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OPEN-FILE REPORT 80-UR – NO. 1: BELLE FOURCHE CITY

STATEWIDE LANDFILL STUDY:
BELLE FOURCHE CITY LANDFILL SITE CHARACTERISTICS

by

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CONTENTS

	Page
INTRODUCTION	1
Purpose and scope	1
Selection of sites	1
BELLE FOURCHE CITY LANDFILL	2
Location	2
Topography, drainage, and climate	2
Geology	3
Hydrology	3
Water quality	3
Adjacent land use and features	3
Operational and siting criteria – summary from the Office of Air Quality and Solid Waste records	4
SUMMARY	4
REFERENCES CITED	5

FIGURES

1. Sites considered for further evaluation	6
2. Location of the Belle Fourche City landfill	7

TABLE

1. List of sites considered for further evaluation	1
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INTRODUCTION

Purpose and Scope

The purpose of this report is to summarize the geologic data, hydrologic data, and other site characteristics of the Belle Fourche City landfill. This information was compiled as a part of the Statewide Landfill Study.

In 1984, the state of South Dakota had 38 permitted solid waste landfills, both private and public, which accepted waste other than ordinary household waste. A study was undertaken in an effort to evaluate selected landfills in South Dakota and identify those that may be best suited for the disposal of these special wastes.

This study was conducted by the South Dakota Geological Survey and the Office of Air Quality and Solid Waste of the Department of Water and Natural Resources, now known as the Department of Environment and Natural Resources. The Office of Air Quality and Solid Waste contracted with the South Dakota Geological Survey for certain geological services. The South Dakota Geological Survey contribution to this study was three-fold. First, available geologic and hydrologic data from landfills in South Dakota were reviewed and evaluated. Second, monitoring well systems were designed and installed at four landfills which were selected by the Office of Air Quality and Solid Waste. Finally, the geology was evaluated in more detail at these four landfills.

Selection of Sites

Existing information concerning 38 permitted and 2 proposed landfill sites was reviewed by the Office of Air Quality and Solid Waste in order to prioritize the sites. The Office of Air Quality and Solid Waste used this preliminary screening to reduce the number of potential sites from 40 to 26 (table 1 and fig. 1).

TABLE 1. List of sites considered for further evaluation

1. Belle Fourche City	14. Miedema City
2. Brookings City - Proposed	15. Milbank City
3. Brown County	16. Miller City
4. Brule County	17. Pierre City - Proposed
5. Byre (Private)	18. Pierre City - Old Site
6. Davison County	19. Ralph Dawson (Private)
7. De Smet City	20. Rapid City
8. Gregory County	21. Sioux Falls (Runge) City
9. Haarstad (Private)	22. Vermillion City
10. Huron City	23. Walworth County
11. John Clements (Private)	24. Watertown City
12. Kadoka City	25. Winner City
13. Marshall County	26. Yankton County

Subsequently, the South Dakota Geological Survey evaluated these 26 sites and prepared a draft report describing each site. No field checking was done. Topics such as topography, drainage, climate, soils, geology, hydrology, water quality, adjacent land use, hazardous waste records, and operational practices were addressed. These reports included copies of available maps, lithologic logs, and water quality analyses. Draft copies of these unpublished reports are on file at the Department of Environment and Natural Resources in Pierre and the South Dakota Geological Survey in Vermillion. The individual report on the Belle Fourche City landfill is the basis for this report.

After the initial assessment of the 26 sites, the Office of Air Quality and Solid Waste established criteria for further prioritizing the sites. Four sites were selected for the installation of monitoring wells. The South Dakota Geological Survey conducted detailed investigations at the Brown County, Watertown City, Yankton County, and Rapid City landfills (fig. 1). A draft copy of the unpublished summary report is on file at the Department of Environment and Natural Resources in Pierre and the South Dakota Geological Survey in Vermillion. The following information was available regarding the Belle Fourche City landfill in 1986.

BELLE FOURCHE CITY LANDFILL

Location

The Belle Fourche City landfill is located half a mile north of Belle Fourche in Butte County. Its legal location is NW¼ sec. 2, T. 8 N., R. 2 E. (fig. 2).

Topography, Drainage, and Climate

The information on topography and drainage was taken from the Belle Fourche Quadrangle (United States Geological Survey, 1954). In actuality, the present landfill surface may be significantly different because of activities at the landfill.

The topography at the Belle Fourche City landfill is dominated by a hillside and the Belle Fourche River floodplain (fig. 2). The river and part of the floodplain are located in the southeastern quarter of the site. The hillside has a relatively steep slope to the northeast and it is divided by an intermittent drainage and is scarred by three mine pits. The elevation ranges from 2,998 to 3,074 feet for a maximum relief of 76 feet at the site.

