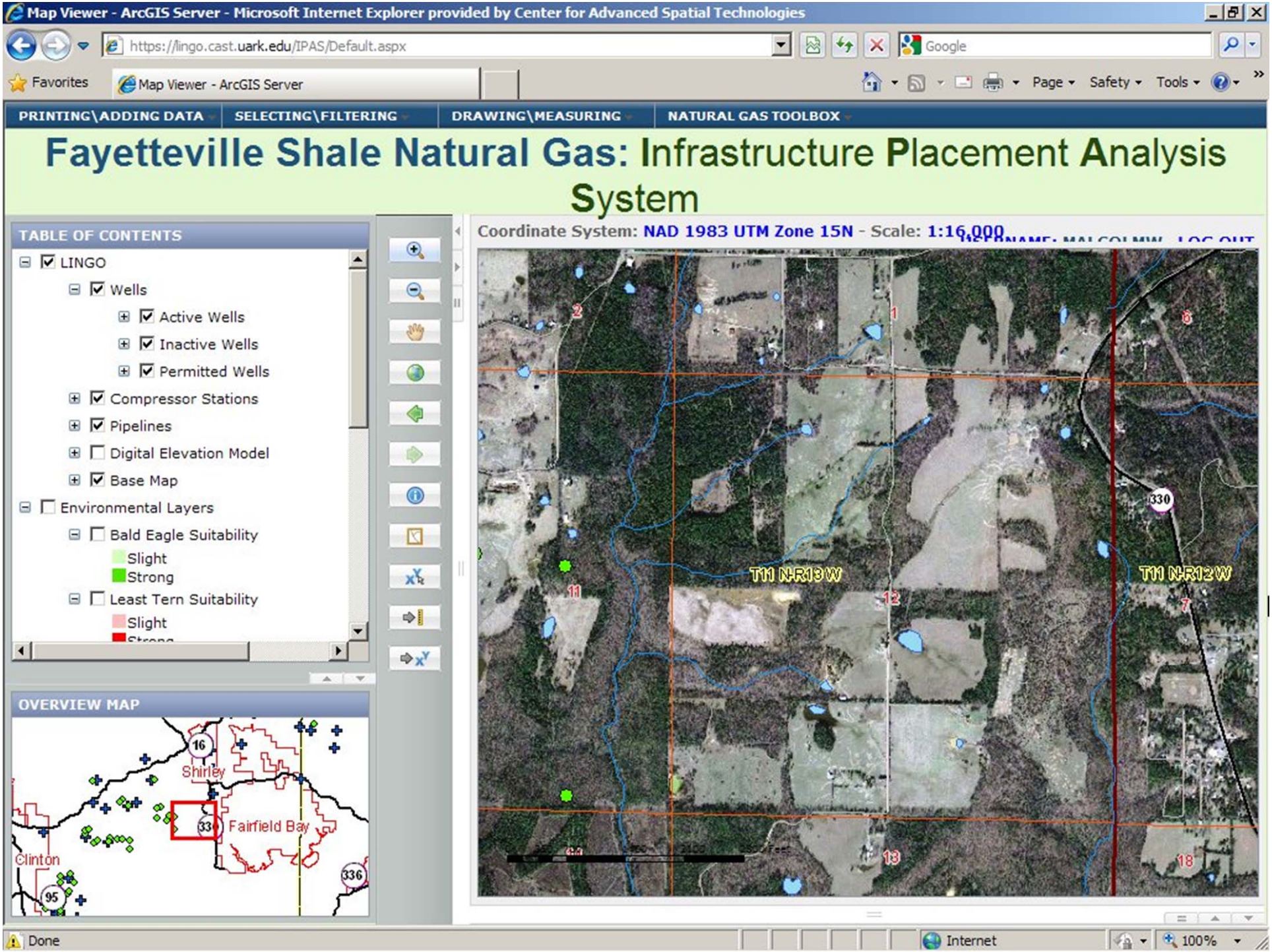
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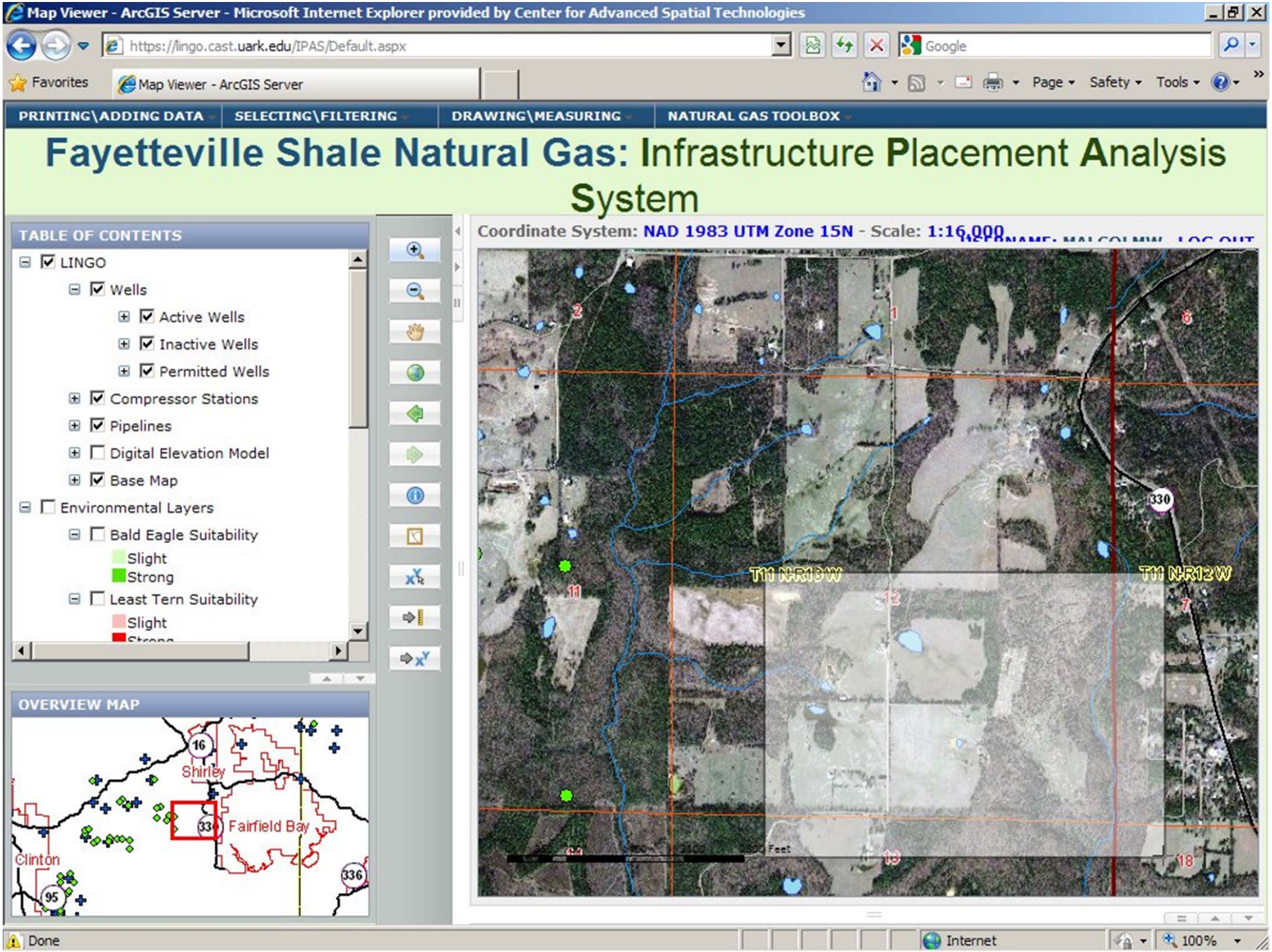
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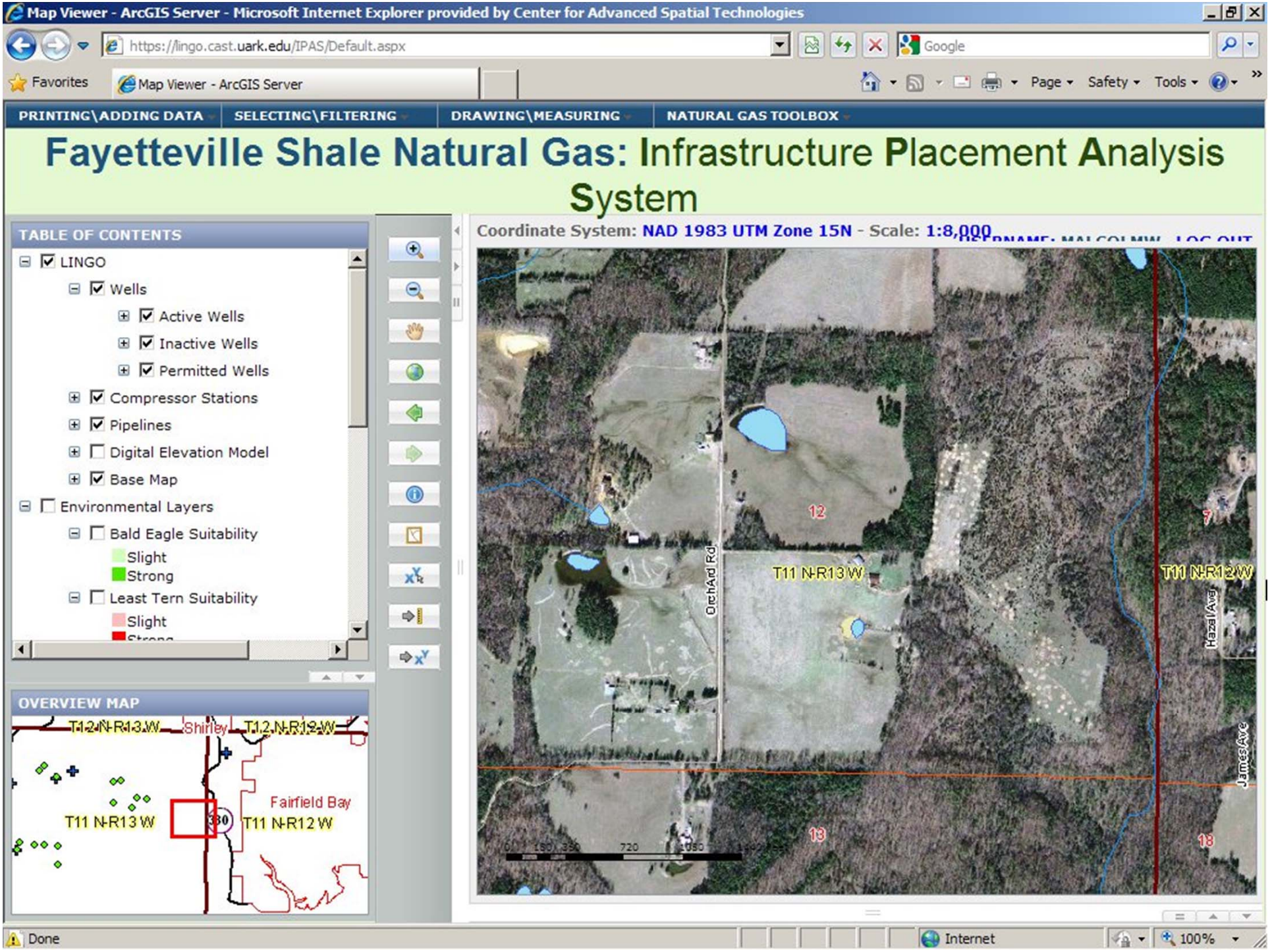
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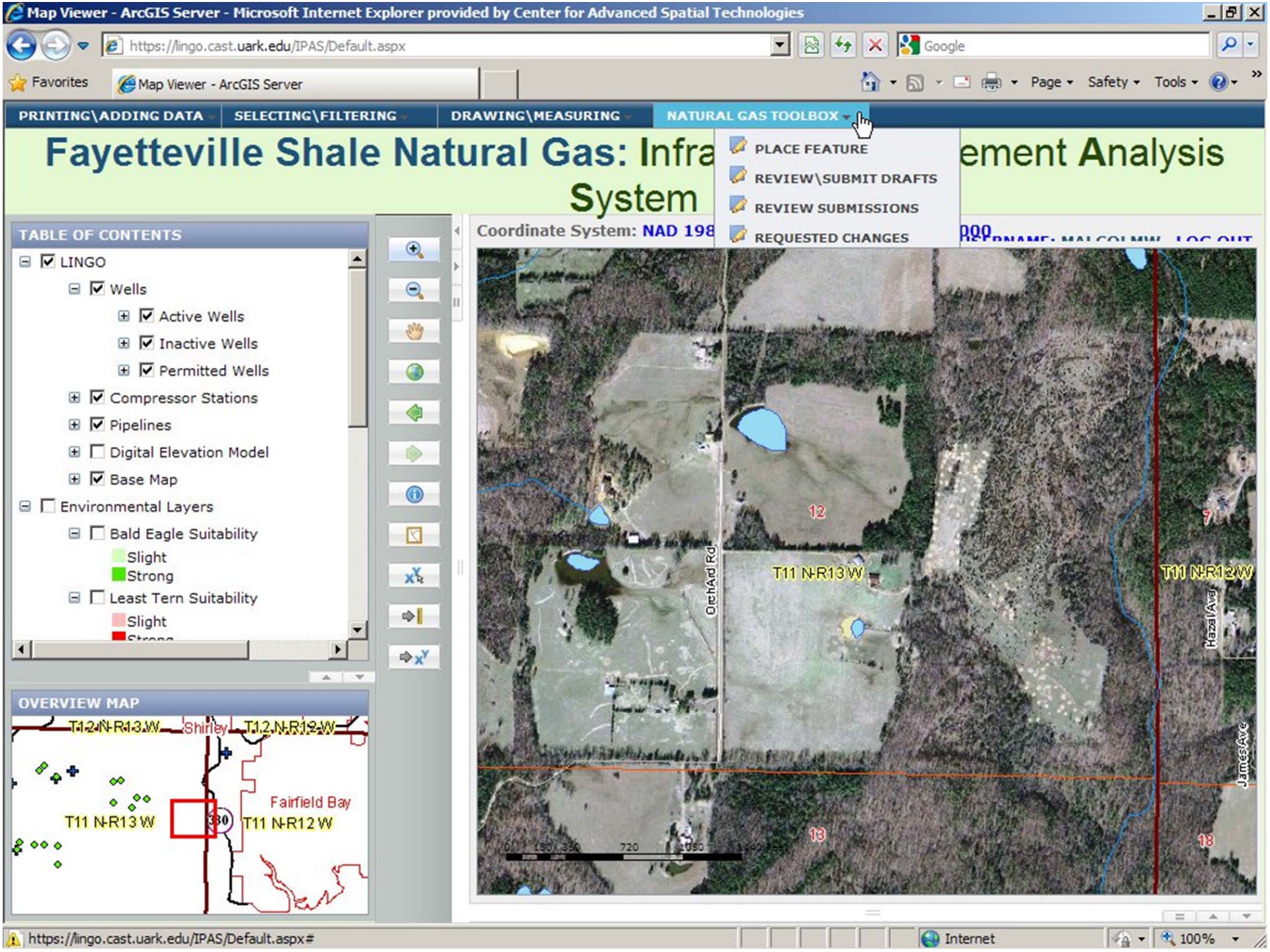
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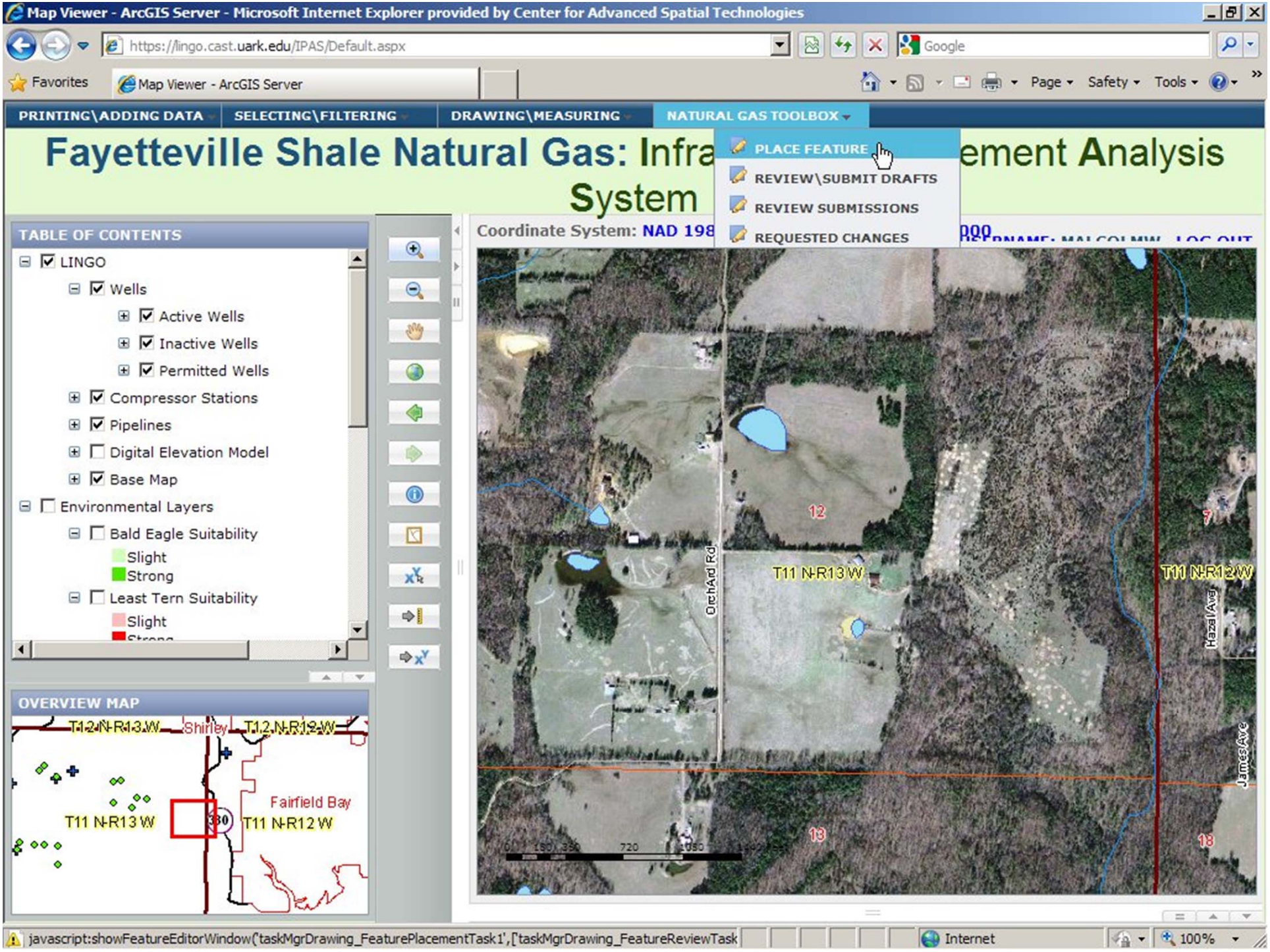
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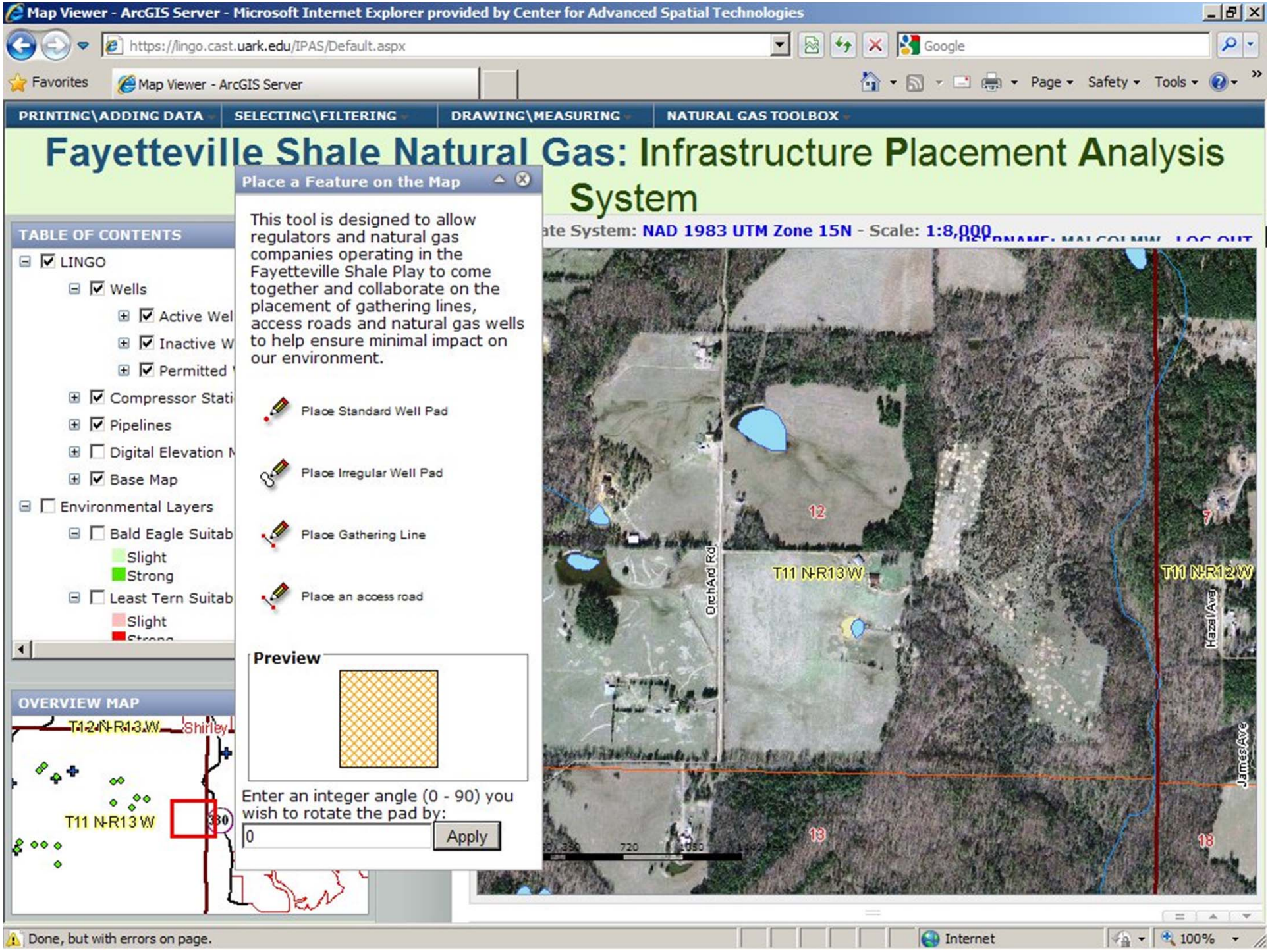
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Fayetteville Shale Natural Gas: Infrastructure Placement Analysis System
Place a Feature on the Map
This tool is designed to allow regulators and natural gas companies operating in the Fayetteville Shale Play to come together and collaborate on the placement of gathering lines, access roads and natural gas wells to help ensure minimal impact on our environment.
Place Standard Well Pad
Place Irregular Well Pad
Place Gathering Line
Place an access road
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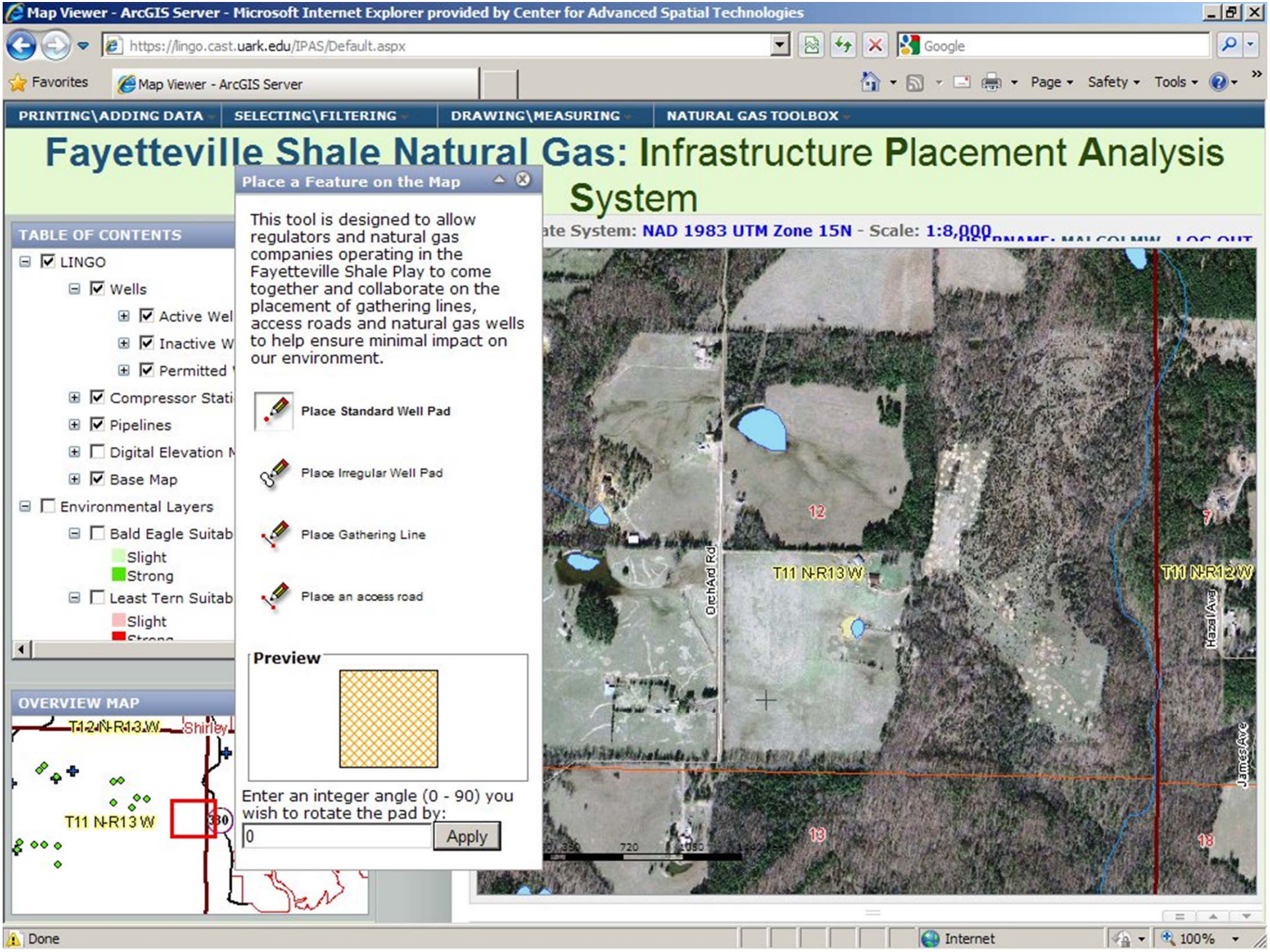
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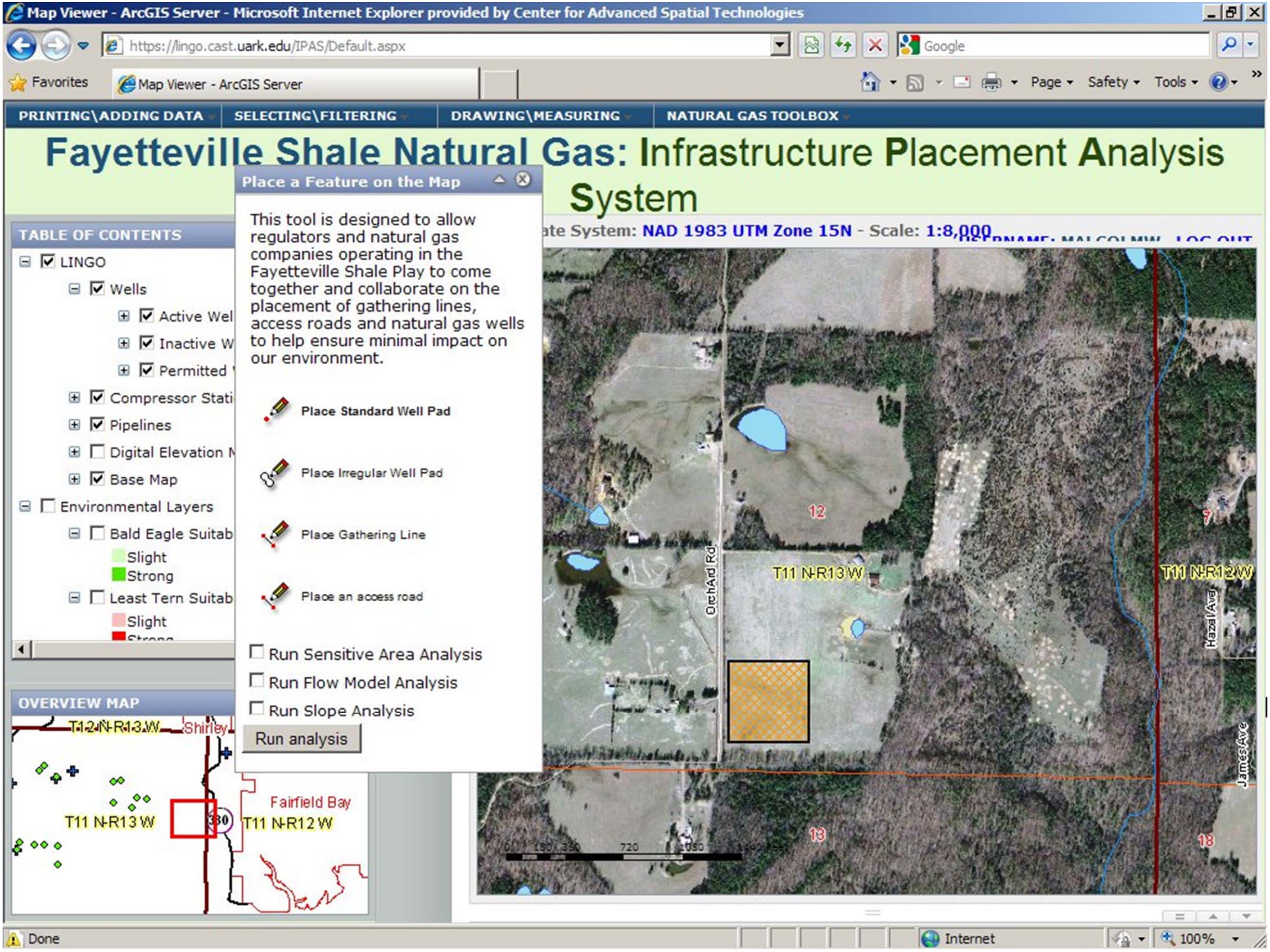
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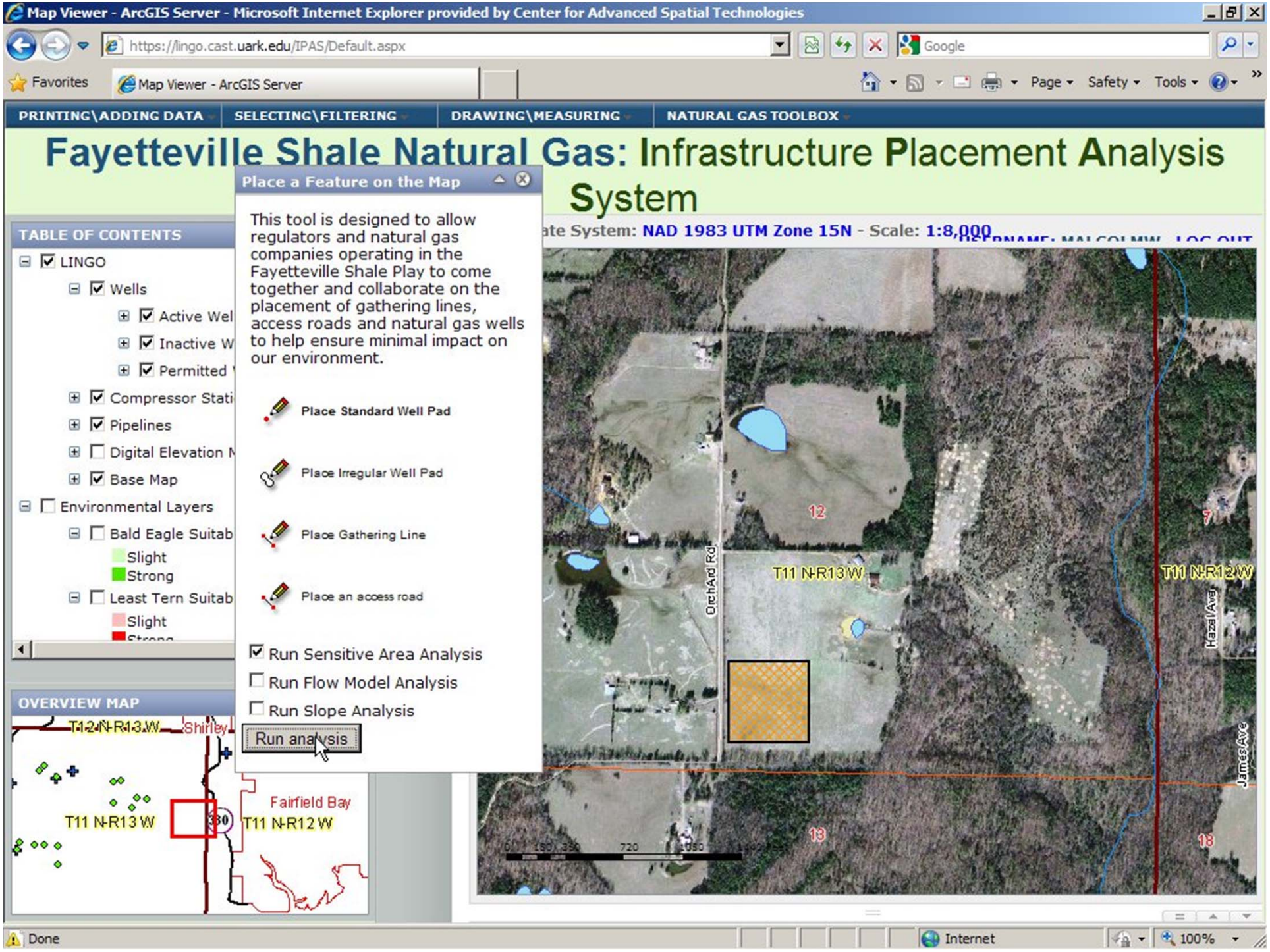
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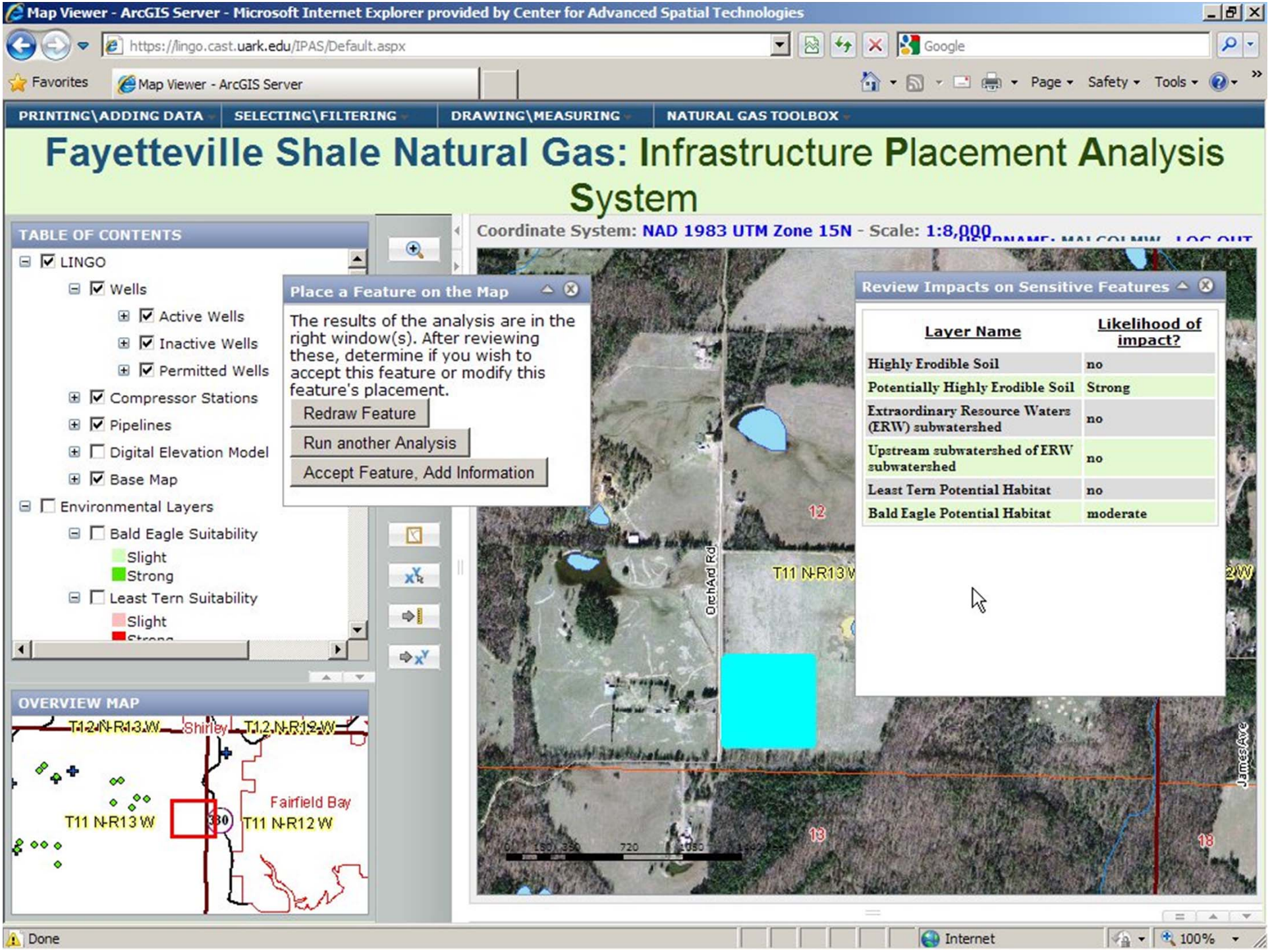
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The results of the analysis are in the right window(s). After reviewing these, determine if you wish to accept this feature or modify this feature's placement.
Redraw Feature
Run another Analysis
Accept Feature, Add Information
Review Impacts on Sensitive Features
Layer Name
Likelihood of impact?
Highly Erodible Soil
no
Potentially Highly Erodible Soil
Strong
