

Ground Water Contamination from UICs?

A case study – City of Bend



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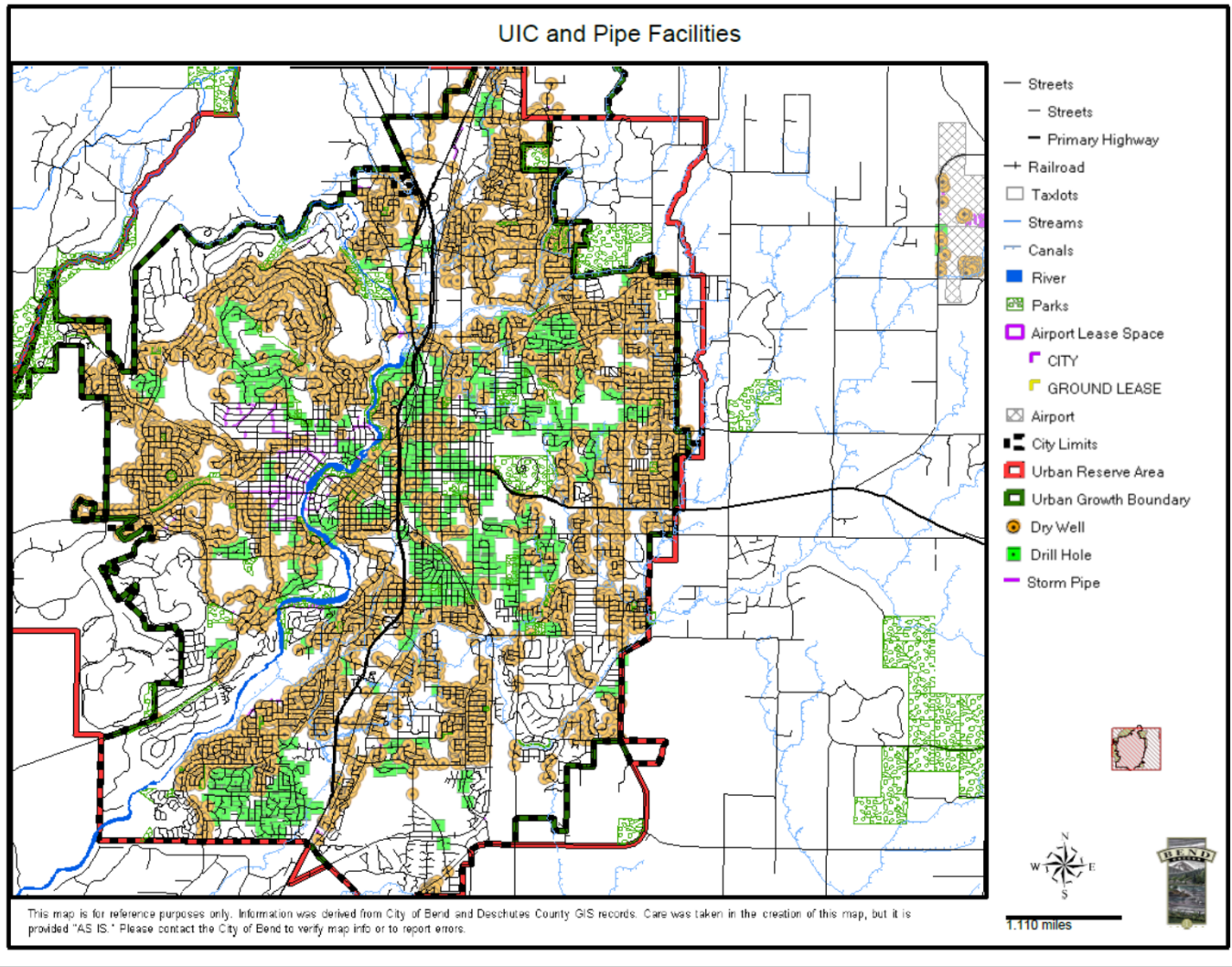
Where Does Stormwater Go?