Drainage is controlled by the Belle Fourche River which flows east to the Cheyenne River. The Belle Fourche River flows through the southeastern corner of the landfill. One intermittent stream is present in the northern half of the landfill. A small natural pond is located along the intermittent stream at the northern boundary of the landfill. Two constructed ponds are located in the northwest quarter of the site.

The average annual temperature in Butte County is 45 degrees Fahrenheit. Precipitation averages 17 inches per year. The average annual class A pan evaporation is 57 inches. Climatological data are from Spuhler and others (1971).

Geology

No site specific geological information is available for the landfill area. The area is represented by upper Cretaceous formations fringing the northern edge of the Black Hills uplift. According to Office of Air Quality and Solid Waste microfiche records, the landfill appears to be underlain by Belle Fourche Shale (letter dated February 26, 1976). Waste is primarily disposed in old bentonite mine pits (Office of Air Quality and Solid Waste site inspection reports dated September 9, 1976, April 22, 1977, October 30, 1980, and April 29, 1982). However, this should be field checked because there is a discrepancy in the Office of Air Quality and Solid Waste records regarding the location of the refuse. Apparently, the majority of the refuse is disposed in the pits on the hillside, but part of it is also placed in the Belle Fourche River floodplain (Gene Nelson, Department of Water and Natural Resources, personal communication, September 1985). No lithologic log data are available.

Hydrology

Presumably, the clay material at the base of the landfill consists primarily of shale (Office of Air Quality and Solid Waste microfiche records). The permeability of this material is not known but can be represented in qualitative terms. In general, the permeability of shale is less than that of sand and gravel.

No monitoring wells have been installed within 1 mile of the site. Based on Office of Air Quality and Solid Waste recommendations (letter dated April 14, 1980), the installation of wells was not deemed necessary for this landfill for unstated reasons. Without the presence of adequately constructed monitoring wells (a minimum of three) in the proper locations and at the proper depths, the lateral hydraulic gradient and direction of potential ground water movement cannot be estimated for the landfill area. The nearest ground water supply (aquifer) is presumably the surficial Belle Fourche floodplain deposits located on site.

Water Quality

No water quality data were available within the landfill or within 1 mile of the landfill boundaries.

Adjacent Land Use and Features

Information about adjacent land use and features was taken from the Belle Fourche Quadrangle (United States Geological Survey, 1954) and the General Highway Map - South Half - Butte County (South Dakota Department of Transportation, 1974).

- * The nearest surface water source is the Belle Fourche River located in the southeast corner of the site. Crow Creek is located 1 mile north of the site.
- * The city sewage lagoons are located 500 feet north of the site.
- * Highway 85 is located 500 feet west of the west boundary of the site.
- * Highway 212 is located 1 mile south and three-fourths of a mile west of the site.

**Operational and Siting Criteria – Summary from the
Office of Air Quality and Solid Waste Records**

The most common responses found on the Office of Air Quality and Solid Waste site inspection reports prior to 1986 are given in this section. Copies of the microfiche data are available from the Department of Environment and Natural Resources in Pierre.

1. Site: Belle Fourche City
2. Population served: 24,000
3. Method of disposal: Cut and fill (trench)
4. Estimated amount of waste received per unit time: 18,720 tons/year
5. Access to site:
 - * Fenced: Yes No Lockable gate: Yes No
 - * Litter fences present: Yes No
 - * All weather access road to site: Yes No
6. List industry present: No information available.
7. Land Use:
 - * Preoperational land use: Bentonite mine pits
 - * Proposed post-operational land use: Open range
 - * Current land use within a quarter of a mile radial area: Waste water treatment plant and residential area (as of January 18, 1982).
8. Other comments:
 - * This landfill began operations in 1977 and was first permitted on June 29, 1977, thus predating many current regulations.

SUMMARY

- * The landfill is located on a hillslope and in a floodplain in close proximity to the Belle Fourche River.
- * An intermittent stream to the Belle Fourche River is located on this site.
- * The geology at this site generally consists of Belle Fourche Shale adjacent to Belle Fourche River floodplain deposits.
- * No test hole data were available near this site.
- * No monitoring wells were present near this site.

- * No water level data were available near this site.
- * No water quality data were available near this site.