Extraordinary Resource Waters (ERW) subwatershed
no
Upstream subwatershed of ERW subwatershed
no
Least Tern Potential Habitat
no
Bald Eagle Potential Habitat
moderate
Orchard Rd
T11 N-R13 W
James Ave
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Done
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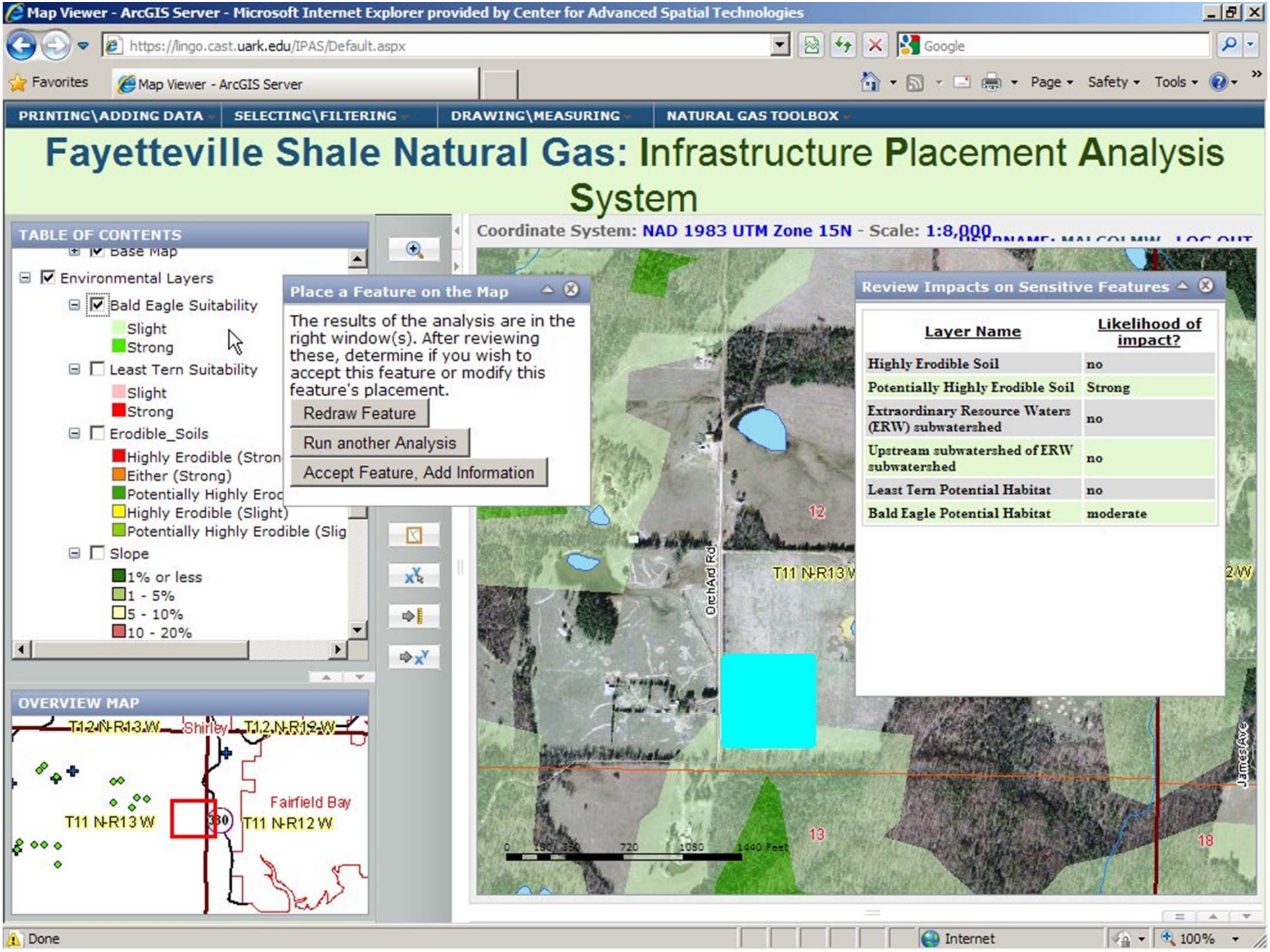
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Least Tern Suitability
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Potentially Highly Erodible (Slig
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T12 N-R12 W
Fairfield Bay
T11 N-R13 W
T11 N-R12 W
Coordinate System: NAD 1983 UTM Zone 15N - Scale: 1:8,000
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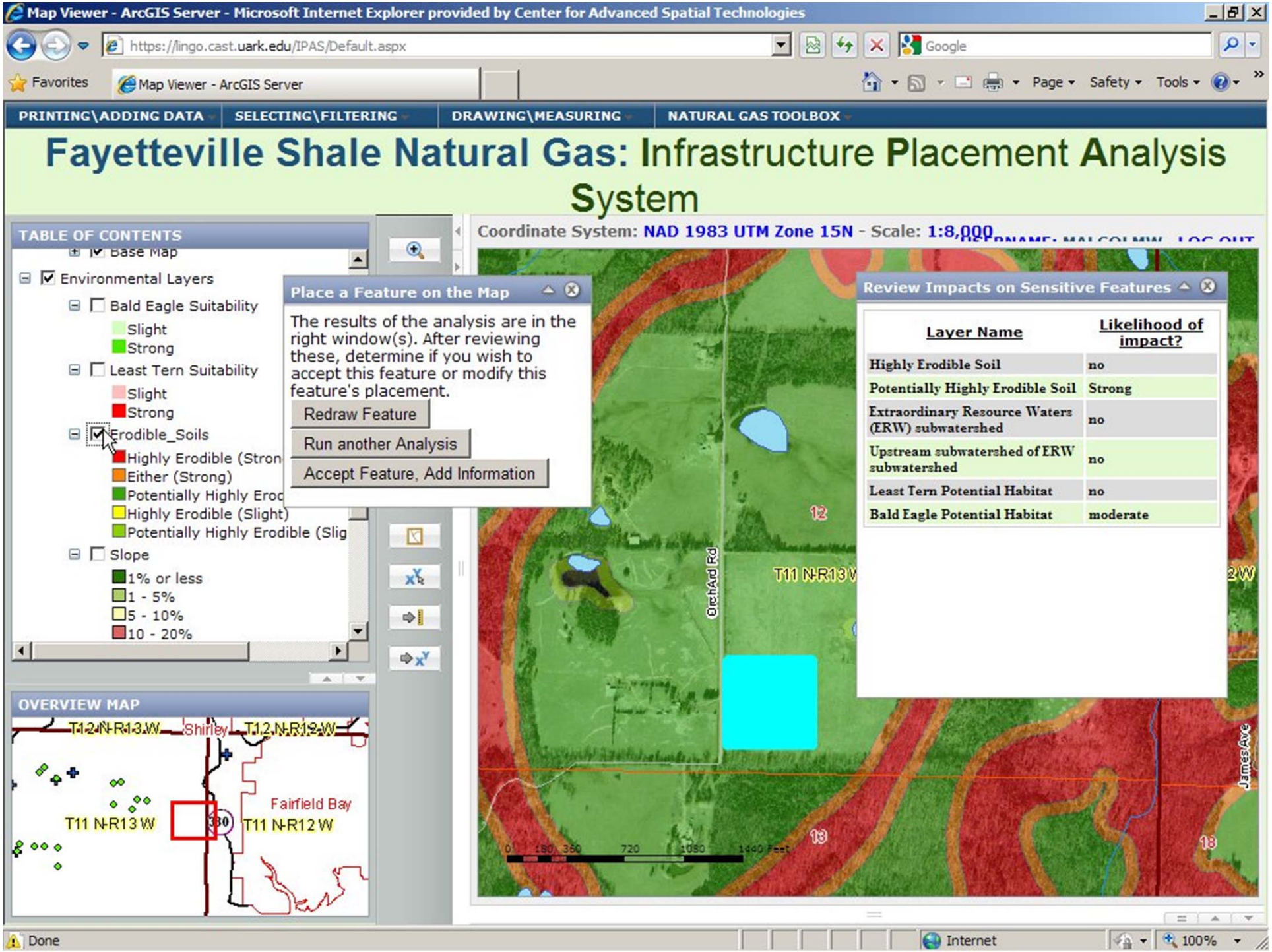
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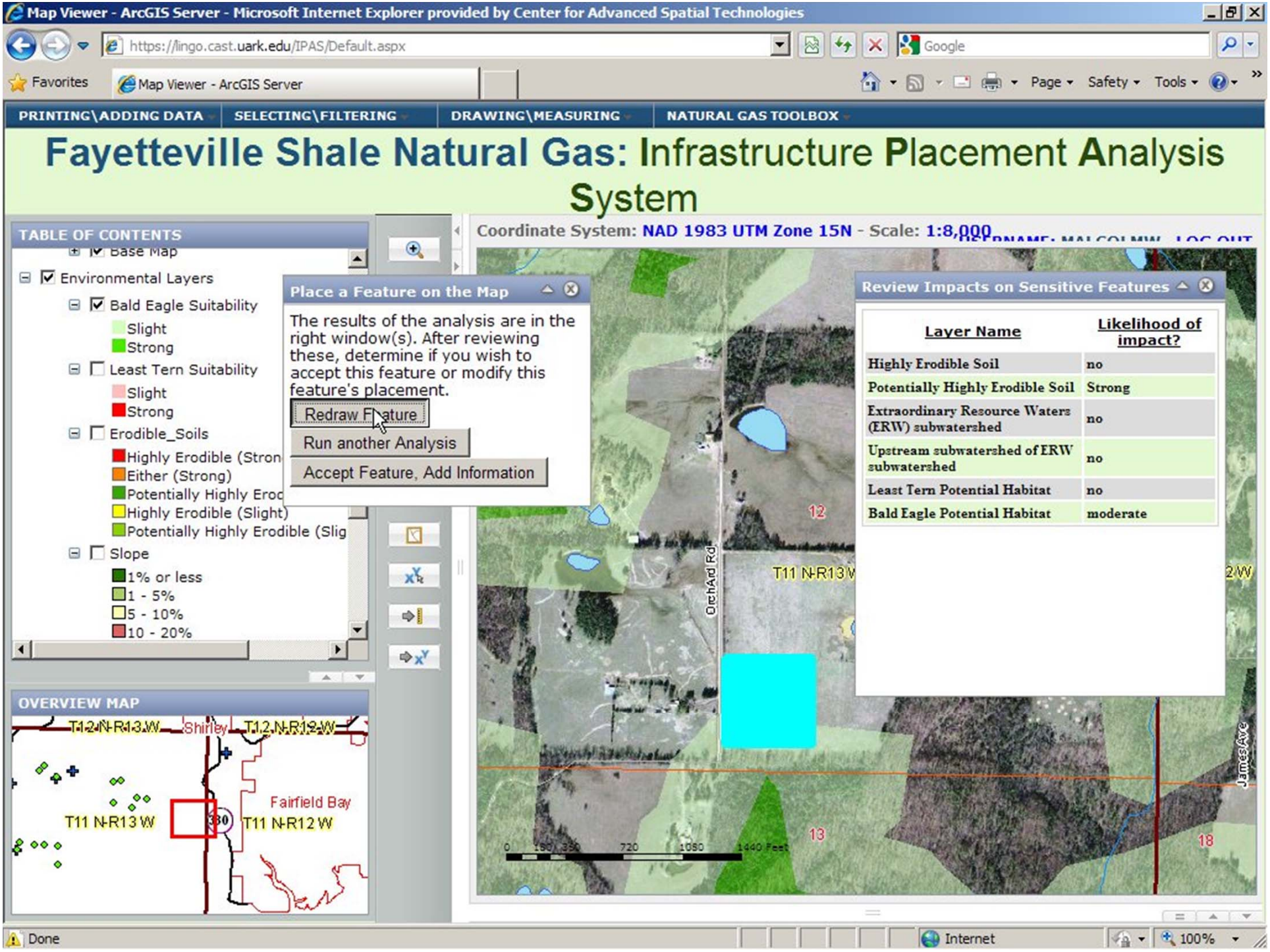
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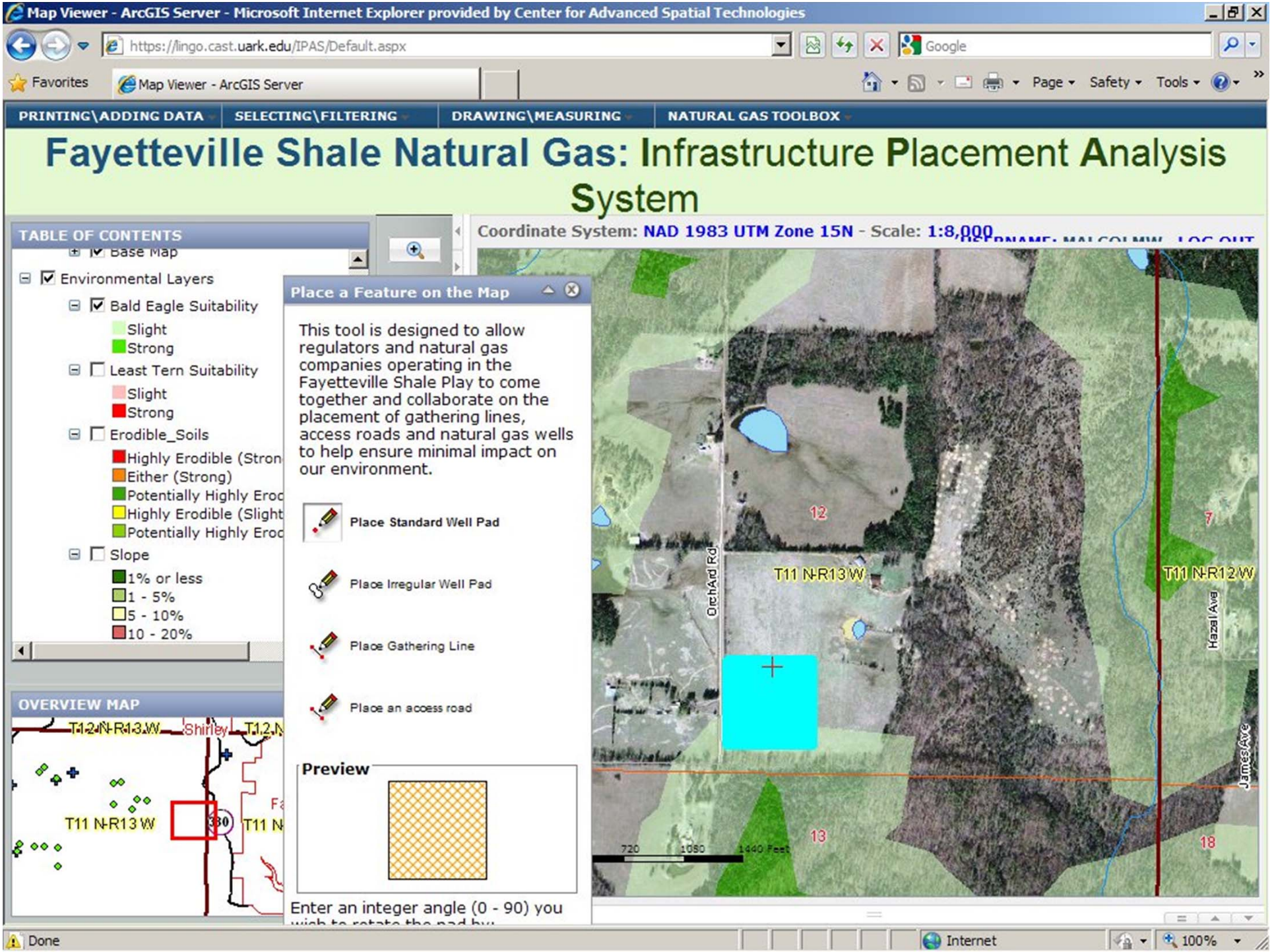
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OVERVIEW MAP
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T11 N-R13 W
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T11 N
Place a Feature on the Map
This tool is designed to allow regulators and natural gas companies operating in the Fayetteville Shale Play to come together and collaborate on the placement of gathering lines, access roads and natural gas wells to help ensure minimal impact on our environment.
Place Standard Well Pad
Place Irregular Well Pad
Place Gathering Line
Place an access road
Preview
Enter an integer angle (0 - 90) you
Coordinate System: NAD 1983 UTM Zone 15N - Scale: 1:8,000
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7
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T11 N-R12 W
Orchard Rd
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James Ave