- Surface Water via 28 Outfalls to the Deschutes River
- Infiltration through upper reaches of soil via swales & pervious surfaces
- Underground via Underground Injection Devices (UICs)
 - Drill holes, dry wells
 - Deeper than width

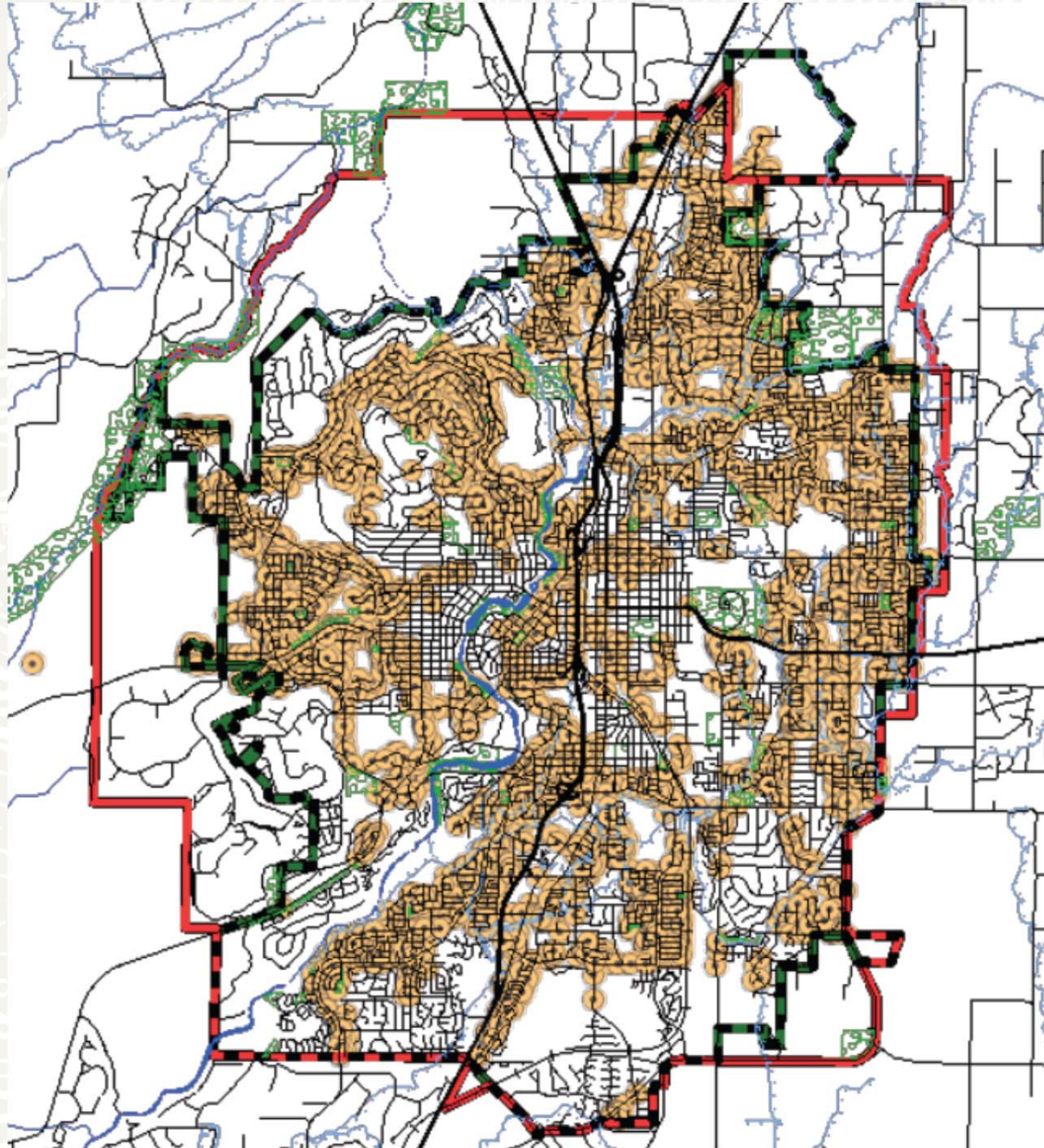


UICs and Drillholes

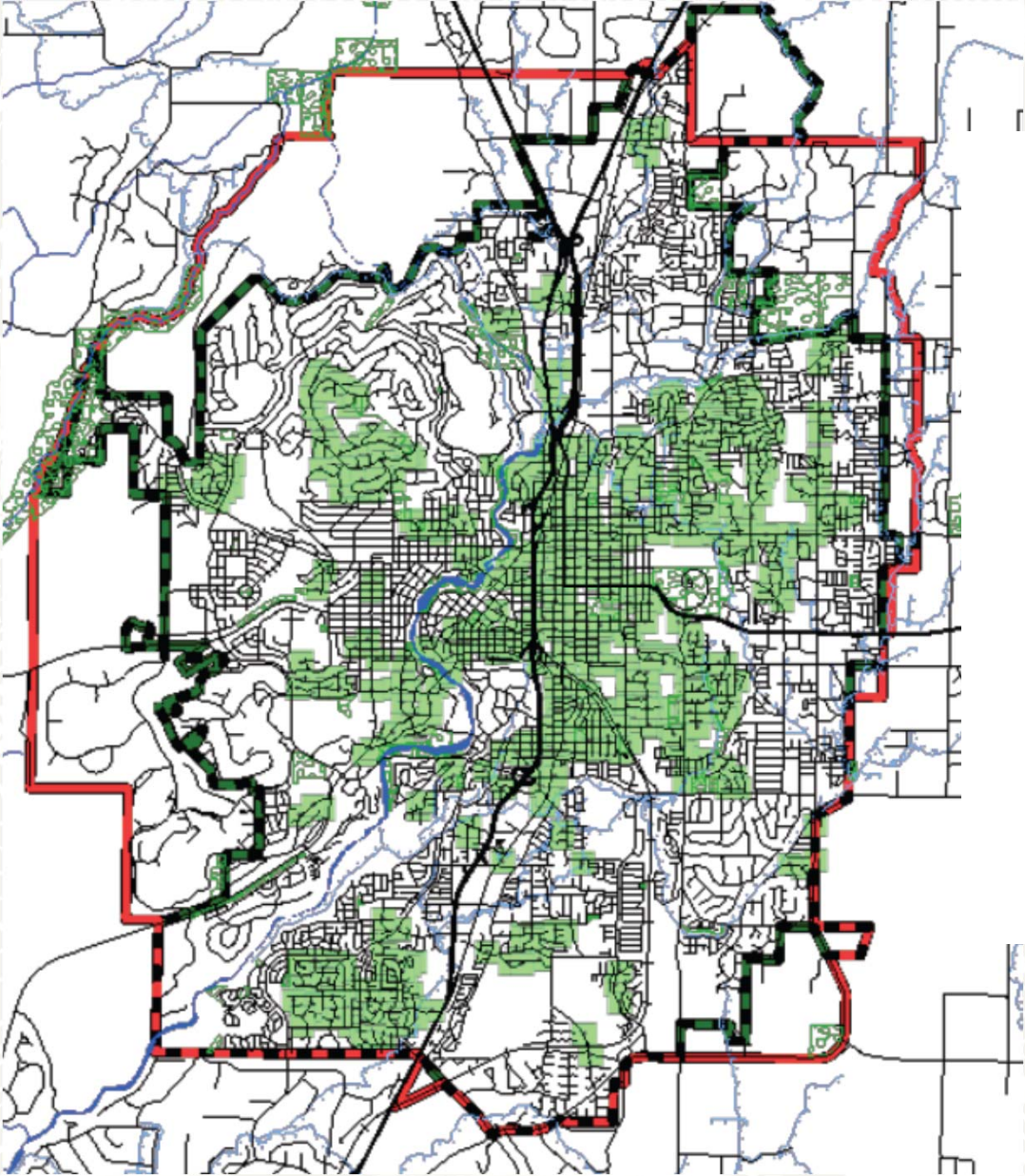


- The City of Bend has 5,500 drywells and drillholes, to manager urban stormwater
- Unknown number of private UIC's and drillholes

