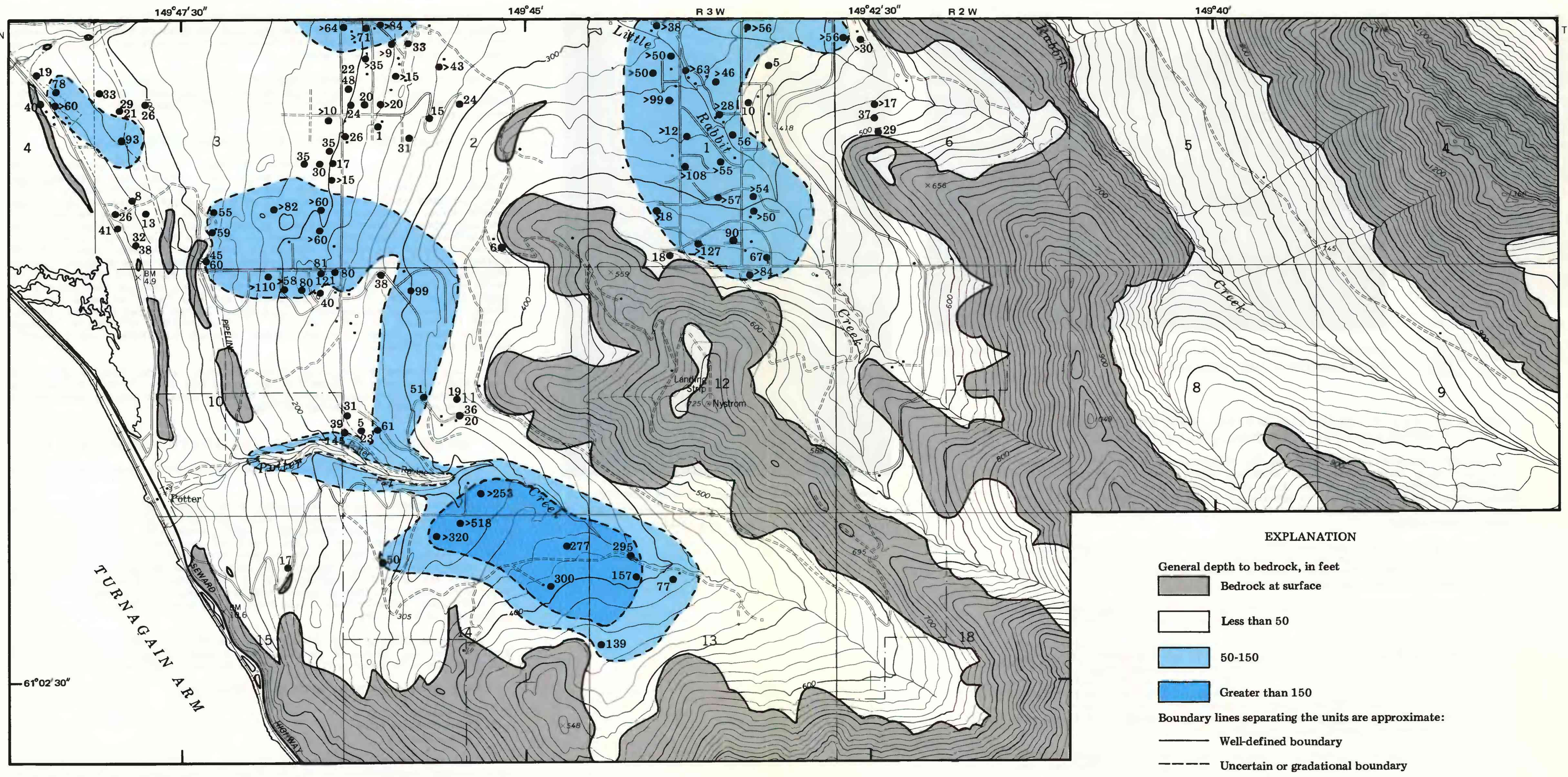


FIGURE 9. – DEPTH TO BEDROCK.