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Internet
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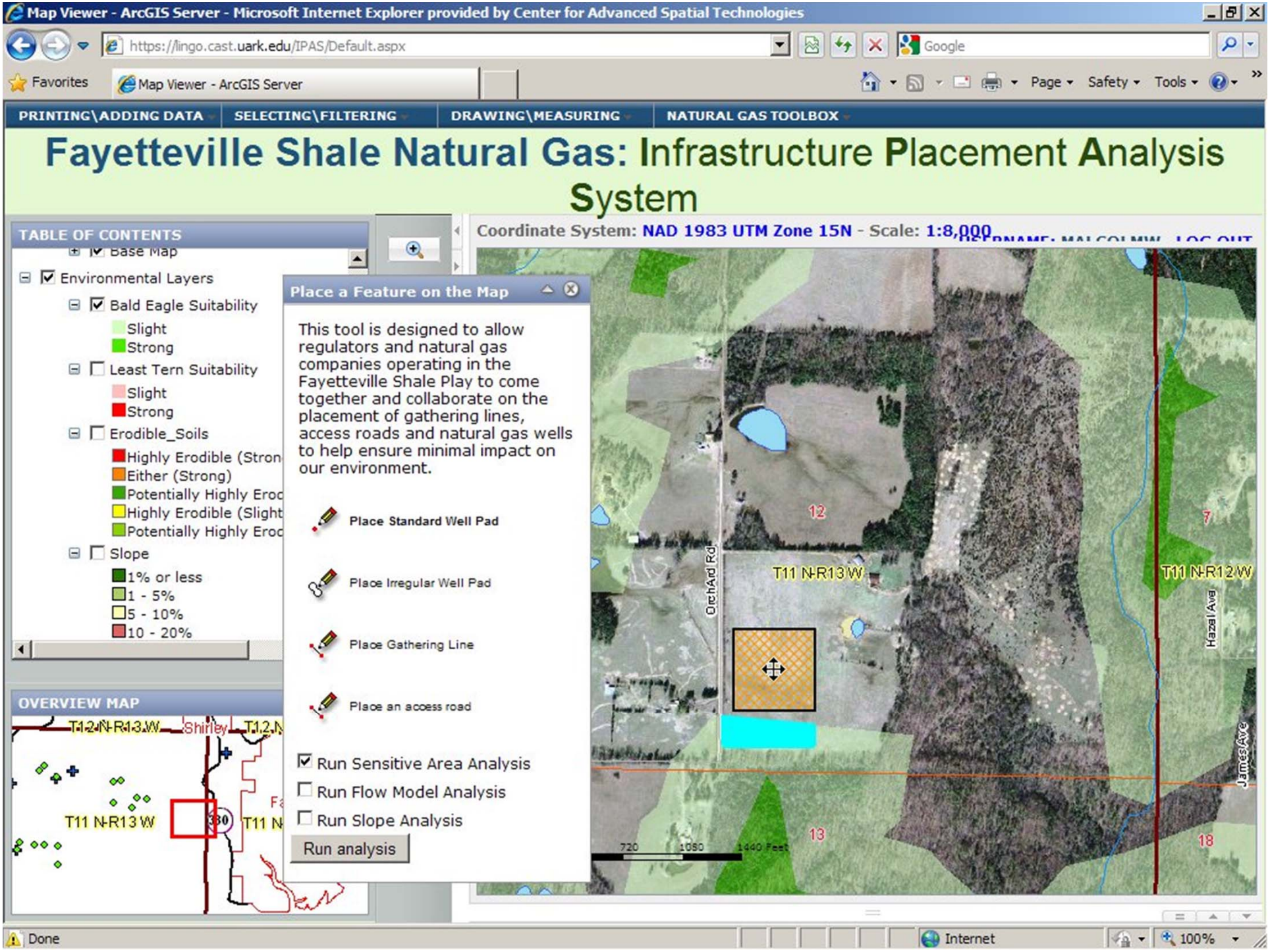
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10 - 20%
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Shirley
T11 N-R13 W
330
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Place Standard Well Pad
Place Irregular Well Pad
Place Gathering Line
Place an access road
Run Sensitive Area Analysis
Run Flow Model Analysis
Run Slope Analysis
Run analysis
Coordinate System: NAD 1983 UTM Zone 15N - Scale: 1:8,000
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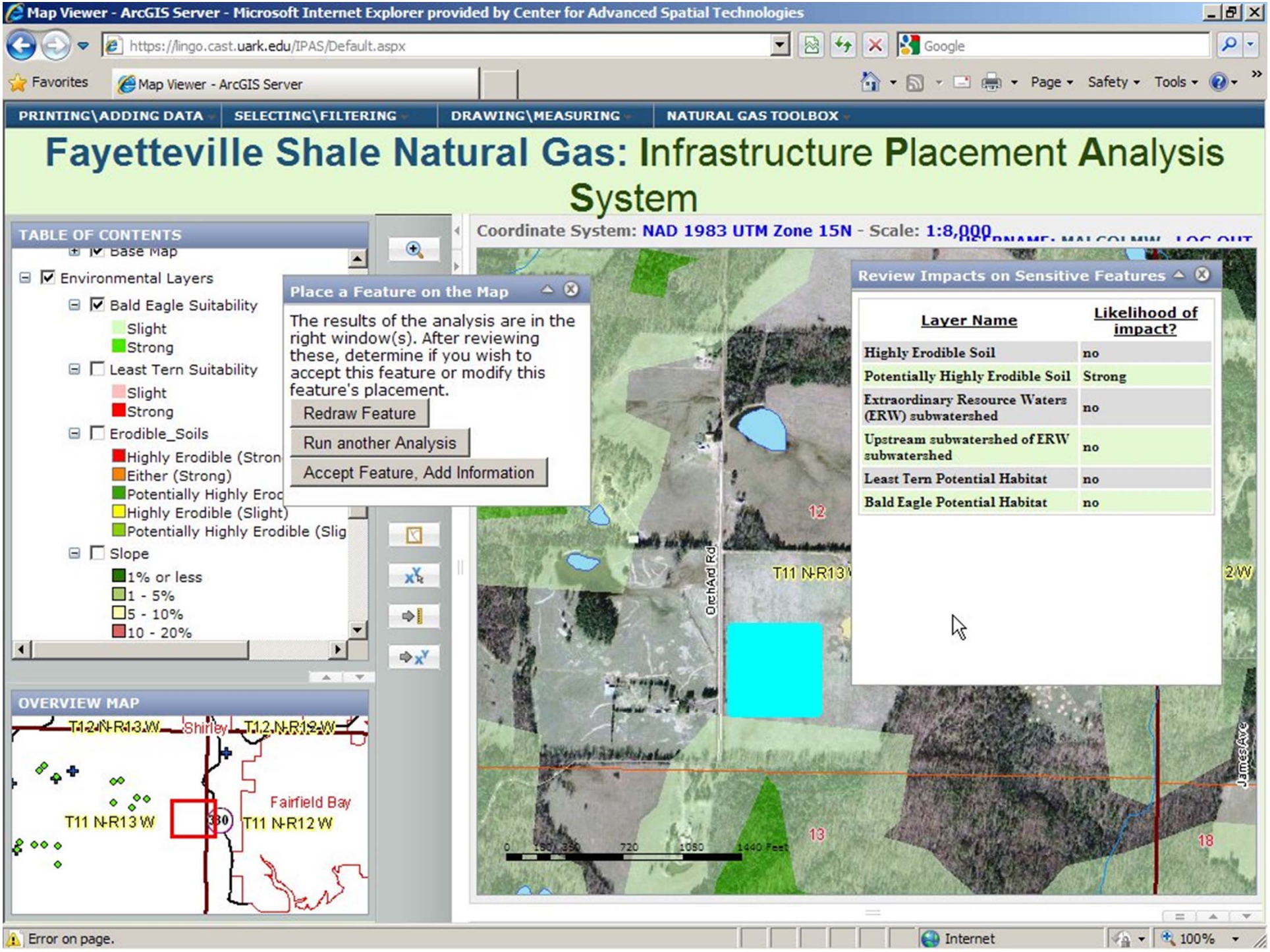
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OVERVIEW MAP
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T12 N-R12 W
Fairfield Bay
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330
T11 N-R12 W
Coordinate System: NAD 1983 UTM Zone 15N - Scale: 1:8,000
Place a Feature on the Map
The results of the analysis are in the right window(s). After reviewing these, determine if you wish to accept this feature or modify this feature's placement.
Redraw Feature
Run another Analysis
Accept Feature, Add Information
Review Impacts on Sensitive Features
Layer Name
Likelihood of impact?
Highly Erodible Soil
no
Potentially Highly Erodible Soil
Strong
Extraordinary Resource Waters (ERW) subwatershed
no
Upstream subwatershed of ERW subwatershed
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Least Tern Potential Habitat
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Bald Eagle Potential Habitat
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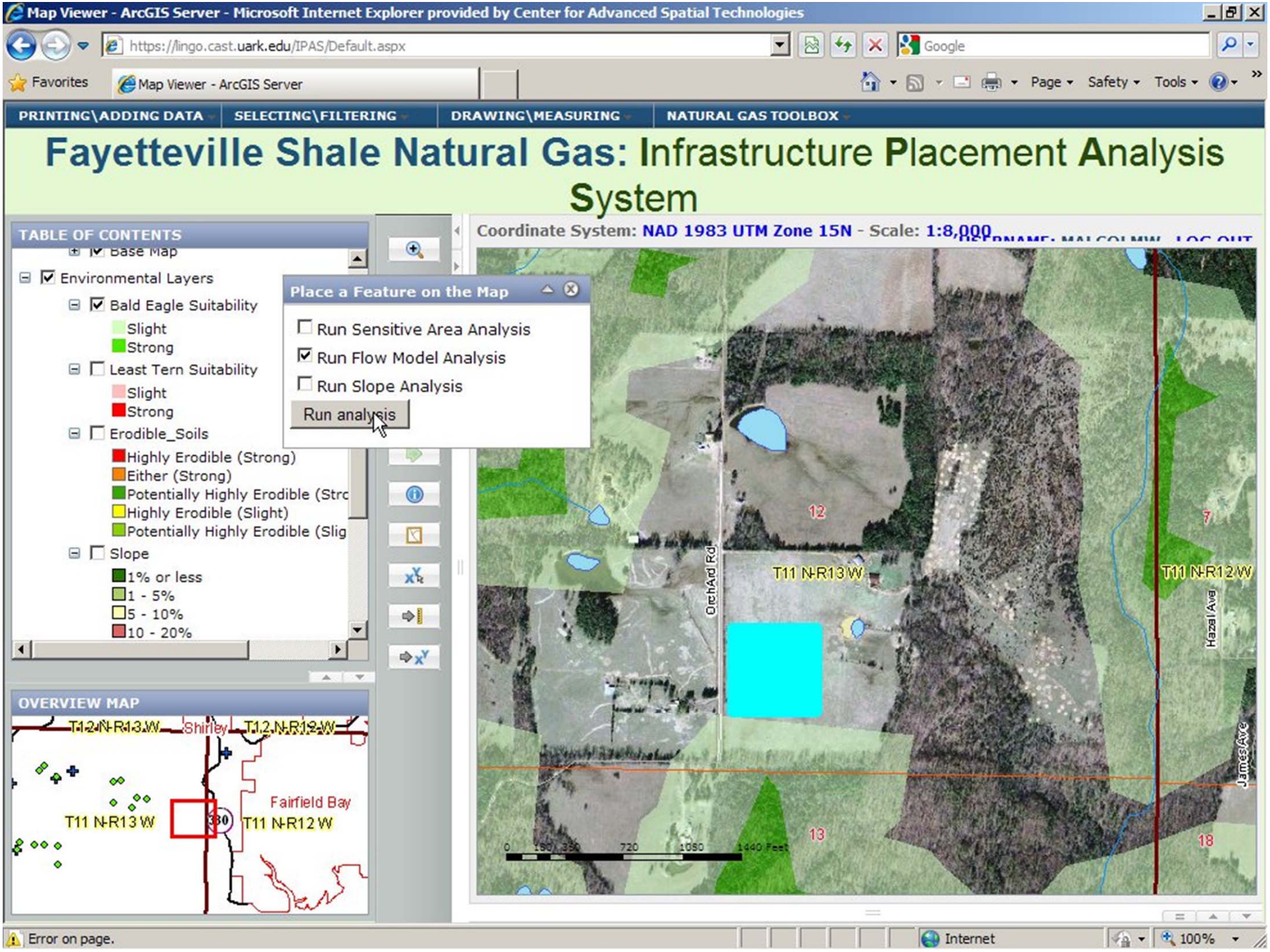
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Strong
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Highly Erodible (Slight)
