Review of the dSGEIS and Identification Best Technology and Best Practices Recommendations
Harvey Consulting, LLC; December 28, 2009

Prepared for:

NYSERDA
17 Columbia Circle
Albany, New York 12203

January 20, 2011

ALPHA GEOSCIENCE

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Geology

Hydrology

Remediation

Water Supply

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1.0 OVERVIEW

Harvey Consulting has provided a technical review of the dSGEIS to determine if it includes best technology and practices in regard to the protection of the environment. Harvey Consulting has made recommendations for improving the dSGEIS analysis and for the incorporation of best practice requirements in New York State regulations.

The following brief explanation of the history and development of the GEIS and dSGEIS will eliminate unnecessary repetition in the response to the comments.

The GEIS on the Oil, Gas and Solution Mining Regulatory Program was prepared to review NYSDEC's program for regulating oil, gas, underground gas storage and solution mining wells of any depth, and brine disposal, stratigraphic and geothermal wells deeper than 500 feet. The GEIS was prepared according to SEQRA, Article 8 of the Environmental Conservation Law, requiring government agencies to analyze the environmental, social and economic impacts of their actions. This document consists of a draft that was released in 1988 and a final volume that was released in 1992.

The SEQRA regulations require a GEIS supplement if a subsequent proposed action may have significant adverse environmental impacts that were not addressed by the GEIS and SEQR Findings (6NYCRR 617.10(d)(4)). NYSDEC determined, in 2008, that a Supplemental GEIS (SGEIS) was necessary to review horizontal drilling and high-volume hydraulic fracturing. Three primary factors were to be the focus:

- Water volumes in excess of GEIS descriptions;
- Possible drilling location issues, including:
    - The NYC watershed;
    - In or near the Catskill Park; and
    - Near the Upper Delaware Scenic and Recreational River; and
- Longer disturbance duration at multi-well drilling sites

Public scoping sessions, held in November and December of 2008, and comments led to the production of NYSDEC's final scope for a supplemental GEIS to address well permit issuance for horizontal drilling and high-volume hydraulic fracturing to develop the Marcellus Shale and other low-permeability gas reservoirs that was released in February 2009. The dSGEIS was completed in September 2009.

Brief descriptions of the purposes and contents of an environment impact statement (EIS), a generic environmental impact statement (GEIS), and a supplemental statement are discussed below. It is important to understand the difference between the three types of studies when evaluating the comments in regard to the dSGEIS.

An Environmental Impact Statement (EIS) analyzes the potential significant adverse environmental impacts of a proposed action and ways to avoid or minimize the impacts (http://www.dec.ny.gov/permits/50602.html). EISs must be written within the framework

presented in 6NYCRR 617.9(b)(5) and should address only those potential significant adverse environmental impacts that can be reasonably anticipated and/or have been identified in the scoping process. EISs should not contain more detail than is appropriate considering the nature and magnitude of the proposed action and the significance of its potential impacts (http://www.dec.ny.gov/regs/4490.html; 6NYCRR 617.9)

GEISs may be more general and broader than site- or project-specific EISs and should discuss the rationale for the choices advanced. They may also include an assessment of specific impacts and may be based on conceptual information in some cases. GEISs may identify the important elements of the natural resource base as well as the existing and projected cultural features, patterns and character. They may discuss the constraints and consequences of any narrowing of future options in general terms. They may present and analyze a few hypothetical scenarios that are likely to occur (http://www.dec.ny.gov/permits/50602.html).

A GEIS might be called for if:

- a number of separate actions are proposed in an area, and they may have minor effects separately but may have significant adverse environmental impacts if considered together;
- a sequence of related or contingent actions is planned by a single entity;
- separate actions share common (generic) impacts; or
- a proposed program would have wide application or restrict the range of future alternative policies or projects (http://www.dec.ny.gov/permits/50602.html).

When a final generic environmental impact statement (FGEIS) has been filed under 6NYCRR 617.10:

- No further SEQR compliance is required if a subsequent proposed action will be carried out in conformance with the conditions and thresholds established for such actions in the GEIS or its findings statement;
- An amended findings statement must be prepared if the subsequent proposed action was adequately addressed in the GEIS but was not adequately addressed in the findings statement;
- A negative declaration must be prepared if a subsequent proposed action was not adequately addressed in the GEIS, and the subsequent action will not result in any significant environmental impacts;
- A supplement to the FGEIS must be prepared if the subsequent proposed action was not adequately addressed in the GEIS and the subsequent action may have one or more significant adverse environmental impacts.

If a project is to be developed in phases or stages, NYSDEC and its contractors should address the site-specific impacts of the individual project and the cumulative impacts of subsequent phases. This part of the GEIS must discuss the elements and constraints in the natural and cultural environment that may affect an agency decision on the immediate project (http://www.dec.ny.gov/regs/4490.html; 6NYCRR 617.10).

2.0 DSGEIS SCOPE COMMENTS

Pages 3 – 6:

Harvey Consulting's review includes two comments in regard to the scope of the dSGEIS.

The first comment is that the Marcellus Shale warrants a formation-specific Environmental Impact Statement. Additional analysis is necessary to study the impacts of the exploration and development of other low-permeability gas reservoirs. Harvey Consulting recommends that the dSGEIS scope should be limited to the analysis of the Marcellus Shale Reservoir.

The second comment regarding the dSGEIS scope is that there is not enough Marcellus Shale Reservoir data provided to support a statewide exploration and production plan. NYSDEC has included only enough information for exploration; site-specific production and development plans require additional information. Harvey Consulting recommends that:

1. The scope of the dSGEIS should be narrowed to exploration and baseline study work. This would require a second EIS for production and development. OR
2. The dSGEIS should clearly outline the data collection and analyses that must be included in the exploration phase to provide sufficient support for a production and development case. The dSGEIS should also include the process for conducting a site-specific environmental assessment for each production well-site based on the results of the exploration phase.

2.1 Accuracy and Completeness

Six public scoping sessions took place in various regions of NYS throughout November and December of 2008 (http://www.dec.ny.gov/energy/51422.html). The Final Scope was released in February 2009. The comments by Harvey Consulting relate to the SGEIS process and not to the content of the SGEIS. These comments were not presented during the proper stage of the assessment process, as discussed in Section 1.0.

A supplement to any GEIS must be prepared if the subsequent proposed action was not adequately addressed in the GEIS and the subsequent action may have one or more significant adverse environmental impacts. The additional analysis that Harvey Consulting suggests is warranted is not part of the SGEIS because it was not part of the Final Scope. The issues raised by Harvey Consulting will be evaluated when a specific project is proposed under the SGEIS and its findings statement.

2.2 Supporting Information

No references or supporting documents are provided in this section of Harvey Consulting's report.

2.3 Mitigation Measures

No mitigation measures are proposed.

2.4 Proposed SGEIS Revisions

Harvey Consulting has proposed that the scope of the SGEIS be narrowed. The scope was finalized in February 2009, and as a result, the suggested revision is inappropriate at this stage of the process. Further analysis and documentation, typically would be required before a permit is issued if the NYSDEC finds that a permit application is deficient.

2.5 List of References

Harvey Consulting, LLC., December 28, 2009, *Review of dSGEIS and Identification of Best Technology and Best Practice Recommendations*, Prepared for the Natural Resources Defense Council (NRDC).

NYSDEC, April 21, 2010. *SEQR Handbook*, A. General Concepts, http://www.dec.ny.gov/permits/50602.html.

NYSDEC, April 21, 2010. 617: *State Environmental Quality Review*, http://www.dec.ny.gov/regs/4490.html.

NYSDEC, April 22, 2010. *Marcellus Shale*, http://www.dec.ny.gov/energy/46288.html.

NYSDEC, April 22, 2010. *Supplemental Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program*, Scoping Meeting Transcripts, http://www.dec.ny.gov/energy/51422.html.

3.0 COMMENTS ON THE NEED FOR NEW YORK STATE REGULATIONS TO GUIDE MARCELLUS SHALE EXPLORATION & DEVELOPMENT

Pages 6 – 9:

The Harvey report includes three comments pertaining to the need for updates and revisions to New York State regulations that guide exploration and development.

Harvey Consulting's review states that "NYSDEC should update its regulations to include best technology and best management practices for oil and gas exploration and production in general, and more specifically, for shale gas development." The review claims that the dSGEIS is out-of-date because it is based on 1972 regulations that do not include updated best technology and best management practices.

The second comment charges that the *Proposed Supplementary Permit Conditions for High-Volume Hydraulic Fracturing*, Appendix 10 of the dSGEIS, is incomplete and inconsistent with some dSGEIS findings and best technology and practices for shale gas development. The assumptions, analysis, and mitigation measures discussion in Chapter 7 is not in total agreement with Appendix 10. Harvey Consulting recommends that the list in Appendix 10 should be updated and extended to include the recommendations and comments submitted to NYSDEC. Additionally, the list should be considered necessary regulatory changes, not merely supplementary permit conditions.

The final comment specifically about New York State regulations is that they "need to be revised to address Marcellus Shale development, provide a clear, complete list of prohibited activities, and describe maximum allowable levels of activities and expected mitigation." The dSGEIS proposes limitations and mitigation, and the proposals are not included in the proposed permit conditions. Regulatory control will prevent undisclosed and unmitigated significant adverse environmental impacts. The review lists the following limits and assumptions found in the text of the dSGEIS that are not set by the *Proposed Supplementary Permit Conditions.*

- No diesel-based fracture fluid may be used (dSGEIS, p.7-41);
- Site-specific analysis is required for hydrofracture shallower than 2,000 feet TVD or if the distance between the target fracture zone and a fresh water supply is less than 1,000 feet TVD (dSGEIS, p.7-49);
- There is a maximum limit for hydraulic fracture size (dSGEIS, p.6-56);
- Flaring is limited to a maximum of three days (dSGEIS, p.6-63); and
- There are annual maximums of 250 operation days for drilling engines, 20 operation days for hydraulic fracturing engines, and 30 days of flaring (dSGEIS, p. 6-72).

Harvey's report alleges there are other portions of the dSGEIS where stated limits, recommendations, and possible scenarios conflict and where recommended permit conditions or mitigations are not included in the *Proposed Supplementary Permit Conditions.*

3.1 Accuracy and Completeness

Harvey Consulting has suggested that NYSDEC revise the NYS oil and gas regulations to specifically address shale gas exploration, development, and production. The purpose of the SGEIS, however, is not to revise regulations. The purpose of the Proposed Supplementary Permit Conditions for shale gas activities is to customize the existing regulations and guideline framework to fit new and changing industry, relieving the need

for frequent or unnecessary law changes. Permit conditions must be met by the party seeking a permit for a proposed action, so whether or not the permit conditions are included in the New York State regulations is irrelevant.

