2018 Shale Network Workshop

The World of “Beneficial Reuse”: Regulating the Spread of Oil and Gas Wastewater on Roads

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Funded project:
• Impact of Spreading Oil & Gas Wastewater as Road Treatments on Groundwater Quality

Additional Co-PIs for the grant:
• William Burgos, Professor of Environmental Engineering, Department of Civil and Environmental Engineering (lead)
• Travis Tasker, Ph.D. candidate in Environmental Engineering, Department of Civil and Environmental Engineering

Forthcoming publication:
Potential waste management and disposal options for produced water from oil & gas production (depending on the state)

Temporary:
- Tanks or pits for temporary storage

Options for Reuse
- Recycle for future use
- Irrigation
- Roadspreading (dust suppression/de-icer)

Options for Disposal
- Underground injection control wells (UICs)
- Discharge to surface water
- Commercial treatment facilities
- Publicly-owned treatment works

GAO 12-874
Focus today is on “beneficial reuse” of oil & gas wastewater: road spreading for dust suppression or deicer

By the numbers:

- ~34% of US roads unpaved
- In PA alone, 25,000+ miles of unpaved roads; 17,500 owned by municipalities (DEP)
- Issues with unpaved roads include dust (airborne particulate) and environmental impacts (runoff, culverts, etc.)
- 190+ different dust suppressants used to treat unpaved roads
- Estimated that 75% of all dust suppressants applied to unpaved roads = chloride salts or salt brines (~$0.25/liter)

At least 13 U.S. states allow the use of oil and gas wastewater for dust suppression or deicer as a form of “beneficial reuse”
Regulations vary by state, part 1

<table>
<thead>
<tr>
<th>State</th>
<th>Regulation</th>
<th>Date adopted or banned</th>
<th>Use</th>
<th>Wastewater type</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL</td>
<td>Code of Ala. § 9-17-6(c)(3)</td>
<td>Banned 05/23/2000 (current as of 09/25/2017)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>CO</td>
<td>CO Regulation 404-1-907-c (2)[D]</td>
<td>Effective 08/01/71 (current as of 09/25/2017)</td>
<td>Road spreading</td>
<td>Produced water</td>
<td>&lt;3,500 mg/L TDS</td>
</tr>
<tr>
<td>CT</td>
<td>Conn. Gen. Stat. § 22a-473</td>
<td>Banned 07/09/1987 (current as of 2017)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>ID</td>
<td>IDAPA 20.07.02</td>
<td>Banned* effective 04/11/2015 (as of 10/01/17)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>IL</td>
<td>Title 62 Ill. Admin Code, Ch. 240.945</td>
<td>Effective 07/09/2001 (current as of 08/11/2017)</td>
<td>Road maintenance</td>
<td>Crude oil</td>
<td>Crude oil bottom sediments with &lt;10% produced water mix</td>
</tr>
<tr>
<td>IN</td>
<td>312 IAC 16-5-27(a)(1)</td>
<td>Effective 09/11/2000 (current as of 09/13/2017)</td>
<td>Dust suppression</td>
<td>Oil or fluid contaminated w/ oil</td>
<td>Fluid spread must not leave the roadbed</td>
</tr>
<tr>
<td>KS</td>
<td>K.S.A. § 55-904 (c) K.A.R. § 28-47-4</td>
<td>Effective 05/01/1983 (current as of 09/21/2017)</td>
<td>Dust suppression and road maintenance</td>
<td>Produced water</td>
<td>Map of roads, methods for spreading, application rates, amounts</td>
</tr>
<tr>
<td>MI</td>
<td>Mich. Admin. Code R 324.705</td>
<td>Effective 2004 (current as of 09/15/2017)</td>
<td>Dust suppression and deicing</td>
<td>Produced water</td>
<td>&lt;500 ppm hydrogen sulfide; &gt;20 g/L Ca; &lt;1 mg/L Benzene, Toulene, Ethylbenzene, and Xylene</td>
</tr>
<tr>
<td>MS</td>
<td>CMSR 26-000-002 R. 1.68 (VII)</td>
<td>Effective 01/01/1952 (current as of 09/06/2017)</td>
<td>Land spreading</td>
<td>NORM contaminated wastes</td>
<td>&lt;600 uR/hr above background; Ra 226 and 228 &lt; 5 pCi/gram after spreading</td>
</tr>
<tr>
<td>NE</td>
<td>Nebraska Admin. Code Title 267, Ch. 3, 022.16</td>
<td>Effective 01/01/2009 (current as of 11/01/2017)</td>
<td>Dust suppression and Deicing</td>
<td>Produced water</td>
<td>The estimated volume of fluids, or the opening and closing tank gauges or meter readings.</td>
</tr>
<tr>
<td>NM</td>
<td>19.15.34.20 NMAC</td>
<td>Effective 03/31/2015 (current as of 08/29/2017)</td>
<td>By case</td>
<td>By case</td>
<td>Except as permitted under: 19.15.17 NMAC, 19.15.26.8 NMAC, 19.15.30 NMAC, 19.15.34 NMAC, or 19.15.36 NMAC</td>
</tr>
<tr>
<td>NY</td>
<td>6 NYCRR § 360-1.15 (d)</td>
<td>Effective 08/25/1993 (current as of 10/06/2017)</td>
<td>Dust suppression and deicing</td>
<td>Produced water only (No Marcellus)</td>
<td>Chemical analyses: chloride, sulfate, sodium, calcium, magnesium, lead, iron, barium, oil &amp; grease, TDS, pH, benzene, ethyl-benzene, toluene, and xylene; Maps; Application rates; Volume</td>
</tr>
<tr>
<td>WY</td>
<td>WCWR 055-0001-4 § 1 (c)(1)(E)</td>
<td>Effective: 06/03/2015; current through August 31, 2017</td>
<td>Dust suppression and deicing</td>
<td>Produced water</td>
<td>Road spreading, land spreading, and landfarming of exploration and production wastes</td>
</tr>
</tbody>
</table>
### Regulations vary by state, part 2