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Place a Feature on the Map
Run Sensitive Area Analysis
Run Flow Model Analysis
Run Slope Analysis
Run analysis
Coordinate System: NAD 1983 UTM Zone 15N - Scale: 1:8,000
OVERVIEW MAP
T12 N-R13 W
Shirley
T12 N-R12 W
Fairfield Bay
T11 N-R13 W
330
T11 N-R12 W
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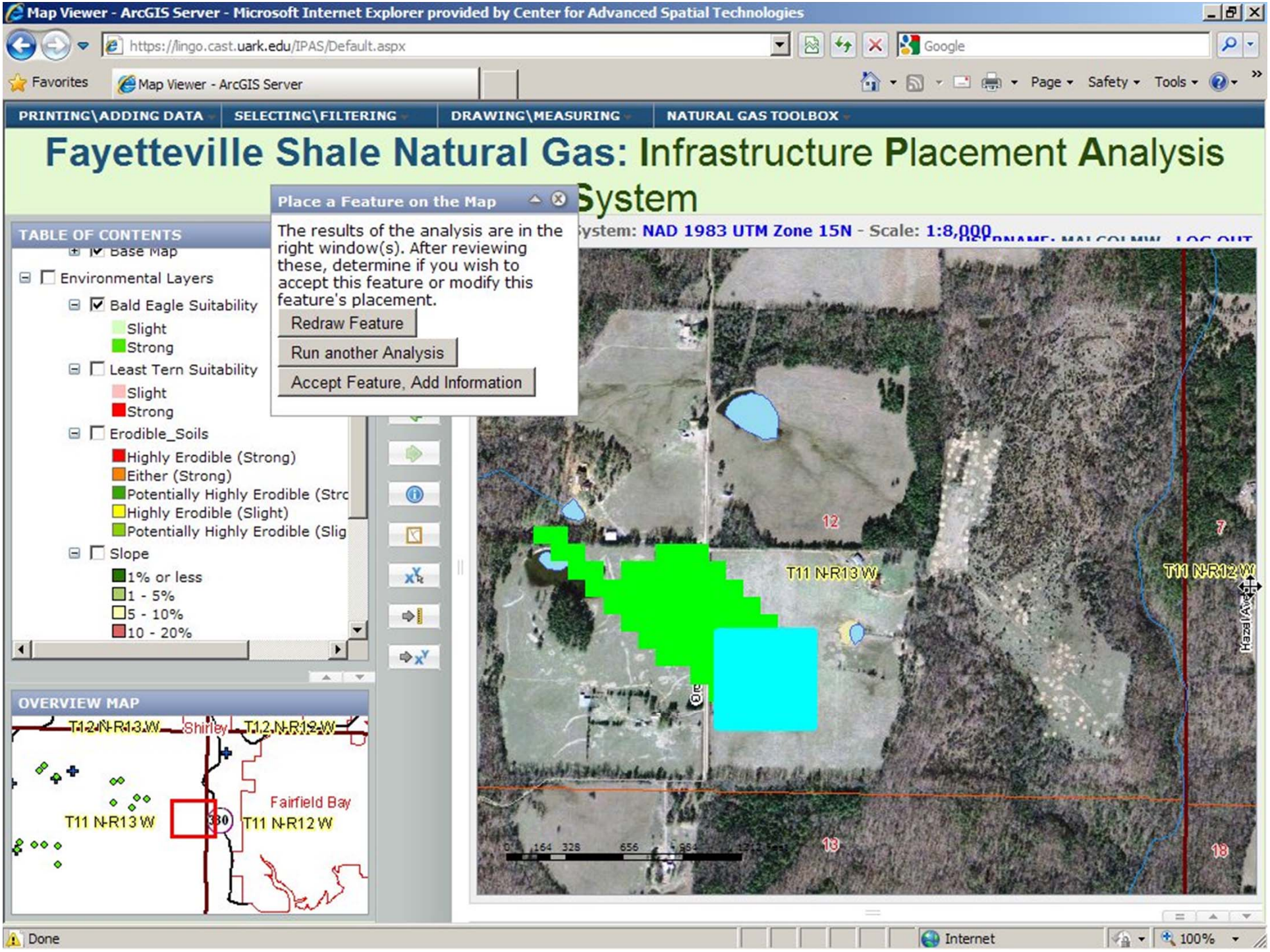
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System
Place a Feature on the Map
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Redraw Feature
Run another Analysis
Accept Feature, Add Information
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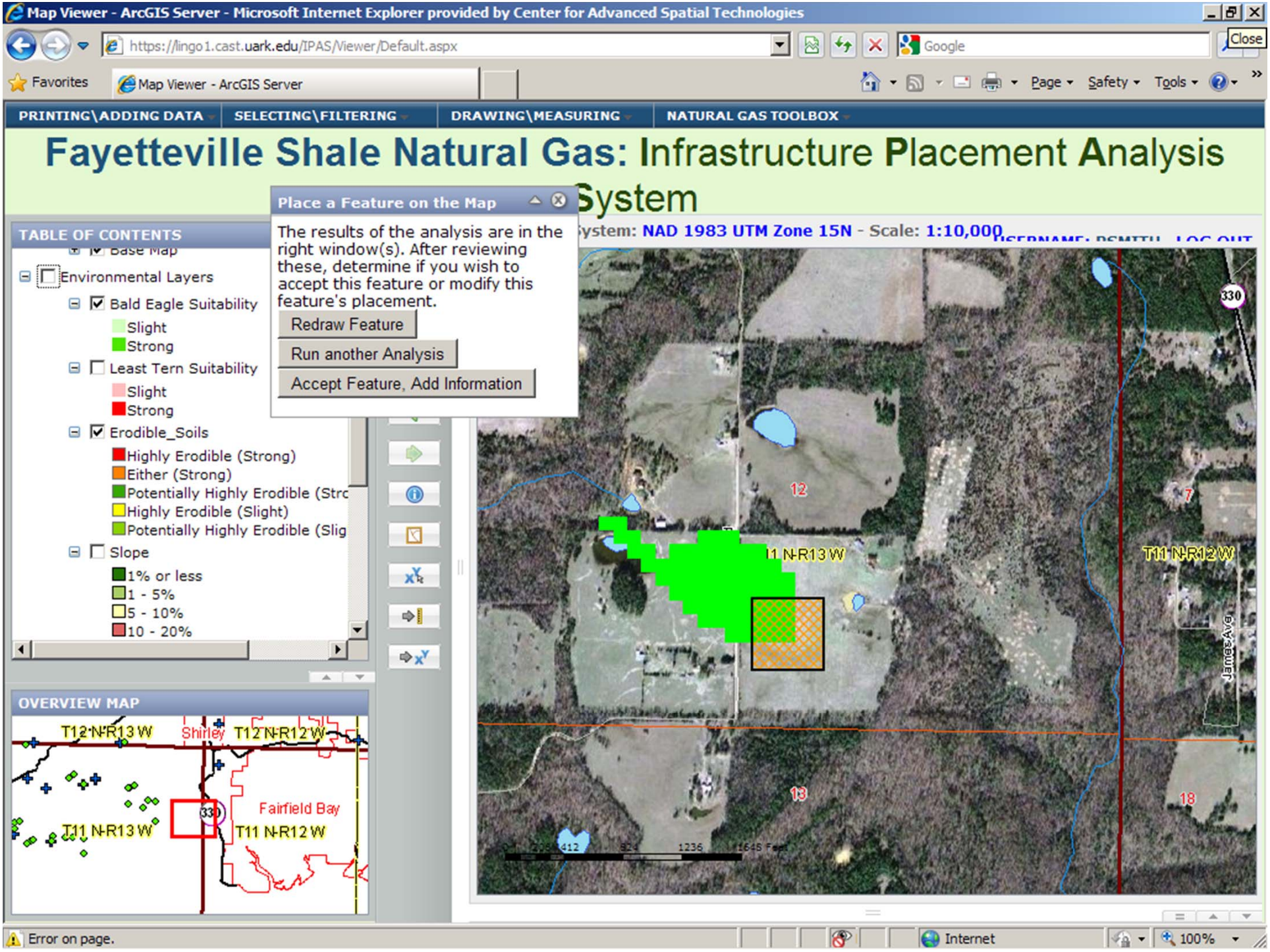
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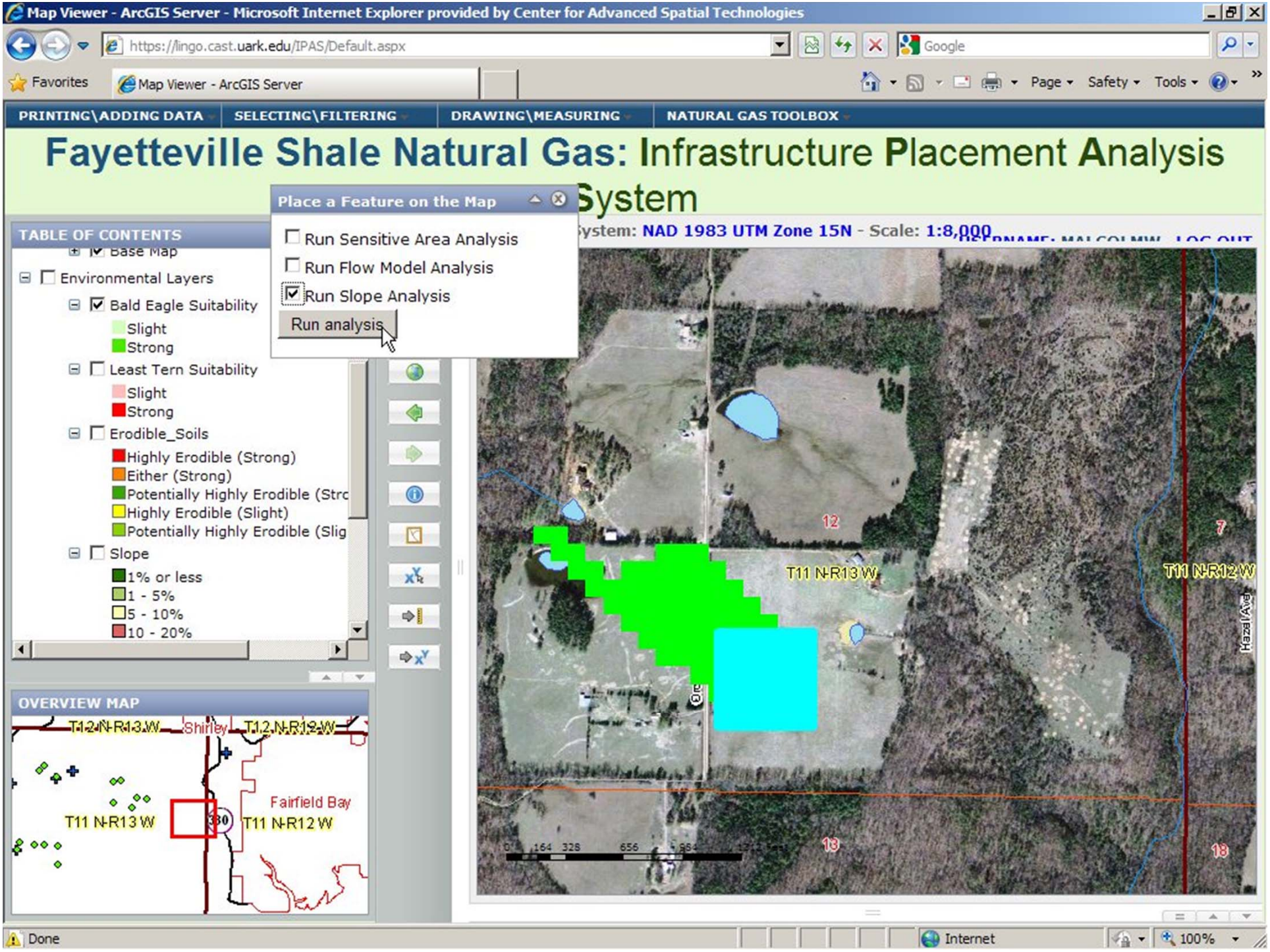
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Run Sensitive Area Analysis
Run Flow Model Analysis
Run Slope Analysis
Run analysis
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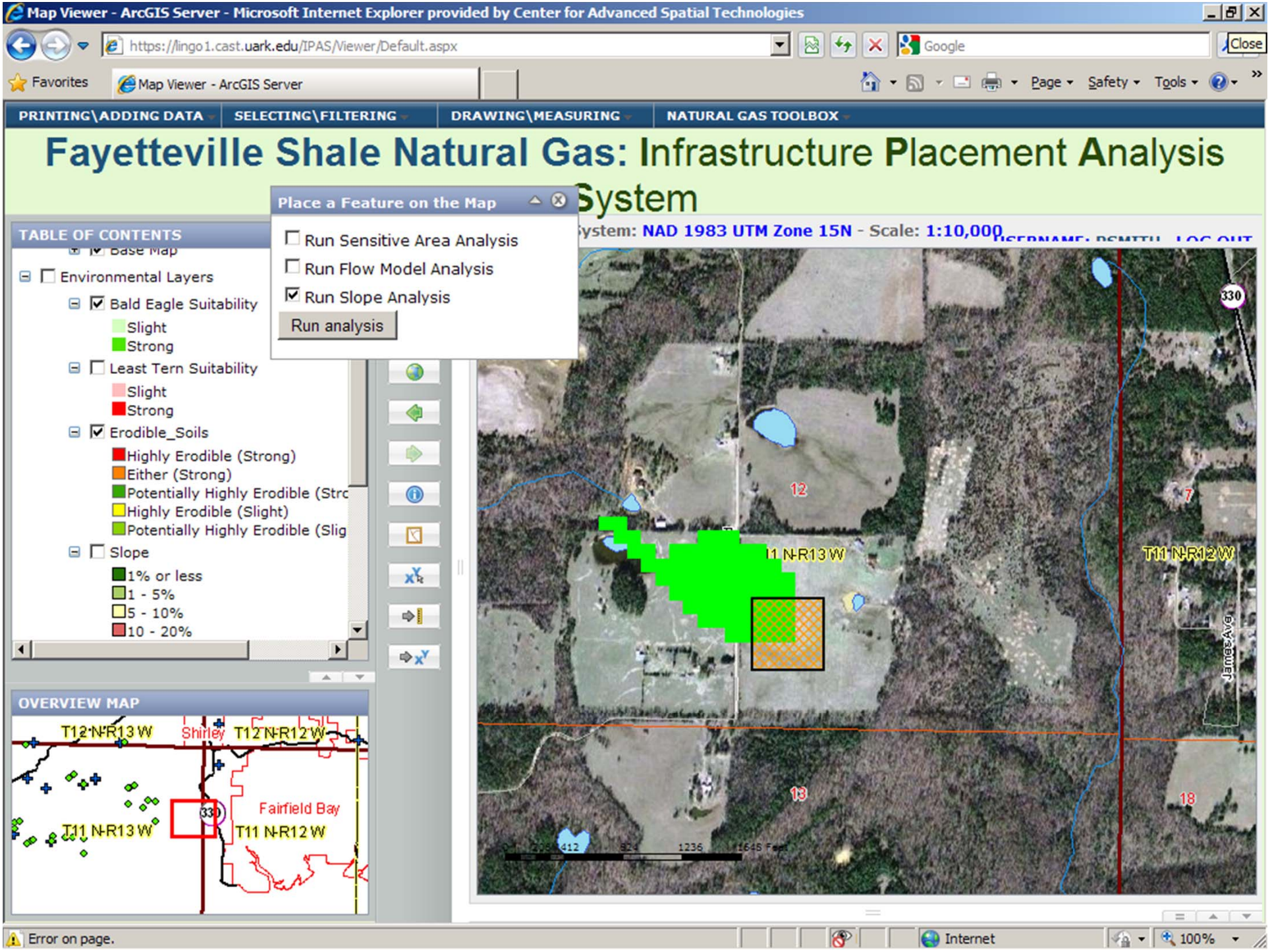
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System: NAD 1983 UTM Zone 15N - Scale: 1:10,000
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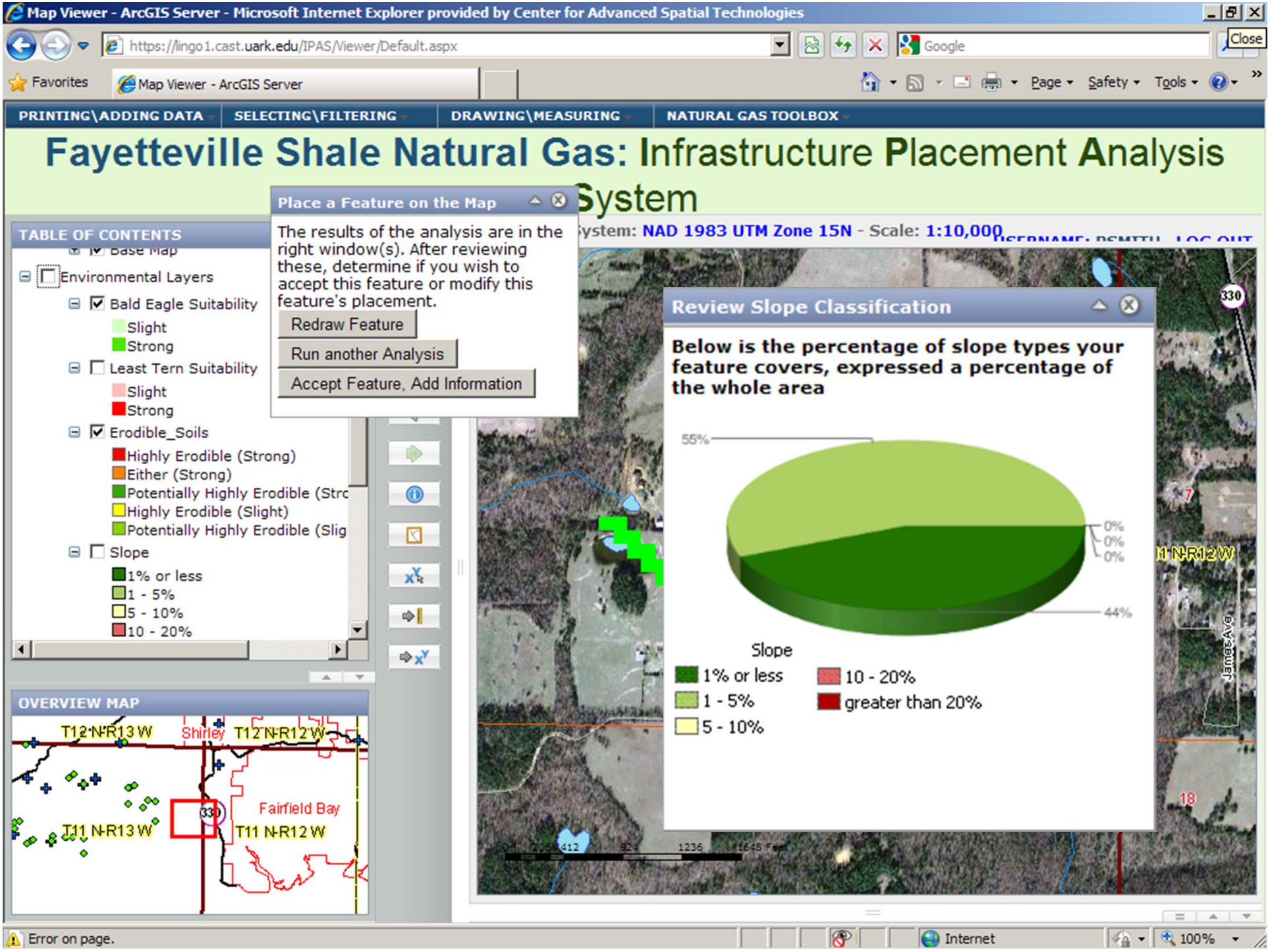
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OVERVIEW MAP
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Shirley
T12 N-R12 W
Fairfield Bay
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System: NAD 1983 UTM Zone 15N - Scale: 1:10,000
Review Slope Classification
Below is the percentage of slope types your feature covers, expressed a percentage of the whole area
55%
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Slope
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10 - 20%
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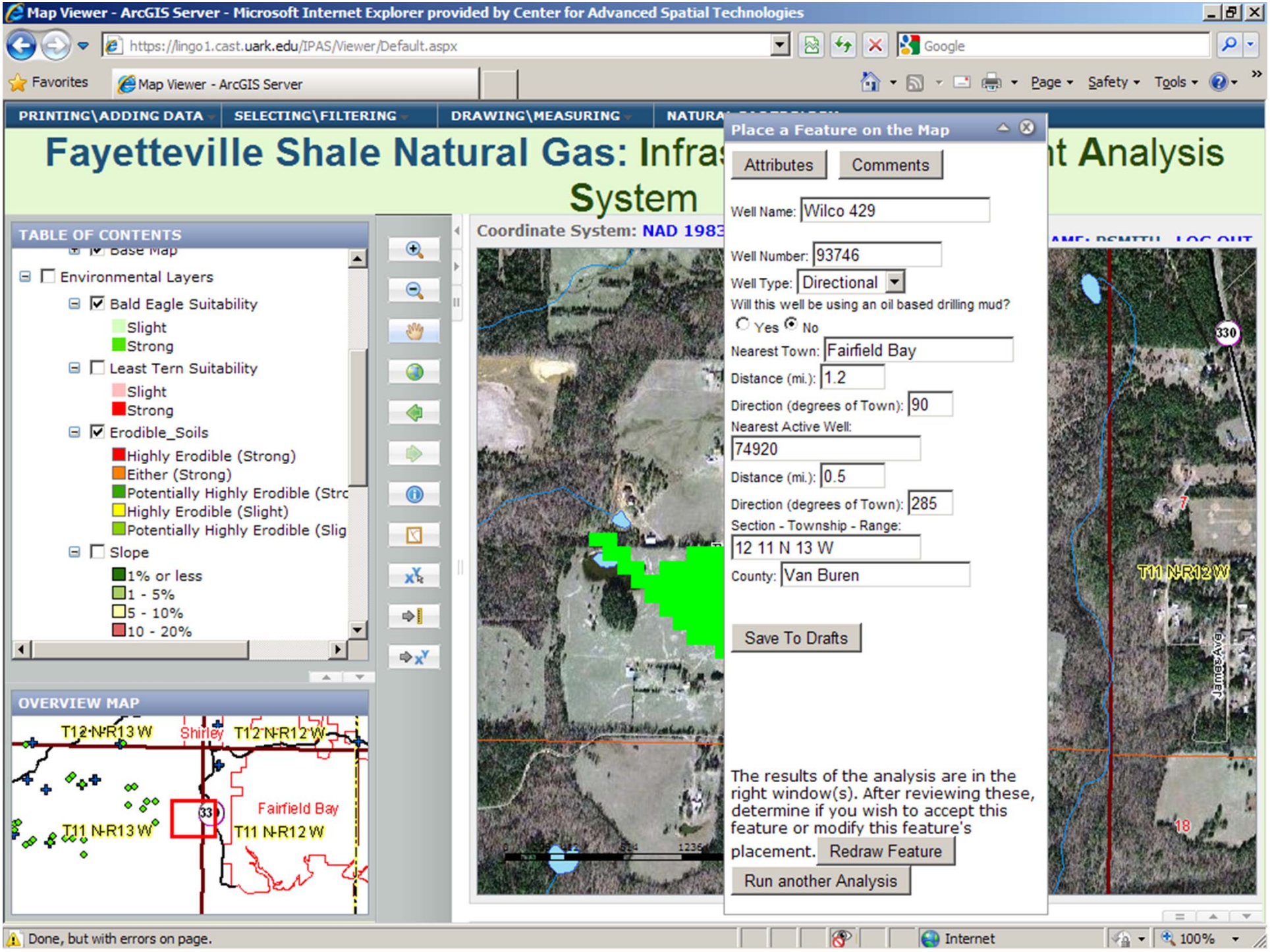
