

From: [Bob Koehler - DNR](#)
To: ["Ellen McElrath"](#)
Subject: RE: Mid-Con: HRMU #11 (017-07793) UIC Form 33 Approved
Date: Tuesday, January 06, 2015 5:11:00 PM

Ellen,

The MIT of the HRMU #11 well (API: 017-07793) witnessed by Brian Welsh on December 23, 2014 is acceptable. Therefore I will change the Maximum Surface Injection pressure from 350 psi to 883 psi.

I was initially concerned with the loss of 65 psi during the test. This loss is 7% and we accept up to 10% so technically there is no problem but it was worrisome. However, because the rate of pressure loss declined over the duration of the test, the test is acceptable.

Other factors regarding the test are fine; the test pressure was higher than both minimum of 300 psi and the new injection pressure and the packer was set < 100 ft from the top perforation (47').

Cheers,

Robert P. (Bob) Koehler, PhD
Underground Injection Control Lead, Geology Advisor



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From: Ellen McElrath [<mailto:emcelrath@midcon-energy.com>]
Sent: Tuesday, January 06, 2015 2:37 PM
To: Bob Koehler - DNR
Subject: RE: Mid-Con: HRMU #11 (017-07793) UIC Form 33 Approved

Hi Bob,

We had a new MIT performed on this well and it passed – see attached. Please let me know what our new permitted pressure is.

Thanks,
Ellen

From: Bob Koehler - DNR [<mailto:bob.koehler@state.co.us>]
Sent: Tuesday, December 16, 2014 3:59 PM
To: Ellen McElrath
Subject: FW: Mid-Con: HRMU #11 (017-07793) UIC Form 33 Approved

Ellen,

I'm sorry, I got so busy that although I wrote the text I never sent the first reply to your email regarding the MIT (Doc # 400720642). With some modification due to what I say below here's what I came up with.

The MIT (enclosed) that COGCC's Brian Welch witnessed on 10/22/2014 began at 350 psi and dropped 5 psi in 15 minutes. Your Pumper, Wade Pelton, signed the form too. The 350 psi is what I can give you for a maximum surface injection pressure at this time.

We willing to give Mid-Con a maximum surface injection pressure up to 883 psi based on the following calculation, but the well must pass a witnessed MIT to 883 psi or higher.

$$(\text{Frac Gradient-Hydrostatic Head of Water}) \times \text{Depth Top Perf} = \text{Maximum Injection Pressure}$$

We assume a frac gradient of 0.6 psi/ft if there isn't a step rate test. Head is 0.433 psi/ft. Top perf is 5289 ft. So,

$$(0.6 \text{ psi/ft} - 0.433 \text{ psi/ft}) \times 5289 \text{ ft} = 883 \text{ psi}$$

Your Company Man may have tested the casing to 1000 psi at some point but evidently it was not during a witnessed MIT procedure. Again, to get the 883 psi the well will need to pass an MIT to at least 883 psi.

If Mid-Con wants to run a step rate test they can do that and get a higher frac gradient than the assumed 0.6 psi/ft. THIS NEEDS TO HAPPEN BEFORE INJECTION STARTS. When applied to the formula above this will allow a higher injection pressure.

Sincerely,

Robert P. (Bob) Koehler, PhD
Underground Injection Control Lead, Geology Advisor



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From: Bob Koehler - DNR [mailto:bob.koehler@state.co.us]
Sent: Tuesday, December 16, 2014 2:51 PM
To: 'Ellen McElrath'
Subject: Mid-Con: HRMU #11 (017-07793) UIC Form 33 Approved

Ellen,

Please check for an email indicating that the Form 33 for the HRMU #11 has been approved. I managed to fix my problem and put the correct maximum surface injection pressure of 350 psi on the form.

As I said on the earlier email, Mid-Con can perform another MIT at a higher pressure and we will grant an increase in the maximum surface injection pressure up to 883 psi.

To go higher than that Mid-Con will have to perform a step rate prior to starting injection. Note I didn't mention that if you want a Step Rate Test you need to do it prior to injection. Once injection is initiated COGCC feels that the original formation pressure has been compromised so that any step rate test data or frac gradient calculations based on that data will be invalid.

Sincerely,

Robert P. (Bob) Koehler, PhD
Underground Injection Control Lead, Geology Advisor



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