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<thead>
<tr>
<th>State</th>
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<th>Date adopted or banned</th>
<th>Use</th>
<th>Wastewater type</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>ND</td>
<td>N.D. Admin. Code 33-24-02-02</td>
<td>Effective 01/01/1984 (current as of 10/01/2017)</td>
<td>Dust suppression and deicing</td>
<td>Produced water only</td>
<td>Chloride &gt;75 g/L; Calcium + Magnesium &gt;10 g/L; Chemical analyses including pH, specific conductivity, iron, manganese, sodium, potassium, phosphorous, SO4, HCO3, CO3, total dissolved solids (TDS), total alkalinity, oil and grease, aluminum, ammonia, arsenic, barium, boron, copper, chromium, lead, nickel, selenium and zinc; Maps; Application rates; Volumes</td>
</tr>
<tr>
<td>OH</td>
<td>ORC Ann. 1509.226</td>
<td>Effective 06/30/2010 (current as of 01/01/2017)</td>
<td>Dust suppression and deicing</td>
<td>Produced water only (no horizontal wells)</td>
<td>Locations, application rates, volumes, and gas well permit #’s</td>
</tr>
<tr>
<td>PA</td>
<td>25 Pa. Code § 78.63</td>
<td>Effective 07/28/1989 (current as of 08/05/2017)</td>
<td>Land spreading and dust control</td>
<td>Only production or treated brines (other than brines produced from shale formations)</td>
<td>Locations, application rates, monthly spreading reports, and chemical analyses including calcium, sodium, chloride, magnesium, and total dissolved solids</td>
</tr>
<tr>
<td>SD</td>
<td>ARSD 74:12:04:15</td>
<td>Effective 01/12/2012 (current as of 09/25/2017)</td>
<td>Dust suppression</td>
<td>Produced water</td>
<td>Prohibited unless permitted by the secretary for dust suppression</td>
</tr>
<tr>
<td>TN</td>
<td>Tenn. Comp. R. &amp; Regs. R. 0400-45-06-.11 (10)(a)</td>
<td>Effective 12/11/2012 (current as of 08/01/2017)</td>
<td>By case</td>
<td>By case</td>
<td>N/A</td>
</tr>
<tr>
<td>TX</td>
<td>16 TAC §3.8</td>
<td>Banned* (01/01/1976) (current 09/30/2017)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>VA</td>
<td>4 VAC 25-150-420</td>
<td>Effective Sept. 25, 1991; current through Aug. 1, 2017</td>
<td>Land spreading</td>
<td>Produced water</td>
<td>Road spreading is permitted through the same code that allows land spreading</td>
</tr>
<tr>
<td>WA</td>
<td>WAC § 344-12-225</td>
<td>Banned* (current as of 2003)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>WV</td>
<td>Memorandum of Agreement, Dec. 22, 2011, WV</td>
<td>Effective 12/22/2011</td>
<td>Deicing</td>
<td>Produced water (no waters associated with hydraulic fracturing)</td>
<td>&gt;200 g/L TDS; &lt;175 g/L Cl, &lt;91.5 g/L Na, 5.5 to 8 pH, Fe &lt;10 mg/L, Barium &lt;2 mg/L, lead &lt;10 mg/L, O&amp;G &lt;10 mg/L, Benzene &lt;0.5 mg/L, Ethylbenzene&lt;0.7 mg/L, Toluene &lt;1 mg/L, Xylene&lt;1mg/L</td>
</tr>
<tr>
<td>WY</td>
<td>WCWR 055-0001-4 § 1(c)(i)(E)</td>
<td>Effective: 06/03/2015; current through August 31, 2017</td>
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Some states limit beneficial reuse to produced water from conventional drilling only (including PA, OH, NY and WV)
Pennsylvania has allowed beneficial reuse from conventional oil & gas wastewater since 1988