Appendix 10, which is *Proposed Supplementary Permit Conditions*, should contain all of the limitations and mitigations discussed in the dSGEIS text. The Harvey Consulting review presents a list of the topics found in the dSGEIS that are not addressed in the proposed permit conditions. Although diesel fuel is not a component of the "slick water" fracturing fluid that typically is used to hydrofracture the Marcellus shale, it may be useful for the NYSDEC to clarify in Appendix 10 of the dSGEIS that no diesel-based fracture fluid will be used. The following items suggested in the Harvey report should not be included in Appendix 10 for the reasons listed below:

- *"Site-specific analysis is required for hydrofracture shallower than 2,000 feet TVD or if the distance between the target fracture zone and a fresh water supply is less than 1,000 feet TVD":* This is not an appropriate permit condition, because this criterion is evaluated before a permit is issued.
- *"There is a maximum limit for hydraulic fracture size":* Alpha could not find this topic on page 6-56 as cited by Harvey Consulting.
- *"Flaring is limited to a maximum of three days":* This is not intended as a limit by NYSDEC. Flaring is not an appropriate issue for a drilling permit condition, because flaring, other than that allowed by 556.2(b), would be controlled by a separate flare permit, not the well drilling permit (NYSDEC, personal communication, July 6, 2010).
- *"There are annual maximums of 250 operation days for drilling engines, 20 operation days for hydraulic fracturing engines, and 30 days of flaring":* This describes the information that was provided for air modeling purposes and is not intended as limits. Moreover these are "pad" figures (i.e., 10 wells). Permits will be issued for individual wells (NYSDEC, personal communication, July 6, 2010).

Harvey Consulting's review goes on to state that there are other portions of the dSGEIS where limitations, recommendations, and possible scenarios are discussed and are inconsistent with or absent from the proposed permit conditions in Appendix 10. Alpha has not identified other inconsistencies.

3.2 Supporting Information

Harvey Consulting references the dSGEIS in this section.

3.3 Mitigation Measures

No mitigation measures are discussed. The main point of this section was to encourage new New York State regulations and to allege discrepancies in the dSGEIS.

3.4 Proposed SGEIS Revisions

Harvey Consulting's review points out five specific instances where there are discrepancies between the dSGEIS main text and Appendix 10. Four of these five issues are inappropriate for permit conditions as discussed in Section 3.1, above. Alpha recommends that the NYSDEC consider a statement in Appendix 10 for clarification that *no diesel-based fracture fluid may be used* for hydrofracturing gas formations in NYS.

3.5 List of References

NYSDEC, September 2009, *DRAFT Supplemental Generic Environmental Impact Statement On The Oil, Gas and Solution Mining Regulatory Program*.

4.0 COMMENTS ON DRILLING MUD COMPOSITION AND DRILLING WASTE DISPOSAL

Pages 9 – 13:

Harvey Consulting has commented on the need for regulation revisions to specifically address drilling mud and drilling waste. The report states "New York State regulations should be revised to acknowledge and mitigate drilling mud pollution impacts, minimize drilling waste generation, limit heavy metal and NORM (Naturally Occurring Radioactive Material) content, and establish best practices for collection, treatment and disposal of drilling waste." The review includes the several more specific recommendations about drilling mud composition and waste disposal as summarized below.

Current NYS regulation 6 NYCRR §554.1(c)(1) states that drilling muds are not considered polluting fluids. The 1992 GEIS allows drill cuttings to be buried onsite, and the dSGEIS does not address the potential impact.

Drilling muds commonly contain barite which contains mercury (1-10 ppm) (www.fossil.energy.gov) and may also contain cadmium. NYSDEC has not set limits on the heavy metal content of drilling mud, and New York State regulations do not address how to dispose of drill cuttings containing NORM. The dSGEIS proposes permit conditions requiring a disposal plan pursuant to 6 NYCRR §554.1(c)(1) and explains that NYS solid waste management regulations (6 NYCRR Chapter IV, Subchapter B) provide the state authority to establish standards and criteria for solid waste management operations. Harvey Consulting contends that NYSDEC's disposal plan standards and best management practices for handling drilling waste, however, are not clearly stated in the dSGEIS.

The review by Harvey Consulting recommends that the dSGEIS analyze the following practices and construct guidelines to minimize adverse environmental impacts:

- Waste minimization (recycling and reusing drilling mud);
- Use of drilling mud additives with lower impacts;
- Reuse of uncontaminated drilling wastes;
- Use of closed-loop tank systems compared to use of reserve pits;
- Burial (landfills or reserve pits);
- Commercial treatment and disposal facilities; and
- Underground injection.

Harvey Consulting's recommended best management practice for most applications includes a combination of waste minimization, using low impact additives, collecting waste in a closed-loop system, pumping waste to a cuttings reinjection unit, and disposing the waste into a disposal well by deep well injection. Harvey Consulting suggests NYSDEC should thoroughly analyze each situation and location to develop the best site-specific best management practices.

4.1 Accuracy and Completeness

Harvey Consulting's comments concerning the composition and handling of drilling mud and drilling waste appear to have some merit. Per 6 NYCRR §554.1 (C)(1) drilling muds are not considered polluting fluids, however the presence of mercury and cadmium in barite composed drilling muds may be cause for concern given the quantity of drilling mud that would be required to drill each well.

NYSDEC regulations do not clearly define the treatment or disposal of drilling waste and any best management practices concerning their handling, and/or recycling are not clearly outlined in the dSGEIS as documented by Harvey Consulting. Section 5.13 of the dSGEIS covers waste disposal, however it is general in its scope and does not outline any best management practices concerning the recycling, treatment, or disposal of drilling waste.

4.2 Supporting Information

Harvey Consulting's research and comments on the make-up, handling, recycling, and disposal of drilling mud used in the process of natural gas well drilling is supported by various government agency documents. Sources include information from the U.S. Department of Energy, U.S. Department of the Interior, and the U.S. Environmental Protection Agency.

4.3 Mitigation Measures

Harvey Consulting's review recommends that the dSGEIS include best management practices concerning the type and handling of drilling mud and the subsequent waste byproducts. It suggests that NYSDEC should determine which drilling fluid composition

and disposal methods are best practices for various scenarios. Alpha agrees that the proposed measures seem reasonable and would serve to protect the public, environment, and the drilling applicant.

The proposed best management practices are:

- Recycling and reuse of drilling mud where appropriate;
- Use of drilling mud additives with lower (mercury and cadmium) impacts;
- Use of closed-loop tank systems rather than using reserve pits;
- Burial (for air and freshwater drilling techniques);
- Commercial treatment and disposal facilities; and
- Underground injection (where applicable).

4.4 Proposed SGEIS Revisions

Alpha suggests that the dSGEIS could be improved by clarifying Sections 5.2.3 (Drilling Mud), 5.13 (Waste Disposal), and 7.1.9 (Solids Disposal). Changes could include recommendations for drilling mud selection and best management practices for the handling of drilling mud and drilling waste.

4.5 List of References

6 NYCRR §554.1 (c) (1)

Harvey Consulting, LLC., December 28, 2009, *Review of dSGEIS and Identification of Best Technology and Best Practice Recommendations*, Prepared for the Natural Resources Defense Council (NRDC).

NYSDEC, September 2009, *DRAFT Supplemental Generic Environmental Impact Statement On The Oil, Gas and Solution Mining Regulatory Program*.

5.0 COMMENTS ON THE DISPOSAL OF DRILLING & PRODUCTION WASTE & EQUIPMENT CONTAINING NORM

Pages 13 – 16:

Harvey Consulting comments on this topic include two recommendations. They are that NYSDEC should adopt regulations:

- to establish best practices for the collection, treatment and disposal of drilling and production wastes and equipment containing NORM; and

- prohibiting the disposal of Marcellus Shale gas wastewater containing NORM through land or road applications.

The Harvey report also contains the following information and statements:

> The Marcellus Shale contains Uranium-238 and Radium-226. The produced water will be rich in chloride which will increase the solubility of other elements, including radioactive materials. The dSGEIS requires that produced water be tested for NORM and that produced water be disposed, recycled, or reused. The dSGEIS discusses water disposal options, including injection wells, treatment plants, and road spreading, but the dSGEIS does not clearly state what NYSDEC considers to be the best waste management practice for safe disposal or what the pollutant thresholds, disposal limits or treatment requirements will be for produced water or flowback. The dSGEIS also acknowledges that NORM scale and sludge can build up in equipment, but does not propose how the NORM-contaminated residues should be cleaned, handled, and disposed.

Harvey Consulting points out that the EPA's website states that TENORM (Technologically Enhanced NORM) in produced water that is stored in lined or earthen pits will concentrate in the sludge or residual salts. The EPA also states that no added radiological risks appear to be associated with disposal by deep well injection if the produced water is returned to the same formation from which it was derived at the same or lower NORM concentration.

The review by Harvey Consulting recommends that NYSDEC analyze the following practices and determine which are best suited to the scenarios and locations addressed by the dSGEIS:

- NORM testing for all materials produced from a gas well, used in stimulation, and built up in equipment;
- NORM testing of equipment scrap metal, cleaning prior to smelting, and installing pollution control devices in smelter stacks;
- Reinjection of produced water;
- Treatment and disposal by a licensed NORM disposal facility; and
- Collection and transportation of waste for disposal in a salt dome.

5.1 Accuracy and Completeness

Harvey Consulting's first two recommendations on this topic involve NYS adopting new regulations. It is not necessary to establish new regulations to enforce preventative measures and best management practices. This is discussed in detail in sections 1.0, 3.0, and 3.1.

Harvey Consulting's recommendation to analyze practices for NORM testing, NORM treatment, and NORM disposal appears to be complete and well-researched. The review

presents a concise analysis of practices involving the testing for and the treatment and disposal of NORM.

It is apparent that NYSDEC has completed an initial analysis of the practices listed in the previous section. Alpha recommends that the NYSDEC consider including treatment and disposal requirements in the dSGEIS based on the outcome of the analyses. It would be useful if the permit conditions specify limits and thresholds for laboratory results. NYSDEC addresses the NORM issue by initially using the existing regulations for the handling of radioactive material handling (State Sanitary Code, 10 NYCRR 16; Industrial Code, 12 NYCRR 38; NYSDEC 6 NYCRR Part 380; and 6 NYCRR Part 360) and putting in place various approvals that need to be granted before NORM can be treated or disposed. NYSDEC intends to assess the variability of NORM content in the Marcellus across NYS using samples and analyses from initial Marcellus development operations and to use these data to determine whether additional mitigation is needed to protect the environment and public health (dSGEIS, p. 7-102). Alpha suggests that NYSDEC consider having temporary guidelines regarding NORM in place, to clarify expectations and requirements for operators prior to the commencement of operations. This also would be helpful to operators for the design of disposal plans.

NYSDEC has acknowledged that the State of Louisiana has one of the most comprehensive NORM regulatory programs, including "the identification, use, possession, transport, storage, transfer, decontamination, and disposal of oil and gas NORM to address the protection of human health and environment" (dSGEIS, page 7-98). Texas has also developed comprehensive NORM regulatory programs. These extensive state programs are useful models for managing NORM-related issues.

5.2 Supporting Information

Harvey Consulting's review of the dSGEIS's content regarding NORM is supported by a range of reliable sources. References include the EPA's website, USGS fact sheets, Texas Railroad Commission regulations, and a publication by Argonne National Laboratory.

