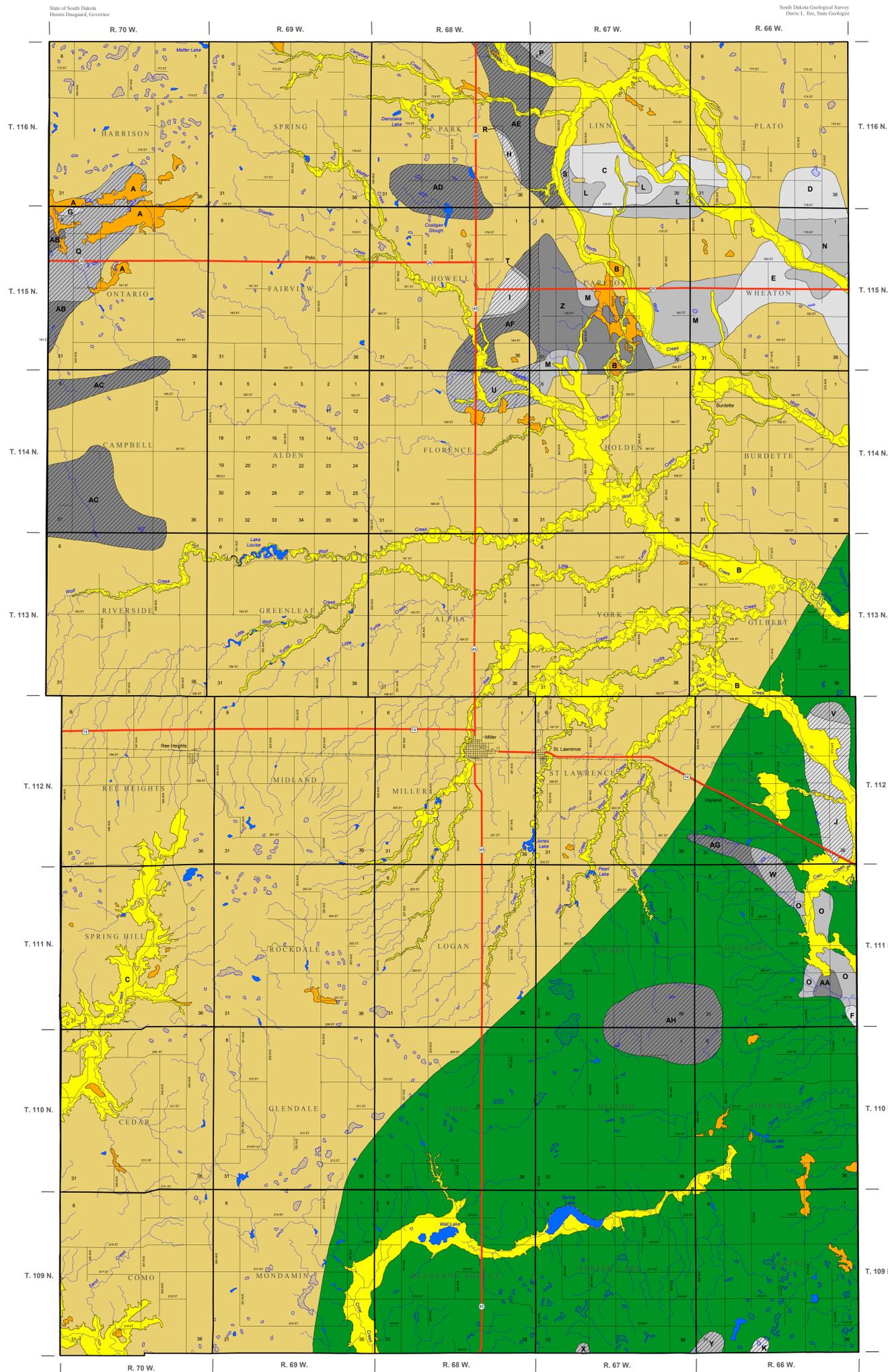


# First Occurrence of Aquifer Materials in Hand County, South Dakota



## Explanation

This map is intended for use as a tool to aid in identifying areas underlain by aquifer material. The aquifer materials shown on this map are categorized below. This map does not show individual aquifers. There may be more than one type of aquifer material present in an area. However, only the aquifer material that would be first encountered is shown. Within the boundaries of any given map unit, there may be localized areas where aquifer material is absent. The thickness and permeability of aquifer material may vary significantly. Also, no attempt was made to distinguish between saturated and unsaturated material. Therefore, not all of the areas defined on this map may be an aquifer. Site-specific information should always be examined when making land management or water development decisions.

