

The background of the slide is a light blue gradient with several realistic water droplets of various sizes scattered across it. The droplets have highlights and shadows, giving them a three-dimensional appearance.

# MANDAN DIESEL FUEL REMEDICATION PROJECT

REGION 8 PRETREATMENT ASSOCIATION ANNUAL CONFERENCE

BISMARCK, ND

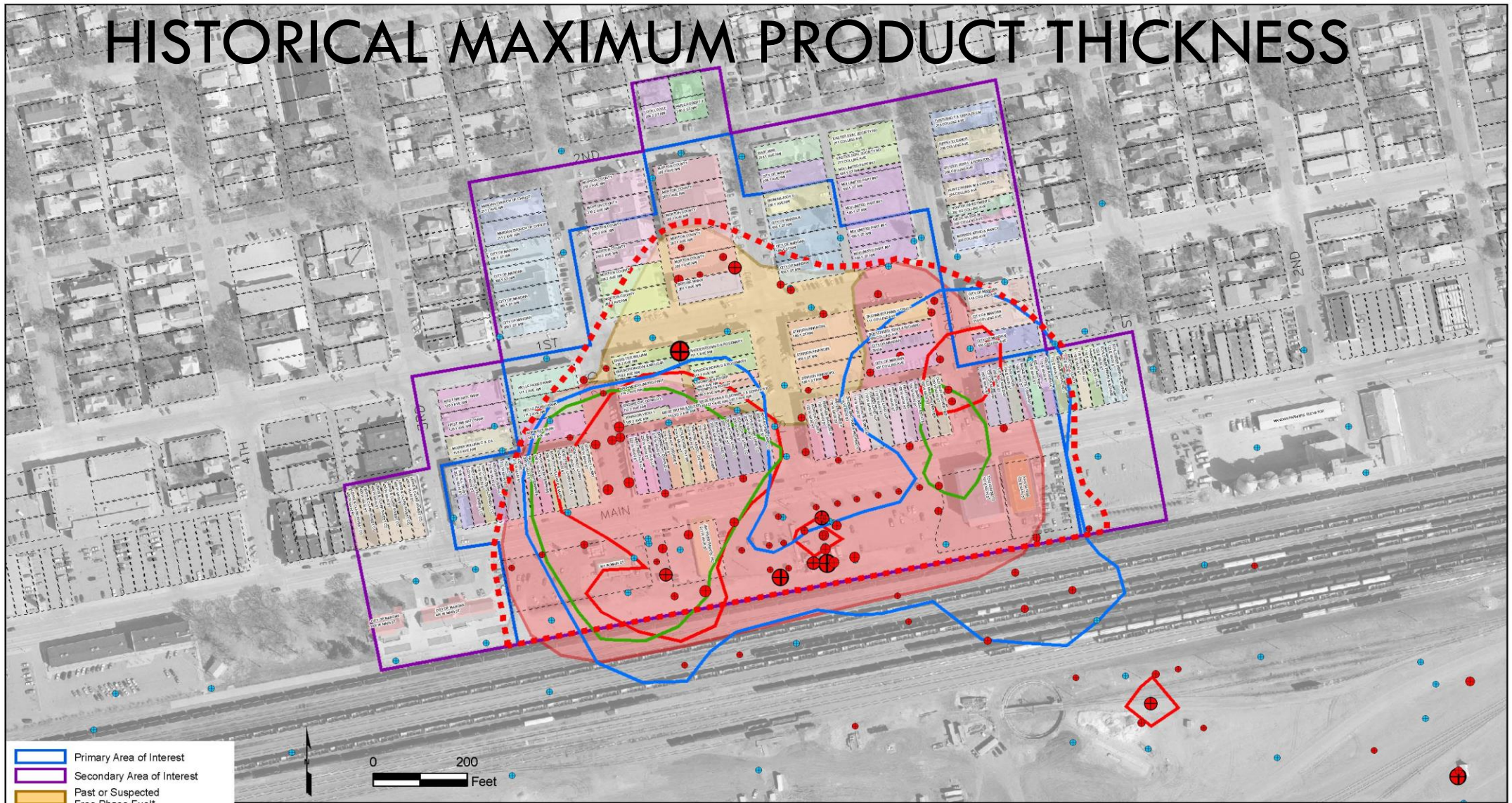
MAY 2, 2019



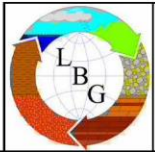
# SITE HISTORY

- 1984 - DISCOVERED FUEL IN CONSTRUCTION OF MANDAN LAW ENFORCEMENT CENTER
- FUEL CAME PRIMARILY FROM BURLINGTON NORTHERN FUELING OPERATIONS
- 1985 - STATE ORDERS RAILROAD TO BEGIN REMOVING PRODUCT
- 1999 - 463,340 GALLONS RECOVERED...SO FAR
- 2000 - REMEDIAL EFFORTS CEASE – RAILROAD CONTESTS RESPONSIBILITY FOR THE SPILL
- 2002 - STATE OF ND AND CITY OF MANDAN SUE RAILROAD