5.3 Mitigation Measures

Harvey Consulting asserts that:

> *Produced water containing NORM should <u>not</u> be used for road spreading. Produced water, containing NORM, should be returned to the subsurface formation from which it came, or should be handled at an approved waste treatment plant.*

5.4 Proposed SGEIS Revisions

Alpha suggests that it may be useful to operators if the SGEIS includes NYSDEC's detailed analyses of NORM testing, treatment, transportation, and disposal. This information may prove useful to the operator for developing handling and disposal plans.

Alpha suggests that NYSDEC consider having temporary guidelines regarding NORM in place, to clarify expectations and requirements for operators prior to the commencement of operations. This also would be helpful to operators for the design of handling and disposal plans.

5.5 List of References

The references used include the dSGEIS and Harvey Consulting's review.

6.0 COMMENTS ON CASING AND CEMENTING REQUIREMENTS

Pages 16 – 17:

Harvey Consulting's only comment on this topic is that NYS should develop casing and cementing regulations specific to Marcellus Shale gas reservoir development, addressing high-angle construction, drinking water protection, and high-volume fracturing. NYS has casing and cementing requirements and fresh water aquifer supplementary permit conditions, but Harvey Consulting contends both should be codified in regulations.

6.1 Accuracy and Completeness

While wellbore construction is addressed in the existing GEIS, some enhancements to well construction are proposed in the dSGEIS because of the high pressures exerted during hydraulic fracturing. The amended casing and cementing requirements are outlined in Section 7.1.4.2 (Sufficiency of As-Built Wellbore Construction) of the dSGEIS. These requirements are repeated in Appendix 10 (p. ci). Appendix 8 of the dSGEIS is *Casing & Cementing Practices Required for All Wells in NY*. These requirements are attached as permit conditions to every permit issued (Sanford, K.; June 10, 2010; personal communication). NYSDEC's current well permit form requires submission of a casing and cementing plan with every well permit application as follows:

> On attached sheet give details for each proposed casing string and cement job including but not limited to: Bit size, casing size, casing weight and grade, TVD and TMD of casing set, scratchers, centralizers, cement baskets, sacks of cement, cement additives with percentages or pounds per sack, estimated TVD and TMD of top of cement, estimated amount of excess cement and waiting-on-cement time (Sanford, K.; June10, 2010; personal communication).

The proposed casing and cement plan is subject to NYSDEC review before a permit is issued.

Gas migration is discussed in the original GEIS in chapters 9, 10, and 16. It is discussed as a potential impact in the dSGEIS on pages 6-35 through 6-36. The mitigation of gas migration is thoroughly discussed on pages 7-44 through 7-48, including the stringent requirements for casing and cementing wells that will be stimulated through high-volume hydraulic fracturing in the vicinities of primary and principal aquifers.

Harvey Consulting suggests that NYSDEC revise the NYS oil and gas regulations to specifically address new casing and cementing practices and fresh water aquifer supplementary permit conditions. The purpose of the SGEIS, however, is not to revise regulations. The purpose of the Proposed Supplementary Permit Conditions for shale gas activities is to customize the existing regulations and guideline framework to fit new and changing industry, relieving the need for frequent regulatory changes. Permit conditions must be met by the party seeking a permit for a proposed action, so whether or not the permit conditions are included in the New York State regulations is irrelevant.

6.2 Supporting Information

Harvey Consulting cites their report (New York State (NYS) Casing Regulation Recommendations) prepared for the Natural Resources Defense Council (NRDC). This report includes specific recommendations for the casing and cementing of wells drilled in NYS. Many of these recommendations are already covered in the dSGEIS.

6.3 Mitigation Measures

Harvey Consulting suggests that casing and cementing regulations should be developed specific to Marcellus Shale gas reservoir development. While NYS has not codified casing and cementing regulations, they have already been outlined in the GEIS and dSGEIS specific to natural gas well construction and development. Regardless, the purpose of the SGEIS is not to revise regulations.

6.4 Proposed SGEIS Revisions

No revisions to the SGEIS were proposed by Harvey Consulting, although it is suggested that casing and cementing regulations be codified specifically for development of the Marcellus Shale. It is Alpha's opinion that the SGEIS adequately addresses casing and cementing requirements for the Marcellus Shale and other low permeability gas reservoirs. NYSDEC's requirement for submitting a casing and cementing plant with each permit application allows complete control of casing and cementing requirements on a well by well basis.

6.5 List of References

Harvey Consulting, LLC., December 28, 2009, *Review of dSGEIS and Identification of Best Technology and Best Practice Recommendations,* Prepared for the Natural Resources Defense Council (NRDC).

Harvey Consulting LLC., September 16, 2009, *New York State (NYS) Casing Regulation Recommendations*, Prepared for the Natural Resources Defense Council (NRDC).

NRDC, December 15, 2008 – not found.

NYSDEC, January 1988. *Draft Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program, Volume I.* http://www.dec.ny.gov/docs/materials_minerals_pdf/dgeisv1ch9.pdf

NYSDEC, July 1992, *Final Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program.*

NYSDEC, September 2009, *DRAFT Supplemental Generic Environmental Impact Statement On The Oil, Gas and Solution Mining Regulatory Program*.

Sanford, K.; June10, 2010. NYSDEC; personal communication.

7.0 COMMENTS ON FLARING, VENTING, AND FUGITIVE EMISSIONS

Pages 17 – 19:

Harvey Consulting also states that NYSDEC should develop regulations to restrict flaring, venting, and fugitive emissions to the lowest possible levels necessary for safety or if there is no safety concern, to the lowest technically feasible levels.

Harvey Consulting contends flaring should be used only during drilling, completion, and testing when processing and pipeline systems are not installed and during periods of equipment malfunction.

During gas production, venting may be necessary during high pressure gas buildup. Continuous venting and flaring at a gas facility is sometimes used for waste and gaseous by-product stream disposal if conservation is uneconomical. Venting or flaring might also be necessary during depressurization, compressor starts, maintenance and inspection, pipeline tie-ins, pigging, sampling, and pipeline hydrate removal.

Harvey Consulting recommends that NYSDEC institute the following best practices for flaring:

- Install a reliable flare system to minimize the risk of flare pilot blowout;

- Use sufficient flare exit velocity or install wind guards;
- Use a reliable ignition system;
- Use a suitable liquid separation system to minimize liquid carryover and entrainment in the gas flare stream; and
- Maximize combustion efficiency by optimizing the fuel and air mix.

Harvey Consulting recommends the following best practices for venting and fugitive emissions:

- Leak Detection and Repair programs;
- Use of low bleed pneumatic instruments, instrument air, and electric or solar powered control devices;
- Use of dry, centrifugal, compressor seals;
- Use of smart automation plunger lifts for liquid unloading;
- Early pipeline installation; and
- Use of Reduced Emission Completion (REC) methods for gas well completions.

7.1 Accuracy and Completeness

Harvey Consulting's first recommendation on this topic involves NYS adopting new regulations. It is not necessary to establish new regulations to enforce preventative measures and best management practices. This is discussed in detail in sections 1.0, 3.0, and 3.1.

Harvey Consulting's review of the dSGEIS on the topics of flaring, venting, and fugitive emissions is accurate and complete. The purpose of the SGEIS, however, is to address issues that are specific to well permit issuance for horizontal drilling and high volume hydraulic fracturing to develop low-permeability gas reservoirs and are not covered by the GEIS or its findings statement. The dSGEIS addresses flaring, venting, and fugitive emissions for the purpose of the air quality impact assessment. NYSDEC's Division of Air Resources (DAR) conducted a modeling assessment to determine possible air permitting requirements for operational scenarios specific to multi-well horizontal drilling and hydraulic fracturing (dSGEIS, p. 6-57). The DEC also estimated greenhouse gas emissions. Modeling for the air quality impact assessment demonstrated that venting caused a hydrogen sulfide level above the one-hour guideline concentration only if the stack height was less than 30 feet. No other non-criteria pollutants exceeded the guidelines. The dSGEIS addresses greenhouse gas emissions mitigation by suggesting best management practices, such as flaring methane instead of venting whenever possible, limiting flaring during flowback by using reduced emissions completions equipment, and implementing USEPA's Natural Gas STAR Best Management Practices (dSGEIS, pages 7-93 and 7-94).

Flaring and venting are used in all types of oil and gas production. They are part of the air quality impact assessment, but they do not pose impacts unique to horizontal drilling and

high-volume hydraulic fracture stimulation. Harvey Consulting's recommended best practices for flaring and for venting and fugitive emissions are well-researched, but they are not part of the scope of the SGEIS.

7.2 Supporting Information

Harvey Consulting's references include a guidance document on flaring and venting from the Global Gas Flaring Reduction Partnership (GGFR), a guidance document by GGFR and World Bank, the USEPA website, a USEPA fact sheet, and a document from Producers Technology Transfer Workshop.

7.3 Mitigation Measures

Harvey Consulting's recommended Best Management Practices (BMPs) for flaring and for venting and fugitive emissions will minimize air pollution and unintentional emissions. These BMPs are included as bulleted lists in section 7.0.

7.4 Proposed SGEIS Revisions

No revisions are proposed by Alpha to address Harvey Consulting's comment regarding flaring, venting, and fugitive emissions.

7.5 List of References

The references for this section include the dSGEIS and Harvey Consulting's review.

8.0 COMMENTS ON HYDROGEN SULFIDE

Page 19:

Harvey Consulting's recommends that NYSDEC adopt regulations requiring hydrogen sulfide detection and protection procedures for employees and the public during drilling and production. The dSGEIS proposed permit conditions require conformance to the American Petroleum Institute (API) Recommended Practice (RP) 49 for drilling and well servicing operations involving hydrogen sulfide. Harvey Consulting comments that compliance to API RP 55, which addresses oil and gas producing and gas processing plant operations involving hydrogen sulfide, should also be part of NYS's regulatory requirements.

The purpose of the dSGEIS is to identify potential environmental impacts from horizontal drilling and high volume hydrofracturing. The comments provided by Harvey Consulting

related to hydrogen sulfide pertain to potential hazards to human health. It is Alpha's understanding that public comments on the dSGEIS related to human health impacts will be addressed separately by the New York State Department of Health.

9.0 COMMENTS ON SEISMIC DATA COLLECTION

Page 19 – 20:

Harvey Consulting comments that NYSDEC should establish regulations for seismic investigation data collection that minimize impacts. Harvey Consulting recommends including the following in the new regulations:

- Prohibiting explosives and requiring less destructive methods;
- Acquiring data during winter months;
- Encouraging joint seismic surveys whenever possible;
- Minimizing equipment and crew sizes;
- Requiring the use of existing roads and utility easements whenever possible for data acquisition; and
- Requiring restoration after acquisition.

9.1 Accuracy and Completeness

Harvey Consulting's comments appear accurate, relatively complete, and seek to establish codified regulations regarding the collection of seismic data for oil and gas well prospecting. The purpose of the SGEIS is to identify potential environmental impacts from horizontal drilling and high volume hydrofracturing. Geophysical surveys are briefly covered in the dSGEIS under Section 4.5.1 as a short summary of the technique; however, these surveys are not regulated by NYSDEC unless they are conducted on NYSDEC land. Geophysical surveys for the purpose of oil and gas exploration, therefore, are beyond the scope of the SGEIS.