- Alluvium:** Consists of clay and silt with minor amounts of sand and gravel appearing at land surface; generally confined to topographically defined modern stream valleys; sand and gravel are occasionally the predominant sediment types, such as where gravel pits have been developed.
  - Occurrences of outwash sand and gravel in the shallow subsurface beneath the mapped alluvium that are confined to modern stream valleys and that have been developed for irrigation exist at several locations in the northeastern part of the county; depth to top of this sand and gravel from ground surface observed in test holes ranges from 0 to 41 feet; maximum thickness observed in test holes is 70 feet.
  - Outwash sand and gravel that occur in the subsurface beneath the mapped alluvium and confined to the Elm Creek valley in the southwestern part of the county have also been developed for irrigation; depth to top of this sand and gravel from ground surface observed in test holes ranges from 18 to 85 feet; maximum thickness observed in test holes is 105 feet.
- Sand and Gravel:** First occurrence is generally at land surface; may be silty and clayey.
  - All mapped areas in this category that are not labeled **A** or **B** are sand and gravel mapped on the basis of the presence of soil derived from outwash; maximum thickness is approximately 25 feet; lateral continuity is probably discontinuous.
  - A** Collapsed outwash located in Ontario and Harrison Townships (T. 115 N., R. 70 W. and T. 116 N., R. 70 W.) along the southern flank of the Orient Hills; maximum thickness observed in test holes is 90 feet.
  - B** Two occurrences of terrace outwash located in Holden and Carlton Townships (T. 114 N., R. 67 W. and T. 115 N., R. 67 W.)
  - Sand and Gravel:** First occurrence is generally below land surface and is probably continuous in lateral extent; may be silty and clayey.
    - C** Outwash sand and gravel located in Carlton, Plato, and Linn Townships (T. 115 N., R. 67 W., T. 116 N., R. 66 W., and T. 116 N., R. 67 W.); maximum thickness observed in test holes is 52 feet.
    - D** Outwash sand and gravel located in Wheaton and Plato Townships (T. 115 N., R. 66 W. and T. 116 N., R. 66 W.); maximum thickness observed in test holes is 88 feet.
    - E** Outwash sand and gravel and glaciolacustrine sand located in Wheaton Township (T. 115 N., R. 66 W.); maximum thickness observed in test holes is 115 feet.
    - F** Outwash sand and gravel located in Rose Hill and Hulbert Townships (T. 110 N., R. 66 W. and T. 111 N., R. 66 W.); maximum thickness observed in test holes is 20 feet.
  - Sand and Gravel:** First occurrence is generally below land surface and is probably discontinuous in lateral extent; may be silty and clayey.
    - G** Outwash sand and gravel located in Ontario Township (T. 115 N., R. 70 W.); maximum thickness observed in single test hole upon which unit is based is 36 feet.
    - H** Outwash sand and gravel located in Park Township (T. 116 N., R. 68 W.); maximum thickness observed in single test hole upon which unit is based is 44 feet.
    - I** Outwash sand and gravel located in Howell Township (T. 115 N., R. 68 W.); maximum thickness observed in single test hole upon which unit is based is 85 feet.
    - J** Outwash sand and gravel located in Grand Township (T. 112 N., R. 66 W.); maximum thickness observed in test holes is 71 feet.
    - K** Outwash sand and gravel located in Bates Township (T. 109 N., R. 66 W.); mapped as an extension of outwash occurring in Jerauld County; maximum thickness observed in single test hole upon which unit is based is 11 feet.
  - Sand and Gravel:** Generally continuous in lateral extent; may be silty and clayey.
    - L** Outwash sand and gravel located in Wheaton, Carlton, Plato, and Linn Townships (T. 115 N., R. 66 W.; T. 115 N., R. 67 W.; T. 116 N., R. 66 W.; T. 116 N., R. 67 W.); maximum thickness observed in test holes is 36 feet.
    - M** Outwash sand, gravel, and lacustrine sand located in Holden, Wheaton, and Carlton Townships (T. 114 N., R. 67 W.; T. 115 N., R. 66 W.; and T. 115 N., R. 67 W.); maximum thickness observed in test holes is 64 feet.
    - N** Outwash sand, gravel, and lacustrine sand located in Wheaton Township (T. 115 N., R. 66 W.); maximum thickness observed in test holes is 50 feet.
    - O** Outwash sand and gravel located in Hulbert Township (T. 111 N., R. 66 W.); maximum thickness observed in test holes is 78 feet.
  - Sand and Gravel:** Generally discontinuous in lateral extent; may be silty and clayey.
    - P** Outwash sand and gravel located in Linn and Park Townships (T. 116 N., R. 67 W. and T. 116 N., R. 68 W.); maximum thickness observed in test holes is 10 feet.
    - Q** Outwash sand and gravel located in Ontario and Harrison Townships (T. 115 N., R. 70 W. and T. 116 N., R. 70 W.); maximum thickness observed in test holes is 60 feet.
