Appendix B

Geotechnical Considerations

B.0 GEOTECHNICAL CONSIDERATIONS

Most of the Beaufort and Chukchi Sea area is underlain by generally strong, competent soils. Soils are mostly Pleistocene very stiff (2 - 4 ksf) to hard (>4 ksf) cohesive soils or dense to very dense granular soils. Relatively weaker Holocene soils, ranging in thickness from 9.8 to 43 ft (3 to 13 m), are generally confined to a zone in shallower waters (less than 65 ft (20 m)) on the inner Beaufort Shelf. The Holocene soils are chiefly over-consolidated, firm (0.5 -1 ksf) to stiff (1 - 2 ksf) silts and clays or loose to dense granular soils. "Soft" zones having shear strengths between 0.5 and 1 ksf are relatively common in Holocene soils and are generally confined to zones 3.3 to 20 ft (1 to 6 m) thick within stronger soils. However, relatively weak soils may also be present in isolated locations within Pleistocene soils. Seafloor soils are highly variable, partly as a result of ice gouging. Modern ice gouging may weaken seafloor soils to depths of typically 1.6 to 9.8 ft (0.5 to 3 m) in water depths up to 165 ft (50 m).

For the purposes of concept evaluation, in the Beaufort and Chukchi Seas, the upper 6.6 ft (2 m) of soil are taken to be a weaker remolded soil (as the result of ice gouging out to approximately 165 ft (50 m) water depth) with an average undrained shear strength of 0.5 ksf or an angle of friction of 30°. In water depths less than 65 ft (20 m), Holocene soils beneath the remolded zone are taken to have an undrained shear strength of 1 ksf or an angle of friction of 35°. In water depths greater than 65 ft (20 m), Pleistocene soils beneath the remolded zone are taken to have an undrained shear strength of 4 ksf or angle of friction of 40°.

For the Bering Sea, silts, sands, and gravels are present. Soil properties for St. George Basin, the North Aleutian Basin, and the Navarin Basin have been adopted from PMB Systems Engineering et al. (1983) and are described below. It must be pointed out that these are significant generalizations based on some information from certain areas.

St. George Basin – Sediments on the St. George basin are a mixture and range from sands to silts to soft clays. Engineering properties of soils proposed by PMB Systems Engineering et al. (1983) are presented in Figure B-1 and Figure B-2 for cohesive and cohesionless soils.

North Aleutian Basin – Sediments are generally sands with some areas of silt. The assumed soil profile is that provided for cohesionless soil in Figure B-2.

Navarin Basin – PMB Systems Engineering et al. (1983) reports that the surficial soils primarily consists of silts and fine sands with some clay. Therefore, cohesionless and cohesive soil profiles in Figure B-1 and Figure B-2 are adopted.

Norton Sound (Basin) – According to Dobson and Wickham (1985), silts are abundant in the Norton Basin area. Soil properties have been proposed by Fluor Engineers Inc (1982) as a saturated density of 115 pcf with an angle of friction of 30° assumed constant with depth.

Figure B-1 and Figure B-2, adapted from PMB Systems Engineering et al. (1983), present geotechnical profiles from the area based on previous studies. The median profiles are being considered as part of the current work. The areas to which each apply are indicated - the Norton Basin was not included in the PMB Systems Engineering et al. (1983) study, but for the purposes of the current study, cohesive and cohesionless soil are considered, assuming the attached plots are representative.

