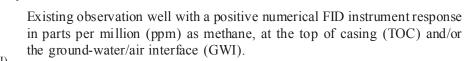


# Field Screening for Shallow Gas in Benson County, North Dakota

### Explanation

#### **Geologic Symbols**



Existing observation well, no FID response at TOC and/or the GWI.

Well sites not visited during this investigation.

Historical observation well location. No existing well at well site location visited. Well presumed abandoned or destroyed.

Nested wells; locations not separable at this scale.

#### Indicates number of wells drilled at same coordinates.

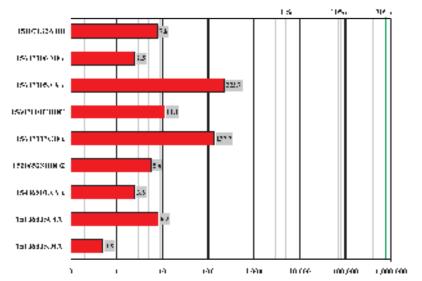


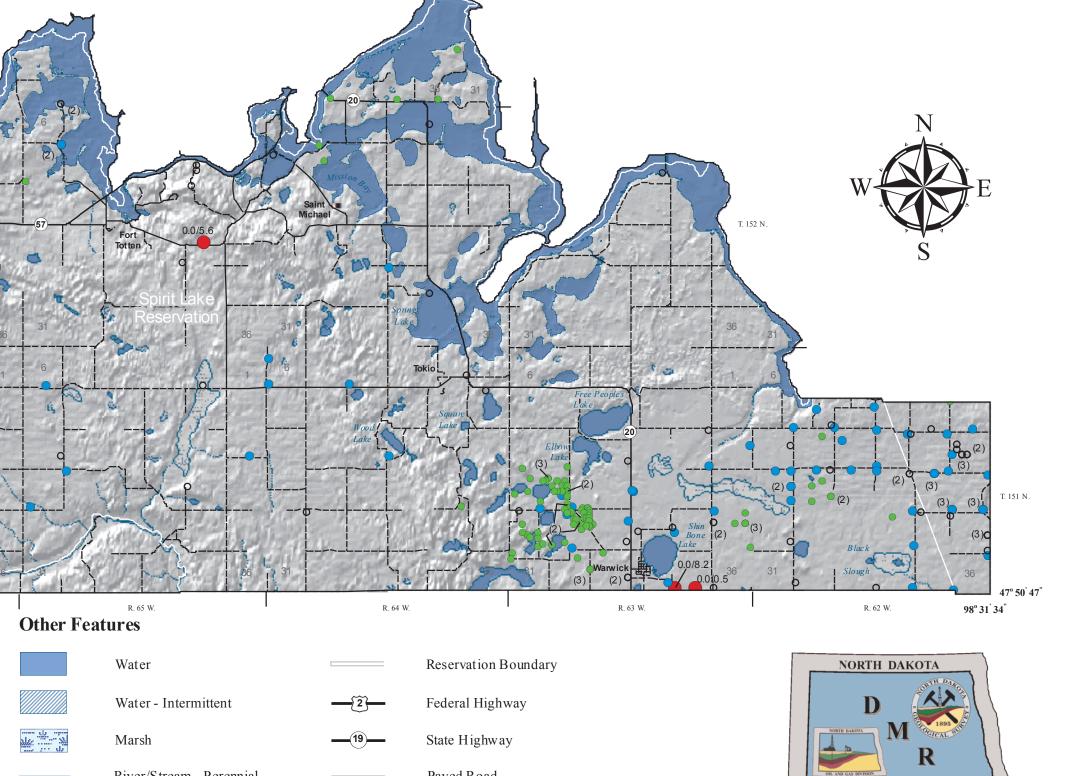
Figure 1. Graph depicting the relative relationship and absolute maximum values of flame-ionization detector (FID) instrument responses from selected wells in Benson County. FID results for each well are presented in order of field screening occurrence from top to bottom. Values shown are those reported from the air/ground-water interface (GWI) (as CH<sub>4</sub> in ppm). The typical concentration of methane in commercial natural gas is highlighted by the vertical green line at 70%.

## Fred J. Anderson 2008

The investigation of shallow natural gas occurrences within existing ground-water observation wells in Benson County, North Dakota was conducted over a four day period on July 29 - 31, and August 4, 2008. A total of 341 observation well sites, consisting of historic and existing ground-water observation wells, drilled in the county for the purposes of ground-water monitoring of unconsolidated and shallow bedrock aquifers, were reviewed prior to the field component of this investigation. 239 of these observation well sites were selected to be visited in the field. The remaining 103 well locations were not visited in the field due to time and/or access constraints. Observation well locations were visited in the field in order to (1) determine the actual existence of the well, (2) to verify its location, and (3) perform flame-ionization detector (FID) field screening for possible shallow natural gas occurrences. 127 observation well site locations were verified to have a ground-water observation well at their prescribed point and were subsequently field screened. 112 wells were not found at their prescribed locations in the field and were presumed abandoned or destroyed.

Each of the wells visited were field screened for the presence of combustible gases using a portable FID calibrated to methane (101 ppm low-span or 10,000 ppm high-span) in air. The FID was used solely for field screening on all wells. Instrument response was collected at the top of well casing (TOC) and just above the groundwater/air interface (GWI). After field screening a water level reading within the well was collected using an electric well tape. Of the existing wells field screened, nine wells returned positive FID responses ranging from 0.5 to 223.7 ppm as methane; 118 of the wells showed no response (i.e., a 0.0 ppm as methane instrument reading) during field screening at both the TOC and GWI. No wells were found to have a detectable concentration of methane emanating from the TOC. It has been observed in the field that it is more likely to detect methane at the GWI or higher in the air column within a given well. It has been less typical to actually detect methane emanating from the TOC.

The occurrence of FID responses are located in the northeast near Pleasant Lake and southwest near Warwick and just south of Devils Lake. This is due, in part, to the spatial distribution of monitoring points in the county. Stock wells and individual private, irrigation, or municipal water supply wells were not considered as a part of this investigation. FID field screening is not a stand-alone analytical tool. It must be used in conjunction with additional analytical methods and procedures. A positive FID instrument response indicates that the presence of methane is highly likely at the well since the instrument is selectively sensitive to methane and is calibrated specifically to a predetermined concentration of methane in air. However, excessive moisture and low oxygen levels or high values of carbon dioxide can influence FID response. A confirmatory gas analysis is required to determine and quantify the absolute presence and concentration of methane and other hydrocarbons that may be present in conjunction with FID field screening results. The reconnaissance level field screening results presented here are intended to aid in the selection of future candidate observation well locations and or areas to conduct additional sampling and analysis and potentially focus future field investigative and exploration efforts.



	Water
	Water - Intermittent
aler ale	Marsh
	River/Stream - Perennial
	Stream - Intermittent

R. 66 W.

Paved Road \_\_\_\_\_ Unpaved Road