- 2004 - PARTIES AGREE TO A SETTLEMENT THAT INVOLVES \$30.25M IN CASH AND REAL ESTATE FROM THE RAILROAD.
  - MANDAN REMEDIATION TRUST CREATED
  - \$24M FOR CLEANUP
- INITIAL DEPARTMENT OF HEALTH ACTIONS

# HISTORICAL MAXIMUM PRODUCT THICKNESS



- Primary Area of Interest
  - Secondary Area of Interest
  - Past or Suspected Free Phase Fuel\*
  - Free Phase Fuel\*
  - October 2004 1-Foot Product Thickness Contour
  - November 2003 1-Foot Product Thickness Contour
  - September 2001 1-Foot Product Thickness Contour
  - Historical Extent of Product
- \* As defined by NDDH



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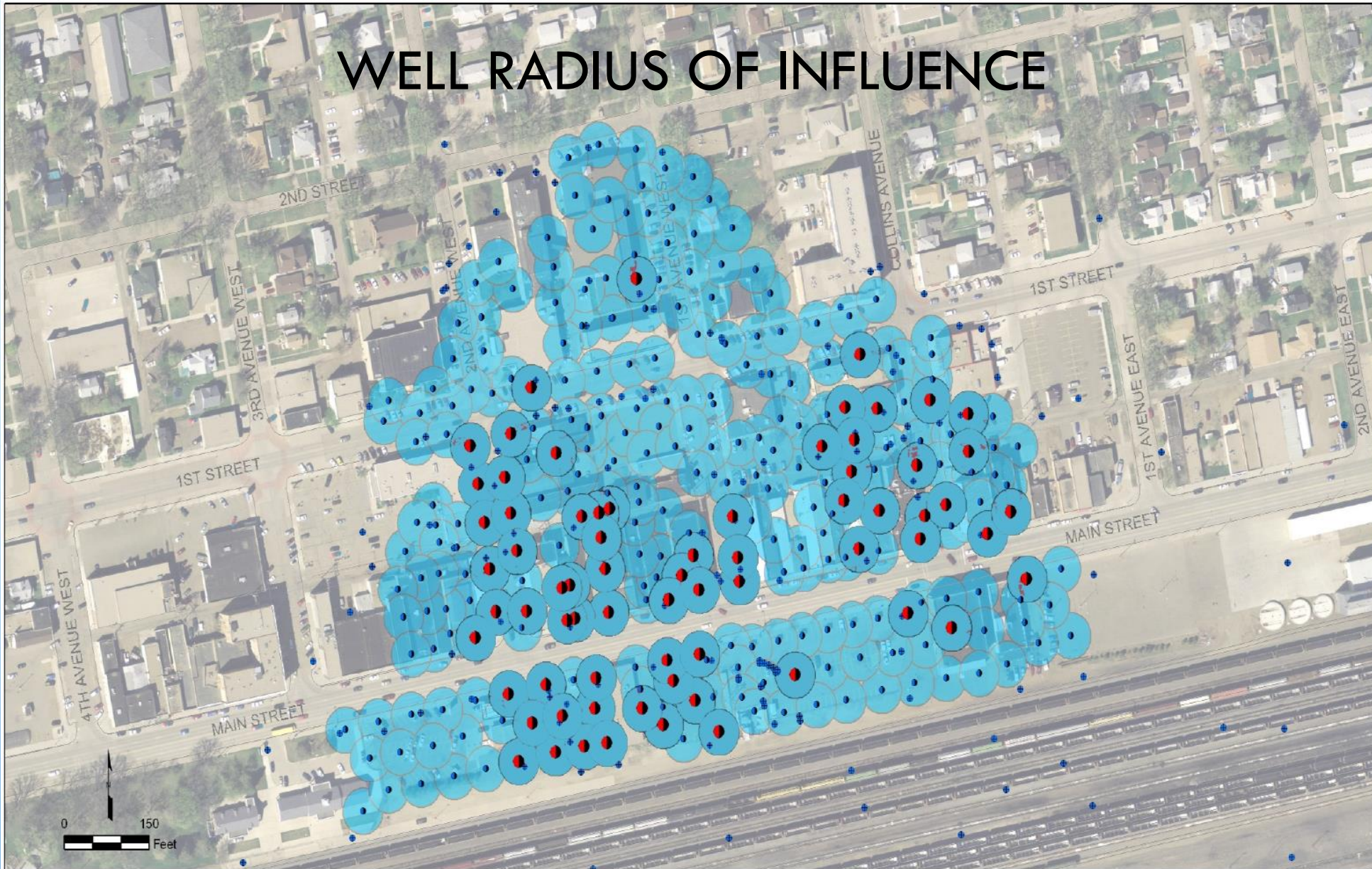
<b>NDDH MANDAN REMEDIATION TRUST</b>		
DOWNTOWN MANDAN REMEDIATION PROJECT		
MANDAN, NORTH DAKOTA		
<b>HISTORICAL MAXIMUM PRODUCT THICKNESS</b>		
<b>THROUGH 2004</b>		
FILE:	G3MANDAN02D.MXD	DATE: 02/18/2005
FIGURE:		12