9.2 Supporting Information

Harvey Consulting cites only one reference in their comments on seismic data collection. The source is a book on exploration seismology copyrighted in 1995, and thus may not provide the most current or comprehensive industry practices or technology regarding the collection and interpretation of seismic data for oil and gas well prospecting.

9.3 Mitigation Measures

Harvey Consulting presents a list of proposed regulations in their comments to the NYSDEC. The list of mitigation measures is irrelevant because they relate to seismic data

collection activities that are beyond the scope of the SGEIS and are not regulated by NYSDEC.

9.4 Proposed SGEIS Revisions

Revisions to the SGEIS are not recommended by Alpha based on this comment by Harvey Consulting.

9.5 List of References

6 NYCRR

Harvey Consulting, LLC., December 28, 2009, *Review of dSGEIS and Identification of Best Technology and Best Practice Recommendations*, Prepared for the Natural Resources Defense Council (NRDC).

NYSDEC, July 1992, *Final Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program*.

NYSDEC, September 2009, *DRAFT Supplemental Generic Environmental Impact Statement On The Oil, Gas and Solution Mining Regulatory Program*.

10.0 COMMENTS ON CORROSION AND EROSION CONTROL

Page 20:

Harvey Consulting comments that NYSDEC regulations should require equipment to be designed to prevent corrosion and erosion, and require monitoring, repair, and replacement programs for gas wells.

10.1 Accuracy and Completeness

Harvey Consulting's comments regarding corrosion and erosion control of gas drilling equipment are brief and are mainly concerned with the addition of best management practices to New York State regulations that aim to provide guidance over gas well construction materials. The purpose of the SGEIS is not to revise regulations.

Well corrosion is covered in the SGEIS under Section 6.1.4.2 and 6.1.5.1. ICF International, under contract from NYSERDA, conducted an analysis of ground water contamination due to casing failure by corrosion and determined the probability of failure to be $2x10^{-8}$ (or, fewer than 1 in 50 million wells).

10.2 Supporting Information

Harvey Consulting's supporting information for their comments on corrosion and erosion control come from a journal article in the Pipeline and Gas Journal. This article, written by the CEO of Curran International (a pipeline coating supply company), provides an opinion on why surface coatings are important in industry. A third party scientific research article with less industry bias is needed to support Harvey Consulting's comments.

10.3 Mitigation Measures

Harvey Consulting recommends that the NYSDEC outline materials and best management practices for natural gas well corrosion and erosion control and codify these into New York State Regulations. The corrosion and erosion of well casings was researched by the NYSDEC and its consultants and is presented in the dSGEIS.

It is Alpha's opinion that current NYSDEC Regulations are sufficient, based on the calculation indication a less than 1 in 50 million chance of the well failing due to corrosion or erosion.

10.4 Proposed SGEIS Revisions

No revisions to the SGEIS are proposed by Alpha to address this comment by Harvey Consulting.

10.5 List of References

Curran, E., *Corrosion Control in Gas Pipelines, Coating Protection Provides a Lifetime of Prevention,* Pipeline & Gas Journal, October 2007. Article found online at, http://www.curranintl.com/articles/corrosion_control_gas_pipeline_systems.asp

Harvey Consulting, LLC., December 28, 2009, *Review of dSGEIS and Identification of Best Technology and Best Practice Recommendations,* Prepared for the Natural Resources Defense Council (NRDC).

ICF International, 2009. *Technical Assistance for the Draft Supplemental Generic EIS: Oil, Gas and Solution Mining Regulatory Program*. NYSERDA Agreement No. 9679.

NYSDEC, September 2009, *DRAFT Supplemental Generic Environmental Impact Statement On The Oil, Gas and Solution Mining Regulatory Program.*

11.0 COMMENTS ON SPILL PREVENTION

Pages 21 – 23:

Harvey Consulting asserts that the recommended mitigation measures and proposed permit conditions in the dSGEIS are insufficient environmental spill protection. Harvey Consulting contends that the NYSDEC should introduce regulations requiring more stringent oil spill prevention measures for temporary fuel tanks, incorporate existing EPA spill prevention standards for oil and gas activities, and make proposed mitigation measures enforceable.

11.1 Accuracy and Completeness

Harvey Consulting's comments regarding oil spill prevention measures are accurate and complete. They accurately describe NYSDEC definition on what constitutes a stationary and non-stationary oil tank and the conditions for any secondary containment measures that may be required. Harvey Consulting recommends that NYS should not classify oil storage tanks at natural gas well sites as non-stationary, and questions the rationale for doing so. They also suggest that NYSDEC regulations regarding oil spill prevention are weak, and should more closely mimic those set forth in federal regulations. The purpose of the SGEIS is not to revise regulations, and the topic of the SGEIS is the oil and gas well permitting program, not the bulk storage or spills programs. Harvey Consulting implies that there is an inherent risk to the environment from an oil spill based on current NYSDEC policy.

11.2 Supporting Information

Harvey Consulting references Federal Regulations regarding spill prevention that apply to oil/fuel storage tanks. The Regulation cited refers to 40 CFR § 112 (Oil Pollution Prevention), and more specifically 112.7(c) and 112.7(d). Harvey Consulting contrasts these Regulations with those of New York State. They suggest that current New York State regulations are not as comprehensive as Federal Regulations, and are insufficient to protect the environment from oil spills.

Harvey Consulting alleges that New York State has deficient oil spill prevention measures in the following three areas:

1. The dSGEIS only "encourages" operators to set tanks 500' back from water bodies, and that this is "not enforceable".
2. NYSDEC's proposed mitigation only requires secondary containment for tanks 10,000 gallons or larger placed within 500' of a water body, and that this Regulation provides "less spill protection than EPA's standard".
3. NYDSDEC's proposed mitigation measures reference an unenforceable draft NYSDEC Program Policy document (DER-17) for construction standards and an outdated September 28, 1994 Spill Prevention Operations Technology Series

(SPOTS) memo for guidance on how a secondary containment could be constructed.

In response to Harvey Consulting's comments:

1. The NYSDEC will require an Environmental Assessment Form (EAF) Addendum to be completed before any high-volume hydraulic fracturing is conducted which will include information regarding the capacity and planned well pad loacation of rig fuel tanks and distance to any primary or principal aquifer, public or private water well, domestic-supply spring, reservoir, reservoir stem, controlled lake, watercourse, perennial or intermittent stream, storm drain, wetland, lake or pond within 500 feet of the proposed location. The NYSDEC will make final judgment on fuel tank location and containment measures upon review of the EAF Addendum and all other permit application materials.
2. Federal Regulations set forth in 40 CFR 112 apply to **stationary** tanks greater than 1,320 gallons. The NYSDEC has deemed that fuel/oil tanks used during natural gas well drilling operations are **non-stationary**. These tanks are exempt from petroleum bulk storage regulations and tank registration requirements because of their non-stationary designation. Tanks smaller than 10,000 gallons only require secondary containment if they could "reasonably be expected to discharge petroleum to the waters of the State".
3. Both DER-17 and SPOTS Memo #10 adequately define NYSDEC's requirements for secondary containment, its inspection, and its certification. The NYSDEC generally uses these documents to guide pertinent, related activities throughout the state despite their draft status.

11.3 Mitigation Measures

Harvey Consulting proposes the following mitigation measures for oil spill prevention in NYS:

1. NYS secondary containment standards, inspection standards, and integrity standards (of 6 NYCRR § 613-614) should be applied to all fuel tanks of at least 1,100 gallons used to explore or develop gas reservoirs in NYS.
2. The use of vaulted, self-diked, or double-walled portable tanks should be considered in situations where secondary containment methods are deemed infeasible or inappropriate.
3. Inspections should be routinely performed on vaulted, self-diked, and double-walled portable tanks to identify damage or corrosion (using API 653 or STI SP001).
4. Required usage of high-liquid-level alarms and automatic pump shutoff devices for stationary and portable tanks.

NYSDEC has proven, effective, and adequate spill prevention measures in place to ensure the protection of New York's water supplies, including the GEIS, dSGEIS, SPOTS #10, and the DER-17.

11.4 Proposed SGEIS Revisions

Alpha recommends no revisions to the SGEIS based on the comprehensive and proven-effective petroleum spill and storage regulations in New York.

11.5 List of References

40 CFR § 112

6 NYCRR, Part 612, 613, 614

Harvey Consulting, LLC., December 28, 2009, *Review of dSGEIS and Identification of Best Technology and Best Practice Recommendations*, Prepared for the Natural Resources Defense Council (NRDC).

NYSDEC, September 1994, *Spill Prevention Operations Technology Series (SPOTS) Memo #10, Secondary Containment Systems for Aboveground Storage Tanks.*

NYSDEC, September 2008, DRAFT DER-17: *Guidelines for Inspecting and Certifying Secondary Containment Systems of Aboveground Petroleum Storage Tanks at Major Oil Storage Facilities*.

NYSDEC, September 2009, *DRAFT Supplemental Generic Environmental Impact Statement On The Oil, Gas and Solution Mining Regulatory Program*.

12.0 COMMENTS ON SPILL RESPONSE

Page 23:

Harvey Consulting comments that New York State should adopt EPA Spill Prevention Control and Countermeasures (SPCC) requirements for drilling operations or requirements that are more stringent than the EPA standards. EPA regulations (40 CFR § 112) require a SPCC Plan for fuel storage volumes of 1320 gallons or greater.

12.1 Accuracy and Completeness

Harvey Consulting's comments regarding preventative measures for hazardous spill protection in NYS are limited to the need for a response team and employee training. They

state that Federal Regulations are more thorough and require a Spill Prevention Control and Countermeasures (SPCC) Plan for tank storage of 1,320 gallons or more. This comment appears to be accurate and reasonably complete; however, the NYSDEC provides for spill protection via its Spill Prevention and Response Program. Part of this program is the requirement of a Storm Water Pollution Prevention Plan (SWPPP) which is outlined in Section 7.1.2 of the dSGEIS.

The basic elements of the SWPPP include:

1. A map and description of the natural and constructed features at a site. A basic site map may be generated using an internet mapping site, but a hand-drawn map is also acceptable.
2. A description of the activities being conducted at the facility.
3. The identification and location of potential sources of contamination of stormwater.
4. Drainage areas and direction of flow of stormwater.
5. Location(s) of place(s) where stormwater is discharged off-site (outfalls).
6. Structural and non-structural Best Management Practices (BMPs) used to treat, divert or contain contaminated stormwater to prevent discharge of pollutants to surface water.
7. Monitoring and reporting requirements that apply to the facility.
8. Identification of the individuals or positions responsible for implementation of the Stormwater Pollution Prevention Plan.

12.2 Supporting Information

Harvey Consulting contrasts the dSGEIS with Federal Regulations under 40 CFR § 112. They state that the NYSDEC only "recommends" a spill response team and employee training for spill prevention; however nowhere in the dSGEIS is this practice described as being "recommended". New York State requires spill prevention and control measures in the form of the SWPPP, which is proven to be effective.

12.3 Mitigation Measures

Harvey Consulting recommends altering the dSGEIS to more closely resemble Federal Regulations for pollution protection.

It is Alpha's opinion that New York already has sufficient pollution protection plans in place, in the form of the SWPPP, GEIS, and SGEIS.