    - R** Outwash sand and gravel located in Park Township (T. 116 N., R. 68 W.)
    - S** Outwash sand and gravel located in Linn Township (T. 116 N., R. 67 W.)
    - T** Outwash sand and gravel located in Carlton and Howell Townships (T. 115 N., R. 67 W. and T. 115 N., R. 68 W.)
    - U** Outwash sand and gravel located in Holden, Florence, Carlton, and Howell Townships (T. 114 N., R. 67 W.; T. 114 N., R. 68 W.; T. 115 N., R. 67 W.; and T. 115 N., R. 68 W.); maximum thickness observed in test holes is 54 feet.
    - V** Outwash sand and gravel located in Grand Township (T. 112 N., R. 66 W.); maximum thickness observed in single test hole upon which unit is based is 38 feet.
    - W** Outwash sand and gravel located in Hulbert and Grand Townships (T. 111 N., R. 66 W. and T. 112 N., R. 66 W.); maximum thickness observed in single test hole upon which unit is based is 30 feet.
    - X** Outwash sand and gravel located in Spring Lake Township (T. 109 N., R. 67 W.); mapped as an extension of outwash occurring in Jerauld County; maximum thickness observed in single test hole upon which unit is based is 14 feet.
    - Y** Outwash sand and gravel located in Bates and Spring Lake Townships (T. 109 N., R. 66 W. and T. 109 N., R. 67 W.); mapped as an extension of outwash occurring in Jerauld County; maximum thickness observed in single test hole upon which unit is based is 46 feet.
  - Sand and Gravel:** Generally continuous in lateral extent; may be silty and clayey.
    - Z** Outwash sand and gravel located in Holden and Carlton Townships (T. 114 N., R. 67 W. and T. 115 N., R. 67 W.); depth to top of unit from ground surface observed in test holes ranges from 105 to 135 feet; maximum thickness observed in test holes is 70 feet.
    - AA** Outwash sand and gravel located in Hulbert Township (T. 111 N., R. 66 W.); depth to top of unit from ground surface observed in test holes ranges from 115 to 139 feet; maximum thickness observed in test holes is 40 feet.
  - Sand and Gravel:** Generally discontinuous in lateral extent; may be silty and clayey.
    - AB** Outwash sand and gravel located in Ontario Township (T. 115 N., R. 70 W.); depth to top of unit from ground surface observed in test holes ranges from 115 to 132 feet; maximum thickness observed in test holes is 10 feet.
    - AC** Outwash sand and gravel located in Riverside, Campbell, and Ontario Townships (T. 113 N., R. 70 W.; T. 114 N., R. 70 W.; and T. 115 N., R. 70 W.); depth to top of unit from ground surface observed in test holes ranges from 179 to 258 feet; maximum thickness observed in test holes is 74 feet.
    - AD** Outwash sand and gravel located in Howell and Park Townships (T. 115 N., R. 68 W. and T. 116 N., R. 68 W.); depth to top of unit from ground surface observed in test holes ranges from 141 to 183 feet; maximum thickness observed in test holes is 45 feet.
    - AE** Outwash sand and gravel located in Carlton, Linn, and Park Townships (T. 115 N., R. 67 W.; T. 116 N., R. 67 W.; and T. 116 N., R. 68 W.); depth to top of unit from ground surface observed in test holes ranges from 110 to 170 feet; maximum thickness observed in test holes is 60 feet.
    - AF** Outwash sand and gravel located in Florence, Carlton, and Howell Townships (T. 114 N., R. 68 W.; T. 115 N., R. 67 W.; and T. 115 N., R. 68 W.); depth to top of unit from ground surface observed in test holes ranges from 125 to 181 feet; maximum thickness observed in test holes is 30 feet.
    - AG** Outwash sand and gravel located in Hulbert, Grand, and St. Lawrence Townships (T. 111 N., R. 66 W.; T. 112 N., R. 66 W.; and T. 112 N., R. 67 W.); depth to top of unit from ground surface observed in test holes ranges from 149 to 251 feet; maximum thickness observed in test holes is 47 feet.
    - AH** Outwash sand and gravel located in Rose Hill, Hulbert, and Pearl Townships (T. 110 N., R. 66 W.; T. 110 N., R. 67 W.; T. 111 N., R. 66 W.; and T. 111 N., R. 67 W.); depth to top of unit from ground surface observed in test holes ranges from 330 to 430 feet; maximum thickness observed in test holes is 73 feet.
- Niobrara Formation:** The upper part of this formation consists of a chalk-like material while the lower part consists of marl; maximum thickness is approximately 150 feet; present in subsurface throughout entire county but utilized for water supply only where formation is shown and in Wheaton Township (T. 115 N., R. 66 W.); depth to top of formation from ground surface ranges from approximately 200 feet in the northeastern part of the county to approximately 500 feet in the southern part of the county.
- Dakota Sandstone:** Consists of interbedded sandstone, siltstone, and shale; maximum thickness is approximately 300 feet; depth to top of unit from ground surface ranges from approximately 1,100 feet in the northern part of the county to approximately 1,400 feet in the southern part of the county.