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OVERVIEW MAP
T12 N-R13 W
Shirley
T12 N-R12 W
Fairfield Bay
T11 N-R13 W
T11 N-R12 W
Coordinate System: NAD 1983
Place a Feature on the Map
Attributes
Comments
Well Name: Wilco 429
Well Number: 93746
Well Type: Directional
Will this well be using an oil based drilling mud?
Yes
No
Nearest Town: Fairfield Bay
Distance (mi.): 1.2
Direction (degrees of Town): 90
Nearest Active Well:
74920
Distance (mi.): 0.5
Direction (degrees of Town): 285
Section - Township - Range:
12 11 N 13 W
County: Van Buren
Save To Drafts
The results of the analysis are in the right window(s). After reviewing these, determine if you wish to accept this feature or modify this feature's placement.
Redraw Feature
Run another Analysis
330
T11 N-R12 W
Done, but with errors on page.
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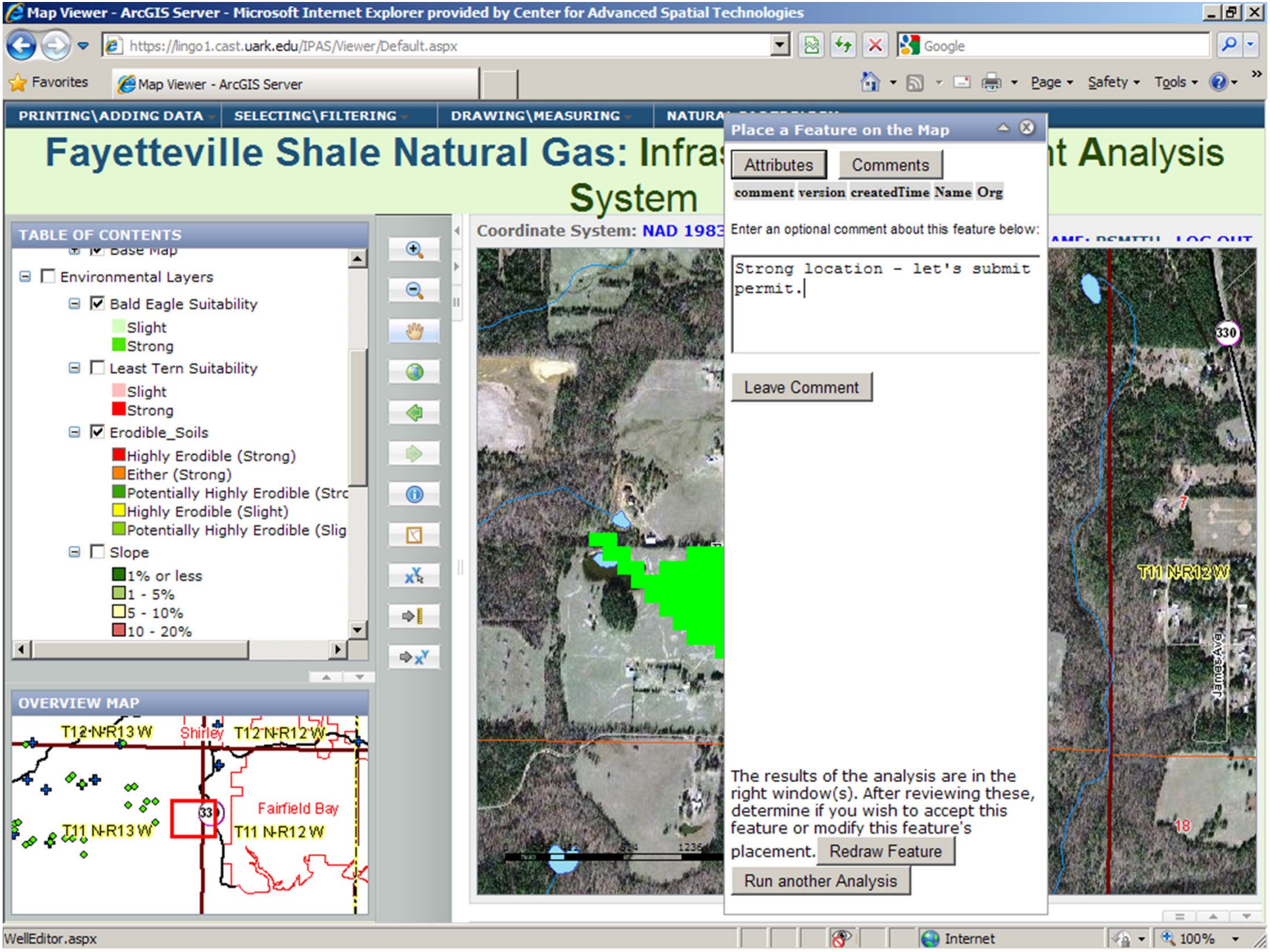
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OVERVIEW MAP
T12 N-R13 W
Shirley
T12 N-R12 W
Fairfield Bay
T11 N-R13 W
T11 N-R12 W
Coordinate System: NAD 1983
Place a Feature on the Map
Attributes
Comments
comment version createdTime Name Org
Enter an optional comment about this feature below:
Strong location - let's submit permit.
Leave Comment
The results of the analysis are in the right window(s). After reviewing these, determine if you wish to accept this feature or modify this feature's placement.
Redraw Feature
Run another Analysis
330
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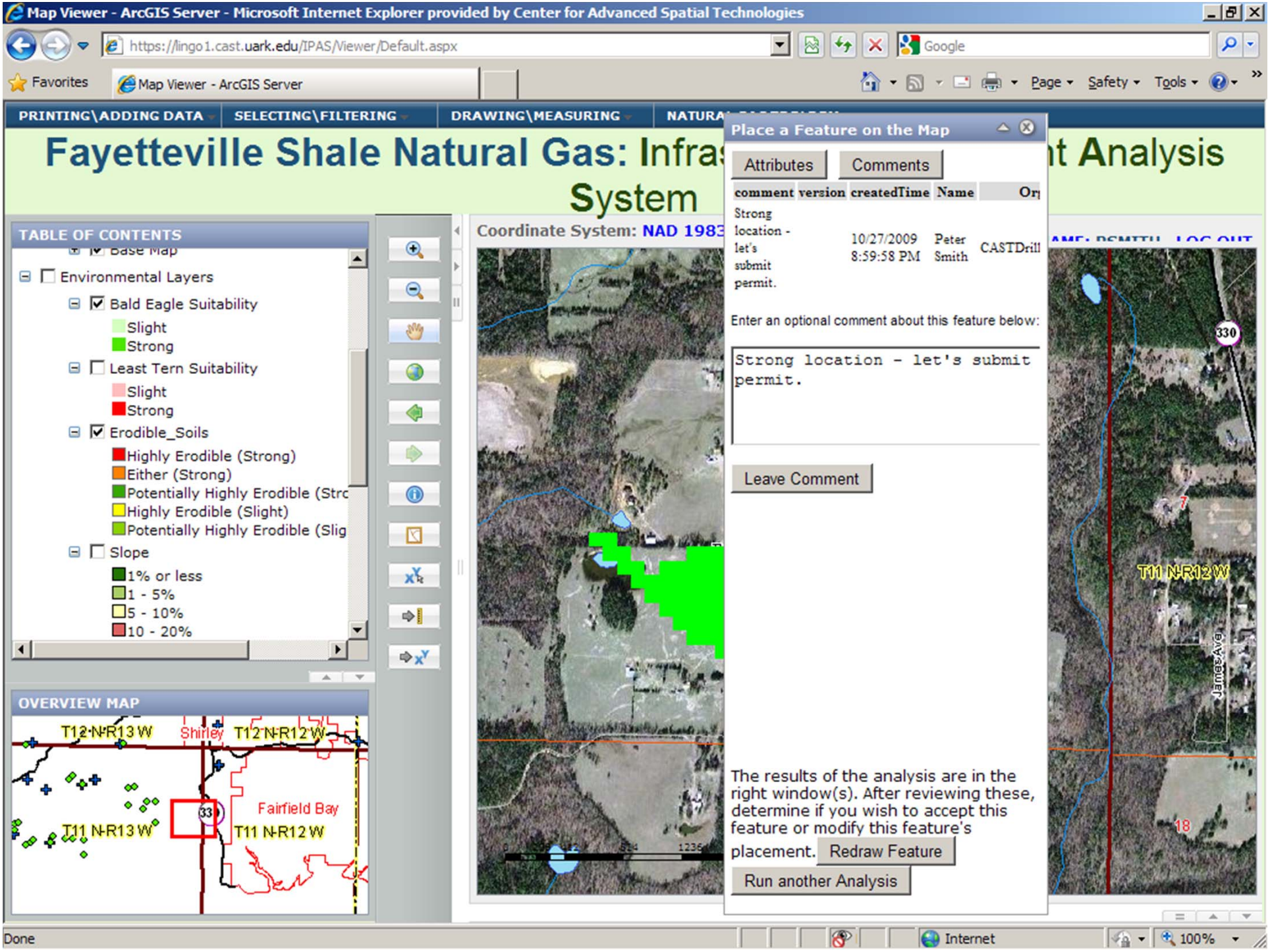
WellEditor.aspx
Internet
100%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Slope
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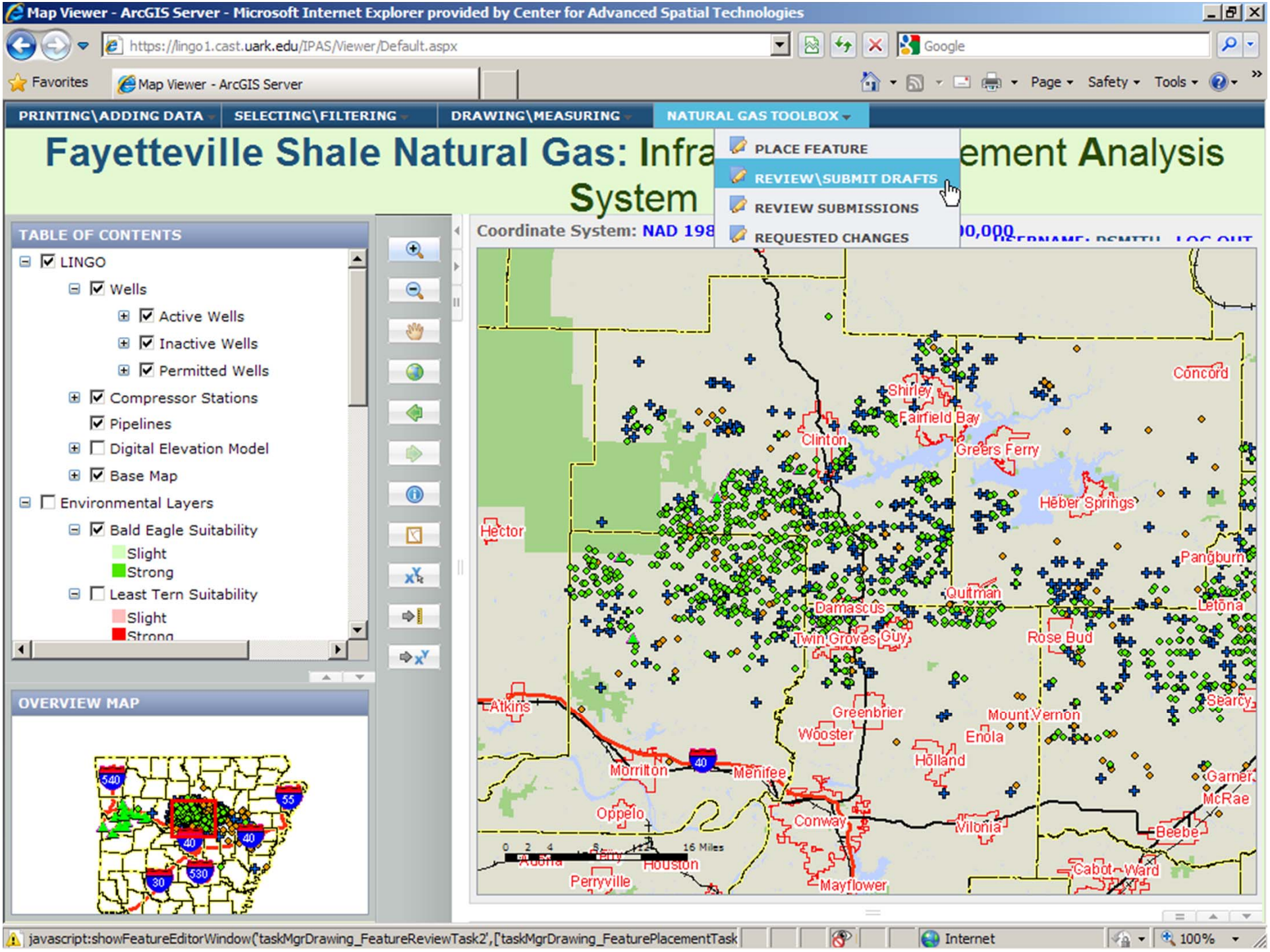
1 - 5%
5 - 10%
10 - 20%
OVERVIEW MAP
T12 N-R13 W
Shirley
T12 N-R12 W
Fairfield Bay
T11 N-R13 W
T11 N-R12 W