12.4 Proposed SGEIS Revisions

Alpha proposes no revisions to the SGEIS based on the effective protections offered by existing New York State regulations.

12.5 List of References

40 CFR § 112

Harvey Consulting, LLC., December 28, 2009, *Review of dSGEIS and Identification of Best Technology and Best Practice Recommendations*, Prepared for the Natural Resources Defense Council (NRDC).

NYSDEC, July 1992, *Final Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program*.

NYSDEC, September 2009, *DRAFT Supplemental Generic Environmental Impact Statement On The Oil, Gas and Solution Mining Regulatory Program*.

13.0 COMMENTS ON FUEL SELECTION

Page 23:

Harvey Consulting comments that NYSDEC should require the use of fuels that are cleaner than diesel, or use electric power whenever possible.

13.1 Accuracy and Completeness

Harvey Consulting states that the dSGEIS is "based on the use of large quantities of diesel fuel to power onsite equipment, without the consideration of alternative cleaner energy sources". This statement is not entirely accurate. These measures are outlined in Sections 7.5 and 7.6 of the dSGEIS (Protecting Air Quality and Mitigating Greenhouse Gas Emissions, respectively), which are devoted to exhaust gas mitigation measures. The comment that alternative energy sources are cleaner ignores the environmental impacts and emissions associated with alternative energy sources. For example, electricity may be a clean energy source at its point of use, but much electricity is generated by coal-burning power plants that are recognized as major sources of green house gases, particulates and NO_X emission. The comment and analysis is incomplete on this basis.

13.2 Supporting Information

Two references are cited in Harvey Consulting's comments concerning fuel selection. They reference information found on www.naturalgas.org and a 2005 EnCana Annual Report. These references suggest that better options exist for the type of fuel used in drilling rigs, namely in the form of natural gas.

13.3 Mitigation Measures

Harvey Consulting recommends that the NYSDEC should require operators to use cleaner fuels than diesel (such as natural gas) or electric power whenever technically feasible. The NYSDEC provides recommendations for measures to mitigate exhaust gas emissions in Sections 7.5 and 7.6 of the dSGEIS.

13.4 Proposed SGEIS Revisions

No revisions to the SGEIS are proposed by Alpha because the dSGEIS adequately addresses measures to mitigation emissions and because the comment is neither accurate nor complete.

13.5 List of References

EnCana 2005 Annual Report.

Harvey Consulting, LLC., December 28, 2009, *Review of dSGEIS and Identification of Best Technology and Best Practice Recommendations,* Prepared for the Natural Resources Defense Council (NRDC).

Naturalgas.org; www.naturalgas.org

NYSDEC, September 2009, *DRAFT Supplemental Generic Environmental Impact Statement On The Oil, Gas and Solution Mining Regulatory Program*.

14.0 COMMENTS ON HYDRAULIC FRACTURE DESIGN AND MONITORING

Pages 24 – 30:

Harvey Consulting contends that NYSDEC should revise regulations to specify best technology and practices to collect data, model, design, implement and monitor a fracture treatment, including that all data must be reported to the state and be available to the public. According to Harvey Consulting, best technology and best practices should include (p. 24):

- Collecting data for a reservoir model;
- Marcellus Shale 3D modeling for fracture treatment design;
- Fracture modeling before each treatment to contain fracturing in the Marcellus Shale Formation;

- Fracture treatment monitoring for leaks or out of zone fractures;
- Fracture Testing: Analyzing small fracture treatment performance in deepest, thickest Marcellus Shale zones for data and experience;
- Using experience from fracture testing (above) to design and implement larger treatments (allowing increasingly thinner and shallower fracture intervals if safe);
- Documenting, reporting and remediating fracture treatment failures to protect drinking water; and
- Using a conservative, step-wise approach: collecting data, to support high-volume fracture treatments that protect the environment instead of a "blanket" permitting program allowing fracturing at all depths and all thickness intervals.

Harvey Consulting asserts that NYS regulatory requirements are necessary to ensure the best practices listed above are enacted and mitigation is refined. They acknowledge that proposed permit conditions listed in Appendix 10 require a pre-fracture treatment checklist and certification, which is presented in Appendix 20 (p. 28).

Harvey Consulting contends that NYSDEC should require operators to perform fracture modeling and monitoring; however Harvey Consulting also comments that NYSDEC could develop a Marcellus Shale fracture model to be used as a standard for all operators, or could require operators to fund the development of a model (p. 28).

Harvey Consulting discusses the technology available to evaluate fracture growth. They contend NYSDEC should require the minifracture treatments at every site prior to high-volume fracturing (p. 28).

Harvey Consulting also comments that NYSDEC also needs to technically justify the proposed minimum 1000' vertical offset from drinking water aquifers with field data, 3D modeling, and hydrological assessment. They also contend NYSDEC should clearly state the vertical offset needed to protect drinking water in New York State regulations once the vertical offset is technically justified (page 29).

14.1 Accuracy and Completeness

Harvey Consulting's assessment of the dSGEIS' discussion of hydraulic fracture design and monitoring is thorough. Harvey Consulting has suggested that NYSDEC add regulations to specifically address shale gas exploration, development, and production. The purpose of the SGEIS, however, is not to revise regulations. The purpose of the Proposed Supplementary Permit Conditions for shale gas activities is to customize the existing regulations and guideline framework to fit new and changing industry, relieving the need for frequent regulatory changes. Permit conditions must be met by the party seeking a permit for a proposed action. Harvey Consulting acknowledges that some of

their suggestions are covered by permit conditions. NYSDEC already requires operators to collect certain data and make it available to NYSDEC.

Harvey Consulting appears to suggest contradictory procedures by contending that NYSDEC should require operators to perform fracture modeling and monitoring while also suggesting that NYSDEC could develop a Marcellus Shale fracture model to be used as a standard for all operators. Requiring every operator to perform fracture modeling would be cost prohibitive and redundant. The idea of having a rock mechanics expert develop a model that is collaboratively funded by operators seems reasonable at an academic level; however, much proprietary information likely would need to be released raising substantial challenges and issues to develop such a model/program. It is Alpha's opinion that such a program is unrealistic and unimplementable.

Requiring every operator to perform fracture modeling and minifracture treatment at every location, including locations that have been thoroughly modeled and assessed, would be extremely costly compared to the technical value. Modeling requirements and minifracture assessments would be better handled through site-specific permit conditions. Modeling and treatment requirements could be included as permit conditions at the start of Marcellus Shale Gas development and re-evaluated as needed.

Fracture monitoring is required by the Proposed Supplementary Permit Conditions in Appendix 10 (#33 and #34). Permit Condition #34 requires operators to make and maintain a complete record of every hydraulic fracturing operation through the flowback phase. A synopsis of the operation must be provided on the *Well Drilling and Completion Report*. The NYSDEC could consider specifying in this permit condition that operators must document, report, and remediate fracture treatment failures immediately to protect drinking water.

Harvey Consulting's comments about using a conservative, step-wise approach; using experience from fracture testing to design and implement larger treatments (allowing increasingly thinner and shallower fracture intervals if safe); collecting data, modeling, monitoring, and testing are all useful. Some are included in the dSGEIS as permit conditions. Operators/applicants likely will implement some or all of these measures as exploratory techniques and NYSDEC could consider all of these ideas for permit conditions for the first wells in any area. Some of these permit conditions will be able to be omitted as the knowledge of the Marcellus Shale increases.

14.2 Supporting Information

Harvey Consulting has thoroughly documented its discussion of hydraulic fracture design and monitoring, citing professional journal articles, professional conference papers, technical guidance documents, and consultant reports.

14.3 Mitigation Measures

Harvey Consulting's list of best technology and best practices is included in Section 14.0 (above) and in Section 13 of Harvey Consulting's report. These measures are all suggested to prevent the degradation of underground drinking water supplies.

14.4 Proposed SGEIS Revisions

Harvey Consulting's ideas should be considered for inclusion in the dSGEIS as possible permit conditions, especially for the first wells drilled in an area.

14.5 List of References

Harvey Consulting, LLC., December 28, 2009, *Review of dSGEIS and Identification of Best Technology and Best Practice Recommendations*, Prepared for the Natural Resources Defense Council (NRDC).

15.0 COMMENTS ON HYDRAULIC FRACTURE TREATMENT ADDITIVE LIMITATIONS

Pages 30 – 31:

Harvey Consulting asserts that New York State regulations should identify the type, volume, and concentrations of additives used in hydraulic fracturing treatments in order to protect health and the environment. They should also develop a list of prohibited additives and prohibit toxic materials to the extent possible. Harvey Consulting comments that many governments have adopted the Olso-Paris Convention PLONOR (Pose Little or No Risk) list of environmentally friendly chemicals for screening drilling and stimulation chemicals.

15.1 Accuracy and Completeness

Harvey Consulting's comments regarding hydraulic fracture treatment additives are mostly accurate and complete. New York State regulations do not specifically identify the volume or concentrations of additives that can be used during the hydraulic fracturing process (this information is proprietary). However, the NYSDEC, NYSDOH, and various independent consulting firms have reviewed extensive lists of the chemical additives in use by well drillers. Chemicals that have been identified for use in hydraulic fracturing, are included in the dSGEIS in Section 5.4 (Fracturing Fluid) listed in Table 5-3, and Table 5-4. Chemicals not listed in these tables may require that additional information to be provided by an applicant before they are used in hydraulic fracturing operations in New York State.

15.2 Supporting Information

Harvey Consulting provides no technical references other than the dSGEIS.

15.3 Mitigation Measures

Harvey Consulting recommends that New York State regulations should identify:

1. The type of additive used in hydraulic fracturing
2. The volume of additive used in hydraulic fracturing
3. The concentration of additive used in hydraulic fracturing

They also recommend that New York State regulations list additives that are prohibited during the hydraulic fracturing process and suggest that New York State adopt the Olso-Paris Convention (OSPAR) PLONOR (Pose Little Or No Risk to the marine environment) list of environmentally friendly chemicals for use during hydraulic fracture treatments.

15.4 Proposed SGEIS Revisions

Harvey Consulting does not propose any revisions to the SGEIS. They do however propose that NYS create new Regulations governing the type, volume, and concentration of hydraulic fracturing additives allowed during well development operations. The purpose of the SGEIS, however, is not to revise regulations.

Alpha Environmental suggests that the only revision to the SGEIS relative to this comment is that the intent of Table 5-3, and Table 5-4 be clarified.

15.5 List of References

References include the dSGEIS and Harvey Consulting's review.

16.0 COMMENTS ON HYDRAULIC FRACTURE FLUID FLOWBACK SURFACE IMPOUNDMENTS (AND HAZARDOUS AIR POLLUTANTS)

Pages 31 – 34:

Harvey Consulting states that surface impoundments should not be used for fracture fluid flowback. They recommend that New York State regulations require routing fracture fluid flowback to onsite treatment systems for fracture fluid recycling or collection of fracture fluid flowback in tanks for transportation to offsite treatment systems. Harvey Consulting contends that the dSGEIS does not clearly state what is required of operators and that the Bureau of Land Management recommends the use of closed loop tank systems whenever

possible. Harvey Consulting also alleges that surface impoundments have the potential to leak into the ground and emit hazardous air pollution.

