


**TO** Jennifer Means and Thomas Donahue

**FROM** Bruce E. Jankura, P.E. 

**DATE** July 31, 2017

**RE** Windfall Oil & Gas Inc.  
Clearfield County - Zelman #1  
Mechanical Integrity Review  
EPA UIC Application Documents

**MESSAGE:**

This is an assessment of the mechanical integrity, for drilling a new underground injection well, by Windfall Oil & Gas Inc., the Zelman #1, in Brady Township, Clearfield County, Pennsylvania, API # 37-033-27255.

I reviewed all the documents that were submitted by Windfall Oil & Gas Inc. to PADEP Office of Oil and Gas Management in September 2015 and follow up clarifications. Various documents were identified as having information pertaining to mechanical integrity. A well is considered to have mechanical integrity when it is in compliance with the well construction and operating requirements of Pennsylvania laws and regulations. Each document section that was determined applicable to mechanical integrity is listed below with comments.

My comments are based on 39 years of experience as a Petroleum Engineer and Environmental Regulator.

The Zelman #1 is proposed to be drilled as a vertical, conventional, coal, conservation well with 24 1/2" conductor to be set at 8' and cemented to surface, 16" water protection casing to be set at 170' and cemented to surface, 11 3/4" coal protection casing to be set at 425' and cemented to surface, 8 5/8" surface casing to be set at 1,00' and cemented to surface and 4 1/2" production casing to be set at 7,306' and cemented to a depth of approximately 5,000' in the annulus (as per Wellbore Diagram in Attachment "M"). This well design meets the most recent regulatory requirements for well construction and operation.

Additional information regarding the construction and operation of this proposed well is set forth below.

**Attachment A – AREA OF REVIEW METHODS**

– "...a fixed radius of ¼ mile or 1320' from the wellbore." will be utilized.

Comment – This area meets the EPA requirements.

#### Attachment C – CORRECTIVE ACTION PLAN AND WELL DATA

– Windfall indicates, "...that no wells: ...are located within the area of review that penetrate the injection zone:". (Within the AOR there is 1 well drilled to a depth of 3,576' that does not penetrate the injection zone.)

– Windfall indicates, "Furthermore, if in the event that any wells(s) is discovered within the area of review after the injection permit is obtained, Windfall Oil & Gas Inc. assumes the responsibility to plug and abandon that well(s) in accordance with the E.P.A. and Pennsylvania DEP specifications."

Comment – Windfall is committing to mitigate unforeseen issues, if and as they arise in the future.

#### Attachment G – GEOLOGIC DATA ON INJECTION AND CONFINING ZONES

– Windfall identifies the injection zone as a combination of the Huntersville Chert (7,306' to 7,358') and the Oriskany Sandstone (7,358' to 7,387'). The upper confining zone is the Onondaga Limestone and the lower confining zone is the Helderberg Limestone.

Comment – Existing injection wells in Pennsylvania currently inject into these known geologic zones.

#### Attachment H – OPERATION DATA

– "The proposed operation rates and volumes are based on: ...previously accepted fracture gradients ...by EPA, ...the Green Glenn #1 injectivity test and ...offset well data. Proposed Average daily injection rate: 2,000 bbls/per day, Proposed Average Injection Pressure (Bottom Hole): 5500 psi, Proposed Maximum Injection Rate: 2296 bbls/day.

##### Comments

1) This is a reasonable injection rate and volume based on the injection test on the Green Glen #1 well (Permit # 033-20228, Huston Township, Clearfield County) where a maximum injection rate of 1350 Bbls / day was achieved into the Oriskany formation with 1240 psi surface pressure on 10/22/2009.

2) The EPA permit Part III, B.3. and 4. establish limitations for volume and maximum surface pressure to not exceed 30,000 bbls per month or 2,443psi surface pressure, respectively. This pressure is higher than the test pressure at the Green Glen #1, which should cause the corresponding higher injection rates to be achieved.

3) The critical parameter is the Maximum Allowable Surface Injection Pressure (MASIP) of 2,443 psi. This pressure will be the controlling factor, not the injection flow rate. As the pressure increases toward the maximum, the injection rate will have to be reduced to stay below the MASIP.

– Annulus Fluid: "2) The nature of the annulus fluid will be fresh water with corrosion control additives. Corrosion inhibitor will be alpha 2278W added at a rate of 2.5 gallons/100 gallons of water."

Comment – This is a common industry best management practice and reasonable to utilize.

#### Attachment I – FORMATION TESTING PROGRAM

– Various injection rate, pressures and fracture gradient information is presented, including offset well data. This information is representative of the proposed injection formation.