# SETTLEMENT AGREEMENT

- THE PRIMARY PROJECT OBJECTIVES ARE TO:
  - REMOVE FREE-PHASE DIESEL
  - PROTECT HUMAN HEALTH
  - FACILITATE THE REDEVELOPMENT OF DOWNTOWN MANDAN
- THE SECONDARY PROJECT OBJECTIVES ARE TO:
  - COMPLETE THE REMEDIAL ACTIVITIES IN A MANNER THAT MINIMIZES INTRUSIVENESS
  - DEVELOP REMEDIATION STRATEGIES THAT WILL MINIMIZE COST TO PRESERVE THE REMEDIATION TRUST
- \$24 MILLION FOR SITE REMEDIATION
  - 300+ REMEDIAL WELLS INSTALLED (39 IN BASEMENTS)
  - 3 REMEDIAL BUILDINGS ERECTED
  - 20 MILES OF PIPE BURIED
  - 11 REMOTE MANIFOLDS CONSTRUCTED
  - 1 GROUND-WATER TREATMENT SYSTEM CONSTRUCTED
  - 3 EXTRACTION SYSTEMS CONSTRUCTED

# WELL RADIUS OF INFLUENCE



-  Monitoring / Remedial Well Not in MPE Mode
-  Remedial Well in MPE Mode
-  ROI (35 feet) for Wells in MPE Mode (November 2008)
-  ROI (35 feet) for Wells Not in MPE Mode (November 2008)



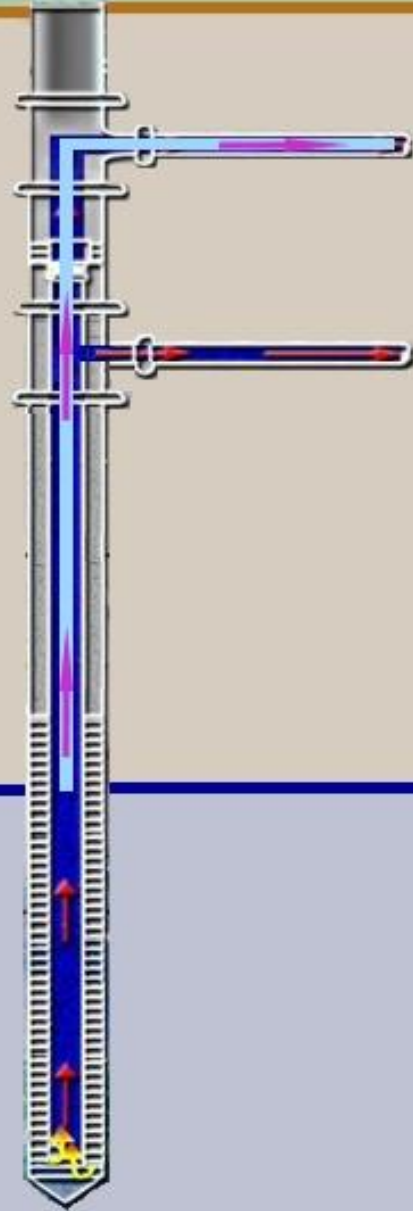
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## MANDAN REMEDIATION PROJECT MANDAN, NORTH DAKOTA

REMEDIAL WELLS IN MPE MODE (NOVEMBER 2008)

FILE: G3MANDAN07E.MXD	DATE: 12/01/2008	FIGURE: 1
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Surface



Multiphase  
Extraction  
(MPE)

Soil Vapor  
Extraction  
(SVE)