REFERENCES CITED

- South Dakota Department of Transportation, 1974, General Highway Map - South Half - Butte County, South Dakota: South Dakota Department of Transportation in cooperation with the United States Department of Transportation, (revisions as of March 15, 1981).
- Spuhler, W., Lytle, W.F., and Moe, D., 1971, Climate of South Dakota: Brookings, South Dakota, South Dakota State University Agricultural Experiment Station Bulletin 582, 30 p.
- United States Geological Survey, 1954, Belle Fourche quadrangle, South Dakota: 7.5 minute series (topographic), scale 1:24,000, (photorevised in 1979).

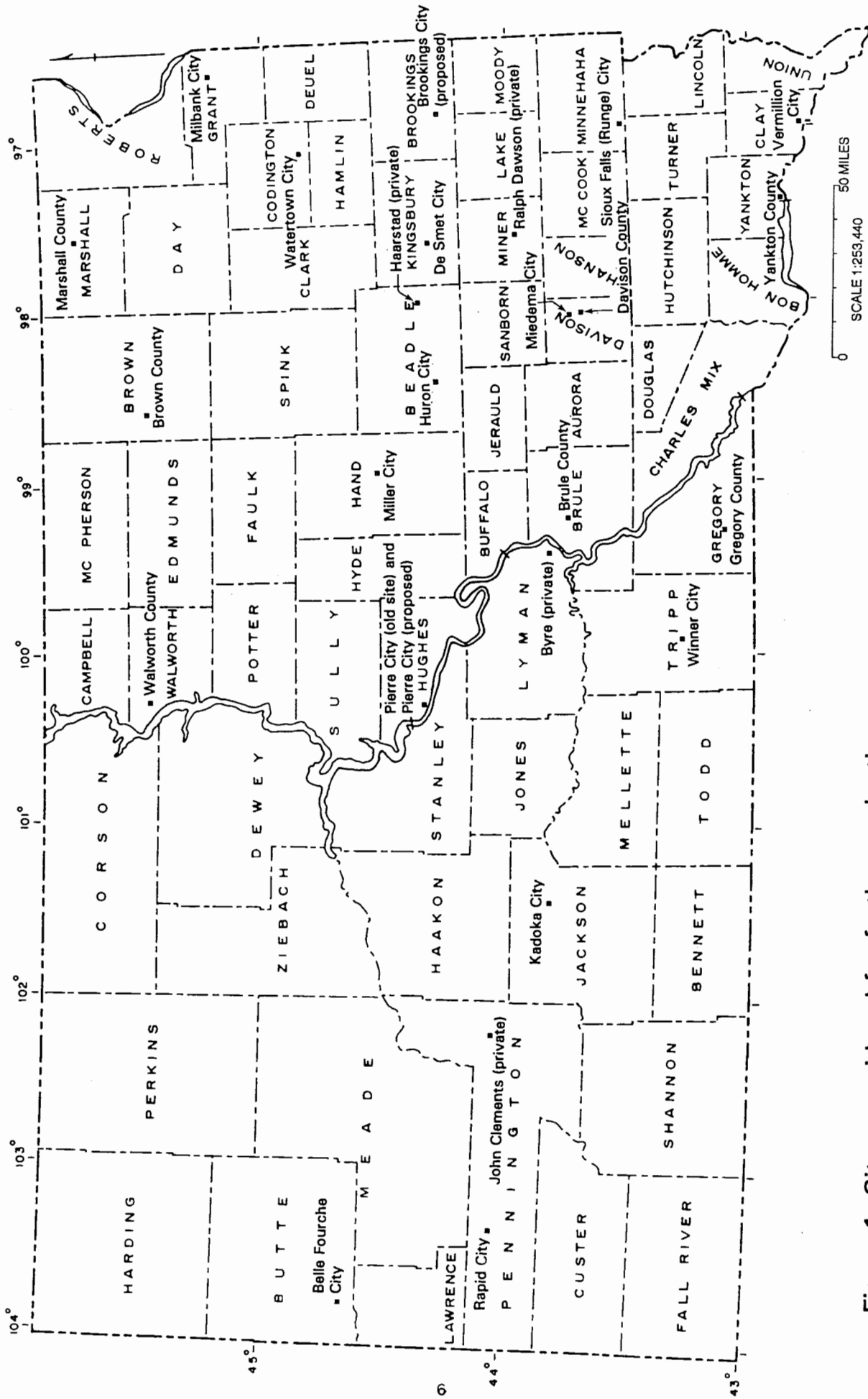
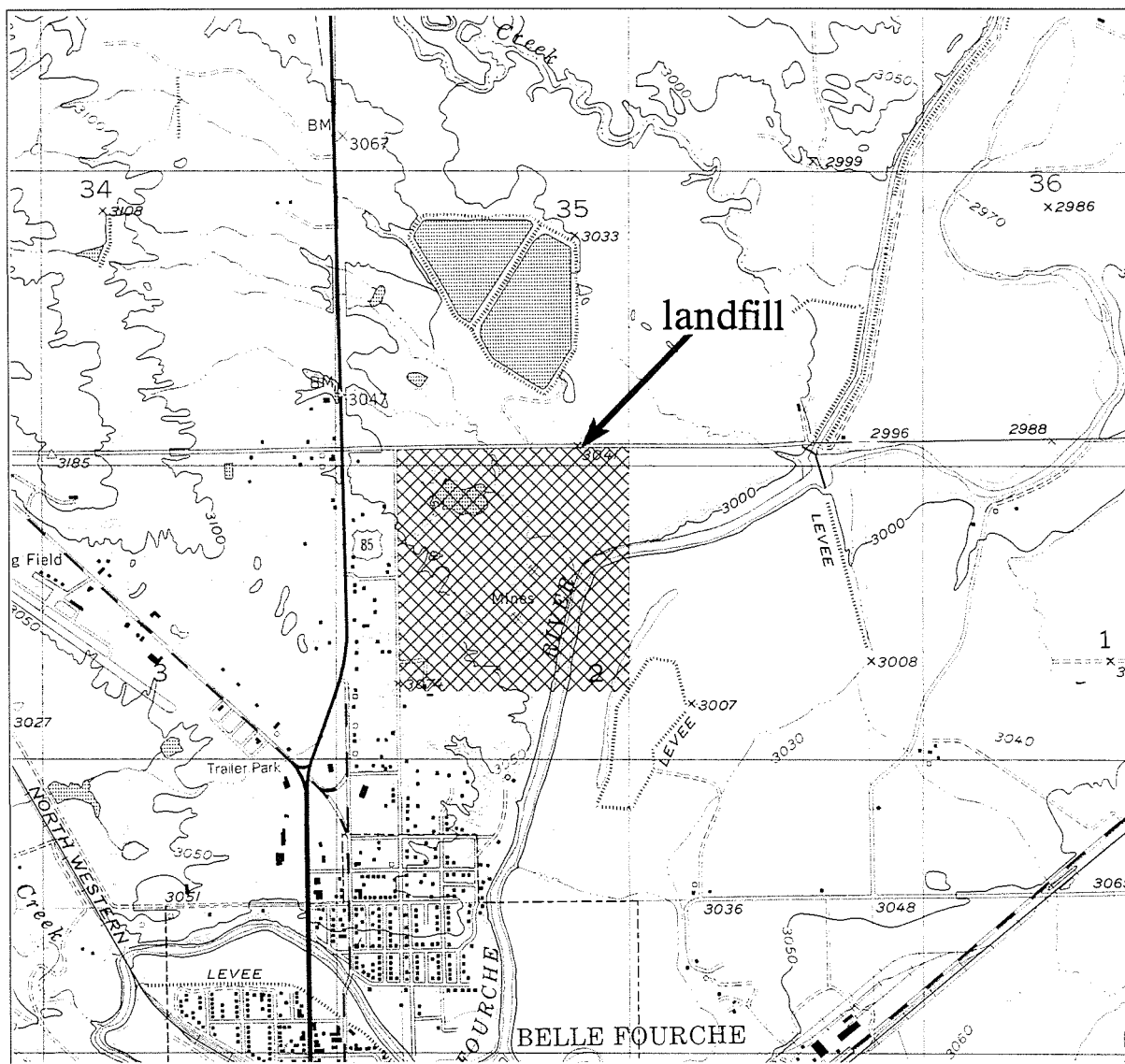


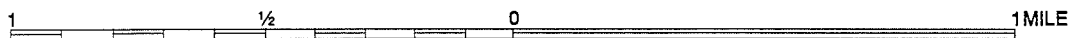
Figure 1. Sites considered for further evaluation.

R. 2 E.

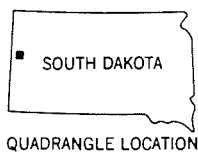


T. 8 N. | T. 9 N.

SCALE 1:24000



BELLE FOURCHE QUADRANGLE
CONTOUR INTERVAL 10 FEET



QUADRANGLE LOCATION

Landfill location: NW $\frac{1}{4}$ sec. 2,
T. 8 N., R. 2 E.
Butte County

Adapted from United States
Geological Survey (1954)



Figure 2. Location of the Belle Fourche City landfill.