TEST WELL PS-1

0-10 ft Sand, medium, intercalated with thin silt lenses, sandy pebble-gravel layers, and 3- to 5-cm thick partings of fibrous peat

MT Reached 16°C; BHT 32°C; SP 12.5 blows/ft; Hammer weight 140 lb

Sample PS-1-1: Sand, medium, with trace to some silt; minor amounts of clay present as discontinuous streaks. Sample recovered at 10 ft

10-20 ft Sand, coarse and pea gravel intercalated with layers or lenses of fine to medium sand and thin organic layers or smears. Drilling rate decreasing gradually over previous interval; drilling character indicates possible thin cobble layer between 18 and 20 ft

MT stable at 17°C entire interval; BHT 38°C; SP 99 blows/ft
Sample recovered at 20 ft. Considerable caving of gravel near bottom

Sample PS-1-2: Gravel, 1 in. pebbles of quartz and slate recovered in upper 12 in. of sample; coarse to medium sand, with trace silt and organic smears recovered in lower 9 in.

20-30 ft Sand, fine, with trace silt and clay, 1 to 1-1/2 ft pebble-gravel sluff from unit above. Remainder of interval alternating layers of sandy pebble gravel and silty sand containing trace organics; dark organic layer at 27-28 ft

MT 19°C; SP 46 blows/ft

Sample PS-1-3: Sand, medium to fine, with some silt and trace to some peat smears, streaks, and lenses intercalated with micaceous-silt over-bank deposits in layers 2-4 in. thick. Sample recovered at 30 ft

30-40 ft Notable decrease in drilling rate; drilling smooth in fine to medium sands and silts. MT decrease at 35 ft

MT 16-19°C; BHT 40.2°C; SP 137 blows/ft

Sample PS-1-4: Sand, fine, dense, well-sorted; peat smears and streaks common; organic partings contain recognizable plant fragments which may be datable; entire sample contains less than 4% silt. Sample recovered at 40 ft

40-50 ft Sand, medium; little or no gravel present; drilling rate uniform

MT 21°C; BHT 42.5° following sampling and prior to mud removal from hole for casing; SP 138 blows/ft

Sample PS-1-5: Sand, fine to very fine, bedded, with trace silt; peat smears and other organic remnants common. Casing set and cemented to 50 ft; cementing plug drilled and aquifer test produced 40 gal/min (pumped) at of 74°C; static water level in hole is 3 ft below ground surface. Sample recovered at 50 ft

50-60 ft Sand and silt indicated by drilling character and cutting returns to depth of 55 ft, where a 1-2-ft thick gravel layer is encountered; sand from 57-60 ft, with small gravel interval at about 59 ft

MT 44°C; BHT no data due to cable problem; SP 182 blows/ft

Sample PS-1-6: Gravel, top 4 in. may be slough from above; 1-2 in. fibrous peat; 12 in. moderately well sorted medium sand with trace silt, color dark gray to dusky-brownish gray; sample recovered at 50 ft

60-70 ft Sand, fine, with trace or less organics and silt; drilling slowed dramatically between 60 and 68 ft

MT 49°C; BHT estimated at 84°C; SP 640 blows/ft

Sample PS-1-7: Sand, fine, medium to dark gray, with deformed or dipping organic streaks and silt partings. Sample incomplete (only 13 in. recovered) because large chunk of aluminum, presumably from cementing plug, wedged in split barrel.

70-80 ft Authigenic minerals such as pyrite and pyrrhotite begin to appear in cuttings; accompanied by fragments of cemented fine and medium sand and fragments of siltstone recovered near 75 ft depth; drilling rate slowed dramatically in this interval

MT 40°C; BHT 86°C after 1 hr

Sample PS-1-8: Sandstone, fine- to medium-grained, well-cemented, containing approximately 10% authigenic sulfides; only 8 in. of penetration achieved after 800 blows; sample recovered at 80 ft

80-90 ft Sandstone, micaceous, and siltstone, well-cemented, drilling difficult; pebble gravel intervals at 85 and 90 ft

MT 38°C; BHT no data; SP no data

Sample PS-1-9 (cuttings): Sandstone, micaceous, with visible pyrite; organic fragments noted in cuttings; collected from 90- and 95-ft depth; no drive sample recovered due to hard formation

90-100 ft Conglomerate, pebble, with visible pyrite; changes to medium pyrite-rich sandstone at 94 ft (pyrite estimated >10%)

