a granitic terrane to the southwest of the basin, probably from the Laramie Range, and in part from the Hartville Uplift. The deposit is located almost directly on the basin axis where strata dip less than 1° NNW.

Roll-type ore bodies occur in three superjacent sandstone units, each 5–10 m thick, separated by 3–7 m thick beds of siltstone, mudstone, and lignite (Fig. 2.30). This sequence is 33 m thick in the south and thickens to 54 m in the north portion of the deposit. Its upper rim lies 60–180 m under a hilly surface. Ore bodies range from 20 to 200 m in width within each of the sandstone units.

Mineralization can be traced along the redox front for several kilometers but does not achieve ore-grade quality continuously (Fig. 2.29). Ore bodies are positioned

(a) At the eastern edge of two tongue-like easterly embayments considered to be meander bends

(b) At outer margins of host sandstones within bends where these transgress laterally into more pelitic sediments, coaly mudstones, and lignites and

(c) Aligned subparallel to the wedge-out boundary of each of the three sandstone horizons

Host sandstones are colored red by hematite on the concave side of rolls, turn yellowish-brown by limonite within the ore zone, and are grey and pyrite-bearing in front of the convex side of rolls. Coffinite is the principal U mineral; pitchblende/sooty pitchblende is present in lesser amounts. These minerals coat sand grains in thin, sooty, or earthy layers or form minute spherulitic or botryoidal concretions with diameters of less than 10 µm. Some ore is cemented by calcite.

2.5.2.2 Smith Ranch, Southern Monument Hill District

Discovered in the 1960s, the Smith Ranch deposit is located about 20 km NE of the town of Glenrock and ca. 15 km W of the Highland mine (Fig. 2.24). Original reserves amounted to 16,700 t U at grades averaging 0.084% U. Additional resources are estimated at 9,500 t U at an average grade of 0.09% U (Stout and Stover 1997).

Cameco (2007 Annual Information Form, pp 46–47) reports for its Smith Ranch property remaining proven and probable reserves of 3,654 t U at a grade of 0.10% U, and additional measured and indicated resources of 1,961 t U at a grade of 0.076% U (status December 31, 2007).

Exploitation of this deposit was originally attempted by an underground mine, 260 m deep, in 1977–1978 (known as *Bill Smith Mine* or *Shaft*). But due to bad ground, this technique was abandoned. ISL methods were tested in the period 1981–1991 in the Q sand (152 m deep in average) and subsequently in the O sand (229 m deep) producing a total of 132 t U (Stout and Stover 1997). Commercial operations by ISL techniques began in 1997 and produced through 2002 ca. 2,100 t U (Stover D, personal communication). Production has continued from 2002 through present, but production figures have since then been combined with output from Highland. Combined output 2003–2007 has been 3,200 t U.

Sources of information. Stout and Stover 1997; Stover D, personal communication.

Geology and Mineralization

The Eocene Wasatch Formation is the uppermost Tertiary unit in the Smith Ranch area. It is from 60 to 90 m thick in the northern and southern portions, and as much as 150 m in the central area, and contains uranium mineralization in the basal E sandstone bed. A lignite seam (School Coal Seam) occurs at its base.

The underlying Paleocene Fort Union Formation, over 300 m in thickness, hosts uranium mineralization in arkosic sandstone horizons in the upper 215 m, which is the stratigraphic equivalent of the upper Fort Union sequence of the Highland deposit. Seven major sandstone horizons separated by mudstone/shale beds are identified in this section, arbitrarily named – from top to bottom – W, U, S, Q, O, M, and K. Uranium resources are primarily contained in the lower O, M, and K horizons. These horizons range from 3 to 60 m in thickness with the O horizon the thickest and most persistent.

Uranium ore bodies are typically crescent-shaped with the downdip side facing north. Depending upon the thickness, intercalated mudstone, and high-lime intervals, between one and 20 mineralized fronts may be present.

2.5.2.3 Bear Creek Mine, NE of Monument Hill District

Discovered in 1967, the Bear Creek mine is situated 110 km NE of Casper (Fig. 2.24) and was exploited by open pits 44–114 m deep. The ore to overburden ratio range was 25:1. Original resources (in-situ and mined) contained in seven ore bodies within a triangular area with side length of 6–8 km amounted to some 5,000 t U at a grade of about 0.12% U.

Sources of information. Davis 1969; Hansink 1976; and Davis JE, personal communication.

Geology and Mineralization

Ore bodies occur in three stratigraphically superjacent sandstone horizons 200–240 m above the base of and within the 300 m thick Wasatch Formation. The stratigraphic thickness of the ore-bearing unit is 20–40 m (Fig. 2.31). The three sandstone horizons are in most places separated by siltstone and mudstone layers, but unify locally to become one sandstone unit up to 20 m in thickness.

The ore-bearing sequence is overlain by mud-, silt-, and sandstones, which interchange quickly by interfingering. Clay constitutes 60–90% of this sequence. The thickness of cover rocks increases from north to south [illegible] due to topographic relief.

Rollfront-type mineralization is bound to a redox front that follows the change from coarse- to fine-grained sandstone.

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