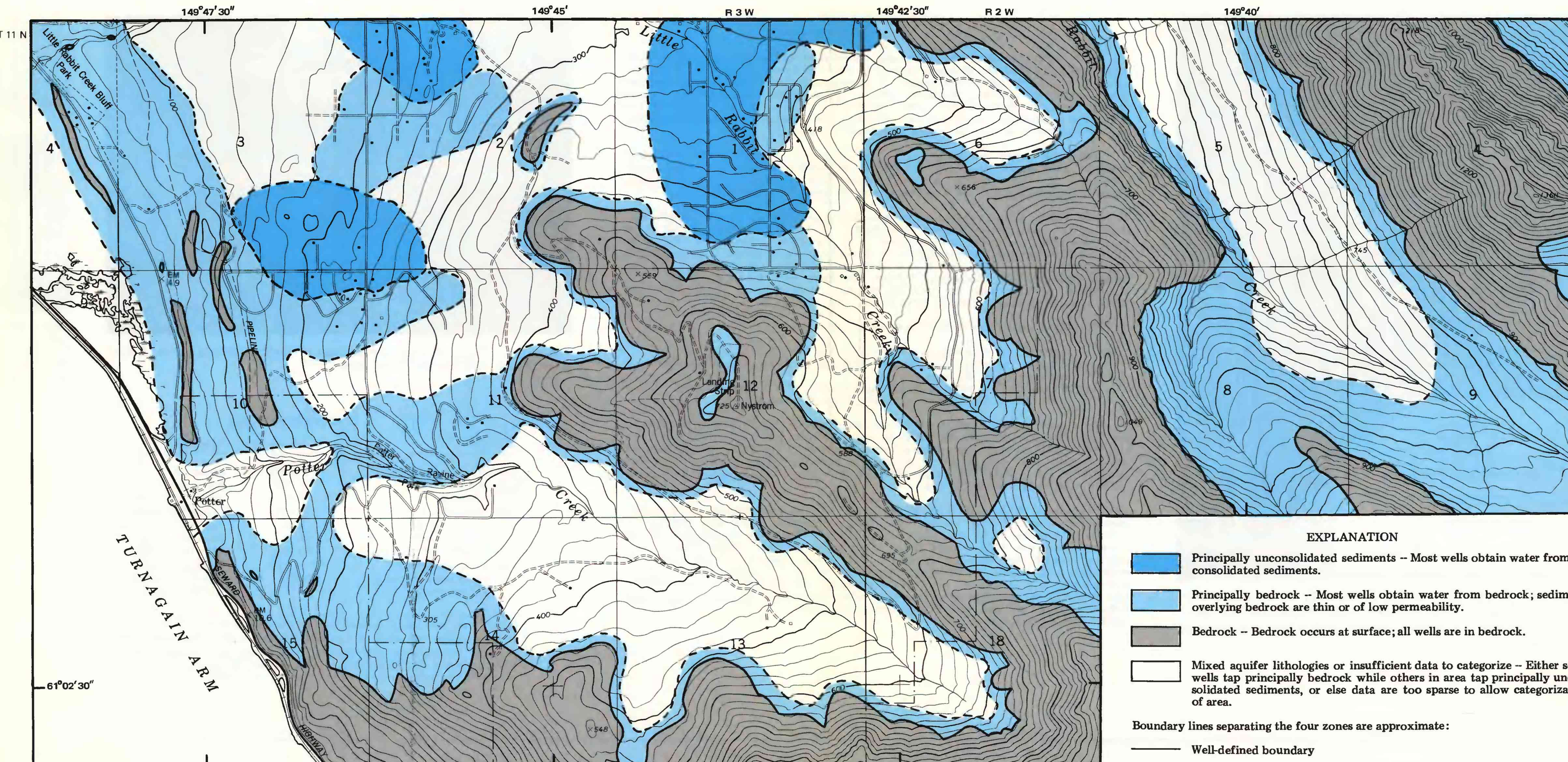


FIGURE 10. – AQUIFER LITHOLOGY.

