

CHEMICAL ANALYSIS OF MAJOR CONSTITUENTS AND TRACE CONTAMINANTS OF ROCK SALT

Robert V. Titler, Environmental Chemist and Paul Curry, Water Program Specialist

**Pennsylvania Department of Environmental Protection
Bureau of Water Standards and Facility Regulation**

Executive Summary

The main purpose of this study is to analyze various rock salt sources to determine the existing composition of rock salt. The results will then be compared to the chemical composition of the salt produced from Shale Gas Extraction Wastewater (SGEW) evaporation. Naturally occurring rock salt was formed from the evaporation of inland seas. Its primary constituents are sodium, chloride, calcium, magnesium, potassium, and sulfate. Rock salt generally contains between 90 to 98% sodium chloride. The salt content in SGEW may exceed 200,000 mg/l or approximately 7 times saltier than sea water.

In the United States, approximately 77% of the rock salt domestically produced, and imported, is used for highway de-icing. In order to compare the differences or similarities of salt obtained from treated SGEW to “conventional” rock salt currently being used for de-icing in Pennsylvania, it is necessary to analyze conventional rock salt samples from various sources. At room temperature, rock salt is in the solid state; therefore, an aqueous solution must be prepared for analysis. The high content of sodium in the rock salt can result in interference issues for metal analysis using Inductively Coupled Plasma analysis. In this study, the high sodium and chloride content of the rock salt also caused interferences in the gross alpha and beta analyses as well.

Rock salt in its native form should not contain any synthetic organic compounds. The chemical composition findings in this study are supported by the Assale and Khewra rock salt studies. Calcium was detected in only one of the samples. If the detection limits of calcium were lower, it should have been detected in all of the DEP’s rock salt samples. The trace chemicals in rock salt samples could vary depending upon the location and geologic time when the salt deposit was formed.

The chemical composition of rock salt, compared to SGEW, yielded very low concentrations of barium and strontium. Conversely, data reviewed from SGEW analyses indicate that high concentrations of both barium and strontium are usually detected. The low concentrations of the few organic compounds detected in this study could have resulted from contamination during transportation of the rock salt or at its storage location.

