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A Tale of Two Valleys: Hydrogeology of the Kalispell and Mission Valleys

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The Kalispell and Mission Valleys are intermontane basins located north and south of Flathead Lake, respectively. Each valley is surrounded on three sides by mountains composed of Precambrian bedrock. The basin-fill deposits within the valleys are as much as several thousand feet thick and contain aquifers that supply municipal, domestic and irrigation water. Ground-water level and ground-water quality data collected as part of the Montana Ground-Water Characterization Program were used to evaluate the hydrogeology of the "deep" aquifers (>100 feet below surface) in the Kalispell and Mission valleys.

In the Kalispell Valley, ground water generally moves away from the valley margins toward the axis of the basin and then south toward Flathead Lake. The water from the wells completed in the valley alluvium and the Precambrian bedrock along the valley margins is a Ca-Mg-HCO3 type with total dissolved solids generally < 500 mg/L. The distribution of dissolved solids, however, shows a slightly atypical pattern with higher concentrations (average = 465 mg/L) upgradient along the west and north margins of the valley, and lower concentrations (average = 355 mg/L) along the eastern and southern margins. Ground water from 23 wells was analyzed for O-18, deuterium, and tritium. The distribution of the environmental isotopes shows a pattern similar to the dissolved-solids concentrations. Ground water along the western and northern margins is generally lighter in O-18 and deuterium and devoid of tritium, while along the east side of the valley, ground water is heavier in O-18 and deuterium and has detectable tritium. The isotopic data show that water along the east side was recharged more recently than that to the west and north. The lower dissolved-solids contents and the isotopic data suggest a more active flow system along the east side of the valley.

In the Mission Valley, ground water generally flows from the Mission Mountains on the east to the Flathead River which bounds the valley on the west and toward Flathead Lake which bounds the valley on the north. Measurements of ground-water temperature and ground-water quality show that the water evolves along its flow path from a fresh (dissolved solids ~ 220 mg/L), cool (temp. ~ 10oC), Ca-Mg-HCO3 type water along the Mission Mountain front, to a more saline (dissolved solids ~ 575 mg/L), warm (temp. ~ 13.5oC), Na-Ca-Mg-HCO3 type water along the Flathead River.

In both valleys, seasonal water-level fluctuations appear to depend on the confining conditions of the aquifer and proximity to high-capacity irrigation wells. Where the aquifer is confined, water levels decline during the summer irrigation season and rise during the late fall and winter. Where the aquifer is unconfined, water levels rise in the spring and early summer in response to spring runoff and decline during the late summer and winter months.