

Carbon Dioxide Enhanced Oil Recovery Potential of the Central Devonian Michigan Basin

Craig R. Johnson¹, David A. Barnes², and William B. Harrison III³

¹NTH Consultants, Ltd., Lansing, Michigan, 48933, crjohnson@nthconsultants.com

²Michigan Geological Repository for Research and Education, Western Michigan University, Kalamazoo, Michigan 49008, dave.barnes@wmich.edu

³Michigan Geological Repository for Research and Education, Western Michigan University, Kalamazoo, Michigan 49008, harrison@wmich.edu

This paper is a general overview of carbon dioxide enhanced oil recovery (CO₂-EOR) potential in Devonian reservoirs of the Dundee Limestone and Detroit River Group in the central Michigan Basin. Given the recent national and international interest in reducing CO₂ emissions, there is considerable new research on the assessment of CO₂ storage targets in geological media. In central Lower Michigan, only oil and natural gas bearing formations and deep saline reservoirs appear to have significant CO₂ storage potential. CO₂-EOR is especially attractive because of the potential for revenue generated by incremental oil production.

Since the early 1920s, Michigan has produced more than 1.34 billion (B) barrels (bbl) of oil. Currently, approximately 4,673 operating oil wells in Michigan produce an average of 22,667 bbls oil per day. It is estimated that approximately 40 to 80 percent of the original oil-in-place (OOIP) has not been recovered, equating to approximately 1 B bbls of remaining oil in place (ROIP) in larger (> 1MM bbls OOIP) fields. CO₂-EOR is currently used in northern Michigan Niagaran Reef Trend using CO₂ from natural gas treatment facilities in that area. This source, along with CO₂ captured at electric power generation or cement plants may provide additional sources for CO₂-EOR in other areas of the Michigan Basin. This paper presents information on general CO₂-EOR methodology, and an overview of prospective central Michigan Basin oilfields for CO₂-EOR opportunities. This analysis was developed using CO₂-EOR screening criteria including geologic conditions and available well field history, reservoir characteristics, and available CO₂-EOR technological assessments and case histories.