MT 37°C; BHT no data; SP estimated 2,400 blows/ft

Sample PS-1-10: Sandstone, laminated, 3/4-in.-thick discs separated by thin micaceous partings giving rise to cleavage. Pyrite and pyrrhotite crystals less abundant than in previous interval, suggesting sulfides may occur in stratiform bands. Hammer weight increased to 240 lb and 6 in. sample recovered

100-110 ft Sand, coarse, intercalated with 3-6 in. thick pebble- conglomerate intervals, well-cemented; sands composed of 60% quartz, 30% slate fragments, 10% accessory mineral grains. By field estimates; 6-in.-organic-silt interval occurs at 108 ft; some material strongly resembles Tertiary 'salt and pepper' sands in the other areas. 6-in.-organic-silt interval occurs at 108 ft.

MT 42°C; BHT no data; SP no data

Sample PS-1-10.5c, PS-1-11c: Cutting samples collected at 105 and 110 ft confirm above callouts for this interval

110-120 ft: Conglomerate, pebble-cobble, 'salt and pepper' gray, with clasts to 3 in. and interbedded coarse sands; drill vibrates and bounces vigorously, possible outwash gravels

MT 46°C; BHT no data; SP no data

Sample PS-1-11.5c, PS-1-12c: cutting samples collected at 115 and 120 ft

120-130 ft: Sandstone, coarse to medium, with less gravel, as indicated by cutting samples and drilling rates. Cementing seems less tight; sulfides still evident

MT 49.5°C; BHT no data; SP no data

Sample PS-12.5c, PS-1-13c: cutting samples collected at 125 and 130 ft

130-140 ft: Gravel, sandy pebble, upper 2-1/2 ft; coarse pyritic sandstone next 2-1/2-5 ft; silty interval inferred from drilling characteristics just below 135 ft; coarse sand 136-140 ft

MT average 48°C; BHT: no data; SP no data

Sample PS-1-13.5c, PS-1-14c: Two cutting samples collected; one at 135 ft and one at 140 ft

140-150 ft: Gravel, sandy-pebble, clean, 140-145 ft; poorly cemented medium sand and gravel, 145-150 ft

MT no data; BHT measured after 4 hours at 88°C; SP no data

No sample collected

TEST WELL PS-2

0-10ft Silt, sandy medium-brown mottled with bright orange streaks, disturbed, top 10-12 in.; followed by 24 in. dark-blue-gray silt and clay; buried organic horizon at 3 ft; 3-10 ft depth is interlayered sand and silt with stringers and lenses of gravel

MT 16°C; BHT 24.5; SP 15 blows/ft

Sample PS-2-1: Sand, medium to coarse with some silt and very fine sand, trace pebble gravel; drive sample recovered at 10 ft

Comments: Circulated clear water to check water table; water table at -2 ft

10-20 ft Sand and silt to 18 ft; gravel layer with clasts up to 2 in. diameter, 18-20 ft

MT 19°C, BHT 30°C; SP 37 blows/ft

Sample PS-2-2: Sand, coarse to medium, compacted, with some pebble gravel and trace silt; recovered at 20 ft

20-30 ft Sand and gravel with trace or less silt to 25 ft; fine to medium sand with organic streaks and plant fragments and trace pebbles to 26.5 ft; fine to medium sand 26.5-30 ft

MT 21°C; BHT not measured; SP 100 blows/ft

Sample PS-2-5: Silt, poorly sorted, and coarse to medium sand with trace organics; drive sample recovered at 30 ft

30-40 ft Difficult drilling 30-38 ft; drill had to be pulled up and down to accomplish cutting; possible weakly cemented zone occurs about 35 ft; fine sand with trace silt 38-40 ft

MT 17°C; BHT 30°C; SP 24 blows/ft

Sample PS-2-4: Poorly sorted sand with some silt; sample taken at 40 ft

40-50 ft Sand, fine, with trace to some silt and silt layers; sandy gravel 49-50 ft; drilling rate slowed.