SCALE 1:25 000

1 5 0 1 2 KILOMETERS

½ 0 1 MILE

1000 0 5000 FEET

CONTOUR INTERVAL 20 METERS

CONVERSION TABLE

| Multiply | by | To obtain |
|---|---|---|
| foot (ft) | 0.3048 | meter (m) |

## DEPTH TO BEDROCK

The approximate depth from land surface to bedrock throughout the Potter Creek study area is mapped in figure 9. Four depth zones are shown. The delineation of areas where bedrock occurs at the surface is based on the geologic map of the study area (fig. 6). Depth to bedrock in other areas is based on information in water-well drillers' logs.

Where bedrock lies near the surface, the possibility may exist for effluent from septic tanks to reach bedrock before being degraded to safe levels. Should this occur, the effluent may penetrate permeable fractured or weathered zones in the bedrock and travel quickly through them to contaminate wells or surface-water bodies in the area. The likelihood of such contamination from septic tanks depends on more than just depth to bedrock, however -- local soil and slope conditions are important factors too. The report by Dearborn and Barnwell (1975) discusses failure of septic systems in more detail.

According to Dearborn and Barnwell, the protection of ground water from pollution by conventional septic systems is "reasonably assured" only in those areas where depth to bedrock is 25 ft or more. Where bedrock is overlain by less than 25 ft of sediment, the possibility of ground-water pollution from septic systems is significant; where depth to bedrock is less than 15 ft, the possibility is "strong" (Dearborn and Barnwell, 1975, p. 25).

Data available do not permit the detailed delineation of those parts of the Potter Creek area where depth to bedrock is less than 15 or 25 ft. Such areas do exist, however, within the less-than-50-ft depth-to-bedrock zone on figure 9. Therefore, ground-water pollution from septic systems is possible both where bedrock is at the surface and in parts of the zone where bedrock is shown to be at depths of less than 50 ft. To evaluate the danger of ground-water pollution at a specific site, test holes and percolation tests can help to determine the local depth to bedrock, as well as the depth to the water table and local soil and slope conditions. Figure 9, then, only indicates areas where special attention should be devoted to the possibility of ground-water pollution because of shallow bedrock. Even where bedrock is shallow, unconventional onsite waste-disposal systems such as a mounded leachfield (if such systems have been approved by local authorities) may provide an acceptable solution to problems of waste disposal.

Bedrock occurs at the surface in about 30 percent of the Potter Creek study area, and within 50 ft of the surface in as much as another 60 percent of the area.

## AQUIFER LITHOLOGY

A generalized map showing the lithology of the principal aquifers tapped in various parts of the Potter Creek study area is given in figure 10. Four lithologic types are delineated.

Domestic wells obtain water from bedrock in about 60 percent of the study area. Wells now obtain adequate water from sediments in only about 6 percent of the study area. In the remaining one-third of the study area, wells tap both aquifer types or data are insufficient to define the local principal aquifer.

Most wells tapping bedrock are deeper than wells finished in unconsolidated sediments. The average depth of wells tapping bedrock in the Potter Creek study area is more than 200 ft, whereas those tapping unconsolidated sediments average less than 100 ft deep.

Most wells tapping unconsolidated sediments have greater yields than wells tapping bedrock. The average yield for a well finished in unconsolidated sediments is 7½ gal/min; average yield for a bedrock well is only 4½ gal/min. Wells having yields less than 3 gal/min may require a means of storing water to provide satisfactory service.

Wells in bedrock generally obtain water from fracture zones or from zones where bedrock is deeply weathered. The depth and character of such zones may vary greatly over a short distance. It is therefore difficult to accurately predict the depth needed for a well tapping bedrock at a given site, or to predict such a well's yield.

