

THE IMC K2 MINE FLOODING

by

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INTRODUCTION

On December 29, 1985, water was discovered in the International Minerals & Chemical Corporation (IMC) K2 potash mine near Esterhazy, Saskatchewan. A major effort was immediately undertaken to discover the source of the inflow and to save the otherwise dry IMC mines by pumping brine up the shafts. For the next 9 months, an exploratory program was conducted to locate the source of the leak. The inflow rate was estimated at 2,700 gpm to more than 8,000 gpm. In September 1986, mine personnel were able to enter a previously inaccessible area of the mine and observed an inflow entering the mine from above. The location of the inflow was the southwestern area of Panel 10B (subsequently called the inflow "A-area"). The inflow was visible as a large waterfall that flowed from the base of the Dawson Bay Formation through the nearly 100-ft-thick saltback.

Beginning in October 1986, a surface-based grouting operation was started. The grouting involved injection of concentrated calcium chloride into the Dawson Bay Formation to cause precipitation of gypsum in the formation fractures and to squelch the aquifer flow toward the inflow area. By mid-December 1986, it appeared that IMC's grouting was winning the battle to save their mine. On December 18, 1986, the inflow erupted at a new location in the same room but at the eastern end of Panel 10B, and a new battle was undertaken to save the mine from a renewed 8,000 gpm inflow. Since 1986, there have been several reoccurring episodes of high inflow followed by temporarily successful bouts of grouting.

Since the inflow began, a significant body of knowledge has emerged concerning the structure of the Prairie Evaporite Salt Formation and the effects of saline brine on potash rock. While the K2 Mine was never intended to be a solution mine, the IMC experience does provide information on the consequences of unintended solution mining of potash. Since 1986, IMC has pumped and disposed of more than 12 billion gallons of brine¹. According to IMC's 1993 Annual Report, IMC has spent C\$365 million on remedial measures to save their K1 and K2 Mines. An annual cost of about C\$34 million is anticipated primarily to pump and dispose of brine and to control the inflow by chemical grouting in the aquifer.

This paper discusses the inflow incident and some of the facts relevant to understanding its origin, size, and consequences. The information presented is often the result of interpretation of facts and measurements; as such, the information represents the opinions and experience of the author. While IMC engineers have reviewed the paper and approved its publication, the paper does not necessarily represent IMC's official position on any matters related to the inflow. Only a limited background is presented because this information is available elsewhere; for example, Baar (1977)². The topics of surface subsidence and selective dissolution are discussed in addition to discussing causes and effects of the inflow.