Coordinate System: NAD 1983
Place a Feature on the Map
Attributes
Comments
comment
version
createdTime
Name
Strong location - let's submit permit.
10/27/2009 8:59:58 PM
Peter Smith
CASTDrill
Enter an optional comment about this feature below:
Strong location - let's submit permit.
Leave Comment
The results of the analysis are in the right window(s). After reviewing these, determine if you wish to accept this feature or modify this feature's placement.
Redraw Feature
Run another Analysis
330
T11 N-R12 W
Done
Internet
100%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Slight
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Fairfield Bay
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Greers Ferry
Heber Springs
Hector
Pangburn
Quitman
Damascus
Letona
Twin Groves
Guy
Rose Bud
Atkins
Greenbrier
Mount Vernon
Searcy
Wooster
Enola
Holland
Morrilton
Menifee
Garner
McRae
Oppelo
Conway
Vilonia
Beebe
Houston
Perryville
Mayflower
Cabot
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Internet
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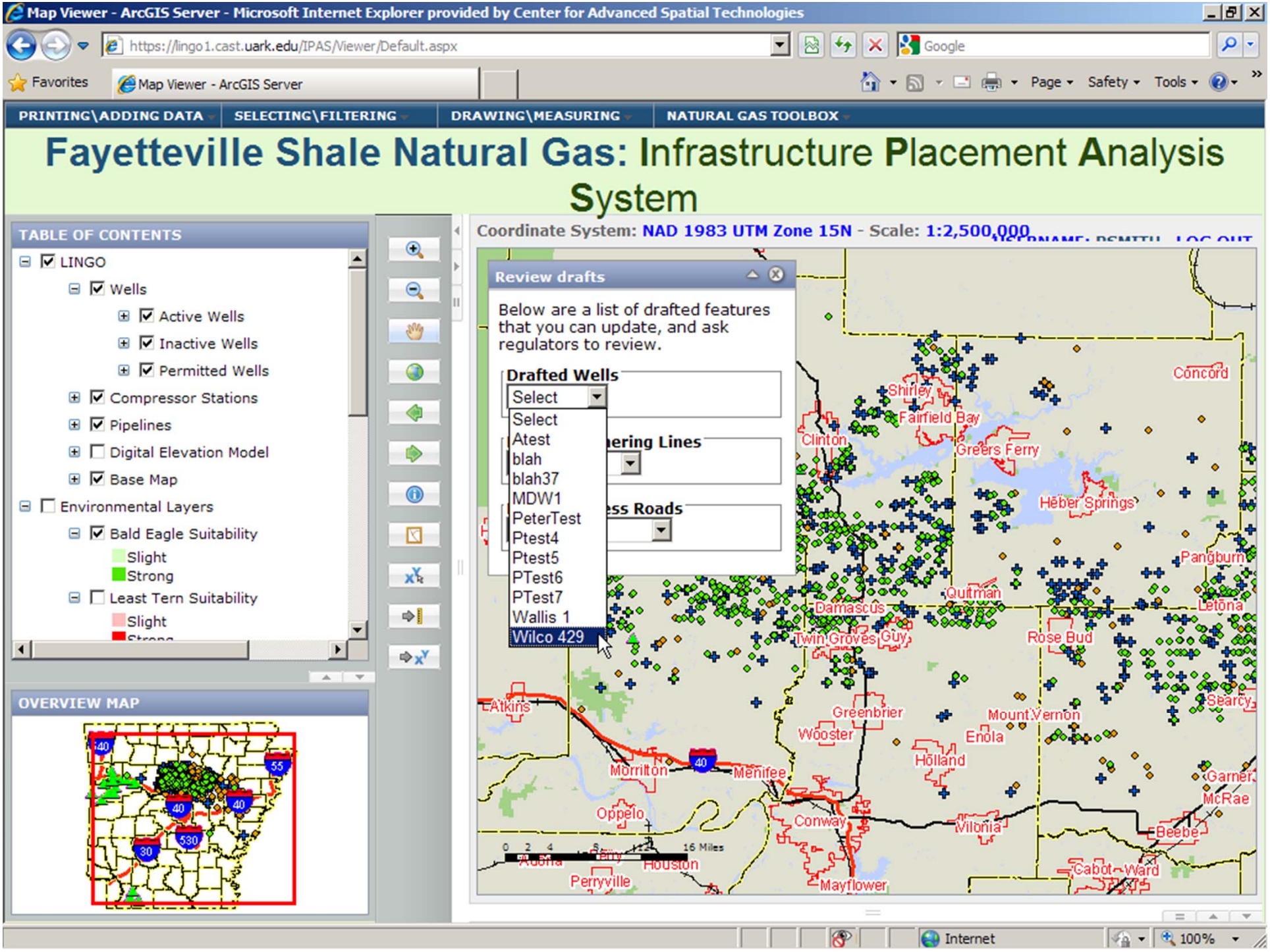
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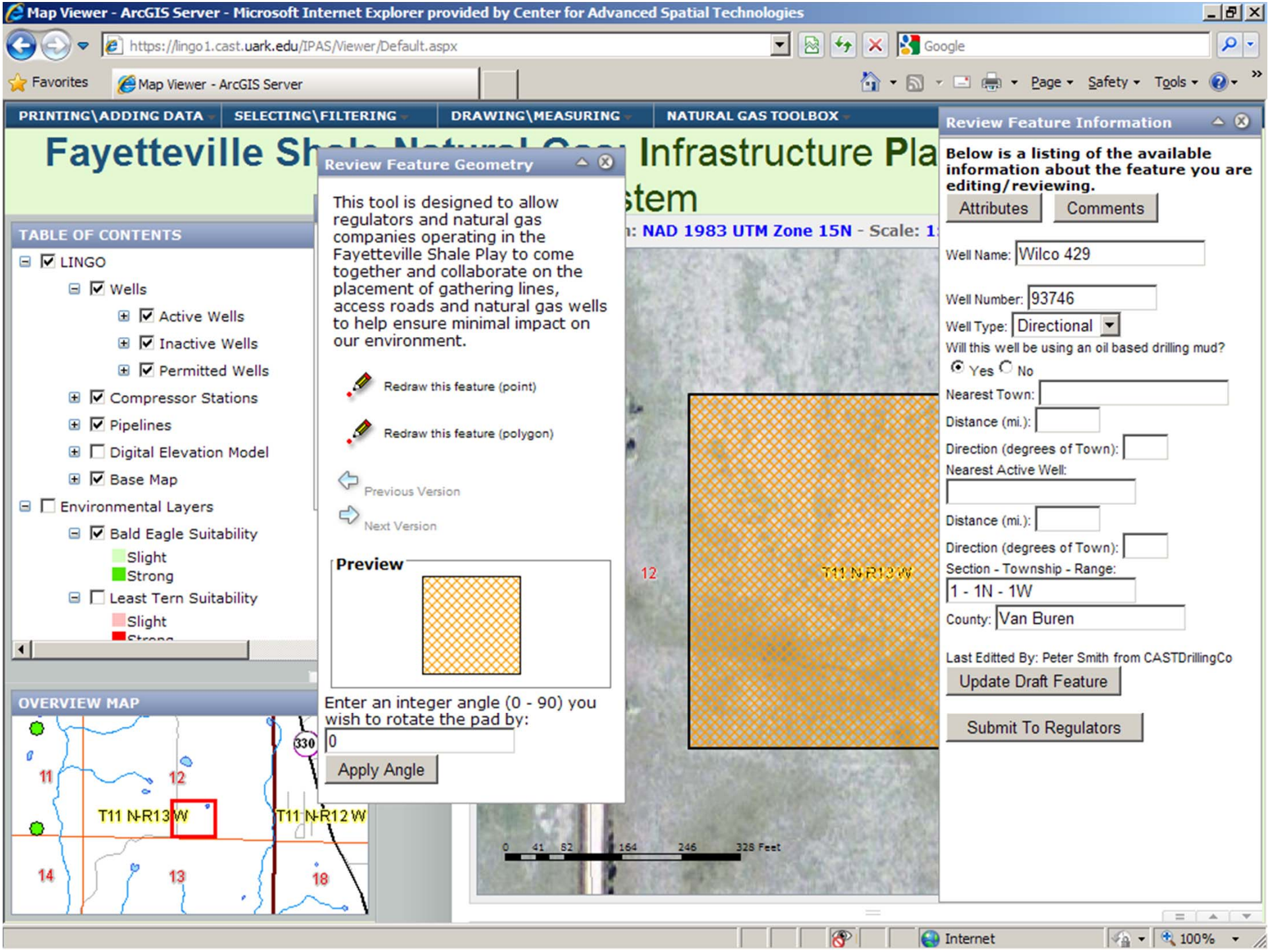
Strong
Least Tern Suitability
Slight
OVERVIEW MAP
Coordinate System: NAD 1983 UTM Zone 15N - Scale: 1:2,500,000
Review drafts
Below are a list of drafted features that you can update, and ask regulators to review.
Drafted Wells
Select
Select
Atest
blah
blah37
MDW1
PeterTest
Ptest4
Ptest5
PTest6
PTest7
Wallis 1
Wilco 429
Concord
Shirley
Fairfield Bay
Clinton
Greers Ferry
Heber Springs
Pangburn
Quitman
Damascus
Letona
Twin Groves
Guy
Rose Bud
Atkins
Searcy
Greenbrier
Mount Vernon
Wooster
Enola
Holland
Morrilton
Menifee
Garner
McRae
Oppelo
Conway
Vilonia
Beebe
Houston
Perryville
Mayflower
Cabot
Ward
0 2 4 8 16 Miles
Internet
100%


