INTRODUCTION

Significant volumes (> 1 million barrels/day) of co-produced water are generated daily during production operations for oil and gas in North Dakota. Most produced water is brine (industrial) with very high concentrations of total dissolved solids. Produced water has historically been considered a waste in the oil and gas industry. Reductions in its volume provide economic and environmental benefits. However, regional studies of the potential for produced water disposal in North Dakota have found that available surface disposal solutions are limited and that subsurface disposal is a potential solution. Overlying the Dakota Group are several thousand feet of Cretaceous marine deposits including the Pierre Formation, a very thick, impermeable shale. This impermeable seal is underlain by the Cretaceous Dakota Group and the Cenozoic Tertiary sediments. The Cretaceous Dakota Group is approximately 640 ft (195 m) thick at depths of approximately 4,060-4,700 ft (1,240-1,430 m) in the center of the Kolumbo 100K Grid.

THE DAKOTA GROUP

Overshading of the area in the main factor in determining if injection is a viable option for produced water disposal. The Williston Basin of North Dakota has a sequence of geologic units (Dakota Group) present at an optimal depth for produced water disposal. The lower Cretaceous Dakota Group consists of four formations. The formations are from top to bottom: Pierre Shale, Niobrara Formation, Medicine Bow Formation, and the Lower Cretaceous Dakota Group. The formations are overlain by the Cenozoic Tertiary sediments which provide an impermeable seal for produced water injection. Of these formations, the Dakota Group is the most desirable for irrigation due to its thickness and the high permeability and porosity of its sandstone beds. The Dakota Group is the most desirable unit for produced water disposal due to its thickness and the high permeability and porosity of its sandstone beds. The Dakota Group is approximately 640 ft (195 m) thick at depths of approximately 4,060-4,700 ft (1,240-1,430 m) in the center of the Kolumbo 100K Grid.

These Cretaceous and Tertiary units provide a complete reservoir system of rocks for produced water injection. Of special interest in this study is the Dakota Group. The Dakota Group is overlain by the Cretaceous Tertiary marine deposits which provide an impermeable seal for produced water disposal. The Dakota Group is the most desirable unit for produced water disposal due to its thickness and the high permeability and porosity of its sandstone beds. The Dakota Group is approximately 640 ft (195 m) thick at depths of approximately 4,060-4,700 ft (1,240-1,430 m) in the center of the Kolumbo 100K Grid.

DISPACH OF INYAN KARA FORMATION SANDSTONES

This map presents thickness contour intervals of interpreted lithostratigraphic sandstone bodies present within the Inyan Kara Formation in the Kolumbo 100K Grid. The map and associated cross-sections were prepared to identify areas where the potential for recovering sandstone bodies for injection of produced water is greatest. Geological features such as roads and rivers are also presented to aid in flood and well placement.