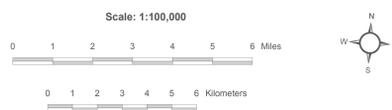
First occurrence is generally less than or equal to 50 feet below land surface

First occurrence is generally greater than 50 feet and less than or equal to 100 feet below land surface

First occurrence is generally greater than 100 feet below land surface

The Geological Survey, Department of Environment and Natural Resources, engages in an ongoing data collection and interpretation process. An outcome of that process is to reflect those interpretations on maps such as this one. Reasonable efforts have been made to ensure that this map accurately reflects the source data used in its preparation. This map is date specific. As additional data become available, geologic interpretations may be revised and the map may be updated by the Geological Survey Program. This map should not be enlarged or otherwise used in an attempt to interpret more detail than can be seen at a scale of 1:100,000.

River or stream  
Lake  
Slough or intermittent lake  
Major highway  
Road  
Township boundary



For township section numbering system, see T. 114 N., R. 69 W.

This map was developed from lithologic logs and published reports. The major sources of information were:

CENDAK Drainage Steering Committee, 1987, *Comparison of irrigated land in southern Alberta, Canada, with the CENDAK area, South Dakota*: South Dakota Geological Survey Open-File Report 8-BAS, 212 p.

Christensen, C.M., 1962, *Water supply for the city of Miller*: South Dakota Geological Survey Special Report 17, 23p.

Helgeson, R., and Duchossois, G.E., 1987, *Geology and water resources of Hand and Hyde Counties, South Dakota: Part 1. Geology*: South Dakota Geological Survey Bulletin 28, 46 p.

Koch, N.C., 1976, *Major aquifers in Hand and Hyde Counties, South Dakota*: South Dakota Geological Survey Information Pamphlet 14, 5 p.

Koch, N.C., 1980, *Geology and water resources of Hand and Hyde Counties, South Dakota: Part II. Water resources*: South Dakota Geological Survey Bulletin 28, 46 p.

Martin, J.E., Sawyer, J.F., Fahrback, M.D., Tomhave, D.W., and Schulz, L.D., 2004, *Geologic map of South Dakota*: South Dakota Geological Survey General Map 10, scale 1:500,000.

Rothrock, E.P., 1941, *Sources of water supply for the city of Miller, South Dakota*: South Dakota Geological Survey Report of Investigations No. 40, 15 p.

Rich, T., 2001 [2005], *Results of monitoring from 1989 through 1997 for the statewide ground water quality monitoring network*: South Dakota Geological Survey Open-File Report 89-4UR, 37 p.

Schroeder, W., 1976, *Sand and gravel resources in Hand County, South Dakota*: South Dakota Geological Survey Information Pamphlet 12, 21 p.

Schoon, R.A., 1971, *Geology and hydrology of the Dakota Formation in South Dakota*: South Dakota Geological Survey Report of Investigations No. 104, 55 p.

Tomhave, D.W., and Schulz, L.D., 2004, *Bedrock geologic map showing configuration of the bedrock surface in South Dakota east of the Missouri River*: South Dakota Geological Survey General Map 9, scale 1:500,000.

South Dakota Geological Survey, Lithologic logs database.

U.S. Department of Agriculture, 1963, *Soil survey of Hand County, South Dakota*, 112 p.



Index map of South Dakota showing the location Hand County