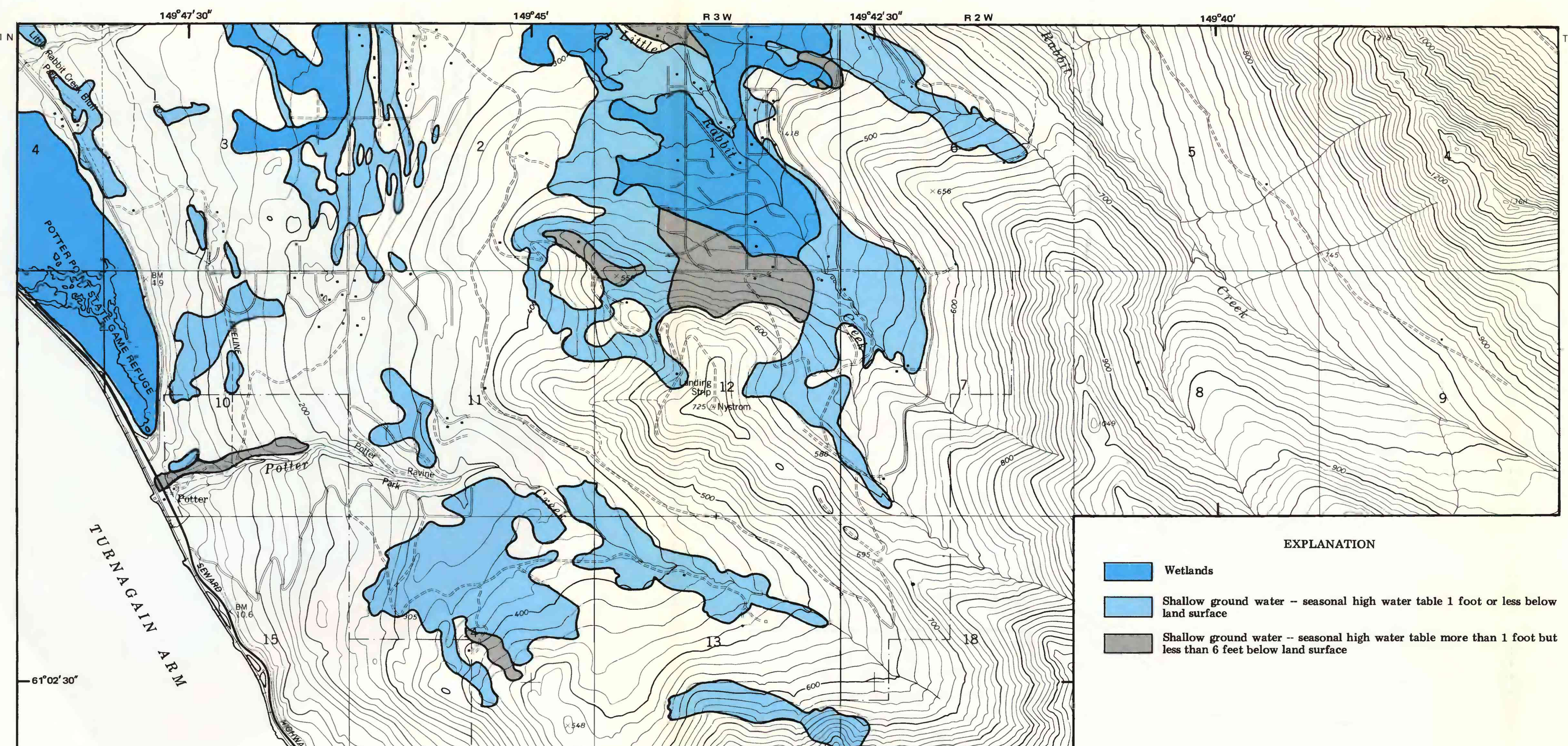


FIGURE 11. – WETLANDS AND SHALLOW GROUND WATER.

## WETLANDS AND AREAS OF SHALLOW GROUND WATER

Figure 11 is a generalized map of wetlands and areas of shallow ground water in the Potter Creek area. A wetland is an area capable of supporting vegetation adapted for life in saturated soils. Wetlands include swamps, bogs, and marshes. There are four wetlands in the Potter Creek study area, the largest being Potter Marsh, a wildlife sanctuary at the western margin of the study area. The wetlands shown on figure 11 are based on the Anchorage Coastal Resources Atlas (Municipality of Anchorage, 1980). Wetlands occupy about 7 percent of the Potter Creek study area.