4,600 Public Drywells



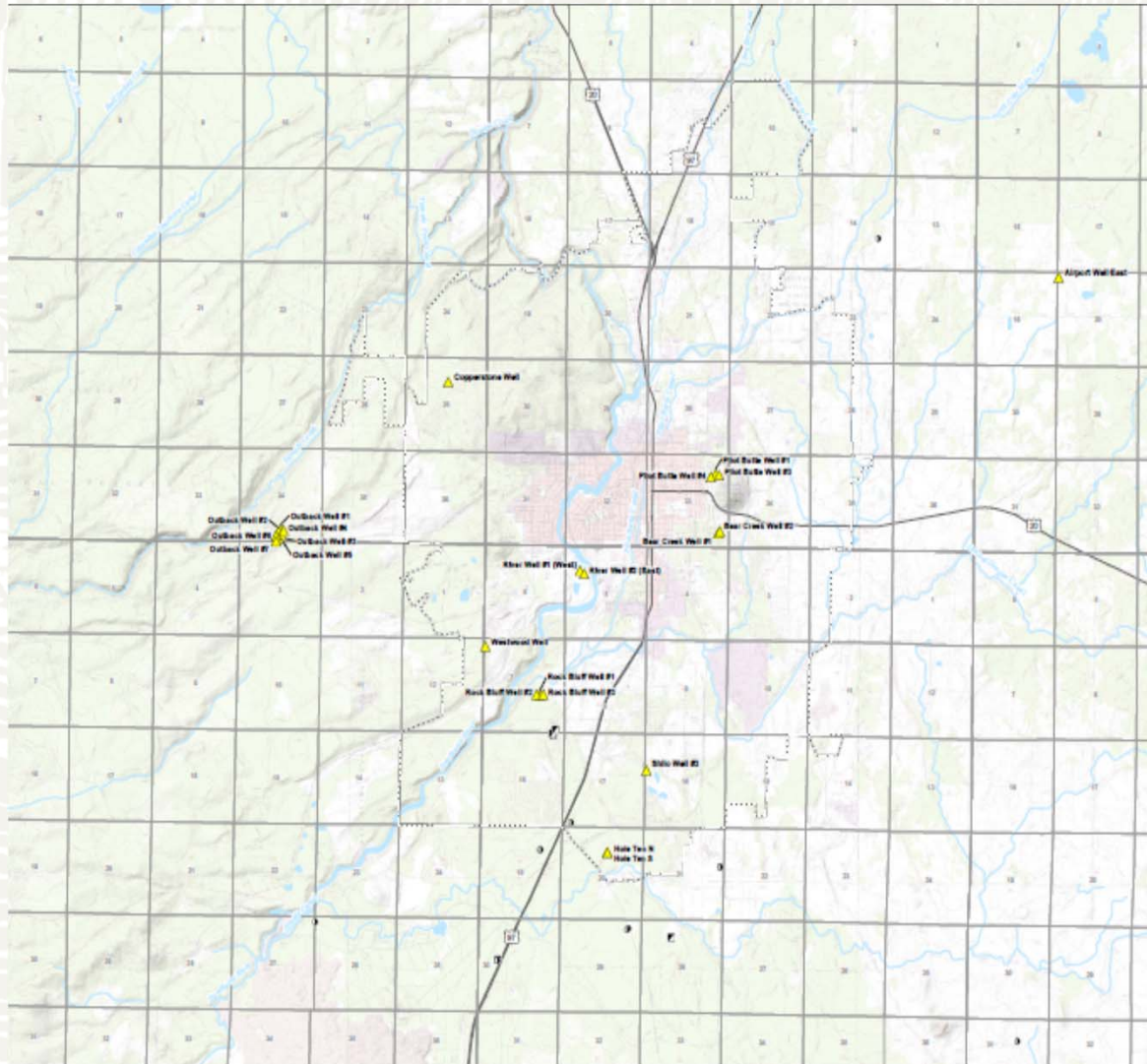
988 Public Drill Holes



City Well Supply



- 50% of City Supply from Groundwater from 23 wells



Why is this a concern?