Map Viewer - ArcGIS Server - Microsoft Internet Explorer provided by Center for Advanced Spatial Technologies
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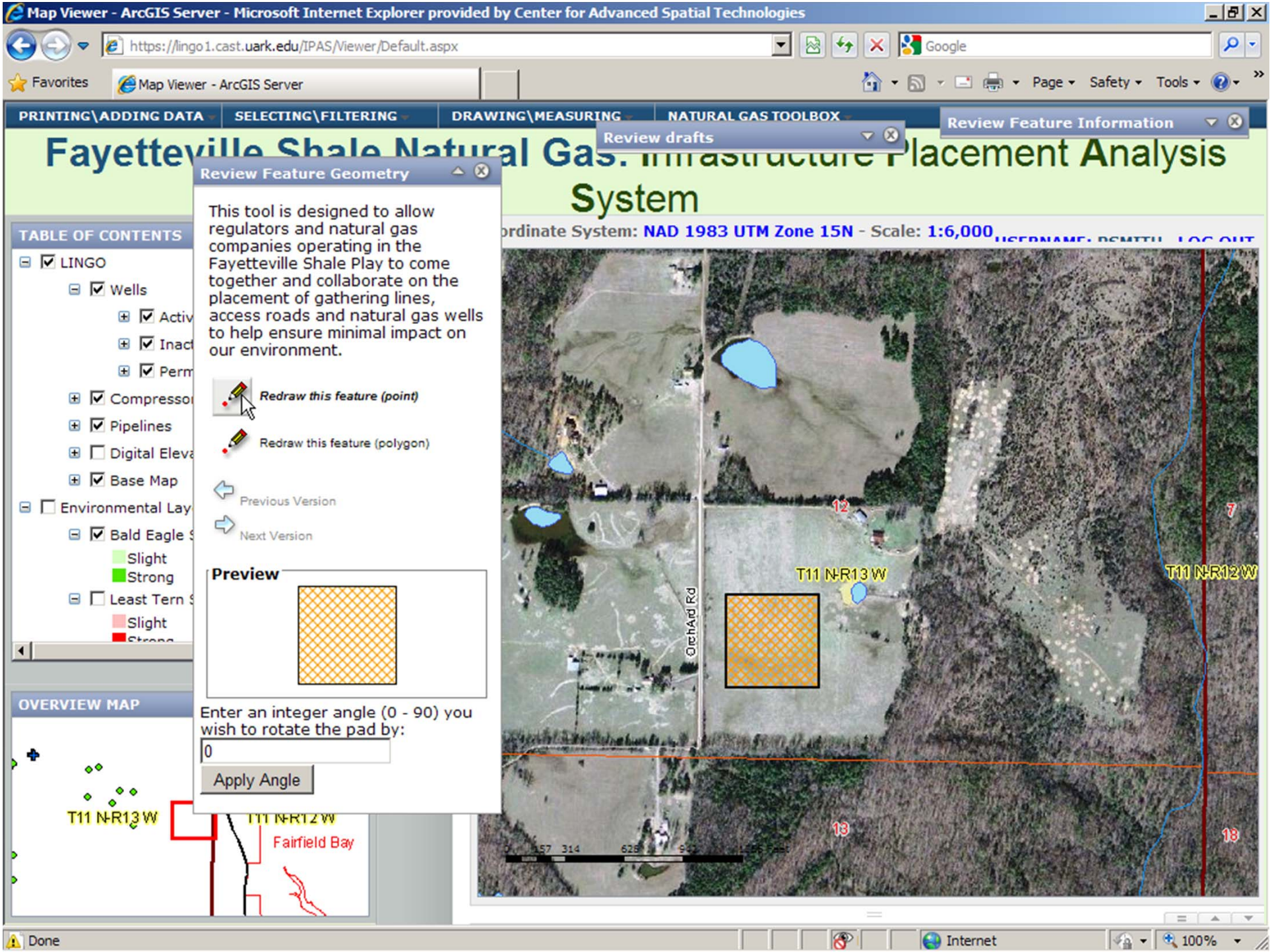
Strong
Least Tern Suitability
Slight
OVERVIEW MAP
T11 N-R13 W
T11 N-R12 W
Review Feature Geometry
This tool is designed to allow regulators and natural gas companies operating in the Fayetteville Shale Play to come together and collaborate on the placement of gathering lines, access roads and natural gas wells to help ensure minimal impact on our environment.
Redraw this feature (point)
Redraw this feature (polygon)
Previous Version
Next Version
Preview
Enter an integer angle (0 - 90) you wish to rotate the pad by:
0
Apply Angle
NAD 1983 UTM Zone 15N - Scale: 1
T11 N-R13 W
0 41 82 164 246 328 Feet
Review Feature Information
Below is a listing of the available information about the feature you are editing/reviewing.
Attributes
Comments
Well Name: Wilco 429
Well Number: 93746
Well Type: Directional
Will this well be using an oil based drilling mud?
Yes
No
Nearest Town:
Distance (mi.):
Direction (degrees of Town):
Nearest Active Well:
Distance (mi.):
Direction (degrees of Town):
Section - Township - Range:
1 - 1N - 1W
County: Van Buren
Last Editted By: Peter Smith from CASTDrillingCo
Update Draft Feature
Submit To Regulators
Internet
100%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NATURAL GAS TOOLBOX
Review Feature Information
Review drafts
Fayetteville Shale Natural Gas Infrastructure Placement Analysis System
Review Feature Geometry
This tool is designed to allow regulators and natural gas companies operating in the Fayetteville Shale Play to come together and collaborate on the placement of gathering lines, access roads and natural gas wells to help ensure minimal impact on our environment.
Redraw this feature (point)
Redraw this feature (polygon)
Previous Version
Next Version
Preview
Enter an integer angle (0 - 90) you wish to rotate the pad by:
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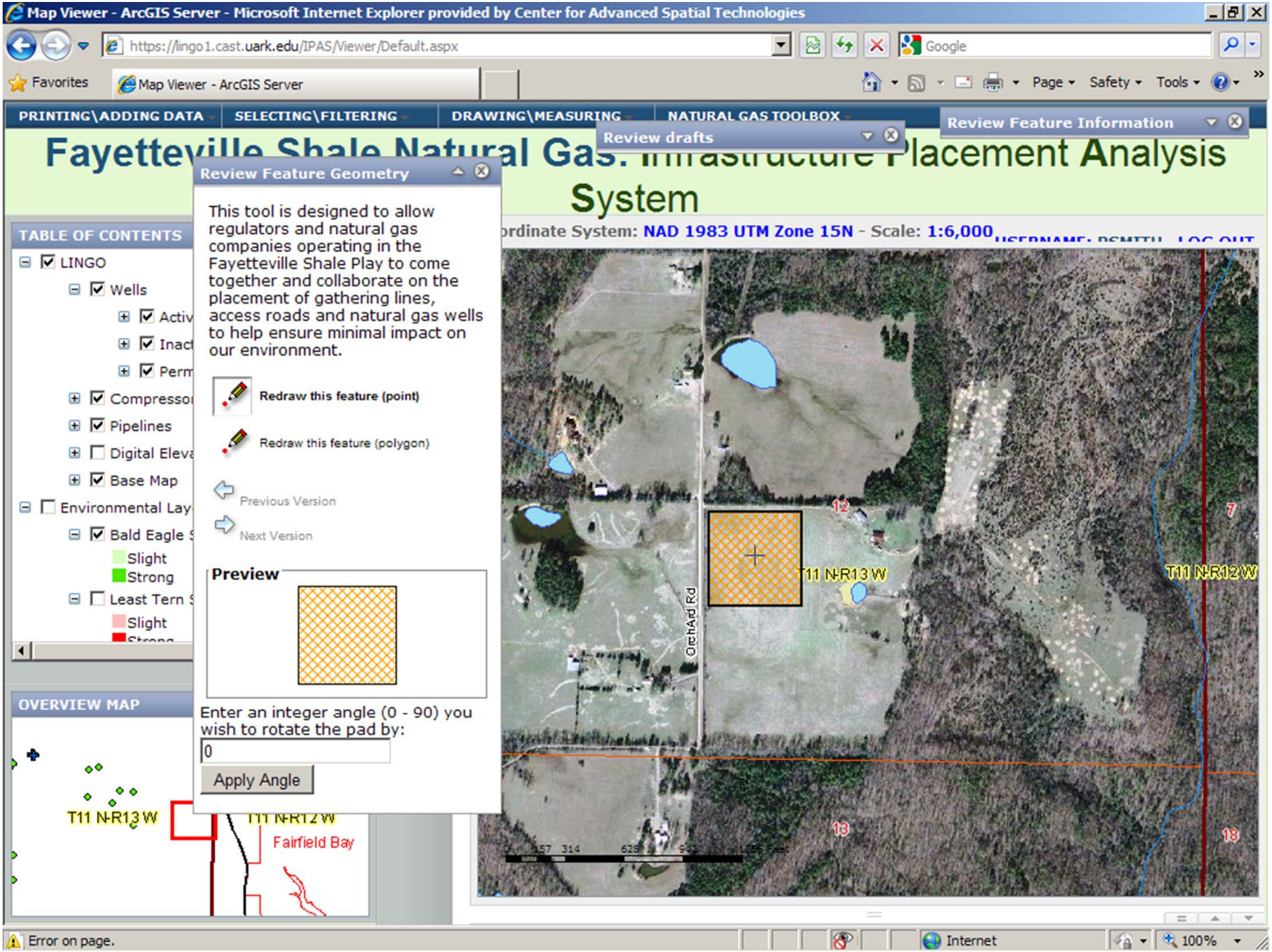
OVERVIEW MAP
T11 N-R13 W
T11 N-R12 W
Fairfield Bay
Ordinate System: NAD 1983 UTM Zone 15N - Scale: 1:6,000
T11 N-R13 W
T11 N-R12 W
Orchard Rd
12
7
13
18
Done
Internet
100%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Redraw this feature (point)
Redraw this feature (polygon)
Previous Version
Next Version
Preview
Enter an integer angle (0 - 90) you wish to rotate the pad by:
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Apply Angle
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Fairfield Bay
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T11 N-R12 W
Error on page.
Internet
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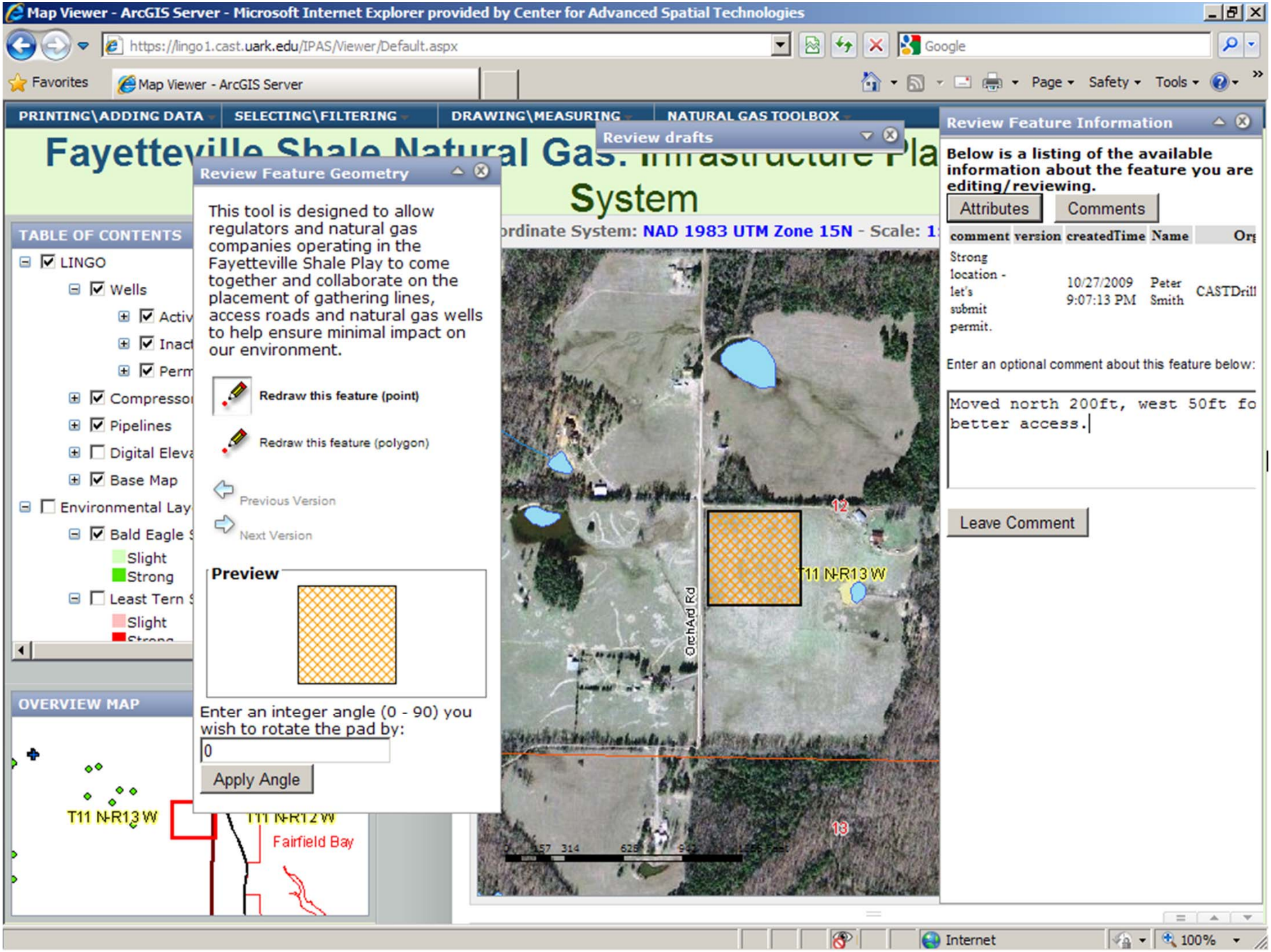
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Review drafts
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Redraw this feature (point)
Redraw this feature (polygon)
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Enter an integer angle (0 - 90) you wish to rotate the pad by:
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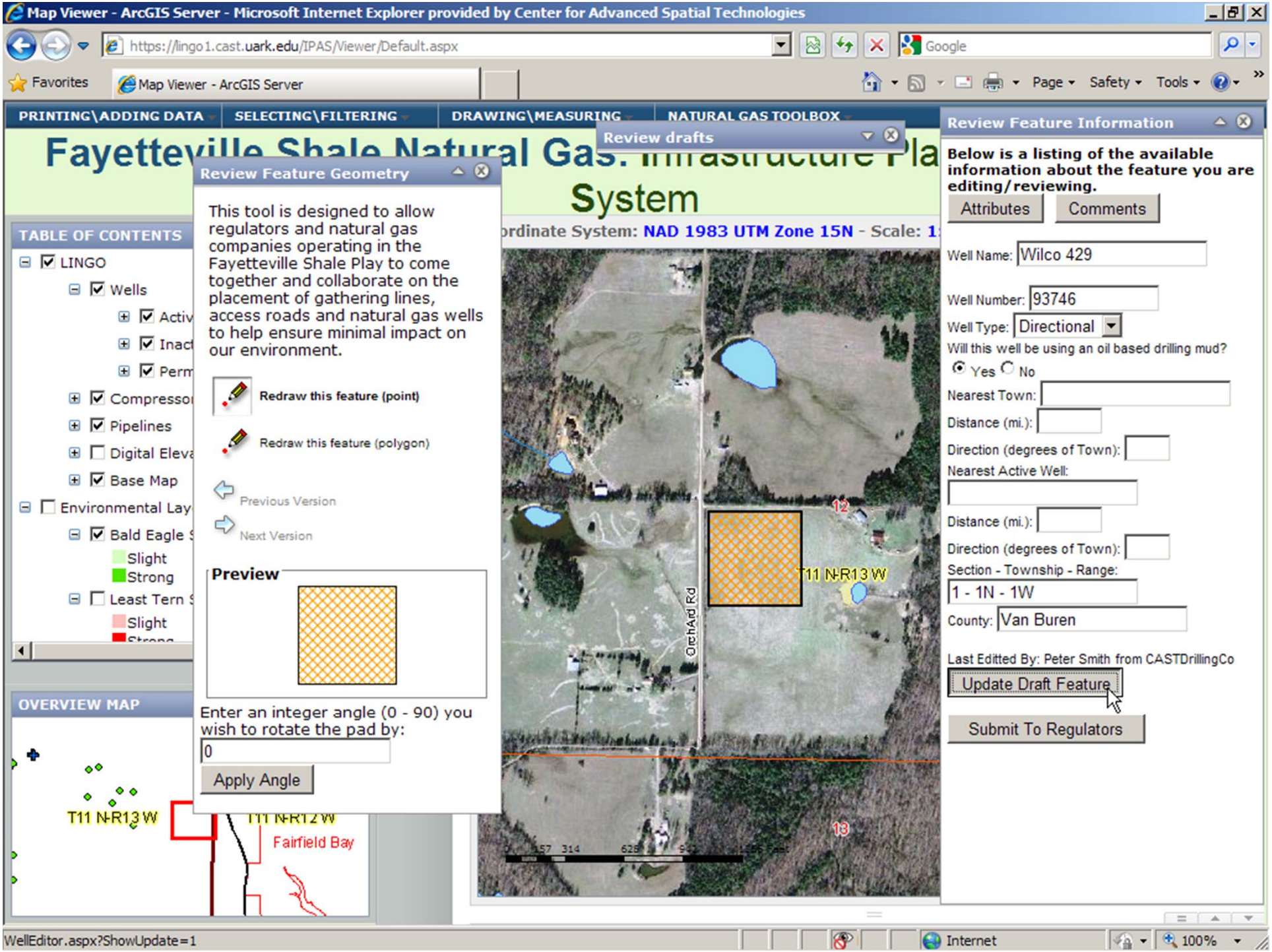
T11 N-R13 W
T11 N-R12 W
Fairfield Bay
Coordinate System: NAD 1983 UTM Zone 15N - Scale:
Orchard Rd
T11 N-R13 W
12
13
Review Feature Information
Below is a listing of the available information about the feature you are editing/reviewing.
Attributes
Comments
comment
version
createdTime
Name
Org
Strong location - let's submit permit.
10/27/2009 9:07:13 PM
Peter Smith
CASTDrill
Enter an optional comment about this feature below:
Moved north 200ft, west 50ft fo better access.
Leave Comment
Internet
100%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Redraw this feature (point)
Redraw this feature (polygon)
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Next Version
Preview
Enter an integer angle (0 - 90) you wish to rotate the pad by:
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Apply Angle
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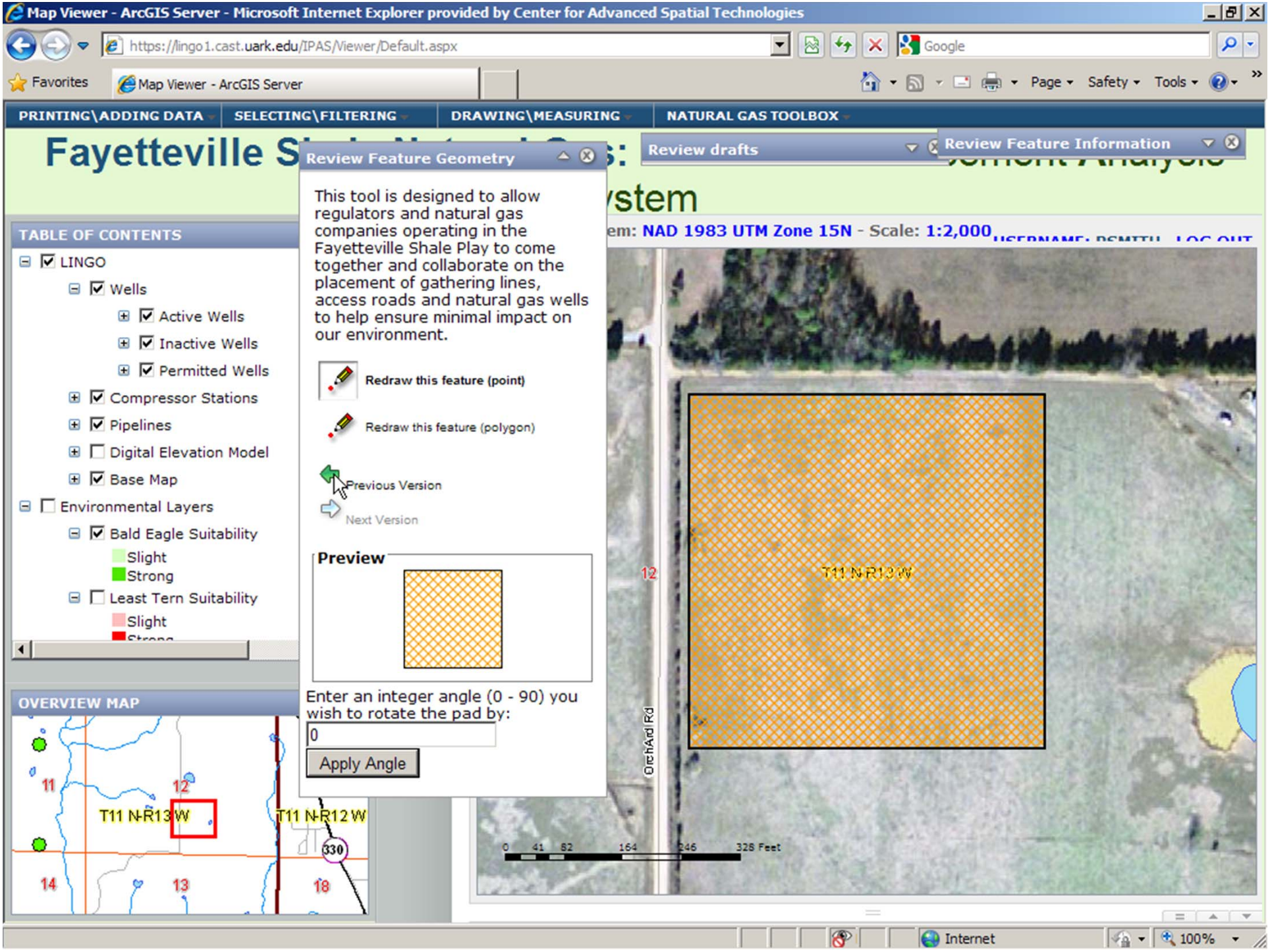
T11 N-R13 W
T11 N-R12 W
Fairfield Bay
Coordinate System: NAD 1983 UTM Zone 15N - Scale:
T11 N-R13 W
Orchard Rd
12
13
Review Feature Information
Below is a listing of the available information about the feature you are editing/reviewing.
Attributes
Comments
Well Name: Wilco 429
Well Number: 93746
Well Type: Directional
Will this well be using an oil based drilling mud?
Yes
No
Nearest Town:
Distance (mi.):
Direction (degrees of Town):
Nearest Active Well:
Distance (mi.):
Direction (degrees of Town):
Section - Township - Range:
1 - 1N - 1W
County: Van Buren
Last Editted By: Peter Smith from CASTDrillingCo
Update Draft Feature
Submit To Regulators
WellEditor.aspx?ShowUpdate=1
Internet
100%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Redraw this feature (point)
Redraw this feature (polygon)
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Strong
Least Tern Suitability
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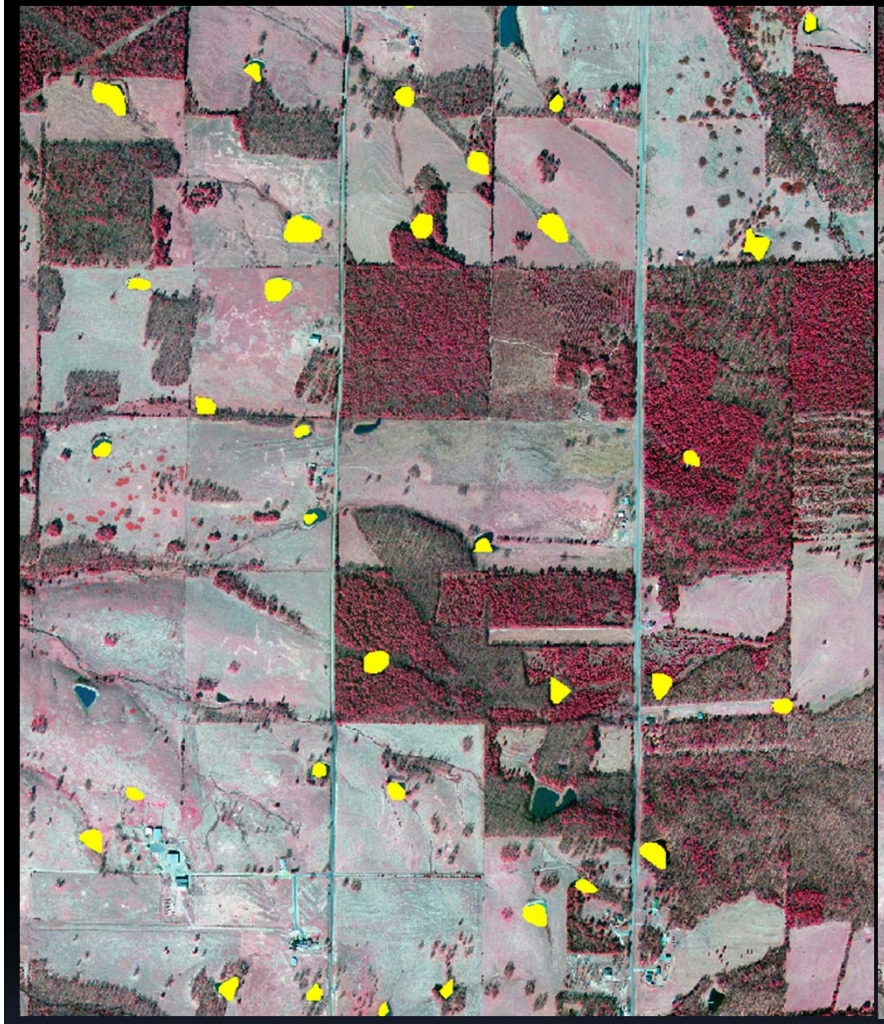
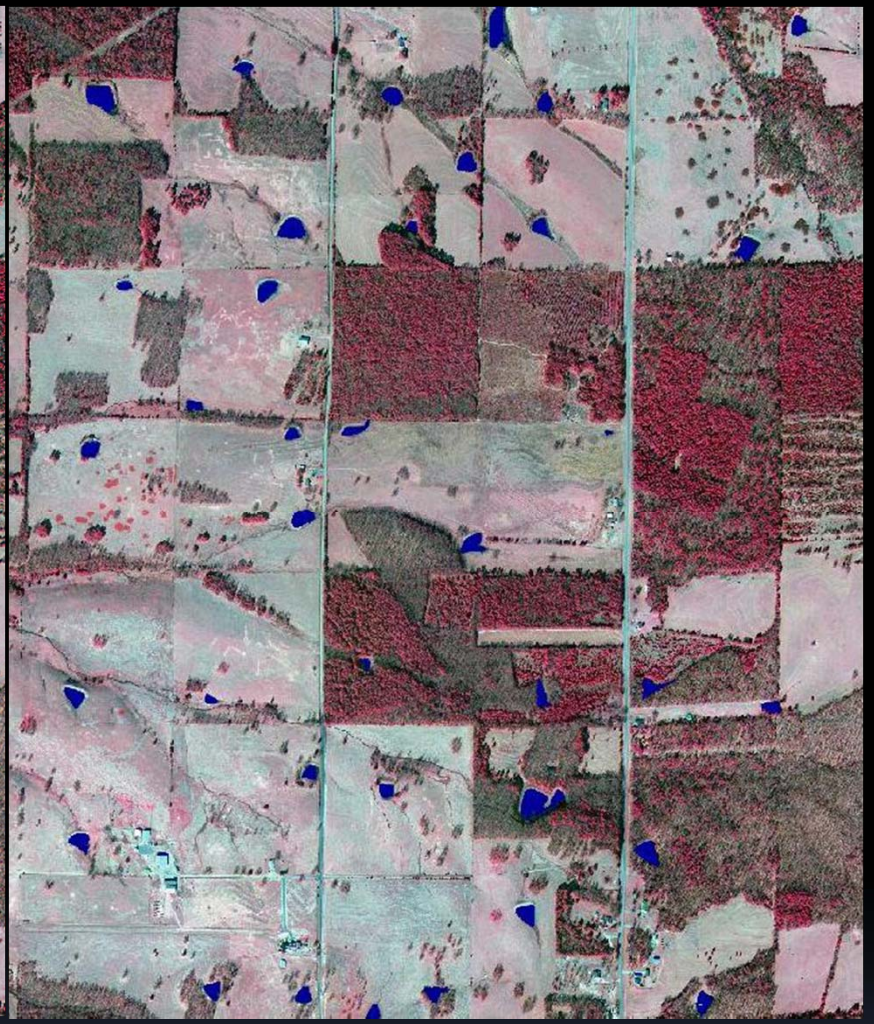
OVERVIEW MAP
T11 N-R13 W
T11 N-R12 W
NAD 1983 UTM Zone 15N - Scale: 1:2,000
Orchard Rd
0 41 82 164 246 328 Feet
Internet
100%