Harvey Consulting also states that the dSGEIS should include how many fracture treatments are allowed over the life of a well and provide a worst case scenario for water use and waste disposal requirements based on this maximum; the dSGEIS is focused on the impacts of a single well treatment.

16.1 Accuracy and Completeness

Harvey Consulting's comments regarding hydraulic fracture fluid flowback surface impoundments and hazardous air pollutants are accurate and complete. Their comments regarding the use of flowback pits at hydraulic fracturing sites have merit; however, surface impoundments for the temporary storage of flowback fluids are extensively covered in the GEIS and dSGEIS (Sections 7.5.3.2, and 7.5.3).

Section 5.11.2 of the dSGEIS (Flowback Water Handling at the Wellsite) states, "…the Department proposes to require tanks for on-site (i.e., well pad) handling of flowback water unless additional compositional data is collected and provided on a site-specific basis to support an alternate proposal".

Also, Section 7.5.3.1 (Summary of Air Quality Impacts Mitigation - Well Pad) states, "…uncertainties relative to potential flowback water volume and composition have led the Department to propose that flowback water not be directed to an on-site reserve pit but instead be held on the well pad in tanks prior to shipment to a disposal, treatment or re-use location".

Additionally, Section 7.1.7.4 (Use of Tanks Instead of Impoundments for Centralized Flowback Water Storage) states, "Above ground storage tanks have some advantages over surface impoundments. The Department's experience is that landfill owners prefer above ground storage tanks over surface impoundments for storage of landfill leachate. Tanks, while initially are more expensive, experience fewer operational issues associated with liner system leakage. In addition, tanks can be easily covered to control odors and air emissions from the liquids being stored. Precipitation loading in a surface impoundment with a large surface area can, over time, increase the volumes of liquid needing treatment. Lastly, above ground tanks also can be dismantled and reused. The provisions of Section 360-6.3 address the minimum regulatory requirements applicable to above ground storage tanks which would be equally applicable for adequate flowback water containment as well".

Nonetheless, it may be worthwhile to review relevant portions of the dSGEIS to be sure that it offers a thorough and consistent explanation regarding circumstances under which surface impoundments or tanks for the temporary storage of flowback fluids are used at well site locations.

Harvey Consulting also recommends that the NYSDEC disclose how many times a well may be fracked over its operational lifetime, and provide a worst case scenario for water use and waste disposal requirements based on this scenario. This is not covered in the GEIS or dSGEIS, because there are many factors that affect the number of fracture treatments such as regional geology, natural gas recovery rates over time, and economics. It is unrealistic to predict the number of times a well will be refractured.

16.2 Supporting Information

Harvey Consulting has thoroughly documented their discussion of surface flowback impoundments and hazardous air pollutants, citing a professional journal article, technical guidance documents, consultant reports, and NYSDEC documents.

16.3 Mitigation Measures

Harvey Consulting recommends that surface impoundments for the temporary storage of flowback fluid not be used for hydraulic fracturing operations in New York State. Instead they recommend that New York State regulations require routing fracture fluid flowback to onsite treatment systems for fracture fluid recycling or collection of fracture fluid flowback in tanks for transportation to offsite treatment systems.

Harvey Consulting also states that the dSGEIS should include how many fracture treatments are allowed over the life of a well and provide a worst case scenario for water use and waste disposal requirements based on this maximum; the dSGEIS is focused on the impacts of a single well treatment.

16.4 Proposed SGEIS Revisions

Harvey Consulting proposes that the dSGEIS should include how many fracture treatments are allowed over the life of a well and provide a worst case scenario for water use and waste disposal requirements based on this maximum.

Harvey Consulting also recommends that New York State regulations require routing fracture fluid flowback to onsite treatment systems for fracture fluid recycling or collection of fracture fluid flowback in tanks for transportation to offsite treatment systems. The purpose of the SGEIS, however, is not to revise regulations.

It is Alpha’s opinion that the dSGEIS adequately addresses flowback surface impoundments and their use. Proposed use of impoundments not in conformance with the dSGEIS will be reviewed by the NYSDEC on a case by case basis.

16.5 List of References

Alpha Environmental Consultants Inc. 2009 September. *Technical Consulting Reports Prepared in Support of the Draft Supplemental Generic Environmental Impact Statement for Natural Gas Production in New York State*. Prepared for NYSERDA, Albany, NY.

Harvey Consulting, LLC., December 28, 2009, *Review of dSGEIS and Identification of Best Technology and Best Practice Recommendations*, Prepared for the Natural Resources Defense Council (NRDC).

NYSDEC, July 1992, *Final Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program*.

NYSDEC, September 2009, *DRAFT Supplemental Generic Environmental Impact Statement On The Oil, Gas and Solution Mining Regulatory Program*.

17.0 COMMENTS ON CHEMICAL TANK CONTAINMENT

Pages 34 – 35:

Harvey Consulting asserts that New York State regulations should require secondary containment or double-walled tanks for chemicals stored on the pad and that this requirement is not included in the permit conditions or regulations, but it was recommended by New York State's consultants.

17.1 Accuracy and Completeness

Harvey Consulting's comments regarding the requirements for secondary containment of chemicals stored onsite are not accurate. The requirement for secondary containment of fracturing chemicals can be found in the dSGEIS in Section 7.1.3 (Surface Spills and Releases at the Well Pad), Sub-Section 7.1.3.3 (Hydraulic Fracturing Additives).

The dSGEIS states, " Specific secondary containment requirements will be included in supplementary well permit conditions for high-volume hydraulic fracturing on a site-specific basis if the proposed location or operation raises a concern about potential liquid chemical releases that is not, in the Department's judgment, sufficiently addressed by the GEIS, the SGEIS, inherent mitigation factors and well pad setbacks.".

The dSGEIS continues, "…the Department may require the applicant to identify in application materials the anticipated maximum number, type, and volume of liquid fracturing additive containers to be simultaneously present onsite. This is in addition to the fluid disclosure requirements on the EAF Addendum. The Department will evaluate whether those containers could reasonably be anticipated to discharge to surface or ground water, if a spill occurred. The criteria for this evaluation will include consideration of factors such as the nature and classification of the liquid, qualitative soil permeability,

relative topographic position, engineered or designed containment controls, or other physical factors specific to the application".

Additionally, "Secondary containment requirements could include, as deemed appropriate, one or a combination of the following; dikes, liners, pads, holding ponds, impoundments, curbs, ditches, sumps, receiving tanks, or other equipment capable of containing the substance. The secondary containment should be sufficient to contain 110% of the single largest liquid chemical container within a common staging area." Also, "Supplementary well permit conditions will also require removal of hydraulic fracturing additives from the site if the site will be unattended".

Further, the dSGEIS states, "The comprehensive SWPPP that is required by the Department's MSGP (GP-0-06-002) will include Best Management Practices relative to additive containers, mixing and pumping, including, but not limited to, a combination of some or all of the following, or other equally protective practices:

1. Identification of a spill response team and employee training on proper spill prevention and response techniques;
2. Location of additive containers and transport, mixing and pumping equipment as follows:
    i. within secondary containment,
    ii. away from high traffic areas,
    iii. as far as is practical from surface waters,
    iv. not in contact with soil or standing water, and
    v. product and hazard labels not exposed to weathering;
3. Use of troughs, drip pads or drip pots under hose connections;
4. Inspection and preventative maintenance protocols for containers, pumping systems and piping systems, including manned monitoring points during additive transfer, mixing and pumping activities;
5. Protocols for ensuring that incompatible materials such as acids and bases are not held within the same containment area;
6. Procedures for notifying appropriate authorities in the event of a spill;
7. Procedures for immediately stopping the source of the spill and containing the liquid until cleanup is complete;
8. Maintenance of a running inventory of additive products present and used on-site;
9. Ready availability of appropriate spill containment and clean-up materials and equipment including absorbent material;
10. Disposal of cleanup materials in the same manner as the spilled material;
11. Use of dry cleanup methods and non-use of emulsifiers or dispersants;
12. Protocols for checking/testing stormwater in any secondary containment area prior to discharge;
13. Use of drip pads or pans where additives and fracturing fluid are transferred from containers to the blending unit, from the blending unit to the pumping equipment and from the pumping equipment to the well;
14. Use of spill and overflow protection devices,;
15. Use of diversion dikes, berms, curbing, grading or other equivalent measures to

minimize or eliminate run-on into additive holding, mixing and pumping areas
16. Availability of manual shutoff valves.

17.2 Supporting Information

Harvey Consulting cites information referenced from Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (also known as The Gold Book), A Bureau of Land Management Publication. According to the Bureau of Land Management website, this publication "was developed to assist operators by providing information on the requirements for obtaining permit approval and conducting environmentally responsible oil and gas operations on Federal lands and on private surface over Federal minerals". The NYSDEC has already outlined requirements for permit approval as described in section 17.1, above.

Harvey Consulting also references Alpha Environmental Consultants, Inc. September 2009 Report to the NYSDEC on the dSGEIS. Alpha provided recommendations to the NYSDEC regarding the bulk storage of fracturing chemicals on-site. Harvey Consulting inaccurately states that, "Alpha's recommendation does not materialize into a permit condition". However, this is not the case. Many of Alpha's recommendations were included in the dSGEIS, as described in section 17.1 above, and are subject to permit approval.

17.3 Mitigation Measures

Harvey Consulting states that the NYSDEC should "adopt regulations requiring secondary containment for chemicals stored on the well pad or, alternatively, the use of double-wall tanks". These measures are not necessary, as permit requirements are already defined in the dSGEIS in Section 7.1.3 (Surface Spills and Releases at the Well Pad), and Sub-Section 7.1.3.3 (Hydraulic Fracturing Additives).

17.4 Proposed SGEIS Revisions

Harvey Consulting recommends no revisions to the SGEIS at this time.

Instead, Harvey Consulting proposes that New York State regulations should require secondary containment or double-walled tanks for chemicals stored on the pad. The purpose of the SGEIS is not to revise regulations.

Alpha proposes no revisions to the SGEIS because the comment by Harvey Consulting on chemical tank containment is addressed by the dSGEIS and other New York State regulations.

17.5 List of References

Alpha Environmental Consultants Inc. 2009 September. *Technical Consulting Reports Prepared in Support of the Draft Supplemental Generic Environmental Impact Statement for Natural Gas Production in New York State*. Prepared for NYSERDA, Albany, NY.

Bureau of Land Management, *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development*, "The Gold Book", 2007.

Harvey Consulting, LLC., December 28, 2009, *Review of dSGEIS and Identification of Best Technology and Best Practice Recommendations*, Prepared for the Natural Resources Defense Council (NRDC).

NYSDEC, July 1992, *Final Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program*.

NYSDEC, September 2009, *DRAFT Supplemental Generic Environmental Impact Statement On The Oil, Gas and Solution Mining Regulatory Program*.