# MULTI PHASE EXTRACTION WELL



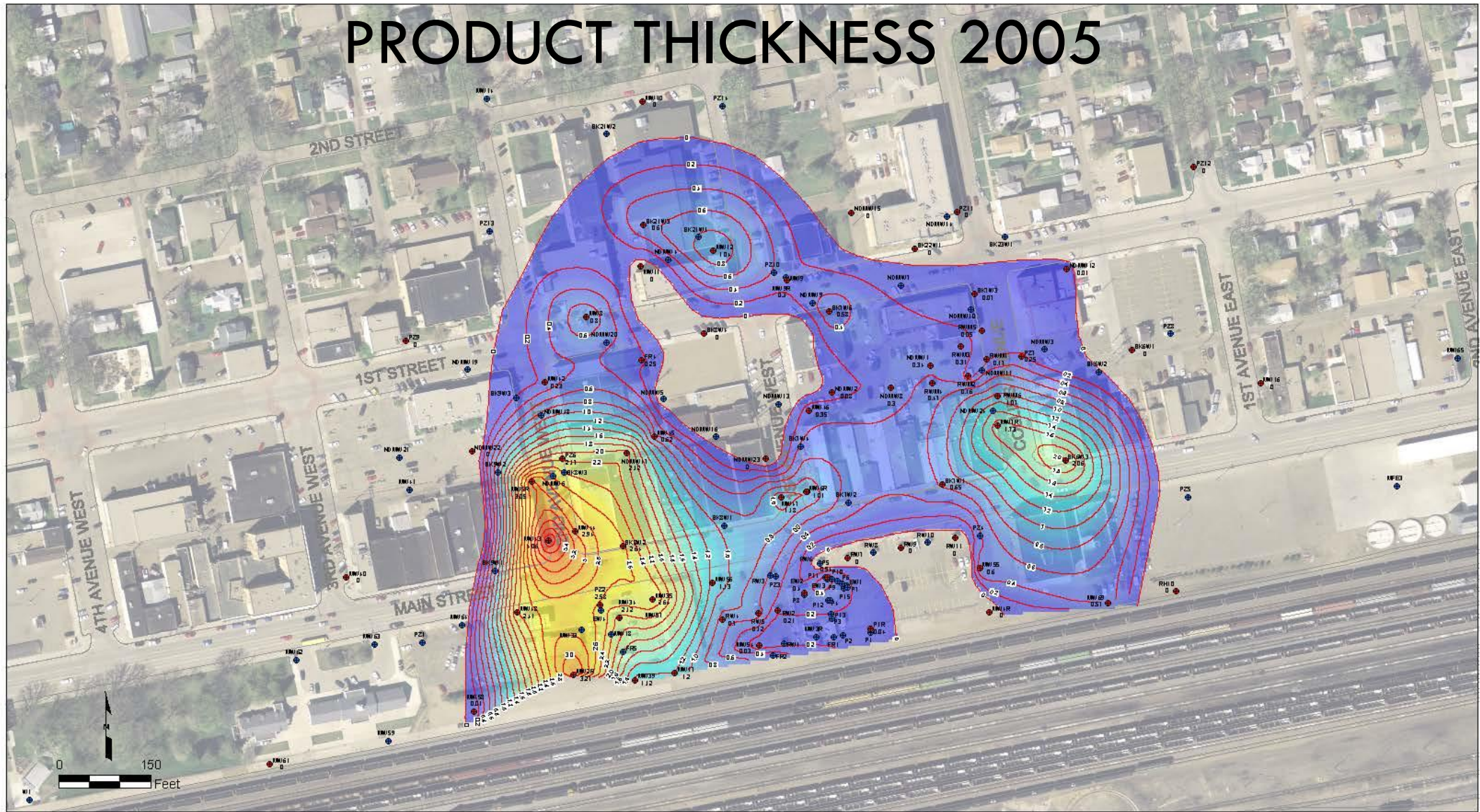
# WELL INSTALLATION



# PIPING INSTALLATION



# PRODUCT THICKNESS 2005

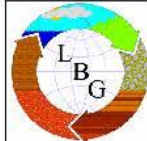


Product Thickness



— Product Thickness Contour (feet)

- Well Not Measured
- Well Measured March 2005
- 2.41 Product Thickness (feet)