Areas of shallow ground water shown on figure 11 are based on soil surveys by the U.S. Soil Conservation Service (Baker, 1980; U.S. Soil Conservation Service, 1979). Areas underlain by shallow ground water are divided into two categories: 1) water table is within 1 ft of land surface for at least 2 weeks during most years (15 percent of study area); and 2) water table is more than 1 ft but less than 6 ft deep for at least 2 weeks during most years (2 percent of study area). Wetlands and shallow ground-water conditions occur in about 24 percent of the Potter Creek study area.

Wetlands and shallow ground water place limitations on building-site development and on placement of septic systems. Where the water table is within 1 ft of land surface, such limitations are "severe" (Baker, 1980). In wet areas, excavations tend to fill with water, roads may be muddy or have standing water at times, and winter icings may be a severe problem or hazard. (Photographs illustrating drainage, icing, and erosion problems are presented in figure 3 on sheet 1.) Special measures can be taken in designing and building roads, buildings, and septic systems to mitigate these problems, but in some areas the expense of such precautions may not be economically justifiable. Site-by-site consideration of drainage problems is recommended in areas shown on figure 11 to be wetlands or to have shallow ground water.

## REFERENCES

Baker, J. K., 1980, South Anchorage area soil survey: U.S. Soil Conservation Service [Anchorage, Alaska, November 1980], 93 p., 1 pl.
Barnwell, W. W., George, R. S., Dearborn, L. L., Weeks, J. B., and Zenone, Chester, 1972, Water for Anchorage--An atlas of the water resources of the Anchorage area, Alaska: U.S. Geological Survey open-file report (pub. by the City of Anchorage and Greater Anchorage Area Borough), 77 p.
Clark, S. H. B., 1972, Reconnaissance bedrock geologic map of the Chugach Mountains near Anchorage, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-350, scale 1:250,000.
1973, The McHugh Complex of south-central Alaska: U.S. Geological Survey Bulletin 1372-D, 11 p.
Compton, R. R., 1962, Manual of field geology: New York, John Wiley and Sons, Inc., 378 p.
Dearborn, L. L., and Barnwell, W. W., 1975, Hydrology for land-use planning: The Hillside area, Anchorage, Alaska: U.S. Geological Survey Open-File Report 75-105 (pub. by Greater Anchorage Area Borough), 46 p.
Ezekiel, Mordecai, and Fox, K. A., 1959, Methods of correlation and regression analysis: New York, John Wiley and Sons, Inc., 548 p.
Hardyck, C. D., and Petrinovich, L. F., 1969, Introduction to statistics for behavioral sciences: Philadelphia, W. B. Saunders Company, 302 p.
Hem, J. D., 1970, Study and interpretation of the chemical characteristics of natural water [2nd ed.]: U.S. Geological Survey Water-Supply Paper 1473, 363 p.
Municipality of Anchorage, 1980, Anchorage coastal resource atlas: Anchorage, Alaska, 13 p., 13 pl.
Patric, J. H., and Black, P. E., 1968, Potential evapotranspiration and climate in Alaska by Thornwaite's classification: U.S. Forest Service Research Paper PNW-71, 28 p.
Schmoll, H. R., and Emanuel, R. P., 1981, Geologic map with hydrologic properties of materials, Potter Creek area, Anchorage, Alaska: U.S. Geological Survey Open-File Report 81-1168.
Sommers, D. A., and Marcher, M. V., 1965, Water resources appraisal of the Anchorage area, Alaska-water conservation through conjunctive use: U.S. Geological Survey open-file report, 34 p.
U.S. Environmental Protection Agency, 1976, Quality criteria for water: U.S. Environmental Protection Agency Report, EPA-440/9-76-023, 501 p.
U.S. Geological Survey, Water resources data for Alaska: U.S. Geological Survey annual State data-compilation reports.
U.S. Soil Conservation Service, 1979, Soils of the Anchorage area, Alaska, v. 7 of Metropolitan Anchorage Urban Study Final Report: U.S. Army Corps of Engineers, Alaska District, 126 p., 22 p.

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