- Soil Permeability
- Actual Spill Incidents
- Many Unknowns

Infiltration Tests and Surficial Geology

Highly Permeable Soils

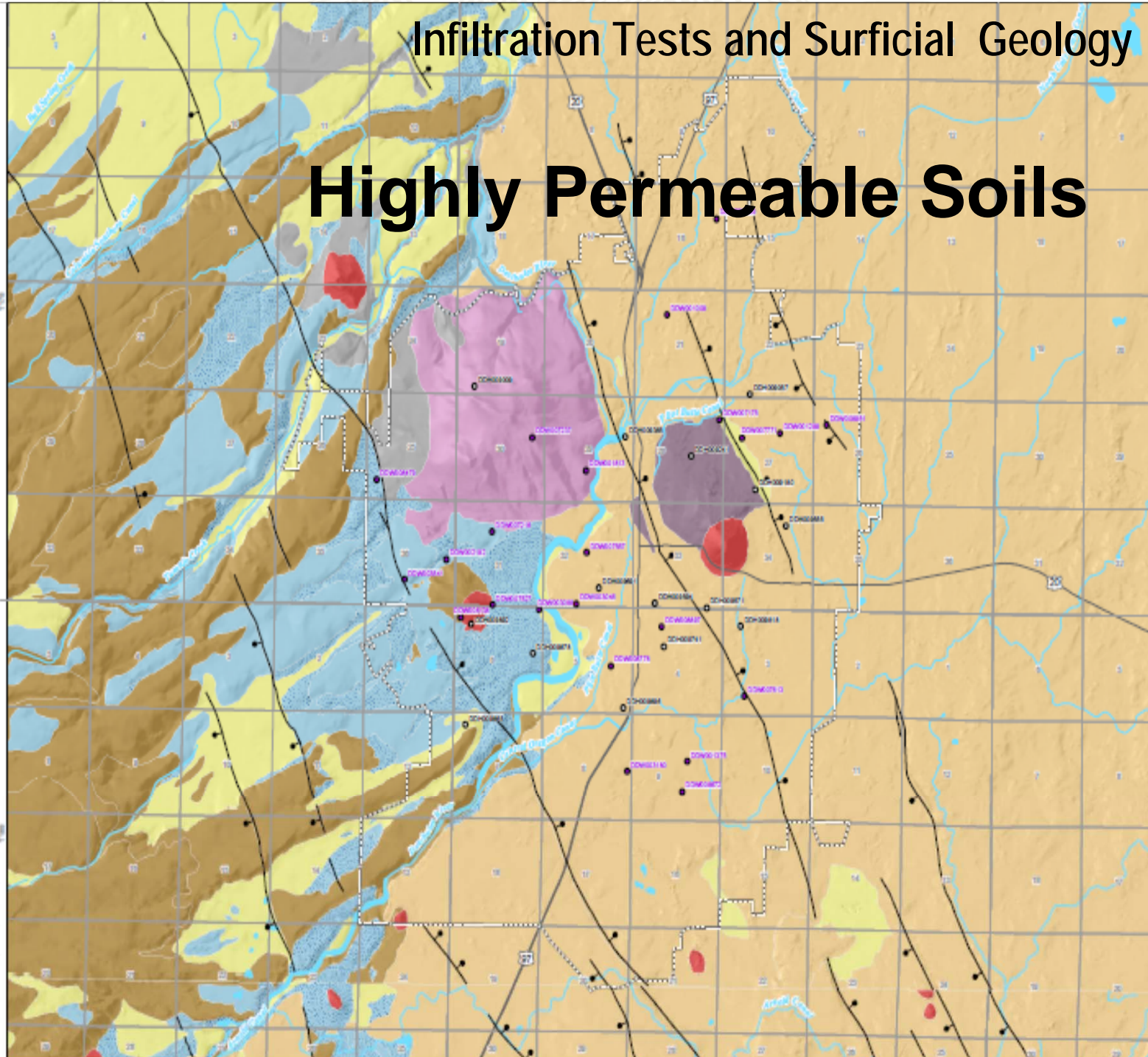
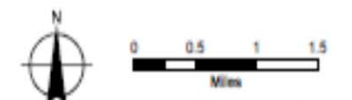