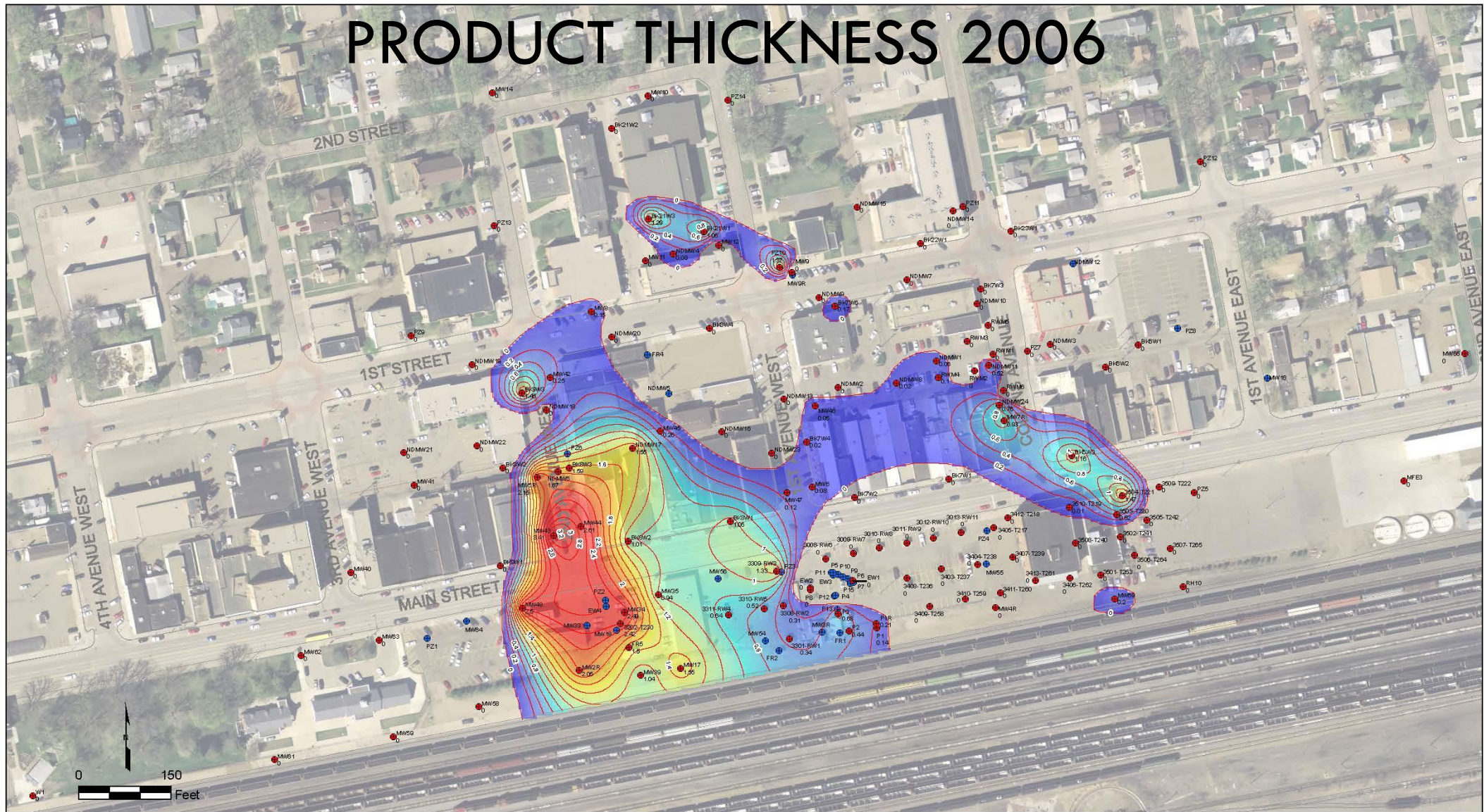


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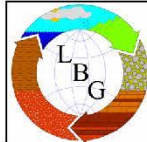
**MANDAN REMEDIATION PROJECT**  
 MANDAN, NORTH DAKOTA

MARCH 2005 FREE-PRODUCT THICKNESS

# PRODUCT THICKNESS 2006



- Product Thickness Contour (feet)
- Well Not Measured
- Well Measured June 2006
- 2.05 Product Thickness (feet)