# New Directions…

- Water modeling in the Fayetteville Shale Play
  - Mauro DiLuzio, Texas A&M
    - SWAT model
  - DOE (NETL) funding
  - Focus on surface water
    - Arkansas Natural Resources Commission
  - Improved understanding of available water
    - Faster permitting with peace of mind

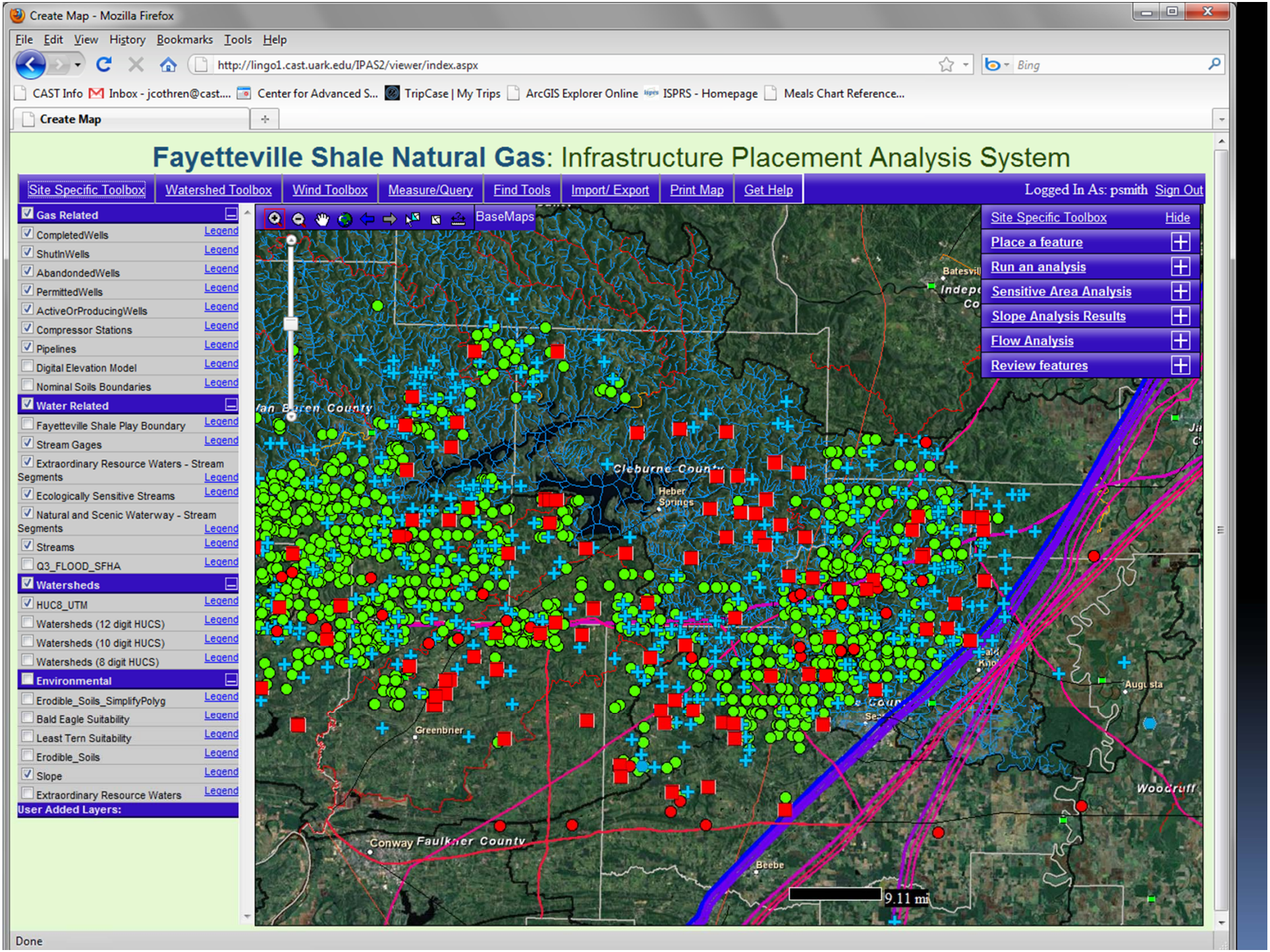


NHD high-resolution water layer. Water is shown as yellow-filled polygons.



Water extracted from the color-infrared imagery using the segmentation /classification process. Water is shown as blue-filled polygons.

Center for Advanced Spatial Technologies


Create Map - Mozilla Firefox
File Edit View History Bookmarks Tools Help
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CAST Info
Inbox - jcothren@cast....
Center for Advanced S...
TripCase | My Trips
ArcGIS Explorer Online
ISPRS - Homepage
Meals Chart Reference...
Create Map
Fayetteville Shale Natural Gas: Infrastructure Placement Analysis System
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Watershed Toolbox
Wind Toolbox
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Print Map
Get Help
Logged In As: psmith
Sign Out
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ShutInWells
AbandondedWells
PermittedWells
ActiveOrProducingWells
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Digital Elevation Model
Nominal Soils Boundaries
Water Related
Fayetteville Shale Play Boundary
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Extraordinary Resource Waters - Stream Segments
Ecologically Sensitive Streams
Natural and Scenic Waterway - Stream Segments
Streams
Q3_FLOOD_SFHA
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User Added Layers:
Legend
BaseMaps
Site Specific Toolbox
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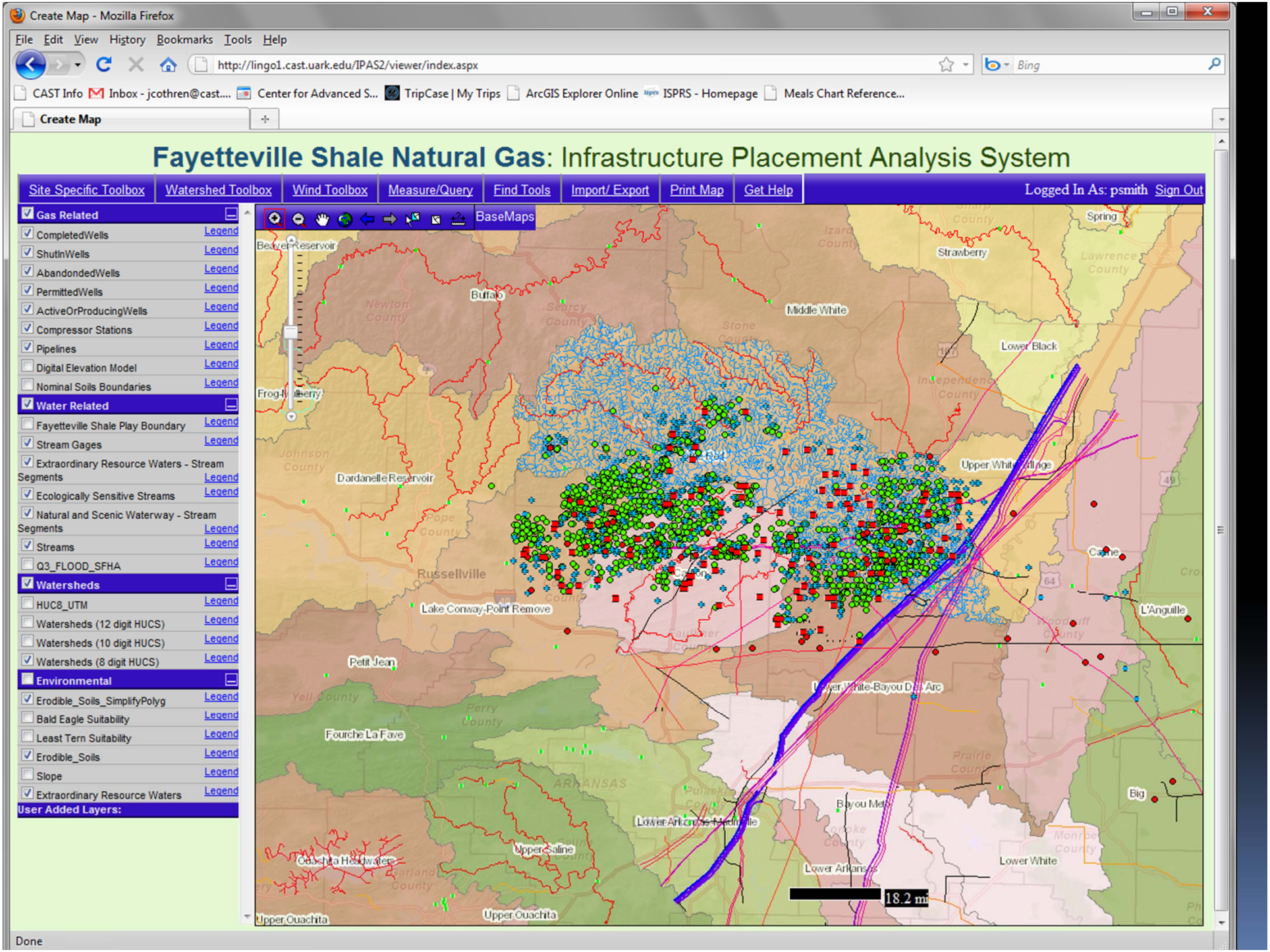
Place a feature
Run an analysis
Sensitive Area Analysis
Slope Analysis Results
Flow Analysis
Review features
Cleburne County
Heber Springs
Greenbrier
Conway
Faulkner County
Beebe
Augusta
Woodruff
9.11 mi
Done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Inbox - jcothren@cast....
Center for Advanced S...
TripCase | My Trips
ArcGIS Explorer Online
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ShutInWells
AbandondedWells
PermittedWells
ActiveOrProducingWells
Compressor Stations
Pipelines
Digital Elevation Model
Nominal Soils Boundaries
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Fayetteville Shale Play Boundary
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Natural and Scenic Waterway - Stream Segments
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Q3_FLOOD_SFHA
Watersheds
HUC8_UTM
Watersheds (12 digit HUCS)
Watersheds (10 digit HUCS)
Watersheds (8 digit HUCS)
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Bald Eagle Suitability
Least Tern Suitability
Erodible_Soils
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Extraordinary Resource Waters
User Added Layers:
Legend
BaseMaps
Beaver Reservoir
Buffalo
Dardanelle Reservoir
Russellville
Lake Conway-Point Remove
Petit Jean
Fourche La Fave
Ouachita Headwaters
Upper Ouachita
Middle White
Lower Black
Strawberry
Spring
Upper White
Cache
L'Anguille
Bayou Meto
Lower White
Lower Arkansas
Upper Saline
18.2 mi
Done

# New Directions…

- Public informational sites
- Haynesville Shale
  - Funded through HARC/EFD
  - Challenges of multi-state regulations and data

Haynesville Shale Play Drilling Locations and Status - Microsoft Internet Explorer provided by Center for Advanced Spatial Tech

http://lingo.cast.uark.edu/HaynesvillePublic/drillloc/index.htm

Haynesville Shale Play Drilling Locations and Status

# Haynesville Shale Natural Gas: Reducing Environmental Impacts

Search Google™ Custom Search Search

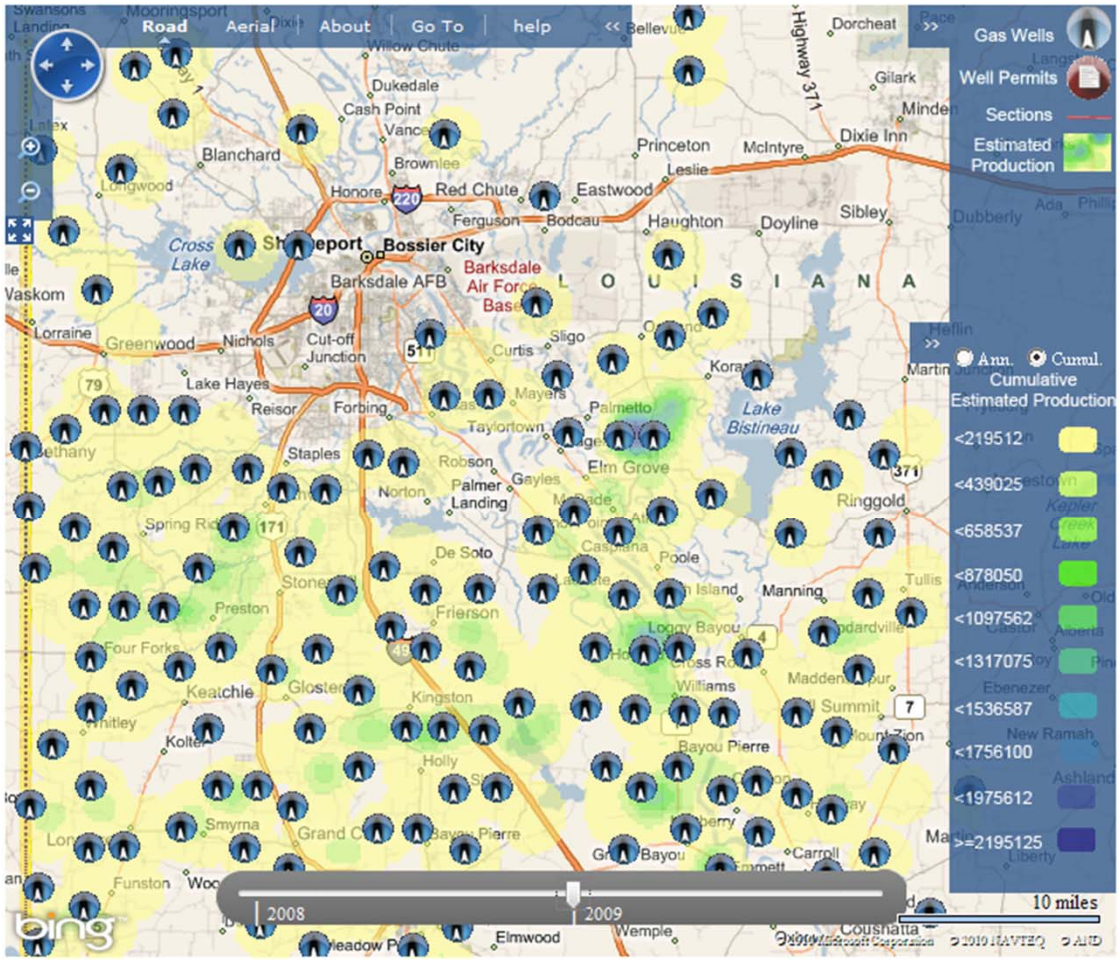
powered by Google™

- Home
- About Haynesville Shale
- Drilling Locations and Status
- Natural Gas Production
- Minimizing Environmental Impacts
- Regulatory Requirements

Announcements

UNIVERSITY OF ARKANSAS

## Drilling Locations and Status



http://www.cast.uark.edu

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