FIGURE 6

Infiltration Tests and Surficial Geology
Near Bend
City of Bend, Oregon

LEGEND

- City of Bend UICs - Infiltration Tests**
 - Drill Holes
 - Dry Wells
- Surficial Geology Near Bend**
 - ⊥ Faults
(ball on fault indicates downthrown side)
- Unconsolidated Sediments**
 - Quaternary Unconsolidated Deposits
(Includes Qal, Qe, and Qs of Sherrod and others, 2004)
- Miocene to Pleistocene Volcanic and Pyroclastic Rocks**
 - Newberry Basalt (Qbn)
 - Tuff/Pumice
(Includes Qap, Qit, Qds, and Qdt of Sherrod and others, 2004. Tumalo Tuff is stippled.)
 - Basaltic Andesite of Pilot Butte (Qbapb)
 - Cinder Cone Deposits (Qc)
 - Quaternary Basalt and Andesite
(Includes Qb and Qba of Sherrod and others, 2004)
 - Basalt of Awbrey Butte (Tbab)
- Miocene to Pleistocene Deschutes Formation**
 - Basalt (Tdt)
- All Other Features**
 - Bend City Limits
 - Major Roads
 - Watercourses
 - Waterbodies



MAP NOTES:
 Date: July 27, 2011
 Data Sources: City of Bend, DOGAMI, USGS, CGIC, SRSI



Nosler Ammunition Plant Explosion
June 2, 2010 (*AP Photo/The Bulletin, Pete Erickson*)



Crews work on spreading absorbent material after the locomotive fuel tank of Burlington Northern Santa Fe freight train locomotive spilled about 2,000 gallons of diesel fuel as the train moved along in Bend, Dec. 23, 2014.
(AP Photo/The Bulletin, Ryan Brennecke)



Ruptured Fuel Tank



Illicit Discharge : Private quick oil change business with a temporary antifreeze change operation



Illicit Discharge : Private quick oil change business with a temporary antifreeze change operation

Detections of Contamination



- City did an intensive collection of sampling of contaminants entering UIC's
- Found low levels of contaminants (i.e. below Federal standards)
- No contaminants have been detected at wells

Biggest Threat to Groundwater



- Large spill events
- Hidden intentional dumping
- Travel times to well heads

Actions the City Took to Protect Ground Water

The Bend logo is a circular emblem with the word "BEND" written in a stylized, bold, sans-serif font. The letters are arranged in a way that they appear to be slightly overlapping or stacked, giving it a three-dimensional feel. The logo is positioned to the right of the main title, partially overlapping the horizontal line that underlines the title.