Comment – A specific test is not proposed or outlined. After the well is drilled and completed, the initial injection activity will provide the injection data for any potential analysis or evaluation that may be needed in the future. The values calculated for rates and pressures are reasonable.

#### Attachment J – STIMULATION PROGRAM

– “In the event stimulation is necessary to enhance injectivity the proposed treatment would be as follows: ...”

Comments -

1)The proposed treatment is a relatively small acid fracture treatment, which is a reasonable and usually effective for these injection formations.

2)Any stimulation treatment plan should be reviewed by the Department prior to implementation. See Recommendations Below.

#### Attachment K – INJECTION PROCEDURES

– The Injection procedures describe control of fluid specific gravity, filtration, pumping, injection pressure monitoring, shut down switches, tubing annulus monitoring and annular pressure automatic shutdown control.

Comment – The injection procedures described are reasonable practices. Windfall should provide the daily injection rate, injected volumes and pressure monitoring data to the Department on a monthly basis in a digital and graphical format acceptable to the Department. This is necessary for the Department to routinely monitor injection activity and potential for induced seismicity. See Recommendations Below.

#### Attachment L – CONSTRUCTION PROCEDURES

– A general procedure is provided for the “Plan to Drill”.

Comments –

1)The general procedure and cement calculations are reasonable.

2)A routine site inspection should be conducted on the Zelman #1 well by the PADEP Oil & Gas Inspector to confirm the well status prior to initiation of injection. See Recommendations below.

#### Attachment M – CONSTRUCTION DETAILS

– “Construction Details-Subsurface: Wellbore Schematic”

Comments –

1) These diagrams are reasonable depictions of the wellbore, casing program, wellhead and retrievable packer.

2) The Casing and Cementing Data indicate:

a) pipe strength data where the oilfield tubulars planned for this well are expected to have adequate properties, including internal yield pressure ratings, for the tubing and production casing that would contain the proposed maximum injection pressure of 2,443 psi and

b) cement blends that should provide adequate zonal isolation.

#### Attachment P – MONITORING PROGRAM

– Injection Fluid Samples / Injection Pressures, Rate and Volume / Mechanical Integrity are addressed.

Comments – The monitoring procedures described are reasonable practices.

#### Attachment Q – PLUGGING & ABANDONMENT PLAN

– “Windfall will plug the Zelman #1 in accordance with the Pennsylvania Bureau of Oil and Gas Management and the EPA regulations in place at the time of abandonment.”

Comment – The Plugging and Abandonment Plan and final plugged well schematic showing cement plug set depths, appear reasonable to meet regulatory requirements.

EPA Notice of Final Permit Decision / EPA UIC Permit & Responses to Comments following closure of the final public comment period on September 10, 2015.

– In Part II, D.2.a. of the UIC Permit, Windfall is required to meet the following condition; “The permittee has submitted the results of the pressure fall-off testing, submitting pressure fall-off testing, including the determination of bottom-hole pressure, whether any linear flow exists, has demonstrated to EPA that the Injection Well has mechanical integrity in accordance with 40 CFR § 146.8 and the Permittee has received written notice from the Director that such demonstration is satisfactory; and...”

Comment – There is no reasonable need to duplicate this demonstration of mechanical integrity prior to initiating injection. Prior to commencing injection, Windfall should provide DEP with the documentation showing how they complied with this provision of the EPA UIC Permit. See Recommendation Below.

## **Overall Mechanical Integrity Review Assessment**

Mechanical Integrity for the Zelman #1 injection well:

In my opinion, based on the data reviewed and with the implementation of the Recommendations below, the mechanical integrity of the proposed Zelman #1 well should be adequate to meet DEP regulations for an underground injection well.

### **Recommendations**

1. Any stimulation treatment plan should be reviewed by the Department prior to implementation (Att. J).
2. Provide, on a monthly basis to the DEP, injection pressures, annular pressures, injection rates and cumulative volume; in both digital and graphical formats (Att. K).
3. A routine site inspection should be conducted by the PADEP Oil & Gas Inspector to confirm the well status, including annular pressure readings, prior to initiation of injection (Att. L).
4. Prior to commencing injection, provide DEP with the documentation showing how Windfall complied with provision Part II, D.2.a. of the EPA UIC Permit; submitting pressure fall-off testing, including the determination of bottom-hole pressure, whether any linear flow exists and demonstrating that the well has mechanical integrity.
5. DEP should be notified in the same fashion as EPA when conditions indicate mechanical integrity problems, which call for injection to cease and EPA to be verbally notified within 24 hours and notified in writing within 7 days. This requirement is in addition to and does not alter notification requirements in DEP regulations.

cc: John Ryder