MT 20°C; BHT 85° at 50 ft; SP 125 blows/ft

Sample PS-2-5: Sand, medium, sand with trace to some silt; drive sample recovered at 50 ft

Comments: >75 gal/min water produced by pumping; vigorous degassing from hole; H_2S detectors show weak reaction; gas not flammable, probably CO_2; top casing emplaced and cemented

50-60 ft Sand, coarse, with trace to some silt and medium sand to 56 ft; 56-57 ft sandy gravel; 57-60 ft fine to medium sand

MT 20°C; BHT 80°C; SP 87 blows/ft

Sample PS-2-6: Sand, medium, with trace silt and scattered intervals of coarse sand and pebble gravel; sample recovered at 50 ft

60-70 ft Sand, medium, with thin pebble intervals, 60-65 ft indicated by drilling rate decrease and cuttings; hole degassing vigorously 65-70 ft, appear to be in uncemented sands and silts

MT 20°C; BHT 82°C; SP 150 blows/ft

Sample PS-2-7: Gravel, pebble, cemented, with some coarse sand pyrite cubes to 20 mm diameter; sample taken recovered at 70 ft

70-80 ft Drill chattering and bouncing violently; sandstone, siltstone, and conglomerate, very micaceous; large pyrite cubes recovered in cuttings

MT 22°C; BHT No data; SP no data

Sample PS-2-5, PS-2-8: Sand, medium pyritic; quartz grains show euhedral secondary growth; cutting samples collected at 75 and 80 ft

80-90 ft Silt and fine to medium sand containing mica and organic fragments present as siltstone and subgraywacke. Less pyrite

MT 24°C; BHT No data; SP no data

Samples PS-2-8-5, PS-2-9: Cutting samples collected at 85 and 90 ft

90-100 ft Sand, micaceous, fine to very fine, cemented; shows differential dissolution and redeposition of quartz on grains; obvious hydrothermal alteration of micas; some silty intervals

MT 26°C; BHT No data; SP no data

Sample PS-2-9-5, PS-2-10: Sand and siltstone, medium to fine fragments; at 95 ft less well consolidated than previous intervals; well consolidated at 100 ft; cutting sample collected at 95 and 100 ft

100-110 ft Sandstone, micaceous, fine-grained, well-sorted, well-cemented, with minor siltstone and sandy-gravel-conglomerate intervals

MT 30°C; BHT no data; SP no data

Samples PS-2-10.5, PS-2-11: Cutting PS-2-11 cuttings suggest thin-bedded sands, estimated composition 80% quartz, 10% mica, 5-7% cement, 3-5% zircon, garnet, feldspars(?) and amphiboles; cutting samples collected at 105 and 110 ft

110-120 ft Sand, silty, granular, coarse, poorly sorted, with some pure pebble-gravel layers; conspicuous pyrite zone begins 110-116 ft

MT 25°C; BHT no data; SP no data

Sample PS-2-11.5: Sandstone, coarse-grained, poorly sorted, with very fine sand and silt groundmass, trace lithic granules predominantly quartz pebbles

Sample PS-2-12: Gravel, pebble, poorly cemented

120-130 ft Gravel, sandy pebble; clasts subangular to subrounded mostly lithic, composed of gneiss, mica schist, quartz and slate; some opalescent chalcedony cement; clastic components suggest short transport distance

MT 23°C; BHT no data; SP no data

Samples PS-2-12.5, PS-2-13: samples recovered at 125 and 130 ft

130-140 ft Sand, coarse, 130-134 ft; changes to fine to medium sand 134-140 ft; scattered pebble intervals throughout

MT 20°C; BHT no data; SP no data

Sample PS-2-13.5, PS-2-14: Sand, coarse granular, with trace pebbles; some sparse sulfides

Sample PS-2-14: Sand, fine, intercalated with medium, moderately well-cemented sand

140-150 ft Sand, medium to coarse, with trace to some poorly sorted silt; opalescent chalcedony veinlets in what appear to be fissure fillings between 140-145 ft

MT no data; BHT no data; SP no data

No samples collected

145-150 ft Sandstone, arkosic, coarse to granular with minor conglomerate; very minor sulfides present; authigenic components more varied, including euhedral quartz overgrowths and chalcedony, sorting poor

MT no data; BHT after standing overnight 96.2°C; SP no data

No sample collected

EXPLANATION

- Sandy pebble gravel
- Medium to coarse sand
- Fine to medium sand
- Silt
- Clay
- Organic material
- Authigenic pyrite (includes other sulfides)
- Indicates presence of indurated sediments

MT Mud temperature
BHT Bottom-hole temperature
SP Sample penetration

Composition estimates
Trace = 4%-12%
Some = 12-30%
And = >30%

LOGS OF TWO SHALLOW TEST WELLS DRILLED IN NOVEMBER, 1979, PILGRIM SPRINGS, ALASKA