- Better Data
- Better Modeling
- Developed Response Plans

Fate & Transport Modeling

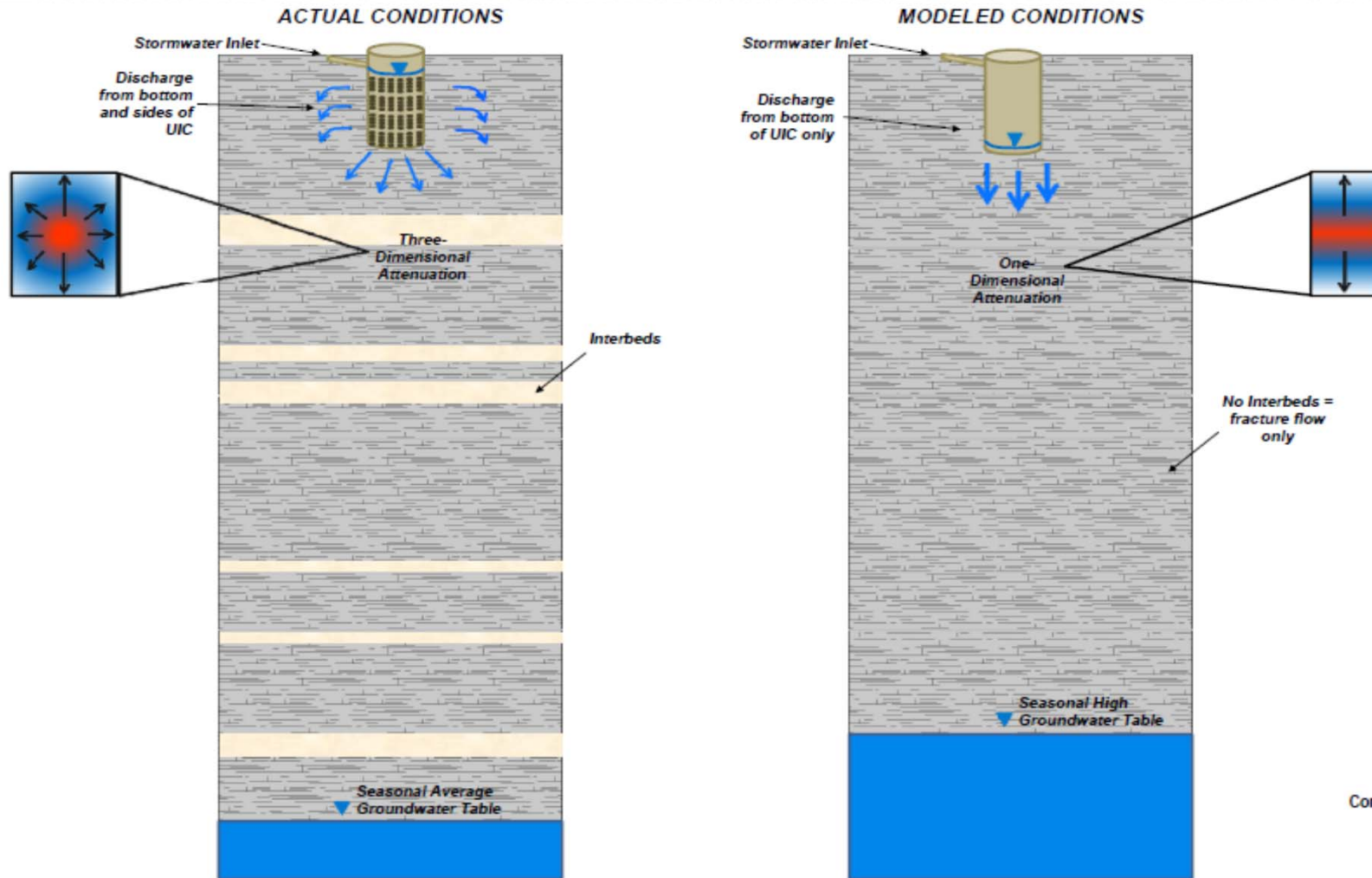


FIGURE 1
Conceptual Model for UIC
Discharge in Bend
City of Bend, Oregon















Fate & Transport Modeling

FIGURE 6

Existing Wellhead Protection Areas and
GSI's Groundwater Capture Zones
City of Bend Wellhead Protections Areas

LEGEND

-  Groundwater Elevations for Summer from Layer 1 of the GSI Model (Shallow)
-  Groundwater Elevations for Summer from Layer 5 of the GSI Model (Deep)
- GSI's Groundwater Capture Zones**
-  1 Year Time of Travel
-  2 Year Time of Travel
-  5 Year Time of Travel
-  10 Year Time of Travel
- Existing Features**
-  Existing City of Bend 2 Year TOT Wellhead Protection Areas
-  City of Bend Water Wells
-  Bend City Limits
-  Major Roads
-  Major Watercourses
-  Major Waterbodies



MAP NOTES:

Date: January 3, 2011
Data Source: City of Bend, USGS, RWRI, Oregon
Geographic Data Clearinghouse



File Path: P:\Portland2011 - City of Bend\008 - WHPA\Project_GIS\Project_modeling\gwmf_solving_WHPA_and_GSI_GW_Capture_Zones.mxd, Date: January 3, 2011 10:10:04 AM

Ground Water Protection



City of Bend

Ground Water Protection



- Setback distances to water wells are protective of groundwater
- Address drill holes first as a priority
- Promote LID upstream of UIC's
- Construct swales and settling basins upstream of UIC's



Questions?