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**Geislinger et al.**

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(54) **SYSTEM AND METHOD FOR ACTIVATING DEEP RAFFINATE INJECTION BASED ON LEACH ANALYTIC DATA**

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See application file for complete search history.

(56) **References Cited**  
U.S. PATENT DOCUMENTS

6,319,389 B1 11/2001 Fountain et al.  
8,986,423 B2 3/2015 Lang et al.  
(Continued)

FOREIGN PATENT DOCUMENTS

CA 2573936 5/2010  
WO WO2009146485 12/2009  
(Continued)

OTHER PUBLICATIONS

USPTO Notice of Allowance in U.S. Appl. No. 17/850,834 dated Sep. 29, 2022.

(Continued)

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(57) **ABSTRACT**

The method may comprise receiving historical data (e.g., mineralogy data, irrigation data, raffinate data, heat data, lift height data, geographic data on ore placement and/or blower data); training a predictive model using the historical data to create a trained predictive model; adding future assumption (Continued)