DEP Guidelines:

- Brine from oil & gas wells can be used as a dust suppressant and road stabilizer on unpaved secondary roads
- New regs in 2016 disallowed spreading from shale formations (25 PA Code 78a.70, 70a)
- Authority for guidelines (statutes & regulations)
  - Clean Streams Law
  - Solid Waste Management Act
  - Chapters 78, 101 of Rules & Regulations
- Annual plan must be submitted, approved by DEP required before road-spreading can begin
- Person spreading the brine subject to multiple conditions and monthly reporting
- Failure to comply may result in DEP rescinding plan approval
The monthly road spreading reports are available for review.

| Date | Road No., Road Name or Property Name | Describe Segment of Road That Was Spread (if less than entire length) | Length of Roadway Spread (mi) | Gallons Spread | Width of Spreader Bar (ft) | Width of Roadway Spread (ft) | License Plate No. of Truck |
|------|--------------------------------------|-------------------------------------------------|-----------------|----------------|----------------|----------------|----------------|----------------|
|      |                                      |                                                 |                 |               |                |                 |                |                |
|      |                                      |                                                 |                 |               |                |                 |                |                |
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|      |                                      |                                                 |                 |               |                |                 |                |                |

**TOTALS**

Page _ of _
Road spreading in PA is concentrated in certain areas, peaked in 2012 but is rising again, and mainly occurs during the summer months.

A) Counties in Pennsylvania and Ohio that spread O&G wastewaters on roads since 2008.
B) Volumes of O&G wastewater spread on roads in PA and Ohio.
C) Monthly volumes of O&G wastewater spread in NW PA.

This practice is not without controversy

Amish oppose use of drilling 'brine' wastewater on roads

DIN HORPEY
Pittsburgh Post-Gazette
dinpey@post-gazette.com
In a case dismissed yesterday, the PA Environmental Hearings Board acknowledged that DEP may not have authority for road spreading under the Solid Waste Management Act

Basic facts

• Individual, Siri Lawson, appealed DEP’s approval of brine spreading in Sugar Grove & Farmington Townships (Warren County), contending:
  • Approval = approved discharge of industrial waste
  • Failed to impose adequate operating requirements to protect waters or air in violation of Art. 1, Section 27 of the PA Constitution
  • Violated the Clean Streams Law & Solid Waste Management Act
  • DEP lacks authority to grant approval for road spreading plans

• Farmington Township & PSATS allowed to intervene

• Case decided as moot because approved permit expired; however, interesting language in the decision:
  • “the brine described in Hydro’s 2017 Plan Approval is a residual waste that the Department cannot authorize to be disposed or beneficially used under the Solid Waste Management Act without a permit. ... The Department affirms that issuing a brine spreading plan approval to Hydro Transport in the future under the present facts would not be authorized under the Solid Waste Management Act. Therefore, the Department decision subject of this appeal will not recur. ... [t]he Department repudiates its authorization under the Solid Waste Management Act based on the specific facts of Hydro’s 2017 Plan Approval.”

Where does this leave us? Perhaps with more questions...

For PA:
• Road spreading of brine allowed?
• Options for municipalities?
• Options for conventional O&G wastewater?
• Options for unconventional O&G wastewater?

For other states:
• Lessons learned in the regulatory arena?
• Potential impacts from health standpoint?
Questions now?
(or more likely after Travis’ presentation)

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