18.0 COMMENTS ON RESERVE PIT & IMPOUNDMENT LINER QUALITY

Pages 35 – 36:

Harvey Consulting states in their review of the dSGEIS that New York State regulations should require closed-loop tank systems unless technically infeasible. They recommend the following regulated requirements for situations in which reserve pits or impoundments are environmentally preferable:

- Impermeable, chemical-resistant liners;
- Limit the types of chemicals stored;
- Wildlife protection design standards; and
- Removal and restoration requirements

18.1 Accuracy and Completeness

Harvey Consulting's comments regarding the NYSDEC's requirements for closed-loop tank systems are not completely accurate. While NYSDEC does not require closed-loop tank systems for all hydraulic fracturing jobs, it does require closed-loop systems to be used in designated floodplain areas. These requirements are outlined in Section 7.1.12.2 (Setbacks from Surface Water Resources), and Section 7.2 (Protecting Floodplains) of the dSGEIS.

Harvey Consulting is also incorrect in their comments regarding NYSDEC pit liner specifications. The NYSDEC has thoroughly analyzed the use of reserve pits and impoundments used for drilling operations. Requirements for centralized flowback water impoundments will be based on 6 NYCRR Part 360. Requirements for pit construction and materials can be found in the GEIS in Chapter 9, Section H (Waste Handling and Disposal), and in the dSGEIS in Sections 7.1.3.2 (Supplementary Permit Conditions for Reserve Pits and Impoundments) and Section 7.1.7 (Centralized Flowback Water Surface Impoundments). Additionally Alpha Environmental Consultants, Inc. provided the NYSDEC with pit construction and liner recommendations. These recommendations can be found in the dSGEIS under Section 5.18.3.2.

18.2 Supporting Information

Harvey Consulting references a book published by the Bureau of Land Management, the Report to the NYSDEC on the dSGEIS by Alpha Environmental Consultants, Inc., the dSGEIS, and a paper published by the Society of Petroleum Engineering as the basis for their comments. Harvey Consulting has thoroughly documented their discussion of reserve pit and impoundment liner quality.

18.3 Mitigation Measures

Harvey Consulting's recommended mitigation measures are included in Section 18.0 of this narrative. These measures are suggested to prevent the degradation of drinking water supplies.

18.4 Proposed SGEIS Revisions

Harvey Consulting proposes no revisions to the SGEIS at this time. However, they state that New York State regulations should require closed-loop tank systems unless technically infeasible. They recommend the following regulatory requirements for situations in which reserve pits or impoundments are environmentally preferable:

- Impermeable, chemical-resistant liners;
- Limit the types of chemicals stored;
- Wildlife protection design standards; and
- Firm removal and restoration requirements

It is not the purpose of the SGEIS to revise New York State regulations on this basis, Alpha proposes no changes to the SGEIS at this time.

18.5 List of References

6 NYCRR § 360

Alpha Environmental Consultants Inc. 2009 September. *Technical Consulting Reports Prepared in Support of the Draft Supplemental Generic Environmental Impact Statement for Natural Gas Production in New York State*. Prepared for NYSERDA, Albany, NY.

Bureau of Land Management, *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development*, "The Gold Book", 2007.

Harvey Consulting, LLC., December 28, 2009, *Review of dSGEIS and Identification of Best Technology and Best Practice Recommendations*, Prepared for the Natural Resources Defense Council (NRDC).

NYSDEC, July 1992, *Final Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program.*

NYSDEC, September 2009, *DRAFT Supplemental Generic Environmental Impact Statement On The Oil, Gas and Solution Mining Regulatory Program.*

19.0 COMMENTS ON WELLBORE PLUGGING & ABANDONMENT REQUIREMENTS

Pages 36 – 37:

Harvey Consulting comments that regulations should clearly state *when* Marcellus Shale wells must be plugged and abandoned and that most states limit temporary abandonment to one year and require an integrity monitoring program. Harvey Consulting also comments that timely plugging and abandonment near drinking water sources and areas of high-volume fracture treatments is very important. The review states that:

> *…NYSDEC allows operators to shut-in wells or temporarily abandon wells without plugging, for what appears to be an indefinite time period. Historically, temporarily abandoned wells have been the source of environmental damage, because operators are not present to monitor wellbore integrity on a routine basis and wellbore infrastructure can corrode and erode, failing over time.*

19.1 Accuracy and Completeness

Harvey Consulting's comments regarding wellbore plugging and abandonment are not entirely correct. New York State regulations, permit requirements, and policies do not specify when, in the course of a well's lifetime, it must be plugged and abandoned. Harvey Consulting is correct in stressing the importance of timely plugging and

abandonment near drinking water sources and areas of high-volume fracture treatments, but setting a specific timeline to be enforced for all wells is neither practical nor necessary.

The offset quote at the end of Section 19.0 is incorrect. NYSDEC does *not* allow wells to be shut in or temporarily abandoned for indefinite time periods. As stated in 6 NYCRR Part 555.2 Shut-in Wells (emphasis added):

> *(a) It shall be unlawful for the owner or operator thereof to shut in a well capable of being produced on a commercial basis **for more than one year** without specific permission from the department for an extension of the time period during which shut-in is permitted.*
>
> *(b) Permission for an extension of the time period during which shut-in is permitted shall be granted administratively by the department upon written application therefor by the owner or operator and the demonstration of sufficient good cause. Such extension shall be granted for a period of not more than one year, but shall be renewable for additional successive periods of equivalent length upon receipt of successive petitions from the owner or operator and the demonstration of continued sufficient good cause.*
>
> *(c) Upon termination of the period of lawful shut-in, the owner or operator must begin producing the well or permanently plug and abandon it as provided hereinafter.*

As stated in 6 NYCRR Part 555.3 Temporary Abandonment (emphasis added):

> *(a) It shall be unlawful for the owner or operator of any well to temporarily abandon same **for more than 90 days** without specific permission from the department for an extension of the time period during which temporary abandonment is permitted.*
>
> *(b) Permission for an extension of the time period during which temporary abandonment is permitted shall be granted administratively by the department upon written application therefor by the owner or operator and the demonstration of sufficient good cause. Such extension shall be granted for a reasonable time period and shall be renewable for additional reasonable time periods upon receipt of successive petitions from the owner or operator and the demonstration of continued sufficient good cause.*
>
> *(c) Upon termination of the period of lawful temporary abandonment, the owner or operator must either resume operations or permanently plug and abandon the well as provided hereinafter.*

19.2 Supporting Information

Harvey Consulting's supporting information is weak. The report cites New York State regulations under 6 NYCRR Part 555 but seems to ignore Parts 555.2 and 555.3. Additionallly, statements made regarding other states regulations are not cited. Harvey Consulting states that, "Most states limit temporary abandonment to a one-year period of time, with a wellbore integrity monitoring program requirement to ensure that the well is not leaking during temporary abandonment", however no references are provided to clarify to which states they are referring.

19.3 Mitigation Measures

Harvey Consulting recommends the mitigation measures mentioned in Section 19.0 of this narrative, that Marcellus Shale wells should be plugged and abandoned near drinking water sources and areas of high-volume fracture treatments in a timely fashion and integrity monitoring programs should be required. These measures are suggested by Harvey to protect ground water supplies and the environment. NYSDEC agrees, making it unlawful to shut in a well capable of being produced on a commercial basis for more than one year without specific permission from the department and making it unlawful to temporarily abandon a well for more than 90 days without specific permission.

19.4 Proposed SGEIS Revisions

Harvey Consulting does not propose any revisions to the SGEIS at this time. However, Harvey Consulting proposes that New York State regulations should clearly state *when* Marcellus Shale wells must be plugged and abandoned and be revised accordingly. The purpose of the SGEIS is not to revise regulations and the regulations already address the issue raised by the Harvey report.

No revisions to the SGEIS are proposed by Alpha. The purpose of the SGEIS is not to revise regulations, as proposed by Harvey. Alpha and the NYSDEC agree that "timely" plugging and abandonment are important; however, a specific timeline for plugging and abandonment is neither practical nor necessary. The purpose and lifecycle of different wells can vary considerably.

19.5 List of References

6 NYCRR § 555

Harvey Consulting, LLC., December 28, 2009, *Review of dSGEIS and Identification of Best Technology and Best Practice Recommendations*, Prepared for the Natural Resources Defense Council (NRDC).

NYSDEC, July 1992, *Final Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program.*

NYSDEC, September 2009, *DRAFT Supplemental Generic Environmental Impact Statement On The Oil, Gas and Solution Mining Regulatory Program.*

20.0 COMMENTS ON WELL CONTROL & EMERGENCY RESPONSE PLANNING

Page 37:

Harvey Consulting recommends updating New York State regulations to include best practices for well control and emergency response planning. Harvey contends that the best practice for emergency response is joint industry and local emergency response planning and training. New York State regulations should require the installation of surface-controlled subsurface safety valve (SSSV) system to prevent an uncontrolled gas release in addition to the wellhead controls already required by the state.

20.1 Accuracy and Completeness

Harvey Consulting's comments regarding well control and emergency response planning are not entirely valid. Well control and emergency response planning are covered in New York State regulations, the GEIS, and the dSGEIS.

Emergency procedures and blowout prevention measures are covered in New York State regulations under 6 NYCRR §559.6 for natural gas and oil wells drilled in the Bass Island Trend. With the recent interest in natural gas resources in the Marcellus shale, it may be useful to revise these regulations to include wells completed in formations other than the Bass Island Trend.

Additionally, emergency procedures and blowout prevention measures are covered in the GEIS under Section 9.A.4 (Drilling Safety Considerations) and Section 9.D.1 (Blowout Preventers), respectively. These measures are also covered in the dSGEIS under Section 7.11 (Mitigating Road Use Impacts) and Appendix 10 (Proposed Supplementary Permit Conditions for High-Volume Hydraulic Fracturing).

Section 7.11 of the dSGEIS states that, "Under New York State highway vehicle traffic laws, local municipalities retain control over their roads". Coordination with local emergency management agencies and highway departments would fall under the responsibility of the local municipalities. Therefore, New York State does not provide regulations or requirements for the construction, maintenance, or access of roadways into or out of well pad locations.

Appendix 10 of the dSGEIS provides proposed supplementary permit conditions for high-volume hydraulic fracturing. Under Appendix 10 Section 2, "The county emergency management office (EMO) must be notified of the well's location and the potential hazards involved as follows:

a) prior to spudding the well,
b) during any flaring while drilling,
c) prior to high-volume hydraulic fracturing, and
d) prior to flaring for well clean-up, treatment or testing.

A record of the type, date and time of any notification provided to the EMO must be maintained by the operator and made available to the Department upon request. In counties without an EMO, the local fire department must be notified as described above".

Additionally, under Appendix 10 Sections 19 and 20, individual crew member's responsibilities for blowout control must be posted in the doghouse and each crew member must be made aware of such responsibilities prior to spud; and appropriate pressure control procedures and equipment must be employed while drilling, tripping, logging and running casing into the well.

20.2 Supporting Information

Harvey Consulting references the dSGEIS and New York State regulations under 6 NYCRR §556.2(c). The references are appropriate and accurate for wells outside of the Bass Island Trend. However, New York State has thorough regulations regarding well control and emergency response planning for oil and gas wells within the Bass Island Trend and has proposed supplementary permit conditions for natural gas wells in the dSGEIS. It would be useful to revise the regulations to oil and gas wells completed in formations other than the Bass Island Trend.