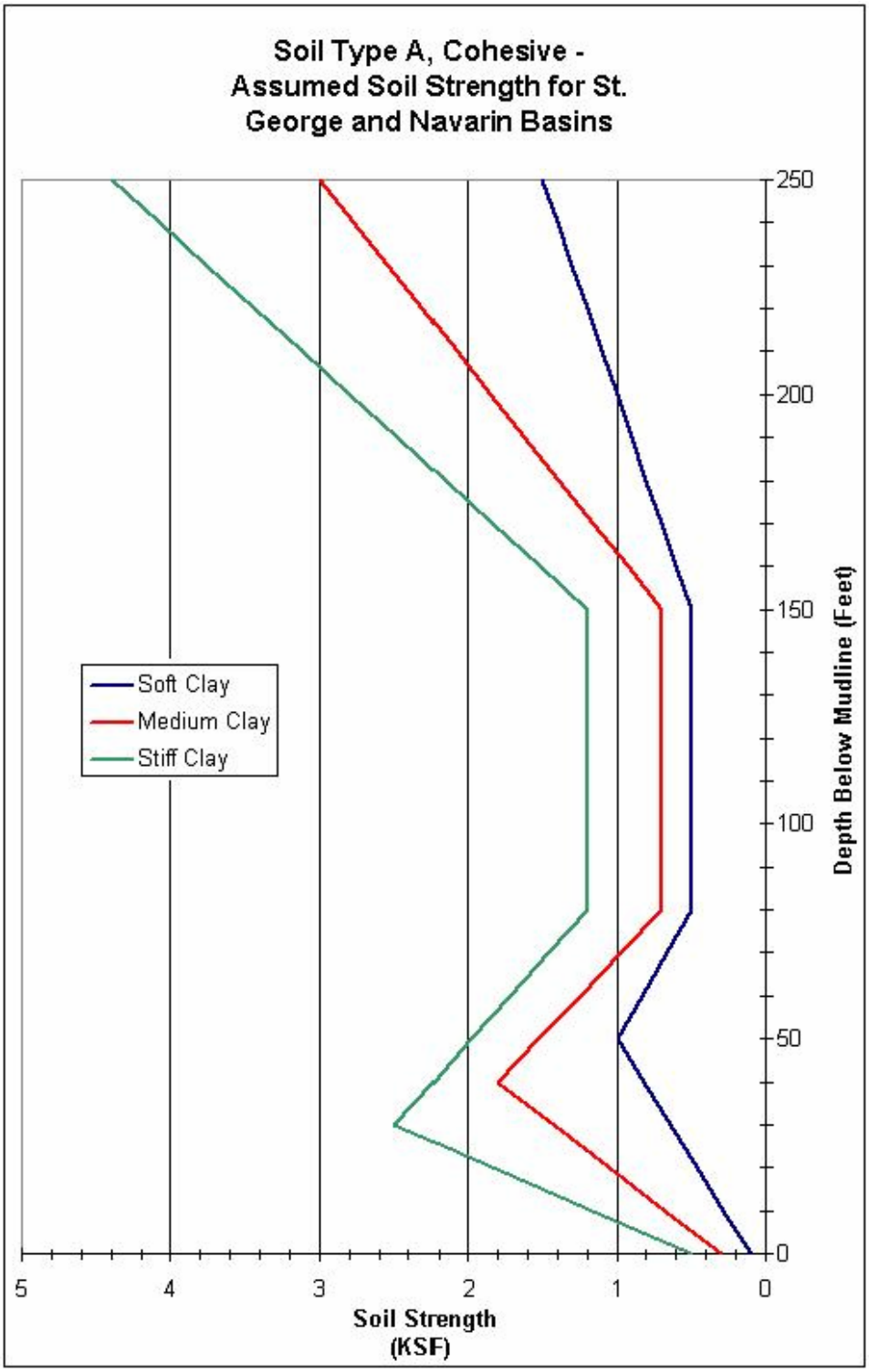

Figure B-1: Assumed Cohesive Soil Strength for St. George and Navarin Basins
(reproduced from PMB Systems Engineering, 1983)

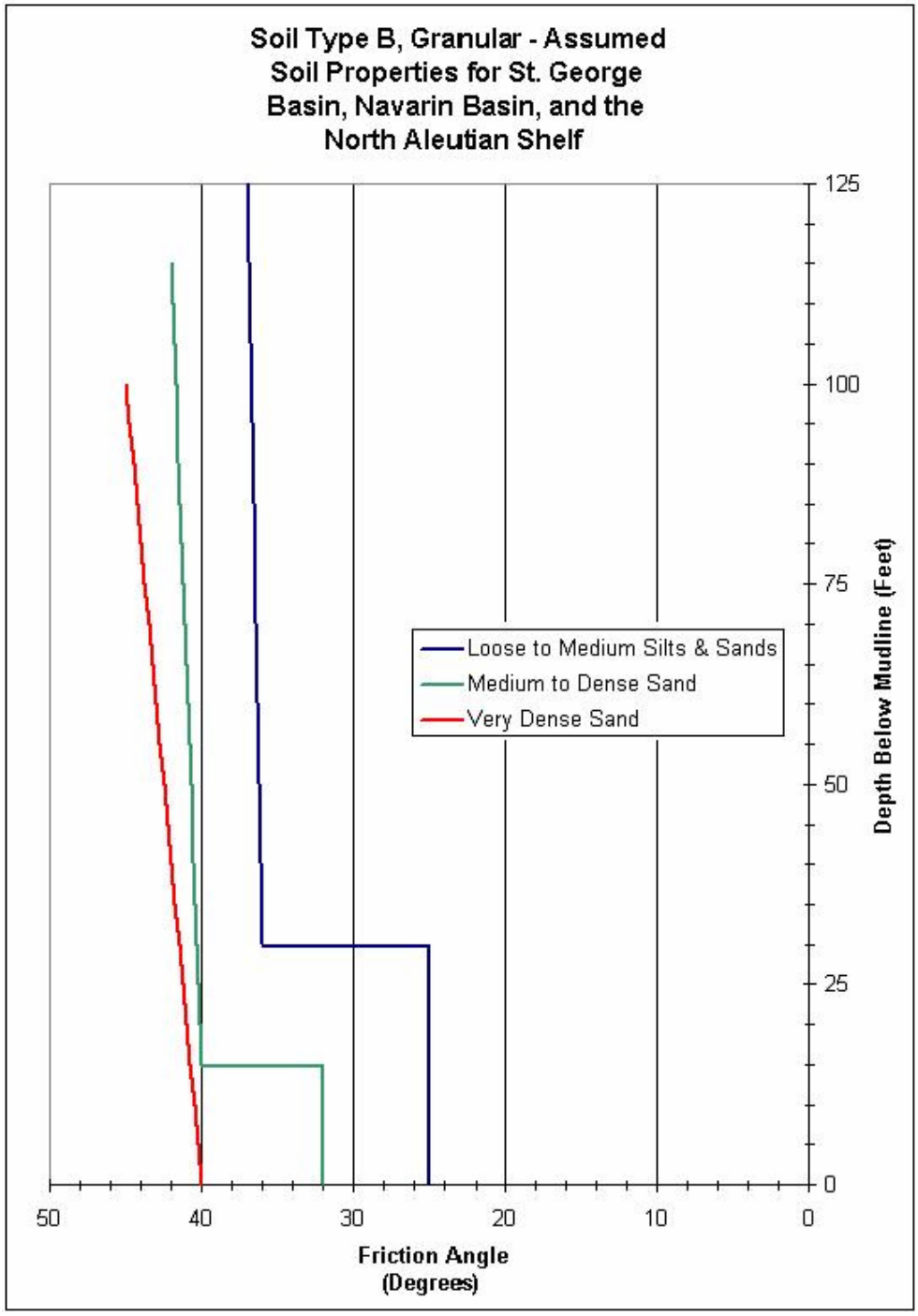

Figure B-2: Assumed Cohesionless (Granular) Soil Properties for St. George Basin, Navarin Basin, and the North Aleutian Shelf (reproduced from PMB Systems Engineering, 1983)