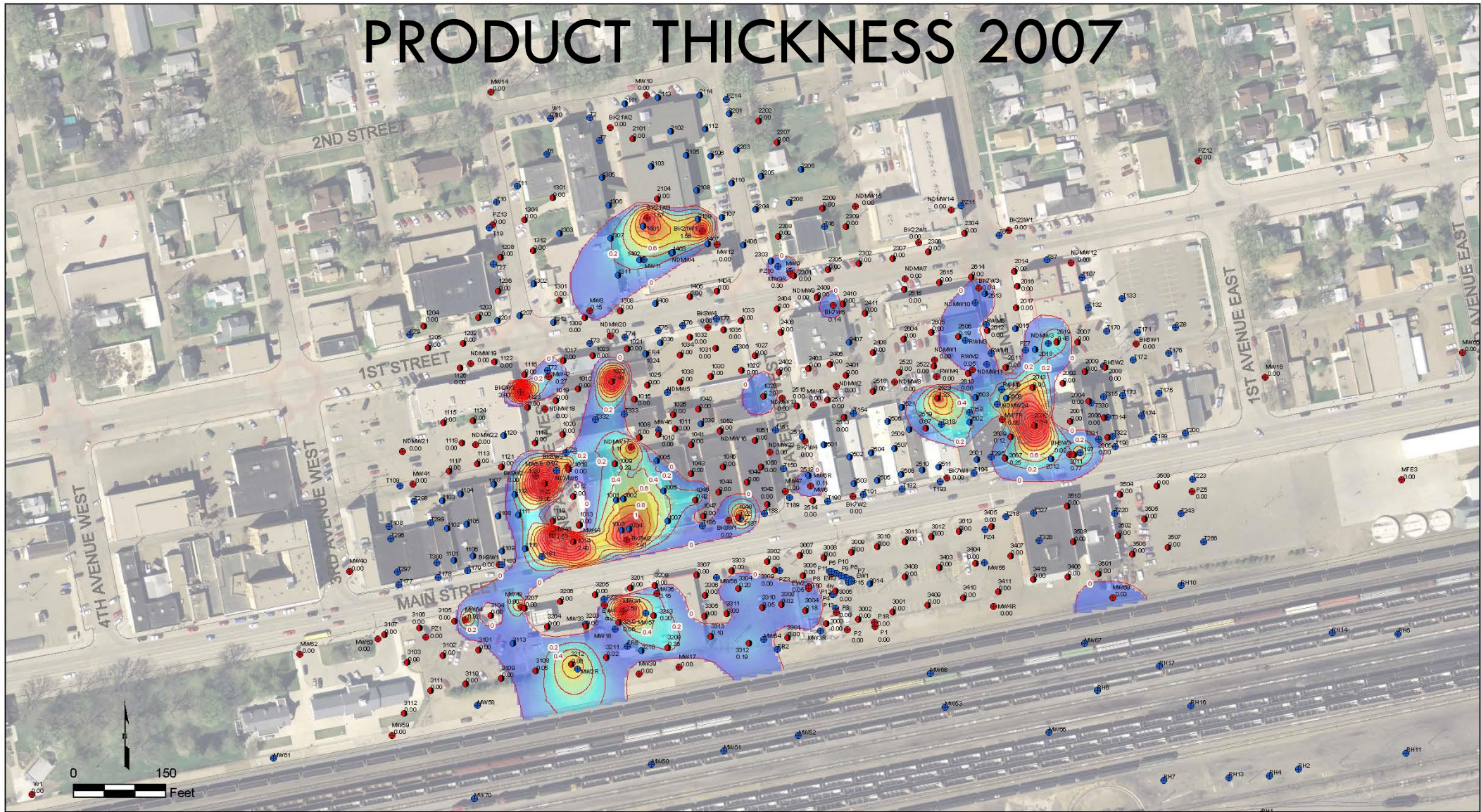
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**MANDAN REMEDIATION PROJECT**  
 MANDAN, NORTH DAKOTA

JUNE 2006 PRODUCT THICKNESS

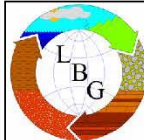
FILE:	G3MANDAN06B.MXD	DATE:	07/31/2006	FIGURE:	1
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# PRODUCT THICKNESS 2007



Product Thickness  
 High : 3.43 feet  
 Low : 0.00 feet

- Product Thickness Contour (feet)
- /● Monitoring / Remedial Well Not Measured
- /● Monitoring / Remedial Well Measured July 2007
- 1.57 Product Thickness (feet)
- \* Not Used in contouring