20.3 Mitigation Measures

As stated in Section 20.0 of this narrative, Harvey Consulting proposes updating New York State regulations to include best practices for well control and emergency response planning. While New York State has well control and emergency response planning regulations for oil and gas wells located within the Bass Island Trend, these regulations do not apply to wells completed in other formations. New York has proposed supplementary permit conditions for high-volume hydraulic fracturing in these areas.

20.4 Proposed SGEIS Revisions

Harvey Consulting proposes no revisions to the SGEIS at this time. However, they recommend updating New York State regulations to include best practices for well control

and emergency response planning. Also, they state that New York State regulations should require the installation of surface-controlled subsurface safety valve (SSSV) system to prevent an uncontrolled gas release in addition to the wellhead controls already required by the state. The purpose of the SGEIS is not to revise New York State regulations.

No revisions to the SGEIS are proposed by Alpha. The purpose of the SGEIS is not to revise regulations, as proposed by Harvey. Nonetheless, the NYSDEC may find it useful o consider revising regulations pertaining to well control and emergency response planning in the Bass Island to extend to other gas plays.

20.5 List of References

6 NYCRR § 556.2(c)

Harvey Consulting, LLC., December 28, 2009, *Review of dSGEIS and Identification of Best Technology and Best Practice Recommendations*, Prepared for the Natural Resources Defense Council (NRDC).

NYSDEC, July 1992, *Final Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program.*

NYSDEC, September 2009, *DRAFT Supplemental Generic Environmental Impact Statement On The Oil, Gas and Solution Mining Regulatory Program*.

21.0 COMMENTS ON HAZARDOUS AIR POLLUTION (HAP) CONTROL

Pages 37 – 39:

Harvey Consulting asserts that New York State regulations should include best technology and best practices to reduce Hazardous Air Pollution (HAP) to lowest possible level. Harvey Consulting specifically addresses dehydration units, impoundments, and benzene.

Harvey Consulting contends that regulations should require flash-tank separators or vapor collection/destruction units to handle the methane, volatile organic compounds, and HAPs that triethylene glycol (TEG) dehydration units otherwise vent to the atmosphere. Desiccant dehydrators could also replace the TEG units because they are less expensive to purchase, operate and maintain and control 99% of the HAPs.

Harvey contends that the dSGEIS gives inconsistent approaches to pollution mitigation for HAPs, and estimates HAP levels (mostly methanol) at 32.5 tons per year at central impoundments. The EPA considers a source giving off 10 tons per year to be a major source of HAP. Harvey Consulting recommends using closed loop collection and tank systems and routing vapors to a pollution control device. They also recommend identifying

the best control technologies for benzene; the Texas Commission on Environmental Quality has reported high levels of benzene.

It is Alpha's understanding that public comments pertaining to air emissions are being addressed by the NYSDEC, Division of Air.

22.0 COMMENTS ON COMPRESSOR STATIONS, PIPELINES, AND GAS PROCESSING FACILITIES

Page 39:

Harvey Consulting believes the dSGEIS should include and analyze compressor stations, gathering pipelines, and gas processing facilities and identify best technologies and best practices for this equipment. The National Resources Defense Council (NRDC) requested that gathering pipelines and gas processing facilities be included and analyzed in the dSGEIS (NRDC, December 15, 2008). Harvey Consulting asserts that this has not been done.

22.1 Accuracy and Completeness

The Final Scope was released in February 2009. Compressor stations, gathering pipelines, and gas processing facilities are not within the scope of the dSGEIS. The dSGEIS scope concentrated on aspects of horizontal drilling and high-volume hydraulic fracturing not covered by the GEIS, including (NYSDEC, 2009):

- Water withdrawals;
- Transportation of water to the site;
- Fracturing additives;
- Water and additive handling;
- Removal and disposition of flowback;
- Potential impacts at sites where multiple wells will be drilled during a three-year period;
- Noise, visual and air quality considerations;
- Potential cumulative and community impacts;
- The well permitting process; and
- Regulatory coordination.

A supplement to any GEIS must be prepared if the subsequent proposed action was not adequately addressed in the GEIS and the subsequent action may have one or more significant adverse environmental impacts. The additional analysis that Harvey Consulting recommends is beyond the scope of the dSGEIS and therefore, is unnecessary.

22.2 Supporting Information

Harvey Consulting's review referernce NRDC's December 15, 2008 scoping comments.

22.3 Mitigation Measures

Harvey Consulting only addresses adding information to the scope of the dSGEIS and does not recommend mitigation measures relative to compressor stations, gathering pipelines, and gas processing facilities.

22.4 Proposed SGEIS Revisions

No SGEIS revisions are necessary based on the irrelevance of this comment to the SGEIS.

22.5 List of References

Harvey Consulting, LLC., December 28, 2009, *Review of dSGEIS and Identification of Best Technology and Best Practice Recommendations*, Prepared for the Natural Resources Defense Council (NRDC).

NYSDEC, February 6, 2009. *Final Scope for dSGEIS on the Oil, Gas and Solution Mining Regulatory Program; Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and Other Low-Permeability Gas Reservoirs.* http://www.dec.ny.gov/docs/materials_minerals_pdf/finalscope.pdf

23.0 COMMENTS ON NYSDEC ENFORCEMENT PROGRAM

Page 39:

Harvey Consulting asserts that the dSGEIS must demonstrate that NYSDEC has the personnel, equipment, technical expertise, and funding to carry out the inspection and enforcement procedures listed. The National Resources Defense Council (NRDC) requested that the scope of the dSGEIS include a description of NYSDEC's current inspection program for gas wells, including: the budget, inspector qualifications, the number of inspectors, and inspection frequency (NRDC, December 15, 2008). Harvey Consulting asserts that this has not been done.

23.1 Accuracy and Completeness

Harvey Consulting's comment is not accurate because required inspections to reduce or eliminate potential environmental impacts are discussed throughout the dSGEIS. Inspections are required for impoundments, pipelines, storage tanks, casing and cementing, pressure testing, and other elements of shale gas development. NYSDEC's inspection budget has no direct bearing on potential environmental impacts and is not relevant to a GEIS. The qualifications of a state inspector and the manpower the state is not required information for a GEIS under SEQRA (NYSDEC, June 17, 2010). A description of what each inspection entails as well as the required inspection frequencies may be useful information but has no direct bearing on potential environmental impacts.

23.2 Supporting Information

Harvey Consulting's review references NRDC's December 15, 2008 scoping comments.

23.3 Mitigation Measures

Harvey Consulting suggests performing a manpower and resource analysis specific to the Marcellus Shale gas development program to prevent an unexpected shortage of qualified personnel to run the program safely and efficiently.

23.4 Proposed SGEIS Revisions

No revisions to the dSGEIS are proposed to address this comment by Harvey Consulting.

23.5 List of References

Harvey Consulting, LLC., December 28, 2009, *Review of dSGEIS and Identification of Best Technology and Best Practice Recommendations*, Prepared for the Natural Resources Defense Council (NRDC).

NRDC, December 15, 2008 – not found.

NYSDEC, June 17, 2010. 617: *State Environmental Quality Review*, 6 NYCRR § 617.9. http://www.dec.ny.gov/regs/4490.html.

24.0 COMMENTS ON FINANCIAL ASSURANCE AMOUNT

Page 39:

Harvey Consulting's review of the dSGEIS states that NYSDEC should require financial assurance adequate to fund long-term monitoring, public response costs, and the cost of proper remediation and abandonment. The National Resources Defense Council (NRDC) requested that the scope of the dSGEIS include an examination of whether NYSDEC requires sufficient financial assurance (NRDC, December 15, 2008). Harvey Consulting asserts that this has not been done.

24.1 Accuracy and Completeness

Harvey Consulting is correct in their assertion that the dSGEIS does not address financial security requirements in depth, but this is because the implementation of new or increased financial security requirements for gas well activities is outside of the scope of the dSGEIS. Final Scope Section 8.4 states that such an implementation would require legislative action, so it will be evaluated within the context of the legislative process.

DSGEIS Section 5.17 states that NYSDEC requires an applicant to ensure funds for well plugging and abandonment and the means to maintain the financial security for the life of the well before NYSDEC will issue a permit to drill. NYSDEC requires the financial security in the form of a bond, cash, an escrow account, and irrevocable letter of credit, or a certificate of deposit (NYSDEC, 1984). This guarantee of financial security is designed to cover the cost of surface restoration (NYSDEC, June 17, 2010).

It should be noted that the amounts of financial security required by NYS is set by law [ECL 23-0305(8)(k)]. A change in law would be required to update the financial security requirments for gas wells. NYSDEC currently requires $5000 per well in financial security for owners of one to nine wells between 2,500 feet and 6,000 feet deep. A fixed amount of $25,000 in financial security is required of an owner of 10 to 25 wells in the same depth range. Financial security requirement details for more than 25 wells and shallower wells can be found on the NYSDEC website (NYSDEC, 1984). NYSDEC handles the financial security requirements of wells over 6,000 feet deep on a case-by-case basis. 6 NYCRR Part 551.6 states that the financial security for a well that exceeds or is expected to exceed 6,000 feet is an amount based on the anticipated costs of plugging and abandoning that well to the satisfaction of NYSDEC in accordance with Part 555, up to $250,000 per well and up to $2,000,000 for all wells deeper than 6,000 feet belonging to one owner.

24.2 Supporting Information

Harvey Consulting's review references NRDC's December 15, 2008 scoping comments. The review states that "some states require as much as $100,000 to cover a single well."

24.3 Mitigation Measures

The mitigation suggested is that NYSDEC should require adequate financial security to ensure funding for long-term monitoring, public response, and proper remediation and abandonment. Harvey Consulting contends that the SGEIS should provide an analysis and financial security requirements based on the requirements of other states that have experience with horizontal shale gas wells.

24.4 Proposed SGEIS Revisions

It may be useful for the SGEIS to include qualitative information about financial security and for NYSDEC to review the financial security requirements for oil and gas wells. It also is suggested that the classification of wells by depth be clarified to indicate whether the amount of financial security required is based on the total length of the borehole for horizontal wells, or the vertical depth from ground surface. A change in law [ECL 23-0305(8)(k)] would be required to update the financial security requirements for shale gas development in NYS, so it is not appropriate to address this matter in the dSGEIS.

24.5 List of References

Harvey Consulting, LLC., December 28, 2009, *Review of dSGEIS and Identification of Best Technology and Best Practice Recommendations*, Prepared for the Natural Resources Defense Council (NRDC).

NYSDEC, 1984. *Financial Security Worksheet, Form 85-11-2.* http://www.dec.ny.gov/docs/materials_minerals_pdf/fs_wrk.pdf.

NYSDEC, 2008. *Well Plugging and Surface Restoration Bond, Form 85-02-2.* http://www.dec.ny.gov/docs/materials_minerals_pdf/bond_fm.pdf.

NYSDEC, June 17, 2010. *Financial Security*. http://www.dec.ny.gov/energy/1622.html.

NYSDEC, July 13, 2010. Regulations and Enforcement. http://www.dec.ny.gov/65.html.

NRDC, December 15, 2008 – not found.