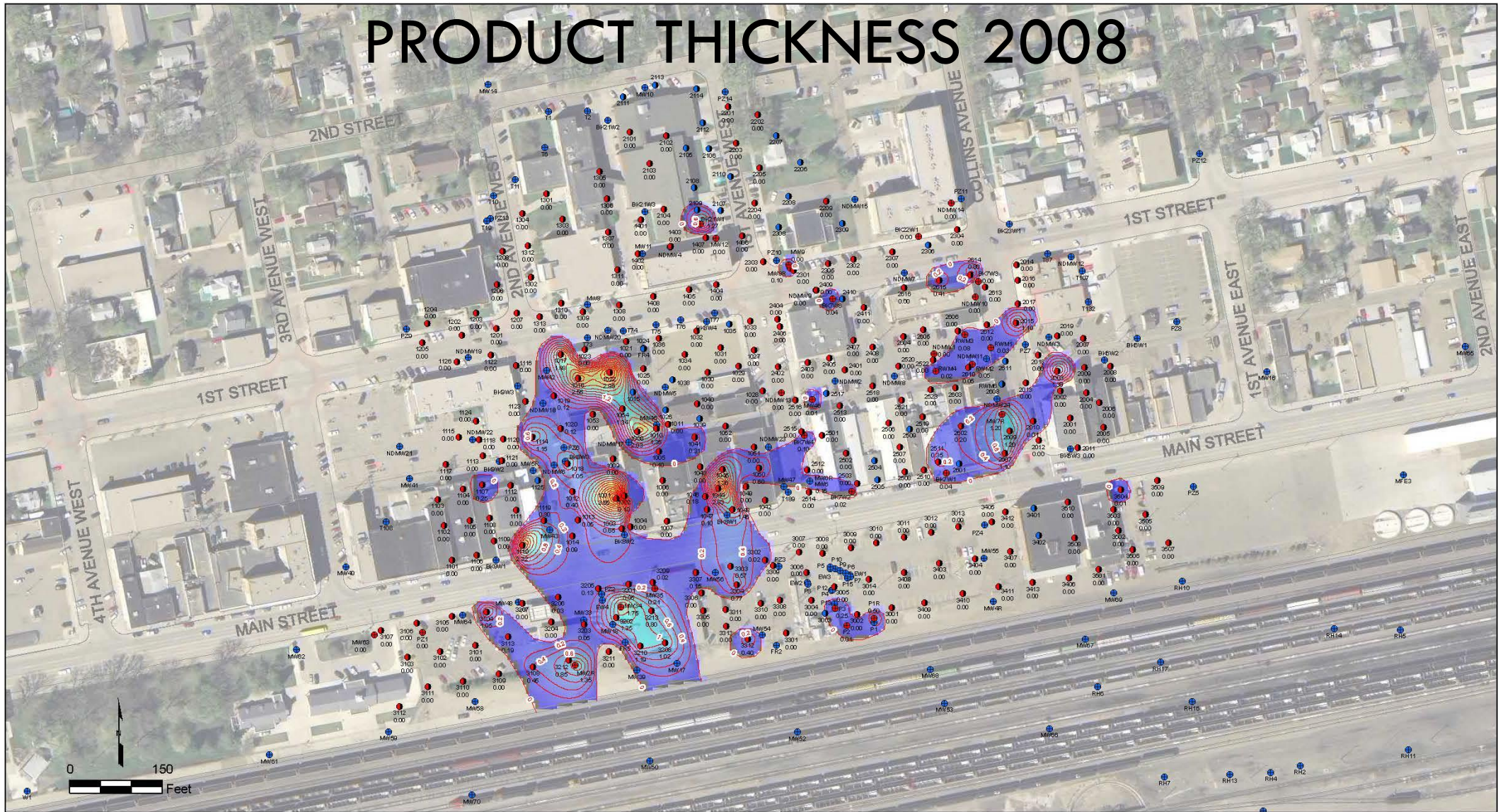
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**MANDAN REMEDIATION PROJECT**  
 MANDAN, NORTH DAKOTA

JULY 2007 PRODUCT THICKNESS

FILE:	G3MANDAN06K.MXD	DATE:	08/22/2007	FIGURE:	1
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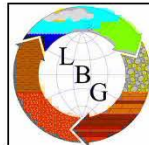
# PRODUCT THICKNESS 2008



Product Thickness  
 High : 3.65 feet  
 Low : 0.00 feet

- Product Thickness Contour (feet)
- Monitoring / Remedial Well Not Measured
- Monitoring / Remedial Well Measured
- 0.85 Product Thickness (feet)

Note: Zone 1 data is from April 2008.



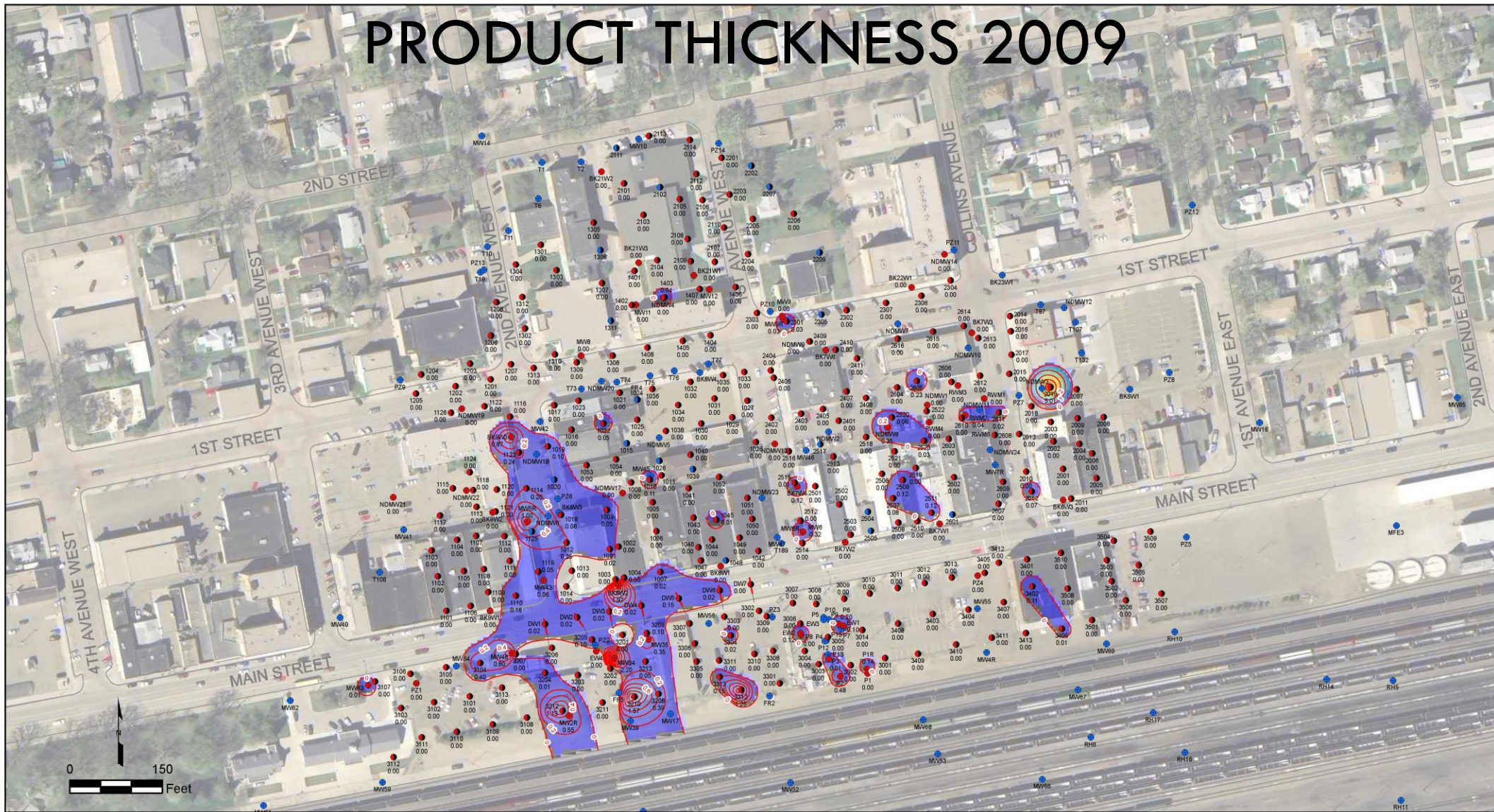
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PRODUCT THICKNESS JULY/AUGUST 2008

FILE: G3MANDAN06W.MXD DATE: 08/29/2008 FIGURE: 1

# PRODUCT THICKNESS 2009

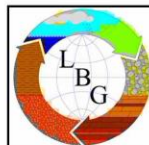


**Product Thickness**



**Product Thickness Contour (feet)**

- / ● Monitoring / Remedial Well Not Measured
- / ● 0.55 Monitoring / Remedial Well Measured Product Thickness (feet)



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**MANDAN REMEDIATION PROJECT**  
 MANDAN, NORTH DAKOTA

PRODUCT THICKNESS JULY/AUGUST 2009

FILE:	G3MANDAN07T.MXD	DATE:	09/17/2009	FIGURE:	1
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# PRODUCT THICKNESS 2010

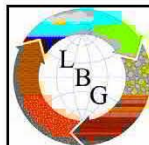


**Product Thickness**



**Product Thickness Contour (feet)**

- / ● Monitoring / Remedial Well Not Measured
- / ● Monitoring / Remedial Well Measured
- 0.48 Product Thickness (feet)



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**MANDAN REMEDIATION PROJECT**  
 MANDAN, NORTH DAKOTA

PRODUCT THICKNESS MAY/JUNE 2010

Source: May 2009 aerial photo (City of Mandan).

FILE:	G3MANDAN07Z.MXD	DATE:	07/29/2010	FIGURE:	1
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